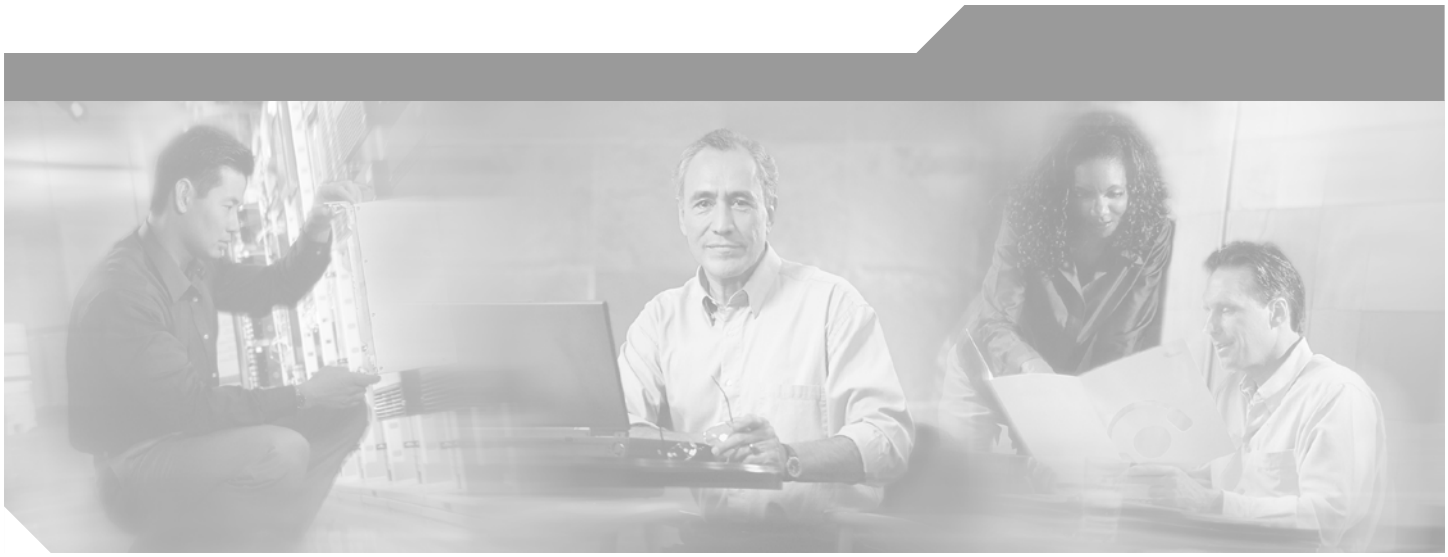

Cisco ONS 15305 Installation and Operations Guide

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About This Guide

This chapter explains the objectives, intended audience, and organization of this publication and describes the conventions that convey instructions and other information.

This chapter provides the following information:

- Document Objectives
- Audience
- Document Organization
- Related Documentation
- Document Conventions
- Where to Find Safety and Warning Information
- Obtaining Documentation
- Obtaining Technical Assistance
- Obtaining Additional Publications and Information

Document Objectives

This Installation and Operations Guide explains the functionality of the Cisco Edge Craft for the Cisco ONS 15302 and ONS 15305 system. It contains installation and user information for the Cisco ONS 15302 and ONS 15305 system. Use this Installation and Operations Guide in conjunction with the appropriate publications listed in the Related Documentation section.

Audience

To use this publication, you should be familiar with Cisco or equivalent optical transmission hardware and cabling, telecommunications hardware and cabling, electronic circuitry and wiring practices, and preferably have experience as a telecommunications technician.

Document Organization

This Cisco ONS 15305 Installation and Operations Guide, R1.1 is organized into the following chapters:

- Chapter 1, “Safety Summary” provides safety considerations for operating the Cisco ONS 15305 system
- Chapter 2, “Product Overview” describes the functionality and the features of the ONS 15305.
- Chapter 3, “Pre-Installation Procedures” provides pre-installation procedures for the ONS 15305. Chapter topics include shipment verification, site preparation, and equipment unpacking.
- Chapter 4, “Installation” provides instructions for installing ONS 15305, including power connections.
- Chapter 5, “Features” provides an overview of the SDH features of the ONS15305.
- Chapter 6, “Physical Interfaces” provides descriptions and parameters for the physical interfaces on ONS15305.
- Chapter 7, “Mechanics and Other Characteristics” provides descriptions of mechanics and other characteristics.

The following chaptersdescribe the features and functions of the ONS 15305 Service Modules:

- Chapter 8, “Hex E3/T3 Tributary Module, E3T3-6”
- Chapter 9, “Single Optical S-16.1 Module, S16.1-1-LC”
- Chapter 10, “Dual Optical S-4.1 Module, S4.1-2-LC”.
- Chapter 11, “Dual Optical LAN 1000Base-LX, GigE-2-LC”
- Chapter 12, “Octal LAN 10/100Base TX Module, E100-8”
- Chapter 13, “Octal E1 Tributary Module, E1-8”
- Chapter 14, “High Density 63xE1 Module, E1-63”
- Chapter 15, “Dual Optical S-1.1 Module, S1.1-2-LC”
- Chapter 16, “Octal Optical S-1.1 Module, S1.1-8-LC”
- Chapter 17, “Single Optical L16.2 Module, L16.2-1-LC”
- Chapter 18, “Dual Optical L4.2 Module, L4.2-2-LC”
- Chapter 19, “Dual Optical + 21xE1 S1.1-2-LC/E1-21 Module”

Related Documentation

Use this Cisco ONS 15305 Installation and Operations Guide, R1.1 in conjunction with the following referenced publications:

- *Cisco ONS 15302 Installation and Operation Guide*
  Provides procedures to install, turn up, provision, and maintain an ONS 15305 node and network.
- *Cisco ONS 15305 Quick Installation Guide*
  Provides quick installation and provisioning procedures.

Document Conventions

This publication uses the following conventions:

Convention	Application
boldface	Commands and keywords in body text.
italic	Command input that is supplied by the user.
[ ]	Keywords or arguments that appear within square brackets are optional.
{ x | x | x }	A choice of keywords (represented by x) appears in braces separated by vertical bars. The user must select one.
Ctrl	The control key. For example, where Ctrl + D is written, hold down the Control key while pressing the D key.
`screen font`	Examples of information displayed on the screen.
`boldface screen font`	Examples of information that the user must enter.
< >	Command parameters that must be replaced by module-specific codes.

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the document.

Caution Means *reader be careful*. In this situation, the user might do something that could result in equipment damage or loss of data.

Warning **IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the translated safety warnings that accompanied this device.

Note: SAVE THESE INSTRUCTIONS

Note: This documentation is to be used in conjunction with the specific product installation guide that shipped with the product. Please refer to the Installation Guide, Configuration Guide, or other enclosed additional documentation for further details.

Where to Find Safety and Warning Information

For safety and warning information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document that accompanied the product. This publication describes the international agency compliance and safety information for the Cisco ONS 15302 and ONS 15305 systems. It also includes translations of the safety warnings that appear in the ONS 15302 and ONS 15305 system documentation.

Obtaining Documentation

Cisco provides several ways to obtain documentation, technical assistance, and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at this URL:

http://www.cisco.com/univercd/home/home.htm

You can access the Cisco website at this URL:

http://www.cisco.com

International Cisco web sites can be accessed from this URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

Optical networking-related documentation is available in a CD-ROM package that ships with your product. The Optical Networking Product Documentation CD-ROM is updated with incremental releases and may be more current than printed documentation.

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:

  http://www.cisco.com/en/US/partner/ordering/index.shtml

- Registered Cisco.com users can order the Documentation CD-ROM (Customer Order Number DOC-CONDOCCD=) through the online Subscription Store:

  http://www.cisco.com/go/subscription

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, U.S.A.) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

You can submit comments electronically on Cisco.com. On the Cisco Documentation home page, click **Feedback** at the top of the page.

You can email your comments to bug-doc@cisco.com.

You can submit your comments by mail by using the response card behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com, which includes the Cisco Technical Assistance Center (TAC) Website, as a starting point for all technical assistance. Customers and partners can obtain online documentation, troubleshooting tips, and sample configurations from the Cisco TAC website. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC website, including TAC tools and utilities.

Cisco.com

Cisco.com offers a suite of interactive, networked services that let you access Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com provides a broad range of features and services to help you with these tasks:

- Streamline business processes and improve productivity
- Resolve technical issues with online support
- Download and test software packages
- Order Cisco learning materials and merchandise
- Register for online skill assessment, training, and certification programs

To obtain customized information and service, you can self-register on Cisco.com at this URL:

http://www.cisco.com

Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two levels of support are available: the Cisco TAC website and the Cisco TAC Escalation Center. The avenue of support that you choose depends on the priority of the problem and the conditions stated in service contracts, when applicable.

We categorize Cisco TAC inquiries according to urgency:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.

- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Cisco TAC Web Site

You can use the Cisco TAC website to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC website, go to this URL:

http://www.cisco.com/tac

All customers, partners, and resellers who have a valid Cisco service contract have complete access to the technical support resources on the Cisco TAC website. Some services on the Cisco TAC website require a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to this URL to register:

http://tools.cisco.com/RPF/register/register.do

If you are a Cisco.com registered user, and you cannot resolve your technical issues by using the Cisco TAC website, you can open a case online at this URL:

http://www.cisco.com/en/US/support/index.html

If you have Internet access, we recommend that you open P3 and P4 cases through the Cisco TAC website so that you can describe the situation in your own words and attach any necessary files.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses priority level 1 or priority level 2 issues. These classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer automatically opens a case.

Log into http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml to obtain a directory of Cisco Technical Support toll-free numbers for your country.

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled: for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). When you call the center, please have available your service agreement number and your product serial number.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The *Cisco Product Catalog* describes the networking products offered by Cisco Systems as well as ordering and customer support services. Access the *Cisco Product Catalog* at this URL:

  http://www.cisco.com/en/US/products/products_catalog_links_launch.html

- Cisco Press publishes a wide range of networking publications. Cisco suggests these titles for new and experienced users: *Internetworking Terms and Acronyms Dictionary, Internetworking Technology Handbook, Internetworking Troubleshooting Guide,* and the *Internetworking Design Guide.* For current Cisco Press titles and other information, go to Cisco Press online at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco monthly periodical that provides industry professionals with the latest information about the field of networking. You can access *Packet* magazine at this URL:

  http://www.cisco.com/en/US/about/ac123/ac114/about_cisco_packet_magazine.html

- *iQ Magazine* is the Cisco monthly periodical that provides business leaders and decision makers with the latest information about the networking industry. You can access *iQ Magazine* at this URL:

  http://business.cisco.com/prod/tree.taf%3fasset_id=44699&public_view=true&kbns=1.html

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in the design, development, and operation of public and private internets and intranets. You can access the *Internet Protocol Journal* at this URL:

  http://www.cisco.com/en/US/about/ac123/ac147/about_cisco_the_internet_protocol_journal.html

- Training—Cisco offers world-class networking training, with current offerings in network training listed at this URL:

  http://www.cisco.com/en/US/learning/le31/learning_recommended_training_list.html

Safety Summary

This chapter lists installation warnings and safety precautions for the Cisco ONS 15305.

1.1 Critical Safety Warnings

Warning **Do not perform cabling on an electrically-live system. Ensure that all power is removed from the shelf before continuing with this procedure. Actual wire gauge should be determined based on local engineering standards and practices.**

Warning **Before connecting 48 V power to the ONS 15305, remove the fuses from both the A and B sides of the power distribution panel (PDP). Failure to do so can cause serious injury or death. Actual wire gauge should be determined based on local engineering standards and practices.**

Warning **Before connecting 230 V power to the ONS 15305, remove the fuse from the 230 V power supply. Failure to do so can cause serious injury or death. Actual wire gauge should be determined based on local engineering standards and practices.**

Warning **Before installing the ONS 15305, remove the fuses from both the A and B sides of the PDP. Failure to do so can cause serious injury or death.**

Warning **Touching electrical connectors or other exposed electrical circuitry inside the ONS 15305, when they are energized can cause serious injury or death.**

1.2 General Safety Precautions

General safety precautions are not related to any specific procedures and do not appear elsewhere in this publication. Personnel must understand and apply the following precautions during installation and testing of the ONS 15305 system.

- Know standard electrical safety and electrical wiring and connection practices.

- Be familiar with cardio-pulmonary resuscitation (CPR). Obtain this information through the appropriate national authority (such as the Red Cross or the local equivalent). This knowledge is imperative for personnel working with or near voltages with levels capable of causing injury or death.
- All electrical cables must not exit the building where the equipment is installed.

1.3 Recommended Safety Precautions

The following precautions are recommended when working on the ONS 15305 system:

- Keep your work area tidy and free of obstructing objects at all times.
- Do not wear loose clothing, jewelry, or other items that could be caught in the components during installation or use.
- Use the equipment only in accordance with the electrical power rating.
- Do not work alone if hazardous conditions may exist in your workplace.
- Install the ONS 15305 components in compliance with the following local and national electrical codes:
  - In the United States: National Fire Protection Association (NFPA) 70; US National Electrical Code
  - In Canada: Canadian Electrical Code, part I, CSA C22.1
  - Elsewhere: International Electrotechnical Commission (IEC) 364, part 1-7
- Properly ground the equipment.
- Connect only a DC power source that complies with the safety extra-low voltage (SELV) requirements in UL1950, CSA 950, EN 60950 (CLASS 3), and IEC950 to an ONS 15305 DC power supply input.
- Install DC power supplies used in restricted access areas in accordance with Articles 110-16, 110-17, and 110-18 of the National Electric Code, ANSI/NFPA 70.
- Terminate all laser outputs properly before connecting laser inputs.
- Disconnect the input end of an optical fiber jumper cable before disconnecting the output end.
- Handle glass fiber with care. Glass fiber can be broken if mishandled. Using broken fiber can result in permanent equipment damage.
- Protect skin from exposed glass fiber. It can penetrate the skin.
- Limit the number of personnel that have access to lightwave transmission systems. Personnel should be authorized and properly trained if access to laser emissions is required.
- Limit the use of laser test equipment to authorized, trained personnel during installation and service. This precaution includes using optical loss test (OLT) set, optical spectrum analyzer, and optical time domain reflectometer (OTDR) equipment.
- Exclude any unauthorized personnel from the immediate laser radiation area during service and installation when there is a possibility that the system may become energized. Consider the immediate service area to be a temporary laser-controlled area.

- The ONS 15305 system functions in the 1270 – 1335 nm window, which is considered invisible radiation. You cannot see the laser light being emitted by a fiber, a pigtail, or a bulkhead connector. Use appropriate eye protection during fiber-optic system installation or maintenance whenever there is potential for laser radiation exposure, as recommended by the company's health and safety procedures. Observe this precaution whether warning labels have been posted.

1.4 Safety Symbols and Labels

The ONS 15305 equipment is clearly printed with warnings about the equipment radiation level. Read and understand all warning notes before working with the equipment.

The ONS 15305 has a warning note located to the left of the optical connector. The warning note consists of warning text CLASS 1 LASER PRODUCT.

1.5 Electrostatic Discharge Cautions

Adhere to the following rules:

- Observe standard precautions for handling ESD-sensitive devices.
- Assume that all solid-state electronic devices are ESD-sensitive.
- Ensure that you are grounded with a grounded wriststrap or equivalent while working with ESD-sensitive devices.
- Transport, store, and handle ESD-sensitive devices in static-safe environments.

1.6 Translated Warnings

1.6.1 DC Power Disconnection Warning

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuit.**

Waarschuwing **Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is.**

Varoitus **Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista.**

Attention **Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension.**

Warnung **Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält.**

Figyelem! **Mielõtt a következõ eljárások bármelyikét végrehajtaná, feltétlenül szakítsa meg az egyenáramú áramkör tápellátását.**

Avvertenza **Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato.**

Advarsel **Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen.**

Aviso **Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua.**

¡Advertencia! **Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF).**

Varning! **Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten.**

Предупреждение Перед выполнением любых описанных ниже действий убедитесь, что цепь питания постоянным током отключена.

警告 在进行下述任一操作过程之前，要确保将电源从直流电路上断开。

警告 次の手順を開始する前に、DC回路から電源が切断されていることを確認してください。

1.6.2 Main Disconnecting Device

Warning **The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device.**

Waarschuwing **De combinatie van de stekker en het elektrisch contactpunt moet te allen tijde toegankelijk zijn omdat deze het hoofdmechanisme vormt voor verbreking van de aansluiting.**

Varoitus **Pistoke/liitinkohta toimii pääkatkaisumekanismina. Pääsy siihen on pidettävä aina esteettömänä.**

Attention **La combinaison de prise de courant doit être accessible à tout moment parce qu'elle fait office de système principal de déconnexion.**

Warnung **Der Netzkabelanschluß am Gerät muß jederzeit zugänglich sein, weil er als primäre Ausschaltvorrichtung dient.**

Figyelem! **A dugaszolóaljzat és a dugasz együttesének mindig hozzáférhetõnek kell lennie, mivel ez szolgál fõmegszakítóként.**

Avvertenza **Il gruppo spina-presa deve essere sempre accessibile, poiché viene utilizzato come dispositivo di scollegamento principale.**

Advarsel **Kombinasjonen støpsel/uttak må alltid være tilgjengelig ettersom den fungerer som hovedfrakoplingsenhet.**

Aviso **A combinação ficha-tomada deverá ser sempre acessível, porque funciona como interruptor principal.**

¡Advertencia! **El conjunto de clavija y toma ha de encontrarse siempre accesible ya que hace las veces de dispositivo de desconexión principal.**

Varning! **Man måste alltid kunna komma åt stickproppen i uttaget, eftersom denna koppling utgör den huvudsakliga frånkopplingsanordningen.**

Предупреждение Штепсельная розетка всегда должна быть доступна, поскольку она служит основным устройством отключения.

警告 插销和插座必须便于随时插拔，因为它是主要断电设备。

警告 主要な切断装置となるので、プラグとソケットは常に手が届く場所に置く必要があります。

1.6.3 Laser Radiation Warning

Warning **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.**

Waarschuwing **Losgekoppelde of losgeraakte glasvezels of aansluitingen kunnen onzichtbare laserstraling produceren. Kijk niet rechtstreeks in de straling en gebruik geen optische instrumenten rond deze glasvezels of aansluitingen.**

Varoitus **Irrotetuista kuiduista tai liittimistä voi tulla näkymätöntä lasersäteilyä. Älä tuijota säteitä tai katso niitä suoraan optisilla välineillä.**

Attention **Les fibres ou connecteurs débranchés risquent d'émettre des rayonnements laser invisibles à l'œil. Ne regardez jamais directement les faisceaux laser à l'œil nu, ni d'ailleurs avec des instruments optiques.**

Warnung **Unterbrochene Fasern oder Steckerverbindungen können unsichtbare Laserstrahlung abgeben. Blicken Sie weder mit bloßem Auge noch mit optischen Instrumenten direkt in Laserstrahlen.**

Figyelem! **A nem csatlakoztatott üvegszálak és csatlakozók láthatatlan lézersugárzást bocsáthatnak ki. Ne nézzen bele a sugárba, és ne nézze közvetlenül, optikai berendezések segítségével!**

Avvertenza **Le fibre ottiche ed i relativi connettori possono emettere radiazioni laser. I fasci di luce non devono mai essere osservati direttamente o attraverso strumenti ottici.**

Advarsel **Det kan forekomme usynlig laserstråling fra fiber eller kontakter som er frakoblet. Stirr ikke direkte inn i strålene eller se på dem direkte gjennom et optisk instrument.**

Aviso **Radiação laser invisível pode ser emitida de conectores ou fibras desconectadas. Não olhe diretamente para os feixes ou com instrumentos ópticos.**

¡Advertencia! **Es posible que las fibras desconectadas emitan radiación láser invisible. No fije la vista en los rayos ni examine éstos con instrumentos ópticos.**

Varning! **Osynlig laserstrålning kan avges från frånkopplade fibrer eller kontaktdon. Rikta inte blicken in i strålar och titta aldrig direkt på dem med hjälp av optiska instrument.**

Предупреждение Отключенные световоды и разъемы могут испускать невидимое лазерное излучение. Не допускайте попадания лазерного луча в глаза и не смотрите на него через оптические приборы.

警告 断开的光纤或接头有可能发出不可见的激光辐射。请勿直视光束或直接用光学仪器观看光束。

警告 光ファイバ ケーブルまたはコネクタを取り外した状態では、目に見えないレーザー光が放射されていることがあります。光線をのぞきこんだり、光学機器を使用して光線を直接見たりしないでください。

1.6.4 Unterminated Fiber Warning

Warning **Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard.**

Waarschuwing **Er kunnen onzichtbare laserstralen worden uitgezonden vanuit het uiteinde van de onafgebroken vezelkabel of connector. Niet in de straal kijken of deze rechtstreeks bekijken met optische instrumenten. Als u de laseruitvoer met bepaalde optische instrumenten bekijkt (zoals bijv. een oogloep, vergrootgras of microscoop) binnen een afstand van 100 mm kan dit gevaar voor uw ogen opleveren.**

Varoitus **Päättämättömän kuitukaapelin tai -liittimen päästä voi tulla näkymätöntä lasersäteilyä. Älä tuijota sädettä tai katso sitä suoraan optisilla välineillä. Lasersäteen katsominen tietyillä optisilla välineillä (esim. suurennuslasilla tai mikroskoopilla) 10 cm:n päästä tai sitä lähempää voi olla vaarallista silmille.**

Attention **Des émissions de radiations laser invisibles peuvent se produire à l'extrémité d'un câble en fibre ou d'un raccord sans terminaison. Ne pas fixer du regard le rayon ou l'observer directement avec des instruments optiques. L'observation du laser à l'aide certains instruments optiques (loupes et microscopes) à une distance inférieure à 100 mm peut poser des risques pour les yeux.**

Warnung **Eine unsichtbare Laserstrahlung kann vom Ende des nicht angeschlossenen Glasfaserkabels oder Steckers ausgestrahlt werden. Nicht in den Laserstrahl schauen oder diesen mit einem optischen Instrument direkt ansehen. Ein Betrachten des Laserstrahls mit bestimmten optischen Instrumenten, wie z.B. Augenlupen, Vergrößerungsgläsern und Mikroskopen innerhalb eines Abstands von 100 mm kann für das Auge gefährlich sein.**

Figyelem! **A lezáratlan optikai kábelek és a csatlakozók láthatatlan lézerfényt bocsáthatnak ki. Ne nézzen bele a sugárba, és ne nézze közvetlenül, optikai berendezések segítségével! Ha a kibocsátott lézert 100 mm-esnél kisebb távolságból nézi bizonyos optikai eszközökkel (például nagyítóval vagy mikroszkóppal), látáskárosodást szenvedhet.**

Avvertenza **L'estremità del connettore o del cavo ottico senza terminazione può emettere radiazioni laser invisibili. Non fissare il raggio od osservarlo in modo diretto con strumenti ottici. L'osservazione del fascio laser con determinati strumenti ottici (come lupette, lenti di ingrandimento o microscopi) entro una distanza di 100 mm può provocare danni agli occhi.**

Advarsel **Usynlig laserstråling kan emittere fra enden av den ikke-terminerte fiberkabelen eller koblingen. Ikke se inn i strålen og se heller ikke direkte på strålen med optiske instrumenter. Observering av laserutgang med visse optiske instrumenter (for eksempel øyelupe, forstørrelsesglass eller mikroskoper) innenfor en avstand på 100 mm kan være farlig for øynene.**

Aviso **Radiação laser invisível pode ser emitida pela ponta de um conector ou cabo de fibra não terminado. Não olhe fixa ou diretamente para o feixe ou com instrumentos ópticos. Visualizar a emissão do laser com certos instrumentos ópticos (por exemplo, lupas, lentes de aumento ou microscópios) a uma distância de 100 mm pode causar riscos à visão.**

¡Advertencia! **El extremo de un cable o conector de fibra sin terminación puede emitir radiación láser invisible. No se acerque al radio de acción ni lo mire directamente con instrumentos ópticos. La exposición del ojo a una salida de láser con determinados instrumentos ópticos (por ejemplo, lupas y microscopios) a una distancia de 100 mm puede comportar lesiones oculares.**

Varning! **Osynlig laserstrålning kan komma från änden på en oavslutad fiberkabel eller -anslutning. Titta inte rakt in i strålen eller direkt på den med optiska instrument. Att titta på laserstrålen med vissa optiska instrument (t.ex. lupper, förstoringsglas och mikroskop) från ett avstånd på 100 mm kan skada ögonen.**

Предупреждение Световоды и разъемы без заглушек могут испускать невидимое лазерное излучение. Не допускайте попадания лазерного луча в глаза и не смотрите на него через оптические приборы. Нельзя смотреть на источник лазерного излучения через некоторые оптические приборы (например увеличительное стекло, лупу или микроскоп) с расстояния ближе 100 мм: это может привести к травме органов зрения.

