



Cisco ONS 15305 Installation and Operation Guide

Software Release 2.0
January 2005

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About This Guide

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

This section provides the following information:

- [Document Objectives](#)
- [Audience](#)
- [Document Organization](#)
- [Related Documentation](#)
- [Document Conventions](#)
- [Where to Find Safety and Warning Information](#)
- [Obtaining Documentation](#)
- [Documentation Feedback](#)
- [Cisco Product Security Overview](#)
- [Obtaining Technical Assistance](#)
- [Obtaining Additional Publications and Information](#)

Document Objectives

This chapter 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 chapter 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 Operation Guide 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, “ONS 15305 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 chapters describe 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 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”](#)
- [Chapter 20, “Dual Optical LAN 1000Base-LX Module with Mapper, GigE-WAN-2”](#)
- [Chapter 21, “Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8”](#)

The following chapter described the line-oriented ASCII-based management interface, ONSCLI

- [Chapter 22, “Command Line Interface - ONSCLI”](#)

Related Documentation

Use this Cisco ONS 15305 Installation and Operation Guide in conjunction with the following referenced publications:

- *Cisco ONS 15305 Quick Installation Guide*
Provides quick installation and provisioning procedures.

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

Document Conventions

This publication uses the following conventions:

Convention	Application
boldface	Commands and keywords in body text.
<i>italic</i>	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. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

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 15xxx systems. It also includes translations of the safety warnings that appear in the ONS 15xxx system documentation.

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:

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

You can access the Cisco website at this URL:

<http://www.cisco.com>

You can access international Cisco websites at this URL:

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

Documentation DVD

Cisco documentation and additional literature are available in a Documentation DVD package, which may have shipped with your product. The Documentation DVD is updated regularly and may be more current than printed documentation. The Documentation DVD package is available as a single unit.

Registered Cisco.com users (Cisco direct customers) can order a Cisco Documentation DVD (product number DOC-DOCDVD=) from the Ordering tool or Cisco Marketplace.

Cisco Ordering tool:

<http://www.cisco.com/en/US/partner/ordering/>

Cisco Marketplace:

<http://www.cisco.com/go/marketplace/>

Cisco Optical Networking Product Documentation CD-ROM

Optical networking-related documentation, including Cisco ONS 15305 product documentation, is available in a CD-ROM package that ships with your product. The Optical Networking Product Documentation CD-ROM is updated periodically 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 Ordering tool:

<http://www.cisco.com/en/US/partner/ordering/>

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 1 800 553-NETS (6387).

Documentation Feedback

You can send comments about technical documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) 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.

Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

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

From this site, you can perform these tasks:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories and notices for Cisco products is available at this URL:

<http://www.cisco.com/go/psirt>

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

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

Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you might have identified a vulnerability in a Cisco product, contact PSIRT:

- Emergencies — security-alert@cisco.com
- Nonemergencies — psirt@cisco.com



Tip

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.x.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one that has the most recent creation date in this public key server list:

<http://pgp.mit.edu:11371/pks/lookup?search=psirt%40cisco.com&op=index&exact=on>

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, Cisco Technical Support provides 24-hour-a-day, award-winning technical assistance. The Cisco Technical Support Website on Cisco.com features extensive online support resources. In addition, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not hold a valid Cisco service contract, contact your reseller.

Cisco Technical Support Website

The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year, at this URL:

<http://www.cisco.com/techsupport>

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

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



Note

Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID

or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

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

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

<http://www.cisco.com/go/marketplace/>

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

<http://www.ciscopress.com>

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

<http://www.cisco.com/packet>

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

<http://www.cisco.com/go/iqmagazine>

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

<http://www.cisco.com/ipj>

- World-class networking training is available from Cisco. You can view current offerings at this URL:

<http://www.cisco.com/en/US/learning/index.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

This section describes Translated Warnings related to installation of ONS 15305.

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!	Mielőtt a következő 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 hozzáférhetőnek kell lennie, mivel ez szolgál főmegszakítóként.

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 fråkopplingsanordningen.
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, vergrootglas 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 lézertényet 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 mikroskop) 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.

1.6 Translated Warnings

- 警告** 无终端接头的光纤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.****Advarsel****Laserprodukt av klasse 1.****Aviso****Produto laser de classe 1.****¡Advertencia!****Producto láser Clase I.****Varning!****Laserprodukt av klass 1.****Предупреждение****Лазерное устройство класса 1.****警告****这是 1 类激光产品。****警告****クラス1レーザー製品です。****주의****1급 레이저 제품.**



Product Overview

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

2.1 Functional Overview

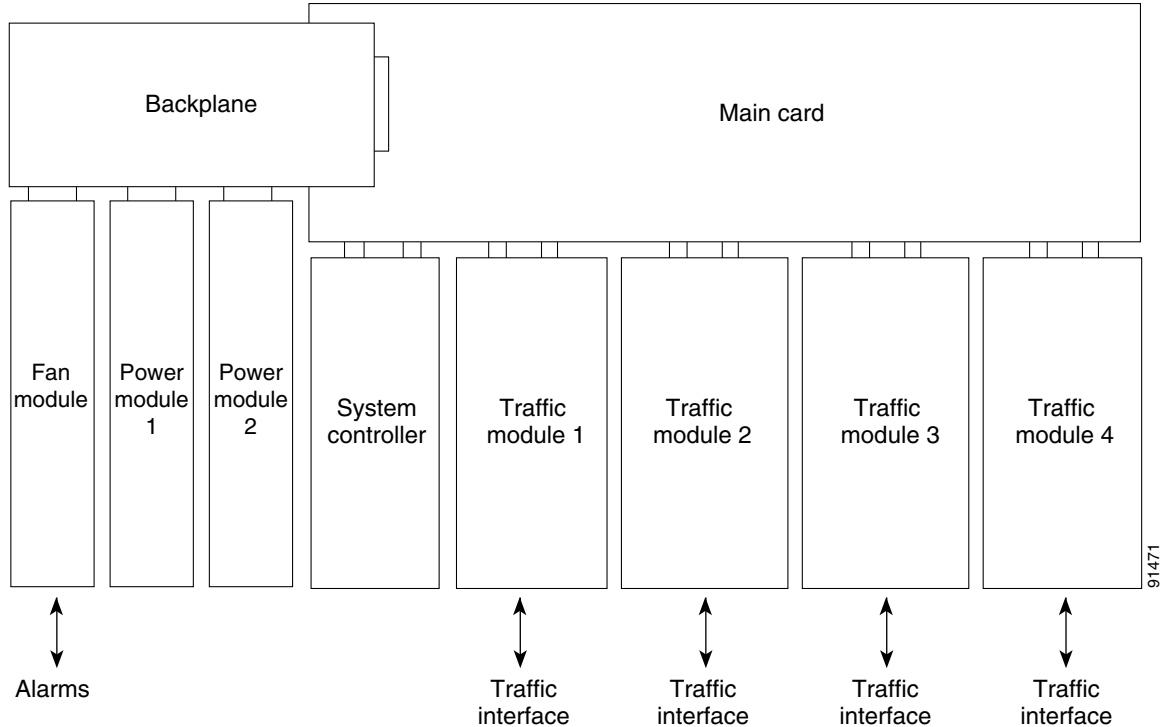
The ONS 15305 is a traffic concentrator that supports different types of transmission media. It can be used in networks based on fibre and copper media. The ONS 15305 concentrates both IP and TDM traffic and is able to interface to both TDM and IP backbone networks. The TDM part of the ONS 15305 is a 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 consists 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

See [Figure 2-1 on page 2-2](#).

Figure 2-1 System Overview



2.2 Applications

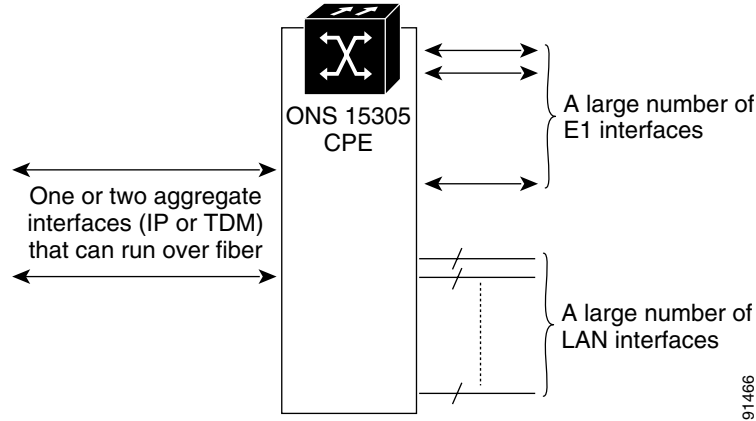
The following sections show examples of ONS15305 Applications.

2.2.1 CPE Application

The ONS 15305 can be used as a Customer Premises Equipment (CPE). The unit has a large number of TDM interfaces (E1) and LAN interfaces (10/100/Base-T, 1000 Base-LX). This application is typically 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

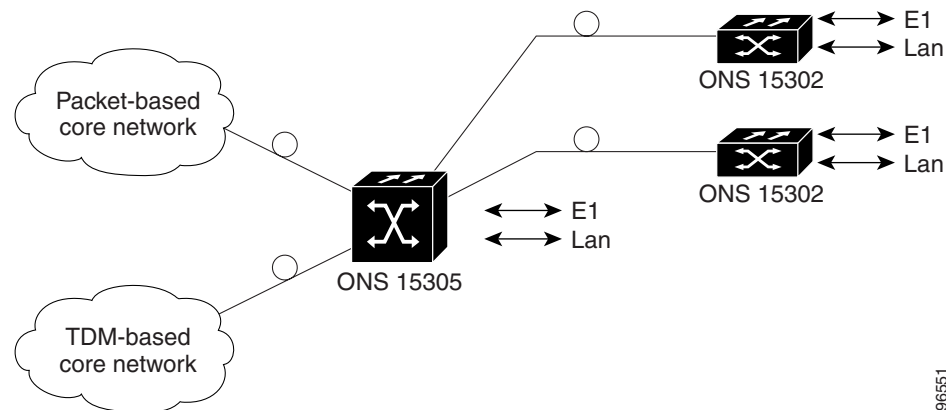


2.2.2 Small PoP Application

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

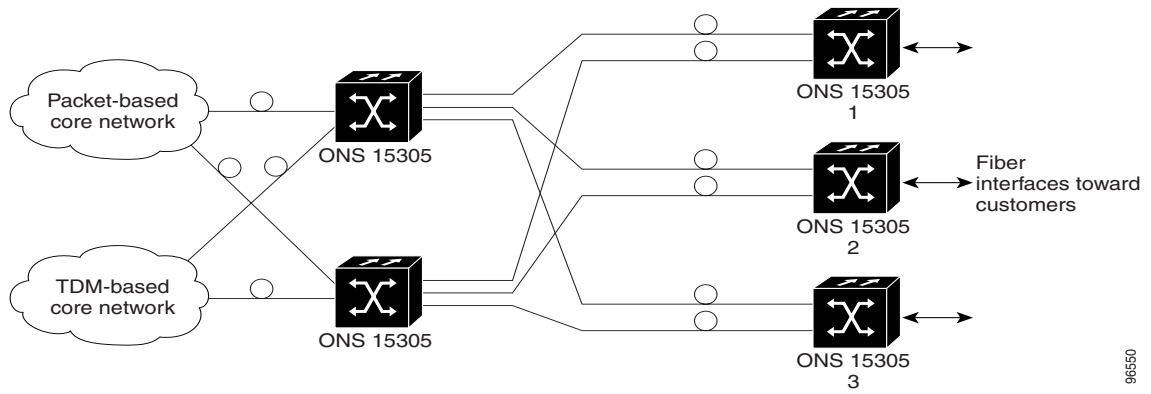


2.2.3 Large PoP Application

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. A typical application is shown in [Figure 2-4](#).

Figure 2-4 Large PoP Application

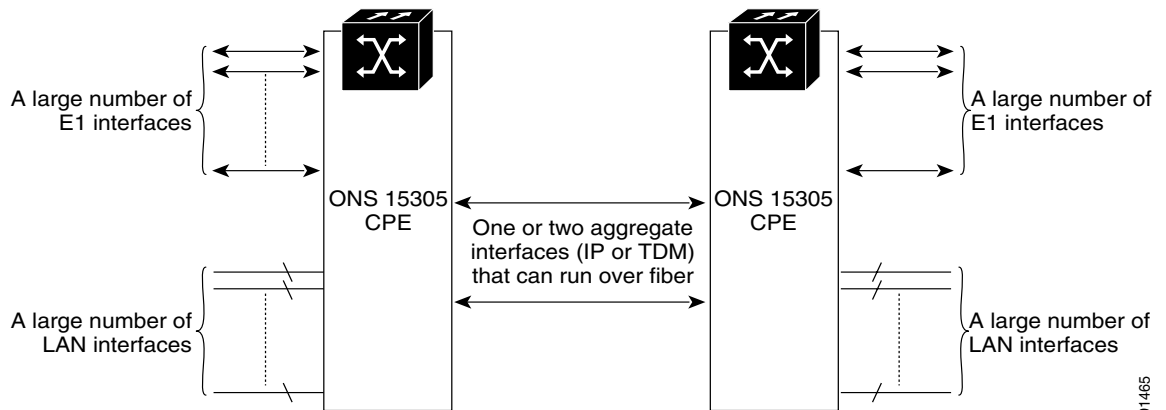


96550

2.2.4 Campus Application

The ONS 15305 can also be connected back to back without any connection to external networks. A typical application is shown in [Figure 2-5](#).

Figure 2-5 Campus Application

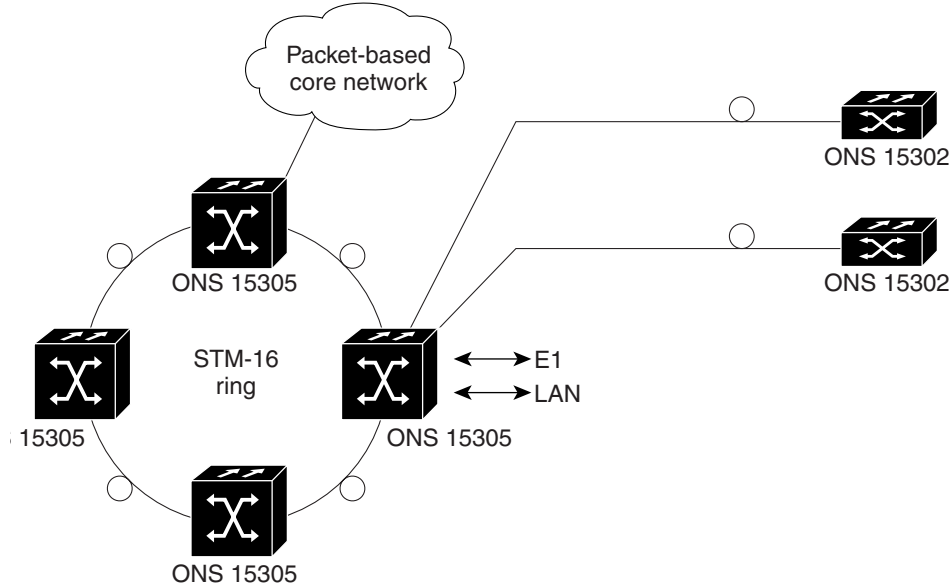


91465

2.2.5 ADM Application

The ONS 15305 can be used as a standard ADM with support of both TDM tributaries and IP tributaries. A typical application is shown in [Figure 2-6](#).

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 $\sim 40^{\circ}\text{C}$, one pair operates. Above $\sim 40^{\circ}\text{C}$ both pairs operate.

Location of Alarm and Fan Module is shown in [Figure 2-7](#).

2.3.1 Protection

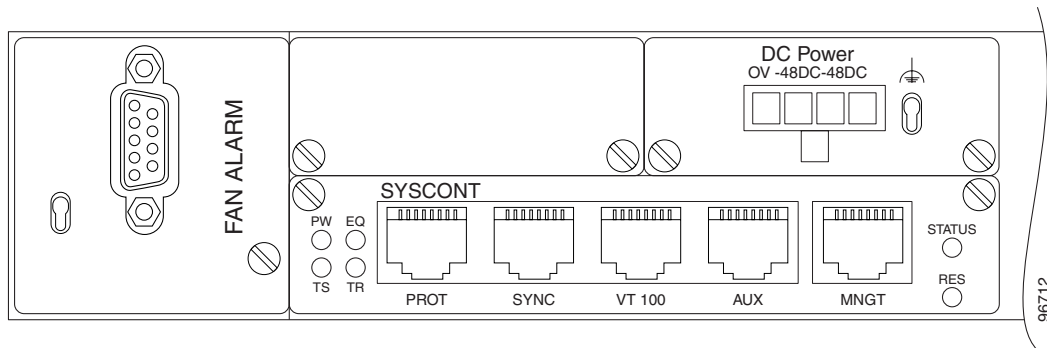
The fan unit consists of four fans. To equalize wear-out time between both fan pairs, they interchange active/stand-by roles every 24-hour. In case of an abnormal temperature rise, all fans will operate simultaneously. The fans operate in pairs; there are two standby fans and two main fans. The maximum 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°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 as shown in [Figure 2-7](#).

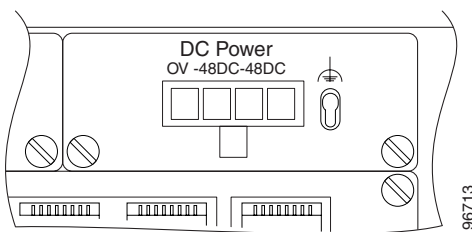
Figure 2-7 Location of Alarm and Fan Module, FAN-ALARM



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. Location of the DC Power Module is shown in Figure 2-8. 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 meet 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%.



Note

It is not recommended that AC power module and DC power module are mixed in one unit. Because of their different characteristics they cannot fully protect each other. Therefore two modules of the same kind should be used in a single unit.

2.4.2 Connectors

The -48V DC supply input is provided through a 4-pin power connector, (Molex Mini-fit) with the pin-out shown in [Table 2-1](#).

Table 2-1 Pin Out -48 V DC

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

2.4.3 Parameters

The -48V DC input conform to the specifications given in [Table 2-2](#).

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

2.4.3.1 Power Supply Output

100 W.

See “Power Consumption - ONS 15305 Modules” section on page 9 and “Module Configuration Within Capacity of DC Power module” section on page 10.

2.5 Power Module, AC 230V

This section describes the Power Module AC 230V shown in [Figure 2-9](#).

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 disconnects 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 limits 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 meet the safety requirements from the EN 60950 specification.

**Note**

It is not recommended that AC power module and DC power module are mixed in one unit. Because of their different characteristics they can not fully protect each other. Therefore two modules of the same kind should be used in a single unit.

2.5.1.1 Power Supply Output

75 W.

2.5.1.2 Power Supply Input

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

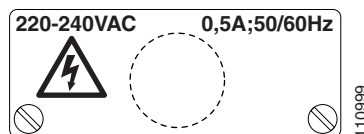
2.5.2 External Interface

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

2.5.3 Connector Type

The physical connector is an IEC C14 mains connector.

Figure 2-9 AC 230V Module



2.5.4 Electrical Specifications - AC input

Electrical Specifications - AC input is shown in [Table 2-3](#).

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

AC 230V Compliance is shown in [Table 2-4](#).

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

2.6 Limitations - Module Configurations

The AC 230V module can provide 75 W to the ONS 15305 unit. The Power module DC Power can provide 100W 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 the 230V module. [Table 2-7](#) provides a module configuration within capacity of the DC 48 V module.

2.6.1 List of Power Consumption - Available ONS 15305 Modules

Power Consumption for the ONS 15305 Modules are shown in [Table 2-5](#).

Table 2-5 Power Consumption - ONS 15305 Modules

Module Name	Power Consumption (W)
Base unit ¹	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
GigE-WAN-2	25
E100-WAN-8	27,5

1. Including Fan Alarm - and System Controller module

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

Example of Module Configuration is shown in [Table 2-6](#).

