Lucent Technologies
Bell Labs Innovations

# *LambdaUnite*™ MultiService Switch (MSS)

## Release 2

Installation Guide

365-374-059
CC109192401
Issue a
January 2002

**Notice**

Every effort has been made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change.

**Mandatory customer information**

Always observe the Safety Instructions given in Chapter 1 when operating the system.

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Lucent Technologies
Bell Labs Innovations

*LambdaUnite*™ MultiService Switch (MSS)
Release 2
Installation Guide
365-374-059 Issue a January 2002

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| Level of detail | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Readability and clarity | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Organization | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Completeness | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Technical accuracy | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Quality of translation | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Appearance | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

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________________________________________

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________________________________________

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*Otherwise fax to 407 767 2760 (U.S.) or +1 407 767 2760 (outside the U.S.) or email comments to ctiphotline@lucent.com*

# Contents

# About this information product

**Purpose**

This manual provides information on the installation and configuration of a *LambdaUnite*™ MultiService Switch (MSS) system. Furthermore, all steps for putting the system into operation are also described.

**Reason for reissue**

This is the first version of this manual.

**Safety labels**

The present manual contains basic safety instructions which have to be strictly observed when handling the equipments and systems described.

The most important safety instructions and admonishments are collected in the chapter "Safety" in Chapter 1 of this manual, which must be observed before carrying out work of any kind on the equipments and systems described.

**Intended audience**

This manual is intended for users who wish to install, configure and cable a *LambdaUnite* MultiService Switch (MSS) rack and/or subrack including all accessories.

This requires that the installation staff has a basic knowledge of SDH and SONET technology. Working on the complex equipments and systems described in this manual requires also special training of the personnel.

**Conventions used**

The following conventions are used throughout the manual:

### Numbering

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

### Cross-references

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

### Keyword-blocks

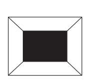
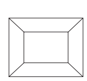
This document contains so-called keyword blocks to facilitate the location of specific text passages. The keyword blocks are placed to the left of the main text and indicate the contents of a paragraph or group of paragraphs.

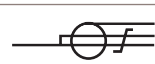
### Abbreviations

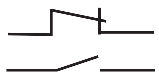
Abbreviations used in this document can be found in the “Glossary” unless it can be assumed that the reader is familiar with the abbreviation.

### Symbols

Symbols Listing:

| | |
|---|---|
|  | Front View |
|  | Rear View |
|  | Top View |
|  | Bottom View |

| | |
|---|---|
| ★6 | Star point. The stars in the figures refer to the descriptions in the text or in the legend. |
|  | Item. The items mentioned in the figures refer to the text or to the list of materials |
| ☐ | Washer |
| ■ | Ground Washer |
| • | Spring Washer |
| ⊙ | Hexagon Nut |
| ◊ | Self-Tapping Screw |
| ∇ | Flat-Head Screw |
| 762 [ 30" ] | Measurements. All dimensions are in millimeters with the corresponding measurement in inches in parentheses. |
| M12x50<br>☐4.2x11<br>⊙M4 | Notation of fastening materials. The notation is divided into two parts: above the line, the bolt or screw, plus washer(s) if needed and below the line, the nut, plus any washer(s). |
|  | Pin Connector |
|  | Socket Connector |
|  | Optical-Fiber Connection |
|  | Coaxial Cable |
|  | Shielded Twisted-Pair Cable |
|  | Optical Cable |
|  | Paddle Board |

| | |
|---|---|
|  | Alarm Lamp |
|  | Fuse |
|  | Circuit Breaker |
|  | Relay Contacts |
|  | Cable Number |
|  | View of the cabling side of the connector |

### DC codes

The Design Codes (DC) in this manual are used to define a hardware item owned by the Lucent Technologies Development Systems. The code consists of a DC followed by a 7-digit number (Example: DC1234567).

## Related documentation

This section briefly describes the documents that are included in the *LambdaUnite* MultiService Switch (MSS) documentation set.

- Installation Guide
  The *LambdaUnite* MSS Installation Guide is a step-by-step guide to system installation and setup. It also includes information needed for pre-installation site planning and post-installation acceptance testing.
- Applications and Planning Guide
  The *LambdaUnite* MSS Applications and Planning Guide (APG) is for use by network planners, analysts and managers. It is also for use by the Lucent Account Team. It presents a detailed overview of the system, describes its applications, gives planning requirements, engineering rules, ordering information, and technical specifications.
- User Operations Guide
  The *LambdaUnite* MSS User Operations Guide provides step-by-step information for use in daily system operations. The manual demonstrates how to perform system provisioning, operations, and administrative tasks by use of WaveStar® CIT.

- Alarm Messages and Trouble Clearing Guide
  The *LambdaUnite* MSS Alarm Messages and Trouble Clearing Guide gives detailed information on each possible alarm message. Furthermore, it provides procedures for routine maintenance, troubleshooting, diagnostics, and component replacement.
- Operations System Engineering Guide
  The *LambdaUnite* MSS Operations System Engineering Guide serves as a reference for all TL1 commands which can be used to operate the network element. The manual gives an introduction to the concept of the TL1 commands and instructs how to use them.
- *Navis*™ Optical EMS Provisioning Guide (Application *LambdaUnite* MSS)
  The *Navis* Optical EMS Provisioning Guide (Application *LambdaUnite* MSS) gives instructions on how to perform system provisioning, operations, and administrative tasks by use of *Navis* Optical EMS.

The following table lists the documents included in the *LambdaUnite* MSS documentation set.

| **Document Number** | **Title** |
|---|---|
| 109088625<br>(365-374-052) | *LambdaUnite* MSS Application and Planning Guide,<br>DIN A4 |
| 109192385<br>(365-374-053) | *LambdaUnite* MSS Application and Planning Guide,<br>US Letter |
| 109088633<br>(365-374-054) | *LambdaUnite* MSS User Operations Guide,<br>DIN A4 |
| 109192393<br>(365-374-055) | *LambdaUnite* MSS User Operations Guide,<br>US Letter |
| 109088682<br>(365-374-056) | *LambdaUnite* MSS Alarm Messages and Trouble Clearing Guide,<br>DIN A4 |
| 109192377<br>(365-374-057) | *LambdaUnite* MSS Alarm Messages and Trouble Clearing Guide,<br>US Letter |

| Document Number | Title |
|---|---|
| 109088641 (365-374-058) | *LambdaUnite* MSS Installation Guide, DIN A4 |
| 109192401 (365-374-059) | *LambdaUnite* MSS Installation Guide, US Letter |
| 109088658 (365-374-060) | *LambdaUnite* MSS Operations System Engineering Guide (TL1 Reference Manual), DIN A4 |
| 109192419 (365-374-061) | *LambdaUnite* MSS Operations System Engineering Guide (TL1 Reference Manual), US Letter |
| 109088674 (365-374-062) | *Navis* Optical EMS Provisioning Guide (Application *LambdaUnite* MSS), DIN A4 |
| 109192369 (365-374-063) | *Navis* Optical EMS Provisioning Guide (Application *LambdaUnite* MSS), US Letter |
| 109192427 (365-374-064) | *LambdaUnite* MSS Safety Guide, DIN A4 |
| 109192435 (365-374-065) | *LambdaUnite* MSS Safety Guide, US Letter |
| 109088666 | *LambdaUnite* MSS CD-ROM Customer Documentation (all manuals on one CD-ROM) |

The following additional documents can be helpful for planning and ordering:

- Ordering & Information Drawings
- Cable Ordering & Information Drawings

## How to comment

As customer satisfaction is extremely important to Lucent Technologies, every attempt is made to encourage feedback from customers about our information products.

### Customer Comment Form

A customer comment form is located immediately after the title page of this document. Please fill out the form and fax it to the number provided on the form.

If the customer comment form is missing, send or fax comments about this document to:

Lucent Technologies Network Systems GmbH

Lucent Learning ONG

Thurn-und-Taxis-Str. 10

90411 Nuernberg, Germany

Fax: +49 911 526 3545

# 1 Safety

## Overview

**Purpose**

The aim of this chapter on safety is to provide users of *LambdaUnite*™ MSS systems with the relevant information and safety guidelines to safeguard against personal injury. Furthermore, this chapter may be useful to prevent material damage to the equipment.

The present chapter on safety ***must*** be read by the responsible technical personnel before carrying out relevant work on the system. The valid version of this document must always be kept close to the equipment.

**Potential sources of danger**

The *LambdaUnite* MSS equipment has been developed in line with the present state-of-the-art and fulfils the current national and international safety requirements. It is provided with a high degree of operational safety resulting from many years of development experience and continuous stringent quality checks in our company.

The equipment is safe in normal operation. There are, however, some potential sources of danger that cannot be completely eliminated. In particular, these arise during the:

- opening of housings or equipment covers,
- manipulation of any kind within the equipment, even if it has been disconnected from the power supply,
- disconnection of optical or electrical connections,

through possible contact with the following:

- live parts,
- laser light,
- hot surfaces, or
- sharp edges

## Contents

# General Notes on Safety

## Overview

**Purpose**

This section provides general information on the structure of safety instructions and summarizes general safety requirements.

**Contents**

# Structure of Safety Instructions

**General structure**

All safety instructions include a ***warning symbol*** and a ***signal word*** that classify the danger, and a ***text block*** that contains descriptions of the type and cause of the danger, the consequences of ignoring the safety instruction and the measures that can be taken to minimise the danger.

**Example:**

**DANGER**

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

*Arcing can cause burns to the hands and damage to the eyes.*

*Ensure that the line circuit breaker on the Power Interface (PI) is in the "OFF" position before removing or inserting the power supply plug.*

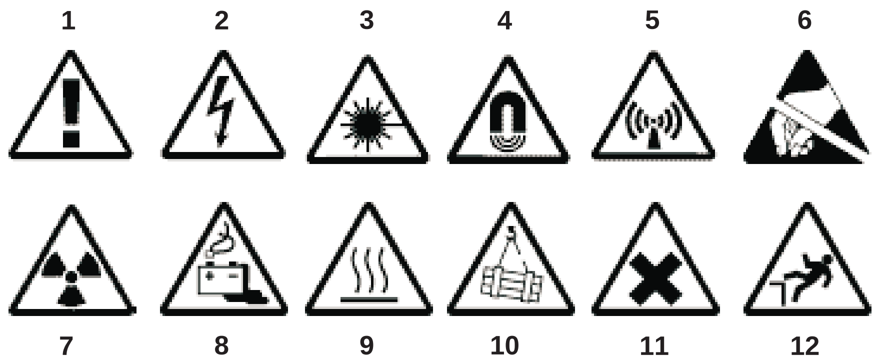
**Danger classification**

There are three classes of safety instructions: "DANGER", "WARNING" and "CAUTION". Which class is relevant depends on the consequences of ignoring the safety instruction:

| | |
|---|---|
| DANGER | Serious injury is definite or likely. |
| WARNING | Serious injury is possible. |
| CAUTION | Minor injury is definite, likely or possible, or material damage to the product or in the product environment is definite or likely. |

**Warning symbols**

These warning symbols are defined for safety instructions:




**Legend:**

| | |
|---|---|
| 1 | General warning of danger |
| 2 | Electric shock |
| 3 | Hazard of laser radiation |
| 4 | Magnetic hazard |
| 5 | Electromagnetic radiation |
| 6 | Components sensitive to electrostatic discharge (ESD) |
| 7 | Radioactivity |
| 8 | Hazard caused by batteries |
| 9 | Hot surface |
| 10 | Heavy load |
| 11 | Unhealthy, irritating substance |
| 12 | Hazard of falling |

□

# Basic Safety Aspects

**General safety requirements**

In order to keep the technically unavoidable residual risk to a minimum, it is imperative to observe the following rules:

- Transport, storage and operation of the system must be under the ***permissible conditions only***.
  See accompanying documentation and information on the system.
- Installation, configuration and disassembly must be carried out only by ***expert personnel*** and ***with reference to the respective documentation***.
  Due to the complexity of the system, the personnel requires ***special training***.
- The system must be operated by ***expert and authorised users only***.
  The user must operate the system only after having ***read and understood*** this chapter on safety and the parts of the documentation relevant to operation. For complex systems, additional training is recommended. Any obligatory training for operating and service personnel must be carried out and documented.
- The system must not be operated unless it is in perfect working order.
  Any faults and errors that might affect safety must be reported ***immediately*** by the user to a person in responsibility.
- The system must be operated only with the connections and under the environmental conditions as described in the documentation.
- Any conversions or changes to the system or parts of the system (including the software) must be carried out by qualified Lucent Technologies personnel or by expert personnel authorised by Lucent Technologies.
  All changes carried out by other persons lead to a ***complete exemption from liability***.
  No components/spare parts must be used other than those recommended by the manufacturer and those listed in the procurement documents.
- The removal or disabling of safety facilities, the clearing of faults and errors, and the maintenance of the equipment must be carried out by ***specially qualified personnel only***.

The respective parts of the documentation must be strictly observed. The documentation must also be consulted during the selection of measuring and test equipment.

- Calibrations, special tests after repairs and regular safety checks must be carried out, documented and archived.
- Non-system software is used at one's ***own risk***. The use/installation of non-system software can adversely affect the normal functioning of the system.
- Only use ***tested and virus-free*** data carriers (floppy disks, streamer tapes, …).

**Summary of important safety instructions**

Especially observe the following safety instructions, since they are of particular importance for *LambdaUnite*™ MSS systems:

- This equipment is to be installed only in ***Restricted Access Areas*** in business and customer premises.
  Applications in accordance with Articles 110-16, 110-17 and 110-18 of the National Electrical Code, ANSI/NFPA No. 70. Other installations exempt from the enforcement of the National Electrical Code may be engineered according to the accepted practices of the local telecommunications utility.
- This product should only be operated from the type of power source indicated on the marking label.
- This equipment must be provided with a readily accessible disconnect device as part of the building installation.
- Disconnect up to four (4) power supply connections when removing power from the system.
- Installation must include an independent frame ground drop to the building ground. Refer to the *LambdaUnite MSS Installation Guide*.
- For information on proper mounting instructions, consult the *LambdaUnite MSS Installation Guide*.
- Install only equipment identified in the *LambdaUnite MSS Installation Guide* provided with this product. Use of other equipment may result in improper connection of circuitry leading to fire or injury to persons.

- To reduce the risk of electrical shock, do not disassemble this product. Installation and 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 re-assembly can cause electrical shock when the unit is subsequently used.
- Slots and openings in this product are provided for ventilation. To protect the product from overheating, these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided.
- 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.
- CAUTION: This equipment is designed to permit the connection of the grounded conductor of the DC supply circuit to the grounding conductor at the equipment.
    1. This equipment shall be connected directly to the DC supply system grounding electrode conductor or to a bonding jumper from a grounding terminal bar or bus to which the DC supply system grounding electrode conductor is connected.
    2. This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection between the grounded conductor of the same DC supply circuit and the grounding conductor, and also the point of grounding of the DC system. The DC system shall not be grounded elsewhere.
    3. The DC supply source is to be located within the same premises as this equipment.
    4. There shall be no switching or disconnection devices in the grounded circuit conductor between the DC source and the point of connection of the grounding electrode conductor.

## CAUTION

*LambdaUnite MSS systems contain optical circuit packs that can emit laser radiation assessed as IEC Hazard Level 3A.*

*Therefore, LambdaUnite MSS systems may only be installed in restricted access locations! Restricted access locations are controlled environments where there is no ready access to the general public, but only to authorized persons who have received adequate training in laser safety.*

# Specific Safety Areas

## Overview

**Purpose**

The aspects of "laser safety" and "handling of components sensitive to electrostatic discharge (ESD)" are of vital importance for the *LambdaUnite*™ MSS equipment. Therefore, the key safety instructions for these subjects are summarised in the following.

**Contents**

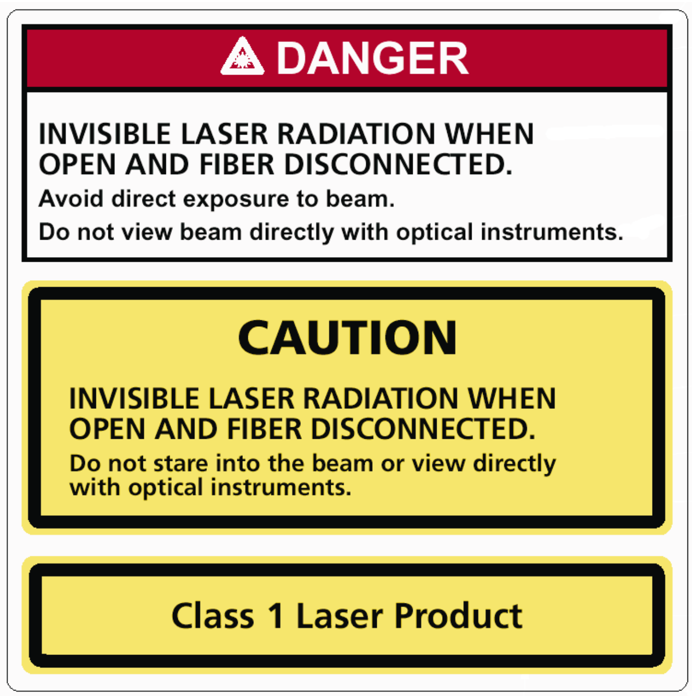
# Laser Safety

**System design**

The *LambdaUnite*™ MSS system complies with the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) regulations FDA/CDRH 21 CFR 1040.10 and 1040.11 as a Class I and with IEC 60825-1 as a Class 1 Optical Fiber Telecommunication laser product.

The system has been designed to ensure that the operating personnel is not endangered by laser radiation during normal system operation. The safety measures specified in the FDA/CDRH regulations and the international standards IEC 60825 and DIN/EN 60825 respectively are met. Please also refer to "Laser Product Classification" (1-15).

These laser warning labels (not to scale) are affixed on the *LambdaUnite* MSS equipment. They refer to the system as a whole in normal operation.




**Potential sources of danger**

Beware of the following potential sources of danger which will remain despite all safety measures taken:

- Laser radiation can cause damage to the skin and eyes.
- Laser radiation from optical transmission systems is in a wavelength range that is invisible to the human eye.

**Laser classes**

The maximum output power of laser radiation depends on the type of laser diode used. The international standards IEC 60825 and DIN/EN 60825 respectively as well as the FDA/CDRH regulations define the maximum output power of laser radiation for each laser class in accordance with the wavelength.

The classification scheme is based on the ability of the laser emission or the reflected laser emission to cause injury to the eye or skin during normal operating conditions.

Please also refer to "Laser Product Classification" (1-15).

**Laser safety instructions**

Observe the following instructions to avoid exposing yourself and others to risk:

- Read the relevant descriptions in the manuals before taking equipment into operation or carrying out any installation and maintenance work on the optical port units, and follow the instructions. Ignoring the instructions may result in hazardous laser radiation exposure.
- Do not view directly into the laser beam with optical instruments such as a fiber microscope, because viewing of laser emission in excess of Class 1 limits significantly increases the risk of eye damage.
- Never look into the end of an exposed fiber or an open connector as long as the optical source is still switched on.

- Ensure that the optical source is switched off or before disconnecting optical fiber connectors.
- In the event of doubt, check that the optical source is switched off by measuring with an optical power meter.

**CAUTION**

*Use of controls, adjustments and procedures other than those specified herein may result in hazardous laser radiation exposure.*

□

# Optical Circuit Pack Specifications

**Specifications** The following table contains the specifications of the *LambdaUnite*™ MSS optical circuit packs.

| Circuit pack | Wavelength [nm] | Fiber type[1] (core/cladding diameter [μm]) | Maximum output power [mW / dBm] | Laser class[2] (IEC / FDA) |
|---|---|---|---|---|
| ***2.5-Gbit/s optical circuit packs*** | | | | |
| OP2G5/1.3IOR4 (KFA12) | 1310 | SM (9/125) | 0.5 / −3 | 1 / I |
| ***10-Gbit/s optical circuit packs*** | | | | |
| OP10/1.3IOR1 (KFA7) | 1310 | SM (9/125) | 0.8 / –1 | 1 / I |
| OP10/1.5IR1 (KFA14) | 1550 | SM (9/125) | 1.6 / +2 | 1 / I |
| OP10/1.5LR1 (KFA6) | 1550 | SM (9/125) | 2 / +3 | 1 / I |
| OP10/01…80/800G (KFA9, KFA81…159) | 1530.72 … 1562.23 | SM (9/125) | 1.6 / +2 | 1 / I |
| OP10/01…16/PWDM (KFA11, KFA61…75) | 1530.33 … 1560.61 | SM (9/125) | 2.5 / +4 | 1 / I |
| ***Gigabit-Ethernet circuit pack*** | | | | |
| GE1/SX/4 (KFA13) | 850 | MM (50/125) | 0.4 / −4 | 1 / I |

**Notes:**

1. SM: Single-mode fiber, MM: multi-mode fiber.
2. It is the class of the circuit pack, not that of the telecommunications system as a whole, that is specified.

**Connector types** All optical circuit packs are equipped with LC-type connectors.

□

# Laser Product Classification

**Standards compliance**

The *LambdaUnite*™ MSS product complies with the applicable IEC standards and the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) regulations.

**FDA/CDRH regulations**

Laser products are classified in accordance with the FDA/CDRH - 21 CFR 1010 and 1040. The classification scheme is based on the ability of the laser emission to cause injury to the eye or skin during normal operating conditions.

In the United States, lasers and laser systems in the infrared wavelength range (greater than 700 nm) are assigned to one of the following classes (please refer to "FDA/CDRH laser classification" (1-16)):

- Class I,
- Class IIIb or
- Class IV.

Laser classification is dependent upon operating wavelength, output power and fiber mode field diameter (core diameter).

**IEC requirements**

The International Electro-Technical Commission (IEC) establishes standards for the electrical and electronic industries. IEC 60825 has been established for the worldwide safety of laser products.

According to the IEC classification, lasers and laser systems in the infrared wavelength range (greater than 700 nm) are assigned to one of the following classes (please refer to "IEC laser classification" (1-16)):

- Class 1,
- Class 3A,
- Class 3B or
- Class 4.

There are some major differences between the FDA/CDRH regulations and the IEC requirements:

1. The Accessible Emission Limits (AEL) are different.
2. Class 3A applies to all wavelengths.

3. Class 3B requires strict engineering controls.
4. Classification is under single fault conditions.

**FDA/CDRH laser classification**

The following table provides an overview of laser classes for wavelengths of 1310 nm and 1550 nm in accordance with the FDA/CDRH regulations.

| Laser class | Wavelength | Max. output power of laser radiation | |
|---|---|---|---|
| I | 1310 nm | 1.53 mW | +1.85 dBm |
| | 1550 nm | 8.52 mW | +9.3 dBm |
| IIIb | 1310 nm | 500 mW | +27 dBm |
| | 1550 nm | 500 mW | +27 dBm |
| IV | 1310 nm | > 500 mW | > +27 dBm |
| | 1550 nm | > 500 mW | > +27 dBm |

Explanatory note: In the United States, lasers and laser systems are assigned to one of the following classes: Roman numerals I, IIa, II, IIIa, IIIb, and IV. Classes I, IIIb and IV apply to lasers of all wavelengths. Classes IIa, II and IIIa apply only to those lasers operating within the visible wavelength range (400-700 nm). Lucent Technologies laser products typically operate in the infrared wavelength range (greater than 700 nm) and, therefore, are primarily in the class I or class IIIb classifications.

**IEC laser classification**

The following table provides an overview of laser classes for wavelengths of 1310 nm and 1550 nm in accordance with the IEC 60825 standard.

| Laser class | Wavelength | Max. output power of laser radiation | |
|---|---|---|---|
| 1 | 1310 nm | 8.85 mW | +9.5 dBm |
| | 1550 nm | 10 mW | +10 dBm |
| 3A | 1310 nm | 24 mW | +13.8 dBm |
| | 1550 nm | 50 mW | +17 dBm |
| 3B | 1310 nm | 500 mW | +27 dBm |
| | 1550 nm | 500 mW | +27 dBm |

| Laser class | Wavelength | Max. output power of laser radiation | |
|---|---|---|---|
| 4 | 1310 nm | > 500 mW | > +27 dBm |
| | 1550 nm | > 500 mW | > +27 dBm |

**Hazard level assignment**

"Hazard level" refers to the potential hazard from laser emission at any location in an end-to-end optical fiber communication system that may be accessible during service or in the event of a failure. The assignment of hazard level uses the AELs for the classes.

Hazard levels for optical transmission equipment are assigned in either of the following two ways:

- the actual output power from the connector or fiber cut.
- if automatic power reduction is used, the output power at the connector or fiber cut at one second after automatic power reduction takes place, provided that maximum output and restart conditions are met.

**Classification of optical telecommunication equipment**

Optical telecommunication equipment is generally classified as IEC Class 1 or FDA/CDRH Class I, because under normal operating conditions the transmitter ports terminate on optical fiber connectors. These are covered by a front panel to ensure protection against emissions from any energized, unterminated transmitter.

The circuit packs themselves, however, may be IEC Class 1 or 3A or FDA/CDRH Class I or IIIb.

□

# Electrostatic Discharge

**Introduction**

Electrostatic discharge (ESD), caused by touching with the hand for example, can destroy semiconductor components. The correct operation of the complete system is then no longer assured.

Industry experience has shown that ***all*** semiconductor components can be damaged by static electricity that builds up on work surfaces and personnel. The electrostatic discharge can also affect the components indirectly via contacts or conductor tracks. The electrostatic charges are produced by various charging effects of movement and contact with other objects. Dry air allows greater static charges to accumulate. Higher potentials are measured in areas with low relative humidity, but potentials high enough to cause damage can occur anywhere.

**The barred-hand symbol**

Circuit packs containing components that are especially sensitive to electrostatic discharge are identified by warning labels bearing the barred-hand symbol.

**ESD instructions**

Observe the following ESD instructions to avoid damage to electrostatic-sensitive components:

- Wear working garment made of 100% cotton to avoid electrostatic charging.
- Touch the circuit packs at the edges or the insertion and removal facilities only.
- Ensure that the rack is grounded.
- Wear conductively connected wrist straps and connect them to the rack ESP bonding point.
- Work in an area which is protected against electrostatic discharge. Use conducting floor and bench mats which are conductively connected to the rack ESP bonding point.
- Conductively connect all test equipment and trolleys to the rack ESP bonding point.

- Store and ship circuit packs and components in their shipping packing. Circuit packs and components must be packed and unpacked only at workplaces suitably protected against build-up of charge.
- Whenever possible, maintain the relative humidity of air above 20%.

□

# Safety Requirements in Specific Deployment Phases

## Overview

**Purpose**

To enable rapid orientation, safety instructions are given on the following pages, which are assigned to various stages in the life cycle of the *LambdaUnite*™ MSS equipment (“deployment phases”).

**Deployment phases**

The instructions are arranged according to the following deployment phases:


- “Transportation” (1-21)
- “Storage” (1-24)
- “Installation” (1-26)
- “Taking into Operation” (1-29)
- “Operation and Maintenance” (1-31)
- “Taking out of Operation” (1-36)


□

# Transportation

### Weight

## WARNING

**Risk of injury due to unsecured shelf.**

*A fully-equipped shelf weighs more than 30 kg (66 lbs) and can cause considerable injuries if it is knocked over or dropped. This can also cause serious damage to the shelf.*

*Use a sturdy vehicle for transportation and secure the shelf against dropping. At least two persons are required for lifting the shelf.*

### Packaging

## CAUTION

**Adverse effect on operation due to incorrect packaging.**

*Dampness and soiling can cause corrosion or tracking paths. This can cause malfunctioning of the system components. Shocks can cause damage.*

*Protect the system components against dampness, soiling and shocks. Use the original packaging if possible.*

### Climatic conditions

**CAUTION**

**Damage to system components under extreme environmental conditions.**

*Extreme environmental conditions can damage system components and cause malfunctioning.*

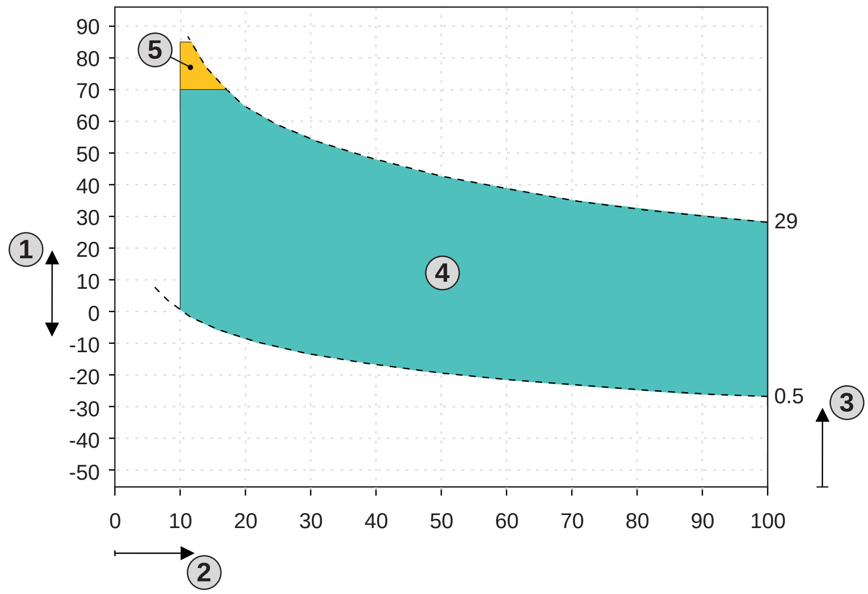
*Ensure that the climatic limits for transportation and storage of LambdaUnite™ MSS equipment are complied with during transportation; please refer to* *"Climatic limits for transportation and storage" (1-22)*.

### Climatic limits for transportation and storage

These are the climatic limits for transportation and storage of *LambdaUnite* MSS systems:

| | |
|---|---|
| Temperature range | -40 °C (-40 °F) to +70 °C (+158 °F)<br>(exceptional: +85 °C (+185 °F)) |
| Humidity range | relative humidity: 10% to 100%<br>absolute humidity: 0.5 g/m$^3$ to 29 g/m$^3$ |

The following climatogram visualizes these climatic limits:




**Legend:**

1 Air temperature [°C]

2 Relative humidity [%]

3 Absolute humidity [g/m$^3$]. The dashed curves specify a constant absolute humidity of 0.5 g/m$^3$ or 29 g/m$^3$, respectively.

4 Permissible range for transportation and storage of *LambdaUnite* MSS systems.

5 Exceptional conditions, permissible for a short duration only.

□

# Storage

**Weight**

**WARNING**

**Risk of injury due to unsecured shelf.**

*A fully-equipped shelf weighs more than 30 kg (66 lbs) and can cause considerable injuries if it is knocked over or dropped. This can also cause serious damage to the shelf.*

*Use only a stable base for storage and secure the shelf against dropping. At least two persons are required for lifting the shelf.*

**Electrostatic discharge (ESD)**

**CAUTION**

**Destruction of components by electrostatic discharge.**

*Electronic components can be destroyed by electrostatic discharge.*

*Circuit packs must therefore always be kept in antistatic covers. Use the original packaging if possible. Always observe the ESD instructions (cf. "Electrostatic Discharge" (1-18)).*

**Packaging**

**CAUTION**

**Adverse effect on operation due to incorrect packaging.**

*Dampness and soiling can cause corrosion or tracking paths. This can cause malfunctioning of the system components. Shocks can cause damage.*

*Protect the system components against dampness, soiling and shocks. Use the original packaging if possible.*

### Climatic conditions

**CAUTION**

**Damage to system components under extreme environmental conditions.**

*Extreme environmental conditions can damage system components and cause malfunctioning.*

*Ensure that the climatic limits for transportation and storage of LambdaUnite™ MSS equipment are complied with during storage; please refer to* *"Climatic limits for transportation and storage" (1-22)*.

□

# Installation

#### Weight

**WARNING**

**Risk of injury due to unsecured shelf.**

*A fully-equipped shelf weighs more than 30 kg (66 lbs) and can cause considerable injuries if it is knocked over or dropped. This can also cause serious damage to the shelf.*

*At least two persons are required for lifting the shelf.*

#### Laser warning labels

**WARNING**

**Ineffectiveness of laser warning labels if removed or concealed.**

*Warning labels on the system and especially on the optical components warn of the dangers of invisible laser radiation. Removed, concealed or illegible labels can lead to incorrect action and thus cause serious injuries to the eyes of operating staff.*

*Ensure that the laser warning labels are not removed or concealed and always clearly legible.*

#### Electrostatic discharge (ESD)

## CAUTION

**Destruction of components by electrostatic discharge.**

*Electronic components can be destroyed by electrostatic discharge.*

*Hold circuit packs only at the edges or on the insertion and removal facilities. Always observe the ESD instructions (cf. "Electrostatic Discharge" (1-18)).*

### Overheating

## CAUTION

**Risk of fire due to overheating.**

*Inadequate heat dissipation can cause heat accumulation or even a fire in the network element.*

*You must therefore ensure that*

- *the fan unit is installed,*
- *the individual fans are not obstructed,*
- *the minimum separation is maintained between two shelves in a rack (follow the installation instructions given in the LambdaUnite™ MSS Installation Guide).*

### Detector diodes

**CAUTION**

**Destruction of the detector diodes caused by too high an input power.**

*Connecting the output and input of optical circuit packs with a transmit power in excess of -3 dBm over short distances will cause the destruction of the detector diodes, as the input power is then too high.*

*Use an optical attenuator pad of approx. 10 to 20 dB when establishing connections over short distances for test purposes.*

□

# Taking into Operation

### Invisible laser radiation

**DANGER**

**Injury to eyes caused by invisible laser radiation.**

*LambdaUnite™ MSS systems operate with invisible laser radiation. Laser radiation can cause considerable injuries to the eyes.*

*Never look into the end of an exposed fiber or into an open optical connector as long as the optical source is switched on. Always observe the laser warning instructions (cf. “Laser Safety” (1-11)).*

### Arcing

**DANGER**

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

*Arcing can cause burns to the hands and damage to the eyes.*

*Ensure that the line circuit breaker on the Power Interface (PI) is in the “OFF” position before removing or inserting the power supply plug.*

### Supply voltage

**CAUTION**

**Destruction of components due to a supply voltage of incorrect polarity or too high.**

*LambdaUnite MSS equipment operates at a nominal voltage of -48 V or -60 V. The permissible tolerance range is -40.5 V to -72 V.*

*Ensure that the supply voltage has the correct range and polarity before connecting the voltage.*

### Fusing

**CAUTION**

**Risk of fire in the event of a short-circuit.**

*A short-circuit can cause a fire in the network element.*

*Protect all supply lines with line circuit breakers matched to the load of the shelf equipment. Note the relevant guide values in the LambdaUnite MSS Installation Guide.*

### Condensation

**CAUTION**

**Condensation causes malfunctioning**

*Condensation can occur in the network element during transport, especially on moving from outside to closed rooms; this can cause malfunctioning of the circuit packs.*

*Ensure that circuit packs and shelves have reached room temperature and are dry before taking them into operation.*

□

# Operation and Maintenance

### Invisible laser radiation

**DANGER**

**Injury to eyes caused by invisible laser radiation.**

*LambdaUnite™ MSS systems operate with invisible laser radiation. Laser radiation can cause considerable injuries to the eyes.*

*Never look into the end of an exposed fiber or into an open optical connector as long as the optical source is switched on. Always observe the laser warning instructions (cf. "Laser Safety" (1-11)).*

### Arcing

**DANGER**

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

*Arcing can cause burns to the hands and damage to the eyes.*

*Ensure that the line circuit breaker on the Power Interface (PI) is in the "OFF" position before removing or inserting the power supply plug.*

### Laser warning labels

## WARNING

**Ineffectiveness of laser warning labels if removed or concealed.**

*Warning labels on the system and especially on the optical components warn of the dangers of invisible laser radiation. Removed, concealed or illegible labels can lead to incorrect action and thus cause serious injuries to the eyes of operating staff.*

*Ensure that the laser warning labels are not removed or concealed and always clearly legible.*

### Electrostatic discharge (ESD)

## CAUTION

**Destruction of components by electrostatic discharge.**

*Electronic components can be destroyed by electrostatic discharge.*

*Hold circuit packs only at the edges or on the insertion and removal facilities. Always observe the ESD instructions (cf.* *"Electrostatic Discharge" (1-18)**).*

### Overheating

**CAUTION**

**Risk of fire due to overheating.**

*Inadequate heat dissipation can cause heat accumulation or even a fire in the network element.*

*You must therefore ensure that*

- *the fan unit is installed,*
- *the individual fans are not obstructed,*
- *the minimum separation is maintained between two shelves in a rack (follow the installation instructions given in the LambdaUnite MSS Installation Guide).*

**Detector diodes**

**CAUTION**

**Destruction of the detector diodes caused by too high an input power.**

*Connecting the output and input of optical circuit packs with a transmit power in excess of -3 dBm over short distances will cause the destruction of the detector diodes, as the input power is then too high.*

*Use an optical attenuator pad of approx. 10 to 20 dB when establishing connections over short distances for test purposes.*

**Short-circuit**

**CAUTION**

**Destruction of circuit packs in the event of a short-circuit.**

*A short-circuit in the network element can cause destruction of electronic components and thus malfunctioning of the complete system.*

*You must therefore not handle objects such as a screwdriver in the circuit pack area of the shelf.*

### Test voltage

**CAUTION**

**Destruction of components due to test voltage of incorrect polarity or too high.**

*The use of test voltages above 6 V DC for measurements on circuit packs can cause destruction of components and thus malfunctioning of the complete system.*

*Ensure that the test voltage does not exceed 6 V DC and that the test equipment is connected with the correct polarity.*

### Climatic conditions

**CAUTION**

**Damage to system components under extreme environmental conditions.**

*Extreme environmental conditions can damage system components and cause malfunctioning.*

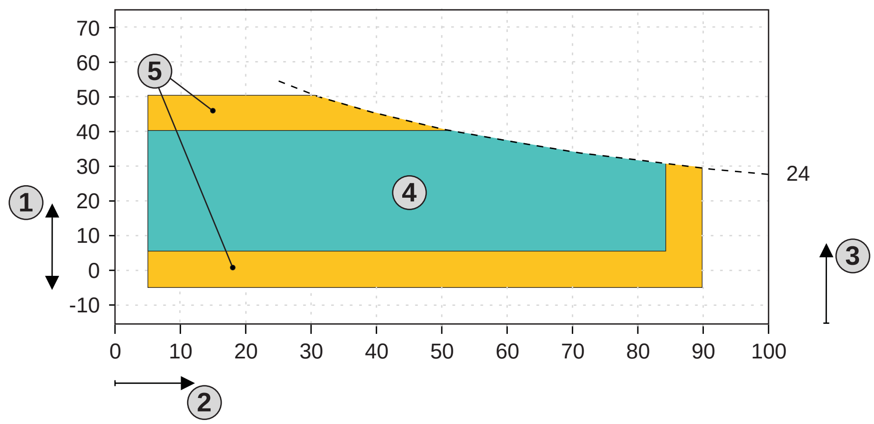
*Ensure that the "Climatic limits for the operation of LambdaUnite MSS equipment" (1-35) are complied with during operation.*

### Climatic limits for the operation of *LambdaUnite* MSS equipment

These are the climatic limits for the operation of *LambdaUnite* MSS systems:

| | |
|---|---|
| Temperature range | +5 °C (+41 °F) to +40 °C (+104 °F)<br>(exceptional: +50 °C (+122 °F)) |
| Humidity range | relative humidity: 5% to 85% (exceptional: 90%),<br>absolute humidity: 0 to 24 g water per kg dry air |

The following climatogram visualizes these climatic limits:




**Legend:**

1 Air temperature [°C]

2 Relative humidity [%]

3 Absolute humidity [g water/kg dry air]. The dashed curve specifies a constant absolute humidity of 24 g water per kg dry air.

4 Permissible range for the operation of *LambdaUnite* MSS systems.

5 Exceptional conditions, permissible for a short duration only.

# Taking out of Operation

### Invisible laser radiation

**DANGER**

**Injury to eyes caused by invisible laser radiation.**

*LambdaUnite™ MSS systems operate with invisible laser radiation. Laser radiation can cause considerable injuries to the eyes.*

*Never look into the end of an exposed fiber or into an open optical connector as long as the optical source is switched on. Always observe the laser warning instructions (cf.* *"Laser Safety" (1-11)**).*

### Arcing

**DANGER**

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

*Arcing can cause burns to the hands and damage to the eyes.*

*Ensure that the line circuit breaker on the Power Interface (PI) is in the "OFF" position before removing or inserting the power supply plug.*

### Weight

### WARNING

**Risk of injury due to unsecured shelf.**

*A fully-equipped shelf weighs more than 30 kg (66 lbs) and can cause considerable injuries if it is knocked over or dropped. This can also cause serious damage to the shelf.*

*At least two persons are required for lifting the shelf.*

**Electrostatic discharge (ESD)**

### CAUTION

**Destruction of components by electrostatic discharge.**

*Electronic components can be destroyed by electrostatic discharge.*

*Hold circuit packs only at the edges or on the insertion and removal facilities. Always observe the ESD instructions (cf.* *"Electrostatic Discharge" (1-18)**).*

**Disposal**

The equipment in the *LambdaUnite* MSS system series must be disposed of at the end of its lifetime. Please contact us in this case and we will arrange for proper and environment-friendly disposal of your equipment (most parts of the system can be recycled).

□

# 2 Overall Installation and Test Planning

## Overview

**Purpose**

The purpose of this chapter is to provide the information needed to plan the installation of a *LambdaUnite*™ MultiService Switch (MSS) system.

**Contents**

# Important Facts to Know

**Floorplan guidelines (ETSI-2 / NEBS-2000)**

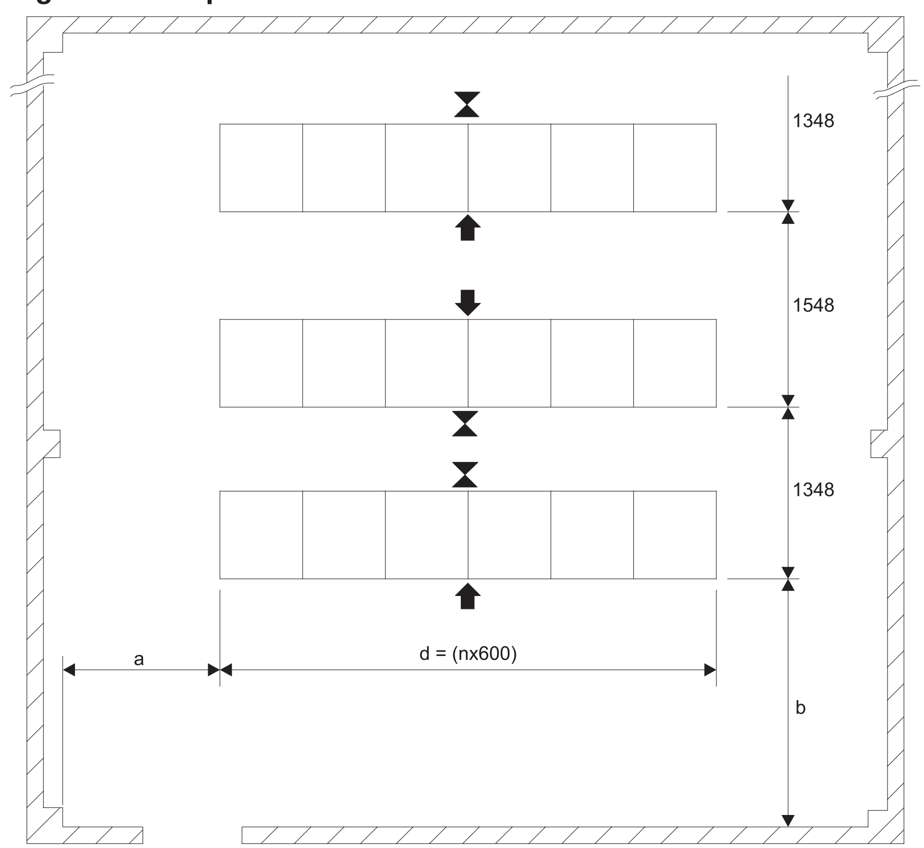
This section describes the floorplan data for both rack types (ETSI-2 and NEBS-2000).

***NOTE:*** For exact measurements see the relevant project documents. Local circumstances can allow deviations from these guidelines.

Use the following figures and data as guidelines:

- a = >1200 mm [47.244”]
- b = >1800 mm [70.866”]
- c = >3400 mm [133.858”]
- d = nx600 mm [23,622”] (n = number of cabinets).

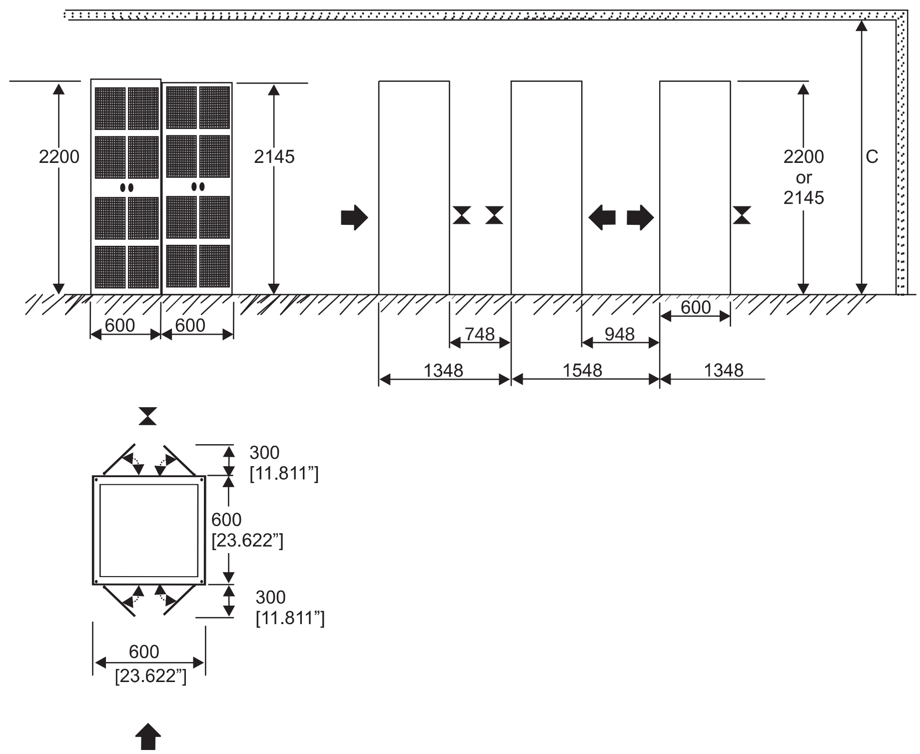
**Figure 2-1 Top view**




**Legend:**

| mm | Inch |
|---|---|
| 600 | 23,622” |
| 1348 | 53,071” |
| 1548 | 60.945” |

**Figure 2-2 Side View**




**Legend:**

| mm | Inch |
|---|---|
| 300 | 11,811” |
| 600 | 23,622” |
| 748 | 29,449” |
| 948 | 37,323” |
| 1345 | 53,071” |
| 1548 | 60.945” |
| 2145 | 84,448” |

| | |
|---|---|
| 2200 | 86,615” |

**Rack dimensions**

The racks require an area of 600 mm [23.622”] x 600 mm [23.622”] (width x depth). This area represents the absolute system limits which must not be exceeded in the operating state by protruding elements such as switches or plugs. The standard height is 2200 mm [86.614”] for an ETSI-2 rack and 2145 mm [84.448”] for an NEBS-2000 rack. The racks are designed to accommodate two *LambdaUnite*™ MSS subracks.

**Rack weights**

The ETSI-2 rack has a maximum weight of 120 kg/264.6 lbs (including PDP, cables and doors).

The NEBS-2000 rack has a maximum weight of 116 kg/255.8 lbs (including PDP, cables and doors).

**Subrack weight**

The subracks have a maximum weight of 41 kg/90.41 lbs (including user panel, fan, PIs, CI-CTL, TIs and 12x blanks at the rear).

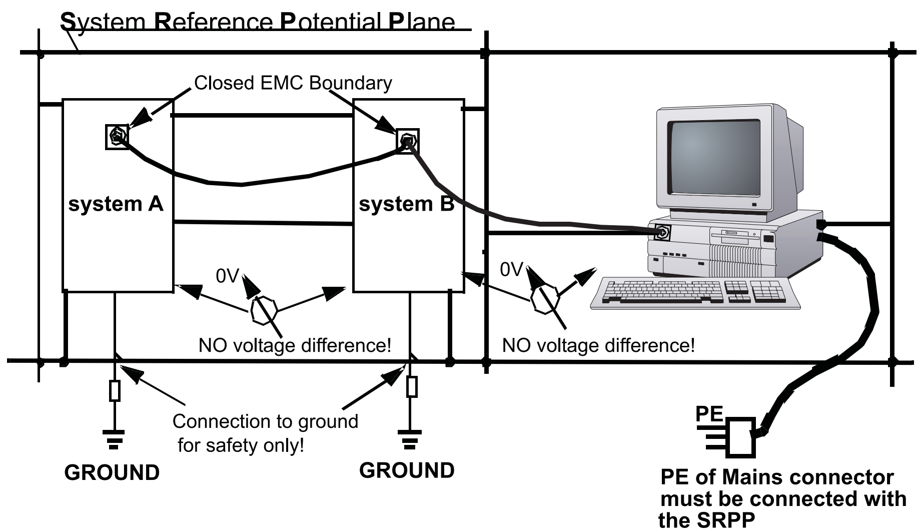
**Power consumption**

The *LambdaUnite* MSS system has a maximum power consumption of 2.200 W.

**EMC/ESD information**

The system was developed in compliance with the ETSI Mesh Ground requirements. This means EMC compliance and personnel safety can be achieved only if the system is connected to a System-Reference Potential Plane (SRPP) at many places as described in ETS 300 253 (see the figure below).

All peripheral equipment must also be connected to the SRPP by one or more fixed wires.




The EMC/ESD boundary is defined at subrack level. The principle is based on the “Faraday Cage” theory. If there are covers, then the covers must be closed.

There is an ESD ground/earth socket on the subrack. A grounded wrist strap with banana plug must be worn when opening the subrack covers.

### Circuit pack handling

The following ***ESD instructions*** must be observed when handling circuit packs:

- Wear working garment made of 100% cotton to avoid electrostatic charging.
- Touch the circuit packs at the edges or the insertion and removal facilities only.
- Ensure that the rack is grounded.
- Wear conductively connected wrist straps and connect them to the rack ESP bonding point.
- Work in an area which is protected against electrostatic discharge. Use conducting floor and bench mats which are conductively connected to the rack ESP bonding point.
- Conductively connect all test equipment and trolleys to the rack ESP bonding point.

- Store and ship circuit packs and components in their shipping packing. Circuit packs and components must be packed and unpacked only at workplaces suitably protected against build-up of charge.
- Whenever possible, maintain the relative humidity of air above 20%.

□

# Required Tools and Test Equipment

**Tools**

Listed below are the tools needed while installing and testing.

| Tool | Purpose |
|---|---|
| ESD wrist strap (included in the shelf delivery) | ESD protection |
| Isopropanol, compressed air and wipes | Fibre cleaning |
| Microscope with a magnification x 200 | Checking the connector face for impurities |
| LC attenuators | Optical attenuation |
| Unshielded crossed LAN cable | NE-PC (CIT) connections |
| Unshielded straight LAN cable | NE-NE and NE-HUB connections |
| ***CompactFlash*** card or PCMCIA ***CompactFlash*** card adapter | Initial load of CompactFlash card |
| PC (Laptop) | Provisioning purposes via *WaveStar*® CIT |

**Test equipment**

A variety of test equipment is required to carry out the individual tests. The following table provides an overview of the required equipment. The types listed are suggestions only. Equipment of another type or manufacturer can also be used.

| Test equipment | Type | Purpose |
|---|---|---|
| SDH analyzer (STM1-STM64) | ACTERNA ANT-20E (www.acterna.com)<br>ANRITSU MP 1570A (www.anritsu.com)<br>HP 37718A (www.hp.com) | Testing different interfaces depending on applications |
| Optical power meter | ACTERNA OLP-15 | Optical power measurement |
| Optical spectrum analyzer | ACTERNA OLS-155 | Optical wavelength and spectral with test |

| Test equipment | Type | Purpose |
|---|---|---|
| Ethernet analyzer | IXIA 400 with 1G/SX-2 interfaces | Measuring 1 Gigabit Interfaces |
| Adjustable optical attenuator | ACTERNA OLA-35 | Optical power measurement |
| Multimeter | FLUKE 8060 | Measuring -48V/-60V DC power supplies |

### *WaveStar* CIT requirements

The minimum requirements for a *WaveStar* CIT are a personal computer with:

- *Pentium*® 266 MHz processor (*Pentium* III 500 MHz or higher recommended) with 128 MB of RAM (256 MB of RAM or higher recommended)
- 150 MB of free hard-disk drive space
- CD-ROM drive (16X recommended)
- *CompactFlash*™ card
- SVGA monitor set to 800x600 resolution or greater, with 256 colors (1024x768, 16 million colors recommended)
- 100BaseT LAN interface, installed and working
- Unshielded crossed Ethernet LAN cable with 4-wire RJ-45 connectors
- *Microsoft*® *Windows NT*® 4.0 with Service Pack 5 or *Microsoft Windows*® 2000 operating system
- *Adobe*® *Acrobat*® *Reader*® for *Windows* (version 3.01 or later)
- Removable hard-disk drive (optional; required only for system backup).

The performance of the user interface can be enhanced by using a higher performance personal computer.

# Customer Requirements

**CE mark**

The CE mark indicates that the products conform to the relevant European Community (EC) Directives.

This CE-marked subrack is compliant with the following Directives:

- EC89.336/EEC - Electromagnetic Compatibility (EMC)
- EC73.23/EEC - Low-Voltage Directive (LVD).

**UR**

The UR mark indicates that the products conform to the relevant American Directives.

**CSA**

The CSA mark indicates that the products conform to the relevant American and Canadian Directives.

□

# Tightening Torque

**Mechanical function**

This standard specifies the conditions to be met when applying live parts together with screws or nuts.

| **Screws and Nuts** | | **Torque** |
|---|---|---|
| **Diameter** | **Pitch[1)]** | **Nominal (Nm)** |
| M2 | 0.4 | 0.24±0.02 |
| M2.5 | 0.45 | 0.48±0.03 |
| M3 | 0.5 | 0.9±0.1 |
| M4 | 0.7 | 2±0.1 |
| M5 | 0.8 | 4±0.2 |
| M6 | 1 | 7±0.3 |
| M8 | 1.25 | 18±0.8 |
| M10 | 1.5 | 34±1.5 |
| M12 | 1.75 | 58±2.5 |

**Notes:**

1. Intermediate fit (H6/G6 ISO metric screw-thread).

**Electrical function**

This standard specifies the conditions to be met when applying HF live parts or ESD contacts of a PCB of screw joints with an electrical function.

| **Stainless-steel cheese screw joints on PCBs** | **Torque (Nm)** |
|---|---|
| M2.5 | 1 |
| M3 | 1.5 |
| M3 | 1.3 |

# 3 Equipment Installation

## Overview

**Purpose**

The purpose of this chapter is to provide the information needed to install all mechanical parts of a *LambdaUnite*™ MultiService Switch (MSS) system.

**Rack types**

The following rack types are available:

- ETSI-2 (International Market)
- NEBS-2000 (USA Domestic Market)

**Required area**

The racks require an area of 600 mm [23.622”] x 600 mm [23.622”] (width x depth). This area represents the absolute system limits which must not be exceeded in the operating state by protruding elements such as switches or plugs. The standard height is 2200 mm [86.614”] for an ETSI-2 rack and 2145 mm [84.448”] for an NEBS-2000 rack.

**Contents**

# Rack Materials (ETSI-2)

**Available ETSI-2 racks**

The following ETSI-2 racks are available and can be ordered:

- ETSI-2 rack with doors — CC848775649
- ETSI-2 rack without doors — CC848775649.