警告 无终端接头的光纤缆的末端或接头有可能发出不可见的激光辐射。请勿直视光束或直接用光学仪器观看。在 100 毫米的距离内用某些光学仪器（例如小型放大镜、放大镜和显微镜）观看激光输出有可能伤害眼睛。

警告 終端されていない光ファイバ ケーブルまたはコネクタの開口部からは、目に見えないレーザー光線が放射されていることがあります。光線をのぞきこんだり、光学機器を使用して直接見たりしないでください。ある種の光学機器（ルーペ、拡大鏡、顕微鏡など）を使用して 100 mm 以内の距離からレーザー光線を見ると、目を痛めることがあります。

1.6.5 Class 1 Laser Product Warning

Warning **Class 1 laser product.**

Waarschuwing **Klasse-1 laser produkt.**

Varoitus **Luokan 1 lasertuote.**

Attention **Produit laser de classe 1.**

Warnung **Laserprodukt der Klasse 1.**

Figyelem! **Class 1 besorolású lézeres termék.**

Avvertenza **Prodotto laser di Classe 1.**

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Product Overview

This chapter describes the functionality and the features of the ONS 15305.

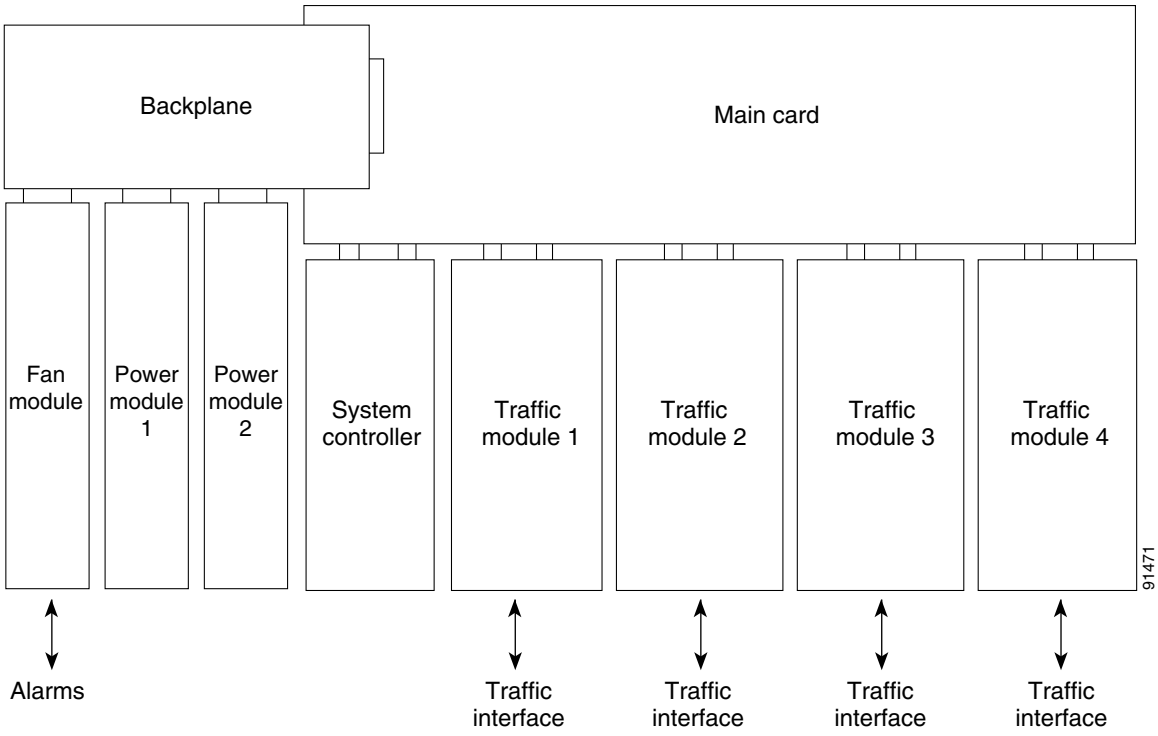
2.1 Functional Overview

The ONS 15305 is a traffic concentrator that supports different types of transmission media. It can be used in networks based on fibre and copper media. The ONS 15305 concentrates both IP and TDM traffic and is able to interface to both TDM and IP backbone networks. The TDM part of the ONS 15305 is a cross-connect that can work as a terminal mux, add and drop mux or non-blocking cross-connect. The IP part consist of a L2 switch. The ONS 15305 is a small device with a high port density. It is targeted for a number of different applications as shown in this chapter. The ONS 15305 is a scalable system due to its modular design. The ONS 15305 consist of a chassis with a motherboard with room for up to eight plug-in modules. Four of the plug-in modules are used for interface modules. The remaining four modules are used for two redundant power supply modules, one fan and a system controller. The ONS 15305 can be used in star networks, ring networks, chained networks and meshed.

The following types of modules/boards exist:

- Alarm and fan module, FAN-ALARM
- Main card
- Back plane
- System controller module, SYSCONT-SD128-RJ45
- Power module, DC Power
- Power module, AC Power
- Service modules, up to four

Figure 2-1 System Overview



2.2 Applications

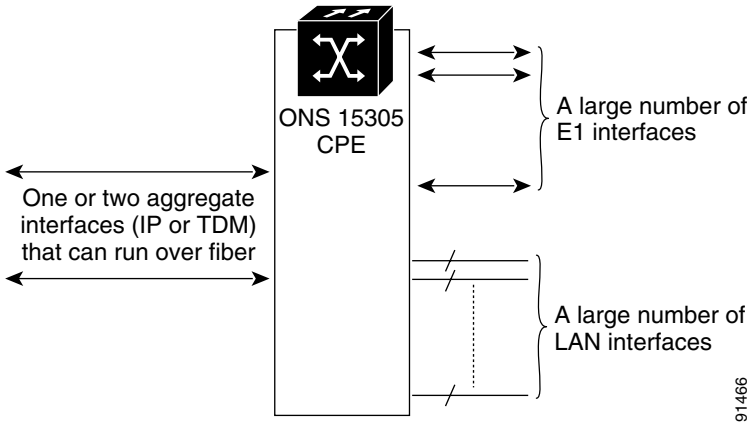
The following sections show eaxmples of ONS15305 Applications.

2.2.1 CPE Application

The ONS 15305 can be used as a Customer Premises Eequipment (CPE). The unit have a large number of TDM interfaces (E1) and LAN interfaces (10/100/Base-T,1000 Base-LX). This application is typical used for very large end customers or in a building with many smaller end customers.

The ONS 15305 can be connected to the backbone network through fibre or copper. The application is shown in Figure 2-2.

Figure 2-2 CPE Application

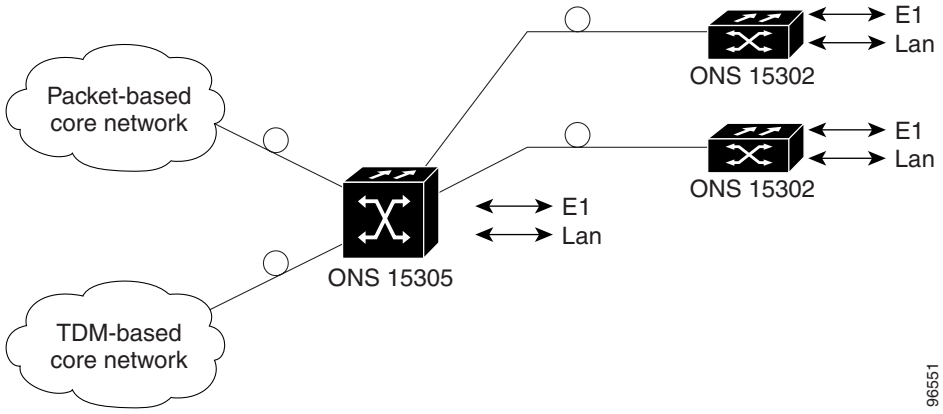


2.2.2 Small PoP Application

The ONS 15305 can also be used as a traffic concentrator in the point of presence (PoP) of the operator. The unit may support many different CPE's and may also support different types of transmission media. The unit is the interface between the core network and the access network. A typical application is shown in Figure 2-3.

In this application the ONS 15305 is used to connect up other Cisco product to the core SDH or IP network. It is also possible to connect equipment from other vendors to the ONS 15305.

Figure 2-3 PoP Application

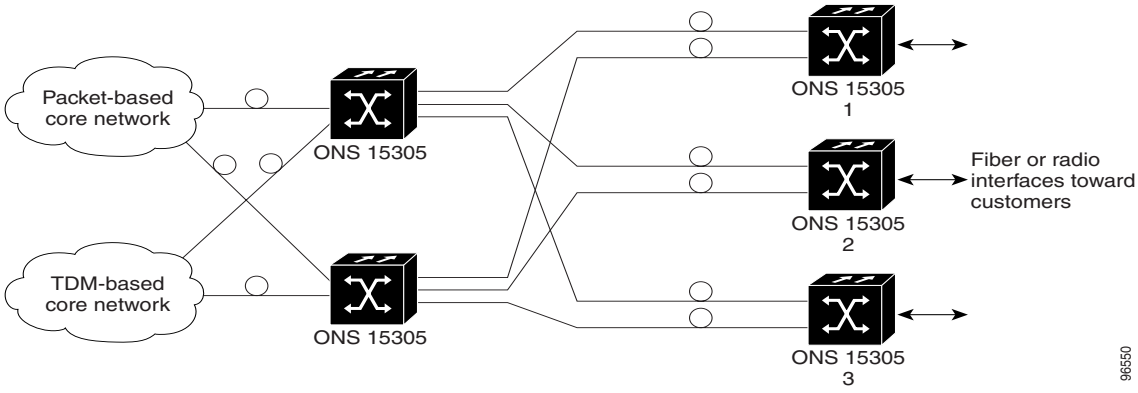


2.2.3 Large PoP Application

There are applications where one ONS 15305 does not have enough performance or does not support enough interfaces. It is possible to stack a number of ONS 15305's to create larger systems.

Typical an internal ONS 15305 is used to groom traffic from a number of ONS 15305's that is connected to the access network. The internal ONS 15305 is connected to the core network. Two ONS 15305 nodes are used for redundancy.

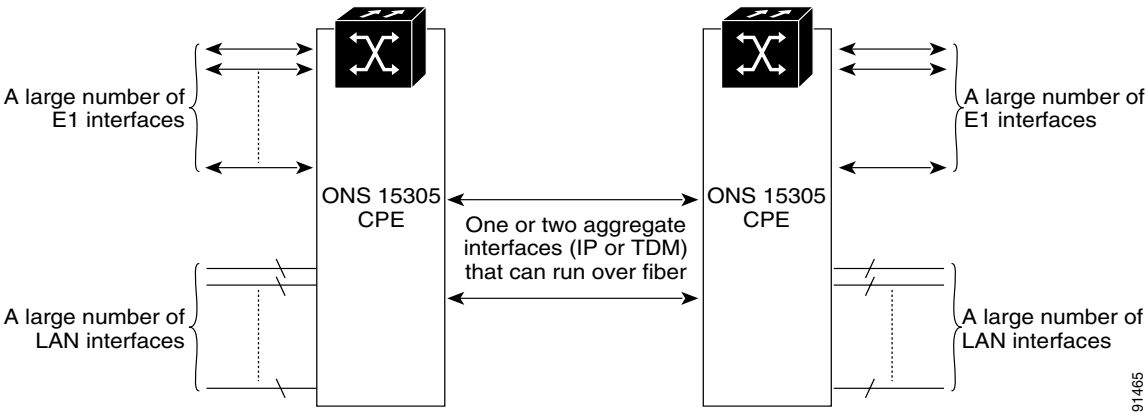
Figure 2-4 Large PoP Application



2.2.4 Campus Application

The ONS 15305 can also be connected back to back without any connection to external networks.

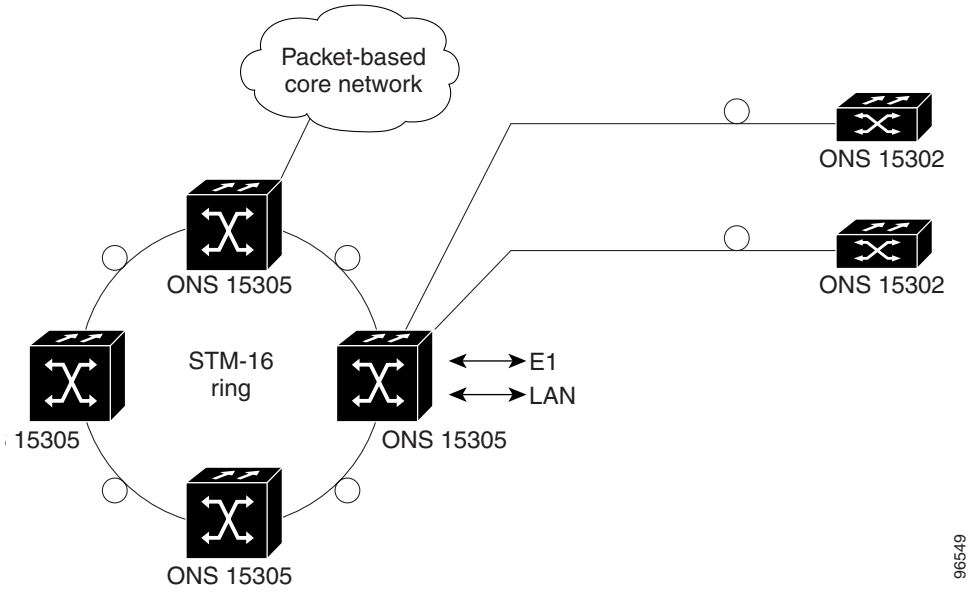
Figure 2-5 Campus Application



2.2.5 ADM Application

The ONS 15305 can be used as a standard ADM with support of both TDM tributaries and IP tributaries.

Figure 2-6 Typical ADM Application for the ONS 15305



2.3 Alarm and Fan Module, FAN-ALARM

The main feature of the fan unit is to ventilate the 19"/ 1U cabinet used for ONS 15305. The fan unit is a plug-in device consisting of a circuit board with 4 fans. The air is sucked in through 4 circular openings in the left sidewall, and emerges through holes in the right side cabinet wall. Four fans are used to improve reliability. During normal operation one or two pair of fans operate at the time. At inside cabinet temperatures below ~40^{o}C, one pair operates. Above ~40^{o}C both pairs operate.

2.3.1 Protection

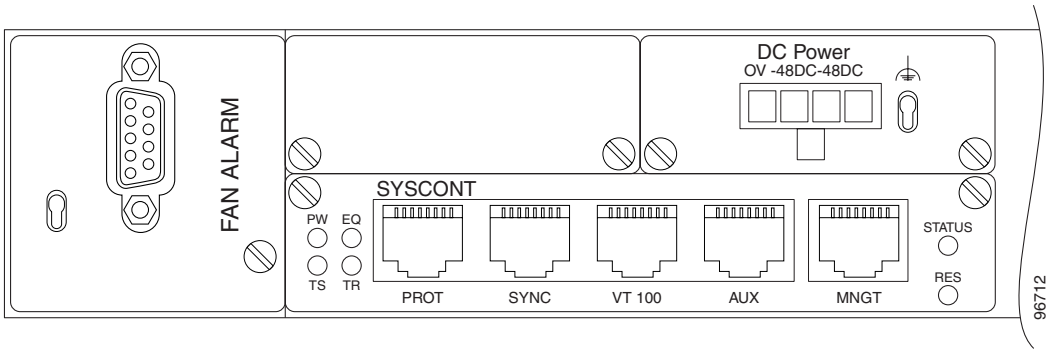
The fan unit consists of four fans. To equalize wear-out time between both fan pairs, they interchange active/stand-by roles every 24-hour. In case of an abnormal temperature rise, all fans will operate simultaneously. The fans operate in pairs; there are two standby fans and two main fans. The maximum temperature measured in the ONS 15305 controls the fans. The only modules not containing temperature sensing are the fan unit itself, the power modules and the system controller card. The FAN module is connected to the main card through the backplane. The O_TEMP_ALM alarm is detected on the main card when temperature rises above 85 ^{o}C. The alarm, specific for each fan, is processed and presented “Fan Failure Alarm”.

2.3.2 External Alarms

The ONS 15305 provides facilities to report four auxiliary alarm inputs for associated equipment, for example power module failure, battery condition, open cabinet door etc.

It also supports 2 alarm outputs used to signal equipment alarms and traffic related alarms. The alarm input/output connector is placed on the fan unit front cover.

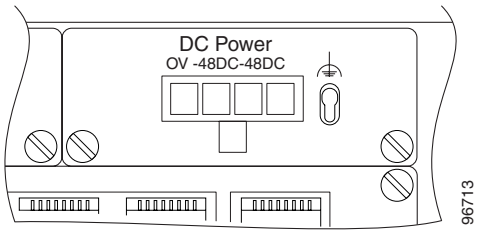
Figure 2-7 Location of Alarm and Fan Module, FAN-ALARM



2.4 Power Module, DC Power

The main feature of the power module is to convert and isolate primary power, 48V, to 5,25 volts for the modules in the product.The module has features that allow power sharing and hot plugging. The module has separate alarms for 2 independent primary supplies (< 40 volts) and alarm for the secondary output (< 4,65 volts). Alarms related to the power module(s) are displayed in CEC. The secondary is short circuit proof and the average s.c. current is less than 1 amp. The maximum secondary current is limited to ab. 26 amps. A power cable is provided with a Mini-fit connector in one end and no connector in the other end. This cable connects the ONS 15305 to the internal 48V power-rails inside the rack. The cable and the power-supply meets the safety requirements from the EN 60950 specification.

Figure 2-8 Location of DC Power



2.4.1 Technical Overview DC/DC

The -48V DC Power supply (DC) covers the -40,5 Vdc to -60Vdc range, also referred to as -48Vdc.The module generate +5.25Vdc, all other voltages necessary are generated on each module. If using two power modules, the current sharing between the two modules is between 40% and 60%.

2.4.2 Connectors

The -48V DC supply input is provided through a 4 pin power connector, (Molex Mini-fit) with the following pin-out:

Table 2-1 Pin Out -48 VDC

Pin	Signal
1	0V
2	48V (supply 1)
3	-48V (supply 2)
4	GND

2.4.3 Parameters

The -48V DC input is conform to the specifications given in the table below

Table 2-2 Electrical Specifications at DC Input

Parameter	Limit
Power dissipation	Less than 120W
Fuse	7A
Battery voltage range	-40,5 to -60V DC

2.5 Power Module, AC 230V

2.5.1 Module Description

The module contains a 75 W AC/DC converter that converts the input voltage from 230V to +5.25V.

The module disconnect the output voltage and activates an alarm if the output voltage is outside the specified tolerance (Higher than 6V or less that 5V). The module also limit the maximum output current to 11A. Alarms related to the power module(s) are displayed in CEC. Two modules can share the output current and the current sharing is between 40 and 60%.A 0,65 M long power cable is provided with a standard mains connector . This cable connects the ONS15305 to the internal 230V power-sockets rails inside the rack or to external mains sockets. The cable and the power supply meets the safety requirements from the EN 60950 specification.

2.5.1.1 Power Supply Output

75 W.

2.5.1.2 Power Supply Input

220-240VAC;0,5A;50/60Hz

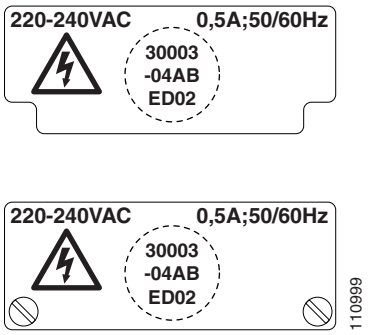
2.5.2 External Interface

The 230V mains supply input is provided through a fixed 0,65 M powercable with a IEC C14 mains connector.

2.5.3 Connector Type

The physical connector is a IEC C14 mains connector.

Figure 2-9 220-240VAC Module



2.5.4 Electrical Specifications - AC input

Table 2-3 Electrical Specifications - AC input

Parameter	Limit
Power dissipation	Less than 75W
Fuse	1.0A (Slow)
Mains voltage	-230V AC +/- 10%

2.5.4.1 Compliance

Table 2-4 AC 230V Compliance

Standard	Comment
EN/IEC 60950	Single phase 230 V 50 Hz AC mains supply
ETS 300 253	Earthing and bonding of telecommunication equipment in telecommunication centers

2.5.5 Limitations - Module Configurations

The AC 230V module can provide 75 W to the ONS 15305 unit. This is not sufficient for all types of configurations. Table 2-5 provides a power consumption list for the base unit and modules. Table 2-6 provides a module configuration within capacity of AC 230V module.

2.5.5.1 List of Power Consumption - Available ONS 15305 Modules

Table 2-5 PowerConsumption - ONS 15305 Modules

Module Name	Power Consumption (W)
Base unit (including FanAlarm module)	20
E3/T3-6	11
S16.1-1-LC	13
S4.1-2-LC	9,5
GigE-2-LC	11
E100-8	5,5
E1-8	3,5
E1-63	21
S1.1-2-LC	9
S1.1-8-LC	25
L16.2-1-LC	18
L4.2-2-LC	13
S1.1-2-LC/E1-21	15

2.5.5.2 Example of Module Configuration Within Capacity of AC 230V Module

Table 2-6 Module Configuration Within Capacity of AC 230V module

Module Name	Power Consumption
Base unit	20
E1-8	3,5
S16.1-1-LC	13
S1.1-8-LC	25
GigE-2-LC	11
Total	72,5 W

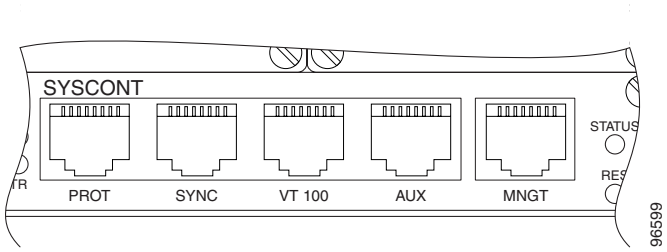
2.6 System Controller Module, (SYSCONT-SD128-RJ45)

Figure 2-10 shows the system controller that contains the processor for the ONS 15305. The software of the ONS 15305 runs in 128 MB SDRAM. The amount of memory can be configured from 64 MB to 512 MB. This is done in the factory .The software is stored in Flash memory devices. The ONS 15305 uses

a Compact Flash card as the storage medium. The 32 MB CompactFlash is mounted in a connector on the system controller. The size of the Compact Flash cards can be from 8 MB to 128 MB; this is determined by the application.

The system controller supports a serial RS-232/VT.100 interface used by the craft terminal. The system controller also supports a 10Base-T LAN interface used for management purposes. The system controller contains the local synchronization interface for the ONS 15305. This interface is directly connected to the SETS functionality on the mainboard.The system controller contains the local user interface for the ONS 15305, the AUX port. The interface supports a framed E1 interface. It is possible to select different overhead bytes from all SDH interfaces to the 30 available timeslots. The physical connectors of the five interfaces are of the RJ-45 type. The system controller also provides four LEDs to indicate the status of the ONS 15305. The LED's are visible from the rear of the ONS 15305. The LEDs have the same functionality as the LEDs in the chassis. The fifth LED indicates the status of the management port.

Figure 2-10 Location of SYSCONT-SD128-RJ45



2.6.1 Power Consumption

6 W

2.6.2 Technical Overview

2.6.2.1 Management Port

A local Ethernet port (10/100BaseT), called the Management Port, is available for connecting to a management DCN.