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

2.6.3 Example of Module Configuration Within Capacity of DC Power Module

Example of Module Configuration is shown in [Table 2-7](#).

Table 2-7 *Module Configuration Within Capacity of DC Power module*

Module Name	Power consumption
Base unit	20
S16.1-1-LC	13
S16.1-1-LC	13
GigE-WAN-2	25
GigE-WAN-2	25
Total	96 W

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

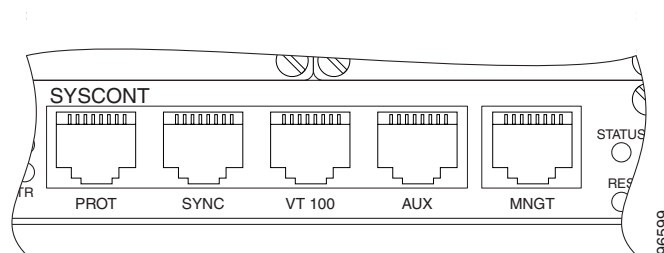
[Figure 2-10](#) shows the system controller that contains the processor for the ONS 15305. The software of the ONS 15305 runs in 128 MB SDRAM. The amount of memory can be configured from 64 MB to 512 MB. This is done in the factory. The software is stored in Flash memory devices. The ONS 15305 uses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

The module supports a serial RS-232/VT100 interface for local access. A VT100 terminal can be used for initial configuration.

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 time slots. 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



2.7.1 Power Consumption

6 W

2.7.2 Technical Overview

This sub.section gives a technical overview of the System Controller Module, (SYSCONT-SD128-RJ45).

2.7.2.1 Management Port

A local Ethernet port (10BaseT), 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.

2.7.2.2 VT100 port

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

2.7.2.3 Synchronization Port

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

2.7.2.4 The 2Mbit/s AUX port

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

2.7.2.5 Proprietary Protection Port

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

2.7.2.6 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.

2.7.2.7 Reset

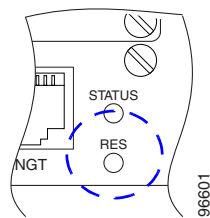


Caution

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

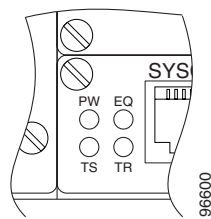


2.7.2.8 LEDs

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 2-8](#).

Table 2-8 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.

2.8 Service Modules

2.8.1 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.

2.8.2 Common Functions

This sub-section describes Service Modules common functions.

2.8.2.1 Memory

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

2.8.2.2 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.

2.8.2.3 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.

2.8.2.4 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.

2.8.2.5 G.Link

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

2.8.2.6 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 high speed 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

		<div style="border: 1px solid black; padding: 2px; width: fit-content;">Bar Code</div>	
(3S) PKG ID:			
<div style="border: 1px solid black; padding: 2px; width: 80%; margin: 0 auto;">Bar Code</div>			
(K) Cust PO:			
<div style="border: 1px solid black; padding: 2px; width: 60%; margin: 0 auto;">Bar Code</div>			
(P) Cust P/N:			
(1P) Prod. #:			
<div style="border: 1px solid black; padding: 2px; width: 60%; margin: 0 auto;">Bar Code</div>			
(S) Serial #:			
<div style="border: 1px solid black; padding: 2px; width: 30%; margin: 0 auto;">Bar Code</div>			
(Q) Qty.:			
<div style="border: 1px solid black; padding: 2px; width: 20%; margin: 0 auto;">Bar Code</div>			
Notes:			
S.O.#:		<div style="border: 1px solid black; padding: 2px; width: 40px;">Bar Code</div> <small>Carton#:</small>	
<div style="border: 1px solid black; padding: 2px; width: 60%; margin: 0 auto;">Bar Code</div>			
Shipset:	FC-Date:		
<div style="border: 1px solid black; padding: 2px; width: 60%; margin: 0 auto;">Bar Code</div>		60126	

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, minimum -5°C.

The following tables are based on typical ONS 15305 configurations. 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 3-5](#) lists these requirements.

Table 3-5 Recommended Ground Capacity

Item	Recommended Capacity
Total weight	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 the [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, [Chapter 3, “Reporting Damage”](#).

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 build-up. 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 build-up. 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 wires
- 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

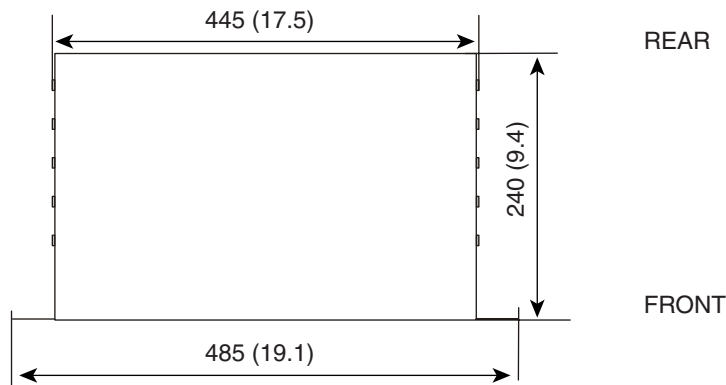
4.2.2 Installation Guidelines

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



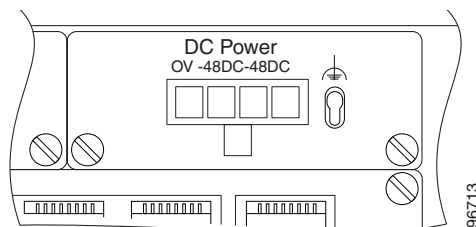
All dimensions are in mm (and in.)

83496

4.2.3 Install Ground to 48 V

The ONS 15305 cabinet must always be tied to a suitable earth reference 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 positive 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



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4.2.4 Install External Ground to the ONS 15305

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

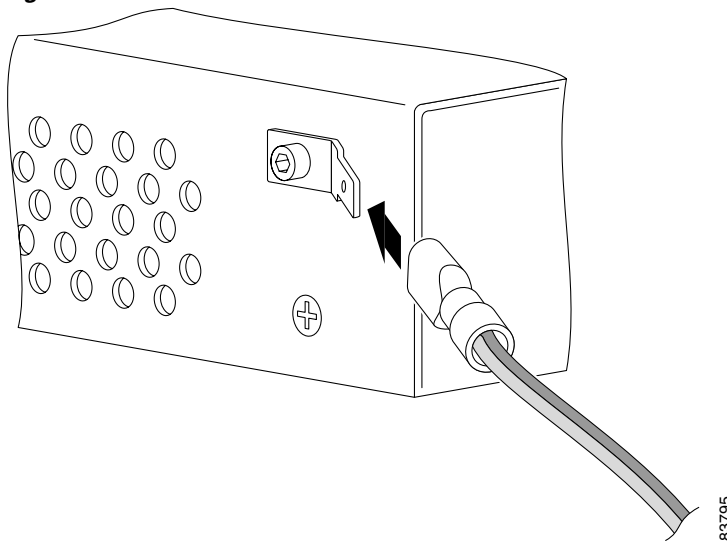
When installed in a rack, the ONS 15305 cabinet will be tied to the rack reference potential through the mounting brackets (earth, ground potential).


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 4-3](#) or by mounting an extra connector to one of the cabinet screws as in [Figure 4-3](#).

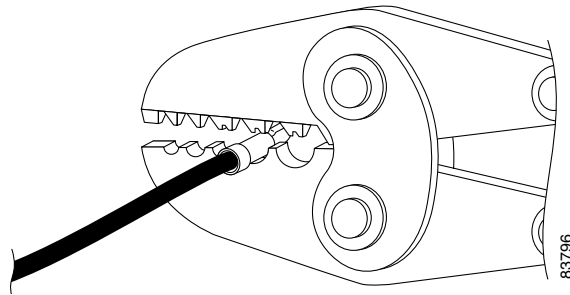
Figure 4-3 Ground Connector Position on the ONS 15305



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

Cleotop 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

Follow the procedure below when cleaning 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

Follow the procedure below when cleaning 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

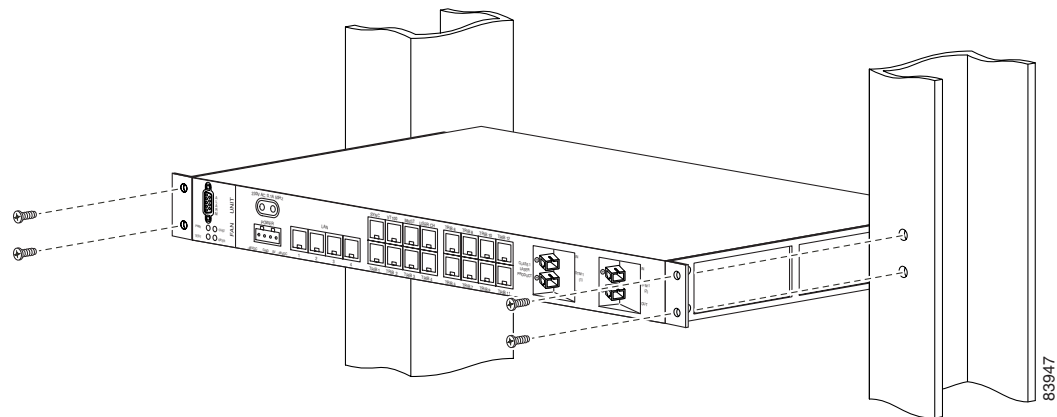
Static electricity can damage electronic equipment. While unpacking and handling electronic modules, wear a grounding wrist strap to discharge the static build-up. Grounding wrist straps are designed to prevent equipment damage caused by static electricity. Before making the necessary interconnections,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

Mount the ONS 15305 in an Equipment Rack

Use the following procedure to install 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 metallicly 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 communication 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.

4.4.2.1 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 build-up. 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 color of the wire with their function.

Table 4-1 Power Cable

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

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 ONS 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.

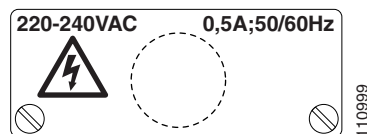


Note The power supply has been connected correctly when the green LED is lit.

4.4.3 Install the ONS 15305 –AC 230V Power

The following procedure explains how to install ONS 15305 AC power connections. The AC 230 Power module is shown in [Figure 4-6](#).

Figure 4-6 AC 230V Module



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 build-up. 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 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 section 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 described in [4.6 Interconnections and Cable Handling, page 4-15](#).

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



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 Cisco EdgeCraft 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)
- Dual Optical LAN 1000Base-LX Module w/ Mapper (GigE-WAN-2)
- Octal LAN 10/100Base-TX Module w/ Mapper (E100-WAN-8)

4.5.1 LEDs

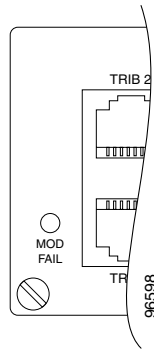
There is one status LED indicator on the front of a Service module, as shown in [Figure 4-7](#).

LED indications is described in [Table 4-2](#)

Table 4-2 LED Indications

Indication	Description
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 [Figure 4-8](#)).



Note

Flashing green LED on Ethernet related modules during shutdown



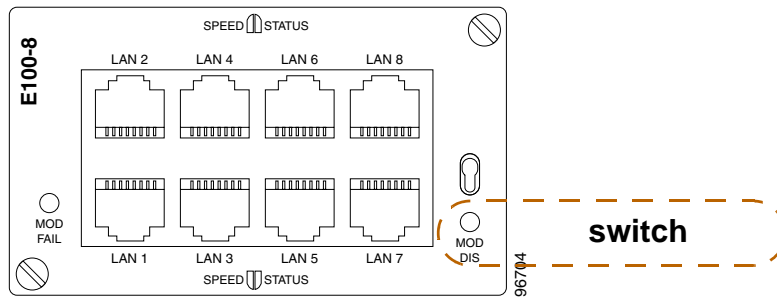
Note

Flashing green LED after inserting a service module in Base Unit indicate that the module is receiving a firmware to align the status for Network release level stored on the system controller. This will only be triggered when the Update policy is enabled for the service module being inserted. An event will be reported in this case.

4.5.2 Hot Insertion and Removal

The ONS 15305 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.



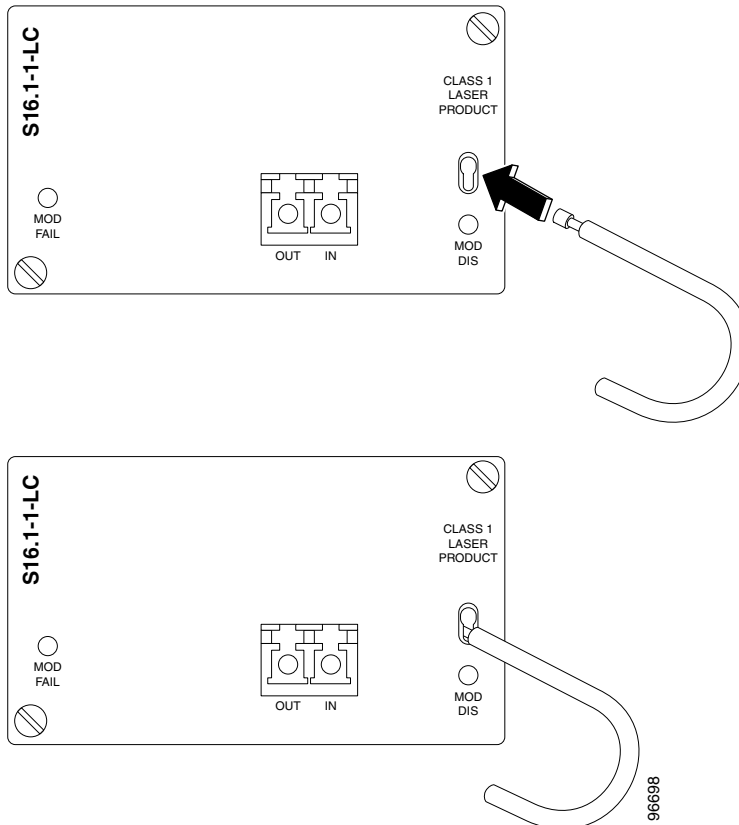
Caution

When activating the switch, ensure that it is not pressed too far in.

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

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. Please 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 build-up. 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 an 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-n) 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 build-up. 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 that guide for instructions on how to set up the necessary communication parameters enabling 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.

**Tip**

Also see the Commissioning Wizard and the MCN Wizard in Cisco EdgeCraft.



ONS 15305 Features

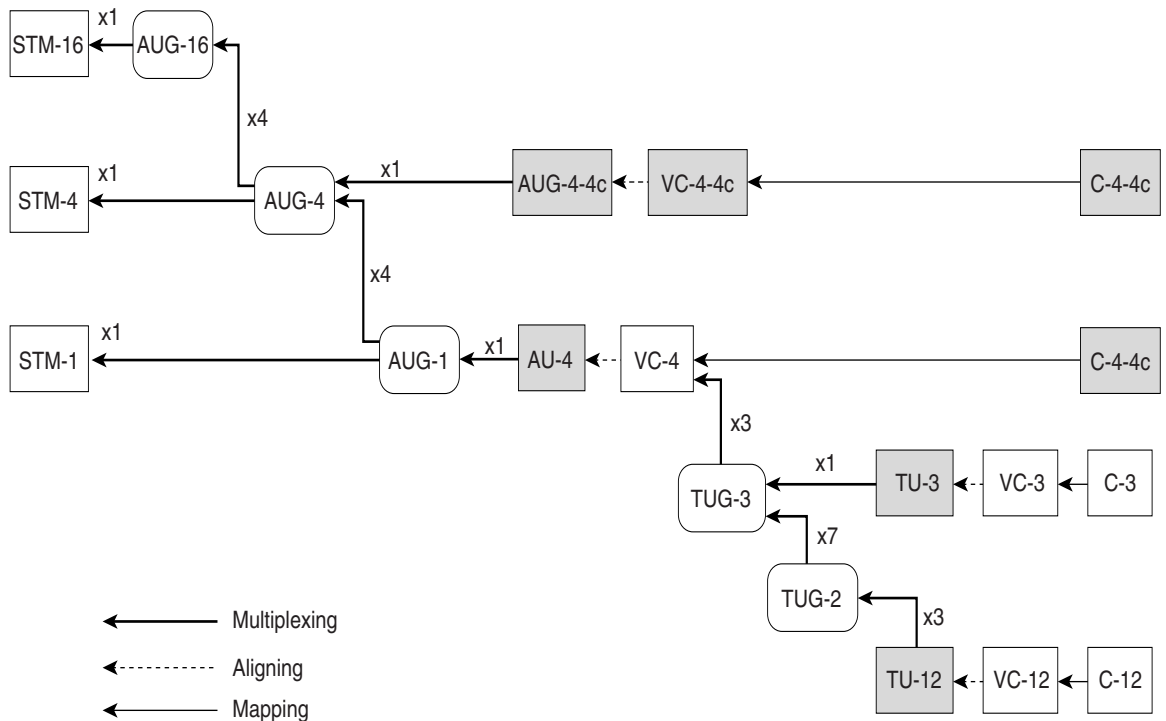
This chapter provides an overview of the features of the ONS 15305.

5.1 SDH Features

The ONS 15305 SDH Features are described in the following sub-sections.

5.1.1 Multiplexing Structure and Mapping modes

The ONS 15305 complies with the basic multiplexing principles outlined in Clause 6 in ITU-T G.707 and ETSI EN 300147 clause 4. The ONS 15305 supports the multiplexing structure outlined in [Figure 5-1](#) This is a subset of the possible multiplexing structures defined in ITU-T G.707 clause 6 and ETSI EN 300 147 clause 4.

Figure 5-1 Multiplexing Mapping Structure

The ONS 15305 complies with the multiplexing methods outlined in clause 7 in ITU-T G.707 and ETSI EN 300 147 clause 5 for the supported multiplexing structures.

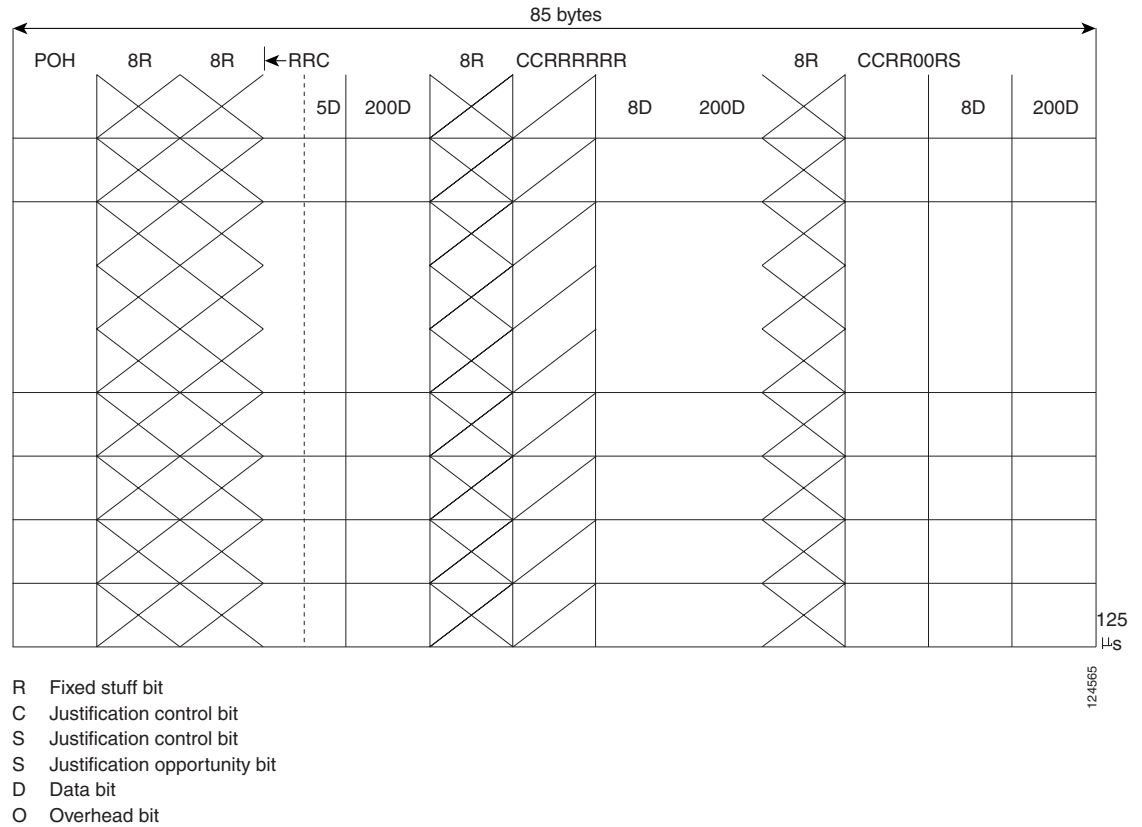
5.1.2 Mapping of Tributaries into VC-n

This section describes supported mapping of tributaries into VC-n.