**Rack delivery**

The ETSI-2 rack is delivered in a pre-assembled version, meaning that the following parts of the frame are already mounted:

| Quantity | Description — Code |
|---|---|
| 1 | Power Distribution Panel (PDP) — CC848727129 |
| 2 | Cable Assy, PDP - LED, Alarm — CC848811543/ DC1002831 (rear/front) |
| 2 | Cable Assy, PI (Upper subrack) - PDP — CC848811501/DC1002826 (A or B), 1850 mm [6,069 ft] |
| 2 | Cable Assy, PI (Lower subrack) - PDP — CC848811519/DC1002827 (A or B), 3200 mm [10,499 ft] |
| 1 | Cable Assy, CI-CTL (Upper subrack) - PDP — CC848811527/DC1002828 , 1100 mm [3,609 ft] |
| 1 | Cable Assy, CI-CTL (Lower subrack) - PDP — CC848811535/DC1001829 , 3300 mm [10,827 ft] |
| 1 | Door Support, Top Assy — DC1001933 (includes: Assy, CM-Alarm - RAL UCMI-I) |
| 1 | Door Support Bottom Assy — CC848302527 |
| 1 | Indicator Strip — DC1000590 |
| 2 | Subrack Guide — DC1002905 (2 per upper subrack) |
| 4 | Adjustable Feet — CC407890623 |
| 2 | Assembly, Fiber U-Bracket — DC1001236 (front-top) |
| 1 | Fiber Guide — SC1007036 |
| 1 | Fiber Guide — SC1007037 |
| 2 | Cable-rod, short — DC1002903 |
| 4 | Cable rod, long — DC1002904 |
| | Clip, Self-Adhesive — CC402185409 |

| Quantity | Description — Code |
|---|---|
| 1 | Anti Recirculation Plate — SC1006022 |

**Package-bag**

A package-bag is mounted within the rack and contains the following parts:

| Quantity | Description — Code |
|---|---|
| 4 | Bushing for Adapter Kit — CC848316279 |
| 4 | Washer STL, ST-70-140HV, 4.3x12 — CC847174950 |
| 4 | CH SCR, STL ST-70, M4x25 — CC847117900 |
| | Nylon Cable-Ties — CC407804715 |
| 14 | Screw, Tapping Thread-Forming, M6x16 — CC901331421 |
| 3 m. | Velcor — DC1005002 |

**Site material (optional)**

The following site material can separately be ordered for the ETSI-2 rack without doors (CC848775649):

| Quantity | Description — Code |
|---|---|
| 1 | Assy, Doors — CC848795001 includes:<br>• 2x Assy, Door, Left — DC1000585<br>• 2x Assy, Door, Right — DC1000586 |
| | Nylon Cable-Ties — CC407804715 |
| Max. 4 | Eye Bolt — DC1001689 (2 per rack) with Nut — CC901344184 |
| 1 | Assy, Sideplates — CC848780177 includes:<br>• 2x Side Plate — DC1000577 (left and right), 2200 mm [7,218 ft] |

**Grounding material (optional)**

The following grounding material can be ordered separately:

| Quantity | Description — Code | Remarks |
|---|---|---|
| 1 | Ground Wire (800 mm [2,625 ft]) — CC848828158 | PDP |

| Quantity | Description — Code | Remarks |
|---|---|---|
| 1 | Bolt, M5x16 | green |
| 1 | Washer, M5, Tooth-Lock — CC901361949 | |
| 1 | Hex. Nut M5 | |

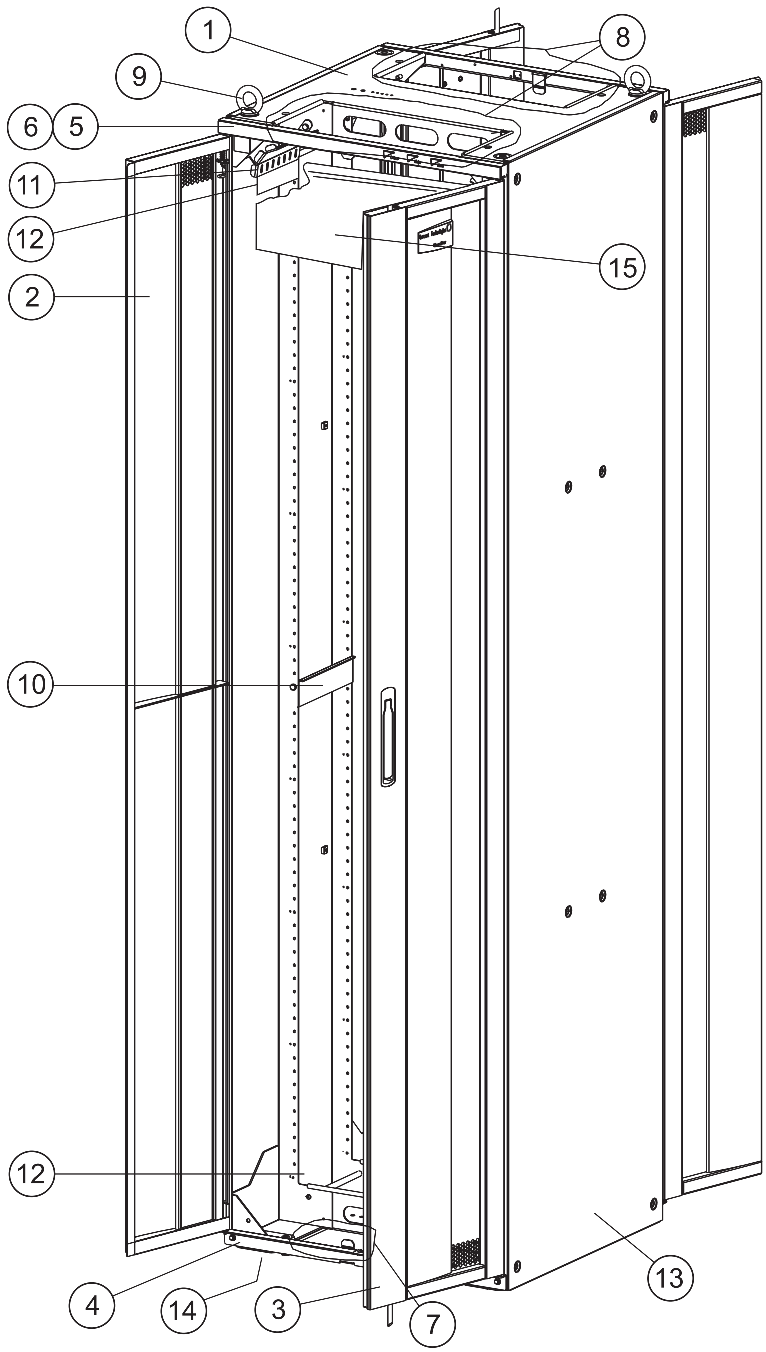
# Technical Data (ETSI-2)

**Specifications** The ETSI-2 rack has the following specifications:

| Item | Quantity / Size |
|---|---|
| Weight | 120 kg [264.6 lbs] (including PDP, cables and doors)<br>80 kg [176.4 lbs] (without doors) |
| Dimensions<br>(H x W x D) | 2200 mm [86.614”] x 600 mm [23.622”] x 600 mm [23.622”] |

**Layout** The ETSI-2 rack is designed to accomodate top and bottom cable access.

**Figure 3-1 Rack Layout**




**Legend:**

1 ETSI-2 rack with/without doors — CC848727095/CC848775649

| | |
|---|---|
| 2 | Assy, Door, Left — DC1000585 |
| 3 | Assy, Door, Right — DC1000586 |
| 4 | Door Support Bottom Assy — CC848302527 |
| 5 | Door Support, Top Assy — DC1001933 |
| 6 | Indicator Strip — DC1000590 |
| 7 | Bottom-Access Entry Hole |
| 8 | Top-Access Entry Hole |
| 9 | Eye Bolt — DC1001689 (optional) |
| 10 | Subrack Guide — DC1002905 |
| 11 | Assembly, Fiber U-Bracket — DC1001236 |
| 12 | Cable rod short/long — DC1002903/DC1002904 |
| 13 | Assy, Sideplates — CC848780177 |
| 14 | Adjustable Feet — CC407890623 |
| 15 | Anti Recirculation Plate — SC1006022 |

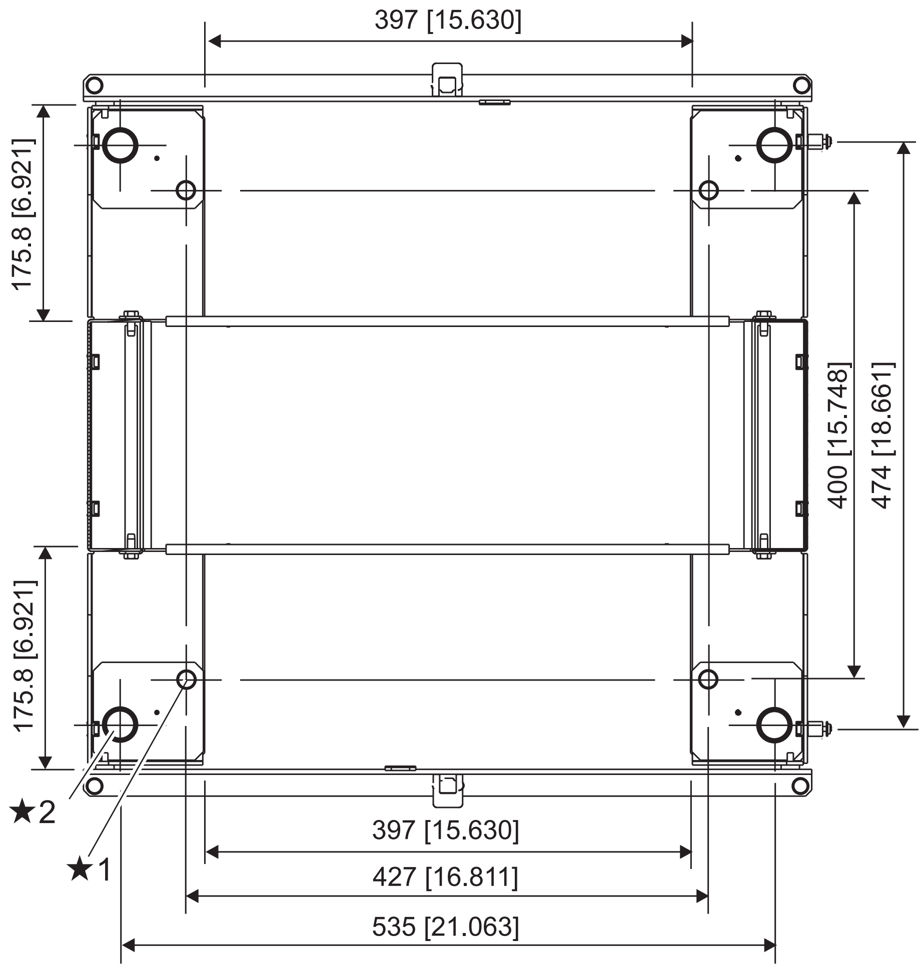
□

# Floor Mounting (ETSI-2)

**Dimensions**

The following figure shows the plate layout (with dimensions) of the ETSI-2 rack.

**Figure 3-2 Top/Bottom Plate Layout**




**Legend:**

*1 Hex. Bolt, STL ST-70, M12x20 — CC847191574

*2 Adjustable Feet — CC407890623

**Important!** The front side is identified by the fiber U-brackets (see item 11 in Figure 3-1, “Rack Layout” (3-7)).

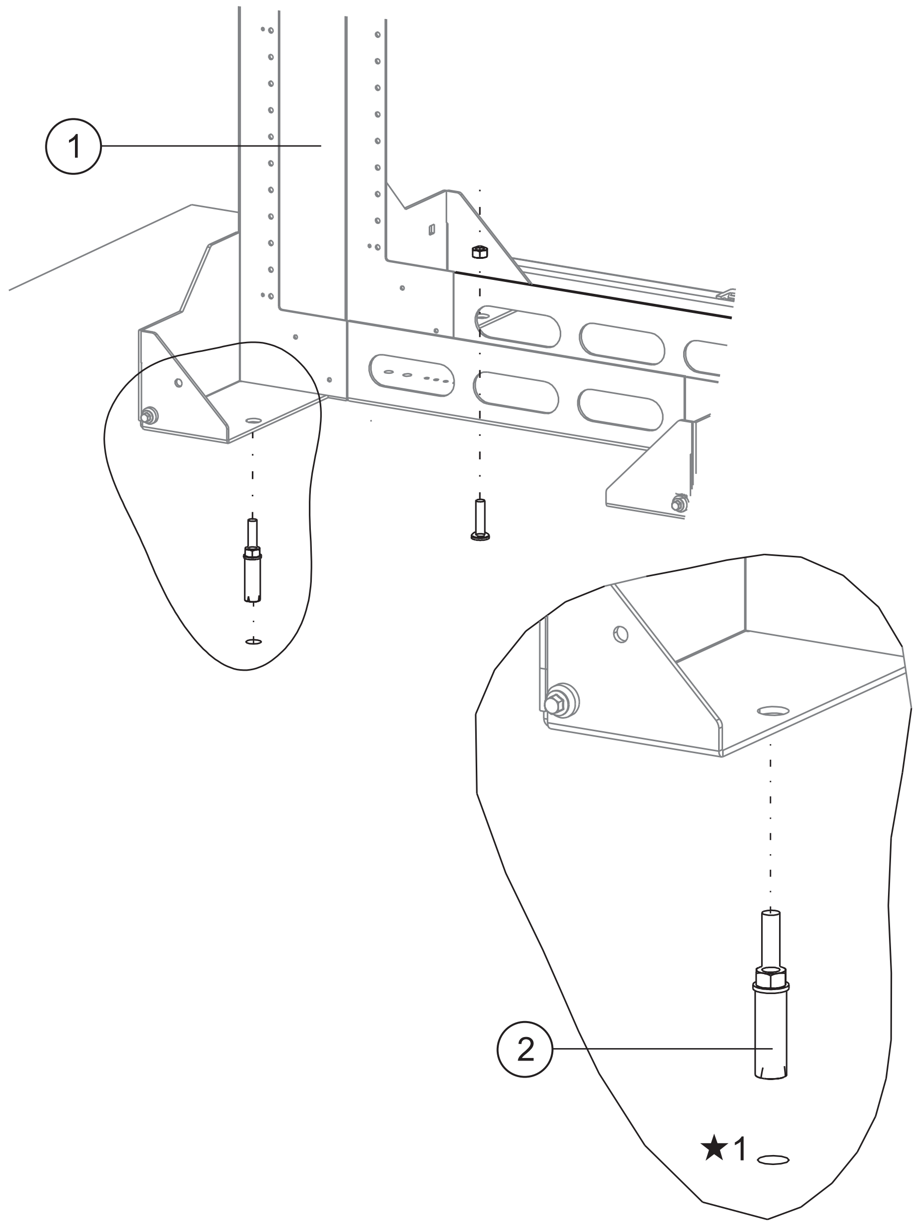
### Mounting

**Important!** If the rack has to be installed on a raised floor, see the customer's specifications and use customer-provided materials.

Complete the following steps to mount an ETSI-2 rack on the floor:

**1** Drill the necessary holes (14 mm [0,551"] in diameter) in the floor (*1).

2 Put the Expanding bolt — CC407758200 (item 2) in place and mount the rack bottom plate on the surface with the help of the Adjustable Feet — CC407890623 .




**Important!** 25 mm [1”] should be between the floor and the rack before levelling the rack. This initial adjustment of the feets ensures that it is still possible to level the next rack.

END OF STEPS

# Rack Materials (NEBS-2000)

**Available NEBS-2000 racks**

The following NEBS-2000 racks are available and can be ordered:

- NEBS-2000 rack with doors — CC848727103
- NEBS-2000 rack without doors — CC848775631.

**Rack delivery**

The NEBS-2000 rack is delivered in a pre-assembled version, meaning that the following parts of the frame are already mounted:

| Quantity | Description — Code |
|---|---|
| 1 | Power Distribution Panel (PDP) — CC848727129 |
| 2 | Cable Assy, PDP - LED, Alarm — CC848811543/ DC1002831 (rear/front) |
| 2 | Cable Assy, PI (Upper subrack) - PDP — CC848811501/DC1002826 (A or B), 1850 mm [6,069 ft] |
| 2 | Cable Assy, PI (Lower subrack) - PDP — CC848811519/DC1002827 (A or B), 3200 mm [10,499 ft] |
| 1 | Cable Assy, CI-CTL (Upper subrack) - PDP — CC848811527/DC1002828 , 1100 mm [3,609 ft] |
| 1 | Cable Assy, CI-CTL (Lower subrack) - PDP — CC848811535/DC1001829 , 3300 mm [10,827 ft] |
| 1 | Door Support, Top Assy — DC1001933 (includes: Assy, CM-Alarm - RAL UCMI-I) |
| 1 | Door Support Bottom Assy — CC848302527 |
| 1 | Indicator Strip — DC1000590 |
| 2 | Subrack Guide — DC1002905 (2 per upper subrack) |
| 2 | Assembly, Fiber U-Bracket — DC1001236 (front-top) |
| 1 | Fiber Guide — SC1007036 |
| 1 | Fiber Guide — SC1007037 |
| 2 | Cable-rod, short — DC1002903 |
| 4 | Cable rod, long — DC1002904 |
| | Clip, Self-Adhesive — CC402185409 |
| 1 | Strain Relief Plate — SC1006001 |
| 1 | Anti Recirculation Plate — SC1006011 |

**Package-bag**

A package-bag is mounted within the rack and contains the following parts:

| Quantity | Description — Code |
|---|---|
| 4 | Bushing for Adapter Kit — CC848316279 |
| 4 | Washer STL, ST-70-140HV, 4.3x12 — CC847174950 |
| 4 | CH SCR, STL ST-70, M4x25 — CC847117900 |
| | Nylon Cable-Ties — CC407804715 |
| 14 | Screw, Tapping Thread-Forming, M6x16 — CC901331421 |
| 3 m. | Velcor — DC1005002 |

**Site material (optional)**

The following site material can separately be ordered for the NEBS-2000 rack without doors (CC848775631):

| Quantity | Description — Code |
|---|---|
| 1 | Assy, Doors — CC848795019 includes:<br>• 2x Assy, Door, Right — DC1002599<br>• 2x Assy, Door, Left — DC1002598 |
| | Nylon Cable-Ties — CC407804715 |
| max. 4 | Eye Bolt — DC1001689 (2 per rack) with Nut — CC901344184 |
| 1 | Assy, Sideplate — CC848780185 includes:<br>• 2x Side Plate — DC1001939 (left or right), 2145mm [7,037 ft] |

**Grounding material (optional)**

The following grounding material can be ordered separately:

| Quantity | Description — Code | Remarks |
|---|---|---|
| 1 | Ground Wire (800 mm [2,625 ft]) — CC848828158 | PDP |
| 1 | Bolt, M5x16 | green |
| 1 | Washer, M5, Tooth-Lock — CC901361949 | |
| 1 | Hex. Nut M5 | |

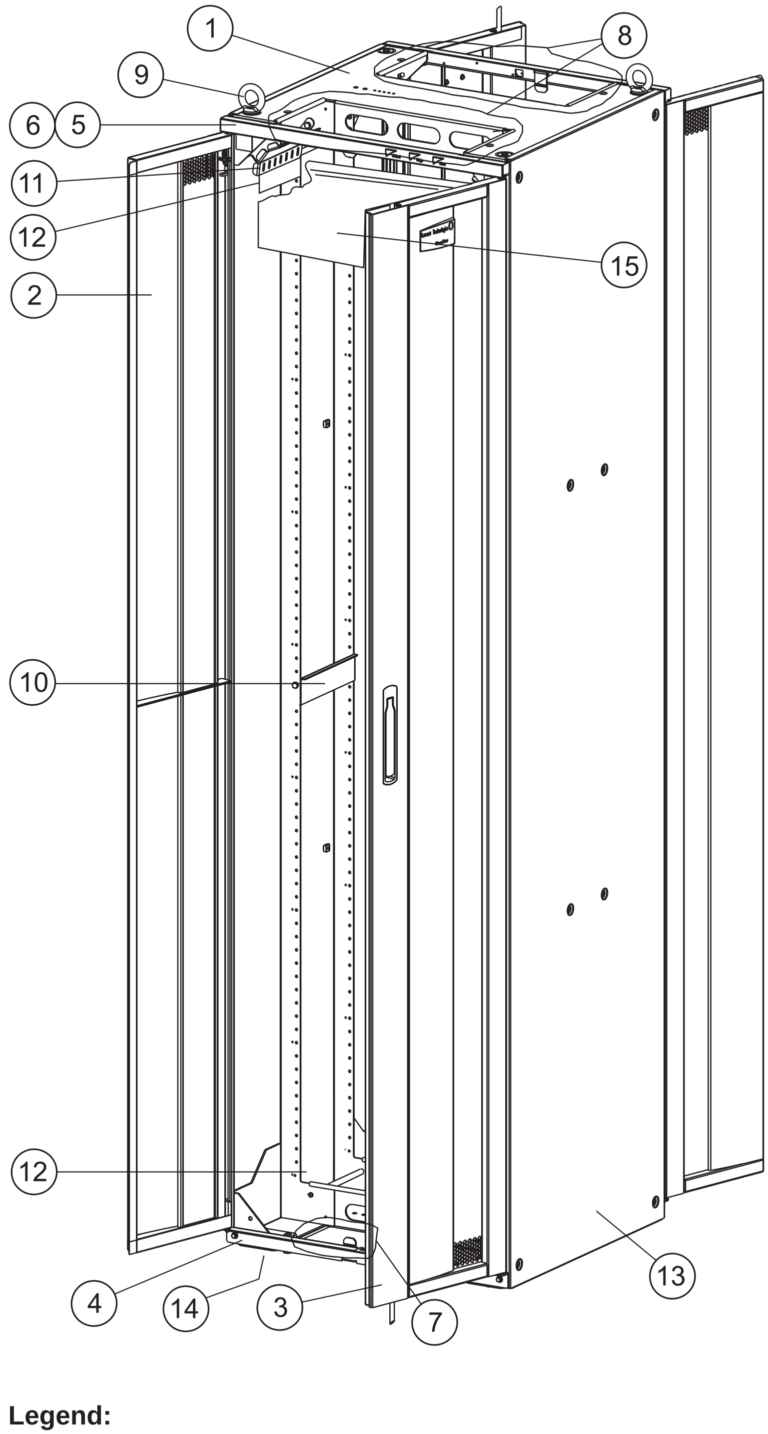
# Technical Data (NEBS-2000)

**Specifications**

| **Item** | **Quantity/ Size** |
|---|---|
| Weight | 116 kg [255.8 lbs] (includes PDP, cables and doors)<br>79kg [174.2 lbs] (without doors) |
| Dimensions (H x W x D) | 2125mm [83.661”] x 600mm [23.622”] x 600mm [23.622”] |

**Layout** This rack is designed to accomodate top- and bottom cable access.

**Figure 3-3 Rack Layout**




**Legend:**

1 Rack NEBS-2000 (incl. doors) – 848727103 / Rack NEBS-2000 (without doors) – 848775631

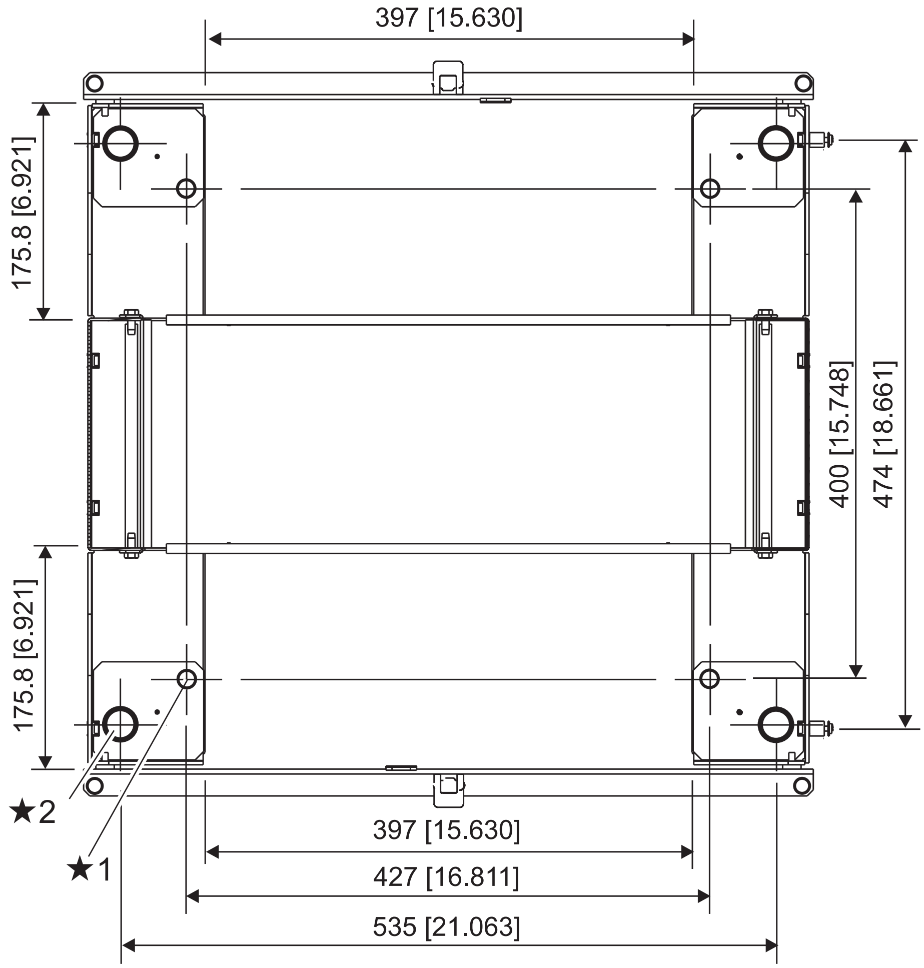
| | |
|---|---|
| 2 | Assy, Door, Left — DC1002598 |
| 3 | Assy, Door, Right — DC1002599 |
| 4 | Door Support Bottom Assy — CC848302527 |
| 5 | Door Support, Top Assy — DC1001933 |
| 6 | Indicator Strip — DC1000590 |
| 7 | Bottom-Access Entry Hole |
| 8 | Top-Access Entry Hole |
| 9 | Eye Bolt — DC1001689 (optional) |
| 10 | Subrack Guide — DC1002905 |
| 11 | Assembly, Fiber U-Bracket — DC1001236 |
| 12 | Cable-rod, short — DC1002903 or Cable rod, long — DC1002904 |
| 13 | Assy, Sideplate — CC848780185 |
| 14 | Strain Relief Plate — SC1006001 |
| 15 | Anti Recirculation Plate — SC1006011 |

□

# Floor Mounting (NEBS-2000)

## Dimensions

**Figure 3-4 Top/Bottom Layout of Plate**




**Legend:**

| | |
|---|---|
| *1 or *2 | Hex. Bolt, STL ST-70, M12x20 — CC847191574 |

**Important!** The front side is identified by the fiber U-brackets (see item 11 in Figure 3-3, “Rack Layout” (3-15)).

**Mounting**

**Important!** If the rack has to be installed on a raised floor, see the customer's specifications and use customer-provided materials.

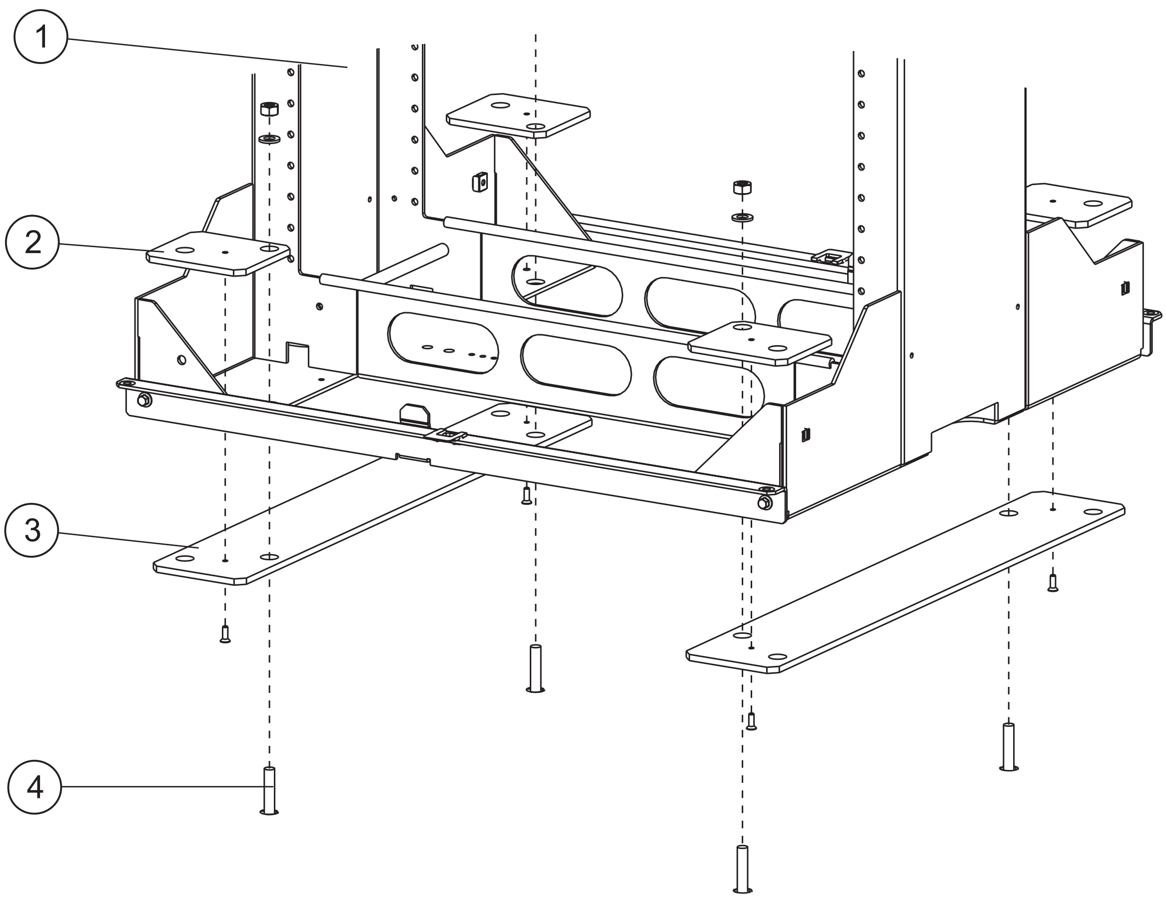
1 Drill the necessary holes (14 mm [0.55”] in diameter) in the floor *1 or *2.

2 Put the Expanding bolt — CC407758200 (Item 2) in place and mount the bottom plate of the rack on the surface.

END OF STEPS

**Layout**

**Figure 3-5 Floor-Mounting**

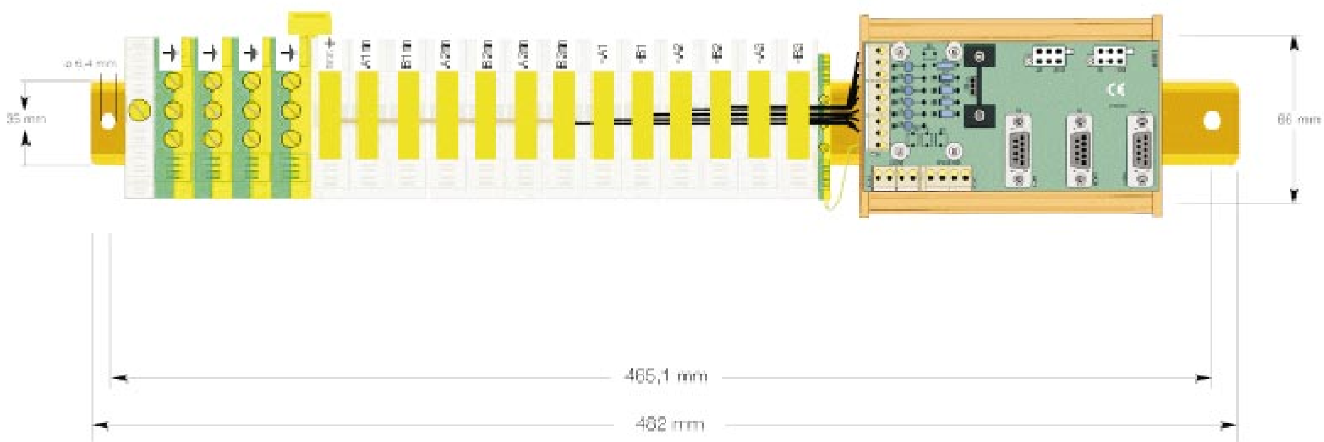


# Technical Data for the PDP

**Specifications** The PDP has the following specifications:

| Item | Quantity/ Size |
|---|---|
| Power consumption | Maximum 2200 Watt;<br>68 A circuit breakers must be used in the External Battery and Fuse Bay (BDFB);<br>63 A circuit breakers are part of the subracks. |
| Voltage range (all components) | -48 to -60 V battery voltages<br>(-40.5 V minimum, -72 V maximum) |
| Power feeds | 3 power feeders (A, B) |
| Ground | 3 x ground-connection points |
| Dimensions (H x W x D) | 70 mm [2.756”] x 482.6 mm [19”] x 60 mm [2.362”] |

**Figure 3-6 Layout**



# Mounting the PDP / Strain Relief

## Installation of the PDP / Strain Relief

**Important!** The PDP is already mounted on the initial frames like

- Rack NEBS-2000 (incl. doors) – 848727103
- Rack NEBS-2000 (without doors) – 848775631
- Rack ETSI-2 (incl. doors) – 848727095
- Rack ETSI-2 (without doors) – 848775649.

1

| **In case of ....** | **Then ....** |
|---|---|
| NEBS-2000 racks | Mount the Power Distribution Panel — CC848727129 (item 2) and the Strain Relief Plate — SC1006001 (item 1) directly with Screw, Tapping Thread-Forming, M6x16 — CC901331421 (item 3) and Spacer — CC848243325 (item 4) on the top of the rack frame as shown in the figure below. Lock then the power cables properly on the strain relief. |
| ETSI-2 racks | Mount the Power Distribution Panel — CC848727129 (item 2) directly with Screw, Tapping Thread-Forming, M6x16 — CC901331421 (item 3) and Spacer — CC848243325 (item 4) on the top of the rack frame as shown in the figure below. |

END OF STEPS

### Cable Secure Procedure

**Important!** First perform the "Installation of the PDP / Strain Relief" (3-20)procedure.

1 Release the swivel head by screw-up the swivel head first till the end before loosing it, because it locks by loosing it directly.

**Important!** The swivel is fixed to the Strain-relief plate with 8-9 Nm.

2 Run the power cables through both pieces of the swivel (item 4). Mount the swivel-head to the swivel-house, but the cable should not fixed yet.

3 Connect the power cables to its configuration position on the Power Distribution Panel.

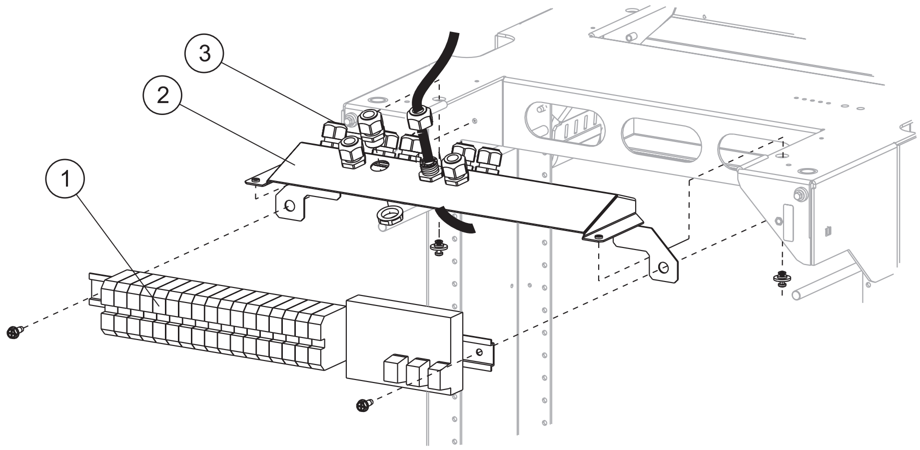
**Important!** Leave some slack in the cable.

4 Screw-up the swivel-head by hand to secure the power cables in their position.

END OF STEPS

### Results

**Figure 3-7 Mounting the PDP and Strain Relief**




□

# Mounting of Eye Bolts

## Procedure

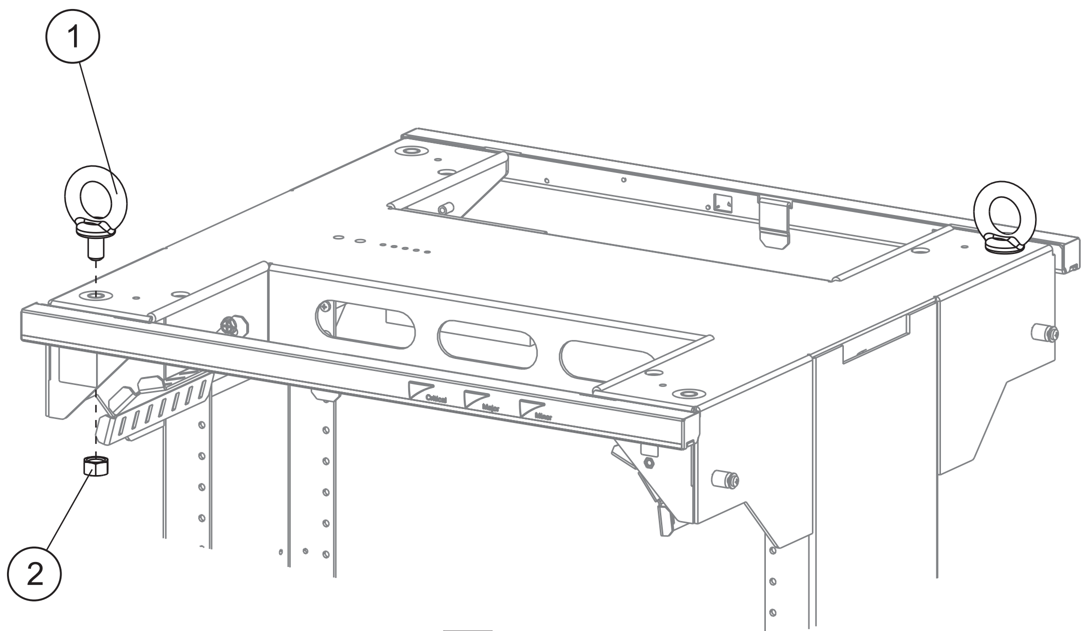
**1** Mount the Eye Bolt — DC1001689 (item 1) into the well-nut at the top of the rack frame.

**2** Mount the Nut — CC901344184 (item 2) at the other end of the eye-bolt to secure it to the rackframe.

END OF STEPS

### Result

**Figure 3-8 Mounting of the Eye Bolt**



# Grounding (NEBS-2000)

**Important!** The following procedure describes the grounding of an NEBS-2000 rack only! The ETSI-2 rack has to be grounded via the PDP (see section "PDP Block-Diagram" (4-3)). The cables which are mentioned below are not delivered as standard with the system but are optional, i.e. they can be delivered as office-engineerable kits if a dedicated grounding is needed.

## Procedure

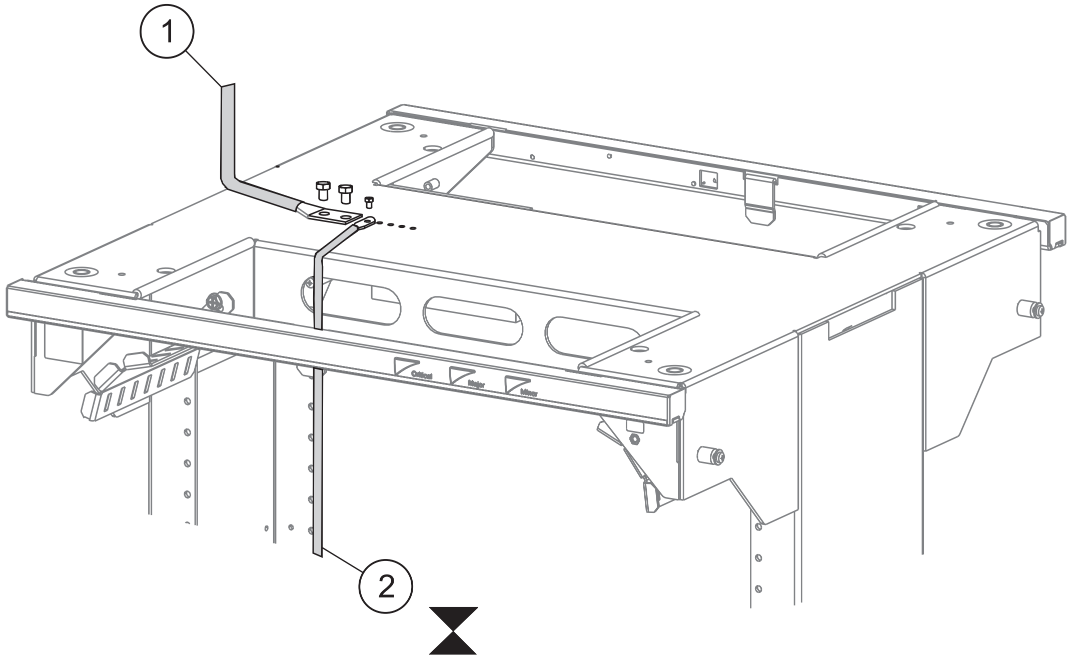
1. Connect the Office Grounding Cable — 848834974 (item 1) to the top of the rack-frame using two hexagonal M8 bolts and hex. nuts M8 as shown in the figure below.

2. Connect each separate ***shelf-grounding cable*** (item 2) to the top of the rack frame with a hexagonal M5x16 bolt, Washer M5, tooth lock — 901361949 and hex. nut M5as shown in the figure below for Lower/Upper Subrack and Power Distribution Panel.
   - Ground Wire (800 mm [2,625 ft]) — CC848828158
   - Ground Wire (2000 mm [6,562 ft]) — CC848828174
   - Ground Wire (3000 mm [9,843 ft]) — CC848828182

END OF STEPS

**Result**

**Figure 3-9 Office Grounding and Shelf Grounding**



# Door Support, Top Assy with Indicator Strip

**Before you begin**

In case of top access temporarily remove the “Rack Doors” (3-64) and the door support top assy before laying the cables in the rack frame.

**Procedure**

**1** Mount the Door Support, Top Assy — DC1001933 (Item 1) at the top of the rack frame using Screw, Tapping Thread-Forming, M6x16 — CC901331421 (Item 2) and place Spacer — 848243325 (Item 3) on the screw between the door support and the rack frame.

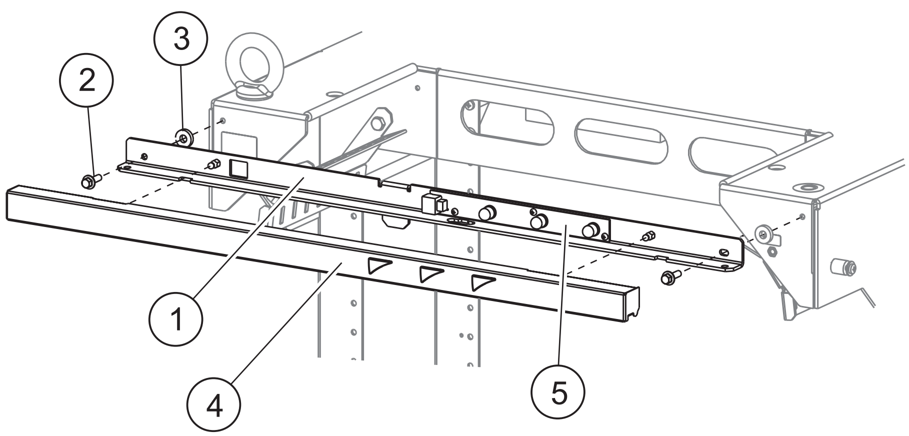
**2** Attach the Indicator Strip — DC1000590 (item 4) to the Door Support, Top Assembly.

**3** Connect the prefab Assy, Alarm Cable PDP/LED — DC1002831 from the PDP to the printing wiring board (item 5) that is mounted on the door support top assembly.

END OF STEPS

**Layout**

**Figure 3-10 Door Support Top Assy with Indicator Strip**




**Legend:**

| | |
|---|---|
| Spare set | Assy, CM-Alarm — RALUCM1_1 |

# Cable-Rods

### Cable rod, short

1 Mount the Cable-rod, short — DC1002903 (Item 1) on both uprights at the rear of the rack frame within the guides configuration position which is counted from the bottom by using CH SCR, STL ST–70, M4x16 – 847117884 .

For Unite rack-frames:

- Two positions below the highest hole *1; (top and bottom access)

END OF STEPS

### Cable rod, long

1 Mount the Cable rod, long — DC1002904 (Item 2) on both uprights in the center of the rack frame within the guides configuration position which is counted from the bottom by using CH SCR, STL ST–70, M4x16 – 847117884

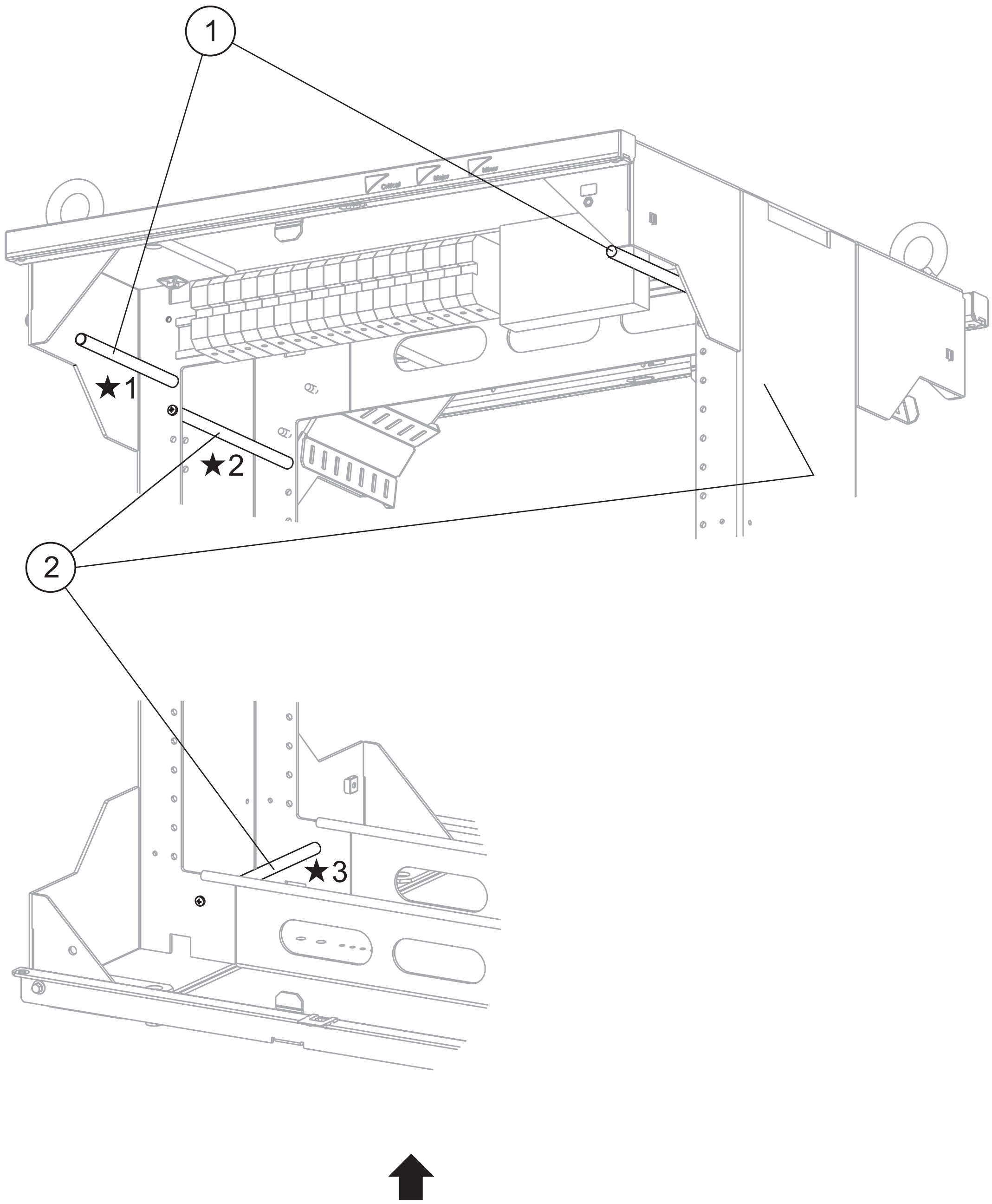
For Unite rack-frames:

- One position below the highest hole *2; (top and bottom access)
- One position below the first hole *3; (top and bottom access)

END OF STEPS

**Results**

**Figure 3-11 Mounting of Cable Rods**




□

# Fiber Guides

**Description**

The fiber guides are used to route the external cables in a proper way from and to the subrack which is mounted into the rack frame and to secure the bending radius of the external fiber cables.

**Assemble**

**1** Mount the Fiber Guide — SC1007037 (item 1) at the left-top front of the rack frame.

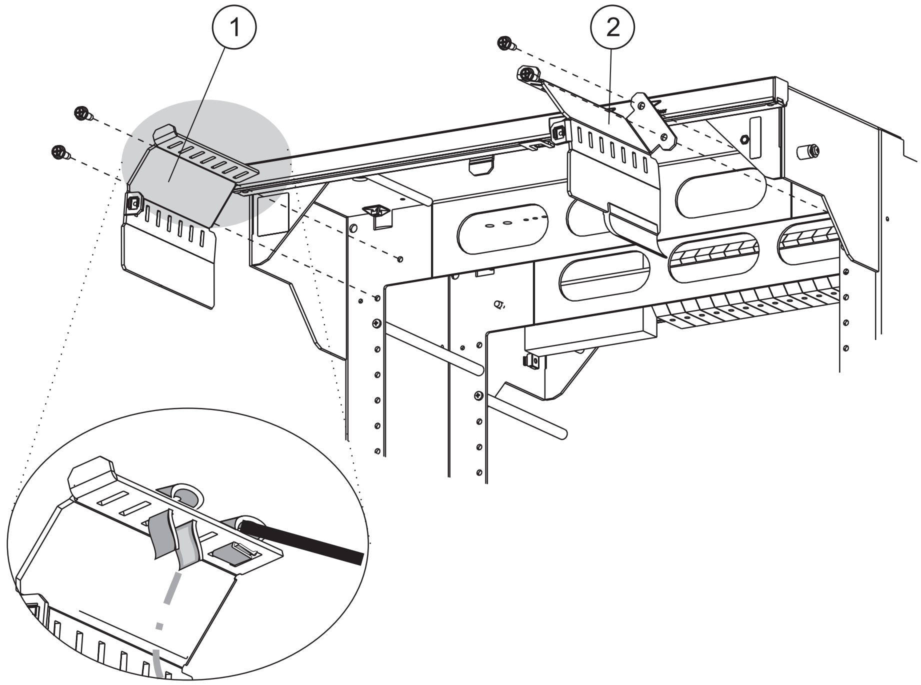
**2** Mount the Fiber Guide — SC1007036 (item 2) at the right-top front of the rack frame.

**3** Use Velcor — DC1005002 to secure the cables on the position of both brackets.

END OF STEPS

## Results

**Figure 3-12 Assemble Fiber Guides**




-

□

# Anti Recirculation Plate

**Description**

The Anti Recicirculation Plate is needed to force the heated air out of the rack frame.

This is only neccessary within rack frames which are closed with doors and/or side plates:

- Rack NEBS-2000 (incl. doors) – 848727103
- Rack ETSI-2 (incl. doors) – 848727095 .

**Assemble**

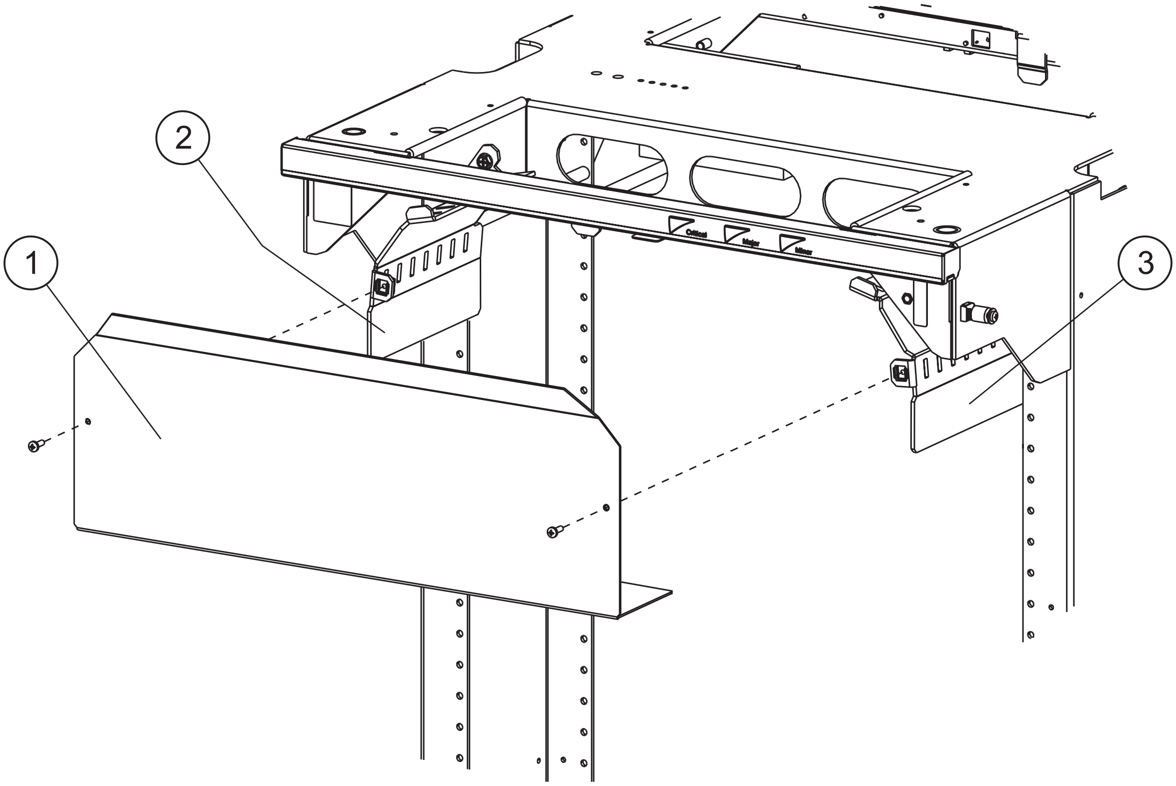
1

| In case of ...... | then |
|---|---|
| Rack NEBS-2000 (incl. doors) – 848727103 | mount the Anti Recirculation Plate — SC1006011 (item 1) to the Fiber Guide — SC1007037 (item 2) and Fiber Guide — SC1007036 (item 3) at the top front of the rack frame. |
| Rack ETSI-2 (incl. doors) – 848727095 | mount the Anti Recirculation Plate — SC1006022 (item 1) to the Fiber Guide — SC1007037 (item 2) and Fiber Guide — SC1007036 (item 3) at the top front of the rack frame. |

END OF STEPS

**Results**

**Figure 3-13 Mounting of Anti Recirculation Plate**




□

# Door Support Bottom Assy

**Before you begin** In case of bottom access temporarily remove the "Rack Doors" (3-64) and the Door Support Bottom Assy. before laying the cables in the rack frame.

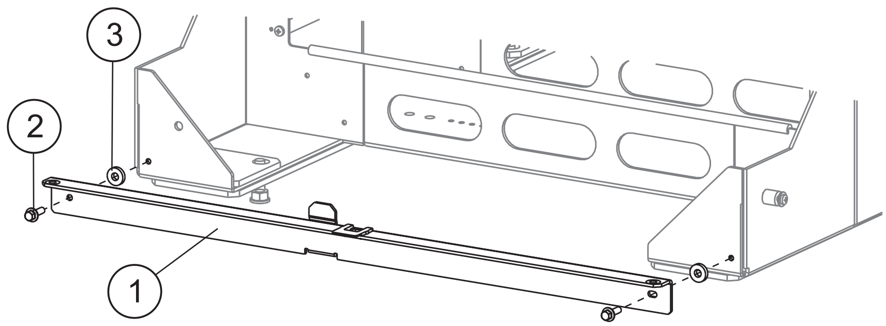
**Procedure**

**1** Mount the Door Support Bottom Assy — CC848302527 (Item 1) on the bottom of the rackframe by using Screw, Tapping Thread-Forming, M6x16 — CC901331421 (Item 2) and Spacer — 848243325 (Item 3) on the screw between the door support and the rack frame.

END OF STEPS

**Layout**

**Figure 3-14 Door Support Bottom Assy**



# Side-Cover Plates

## Installation Procedure

1 Check if the Assy, Cage Nut — DC1002834 (Item 3) is mounted in the designated gaps in the rack frame.

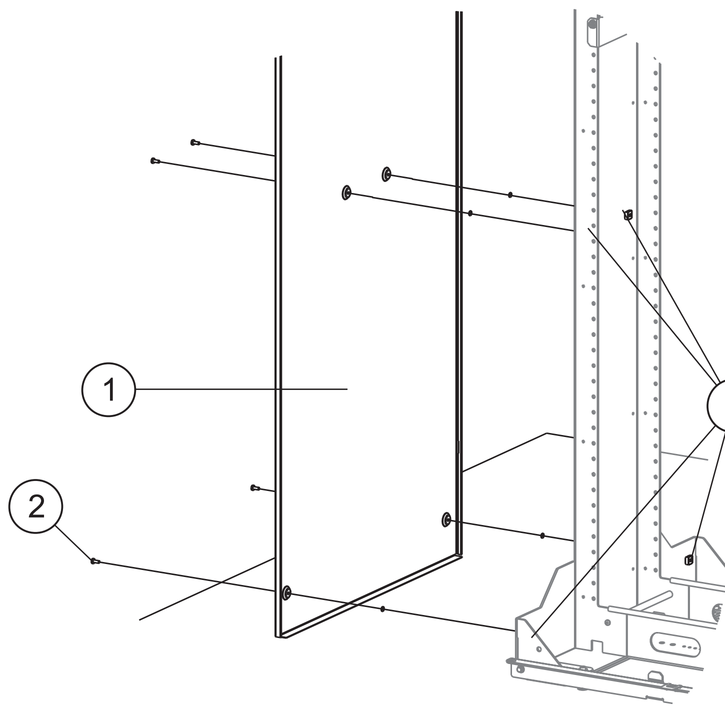
2

| If rack frame is for an | Then |
|---|---|
| NEBS-2000 Rack | Attach the Assy, Sideplate — CC848780185 (Item 1) and fasten in place using screws (Item 2). |
| ETSI-2 Rack | Attach the Assy, Sideplates — CC848780177 (Item 1) and fasten them inplace using screws (Item 2). |

END OF STEPS

## Layout

**Figure 3-15 Side-Cover Plates, Assembly**



**Note:**

Assy, Sideplate — 848780785 for NEBS-2000 consists of: Side Plate — DC1001939 (right and left).

Assy, Sideplates — CC848780177 for ETSI-2 consists of: Side Plate — DC1000577 (right and left).

□

# Rack Adapter-Kit

**Before you begin**

If the existing rack(s) already have side-cover plates, remove these cover plates from the sides of the existing rack(s) to which another rack(s) will be connected. See "Side-Cover Plates" (3-34) for instructions on how to re-install side-cover plates.

**Installation Procedure**

1

| Extension side of the existing rack is | Then |
|---|---|
| At the front to the left | Demount the rack adapter-kit on the extension rack. |
| At the front to the right | Demount the rack adapter-kit on the existing rack. |

2 Remove the Assy, Cage Nut — DC1002834 on the opposite side to the demounted rack adapter-kit (see Step 1) (two at the top and the two at the bottom).

3 Place the center style (item 4) of the extension rack next to the existing rack.

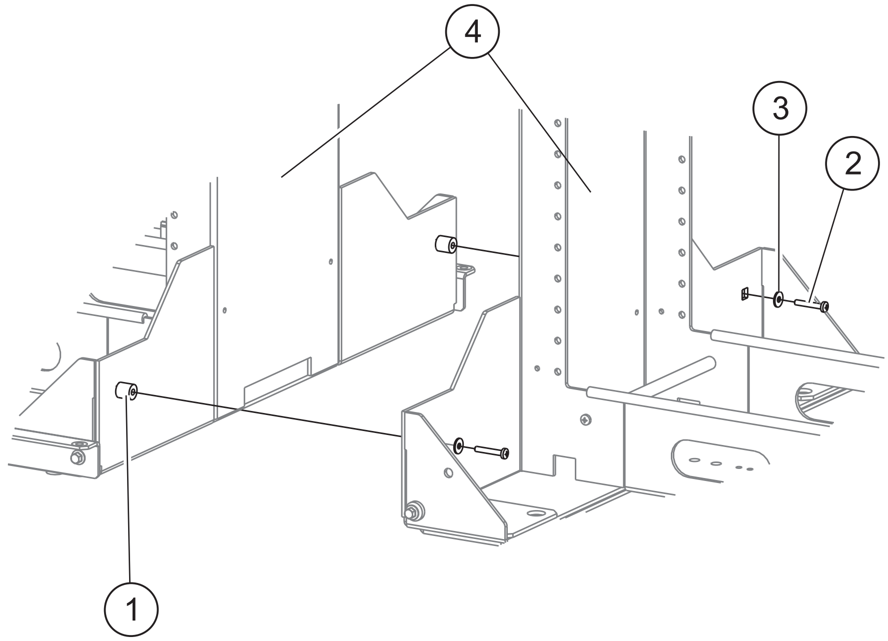
4 Put the Bushing for Adapter Kit — CC848316279 (Item 1) in the center style and fix in place using CH SCR, STL ST-70, M4x25 — CC847117900 (Item 2) and Washer STL, ST-70-140HV, 4.3x12 — CC847174950 (Item 3) at each nut retainer-position.