The management signals goes to an Ethernet Controller in the MPC8265 processor situated on the module.

2.6.2.2 VT100 Port

The ONS 15305 offers a VT-100 interface for connection of CiscoEdgeCraft Terminal/CLI interface. The interface is running at a data rate of 19.200 baud.

2.6.2.3 Synchronization Port

The synchronization port is used for SETS functionality on the main card.

2.6.2.4 The 2Mbit/s AUX port

The 2Mb/s AUX signals go to the SETS FPGA.

2.6.2.5 Proprietary Protection Port

The proprietary protection interface is used for equipment protection.
For use in future release.

2.6.2.6 Power

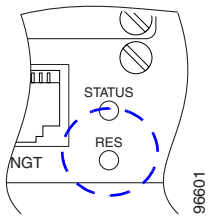
The voltages are generated on board with the exception of the +5.2V that comes directly from the power module(s). The module is equipped with a reset-circuit resetting the card in case of a fault in one of the voltages.

2.6.2.7 Reset

Caution The reset switch accessible in front of the system controller module will reset the ONS 15305.

A special tool like a small screwdriver or a pencil may be used to activate the switch, Figure 2-11.

Figure 2-11 Location of the Reset Push Button



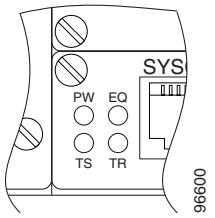
2.6.2.8 LEDs

LEDs are visual indicators that show ONS 15305 failure conditions. These LEDs are placed on the System Controller Unit front cover and the front of the ONS 15305, Figure 2-12. These LEDs are placed on the main card and have the same functionality as the ones on the system controller card. The color and functionality of the LED's are described in Table 2-7.

Table 2-7 LEDs on System Controller

Identity	Color	Function
Power	Green	Power is present and operating correctly.
Equipment	Red	There is an error with the equipment.
Traffic	Red	There is a traffic alarm at one of the interfaces.
Test	Yellow	There are test-loops activated on the unit.

Figure 2-12 Locations of LEDs - System Controller Front



The LEDs are controlled by the SETS FPGA and are not affected by the external alarms.

A fifth, green LED is also mounted in the front of the system controller card. This LED indicates the link status of the management port.

2.7 Service Modules

2.7.1 Introduction

The ONS 15305 consists of a unit with a main card with space for up to four plug-in modules (service modules). The plug-in modules support a number of different external interfaces and different transmission media. The internal interface with the main card is identical for all service modules. This chapter will treat the standardized blocks for the Service modules.

Please see detailed descriptions for each service module, starting in chapter 8.

2.7.2 Common Functions

2.7.2.1 Memory

All modules store inventory data in non-volatile memory, e²prom.

2.7.2.2 FPGA Configuration

The modules containing one or more FPGAs also contain a local flash used to store FPGA configuration data in two banks.

The FPGA configuration is automatically loaded from the active flash bank upon power-up. New FPGA files can be downloaded from the management system. Also the flash bank selection is controlled by the management system.

2.7.2.3 Processor Interface

The modules are connected to the main card through a 16-bit wide time multiplexed address and data bus. The DXC devices on the main card are responsible for generating module chip select and the translation from a time multiplexed bus towards the modules to a separate data and address bus towards the processor.

2.7.2.4 DCC

The modules terminating one or more STM-N lines are able to terminate both the DDC-R (192 kbit/s), and DCC-M (576 kbit/s) channels.

2.7.2.5 G.Link

All modules with IP switching capability are interconnected with a highspeed link, to a crossbar on the Main card. The link is called G-link.

2.7.2.6 TDM

The mapping of IP traffic into VC12 containers is performed at service module level. There is no connection between the IP and SDH traffic on the main card. (in the base unit).

All modules with IP switching capability are interconnected with a highspeed link, to a central switch on the Main card. All modules with TDM-functionality are connected to the cross-connect on the Main card.

Pre-Installation Procedures

This chapter provides pre-installation procedures for the Cisco ONS 15305. Chapter topics include shipment verification, site preparation, and equipment unpacking.

3.1 Shipment Verification

When you receive ONS 15305 system equipment at the installation site, immediately verify that the shipment is correct.

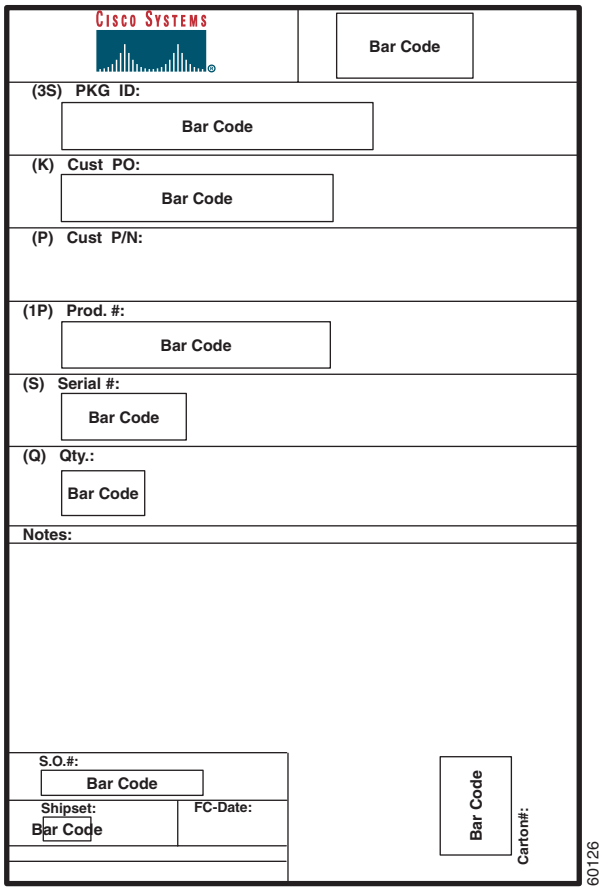
Note Cisco does not recommend shipping equipment that is mounted in racks. To ship equipment from one site to another, pack the equipment in the original box.

Note If you store the ONS 15305 before installing it, keep the ONS 15305 system equipment in the original shipping containers. The storage period should not exceed 12 months. Store the packed equipment indoors in a well-ventilated and static-safe environment.

3.1.1 ONS 15305 Shipping Container Label

The ONS 15305 shipping container label provides specific information about the shipped item. The label displays information in alphanumeric bar code format. Figure 3-1 shows a sample of a shipping container label.

Figure 3-1 Example of a Shipping Container Label



3.1.2 Preliminary Inventory Check

Compare the packing list information with the alphanumeric information provided on the shipping labels. The packing list and shipping labels should contain the same information. If there are any discrepancies between the shipping label information and the packing list information, call the Cisco Technical Assistance Center (TAC).

Log into http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml to obtain a directory of Cisco Technical Support toll-free numbers for your country.

3.1.3 Reporting Damage

To report damage to shipped articles, contact the Cisco Technical Assistance Center (TAC) to open a Return Material Authorization and Fault Symptom Report (RMA).

Log into http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml to obtain a directory of Cisco Technical Support toll-free numbers for your country. .

3.2 Site Preparation

Verify that the installation site meets the following criteria:

1. The site conforms to all environmental specifications in the Chapter 2, "Product Overview."
2. The floor or mounting area where you will install the equipment can support the equipment.

Caution Maximum recommended ambient is 45°C, minimimun -5°C.

The following tables are based on typical ONS 15305configurations. Floor loading, power consumption, heat dissipation, and clearances may vary in specific customer configurations.

3. The installation site meets the power supply requirements of the ONS 15305 equipment. Table 3-1 lists these requirements.

Table 3-1 Power Supply Requirements by ONS 15305 Equipment Type

Equipment Type	Power Supply Requirements
–48 V DC	–40.5 to –60 V DC

4. The installation site meets the power consumption requirements of the ONS 15305 equipment. Table 3-2 lists these requirements.

Table 3-2 Power Consumption Requirements by ONS 15305 Equipment Type

Equipment Type	Power Consumption Requirements
ONS 15305	maximum 120 W

5. The installation site meets the circuit breakers requirements of the ONS 15305 equipment. Table 3-3 lists these requirements.

Table 3-3 Circuit Breakers Requirements by ONS 15305 Equipment Type

Equipment Type	Circuit Breakers Requirements
ONS 15305	7 A (FAST)

6. Minimum recommended clearance is provided for accessing bays from the front and back, opening front covers, and clearing the top of the racks. Table 3-4 provides clearance requirements.

Table 3-4 Recommended Access Clearance

Item	Recommended Clearance
Bay access needed for maintenance	Front access only, 500 mm (19.7 in.)
Back clearance to bays (if necessary)	500 mm (19.7 in.)

7. The installation site meets the ground requirements of the ONS 15305 equipment. Table 3-1 lists these requirements.

Table 3-5 Recommended Ground Capacity

Item	Recommended Capacity
Total wight	maximum 5 Kg

3.3 Unpacking

Use the following considerations when unpacking and storing ONS 15305 equipment:

- Leave equipment packed until it is needed for immediate installation.
- Store packed equipment in the temperature and environmental conditions described in Chapter 2, "Product Overview."
- After unpacking the equipment, save and store the packaging material in case the equipment must be returned.
- If the packaging is damaged and possible equipment damage is present, preserve as much of the packaging as possible to allow Customer Service and the shipper to analyze the damage. To report damage to shipped articles, contact the Cisco Technical Assistance Center (TAC) to open an RMA. See the "3.1.3 Reporting Damage" section on page 3-2.

The following procedures contain specific instructions for unpacking ONS 15305 system equipment.

Unpack the ONS 15305

Caution When opening the shipping container, use caution to avoid damaging the contents.

Caution Static electricity can damage electro-optical equipment. While unpacking and handling optical and electrical modules, wear a grounding wrist strap to discharge the static buildup. Before unpacking and installing modules or making system interconnections, connect the grounding wrist strap. The grounding wrist strap is designed to prevent equipment damage caused by static electricity.

Note If any optical adapters are included in the container, remove them and save them for use while installing the module front-panel optical fiber jumper cables.

Step 1 Open the top of the cardboard shipping container.

Step 2 Remove the ONS 15305 accessory kit and documentation CD out of the shipping container.

Step 3 Take the ONS 15305 out of the shipping container.

Step 4 Take the ONS 15305 out of the plastic protective bag.

The ONS 15305 shipping container should contain the following items:

- One ONS 15305 configured as ordered

- One accessory kit (15305-SHIPKIT-74-3106-01) , which includes brackets and screws for 19" and 23" rack, disposable ESD wrist straps, one release rook for card extraction, one ONSCLI cable, one blade terminal with screw and blade jack, a registration and warranty card, and "*Cisco ONS 15305 Quick Installation Guide*."

Installation

This chapter provides instructions for installing the Cisco ONS 15305.

Note The instructions in this section primarily address the installation of the ONS 15305, and modules supplied by Cisco Systems. When installing racks, electrical wiring, raceways, and other equipment not covered in this manual, you should follow all local, state, federal, or international (if applicable) codes and regulations.

Caution Static electricity can damage electronic equipment. While unpacking and handling electronic modules, wear a grounding wrist strap to discharge the static buildup. Grounding wrist straps are designed to prevent equipment damage caused by static electricity. Before making the necessary interconnections, connect the grounding wrist strap.

4.1 Installation Overview

You should be thoroughly familiar with the instructions in this manual before starting any work. Use the following instructions when installing the ONS 15305.

Step 1 Read and observe all safety cautions and warnings in Chapter 1, "Safety Summary."

Step 2 Before inspecting the ONS 15305, first verify the ONS 15305 equipment according to the procedures in Chapter 3, "Pre-Installation Procedures." If there is a problem with the equipment, contact the Cisco TAC. Log into http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml to obtain a directory of Cisco Technical Support toll-free numbers for your country.

Step 3 If you do not install the equipment immediately, store as specified in Chapter 3, "Pre-Installation Procedures."

Step 4 Unpack equipment only after preparing the site as described in Chapter 3, "Pre-Installation Procedures."

Step 5 When installing equipment at a site, follow the procedures in this chapter in the order presented.

Step 6 Make connections using the information in Chapter 6, "Physical Interfaces."

4.2 Installation Planning

Based on the configuration to be installed, determine the size, number, and location of racks, as well as the ONS 15305 installation requirements. The following are unit dimensions to take into consideration when installing the ONS 15305. The ONS 15305 can be installed in 485 mm (19-in.) equipment racks, and can be adapted for 600 mm ETSI (23.6-in.) racks. The racks must be accessible from the front and rear for equipment installation.

Note You need 500 mm (19.7-in.) space of rear access for installation of the equipment.

Use the following considerations:

- Install the lowest unit in a rack first.
- Wire size and dimension requirements are based on cable length and local engineering standards and practices.
- Route the power cable from the power distribution panel (PDP) to the ONS 15305, along the edge of the equipment rack.
- Route the grounding cable from the station ground to the ONS 15305, proceeding down along the edge of the equipment rack.
- Route the electrical cables from the ONS 15305 along the edge of the rack to the overhead cable transport tray.
- Route the optical cables from the ONS 15305 along the edge of the rack to the overhead cable transport tray.

Note The interfaces cables (especially E1 interfaces) must not run in the same pipes of the power cables

4.2.1 Required Items

In addition to a standard installers tool kit, the following items are also required:

- Phillips screwdriver (PH3) to attach the ONS 15305 to the rack, and Phillips screwdriver (PH1) to attach the brackets to the ONS 15305
- 2.5-mm Allen key (to attach the external grounding)
- 4 mounting screws, M6 (#12-24 x 3/4 pan head phillips) and nuts
- Power cable (from fuse to power connector), #18 AWG (0.75 mm²) up to #16 AWG (1.5 mm²) with four rigid wire
- Yellow green flexible ground cable, #16 AWG (1.25 mm²) up to #14 AWG (2.50 mm²) (for the external grounding)
- Cletop cleaning cassette (type A for LC connectors)
- Video fiber connector inspection instrument
- Caps for optical connectors
- Plugs for optical adapters
- Tie wraps

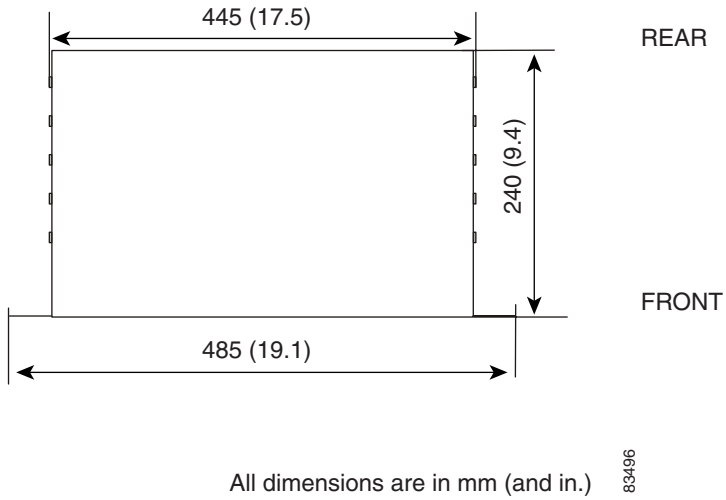
4.2.2 Installation Guidelines

When installing ONS 15305 equipment into a rack, follow these guidelines:

- Consider the effect of additional electronic equipment and its generated heat on the ONS 15305 system equipment.
- Make sure the equipment rack is properly bolted to the ground, and if required, to the ceiling. Ensure that the weight of the equipment does not make the rack unstable.
- When mounting the equipment between two posts or rails, ensure that the minimum clearance between the sides is 485 mm (19 in.).
- Maintain a minimum clearance of 500 mm (19.7 in.) in front of the equipment and 500 mm (19.7 in.) at the back of the equipment.

Figure 4-1 shows the outer dimensions of the ONS 15305 system equipment.

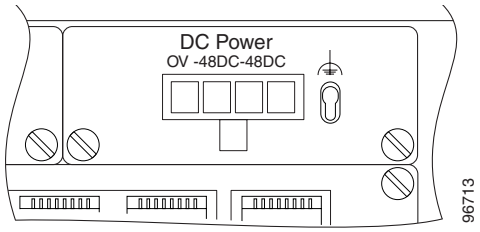
Figure 4-1 Outer Dimensions of the ONS 15305 System



4.2.3 Install Ground to 48 V

The ONS 15305 cabinet must always be tied to a suitable earth refernce potential as described in section 4.2.4 Install External Ground to the ONS 15305, page 4-4. The 48V power interface of ONS 15305 is galvanically insulated from the cabinet and the postive pole of the 48V supply (0 VDC) must always be connected to the same earth potential at the station battery, PDP side. See section "4.4.2 Install the ONS 15305 –48 VDC Power".The location of the power connector on the ONS 15305 is shown in Figure 4-2.

Figure 4-2 ONS 15305 - DC Power Module



4.2.4 Install External Ground to the ONS 15305

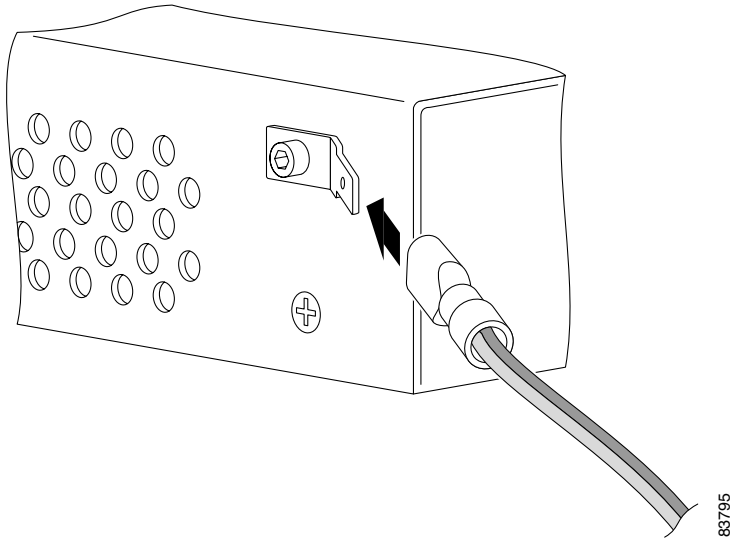
It is vital that the ONS 15305 cabinet is properly grounded.

When installed in a rack, the ONS 15305 cabinet will be tied to the rack reference potential through the mounting brackets (earth, ground potential).

Note Make sure that the ONS15305 brackets are mounted on unpainted rack area.

When not installed in a rack, the cabinet can be tied to an earth reference potential through the ground connector of the power supply plug as shown in Figure 4-2 on page 4-4 or by mounting an extra connector to one of the cabinet screws as in Figure 4-3 on page 4-4.

Figure 4-3 Ground Connector Position on the ONS 15305



Install the Ground Connector

Step 1 Remove the phillips screw from the ONS 15305, Figure 4-3.

Step 2 Affix the flat connector with the washer and the socket screw on the ONS 15305, Figure 4-3 .

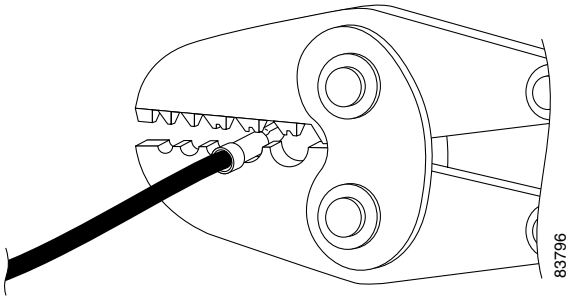
Step 3 Insert the grounding cable in the flat cable plug and crimp the plug with a crimping tool, Figure 4-4.

Step 4 Verify that the ground cable is affix in the flat cable plug.

Step 5 Connect the flat cable plug to the flat connector.

Step 6 Route the ground cable securely to the local ground connector and connect it according to local site practice.

Figure 4-4 Connection of the Ground Cable with a Crimp Tool



4.2.5 Power Considerations

The ONS 15305 can be powered using a Central Office power supply of –48 VDC with a VDC return. The ONS 15305 supports redundant 48 VDC power supplies but if used, the two supplies should be independently powered.

4.3 Fiber Cleaning

Cletop cleaning cassettes (type A for LC connectors) must be used to clean the fiber connectors and adapters before installing fiber. A video inspection instrument, with optical adapters for LC connectors is also required to inspect the fiber connectors and adapters before installing fiber.

Note Before powering the ONS 15305 clean and inspect the fiber, to prevent equipment damage. Dust particles and damaged fiber connectors will affect the optical transmission. Replace damaged fiber connectors immediately.

Warning **Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard.**

Warning **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.**

Warning **Class 1 laser product.**

Clean Fiber Connectors

Step 1 Remove the dust cap from the fiber connector.

Step 2 Inspect connector for damage or dirt with a proper inspection tool.

Step 3 Insert the connector into the Cletop cleaning cassette slot, rotate one quarter turn, and gently swipe downwards. Repeat the inspection and cleaning from the connectors, until satisfactory results are achieved.

Step 4 Insert the fiber connector into the applicable adapter.

Step 5 Place dust caps on the fiber connectors when not in use.

Clean Fiber Adapters

Step 1 Remove the dust plug from the fiber adapter.

Step 2 Inspect the connector for damage or dirt with a proper inspection tool.

Step 3 Insert a cleaning stick into the adapter opening.

Step 4 Inspect results and continue Step 3 until satisfactory results are achieved.

Step 5 Place dust plugs on the fiber adapters when not in use.

4.4 ONS 15305 Installation

Use the following procedures to install the ONS 15305 in an equipment rack, but verify first that at least 3 RU of rack space is available.

When installing the ONS 15305, you can also use the extension brackets, included in the ONS 15305 accessory kit, to convert a 485-mm (19-inch) rack to a 600-mm (23.6-inch) rack.

Note Make sure that the ONS15305 brackets are mounted on unpainted rack area.

Note 1 RU is 44.45 mm.

Caution Static electricity can damage electronic equipment. While unpacking and handling electronic modules, wear a grounding wrist strap to discharge the static buildup. Grounding wrist straps are designed to prevent equipment damage caused by static electricity. Before making the necessary interconnections, connect the grounding wrist strap.

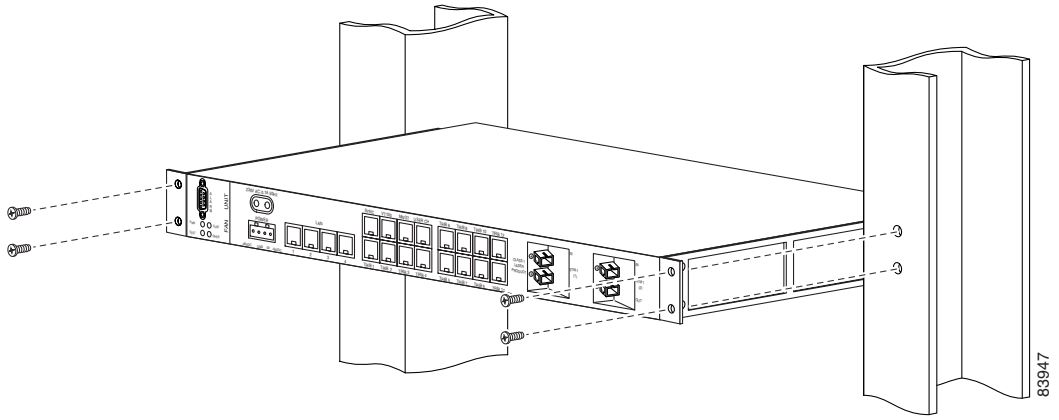
Mount the ONS 15305 in an Equipment Rack

Step 1 Remove the four phillips screws on the left and right side of the ONS 15305 and install the brackets with the longer phillips screws that are provided.

Step 2 Move the ONS 15305 to the desired rack position, Figure 4-5.

Step 3 Affix the ONS 15305 to the rack with four M6 (#12-24 x3/4 pan head phillips) screws and nuts.

Figure 4-5 The Connector Array in Front, in a 19-in. Rack



Mount the ONS 15305 in an Equipment Rack Using Extension Brackets

The ONS 15305 can be installed in a 600-mm (23.6-in.) rack using the extension brackets. You need two 1 RU extension brackets for this procedure.

Step 1 Remove the four phillips screws on the left and right side of the ONS 15305 and install the brackets with the longer phillips screws that are provided.