5.1.2.1 Asynchronous Mapping of 44 736 kbps

The ONS 15305 supports asynchronous mapping of 44 736 Kbps signal into a VC-3 container as shown in [Figure 5-2](#). The mapping is in accordance to ITU-T G.707 clause 10.1.2.1 and ETSI EN 300 147 Clause 8.

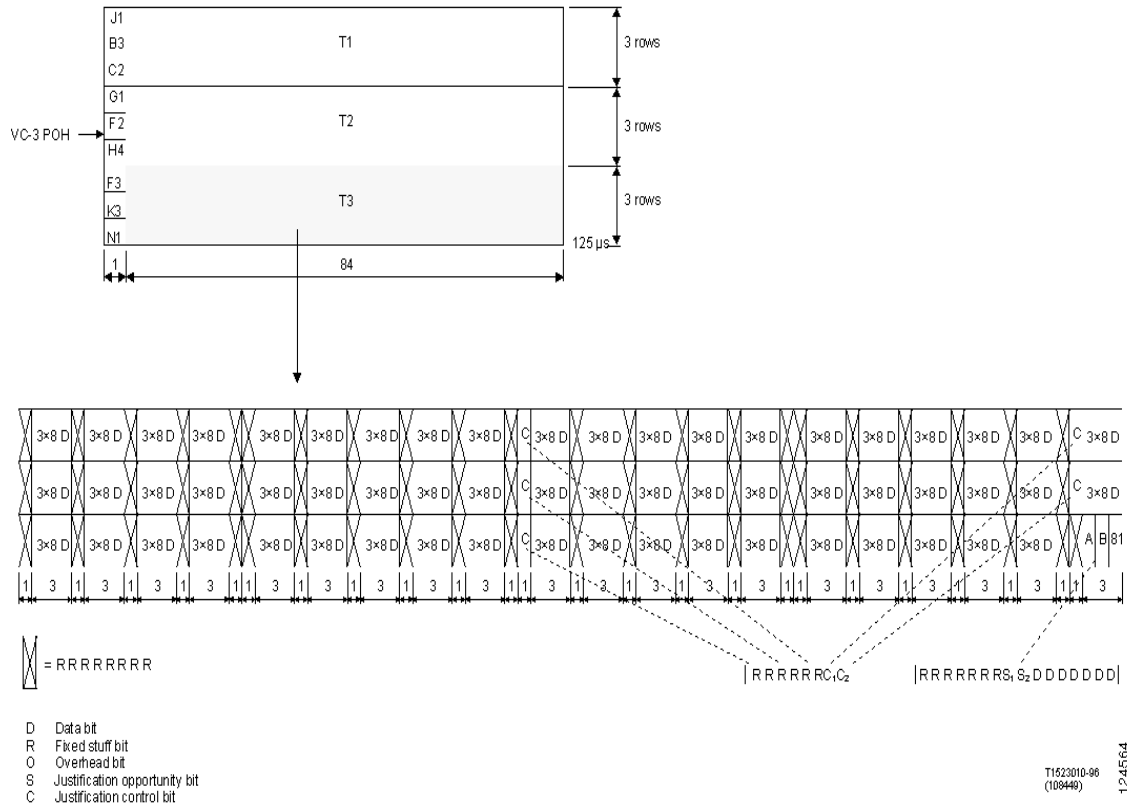
Figure 5-2 Asynchronous Mapping of 44 736 kbps Tributary into VC-3



5.1.2.2 Asynchronous Mapping of 34 368 kbps

The ONS 15305 supports asynchronous mapping of 34 368 kbps signal into a VC-3 container as shown in [Figure 5-3](#). The mapping is in accordance to ITU-T G.707 clause 10.1.2.2 and ETSI EN 300 147 Clause 8.

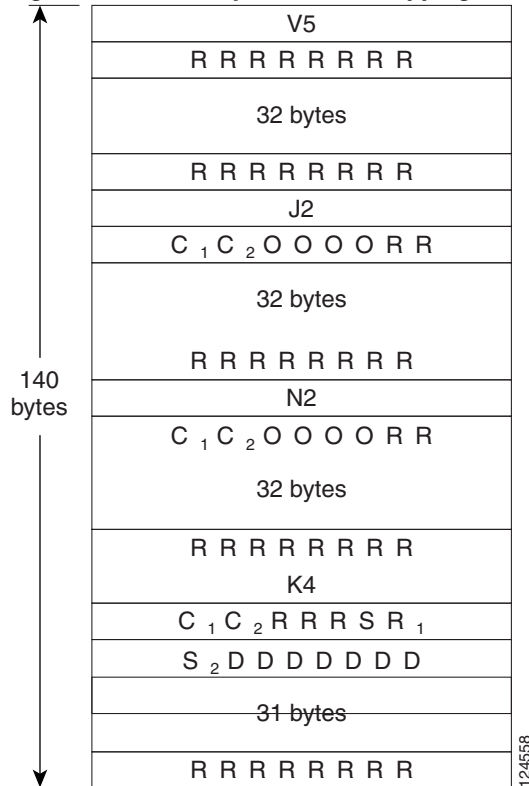
Figure 5-3 Asynchronous Mapping of 34 368 kbps Tributary into VC-3



5.1.2.3 Asynchronous mapping of 2048kbps

The ONS 15305 supports asynchronous mapping of 2048kbps signal into a VC-12 container as shown in Figure 5-4. The mapping is in accordance to ITU-T G.707 clause 10.1.4.1 and ETSI EN 300 147 Clause 8.

Figure 5-4 Asynchronous Mapping 2048 kbps Tributary into VC-12



- D Data bit
- R Fixed stuff bit
- O Overhead bit
- C Justification opportunity bit
- S Justification control bit

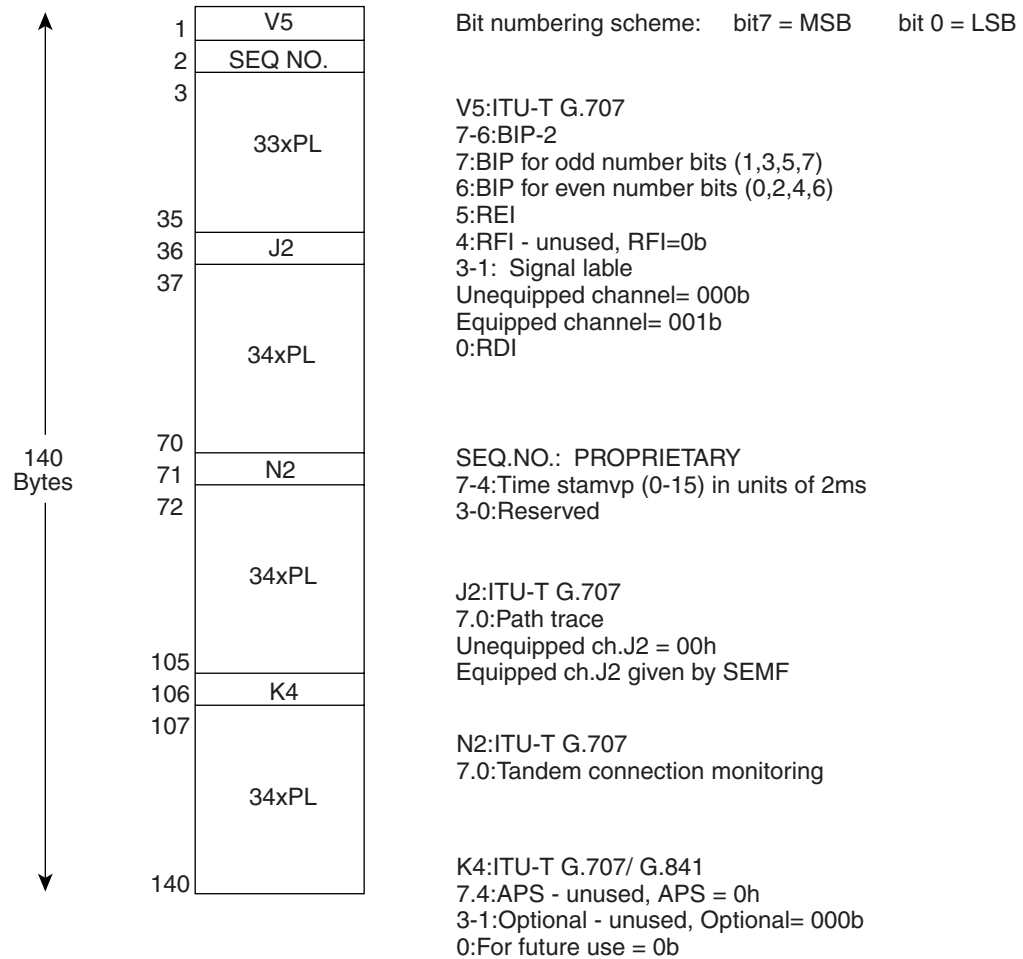
5.1.2.4 Mapping of GFP frames

The ONS 15305 supports the Generic Framing Procedure (GFP) to encapsulate variable length payload of various client signals for subsequent transport over SDH networks as defined in ITU-T G.707. The ONS 15305 supports mapping of a GFP frame stream into a Container-n (n=12,3,4 or 12/3/4-Xv). The mapping is in accordance to ITU-T G.707 clause 10.6.

5.1.2.5 Proprietary mapping of HDLC encapsulated Ethernet frames

The ONS 15305 provides a proprietary mapping scheme for mapping of HDLC encapsulated Ethernet frames traffic into VC-12 containers. The proprietary mapping scheme used to map the data into a VC-12 container is described in [Figure 5-5](#).

Figure 5-5 Proprietary mapping of HDLC frames



Capacity for WAN traffic:
 $(33 + (34 \times 3)) \times 8 \text{ bit} / 500 \mu\text{s} = 2.160\text{Mbit/s}$

91467

5.1.3 STM-N Physical Layer

The ONS 15305 offers the following physical interfaces:

- Optical STM-1 interfaces, S1.1, L1.1, L1.2
- Optical STM-4 interfaces, S4.1, L4.1, L4.2
- Optical STM-16 interfaces, S16.1, L16.1, L16.2

The ONS 15305 implements the supported Physical layer functions in accordance to ITU-T G.783 clause 9.

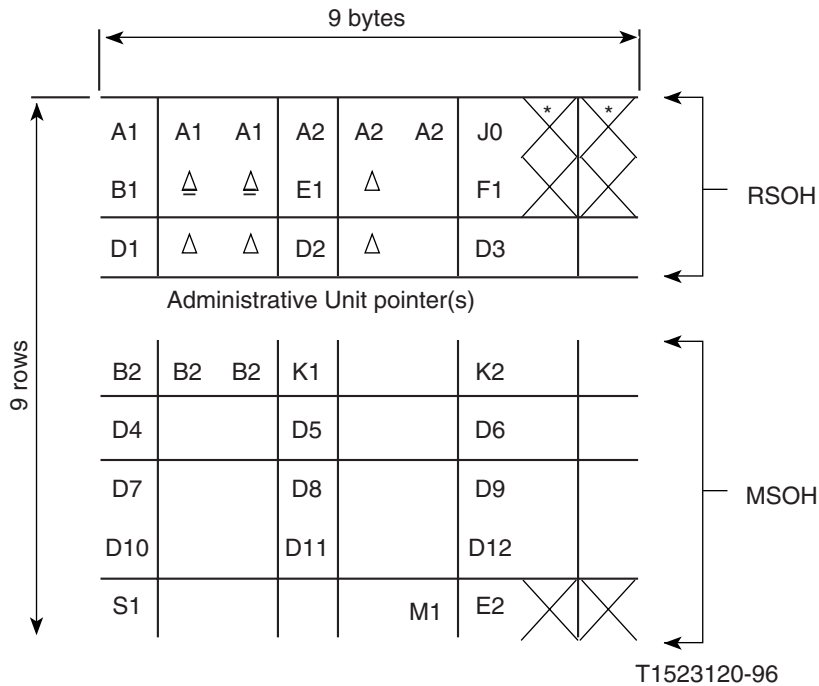
5.1.4 STM-N Regenerator and Multiplex Section Layer

The ONS 15305 implements the STM-N (n=1,4 and 16) Regenerator and Multiplex Section layer functions in accordance to ITU-T G.783 clause 10 and 11.

5.1.4.1 SOH Implementation

The ONS 15305 complies with the SOH implementation methods outlined in clause 9 in ITU-T G.707 and ETSI EN 300 147 clause 7. The assignment of the STM-n SOH is outlined in Figure 5-6.

Figure 5-6 STM-n Section Overhead (SOH)



- X Bytes reserved for national use
- * Unscrambled bytes. Therefore care should be taken with their content.
- △ Media dependent bytes

NOTE: - All unmarked bytes are reserved for future international standardization (for media dependent, additional national use and other purposes).

91472



Note

The ONS 15305 supports all the SOH bytes as described in ITU-T G.707 Clause 9.2, with the following exceptions; Forward Error Correction bytes P1, Q1 are not supported for STM-16 connections.

5.1.5 VC-n/m Path layer

The ONS 15305 offers the support of the following payloads:

- VC-4
- VC-4-4c
- VC-4-Xv
- VC-3
- VC-3-Xv
- VC-12
- VC-12-Xv

The support of the VC-4-4c contiguous concatenation and the support of the VC-12/3/4-Xv virtual concatenation are described in [5.1.7 Concatenation Schemes, page 5-11](#).

The ONS 15305 implements the supported Path layer functions in accordance to ITU-T G.783 clause 12 for VC-n, where n=4-X, 4, 3-X, 3.

The ONS 15305 implements the supported Path layer functions in accordance to ITU-T G.783 clause 13 for VC-m, where m=12-X, 12.

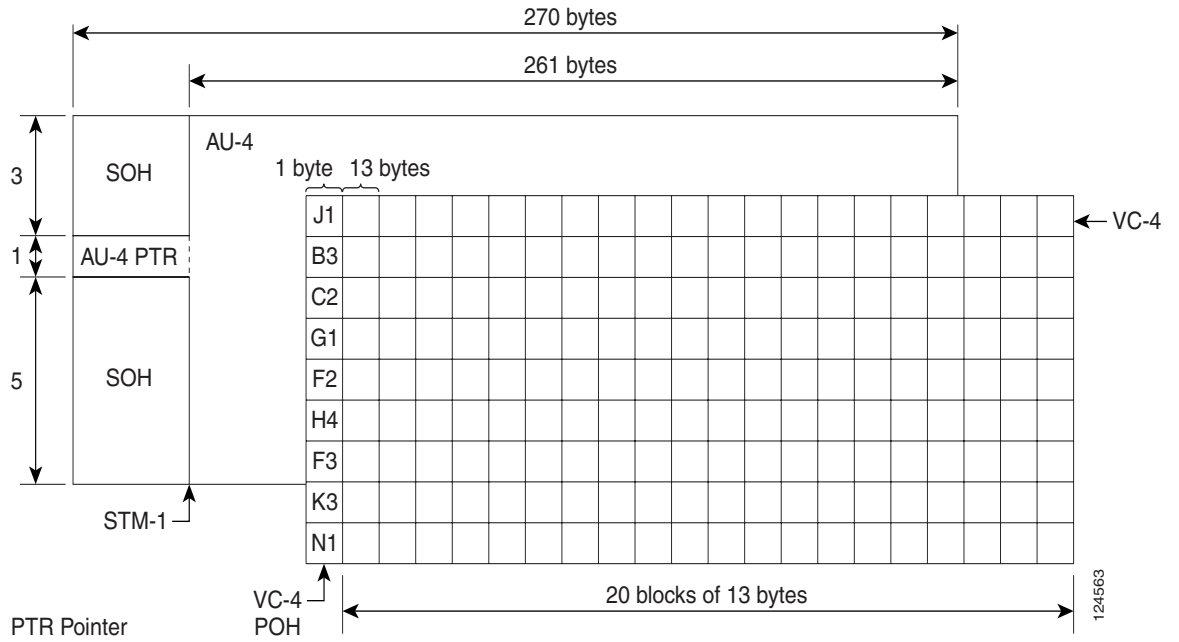
5.1.5.1 VC-4-Xc/VC-4/VC-3 POH Implementation

The ONS 15305 complies with the POH implementation methods outlined in clause 9 in ITU-T G.707 and ETSI EN 300 147 clause 7. The assignment of the VC-4 POH is outlined in [Figure 5-7](#)

The ONS 15305 supports all the VC-4-Xc/VC-4/VC-3 POH bytes as described in ITU-T G.707 Clause 9.3.1, with the following exceptions:

- G1 bit 6 and 7 Enhanced RDI, Clause 9.3.1.4 is not supported
- Path user channels F2 and F3, Clause 9.3.1.5 are not supported
- K3 byte, Clause 9.3.1.7, 9.3.1.9-10 is not supported
- Network operator byte N1, Clause 9.3.1.8 is not supported

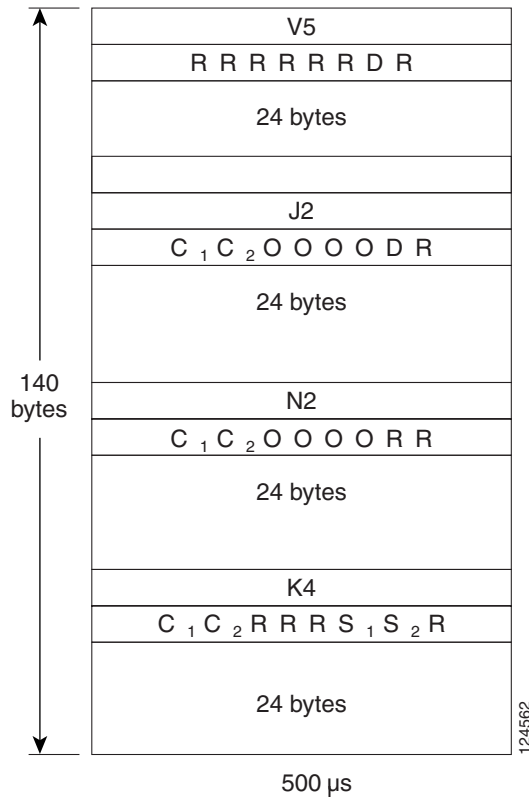
Figure 5-7 VC-4 POH



5.1.5.2 VC-2/VC-1 POH implementation

The ONS 15305 complies with the POH implementation methods outlined in clause 9 in ITU-T G.707 and ETSI EN 300 147 clause 7. The assignment of the VC-12 POH is outlined in [Figure 5-8](#).