5 Tighten the CH SCR, STL ST-70, M4x25 — CC847117900 (Item 2) to tie the rack frame together.

END OF STEPS

### Layout

#### Figure 3-16 Racks Side by Side

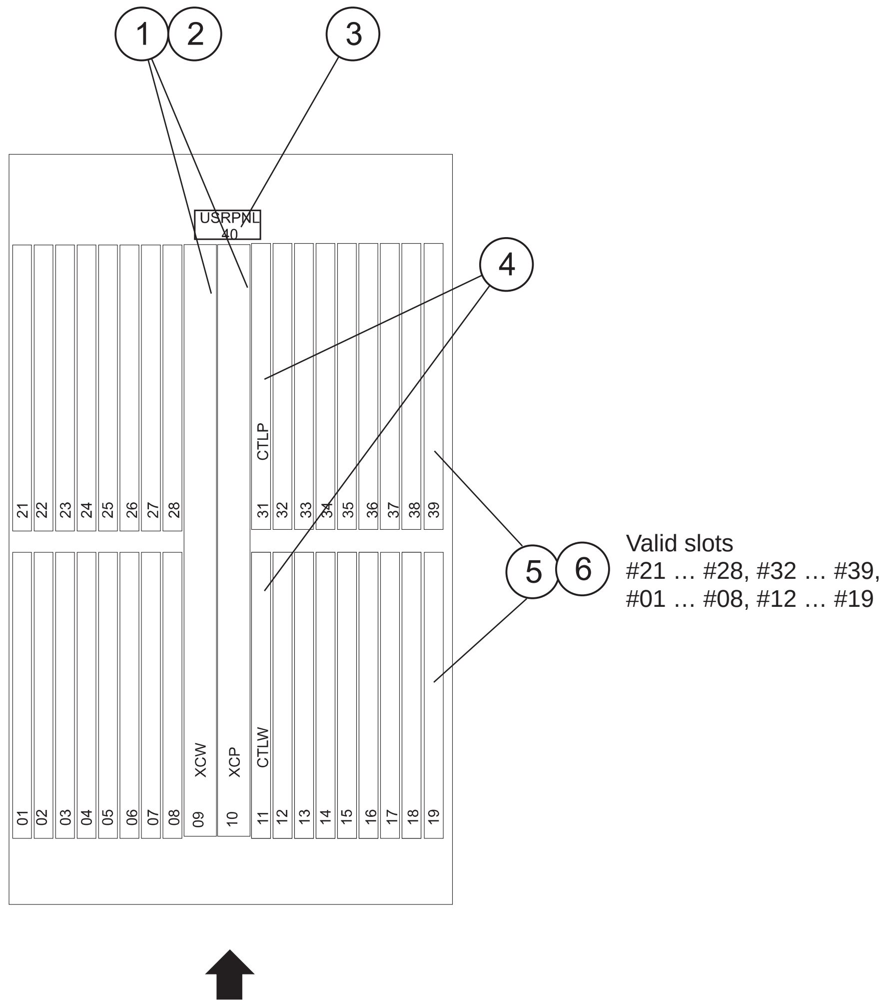



□

# Subrack Layout

## Front View of Layout

**Figure 3-17 Circuit-pack Positions in the Subrack**




**Legend:**

1 Switch Pack 320G & Timing — 109000299

2 Blank XC320 (6N) — 848782876

3 User Panel — 848730636

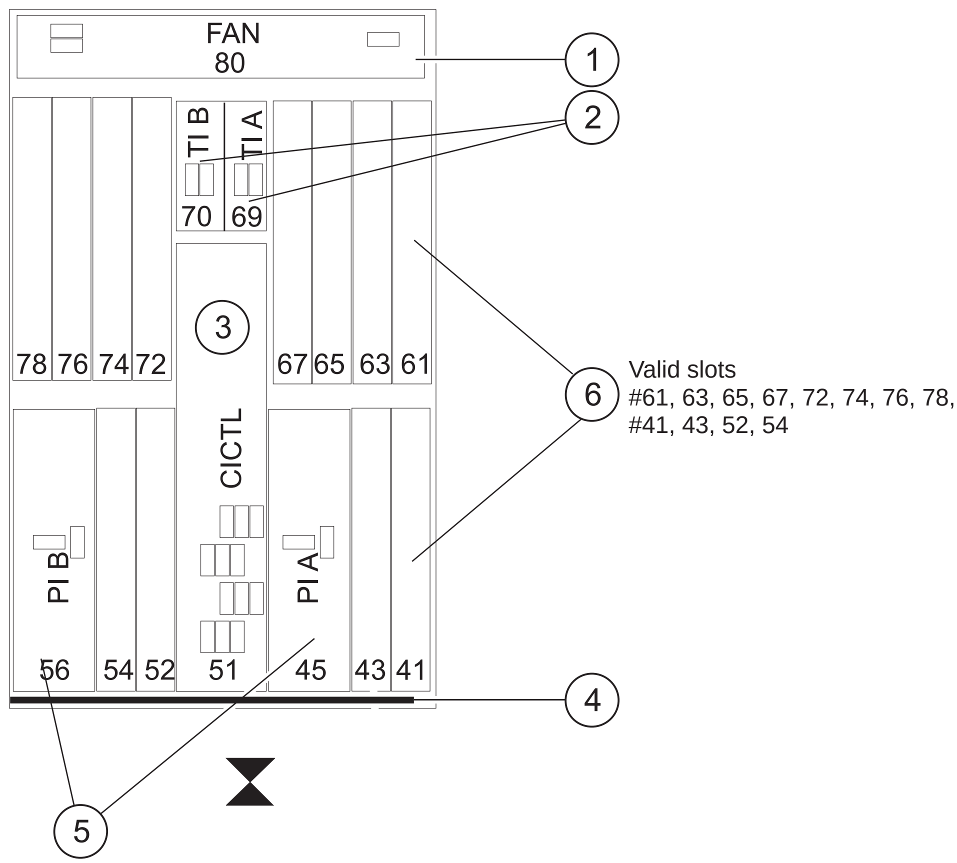
4 Controller — 10900158

5 OP2G5 or OP10G or GE1 Circuit Packs (see “Specifications for *LambdaUnite*™ MSS Optical-Circuit Packs” (B-14))

6 Front Blank (3N) — 848782868 or Front Blank (3N) — 848840112

## Back-Plane Layout

**Figure 3-18 Paddle Board Positions in the Subrack**




**Legend:**

1 Fan Unit — 848730644

2 Timing Interface, E1/DS1 — 109001453

3 Controller Interface — 109001461

4 Filter, Washable — 408643005

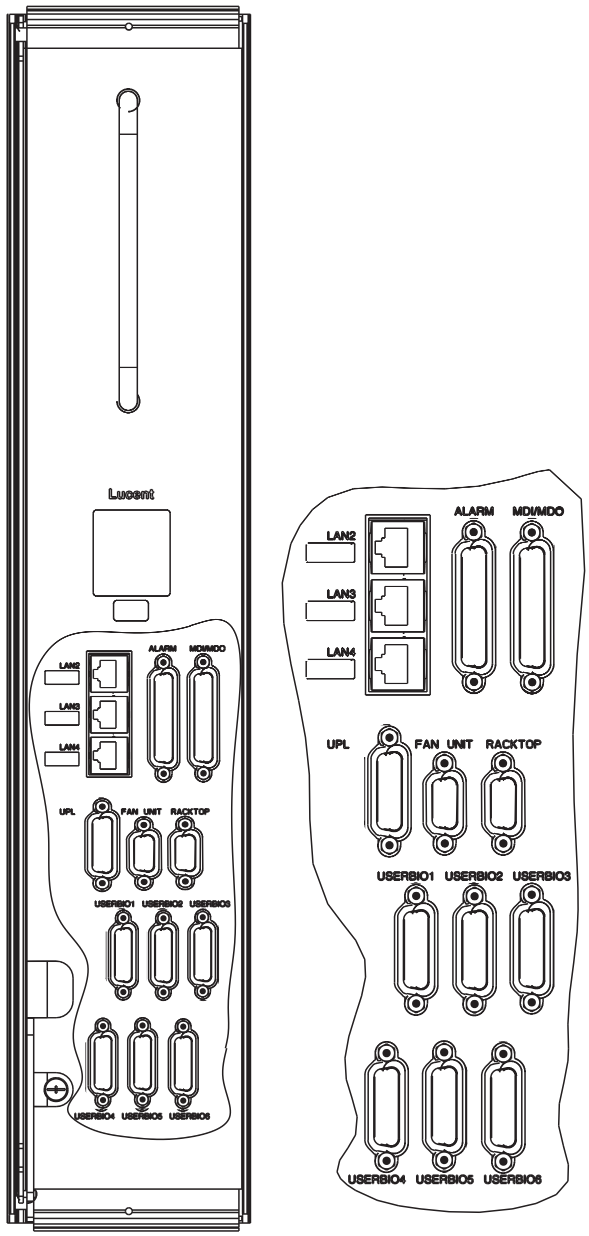
5 Power Interface — 109001446 or Power Interface-100 — 109187211

6 Paddle Board, Blank — 848780193 (two required next to each Power Interface — 109001446 )

7 2 slots wide blank (one required next to each Power Interface-100 — 109187211 )

## CI-CTL

**Figure 3-19 CI-CTL Layout**



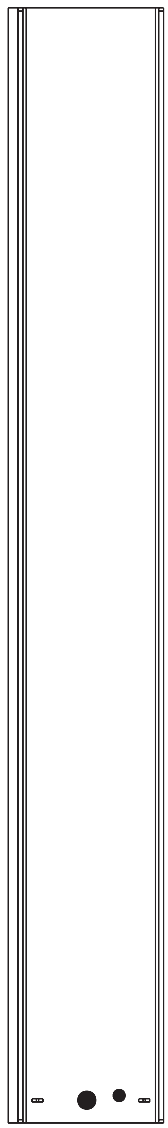
**Rear Blanks**

The rear blank face plate are:

- Paddle Board, Blank — 848780193 (two slots wide), which is used in the top row position of the subrack and the positions next to the Power Interface — 109001446
- Paddle Board, Blank — 848840104 (three slots wide), which is used next to the Power Interface-100 — 109187211

**Two Slots wide**

**Figure 3-20 Blank Rear Faceplate**

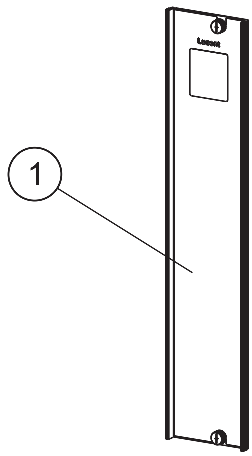


**Legend:**

1 Paddle Board, Blank — 848780193

**Three Slots wide**

**Figure 3-21 Blank Rear Faceplate**




**Legend:**

1 Paddle Board, Blank — 848840104

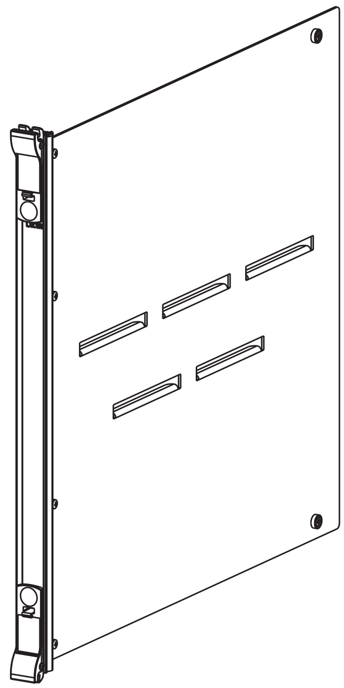
**Front Blanks**

The subrack has blank face plates in two heights:

- 3N types
- 6N type

### 3N Types

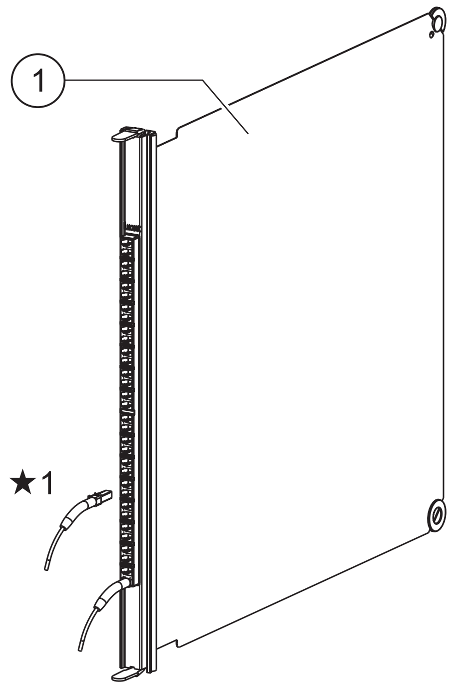
**Figure 3-22 Blank Front Faceplate (3N)**



**Legend:**

1 Front Blank (3N) — 848782868

**Figure 3-23 Blank Front Faceplate (3N) with empty holes**



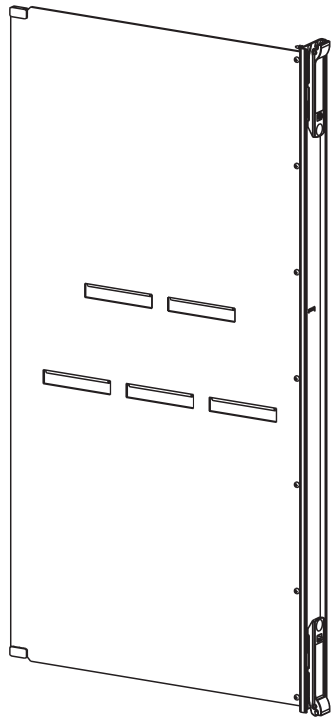

**Legend:**

1 Front Blank (3N) — 848840112

*1 Hang the cables temporarily in the empty holes on the Front Blank (3N) — 848840112 , when the cables are pre-arranged.

### 6N Type

**Figure 3-24  Blank Front Faceplate (6N)**



**Legend:**

1  Blank XC320 (6N) — 848782876

# Subrack Accessories

**Subrack Kit**

Mounted on *LambdaUnite*™ MSS Dur-Subrack Core Assembly — 848811865

| Quantity | Description — Code |
|---|---|
| 1 | *LambdaUnite* MSS Dual Unit Row Subrack — 848727111 |
| 1 | User Panel — 848730636 |
| 1 | Fan Unit — 848730644 |
| 2 | Power Interface — 109001446 |
| 1 | Controller Interface — 109001461 |
| 2 | Timing Interface, E1/DS1 — 109001453 |
| 12 | Paddle Board, Blank — 848780193 |
| 1 | Filter, Washable — 408643005 |

Prepacked material

| Quantity | Description — Code |
|---|---|
| 1 | Bracket, Front-left, Unite — DC1003774 |
| 1 | Bracket, Front-right,Unite — DC1003775 |
| 4 | Fiber Clip — DC1000680 |
| 2 | Fiber-Routing Guides (RT/LB) — DC1001516 |
| 2 | Fiber-Routing Guides (LT/RB) — DC1001517 |
| 4 | Fiber-Routing Guides (corner) — DC1001518 |
| 8 | Self-Tapping Screw — DC1002024 |
| 26 | Screw, Tapping Thread-Forming, M6x16 — CC901331421 |

Intra Subrack Cables

| Quantity | Description — Comcode | Remarks |
|---|---|---|
| 1 | Cable Assy, CI-CTL - UPL — 848811584/DC1003272 | Mounted |

| Quantity | Description — Comcode | Remarks |
|---|---|---|
| 1 | Cable Assy, PI - FAN Unit, Power B — 848811576/DC1003270 | Prepacked |
| 1 | Cable Assy, CI-CTL - FAN Unit — 848811568/DC1003271 | Prepacked |
| 1 | Cable Assy, PI - FAN Unit Power A — 848811550/DC1003269 | Prepacked |

**Cables** Intra Rack Cables

| Quantity | Description — Comcode | Remarks |
|---|---|---|
| 1 | Cable Assy, PDP - LED, Alarm — CC848811543/DC1002831 | Mounted |
| 1 | Cable Assy, CI-CTL (Lower subrack) - PDP — CC848811535/DC1001829 | Prepacked |
| 1 | Cable Assy, CI-CTL (Upper subrack) - PDP — CC848811527/DC1002828 | Prepacked |
| 1 | Cable Assy, PI (Lower subrack) - PDP — CC848811519/DC1002827 | Mounted |
| 1 | Cable Assy, PI (Upper subrack) - PDP — CC848811501/DC1002826 | Mounted |

**Optional** Grounding Material

| Quantity | Description — Comcode | Remarks |
|---|---|---|
| 1 | Ground Wire (2000 mm [6,562 ft]) — CC848828174 | Upper Subrack |
| 1 | Ground Wire (3000 mm [9,843 ft]) — CC848828182 | Lower Subrack |
| 1 | Bolt M6x16 | green colored |
| 1 | Bolt M5x16 | |
| 1 | Washer, M5, Tooth-Lock — CC901361949 | |
| 1 | Washer, M6, Tooth-Lock — 901361956 | |

# Technical Data

### Specifications

| Item | Quantity/Value |
|---|---|
| Voltage Range (all components) | -48 to -60 V battery voltage<br>(-40.5 V minimum, -72 V maximum) |
| Power Feeders | Two power feeders (A, B) |
| Upstream Fuse or Circuit-Breaker | The fuse must be ≥ 68 A in the external BDFB<br>(depends on cable) |
| Power Consumption | 2200 Watt maximum<br>(depends on configuration). |
| Weight | Maximum 41kg [90.41 lbs]<br>(includes: user panel, fan, PIs, CI-CTL TIs and 12x blanks at the rear). |
| Dimensions (D x W x H) | 545mm [21.457”] x 500mm [19.685”] x 950mm [37.402”]<br>(includes fan and cabling). |
| Site Engineering Dimensions | 545mm [21.457”] x 500mm [19.685”] x 1100mm [43.307”]<br>(includes cabling and fan space) |

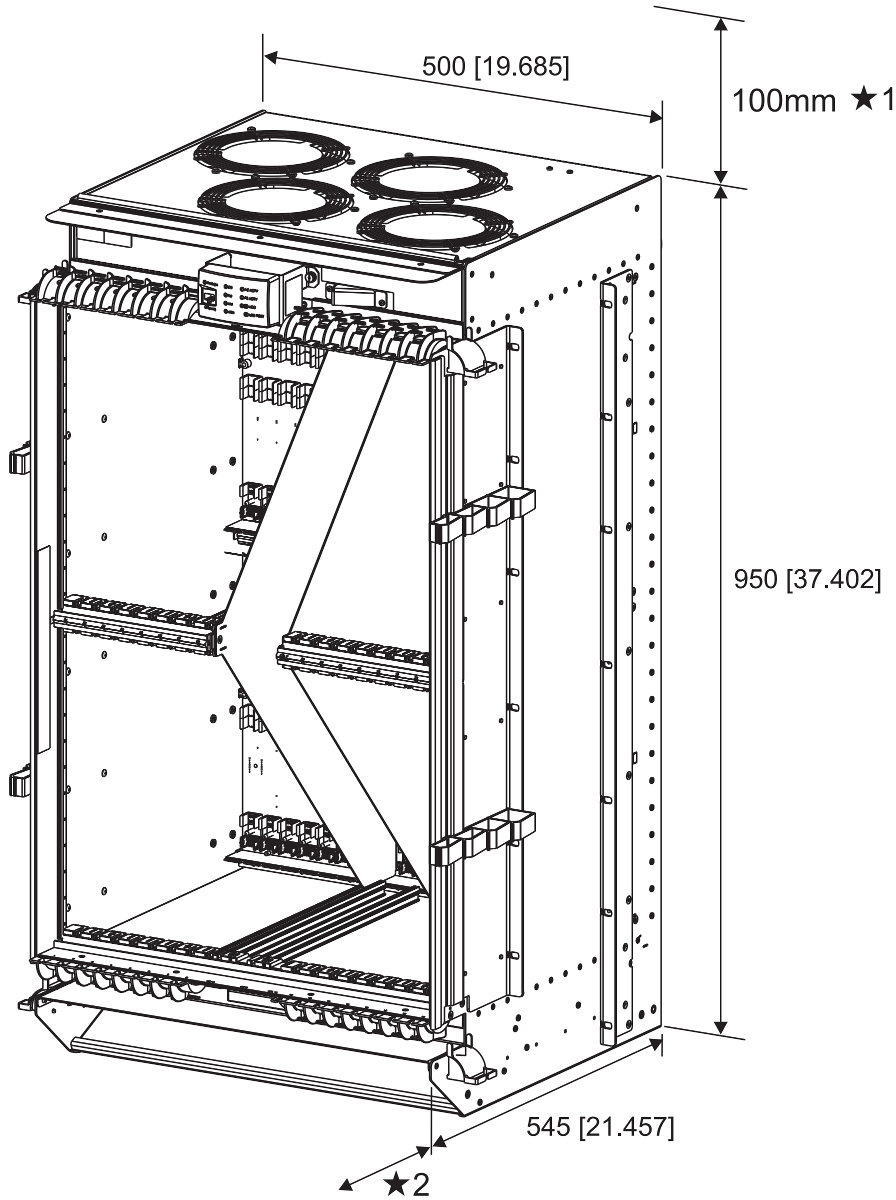
### Subrack Requirements

The mounting requirements are:

- Leave a space of ≥ 100 mm [3,94”] above the subrack, when a single subrack is mounted into a rack frame.
- The subrack is designed for mounting in the *LambdaUnite*™ MSS Rack Frames so that the temperature can be controlled and the cables laid properly.

## Subrack Dimensions

**Figure 3-25 Subrack Mounting Dimensions**




**Legend:**

*1 Required space for air outlet (≥ 100 mm [3,94”]) when a single subrack is mounted into a rack frame.

*2 Bend radius of fiber and external cabling.

□

# Mounting the Subrack

### Procedure

1 Unpack the subrack and check the installation materials.

**Reference:**

“Subrack Accessories” (3-46)

2 Mount the subrack in its position in the rack frame.

**Reference:**

“Installation of Subrack” (3-52)

3 Mount the grounding cable on the subrack.

**Reference:**

“ESD and Ground Connections” (4-28)

4 Place the“Circuit Packs” (3-55) according to the configuration.

5 Route the fiber cables to the Optical Circuit Packs at the front of the subrack and connect according to the configuration:

- “Gigabit-Ethernet Interfaces” (4-68)
- “Optical Interfaces” (4-64)

6 Route the external cables to the rear of the subrack according to the configuration:

- “Station-Alarm Interface” (4-45)
- “LAN 10/100 Base-T Interface” (4-49)
- Timing Interfaces:
  - “TI-DS1 Station Clock Output/Input Interface 100/110 Ω” (4-52)
  - “TI-E1 Station-Clock Output/Input Interface, 120 Ω” (4-56)
  - “TI-E1 Station-Clock Output/Input Interface, 75 Ω” (4-60)
- “Rack-Top Alarm-Interface Cable, CI-CTL – PDP” (4-42)

**7** Connect the “Power Cables, PI – PDP” (4-30) at the rear of the subrack. according to the configurations.

END OF STEPS

# Installation of Subrack

**Procedure**

**1** Temporarily remove the mounting brackets ( Bracket, Front-left, Unite — DC1003774 Item 1) and ( Bracket, Front-right,Unite — DC1003775 Item 2); from the subrack.

**2** Mount the Fiber Clip — DC1000680 (Item 5) on the front mounting-brackets.

**3** When a second subrack is mounted in the configuration of one *LambdaUnite*™ rack frame, temporarily remove the Rubber Profile — DC1003971 (Item 6) at the front-top of the bottom subrack and at both front-top sides.

**4** Slide the subrack at the rear into its configuration position in the Unite rack.

| If subrack is located in the | Then |
|---|---|
| Upper position in the Unite rack | Use the Subrack Guide — DC1002905 which is mounted at hole 38 on the center style of the Unite rack-frame. |
| Lower position in the Unite rack | Use the bottom of the Unite rack-frame as guide. |

**5** Mount the subrack on the center style at the rear by using Screw, Tapping Thread-Forming, M6x16 — CC901331421 with 7 Nm±1.0 torque .

**6** Where two subracks are mounted in one Unite rack-frame attach the Rubber Profile — DC1003971 (item 6) at the front-top of the bottom subrack and at both front-top sides.

**7** Mount the mounting brackets ( Bracket, Front-left, Unite — DC1003774 Item 1) and ( Bracket, Front-right,Unite — DC1003775

Item 2) on the upright of the Unite rack-frame within its configuration position by using ( Screw, Tapping Thread-Forming, M6x16 — CC901331421 Item 4), but do not fasten completely.

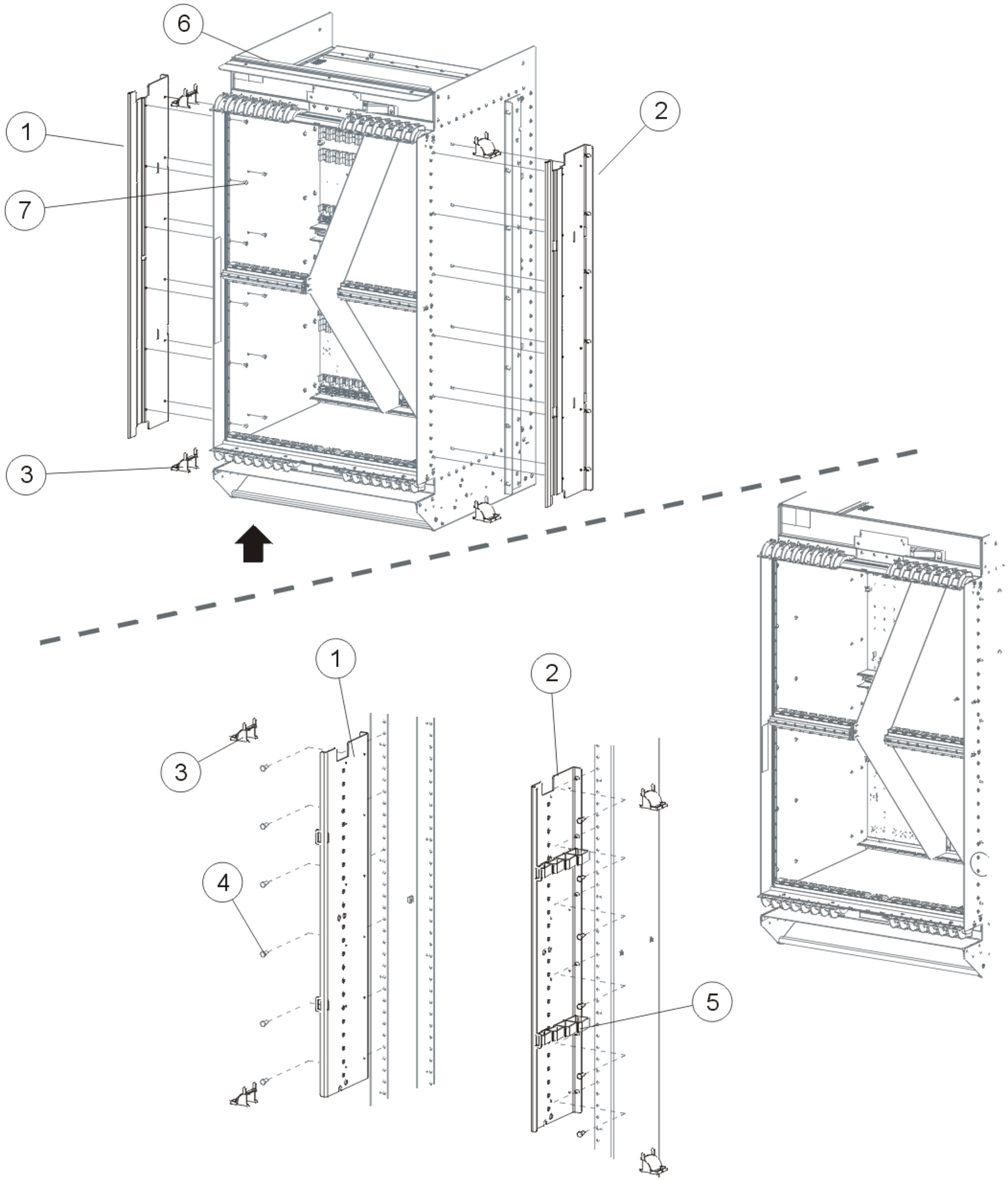
**8** Mount the subrack on the mounting brackets at the front from inside the subrack by using Screw Hexagon Socket Button Head M4x8 — DC1002976 (item 7), but do not fasten completely.

**9** Fasten the front and rear Screw, Tapping Thread-Forming, M6x16 — CC901331421 (Item 4) and Screw Hexagon Socket Button Head M4x8 — DC1002976 (item 7).

**10** Mount the Fiber-Routing Guides (corner) — DC1001518 (Item 3) at each corner of the subrack by clicking them into the holes at the top and bottom sides of the subrack.

END OF STEPS

**Figure 3-26 Mounting Subrack**




□

# Circuit Packs

**CAUTION**

*ESD-sensitive components, take precautionary measures*

### Minimum required circuit packs

The minimum complement of circuit packs required for an operational *LambdaUnite*™ MSS shelf is

- Working XC320 switch circuit pack
- CTL circuit pack
- Any interface circuit packs in the universal slots

A shelf equipped with these circuit packs would be fully functional. Other essential parts of the system which always have to be installed in the shelf are the Power Interfaces (PI), the fan unit, the User Panel and a CI-CTL.

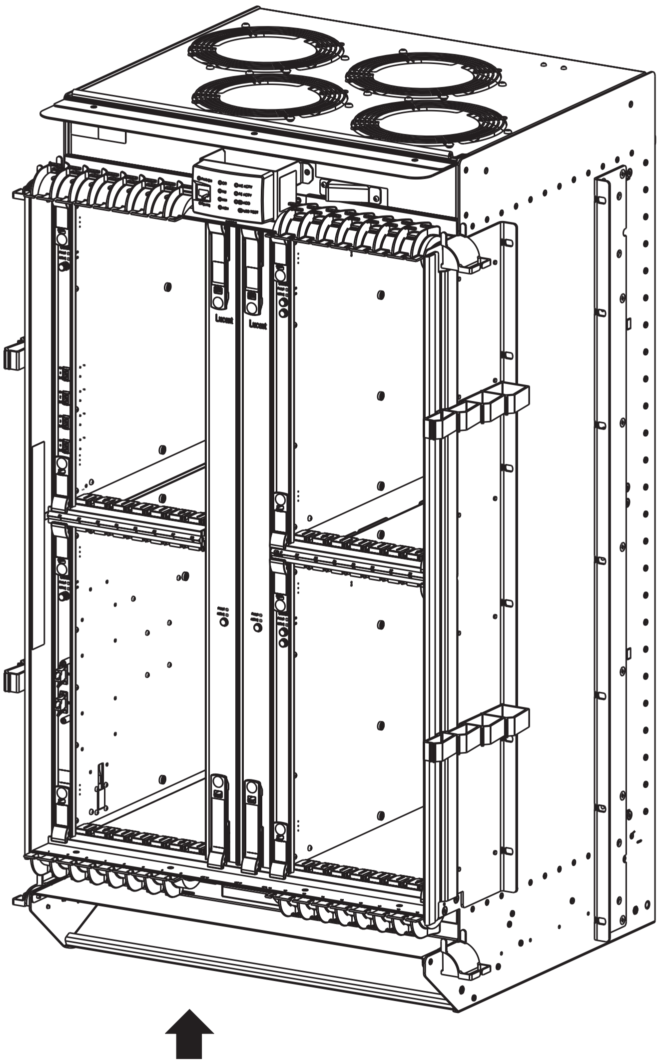
### Position of circuit packs

**Important!** See "Front View of Layout" (3-38) for slot positions.

| Circuit pack | Valid slots |
|---|---|
| OP2G5, OP10G | Any slot numbered #1...#8, #12...#19, #21...#28, and #32...#39. |
| XC320G | The working pack must be in slot #9, the protection pack must be in slot #10. |
| CTL | The working pack must be in slot #11, the protection pack must be in slot #31. |
| Gigabit–Ethernet | Any slot numbered #1...#8, #12...#19, #21...#28, and #32...#39. |
| User Panel (UPL) | In front of the subrack above the XC320 and mounted on a bracket (port circuit-pack #40). |
| Blank | Each empty circuit pack slot in order to close the EMC boundary. |

### Results

**Figure 3-27 Front View of Subrack**



### Gigabit Ethernet and 10-Gbit/s port units

It is recommended, to avoid thermic stress, not to place a 10-Gbit/s port unit directly above a Gigabit Ethernet port unit.

### Optical port unit protection

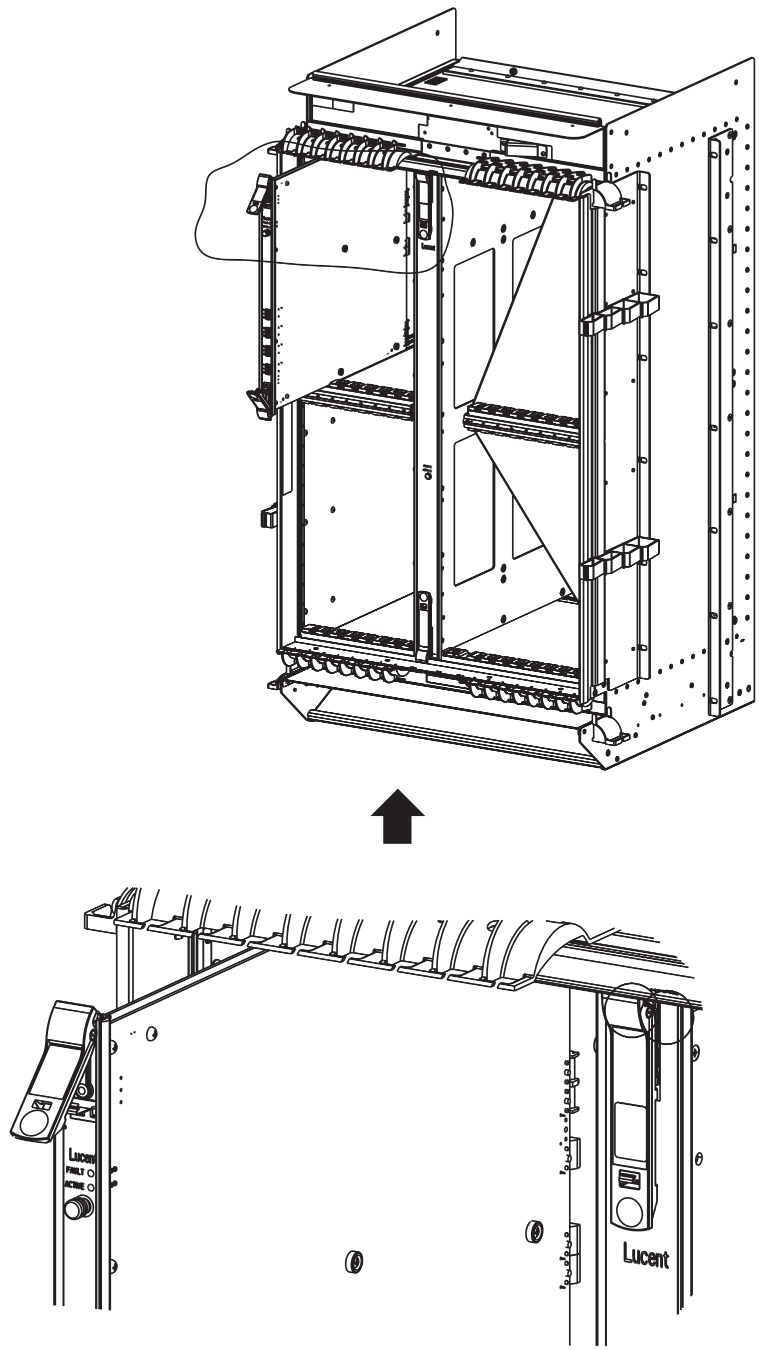
In the case of optical port protection (1+1 Linear APS / 1+1 MSP) it is recommended to place the working port unit and the protection port unit side by side for ease of maintenance.

**Insertion of Circuit Pack**

**Important!** Operate both latches simultaneously during insertion and extraction of a circuit pack.

1 Insert the circuit packs as shown in the figure below.

**Figure 3-28 Insertion of a Circuit Pack**



END OF STEPS

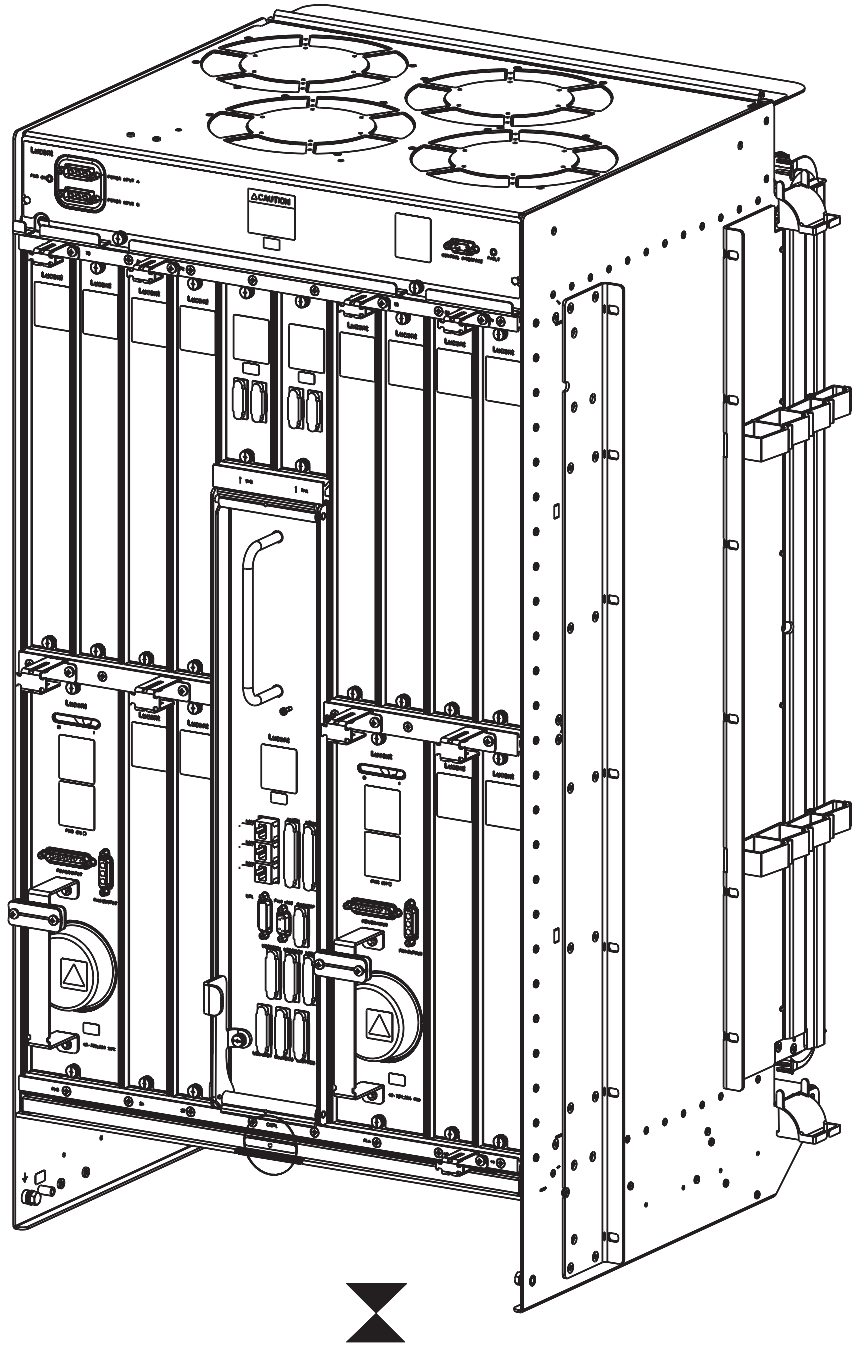
## Position of Paddle-Board Interface

**Important!** See "Back-Plane Layout" (3-39) for slot positions, which are initially mounted into the subrack.

| Paddle board | Valid slots |
|---|---|
| PI | Slots #45 and #56 |
| CI-CTL | Slot #51 (position in the middle of the row that covers both rows)**Important-!** Mount the connector as one part by using the locking mechanism. |
| TI | Slots #69 and #70 |
| Blank (3N) | In each empty position to close the EMC boundary.<br>The complete the first row and the first 2 slots next to the PI. |
| Blank (6N) | In each empty position of XC320G slot. |

## Results

### Figure 3-29 Rear View of Subrack



### Mounting the Paddle-Board Interface

**Important!** Always wear a wrist strap that is properly connected to the earth/ground.

**1**

| If interface paddle is | Then .... |
|---|---|
| CI-CTL | 1. Open the locking mechanism of the board by releasing the screw.<br>2. Position the top of the board in its sleeve and then bring the bottom of the board into its position<br>3. Pull the locking mechanism upwards and fix it in place with the screw. |
| TI/PI/Blank | Lock the interface paddle boards by tightening the screws. |

END OF STEPS

### Results

**Figure 3-30 Insertion of Paddle Board for TI/PI/blank**

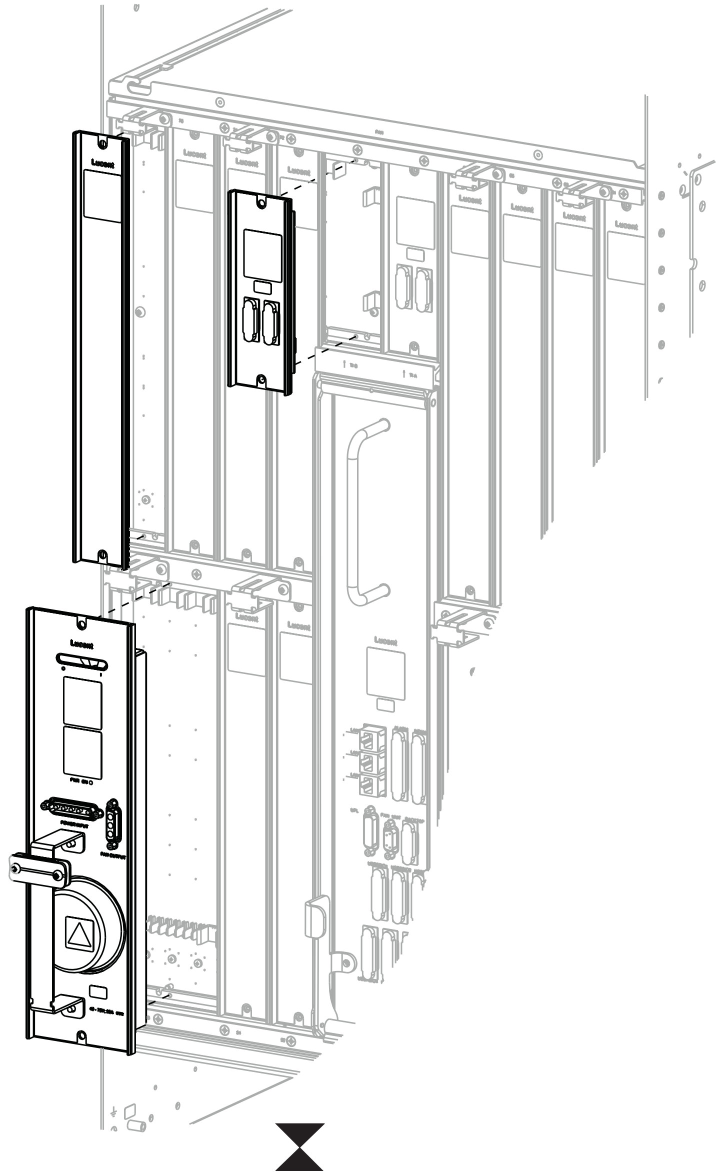
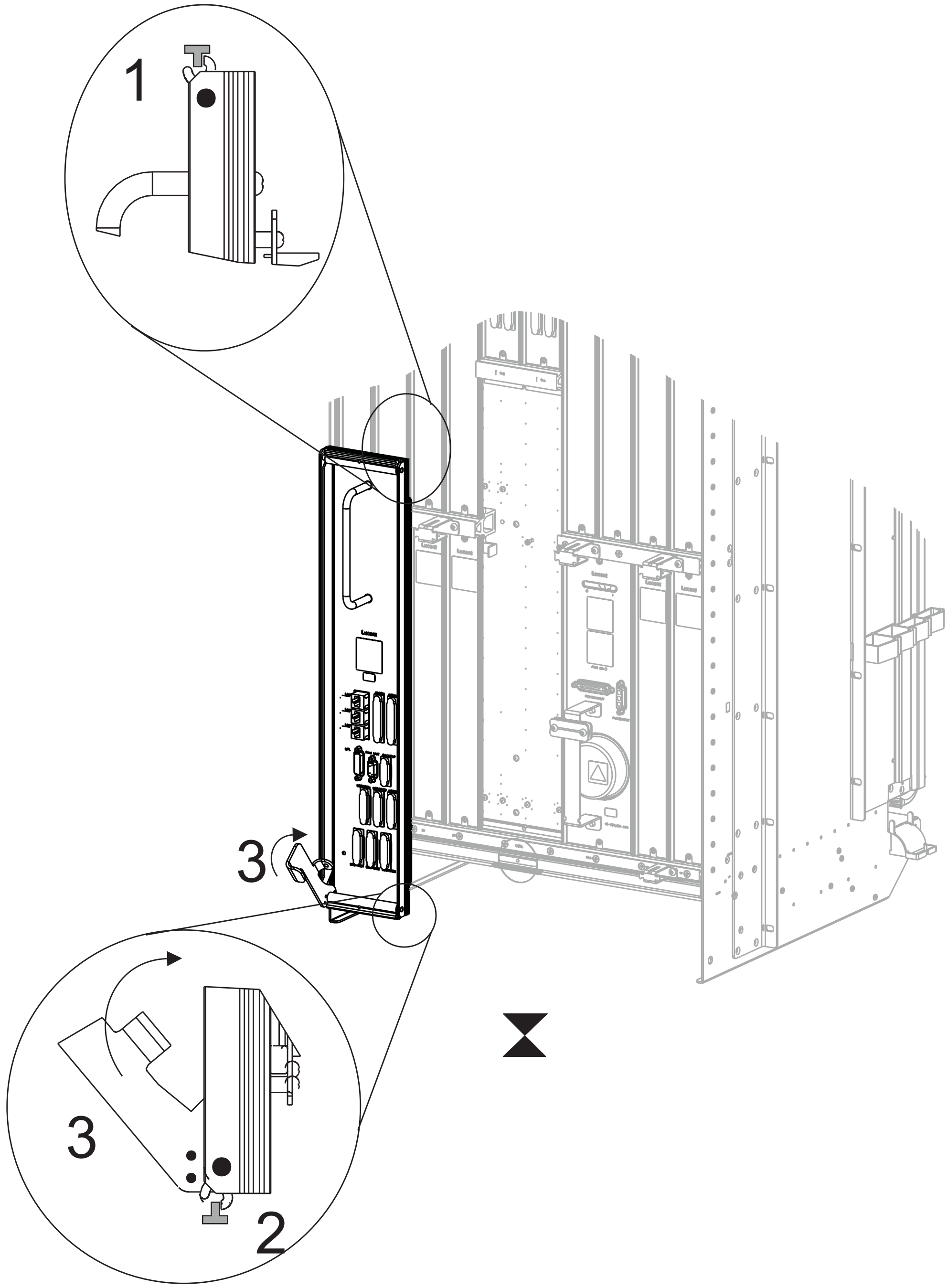


**Figure 3-31 Insertion of a Paddle Board for CI-CTL**



# Rack Doors

### Positioning

1. Place the lower hinge-pin of the door into the hole in the door support, bottom assyembly.

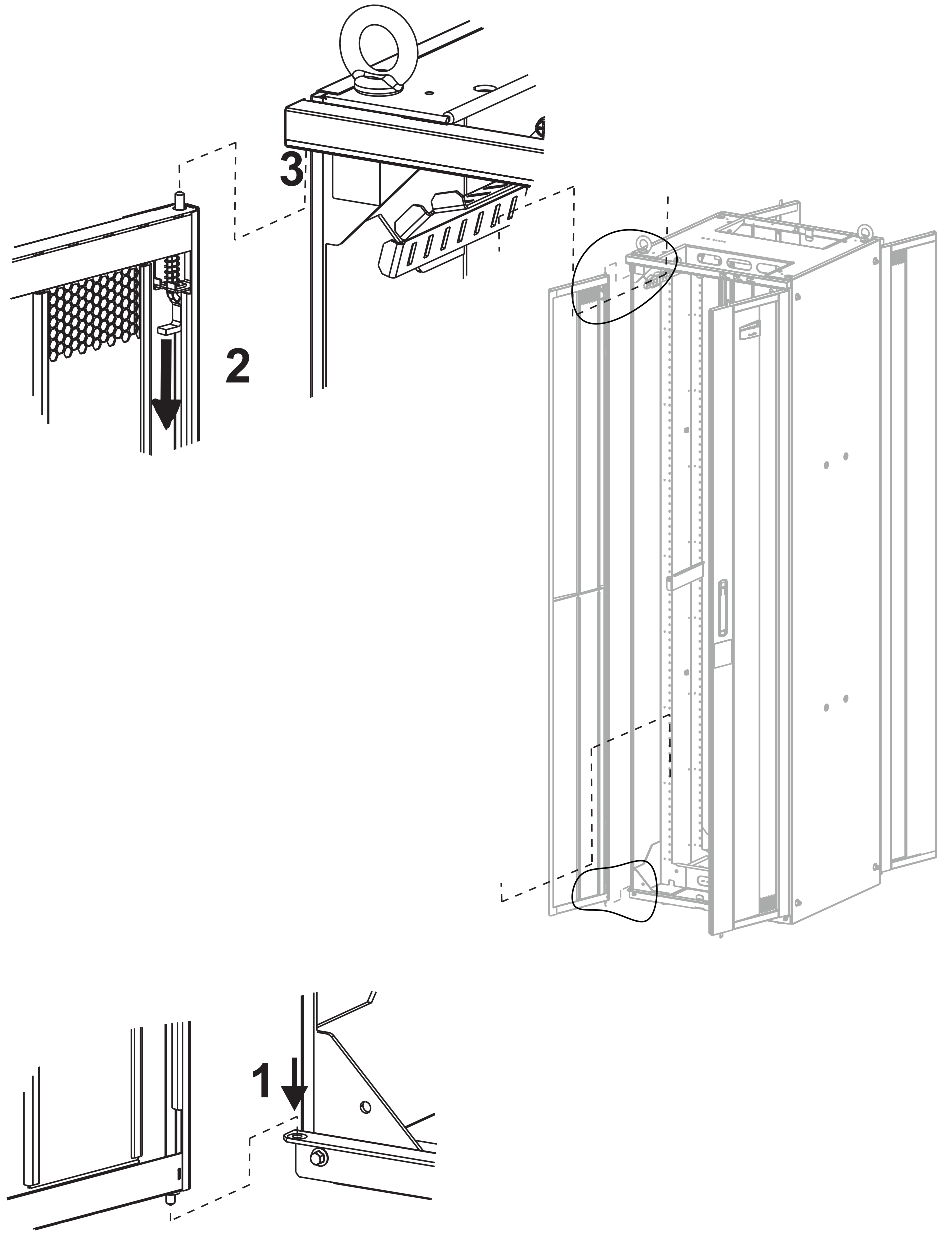
2. Pull down the locking mechanism at the top of the door.

3. Lock the door by releasing the locking mechanism of the upper hinge-pin in the hole of the door support, top assembly.

END OF STEPS

### Result

### Figure 3-32 Positioning the Rack Door




**Legend:**

| | |
|---|---|
| ETSI-2; Assy, Doors — CC848795001 | Assy, Door, Left — DC1000585 and Assy, Door, Right — DC1000586 |
| NEBS–2000; Assy, Doors — CC848795019 | Assy, Door, Left — DC1002598 and Assy, Door, Right — DC1002599 |

### Opening the door

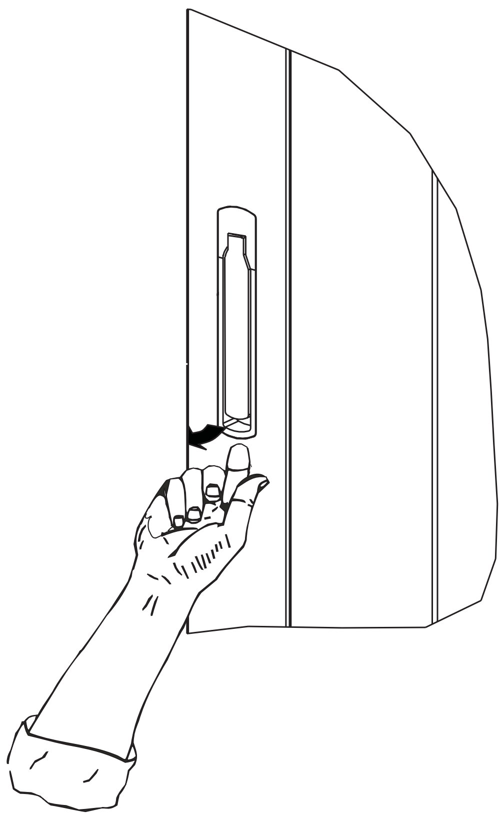
1 Put a finger in the hole below the door latch to lift the latch (see figure below).

2 Pull the latch to open the door.

END OF STEPS

#### Result

**Figure 3-33 Opening the Rack Door**



□

Lucent Technologies
Bell Labs Innovations

# 4 Cable Installation

## Overview

**Purpose**

This chapter covers the connection of cables between subracks and/or from subrack(s) to the rack frame and/or to other external equipments.

**Pre-cautions**

**CAUTION**

*Unterminated optical connectors may emit laser radiation*

*Avoid direct exposure to the beam. Do not view this beam with optical instruments.*

**WARNING**

*Components damage*

*ESD Sensitive components, take precautionary measures (see Chapter 1, Safety).*

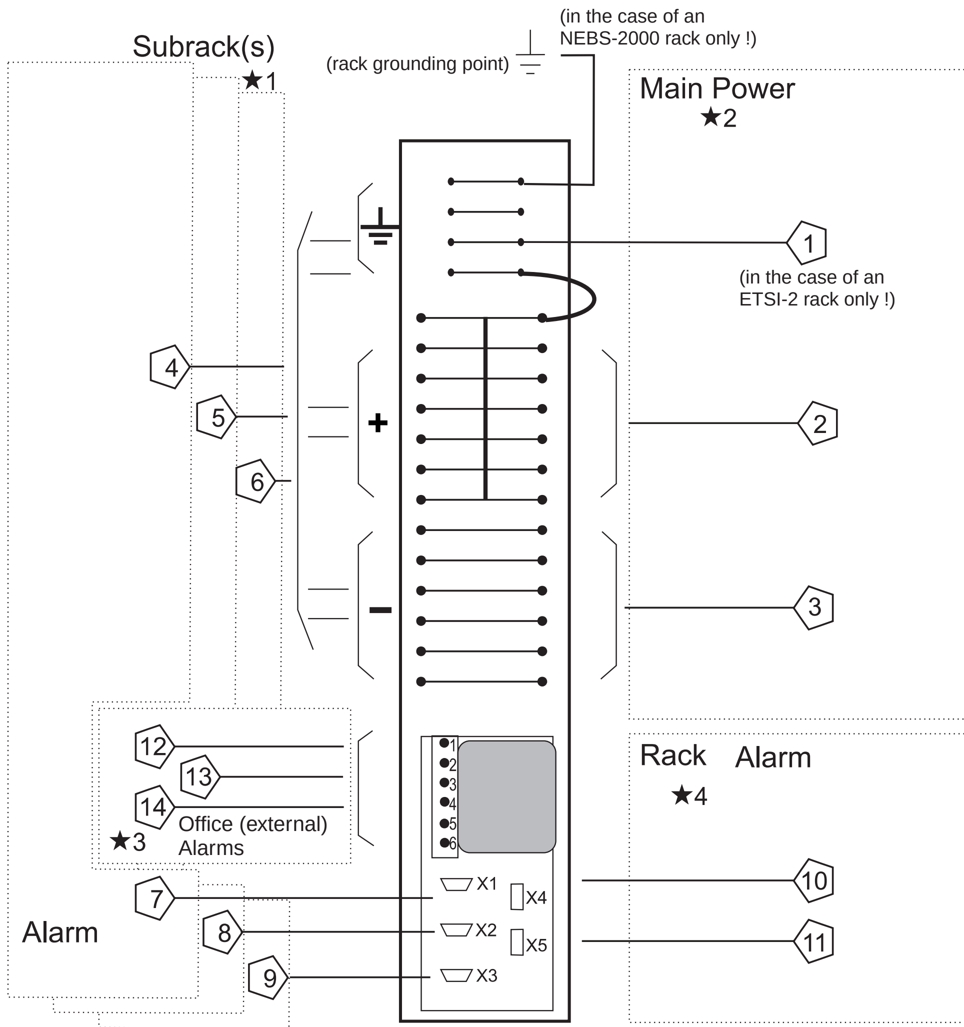
**Contents**

☐

# PDP Block-Diagram

**Layout** The connection points of this product are shown as a cable number in the figure below.

**Figure 4-1 Block Diagram of Cable Links**




**List of Cable Numbers** The following table explains the use of the cables.

| Cable No. | Type of cable | Color | Remarks |
|---|---|---|---|
| 1 | Ground Cable (for ETSI-2 rack only) | Yellow/ Green | Max. 35 $mm^2$ *2 (customer dependent) |
| 2 | Power Cable | Red (return) | |
| 3 | Power Cable | Blue (-48V) | |
| 4 | Cable Assy, PI (Upper subrack) - PDP — CC848811501/DC1002826 (1850 mm [6,069 ft]) | Yellow/ Green, Blue, Red | $16mm^2$ *1 |
| 5 | Cable Assy, PI (Lower subrack) - PDP — CC848811519/DC1002827 (3200 mm [10,499 ft]) | | |
| 6 | 3rd Subrack power cable | | |
| 7 | Cable Assy, CI-CTL (Upper subrack) - PDP — CC848811527/ DC1002828 (1100mm [3,609 ft]) | | |
| 8 | Cable Assy, CI-CTL (Lower subrack) - PDP — CC848811535/ DC1001829 (3300mm [10,827 ft) | | |
| 9 | 3rd Subrack Alarm Cable | | |
| 10, 11 | Cable Assy, PDP - LED, Alarm — CC848811543/DC1002831 (1300mm [4,265 ft]), Front/Rear | | Unite rack-frames, *4 |
| 12 | External-Alarm Critical | | *3 (customer dependent) |
| 13 | External-Alarm Major | | |
| 14 | External-Alarm Minor | | |

# Alarm Lamp Cable Routing

**Routing Procedure**

**Important!** These cables are prefabricated and mounted in the unite rack-frame.

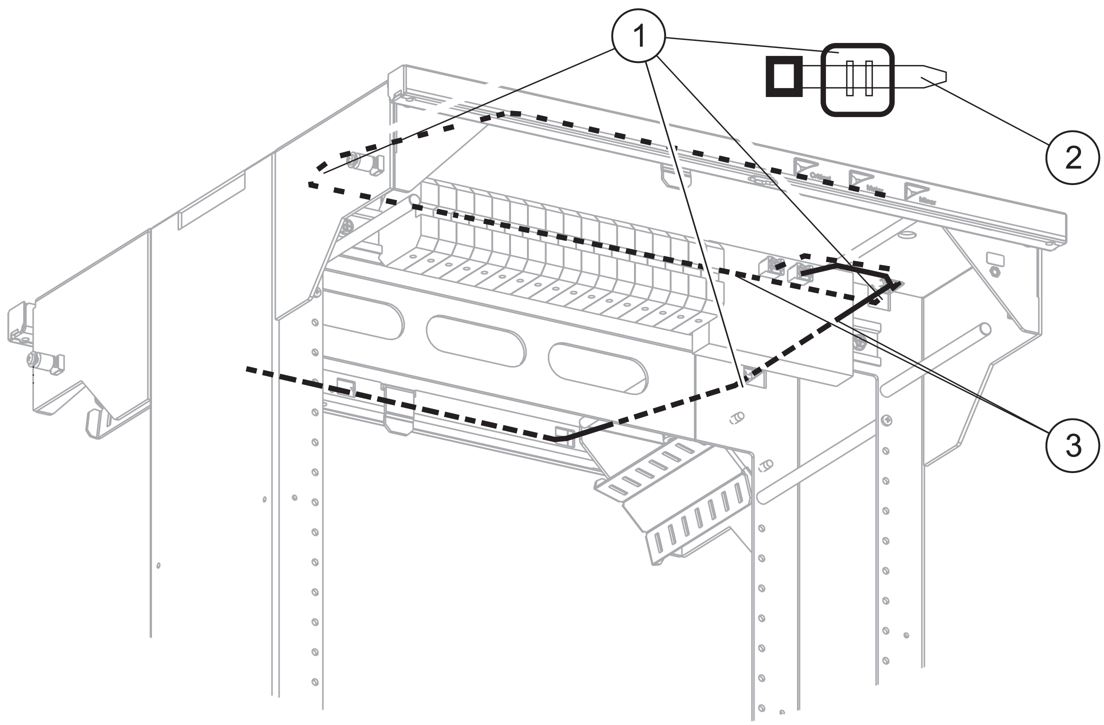
1 Stick the Clip, Self-Adhesive — CC402185409 (Item 1) on the rack.

2 Insert the Nylon Cable-Ties — CC407804715 (Item 2) in the gaps in the self-adhesive clip to bind together the cables in the Assy, Alarm Cable PDP/LED — DC1002831 (Item 3).