Step 2 Move the ONS 15305 to the desired rack position, Figure 4-5.

Step 3 Affix the ONS 15305 to the equipment rack with four M6 (#12-24x3/4 pan head phillips) screws and nuts.

4.4.1 Installation in Restricted Access Locations

The ONS 15305 can be installed in a restricted access location (RAL) or outside of an RAL.

4.4.1.1 Definitions

Restricted Access Location

A restricted access location is a site location for equipment where both of the following paragraphs apply:

- Access can only be gained by service persons or by users who have been trained on the restrictions and the precautions for this specific site.
- Access is by means of at least one of the following, special tool, lock and key, or other means of security.

SELV Circuits

Safety Extra-Low Voltage (SELV) circuits are ports that have maximum DC working voltage level less than 60 V (42.4 VAC). In addition, the ports must not be connected to telecommunication networks as defined in EN 60950 (see CEI/ IEC 60950-1 2001-10, standard clause 1.2.13.8).

In practice, the electrical cables must not exit the building. In addition, the electrical cables must be connect to equipment that meets one of the following requirements:

- Installed in the RAL.
- Does not have electrical cables that exit the building .
- Has a written consent (or in other evidence) that its connecting port towards the SELV circuit port is not a telecommunication network.

Telecommunication Network

A telecommunication network is a metallically terminated transmission medium intended for communication between equipment that might be located in separate buildings, excluding:

- Main system for supply, transmission and distribution of electrical power, if used as a telecommunication transmission medium
- Cable distribution system
- SELV circuits connecting units of information technology equipment

TNV Circuit

A TNV circuit in the equipment to which the accessible area of contact is limited. A TNV circuit is so designed and protected that, under normal operating conditions and single fault conditions (see CEI/IEC 60950-1 2001-10, standard clause 1.4.14), the voltages do not exceed specified limit values.

4.4.1.2 Installation in Restricted Access Location

After installation in a RAL, such as in a telecommunications center, the ONS 15305 must be properly installed in a rack with brackets or in other ways properly connected to a safety ground. The ONS 15305 48-VDC power must not be powered from a source external to the RAL. All communiction interfaces used must be limited to SELV.

4.4.1.3 Installation Outside of a Restricted Access Location

After installation in a non-RAL location, the ONS 15305 48-V power and all communication ports used must be connected to SELV circuits, for example, a port on a personal computer or 10/100-Mbit Ethernet hub/router or other information technology (IT) equipment. The 48-VDC power must not exceed 60 VDC, and must be powered from a certified external power supply unit (PSU) or a battery unit (with no connection to –48 V telecommunications voltage).

4.4.2 Install the ONS 15305 –48 VDC Power

The following procedure explains how to install ONS 15305 DC power connections.

Connect the ONS 15305 A-side and B-side Power Connections to the PDP

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuit.**

Warning **The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device.**

Caution Static electricity can damage electronic equipment. While unpacking and handling electronic modules, wear a grounding wrist strap to discharge the static buildup. Grounding wrist straps are designed to prevent equipment damage caused by static electricity. Before making the necessary interconnections, connect the grounding wrist strap.

Table 4-1 displays the colour of the wire with there function.

Table 4-1 Power Cable

Wire Color Coding	Wire Carrying
Brown	GND
Blue	–48 VDC
Black	–48 VDC
Green/yellow	OV

Step 1 Remove the A- and B-side fuses from the power distribution panel (PDP).

Step 2 Make sure that –48 VDC (tolerance –40,5 to –60 VDC) power is present.

Note Be sure that the power cable is connected and verify the correct polarity. Check if is properly fused (7-A recommended).

Note Note that the ONS 15305 power cannot be switched off with a separate power switch.

Step 3 Remove the A- and B-side fuses from the PDP.

Step 4 Connect the ONS 15305 power cable (with the ground) to the power connector of the connector array of the ONS 15305 as shown in Figure 4-2.

Step 5 Connect the first ONS 15305 –48 VDC power cable to the A-side of the PDP.

Step 6 Connect the first ONS 15305 0 VDC power cable to the A-side of the PDP

Step 7 Connect the second ONS 15305 –48 VDC power cable to the B-side of the PDP.

Step 8 Connect the second O NS 15305 0 VDC power cable to the B-side of the PDP

Note Make sure that positive pole of the power supply (0V pin) is connected to Central Office Ground

Note Be sure the poles are correct when you connect the power cable.

Step 9 Reinsert the A-side and B-side PDP fuses.

Step 10 Verify that the A- and B-side –48 VDC and –48 VDC return (0 VDC) of the ONS 15305 are connected to the proper poles at the power source. The –48 VDC return must be connected to ground the PDP on both the A and B sides.

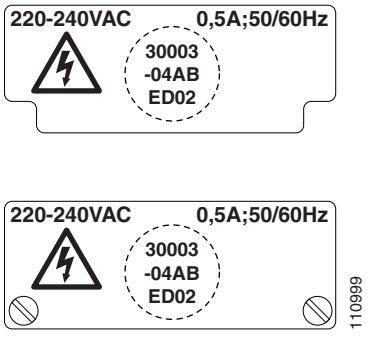
Step 11 Verify that the incoming power is within the range of –40.5 VDC to –60 VDC before applying power.

Note The power supply has been connected correctly when the green LED is lit.

4.4.3 Install the ONS 15305 –AC 230V Power

The following procedure explains how to install ONS 15305 AC power connections.

Figure 4-6 AC 230VModule



Warning **Please follow the safety precautions below when installing or removing the AC- 230V module !**

Warning **Before performing any of the following procedures, ensure that power is removed from the AC circuit.**

Warning **The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device.**

Caution Static electricity can damage electronic equipment. While unpacking and handling electronic modules, wear a grounding wrist strap to discharge the static buildup. Grounding wrist straps are designed to prevent equipment damage caused by static electricity. Before making the necessary interconnections, connect the grounding wrist strap.

4.4.3.1 AC 230V Module Not Installed in ONS15305

Warning **If the AC Power 230 module is not installed in ONS15305, do not connect the the power cable to mains. This will cause condensators inside the module to charge. Even if the power cable is removed from an un-installed module, the discharge time will be long. Thus, touching the module will cause a hazardous discharge.**

4.4.3.2 Power On

Warning **Insert the AC 230V module into ONS15305 before connecting the power cable to mains.**

Step 1 Insert the AC 230V module into the ONS15305 device.

Step 2 Connect the AC power cable to mains.

4.4.3.3 Power Off

Warning **Do not remove the AC 230V module when the module is connected to mains. Make sure that the power cable is disconnected before removing the module.**

Caution To avoid hazardous discharge, please wait some minutes before removing the module.

Step 1 Remove the power cable from the mains.

Step 2 Please wait some minutes before removing the module, to avoid hazardous discharge

Step 3 Remove the AC 230V module if necessary.

4.5 Installation of Service Modules

This chapter describes installation procedures that are common and independent of Service module type.

For details on each Service modules see separate chapters. Interconnections and cabling are descibed in 4.6 Interconnections and Cable Handling, page 4-14.

It is possible to freely mix the four interface modules. There are no fixed positions for specific modules.

Note Note!Due to a heat/power dissipation related to the S1.1-8-LC module, there will be a limitation of only two modules per ONS 15305 chassis. This is only related to this module.

Insertion or withdrawal of new modules does not affect the other modules. No manual configuration is needed, if a module is replaced with a module of the same type.

It is possible to protect a module by adding a redundant module in the chassis.

All modules store inventory data in non-volatile memory. The inventory data is accessible from the system controller and the management system.

All modules contain a LED that indicates the status of the module. The LED is green when the module is active. The LED is red if the module is failed. The LED is extinguished when the module is deactivated.

All modules supports hot insertion and removal. When a module shall be replaced the switch must be activated and the user must wait for the LED to extinguish before the module is removed. It is also possible to deactivate the module from the CiscoEdgeCraft terminal. A special tool, the Card Extraction Tool is needed to activate this switch.

The following Service modules are described in separate chapters:

- Octal optical S-1.1 module (S1.1-8-LC)
- Dual optical S-4.1 module (S4.1-2-LC)
- Single optical S-16.1 module (S16.1-1-LC)
- Dual optical LAN 1000Base-LX module (GigE-2-LC)
- Octal LAN 10/100Base-TX module (E100-8)
- Octal E1 tributary module (E1-8)
- Hex E3/T3 tributary module (6xE3/T3-1.0/2.3)
- High density 63xE1 module (E1-63)
- Dual optical S-1.1 module (S1.1-2-LC)
- Single optical L-16.1 module (L16.2-1-LC) (Long Haul)
- Dual optical L4.2 module (L4.2-2-LC) (Long Haul)
- Dual optical + 21xE1 module (S1.1-2-LC/E1-21)

4.5.1 LEDs

There is one status LED indicator on the front of a Service module. The following indications can be given:

Red
Module-fail. Faulty module. Module can be removed.Red indication is also given during power-up or re-booting of SYSCONT.

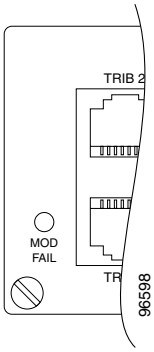
Green

Module In-Service.

Extinguished

Indicates that the module is Out-of-Service. Module can be removed.

Figure 4-7 Location of LED for Module Failure



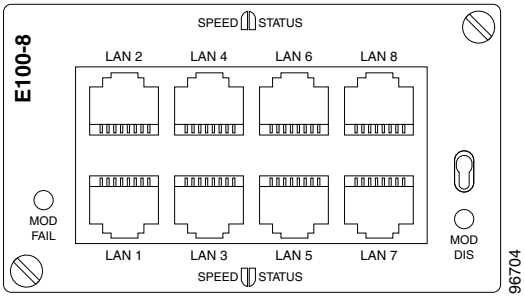
A module is taken Out-of-Service by an operator shutdown-command or by activation of the shutdown button (see 1.6.3)

Note Flashing green LED on Ethernet related modules during shutdown

4.5.2 Hot Insertion and Removal

The ONS15305 service modules support hot insertion and removal. Each module contains a switch that is activated when the module is removed. A special tool, the Card Extraction Tool, must be used to activate the switch.

Figure 4-8 Switch to be Activated When the Module is Removed



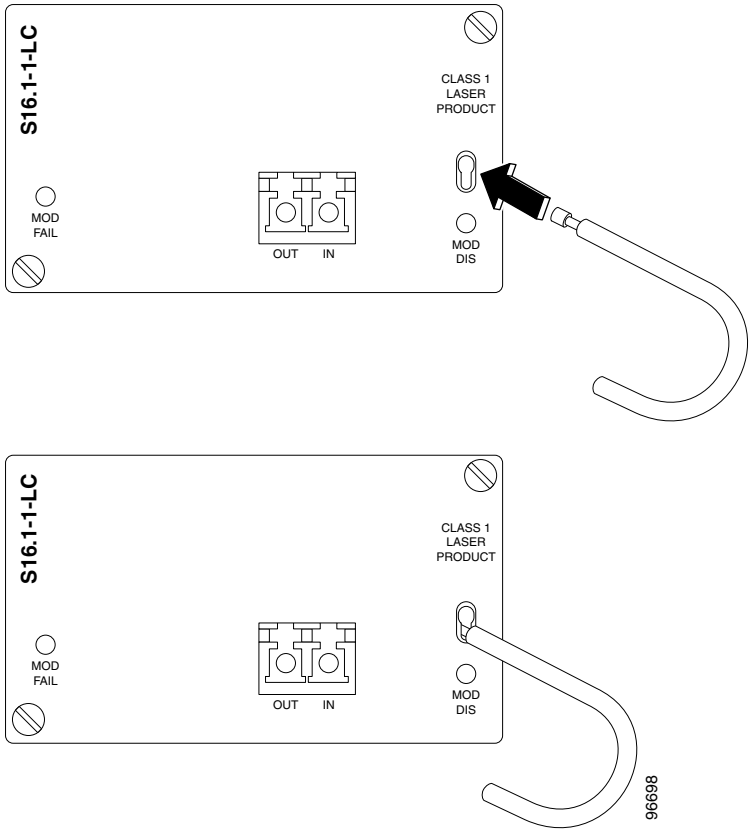
When the module is replaced the switch must be activated and then the MOD FAIL LED must be extinguished before the module is removed.

Caution When activating the switch, ensure that is not pressed to far in.

It is also possible to deactivate the module from the craft terminal, CiscoEdgeCraft.

When the switch is activated, the module is disabled in SW, and the MOD FAIL LED is switched off (for modules carrying IP, the LED blinks during SW cleanup, and extinguishes afterwards).The module can now be removed. See Figure 4-9 on page 4-14.

Figure 4-9 Card Extraction Tool



4.6 Interconnections and Cable Handling

4.6.1 Install the ONS 15305 Fiber Cable

Caution Static electricity can damage electronic equipment. While unpacking and handling electronic modules, wear a grounding wrist strap to discharge the static buildup. Grounding wrist straps are designed to prevent equipment damage caused by static electricity. Before making the necessary interconnections, connect the grounding wrist strap.

To install fiber-optic cables in the ONS 15305, connect a fiber cable with LC connector type to the transmit and receive ports of the transmission system. On a the ONS 15305 module, the transmit and receive ports are located at the connector array of the unit. The receive port is named IN and the transmit port is named OUT.

Cisco recommends that you label the transmit and receive fiber (before installation) to and from the optical transmission system at each end of the fiber span to avoid confusion with cables that are similar in appearance.

Warning **Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard.**

Warning **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.**

Warning **Class 1 laser product.**

Connect the Fiber Cable

Step 1 Remove the dust plugs from the LC (STM-1) connectors.

Step 2 Clean and inspect the LC jumper cable connectors.

Step 3 Connect the LC module input and output to the fiber termination rack.

Step 4 Repeat Step 1 to Step 3 for protection if applicable.

Step 5 Guide the fiber through the cable ties mounted on the sides of the rack. The cable ties affix the fiber to the side of the rack to reduce the risk of fiber pinching.

4.6.2 Install the ONS 15305 Electrical Cable

Caution Static electricity can damage electronic equipment. While unpacking and handling electronic modules, wear a grounding wrist strap to discharge the static buildup. Grounding wrist straps are designed to prevent equipment damage caused by static electricity. Before making the necessary interconnections, connect the grounding wrist strap.

To install electrical connection cables in the ONS 15305, connect the electrical cable with the corresponding ports of the transmission system. On the ONS 15305 module, the electrical ports are located at the connector array of the system. All electrical cables are equipped with RJ-45 connectors. The alarm cable is equipped with a DS-9 connector. Cisco recommends that you label the electrical cable at each end before installation to avoid confusion with cables that are similar in appearance.

Caution Follow all directions and warning labels when working with electrical cables.

Connect the Electrical Cables

Step 1 Carefully connect the electrical cables to the customer specified point.

Step 2 Repeat Step 1 to for all other electrical cables.

Step 3 Guide the cables through the cable ties mounted on the sides of the rack. The cable ties are used to hold the cables to the side of the rack to reduce the risk of fiber pinching.

4.7 Initial Configuration

Both initial and further configuration steps are described in the Cisco Edge Craft User Guide. Please see Chapter 1 of this guide for instructions on how to set up the necessary communication parameters enabeling access to the element through Cisco Edge Craft over the management port. All other management features for the Cisco ONS 15305 are also described in the Cisco Edge Craft User Guide.

Features

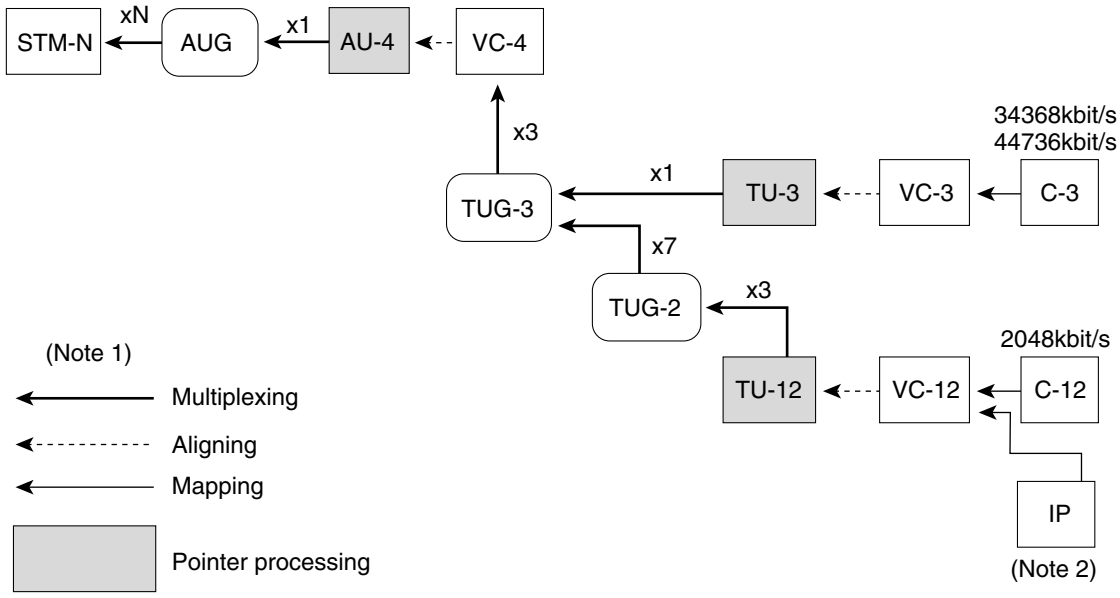
This chapter provides an overview of the features of the Cisco ONS15305.

5.1 SDH Features

5.1.1 Multiplexing Structure and Mapping Modes

The ONS 15305 supports the multiplexing structure given in figure below. This is a subset of the possible multiplexing structures defined in ITU-T G.707 clause 6, according to ETS300147 The multiplexing is done in accordance with ITU-T G.707 clause 7.

Figure 5-1 Multiplexing Mapping Structure



Note 2: This is a proprietary mapping scheme for mapping of IP traffic into a number of VC-12 containers.

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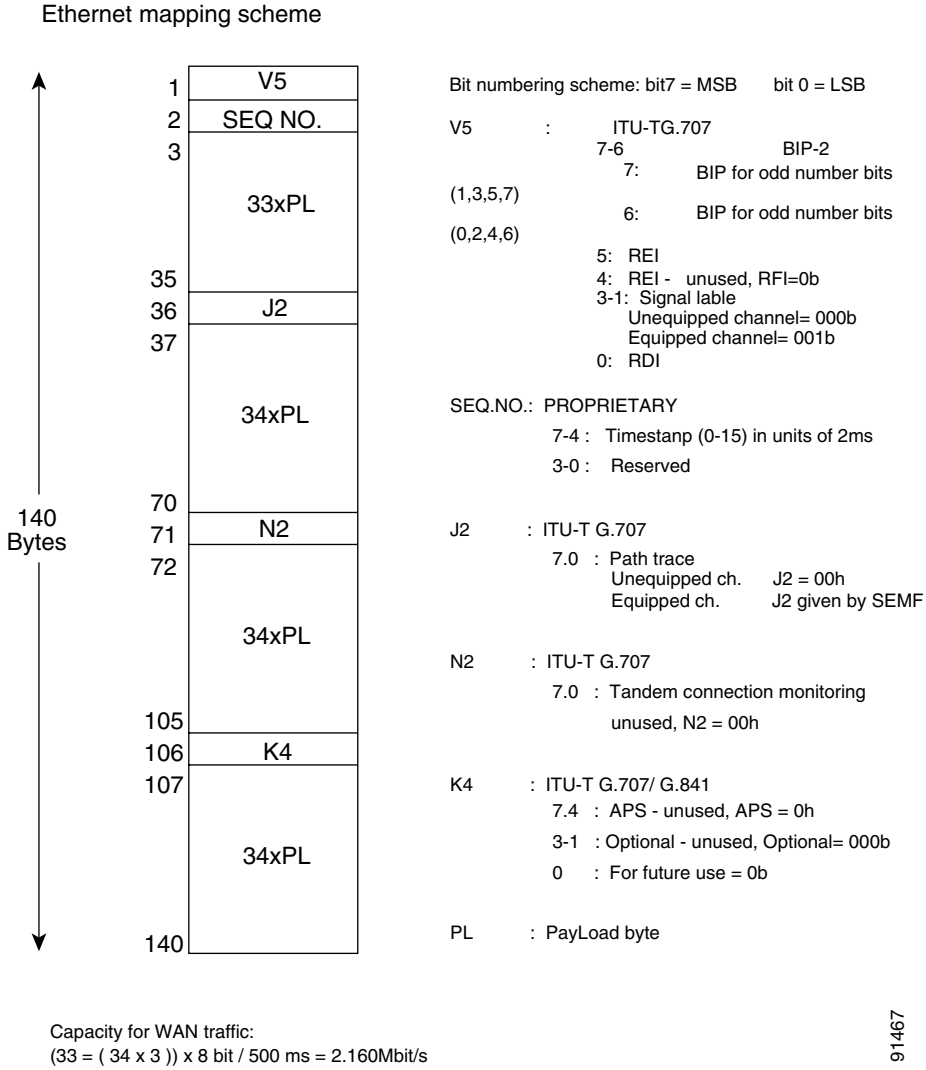
The ONS 15305 support asynchronous mapping of E3 (34 368 kbit/s) signals and T3 (44 736kbit/s) signals into a VC-3 according to ITU-T G.707 clause 10.1.2, and asynchronous mapping of E1 (2 048kbit/s) signals into a VC-12 according to ITU-T G.707 clause 10.1.4.1.

The ONS 15305 also provides a mapping scheme for transporting Ethernet traffic in a number of VC-12s. The mapping is performed in a round-robin fashion with an inverse multiplexer function. The mapping between Ethernet and SDH is performed in WAN ports that are located on the 8xSTM-1 module.

The proprietary mapping scheme used is described in Figure 5-1. It's only the mapping that is proprietary; all POH in the VC-12 is according to ITU-T G.707.

Figure 5-2 Ethernet Mapping Scheme



The total bandwidth for one WAN channel cannot be greater than 100 Mbit/s or 50xVC-12 containers, though the proprietary VC-12 mapping scheme for Ethernet, take advantage of 2,16 MBit/s in each VC-12, which means that 47xVC-12 are sufficient to transport 100MBit/sEhernet. The VC-12 k.l.m reference assignment for the Ethernet WAN port is fully flexible, and controlled in the same way as a VC-12 cross connect. The only thing, which is required and must be obtained is the order of VC's carrying Ethernet traffic between two WAN-ports.

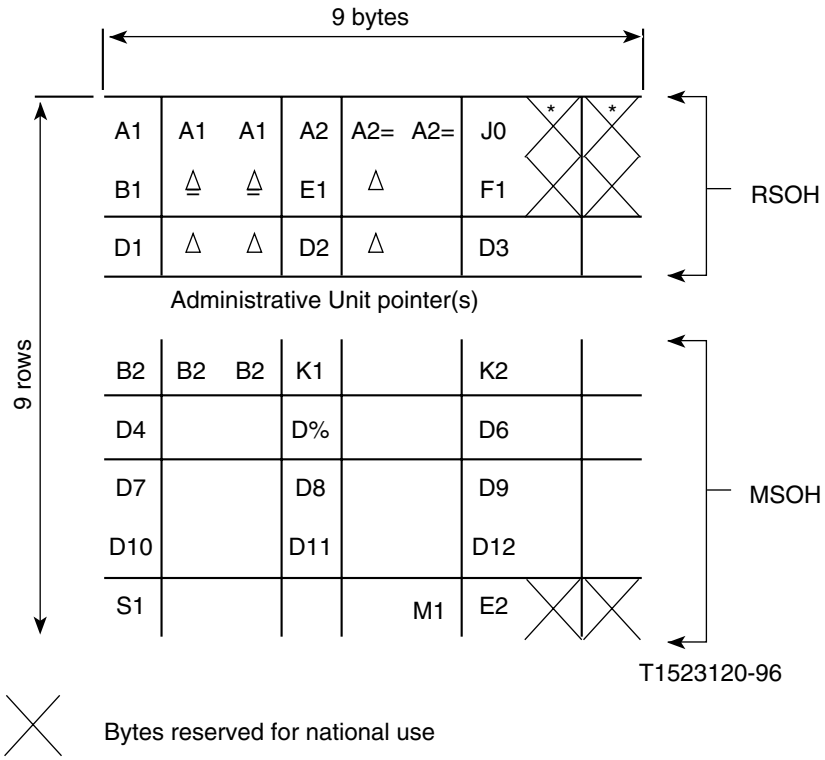
5.1.2 SOH and POH Termination

5.1.2.1 RSOH and MSOH

The ONS 15305 terminates and generates a subset of the SOH-overhead specified in ITU-T G.707 clause 9.