Figure 5-8 VC-12 POH



- D Data bit
- O Overhead bit
- S Justification control bit
- C Justification opportunity bit
- R Fixed stuff bit

The ONS 15305 supports all the VC-2/VC-1 POH bytes as described in ITU-T G.707 Clause 9.3.1, with the following exceptions:

- Network operator byte N2, Clause 9.3.2.3 is not supported
- K4 byte (b3-b8), clause 9.3.2.6-8 is not supported

5.1.6 Cross-Connect

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

The following cross connect types are supported:

- Bi-directional connections on all levels
- Uni-directional connections on all levels

5.1.7 Concatenation Schemes

This section describes supported Concatenation Schemes.

5.1.7.1 Contiguous Concatenation

The ONS 15305 supports standard contiguous concatenation at VC-4-4c level. The ONS 15305 implements the supported VC-4-4c in accordance to ITU-T G.707 clause 11.1 and ETSI EN 300 147 Clause 9.

The support for the standard concatenation schemes includes the following features:

- Support of cross connection
- Support of SNC protection
- IPPM support

The following modules supports contiguous concatenation:

- All optical STM-16 modules, each port can support up to 4 VC-4-4c streams
- All optical STM-4 modules, each port can support one VC-4-4C stream

5.1.7.2 Virtual Concatenation

The ONS 15305 supports virtual concatenation and the following VC-n-Xv are supported:

- VC-12-Xv
- VC-3-Xv
- VC-4-Xv

Number of members the VCAT bundles can include (1-7) is found in [Table 5-1](#).

Table 5-1 *Number of members the VCAT Bundles*

VCx	E100-WAN-8 module	GigE-WAN-2 module	Comment
VC12	50	N/A	Maximum per Vcgroup
VC3	3	21	Maximum per Vcgroup
VC4	1	7	Maximum per Vcgroup

The ONS 15305 implements the supported VC-4-Xv and VC-3-Xv functionality in accordance to ITU-T G.707 clause 11.2 and ETSI EN 300 147 Clause 9. The ONS 15305 implements the supported VC-12-Xv functionality in accordance to ITU-T G.707 clause 11.4 and ETSI EN 300 147 Clause 9.

Virtual concatenation is supported in conjunction with EOS mapping and is module dependent. The EOS mapping is described in [5.2 Ethernet over SDH mapping, page 5-17](#).

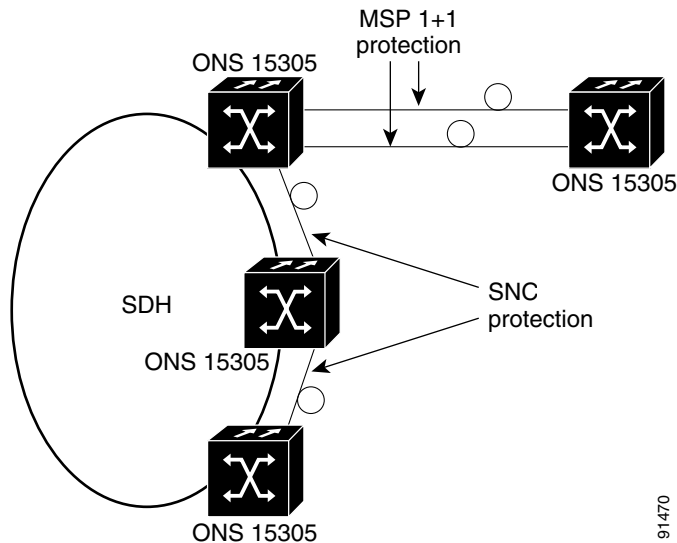
5.1.8 Protection

As shown in [Figure 5-9](#), ONS 15305 offers the following different protection schemes:

- 1+1 MSP protection

- SNC protection

Figure 5-9 Protection Scheme for the ONS 15305



5.1.8.1 1+1 Linear MSP

The ONS 15305 offers 1+1 linear Multiplex Section Protection (MSP) on all optical STM-N interfaces.

The following rules apply for the 1+1 MSP protection:

- Protection can only be enabled between two ports of the same STM-N type
- Ports on module 1 and 2 can protect each other and ports on module 3 and 4 can protect each other.

The 1+1 MSP functionality is in accordance with ITU-T G.841, clause 7.1. The following parameters are configurable on an MSP object:

- Enabled/disabled
- Mode, unidirectional or bi-directional
- Operation Type, revertive or non-revertive
- WTR time (Wait to restore time), configurable from 0-15 minutes, default 5 minutes

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.

5.1.8.2 SNC Protection

The ONS 15305 supports two types of SNC protection, SNC/I (Sub Network Connection protection with Inherent monitoring) and SNC/N (Sub Network Connection protection with non-intrusive monitoring).

SNC is supported for the following objects:

- VC-12
- VC-3
- VC-4
- VC-4-4c

The SNC P functionality is in accordance with ITU-T G.841 Clause 8. The following parameters are configurable on an SNC object:

- Enabled/disabled
- Operation Type, revertive or non-revertive
- Hold-off time, configurable from 0-10s in 100ms steps, default 0s
- WTR time (Wait to restore time), configurable from 0-15minutes, default 5 minutes

The Application architecture supported is 1+1 unidirectional switching, according to ITU-T G.841 clause 8.3.2. The switch initiation criteria are implemented as described in ITU-T G.841 clause 8.4.

The protection algorithm is implemented according to ITU-T G.841 clause 8.6.

5.1.8.2.1 SNC Protected Uni-directional Cross-Connection - Limitations

When one direction of a path forms part of an SNC protected uni-directional cross-connection, the other direction **can not** form part of a different SNC **protected** uni-directional cross-connection. But the two directions **can** form part of two different uni-directional **un-protected** cross connections. This applies to uni-directional cross-connections on all path layers.

Example:

Suppose the uni-directional VC-12 cross-connection from 1/1/1.1.1.1 (input) to 1/2/1.1.1.1 (output) is SNC protected by 1/3/1.1.1.1 (input). In this case, the output direction of 1/1/1.1.1.1 and 1/3/1.1.1.1, and the input direction of 1/2/1.1.1.1 are un-used. However, due to the above mentioned limitation, they **can not** be part of a new SNC protected unidirectional cross-connection, e.g. from 1/2/1.1.1.1 (input) to 1/1/1.1.1.1 (output) protected by 1/14/1.1.1.1. They may however form part of un-protected uni-directional cross-connections.

5.1.9 Performance Monitoring

In the subsequent chapters the following definition are used, according to G.826:

- Errored second (**ES**) A one second period with one or more errored blocks or at least one defect.
- Severely errored second (**SES**) A one second period which contains $\geq 30\%$ errored blocks or at least one defect
- Background block error (**BBE**) An errored block not occurring as a part of an SES

- Unavailable seconds (UAS) A period of unavailable time begins at the onset of ten consecutive SES events. These ten seconds are considered to be part of unavailable time. A new period of available time begins at the onset of 10 consecutive non-SES events. These ten seconds are considered to be part of available time. UAS is the number of second of unavailable time.

5.1.9.1 Regenerator and Multiplex Section Performance Monitoring

ONS 15305 offers full performance monitoring on regenerator and multiplex sections according to G.829.

The following parameters are calculated:

- ES
- SES
- BBE
- UAS

For the regenerator section near end data are presented, for the multiplex section both near end and far end data are presented.

The available time periods are:

- 15 minutes
- 24 hours

The system presents current data and historical data, the number of time periods are:

- 16x15 minute
- 1x24 hours

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 detected if the equivalent BER exceeds a pre-set threshold of $10E-5$, and be 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 regenerator and multiplex section, from $10E-6$ to $10E-9$.

5.1.9.2 Path Performance Monitoring

ONS 15305 offers full performance monitoring on the SDH path level according to G.828, the following objects are supported:

- VC-12
- VC-3
- VC-4
- VC-4-4c

The following parameters are calculated:

- ES

- SES
- BBE
- UAS

Both near end and far end data are presented.

The available time periods are:

- 15 minutes
- 24 hours

The system presents current data and historical data, the number of time periods are:

- 16x15 minute
- 1x24 hours

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 detected if the equivalent BER exceeds a pre-set threshold of $10E-5$, and be 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 objects, from $10E-6$ to $10E-9$.

5.1.9.3 Intermediate Path Performance Monitoring (IPPM)

ONS 15305 supports IPPM (Intermediate Path Performance monitoring) functions on the following objects:

- VC-12
- VC-3
- VC-4
- VC-4-4c

The functionality is used to monitor relayed cross connects in the system, the functionality is specially useful for debugging of errored paths, to determine which section that is causing the problem. The functionality is also used to monitor paths crossing operator borders.

The functionality is supported by use of the non-intrusive monitor points used by the SNCP process. A probe is placed on the selected object, and the performance monitoring is then automatically turned on.

The following parameters are calculated:

- ES
- SES
- BBE
- UAS

Both near end and far end data are presented. The available time periods are:

- 15 minutes
- 24 hours

The system presents current data and historical data, the number of time periods are:

- 16x15 minute
- 1x24 hours

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 detected if the equivalent BER exceeds a pre-set threshold of $10E-5$, and be 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 objects, from $10E-6$ to $10E-9$.

The number of simultaneously probes supported in the system are 63.

5.1.9.4 SNC Performance Parameters

ONS 15305 implements the following SNC Performance Parameters:

- PSC (Protection Switching Count) is the total accumulated number of protection switching events
- PSD (Protection Switching Duration) is the accumulated time that the Protection path has been selected
- Measured Time is the number of seconds since this protection instance was enabled.

PSC is incremented automatically each time a switch occurs. PSD and Measured Time are updated once each second. PSD is only meaningful for revertive mode.

The parameters are cleared when the protection instance is disabled or if a “ClearAllPmData” command is issued from the operator.

5.1.9.5 MSP 1+1 Parameters

ONS 15305 implements the following MSP 1+1 Performance Parameters:

- PSC (Protection Switching Count) is the total accumulated number of protection switching events
- PSD (Protection Switching Duration) is the accumulated time that the Protection link has been selected
- Measured Time is the number of seconds since this protection instance was enabled.

PSC is incremented automatically each time a switch occurs. PSD and Measured Time are updated once each second. PSD is only meaningful for revertive mode.

The parameters are cleared when the protection instance is disabled or if a “ClearAllPmData” command is issued from the operator.

5.1.9.6 Pointer Justification Performance Parameters

ONS 15305 offers pointer justification performance parameters, PJE for the following objects:

- AU-4
- AU-4-4c

PJE, both positive and negative justifications, are counted and measured over a 24 hour interval. Both current and past 24hour interval counters are available.

In addition to the PJE counters an alarm is raised if the number of PJE's over a 15minute period is greater than a configurable number, PJEL (Pointer Justification Event Limit). The PJEL is configurable from 1 to 1024 events.

5.1.10 Synchronization

ONS 15305 offers synchronization from a range of different interfaces.

In addition to the module interfaces it is possible to synchronize from a 2MHz synchronization input source on the controller module. The interface is according to ITU-T G.703. The ONS 15305 also offers a synchronization output port in the same connector, according to ITU-T G703.

The different interfaces allowed for synchronization are listed below.

Synchronization sources:

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

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

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

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

5.2 Ethernet over SDH mapping

ONS 15305 supports two different modes of Ethernet over SDH (EOS) mapping:

1. Proprietary mapping, [5.1.2.5 Proprietary mapping of HDLC encapsulated Ethernet frames, page 5-5](#), combined with inverse multiplexing at VC-12 level
2. GFP-F mapping, see [5.1.2.4 Mapping of GFP frames, page 5-5](#), combined with VCAT, at VC-12, VC-3 and VC-4 level, and LCAS

The support of the different EOS modes is module dependent.

The following modules are Proprietary mapping:

- [Single Optical L16.2 Module, L16.2-1-LC, page 17-1](#)
- [Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8, page 21-1](#)

The following modules are GFP-F mapping:

- [Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8, page 21-1](#)
- [Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8, page 21-1](#)

5.2.1 Proprietary Mapping

ONS 15305 provides a proprietary mapping scheme for mapping of Ethernet traffic into a number of VC-12 containers.

The HDLC encapsulated Ethernet frames are mapped into a number of VC-12 containers in a round-robin fashion with an inverse multiplexer function. The mapping process is described in [5.1.2.5 Proprietary mapping of HDLC encapsulated Ethernet frames, page 5-5](#).

A total differential delay of up to 8ms is supported.

The total bandwidth for one WAN channel is 100 Mbps or 50xVC-12 containers. The Proprietary VC-12 mapping scheme for Ethernet take advantage of 2,16 Mbps in each VC-12, which means that 47xVC-12 are sufficient to transport 100MbpsEthernet.

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 sequence number attached to each VC-12 is used for alarm indication only in case of a sequence mismatch, the sequence number is not used for reordering of the incoming VC-12's. The order of VC's carrying Ethernet traffic between two WAN-ports therefore needs to be obtained.

In case of a failure on one of the VC-12s, the effected VC-12 is removed from the channel, allowing the traffic to flow on the remaining VC-12 connections. RDI is used to indicate a failure to the remote side.

5.2.2 Standardized Mapping

ONS 15305 supports standardized ways of mapping Ethernet over SDH. The mapping schemes include mapping protocol, concatenation scheme and control protocols.

5.2.2.1 GFP

ONS 15305 supports framed mapped GFP (GFP-F) according to ITU-T 7041. The GFP implementation supports the following functions:

- The implementation only supports GFP null extension header
- Client data frames are supported
- Client management frames are supported
- For control frames, the implementation only supports GFP idle frames insertion and processing, other unspecified control frames are dropped
- Standard GFP scrambling is supported, with the polynomial $1+x^{43}$
- The implementation supports the optional data FCS insertion and checking via the PFI bit
- The implementation supports frame sizes from 9 bytes up to 64k bytes (only sizes from 64 bytes to 9k bytes are applicable for this implementation)

The mapping of GFP frames in VC-x containers are described in [5.1.2.4 Mapping of GFP frames, page 5-5](#).

5.2.2.1.1 GFP Alarm and Event Conditions

The GFP implementation supports the following alarm and event conditions:

- GFP Frame Delineation Loss Event, LFD
- Payload Mismatch, PLM
 - Alarm based on detection of PTI field value in ITU-T G.7041
- User Payload Mismatch, UPM
 - Alarm based on detection of UPI field value in ITU-T G.7041
- Payload FCS Mismatch, PFM.
 - Alarm based on detection of PFI field value in ITU-T G.7041
- Extension Header Mismatch, EXM
 - Alarm based on detection of EXI field value in ITU-T G.7041

5.2.2.1.2 GFP Performance Monitoring

The GFP implementation collects the following performance parameters:

- Total number GFP frames transmitted and received
- Total number Client management frames transmitted and received
- Number of bad GFP frames received, based upon payload CRC calculation
- Number of cHEC corrected errors
- Number of cHEC uncorrected errors
- Number of tHEC corrected errors
- Number of tHEC uncorrected errors
- Number of Dropped GFP frames Downstream

A degrade alarm is available for the following performance parameters:

- Number of bad GFP frames received, based upon payload CRC calculation, degFCS
- Number of tHEC corrected and uncorrected errors, degtHEC

The degrade alarms are handled in a similar way as the SDH degrade alarms.

5.2.2.2 Virtual Concatenation (VCAT) and Link Capacity Adjustment Scheme (LCAS)

ONS 15305 supports virtual concatenation according to ITU-T 707, the support of VCAT is dependent on module type. The VCAT implementation supports the following functions:

- FE (Fast Ethernet) mapper interface
 - VC-12-nV, where n=1.50
 - VC-3-nV, where n=1.3
 - VC-4-nV, where n=1
- GE (Gigabit Ethernet) mapper interface
 - VC-3-nV, where n=1.21
 - VC-4-nV, where n=1.7

The VC-x level is individually configurable pr. mapper port, a mix of different VC-x levels in one VCG group is not allowed.

A total differential delay of up to 62ms is supported for the different VCG groups.

ONS 15305 supports the LCAS protocol in conjunction with VCAT as defined in ITU-T 7042. The LCAS protocol implemented covers the following functions:

- Automatically temporary removal of a faulty VCAT member
- Automatically insertion of a temporary removed VCAT member when the fault is repaired
- Hitless increase of the VCG capacity by adding a VCG new member
- Hitless decrease of the VCG capacity by removing a current VCG member
- Inter-working with equipment supporting VCAT but not supporting LCAS

5.2.2.1 VCAT and LCAS Configuration Modes

The ONS 15305 offers two different operation modes for the VCAT and LCAS functionality, the two modes are:

1. VCAT with LCAS enabled
2. VCAT without LCAS enabled

5.2.2.2 VCAT with LCAS enabled

VCAT with LCAS enabled is always uni-directional, which enables the possibility to have different capacity in each direction, but requires a separate cross connect/capacity setup in each direction.

5.2.2.3 VCAT without LCAS enabled

When VCAT is used without LCAS, there is no mechanism for removing of a faulty VC container in a VCG group. To solve this problem the ONS 15305 implements, in addition to the standard mode, a proprietary mode.

The following configurations are available:

- Default mode, unidirectional connections with the possibility of configuring symmetric capacity as explained in mode 1. Same features as in mode 1 but without LCAS
- SoftLCAS-bidirectional mode

If SoftLCAS-bidirectional mode is enabled, the cross connections are not uni-directional, but bi-directional. In addition RDI signalling is enabled. A faulty container in a VCG group is removed based upon the VC alarm condition or based upon RDI signalling (similar to proprietary mapping). This will allow a VCG group to continue operation even if the VCG has a failed member. This configuration mode is proprietary.

5.2.2.4 VCAT and LCAS Alarm and Event Conditions

Alarms related to the VCAT and LCAS reported by default are shown in [Table 5-2](#).

Table 5-2 Default Alarms related to the VCAT and LCAS

Alarm	Description
LOM	Vcat, loss of multiframe
SQM	Vcat sequence indicator mismatch
LOA	Lcas loss of alignment for channels with traffic
GIDERR	Lcas Group Id different for active channels
LCASCRC	Lcas CRC error detected
NONLCAS	Lcas non-Lcas source detected
PLCR	Lcas partial loss of capacity receive
TLCR	Lcas total loss of capacity receive
PLCT	Lcas partial loss of capacity transmit
TLCT	Lcas total loss of capacity transmit
FOPR	Lcas failure of protocol
SQNC	Inconsistent SQ numbers

In addition to the default alarms in [Table 5-2](#), the optional alarms shown in [Table 5-3](#) are available if enabled from the Cisco EdgeCraft.

Table 5-3 Optional Alarms related to the VCAT and LCAS

Alarm	Description
acMstTimeout	Lcas acMst timeout
rsAckTimeout	Lcas RS-ack timeout
eosMultiple	Lcas two or more channels have EOS
eosMissing	Lcas one channel has EOS
sqNonCont	Lcas missing SQ detected in set of channels
sqMultiple	Lcas equal SQ for two or more channels
sqOor	Lcas SQ outside of range
mnd	Lcas member not deskewable
ctrlOor	Lcas undefined Ctrl-word for one or more channels

5.3 PDH Features

The ONS 15305 PDH features are described in the following sub-sections.

5.3.1 E1 features

ONS 15305 supports a number of E1 interfaces that are mapped into SDH VC-12 containers. The SDH mapping features is described [5.1 SDH Features, page 5-1](#).

Different E1 tributary modules are available supporting 8, 21 or 63 E1 interfaces.

The E1 interfaces provides a number of different services:

- Transparent leased line
- ISDN primary rate access
- ISDN primary rate access with fixed timing.

It is possible to configure the E1 interfaces individually to support the different services.

5.3.1.1 Transparent Leased Line

The transparent or unstructured leased line service delivers a full digital bit rate of 2048 kbps with no restriction on the binary content.

The service is symmetrical in both directions and only supports point-to-point connections. The service is specified in EN 300 247 and the network interface is specified in EN 300 418.