END OF STEPS

**Layout**

**Figure 4-2 Routing the alarm-lamp cable**



# Power Wiring (Unite)

## Routing of Customer Cables

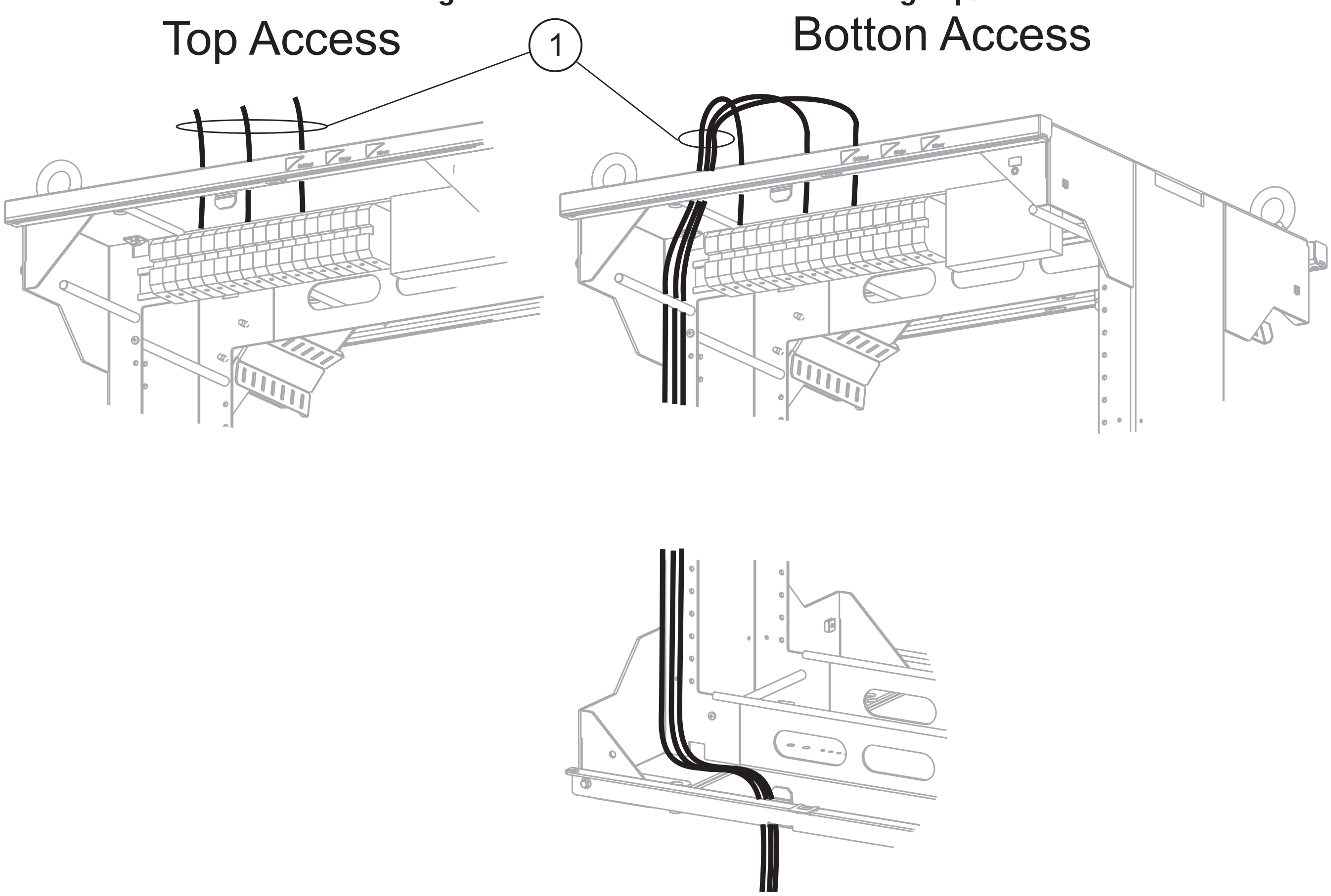
1

| In case of ... | Then ... |
|---|---|
| Top Access | The cables (item 1) are routed directly into the PDP. |
| Bottom Access | The cables (item 1) are routed via the right-rear side of the rack frame to the top of the rack frame. |

END OF STEPS

### Result

**Figure 4-3 Customer cables routing top/Bottom Access**



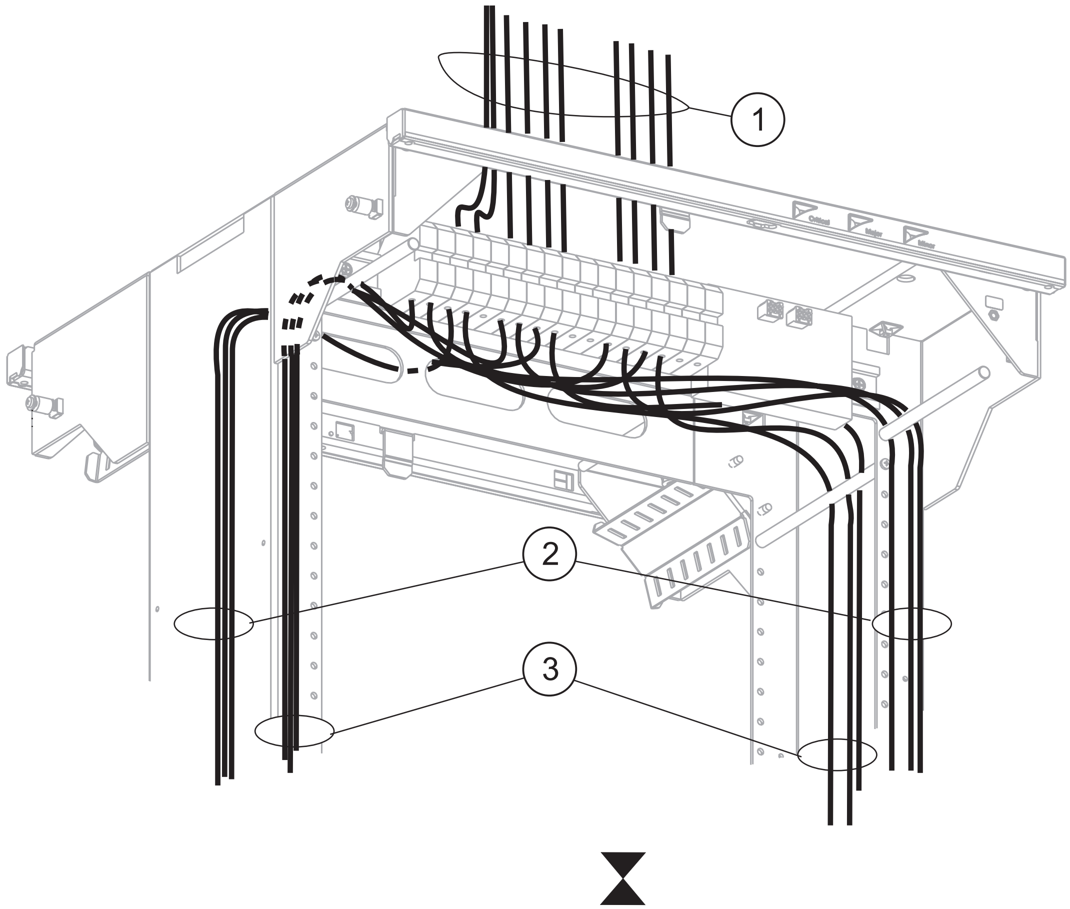
## Routing of Subrack Cables

**Important!** These cables are mounted within the Unite rack-frames.

| In case of ... | Then ... |
|---|---|
| Upper Subrack | The Cable Assy, PI (Upper subrack) - PDP — CC848811501/DC1002826 (item 3) of the upper DUR subrack is routed at the rear side of the center styles of the frame. The B side to the left “center style” and the A side to the right “center style”. |
| Lower Subrack | The Cable Assy, PI (Lower subrack) - PDP — CC848811519/DC1002827 (item 2) of the lower DUR-subrack is routed through the center styles of the frame. The B side to the left “center style” and the A side to the right “center style”. |

**Result**

**Figure 4-4 Front/Top View of PDP (rack rearview)**



# Subrack-Alarm Wiring (Unite)

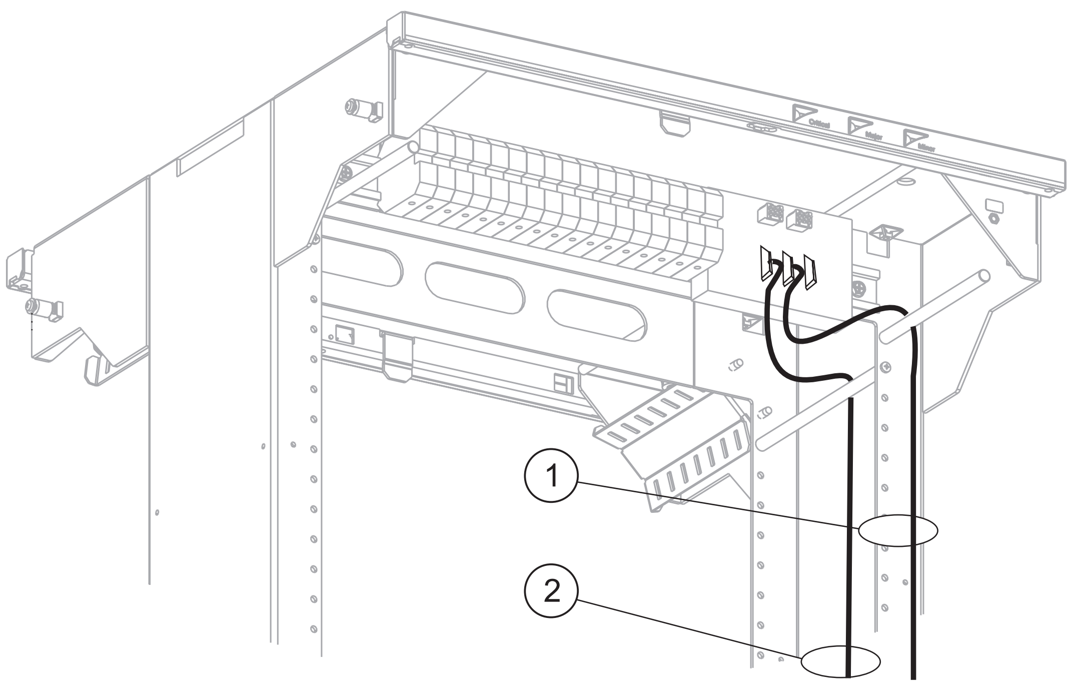
**Routing of Subrack Cables**

**Important!** These cables are mounted within the Unite rack-frames.

| In case of ... | Then ... |
|---|---|
| Upper Subrack | The Cable Assy, CI-CTL (Upper subrack) - PDP — CC848811527/ DC1002828 (item 1) in the top of the frame is routed at the rear-right side of the center style of the frame. |
| Lower Subrack | The Cable Assy, CI-CTL (Lower subrack) - PDP — CC848811535/ DC1001829 (item 2) of the lower DUR subrack at the bottom of the frame is routed through the right center-style of the frame. |

**Result**

**Figure 4-5 Front/Top View of PDP**

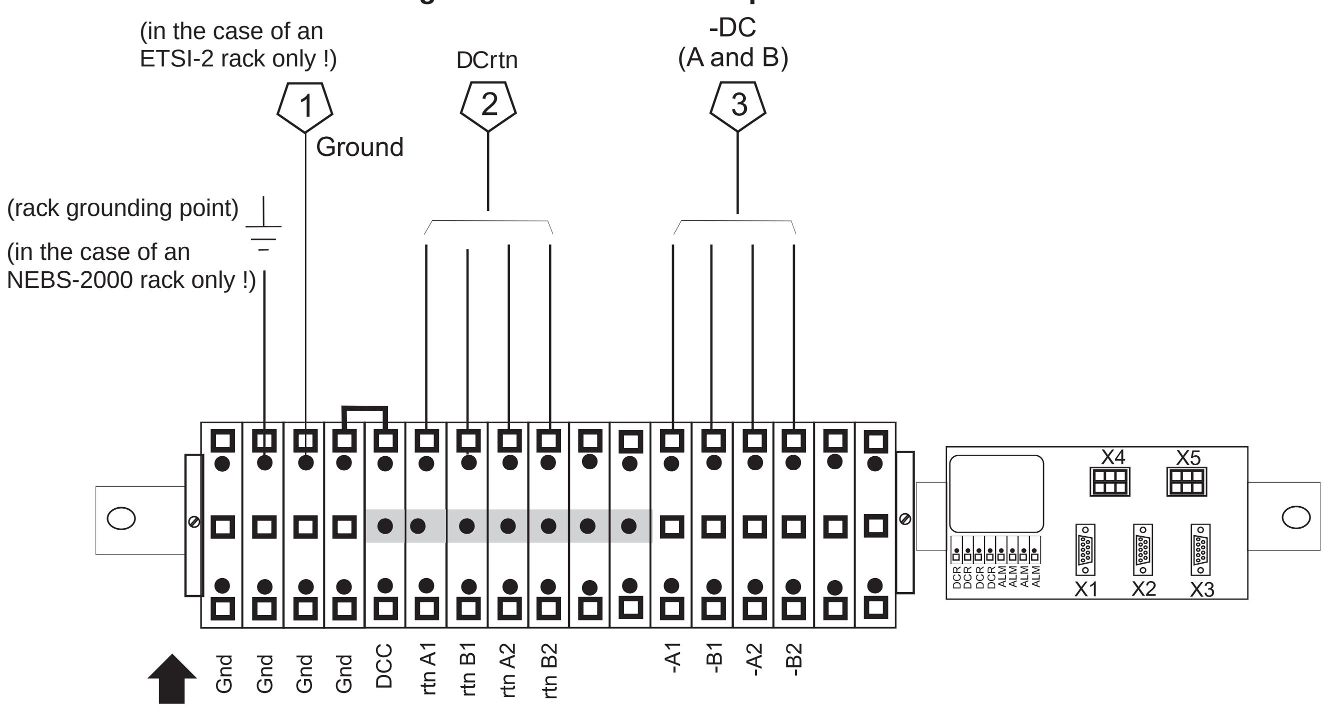


# Ground, Power and Alarms

### Power input

| Item | Description | Remark |
|---|---|---|
| 2, 3 | Power (4/0) 25m [82,021 ft] — CC848827457 | Both used for Batt and RTN |
| 2, 3 | Power (2/0) 16m [52,493 ft] — CC848827499 | |
| 2, 3 | Power (2/0) 8m [26,247 ft] — CC848827481 | |
| 2, 3 | Power (2) 5m [16,404 ft] — CC848827473 | |
| 1 | Office Ground 2/0 — CC848833604 | for ETSI-2 rack only |
| Rack grounding point | Ground Wire (800 mm [2,625 ft]) — CC848828158 | for NEBS-2000 rack only |

**Figure 4-6 PDP Power-Input**




**Legend:**

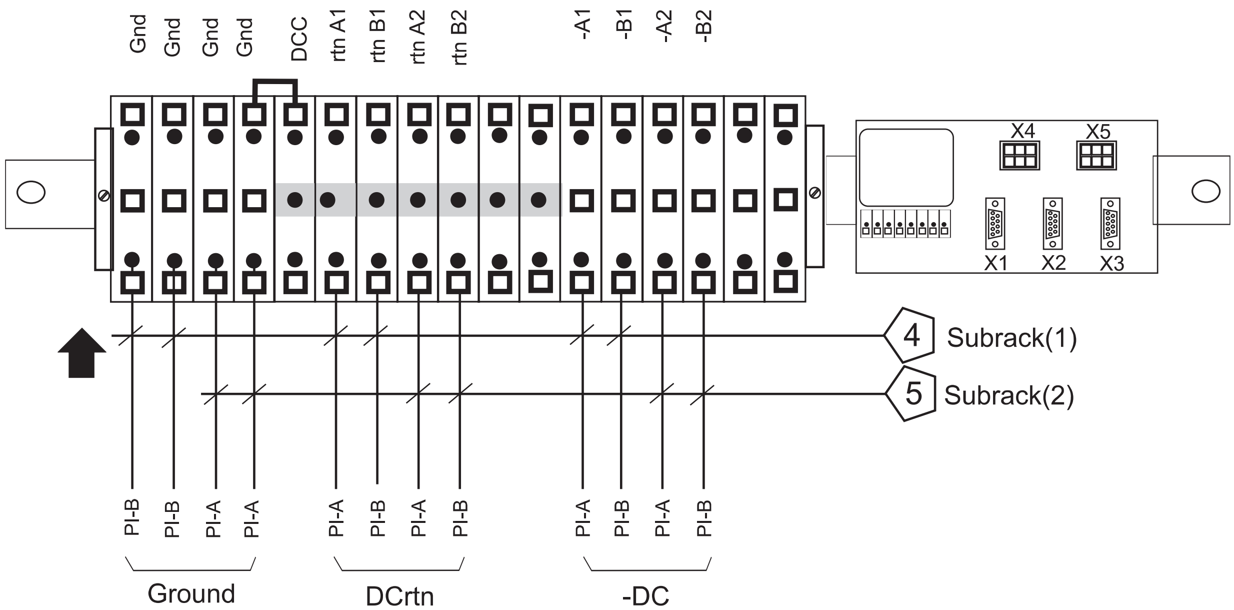
1 Yellow/Green (ground), for ETSI-2 rack only

2 Red (DCrtn)

3 Blue (-DC)

**Power output**

**Figure 4-7 PDP Power Output**




**Legend:**

| | |
|---|---|
| 4, 5 | Subrack # power cables (combined: Yellow/Green, Red, Blue) |
| Ground Color | Yellow/Green |
| DCrtn Color | Red |
| –DC Color | Blue |

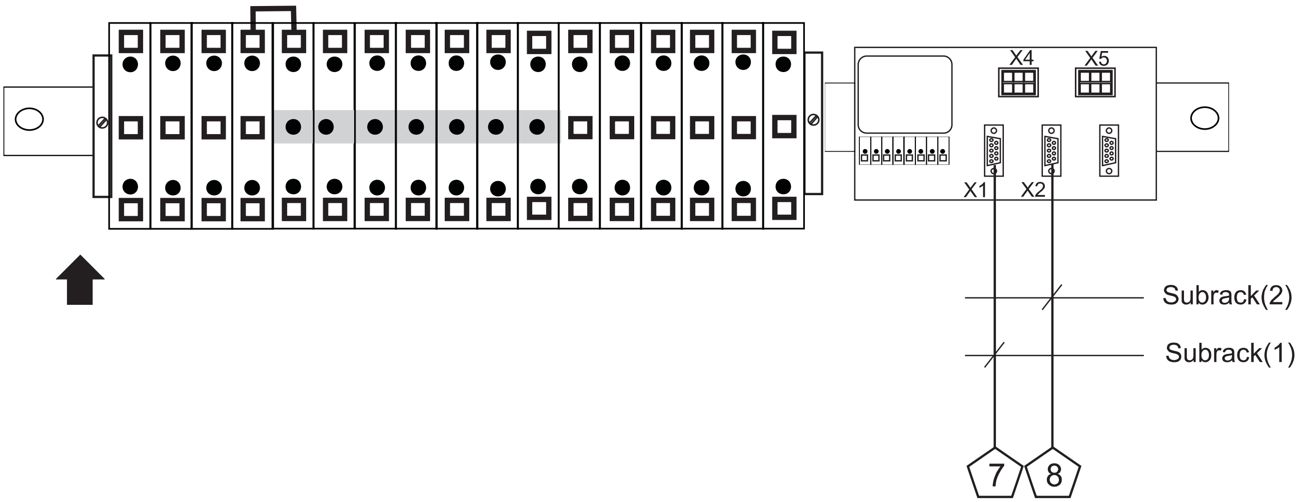
**For *LambdaUnite*™ MSS**

| Item | Description |
|---|---|
| 4 | Cable Assy, PI (Lower subrack) - PDP — CC848811519/DC1002827 |

| | |
|---|---|
| 5 | Cable Assy, PI (Upper subrack) - PDP — CC848811501/DC1002826 |

## Subrack Alarms

**Figure 4-8 PDP Subrack-Alarms**

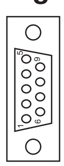



**Legend:**

7 1st Subrack, Alarms (X1)

8 2nd Subrack, Alarms (X2)

**Figure 4-9 PDP Subrack-Alarm Connector**



**Legend:**

1 Ground

2 Major Rack-Top Return

3 Ground

4 Critical Rack-Top Output

5 Minor Rack-Top Output

6 Critical Rack-Top Return

7 Minor Rack-Top Return

8 Ground

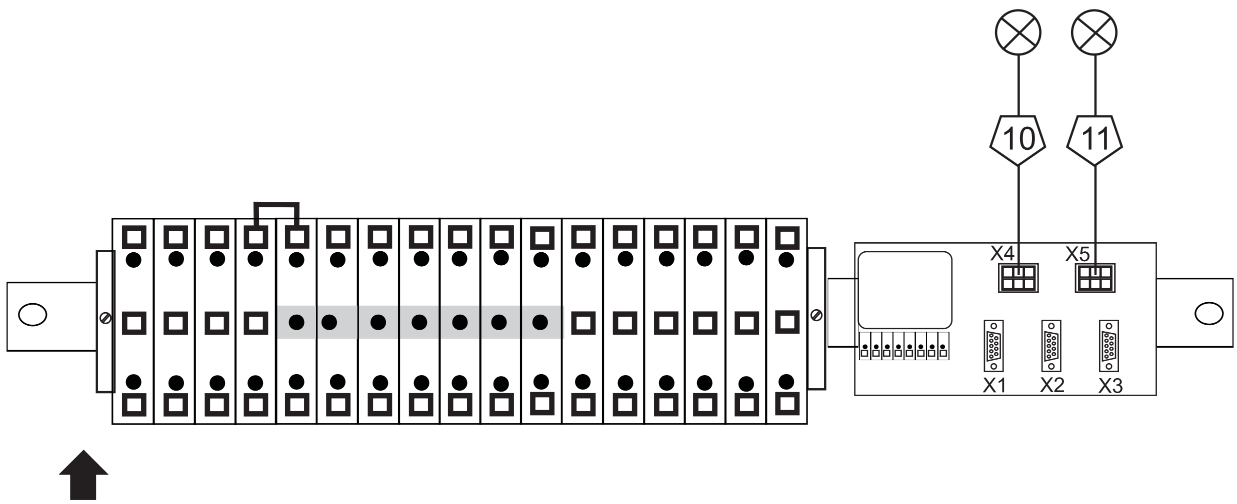
9 Major Rack-Top Output

### For *LambdaUnite* MSS

| Item | Description |
|---|---|
| 7 | Cable Assy, CI-CTL (Upper subrack) - PDP — CC848811527/DC1002828 |
| 8 | Cable Assy, CI-CTL (Lower subrack) - PDP — CC848811535/DC1001829 |

## Rack Alarm Lamps

**Figure 4-10 PDP Rack-Alarm Lamps**

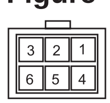



**Legend:**

10 Front of Rack Frame, Alarm Lamps (X4)

11 Rear of Rack Frame, Alarm Lamps (X5)

**Figure 4-11 PDP Rack-Alarm Connector**



**Legend:**

| | |
|---|---|
| 1, 4 | Critical Alarm |
| 2, 5 | Major Alarm |
| 3, 6 | Minor Alarm |

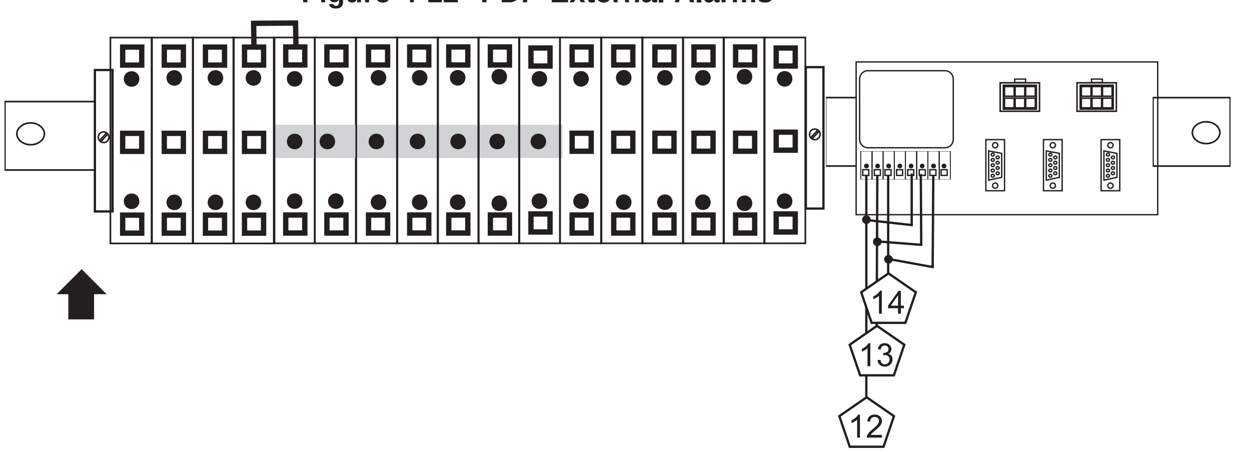
### For *LambdaUnite* MSS

| Item | Description |
|---|---|
| 10, 11 | Assy, Alarm Cable PDP/LED — DC1002831 |

### External Alarms

| Item | Description | Remark |
|---|---|---|
| 12, 13, 14 | Office alarm 15m [49,213 ft] — CC848834925 | Critical, majaor and minor |
| | Office alarm 30m [98,425 ft] — CC84883933 | |
| | Office alarm 45m [147,638 ft] — CC848834941 | |
| | Office alarm 75m [246,063 ft] — CC848834958 | |

**Figure 4-12 PDP External Alarms**



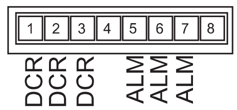

**Legend:**

12 External Critical Alarm

13 External Major Alarm

14 External Minor Alarm

**Figure 4-13 PDP External-Alarm Connector**



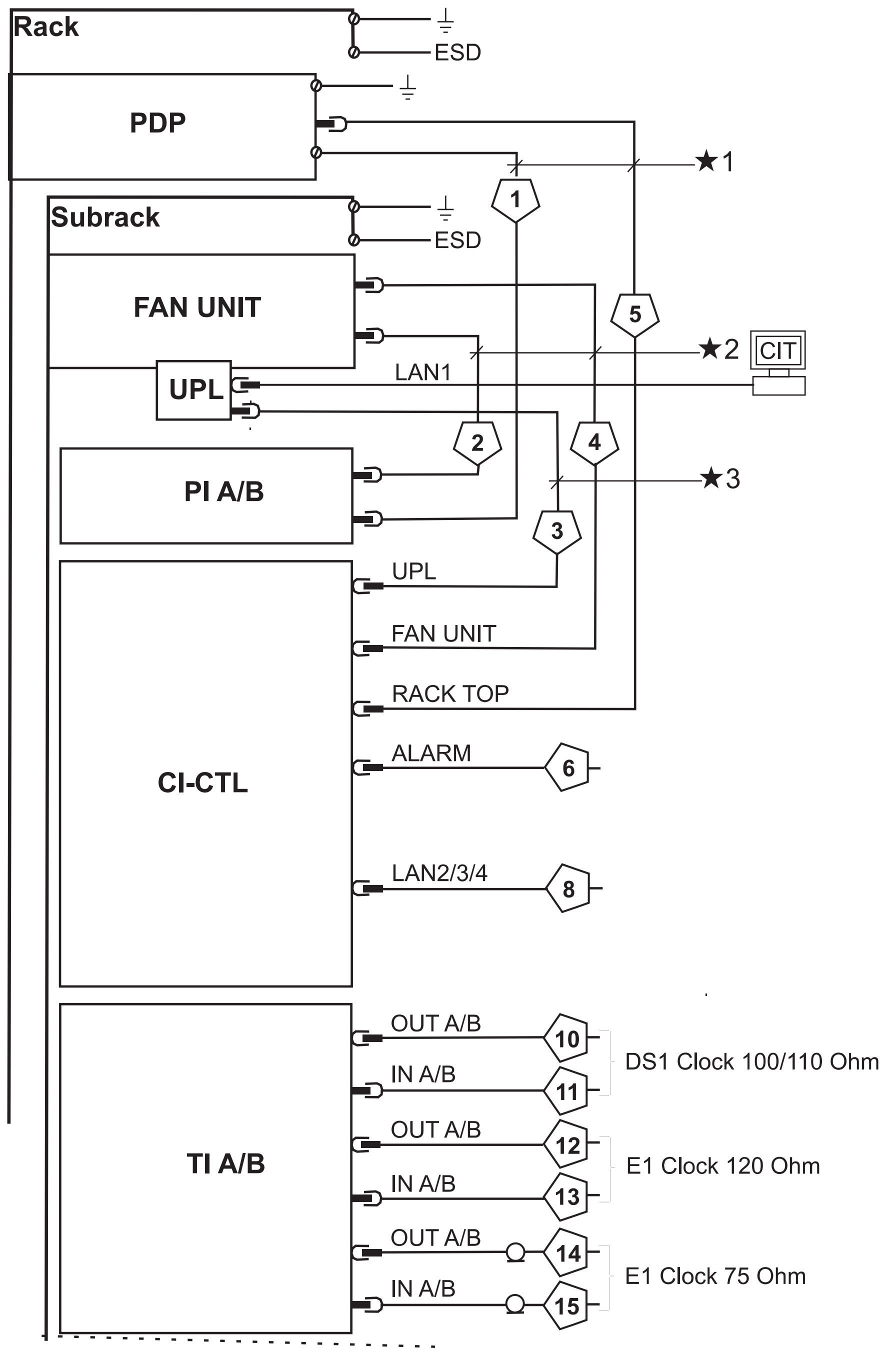

**Legend:**

| | |
|---|---|
| 1, 5 | Critical Alarm |
| 2, 6 | Major Alarm |
| 3, 7 | Minor Alarm |

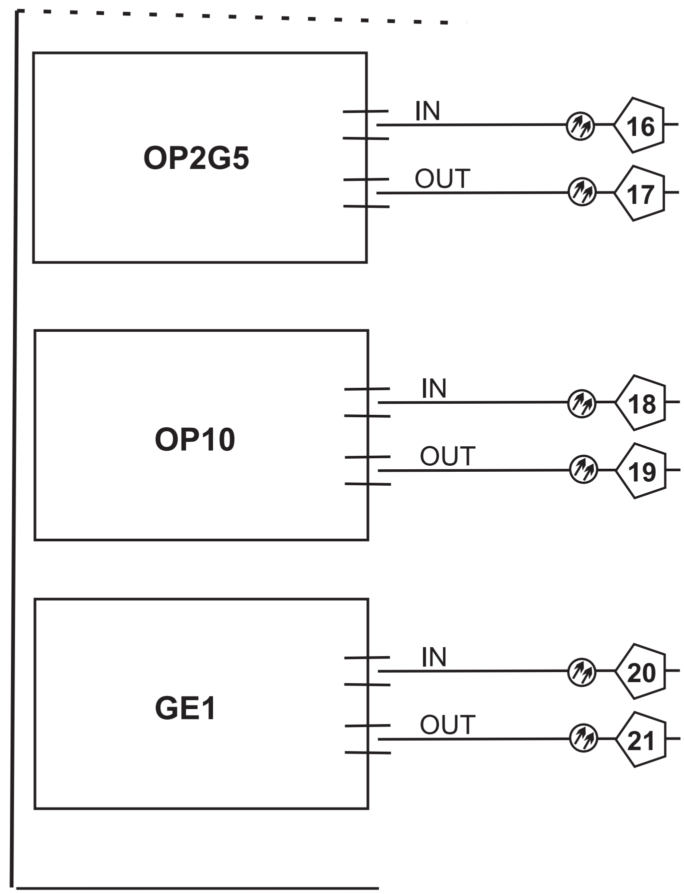
# Block Diagram for Cables

The connection points of this product are marked by cable numbers.

### Layout Part 1



### Layout Part 2




**Legend:**

*1 These prefabricated cables are to be connected to the PDP (see the configuration – and related documentation.

*2 These prefabricated cables are to be connected.

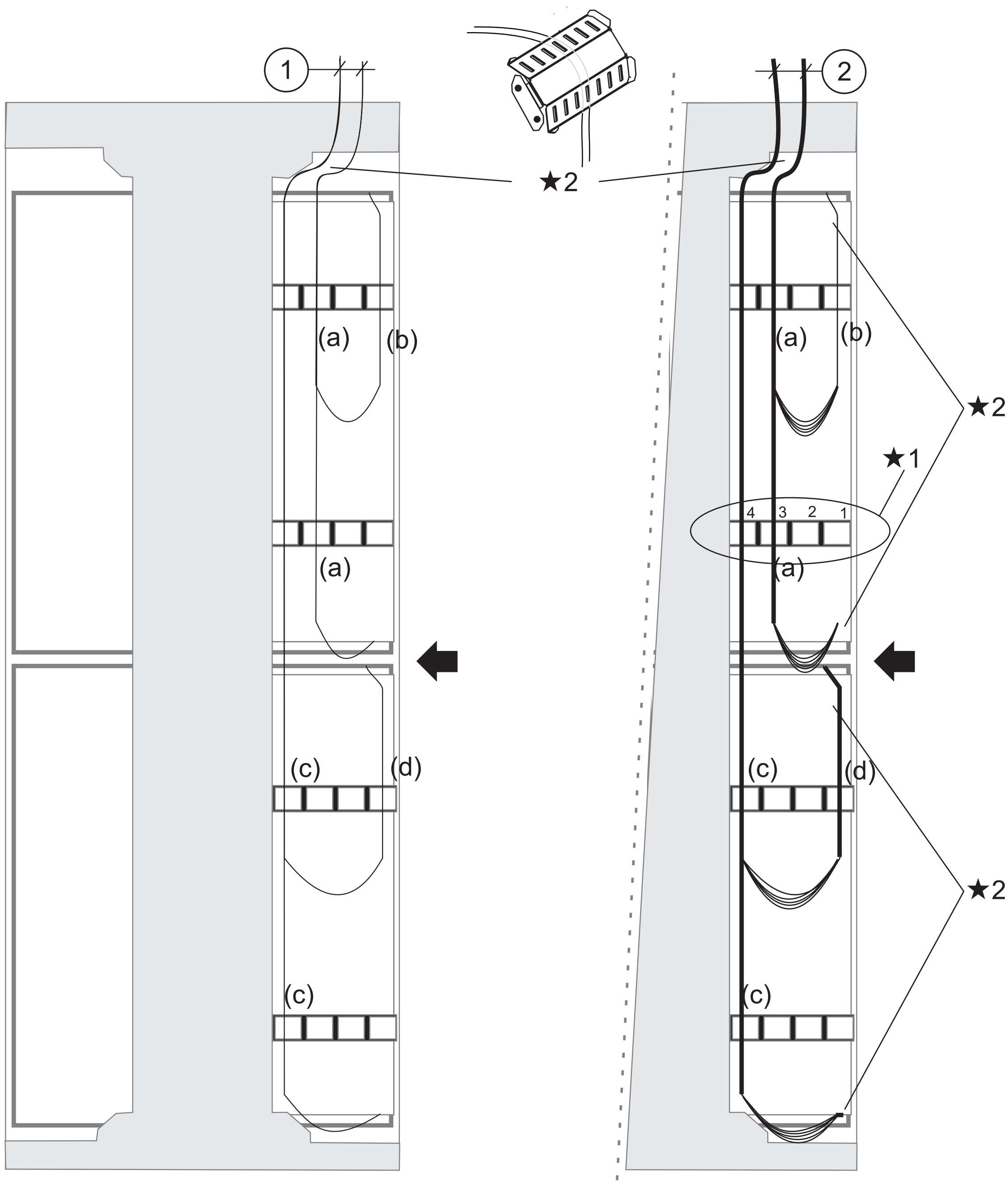
*3 This prefabricated cable is installed in the subrack.

□

# Fiber Management in the Rack Frame (Unite)

### Top Access

**Figure 4-14 Top Access for Fiber Management (Side View Rack)**



**Important!** The entries (*1) in the fiber guides are counted from the front (first entry) to the back of the bracket (fourth entry). The cables are tied together with velcro at the entries (*2) of the rack frame and subrack

### Upper Subrack

The upper subrack cables are using the third entry of the fiber guide (a) to route down first and then upwards to:

- The upper row via the first entry (b)
- The bottom row directly

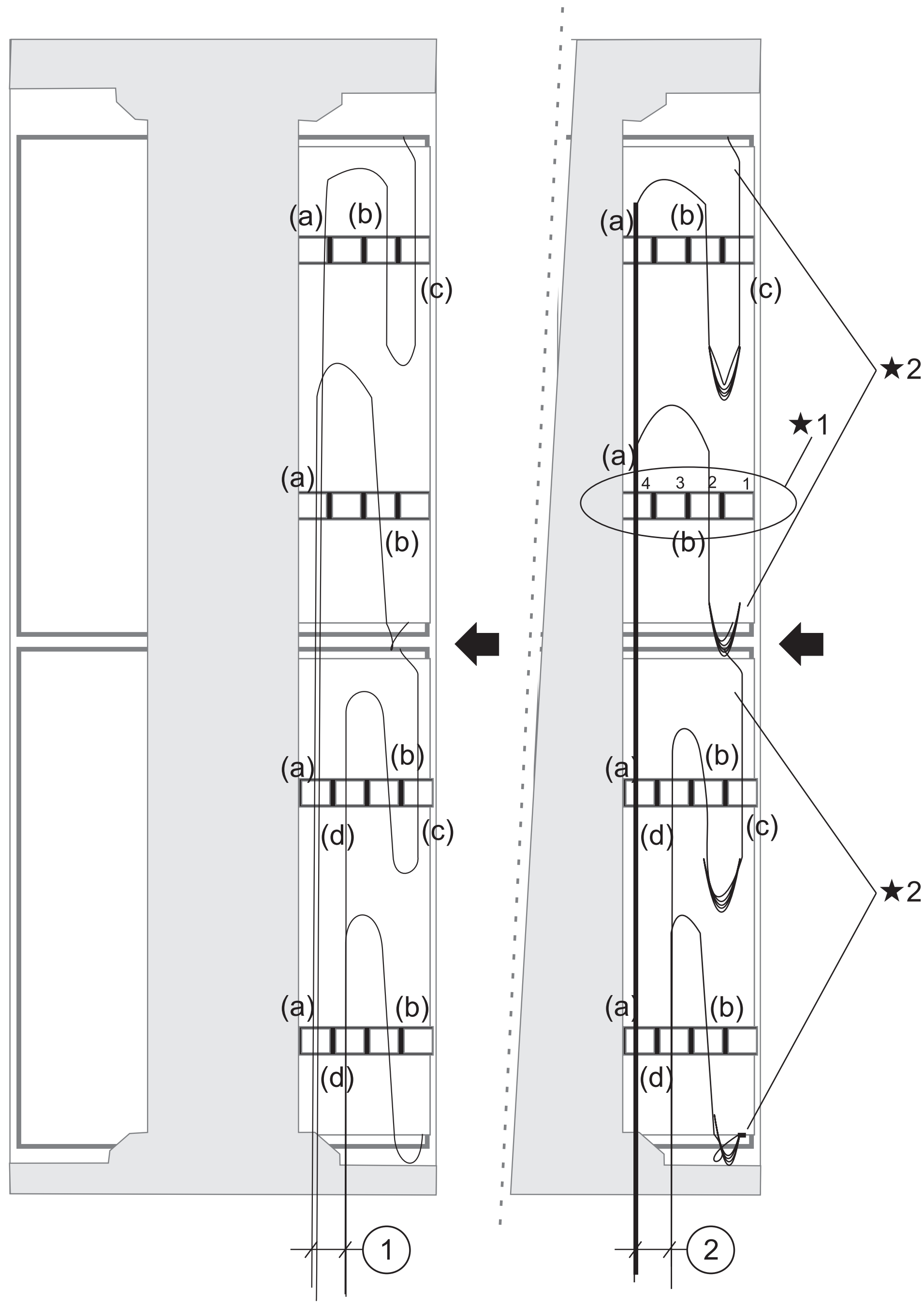
### Bottom Subrack

The bottom subrack cables are using the fourth entry of the fiber guide (c) to route down first and then upwards to:

- The upper row via the first entry (d)
- The bottom row directly

## Bottom Access

**Figure 4-15 Bottom Access Fiber Management (Side View Rack)**




**Important!** The entries (*1) in the fiber guides are counted from the front (first entry) to the end of the bracket (fourth entry). The cables are tight together with velcro at the entries (*2) of the rack frame and subrack

### Upper Subrack

The upper subrack cables are using the fourth entry of the fiber guide (a) to route up first and then upwards to:

- The upper row down via the second entry (b) and up via the first entry (c)
- The bottom row down via the second entry (b) and directly to the row

### Bottom Subrack

The bottom subrack cables are using the third entry (d) of the fiber guide to route up first and then upwards to:

- The upper row down via the second entry (b) and up via the first entry (c)
- The bottom row down via the second entry (b) and directly to the row.

□

# Fiber Management Subrack

**Optical cables**

The Fiber optic cables are:

- “Single Mode 9/125 Fiber-Optic Cables” (B-2) for “Optical Interfaces” (4-64) (OP2G5 and OP10)
- “Multi-Mode 62.5/125 Fiber-Optic Cables” (B-8) for “Gigabit-Ethernet Interfaces” (4-68)

The above optical cables are routed on both sides from the top or bottom of the Unite rack-frame to the subrack via the fiber guides that are on the subrack’s mounting brackets at the right-front and left-front sides of the subrack.

The break-out cables will be stripped to the halfway point of the subracks’s height.

**Important!** When dressing the optical cables (break-out or simplex) use a bending radius of of a minimum of 25mm [1”] for stripped break-out or single fibers and a minimum of 77 mm [3.03”] for an unstripped break-out cable.

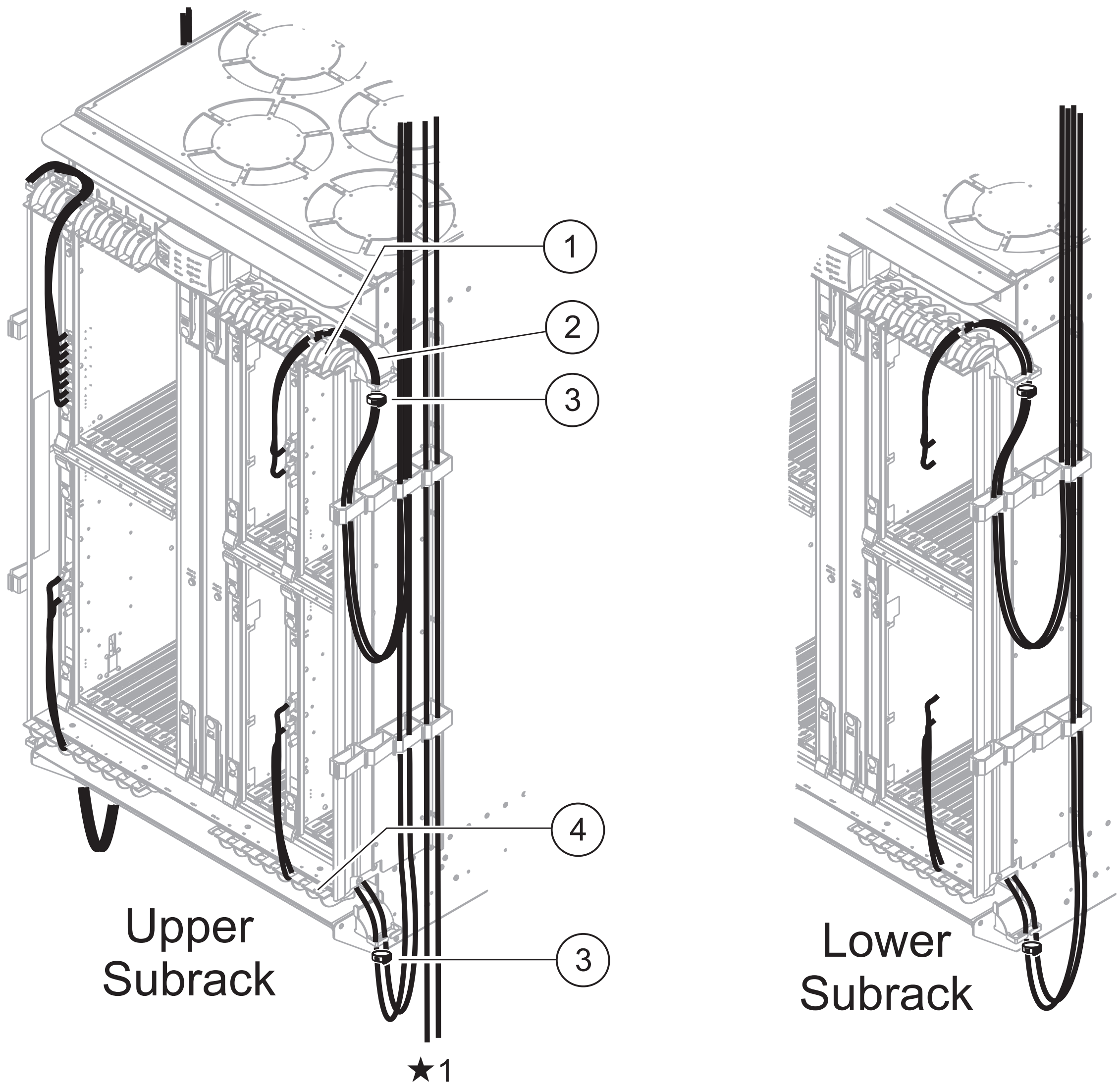
**Fiber Routing in a Subrack**

The fiber cables are routed from both sides of the subrack to the top or bottom via the Fiber-Routing Guides (corner) — DC1001518 (item 2) which are mounted at each corner position of the subrack. The cables are tightened with Velcor — DC1005002 (item 3) before they enter the subrack.

Cables are lead to the slot position via the Fiber-Routing Guides (RT/LB) — DC1001516 (item 1) or the Fiber-Routing Guides

(LT/RB) — DC1001517 (item 4) which are mounted on the top/bottom of the subrack.

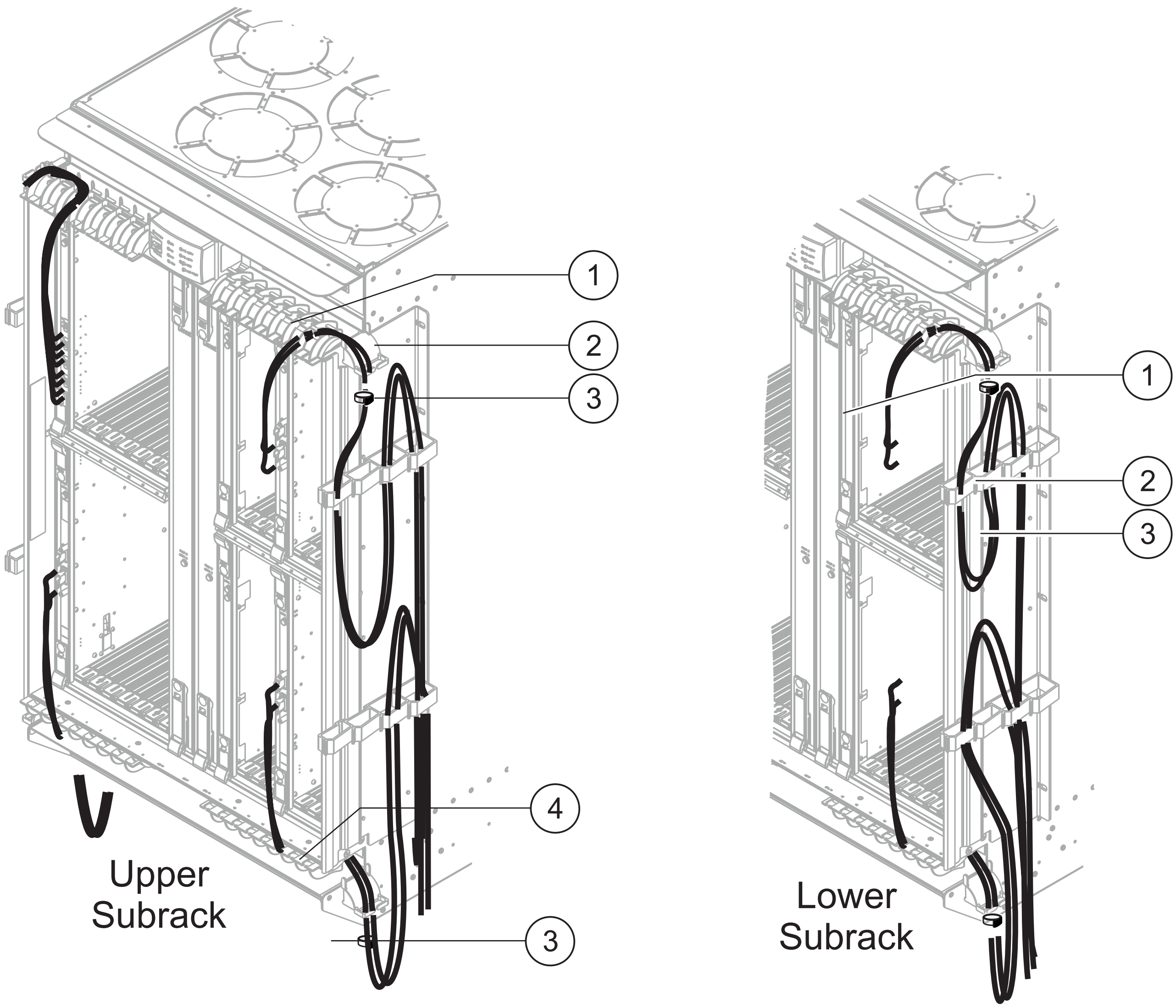
**Figure 4-16 Fiber Management in the Subrack (Top Access)**




**Legend:**

*1 Cable routed to the lower subrack

**Figure 4-17 Fiber Management in the Subrack (Bottom Access)**




**Legend:**

*1 Cable routed to the upper subrack

□

# Electrical Cable Management

**Electrical cables**

Electrical cables are:

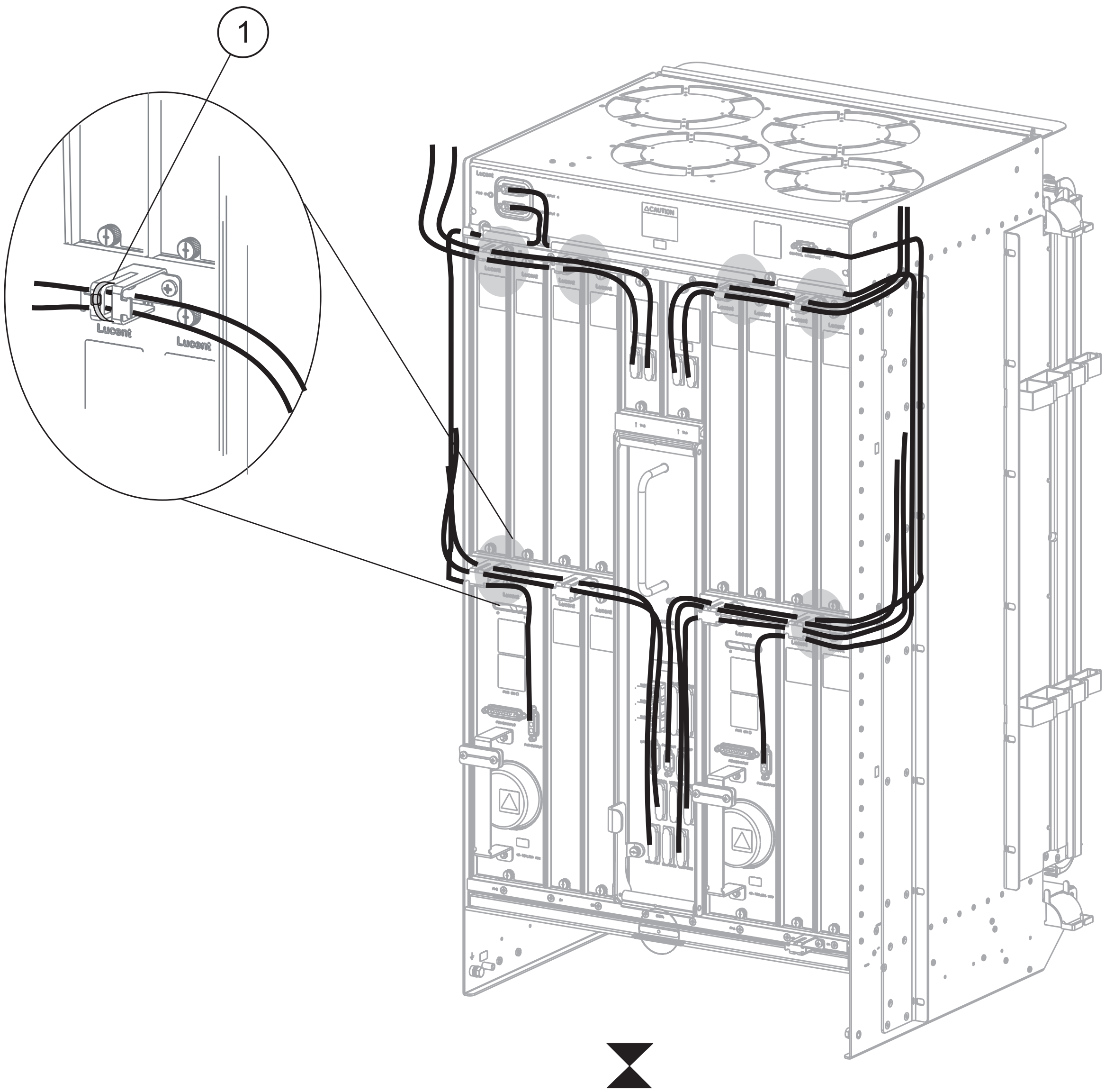
- TI-E1/DS1 (75100/120)
- PI-FAN
- PI-PDP
- Alarm-PDP
- LAN

The above electrical cables are routed on both sides from the top or bottom of the Unite rack-frame to the subrack via the guides that are mounted on the rear of the subrack.

**Important!** When dressing the cables attach them to the guides by using tie wraps (item 1). See the following figures.

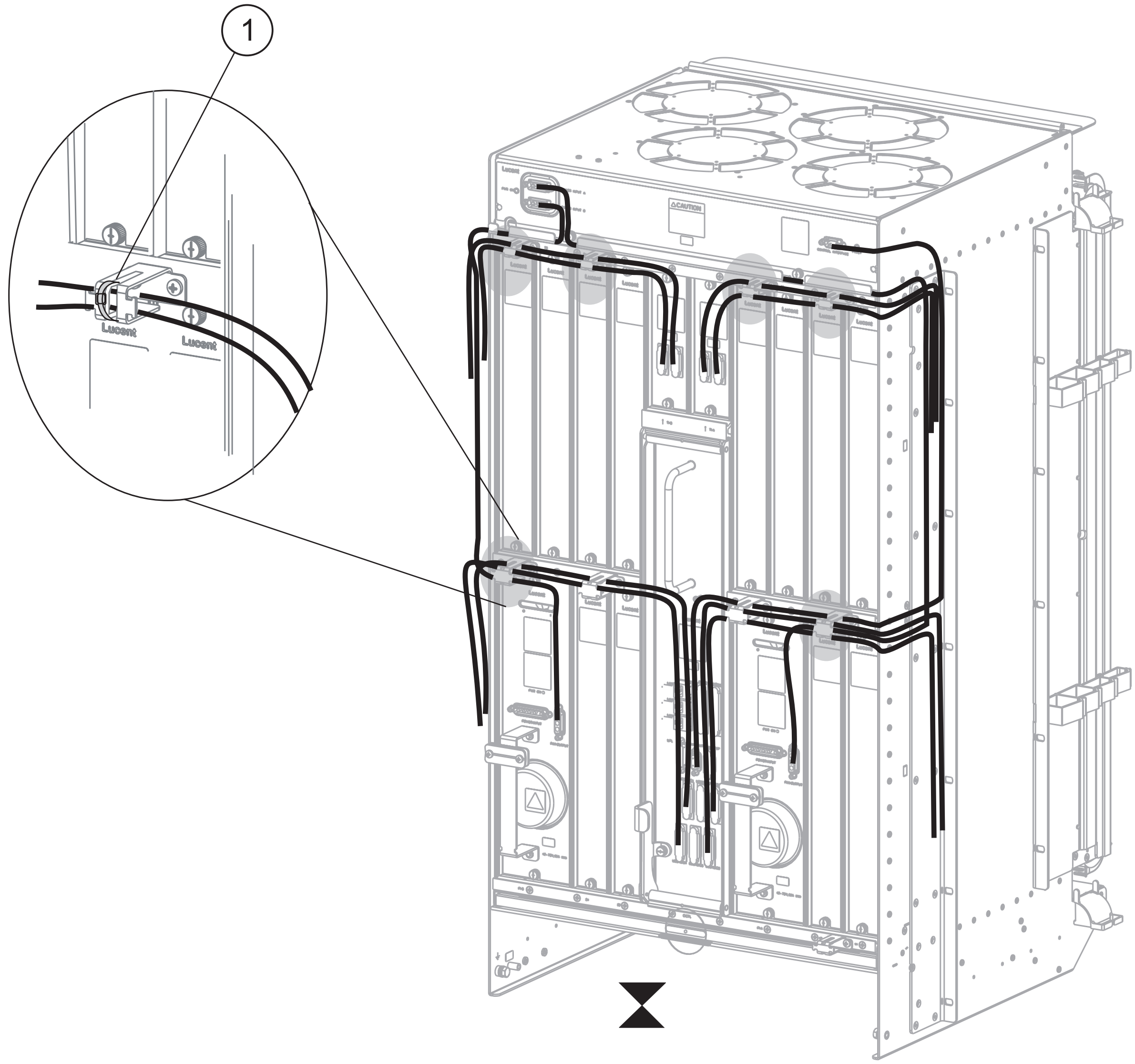
### Top Access

**Figure 4-18 Electrical-Cable Management (Top Access)**



### Bottom Access

**Figure 4-19 Electrical-Cable Management (Bottom Access)**



# ESD and Ground Connections

## Ground Cable

Cable Data

| Cable | Description |
|---|---|
| Type | DC1003200 |
| Diameter | AWG 8 / 8mm$^2$ |
| Ground cables (only needed in the case of a NEBS-2000 rack) | Ground Wire (2000 mm [6,562 ft]) — CC848828174 (Upper Subrack) |
| | Ground Wire (3000 mm [9,843 ft]) — CC848828182 (Lower Subrack) |

## Positions

**Figure 4-20 Position of the ESD-Connection and Ground-Connection Points (1 of 2)**

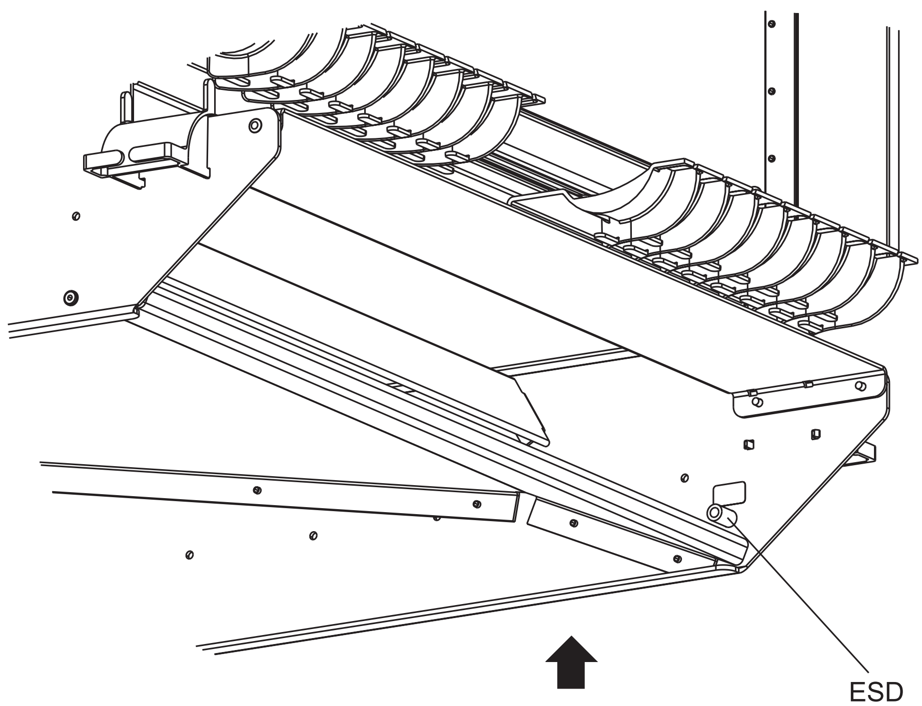
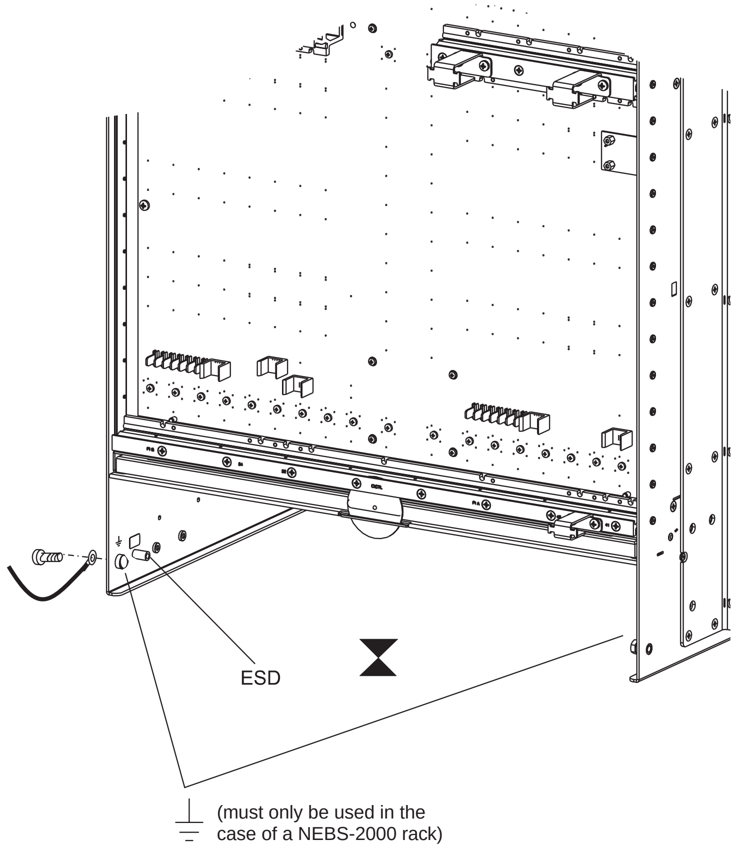


**Figure 4-20 Position of the ESD-Connection and Ground-Connection Points (2 of 2)**



# Power Cables, PI – PDP

### DC Power Cables

**Important!** These cables are prefabricated and mounted within the Unite rack-frames.

Cable Data

| Description — Code | Remarks |
|---|---|
| Cable Assy, PI (Upper subrack) - PDP — CC848811501/DC1002826 | 2x for Upper subrack, A and B feeder |
| Cable Assy, PI (Lower subrack) - PDP — CC848811519/DC1002827 | 2x for Lower subrack, A and B feeder |

### Layout and Routing

**Important!** The surface of an operating PI may be hot.

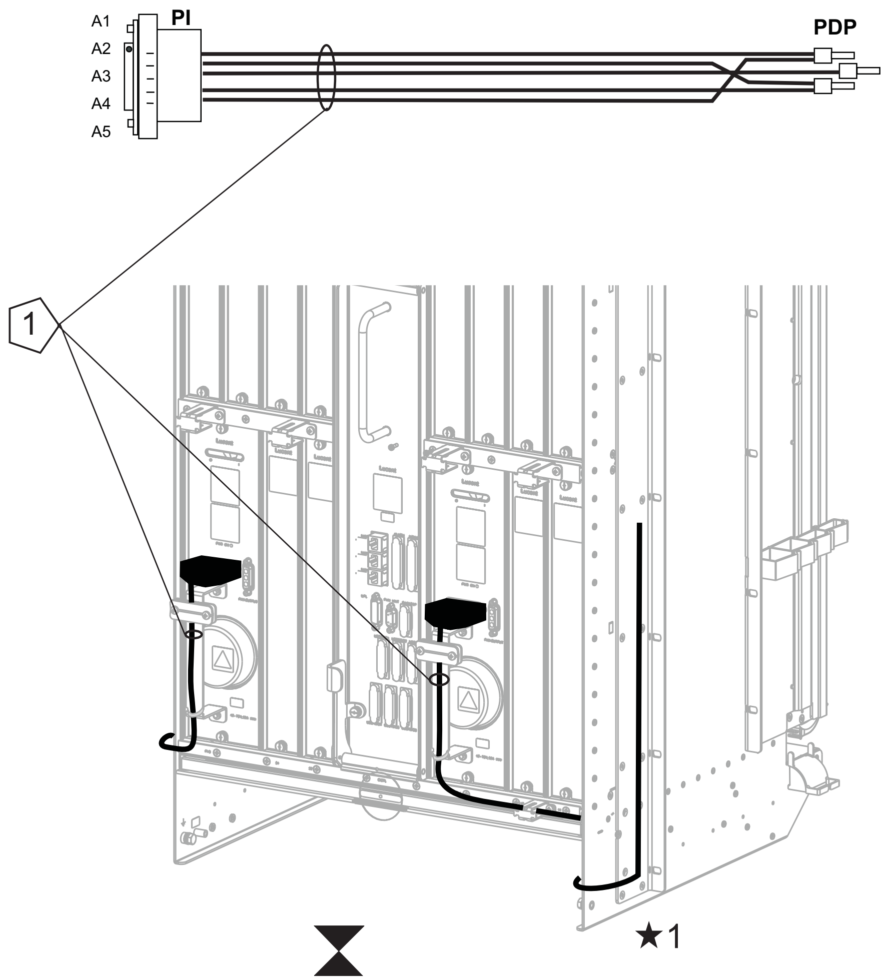
When the power connector is connected to the PI, tie the cable to the handle of the PI by using tie-wraps.