The SOH for an STM-1 is reproduced in the figure below.

Figure 5-3 SDH Overhead Bytes



The ONS 15305 generates and terminates the following bytes:

Table 5-1 Bytes that are Generated by the ONS 15305

Bytes	Explanation
A1, A2	Frame sync word, according to ITU-T G.707
J0	It is possible to edit both the transmitted, received and expected value of the J0 byte from the NM system.
B1	According to ITU-T G.707, shall be available as an error performance counter at the NM level.
E1	Is terminated/generated According to ITU-T G.707 and available on an output port upon request from the NM level.
F1	Is terminated/generated According to ITU-T G.707 and available on an output port upon request from the NM level.
D1-D3	Is terminated/generated According to ITU-T G.707.
B2	According to ITU-T G.707, shall be available as an error performance counter at the NM level.
K1,K2(b1-b5)	Terminated/generated according to the MSP protocol defined in ITU-T G.841. The protocol used is the one defined in clause 7.1.4.5.1, 1+1 bi-directional switching compatible with 1:n bi-directional switching.
K2(b6-b8)	Terminated/generated according to ITU-T G.707 clause 9.
D4-D12	Is terminated/generated According to ITU-T G.707.
S1	Terminated/generated according to ITU-T G.707 clause 9
M1	Terminated/generated according to ITU-T G.707 clause 9.
E2	Is terminated/generated According to ITU-T G.707 and available on an output port upon request from the NM level.
POH VC-4/VC-3 and VC-12 level	The ONS 15305 offers termination/generation of a subset of the POH bytes defined in ITU-T G.707 clause 9. The ONS 15305 terminates/generates the following POH bytes at VC-4/VC-3 level:

Table 5-1 Bytes that are Generated by the ONS 15305

Bytes	Explanation
J1	A 16 byte frame is defined for the transmission of the Path Access Point Identifier. The format of the frame is in accordance with ITU-T G.831 clause 3 and ITU-T G.707 clause 9. It is possible to edit both the transmitted, received and expected value of the J1 byte from the NM system.
B3	According to ITU-T G.707, shall be available as an error performance counter at the NM level.
C2	Terminated/generated according to ITU-T G.707 clause 9.
G1:	Terminated/generated according to ITU-T G.707 clause 9.
F2/F3	Not used.
H4	Payload dependent, terminated/generated according to ITU-T G.707.
K3	Not used
N1	Not used
The ONS 15305 terminates/generates the following POH bytes at VC-12 level:	
V5	Terminated/generated according to ITU-T G.707 clause 9.
J2	A 16 byte frame is defined for the transmission of the Path Access Point Identifier. The format of the frame is in accordance with ITU-T G.831 clause 3 and ITU-T G.707 clause 9. It is possible to edit both the transmitted, received and expected value of the J2 byte from the NM system.
N2	Not used.
K4	Not used.

5.1.3 Cross-Connect

The ONS 15305 implements a full non-blocking 64x64 STM1 cross connect with VC12, VC-3 and VC-4 granularity.

The cross-connect supports bi-directional cross-connections on all levels.

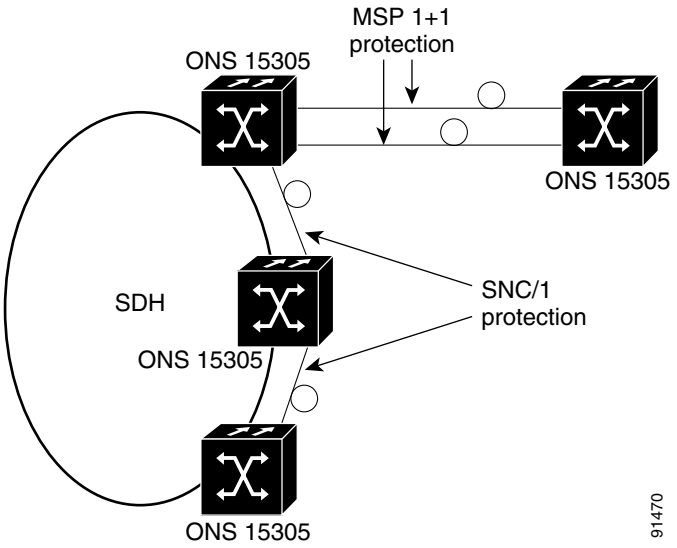
5.1.4 Protection

5.1.4.1 1+1 linear MSP

The ONS 15305 offers 1+1 linear Multiplex Section Protection (MSP). The protocol used for K1 and K2 (b1-b5) is defined in ITU-T G.841, clause 7.1.4.5.1. The protocol used is 1+1 bi-directional switching compatible with 1:n bi-directional switching.

The MSP protection is not linked to a pair of ports on the same module, ports on module 1 and 2 can protect each other and ports on module 3 and 4 can protect each other as long as they are of the same type.

Figure 5-4 Protection Scheme for the ONS 15305



5.1.4.2 SNC/I

The ONS 15305 also support SNC/I, (Sub Network Connection protection with Inherent monitoring) on both LO and HO VC's. The Application architecture supported is 1+1 unidirectional switching according to ITU-T G.841 clause 8.3.2.

Note This protection scheme is called SNCP by ETSI.

5.1.5 Performance Monitoring

The ONS 15305 offers full G.826/G.829 performance monitoring on all levels in the SDH hierarchy, including B1 monitoring in RSOH, B2 near and far end in MSOH, B3 near and far end at VC-4/VC-3 level and BIP-2 near and far end at VC-12 level.

The ONS 15305 calculates excessive error and degrade signal defects assuming Poisson distribution of errors, according to ITU-T G.826.

The excessive error defect (dEXC) is be detected if the equivalent BER exceeds a pre-set threshold of 10E-5, and is cleared if the equivalent BER is better than 10E-6, according to ITU-T G.806.

The degraded signal defect (dDEG) is detected if the equivalent BER exceeds a pre-set threshold of 10E-X, where x=6,7,8 or 9. The dDEG is cleared if the equivalent BER is better than 10E-(X+1), according to ITU-T G.806.The threshold is individual configurable for the different levels in the SDH hierarchy, from 10E-6 to 10E-9.

5.1.6 Synchronization

The ONS 15305 offers synchronization from a range of different interfaces:

- STM-16
- STM-4
- STM-1
- 2MHz sync input
- E1 interface configured in PRA mode

The synchronization is G.781 compliant.

Through the SETS (Synchronous Equipment Timing Source), the synchronization signals are distributed to the equipment ports.

The ONS 15305 offers a list of 5 possible synchronization sources for the T0, selection of the sync source is based upon the quality level.

The ONS 15305 supports SSM messaging on the STM-N interfaces, this is not supported on the E1 interface.

5.2 IP Features

ONS15305 supports a transparent multi-port remote Ethernet bridge as specified in IEEE 802.3. The number of interfaces is dependent of the inserted modules. The plug-in modules support 10Base-T over copper, 100Base-TX (fast Ethernet (FE)) over copper, gigabit Ethernet (GE) over fibre and a proprietary STM-1 interface for connection to the ONS15302 product.

The bridge supports the following features:

- MAC switching
- Static MAC entries
- Support of up to 32k MAC addresses
- Automatic Learning & Ageing for MAC addresses
- Auto negotiation (speed/duplex)
- Fixed Ethernet Port settings i.e. 10/100/1000 half/full duplex
- Auto MDI/MDIX, Ethernet FE/GE interfaces
- MAC Multicast
- Transparent Bridging
- Port-based Virtual LANs (VLANs)
- VLAN by Port and VLAN by Port and Protocol

- Full IEEE 802.1Q VLAN tagging compliance
- Head of Line Blocking prevention
- Back pressure and flow control Handling
- IGMP snooping
- Spanning Tree Protocol (STP) per device
- Rapid reconfiguration of edge LANs in spanning trees
- STP per VLAN
- Mirroring Port
- IEEE 802.1p priorities (Strict Policy, 4 queues)
- GARP VLAN registration protocol (GVRP)
- MTU Size 6144 bytes

The filtering rate of the bridge is able to operate at full wire speed. For FE-modules the maximum pps is 148 kpps for 64 byte packet size. The forwarding rate on GE connections will be limited in case of just small packets. For GE this pps is 70% of wirespeed on small packet sizes. I.e. 1015 k at 64 bytes packet size wirespeed from 100 bytes packets 1008 k pps.

BootP is used to get one IP address for the ONS 15305 under the installation process.

5.2.1 VLAN acc. to IEEE802.1Q

By default SW configuration, the ONS15305 support 802.1Q and can handle up to 4000 VLAN simultaneously. The VLAN id range available in this case are 1-4000.

If you need to activate STP per VLAN acc. to an early draft of IEEE802.1s, the maximum VLAN's are 200. The VLAN id range availability persists i.e. 1-4000.

If you need to enable multicast configuration (and IGMPsnooping) on the device the maximum number of potential VLAN's must be reduced to a number lower than 4000. Each multicast group entry reduce the maximum number of VLAN's by one (1).

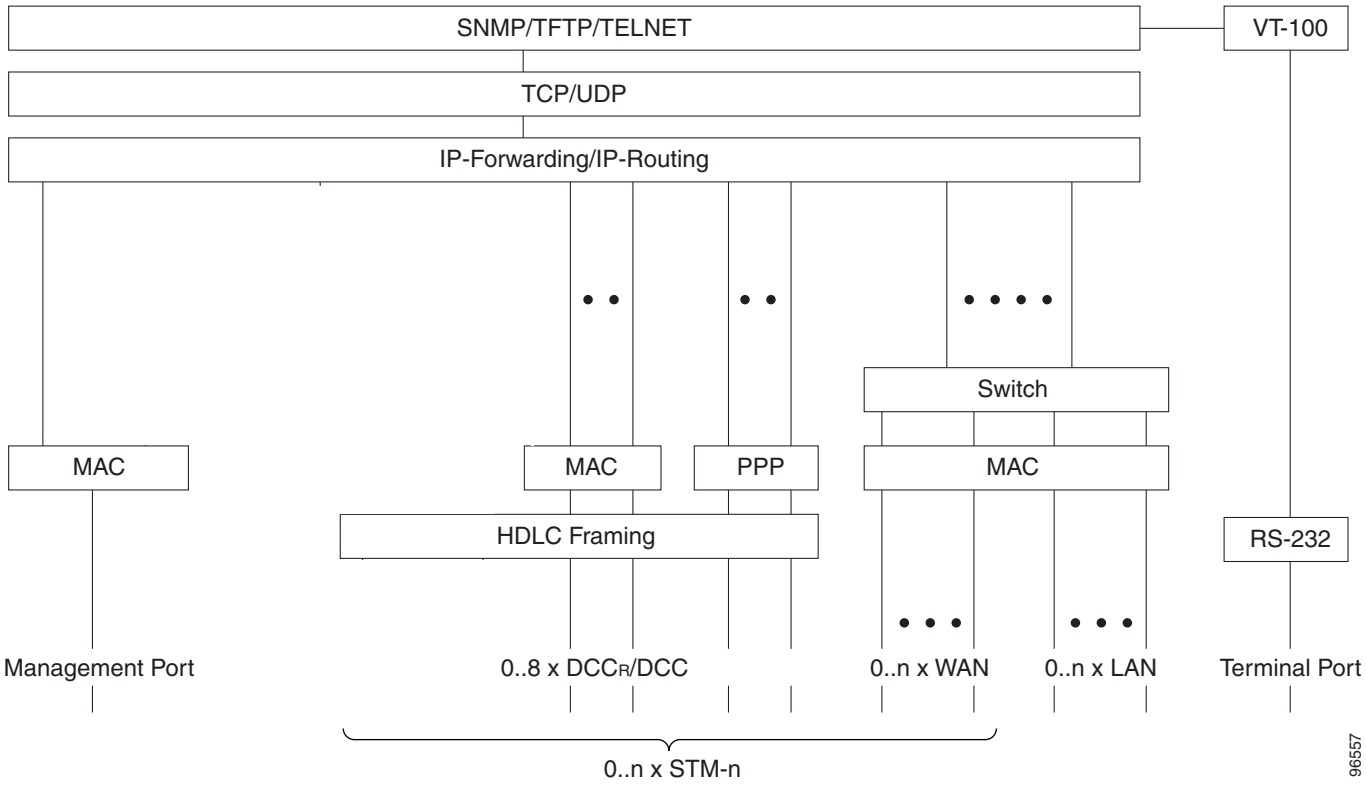
Note Enabling the multicast configuration feature, will also disable part of the VLAN ingress filtering mechanisms. The consequence of this is that frames can be inserted into a neighbouring VLAN by spoofing the VLAN tag of the said frame. However, correctly tagged frames will NOT leak to the other VLANs.

5.3 DCN Features

This chapter presents the ONS 15305 protocol stack, interfaces, communication functions used for management communications.

5.3.1 Protocol Stack

Figure 5-5 DCN Protocols



The following standards apply:

Table 5-2 Protocol Standards

Abbreviation	Standard
Switch	IEEE 802.1d - Media Access Control Bridges, 1998 Edition Revision (incorporating IEEE 802.1p). The requirements in chapter 2.2.3 apply.
MAC / LLC	IEEE 802.x - Information Processing Systems - Local Area Networks
PPP	RFC 1661 Point to Point ProtocolNSIF-DN-0101-001
HDLC	ISO 4335 - High-level Data Link Control (HDLC) proceduresRFC 1662 PPP in HDLC-like framing.
IP	RFC 791 - Internetwork Protocol
RS-232	EIA-232
TCP	RFC 793 - Transmission Control Protocol (TCP)
UDP	RFC 768 - User Datagram Protocol (UDP)

5.3.2 Management Interfaces

The purpose of the Management DCN is to carry management traffic between a management system and the managed devices. The management traffic pertinent to the ONS 15305 is IP carrying SNMP, TELNET and TFTP application protocols. In order to support management connectivity in any possible topology and application, the ONS 15305 supports management traffic on the following interfaces:

5.3.2.1 Management Port

The ONS 15305 has a dedicated Ethernet port for management, called the "Management Port". This port can be used for local management, e.g. connecting a craft terminal. It can also be used for connecting to a separate external management network. The management port can be turned off to avoid unauthorized local access. The management port cannot be member of a VLAN.

5.3.2.2 LAN Ports

The LAN ports are Ethernet ports used for connecting end customer IP traffic to the ONS 15305. The LAN ports can be members of VLANs which may or may not have an IP address, or they can have their own IP address. A LAN port can be used for carrying management traffic to/from the box, provided that it (or the VLAN it is member of) is assigned to an IP address. This is called IP-Inband, i.e. some of the end-user IP bandwidth is used for management traffic.

5.3.2.3 WAN Ports

The WAN ports are device internal Ethernet ports that can be mapped into one or more VC-12s of a SDH STM-n signal. The WAN ports can be members of VLANs which may or may not have an IP address, or they can have their own IP address. A WAN port can be used for carrying management traffic to/from the box, provided that it (or the VLAN it is member of) is assigned to an IP address. This is called IP-Inband, i.e. some of the end-user IP bandwidth is used for management traffic.

5.3.2.4 SDH Ports

The SDH architecture defines data communication channels (DCC) for transport of management traffic in the regenerator section (DCC_R - 192 kbit/s) and in the multiplexer section (DCC_M - 512 kbit/s).

The ONS 15305 supports the NSIF-DN-0101-001-R1 Draft Specification which defines IP in PPP over DCC.

The ONS 15305 also offers non-standard DCC communication that can be used in subnets of Cisco devices only. Ethernet frames are encapsulated in HDLC-like frames and sent on the DCC channel (i.e. not using CLNP and LAP-D). Both DCC_R (Regenerator Section) and DCC_M (Multiplexer Section) channels are supported.

Both DCC channels may be enabled on a port at a time. Activation/deactivation of DCC channels is configurable on a per port basis. The upper limit for simultaneously utilisation of DCC on the ONS15305 is:

- $4xDCC_M$ and $8xDCC_R$ channels in each slot

5.3.2.5 Local VT-100Serial Port

CLI for basic set-up of the ONS 15305. Can also be accessed through TELNET.

5.3.3 Communication Features

5.3.3.1 IP-Forwarding

The IP-Forwarding implies that the device can have multiple IP interfaces, i.e. it can be a multi-homed IP host. In addition it is able to perform forwarding of IP datagrams between the interfaces, and the routing protocols (RIP, OSPF) are available. IP-Forwarding is intended for management traffic only.

5.3.3.2 SW based IP Routing

Forwarding of IP datagrams to/from the Management Port and DCC interfaces are software based.The routing is performed by the CPU and mainly intended for management purpose.

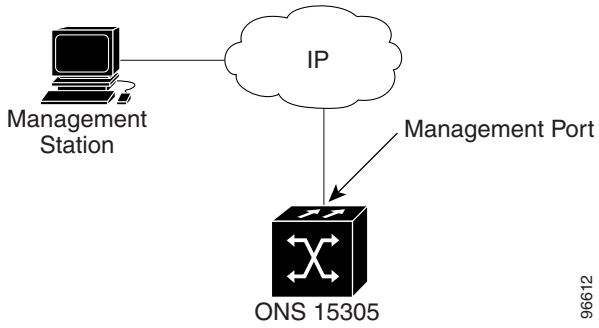
The the following features are supported:

- Address Resolution Protocol (ARP)
- ARP proxy
- Internet control message protocol (ICMP) Messages
- Static IP routes
- Routing information protocol (RIP) versions I and II
- RIP subnet filtering
- Open shortest path first (OSPF) version 2

5.3.3.3 External DCN

This configuration is applicable for users connecting an IP based DCN directly to the ONS 15305 or for connecting a craft terminal. For this type of connection, the management port is used. The configuration is described Figure 5-6.

Figure 5-6 Network Configuration

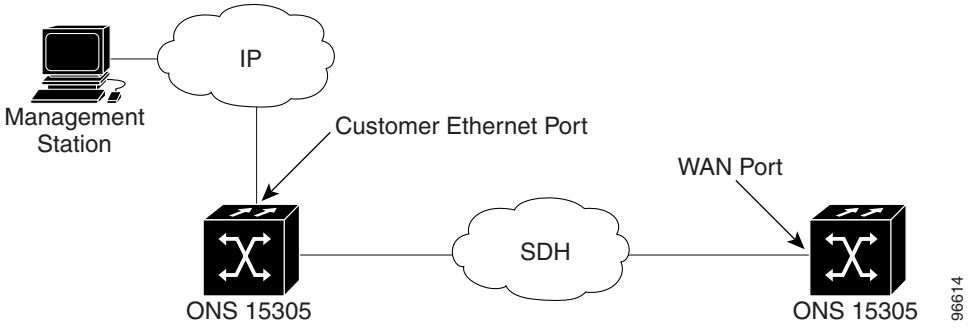


5.3.3.4 IP-Inband

IP-Inband means that LAN and WAN ports are carrying management traffic together with customer traffic. The configuration is described in Figure 5-7.

When using IP-Inband, the management traffic can be routed or switched (using VLANs). If routed, the routing is carried out in hardware (FFT) if IP-Routing is enabled. Otherwise, IP-Forwarding is used, i.e. software based .

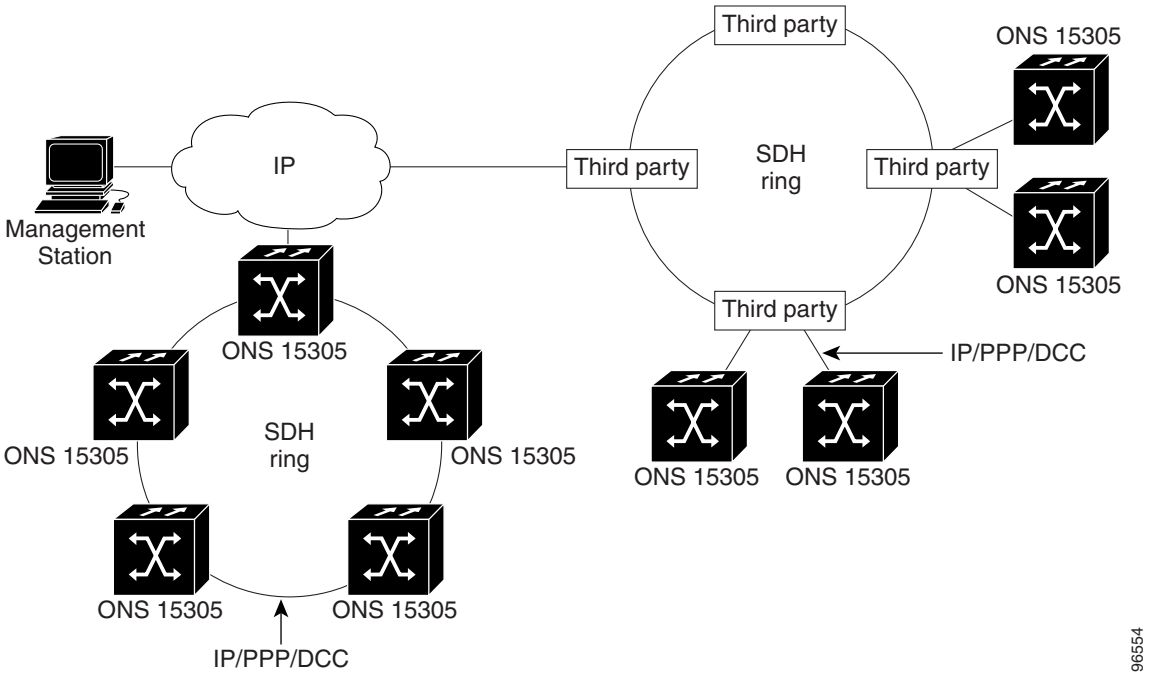
Figure 5-7 Network Configuration



5.3.3.5 IP/PPP

IP/PPP means IP carried in PPP on the SDH DCC channel according to NSIF-DN-0101-001. Typical configurations are described by Figure 5-8 When MSP is enabled, the management traffic over DCC follows the user traffic, i.e. traffic is sent over both link (working and protecting), but received only from the active link.

Figure 5-8 Network Configuration

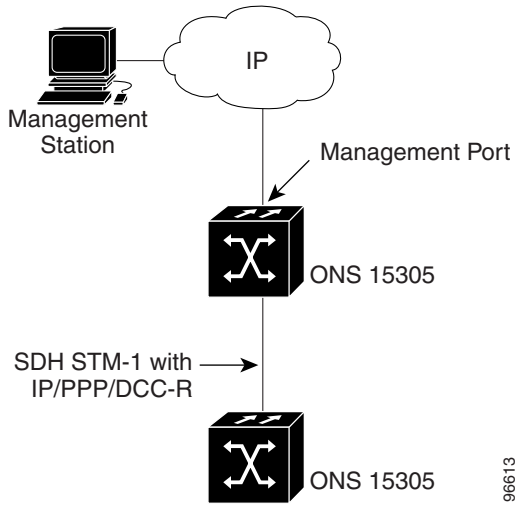


5.3.3.6 IP/DCC

IP/DCC is a non-standard mechanism used for conveying management information on the SDH DCC channels in a network of Cisco devices only. This mechanism can be used together with the IP/DCC-Broadcast mechanism of other Cisco devices emulating a shared media on the SDH DCC channel. The IP datagrams are encapsulated in HDLC frames before sent out on the SDH DCC.

This configuration is applicable for a user having a subnet of Cisco devices (with the ONS 15305 in the center) and an IP based DCN connected to the ONS 15305 (e.g. the management port). The configuration is described Figure 5-9.

Figure 5-9 Network Configuration



5.3.4 Management Security

The following security features applies to management communications:

5.3.4.1 CLI Access Control

- Locally through VT100; User name and Password mechanisms.
- Remotely Telnet; Telnet password and aditionally same mechanism as through VT100.