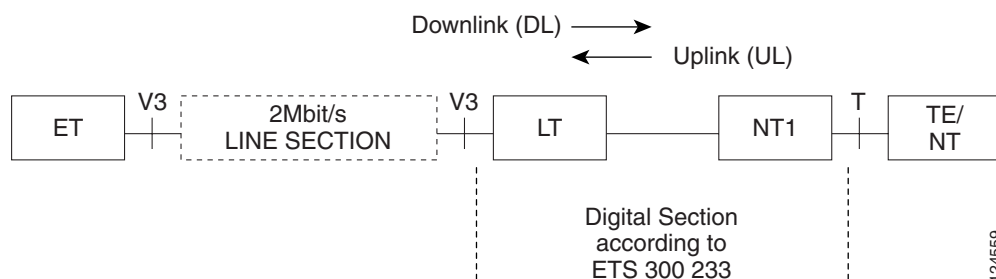
An alarm indication signal (AIS) is inserted toward the network if loss of signal (LOS) is detected from the customer.

AIS is also inserted towards the customer if LOS or other major alarms are detected from the networks.

5.3.1.2 ISDN Primary Rate Access

ISDN Primary rate access (PRA) is used to provide ISDN access for the end customers of an operator. A block diagram describing the digital line section for PRA is shown in [Figure 5-10](#).

Figure 5-10 Digital Line Section for PRA - Block Diagram



- ET - Exchange Terminal
 - LT - Line Terminal
 - NT1- Network Terminal
 - TE/NT2 - Terminal Equipment/Network Terminal 2 (users equipment)
 - T - Network Interface to user (ETS 300 011)
 - V3 - LT interface to ET (ETS 300 233).
- If a 2 Mbps Line Section is inserted between LT and ET, the interface at the ET side is named V3

The interfaces related to the transmission between LT and NT1 are not specified, nor the transmission medium.

- Transmission rate at V3 (V3') and T is 2.048 kbps +/- 50 ppm with independent clocks for two directions of transmission
- Transmission format is according to G.704 and electrical interface according to G. 703 120 ohm balanced T interface.

The ET is responsible for management of the PRA access section. This is embedded in the functional specification of interface V3 comprising uplink reporting of failure conditions and detected bit errors, and downlink provision of loop back commands.

The LT does not any function related to supervision of transmission quality. Note that no LT1 functionality is implemented in ONS 15305.

The NT1 performs the following functions related to supervision of transmission quality:

- CRC-4 errors are detected and reported for the ET-NT1 CRC-4 segment using E-bits.
- CRC-4 errors are detected and reported for the NT1-TE CRC-4 segment using Sa6 codes.
- Failure conditions are also reported using Sa6 codes.
- The NT1 is transparent to the following TS0 bits in both directions: A(RA1), Sa4, Sa7 and Sa8.
- Bits Sa5 and Sa6 are utilized between NT1 and ET only, and is not interpreted by the TE

Loopback point 2 in the NT1 is specified towards the ET. Loopback commands are given from the ET by codes in TS0 bit Sa6.

5.3.1.3 ISDN PRA with Fixed Timing

When an E1 is configured in ISDN PRA with fixed timing, a slip buffer is implemented in the receiver direction. The E1 output signal is clocked with the internal T0 timing reference, providing the network timing to the E1 interface. A slip buffer is used to adapt to phase changes in the E1.

5.3.2 E3/T3 features

ONS 15305 supports a number of E3/T3 interfaces that is mapped into SDH VC-3 containers. The SDH mapping features is described in [5.1 SDH Features, page 5-1](#).

Different E3/T3 tributary modules are available supporting 3 or 6 E1 interfaces.

The E3/T3 interfaces provides a number of different services as shown below:

- E3 Transparent leased line
- T3 Transparent leased line

It is possible to configure the E3/T3 interfaces individually to support the different services.

5.3.2.1 E3 transparent Leased Line

The transparent or unstructured leased line service delivers a full digital bit rate of 34.368 Mbps with no restriction on the binary content. The service is symmetrical in both directions and only supports point-to-point connections. An alarm indication signal (AIS) is inserted toward the network if loss of signal (LOS) is detected from the customer. AIS is also inserted towards the customer if LOS or other major alarms are detected from the networks.

5.3.2 T3 transparent Leased Line

The transparent or unstructured leased line service delivers a full digital bit rate of 44.736 Mbps with no restriction on the binary content. The service is symmetrical in both directions and only supports point-to-point connections. An alarm indication signal (AIS) is inserted toward the network if loss of signal (LOS) is detected from the customer. AIS is also inserted towards the customer if LOS or other major alarms are detected from the networks.

5.3.3 Loopbacks

Two types of loopbacks are supported for the interface; Customer Loop (LL3) and Network loop (LL2).

A customer loop takes the incoming customer traffic and sends it back towards the customer. Note that AIS is sent towards the network.

A network loop takes the incoming traffic from the network and sends it back towards the network. Note that in this case AIS is sent towards the customer.

The loops can be activated from the Cisco EdgeCraft terminal. For E1 tributary configured in ISDN PRA mode, loopbacks are set in-band.

5.4 IP Features

The ONS 15305 supports Ethernet L1, L2 bridging and L2 Provider Bridging Functionality.

The Ethernet L1 functionality is supported dependent on equipped module type(s) and the port configuration. See individual module descriptions;

[Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8, page 21-1](#) and
[Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8, page 21-1](#).

Any modules, which have Ethernet LAN- or WAN-ports, supports L2 bridging.

The bridging and routing functionality is described in the subsequent chapters.

The maximum number of bridging/routing ports supported in the system is 64, which means up to 16 ports per module slot. The number of ports per slot is dependent of the module type. The following ports are supported:

- FE LAN (10/100 Base-Tx) user ports
- GE LAN (10/100/1000-TX/LX) user ports, either fibre or copper
- FE WAN ports, connected to an EOS mapper circuit
- GE WAN ports, connected to an EOS mapper circuit

The filtering rate of the bridge is able to operate with at full wire speed (Up to 1 Gbit/s). The forwarding rate is only be limited by the forwarding interface speed.

5.4.1 Ethernet L1

The Ethernet L1 is Ethernet mapped over SDH, with the mapping types described in [5.2 Ethernet over SDH mapping, page 5-17](#). The functionality supported on a LAN port configured to L1 mode is:

- Auto negotiation (speed/duplex)
(N/A for Optical Gigabit Ethernet modules)

- Fixed Ethernet Port settings i.e. 10/100/1000 half/full duplex
- Auto MDI/MDIX, Ethernet FE interfaces
- RMON counters
- Back pressure and flow control Handling
- IEEE 802.1p priorities (Strict Policy, 4 queues)
- Tag insertion/removal for Q in Q/ VLAN tunnelling support with the following options:
 - Vid configuration
 - Priority configuration (Priority taken from inner tag/Configured port priority)
- Protocol tunnelling, offering transparency of the following MAC addresses/protocols:
 - All MAC addresses in range; 0180C2000000 to 0180C20000FF, except for 0180C2000001 (pause frames), is transported transparently, including the following protocols: RSTP, MSTP, STP, GVRP, GMRP, LACP and 802.1x

The Q in Q/VLAN tunnelling and Protocol tunnelling features are described in more detail in [5.4.3 L2 Provider Bridging functionality, page 5-26](#). The reason for offering such features on a Ethernet L1 connections is related to the possibility of interconnection of Ethernet L1 and L2 connections, a typically scenario would be grooming of several L1 connections in an ONS 15305 offering L2 functionality.

5.4.2 L2 Bridging

The bridge is a transparent multi-port remote Ethernet bridge as specified in IEEE 802.3. The ONS 15305 supports standard bridging functionality, in addition it also supports provider bridge functionality. All modules/ports support standard bridging functionality, the following modules only support the provider bridge functionality:

- [Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8, page 21-1](#)
- [Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8, page 21-1](#)

The standard bridging functionality include 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)
(N/A for Optical Gigabit Ethernet modules)
- Fixed Ethernet Port settings i.e. 10/100/1000 half/full duplex
- Auto MDI/MDIX, Ethernet FE/GE interfaces
- MAC Multicast
- Transparent Bridging
- VLAN by Port and VLAN by Port and Protocol
- Full IEEE 802.1Q VLAN tagging compliance, limited to 4000 VLANs.
- Head of Line Blocking prevention
- Back pressure and flow control Handling

- IGMP snooping
- Rapid Spanning Tree Protocol per device (RSTP)
- Port Mirroring
- 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 kpps.

5.4.2.1 VLAN acc. to IEEE802.1Q

By default software configuration, the ONS 15305 support 802.1Q and can handle up to 4000 VLAN simultaneously. The VLAN ID range available in this case is 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 reduces 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 neighboring VLAN by spoofing the VLAN tag of the said frame. However, correctly tagged frames will NOT leak to the other VLANs.

5.4.3 L2 Provider Bridging functionality

In addition to the standard L2 functionality the following Provider Bridge functionality is supported on the specific modules listed in [5.4.2 L2 Bridging, page 5-25](#).

- Tag insertion/removal for Q in Q/ VLAN tunnelling support with the following options:
 - Priority configuration (Priority taken from inner tag/ Configured port priority)
- Protocol tunnelling, offering transparency of the following MAC addresses/protocols:
 - All MAC addresses in range; 0180C2000000 to 0180C20000FF, except for 0180C2000001 (pause frames), is transported transparently, including the following protocols: RSTP, MSTP, STP, GVRP, GMRP, LACP and 802.1x

The offering of Q in Q/VLAN tunnelling and protocol tunnelling enables the user to offer transparent Ethernet services in a L2 network with guaranteed security, also called L2 VPN's. The functionality is enabled at the ingress and egress ports in the network, and therefore only supported on LAN ports in the ONS 15305. The functionality is individually configurable on a pr. port basis.

The Ethertype used for the Tag insertion is the configured system Ethertype, default 0x8100.

When Tag insertion/removal is configured on a LAN port in L2 mode, only one VLAN can be configured for each port.

5.4.4 BootP Client

BootP Client is an option to automatically get an IP address and configuration-file from a BootP server during power up.

5.5 DCN Features

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

In this context the term DCN (Data Communication Network) is used to denote the network that transports management information between a management station and the NE. This definition of DCN is sometimes referred to as MCN (Management Communication Network). The DCN is usually physically or logically separated from the customer network.

The ONS 15305 management solution is based on SNMP over IP. The main purpose of the DCN implementation is to provide connectivity to the SNMP Agent inside the ONS 15305 via different DCN topologies. The DCN implementation however, also support transport of management traffic between other Cisco or third party nodes.

For the “IP In-band” L2 topology [5.5.2.3 IP-In-band DCN, page 5-29](#), the management traffic is switched/routed between LAN/WAN ports. When IP-addressing a VLAN IF (id 100000-104000) the management connectivity is obtained at wire-speed along with the user traffic or on a separate WAN-port dedicated for management.

For all other cases, the following applies: The DCN traffic is always routed (IP) between the management interfaces. Two different router modes are available for management connectivity. One shall operate for “Numbered mode” and the second shall operate in “Un-numbered mode”. Both routers shall not be accessible for DCN purpose simultaneously, and a system mode is introduced to enable desired router.

Most topologies in the following sections assume standard numbered IP interfaces, i.e. every interface (IF) connected to the router takes an IP address and a subnet. However the feature called “IP Unnumbered Interfaces” introduced in Release 2.0 will simplify planning, supervision and configuration since one IP address per network element within the same subnet shall be sufficient.

5.5.1 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 interfaces in this section.

5.5.1.1 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.

5.5.1.2 LAN ports

The LAN ports are FE or GE Ethernet ports used for connecting customer IP traffic to the ONS 15305. LAN-ports connected to the switch (L2-mode) can be used to carry management traffic.

5.5.1.3 WAN ports

The WAN ports are device internal FE or GE Ethernet ports that can be mapped into one or more virtual containers of an SDH STM-n signal. WAN-ports can carry management traffic both in L1-and L2-mode.

5.5.1.4 DCC channels

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 - 576 kbit/s).

Each SDH-module may terminate up to 8 DCC_R and/or 4 DCC_M channels, i.e. an absolute upper limitation on the number of active DCC-channels is 48. For one SDH-port, both DCC channels may be active simultaneously. Activation/deactivation of DCC channels are configurable on a per port basis.

5.5.1.5 Local VT-100 serial port

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

Also this RS-232 interface is regarded as a management interface, although it does not relate to the various DCN topologies described throughout the rest of this section. Only a few basic CLI-commands are provided via this interface.

5.5.2 Communication Features

The ONS 15305 Communication features are described in the following sub-sections.

5.5.2.1 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 software based and low capacity and is intended for management traffic only.

5.5.2.2 External DCN

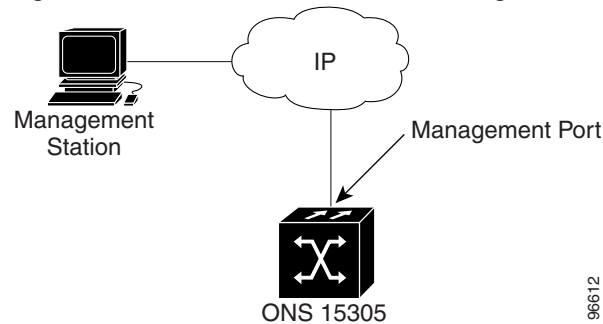
“External DCN” means that the management station connects to the ONS 15305 via a separate DCN. The physical connection to the ONS 15305 is the Management Port.

IP/Ethernet is supported. The ONS 15305 may also serve as a gateway from an External DCN to other Cisco-nodes in the SDH network, i.e. the External DCN topology may be combined with other topologies described in the next subsections.

The direct connection of a Cisco EdgeCraft terminal to the Management Port may be regarded as a special case of the External DCN topology.

Example of the configuration is shown by [Figure 5-11](#).

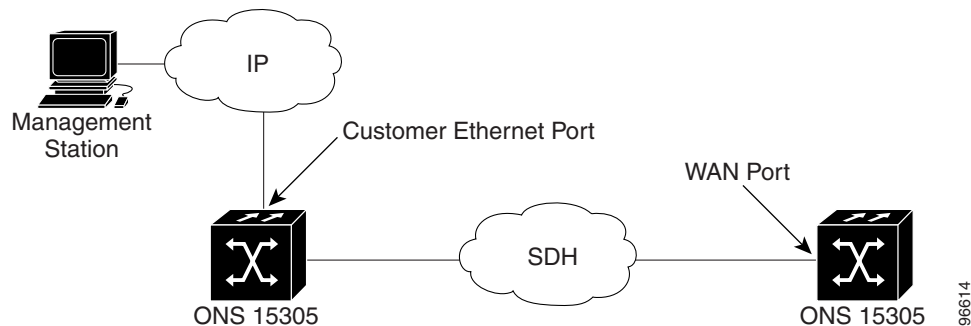
Figure 5-11 External DCN - Network Configuration



5.5.2.3 IP-In-band DCN

The configuration is described by [Figure 5-12](#).

Figure 5-12 IP-In-band DCN - Network Configuration



“IP-In-band” means that LAN and WAN ports are carrying management traffic together with customer traffic. This is useful in topologies where (parts of) the SDH-network is owned by a different operator that does not allow a third party to use the DCC capacity.

With IP-In-band it is possible to build tunnels between “islands” that have other DCN solutions. This feature has different restrictions and options depending on whether the ports are in L1-or L2 mode:

5.5.2.3.1 L2 Mode:

A LAN- and WAN-port in L2 mode is connected to the switch. Such ports may carry in-band management traffic if an IP-address is assigned to it, or to the VLAN it belongs to. This solution is equivalent to the previous versions of ONS 15305. It is possible to split management traffic from user traffic by assigning dedicated LAN/WAN ports to management traffic.

5.5.2.3.2 L1 Mode:

In ONS 15305 R2.0 LAN- and WAN-ports can also be in L1-mode in order to support Ethernet L1 services. In this case the ports are not connected to the switch.

WAN-ports in L1-mode can carry in-band management traffic. The management traffic in such WAN-ports is identified by means of a proprietary MAC-address and can only be used over point-to-point links between Cisco nodes. This feature can be enabled or disabled per L1 WAN port.

From a system point of view this feature is similar to PPP/DCC case (See [5.5.2.4 PPP/DCC DCN \(IP over PPP\)](#), page 5-30).

5.5.2.4 PPP/DCC DCN (IP over PPP)

PPP/DCC means that the management IP-traffic is carried in PPP over the SDH DCC channels according to NSIF-DN-0101-001. The PPP implementation supports RFC1661 (PPP), RFC1662 (PPP in HDLC-like framing) and RFC1332 (IPCP). The configuration is described by [Figure 5-13](#).

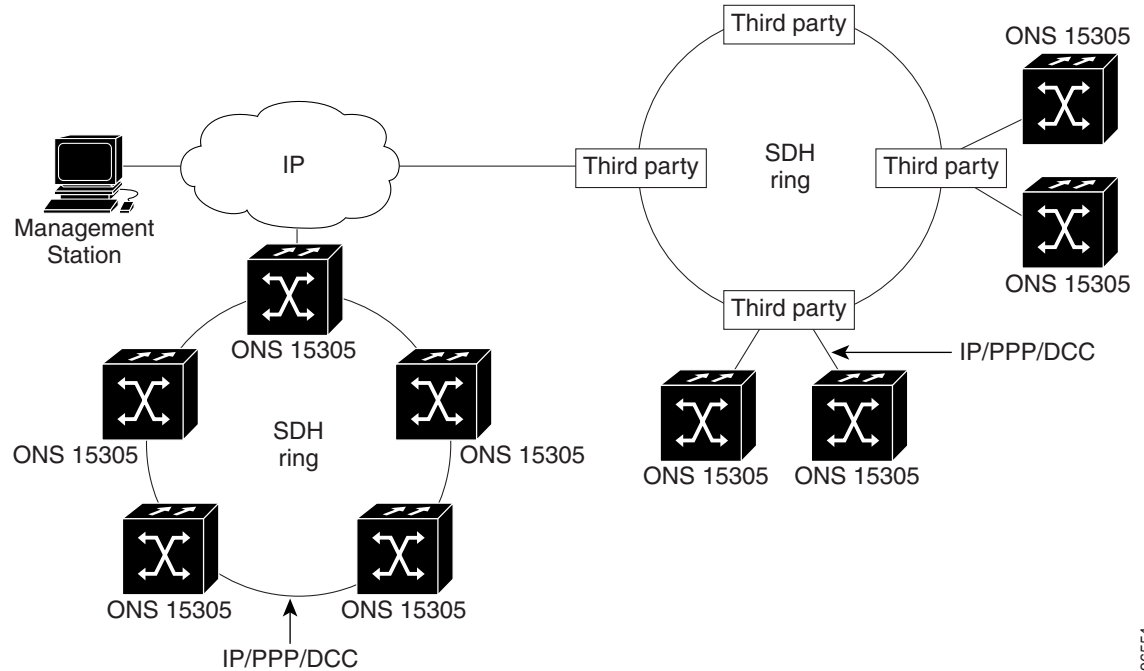
Each PPP/DCC channel connects to the IP router individually. Normally this would take one IP subnet per DCC-link, and this is how previous versions of ONS 15305 implementations would behave. However, from ONS 15305 R2.0 on a more comprehensive PPP/DCC strategy is supported. This strategy is based on the feature called “IP Unnumbered Interfaces”, and the rest of this section assumes this option.

The IP Unnumbered concept allows the system to provide IP processing on a serial interface or in general a point-to-point without assigning it an explicit IP address. The IP unnumbered interface borrows the IP address of another interface already configured on the system/router (i.e. the Management Port), thereby conserving network and address space, and making the system easier to configure, manage and maintain.

With IP Unnumbered, all nodes connected via PPP-links may be on the same IP subnet. An essential part of the implementation is the DCN ARP Proxy Agent, which makes sure that connectivity between the nodes is obtained without having to provision static routes. The Proxy Agent builds entries for all the DCN IP destinations, and will reply to ARP requests on behalf of them.