Routing from Power Interface to PDP:

- Upper subrack — keep the power cabling at the rear side of the center style (B to the left and A to the right).

- Lower subrack — the power cabling is routed within the center style to the bottom of the rack and then up to the subrack (B to the left and A to the right).

**Figure 4-21 DC Power Cables**




Pin Arrangement

| Point on Connector | Signal Name | Color |
|---|---|---|
| A1 | –DC | Blue |
| A2 | Return | Red |
| A3 | Ground | Yellow/Green |
| A4 | Return | Red |
| A5 | –DC | Blue |

□

# Power Cables, PI – FAN Unit

## Power Cable, FAN Unit

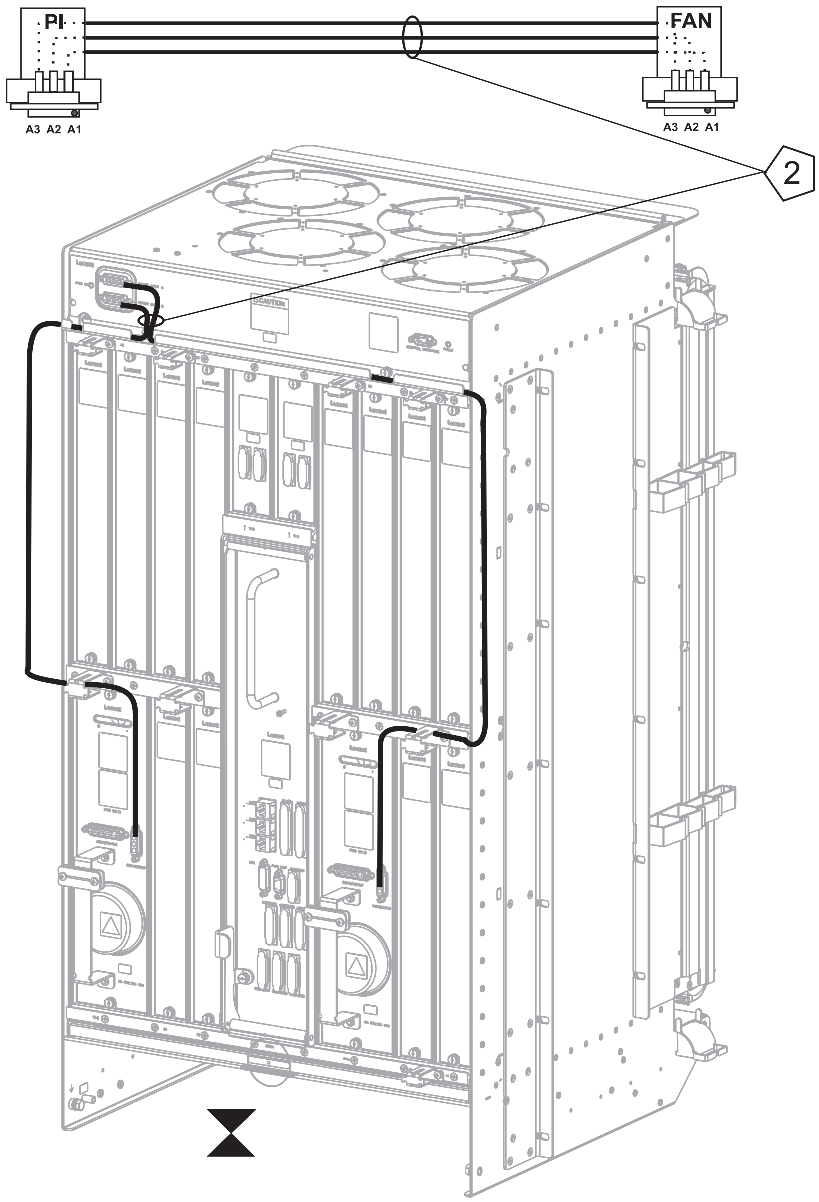
**Important!** These cables are prefabricated and already installed with the subrack.

Cable Data

| Description — Code | Remarks |
|---|---|
| Cable Assy, PI - FAN Unit Power A — 848811550/DC1003269 | PI-A |
| Cable Assy, PI - FAN Unit, Power B — 848811576/DC1003270 | PI-B |

## Routing and Layout

### Figure 4-22 Power Cable FAN Unit




Pin Arrangement

| PI | | | FAN | |
|---|---|---|---|---|
| **Point on Connector** | **Signal Name** | | **Point on Connector** | **Signal Name** |
| A1 | Ground | | A1 | Ground |

| PI | | | FAN | |
|---|---|---|---|---|
| **Point on Connector** | **Signal Name** | | **Point on Connector** | **Signal Name** |
| A2 | –DCA/-DCB | | A2 | –DCA/-DCB |
| A3 | Return | | A3 | Return |

# Cable, CI-CTL – UPL

## UPL Cable

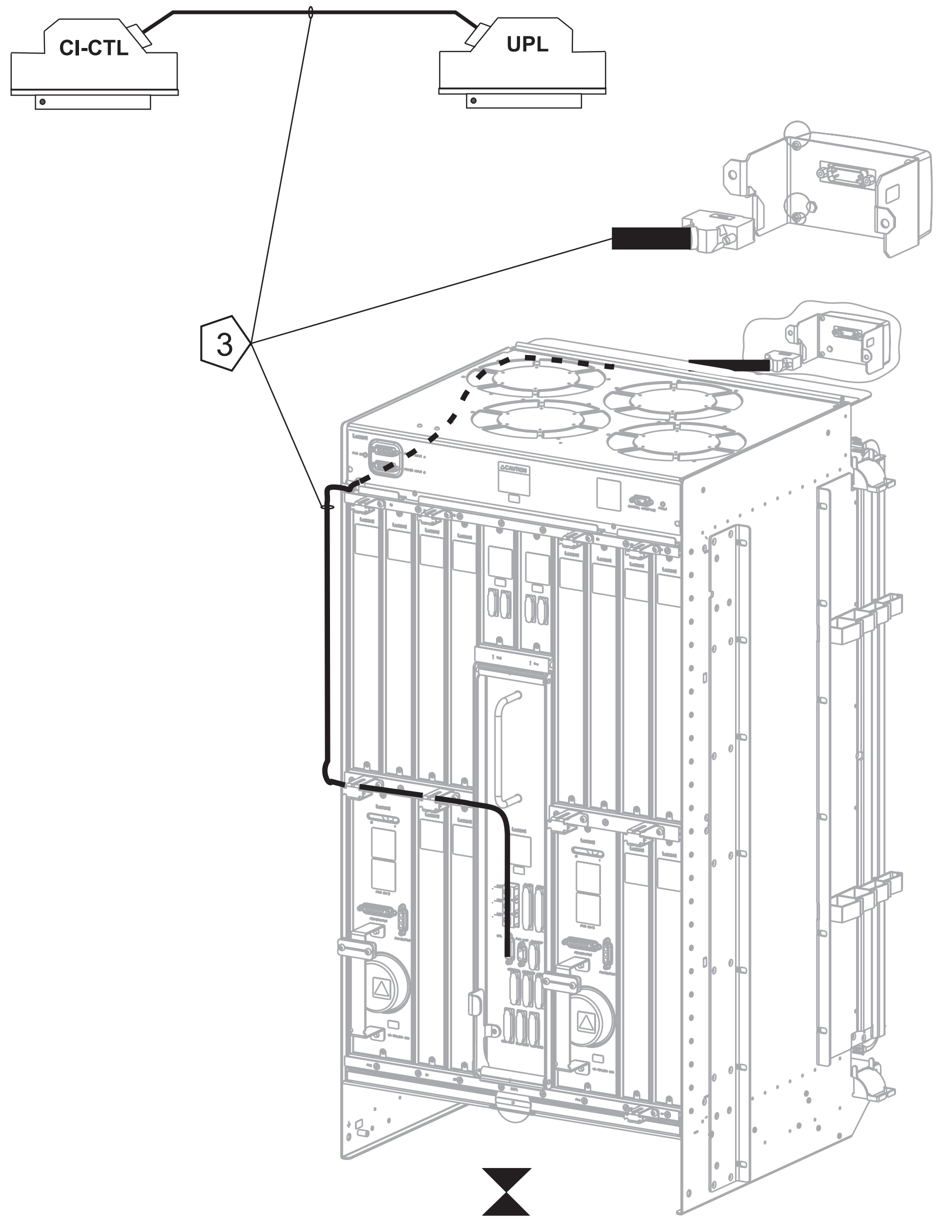
**Important!** This cable is prefabricated and mounted on the subrack.

Cable Data

| Description — Code | Remarks |
|---|---|
| Cable Assy, CI-CTL - UPL — 848811584/ DC1003272 | |

## Routing and Layout

**Figure 4-23 Cable, CI-CTL – UPL**




Pin Arrangement

| **CI-CTL** | | **UPL** | |
|---|---|---|---|
| **Point on Connector** | **Signal Name** | **Point on Connector** | **Signal Name** |
| 1 | Ground | 1 | Ground |
| 2 | TDP of CIT | 2 | Ethernet-Transmitter Positive |
| 3 | TDN of CIT | 3 | Ethernet-Receiver Positive |
| 4 | Equipment Sense | 4 | Equipment Sense |
| 5 | $1^2$C Clock Line | 5 | $1^2$C Serial Clock line |
| 6 | $1^2$C Data Line | 6 | $1^2$C Serial Data line |
| 7 | Not Connect | 7 | Ground |
| 8 | Ground | 8 | Ground |
| 9 | Ground | 9 | Ground |
| 10 | RDP of CIT | 10 | Ethernet-Transmitter Negative |
| 11 | RDN of CIT | 11 | Ethernet-Receiver Negative |
| 12 | Test Point | 12 | Test Point |
| 13 | Alarm-Cut Off Button | 13 | Alarm Cut-Off Button |
| 14 | LED-Test Button | 14 | LED-Test Button |
| 15 | +4V | 15 | Power Line |

# Controller Cable, CI-CTL – FAN Unit

**Controller Cable FAN Unit**

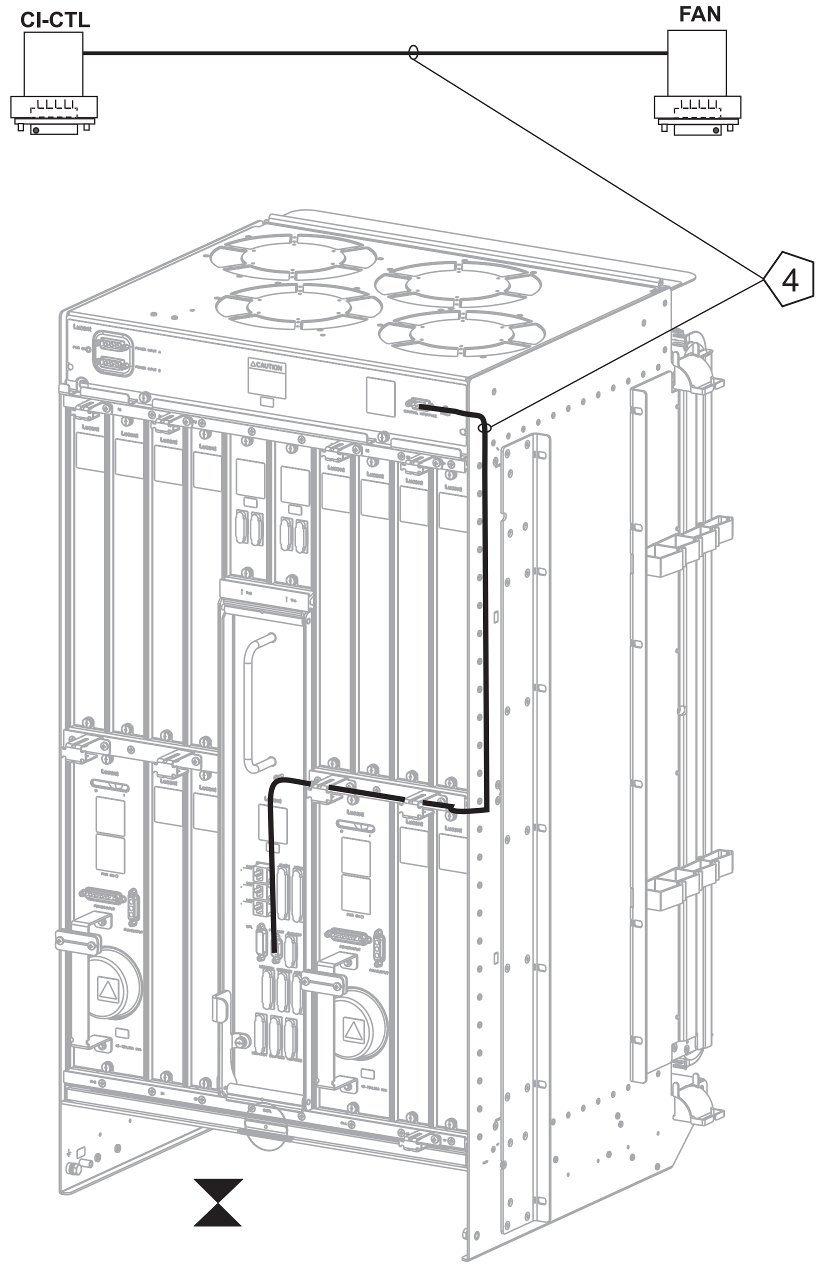
**Important!** This cable is prefabricated and mounted with the subrack.

Prefab-Cable Data

| Description — Code | Remarks |
|---|---|
| Cable Assy, CI-CTL - FAN Unit — 848811568/ DC1003271 | |

## Routing and Layout

**Figure 4-24 Controller Cable, CI-CTL – FAN Unit**




Pin Arrangement

| **CI-CTL** | | **FAN** | |
|---|---|---|---|
| **Point on Connector** | **Signal Name** | **Point on Connector** | **Signal Name** |
| 1 | $1^2$C Clock line | 1 | $1^2$C Clock line |
| 2 | $1^2$C Data line | 2 | $1^2$C Data line |
| 3 | Not Connect | 3 | Not Connect |
| 4 | Equipment Sense | 4 | Equipment Sense |
| 5 | +4V | 5 | +4V |
| 6 | FAN Alarm | 6 | FAN Alarm |
| 7 | Feeder A Alarm | 7 | Feeder-A Alarm |
| 8 | Feeder B Alarm | 8 | Feeder-B Alarm |
| 9 | Ground | 9 | Ground |

# Rack-Top Alarm-Interface Cable, CI-CTL – PDP

## Rack-Top Alarm Cable, CI-CTL – PDP

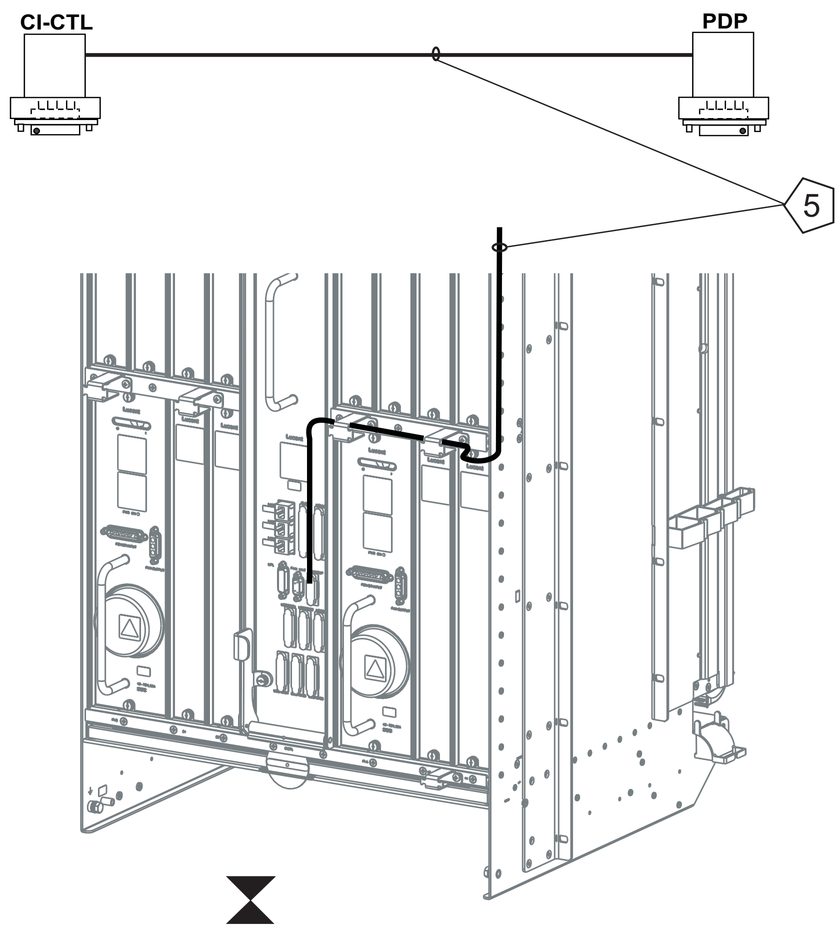
**Important!** These cables are prefabricated. They are mounted in the rack frame and connect on the side of the subrack.

Cable Data

| Description — Code | Remarks |
|---|---|
| Cable Assy, CI-CTL (Upper subrack) - PDP — CC848811527/DC1002828 | |
| Cable Assy, CI-CTL (Lower subrack) - PDP — CC848811535/DC1001829 | |

## Layout and Routing

**Figure 4-25 Rack-Top Alarm Cable, CI-CTL – PDP**




Pin Arrangement

| CI-CTL | | PDP | |
|---|---|---|---|
| **Point on Connector** | **Signal Name** | **Point on Connector** | **Signal Name** |
| 1 | Ground | 1 | Ground |
| 2 | Major Rack-Top Return | 2 | Major Rack-Top Return |
| 3 | Ground | 3 | Ground |
| 4 | Critical Rack-Top Output | 4 | Critical Rack-Top Output |
| 5 | Minor Rack-Top Output | 5 | Minor Rack-Top Output |
| 6 | Critical Rack-Top Return | 6 | Critical Rack-Top Return |
| 7 | Minor Rack-Top Return | 7 | Minor Rack-Top Return |
| 8 | Ground | 8 | Ground |
| 9 | Major Rack-Top Output | 9 | Major Rack-Top Output |

□

# Station-Alarm Interface

**Station Alarms**

This interface consists of 6 isolated output-pairs. The ports can switch both 0.5A at 72V and 2.0A at 30V. Critical contacts (visual and acoustic) can be configured to be active without system power. These contacts are closed if there is loss of control or of power.

**Technical Data**

**Important!** See for color code "US Color Codes" (A-9)

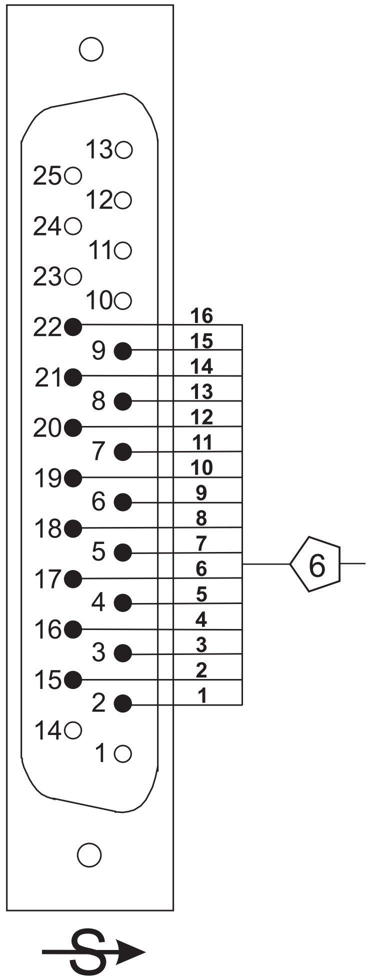
Length of pre-fabricated 8 x 2 x 0.4 mm / AWG26 + overall screen cables:

- 10 m [32,808 ft] Cable Assy, Station Alarm — CC109155788
- 25 m [82,021 ft] Cable Assy, Station Alarm — CC109155796
- 50 m [164,042 ft] Cable Assy, Station Alarm — CC109155804
- 75 m [246,063 ft] Cable Assy, Station Alarm — CC109164186
- 100 m [328,084 ft] Cable Assy, Station Alarm — CC109164194

Connector Data

| Type of Connector | D-SUB pin, 25p solder | Remarks |
|---|---|---|
| Code no. of Connector | CC407362730 | |
| Code no. of Hood | DC1003599 | |
| Mounting Instructions | "D-Sub Metallic Hoods" (A-2) | |

**Figure 4-26 Station Alarm Interface**



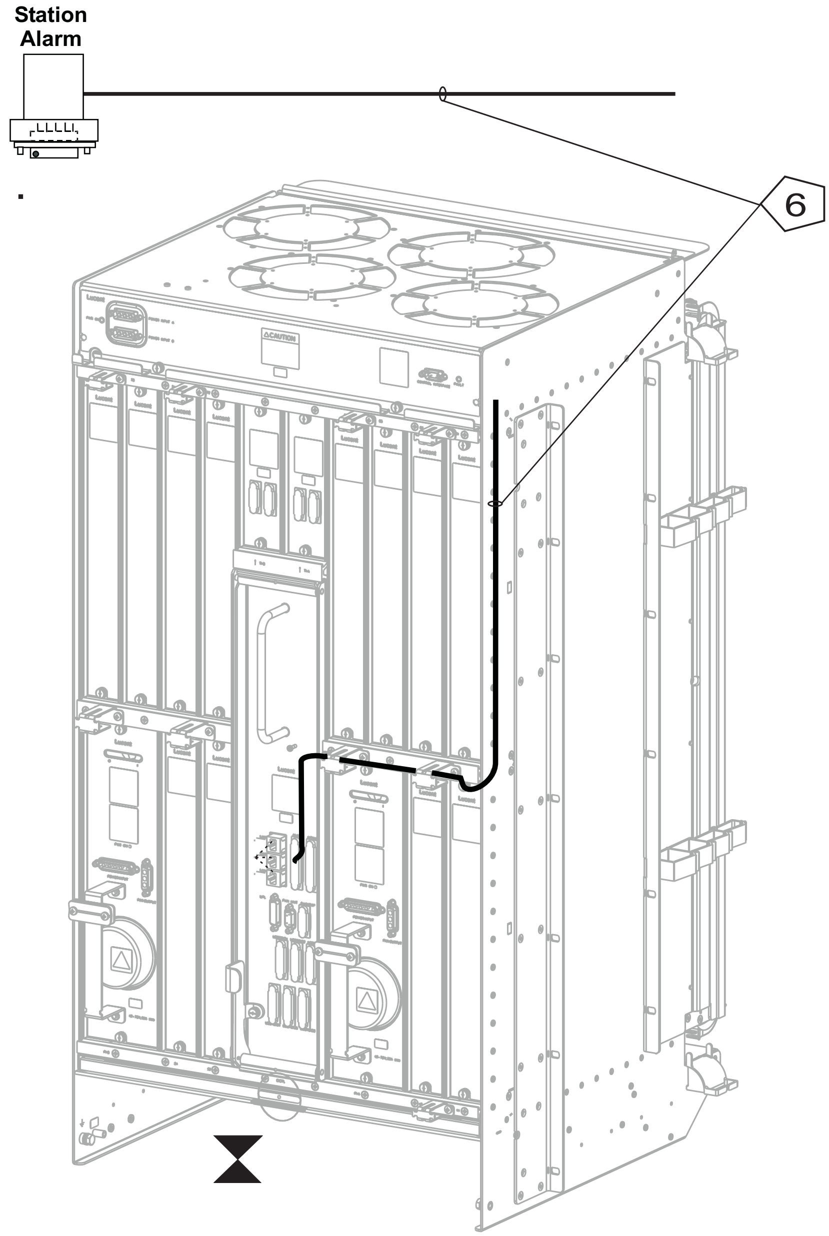

Pin Arrangement

| Point on Connector | Signal Name |
|---|---|
| 2 | Critical Audio Output |
| 3 | Critical Visual Output |
| 4 | Major Audio-Output Return |
| 5 | Major Visual Output |
| 6 | Minor Audio Output |
| 7 | Minor Visual Output |

| Point on Connector | Signal Name |
|---|---|
| 8 | Ground |
| 9 | Ground |
| 15 | Critical Audio-Output Return |
| 16 | Critical Visual-Output Return |
| 17 | Major Audio Output |
| 18 | Major Visual-Output Return |
| 19 | Minor Audio-Output Return |
| 20 | Minor Visual-Output Return |
| 21 | Ground |
| 22 | Ground |

## Layout and Routing

### Figure 4-27 Station-Alarm Layout and Routing



# LAN 10/100 Base-T Interface

**Locations**

The LAN ports are positioned at:

- LAN1 – CIT Interface
- CI-CTL:
  - LAN2, LAN3 – Local EMS Interfaces
  - LAN4 – XTreme Interface

**LAN 10/100 Base-T**

**Important!** See for color code “US Color Codes” (A-9)

Length of pre-fabricated CAT5 cable (4 pairs) with overall shield cables:

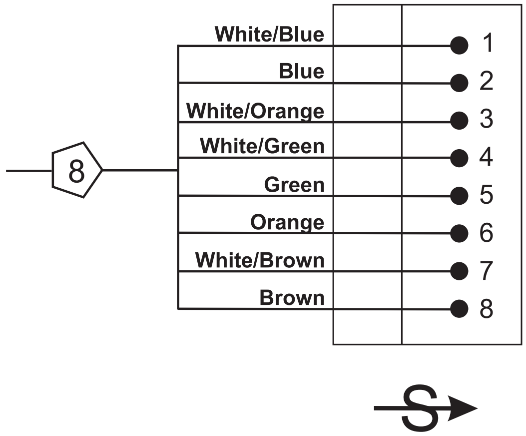
- 10 m [32,808 ft] Cable Assy, LAN — CC109155929
- 25 m [82,021 ft] Cable Assy, LAN— CC109155945
- 50 m [164,042 ft] Cable Assy, LAN— CC109155952
- 75 m [246,063 ft] Cable Assy, LAN — CC109164368
- 91 m [298,556 ft] Cable Assy, LAN — CC109164376

***NOTE:*** The mentioned cables are straight shielded LAN cables and can only be used for NE-NE and NE-HUB connections. Crossed shielded LAN cables must be used for NE-PC (CIT) connections!

Connector Data

| Type of Connector | Modular Plug / RJ45 8p shielded | Remarks |
|---|---|---|
| Code no. of Connector | CC407890193 / DC1003604 | |
| | 336 330–1 | Tyco/AMP |
| Mounting Instructions | “Modular Plug Connector” (A-4) | |

**Figure 4-28  LAN 10/100 Base-T Interface**

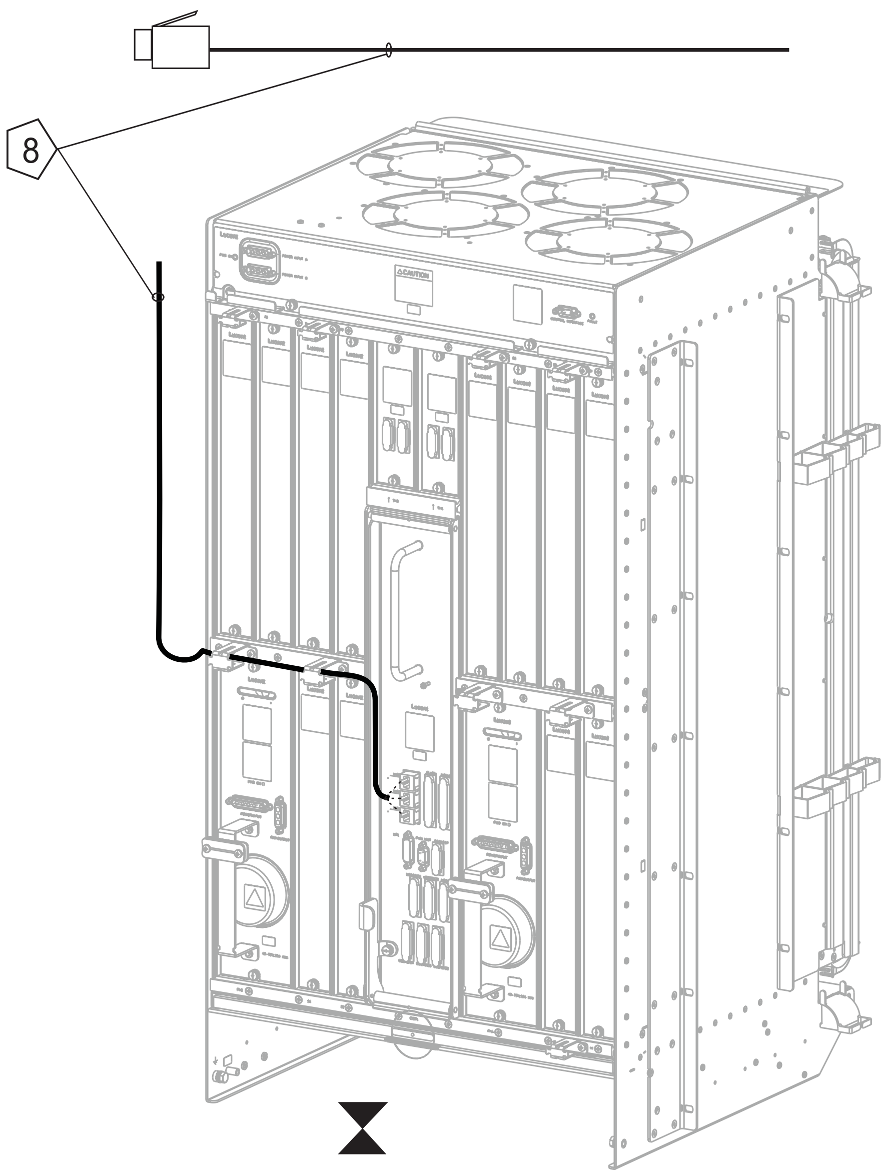



Pin Arrangement

| Point on Connector | Signal Name |
|---|---|
| 1 | Transmit-Data Positive |
| 2 | Transmit-Data Negative |
| 3 | Receive-Data Positive |
| 6 | Receive-Data Negative |

## LAN Layout and Routing on CI-CTL

Figure 4-29 Layout



# TI-DS1 Station Clock Output/Input Interface 100/110 Ω

**TI-DS1 Output/Input 100 Ω Cable**

Cable Data

| | |
|---|---|
| Type | Shielded Twisted Pair 100 Ω + overall screen |

**TI-DS1 Output 100 Ω**

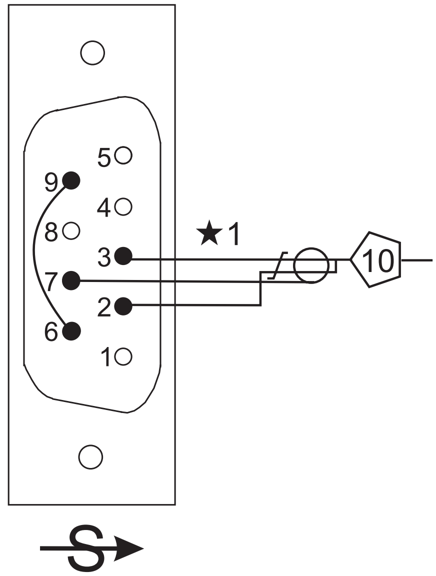
Length of pre-fabricated cables:

- 10 m [32,808 ft] Cable Assy, TI–DS1 — CC109155580
- 25 m [82,021 ft] Cable Assy, TI–DS1 — CC109155598
- 50 m [164,042 ft] Cable Assy, TI–DS1 — CC109155606
- 75 m [246,063 ft] Cable Assy, TI–DS1 — CC109164269
- 100 m [328,084 ft] Cable Assy, TI–DS1 — CC109164277
- 125 m [410,105 ft] Cable Assy, TI–DS1 — CC109187484
- 150 m [492,126 ft] Cable Assy, TI–DS1 — CC109187492
- 175 m [574,147 ft] Cable Assy, TI–DS1 — CC109187500
- 200 m [656,168 ft] Cable Assy, TI–DS1 — CC109187518

Connector Data

| Type of Connector | D-SUB pin, 9p solder | Remarks |
|---|---|---|
| Code no. of Connector | CC407362748 / DC1003660 | |
| Code no. of Hood | DC1003609 | |
| Mounting Instructions | “D-Sub Metallic Hoods” (A-2) | |

**Figure 4-30 DS1 – Station Clock Output Interface, 100 Ω**




Pin Arrangement

| **Point on Connector** | **Signal Name** | **Wire Color *1** |
|---|---|---|
| 2 | Station-Clock Output Positive | White |
| 3 | Station-Clock Output Negative | Blue |
| 7 | Ground | Screen |
| 6, 9 | Strap | |

**TI-DS1 Input, 100 Ω**

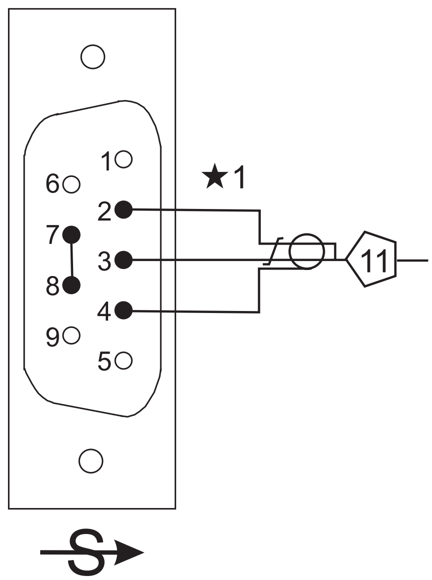
Length of Pre-fabricated cables:

- 10 m [32,808 ft] Cable Assy, TI–DS1 — CC109155846
- 25 m [82,021 ft] Cable Assy, TI–DS1 — CC109155853
- 50 m [164,042 ft] Cable Assy. TI–DS1 — CC109155861
- 75 m [246,063 ft] Cable Assy, TI–DS1 — CC109164327
- 100 m [328,084 ft] Cable Assy, TI–DS1 — CC109164335
- 125 m [410,105 ft] Cable Assy, TI–DS1 — CC109187526
- 150 m [492,126 ft] Cable Assy, TI–DS1 — CC109187534
- 175 m [574,147 ft] Cable Assy, TI–DS1 — CC109187542
- 200 m [656,168 ft] Cable Assy, TI–DS1 — CC109187559

Connector Data

| Type of Connector | D-SUB Socket, 9p Solder | Remarks |
|---|---|---|
| Code no. of Connector | CC407362797 / DC1003661 | |
| Code no. of Hood | DC1003609 | |
| Mounting Instructions | “D-Sub Metallic Hoods” (A-2) | |

**Figure 4-31 DS1 – Station-Clock Input Interface, 100 Ω**



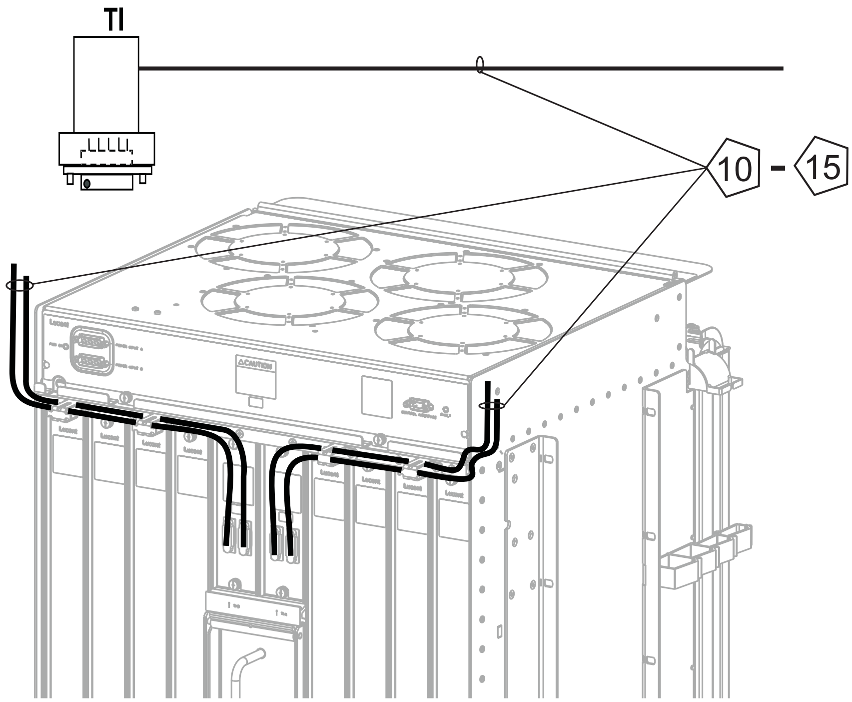

Pin arrangement

| Point on Connector | Signal Name | Wire Color *1 |
|---|---|---|
| 2 | Station-Clock Input Positive | White |
| 3 | Station-Clock Input Negative | Blue |
| 4 | Ground | Screen |
| 7, 8 | Strap | |

**TI Layout and Routing**

The upper and lower subracks have the cabling at the rear side: the B (IN/OUT) to the left and the A (IN/OUT) to the right.

**Figure 4-32 TI**



# TI-E1 Station-Clock Output/Input Interface, 120 Ω

**TI-E1 Output/Input Cable, 120 Ω**

Cable Data

| | |
|---|---|
| Type | Shielded Twisted Pair, 100 Ω + overall screen |

**TI-E1 Output, 120 Ω**

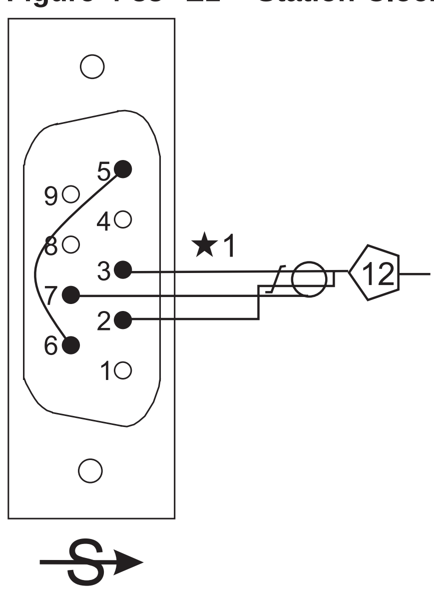
Length of pre-fabricated cables:

- 10 m [32,808 ft] Cable Assy, TI–E1 (120Ω) — CC109155556
- 25 m [82,021 ft] Cable Assy, TI–E1 (120Ω) — CC109155564
- 50 m [164,042 ft] Cable Assy, TI–E1 (120Ω) — CC109155572
- 75 m [246,063 ft] Cable Assy, TI–E1 (120Ω) — CC109164244
- 100 m [328,084 ft] Cable Assy, TI–E1 (120Ω) — CC109164251

Connector Data

| Type of Connector | D-SUB pin, 9p solder | Remarks |
|---|---|---|
| Code no. of Connector | CC407362748 | |
| Code no. of Hood | DC1003609 | |
| Mounting Instructions | "D-Sub Metallic Hoods" (A-2) | |

**Figure 4-33 E1 – Station Clock Output Interface, 120 Ω**



Pin Arrangement

| Point on Connector | Signal Name | Wire Color *1 |
|---|---|---|
| 2 | Station-Clock Output Positive | White |
| 3 | Station-Clock Output Negative | Blue |
| 7 | Ground | Screen |
| 5, 6 | Strap | |

**TI-E1 Input 120Ω**

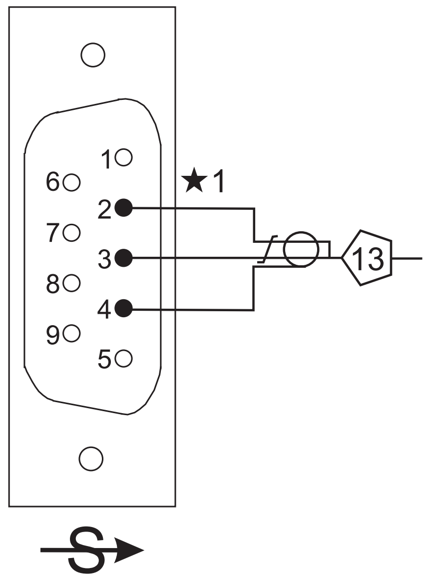
Length of pre-fabricated cables:

- 10 m [32,808 ft] Cable Assy, TI–E1 (120Ω) — CC109155812
- 25 m [82,021 ft] Cable Assy, TI–E1 (120Ω) — CC109155820
- 50 m [164,042 ft] Cable Assy, TI–E1 (120Ω) — CC109155838
- 75 m [246,063 ft] Cable Assy, TI–E1 (120Ω) — CC109164301
- 100 m [328,084 ft] Cable Assy, TI–E1 (120Ω) — CC109164319

Connector Data

| | | |
|---|---|---|
| Type of Connector | D-SUB Socket, 9p Solder | Remarks |
| Code no. of Connector | CC407362797 | |
| Code no. of Hood | DC1003609 | |
| Mounting Instructions | “D-Sub Metallic Hoods” (A-2) | |

**Figure 4-34 E1 – Station Clock Input Interface, 120 Ω**



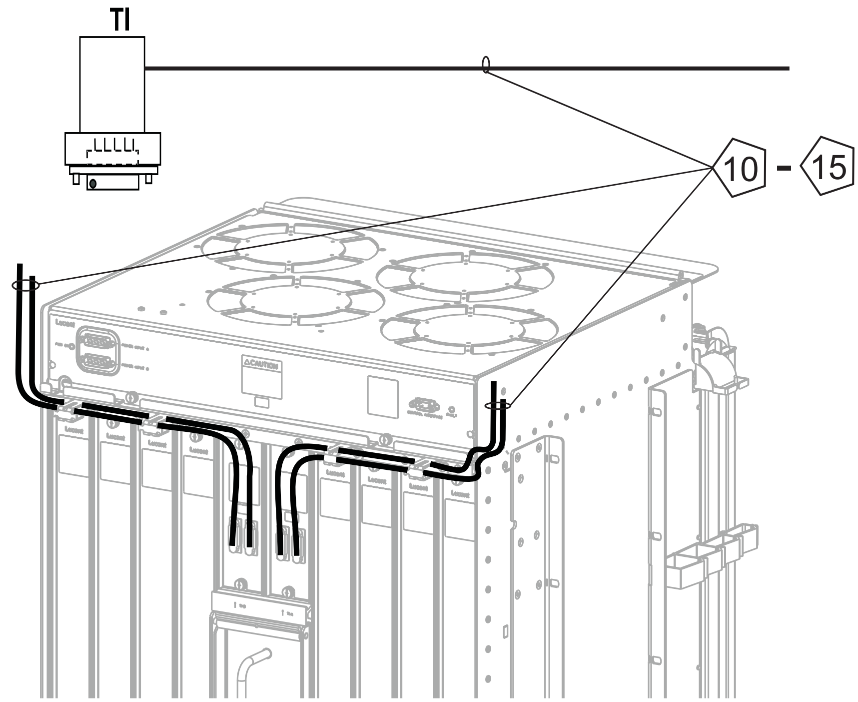

Pin arrangement

| Point on Conn. | Signal Name | Wire Color *1 |
|---|---|---|
| 2 | Station-Clock Input Positive | White |
| 3 | Station-Clock Input Negative | Blue |
| 4 | Ground | Screen |

**TI Layout and Routing**

The upper and lower subracks have the cabling at the rear side: the B (IN/OUT) to the left and the A (IN/OUT) to the right.

**Figure 4-35 TI**



# TI-E1 Station-Clock Output/Input Interface, 75 Ω

**TI-E1 Output/Input Cable, 75 Ω**

Cable Data

| Cable | Description |
|---|---|
| Type | Coaxial Cable, 75 Ω |

**TI-E1 Output 75 Ω**

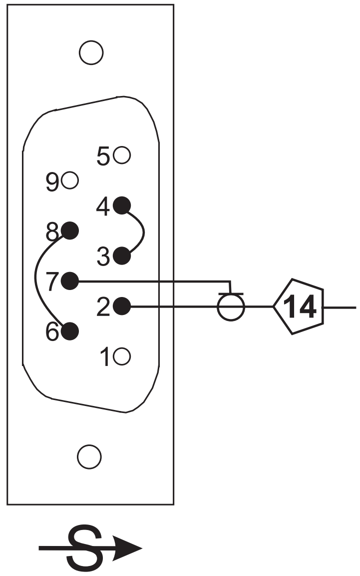
Length of pre-fabricated cables:

- 10 m [32,808 ft] Cable Assy, TI–E1 (75Ω) — CC109155614
- 25 m [82,021 ft] Cable Assy, TI–E1 (75Ω) — CC109155622
- 50 m [164,042 ft] Cable Assy, TI–E1 (75Ω) — CC109155630
- 75 m [246,063 ft] Cable Assy, TI–E1 (75Ω) — CC109164285
- 100 m [328,084 ft] Cable Assy, TI–E1 (75Ω) — CC109164293

Connector Data

| | | |
|---|---|---|
| Type of Connector | D-SUB pin, 9p solder | Remarks |
| Code no. of Connector | CC407362748 | |
| Code no. of Hood | DC1003609 | |
| Mounting Instructions | "D-Sub Metallic Hoods" (A-2) | |

**Figure 4-36 TI-E1 Station-Clock Output Interface, 75 Ω**




Pin Arrangement

| Point on Connectors | Signal Name | Wire Color |
|---|---|---|
| 2 | Station-Clock Output | Inner wire |
| 7 | Ground | Screen |
| 3, 4 | Strap | |
| 6, 8 | Strap | |

**TI-E1 Input, 75 Ω**

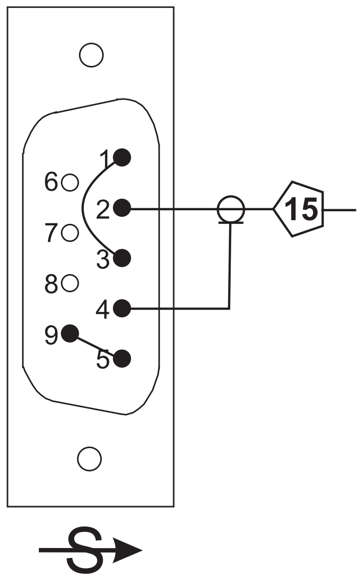
Length of pre-fabricated cables:

- 10 m [32,808 ft] Cable Assy, TI–E1 (75Ω) — CC109155879
- 25 m [82,021 ft] Cable Assy, TI–E1 (75Ω) — CC109155887
- 50 m [164,042 ft] Cable Assy, TI–E1 (75Ω) — CC109155895
- 75 m [246,063 ft] Cable Assy, TI–E1 (75Ω) — CC109164343
- 100 m [328,084 ft] Cable Assy, TI–E1 (75Ω) — CC109164350

Connector Data

| Type of Connector | D-SUB Socket, 9p Solder | Remarks |
|---|---|---|
| Code no. of Connector | CC407362797 | |
| Code no. of Hood | DC1003609 | |
| Mounting Instructions | "D-Sub Metallic Hoods" (A-2) | |

**Figure 4-37 TI-E1 Station Clock Input Interface, 75 Ω**



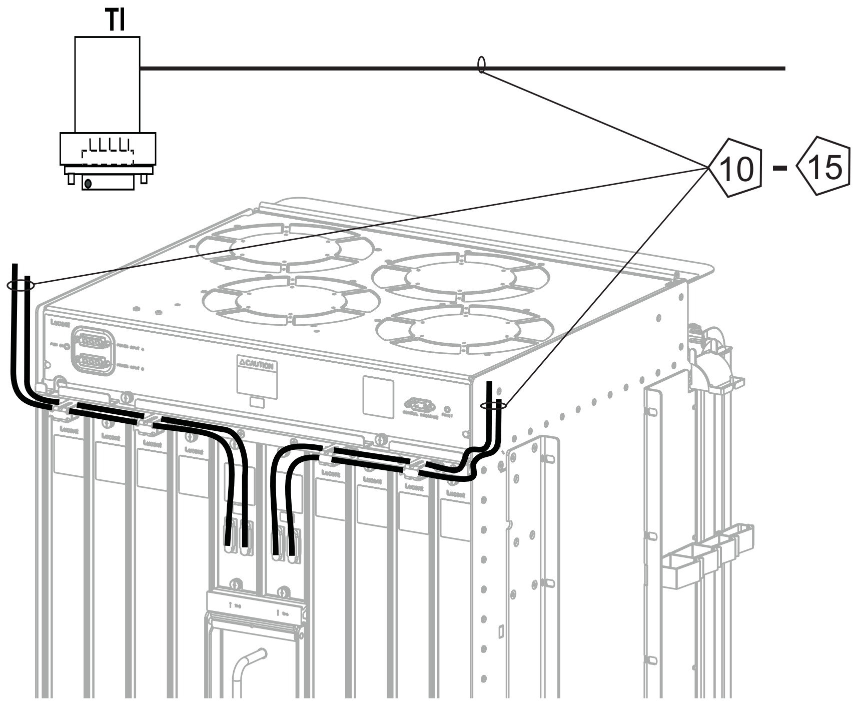

Pin Arrangement

| Point on Conn. | Signal Name | Wire Color |
|---|---|---|
| 1, 2, 3 | Station-Clock Input | Inner wire |
| 4 | Ground | Screen |
| 5, 9 | Strap | |

**TI Layout and Routing**

The upper and lower subracks have the cabling at the rear side: the B (IN/OUT) to the left and the A (IN/OUT) to the right.

**Figure 4-38 TI**



# Optical Interfaces

**Application Packs**

The pack types are:

- OP2G5 — KFA 12, 203 and 204
- OP10 — KFA 6, 7, 14, 9 and 81/159, 11 and 61/75

See "Specifications for *LambdaUnite*™ MSS Optical-Circuit Packs" (B-14)for order codes and specifications.

**Cables**

**Important!** Only the fiber cables with listed comcode are allowed to be used , otherwise the proper functioning of the system can not be guaranteed.

The "Break-Out Cables" (B-2) fiber types are:

- SM-minicord BreakOut cable
- SM-Simplex Cable

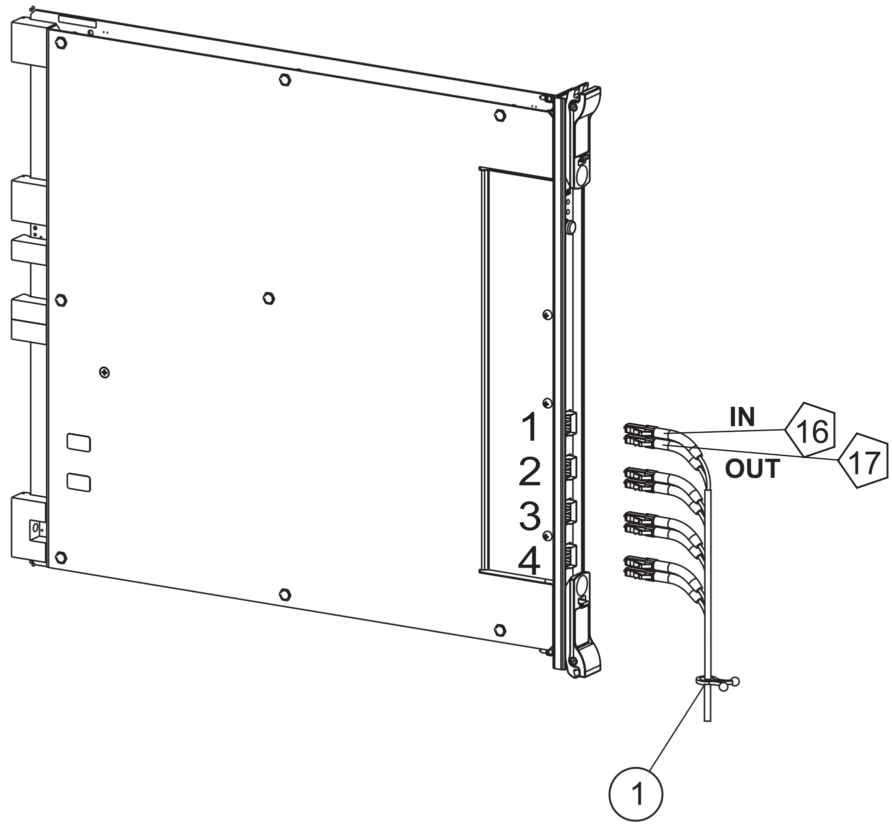
**Connector Type**

LC connector with an angled Boot 40-45 degrees for termination to port units. Blue connector for SM, beige connector for MM. The LC boot must remain freely rotatable around the connector length axis after termination, in order to adjust its orientation to the fiber routing direction without damaging the fiber.

## OP2G5

### OP2G5 - KFA12

**Figure 4-39 OP2G5 – KFA12**

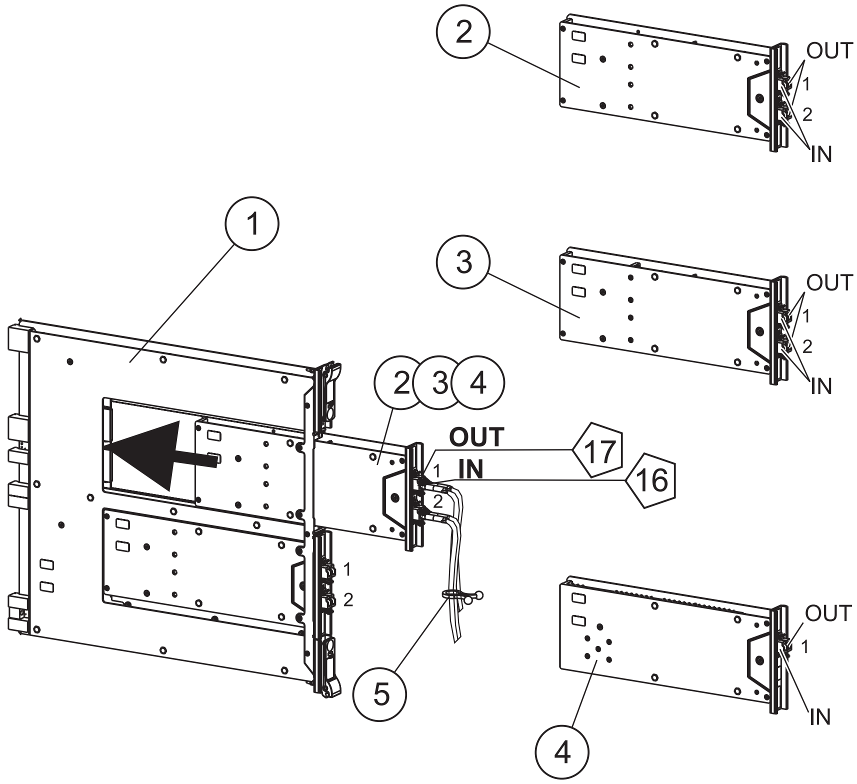



**Legend:**

1 Richco Twist Lock TL250 — DC1004336 (part of circuit pack delivery)

### OP2G5 - Main and Modules

**Figure 4-40 OP2G5 – Main (KFA) and Modules (KFA203/204)**

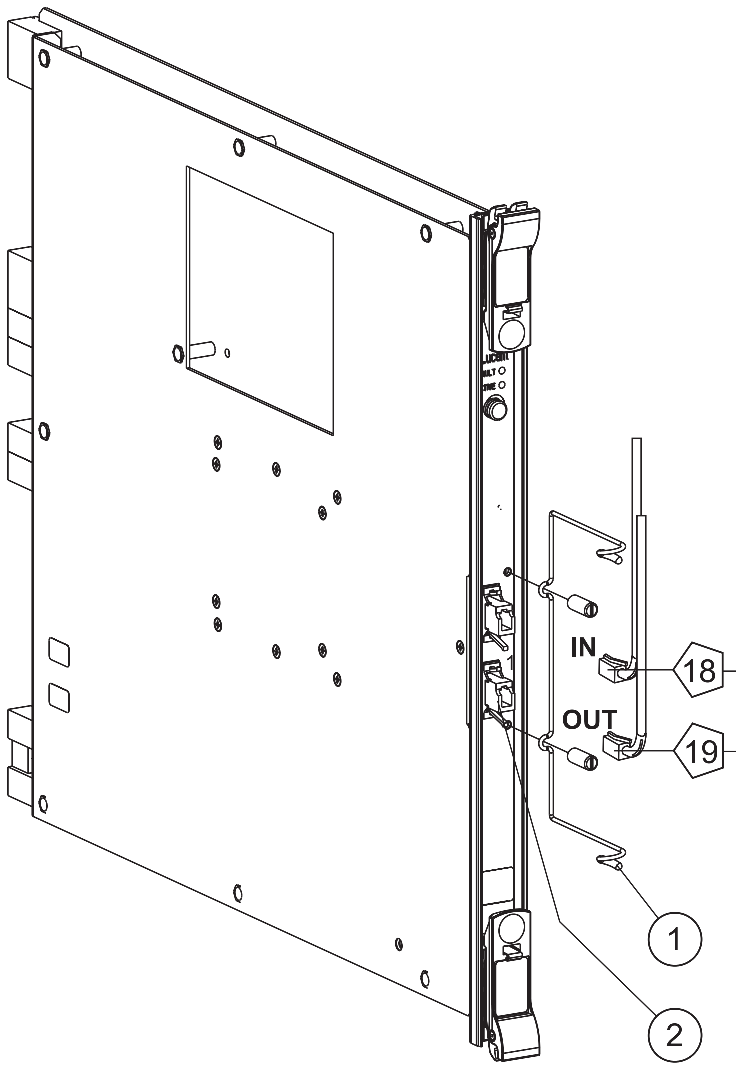



**Legend:**

| | |
|---|---|
| 1 | Main Board — KFA.... (Main) |
| 2 | OP2G5M AM1 Ap 1.X — KFA203 (1300nm) |
| 3 | OP2G5M AM1 Ap 1.X — KFA204 (1550nm) |
| 4 | OP2G5 PWDM AM1 Ap 1.x – KFA20 |
| 5 | Richco Twist Lock TL250 — DC1004336 (part of circuit pack delivery) |

**OP10G**

**Figure 4-41 OP10G**




**Legend:**

| | |
|---|---|
| Item 2 | ASSY-A1LC-BASE (BLACK) B* — 108265950<br>See“LC Attenuators” (B-12)for a list of varoius attenuators. |

□

# Gigabit-Ethernet Interfaces

**Application Packs**

The pack types are:

- GE1 / SX / 4 — KFA13

See "Specifications for *LambdaUnite*™ MSS Optical-Circuit Packs" (B-14)for order codes and specifications.