5.3.4.2 SNMPv1 Access Control

For each user (SNMP Community), the following can be configured:

- Read , Read/Write or Super access. With Super access rights you will be allowed to configure Community table.
- From which managers, in terms of IP address, SNMP requests are accepted.

5.3.4.3 Management Port Control

The Management Port can be enabled/disabled. This gives the operator control of the local access.

5.4 Alarm Definitions

The following subsections (heading relate to the managed object type) present alarms and events listed with Alarm ID, default severity and description

Note All alarm IDs with higher severity than “Warning”,except “info” which is an event, are on-off alarms. Also “alarmInp (has default severity “Warning”) is an on-off alarm.

5.4.1 Device

Table 5-3 Device Alarms

Alarm Id	Default Severity	Description
ufail	Critical	Device main unit failure
temp	Major	High temperature alarm
t0HoldOver	Major	T0 in holdover mode
t0Defect	Critical	T0 SETG defect
t0SyncSwitch	Warning	T0 sync switchover
t0QlFailed	Warning	T0 sync candidate in fail
t0QlDnu	Warning	T0 sync candidate received DNU
t4Squelch	Critical	T4 output squelched
inletFail	Critical	DXC inlet failure
inletBitError	Critical	DXC inlet bit error
info	Critical	
rxOverflowHWFault	Warning	RX buffer overflow on LAN interface
txOverflowHWFault	Warning	Interport queue overflow on LAN interface
routeTableOverflow	Warning	Routing table overflow
resetRequired	Warning	Reset required
endTftp	Warning	TFTP session completed
abortTftp	Warning	TFTP session aborted
startTftp	Warning	TFTP session initiated
faultBackUp	Warning	Automatic switchover to backup link
mainLinkUp	Warning	Communication returned to main link
ipxRipTblOverflow	Warning	OpenGate IPX RIP table overflow
ipxSapTblOverflow	Warning	OpenGate IPX SAP table overflow
facsAccessVoilation	Warning	FACS blockAndReport statement forwarded to interface
autoConfigurationCompleted	Warning	Autoconfiguration completed successfully

Table 5-3 Device Alarms

Alarm Id	Default Severity	Description
forwardingTabOverflow	Warning	Layer II Forward Table overflow
framRelaySwitchConnectionUp	Warning	Connection established between Frame Relay Switch and WanGate
framRelaySwitchConnectionDown	Warning	Connection failure between Frame Relay Switch and WanGate
errorsDuringInit	Warning	Error during initialisation
vlanDynPortAdded	Warning	Dynamic VLAN port added
vlanDynPortRemoved	Warning	Dynamic VLAN port removed
rsSDclientsTableOverflow	Warning	Client table overflow
rsSDinactiveServer	Warning	Server not responding
rsIpZhrConnectionsTableOverflow	Warning	Zero Hop Routing Table overflow
rsIpZhrReqStaticConnNotAccepted	Warning	Static connection rejected, no virtual IP address
rsIpZhrVirtualIpAsSource	Warning	Virtual IP address appeared as source IP
rsIpZhrNotAllocVirtualIp	Warning	Virtual IP not allocated for source
rsSnmpSetRequestInSpecialCfgState	Warning	SET request rejected during reconfiguration
rsPingCompletion	Warning	Ping sequence completed
pppSecurityViolation	Warning	PPP security violation
frDLCIStatudChange	Warning	FR DLCI status change
papFailedCommunication	Warning	PAP failed communication
chapFailedCommunication	Warning	CHAP failed communication
rsWSDRedundancySwitch	Warning	Redundancy switchover
rsDhcpAllocationFailure	Warning	DHCP IP address allocation failed
rlIgmpTableOverflow	Warning	IGMP table overflow
rlPimTableOverflow	Warning	PIM table overflow
rlIpFftStnOverflow	Warning	IP SFFT overflow
rlIpFftSubOverflow	Warning	IP NFFT overflow
rlIpxFftStnOverflow	Warning	IPX SFFT overflow
rlIpxFftSubOverflow	Warning	IPX NFFT overflow
rlIpmFftOverflow	Warning	IPM FFT overflow
rlPhysicalDescriptionChanged	Warning	Physical description of device has changed
rlPolicyDropPacketTrap	Warning	Packet is dropped due to qos policy
rlPolicyForwardPacketTrap	Warning	Packet is forwarded based on qos policy

5.4.2 SDH

Table 5-4 SDH Alarms

Alarm Id	Default Severity	Description
SDH Port		
los	Critical	Loss Of Signal
RS		
lof	Critical	Loss Of Frame
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
tim	Critical	Trace Identifier Mismatch
csf	Minor	Communication Signal Fail
MS		
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
csf	Minor	Communication Signal Fail
ais	Minor	Alarm Indication Signal
rdi	Minor	Remote Defect Indication
msp	Critical	MSP signalling problem
switchToProt	Warning	MSP switched to protection
switchToWork	Warning	MSP switched to working
mspComTimeOut	Warning	MSP command timed out, removed
mspComOverruled	Warning	MSP command overruled, removed
AU4		
ais	Minor	Alarm Indication Signal
lop	Critical	Loss Of Pointer
AUG4c		
ais	Minor	Alarm Indication Signal
lop	Critical	Loss Of Pointer
VC4		
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
tim	Critical	Trace Identifier Mismatch
rdi	Minor	Remote Defect Indication
lom	Critical	Loss Of Multiframe
uneq	Critical	Un-equipped
plm	Critical	Payload Mismatch
TU3		

Table 5-4 SDH Alarms

Alarm Id	Default Severity	Description
ais	Minor	Alarm Indication Signal
lop	Critical	Loss Of Pointer
VC3		
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
tim	Critical	Trace Identifier Mismatch
rdi	Minor	Remote Defect Indication
ssf	Minor	Server Signal Failure
uneq	Critical	Unequipped
plm	Critical	Payload Mismatch
TU12		
ais	Minor	Alarm Indication Signal
lop	Critical	Loss Of Pointer
VC12		
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
tim	Critical	Trace Identifier Mismatch
rdi	Minor	Remote Defect Indication
ssf	Minor	Server Signal Failure
uneq	Critical	Un-equipped
plm	Critical	Payload Mismatch

5.4.3 LAN/WAN

Table 5-5 LAN/WAN Alarms

Alarm Id	Default Severity	Description
DCC_M		
lanOn	Warning	Link Up
lanOff	Warning	Link Down
DCC_R		
lanOn	Warning	Link Up
lanOff	Warning	Link Down
WAN		
wanDelay	Critical	Delay between VC12's above limit
seqFail	Critical	Wrong channel seq. numbering P2P

Table 5-5 LAN/WAN Alarms

Alarm Id	Default Severity	Description
lanOn	Warning	Link Up
lanOff	Warning	Link Down
rldot1dStpPortStateForwarding	Warning	Bridge port learning to forwarding state transition
rldot1dStpPortStateNotForwarding	Warning	Bridge port forwarding to blocking state transition
e1Port		
lofRx	Major	Loss Of Frame downlink
lofTx	Major	Loss Of Frame uplink
aisRx	Minor	AIS received downlink
los	Critical	Loss Of Signal
loopClosed	Warning	Loop closed
loopOpened	Warning	Loop opened
e3T3Port		
aisRx	Minor	AIS received downlink
los	Critical	Loss Of Signal
eth		
lanOn	Warning	Link Up
lanOff	Warning	Link Down
rldot1dStpPortStateForwarding	Warning	Bridge port learning to forwarding state transition
rldot1dStpPortStateNotForwarding	Warning	Bridge port forwarding to blocking state transition -
osiEncap		
lanOn	Warning	Link Up
lanOff	Warning	Link Down

5.4.4 Miscellaneous

Table 5-6 Miscellaneous Alarms

Alarm Id	Default Severity	Description
MgmtPort		
lanOn	Warning	Link Up
lanOff	Warning	Link Down
Module		
modFail	Critical	module failure
diagFail	Critical	Diagnostic failure
inventoryFail	Major	Inventory failure
inletFail	Critical	DXC inlet failure
inletBitError	Critical	DXC inlet bit error
cardIsolated	Critical	Card isolated
cardAnomaly	Critical	Card anomaly
hotSwapFailure	Critical	Hot swap failure
modOos	Warning	Module Out Of Service
modOosMaint	Warning	Module OOS by maintenance
modIns	Warning	Module IN Service
Slot		
modMis	Critical	Module mismatch
modOut	Critical	Module removed
Fan		
fan	Major	Fan failure
diagFail	Critical	Diagnostic failure
inventoryFail	Major	Inventory failure
Power		
pwrInA	Critical	Power failure input A
pwrInB	Critical	Power failure input B
pwrOut	Critical	Power output failure
pwrFail	Critical	Power module out
diagFail	Critical	Diagnostic failure
inventoryFail	Major	Inventory failure
aiPort		
alarmInp	Warning	Alarm condition on alarm-in port
auxIf		
lofTx	Major	Loss Of Frame
los	Major	Loss Of Signal

5.5 Physical Interface Indexes

Table 5-7 Interface Index Reference Numbers

Ethernet Interface Numbers	
Management-port	1000
Slot-1	1 - 16
Slot-2	17 - 32
Slot-3	33 - 48
Slot-4	49 - 64
Trunk ports (link aggregation)	65 - 72
VLAN	100000 - 104000
DCC channels Ethernet Interface Numbers	
Slot-1	1002 - 1017
Slot-2	1018 - 1033
Slot-3	1034 - 1049
Slot-4	1050 - 1065

Physical Interfaces

6.1 Power module, DC Power

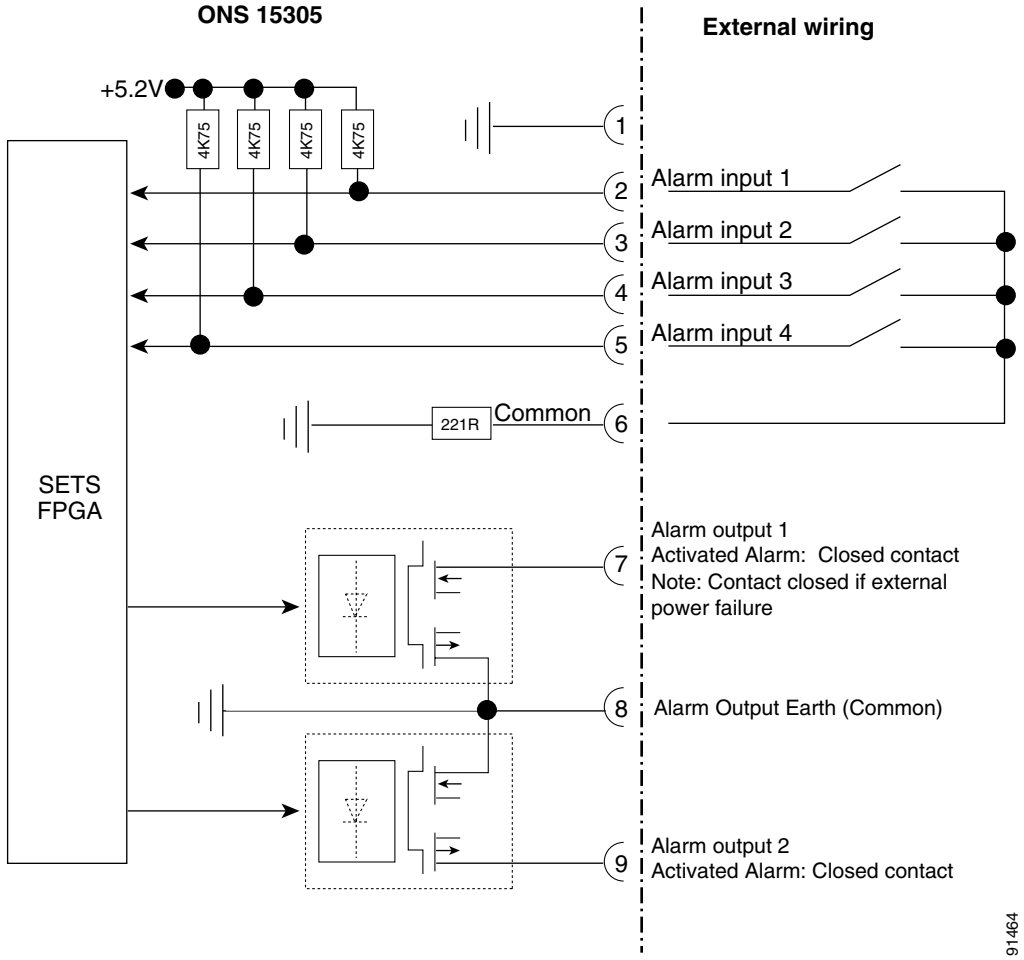
See the "2.4 Power Module, DC Power" section on page 2-6.

6.2 Alarm Interface, FAN-ALARM

6.2.1 Description

The ONS15305 provides facilities to report a minimum of 4 auxiliary alarm inputs for associated equipment, e.g. power unit failure battery condition, cabinet door etc. and 2 dedicated alarm outputs. The alarm outputs are related to the unit alarm indicator and the traffic alarm indicator. The input alarms are reported to the management system and are activated by a closed or open loop condition between a pair of contacts.

Figure 6-1 Alarm Input and Output Overview



6.2.2 Connectors

The alarm interface connector is a 9 pin DSUB type connector, with the following pin-out:

Table 6-1 Pin Out Alarm Connector

Pin	Signal
1	GND
2	Alarm input 1
3	Alarm input 2
4	Alarm input 3
5	Alarm input 4
6	Alarm input return
7	Alarm output 1 (Unit)
8	Alarm output return

Table 6-1 Pin Out Alarm Connector

Pin	Signal
9	Alarm output 2 (Traffic)
Fuse	7A
Battery voltage range	-40,5 to -72V DC

6.2.3 Electrical Parameters Alarm Input

Table 6-2 Electrical Specification at Alarm Input

Parameter	Value
Nominal open contact voltage	5 V
Nominal closed contact current	1 mA
Max. closed contact resistance	0.5 kohm
Min. open contact resistance	10 kohm

6.2.4 Electrical Parameters Alarm Output

Table 6-3 Electrical Specification at Alarm Output

Parameter	Value
Maximum load bias referred to common return	+/-75V
Maximum load current	50mA
Common return to earth	+/-250V
Maximum contact resistance	50 ohm

6.3 Auxiliary Interface

6.3.1 Description

The ONS15305 offers a proprietary Auxiliary interface for termination of overhead bytes selected from the different STM-N interfaces. The Auxiliary interface is located on the System controller module, SYSCONT-SD128-RJ45.

Each STM-N interface can be configured to terminate one of the following overhead bytes: E1,F1 or E2. The byte to be terminated is selected from the network management system together with a unique timeslot number n, where n equals 1-15 or 17-31. The Auxiliary interface is a framed E1 interface, according to ITU-T G.704, where timeslot 1-15 and 17-31 can carry one overhead byte each, according to the configuration described above.

The interface is synchronous which means that the incoming STM-N need to be synchronized with the T0 reference clock in the ONS15305 and the incoming framed E1 need to be synchronized with the outgoing framed E1. Bit slips will occur if one of the interfaces are free running.

6.3.2 Connector

The connector is a RJ-45 connector, with the following pin-out:

Table 6-4 Pin Out Auxiliary Interface

Pin	Signal
1	AUX_DO+
2	AUX_DO-
3	GND
4	AUX_DI+
5	AUX_DI-
6	AUX_SHIELD
7	NC
8	NC

Note Pin 6 is always AC connected to ground

The outer screen is always direct connected to ground.

6.4 VT-100 Terminal Interface

6.4.1 Description

The ONS15305 offers a VT-100 interface for connection of a CiscoEdgeCraft Terminal/CLI interface. The interface is running at a data rate of 19.200 baud and is located on the System controller module, SYSCONT-SD128-RJ45.

The interface is in accordance with the specifications given in the Compliance chapter below.

6.4.2 Connector

The RS232 interface for ONS15305 is provided through a RJ-45 connector, with the following pin-out:

Table 6-5 Pin-out VT-100 Connector

Pin	Signal
1	GND
2	TxD
3	RxD
4	DB-TxD
5	GND
6	VT_CTS
7	DB_RxD
8	VT_RTS

Note Pin 4 and 7 are only used for debug purposes.

6.5 Synchronization Interface

6.5.1 Description

The interface is a 120 ohm 2048 kHz synchronization input and output port, with specifications according to ITU-T G.703, and is located on the System controller module, SYSCONT-SD128-RJ45.

6.5.2 Connectors

Both input and output is provided on 8 pin RJ-45 connector, with the following pin-out:

Table 6-6 Pin Out Synchronization Port

Pin	Signal
1	SYNC_OUT+
2	SYNC_OUT-
3	GND
4	SYNC_IN+
5	SYNC_IN-
6	SYNC_SCREEN
7	NC
8	NC

Note Pin 6 is always AC connected to ground. The outer screen is always direct connected to ground.

6.5.3 Other Interfaces

Other interface descriptions are found in the chapters describing each service module.

6.5.4 Prot Interface

For future release.

Mechanics and Other Characteristics

7.1 Mechanical Parameters

7.1.1 Chassis

The equipment is provided as a sub-rack suitable for mounting within a 19-inch equipment cabinet. The height of the unit is 43.6 mm (1U =44.45mm).

It is possible to mount one single unit including power supply, cable terminating and fibre handling facilities, within an enclosure with external dimensions less than:

Table 7-1 Chassis Dimensions

Width	445mm
Height	43.6mm
Length	280mm

The depth of the sub-rack is 240 mm. The total weight of the ONS 15305 fully equipped does not exceed 5Kg. Different mounting brackets are available for both 19" and ETSI cabinets/racks (as specified in ETS 300 119, IEC 60917 and IEC 60297). The thermal design of the unit meets the requirements of EN/IEC 60950.

7.1.2 Service Modules

The service modules in the ONS 15305 have the following physical dimensions:

Table 7-2 Service Module Dimensions

Length	175mm
Height	41mm
Width	75mm

7.1.3 Power Module, DC Power

The power module in the ONS 15305 have the following physical dimensions

:

Table 7-3 Power Module Dimensions

Length	230mm
Height	19mm
Width	44mm

7.1.4 System Controller Module, SYSCONT-SD128-RJ45

The system controller module in the ONS 15305 has the following physical dimension:

Table 7-4 System Controller Module dimensions

Length	175mm
Height	19mm
Width	95mm

7.1.5 Alarm and Fan module, FAN-ALARM

The Alarm and fab module in the ONS 15305 has the following physical dimensions:

Table 7-5 Alarm and Fan Module Dimensions

Length	236mm
Height	41mm
Width	28mm

7.2 Reliability, MTBF

MTBF values according to:

Telcordia Technologies Special Report, SR-332, Issue 1, May 2001, but with the following correction:

- Based on experience, for all Telcordia standard values, a Correction Factor, CF=2 has been used to improve the reliability figures.
- For components where the manufacturer's reliability figures have been used, no further correction has been applied.

Table 7-6 MTBF Values

Item	MTBF [Years] 40°C ambient temperature Ground Benign]
64x64/20G Base module without FAN-ALARM	43,6
FAN-ALARM	74,8
DC Power	150,9
AC 230V	150,7
SYSCONT-SD128-RJ45	95,8
MAIN CARD	85,1
BACKPLANE	1375,4
S1.1-8-LC	50,1
S16.1-1-LC	127,3
GigE-2-LC	99,7
E100-8	157,2
E1-8	207,4
E1-63	88
S4.1-2-LC	125,9
6XE3/T3-1.0/2.3	125,2
S1.1-2-LC	136,6
S1.1-2-LC/E1-21	101,5
L4.2-2-LC	122
L16.2-1-LC	127,2
32xE1-LFH-RJ45 panel	913,2
32xE1-LFH-1.0/2.3 panel	713,5

7.3 Environmental Conditions

The equipment conforms to the requirement of EN 300 386 for EMC related specifications. The equipment is also compliant with the following standards:

- ETSI EN 300 386
- EN 55022
- EN 55024
- EN 61000-4-2
- EN 61000-4-3
- EN 61000-4-4
- EN 61000-4-5
- EN 61000-4-6

- EN60950, The Low Voltage Directive.
- EN 61000-3-2
- EN 61000-3-3
- EN-61000-4-11

The equipment operates under all environmental conditions detailed in ETS 300 019-2-3 Class 3.2.

7.3.1 Health and Safety

The equipment meets the requirements in EN/IEC 60950 (CLASS III) and EN60825. The equipment meets the requirements in ETS 300 753 for acoustic noise.

7.3.2 Storage and Transport

The equipment meets the requirements in ETS 300 019, Class 1.2 and class 2.2. Supported storage temperature range : -40^{O}C to +70^{O}C.

7.4 Referenced Specifications

7.4.1 ITU-T Recommendations

- G.652

  Single Mode Optical Fibre
- G.701

  Vocabulary of Transmission and Multiplexing, and Pulse Code Modulation (PCM) Terms.
- G.702

  Digital Hierarchy Bit Rates
- G.703

  Physical/Electrical Characteristics of Hierarchical Digital Interfaces
- G.704

  Synchronous Frame Structures at Primary and Secondary Hierarchical levels.
- G.706

  Frame Alignment and Cyclic Redundancy Check (CRC) Procedures Relating to Basic Frame Structures Defined in Recommendation G.704
- G.707

  Network node interface for the synchronous digital hierarchy (SDH)
- G.783

  Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks
- G.784

Synchronous digital hierarchy (SDH) management

- G.810

  Definition and terminology for synchronization networks

- G.811

  Timing characteristic of primary reference clocks

- G.812

  Timing characteristics of slave clocks suitable for use as a node clocks in synchronization networks

- G.813

  Timing characteristics of SDH equipment slave clocks (SEC)

- G.823

  The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy

- G.825

  The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)

- G.826

  End-to-end error performance parameters and objectives for international, constant bit rate digital paths and connections.

- G.832

  Transport of SDH elements on PDH networks - Frame and multiplexing structures

- G.841

  Types and characteristics of SDH network protection architectures

- G.957

  Optical interfaces for equipment and systems relating to the synchronous digital hierarchy

- G.958

  Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables

- X.150

  Principles of maintenance Testing for Public Data Network using Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) test Loops

7.4.2 Cenelec Documents

- EN 55022

  Specification for Limits and methods of Measurement of Radio Interference Characteristics of Information Technology Equipment

- EN 55024

  Electromagnetic Compatibility Requirements for Information Technology Equipment (Previously EN 55101)

- EN 60825

  Radiation Safety of Laser Products

- EN 60950

  Safety of Information Technology Equipment Including Electrical Business Equipment

- EN 61000-3-2

  Electromagnetic compatibility (EMC). Part 3: Limits; Section 2: Limits for harmonic current emissions (equipment input current £16 A per phase)

- EN 61000-3-3

  Electromagnetic compatibility (EMC). Part 3: Limits; Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current £16 A

- EN 61000-4-2

  Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques; Section 2: Electrostatic discharge immunity test. Basic EMC Publication

- EN 61000-4-3

  Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques; Section 3: Radiated, radio-frequency, electromagnetic field immunity test

- EN 61000-4-4

  Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques; Section 4: Electrical fast transient/burst immunity test. Basic EMC Publication

- EN 61000-4-5

  Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques; Section 5: Surge immunity test

- EN 61000-4-6

  Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques; Section 6: Conducted disturbances induced by radio-frequency fields

7.4.3 ETSI Documents

- ETS 300 011

  Integrated Services Digital Network (ISDN); Primary rate user-network interface; Layer 1 specification and test principles

- ETS 300 019-2-1

  Environmental engineering (EE); Environmental conditions and environmental tests for telecommunication equipment Part 2-1: Specification of environmental test; Storage

- ETS 300 019-2-2

  Environmental engineering (EE); Environmental conditions and environmental tests for telecommunication equipment Part 2-2: Specification of environmental test; Transportation

- ETS 300 019-2-3

  Environmental engineering (EE); Environmental conditions and environmental tests for telecommunication equipment Part 2-2: Specification of environmental test; Stationary use at weather protected locations

- ETS 300 119-4

  Equipment engineering (EE): European telecommunication standard for equipment practice Part 4: Engineering requirements for subracks in miscellaneous racks and cabinets

- ETS 300 147

  Transmission and multiplexing (TM); Synchronous digital hierarchy (SDH); Mulitiplexing structure

- ETS 300 233

  Integrated Services Digital Network (ISDN); Access digital section for ISDN primary rate

  ETS 300 253

  Environmental engineering (EE): Earthing and bonding configuration inside telecommunication centres

- ETS 300 386

  Electromagnetic compatibility and radio spectrum matters (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements

- ETS 300 417

  Transmission and Multiplexing (TM);Generic functional requirements for Synchronous Digital Hierarchy (SDH) transmission equipment.Compliant to ETS 300 417 for relevant parts (i.e the functionality implemented can be considered as compliant).