“IP Unnumbered” is regarded as a main mode, and cannot be combined with other modes that require numbered interfaces. This implies that this PPP/DCC option cannot be combined with L2 IP In-band.

Figure 5-13 PPP/DCC DCN - Example of Network Configuration



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5.5.2.5 Compatibility Issues

ONS 15305 R2.0 is able to provide DCN connectivity with all ONS 15305 and ONS 15302 devices already deployed, including the installed base of ONS 15305 devices with an earlier software revision. Hence, two additional DCN options are supported; PPP/DCC for numbered interfaces and proprietary IP/DCC communication. Both M-DCC and R-DCC are configurable with CRC-16 or CRC-32.

5.5.2.5.1 PPP/DCC(IP over PPP)

ONS 15305 support PPP/DCC also on numbered interfaces. This option cannot co-exist with the IP unnumbered version of PPP/DCC as described in [5.5.2.4 PPP/DCC DCN \(IP over PPP\)](#), page 5-30. However, the numbered variant of PPP/DCC has the advantage that it can be used in combination with all other DCN modes.

5.5.2.5.2 IP/DCC(IP over HDLC)

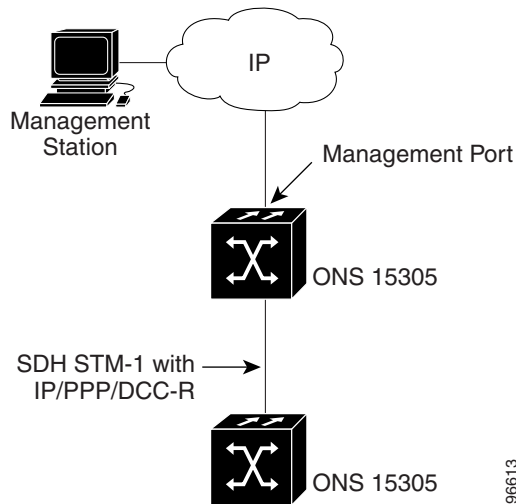
IP/DCC is a non-standard mechanism used for conveying management information on the SDH DCC channels in a network with ONS 15305 and ONS 15302 devices only. This mechanism can be used together with the IP/DCC-Broadcast mechanism of other ONS 15305 and ONS 15302 devices emulating a shared medium on the SDH DCC channel. The IP datagrams are encapsulated in HDLC frames before they are sent out on the SDH DCC.

This configuration is applicable for a user having a subnet of ONS 15305 and ONS 15302 devices (with the ONS 15305 in the centre) and an IP based DCN connected to the ONS 15305 (e.g. the management port). The configuration is described by [Figure 5-14](#).

The IP/DCC option has two special restrictions, imposed by the proprietary pseudo-broadcast mechanism:

- Maximum one DCC per link (M or R)
- The broadcast solution cannot be used in a MSP protection configuration, which involves one, or more radio hops.

Figure 5-14 IP/DCC - Network Configuration



5.5.3 Management Security

The following security features applies to management communications:

5.5.3.1 CLI Access Control

ONSCLI is by default a superuser and can block all remote SNMP users by changing the access rights and passwords. Changing CLI passwords is only possible in ONSCLI.

Locally through VT100: User name and Password mechanisms

Remotely Telnet: Telnet password and additionally same mechanisms as through VT100.

5.5.3.2 SNMPv1 Access Control

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

- Read, Read/ Write access 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.

5.5.3.3 SNMP Manager Identity

This is an enhancement of the SNMPv1 Community feature. Here, the SNMP manager's IP address must be configured in the device subject to management. Only legal combinations of community name and source IP address in SNMP requests are accepted.

5.5.3.4 SNMP Read/Write Control

The access rights of the registered management systems can be set to super, read/write or read only.

5.5.3.5 VLAN (802.1Q)

This security mechanism relates to the IP in-band option only: By configuring a separate VLAN for the management traffic and assigning an IP address to it, the end-users will not be able to access the device or generate traffic into the management VLAN.

5.5.3.6 Management Port Control

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

5.5.4 DCC Transparency Features

This section presents the DCC Transparency feature supported by ONS 15305 and provides a description of applications.

5.5.4.1 General description

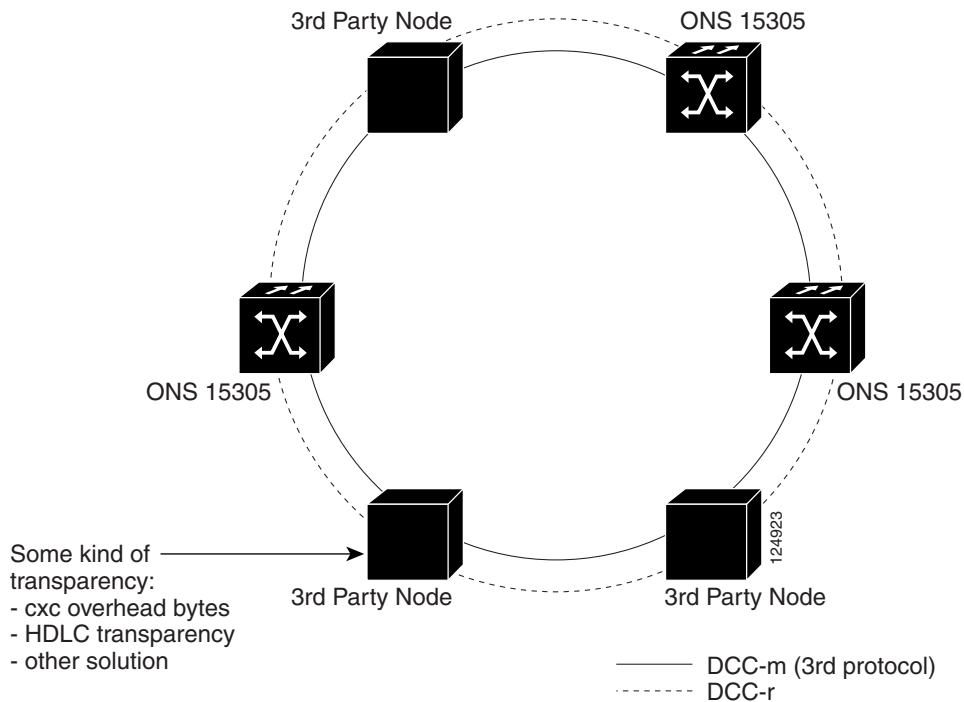
To overcome 3rd party vendors proprietary or not commonly used protocols for management connectivity, ONS 15305 has the ability to transparently forward the management signals through our nodes. This feature will typically be used when our nodes are supposed to fit into existing ring-configurations. It may also relieve heavily loaded data communications channels (D1- D3 or D4- D12) in the network and instead let the existing signals pass through our nodes and take advantage of the potentially second channel for ONS 15305 and ONS 15302 devices utilization. In this case it is required that the existing nodes transparently pass through our signals.

5.5.4.2 Functional overview

The DCC transparency feature provides the ability to transparently connect to HDLC- layer from a DCC- West to DCC- East. The feature available for ONS 15305 covers full flexibility for supported STM- n. It can be performed between any SDH- ports, though limited to maximum 4xDCC-M per- and 8xDCC-R per slot.

Protocols based upon either 16- bit or 32- bit HDLC- framing type will be passed through via CPU. See [Figure 5-15](#) for a typical network setup.

Figure 5-15 DCC Transparency - Typical Network Set Up



5.6 Alarm Definitions

The alarm and event definitions and their relations to the managed object types are listed in this section.

5.6.0.1 Introduction

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.

5.6.0.2 Device Alarms

The ONS 15305 device alarms are listed in [Table 5-4](#).

Table 5-4 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
t0QIFailed	Warning	T0 sync candidate in fail
t0QIDnu	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
forwardingTabOverflow	Warning	Layer II Forward Table overflow
errorsDuringInit	Warning	Error during initialisation
vlanDynPortAdded	Warning	Dynamic VLAN port added
vlanDynPortRemoved	Warning	Dynamic VLAN port removed
rsIpZhrNotAllocVirtualIp	Warning	Virtual IP not allocated for source
rsPingCompletion	Warning	Ping sequence completed
rsDhcpAllocationFailure	Warning	DHCP IP address allocation failed
rlIcmpTableOverflow	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

5.6.0.3 SDH Alarms

The ONS 15305 SDH alarms are listed in [Table 5-5](#).

Table 5-5 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
msh	Critical	MSP signalling problem
switchToProt	Warning	MSP switched to protection
switchToWork	Warning	MSP switched to working
mshComTimeOut	Warning	MSP command timed out, removed
mshComOverruled	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 5-5 SDH Alarms (continued)

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

5.6.0.4 LAN/WAN Alarms

The ONS 15305 LAN/WAN alarms are listed in [Table 5-6](#).

Table 5-6 LAN/WAN Alarms

Alarm Id	Default Severity	Description
DCCM		
lanOn	Warning	Link Up
lanOff	Warning	Link Down
DCCR		
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 5-6 LAN/WAN Alarms (continued)

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
TLC	Critical	Total Loss Capacity
TLCR	Critical	Total Loss Capacity, RX
PLC	Major	Partial Loss Capacity
PLCR	Major	Partial Loss Capacity, RX
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 learning to forwarding state transition
osiEncap		
lanOn	Warning	Link Up
lanOff	Warning	Link Down

5.6.0.5 Miscellaneous Alarms

The ONS 15305 miscellaneous alarms are listed in [Table 5-7](#).

Table 5-7 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

5.6.1 Alarm Parameters

Parameters associated with an alarm entry as stored in the alarm log on the network element, are found in [Table 5-8](#).

Table 5-8 Alarm Parameters

Parameter	Description
Timestamp	Date/Time of alarm event
Alarm Object	Object subject to alarm situation. Should contain both object type (class) and identification (instance).
Alarm Identifier	Short form alarm description, e.g. "LOS"
Alarm Description	Alarm description, e.g. "Loss of signal"
Alarm Severity	According to ITU-T X.733
Event Type	Raised, Cleared or Event. Applicable for alarm log only. Event means alarm with no duration.

5.6.1.1 Alarm Severity

It is possible for the operator to assign an alarm severity for each combination of object type and alarm ID. The severity levels are WARNING, MINOR, MAJOR and CRITICAL. Default values are assigned automatically.

5.6.1.2 Alarm Presentation

It also possible to view a list of all current alarms and a log of alarm events. The size of the log of alarm events is 5000. The graphical representation of managed objects reflects the alarm state (severity level) by use of an appropriate color.

5.6.1.3 Alarm Filtering

Alarms are suppressed if the object subject to alarm is disabled (by setting its administrative state down). Alarm disabling applies to device, module and port objects. Disabling an object also applies to its subordinate objects.

For the SDH objects AU-4, AU-4-4-c, VC-4, TU-3, VC-3, TU-12 and VC-12, the operator is able to configure an alarm mask for each object type. This alarm mask applies as a general filter to all SDH objects of the corresponding type. Maskable alarm identifiers are: AIS, EXC, DEG, SSF and RDI

For E1 and E3 ports, the operator is able to configure an alarm mask for each port instance. Maskable alarm identifier is: AIS-RX.

5.6.1.4 Alarm suppression

If an alarm is active, it may also suppress other (lower-order) alarms. How active alarms may suppress other (lower-order) alarms, are defined by [Table 5-9](#) and [Table 5-10](#).

Table 5-9 Alarm Suppression for SDH related Alarms

Probable Cause		Object type (class)								Suppression of other alarms?
		SPI	RS	MS	AU-4-4-c AU-4	VC-4	TU-3 TU-12	VC-3 VC-12	PDH (RX)	
1)	LOS	x								Yes, all with higher numbers
2)	LOF		x							Yes, all with higher numbers
3)	TIM		x							Yes, all with higher numbers
4)	CSF		x							No
5)	EXC		x							Yes, DEG (at same level)
6)	DEG		x							No
7)	AIS			x						Yes, all with higher numbers
8)	CSF			x						No
9)	RDI			x						No
10)	EXC			x						Yes, DEG (at same level)
11)	DEG			x						No
12)	LOP				x					Yes, all with higher numbers
13)	AIS				x					Yes, all with higher numbers
14)	SSF					x				Yes, all with higher numbers
15)	UNE Q					x				Yes, all with higher numbers
16)	TIM					x				Yes, all with higher numbers
17)	EXC					x				Yes, DEG (at same level)
18)	DEG					x				No
19)	RDI					x				No
20)	PLM					x				Yes, all with higher numbers
21)	LO M					x				Yes, all with higher numbers
22)	LOP						x			Yes, all with higher numbers
23)	AIS						x			Yes, all with higher numbers
24)	SSF							x		Yes, all with higher numbers
25)	UNE Q							x		Yes, all with higher numbers
26)	TIM							x		Yes, all with higher numbers
27)	EXC							x		Yes, DEG (at same level)
28)	DEG							x		No
29)	RDI							x		No
30)	PLM							x		Yes, all with higher numbers

Table 5-9 Alarm Suppression for SDH related Alarms (continued)

		Object type (class)							
31)	AIS							x	Yes, all with higher numbers
32)	LFA							x	Yes, all with higher numbers

**Note**

Alarm suppression (as stated in [Table 5-9](#)) is only performed for alarms confined to one side of the DXC. Hence, alarm suppression is not provided across the DXC.

Table 5-10 Alarm Suppression for PDH (tributary) TX-Alarms

Alarm-Id		Suppress alarms with higher numbers
1)	LOS	Yes
2)	LFA	-

5.6.1.5 Alarm Persistency

All SDH and PDH alarms are filtered through persistency filters. This means that an alarm must stay on/off for a certain amount of time before being raised/cleared respectively. Two values are associated with each persistency filter.

T_{ON} - The number of consecutive faulty seconds before declaring a failure condition (alarm)

T_{OFF} - The number of consecutive non-faulty seconds before declaring the alarm deactivated

Setting of alarm persistency thresholds is provided according to the scheme described in [5.7 Configuration Management, page 5-43](#). All alarm types are sorted into three different persistency categories, see [Table 5-11](#). The sorting of the alarm types into a persistency category depends of the characteristics of each alarm id. The persistency thresholds for each category are individually configurable in steps from 0 - 30 seconds.

Table 5-11 Alarm Persistency Categories

Persistency category	Description	Associated Probable Cause	Managed Objects associated with each Alarm Type
1	This category contains alarms associated with higher order levels. There are few instances of each type.	LOS	SDHPort, E1, E3
		LOF	RS
		AIS	MS
		EXC	RS, MS
		DEG	RS, MS
		TIM	RS
		RDI	MS
		CSF	RS, MS

Table 5-11 Alarm Persistency Categories

Persistency category	Description	Associated Probable Cause	Managed Objects associated with each Alarm Type
2	This category contains alarms (normally) not subject to persistency filtering.	LOP	AU-4-4c, AU-4, TU-3, TU-12
		LOM	VC-4
		LFA	E1, E3
3	This category contains the remaining alarm types. Most of them have many instances.	AIS	AU-4-4c, AU-4, TU-3, TU-12, E1, E3
		EXC	VC-4, VC-3, VC-12
		DEG	VC-4, VC-3, VC-12
		SSF	VC-4, VC-3, VC-12
		TIM	VC-4, VC-3, VC-12
		RDI	VC-4, VC-3, VC-12
		UNEQ	VC-4, VC-3, VC-12
		PLM	VC-4, VC-3, VC-12

5.7 Configuration Management

This section lists the ONS 15305 Configuration Management features.

5.7.1 Backup and Restoration of Configuration Data

It is possible to back-up the configuration data of an ONS 15305 device. It is possible to reload the configuration from the back up. The back-up media is a central repository.

5.7.2 Software Download

It is possible to download new software and FPGA code to the ONS 15305 device itself and to modules/external modules. For all software and FPGA code items there are capacity of storing two different versions in the device, and switchover from one version to the other one is possible by operator command.

5.7.3 Device Reset

It is possible to reset (reboot) the device with or without resetting the current configuration. Reboot have minimal impact on traffic processing. The following situations will affect Ethernet/IP traffic and require a Device reset to become operative:

- When decreasing/increasing entries in tunable tables e.g. maxARP, maxIP-forwarding, maxVLAN's, maxDHCP, maxBridge, etc.
- Software upgrade without FPGA fix (Ethernet/IP traffic affecting)

- Software upgrade with FPGA fix (All traffic affected)
- Enabling OSPF requires a software reset
- Changing the “Router ID” for OSPF requires a software reset

The period of time from the moment you have triggered a restart to the device is up and running is dependent of equipped modules and software configuration of the device.

5.7.4 Device Replacement

It is possible to replace an ONS 15305 device with a new one with an identical physical configuration. This may be a partial or fully automated process.

A fully automated solution is possible by taking advantage of the BootP client feature.

The ONS 15305 receives an IP address during power up by sending BootP request to a BootP server accessible via a network connected the MNGT-port. Once the IP address is assigned, the NE will restart and request a configuration file via TFTP from the same server. This processes will only take place if the new NE is has not yet been configured.

**Note**

To use this feature it is necessary to have an empty configuration file to trigger BootP requests.

A partial automated process is possible by initially assign an IP-address and Community string to be able to connect with Cisco EdgeCraft.

A TFTP download session can be triggered from Cisco EdgeCraft.

5.7.5 Module Management

An ONS 15305 module's configurations are maintained in the ONS 15305. If a module is restarted or replaced with a new one of the same type, it is initialized with the right configuration automatically. If a module is replaced with a new one of another type, an alarm is raised. If a module is removed or communication with the module is lost, an alarm is raised.

5.7.6 Managed Object Attributes

All defined attributes are available for read or read/write access by the management applications. The management architecture is based on SNMPv1.

5.8 Physical Interface Indexes

The Index Reference Numbers for the ONS 15305 is found in [Table 5-12](#).

Table 5-12 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

Please see section [2.4 Power Module, DC Power, page 2-6](#).

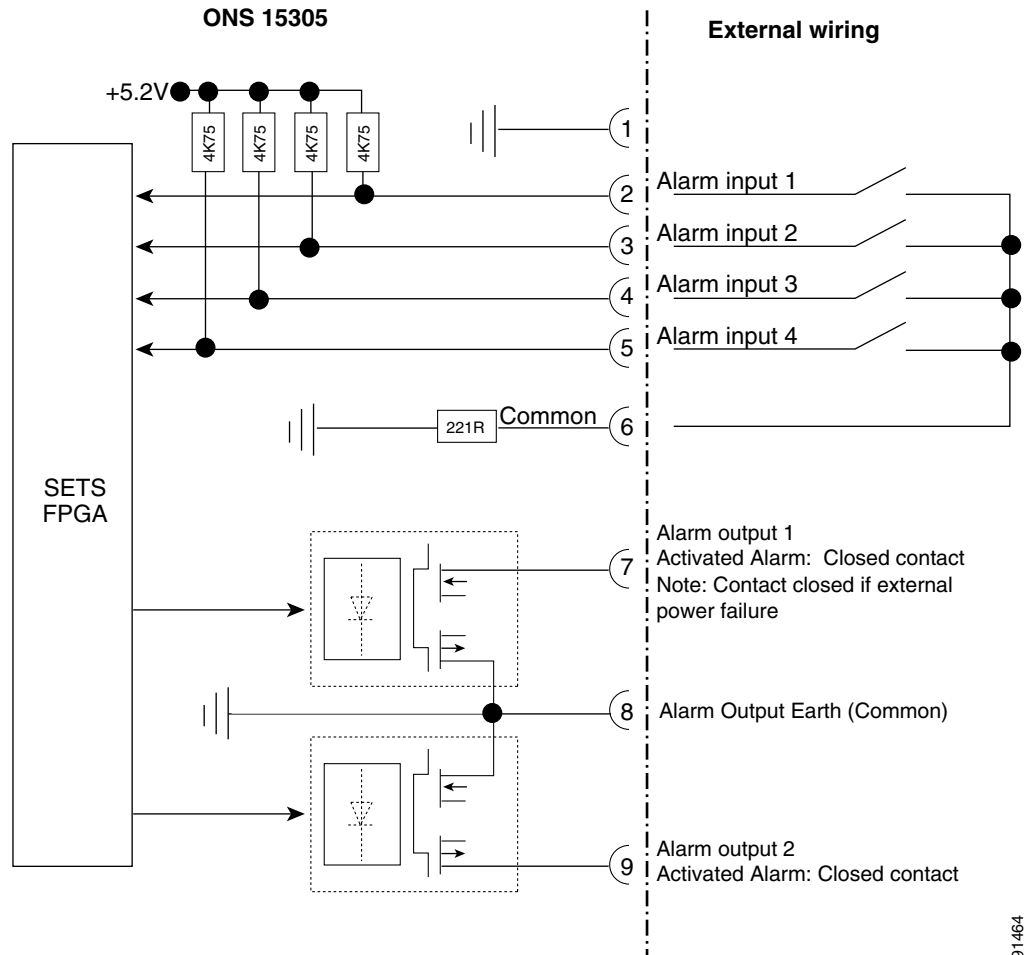
6.2 Alarm Interface, FAN-ALARM

The ONS 15305 Alarm Interface is described in the following sub-sections.