**Cables**

**Important!** Only the fiber cables with listed comcode are allowed to be used , otherwise the proper functioning of the system can not be guaranteed.

The "Multi-Mode 62.5/125 Fiber-Optic Cables" (B-8) types are:

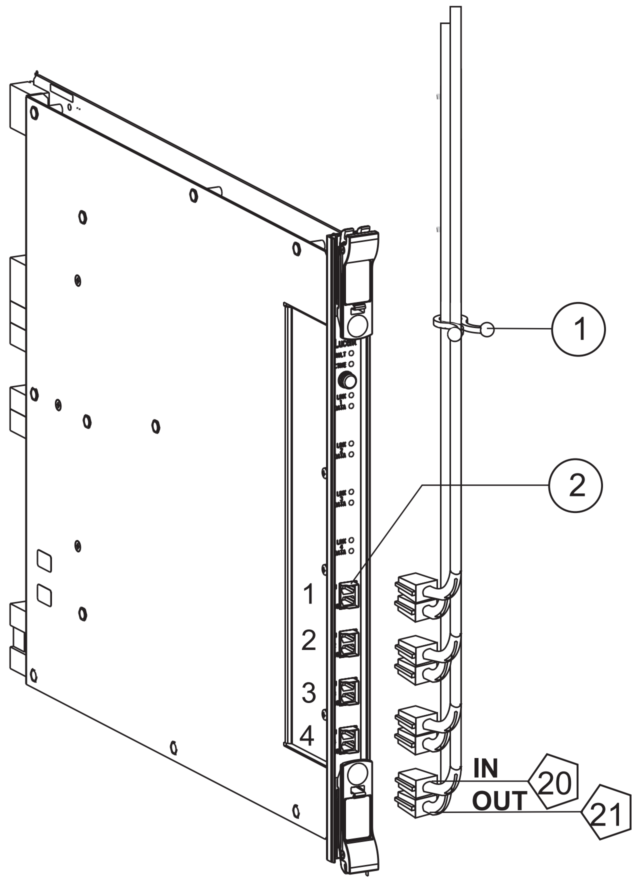
- MM-minicord Break-Out Cable
- MM-Simplex Cable

**Connector Type**

LC connector with an angled Boot 40-45 degrees for termination to port units. Blue connector for SM, beige connector for MM. The LC boot must remain freely rotatable around the connector length axis after termination, in order to adjust its orientation to the fiber routing direction without damaging the fiber.

### GE1

**Figure 4-42 GE1**




**Legend:**

1 Richco Twist Lock TL250 — DC1004336 (part of circuit pack delivery)

See for a list of various attenuators "LC Attenuators" (B-12).

□

# 5 Commissioning

## Overview

**Purpose**

This chapter describes all steps, which are necessary to put the *LambdaUnite*™ MultiService Switch (MSS) system into operation.

**Assumptions**

Be sure all listed assumptions described below are fulfilled before performing the described steps:

- All NEs must be mounted and cabled correctly (see Chapters 3 and 4).
- The persons setting up the system should be familiar with the SDH or SONET functionality and *WaveStar*® CIT.

**Related information**

An overview about all *WaveStar* CIT related tasks is given in the “*LambdaUnite* MultiService Switch (MSS) User Operation Guide”.

**Contents**

# Switching on and Testing the Voltage Supply Lines

**Procedure** Proceed as follows to switch on and test the voltage supply lines:

1. Insert a 68 A fuse for each supply line into the external Battery Distribution and Fuse Bay (BDFB). If circuit breakers are being used (in BDFB), put both of them in the ***ON*** position.

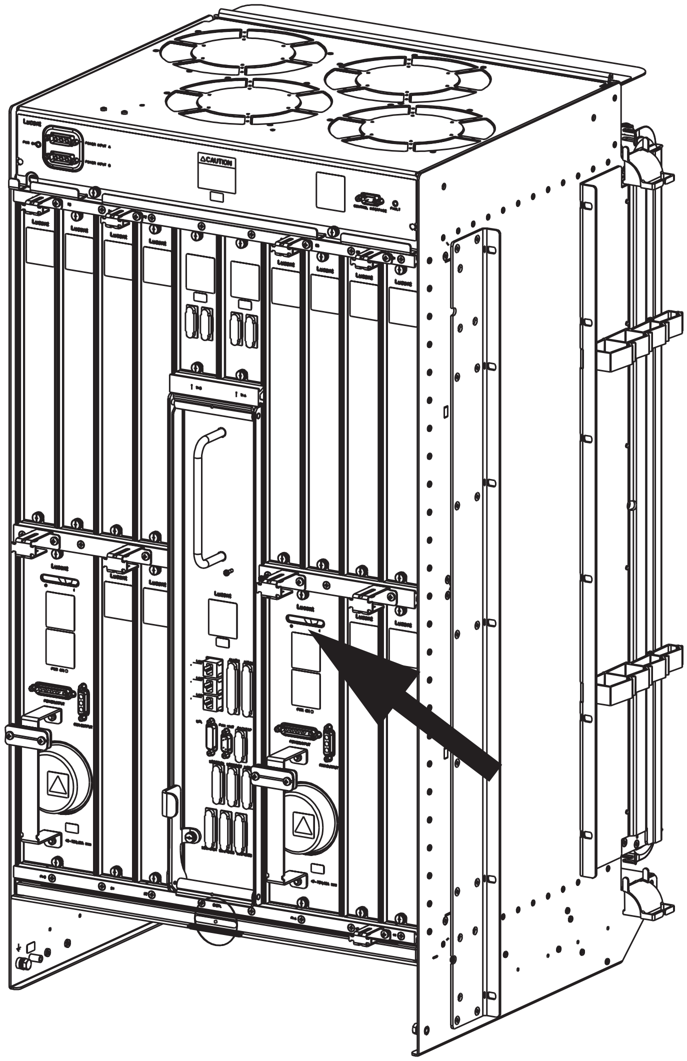
2. Use the voltage meter to check the primary voltage at the Power Distribution Panel (PDP) for both power supply feeders.

   **Result:**

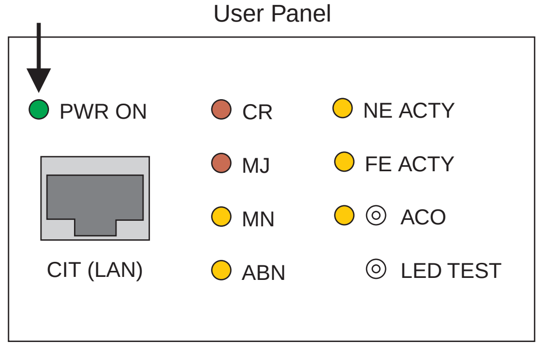
   The voltage on the PDP must be in the range of -40.5 … -72 DC.

   ***NOTE***: Do not power up the system if the voltage is outside the range!

**3** Switch the right circuit breaker of the subrack (located on the rear) to the ***ON*** position (= 1).



***Requirement:*** The PWR ON LEDs on the user panel and fan unit must be lit.




**4** Switch the right circuit breaker of the subrack to the ***OFF*** (= 0) position.

***Requirement:*** The PWR ON LEDs on the user panel and fan unit are extinguished.

**5** Repeat Steps 3 and 4 with the left circuit breaker of the subrack.

**6** Switch both circuit breakers of the subrack to the ***ON*** (= 1) position.

END OF STEPS

# Installing the *WaveStar*® CIT

**Purpose**

Use this procedure to:

- Install the *WaveStar* CIT software onto a new system.
- Upgrade/change an existing *WaveStar* CIT to a new software version.

**Required equipment**

The minimum requirements for a *WaveStar* CIT are a personal computer with:

- *Pentium*® 266 MHz processor (*Pentium* III 500 MHz or higher recommended) with 128 MB of RAM (256 MB of RAM or higher recommended)
- 150 MB of free hard-disk drive space
- CD-ROM drive (16X recommended)
- *CompactFlash*™ card
- SVGA monitor set to 800x600 resolution or greater, with 256 colors (1024x768, 16 million colors recommended)
- 100BaseT LAN interface, installed and working
- Unshielded crossed Ethernet LAN cable with 4-wire RJ-45 connectors
- *Microsoft*® *Windows NT*® 4.0 with Service Pack 5 or *Microsoft Windows*® 2000 operating system
- *Adobe*® *Acrobat*® *Reader*® for *Windows* (version 3.01 or later)
- Removable hard-disk drive (optional; required only for system backup).

The performance of the user interface can be enhanced by using a higher performance personal computer.

**Before you begin**

A user who has *Windows NT* / *Windows* 2000 System Administration privileges must install the software. That same user, then, becomes the *WaveStar* CIT System Administrator. The *WaveStar* CIT System

Administrator sets up the operating environment for other users. Some of these administration functions include:

- Assigning login IDs
- Assigning an initial password for each login ID
- Customizing the access privileges and security attributes for each login ID, and so forth.

The installation program cannot install system files or update shared files if they are in use by other programs. For this reason you should stop as many *Windows NT* applications as possible, before starting with the installation procedure.

**Installation**

Complete the following steps to install the *WaveStar* CIT software on your PC:

**1** Insert the *WaveStar* CIT CD-ROM (ComCode: 109088708) into the appropriate drive of your PC.

**Result:**

Autorun will start the install process.

**2**

| IF | THEN |
|---|---|
| autorun does not start | manually start the program by clicking **Start** → **Run**, click on **Browse**, select the CD-ROM drive, and select **setup.exe**, click **Open** and click **ok**.<br>**Result:**<br>The *WaveStar* CIT **CD Browser** appears. |
| autorun starts | no action is required.<br>**Result:**<br>The *WaveStar* CIT **CD Browser** appears. |

**3** Click on **continue.**

**4** Choose the entry **CIT Software.**

5 Select the **WaveStar CIT** area on the right.

6 Follow the on-screen instructions. Select **Full Install** when prompted.

7 If there are 2 or more LAN cards on the PC, select the LAN card with the IP Address that corresponds to the OSI LAN, otherwise if there is only 1 LAN card, *WaveStar* CIT will select it automatically.

8 If not yet available on your PC, install the **Acrobat Reader** by selecting the respective area below the entry **CIT Software**.

9 The PC will have to be rebooted if the OSILLC driver is installed. This is installed on the initial *WaveStar* CIT installation. Subsequent upgrades do not require OSILLC driver installation.

END OF STEPS

# *WaveStar*® CIT Login/Logout Procedure

**Overview**

Some procedures throughout this document require the user to login to and logout of the *WaveStar* CIT GUI. The following procedure describes how this is accomplished. This procedure requires the *WaveStar* CIT to be already loaded on the PC (see section "Installing the *WaveStar* CIT" (5-6)).

**Login procedure**

Complete the following steps to log into the *WaveStar* CIT GUI:

**1** Start the *WaveStar* CIT software by double clicking on the *WaveStar* CIT icon.

**2**

| IF ... | THEN ... |
|---|---|
| it is the first *WaveStar* CIT installation on the respective PC, | log into *WaveStar* CIT with **User Id**: "LUC01" or "LUC02" and **Password**: "LUC+01" or "LUC+02". |
| a previous *WaveStar* CIT version has already been installed on the respective PC, | log into *WaveStar* CIT with **User Id**: "LUC01" or "LUC02" and the last used **Password**. |

**3** Click **OK** to connect. *WaveStar* CIT will be "initializing views" for about 3 minutes. Click **OK** and read the legal notice.

**4**

| IF ... | THEN ... |
|---|---|
| it is the first *WaveStar* CIT session, | proceed to Step 5. |
| it is not the first *WaveStar* CIT session, | **Stop! End of Task.** |

**5** In the *WaveStar* CIT Main Window, choose the option **Administration** → **Data Communications...** .

6 Make sure that the **Auto-Learn NSAP** box is not checked.

END OF STEPS

**Logout from *WaveStar* CIT**

Complete the following steps to log out from *WaveStar* CIT:

1 In the *WaveStar* CIT main window, click **File** → **Exit**.

**Result:**

If there are still connections to NEs established from this CIT session, an alert window appears which shows the currently established connections.

2

| IF | THEN |
|---|---|
| you are sure you want to exit | click **Yes** in the alert window. |
| you do not want to exit, | press the **No** pushbutton. |

END OF STEPS

□

# NE Software Installation

**Overview**

The software is initially delivered to the customer on a CD-ROM (Comcode 109088708). The software generic has to be copied from the CD-ROM to the *WaveStar*® CIT PC and then to the empty *CompactFlash*™ card via *WaveStar* CIT. Afterwards, the *CompactFlash* card is inserted into the NE.

**Before you begin**

Prior to performing this task, you must

1. have 120 MB of free hard-disk drive space.
2. have a valid login on both the *WaveStar* CIT and the NE.
3. acquire the CD-ROM that contains the generic/version of the NE software (Comcode 109088708).

**Required privilege code**

You must have at least a privilege code of S4.

**Required equipment**

The following equipment is required to perform this task:

- Empty 256 MB *CompactFlash* card (as delivered from manufacturer)
- CD-ROM that contains the generic/version of the NE software
- PC with *CompactFlash* or PCMCIA slot. For the second case an adapter is required.

**Safety precaution**

Please observe the following safety precaution:

**CAUTION**

**Electrostatic discharge damage to sensitive components**

*Handling circuit packs or working on a WaveStar CIT can cause electrostatic discharge damage to sensitive components.*

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar CIT, to prevent electrostatic discharge damage to sensitive components.*

**SW installation** To install the NE software (delivered on a CD-ROM), proceed as follows:

**1** Power up the *WaveStar* CIT PC and log into Windows® NT / Windows® 2000 as administrator. If you are already logged into Windows® NT / Windows® 2000, close any open window.

**2** Install the NE software onto your PC. To do this, use one of the following two methods (automatic or manual installation):

***Automatic Installation:***

- Insert the *LambdaUnite*™ CD-ROM with the new NE software and wait for the welcoming screen to appear. If your PC does not start the CD-ROM automatically, perform the following:
  - Double-click **My Computer** on your desktop
  - Right click on your CD-ROM drive’s icon
  - Click **Auto Play**.

  If **Auto Play** is not available in this menu list, you have to start the ***setup.exe*** file in the root directory of your CD-ROM.
- Click the **Next** button.
- Wait for the software transfer to complete. You will notice that the “Decompressing Files In …” message and also the InstallShield Wizard disappears when this operation has completed.

***Manual Installation:***

- Insert the *LambdaUnite* CD-ROM with the new NE software. If the welcoming screen appears, select **Cancel** to exit from the automatic installation procedure.
- Open the Windows® NT / Windows® 2000 Explorer on your desktop.
- Select the harddisk drive where the *WaveStar* CIT is installed and click through to **Program Files** → **Lucent Technologies** → **WaveStar CIT** → **generics**.
  ***NOTE:*** If the subdirectory **generics** does not exist, you must create it!
- In the **generics** directory, create a new folder, preferrably stating the new software version in its name.

- In the Windows® NT / Windows® 2000 Explorer, right click the CD-ROM drive of your computer and select **Explore**. Go to the **generics** directory. This directory contains two subdirectories: **p** and **up**.
- Select the complete **up** and **p** directories and copy them to the folder you created two steps before.
- To install ***Acrobat Reader*** on your system, go to the ***AcrobatReader*** subdirectory on your CD-ROM drive and double click the ***AcrobatReader40.exe*** file.
- The Software Release Description (SRD) is located in the **Documentation** subdirectory of the CD. You can read it by double clicking the **pdf** file in this subdirectory.

---

**3** Insert the empty *CompactFlash* card into the *CompactFlash* slot (or PCMCIA slot with adapter) of the *WaveStar* CIT PC.

---

**4** Format the *CompactFlash* card by performing the following:

- Double click the **My Computer** icon on your desktop.
- Select **Cards** → **Format...** in the PC card control window.
- Select **FAT** in the **File System** selection box.
- Select **Quick Format**
- Click **Start**.

---

**5** Start the Windows Explorer.

---

**6** Copy all files in the directory ..*\Program Files\Lucent Technologies\WaveStar CIT\generics\xx.xx.xx\up* to the *CompactFlash* card.

**Result:**

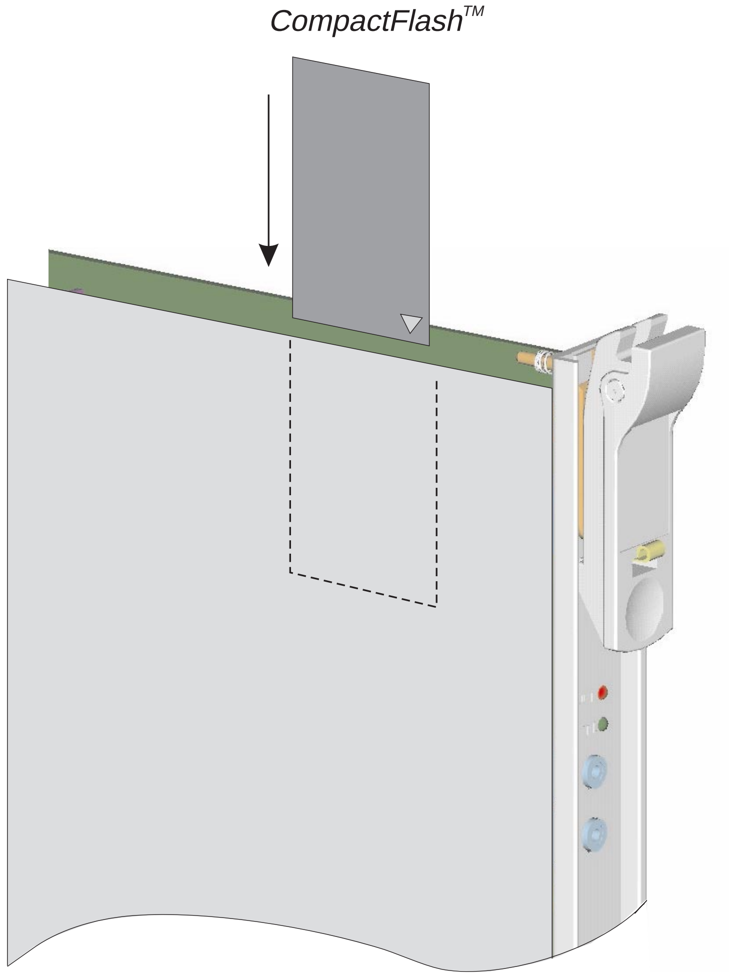
The file copy function begins and you see a “Copying files...” message.

---

**7** After copying, ***power off*** the flash disk slot.

**8** Eject the *CompactFlash* card from the *CompactFlash* slot (or from the PCMCIA adapter) of the PC.

**9** Insert the *CompactFlash* card with the new software version into the CTL circuit pack (red arrow on card down and facing left). Make sure that it is firmly seated in the CTL.




**Result:**

The system automatically starts the download (takes about 15 minutes).

***NOTE:*** The *CompactFlash* card has to remain in the CTL circuit pack during normal operation!

END OF STEPS

**Download failure**

In the case of a download failure (red LEDs are still lit), please refer to Chapter 7, section "SW Download Failure" (7-7).

□

# Connecting the *WaveStar*® CIT to the NE

**Overview**

The *WaveStar* CIT can be connected to a network element in 3 different ways:

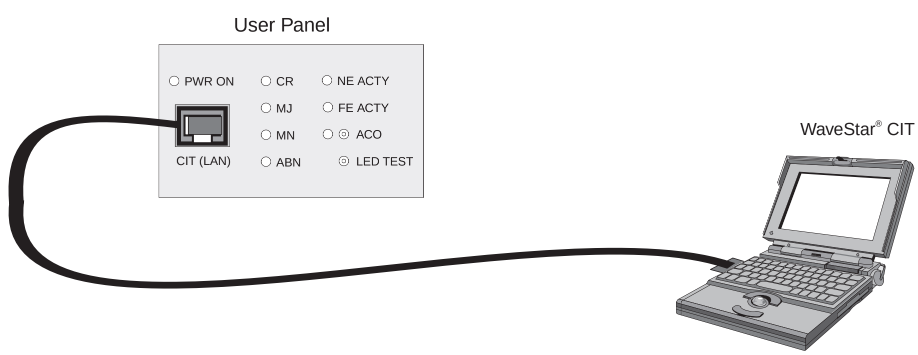
- Direct LAN Access (point-to-point)
- LAN Access (network)
- Remote Access via DCC.

**Direct LAN access (point-to-point)**

The *WaveStar* CIT (LAN card) is connected to the *LambdaUnite*™ MultiService Switch (MSS) via the “CIT” port of the user panel or through a backplane connector (LAN I/O Panel). An unshielded crossed Ethernet LAN cable (100BaseT) with 4-wire RJ-45 connectors is used for this connection.

The usage of ***shielded*** 100BaseT LAN cables is only allowed if the applicable national safety requirements have been met by the user. Otherwise, there is a ***risk of electrical shock and/or serious injury***.

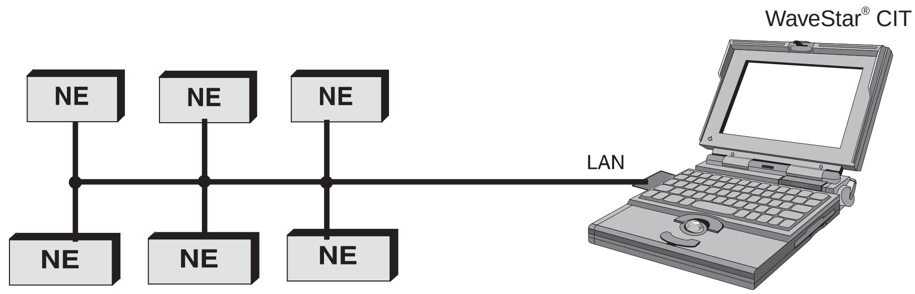
The following figure illustrates the Direct LAN Access (Point-to-Point).




***WaveStar* CIT LAN access (network)**

*WaveStar* CIT access to more than one NE, e.g. within one site, can be done via a Local Area Network (LAN). The LAN is connected to the NEs by means of 100-BaseT Ethernet interfaces on 4-wire RJ-45 connectors (a crossed LAN cable must be used!).

The following figure illustrates the *WaveStar* CIT LAN Access (Network).



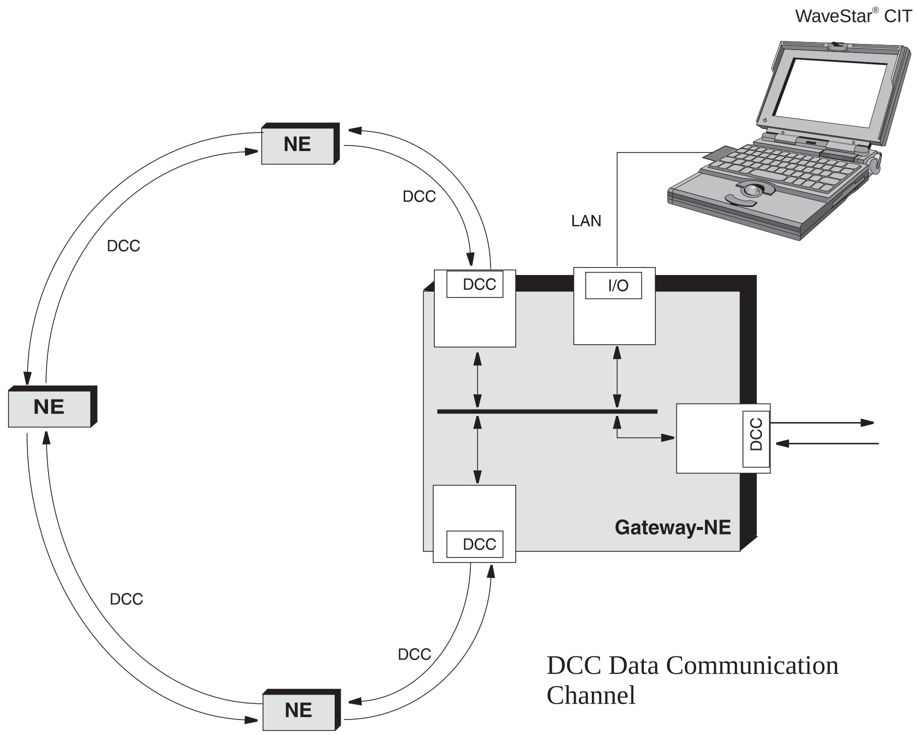

LAN Local Area Network

The usage of ***shielded*** 100BaseT LAN cables is only allowed if the applicable national safety requirements have been met by the user. Otherwise, there is a ***risk of electrical shock and/or serious injury***.

### *WaveStar* CIT access via Data Communications Channel (DCC)

*WaveStar* CIT access to remote NEs can easily be done via the Data Communications Channel (DCC) which are part of the SDH/SONET aggregate or tributary signals. The CIT is connected via a point-to-point connection to one NE of the network (cf. “Direct Access”), which is then called the Gateway NE. All other NEs can be reached by the DCC. Thus, no additional management network is needed to connect the CIT to each individual NE.

The following figure shows an example of the access via the Data Communications Channel.




DCC Data Communication Channel

□

# NE Login/Logout procedure

**Overview**

This section describes the login and logout procedures to/from an NE. It is necessary that the *WaveStar*® CIT is already connected to the NE (see section "Connecting the *WaveStar* CIT to the NE" (5-16)).

**Initial login procedure**

Complete the following steps to login to an NE:

**1** Login to *WaveStar* CIT as described in section "*WaveStar* CIT Login/Logout Procedure" (5-9).

**2** Enter the target identifier (TID) in the **NE Name** box. The default TID (= default name of the NE) is: "LUCENT-UNITE-NE".

**3** Select the used **NE Type** and "OSI" as **Connection Type** and click on **Graphical**.

**4** Login with **UserId** "LUC01" or "LUC02" and the associated **Password** "UNITE+01" or "UNITE+02".

**5** Click **OK** to confirm, then **OK** to the legal notice.

**Result:**

The **System View** window appears for the selected NE.

**6** Change the NE name (see section "Changing the NE Name (TID)" (5-21)).

END OF STEPS

**Logout procedure**

Complete the following steps to logout from an NE:

1 Click **File** → **NE Disconnect**.

2 Click **Yes** in the confirmation window.

END OF STEPS

# Changing the NE Name (TID)

**Overview**

This section provides a procedure for changing the NE name (TID).

**NE names**

NE names must be unique within a network to guarantee the reachability by management systems and the proper interworking of NEs.

**Before you begin**

Prior to performing this task, you must:

- have a valid user login and password,
- be connected to the subject NE, and
- have proper access privileges to perform this task.

**Required privilege codes**

You must have at least privilege codes of S4 and M4 and P1 to perform this task.

**Required equipment**

The following equipment is required to perform this task:

- *WaveStar®* CIT.

**Procedure**

Complete the following steps to change a network element's name:

1. From the **System View** main menu, select **Fault** → **Enter/Exit Maintenance Condition...** → **Enter Maintenance Condition ...**

2. Confirm the resulting system message by clicking **Yes**.

3. Invoke the **Provision TID/NE Name** window from the **System View** main menu via **Administration** → **Set TID...**

4 Place the cursor in the **New TID/NE Name** text box and key in the new TID observing the following configuration rules:

- Each NE name must be unique within the network.
- The following characters are allowed in an NE name:
  - Upper-case letters ("A" .. "Z"),
  - Lower-case letters ("a" .. "z"),
  - Special characters("-", "+", "_", ".", "/"),
  - Digits ("0" .. "9").
- An NE name must not end and begin with an special character.
- Each NE name must be maximally 20 characters in length.
- The NE name may contain segments separated by hyphens ("-") or slashes ("/"), but each segment must begin with a letter.

Please note that NE names are case-insensitive.

5 Make sure that the new TID is correct.

| IF ... | THEN ... |
|---|---|
| the new TID is correct, | continue with Step 6. |
| the new TID is not correct, | correct the entry in the **New TID/NE Name** text box and continue with Step 6. |

6 Place the cursor in the **Confirm TID/NE Name** text box and key in the new TID again.

**Important!** Take a note of the TID you are going to assign to the NE!

7 Click **OK** to assign the new TID and to dismiss the window.

8 From the **System View** main menu, select **Fault** → **Enter/Exit Maintenance Condition...** → **Exit Maintenance Condition...**.

9 Confirm the resulting system message by clicking **OK**.

**Result:**

The *LambdaUnite*™ MultiService Switch (MSS) NE will now perform a system reset. As a consequence, the management association between the *WaveStar* CIT and the NE will be lost.

After the system reset has finished, you can re-establish the management association by again connecting the *WaveStar* CIT to the NE, now using the new TID.

END OF STEPS

# Provisioning the System Parameters

**Overview**

This section provides a procedure for configuring the system parameters.

**Before you begin**

Prior to performing this task, you must be logged into the *WaveStar*® CIT and the respective NE.

**Required privilege code(s)**

You must have at least a privilege code of P3, Provisioning, or M3, Maintenance, to set the system parameters.

**Required equipment**

The following equipment is required to perform this task:

- *WaveStar* CIT.

**Procedure**

Complete the following steps to set the system parameters:

**1** In the *WaveStar* CIT **System View**, select **Configuration** → **Provision**.

**Result:**

The window **Provision Parameters for Protection Groups or Equipment** opens. The **Equip** selection tab appears on the left side of the window.

**2** Select the system in the **Equip** selection tab and click on **Provision**.

**Result:**

The selection window for the system parameters appears on the right side of the window. This window consists of two tabs, **Settings** and **Date and Time**.

**3** In the **Settings** tab you can set or modify various parameters associated with the entire system. Click on the respective check box.

| IF | THEN |
|---|---|
| you want to change the default interface standard to SONET, | set the **Optical Interface Standard** to **SONET**. |
| you want to change the default interface standard to SDH, | set the **Optical Interface Standard** to **SDH**. This is the default value. |
| you want a fixed tributary rate list, | set the **Tributary Mode Default** to **Fixed-Rate**. |
| you want the tributary signal rate list to adapt, | set the **Tributary Mode Default** to **Adaptive-Rate**. |
| you want that the system synchronization is in SDH characteristics, | set the **System Synch Characteristics** to **SDH**. This is the default value. |
| you want that the system synchronization is in SONET characteristics, | set the **System Synch Characteristics** to **SONET**. |

**4** Click the **Apply** pushbutton.

**Result:**

The *LambdaUnite*™ MSS NE will now perform a system reset. As a consequence, the management association between the *WaveStar* CIT and the NE will be lost.

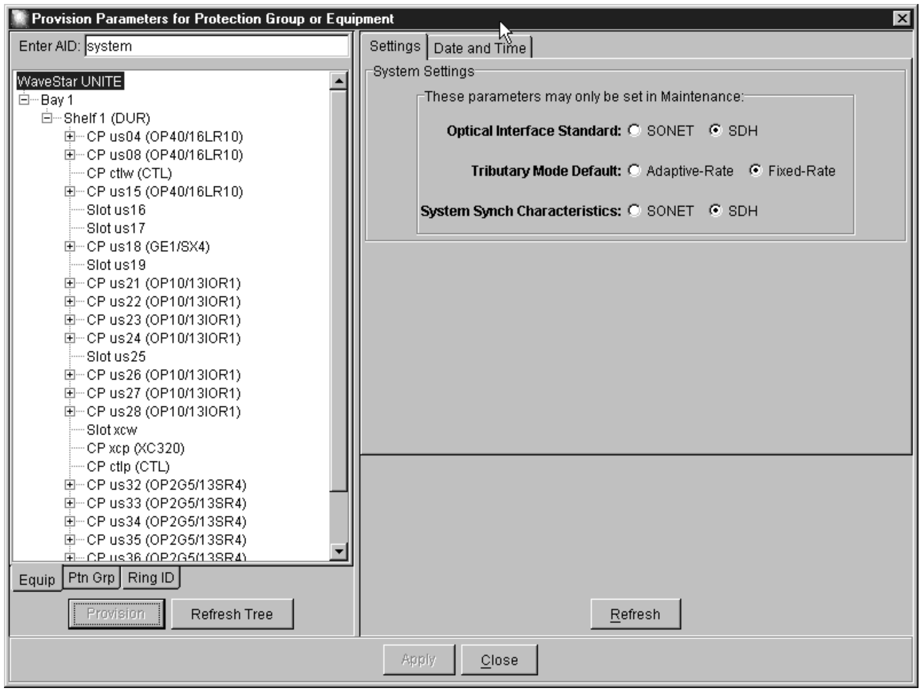
After the system reset has finished, you can re-establish the management association by again connecting the *WaveStar* CIT to the NE.

**5** Confirm the resulting system message by clicking **OK**.

END OF STEPS

### Relevant *WaveStar* CIT window

The **System Settings** window makes it possible to provision system parameters.




### Elements of the *Settings* tab

The elements of the **Settings** tab and their meaning are listed in the following table.

| Option | Meaning |
|---|---|
| **Optical Interface Standard** | Used to set the **Optical Interface Standard** for the actual NE by selecting the according radio button (**SONET** or **SDH**). |
| **Tributary Mode Default** | Used to set the **Tributary Mode Default** for the actual NE by selecting the according radio button (**Adaptive-Rate** or **Fixed-Rate**). |
| **System Synch Characteristics** | Used to set the **System Synch Characteristics** for the actual NE by selecting the according radio button (**SONET** or **SDH**). |

# Setting the NE Date and Time

**Overview**

This section provides a procedure for setting up the NE date and time.

***NOTE:*** The NE clock must be set again after each power on or reboot!

**Before you begin**

Prior to performing this task, you must be logged into the *WaveStar*® CIT and the respective NE.

**Required privilege code(s)**

You must have at least a privilege code of P3, Provisioning, or M3, Maintenance, to set the system parameters.

**Required equipment**

The following equipment is required to perform this task:

- *WaveStar* CIT.

**Procedure**

Complete the following steps to set the date and time of the system:

**1** In the *WaveStar* CIT **System View**, select **Configuration** → **Provision**.

> **Result:**
>
> The window **Provision Parameters for Protection Groups or Equipment** opens. The **Equip** selection tab appears on the left side of the window.

Alternatively you can also right-click on the white area of the window and select **Provision System...**. Proceed with Step 3.

**2** Select the system in the **Equip** selection tab and click on **Provision**.

> **Result:**
>
> The selection window for the system parameters appears on the right side of the window.

**3** Select the **Date and Time** tab.

**4** Select the day (by clicking on the respective date), month (via the drop-down list box) and year (via the drop-down list box) in the group box **Date**.

**5** Set the time in the group box **Time**.

**6** Click the **Apply** pushbutton.

**Result:**

The *LambdaUnite*™ MSS NE will now perform a system reset. As a consequence, the management association between the *WaveStar* CIT and the NE will be lost.

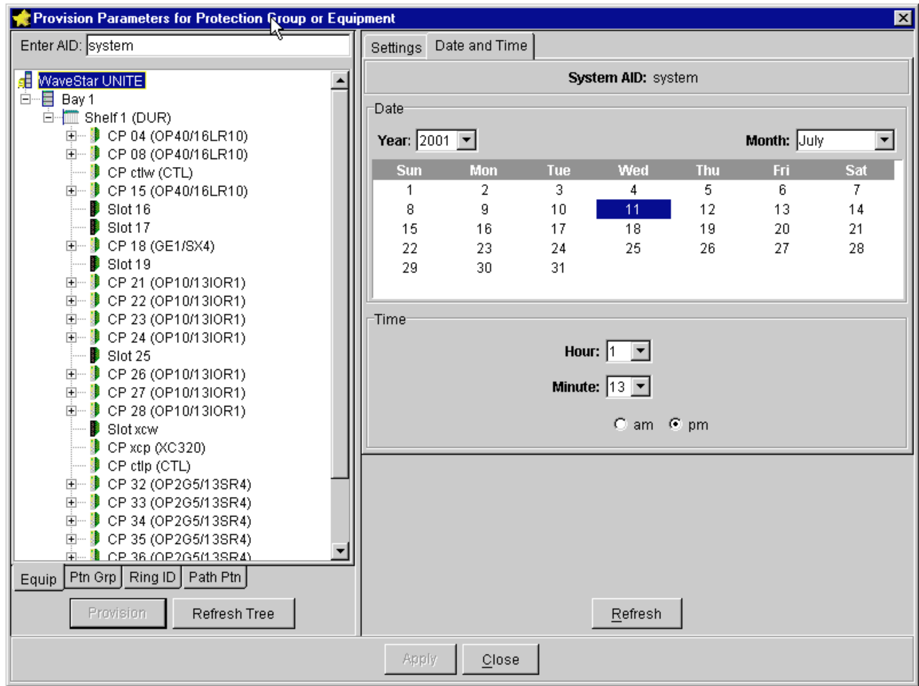
After the system reset has finished, you can re-establish the management association by again connecting the *WaveStar* CIT to the NE.

**7** Confirm the resulting system message by clicking **OK**.

END OF STEPS

### Relevant *WaveStar* CIT window

The following window is used to set the date and time of the system.




### Elements of the *Date and Time* tab

The elements of the **Date and Time** tab and their meaning are listed in the following table.

| Option | Meaning |
|---|---|
| **Year** | Select the year to be set. |
| **Month** | Select the month to be set. |
| **Day field** | Select the day to be set. |
| **Time** | Select the time to be set. |

# Configuring the Data Communication Network (DCN)

**Purpose**

The user should now perform the management communication setup. For example, the DCC parameters must be configured correctly to be able to transmit managing information from NE to NE. Furthermore, the described DCN setup is required for performing the network tests described in Chapter 6.

**Related information**

All required tasks for setting up the management communication are described in the " *LambdaUnite*™ MultiService Switch (MSS) User Operations Guide", Chapter 3.

□

# Provisioning the Timing References

**Overview**

This section provides a procedure for configuring the external timing references.

**Before you begin**

Prior to performing this task, you must be logged into the *WaveStar*® CIT and the respective network element. Furthermore, you must have completed the task "Configuring the Data Communication Network (DCN)" (5-30).

Select the synchronisation system mode (**SONET mode** or **SDH mode**). That is only possible in the maintenance condition selectable via **Fault** → **Enter/Exit Maintenance Condition ...** → **Enter Maintenance Condition ...**).

**Required privilege code**

You must have at least a privilege code of P3 to configure the external timing references.

**Required equipment**

The following equipment is required to perform this task:

- *WaveStar* CIT.

**Procedure**

Complete the following steps to configure the external timing references:

1. Select **Configuration** → **Timing/Sync** in the **System View** of the *WaveStar* CIT.

   **Result:**

   The window **Synchronisation Characteristics** appears.

2. Select the tab of the **External Timing Reference** which you wish to configure. You can select two external timing signals from the external timing input ports. There is one tab for each port (**External Timing Reference 1** and **External Timing Reference 2**). 2 MHz or 2 Mbit/s signals for SDH mode or D1 timing signals for SONET mode can be used as external timing sources.

**3** Select the timing quality belonging to the external timing reference in the drop-down list box **Quality Level**. Assign the actual quality level of the external timing source (**PRC**, **SSUT**, **SSUL**, **SEC** for SDH mode or **PRS**, **STU**, **ST2**, **ST3** for SONET mode).

**Result:**

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

**4** Select the port AID in the drop-down-list box **Assigned Port AID**. Select in the drop-down list box **Not Connected**, if the respective external timing signal should not be used or select **External Timing Input Port 1** or **External Timing Input Port 2** depending on the tab you have selected.

**5** Select in the drop-down list box **System Timing Reference Priority** the priority of the selected timing reference. The values can be

- **Disable** (initial value)
- **1**, **2, 3, 4, 5, 6, 7**, or **8**

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

**Result:**

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

**6** Select the **Timing Port Mode Monitoring**. The values **Monitored** or **Not Monitored** are possible. This defines whether alarms are raised for the timing signals or not.

7 Select the **ASAP Name** Alarm Severity Assignment Profile. Via the push-button **Browse...** you can select the alarm in the drop-down list box. Click on **OK** to apply your setting.

By clicking on the push-button **Info...** you can call up a table with details on the ASAPs.

8 Apply the changes by clicking on **Apply**. If you wish to discard the changes click on **Cancel** or **Undo**.

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

END OF STEPS

# Provisioning the System Timing

**Overview**

This section provides a procedure for configuring the system timimg.

**Before you begin**

Prior to performing this task, you must be logged into the *WaveStar*® CIT and the respective network element. Furthermore, you must have completed the task "Configuring the Data Communication Network (DCN)" (5-30).

**Required privilege code**

You must have at least a privilege code of P3 to configure the system timing.

**Required equipment**

The following equipment is required to perform this task:

- *WaveStar* CIT.

**Procedure**

Complete the following steps to configure the system timing:

1 Select **Configuration** → **Timing/Sync** in the **System View** of the *WaveStar* CIT.

**Result:**

The window **Synchronisation Characteristics** appears.

2 Select the **System Timing Parameters** tab.

3 Select the **System Timing** tab.

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

- **Zero** (initial value)
- **20 SEC**(**SONET** mode only)
- **1 Minutes** ... **60 Minutes** (selectable via a spin box)
- **Infinite** (**SONET** mode only)

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

5 Enable or disable the use of **System Synchronisation Status Messaging Mode** by selecting **QL Disable** or **QL Enable**. This means that the selection of timing reference for the system timing is either determined only by the provisioned priority list or by the quality level given by the timing marker (SSM, Synchronization Status Message) and secondly by the priority list. Click on the respective radio button.

6 Select the clock mode in the group box **Clock Mode.** Click on the respective radio button. You can select the following values:

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

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

**Result:**

If you select **Free Running** the following warning window appears: “***Switching the timing clock from locked to free running can temporarily result into transmission errors.***”

7 Select the **ASAP Name** Alarm Severity Assignment Profile. Via the push-button **Browse...** you can select the alarm in the drop-down list box. Click on **OK** to apply your setting.

By clicking on the push-button **Info...** you can call up a table with details on the ASAPs.

8 Apply the changes by clicking on **OK** or **Apply**. If you wish to discard the changes, click on **Cancel** or **Undo**.

END OF STEPS

# Setting up a Cross-Connection

**Overview**

This section provides a procedure for setting up a cross-connection.

**Before you begin**

Prior to performing this task, you must be logged into the *WaveStar*® CIT and the respective network element.

**Required privilege code**

You must have at least a privilege code of P3 to create new cross-connections. For some fields privilege code M1 is required.

**Required equipment**

The following equipment is required to perform this task:

- *WaveStar* CIT.

**Procedure**

Complete the following steps to create a new cross-connection:

1. Call up the **Cross-Connection Wizard** via **Configuration** → **Cross-Connections...** in the **System View** of the *WaveStar* CIT.

2. Click on the radio button **Create a new cross-connection** and click on **Next>**.

   **Result:**

   **Screen 1** appears.

3. Define the cross-connection rate in the drop-down list box **Rate:**. The following values are possible:

   - **VC-3**(default value)
   - **VC-4**
   - **VC-4-4c**
   - **VC-4-16c**
   - **VC-4-64c**
   - **STS-1**
   - **STS-3**
   - **STS-12**

- **STS-48**
- **STS-192**

Please note that it is not possible to proceed to the next window before selecting the cross-connection rate.

4 Select **2 Way Point-to-Point** in the group box **Type of Cross-connection**.

5 Click on **Next>** to proceed to the next window.

**Result:**

**Screen 2 of 3** opens.

6 Click on **Select...** to select the source tributary.

**Result:**

The **Ptn Grp** selection tab appears. In the list box of the **Ptn Grp** selection tab the system is displayed. The displays can be expanded. Thus a tree of systems, bays, shelves, circuit packs, and ports is depicted.

7 Select one port in the list or enter the AID in the text box **Enter AID:** above.

**Result:**

In the list box **Tributary** on the right, the AIDs of all VCs/STSs belonging to the respective port are displayed.

8 Select the VC/STS which shall be used as the source and click on the **Select...** button.

9 Select the destination port in the **Ptn Grp** selection tab and the corresponding VC/STS in the **Tributary** list box and click on the **Select...** button.

**Result:**

On **Screen 2 of 3** both, the source and destination tributary, are displayed.

10 Click on the **Next>** button.

**Result:**

The **Screen 3 of 3** opens.

The current data of the cross connection are displayed.

11 The fields **XC Application**, **Source NE Name** and **Destination NE Name** are view only and display the previous decisions.

12 Select **IDLE/UNEQ** as **Output Mode** in the group boxes **Source to Destination** and **Destination to Source**.

**Result:**

An unequipped signal is transmitted for test and maintenance purposes.

13 Type a number for the cross connection in the field **XC Number** or use the automatically generated one.

14 Click on the **Finish** button to apply your settings.

END OF STEPS

# Network Commissioning

**Overview**

This chapter describes how to establish a network with optical fibre connections. It provides procedures for directly connecting the *LambdaUnite*™ MSS NEs and should be used for high-level network connection.

**Assumptions**

Be sure all listed assumptions described below are fulfilled before establishing the network:

- Each NE is provisioned as described in that chapter.
- The person setting up the network should be familiar with the SDH or SONET functionality.

**Related information**

In this chapter all procedures are described for a protected ring topology. In the "*LambdaUnite* MultiService Switch (MSS) Application, Planning and Ordering Guide" other possible topologies are also described.

**Procedure**

**DANGER**

*Never look into the end of an exposed fiber or into an open optical connector as long as the optical source is switched on. This applies particularly to the connections of the optical plug-in units.*

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar® CIT, to prevent electrostatic discharge damage to sensitive components.*

**CAUTION**

*To avoid cable break ensure that the bending radius of optical fibre cables is not less than 30 mm.*

Perform the following procedure to establish a protected ring connection:

---

**1** At the first node, clean and connect the fibre to the OUT port of one optical circuit pack (OP10G or OP2G5).

**Reference:**

Chapter 7, section "Fibre Cleaning" (7-12)

---

**2** Move to the next adjacent node in the east.

---

**3** Follow the LC attenuator selection procedure to determine the correct attenuation value for the IN port of the respective optical circuit pack.

**Reference:**

Section "LC Attenuator Selection" (5-42)

---

**4** Clean and connect the fibre to this IN port.

**Reference:**

Chapter 7, section "Fibre Cleaning" (7-12)

---

**5** Repeat steps 1-4 until you have gone all the way around the ring.

---

**6** Repeat steps 1-5 with other optical circuit packs (OP10G or OP2G5) used for protection.

---

**7** Setup far-end communications.

**Reference:**

Section "Configuring the Data Communication Network (DCN)" (5-30)

---

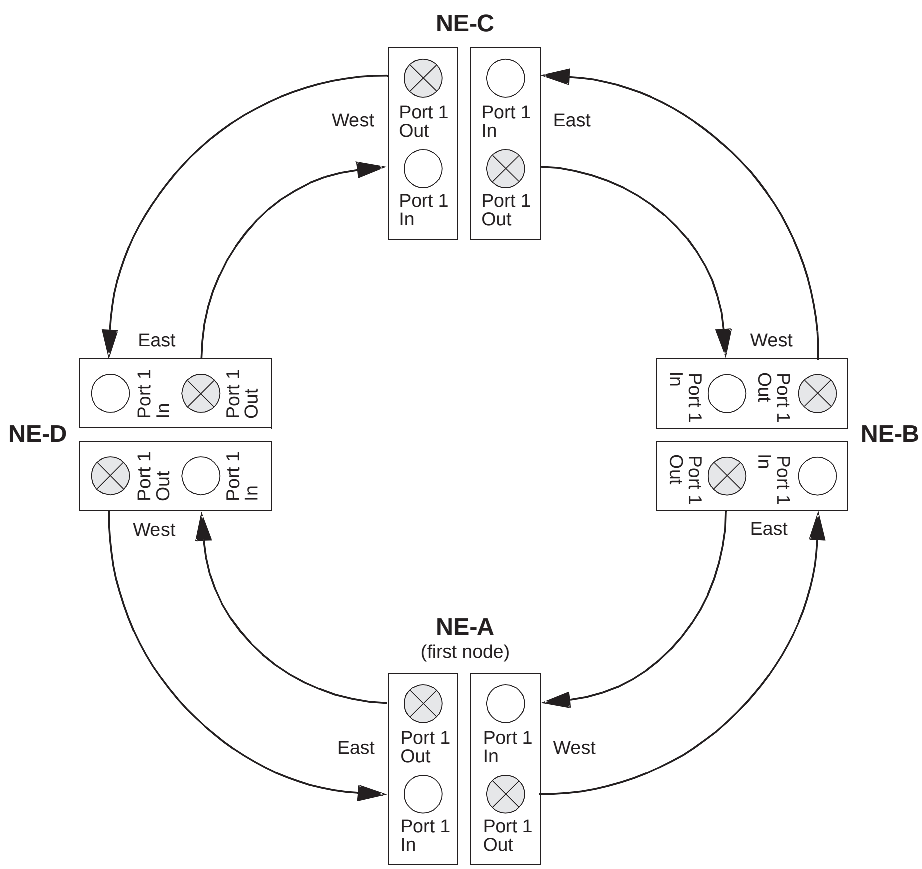
**8** Setup cross-connections.

**Reference:**

Section "Setting up a Cross-Connection" (5-36)

END OF STEPS

## Result




□

# LC Attenuator Selection

**Ordering** See Appendix B, “LC Attenuators” (B-12).

**Selection procedure** This section covers the selection of LC attenuators to be used on the input to the long reach 2.5G/10G based on the received optical power. It is recommended that the LC attenuator be placed on the INPUT port since this is the furthest physical point on the fibre line from the OUTPUT port and takes all connector losses into account. Perform the steps as described below to choose and install the appropriate LC attenuator for all port units:

**1** At the input of the receiver measure the received optical power from the far-end transmitter. Be sure to set the optical power meter for the wavelength of the light to be measured (i.e. 1310 nm or 1550 nm).

**2** Check that the measured value is within the range shown below (“LC attenuator value range” (5-43)).

| IF... | THEN... |
|---|---|
| the measured value is within the range, | END OF STEPS |
| the measured value is not within the range, | choose the appropriate LC attenuator value. |

**3** Remove the 0-dB LC attenuator in the faceplate IN port of the optical circuit pack.

**4** Install the chosen LC attenuator.

**5** Measure the received optical power again.

**Result:**

The measured value must be within the valid range.

END OF STEPS

### LC attenuator value range

The following table helps you to check the LC attenuation value.

| Circuit pack | Range (dBm) |
|---|---|
| OP10/1.3IOR1 | –11.0 ... –1.0 |
| OP10/1.5IR1 | –14.0 ... –1.0 |
| OP10/1.5LR1 | –14.0 ... –1.0 |
| OP10/01-80/800G | –20.0 ... –13.0 |
| OP2G5/1.3SR4 | –18.0 ... –3.0 |

# 6 Test Procedures

## Overview

**Purpose**

This chapter describes all the tests that should be carried out to check the functionality of the system.

**Assumptions**

Be sure all listed assumptions described below are fulfilled before carrying out any tests:

- All NEs must be mounted and cabled correctly (see Chapters 3 and 4).
- The people carrying out the tests are familiar with the SDH functionality, the *WaveStar*® CIT software and the handling of the test equipment.

**Related information**

An overview about all *WaveStar* CIT related tasks is given in the “ *LambdaUnite*™ MultiService Switch (MSS) User Operations Guide”.

**Contents**

# Physical Installation Check

**Overview** Each component must undergo a visual check by a qualified person to ensure that all components are complete and the cables are connected correctly. The test should be carried out for each installed NE.

**Checks** Check that

- there are no visible defects
- the mechanical parts are secured
- all cables are assembled correctly
- all optical cables have a bending radius of minimal 25 mm
- the optical couplings are affixed to the optical circuit packs
- all circuit packs are situated in the slots according to the guidelines described in Chapter 3.

□

# Status Test of the Circuit Packs

**Overview**

The current operating state of the circuit packs is displayed by means of the following 3 diagnostic LEDs:

- ACTIVE
  ON in case of active status. In standby mode the LED is dark.
- FAULT
  ON or FLASHING in case of hardware failure or wrong detection in the system.

**Check**

Check that on each circuit pack only the ACTIVE LED is lit up. This is the case if there are no alarms present on the circuit packs. Otherwise, the FAULT LED is lit up or flashing. The test should be carried out for each installed NE.

**Important!** The LEDs of the protection cards are off as long as they are in the standby mode.

☐

# Fan Unit Test

**Overview** This test clarifies the correct working of the Fan Unit in the *LambdaUnite*™ MultiService Switch (MSS) subrack. Check if the fan unit is running. The test should be carried out for each installed NE.

**Procedure** Proceed as follows to test the correct functionality of the fan unit:

**1** Control the correct installation of the fan unit and fan filter.

Check that

- the air flow direction is from bottom to top
- the unit is fixed correctly.

**2** Control the status indication on the faceplate of the fan unit.

**Result:**

On the fan unit only the PWR ON LED should be lit.

END OF STEPS

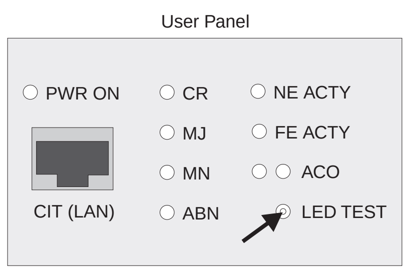
# LED Test

**Overview**

This test ensures the functionality of the LEDs on all circuit packs as well as on the user panel. The PWR ON LED on the user panel and the fan unit LEDs are not affected by the LED test. The test should be carried out for each installed NE.

**Test procedure**

**1** Push the LED TEST button on the user panel to test the circuit pack and user panel LEDs.




**Result:**

The following should happen:

1. The LEDs on the user panel (except the PWR ON LED) turn on for 2 seconds and then off for 2 seconds three times in sequence.
2. The LEDs on the circuit packs turn on for 2 seconds and then off for 2 seconds three times in sequence.

END OF STEPS

**LED test failure**

In the case of a LED test failure (LEDs are not lit), please refer to Chapter 7, section "LED Test Failure" (7-8).

□

# Alarm Reporting Test

**Overview**

This test verifies that currently active alarms of the system are reported to the *WaveStar*® CIT and the User Panel. The test includes raise and clear behaviour of the alarms created.

**Related information**

All the needed information for the tasks described below (creating and clearing of alarms) is given in the “ *LambdaUnite*™ MultiService Switch (MSS) User Operations Guide”.

**Procedure**

Proceed as follows to complete the alarm test:

**1** Login to the NE as described in Chapter 5, section “NE Login/Logout procedure” (5-19).

**2** Create the different alarms in sequence as shown in the table below.

**Example:**

Create the following alarms separately:

| Created alarm | Alarm level | Example for creation of the alarm |
|---|---|---|
| Protection Clock Input Fail | Deferred/ Minor | Remove the XC320 circuit pack which is located in the protection slot 10. |
| NE Clock Failure | Prompt/ Critical | Remove both XC320 circuit packs (worker and protection). |

| Created alarm | Alarm level | Example for creation of the alarm |
|---|---|---|
| Fan Voltage Feed A Failure | Prompt/Major | 1. Reprovision the ASAP level for the “Fan Voltage Feed A Failure” alarm from “Deferred/Minor” to “Prompt/Major”.<br>2. Disconnect the fan power cable from the **Power Input A** connector of the Fan Unit and verify the receipt of a “Prompt/Major” alarm.<br>3. Change the ASAP back to “Deferred/Minor”. |

**3** Check whether alarms are reported to the *WaveStar* CIT (via **Fault** → **NE Alarm List...** or **Reports** → **NE Alarm List...**). Check also the correct behaviour of the LEDs on the User Panel and on the circuit pack, which generates the produced failure.

**4** Clear alarms created at step 2.

**5** Check the *WaveStar* CIT alarm list for correct clearing of the reported alarm. To make sure that the “NE Alarm List” reflects the current alarm status, click the **Refresh** button.

**6** Repeat step 2 to 5 for all alarm levels.

END OF STEPS

# NE Synchronisation Test

**Overview** This test ensures protected synchronisation of the NE to external clock sources.

**Important!** The test must only be carried out for NEs with connected external clock sources.

**Procedure** Proceed as follows to complete the NE synchronisation test:

**1** Connect an external clock source (2.048 MHz signal, 2.048 Mbit/s framed signal or a 1.544 Mbit/s framed signal (SONET)) to both external timing input ports located on the rear side of the subrack (see Chapter 4).

**2** Login to the NE as described in Chapter 5, section “NE Login/Logout procedure” (5-19).

**3** Assign the first clock source.

To do this, select **Configuration** → **Timing/Sync** in the System view, then the tab **External Timing Reference 1**.

- Select “AUTO” in the **Provisioned Quality Level** field.
- Set the priority to “1” in the **System Timing Reference Prioriy** field.
- Select “External Timing Input Port 1” in the **Assigned Port AID** field.
- Set the **Timing Port Mode Monitoring** field to “Monitored”.

**4** Assign the second clock source.

To do this, select **Configuration** → **Timing/Sync** in the System view, then the tab **External Timing Reference 2**.

- Select “AUTO” in the **Provisioned Quality Level** field.
- Set the priority to “2” in the **System Timing Reference Prioriy** field.

- Select “External Timing Input Port 2” in the **Assigned Port AID** field.
- Set the **Timing Port Mode Monitoring** field to “Monitored”.

**5** Assign the system timing.

To do this, select **Configuration** → **Timing/Sync** in the System view, then the tab **System Timing Parameters**, then the tab **System Timing**.

- Select “QI Disable” in the **System Synchronisation Status Messaging Mode** field.
- Set the **Wait To Restore** time (WTR) to “1 Minute”.
- Set the **Clock Mode** to “Locked”.

**6** Verify that the NE is synchronising onto the first external clock source for at least 3 minutes. To do this, select **View** → **Timing/Sync**, then the tab **External Timing Reference 1**.

**7** Disconnect the connection of the first clock source and click **Close**.

Select **View** → **Timing/Sync...**, then the tab **External Timing Reference 2**.

**Result:**

The second clock source should become active.

**8** Reconnect the first clock source.

**Result:**

The first clock source should become active again after WTR time has expired.

END OF STEPS

**NE synchronisation failure**

In the case of an NE synchronisation failure (NE cannot synchronise to an external clock source), please refer to Chapter 7, section "NE Synchronisation Failure" (7-5).