- ETS 300 752

  Equipment engineering (EE): Acoustic noise emitted by telecommunication equipment

7.4.4 IEC Documents

- IEC 60917-2

  Modular order for the development of Mechanical structures for electronic equipment practice

- IEC 60297-3

  Dimension of mechanical structures of the 482.6mm (19 in) series Part 3 Subracks and associated plug-in units

7.4.5 Bellcore Documents

- SR-332

  Reliability prediction procedure for electronic equipment

Hex E3/T3 Tributary Module, E3T3-6

8.1 Module Description

This module contains six E3 interfaces. The E3 traffic is mapped into VC-3 containers and multiplexed together as described in the "5.1 SDH Features" section on page 5-1. The interfaces can be configured to E3 or T3.The physical connector for the interface is the miniature 1.0/2.3 type.The module does not contain any IP functionality.The interface supports transparent data (G.703).

8.1.1 Power Consumption

11 W.

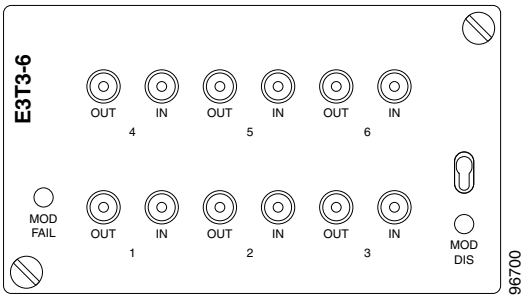
8.2 E3/T3 75 Ohm Electrical Interface

The interface is a 34Mbit/s E3 or 45Mbit/s T3 interface (configurable) according to ITU-T G.703, 75 ohm coaxial interface.

8.2.1 Connectors

The connector used is a 75 ohm coaxial connector type 1.0/2.3. The screen on the input and on the output connector is always DC coupled to ground

Figure 8-1 Hex E3/T3 Tributary Module



8.2.2 Compliance

Table 8-1 E3 Interface Compliance

Standard	Comment
ITU-T G.703	Cable attenuation
	Input reflection loss
	Input port immunity against reflection
	Output pulse mask
ITU-T G.783	Output jitter in the absence of input jitter
	Output combined jitter
ITU-T G.823	Max. tolerable input jitter

Single Optical S-16.1 Module, S16.1-1-LC

9.1 Module Description

The module contains one optical STM-16 interfaces that meets the S-16.1 specification in ITU-T G.957. The physical connector is a LC connector. The module only supports TDM traffic.

9.1.1 Power Consumption

13 W.

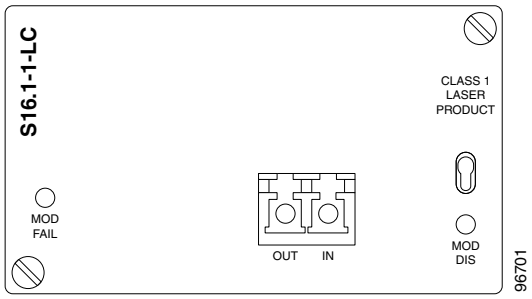
9.2 External Interface

The interface is an optical STM-16 short haul interface, according to clause 5 ITU-T G.957 The definitions of optical parameters and reference points S and R refer to ITU-T G.957. Reference point S means transmit direction while R is the receive direction of the fibre.

9.2.1 Connector Type

The physical connector is a LC connector.

Figure 9-1 Single Optical S-16.1 Module, S16.1-1-LC



9.2.2 Optical Budget

Table 9-1 Optical Budget S-16.1

Parameter	Value
Modulation rate on optical line	2488 380 kbit/s
Wavelength range	1261 - 1360 nm
Transmitter at reference point S	
Source type	SLM
Maximum -20dB width	1nm
minimum side mode suppression ratio	30dB
Mean launched power (max.)	0dBm
Mean launched power (min.)	-5 dBm
Min. extinction ratio	8.2 dB
Optical path between S and R	
Attenuation range	0 - 12 dB
Max. tolerable dispersion	NA
Min. optical return loss at S inc. any connectors	24dB
Max. discrete reflectance between S and R	-27dB
Receiver at reference point R	
Min. sensitivity (BER < 1 in 1010)	-18 dBm
Min. overload	0 dBm
Max. optical path penalty	1 db
Max. reflectance at R	-27dB

9.2.3 Traffic Alarms

- Rx direction
  - Loss of signal (LOS): Traffic Alarm. Optical power of input signal is below receiver sensitivity level.
  - Loss of lock (LOL):Indicates clock recovery of deserializer is out of lock. Signal must be present for indication to be valid. Indication to be reported as unit failure alarm.
  - Transmit failure: Laser degradation

Dual Optical S-4.1 Module, S4.1-2-LC

10.1 Module Description

The module contains two optical STM-4 interfaces that meets the S-4.1 specification in ITU-T G.957. The physical connector is a LC connector.The module only supports TDM traffic.

10.1.1 Power Consumption

9,5 W.

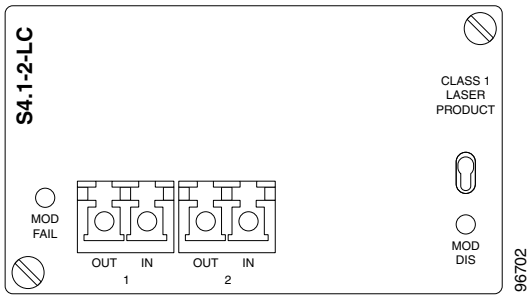
10.2 External Interface

The interface ia an optical STM-4 short haul interface, according to clause 5 ITU-T G.957 The definitions of optical parameters and reference points S and R refer to ITU-T G.957. Reference point S means transmit direction while R is the receive direction of the fibre. The following descriptions refer to both Single Mode fibre and Multi Mode fibre.

10.2.1 Connector Type

The physical connector is a LC connector

Figure 10-1 Dual Optical S-4.1 Module, S4.1-2-LC.



10.2.2 Compliance

Table 10-1 Optical Interface Compliance

Standard	Comment
ITU-T G.652	Single Mode Fibre specification 10/125
ITU-T G.651	Multi Mode Fibre specification 50/125 µm
IEC 793-2	Multi Mode Fibre specification 62.5/125 µm
ITU-T G.707	Optical line signal
ITU-T G.783	RX pull-in and hold range
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter
ITU-T G.957	Optical spectrum, Optical output power, Optical eye diagram, Optical extinction ratio.

10.2.3 Optical Power Budget S4.1-2-LC Two-Fibre

Table 10-2 Optical Power Budget STM-4 S4.1 SH and LH

Parameter	Short-Haul		
Types of fibre:	ITU-T Rec. G.652 SM	10/125	µm
	ITU-T Rec. G.651 MM	50/125	
	IEC 739-2 MM	62.5/125	
Modulation rate on optical line		622 080	kbit/s
Wavelength range		1274 - 1356	nm
Transmitter at reference point S			
Source type		MLM	
Spectral characteristics (max. RMS width)		2.5	nm
Mean launched power (max.)		-8	dBm
Mean launched power (min.)		-15	dBm
Min. extinction ratio		8.2	dB
Optical path between S and R			

Table 10-2 Optical Power Budget STM-4 S4.1 SH and LH

Parameter	Short-Haul		
Attenuation range		0 - 12	dB
Max. tolerable dispersion		200	ps/nm (SM Fibre)
Min. optical return loss		NA	
Max. discrete reflectance between S and R		NA	
Receiver at reference point R			
Min. sensitivity (BER < 1 in 1010)		-28	dBm
Min. overload		-8	dBm
Max. optical path penalty		1	dB
Max. reflectance at R		NA	

Dual Optical LAN 1000Base-LX, GigE-2-LC

11.1 Module Description

This module contains two Gigabit Ethernet (GE) interfaces that meets the 1000Base-LX specification in IEEE 802.3. This interface is a long haul interface based on single-mode fibre. The physical connector is a LC connector.

The module contains no TDM interfaces.

11.1.1 Power Consumption

11 W.

11.2 External Interface

The interface offered is a Gigabit Ethernet (GE) interface that meets the 1000Base-LX specification in IEEE 802.3. This interface is a optical long haul interface based on single-mode fibre, SMF.

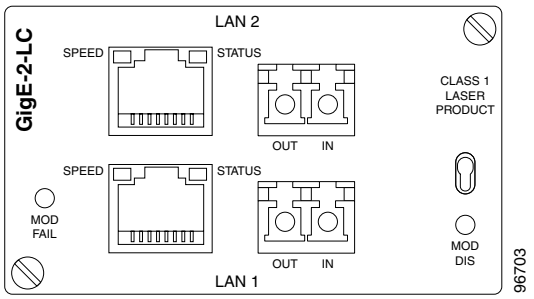
The optical LAN interface for 1000BASE-LX (Gigabit) on the module, uses dual fiber interface LC style connector. With one fiber in each direction, 1310nm wavelength and single mode fiber of type 10/125mm.

11.2.1 Connector

The physical connector is a LC connector, type LC SFF PTH

Note The two RJ-45 connectors on the GigE-2-LC module must not be used.

Figure 11-1 Dual Optical LAN 1000BASE-LX, GigE-2-LC Module



11.2.2 Compliance

Table 11-1 1000Base-LX Interface Compliance

Standard	Comment
IEEE 802.3	Clause 38, PDM sublayer and baseband medium
	Clause 37, Auto negotiation
	Clause 36, PCS and PMA sublayer
IEC 60825-1	Laser safety

11.2.2.1 Jitter Optical Interface

Table 11-1gives the output jitter as specified in the datasheet for the optical transceiver.

Table 11-2 Output Jitter for Optical Transceiver

Transmit Signal Interface (from host to SFF-PTH-1250-LW-2X5)					
Symbol	Parameter	Min.	Max.	Unit	Notes
DJ elec-xmit	PECL Deterministic Jitter (1.0625Gb/s)		0.12	UI	1
TJ elec-xmt	PECL Total Jitter		0.25	UI	1

1. Deterministic jitter (DJ) and total jitter (TJ) values are measured according to the methods defined in appendix A [1]. [1UI (Unit Interval) = 800ps at 1.25Gb/s, and 1 UI = 941ps at 1.0625Gb/s]. Listed values apply to 1.0625Gb/s, 1.25Gb/s transceivers accept TJ < 0.24 UI.

Table 11-3 gives the input jitter as specified in the datasheet for the optical transceiver.

Table 11-3 Input Jitter for Optical Transceiver

Receive Signal Interface (from SFF-PTH-1250-LW-2X5 to host)					
Symbol	Parameter	Min.	Max.	Unit	Notes
DJ elec-rcv	PECL Deterministic Jitter (1.0625Gb/s)		0.36	UI	1
TJ elec-rcv	PECL Total Jitter		0.61	UI	1

1. Deterministic jitter (DJ) and total jitter (TJ) values are measured according to the methods defined in appendix A [1]. Jitter values assume worst case input jitter. [1UI (Unit Interval) = 800ps at 1.25Gb/s, and 1UI = 941ps at 1.0625Gb/s]. Listed values apply to 1.0625Gb/s, 1.25Gb/s transceivers have TJ < 0.749 UI.

11.2.3 References

- IEC/IEEE
  - IEC 60825-1: Laser safety.
  - IEEE 802.3, 1998 Edition: Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.
  - IEEE 802.3z: GE Network Standard.
- ANSI

American National Standards Institute Inc. (ANSI), T11.2/Project 1230/Rev10, Fibre Channel-Methodologies for Jitter Specifications (MJS) Drafts of this standard are available to members of the standards working committee. For further information see the T11.2 website at www.t11.org.

  - ANSI/EIA/TIA-455-127-1991 [B8].
  - ANSI/EIA-455-95-1986 [B7].
  - ANSI/TIA/EIA-526-4A-1997 [B13].
  - ANSI X3.230-1994 [B19] (FC-PH), Annex A, A.5, Relative intensity noise (RIN) measuring procedure.
  - ANSI X3.230-1994 [B19] (FC-PH), Annex A, A.4.2, Active output interface eye opening measurement.
  - ANSI X3.230-1994 [B19] (FC-PH), Annex A, A.4.3,DJ Measurement.
  - ANSI/EIA/TIA-526-14A [B14].

CHAPTER 12

Octal LAN 10/100Base TX Module, E100-8

12.1 Module Description

This module contains eight Ethernet interfaces that support both 10Base-T and 100Base-TX according to the IEEE 802.3 specification. The interface supports both the half-duplex and the full-duplex modes. The interfaces are connected to an integrated Ethernet switch. The physical interface uses a RJ-45connector. Every interface also has a LED that signal the status of the link. The module supports IP interface only.

12.1.1 Power Consumption

5,5 W.

12.2 External Interface

The interface is a 10Base-T and 100Base-TX Ethernet interface according to the IEEE 802.3 specification. Cabletype must be CAT5-STP

12.2.1 Pinout

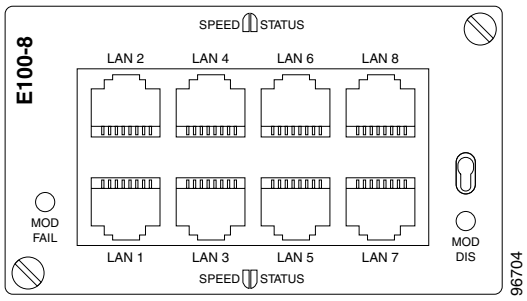
The connectors are RJ-45 connectors, with the following pin-out:

:

Table 12-1 Pinout Ethernet Port

Pin	Signal
1	TxD+
2	TxD--
3	RxD+
4	NC
5	NC
6	RxD--
7	NC
8	NC

Figure 12-1 Octal LAN 10/100Base TX Module, E100-8



12.2.2 Compliance

Table 12-2 10/100BASE-T Interface Compliance

Standard	Comment
ISO/IEC8877	MAU MDI connector
IEEE 802.3	Clause 14, Twisted pair MAU and baseband medium type 10BASE-T Clause 25, PMD sublayer and baseband medium type 100BASE-TX Clause 24, PCS and PMA sublayer, type 100BASE-X Clause 28, Auto-negotiation on Twisted pair
ANSI X3.263:1995	Physical medium 100BASE-TX

12.2.3 Connector Type

8x RJ-45 Fast Ethernet

- Pins available: 8x 8pin
- Spare pins: 8x 4

LAN1 to LAN8 are numbered from upper left corner. Traffic and link status are indicated in a LED (light pipe) which is formed as an arrow, pointing on the actual port.

Table 12-3 Fast Ethernet Port Pinouts

Signal name	Pin	I/O	Signal Description
LAN 1			
RJ_TX1+	1	O	Transmit+ LAN 1
RJ_TX1-	2	O	Transmit- LAN 1
RJ_RX1+	3	I	Receive+ LAN 1
RJ_RX1-	6	I	Receive- LAN 1

Table 12-3 Fast Ethernet Port Pinouts

Signal name	Pin	I/O	Signal Description
LAN 2			
RJ_TX2+	1	O	Transmit+ LAN 2
RJ_TX2-	2	O	Transmit- LAN 2
RJ_RX2+	3	I	Receive+ LAN 2
RJ_RX2-	6	I	Receive- LAN 2
LAN 3			
RJ_TX3+	1	O	Transmit+ LAN 3
RJ_TX3-	2	O	Transmit- LAN 3
RJ_RX3+	3	I	Receive+ LAN 3
RJ_RX3-	6	I	Receive- LAN 3
LAN 4			
RJ_TX4+	1	O	Transmit+ LAN 4
RJ_TX4-	2	O	Transmit- LAN 4
RJ_RX4+	3	I	Receive+ LAN 4
RJ_RX4-	6	I	Receive- LAN 4
LAN 5			
RJ_TX5+	1	O	Transmit+ LAN 5
RJ_TX5-	2	O	Transmit- LAN 5
RJ_RX5+	3	I	Receive+ LAN 5
RJ_RX5-	6	I	Receive- LAN 5
LAN 6			
RJ_TX6+	1	O	Transmit+ LAN 6
RJ_TX6-	2	O	Transmit- LAN 6
RJ_RX6+	3	I	Receive+ LAN 6
RJ_RX6-	6	I	Receive- LAN 6
LAN 7			
RJ_TX7+	1	O	Transmit+ LAN 7
RJ_TX7-	2	O	Transmit- LAN 7
RJ_RX7+	3	I	Receive+ LAN 7
RJ_RX7-	6	I	Receive- LAN 7
LAN 8			
RJ_TX8+	1	O	Transmit+ LAN 8
RJ_TX8-	2	O	Transmit- LAN 8
RJ_RX8+	3	I	Receive+ LAN 8
RJ_RX8-	6	I	Receive- LAN 8

12.2.4 References

12.2.4.1 IEEE Documents

- IEEE 802.3
  - Clause 14, Twisted pair MAU and baseband medium type 10BASE-T
  - Clause 25, PMD sublayer and baseband medium type 100BASE-TX
  - Clause 24, PCS and PMA sublayer, type 100BASE-X
  - Clause 28, Auto-negotiation on Twisted pair

12.2.4.2 ETSI Documents

- **EN 50081-1**, January 1992 "Electromagnetic compatibility-Generic emission standard, Part 1: commercial and light industry (CE marking requirements)"
- **EN50082-1**, January 1992 "Electromagnetic compatibility- Generic immunity standard, Part 1: Residential, commercial and light industry"
- **EN 60950** Safety of Information Technology Equipment Including Electrical Business Equipment
- **ETS 300 019** European Telecommunications Standard for Environment

12.2.4.3 ANSI Documents

- **ANSI X3.263**, 1995 Physical medium 100BASE-TX

12.2.4.4 ISO/IEC Documents

- **ISO/IEC8877** MAU MDI connector

CHAPTER 13

Octal E1 Tributary Module, E1-8

13.1 Module Description

This module contains eight E1 interfaces. The E1 traffic is mapped into VC-12 containers and multiplexed together according to chapter 2.1.1 The physical interface use a RJ-45 connector and only supports120-ohm differential interface. The module does not contain any IP functionality. The interface supports both transparent data (G.703) and the NT functionality of ISDN PRA according to ETSI 300 233.

13.1.1 Power Consumption

3,5 W

13.2 External Interface

The interface is a 2Mbit/s E1 interface according to ITU-T G.703, 120ohm differential pair. Cabletype must be CAT5E-STP.

13.2.1 Connectors

The connector is a RJ-45 connector, with the following pin-out:

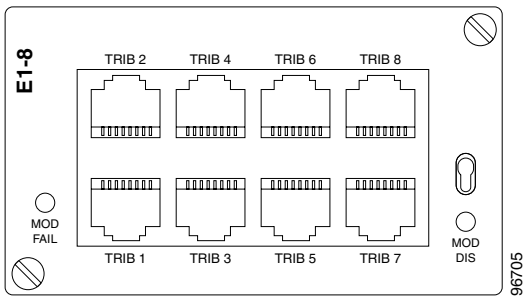
Table 13-1 E1 Interface Pinouts

Pin	Signal
1	P120 OUT
2	N120 OUT
3	GND
4	P120 IN
5	N120 IN
6	SHIELD

Table 13-1 E1 Interface Pinouts

Pin	Signal
7	NC
8	NC

Figure 13-1 Octal E1 Tributary Module, E1-8



Note Pin 6 is always AC connected to ground. The outer screen is always direct connected to ground.

13.2.2 Pinout

Table 13-2 Pinout-8xRJ45 2Mb

Signal name	Pin	I/O	Signal Description
PORT 1			
RJ_TX1+	A1	O	Transmit+ Port1
RJ_TX1-	A2	O	Transmit- Port1
RJ_RX1+	A4	I	Receive+ Port1
RJ_RX1-	A5	I	Receive- Port1
PORT 2			
RJ_TX2+	B1	O	Transmit+ Port 2
RJ_TX2-	B2	O	Transmit- Port 2
RJ_RX2+	B4	I	Receive+ Port 2
RJ_RX2-	B5	I	Receive- Port 2
PORT 3			
RJ_TX3+	C1	O	Transmit+ Port 3
RJ_TX3-	C2	O	Transmit- Port3
RJ_RX3+	C4	I	Receive+ Port3
RJ_RX3-	C5	I	Receive- Port 3
PORT 4			
RJ_TX4+	D1	O	Transmit+ Port 4

Table 13-2 Pinout-8xRJ45 2Mb

Signal name	Pin	I/O	Signal Description
RJ_TX4-	D2	O	Transmit- Port 4
RJ_RX4+	D4	I	Receive+ Port4
RJ_RX4-	D5	I	Receive- Port 4
PORT5			
RJ_TX5+	E1	O	Transmit+ Port 5
RJ_TX5-	E2	O	Transmit- Port5
RJ_RX5+	E4	I	Receive+ Port 5
RJ_RX5-	E5	I	Receive- Port 5
PORT 6			
RJ_TX6+	F1	O	Transmit+ Port 6
RJ_TX6-	F2	O	Transmit- Port 6
RJ_RX6+	F4	I	Receive+ Port6
RJ_RX6-	F5	I	Receive- Port 6
PORT 7			
RJ_TX7+	G1	O	Transmit+ Port 7
RJ_TX7-	G2	O	Transmit- Port7
RJ_RX7+	G4	I	Receive+ Port7
RJ_RX7-	G5	I	Receive- Port 7
PORT 8			
RJ_TX8+	H1	O	Transmit+ Port 8
RJ_TX8-	H2	O	Transmit- Port8
RJ_RX8+	H4	I	Receive+ Port8
RJ_RX8-	H5	I	Receive- Port 8

13.2.3 Compliance

Table 13-3 E1 Interface Compliance

Standard	Comment
ETS 300 246	Connector
ETS 300 247	Connector
ETS 300 011	Impedance towards ground Tolerable longitudinal voltage
ETS 300 126	Output signal balance

Table 13-3 E1 Interface Compliance

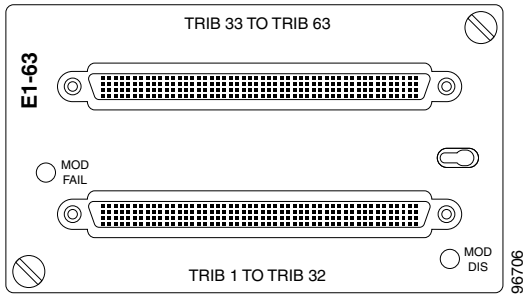
Standard	Comment
ITU-T G.703	Cable attenuation Input reflection loss Input port immunity against reflection Output pulse mask
ITU-T G.783	Output jitter in the absence of input jitter Output combined jitter
ITU-T G823	Max. tolerable input jitter

High Density 63xE1 Module, E1-63

14.1 Module Description

This module contains 63 E1 interfaces. The E1 traffic is mapped into VC-12 containers and multiplexed together according to the "5.1.1 Multiplexing Structure and Mapping Modes" section on page 5-1. Two high density LFH type connectors are used to interface the 63 E1's, 32 interfaces in the bottom connector and 31 interfaces in the top connector (one pair left unconnected). This module supports transparent data (G.703) and ISDN PRA.