6.2.1 Description

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. See [Figure 6-1](#).

Figure 6-1 Alarm Input and Output Overview



91464

6.2.2 Connectors

The alarm interface connector is a 9 pin DSUB type connector, with the pin-out given in [Table 6-1](#).

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 (continued)

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

6.2.3 Electrical Parameters Alarm Input

Electrical Specification at Alarm Input is found in [Table 6-2](#).

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

Electrical Specification at Alarm Output is found in [Table 6-3](#).

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

The ONS 15305 Auxiliary Interface is described in the following sub-sections.

6.3.1 Description

ONS 15305 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 time slot 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 time slot 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 ONS 15305 and the incoming framed E1 need to be synchronized with the outgoing framed E1. Bit slips will occur if one of the interfaces is free running.

6.3.2 Connector

The connector is a RJ-45 connector, with the pin-out described in [Table 6-4](#).

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

This section describes the ONS 15305 VT-100 Terminal Interface.

6.4.1 Description

ONS15305 offers a VT-100 interface for connection of a Cisco EdgeCraft 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 “[6.4.2Connector](#)”.

6.4.2 Connector

The RS232 interface for ONS15305 is provided through a RJ-45 connector, with the pin-out described in [Table 6-5](#).

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

This section describes the ONS 15305 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 pin-out described in [Table 6-6](#).

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

Table 6-6 Pin Out Synchronization Port (continued)

Pin	Signal
7	NC
8	NC



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

6.6 Management Port

6.6.1 Description

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



Note

The Management Port is configured with a fixed setup - 10Mb / half-duplex.

6.6.2 Connector type

The connector is an RJ-45 Fast Ethernet, with the pin-out described in [Table 6-7](#).

Table 6-7 Management Port - Pin Out

Pin	Signal
1	TxD+ (In)
2	TxD-- (in)
3	RxD+ (out)
4	NC
5	NC
6	RxD--(out)
7	NC
8	NC

6.6.3 Compliance

Management Port compliance is described in [Table 6-8](#).

Table 6-8 Management Port -Compliance

Standard	Comment
ISO/IEC8877	MAU MDI connector
IEEE 802.3, Clause 14	Twisted pair MAU and baseband medium type 10BASE-T

6.7 Other Interfaces

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



Mechanics and Other Characteristics

This chapter describes ONS 15305 Mechanical Parameters, Reliability-MTBF, Environmental Conditions and Referenced Specifications.

7.1 Mechanical Parameters

This section describes ONS 15305 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 described in [Table 7-1](#).

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 physical dimensions as described in [Table 7-2](#).

Table 7-2 Service Module Dimensions

Length	175mm
---------------	-------

Table 7-2 Service Module Dimensions (continued)

Height	41mm
Width	75mm

7.1.3 Power Module, DC Power

The ONS 15305 DC Power Module physical dimensions are described in [Table 7-3](#).

Table 7-3 Power Module Dimensions

Length	230mm
Height	19mm
Width	44mm

7.1.4 System Controller Module, SYSCONT-SD128-RJ45

The ONS 15305 System Controller module physical dimensions are described in [Table 7-4](#).

Table 7-4 System Controller Module dimensions

Length	175mm
Height	19mm
Width	95mm

7.1.5 Alarm and Fan module, FAN-ALARM

The ONS 15305 Alarm and Fan module physical dimensions are described in [Table 7-5](#).

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.

ONS 15305 MTBF values are described in [Table 7-6](#).

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
GigE-WAN-2	79,4
E100-WAN-8	74,4

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°C to $+70^{\circ}\text{C}$.

7.4 Referenced Specifications

This section lists referenced ITU-T, Cenelec, ETSI, IEC and Bellcore Documents.

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); Multiplexing 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

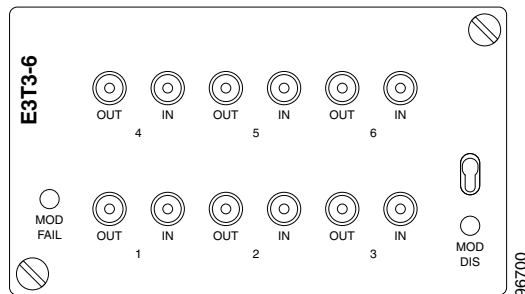


Hex E3/T3 Tributary Module, E3T3-6

8.1 Module Description

This module contains six E3 interfaces. See [Figure 8-1](#). The E3 traffic is mapped into VC-3 containers and multiplexed together as described in “[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).

Figure 8-1 Hex E3/T3 Tributary Module



8.1.1 Power Consumption

The module power consumption is 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.

8.2.2 Compliance

The E3 Interface Compliance is provided in [Table 8-1](#).

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

The module power consumption is 13 W.

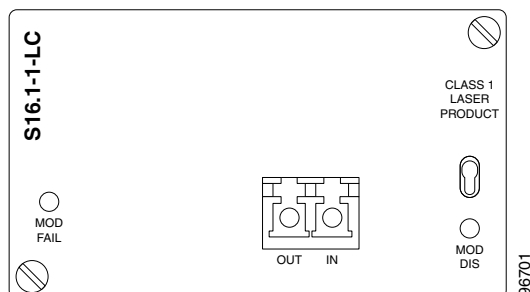
9.2 External Interface

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. See [Figure 9-1](#).

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



9.2.2 Optical Budget

S-16.1 optical budget is found in [Table 9-1](#).

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 (see [Figure 10-1](#)) 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

The module power consumption is 9,5 W.

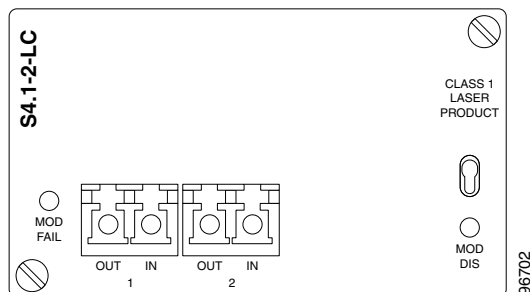
10.2 External Interface

The interface is 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

Optical Interfaces compliance is described in [Table 10-1](#).

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

The Optical Power Budget for STM-4 S4.1 SH and LH is listed in [Table 10-2](#).

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

Table 10-2 Optical Power Budget, STM-4 S4.1 SH and LH (continued)

Parameter	Short-Haul		
Optical path between S and R			
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 10 ¹⁰)	-28		dBm
Min. overload	-8		dBm
Max. optical path penalty	1		dB
Max. reflectance at R	NA		

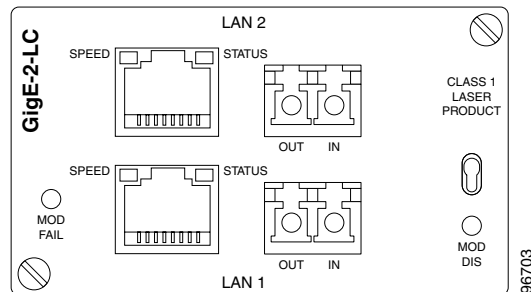


Dual Optical LAN 1000Base-LX, GigE-2-LC

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. See [Figure 11-1](#).

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



11.1.1 Power Consumption

The module power consumption is 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 an 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.

11.2.2 Compliance

The 1000Base-LX Interface Compliance is described in [Table 11-1](#).

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 11-2](#) gives 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

- 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

- 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].

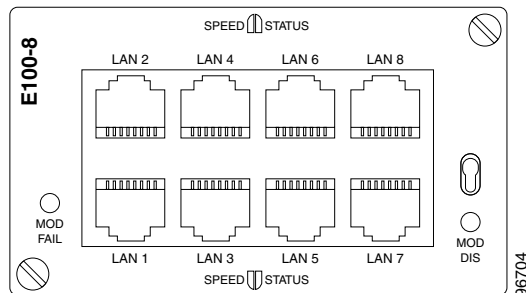


Octal LAN 10/100Base TX Module, E100-8

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. See [Figure 12-1](#). 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-45 connector. Every interface also has a LED that signal the status of the link. The module supports IP interface only.

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



12.1.1 Power Consumption

The module power consumption is 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. Cable type must be CAT5-STP.

12.2.1 Pinout

The connectors are RJ-45 connectors, with the pin-out as described in [Table 12-1](#).

Table 12-1 Pinout Ethernet Port

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

12.2.2 Compliance

10/100BASE-T Interface Compliance is described in [Table 12-2](#).

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. The Fast Ethernet Port Pin out is described in [Table 12-3](#).

Table 12-3 Fast Ethernet Port Pin out

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
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			

Table 12-3 Fast Ethernet Port Pin out (continued)

Signal name	Pin	I/O	Signal Description
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

This section lists referenced documents related to this module.

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

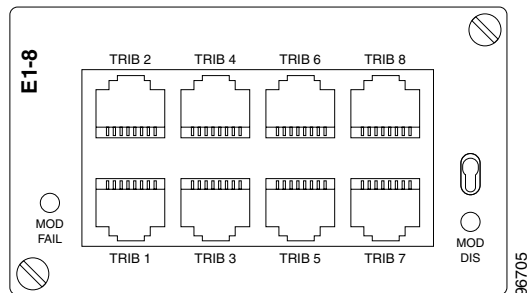


Octal E1 Tributary Module, E1-8

13.1 Module Description

This module contains eight E1 interfaces, see [Figure 13-1](#). The E1 traffic is mapped into VC-12 containers and multiplexed together according to chapter 2.1.1. The physical interface uses a RJ-45 connector and only supports 120-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.

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



13.1.1 Power Consumption

The module power consumption is 3,5 W.

13.2 External Interface

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

13.2.1 Connectors

The connector is a RJ-45 connector, with the pin-out described in [Table 13-1](#):

Table 13-1 E1 Interface Pinouts

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



Note

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

13.2.2 Pinout

Pinout-8xRJ45 2Mb is given in [Table 13-2](#).

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
RJ_TX4-	D2	O	Transmit- Port 4
RJ_RX4+	D4	I	Receive+ Port4

Table 13-2 Pinout-8xRJ45 2Mb (continued)

Signal name	Pin	I/O	Signal Description
RJ_RX4-	D5	I	Receive- Port 4
PORT 5			
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

E1 Interface Compliance is given in [Table 13-3](#).

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
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

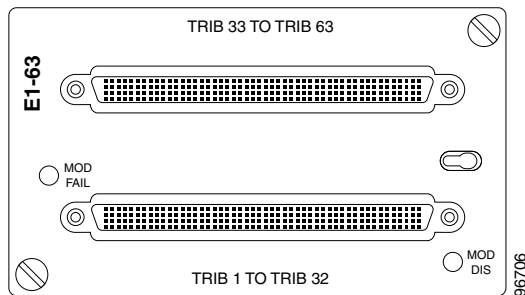


High Density 63xE1 Module, E1-63

14.1 Module Description

This module contains 63 E1 interfaces. The E1 traffic is mapped into VC-12 containers and multiplexed together according to chapter 5.1.1 [Multiplexing Structure and Mapping modes, page 5-1](#). As shown in [Figure 14-1](#) 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

The module power consumption is 21 W.

14.1.2 Connectors

The connector is a high density LFH connector with pin-out as described in [Table 14-1](#) and [Table 14-2](#).

Table 14-1 Multi-interface Lower connector - Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	RxD29-	41	RxD2-	81	RxD31-	121	RxD4-
2	RxD29+	42	RxD2+	82	RxD31+	122	RxD4+
3	GND	43	GND	83	GND	123	GND

Table 14-1 Multi-interface Lower connector - Pinout (continued)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
4	TxD29-	44	TxD2-	84	TxD31-	124	TxD4-
5	TxD29+	45	TxD2+	85	TxD31+	125	TxD4+
6	TxD25-	46	TxD6-	86	TxD27-	126	TxD8-
7	TxD25+	47	TxD6+	87	TxD27+	127	TxD8+
8	GND	48	GND	88	GND	128	GND
9	RxD25-	49	RxD6-	89	RxD27-	129	RxD8-
10	RxD25+	50	RxD6+	90	RxD27+	130	RxD8+
11	RxD21-	51	RxD10-	91	RxD23-	131	RxD12-
12	RxD21+	52	RxD10+	92	RxD23+	132	RxD12+
13	GND	53	GND	93	GND	133	GND
14	TxD21-	54	TxD10-	94	TxD23-	134	TxD12-
15	TxD21+	55	TxD10+	95	TxD23+	135	TxD12+
16	TxD17-	56	TxD14-	96	TxD19-	136	TxD16-
17	TxD17+	57	TxD14+	97	TxD19+	137	TxD16+
18	GND	58	GND	98	GND	138	GND
19	RxD17-	59	RxD14-	99	RxD19-	139	RxD16-
20	RxD17+	60	RxD14+	100	RxD19+	140	RxD16+
21	RxD13-	61	RxD18-	101	RxD15-	141	RxD20-
22	RxD13+	62	RxD18+	102	RxD15+	142	RxD20+
23	GND	63	GND	103	GND	143	GND
24	TxD13-	64	TxD18-	104	TxD15-	144	TxD20-
25	TxD13+	65	TxD18+	105	TxD15+	145	TxD20+
26	TxD9-	66	TxD22-	106	TxD11-	146	TxD24-
27	TxD9+	67	TxD22+	107	TxD11+	147	TxD24+
28	GND	68	GND	108	GND	148	GND
29	RxD9-	69	RxD22-	109	RxD11-	149	RxD24-
30	RxD9+	70	RxD22+	110	RxD11+	150	RxD24+
31	RxD5-	71	RxD26-	111	RxD7-	151	RxD28-
32	RxD5+	72	RxD26+	112	RxD7+	152	RxD28+
33	GND	73	GND	113	GND	153	GND
34	TxD5-	74	TxD26-	114	TxD7-	154	TxD28-
35	TxD5+	75	TxD26+	115	TxD7+	155	TxD28+
36	TxD1-	76	TxD30-	116	TxD3-	156	TxD32-
37	TxD1+	77	TxD30+	117	TxD3+	157	TxD32+
38	GND	78	GND	118	GND	158	GND

Table 14-1 Multi-interface Lower connector - Pinout (continued)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
39	RxD1-	79	RxD30-	119	RxD3-	159	RxD32-
40	RxD1+	80	RxD30+	120	RxD3+	160	RxD32+

Table 14-2 Multi-interface Upper connector - Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	RxD61-	41	RxD34-	81	RxD63-	121	RxD36-
2	RxD61+	42	RxD34+	82	RxD63+	122	RxD36+
3	GND	43	GND	83	GND	123	GND
4	TxD61-	44	TxD34-	84	TxD63-	124	TxD36-
5	TxD61+	45	TxD34+	85	TxD63+	125	TxD36+
6	TxD57-	46	TxD38-	86	TxD59-	126	TxD40-
7	TxD57+	47	TxD38+	87	TxD59+	127	TxD40+
8	GND	48	GND	88	GND	128	GND
9	RxD57-	49	RxD38-	89	RxD59-	129	RxD40-
10	RxD57+	50	RxD38+	90	RxD59+	130	RxD40+
11	RxD53-	51	RxD42-	91	RxD55-	131	RxD44-
12	RxD53+	52	RxD42+	92	RxD55+	132	RxD44+
13	GND	53	GND	93	GND	133	GND
14	TxD53-	54	TxD42-	94	TxD55-	134	TxD44-
15	TxD53+	55	TxD42+	95	TxD55+	135	TxD44+
16	TxD49-	56	TxD46-	96	TxD51-	136	TxD48-
17	TxD49+	57	TxD46+	97	TxD51+	137	TxD48+
18	GND	58	GND	98	GND	138	GND
19	RxD49-	59	RxD46-	99	RxD51-	139	RxD48-
20	RxD49+	60	RxD46+	100	RxD51+	140	RxD48+
21	RxD45-	61	RxD50-	101	RxD47-	141	RxD52-
22	RxD45+	62	RxD50+	102	RxD47+	142	RxD52+
23	GND	63	GND	103	GND	143	GND
24	TxD45-	64	TxD50-	104	TxD47-	144	TxD52-
25	TxD45+	65	TxD50+	105	TxD47+	145	TxD52+
26	TxD41-	66	TxD54-	106	TxD43-	146	TxD56-
27	TxD41+	67	TxD54+	107	TxD43+	147	TxD56+
28	GND	68	GND	108	GND	148	GND
29	RxD41-	69	RxD54-	109	RxD43-	149	RxD56-
30	RxD41+	70	RxD54+	110	RxD43+	150	RxD56+
31	RxD37-	71	RxD58-	111	RxD39-	151	RxD60-

Table 14-2 Multi-interface Upper connector - Pinout (continued)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
32	RxD37+	72	RxD58+	112	RxD39+	152	RxD60+
33	GND	73	GND	113	GND	153	GND
34	TxD37-	74	TxD58-	114	TxD39-	154	TxD60-
35	TxD37+	75	TxD58+	115	TxD39+	155	TxD60+
36	TxD33-	76	TxD62-	116	TxD35-	156	
37	TxD33+	77	TxD62+	117	TxD35+	157	
38	GND	78	GND	118	GND	158	GND
39	RxD33-	79	RxD62-	119	RxD35-	159	
40	RxD33+	80	RxD62+	120	RxD35+	160	

14.1.3 Compliance

Multi-Interface E1 Compliance is given in [Table 14-3](#).

Table 14-3 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

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

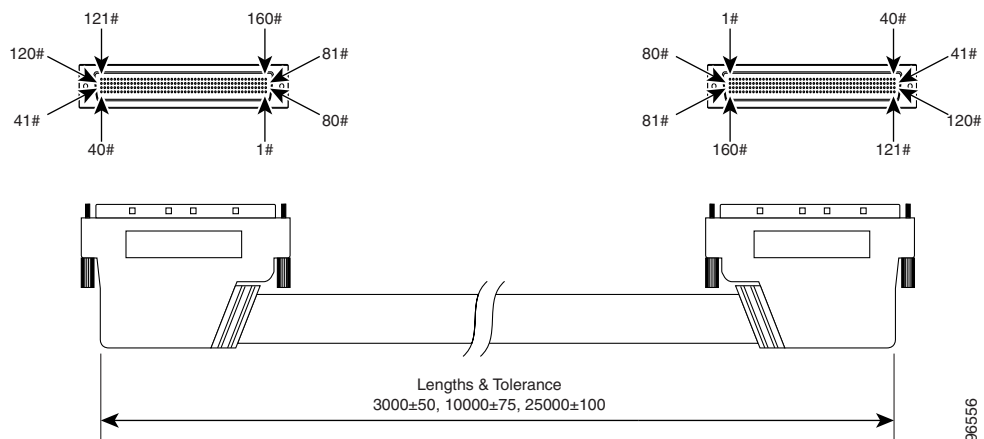
14.2.1 32XE1 LFH - LFH Cable

The patch cable is depicted in [Figure 14-2](#).