□

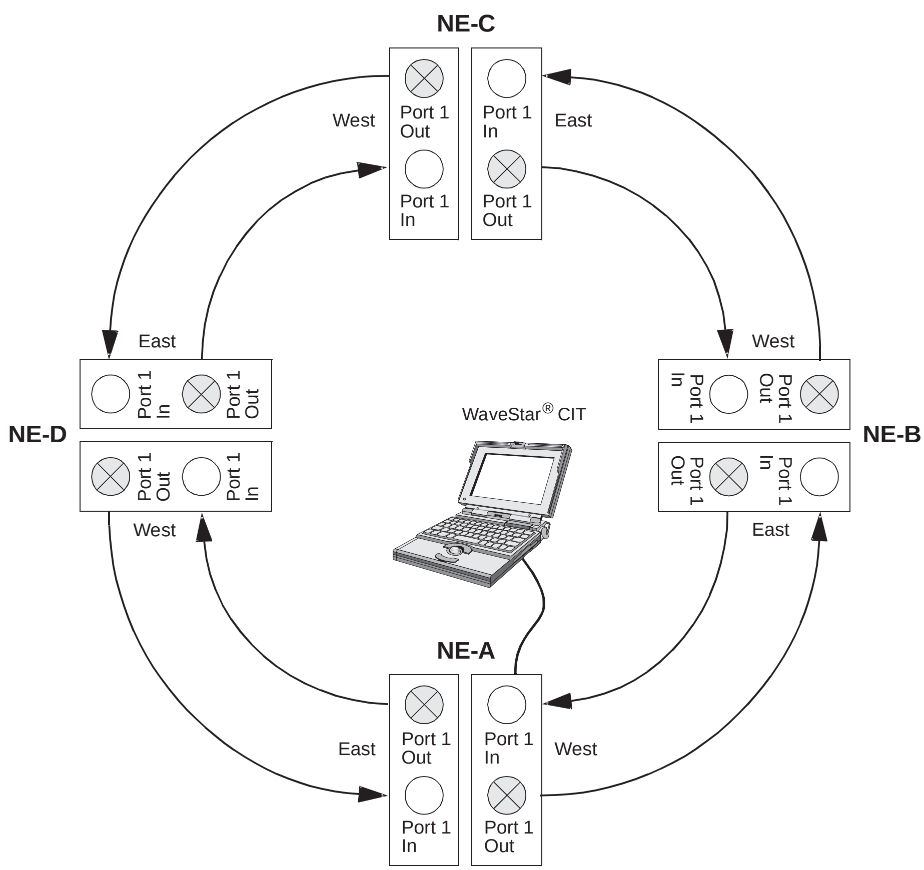
# Network Test: Remote Login

**Overview**

**Important!** This test can only be done after the DCC channels have been configured correctly (see Chapter 5, section "Configuring the Data Communication Network (DCN)" (5-30)).

The test ensures the accessibility to all NEs via remote login. In the test procedure a protected ring configuration will be used as example. However, the described procedure is in principle also valid for other network topologies.

**Test setup**




**Procedure**

Perform the following procedure to test the NE control and supervision functionality via remote login:

**1** Login to the NE-A as described in Chapter 5, section "NE Login/Logout procedure" (5-19).

**2** Set the NE-A time to the actual value (see Chapter 5, section "Setting the NE Date and Time" (5-27)).

**3** Start a remote login to NE-B.

**Result:**

All units of the NE-B will be displayed.

**4** Read out the inventory data by double clicking on a unit.

**Result:**

The inventory data window (Pack Data) for the selected board will be opened.

Tab **Pack Data**


Tab **Status**


**5** Set the NE-B time to the actual value.

**6** Repeat Steps 3 to 5 for NE-C and NE-D.

END OF STEPS

**Remote login failure**

In the case of a remote login failure, please refer to Chapter 7, section "Remote Login Failure" (7-9).

☐

# Network Test: Line Timing Functionality

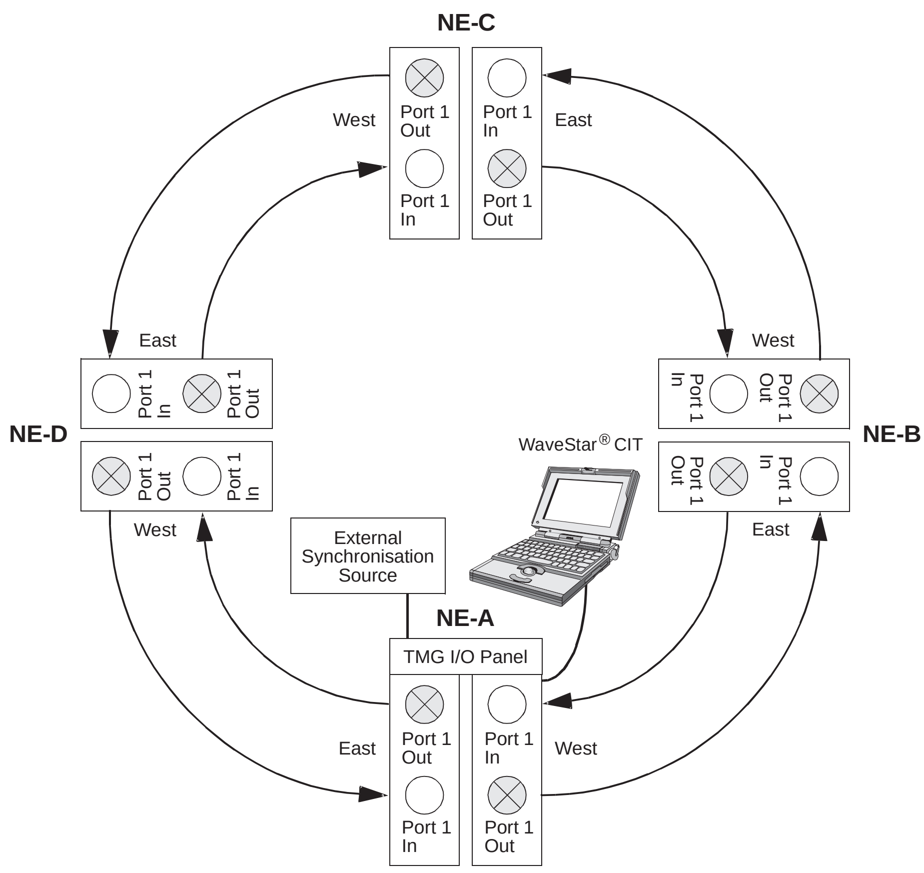
**Overview**

This test checks that all NEs can be synchronized using the line timing function. In the test procedure a protected ring configuration will be used as example. However, the described procedure is in principle also valid for other network topologies.

**Assumptions**

To be able to carry out this test all NEs with the exception of NE-A must be prepared/provisioned for the line timing functionality (e.g. port provisioning). The needed information for performing this step is given in the " *LambdaUnite*™ MultiService Switch (MSS) User Operations Guide".

**Test setup**




**Procedure**

Perform the following procedure to test the network line timing functionality:

1 Connect an external clock source to an external timing input port.

2 Login to the NE-A as described in Chapter 5, section "NE Login/Logout procedure" (5-19).

3 Check that NE-A is synchronized onto the external synchronisation source (see section "NE Synchronisation Test" (6-10)).

4 Start a remote login to NE-B.

5 Check that NE-B is synchronized onto the internal line clock source. To do this select **View** → **Timing/Sync**, then the respective **Line Timing Reference** tab (depends on the configuration).

6 Repeat Steps 4 and 5 for NE-C and NE-D.

END OF STEPS

# 7 Installation Troubleshooting

## Overview

**Purpose**

This chapter provides basic installation troubleshooting information for the *LambdaUnite*™ MultiService Switch (MSS) system.

**Contents**

# Power Failure

**Overview**

The procedures described below should be performed if the subrack powering procedure was unsuccessful.

Procedure 1 should be used if the measured voltage at the termination blocks of the PDP does not lie between -40.5 and -72 V.

Procedure 2 should be used if the PWR ON LEDs do not light up on the user panels.

Procedure 3 should be used if the PWR ON LEDs do not light up on the fan units.

**Procedure 1**

Follow the steps below if the measured voltage at the termination blocks of the PDP does not lie between -40.5 and -72 V:

**1** Switch off the external battery.

**2** Replace all affected power supply lines between the external battery and the termination blocks of the PDP. Make sure the cables are tight afterwards.

**3** Switch on the external battery.

| IF ... | THEN ... |
|---|---|
| the measured voltage does not lie between -40.5 and -72 V, | check the external battery. |
| the measured voltage lies between -40.5 and -72 V, | END OF STEPS |

END OF STEPS

**Procedure 2** Follow the steps below if the PWR ON LEDs do not light up on the user panels:

**1** Switch all circuit breakers on the subrack backplanes to the ***OFF*** position.

**2** Replace all affected shelf power cables between the PDP and the power connectors of the Power Interface Units (PIUs). Make sure that the cables are tight afterwards.

**3** Switch all circuit breakers on the subrack backplanes to the ***ON*** position.

| IF ... | THEN ... |
|---|---|
| the PWR ON LEDs do not light up on the user panels, | switch all circuit breakers on the subrack backplanes to the ***OFF*** position and replace all affected PIUs. |
| the PWR ON LEDs light up on the user panels, | END OF STEPS |

END OF STEPS

**Procedure 3** Follow the steps below if the PWR ON LEDs do not light up on the fan units:

**1** Switch all circuit breakers on the subrack backplanes to the ***OFF*** position.

**2** Replace all affected fan power cables between the PIUs and the Fan Units. Make sure that the cables are tight afterwards.

**3** Switch all circuit breakers on the subrack backplanes to the ***ON*** position.

| IF ... | THEN ... |
|---|---|
| the PWR ON LEDs do not light up on the Fan Units, | switch all circuit breakers on the subrack backplanes to the ***OFF*** position and replace all affected Fan Units. |
| the PWR ON LEDs light up on the Fan Units, | END OF STEPS |

END OF STEPS

# NE Synchronisation Failure

**Overview**

The procedure described below should be performed if no valid timing reference signal is received at the respective external synchronization input (see Chapter 6, section "NE Synchronisation Test" (6-10)).

**Procedure**

Follow the steps below in the case of an NE synchronization failure:

**1** Check for correct cabling and change as necessary.

| IF ... | THEN ... |
|---|---|
| the NE does not synchronize to the external clock source, | proceed to step 2. |
| the NE synchronizes to the external clock source, | END OF STEPS |

**2** Check for correct input impedance (75 Ω, 100/110 Ω, 120 Ω) and change as necessary.

| IF ... | THEN ... |
|---|---|
| the NE does not synchronize to the external clock source, | proceed to step 3. |
| the NE synchronizes to the external clock source, | END OF STEPS |

**3** Check for an external fault: input/output reversed or exchange supply defect.

| IF ... | THEN ... |
|---|---|
| the NE does not synchronize to the external clock source, | proceed to step 4. |

| IF ... | THEN ... |
|---|---|
| the NE synchronizes to the external clock source, | END OF STEPS |

**4** Replace the currently active Timing Generator Unit.

| IF ... | THEN ... |
|---|---|
| the NE does not synchronize to the external clock source, | proceed to step 5. |
| the NE synchronizes to the external clock source, | END OF STEPS |

**5** Replace the timing interfaces E1/DS1.

END OF STEPS

# SW Download Failure

**Overview** The procedure described below should be performed if the circuit packs have the red LEDs illuminated (instead of the green LEDs) after the reset of the CTL circuit pack. This indicates a software download failure (see Chapter 6, section "NE Software Installation" (5-11)).

**Procedure** Follow the steps below in the case of a software download failure:

**1** Replace the ***CompactFlash*** card.

| IF ... | THEN ... |
|---|---|
| the circuit packs do not have the green LEDs illuminated, | proceed to step 2. |
| the circuit packs have the green LEDs illuminated, | END OF STEPS |

**2** Replace the CTL circuit pack.

END OF STEPS

# LED Test Failure

**Overview**

The procedure described below should be performed if some LEDs do not light up during an LED test (see Chapter 6, section "LED Test" (6-6)).

**Procedure**

Follow the steps below in the case of an LED test failure:

**1** Check that the circuit packs are plugged in correctly and the power supply is on.

| IF ... | THEN ... |
|---|---|
| circuit pack LEDs do not light up, | replace the respective circuit packs. |
| LEDs of the User Panel do not light up, | replace the User Panel. |
| all LEDs light up, | END OF STEPS |

END OF STEPS

### Circuit pack fuse

If the circuit pack fuse is defect the circuit pack has to be returned to a manufacturing facility for repair.

□

# Remote Login Failure

**Overview**

The procedure described below should be performed if no remote login is possible (see Chapter 6, section "Network Test: Remote Login" (6-13)).

**Procedure**

Follow the steps below in the case of a remote login failure:

**1** Check that the DCC channels are configured correctly (see Chapter 5, section "Configuring the Data Communication Network (DCN)" (5-30)).

| IF ... | THEN ... |
|---|---|
| a remote login is not possible, | proceed to step 2. |
| a remote login is possible, | END OF STEPS |

**2** Replace the CTL circuit pack of the near-end NE.

| IF ... | THEN ... |
|---|---|
| a remote login is not possible, | proceed to step 3. |
| a remote login is possible, | END OF STEPS |

**3** Replace the CTL circuit pack of the far-end NE.

| IF ... | THEN ... |
|---|---|
| a remote login is not possible, | proceed to step 4. |
| a remote login is possible, | END OF STEPS |

**4** Replace the OP10 transmitter in the near-end NE.

| IF ... | THEN ... |
|---|---|
| a remote login is not possible, | proceed to step 5. |

| **IF ...** | **THEN ...** |
|---|---|
| a remote login is possible, | END OF STEPS |

5 Replace the OP10 receiver in the far-end NE.

END OF STEPS

# Alarm Handling

**Overview** The procedure described below should be performed if there are active alarms after an alarm test via WaveStar® CIT (see Chapter 6, section “Alarm Reporting Test” (6-8)).

**Procedure** Follow the steps below in the case of active alarms:

**1** Note all active alarms.

**2** Follow the trouble clearing tasks described in the “ *LambdaUnite*™ MultiService Switch (MSS) Alarm Messages and Trouble Clearing Guide”.

END OF STEPS

# Fibre Cleaning

**Overview**

This procedure describes the Lucent recommended method for the cleaning and inspection of optical connectors using specific tools and materials that have been proven to be effective in the assembly and testing of optical transmission equipment. It is critical that the connector endfaces are clean and free from particular contamination to assure proper performance and reliability of lightwave systems. With the modern high-speed, high-power and wider bandwidth optical transmission systems, clean connectors along the optical path are absolutely essential for successful operation.

Before working with optical fibre cables please observe the following safety warnings:

**DANGER**

*Never look into the end of an exposed fibre or plug-in optical connectors as long as the optical source is switched on. This applies particularly to the connections of the optical plug-in units.*

**CAUTION**

*To avoid cable break ensure that the bending radius of optical fibre cables is not less than 30 mm.*

**Cleaning of Optical Connectors**

Optical connectors are only to be cleaned in accordance with the cleaning instructions listed below.

If impurities are assumed, the use of a microscope is recommended in order to check the connector face for impurities (e.g. fluff, dust particles). A microscope with a magnification x 200 is preferred.

**Connectors**

If impurities are discovered, the optical connector must be cleaned in accordance with the following rules:

1. Wipe off the connector face ***lengthwise*** (not with a circular motion!) using a ***smooth*** tissue (***moistened*** with isopropanol).

2 Wipe off the connector face ***lengthwise*** (not with a circular motion!) using a ***dry and smooth*** tissue.

3 Then let the connector face air-dry (the isopropanol must evaporate completely!). As an option, purified compressed air can also be used for drying.

4 If necessary, the connector face can additionally be dabbed on the tape dispenser.

5 Finally check the connector face for cleanliness using the microscope.

If the connector impurities were not removed completely during the first cleaning procedure, repeat steps 1-5 until the result is satisfactory.

END OF STEPS

**Note:**

Do not connect the optical connectors without checking them for impurities under the microscope!

**Coupling**

Impurities caused by dust particles or fluff etc. can also occur on the optical coupling. To clean the coupling follow the instructions below:

1 Soak the coupling cleaner in isopropanol and move it back and forth in the coupling several times.

2 Blow purified compressed air through the coupling and visually check for residual impurities by holding it to the light.

**Important!** Lightguide Build-Outs (LBOs) may be damaged when compressed air is used for drying. Therefore, do not use compressed air for drying LBOs.

END OF STEPS

# Appendix A: Assembly Instructions

## Overview

**Purpose** This appendix describes the general assembly instructions.

**Contents**

# D-Sub Metallic Hoods

## Description

The Amphenol metal hoods series for D-Sub connectors offers protection from magnetic and radio interferencies to cable assemblies.

Easily assembled these hoods are suitable for all industrial and telecom applications.

## Assembly Instructions

**Important!** Be aware to protect the braid by stripping.

1 Strip the cable according the following dimensions.

**Result:**

Cable stripping dimensions:

| Connector type | A | B |
|---|---|---|
| 9 pole | 30mm [1.181”] | 20mm [.787”] |
| 15 pole | | |
| 25 pole | 45mm [1.772”] | 20mm [.787”] |
| 37 pole | | |

2 Prepare the braid as shown in the figure.

3 Solder the wires to the pin contact.

4 Put the ferrules around the braid on the cable.

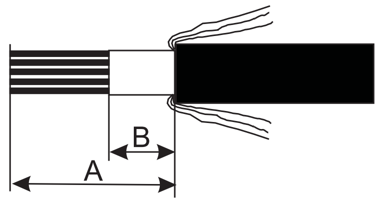
**Important!** Shape the strands of braid into two pigtails and bend these back over the ferrule in a shape of 180 degrees.

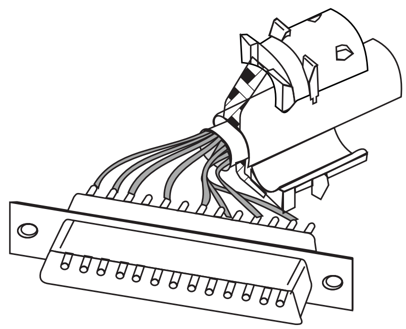
5 Insert the cable with the ferrule in the D-Sub connector.

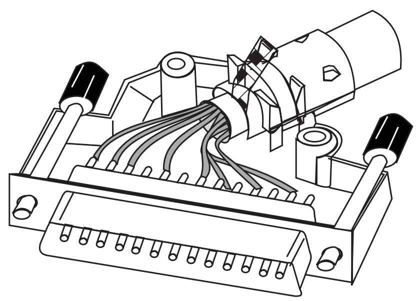
6 Close the connector by tighting the screws.

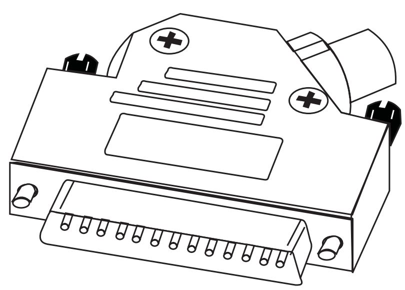
END OF STEPS

## Assembled connector







□

# Modular Plug Connector

**1** Strip the cable jacket 35 mm.

**Important!** Make sure not to cut the cable shield.

**2** Fold the cable shield back over the cable jacket. Bend the drain wire back across center of the cable shield on external conductive side.

Strip the shield for each pair maintaining 5.0 mm shield from the jacket end.

**3** Slide the connector shield onto the cable shield. If the cable diameter is close to 6.0 mm it may be necessary to rotate the connector shield as it passes over the cable shield. Cut and remove the plastic wrap if any.

**Important!** Make sure not to exceed the cable shield length.

**4** Arrange the conductors.

- Untwist conductors and orient them according to the next table (cross conductor 6 over conductors 4 & 5).
- Trim the conductor ends. This makes insertion into the wire holder easy.

Slide the conductors into the wire holder. Use the floor of the wire holder to bring the conductor ends into the same plane.

**Important!** The wire holder should be fully slid down onto the twisted conductors until the conductors resistance impede to continue.

**5** Turn the subassembly (housing + contacts) over to aid trimming.

**6** Trim the conductors using the front edge of the wire holder as a guide.

**7** Turn the subassembly over to aid insertion.

**8** Slide the plug subassembly onto the wire holder.

**9** Make sure that you have completely finished the insertion.

Visual aid : lateral protruberance back edge of the wire holder has to be at the same plane with the back plane of the plug subassembly.

**10** Hold tightly the plug subassembly and slide the connector shield onto the plug subassembly.

**11** Insert the connector into the tooling and crimp it. Trim back the remainder of the cable shield and drain wire.

**Important!** Press the plug against the tooling when crimping to ensure the correct position of the conductors.

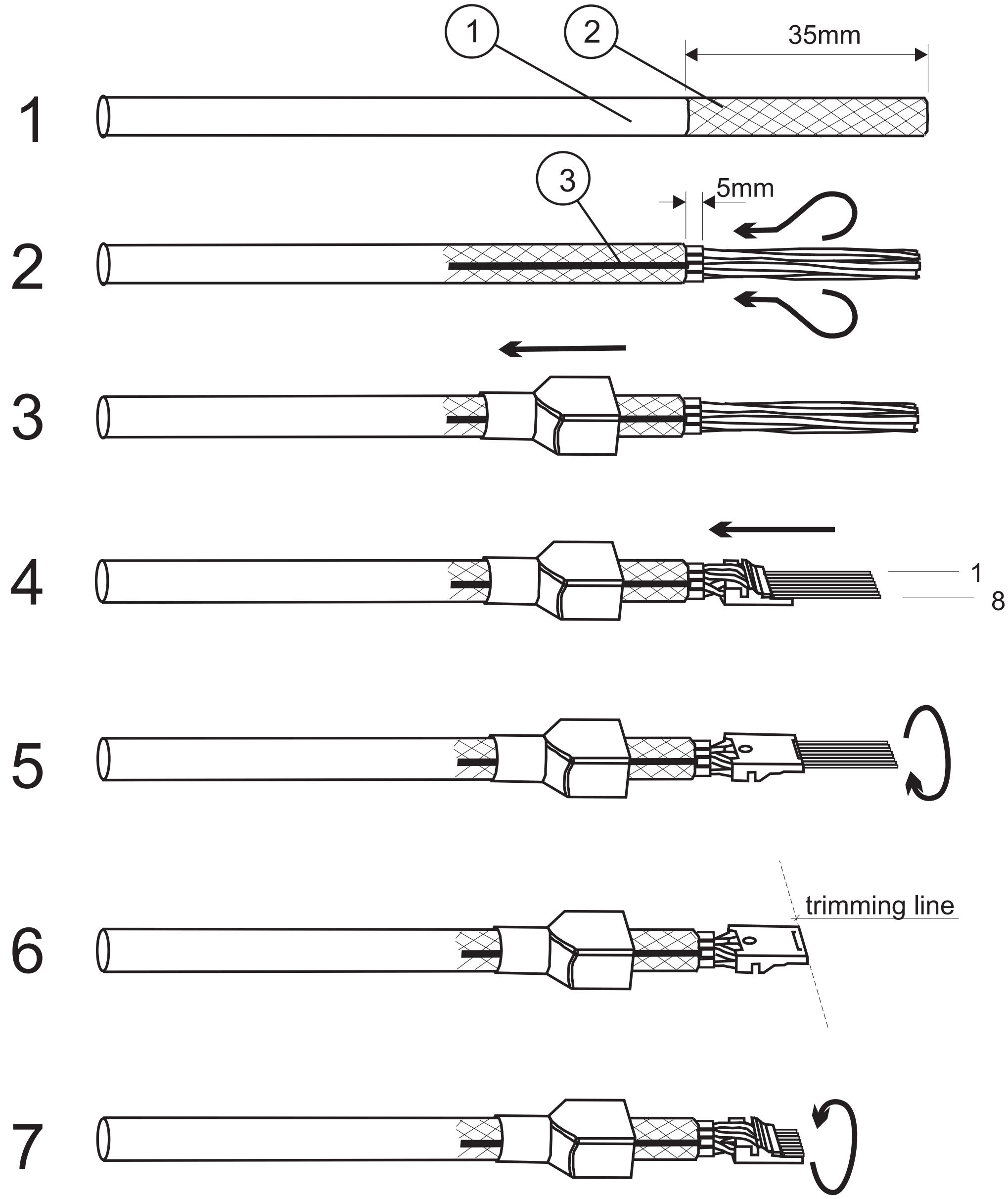
**12** Slide the boot onto the crimped plug.

END OF STEPS

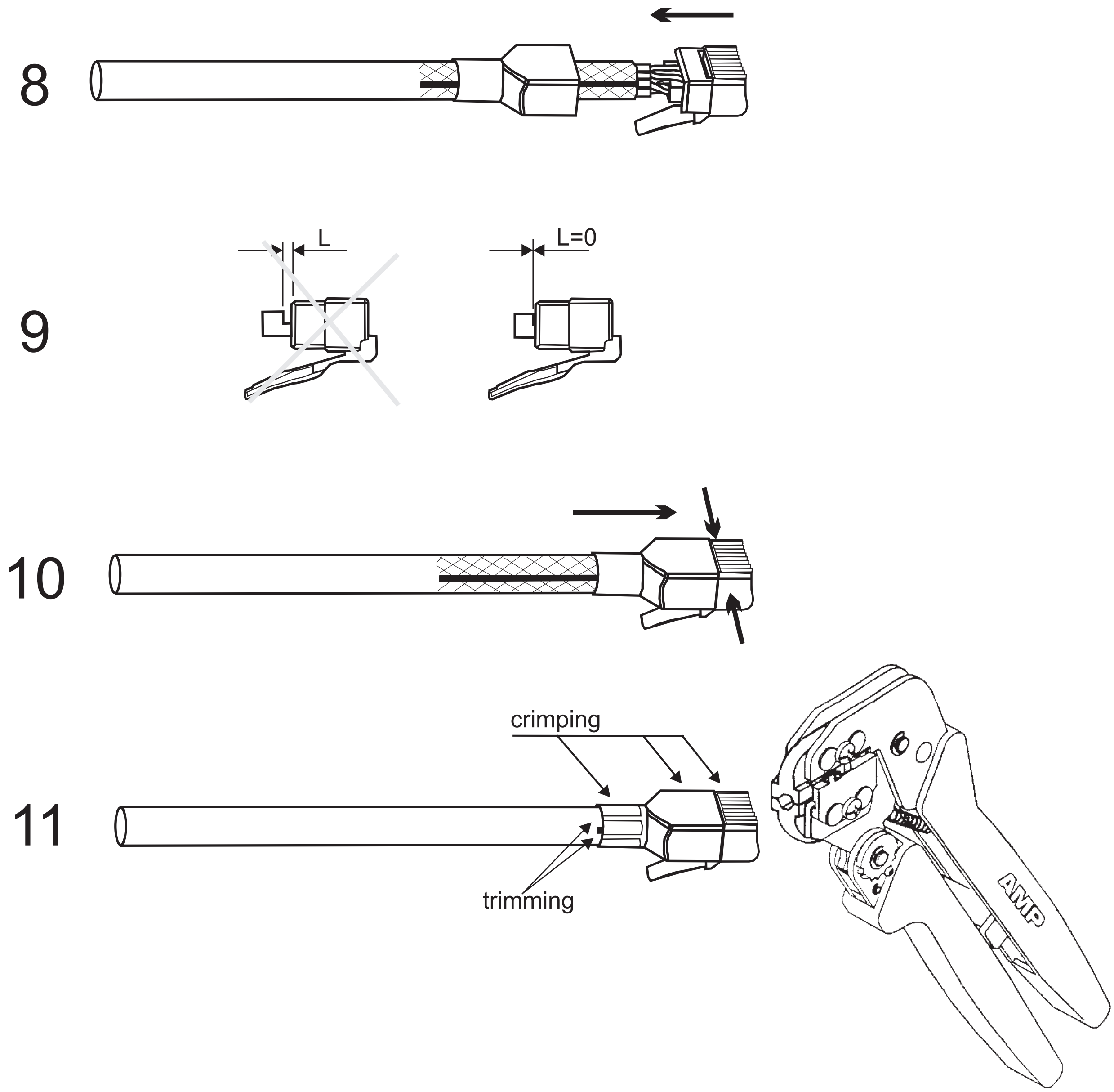
### Conductor Arrangement

| Pair | Wire | Color | Contact |
|---|---|---|---|
| 1 | 1a | white-blue | 1 |
| | 1b | blue | 2 |
| 2 | 2a | white-orange | 3 |
| | 2b | orange | 6 |
| 3 | 3a | white-green | 4 |
| | 3b | green | 5 |
| 4 | 4a | white-brown | 7 |
| | 4b | brown | 8 |

LAN Cable (CAT5) Assembly — Part 1



## LAN Cable (CAT5) Assembly — Part 2




**Legend:**

1 Cable Jacket

2 Cable Shield

3 Drain Wire

### *Material LAN Cable CAT 5*

| QTY | Description | Comcode |
|---|---|---|
| 1 | Modular Plug 8p — 407890193 | (AMP 336330–1) |
| 1 | Belden 1869ENH CAT 5 patch STP FRNC (43067 2651 011) — 408386175 | Lucent |
| | 4 pair CAT 5 STP FRNC — TDD21951 | Capable |
| | 4 pair CAT 5 STP FRNC — 43167 3307 079 | Belden |
| | 4 pair CAT 5 STP FRNC — MS100–4445 | Madison |
| 1 | Crimp Tool (AMP 790163–1) | |

□

# Multicore Low-Current Cables

## US Color Codes

### Multi-Pair

US Color Codes Multipair

| Pair | $1^{ST}$ Conductor Base/Band | $2^{ND}$ Conductor Base/Band |
|---|---|---|
| | | |
| 1 | White/Blue | Blue/White |
| 2 | White/Orange | Orange/White |
| 3 | White/Green | Green/White |
| 4 | White/Brown | Brown/White |
| 5 | White/Grey | Grey/White |
| 6 | Red/Blue | Blue/Red |
| 7 | Red/Orange | Orange/Red |
| 8 | Red/Green | Green/Red |
| 9 | Red/Brown | Brown/Red |
| 10 | Red/Grey | Grey/Red |
| 11 | Black/Blue | Blue/Black |
| 12 | Black/Orange | Orange/Black |
| 13 | Black/Green | Green/Black |
| 14 | Black/Brown | Brown/Black |
| 15 | Black/Grey | Grey/Black |
| 16 | Yellow/Blue | Blue/Yellow |
| 17 | Yellow/Orange | Orange/Yellow |
| 18 | Yellow/Green | Green/Yellow |
| 19 | Yellow/Brown | Brown/Yellow |
| 20 | Yellow/Grey | Grey/Yellow |
| 21 | Violet//Blue | Blue/Violet |
| 22 | Violet/Orange | Orange/Violet |
| 23 | Violet/Green | Green/Violet |
| 24 | Violet/Brown | Brown/Violet |

| Pair | $1^{ST}$ Conductor Base/Band | $2^{ND}$ Conductor Base/Band |
|---|---|---|
| 25 | Violet/Grey | Grey/Violet |

## DIN Color Codes

### Multi-Pair

DIN Color Codes Multipair

| Pair | Color of Conductor a | Color of Conductor b |
|---|---|---|
| 1 | White | Brown |
| 2 | Green | Yellow |
| 3 | Gray | Pink |
| 4 | Blue | Red |
| 5 | Black | Violet |
| 6 | Gray-Pink | Red-Blue |
| 7 | White-Green | Brown-Green |
| 8 | White-Yellow | Yellow-Brown |
| 9 | White-Gray | Gray-Brown |
| 10 | White-Pink | Pink-Brown |
| 11 | White-Blue | Brown-Blue |
| 12 | White-Red | Brown-Red |
| 13 | White-Black | Brown-Black |
| 14 | Gray-Green | Yellow-Gray |
| 15 | Pink-Green | Yellow-Pink |
| 16 | Green-Blue | Yellow-Blue |

### Multi-Conductor

DIN Color Codes Multi-conductor

| Conductor | Insulation Color | Tracer |
|---|---|---|
| 1 | White | |
| 2 | Brown | |
| 3 | Green | |
| 4 | Yellow | |

| Conductor | Insulation Color | Tracer |
|---|---|---|
| 5 | Gray | |
| 6 | Pink | |
| 7 | Blue | |
| 8 | Red | |
| 9 | Black | |
| 10 | Violet | |
| 11 | Gray | Pink |
| 12 | Red | Blue |
| 13 | White | Green |
| 14 | Brown | Green |
| 15 | White | Yellow |
| 16 | Yellow | Brown |
| 17 | White | Gray |
| 18 | Gray | Brown |
| 19 | White | Pink |
| 20 | Pink | Brown |
| 21 | White | Blue |
| 22 | Brown | Blue |
| 23 | White | Red |
| 24 | Brown | Red |
| 25 | White | Black |

# Multicore Fiber Cables

## Breakout cables

| Fiber | Fiber Color |
|---|---|
| 1 | Blue |
| 2 | Orange |
| 3 | Green |
| 4 | Brown |
| 5 | Slate |
| 6 | White |
| 7 | Red |
| 8 | Black |
| 9 | Yellow |
| 10 | Violet |
| 11 | Rose |
| 12 | Aqua |

# Coax 1.6/5.6 Connectors

**Description**

The connectors are

- IMS — type 3320.52.1420.0D5 (45°)
- IMS — type 2360.52.1310.0D5 (Straight)
- Büschel (Isolectra) — type: 005 12550 320008 (45°)

**Büschel (Isolectra)**

**Important!** Make use of the correct tools to ensure a proper connection

**1** Strip the cable according to the dimension indicated in the next figure and tin the centre conductor.

**2** Slide the cable outer ferrule and if applicable the bend prevention tube over the stripped cable.

**3** Push the centre conductor and the dielectric into the connector house till the dielectric stops. Make sure the braid of the cable is around the inner ferrule of connector and butted against the connector house

**4** Solder the center conductor to the center contact.

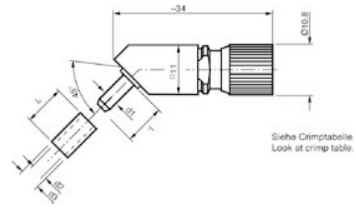
**5** Crimp the outer ferrule, when it is butted against the connector house with Hexagon Die 4.6 (Isolectra) — 24025001000555 by using the Crimptool (Isolectra) — Z586.

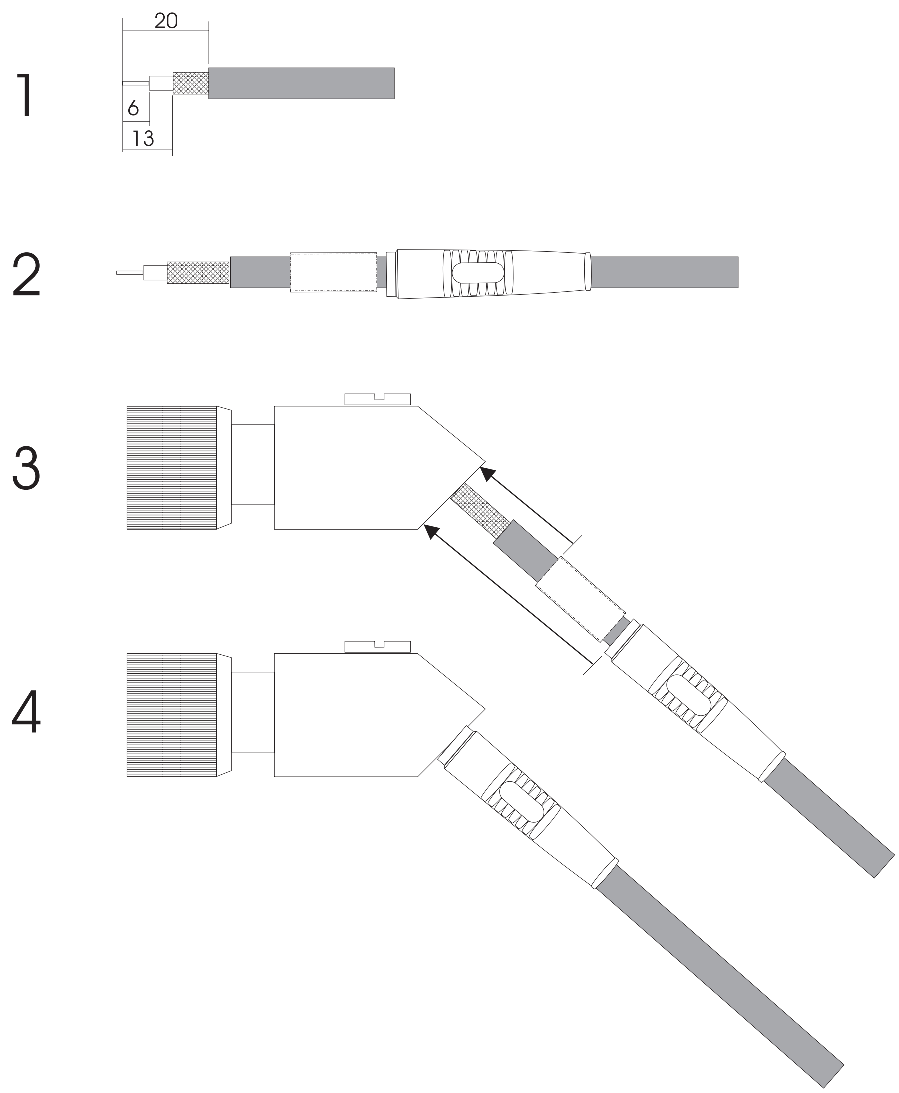
**6** Screw the cover of the connector house into the connector and slide the bend prevention tube over the crimped piece.

END OF STEPS

### Results

### Figure A-1 Büchsel (Isolectra) Assembly procedure




### Crimptool

| | |
|---|---|
| 1 | Crimptool (Isolectra) — Z586 |

| | |
|---|---|
| 2 | Hexagon Die 4.6 (Isolectra) — 24025001000555 |

**IMS** **Important!** Make use of the correct tools to ensure a proper connection

**1** Strip the cable according to the dimensions indicated in the next figure and tin the centre conductor.

**Important!** The stripping lengths are connector type dependent!

**2** Pull the crimp outer ferrule over the stripped cable.

**3** Pull back the braid of the cable

**4** Push the centre conductor and the dielectric into the connector house till the dielectric stops.

**5** Solder the inner conductor to the center contact of the connector house

**6** Press the cover into the connector body after soldering.

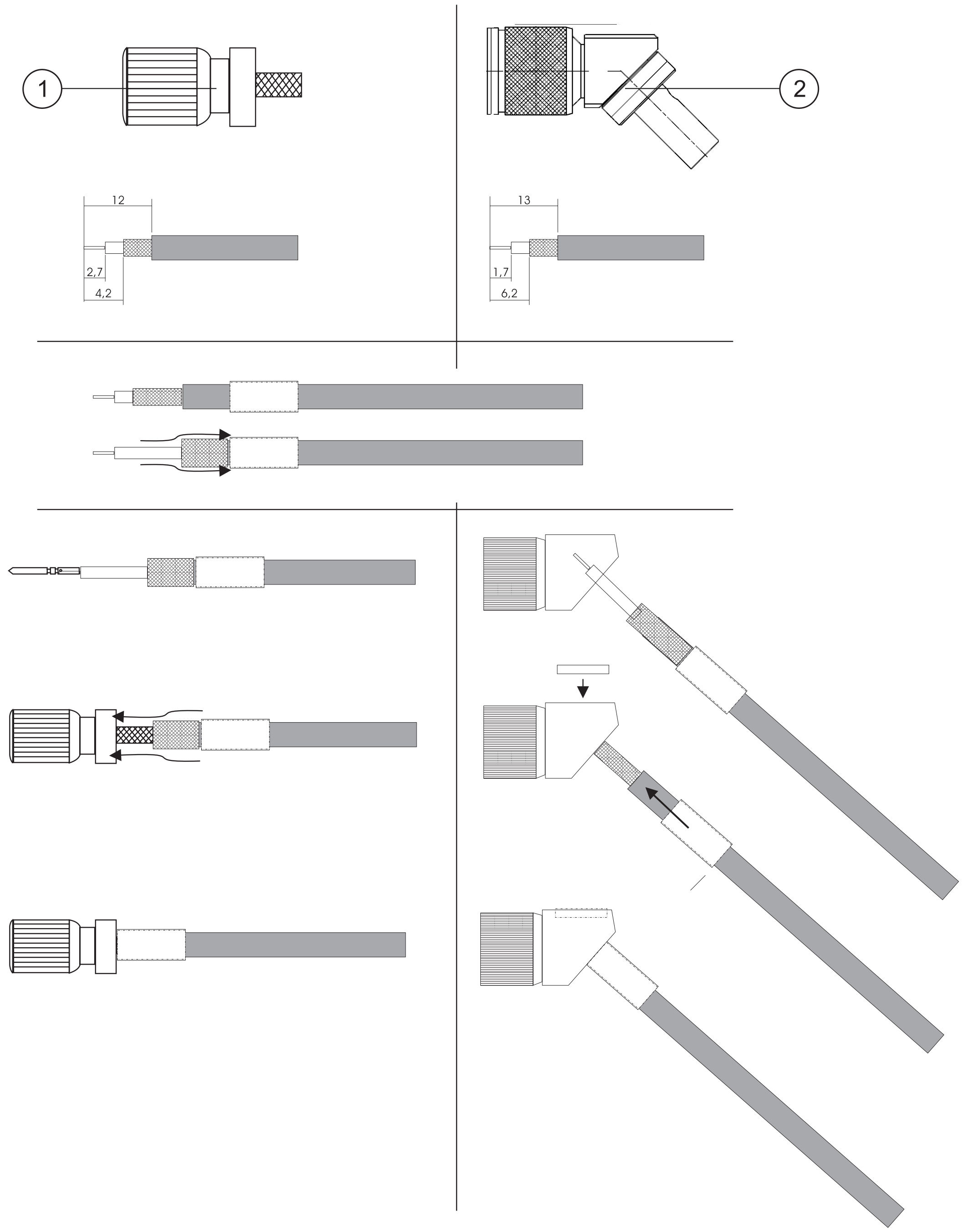
**7** Roll at first the braid of the cable over the termination part (inner ferrule) of the connector and pull the crimp outer ferrule over that braid.

**8** Crimp the outer ferrule with Hexagon Die 4,6 — AGK 3068 by using Crimptool — AGK 2365.

END OF STEPS

### Results

### Figure A-2 IMS Assembly procedure



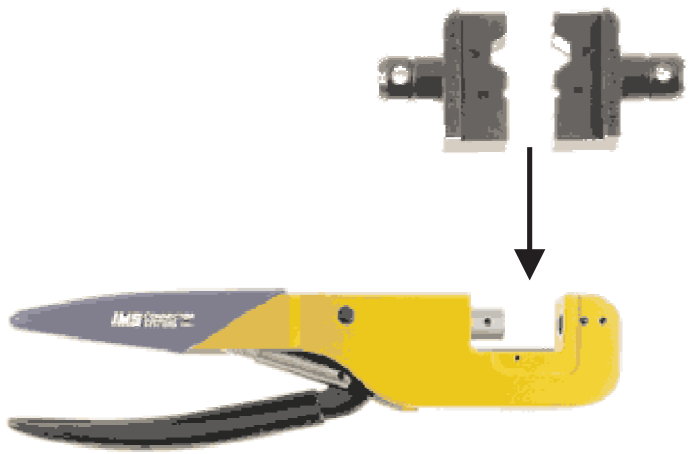

**Legend:**

1 Coax 1,5/5,6 connector (straight) — 408663482

2 Coax 1,5/5,6 connector (45°)

### Crimptool

**Figure A-3 Crimptool and Die**



**Legend:**

1 Crimptool — AGK 2365

2 Hexagon Die 4,6 — AGK 3068 or square 1,2

□

Lucent Technologies
Bell Labs Innovations

# Appendix B: Ordering Codes and Specifications

## Overview

**Purpose** This appendix describes the ordering codes and specifications of this product.

**Contents**

# Single Mode 9/125 Fiber-Optic Cables

## Break-Out Cables

### LC 45° (12x) to *x* 180° (12x)

**Important!** *x* = connector types (LC, SC, FC, ST, DIN, E-2000)

Cable Data

| Type | SM-Simplex cable 9/125 | |
|---|---|---|
| Connectors | LC (45°) to LC, SC, FC, ST, DIN (180°) | Blue |

SM LC to LC (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 3 | 109165779 | | | | | | |
| 5 | 109158451 | 30 | 109158519 | 55 | 109158568 | 80 | 109158618 |
| 10 | 109158477 | 35 | 109158527 | 60 | 109158576 | 85 | 109158626 |
| 15 | 109158485 | 40 | 109158535 | 65 | 109158584 | 90 | 109158634 |
| 20 | 109158493 | 45 | 109158543 | 70 | 109158592 | 95 | 109158642 |
| 25 | 109158501 | 50 | 109158550 | 75 | 109158600 | 100 | 109158659 |

SM LC to SC (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109158667 | 30 | 109158717 | 55 | 109158766 | 80 | 109158816 |
| 10 | 109158675 | 35 | 109158725 | 60 | 109158774 | 85 | 109158824 |
| 15 | 109158683 | 40 | 109158733 | 65 | 109158782 | 90 | 109158832 |
| 20 | 109158691 | 45 | 109158741 | 70 | 109158790 | 95 | 109158840 |
| 25 | 109158709 | 50 | 109158758 | 75 | 109158808 | 100 | 109158857 |

SM LC to FC (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109158865 | 30 | 109158915 | 55 | 109158964 | 80 | 109159012 |
| 10 | 109158873 | 35 | 109158923 | 60 | 109158972 | 85 | 109159020 |
| 15 | 109158881 | 40 | 109158931 | 65 | 109158980 | 90 | 109159038 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | 109158899 | 45 | 109158949 | 70 | 109158998 | 95 | 109159046 |
| 25 | 109158907 | 50 | 109158956 | 75 | 109159004 | 100 | 109159053 |

SM LC to ST (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109159061 | 30 | 109159111 | 55 | 109159160 | 80 | 109159210 |
| 10 | 109159079 | 35 | 109159129 | 60 | 109159178 | 85 | 109159228 |
| 15 | 109159087 | 40 | 109159137 | 65 | 109159186 | 90 | 109159236 |
| 20 | 109159095 | 45 | 109159145 | 70 | 109159194 | 95 | 109159244 |
| 25 | 109159103 | 50 | 109159152 | 75 | 109159202 | 100 | 109159251 |

SM LC to DIN (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109159269 | 30 | 109159319 | 55 | 109159368 | 80 | 109159418 |
| 10 | 109159277 | 35 | 109159327 | 60 | 109159376 | 85 | 109159426 |
| 15 | 109159285 | 40 | 109159335 | 65 | 109159384 | 90 | 109159434 |
| 20 | 109159293 | 45 | 109159343 | 70 | 109159392 | 95 | 109159442 |
| 25 | 109159301 | 50 | 109159350 | 75 | 109159400 | 100 | 109159459 |

**SC with short boot 180° (12x) to *x* 45° (12x)**

**Important!** *x* = connector types (LC, SC, FC, ST, DIN, E-2000)

Cable Data

| | | |
|---|---|---|
| Type | SM-Simplex cable 9/125 | |
| Connectors | SC(180°) to LC, SC, FC, ST, DIN (45°) | |

SM SC to LC (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109188318 | 30 | 109188367 | 55 | 109188417 | 80 | 109188466 |
| 10 | 109188326 | 35 | 109188375 | 60 | 109188425 | 85 | 109188474 |
| 15 | 109188334 | 40 | 109188383 | 65 | 109188433 | 90 | 109188482 |
| 20 | 109188342 | 45 | 109188391 | 70 | 109188441 | 95 | 109188490 |
| 25 | 109188359 | 50 | 109188409 | 75 | 109188458 | 100 | 109188508 |

## Simplex Cables

### LC 45° (1x) to *x* 180° (1x)

**Important!** *x* = connector types (LC, SC, FC, ST, DIN, E-2000)

Cable Data

| Type | SM-minicord Break-Out Cable, 12 Fibers | Remarks |
|---|---|---|
| Connector | LC (45°) to LC, SC, FC, ST, DIN (180°) | Blue |

SM LC to LC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 3 | 109165761 | | | | | | |
| 5 | 109159467 | 30 | 109159517 | 55 | 109159566 | 80 | 109159624 |
| 10 | 109159475 | 35 | 109159525 | 60 | 109159574 | 85 | 109159632 |
| 15 | 109159483 | 40 | 109159533 | 65 | 109159590 | 90 | 109159640 |
| 20 | 109159491 | 45 | 109159541 | 70 | 109159608 | 95 | 109159657 |
| 25 | 109159509 | 50 | 109159558 | 75 | 109159616 | 100 | 109159665 |

SM LC to SC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109159673 | 30 | 109159723 | 55 | 109159772 | 80 | 109159822 |
| 10 | 109159681 | 35 | 109159731 | 60 | 109159780 | 85 | 109159830 |
| 15 | 109159699 | 40 | 109159749 | 65 | 109159798 | 90 | 109159848 |
| 20 | 109159707 | 45 | 109159756 | 70 | 109159806 | 95 | 109159855 |
| 25 | 109159715 | 50 | 109159764 | 75 | 109159814 | 100 | 109159863 |

SM LC to FC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109159871 | 30 | 109159921 | 55 | 109159970 | 80 | 109160028 |
| 10 | 109159889 | 35 | 109159939 | 60 | 109159988 | 85 | 109160036 |
| 15 | 109159897 | 40 | 109159947 | 65 | 109159996 | 90 | 109160044 |
| 20 | 109159905 | 45 | 109159954 | 70 | 109160002 | 95 | 109160051 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 25 | 109159913 | 50 | 109159962 | 75 | 109160010 | 100 | 109160069 |

SM LC to ST (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109160077 | 30 | 109160127 | 55 | 109160176 | 80 | 109160226 |
| 10 | 109160085 | 35 | 109160135 | 60 | 109160184 | 85 | 109160234 |
| 15 | 109160093 | 40 | 109160143 | 65 | 109160192 | 90 | 109160242 |
| 20 | 109160101 | 45 | 109160150 | 70 | 109160200 | 95 | 109160259 |
| 25 | 109160119 | 50 | 109160168 | 75 | 109160218 | 100 | 109160267 |

SM LC to DIN (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109160275 | 30 | 109160325 | 55 | 109160374 | 80 | 109160424 |
| 10 | 109160283 | 35 | 109160333 | 60 | 109160382 | 85 | 109160432 |
| 15 | 109160291 | 40 | 109160341 | 65 | 109160390 | 90 | 109160440 |
| 20 | 109160309 | 45 | 109160358 | 70 | 109160408 | 95 | 109160457 |
| 25 | 109160317 | 50 | 109160366 | 75 | 109160416 | 100 | 109160465 |

**SC with short boot 180° (1x) to *x* 180° (1x)**

**Important!** *x* = connector types (LC, SC, FC, ST, DIN, E-2000)

Cable Data

| | | |
|---|---|---|
| Type | SM-Simplex cable 9/125 | |
| Connectors | SC (45°) to LC, SC, FC, ST, DIN (180°) | |

SM SC to LC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109172338 | 30 | 109172387 | 55 | 109172437 | 80 | 109172486 |
| 10 | 109172346 | 35 | 109172395 | 60 | 109172445 | 85 | 109172494 |
| 15 | 109172353 | 40 | 109172403 | 65 | 109172452 | 90 | 109172502 |
| 20 | 109172361 | 45 | 109172411 | 70 | 109172460 | 95 | 109172510 |
| 25 | 109172379 | 50 | 109172429 | 75 | 109172478 | 100 | 109172528 |

SM SC to SC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109172767 | 30 | 109172817 | 55 | 109172866 | 80 | 109172916 |
| 10 | 109172775 | 35 | 109172825 | 60 | 109172874 | 85 | 109172924 |
| 15 | 109172783 | 40 | 109172833 | 65 | 109172882 | 90 | 109172932 |
| 20 | 109172791 | 45 | 109172841 | 70 | 109172890 | 95 | 109172940 |
| 25 | 109172809 | 50 | 109172858 | 75 | 109172908 | 100 | 109172965 |

SM SC to FC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109172973 | 30 | 109172021 | 55 | 109172070 | 80 | 109172120 |
| 10 | 109172981 | 35 | 109172039 | 60 | 109172088 | 85 | 109172138 |
| 15 | 109172999 | 40 | 109172047 | 65 | 109172096 | 90 | 109172146 |
| 20 | 109172005 | 45 | 109172054 | 70 | 109172104 | 95 | 109172153 |
| 25 | 109172013 | 50 | 109172062 | 75 | 109172112 | 100 | 109172161 |

SM SC to ST (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109173575 | 30 | 109173625 | 55 | 109173674 | 80 | 109173724 |
| 10 | 109173583 | 35 | 109173633 | 60 | 109173682 | 85 | 109173732 |
| 15 | 109173591 | 40 | 109173641 | 65 | 109173690 | 90 | 109173740 |
| 20 | 109173609 | 45 | 109173658 | 70 | 109173708 | 95 | 109173757 |
| 25 | 109173617 | 50 | 109173666 | 75 | 109173716 | 100 | 109173765 |

SM SC to DIN (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109172536 | 30 | 109172585 | 55 | 109172635 | 80 | 109172684 |
| 10 | 109172544 | 35 | 109172593 | 60 | 109172643 | 85 | 109172692 |
| 15 | 109172551 | 40 | 109172601 | 65 | 109172650 | 90 | 109172700 |
| 20 | 109172569 | 45 | 109172619 | 70 | 109172668 | 95 | 109172718 |
| 25 | 109172577 | 50 | 109172627 | 75 | 109172676 | 100 | 109172726 |

**SC with short boot 180° (1x) to *x* 45° (1x)**

**Important!** *x* = connector types (LC, SC, FC, ST, DIN, E-2000)

## Cable Data

| Type | SM-Simplex cable 9/125 | |
|---|---|---|
| Connectors | SC(180°) to LC, SC, FC, ST, DIN (45°) | |

## SM SC to LC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 3 | 109174169 | | | | | | |
| 5 | 109174177 | 30 | 109174227 | 55 | 109174276 | 80 | 109174326 |
| 10 | 109174185 | 35 | 109174235 | 60 | 109174284 | 85 | 109174334 |
| 15 | 109174193 | 40 | 109174243 | 65 | 109174292 | 90 | 109174342 |
| 20 | 109174201 | 45 | 109174250 | 70 | 109174300 | 95 | 109174359 |
| 25 | 109174219 | 50 | 109174268 | 75 | 109174318 | 100 | 109174367 |

# Multi-Mode 62.5/125 Fiber-Optic Cables

## Break-Out Cables

### LC 45° (12x) to *x* 180° (12x)

**Important!** *x* = connector types (LC, SC, FC, ST, DIN, E-2000)

Cable Data

| Type | MM-minicord Break-Out Cable 62.5/125, 12 Fibers | Remarks |
|---|---|---|
| Connectors | LC (45°) to LC, SC, FC, ST, DIN (180°) | |

MM LC to LC (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 3 | 109165746 | | | | | | |
| 5 | 109161422 | 30 | 109161471 | 55 | 109161521 | 80 | 109161570 |
| 10 | 109161430 | 35 | 109161489 | 60 | 109161539 | 85 | 109161588 |
| 15 | 109161448 | 40 | 109161497 | 65 | 109161547 | 90 | 109161596 |
| 20 | 109161455 | 45 | 109161505 | 70 | 109161554 | 95 | 109161604 |
| 25 | 109161463 | 50 | 109161513 | 75 | 109161562 | 100 | 109161612 |

MM LC to SC (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109161620 | 30 | 109161679 | 55 | 109161729 | 80 | 109161786 |
| 10 | 109161638 | 35 | 109161687 | 60 | 109161737 | 85 | 109161794 |
| 15 | 109161646 | 40 | 109161695 | 65 | 109161752 | 90 | 109161802 |
| 20 | 109161653 | 45 | 109161703 | 70 | 109161760 | 95 | 109161810 |
| 25 | 109161661 | 50 | 109161711 | 75 | 109161778 | 100 | 109161828 |

MM LC to FC (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109161836 | 30 | 109161885 | 55 | 109161935 | 80 | 109161984 |
| 10 | 109161844 | 35 | 109161893 | 60 | 109161943 | 85 | 109161992 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 15 | 109161851 | 40 | 109161901 | 65 | 109161950 | 90 | 109162008 |
| 20 | 109161869 | 45 | 109161919 | 70 | 109161968 | 95 | 109162016 |
| 25 | 109161877 | 50 | 109161927 | 75 | 109161976 | 100 | 109162024 |

MM LC to ST (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109162032 | 30 | 109162081 | 55 | 109162131 | 80 | 109162180 |
| 10 | 109162040 | 35 | 109162099 | 60 | 109162149 | 85 | 109162198 |
| 15 | 109162057 | 40 | 109162107 | 65 | 109162156 | 90 | 109162206 |
| 20 | 109162065 | 45 | 109162115 | 70 | 109162164 | 95 | 109162214 |
| 25 | 109162073 | 50 | 109162123 | 75 | 109162172 | 100 | 109162222 |

MM LC to DIN (12 to 12)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109162230 | 30 | 109162289 | 55 | 109162339 | 80 | 109162388 |
| 10 | 109162248 | 35 | 109162297 | 60 | 109162347 | 85 | 109162396 |
| 15 | 109162255 | 40 | 109162305 | 65 | 109162354 | 90 | 109162404 |
| 20 | 109162263 | 45 | 109162313 | 70 | 109162362 | 95 | 109162412 |
| 25 | 109162271 | 50 | 109162321 | 75 | 109162370 | 100 | 109162420 |

## Simplex cables

### LC 45° (1x) to *x* 180° (1x)

**Important!** *x* = connector types (LC, SC, FC, ST, DIN, E-2000)

Cable Data

| | | |
|---|---|---|
| Type | MM-Simplex cable 62.5/125 | |
| Connectors | LC (45°) to LC, SC, FC, ST, DIN (180°) | Beige |

MM LC to LC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 3 | 109165753 | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | 109162438 | 30 | 109162487 | 55 | 109162537 | 80 | 109162586 |
| 10 | 109162446 | 35 | 109162495 | 60 | 109162545 | 85 | 109162594 |
| 15 | 109162453 | 40 | 109162503 | 65 | 109162552 | 90 | 109162602 |
| 20 | 109162461 | 45 | 109162511 | 70 | 109162560 | 95 | 109162610 |
| 25 | 109162479 | 50 | 109162529 | 75 | 109162578 | 100 | 109161628 |

MM LC to SC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109162636 | 30 | 109162693 | 55 | 109162750 | 80 | 109162800 |
| 10 | 109162651 | 35 | 109162701 | 60 | 109162768 | 85 | 109162818 |
| 15 | 109162669 | 40 | 109162719 | 65 | 109162776 | 90 | 109162826 |
| 20 | 109162677 | 45 | 109162727 | 70 | 109162784 | 95 | 109162842 |
| 25 | 109162685 | 50 | 109162743 | 75 | 109162792 | 100 | 109162859 |

MM LC to FC (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109162883 | 30 | 109162933 | 55 | 109162982 | 80 | 109163030 |
| 10 | 109162891 | 35 | 109162941 | 60 | 109162990 | 85 | 109163048 |
| 15 | 109162909 | 40 | 109162958 | 65 | 109163006 | 90 | 109163055 |
| 20 | 109162917 | 45 | 109162966 | 70 | 109163014 | 95 | 109163063 |
| 25 | 109162925 | 50 | 109162974 | 75 | 109163022 | 100 | 109163089 |

MM LC to ST (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109163097 | 30 | 109163147 | 55 | 109163196 | 80 | 109163253 |
| 10 | 109163105 | 35 | 109163154 | 60 | 109163204 | 85 | 109163261 |
| 15 | 109163113 | 40 | 109163162 | 65 | 109163212 | 90 | 109163279 |
| 20 | 109163121 | 45 | 109163170 | 70 | 109163238 | 95 | 109163287 |
| 25 | 109163139 | 50 | 109163188 | 75 | 109163246 | 100 | 109163295 |

MM LC to DIN (1 to 1)

| Length | Comcode | Length | Comcode | Length | Comcode | Length | Comcode |
|---|---|---|---|---|---|---|---|
| 5 | 109163303 | 30 | 109163352 | 55 | 109163402 | 80 | 109163451 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | 109163311 | 35 | 109163360 | 60 | 109163410 | 85 | 109163469 |
| 15 | 109163329 | 40 | 109163378 | 65 | 109163428 | 90 | 109163477 |
| 20 | 109163337 | 45 | 109163386 | 70 | 109163436 | 95 | 109163485 |
| 25 | 109163345 | 50 | 109163394 | 75 | 109163444 | 100 | 109163493 |