Figure 14-1 High Density 63xE1 Module, E1-63



14.1.1 Power Consumption

21 W.

14.1.2 Connectors

The connector is a high density LFH connector

14.1.3 Compliance

Table 14-1 Multi-Interface E1 Compliance

Standard	Comment
ETS 300 011	Impedance towards ground
	Tolerable longitudinal voltage
ETS 300 126	Output signal balance
ITU-T G.703	Cable attenuation
	Input reflection loss
	Input port immunity against reflection
	Output pulse mask
ITU-T G.783	Output jitter in the absence of input jitter
	Output combined jitter
ITU-T G.823	Max. tolerable input jitter

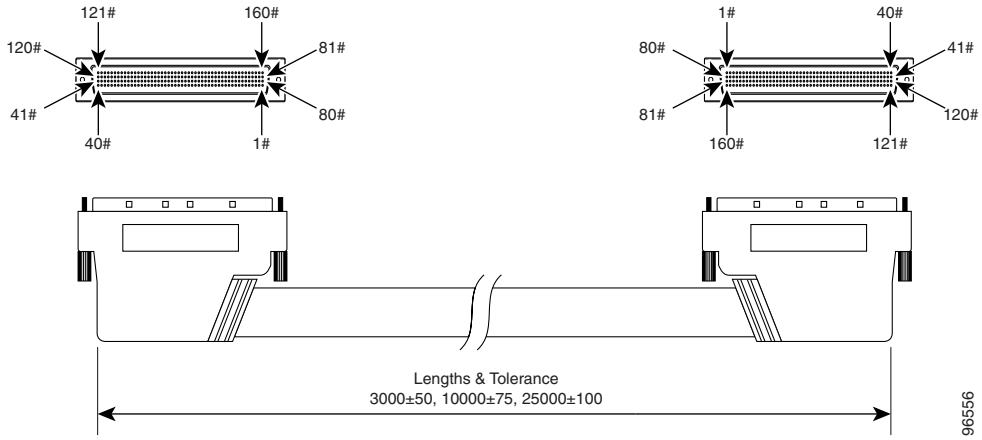
14.2 Patch Panels

Two types of patch panels and a LFH cable are available for patching the 63 E1's interface on the High Density 63xE1 module.Please see the following sections for details.

Warning **This interface is considered SELV cicuit. Avoid connecting this interface to TNV circuits. The cables must not run with power cables, Network cables, or any other cables wich are not connected to SELV circuits. The electrical cables must not exit the building. If cables are connected to an equipment wich contains not SELV circuits, proper insulation between the ONS15305 E1 cables interface and the other equipment interfaces must be provided.**

14.2.1 32XE1 LFH - LFH Cable

Figure 14-2 32XE1 LFH - LFH Cable



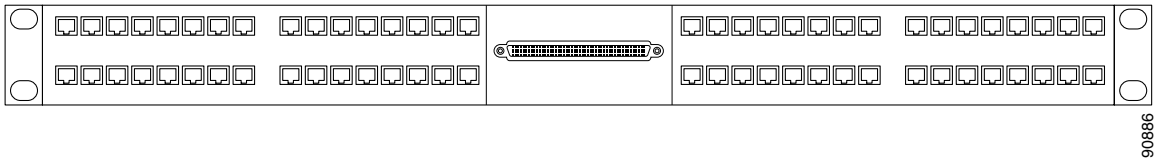
Available patch cable length : 3 M.

Cables with 10 M and 25 M length will be available soon.

Warning **To protect the cable jacket, avoid sharp edges and excessive bending. Always fasten the cable connectors with both fixing screws. If the connector is fixed with one screw only, this screw is likely to break if the cable is pulled by accident.**

14.2.2 32xE1-LFH-RJ45 Panel

Figure 14-3 32xE1-LFH-RJ45 Panel



The RJ45 patch panel provide an interface with impedance 120 ohm.

14.2.2.1 Pinout

Table 14-2 RJ-45 Connector - Pinout

Pin	Signal
1	P120 OUT
2	N120 OUT
3	GND
4	P120 IN

Table 14-2 RJ-45 Connector - Pinout

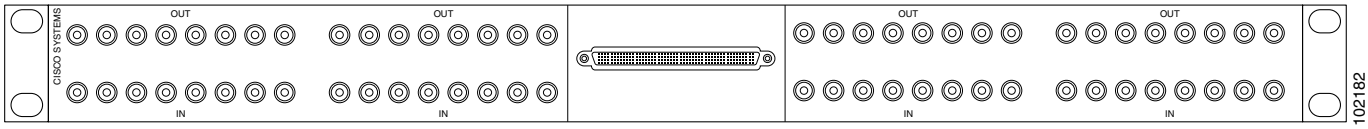
Pin	Signal
5	N120 IN
6	SHIELD
7	NC
8	NC

14.2.3 32xE1-LFH-1.0/2.3 Panel

This is a patch panel for the multi interface E1 connector. One connector can have up to 32 E1 interfaces.

The patch panel have 32 1.0/2.3 connectors for the E1 interfaces and one LFH connector for connection to the module. The patch panel includes baluns for all interfaces and convert the impedance from 75 ohm to 120 ohm. Cable with predefined length 3m, must be used to connect the patch panel to the multi interface E1 module. The patch panel can be mounted in 19" or ETSI racks and the height is 1U (44 mm).

Figure 14-4 32xE1-LFH-1.0/2.3 Panel



Dual Optical S-1.1 Module, S1.1-2-LC

15.1 Module Description

The module contains two optical STM-1 interfaces that meets the S-1.1 specification in ITU-T G.957. The physical connector is a LC connector.

15.1.1 Power Consumption

9 W.

15.2 External STM-1 S-1.1 interface

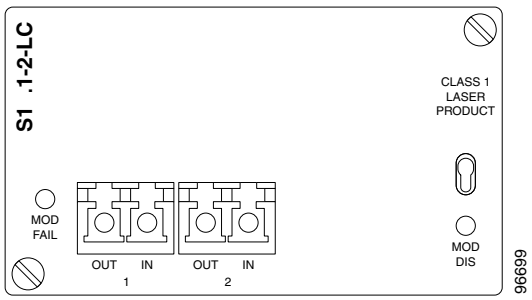
The two optical STM-1 interfaces use dual fiber interface, LC style connector, one fiber in each direction, 1310nm wavelength and use single mode fiber of type 10/125 um. The optical interfaces is compatible with ITU-T 957 for S-1.1.

The interface is an optical STM-1 short haul interface, according to clause 5 ITU-T G.957 The definitions of optical parameters and reference points S and R refer to ITU-T G.957. Reference point S means transmit direction while R is the receive direction of the fibre.

15.2.1 Connector Type

The physical connector is a LC connector.

Figure 15-1 S1.1-2-LC Module



15.2.2 Optical Budget

Table 15-1 S-1.1 Interface Optical Budget

Parameter	Value
Modulation rate on optical line	155 520 kbit/s
Wavelength range	1261 - 1360 nm
Transmitter at reference point S	
Source type	MLM
Spectral characteristics (max. RMS width)	7.7 nm
Mean launched power (max.)	-8 dBm
Mean launched power (min.)	-15 dBm
Min. extinction ratio	8.2 dB
Optical path between S and R	
Attenuation range	0 - 12 dB
Max. tolerable dispersion	96 ps/nm
Min. optical return loss	NA
Max. discrete reflectance between S and R	NA
Receiver at reference point R	
Min. sensitivity (BER < 1 in 10^{10})	-28 dBm
Min. overload	-8 dBm
Max. optical path penalty	1 db
Max. reflectance at R	NA

15.2.3 Compliance

Table 15-2 Optical S-1.1 Interface Compliance

Standard	Comment
ITU-T G.652	Type of optical fibre
ITU-T G.707	Optical line signal
ITU-T G.783	RX pull-in and hold range
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter
ITU-T G.957	Optical spectrum Optical output power Optical eye diagram Optical extinction ratio
ITU-T G.958	Input jitter measurement

CHAPTER 16

Octal Optical S-1.1 Module, S1.1-8-LC

16.1 Module Description

The module contains eight optical STM-1 interfaces that meets the S-1.1 specification in ITU-T G.957. The physical connector is a LC connector. The module also contains 8 mapper circuits and an IP switch, allowing concentration of IP traffic mapped into VC-12 container. Since the mapper circuits are connected to the matrix, the mapper circuits are global resources which means that the traffic to be terminated may come from other modules in the system.

16.1.1 Power Consumption

25 W.

16.2 External STM-1 Interface

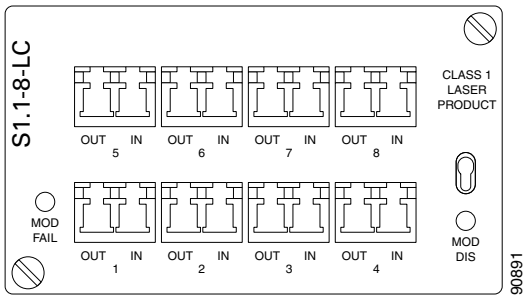
The eight optical STM-1 interfaces use dual fiber interface, LC style connector, one fiber in each direction, 1310nm wavelength and use single mode fiber of type 10/125 um. The optical interfaces is compatible with ITU-T 957 for S-1.1.

The interface is an optical STM-1 short haul interface, according to clause 5 ITU-T G.957 The definitions of optical parameters and reference points S and R refer to ITU-T G.957. Reference point S means transmit direction while R is the receive direction of the fibre.

16.2.1 Connector Type

The physical connector is a LC connector.

Figure 16-1 Octal Optical S-1.1 Module, S1.1-8-LC



16.2.2 Optical Budget

Table 16-1 Optical Budget S-1.1 Interface

Parameter	Value
Modulation rate on optical line	155 520 kbit/s
Wavelength range	1261 - 1360 nm
Transmitter at reference point S	
Source type	MLM
Spectral characteristics (max. RMS width)	7.7 nm
Mean launched power (max.)	-8 dBm
Mean launched power (min.)	-15 dBm
Min. extinction ratio	8.2 dB
Optical path between S and R	
Attenuation range	0 - 12 dB
Max. tolerable dispersion	96 ps/nm
Min. optical return loss	NA
Max. discrete reflectance between S and R	NA
Receiver at reference point R	
Min. sensitivity (BER < 1 in 1010)	-28 dBm
Min. overload	-8 dBm
Max. optical path penalty	1 db
Max. reflectance at R	NA

16.2.3 Compliance

Table 16-2 Compliance Optical S-1.1Interface

Standard	Comment
ITU-T G.652	Type of optical fibre
ITU-T G.707	Optical line signal
ITU-T G.783	RX pull-in and hold range
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter
ITU-T G.957	Optical spectrum Optical output power Optical eye diagram Optical extinction ratio
ITU-T G.958	Input jitter measurement

Single Optical L16.2 Module, L16.2-1-LC

17.1 Module Description

This is an STM16 long haul module for transmission at 1550nm optical wavelength.The main functions of the module are O/E- E/O conversion and SDH multi-/demultiplexing with VC-12, VC3 and VC-4 granularity. See the "5.1.1 Multiplexing Structure and Mapping Modes" section on page 5-1.

17.1.1 Power Consumption

18W .

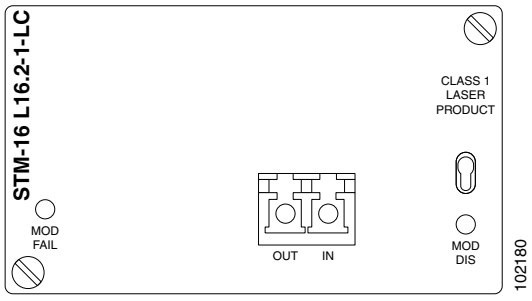
17.2 External L-16.2-LC Interface

The 1xL-16.2-LC line interface bitrate is bi-directional with a transmit (Tx) and a receive (Rx) direction. Tx and Rx directions are transmitted on separate fibres. The optical interfaces are compliant to ITU-T Rec. G.957 L-16.2 Long Haul specification for transmission on Single Mode (SM) fibre.

17.2.1 Connector Type

The physical connector is a LC connector.

Figure 17-1 STM-16 L16.2-1-LC Module



17.2.2 Optical Budget

For definitions of optical parameters, see ITU-T Rec. G.957. Reference point S means transmit interface while R is the receive interface.

Table 17-1 Optical Budget - L16.2-1-LC Interface

Parameter	Value	
Types of fibre: ITU-T Rec. G.652	10/125	µm
Modulation rate on optical line	2 488 320	kbit/s
Wavelength range	1500 - 1580	nm
Transmitter at reference point S		
Source type	SLM	
Spectral characteristics (max. -20dB width)	1	nm
Mean launched power (max.)	+3	dBm
Mean launched power (min.)	-2	dBm
Min. extinction ratio	8.2	dB
Optical path between S and R		
Attenuation range	10 - 24	dB
Max. tolerable dispersion	1600	ps/nm
Min. optical return loss	24	dB
Max. discrete reflectance between S and R	-27	dB
Receiver at reference point R		
Min. sensitivity (BER < 1 in 10^{10})	-28	dBm
Min. overload	-9	dBm
Max. optical path penalty	2	dB
Max. reflectance at R	-27	dB

17.2.3 Compliance

Table 17-2 Compliance - L16.2-1-LC Interface

Standard	Comment
ITU-T G.652	Single Mode Fibre specification 10/125
ITU-T G.707	Optical line signal
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter
ITU-T G.957	Optical spectrum, Optical output power, Optical eye diagram, Optical extinction ratio.

17.2.4 Example of Cable Planning

Table 17-3 Typical Cable Parameters

Cable Loss, according to ITU-T Rec. G.957	Single Mode fibre Acc. to ITU-T G.652
Fibre Cable Attenuation	0.3 dB/km
Cable Margin (Mc)	Incl. in fibre cable attenuation
Loss in Optical Distribution Frame	Incl. in fibre cable attenuation
Cable Dispersion:	
Maximum Chromatic Dispersion Coefficient	20 ps/nm*km

Table 17-4 Typical Link Spans for 1xL-16.2-LC

Loss Limited Span	Dispersion Limited Span	Overall Link Span
80 km	80 km	80 km

17.2.5 Optical Rx Power Monitoring

The optical input power of the Rx interface is monitored and can be read from the CiscoEdgeCraft terminal.

CHAPTER 18

Dual Optical L4.2 Module, L4.2-2-LC

18.1 Module Description

This is a dual port STM4 module for long haul transmission at 1550nm optical wavelength. The main functions of the module are O/E- E/O conversion and SDH multi-/demultiplexing with VC-12, VC3 and VC-4 granularity. See the "5.1.1 Multiplexing Structure and Mapping Modes" section on page 5-1.

18.1.1 Power Consumption

13W.

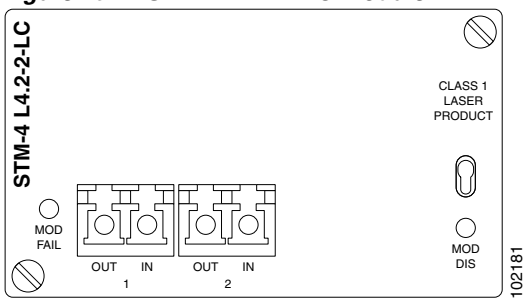
18.2 External L-4.2-LC Interface

The 2xL-4.2-LC line interface bitrate is bi-directional with a transmit (Tx) and a receive (Rx) direction. Tx and Rx directions are transmitted on separate fibres. The optical interfaces are compliant to ITU-T Rec. G.957 L-4.2 Long Haul specification for transmission on Single Mode (SM) fibre

18.2.1 Connector Type

The physical connector is a LC connector.

Figure 18-1 STM-4 L4.2-2-LC Module



18.2.2 Optical Budget

For definitions of optical parameters, see ITU-T Rec. G.957. Reference point S means transmit interface while R is the receive interface.

Table 18-1 Optical Budget - L4.2-2-LC Interface

Parameter	Value	
Types of fibre: ITU-T Rec. G.652	10/125	µm
Modulation rate on optical line	622 080	kbit/s
Wavelength range	1480 - 1580	nm
Transmitter at reference point S		
Source type	SLM	
Spectral characteristics (max. 20 dB width)	1	nm
Mean launched power (max.)	+3	dBm
Mean launched power (min.)	-2	dBm
Min. extinction ratio	10	dB
Optical path between S and R		
Attenuation range	10 - 24	dB
Max. tolerable dispersion	3000	ps/nm
Min. optical return loss	24	dB
Max. discrete reflectance between S and R	-27	dB
Receiver at reference point R		
Min. sensitivity (BER < 1 in 10^{10})	-28	dBm
Min. overload	-8	dBm
Max. optical path penalty	1	dB
Max. reflectance at R	-27	dB

18.2.3 Compliance

Table 18-2 .Compliance - L4.2-2-LC Interface

Standard	Comment
ITU-T G.652	Single Mode Fibre specification 10/125
ITU-T G.707	Optical line signal
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter
ITU-T G.957	Optical spectrum, Optical output power, Optical eye diagram, Optical extinction ratio.

18.2.4 Example of Cable Planning

Table 18-3 Typical Cable Parameters

Cable Loss, according to ITU-T Rec. G.957	Single Mode fibre Acc. to ITU-T G.652
Fibre Cable Attenuation	0.3 dB/km
Cable Margin (Mc)	Incl. in fibre cable attenuation
Loss in Optical Distribution Frame	Incl. in fibre cable attenuation
Cable Dispersion:	
Maximum Chromatic Dispersion Coefficient	20 ps/nm*km

Table 18-4 Typical Link Spans for 2xL4.2-2-LC

Loss Limited Span	Dispersion Limited Span	Overall Link Span
80 km	150 km	80 km

18.2.4.1 Optical Rx Power Monitoring

The optical input power of the Rx interface is monitored and can be read from the CiscoEdgeCraft terminal.

CHAPTER 19

Dual Optical + 21xE1 S1.1-2-LC/E1-21 Module

19.1 Module Description

The module contains two optical STM-1 short-haul interfaces and 21 E1 interfaces. The main functions of the module are O/E- E/O conversion and SDH multi-/demultiplexing with VC-12, VC3 and VC-4 granularity of the STM-1 traffic and VC-12 mapping/demapping demultiplexing of the E1 traffic. Seethe "5.1.1 Multiplexing Structure and Mapping Modes" section on page 5-1. The module supports both transparent E1 data transmission acc. to ITU-T Rec. G.703 as well as the NT functionality of ISDN PRA according to ETSI 300 233. One high density LFH type connector is used to interface the 21 E1's and a dual fiber LC connector, one fibre in each direction, is used on the two STM1 interfaces.

19.1.1 Power Consumption

15 W.

19.2 External STM-1 S-1.1 Interface

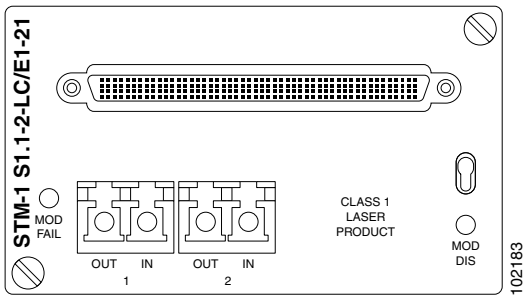
The optical STM1 interfaces are short haul interfaces, according to ITU-T Rec. G.957, S-1.1, bi-directional transmission on two Single Mode (SM) fibres.

The module can also be used for transmission on Multi Mode (MM) fibres, see the "19.4 Example of Cable Planning, STM-1 S-1.1 interface" section on page 19-4.

19.2.1 Connector Type

The physical connector is a LC connector.

Figure 19-1 STM-1 S1.1-2-LC/E1-21 Module



19.2.2 Optical Budget

Table 19-1 S-1.1 Interface Optical Budget

Parameter	Value
Type of fibre: SM acc. ITU-T Rec. G.652 (See Note below)	10/125 µm
Modulation rate on optical line	155 520 kbit/s
Wavelength range	1261 - 1360 nm
Transmitter at reference point S	
Source type	MLM
Spectral characteristics (max. RMS width)	7.7 nm
Mean launched power (max.)	-8 dBm
Mean launched power (min.)	-15 dBm
Min. extinction ratio	8.2 dB
Optical path between S and R	
Attenuation range	0 - 12 dB
Max. tolerable dispersion	260 ps/nm
Min. optical return loss	NA
Max. discrete reflectance between S and R	NA
Receiver at reference point R	
Min. sensitivity (BER < 1 in 10^{10})	-28 dBm
Min. overload	-8 dBm
Max. optical path penalty	1 dB
Max. reflectance at R	NA

Note The module can also be used for transmission on Multi Mode fibre, see the "19.4 Example of Cable Planning, STM-1 S-1.1 interface" section on page 19-4 .

19.2.3 Compliance

Table 19-2 Optical S-1.1 Interface Compliance

Standard	Comment
ITU-T G.652	Type of optical fibre
ITU-T G.707	Optical line signal
ITU-T G.783	RX pull-in and hold range
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter
ITU-T G.957	Optical spectrum Optical output power Optical eye diagram Optical extinction ratio
ITU-T G.958	Input jitter measurement
ITU-T G.651	Multi Mode Fibre specification 50/125 µm
IEC/EN 60793-2-10	Optical fibres -- Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres

19.2.3.1 Optical Rx Power Monitoring

The optical input power of the Rx interface is monitored and can be read from the CiscoEdgeCraft terminal.

19.3 External E1 Interface

19.3.1 Connectors

The connector is a high density LFH connector. See the "14.2.1 32XE1 LFH - LFH Cable" section on page 14-3 for details.

19.3.2 Patch Panels

Two types of patch panels are available for patching the 21 E1's interface. See the "14.2 Patch Panels" section on page 14-2 for details.

Note When the LFH connector/Patch panels are used together with the STM-1 S1.1-2-LC/E1-21 module, only the first 21 ports are used.

Warning **This interface is considered SELV cicuit. Avoid connecting this interface to TNV circuits. The cables must not run with power cables, Network cables, or any other cables wich are not connected to SELV circuits. The electrical cables must not exit the building. If cables are connected to an equipment wich contains not SELV circuits, proper insulation between the ONS15305 E1 cables interface and the other equipment interfaces must be provided.**

19.3.3 Compliance

Table 19-3 Multi-Interface E1 Compliance

Standard	Comment
ETS 300 011	Impedance towards ground
	Tolerable longitudinal voltage
ETS 300 126	Output signal balance
ITU-T G.703	Cable attenuation
	Input reflection loss
	Input port immunity against reflection
	Output pulse mask
ITU-T G.783	Output jitter in the absence of input jitter
	Output combined jitter
ITU-T G.823	Max. tolerable input jitter

19.4 Example of Cable Planning, STM-1 S-1.1 interface

Table 19-4 Typical Cable Parameters

Cable Loss, according to ITU-T Rec. G.957	Single Mode fibre Acc. to ITU-T G.652	Multi Mode fibre 50/125 um Acc. to ITU-T G.651	Multi Mode fibre 62.5/125 um Acc. to IEC/EN 60793-2-10
Fibre Cable Attenuation	0.5 dB/km	1.0 dB/km	1.0 dB/km
Cable Margin (Mc)	Incl. in fibre att	3 dB	3 dB
Loss in Optical Distribution Frame	Incl. in fibre att.	1 dB	1 dB
Cable Dispersion:			
Maximum Chromatic Dispersion Coefficient	5.5 ps/nm*km	6 ps/nm*km	6 ps/nm*km
Modal bandwidth	-	800 MHz*km (Note 1)	500 MHz*km (Note 1)
Overall bandwidth	-	80 MHz	80 MHz

Table 19-5 Typical Link Spans

Type of fibre		Loss Limited Span	Dispersion Limited Span	Overall Link Span	Notes
Two-fibre	SM	24 km	47 km	24 km	
	MM 50 µm	13 km	10 km	10 km	Note 2,3
	MM 62.5 µm	13 km	6 km	6 km	Note 2,3

Note Modal bandwidth for Overfilled launch (OFL).

Note Offset launch with mode-conditioning patchcord according to IEEE Std. 802.3 1998 edition.

Note By using a MM fibre like GIGAlite™ II, dispersion limited spans can be extended to 15km (50/125µm) and 9 km (62.5/125 µm) without the need of a mode-conditioning patchcord.

Centre launch with SM patch cord connected directly to the MM fibre gives potentially much higher bandwidths than the OFL bandwiths (several GHz/km) as only a few central modes are launched.

However, MM fibres can contain central index distortions, which can give rise to bandwitdh collapse with small offsets from centre . Both centre launch and offset launch with FP laser creates underfilled exictation of the MM fibre. Offset launch is less vulnerable to mode coupling distortions due to the higher number of modes beeing exited. Underfilled excitations generally gives higher bandwidths than OFL.

Recommendation

Centre launch i.e. SM patchcord from 2xS-1.1-LC, is likely to achieve transmssion distances at least as given in the table for most MM fibre cables. Use of mode conditoning cord for offset launch, is preferred when quality of MM fibre plant is unknown.