# LC Attenuators

**Fiber Type** SM

**Attenuator Type** LC Modular Adapter used with A1LC-BASE — 108265950

**Tolerance at 1550 nm** AALCS-00.5 – AALCS-10.0 — ±0.25 dB AALCS-11.0 – AALCS-20.0 — ±0.50 dB

**List of Attenuators** List

| Product Code | Nominal Loss dB | COMCODE |
|---|---|---|
| AALCS-00.5 | 0.5 | 108355363 |
| AALCS-01.0 | 1 | 108355371 |
| AALCS-01.5 | 1.5 | 108355389 |
| AALCS-02.0 | 2 | 108349457 |
| AALCS-02.5 | 2.5 | 108349440 |
| AALCS-03.0 | 3 | 108288481 |
| AALCS-03.5 | 3.5 | 108288440 |
| AALCS-04.0 | 4 | 108357963 |
| AALCS-04.5 | 4.5 | 108357971 |
| AALCS-05.0 | 5 | 108288473 |
| AALCS-05.5 | 5.5 | 108357989 |
| AALCS-06.0 | 6 | 108349432 |
| AALCS-06.5 | 6.5 | 108357997 |
| AALCS-07.0 | 7 | 108288465 |
| AALCS-07.5 | 7.5 | 108358003 |
| AALCS-08.0 | 8 | 108358011 |
| AALCS-08.5 | 8.5 | 108358029 |
| AALCS-09.0 | 9 | 108358037 |
| AALCS-09.5 | 9.5 | 108358045 |
| AALCS-10.0 | 10 | 108288457 |
| AALCS-11.0 | 11 | 108358078 |

| Product Code | Nominal Loss dB | COMCODE |
|---|---|---|
| AALCS-12.0 | 12 | 108358094 |
| AALCS-13.0 | 13 | 108358128 |
| AALCS-14.0 | 14 | 108358144 |
| AALCS-15.0 | 15 | 108358169 |
| AALCS-18.0 | 18 | 108358193 |
| AALCS-19.0 | 19 | 108358201 |
| AALCS-20.0 | 20 | 108358219 |

# Specifications for *LambdaUnite*™ MSS Optical-Circuit Packs

**OP2G5** ***The OP2G5 Optical Circuit Packs are:***

| Optical-Circuit Packs | Wavelength (nanometers) | Core Diameter of Fiber Type (microns) | Output Power (milliwatts) | Laser Class (FDA/IEC) |
|---|---|---|---|---|
| OP2G5 / 1.3SR4 (KFA 12), 2km | 1310 | SM (9.0/125) | 0.5 (max) | 1/1 |
| OP2G5/1.3LR4 (KFA203), 40km | 1300 | SM (9.0/125) | 1 | 3A |
| OP2G5/1.5LR4 (KFA204), 80km | 1500 | SM (9.0/125) | 1 | 3A |

**OP10** ***The OP10 Optical Circuit Packs are:***

| Optical-Circuit Packs | Wavelength (nanometers) | Core Diameter of Fiber Type (microns) | Output Power (milliwatts) | Laser Class (FDA/IEC) |
|---|---|---|---|---|
| OP10 / 1.5LR1 (KFA 6), 80 km | 1550 | SM (9.0/125) | 2 | I/1 |
| OP10 / 1.3IOR1 (KFA 7), 600 m | 1310 | SM (9.0/125) | 0.794 | I/1 |
| OP10 / 1.5IR1 (KFA14) | 1550 | SM (9.0/125) | 1.585 | I/1 |

***The OP10 – 800G Optical Circuit Packs (80x)s are:***

| Optical-Circuit Packs | Wavelength (nanometers) | Core Diameter of Fiber Type (microns) | Output Power (milliwatts) | Laser Class (FDA/IEC) |
|---|---|---|---|---|
| OP10 / 01 / 800G (KFA9) | 1530.72 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 02 / 800G (KFA81) | 1531.12 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 03 / 800G (KFA82) | 1531.51 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 04 / 800G (KFA83) | 1531.90 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 05 / 800G (KFA84) | 1532.29 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 06 / 800G (KFA85) | 1532.68 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 07 / 800G (KFA86) | 1533.07 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 08 / 800G (KFA87) | 1533.47 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 09 / 800G (KFA88) | 1533.86 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 10 / 800G (KFA89) | 1534.25 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 11 / 800G (KFA90) | 1534.64 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 12 / 800G (KFA91) | 1535.04 | SM (9.0/125) | 1.585 | I/1 |

| Optical-Circuit Packs | Wavelength (nanometers) | Core Diameter of Fiber Type (microns) | Output Power (milliwatts) | Laser Class (FDA/IEC) |
|---|---|---|---|---|
| OP10 / 13 / 800G (KFA92) | 1535.43 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 14 / 800G (KFA93) | 1535.82 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 15 / 800G (KFA94) | 1536.22 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 16 / 800G (KFA95) | 1536.61 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 17 / 800G (KFA96) | 1537.00 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 18 / 800G (KFA97) | 1537.40 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 19 / 800G (KFA98) | 1537.79 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 20 / 800G (KFA99) | 1538.19 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 21 / 800G (KFA100) | 1538.58 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 22 / 800G (KFA 101) | 1539.98 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 23 / 800G (KFA 102) | 1539.37 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 24 / 800G (KFA 103) | 1539.77 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 25 / 800G (KFA 104) | 1540.16 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 26 / 800G (KFA 105) | 1540.56 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 27 / 800G (KFA 106) | 1540.95 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 28 / 800G (KFA 107) | 1541.35 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 29 / 800G (KFA 108) | 1541.75 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 30 / 800G (KFA 109) | 1542.14 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 31 / 800G (KFA 110) | 1542.54 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 32 / 800G (KFA 111) | 1542.94 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 33 / 800G (KFA 112) | 1543.33 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 34 / 800G (KFA 113) | 1543.73 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 35 / 800G (KFA 114) | 1544.13 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 36 / 800G (KFA 115) | 1544.53 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 37 / 800G (KFA 116) | 1544.92 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 38 / 800G (KFA 117) | 1545.32 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 39 / 800G (KFA 118) | 1545.72 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 40 / 800G (KFA 119) | 1546.12 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 41 / 800G (KFA 120) | 1546.52 | SM (9.0/125) | 1.585 | I/1 |

| Optical-Circuit Packs | Wavelength (nanometers) | Core Diameter of Fiber Type (microns) | Output Power (milliwatts) | Laser Class (FDA/IEC) |
|---|---|---|---|---|
| OP10 / 42 / 800G (KFA121) | 1546.92 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 43 / 800G (KFA122) | 1547.32 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 44 / 800G (KFA123) | 1547.72 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 45 / 800G (KFA124) | 1548.11 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 46 / 800G (KFA125) | 1548.50 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 47 / 800G (KFA126) | 1548.91 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 48 / 800G (KFA127) | 1549.32 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 49 / 800G (KFA128) | 1549.72 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 50 / 800G (KFA129) | 1550.12 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 51 / 800G (KFA130) | 1550.52 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 52 / 800G (KFA131) | 1550.92 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 53 / 800G (KFA132) | 1551.32 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 54 / 800G (KFA133) | 1551.72 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 55 / 800G (KFA134) | 1552.12 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 56 / 800G (KFA135) | 1552.52 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 57 / 800G (KFA136) | 1552.93 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 58 / 800G (KFA137) | 1553.33 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 59 / 800G (KFA138) | 1553.73 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 60 / 800G (KFA139) | 1554.13 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 61 / 800G (KFA140) | 1554.54 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 62 / 800G (KFA 141) | 1554.94 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 63 / 800G (KFA 142) | 1555.34 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 64 / 800G (KFA 143) | 1555.75 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 65 / 800G (KFA 144) | 1556.15 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 66 / 800G (KFA 145) | 1556.56 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 67 / 800G (KFA 146) | 1556.96 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 68 / 800G (KFA 147) | 1557.36 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 69 / 800G (KFA 148) | 1557.77 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 70 / 800G (KFA 149) | 1558.17 | SM (9.0/125) | 1.585 | I/1 |

| Optical-Circuit Packs | Wavelength (nanometers) | Core Diameter of Fiber Type (microns) | Output Power (milliwatts) | Laser Class (FDA/IEC) |
|---|---|---|---|---|
| OP10 / 71 / 800G (KFA 150) | 1558.58 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 72 / 800G (KFA 151) | 1558.98 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 73 / 800G (KFA 152) | 1559.39 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 74 / 800G (KFA 153) | 1559.79 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 75 / 800G (KFA 154) | 1560.20 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 76 / 800G (KFA 155) | 1560.61 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 77 / 800G (KFA 156) | 1561.01 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 78 / 800G (KFA 157) | 1561.42 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 79 / 800G (KFA 158) | 1561.83 | SM (9.0/125) | 1.585 | I/1 |
| OP10 / 80 / 800G (KFA 159) | 1562.23 | SM (9.0/125) | 1.585 | I/1 |

**GE 1** *The GE1 Optical Circuit Packs are:*

| Optical Circuit Packs | Wavelength (nanometers) | Core Diameter of Fiber Type(microns) | Output Power (milliwatts) | Laser Class (FDA/IEC) |
|---|---|---|---|---|
| GE1 (KFA 13) | 850 | MM (62.5/125) | 0.4 | I/1 |

□

# Glossary

**μ**
Microns

## NUMERICS

**0x1 Line Operation**
0x1 means unprotected operation. The connection between network elements has one bidirectional line (no protection line).

**1+1 Line Protection**
A protection architecture in which the transmitting equipment transmits a valid signal on both the working and protection lines. The receiving equipment monitors both lines. Based on performance criteria and OS control, the receiving equipment chooses one line as the active line and designates the other as the standby line.

**1xN Equipment Protection**
1xN protection pertains to N number of circuit pack/port units protected by one circuit pack or port unit. When a protection switch occurs, the working signals are routed from the failed pack to the protection pack. When the fault clears, the signals revert to the working port unit.

**12NC (12-digit Numerical Code)**
Used to uniquely identify an item or product. The first ten digits uniquely identify an item. The eleventh digit is used to specify the particular variant of an item. The twelfth digit is used for the revision issue. Items with the first eleven digits the same, are functionally equal and may be exchanged.

## A

**ABN**
Abnormal (condition)

**ABS (Absent)**
Used to indicate that a given circuit pack is not installed.

**AC**
Alternating Current

**ACO (Alarm Cut-Off)**
A button on the user panel used to silence audible alarms.

**ACT (Active)**
Used to indicate that a circuit pack or module is in-service and currently providing service functions.

**Adaptive-rate tributary operation of a port (Pipe mode)**
Mode of operation of a port in which tributaries are ***not*** explicitly provisioned for the expected signal rates. The signal rates are automatically identified.

**ADM (Add/Drop Multiplexer)**
The term for a synchronous network element capable of combining signals of different rates and having those signals added to or dropped from the stream.

**AEL**
Accessible Emission Limits

**Agent**
Performs operations on managed objects and issues events on behalf of these managed objects. All SDH managed objects will support at least an agent. Control of distant agents is possible via local “Managers”.

**AGNE**
Alarm Gateway Network Element

**AID (Access Identifier)**
A technical specification for explicitly naming entities (both physical and logical) of an NE using a grammar comprised of ASCII text, keywords, and grammar rules.

**AIS (Alarm Indication Signal)**
A code transmitted downstream in a digital network that indicates that an upstream failure has been detected and alarmed if the upstream alarm has not been suppressed.

**AITS**
Acknowledged Information Transfer Service: Confirmed mode of operation of the LAPD protocol.

**Alarm**
Visible or audible signal indicating that an equipment failure or significant event/condition has occurred.

**Alarm Correlation**
The search for a directly-reported alarm that can account for a given symptomatic condition.

**Alarm Severity**
An attribute defining the priority of the alarm message. The way alarms are processed depends on the severity.

**Alarm Suppression**
Selective removal of alarm messages from being forwarded to the GUI or to network management layer OSs.

**Alarm Throttling**
A feature that automatically or manually suppresses autonomous messages that are not priority alarms.

**Aligning**
Indicating the head of a virtual container by means of a pointer, for example, creating an Administrative Unit (AU) or a Tributary Unit (TU).

**AMI (Alternate Mark Inversion)**
A line code that employs a ternary signal to convert binary digits, in which successive binary ones are represented by signal elements that are normally of alternative positive and negative polarity but equal in amplitude and in which binary zeros are represented by signal elements that have zero amplitude.

**Anomaly**
A difference between the actual and desired operation of a function.

**ANSI**
American National Standard Institute

**APD**
Avalanche Photo Diode

**APS (Automatic Protection Switch)**
A protection switch that occurs automatically in response to an automatically detected fault condition.

**ASCII (American Standard Code for Information Interchange)**
A standard 7-bit code that represents letters, numbers, punctuation marks, and special characters in the interchange of data among computing and communications equipment.

**ASN.1**
Abstract Syntax Notation 1

**Assembly**
Gathering together of payload data with overhead and pointer information (an indication of the direction of the signal).

**Association**
A logical connection between manager and agent through which management information can be exchanged.

**Assy**
Assembly

**Asynchronous**
The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

**ATM (Asynchronous Transfer Mode)**
A high-speed transmission technology characterized by high bandwidth and low delay. It utilizes a packet switching and multiplexing technique which allocates bandwidth on demand.

**Attribute**
Alarm indication level: critical, major, minor, or no alarm.

**AU (Administrative Unit)**
Carrier for TUs.

**AU PTR (Administrative Unit Pointer)**
Indicates the phase alignment of the VC-N with respect to the STM-N frame. The pointer position is fixed with respect to the STM-N frame.

**AUG**
Administrative Unit Group

**AUTO (Automatic)**
One possible state of a port or slot. When a port is in the AUTO state and a good signal is detected, the port automatically enters the IS (in-service) state. When a slot is in the AUTO state and a circuit pack is detected, the slot automatically enters the EQ (equipped) state.

**Autolock**
Action taken by the system in the event of circuit pack failure/trouble. System switches to protection and prevents a return to the working circuit pack even if the trouble clears. Multiple protection switches on a circuit pack during a short period of time cause the system to autolock the pack.

**AVAIL**
Available

**AWG**
American Wire Gauge

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**B** **Bandwidth**
The difference in Hz between the highest and lowest frequencies in a transmission channel. The data rate that can be carried by a given communications circuit.

**Baud Rate**
Transmission rate of data (bits per second) on a network link.

**BDFB**
Battery Distribution and Fuse Bay

**BER (Bit Error Rate)**
The ratio of error bits received to the total number of bits transmitted.

**Bidirectional Line**
A transmission path consisting of two fibers that handle traffic in both the transmit and receive directions.

**Bidirectional Ring**
A ring in which both directions of traffic between any two nodes travel through the same network elements (although in opposite directions).

**Bidirectional Switch**
Protection switching performed in both the transmit and receive directions.

**BIP-N (Bit Interleaved Parity-N)**
A method of error monitoring over a specified number of bits (BIP-3 or BIP-8).

**Bit**
The smallest unit of information in a computer, with a value of either 0 or 1.

**Bit Error Rate Threshold**
The point at which an alarm is issued for bit errors.

**BLD OUT LG**
Build-Out Lightguide

**Bridge Cross-Connection**
The setting up of a cross-connection leg with the same input tributary as that of an existing cross-connection leg. Thus, forming a 1:2 bridge from an input tributary to two output tributaries.

**Broadband Communications**
Voice, data, and/or video communications at greater than 2 Mbit/s rates.

**Broadband Service Transport**
STM-1 concatenation transport over the *LambdaUnite*™ MSS for ATM applications.

**Byte**
Refers to a group of eight consecutive binary digits.

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## C

**C**
Container

**CAT5**
Category 5 cable

**CC**
Cross Connect

**CE**
The CE marking indicates that the products conform to relevant European Community (EC) Directives

**Cell Relay**
Fixed-length cells. For example, ATM with 53 octets.

**CEPT**
Conférence Européenne des Administrations des Postes et des Télécommunications

**Channel**
A sub-unit of transmission capacity within a defined higher level of transmission capacity.

**CI-CTL**
Customer Interface of the Controller

**Circuit**
A set of transmission channels through one or more network elements that provides transmission of signals between two points, to support a single communications path.

**CIT or *LambdaUnite* CIT (Craft Interface Terminal)**
The user interface terminal used by craft personnel to communicate with a network element.

**CL**
Clear

**CLEI**
Common Language Equipment Identifier

**Client**
Computer in a computer network that generally offers a user interface to a server.

**CLLI**
Common Language Location Identifier

**Closed Ring Network**
A network formed of a ring-shaped configuration of network elements. Each network element connects to two others, one on each side.

**CM (Configuration Management)**
Subsystem that configures the network and processes messages from the network.

**CMI**
Coded Mark Inversion

**CMIP**
Common Management Information Protocol. OSI standard protocol for OAM&P information exchange.

**CMISE**
Common Management Information Service Element

**CO (Central Office)**
A building where common carriers terminate customer circuits.

**Co-Resident**
A hardware configuration where two applications can be active at the same time independently on the same hardware and software platform without interfering with each others functioning.

**Collocated**
System elements that are located in the same location.

**Command Group**
An administrator-defined group that defines commands to which a user has access.

**Concatenation**
A procedure whereby multiple virtual containers are associated one with each other resulting in a combined capacity that can be used as a single container across which bit sequence integrity is maintained.

**Correlation**
A process where related hard failure alarms are identified.

**CP**
Circuit Pack

**CPE**
Customer Premises Equipment

**CPU**
Central Processing Unit

**CR (Critical (alarm))**
Alarm that indicates a severe, service-affecting condition.

**CRC**
Cyclical Redundancy Check

**Cross-Connect Map**
Connection map for an SDH Network Element; contains information about how signals are connected between high speed time slots and low speed tributaries.

**Crosstalk**
An unwanted signal introduced into one transmission line from another.

**CSA**
CSA marking indicates that the poducts conform to relevant America and Canadian Directives.

**CSMA/CD**
Carrier Sense Multiple Access with Collision Detection

**CTL**
System Controller

**CTS**
Customer Technical Support within Lucent Technologies

**Current Value**
The value currently assigned to a provisionable parameter.

## D

**D-SUB**
D-Subminiature

**DACS/DCS**
Digital Access Cross-Connect System

**Data**
A collection of system parameters and their associated values.

**Database Administrator**
A user who administers the database of the application.

**dB**
Decibels

**DC**
Direct Current

**DCC (Data Communications Channel)**
The embedded overhead communications channel in the synchronous line, used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between network elements in a synchronous network.

**DCE (Data Communications Equipment)**
The equipment that provides signal conversion and coding between the data terminating equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions usually performed at the network end of the line.

**DCF**
Data Communications Function; Dispersion Compensation Fiber

**DCM (Dispersion Compensation Module)**
A device used to compensate the dispersion, the pulse spreading properties of an optical fiber. DCMs are necessary for very-long-haul applications and high bit rates.

**DCN**
Data Communications Network

**DCR**
Direct Current Return

**DCrtn**
Direct Current return

**Default**
An operation or value that the system or application assumes, unless a user makes an explicit choice.

**Default Provisioning**
The parameter values that are pre-programmed as shipped from the factory.

### Defect
A limited interruption of the ability of an item to perform a required function. It may or may not lead to maintenance action depending on the results of additional analysis.

### Demultiplexing
A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

### DEMUX (Demultiplexer)
A device that splits a combined signal into individual signals at the receiver end of transmission.

### Deprovisioning
The inverse order of provisioning. To manually remove/delete a parameter that has (or parameters that have) previously been provisioned.

### Digital Link
A transmission span such as a point-to-point 2 Mbit/s, 34 Mbit/s, 140 Mbit/s, VC12, VC3 or VC4 link between controlled network elements.

### Digital Multiplexer
Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

### Digital Section
A transmission span such as an STM-N signal. A digital section may contain multiple digital channels.

### Disassembly
Splitting up a signal into its constituents as payload data and overhead (an indication of the direction of a signal).

### Dispersion
Time-broadening of a transmitted light pulse.

### Dispersion Shifted Optical Fiber
1330/1550 nm minimum dispersion wavelength.

### Divergence
When there is unequal amplification of incoming wavelengths, the result is a power divergence between wavelengths.

### DNI (Dual Node Ring Interworking)
A topology in which two rings are interconnected at two nodes on each ring and operate so that inter-ring traffic is not lost in the event of a node or link failure at an interconnecting point.

**Doping**
The addition of impurities to a substance in order to attain desired properties.

**Downstream**
At or towards the destination of the considered transmission stream, for example, looking in the same direction of transmission.

**DPLL**
Digital Phase Locked Loop

**DRAM**
Dynamic Random Access Memory

**Drop and Continue**
A circuit configuration that provides redundant signal appearances at the outputs of two network elements in a ring. Can be used for Dual Node Ring Interworking (DNI) and for video distribution applications.

**Drop-Down Menu**
A menu that is displayed from a menu bar.

**DS1**
1.5 Mbps interface

**DSNE (Directory Service Network Element)**
A designated Network Element that is responsible for administering a database that maps Network Elements names (node names) to addresses (node Id). There can be one DSNE per (sub)network.

**DTE (Data Terminating Equipment)**
The equipment that originates data for transmission and accepts transmitted data.

**DTMF**
Dual Tone Multifrequency

**DUR**
Dual Unit Row

**DUS**
Do not Use for Synchronization

**E** **E1**
2 Mbps interface

**EBER (Excessive Bit Error Rate)**
The calculated average bit error rate over a data stream.

**EC**
European Community

**ECC**
Embedded Control Channel

**EEPROM**
Electrically Erasable and Programmable Read-Only Memory

**EIA (Electronic Industries Association)**
A trade association of the electronic industry that establishes electrical and functional standards.

**EM (Event Management)**
Subsystem of *Navis*™ Optical EMS that processes and logs event reports of the network.

**EMC**
Electro-Magnetic Compatibility

**EMI (Electromagnetic Interference)**
High-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

**EMS**
Element Management System

**Entity**
A specific piece of hardware (usually a circuit pack, slot, or module) that has been assigned a name recognized by the system.

**Entity Identifier**
The name used by the system to refer to a circuit pack, memory device, or communications link.

**EPROM**
Erasable Programmable Read-Only Memory

**EQ (Equipped)**
Status of a circuit pack or interface module that is in the system database and physically in the

frame, but not yet provisioned.

**ES (Errored Seconds)**
A performance monitoring parameter. ES “type A” is a second with exactly one error; ES “type B” is a second with more than one and less than the number of errors in a severely errored second for the given signal. ES by itself means the sum of the type A and type B ESs.

**ESD**
Electrostatic Discharge

**ESP**
Electrostatic Protection

**Establish**
A user initiated command, at the *LambdaUnite* CIT, to create an entity and its associated attributes in the absence of certain hardware.

**ETSI**
European Telecommunications Standards Institute

**Event**
A significant change. Events in controlled Network Elements include signal failures, equipment failures, signals exceeding thresholds, and protection switch activity. When an event occurs in a controlled Network Element, the controlled Network Element will generate an alarm or status message and send it to the management system.

**Event Driven**
A required characteristic of network element software system: NEs are reactive systems, primarily viewed as systems that wait for and then handle events. Events are provided by the external interface packages, the hardware resource packages, and also by the software itself.

**Externally Timed**
An operating condition of a clock in which it is locked to an external reference and is using time constants that are altered to quickly bring the local oscillator’s frequency into approximate agreement with the synchronization reference frequency.

**Extra traffic**
Unprotected traffic that is carried over protection channels when their capacity is not used for the protection of working traffic.

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## F

**Fault**
Term used when a circuit pack has a hard (not temporary) fault and cannot perform its normal function.

**Fault Management**
Collecting, processing, and forwarding of autonomous messages from network elements.

**FCC**
Federal Communications Commission

**FDA/CDRH**
The Food and Drug Administration′s Center for Devices and Radiological Health.

**FDDI (Fiber Distributed Data Interface)**
Fiber interface that connects computers and distributes data among them.

**FE (Far End)**
Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

**FEBE (Far-End Block Error)**
An indication returned to the transmitting node that an errored block has been detected at the receiving node. A block is a specified grouping of bits.

**FEC (Forward Error Correction)**
An error correction technique in which redundant bits are added to the payload signal enabling the receiving station to detect and correct bit errors that unavoidably occur when an optical line signal is transmitted over longer distances over an optical fiber. FEC is used to increase the transmission span length.

**FEPROM (Flash EPROM)**
A technology that combines the non-volatility of EPROM with the in-circuit re-programmability of EEPROM.

**FERF (Far-End Receive Failure)**
An indication returned to a transmitting Network Element that the receiving Network Element has detected an incoming section failure. Also known as RDI.

**FIT (Failures in Time)**
Circuit pack failure rates per $10^9$ hours as calculated using the method described in Reliability Prediction Procedure for Electronic Equipment, BellCore Method I, Issue 6, December 1997.

**Fixed-rate tributary operation of a port**
Mode of operation of a port in which tributaries are provisioned for the expected signal rates. This provisioning information is used for cross-connection rate validation and for alarm handling (for example “Loss of Pointer”).

**Folded Rings**
Folded (collapsed) rings are rings without fiber diversity. The terminology derives from the image of folding a ring into a linear segment.

**Forced**
Term used when a circuit pack (either working or protection) has been locked into a service-providing state by user command.

**FR (Frame Relay)**
A form of packet switching that relies on high-quality phone lines to minimize errors. It is very good at handling high-speed, bursty data over wide area networks. The frames are variable lengths and error checking is done at the end points.

**Frame**
The smallest block of digital data being transmitted.

**Framework**
An assembly of equipment units capable of housing shelves, such as a bay framework.

**Free Running**
An operating condition of a clock in which its local oscillator is not locked to an internal synchronization reference and is using no storage techniques to sustain its accuracy.

## G

**GB**
Gigabytes

**Gbit/s**
Gigabits per second

**GE**
Gigabit Ethernet

**GHz**
Gigahertz

**Global Wait to Restore Time**
Corresponds to the time to wait before switching back to the timing reference. It occurs after a timing link failure has cleared. This time applies for all timing sources in a system hence the name global. This can be between 0 and 60 minutes, in increments of one minute.

**GND**
Ground

**GNE (Gateway Network Element)**
A network element that passes information between other network elements and management systems through a data communication network.

**Grooming**
In telecommunications, the process of separating and segregating channels, as by combing, such that the broadest channel possible can be assembled and sent across the longest practical link. The aim is to minimize de-multiplexing traffic and reshuffling it electrically.

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## H

**Hard Failure**
An unrecoverable non-symptomatic (primary) failure that causes signal impairment or interferes with critical network functions, such as DCC operation.

**HDB3 (High Density Bipolar 3 Code)**
Line code for 2 Mbit/s transmission systems.

**HDLC (High Level Data Link Control)**
OSI reference model datalink layer protocol.

**HMI**
Human Machine Interface

**HML (Human Machine Language)**
A standard language developed by the ITU for describing the interaction between humans and dumb terminals.

**HO**
High Order

**Holdover**
An operating condition of a clock in which its local oscillator is not locked to an external reference but is using storage techniques to maintain its accuracy with respect to the last known frequency comparison with a synchronization reference.

**Hot Standby**
A circuit pack ready for fast, automatic placement into operation to replace an active circuit pack. It has the same signal as the service going through it, so that choice is all that is required.

**HPA (Higher Order Path Adaptation)**
Function that adapts a lower order Virtual Container to a higher order Virtual Container by processing the Tributary Unit pointer which indicates the phase of the lower order Virtual Container Path Overhead relative to the higher order Virtual Container Path Overhead and assembling/disassembling the complete higher order Virtual Container.

**HPC (Higher Order Path Connection)**
Function that provides for flexible assignment of higher order Virtual Containers within an STM-N signal.

**HPT (Higher Order Path Termination)**

Function that terminates a higher order path by generating and adding the appropriate Virtual Container Path Overhead to the relevant container at the path source and removing the Virtual Container Path Overhead and reading it at the path sink.

**HS**
High Speed

**HW**
Hardware

**Hz**
Hertz

## I

**I/O**
Input/Output

**IAO LAN**
Intraoffice Local Area Network

**ID**
Identifier

**IEC**
International Electrotechnical Commission

**IEEE**
Institute of Electrical and Electronics Engineers

**IMF**
Infant Mortality Factor

**IN**
Receive

**Insert**
To physically insert a circuit pack into a slot, thus causing a system initiated restore of an entity into service and/or creation of an entity and associated attributes.

**Interface Capacity**
The total number of STM-1 equivalents (bidirectional) tributaries in all transmission interfaces with which a given transmission interface shelf can be equipped at one time. The interface capacity varies with equipage.

**Intermediate System (IS)**
A system which routes/relays management information. An SDH Network Element may be a combined intermediate and end system.

**IS (In-Service)**
A memory administrative state for ports. IS refers to a port that is fully monitored and alarmed.

**IS-IS Routing**
The Network Elements in a management network, route packets (data) between each other using an IS-IS level protocol. The size of a network running IS-IS Level 1 is limited, and therefore certain mechanisms are employed to facilitate the management of larger networks.
For STATIC ROUTING, the capability exists for disabling the protocol over the LAN connections, effectively causing the management network to be partitioned into separate IS-IS Level 1 areas. In order for the network management system to communicate with a specific Network Element in one of these areas, the network management system must identify through which so-called Gateway Network Element this specific Network Element is connected to the LAN. All packets to this specific Network Element are routed directly to the Gateway Network Element by the network management system, before being re-routed (if necessary) within the Level 1 area.
For DYNAMIC ROUTING an IS-IS Level 2 routing protocol is used allowing a number of Level 1 areas to interwork. The Network Elements which connect an IS-IS area to another area are set to run the IS-IS Level 2 protocol within the Network Element and on the connection between other Network Elements. Packets can now be routed between IS-IS areas and the network management system does not have to identify the Gateway Network Elements.

**ISDN**
Integrated Services Digital Network

**ITM**
Integrated Transport Management

**ITM-NM**
Integrated Transport Management Network Module

**ITU**
International Telecommunication Union (formally known as CCITT)

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## J

**Jitter**
Short term variations of amplitude and frequency components of a digital signal from their ideal position in time.

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## K

**kbit/s**
Kilobits per second

**KFA XX**
Apparatus code of circuit packs

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L **_LambdaUnite_ OLS 1.6T (400G/800G)**
*LambdaUnite* Optical Line System 1.6 Terabit/s (400Gbit/s/800Gbit/s)

**LAN (Local Area Network)**
A communications network that covers a limited geographic area, is privately owned and user administered, is mostly used for internal transfer of information within a business, is normally contained within a single building or adjacent group of buildings, and transmits data at a very rapid speed.

**LAPD (Link Access Procedure D-bytes)**
Protocol used on Data Link Layer (OSI layer two) according to ITU-T Q.921.

**LBC**
Laser Bias Current

**LBFC**
Laser Backface Currents

**LBO (Lightguide Build-Out )**
An attenuating (signal-reducing) element used to keep an optical output signal strength within desired limits.

**LCN**
Local Communications Network

**LCS**
Local Customer Support

**LED**
Light-Emitting Diode

**LH**
Long Haul

**Line**
A transmission medium, together with the associated equipment, required to provide the means of transporting information between two consecutive network elements. One network element originates the line signal; the other terminates it.

### Line Protection

The optical interfaces can be protected by line protection. Line protection switching protects against failures of line facilities, including the interfaces at both ends of a line, the optical fibers, and any equipment between the two ends. Line protection includes protection of equipment failures.

### Line Timing

Refers to a network element that derives its timing from an incoming STM-N signal.

### Link

The mapping between in-ports and out-ports. It specifies how components are connected to one another.

### LL

Lucent Learning (former CTIP)

### LO

Low Order

### Location

An identifier for a specific circuit pack, interface module, interface port, or communications link.

### Lockout of Protection

The *LambdaUnite* CIT command that prevents the system from switching traffic to the protection line from a working line. If the protection line is active when a “Lockout of Protection” is entered – this command causes the working line to be selected. The protection line is then locked from any Automatic, Manual, or Forced protection switches.

### Lockout State

The Lockout State shall be defined for each working or protection circuit pack. The two permitted states are: None – meaning no lockout is set for the circuit pack, set meaning the circuit pack has been locked out. The values (None & Set) shall be taken independently for each working or protection circuit pack.

### LOF (Loss of Frame)

A failure to synchronize an incoming signal.

### LOM

Loss Of Multiframe

### Loop Timing

A special case of line timing. It applies to network elements that have only one OC-N/STM-N interface. For example, terminating nodes in a linear network are loop timed.

**Loopback**

Type of diagnostic test used to compare an original transmitted signal with the resulting received signal. A loopback is established when the received optical or electrical external transmission signal is sent from a port or tributary input directly back toward the output.

**LOP (Loss of Pointer )**

A failure to extract good data from a signal payload.

**LOS (Loss of Signal)**

The complete absence of an incoming signal.

**Loss Budget**

Loss (in dB) of optical power due to the span transmission medium (includes fiber loss and splice losses).

**LPA (Lower order Path Adaptation)**

Function that adapts a PDH signal to a synchronous network by mapping the signal into or de-mapping the signal out of a synchronous container.

**LPC (Lower Order Path Connection )**

Function that provides for flexible assignment of lower order VCs in a higher order VC.

**LPT (Lower Order Path Termination)**

Function that terminates a lower order path by generating and adding the appropriate VC POH to the relevant container at the path source and removing the VC POH and reading it at the path sink.

**LS**

Low Speed

**LT/RB**

Left Top/Right Bottom

**LTE**

Line Terminating Equipment

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**M** **µm**

Micrometer

**MAF**

Management Application Function

**Maintenance Condition**

An equipment state in which some normal service functions are suspended, either because of a problem or to perform special functions (copy memory) that can not be performed while normal service is being provided.

**Management Connection**
Identifies the type of routing used (STATIC or DYNAMIC), and if STATIC is selected allows the gateway network element to be identified.

**Manager**
Capable of issuing network management operations and receiving events. The manager communicates with the agent in the controlled network element.

**Manual Switch State**
A protection group shall enter the Manual Switch State upon the initiation and successful completion of the Manual Switch command. The protection group leaves the Manual Switch state by means of the Clear or Forced Switch commands. While in the Manual Switch state the system may switch the active unit automatically if required for protection switching.

**Mapping**
The logical association of one set of values, such as addresses on one network, with quantities or values of another set, such as devices or addresses on another network.

**MB**
Megabytes

**Mbit/s**
Megabits per second

**MCF (Message Communications Function)**
Function that provides facilities for the transport and routing of Telecommunications Management Network messages to and from the Network Manager.

**MD (Mediation Device)**
Allows for exchange of management information between Operations System and Network Elements.

**MDI**
Miscellaneous Discrete Input

**MDO**
Miscellaneous Discrete Output

**MEC (Manufacturer Executable Code)**
Network Element system software in binary format that after being downloaded to one of the stores can be executed by the system controller of the network element.

**MEM**
Memory

**Mid-Span Meet**
The capability to interface between two lightwave network elements of different vendors. This applies to high-speed optical interfaces.

**MIPS**
Millions of Instructions Per Second

**Miscellaneous Discrete Interface**
Allows an operations system to control and monitor equipment collocated within a set of input and output contact closures.

**MJ (Major (alarm))**
Indicates a service-affecting failure, main or unit controller failure, or power supply failure.

**MM**
Multi Mode

**MMF**
Multi-Mode Fiber

**MMI**
Man-Machine Interface

**MML**
Human-Machine Language

**MN (Minor (alarm))**
Indicates a non-service-affecting failure of equipment or facility.

**MO**
Managed Object

**MS**
Multiplexer Section

**ms**
Millisecond

**MS-SPRING (Multiplexer Section Shared Protection Ring)**
A protection method used in Add-Drop Multiplexer Network Elements.

**MSOH (Multiplexer Section OverHead)**
Part of the Section Overhead. Is accessible only at line terminals and multiplexers.

**MSP (Multiplexer Section Protection)**
Provides capability for switching a signal from a working to a protection section.

**MST (Multiplexer Section Termination)**
Function that generates the Multiplexer Section OverHead in the transmit direction and terminates the part of the Multiplexer Section overhead that is acceptable in the receive direction.

**MTBF**
Mean Time Between Failures

**MTBMA**
Mean Time Between Maintenance Activities

**MTIE**
Maximum Time Interval Error

**MTPI**
Multiplexer Timing Physical Interface

**MTS (Multiplexer Timing Source)**
Function that provides timing reference to the relevant component parts of the multiplex equipment and represents the SDH Network Element clock.

**MTTR**
Mean Time To Repair

**Multiplexer**
A device (circuit pack) that combines two or more transmission signals into a combined signal on a shared medium.

**Multiplexing**
A procedure by which multiple lower order path layer signals are adapted into a higher order path, or the multiple higher order path layer signals are adapted into a multiplex section.

## N

**NA**
Not Applicable

***Navis* Optical NMS**
Optical Network Management System

**NE (Network Element)**
A node in a telecommunication network that supports network transport services and is directly manageable by a management system.

**NEBS**
Network Equipment-Building System requirements, U.S. Telecom Requirements dealing with EMC/EMI, Environmental, Electrical safety.

**nm**
Nanometer ($10^{-9}$ meters)

**NMON (Not Monitored )**
A provisioning state for equipment that is not monitored or alarmed.

**No Request State**
This is the routine-operation quiet state in which no external command activities are occurring.

**Node**
A network element in a ring or, more generally, in any type of network. In a network element supporting interfaces to more than one ring, node refers to an interface that is in a particular ring. Node is also defined as all equipment that is controlled by one system controller. A node is not always directly manageable by a management system.

**Non-Revertive Switching**
In non-revertive switching, an active and stand-by line exist on the network. When a protection switch occurs, the standby line is selected to support traffic, thereby becoming the active line. The original active line then becomes the stand-by line. This status remains in effect even when the fault clears. That is, there is no automatic switch back to the original status.

**Non-Synchronous**
The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

**NORM**
Normal

**NPI**
Null Pointer Indication

**NPPA (Non-Preemptible Protection Access)**
Non-preemptible protection access increases the available span capacity for traffic which does not require protection by a ring, but which cannot be preempted.

**NRZ**
Nonreturn to Zero

**NSA**
Non-Service Affecting

**NSAP Address (Network Service Access Point Address)**

Network Service Access Point Address (used in the OSI network layer 3). An automatically assigned number that uniquely identifies a Network Element for the purposes of routing DCC messages.

**NVM (Non-Volatile Memory )**
Memory that retains its stored data after power has been removed. An example of NVM would be a hard disk.

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## O

**O&M**
Operation and Maintenance

**OA**
Optical Amplifier

**OAM&P**
Operations, Administration, Maintenance, and Provisioning

**OC, OC-n**
Optical Carrier

**OC-12**
Optical Carrier, Level 12 Signal (622.08 Mbit/s)

**OC-192**
Optical Carrier, Level 192 (9953.28 Mbit/s) (10 Gbit/s)

**OC-3**
Optical Carrier, Level 3 Signal (155 Mbit/s)

**OC-48**
Optical Carrier, Level 48 (2488.32 Mbit/s) (2.5 Gbit/s)

**OC-768**
Optical Carrier, Level 768 (39813.12 Mbit/s) (40 Gbit/s)

**ODM**
Office Data Manual

**OI (Operations Interworking)**
The capability to access, operate, provision, and administer remote systems through craft interface access from any site in an SDH network or from a centralized operations system.

**OLS**
Optical Line System

**OOF**
Out-of-Frame

**OOS (Out-of-Service)**
The circuit pack is not providing its normal service function (removed from either the working or protection state) either because of a system problem or because the pack has been removed from service.

**OP**
Optical

**Open Ring Network**
A network formed of a linear chain-shaped configuration of network elements. Each network element connects to two others, one on each side, except for two network elements at the ends which are connected on only one side. A closed ring can be formed by adding a connection between the two end nodes.

**Operations Interface**
Any interface providing you with information on the system behavior or control. These include the equipment LEDs, user panel,*LambdaUnite* CIT, office alarms, and all telemetry interfaces.

**Operator**
A user of the system with operator-level user privileges.

**Optical Channel**
A STM-N wavelength within an optical line signal. Multiple channels, differing by 1.5 μm in wavelength, are multiplexed into one signal.

**Optical Line Signal**
A multiplexed optical signal containing multiple wavelengths or channels.

**Original Value Provisioning**
Preprogramming of a system's original values at the factory. These values can be overridden using local or remote provisioning.

**OS (Operations System)**
A central computer-based system used to provide operations, administration, and maintenance functions.

**OSF**
Open Software Foundation; Operations System Function

**OSI (Open Systems Interconnection)**
Referring to the OSI reference model, a logical structure for network operations standardized by the International Standards Organization (ISO).

**OTDR**
Optical Time-Domain Reflectometer

**OUT**
Transmit

**Outage**
A disruption of service that lasts for more than 1 second.

**OW (Orderwire)**
A dedicated voice-grade line for communications between maintenance and repair personnel.

## P

**Parameter**
A variable that is given a value for a specified application. A constant, variable, or expression that is used to pass values between components.

**Parity Check**
Tests whether the number of ones (or zeros) in an array of binary bits is odd or even; used to determine that the received signal is the same as the transmitted signal.

**Pass-Through**
Paths that are cross-connected directly across an intermediate node in a network.

**Path**
A logical connection between the point at which a standard frame format for the signal at the given rate is assembled, and the point at which the standard frame format for the signal is disassembled.

**Path Terminating Equipment**
Network elements in which the path overhead is terminated.

**PCB**
Printed Circuit Board

**PCM**
Pulse Code Modulation

**PDH**
Plesiochronous Digital Hierarchy

**PDP**
Power Distribution Panel

**PI**
Power Interface

**Pipe mode (Adaptive-rate tributary operation of a port)**
Mode of operation of a port in which tributaries are ***not*** explicitly provisioned for the expected signal rates. The signal rates are automatically identified.

**Platform**
A family of equipment and software configurations designed to support a particular application.

**Plesiochronous Network**
A network that contains multiple subnetworks, each internally synchronous and all operating at the same nominal frequency, but whose timing may be slightly different at any particular instant.

**PM (Performance Monitoring)**
Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

**PMD (Polarization Mode Dispersion)**
Output pulse broadening due to random coupling of the two polarization modes in an optical fiber.

**POH (Path Overhead)**
Informational bytes assigned to, and transported with the payload until the payload is de-multiplexed. It provides for integrity of communication between the point of assembly of a virtual container and its point of disassembly.

**Pointer**
An indicator whose value defines the frame offset of a virtual container with respect to the frame reference of the transport entity on which it is supported.

**POP**
Point of Presence

**Port (also called Line)**
The physical interface, consisting of both an input and output, where an electrical or optical transmission interface is connected to the system and may be used to carry traffic between network elements. The words “port” and “line” may often be used synonymously. “Port” emphasizes the physical interface, and “line” emphasizes the interconnection. Either may be used to identify the signal being carried.

**Port State Provisioning**
A feature that allows a user to suppress alarm reporting and performance monitoring during provisioning by supporting multiple states (automatic, in-service, and not monitored) for low-speed ports.

**POTS**
Plain Old Telephone Service

**PP**
Pointer Processing

**PRC (Primary Reference Clock)**
The main timing clock reference in SDH equipment.

**Preprovisioning**
The process by which the user specifies parameter values for an entity in advance of some of the equipment being present. These parameters are maintained only in NVM. These modifications are initiated locally or remotely by either *LambdaUnite* CIT or *Navis* Optical EMS. Preprovisioning provides for the decoupling of manual intervention tasks (for example, install circuit packs) from those tasks associated with configuring the node to provide services (for example, specifying the entities to be cross-connected).

**PRI**
Primary

**Proactive Maintenance**
Refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal fail or signal degrade defect.

**Protection Access**
To provision traffic to be carried by protection tributaries when the port tributaries are not being used to carry the protected working traffic.

**Protection Group Configuration**
The members of a group and their roles, for example, working protection, line number, etc.

**Protection Path**
One of two signals entering a path selector used for path protection switching or dual ring interworking. The other is the working path. The designations working and protection are provisioned by the user, whereas the terms active path and standby path indicate the current protection state.

**Protection State**
When the working unit is currently considered active by the system and that it is carrying traffic. The “active unit state” specifically refers to the receive direction of operation — since protection switching is unidirectional.

**PROTN (Protection)**
Extra capacity (channels, circuit packs) in transmission equipment that is not intended to be used for service, but rather to serve as backup against equipment failures.

**PROV (Provisioned)**
Indicating that a circuit pack is ready to perform its intended function. A provisioned circuit pack can be active (ACT), in-service (IS), standby (STBY), provisioned out-of-service (POS), or out-of-service (OOS).

**PSDN**
Public Switched Data Network

**PSTN**
Public Switched Telephone Network

**PTE**
Path Terminating Equipment

**PTR**
Pointer

**PWR**
Power

**PWR ON**
Power On

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**Q**

**Q-LAN**
Thin Ethernet LAN which connects the manager to Gateway Network Elements so that management information between Network Elements and management systems can be exchanged.

**QL (Quality Level)**
The quality of the timing signal(s) provided to synchronize a Network Element. In case of optical line timing the level can be provided by the Synchronization Status Message (S-1 byte). If the System and Output Timing Quality Level mode is “Enabled”, and if the signal selected for the Station Clock Output has a quality level below the Acceptance Quality Level, the Network Element “squelches” the Station Clock Output Signal, which means that no signal is forwarded at all.

**QOS**
Quality of Service

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**R**

**RAM**
Random Access Memory

**RDI (Remote Defect Indication)**

An indication returned to a transmitting terminal that the receiving terminal has detected an incoming section failure. [Previously called far-end-receive failure (FERF).]

### Reactive Maintenance

Refers to detecting defects/failures and clearing them.

### Receive-Direction

The direction towards the Network Element.

### Regeneration

The process of reconstructing a digital signal to eliminate the effects of noise and distortion.

### Regenerator Loop

Loop in a Network Element between the Station Clock Output(s) and one or both Station Clock Inputs, which can be used to de-jitterize the selected timing reference in network applications.

### Regenerator Section Termination (RST)

Function that generates the Regenerator Section Overhead (RSOH) in the transmit direction and terminates the RSOH in the receive direction.

### Reliability

The ability of a software system performing its required functions under stated conditions for a stated period of time. The probability for an equipment to fulfill its function. Some of the ways in which reliability is measured are: MTBF (Mean Time Between Failures) expressed in hours; Availability = (MTBF)/(MTBF+MTTR)(%) [where MTTR = mean time to restore]; outage in minutes per year; failures per hour; percentage of failures per 1,000 hours.

### Remote Network Element

Any Network Element that is connected to the referenced Network Element through either an electrical or optical link. It may be the adjacent node on a ring, or N nodes away from the reference. It also may be at the same physical location but is usually at another (remote) site.

### Restore Timer

Counts down the time (in minutes) during which the switch waits to let the worker line recover before switching back to it. This option can be set to prevent the protection switch continually switching if a line has a continual transient fault.

### Revertive

A protection switching mode in which, after a protection switch occurs, the equipment returns to the nominal configuration (that is, the working equipment is active, and the protection equipment is standby) after any failure conditions that caused a protection switch to occur, clear, or after any external switch commands are reset. (See “Non-Revertive”.)

### Revertive Switching

In revertive switching, there is a working and protection high-speed line, circuit pack, etc. When a protection switch occurs, the protection line, circuit pack, etc. is selected. When the fault clears, service “reverts” to the working line.

### Ring

A configuration of nodes comprised of network elements connected in a circular fashion. Under normal conditions, each node is interconnected with its neighbor and includes capacity for transmission in either direction between adjacent nodes. Path switched rings use a head-end bridge and tail-end switch. Line switched rings actively reroute traffic over the protection capacity.

### Route

A series of contiguous digital sections.

### Router

An interface between two networks. While routers are like bridges, they work differently. Routers provide more functionality than bridges. For example, they can find the best route between any two networks, even if there are several different networks in between. Routers also provide network management capabilities such as load balancing, partitioning of the network, and trouble-shooting.

### RSOH

Regenerator Section OverHead; part of SOH

### RST

Regenerator Section Termination

### RT

Remote Terminal

### RT/LB

Right Top/Left Bottom

### RTRV

Retrieve

### Rx

Receive/IN

### RZ (Return to Zero)

A code form having two information states (termed zero and one) and having a third state or an at-rest condition to which the signal returns during each period.

S **SA**
Service Affecting

**SA**
Section Adaptation

**SD**
Signal Degrade

**SDH (Synchronous Digital Hierarchy)**
A hierarchical set of digital transport structures, standardized for the transport of suitable adapted payloads over transmission networks.

**SDS**
Standard Directory Service based on ANSI recommendation T1.245

**SEC**
Secondary

**SEC**
SDH Equipment Clock

**Section**
The portion of a transmission facility, including terminating points, between a terminal network element and a line-terminating network element, or two line-terminating network elements.

**Section Adaptation**
Function that processes the AU-pointer to indicate the phase of the VC-3/4 POH relative to the STM-N SOH and assembles/disassembles the complete STM-N frame.

**Self-Healing**
A network’s ability to automatically recover from the failure of one or more of its components.

**SEMF (Synchronous Equipment Management Function)**
Function that converts performance data and implementation specific hardware alarms into object-oriented messages for transmission over the DCC and/or Q-interface. It also converts object-oriented messages related to other management functions for passing across the S reference points.

**Server**
Computer in a computer network that performs dedicated main tasks which generally require sufficient performance.

**Service**
The operational mode of a physical entity that indicates that the entity is providing service. This designation will change with each switch action.

**SES (Severely Errored Seconds)**
This performance monitoring parameter is a second in which a signal failure occurs, or more than a preset amount of coding violations (dependent on the type of signal) occurs.

**SH**
Short Haul

**Single-Ended Operations**
Provides operations support from a single location to remote Network Elements in the same SDH subnetwork. With this capability you can perform operations, administration, maintenance, and provisioning on a centralized basis. The remote Network Elements can be those that are specified for the current release.

**Site Address**
The unique address for a Network Element.

**Slot**
A physical position in a shelf designed for holding a circuit pack and connecting it to the backplane. This term is also used loosely to refer to the collection of ports or tributaries connected to a physical circuit pack placed in a slot.

**SM or SMF (Single-Mode Fiber)**
A low-loss, long-span optical fiber typically operating at either 1310 nm, 1550 nm, or both.

**SMN**
SDH Management Network

**SNC/I**
SubNetwork Connection (protection) / Inherent monitoring

**SNC/N**
SubNetwork Connection (protection) / Non-Intrusive Monitoring

**SNR (Signal-to-Noise Ratio)**
The relative strength of signal compared to noise.

**Software Backup**
The process of saving an image of the current network element’s databases, which are contained in its NVM, to a remote location. The remote location could be the*LambdaUnite* CIT or *Navis* Optical EMS.

**Software Download**

The process of transferring a generic (full or partial) or provisioned database from a remote entity to the target network element's memory. The remote entity may be the*LambdaUnite* CIT or *Navis* Optical EMS. The download procedure uses bulk transfer to move an un-interpreted binary file into the network element.

**Software ID**

Number that provides the software version information for the system.

**SOH (Section Overhead)**

Capacity added to either an AU-4 or assembly of AU-3s to create an STM-1. Contains always STM-1 framing and optionally maintenance and operational functions. SOH can be subdivided in MSOH (multiplex section overhead) and RSOH (regenerator section overhead).

**SONET (Synchronous Optical Network)**

The North American standard for the rates and formats that defines optical signals and their constituents.

**Span**

An uninterrupted bidirectional fiber section between two network elements.

**Span Growth**

A type of growth in which one wavelength is added to all lines before the next wavelength is added.

**SPARE WIRES**

Ensure that spare wires have sufficient length to reach all contacts on the connector

**SPE**

Synchronous Payload Envelope

**SPF (Single point of failure)**

A single failure in the OSI-network (DCC, LAN or node), that causes isolation of more than one node in the OSI-network. The use of IS-IS areas, without obeying all rules & guidelines, increases the risk of a single point of failure in the network.

**SPI**

SDH Physical Interface

**Squelch Map**

This map contains information for each cross-connection in a ring and indicates the source and destination nodes for the low-speed circuit that is part of the cross-connection. This information is used to prevent traffic misconnection in rings with isolated nodes or segments.

**SRPP**

System Reference Potential Plane

**SSM**
Synchronization Status Marker

**SSU_L**
Synchronization Supply Unit — Local

**SSU_T**
Synchronization Supply Unit — Transit

**Standby Path**
One of two signals entering a constituent path selector, the standby path is the path not currently being selected.

**State**
The state of a circuit pack indicates whether it is defective or normal (ready for normal use).

**Station Clock Input**
An external clock may be connected to a Station Clock Input.

**Status**
The indication of a short-term change in the system.

**STBY (Standby)**
The circuit pack is in service but is not providing service functions. It is ready to be used to replace a similar circuit pack either by protection or by duplex switching.

**STM**
Synchronous Transport Module (SDH)

**STM-N (Synchronous Transport Module, Level N)**
A building block information structure that supports SDH section layer connections, where N represents a multiple of 155.52 Mbit/s. Normally N = 1, 4, 16, 64 or 256.

**STP**
Shielded Twisted Pair

**Stream (Line; aggregate)**
A synchronous high rate connection between multiplexers, typically 10 or 40 Gbit/s.

**STS**
Synchronous Transport Signal (SONET)

**Subnetwork**
A group of interconnected/interrelated Network Elements. The most common connotation is a synchronous network in which the Network Elements have data communications channel (DCC) connectivity.

**Supervisor**
A user of the application with supervisor user privileges.

**Suppression**
A process where service-affecting alarms that have been identified as an “effect” are not displayed to a user.

**SYNC**
Synchronizer

**Synchronization Messaging**
Synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

**Synchronous**
The essential characteristic of time scales or signals such that their corresponding significant instances occur at precisely the same average rate, generally traceable to a single Stratum 1 source.

**Synchronous Network**
The synchronization of transmission systems with synchronous payloads to a master (network) clock that can be traced to a reference clock.

**Synchronous Payload**
Payloads that can be derived from a network transmission signal by removing integral numbers of bits from every frame. Therefore, no variable bit-stuffing rate adjustments are required to fit the payload in the transmission signal.

**SYSCTL**
System Controller circuit pack

**System Administrator**
A user of the computer system on which the system’s OS software application can be installed.

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## T

**TARP**
Target Identifiers Address Resolution Protocol

**TBD**
To Be Determined

**TCA (Threshold-Crossing Alert)**
A message type sent from a Network Element that indicates that a certain performance monitoring parameter has exceeded a specified threshold.

**TDM (Time Division Multiplexing)**
A technique for transmitting a number of separate data, voice, and/or video signals simultaneously over one communications medium by interleaving a portion of each signal one after another.

**TEN**
Telecommunications Management Network

**Through (or Continue) Cross-Connection**
A cross-connection within a ring, where the input and output tributaries have the same tributary number but are in lines opposite each other.

**Through Timing**
Refers to a network element that derives its transmit timing in the east direction from a received line signal in the east direction and its transmit timing in the west direction from a received line signal in the west direction.

**THz**
Terahertz ($10^{12}$ Hz)

**TI**
Timing Interface

**TID (Target Identifier)**
A provisionable parameter that is used to identify a particular Network Element within a network. It is a character string of up 20 characters where the characters are letters, digits, or hyphens (-).

**TL1 (Transaction Language One)**
A subset of ITU's human-machine language.

**TM (Terminal Multiplexer)**
An Add/Drop Multiplexer with only one stream interface.

**Transmit-Direction**
The direction outwards from the Network Element.

**Tributary**
A signal of a specific rate (2 Mbit/s, 34 Mbit/s, 140 Mbit/s, VC12, VC3, VC4, STM-1 or STM-4) that may be added to or dropped from a line signal.

**Tributary**
A path-level unit of bandwidth within a port, or the constituent signal(s) being carried in this unit of bandwidth, for example, an STM-1 tributary within an STM-N port.

**Tributary Unit Pointer**
Indicates the phase alignment of the VC with respect to the TU in which it resides. The pointer position is fixed with respect to the TU frame.

**True Wave™ Optical Fiber**
Lucent Technologies' fiber generally called non-zero dispersion-shift fiber, with a controlled amount of chromatic dispersion designed for amplified systems in the 1550/1310 nm range.

**TRY**
Technical Requirement

**TSA (Time Slot Assignment)**
A capability that allows any tributary in a ring to be cross-connected to any tributary in any lower-rate, non-ring interface or to the same-numbered tributary in the opposite side of the ring.

**TSI (Time Slot Interchange)**
The ability of the user to assign cross-connections between any tributaries of any lines within a Network Element. Three types of TSI can be defined: Hairpin TSI, Interring TSI (between rings), and intra-ring TSI (within rings).

**TSO**
Technical Support Organization

**TTP**
Trail Termination Point

**TU (Tributary Unit)**
An information structure which provides adaptation between the lower order path layer and the higher path layer. Consists of a VC-n plus a tributary unit pointer (TU PTR).

**TUG**
Tributary Unit Group

**Two-Way Point-to-Point Cross-Connection**
A two-legged interconnection, that supports two-way transmission, between two and only two tributaries.

**Two-Way Roll**
The operation which moves a two-way cross-connection between tributary i and tributary j to a two-way cross-connection between the same tributary i and a new tributary k with a single user command.

**Tx**
Transmit/OUT

**U** **UAS (Unavailable Seconds )**
In performance monitoring, the count of seconds in which a signal is declared failed or in which 10 consecutively severely errored seconds (SES) occurred, until the time when 10 consecutive non-SES occur.

**UITS (Unacknowledged Information Transfer Service)**
Unconfirmed mode of LAPD operation.

**UL**
UL marking indicates that the products conform to relevant American Directives.

**UNEQ**
Path Unequipped

**UPL**
User PaneL

**Upstream**
At or towards the source of the considered transmission stream, for example, looking in the opposite direction of transmission.

**UR**
UR marking indicates that the products conform to relevant American Directives.

**User Privilege**
Permissions a user must perform on the computer system on which the system software runs.

**UTC (Universal Time Coordinated )**
A time-zone independent indication of an event. The local time can be calculated from the Universal Coordinated Time.

**UTP**
Unshielded Twisted Pair cable 120 Ohm

**V** **V**
Volts

**VAC**
Volts Alternating Current

**Value**
A number, text string, or other menu selection associated with a parameter.

**Variable**
An item of data named by an identifier. Each variable has a type, such as int or Object, and a scope.

**VC (Virtual Container)**
Container with path overhead.

**VDC**
Volts Direct Current

**VF**
Voice frequency

**Virtual**
Refers to artificial objects created by a computer to help the system control shared resources.

**Virtual Circuit**
A logical connection through a data communication (for example, X.25) network.

**Voice Frequency (VF) Circuit**
A 64 kilobit per second digitized signal.

**Volatile Memory**
Type of memory that is lost if electrical power is interrupted.

## W

**WAD**
Wavelength Add/Drop

**WAN (Wide Area Network )**
A communication network that uses common-carrier provided lines and covers an extended geographical area.

**Wander**
Long term variations of amplitude frequency components (below 10 Hz) of a digital signal from their ideal position in time possibly resulting in buffer problems at a receiver.

**Wavelength Interchange**
The ability to change the wavelength associated with an STM-N signal into another wavelength.

**WDCS**
Wideband Digital Cross-Connect System

**WDM (Wavelength Division Multiplexing)**
A means of increasing the information-carrying capacity of an optical fiber by simultaneously

transmitting signals at different wavelengths.

**Wideband Communications**
Voice, data, and/or video communication at digital rates from 64 kbit/s to 2 Mbit/s.

**Working**
Label attached to a physical entity. In case of revertive switching the working line or unit is the entity that is carrying service under normal operation. In case of nonrevertive switching the label has no particular meaning.

**Working State**
The working unit is currently considered active by the system and that it is carrying traffic.

**WRT (Wait to Restore Time)**
Corresponds to the time to wait before switching back after a failure has cleared, in a revertive protection scheme. This can be between 0 and 15 minutes, in increments of one minute.

**WS**
Work Station

**WTR (Wait to Restore)**
Applies to revertive switching operation. The protection group enters the WTR state when all Equipment Fail (EF) conditions are cleared, but the system has not yet reverted back to its working line. The protection group remains in the WTR state until the Wait-to-Restore timer completes the WTR time interval.

## X

**X.25**
An ITU standard defining the connection between a terminal and a public packet-switched network

**X.25 Interface/Protocol**
The ITU packet-switched interface standard for terminal access that specifies three protocol layers: physical, link, and packet for connection to a packet-switched data network.

**XC**
Cross Connect

## Z

**Zero Code Suppression**
A technique used to reduce the number of consecutive zeros in a line-coded signal (B3ZS, B8ZS).

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