Available patch cable length:

- 3 M
- 10 M
- 25 M.

Figure 14-2 32XE1 LFH - LFH Cable

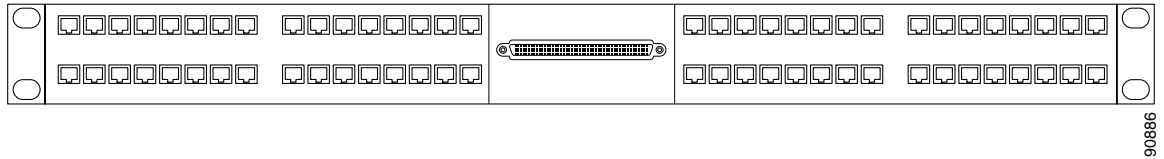


Warning

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 shown in [Figure 14-3](#) provide an interface with impedance 120 ohm.

14.2.2.1 Pinout

RJ-45 Connector - Pinout is described in [Table 14-4](#).

Table 14-4 RJ-45 Connector - Pinout

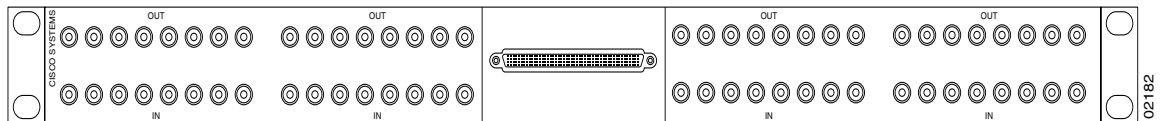
Pin	Signal
1	P120 OUT
2	N120 OUT
3	GND
4	P120 IN
5	N120 IN
6	SHIELD
7	NC
8	NC

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. See [Figure 14-3](#). The patch panel interface impedance is 75 Ohm. Cable with predefined length (see [14.2.1 32XE1 LFH - LFH Cable, page 14-5](#)) 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).

32xE1-LFH-1.0/2.3 Panel



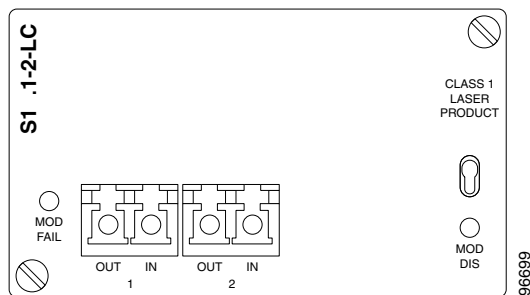


Dual Optical S-1.1 Module, S1.1-2-LC

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. See [Figure 15-1](#).

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



15.1.1 Power Consumption

The module power consumption is 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.

15.2.2 Optical Budget

S-1.1 Interface Optical Budget is listed in [Table 15-1](#).

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

Optical S-1.1 Interface Compliance is listed in [Table 15-2](#).

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

Table 15-2 Optical S-1.1 Interface Compliance (continued)

Standard	Comment
ITU-T G.957	Optical spectrum Optical output power Optical eye diagram Optical extinction ratio
ITU-T G.958	Input jitter measurement

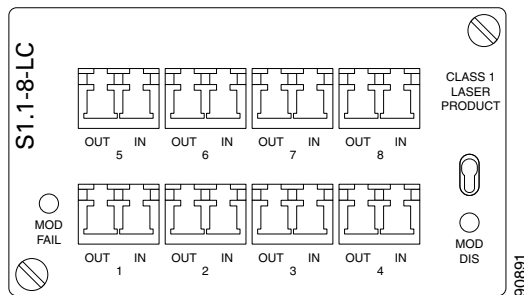


Octal Optical S-1.1 Module, S1.1-8-LC

16.1 Module Description

The module (see [Figure 16-1](#)) 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.

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



16.1.1 Power Consumption

The module power consumption is 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.

16.2.2 Optical Budget

The Optical Budget S-1.1 Interface is given in [Table 16-1](#).

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

Table 16-1 *Optical Budget S-1.1 Interface (continued)*

Parameter	Value
Max. optical path penalty	1 db
Max. reflectance at R	NA

16.2.3 Compliance

The Optical S-1.1InterfaceCompliance is given in [Table 16-2](#).

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 section [5.1.1 Multiplexing Structure and Mapping modes, page 5-1](#).

17.1.1 Power Consumption

The module power consumption is 18W.

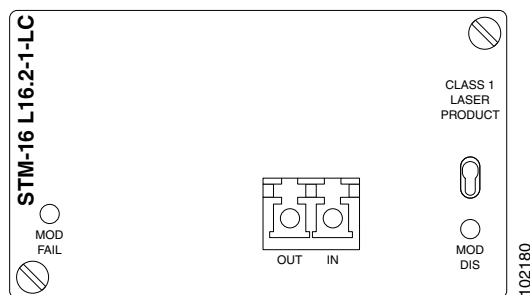
17.2 External L-16.2-LC Interface

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

Figure 17-1 The physical connector is a LC connector. See [Figure 17-2](#).

Figure 17-2 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

L16.2-1-LC Interface compliance is given in [Table 17-2](#).

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

Typical cable parameters and link spans are found in [Table 17-3](#) and [Table 17-4](#).

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 Cisco EdgeCraft terminal.



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 [5.1.1 Multiplexing Structure and Mapping modes, page 5-1](#).

18.1.1 Power Consumption

The module power consumption is 13W.

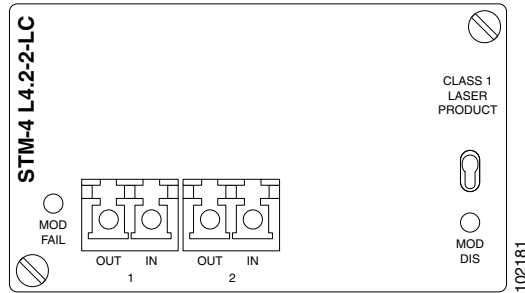
18.2 External L-4.2-LC Interface

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. See [Figure 18-1](#).

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



18.2.2 Optical Budget

The Optical Budget - L4.2-2-LC Interface is described in [Table 18-1](#). 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

L4.2-2-LC Interface compliance is described in [Table 18-2](#).

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

Example of typical cable parameters and typical link spans are found in [Table 18-3](#) and [Table 18-4](#).

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 Cisco EdgeCraft terminal.

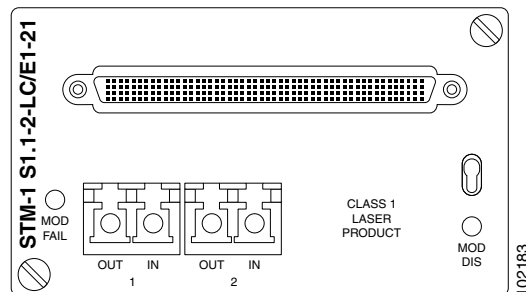


Dual optical + 21x E1 S1.1-2-LC/E1-21 Module

19.1 Module Description

The module contains two optical STM-1 short-haul interfaces and 21 E1 interfaces as shown in [Figure 19-1](#). 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. See [5.1.1 Multiplexing Structure and Mapping modes, 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 fiber in each direction, is used on the two STM1 interfaces.

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



19.1.1 Power Consumption

The module power consumption is 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 [19.4 Example of Cable Planning, STM-1 S-1.1 interface, page 19-6](#).

19.2.1 Connector Type

The physical connector is a LC connector.

19.2.2 Optical Budget

The S-1.1 Interface Optical Budget is listed in [Table 19-1](#).

Table 19-1 S-1.1 Interface Optical Budget

Parameter	Value
Type of fiber: 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	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



Note

The module can also be used for transmission on Multi Mode fiber, see [19.4 Example of Cable Planning, STM-1 S-1.1 interface, page 19-6](#).

19.2.3 Compliance

The Optical S-1.1 Interface Compliance is listed in [Table 19-2](#).

Table 19-2 Optical S-1.1 Interface Compliance

Standard	Comment
ITU-T G.652	Type of optical fiber
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 fiber 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 Cisco EdgeCraft terminal.

19.3 External E1 Interface

This section lists related external E1 interface characteristics.

19.3.1 Connectors

The connector is a high density LFH connector. See [14.2.1 32XE1 LFH - LFH Cable, page 14-5](#) for details.

19.3.2 Pinout

The high density LFH connector pin-out is given in [Table 19-3](#).

Table 19-3 Pin-out high density LFH connector

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1		41	RxD2-	81		121	RxD4-
2		42	RxD2+	82		122	RxD4+
3	GND	43	GND	83	GND	123	GND
4		44	TxD2-	84		124	TxD4-
5		45	TxD2+	85		125	TxD4+
6		46	TxD6-	86		126	TxD8-
7		47	TxD6+	87		127	TxD8+
8	GND	48	GND	88	GND	128	GND
9		49	RxD6-	89		129	RxD8-
10		50	RxD6+	90		130	RxD8+
11	RxD21-	51	RxD10-	91		131	RxD12-
12	RxD21+	52	RxD10+	92		132	RxD12+
13	GND	53	GND	93	GND	133	GND
14	TxD21-	54	TxD10-	94		134	TxD12-
15	TxD21+	55	TxD10+	95		135	TxD12+
16	TxD17-	56	TxD14-	96	TxD19-	136	TxD16-
17	TxD17+	57	TxD14+	97	TxD19+	137	TxD16+
18	GND	58	GND	98	GND	138	GND
19	RxD17-	59	RxD14-	99	RxD19-	139	RxD16-
20	RxD17+	60	RxD14+	100	RxD19+	140	RxD16+
21	RxD13-	61	RxD18-	101	RxD15-	141	RxD20-
22	RxD13+	62	RxD18+	102	RxD15+	142	RxD20+
23	GND	63	GND	103	GND	143	GND
24	TxD13-	64	TxD18-	104	RxD15-	144	TxD20-

Table 19-3 Pin-out high density LFH connector (continued)

25	TxD13+	65	TxD18+	105	RxD15+	145	TxD20+
26	TxD9-	66		106	TxD11-	146	
27	TxD9+	67		107	TxD11+	147	
28	GND	68	GND	108	GND	148	GND
29	RxD9-	69		109	RxD11-	149	
30	RxD9+	70		110	RxD11+	150	
31	RxD5-	71		111	RxD7-	151	
32	RxD5+	72		112	RxD7+	152	
33	GND	73	GND	113	GND	153	GND
34	TxD5-	74		114	RxD7-	154	
35	TxD5+	75		115	RxD7+	155	
36	TxD1-	76		116	TxD3-	156	
37	TxD1+	77		117	TxD3+	157	
38	GND	78	GND	118	GND	158	GND
39	RxD1-	79		119	RxD3-	159	
40	RxD1+	80		120	RxD3+	160	

19.3.3 Patch Panels

Two types of patch panels are available for patching the 21 E1's interface. See [14.2 Patch Panels, page 14-5](#) 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 circuit. Avoid connecting this interface to TNV circuits. The cables must not run with power cables, Network cables, or any other cables which are not connected to SELV circuits. The electrical cables must not exit the building. If cables are connected to an equipment which contains not SELV circuits, proper insulation between the ONS15305 E1 cables interface and the other equipment interfaces must be provided.

19.3.4 Compliance

The Multi-Interface E1 compliance is given in [Table 19-4](#).

Table 19-4 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

Typical cable parameters are described in [Table 19-5](#).

Table 19-5 Typical Cable Parameters

Cable Loss, according to ITU-T Rec. G.957	Single Mode fiber Acc. to ITU-T G.652	Multi Mode fiber 50/125 um Acc. to ITU-T G.651	Multi Mode fiber 62.5/125 um Acc. to IEC/EN 60793-2-10
fiber Cable Attenuation	0.5 dB/km	1.0 dB/km	1.0 dB/km
Cable Margin (Mc)	Incl. in fiber att	3 dB	3 dB
Loss in Optical Distribution Frame	Incl. in fiber 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 ¹	500 MHz*km ²
Overall bandwidth	-	80 MHz	80 MHz

1. Modal bandwidth for Overfilled launch (OFL).
2. Modal bandwidth for Overfilled launch (OFL).

Typical Link Spans are described in [Table 19-6](#).

Table 19-6 Typical Link Spans

Type of fiber		Loss Limited Span	Dispersion Limited Span	Overall Link Span	Notes
Two-fiber	SM	24 km	47 km	24 km	
	MM 50 μm	13 km	10 km	10 km	^{1, 2}
	MM 62.5 μm	13 km	6 km	6 km	³

1. Offset launch with mode-conditioning patchcord according to IEEE Std. 802.3 1998 edition.
2. By using a MM fiber like GIGAlite™ II, dispersion limited spans can be extended to 15km (50/125mm) and 9 km (62.5/125 mm) without the need of a mode-conditioning patchcord.
3. See 1 and 2 above.

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

However, MM fibres can contain central index distortions, which can give rise to bandwidth collapse with small offsets from center. Both center launch and offset launch with FP laser creates underfilled excitation of the MM fiber. Offset launch is less vulnerable to mode coupling distortions due to the higher number of modes being excited. Underfilled excitations generally gives higher bandwidths than OFL.

Recommendation

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

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



Dual Optical LAN 1000Base-LX Module with Mapper, GigE-WAN-2

20.1 Module Description

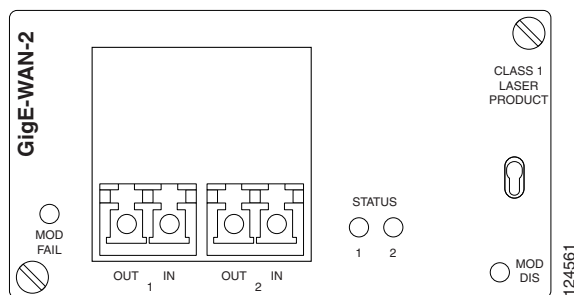
The module (see [Figure 20-1](#)) is a tributary module that supports both optical and electrical gigabit Ethernet interfaces. It supports up to two interfaces.

It includes up to two Gigabit Ethernet to SDH mappers. The module support both L1 and L2 services.

It consists of the following functionality:

- Ethernet features
- SDH features
- Optical or electrical interfaces
- LED indicators
- Inventory EEPROM
- Local power supply
- Back plane interfaces

Figure 20-1 Dual Optical LAN 1000Base-LX Module with Mapper, GigE-WAN-2



20.1.1 Ethernet Features

The module supports both L1 and L2 services. The number of physical interfaces is two. The tributary module includes the following Ethernet functionality:

- Q in Q tunneling of data
- L2 protocol tunneling
- RMON counters
- Flow control
- Priority according to 802.1p, with 4 queues
- Strict priority
- Configurable mapping of priority to queue

The module includes two Ethernet switches and both are connected to the policer. The mappers and physical interfaces are also connected to the policer.

The following options are available in the policer:

- A physical interface can be connected to the mapper, via the policer, for a L1 service
- A physical interface can be connected to the Ethernet switch, via the policer, for a L2 service
- The Ethernet switch can be connected to the mapper, via the policer for a L2 service

20.1.2 SDH Features

The tributary module includes the following SDH functionality:

- Support for up to 2 independent mappers
- AU-4/TU-3/TU-12 pointer interpretation/generation and VC-4/3/12 termination
- GFP-F mapping of Ethernet traffic into VC-4-nV or VC-3-nV
- Support of Virtual Concatenation with VC-3-nV, where n=1.3 or VC-4-nV, where n=1
- Support for LCAS
- Alarm processing
- Performance counters
- In-band management
- Support for management traffic via a designated VC-12

20.1.3 Power Consumption

The module power consumption is 25 W.

20.1.4 External Interface

There is room for two interfaces in the module. Both interfaces only support full duplex GE.

The interfaces are based on the SFP multi source agreement (MSA) and it is possible to add the modules in the field. The modules supports hot insertion. The following interfaces are supported in the first release:

- 1000Base-SX
- 1000Base-LX

20.1.5 LED Indicators

Visual indicators (LED's) provide the status of the service module.

20.2 Configuration

In addition to the two GE interfaces the module contains two single port Ethernet switches, and two single port mapper circuits.

All Ethernet switches in the ONS 15305 are inter-connected via the main card.

The module is configurable in two main operation modes:

- 2xGE without mapper circuits
- 2xGE with mapper circuits

20.2.1 2xGE Without Mapper Circuits

In this operation mode the 2 physical input ports are connected directly to the two Ethernet switch ports. In this configuration none of the mapper circuits are available.

20.2.2 2xGE With Mapper Circuits

In this operation mode the physical port 2 will always operate as a L1 port, connected to mapper circuit number 2. It is possible to configure physical port 1 to operate either as a L1 port or as a L2 port. When port 1 is configured to operate in L1 mode it is directly connected to mapper circuit number 1, the Ethernet switch are not used. When port 1 is configured in L2 mode, the physical port is connected to Ethernet switch number 1. Ethernet switch number 2 is connected to mapper circuit number 1.

The mapper circuits support the mapping functionality described in [5.2 Ethernet over SDH mapping, page 5-17](#). The LAN and WAN ports offer the IP functionality described in [5.4 IP Features, page 5-24](#).

20.3 External Interface

This section contains descriptions of the external module interfaces.

20.3.1 Description

The module contains two Gigabit Ethernet (GE) LAN interfaces that meets the specification in IEEE 802.3.

The interfaces use Small Form Pluggable (SFP) optics with the following optics offered:

- 1000Base-LX, single mode
- 1000Base-SX, multimode

20.3.2 1000Base-SX

The interface offered is a Gigabit Ethernet (GE) interface that meets the 1000Base-SX specifications in IEEE 802.3. This interface is an optical short haul interface based on multi-mode fibre. Operating range and Transmitter characteristic for 1000Base-SX are found in [Table 20-1](#) and [Table 20-2](#). Receiver characteristic is found in [Table 20-3](#).

Table 20-1 Operating range for 1000Base-SX over each optical fiber type

Fiber type	Modal bandwidth @ 1300 nm (min. overfilled launch) (MHz · km)	Minimum range (meters)
62.5 µm MMF	160	2 to 220
62.5 µm MMF	200	2 to 275
50 µm MMF	400	2 to 500
50 µm MMF	500	2 to 550
10 µm SMF	N/A	Not supported

Table 20-2 Transmitter characteristic for 1000Base-SX

Description	62.5 µm MMF	50 µm MMF	Unit
Transmitter type	Shortwave Laser		
Signaling speed (range)	1.25 ± 100 ppm		GBd
Wavelength (range)	770 to 860		nm
Trise/Tfall (max; 20%-80%; > 830 nm)	0.26		ns
Trise/Tfall (max; 20%-80%; < 830 nm)	0.21		ns
RMS spectral width (max)	0.85		nm
Average launch power (max)	See footnote ¹		dBm
Average launch power (min)	-11.5		dBm
Average launch power of OFF transmitter (max) ²	-30		dBm
Extinction ratio (min)	9		dB
RIN (max)	-117		dB/Hz
Coupled Power Ratio (CPR) ³	9 < CPR		dB

1. The 1000BASE-SX launch power shall be the lesser of the class 1 safety limit as defined by 802.3 38.7.2 or the average receive power (max) defined by 802.3 Table 38-4.
2. Examples of an OFF transmitter are: no power supplied to the PMD, laser shutdown for safety conditions, activation of a “transmit disable” or other optional module laser shut down conditions. During all conditions when the PMA is powered, the ac signal (data) into the transmit port will be valid encoded 8B/10B patterns (this is a requirement of the PCS layers) except for short durations during system power-on-reset or diagnostics when the PMA is placed in a loopback mode.
3. Radial overfilled launches as described in 802.3 38A.2, while they may meet CPR ranges, should be avoided.

Table 20-3 Receiver characteristic for 1000Base-SX

Description	62.5 μ m	50 μ m	Unit
Signaling speed (range)	1.25 \pm 100 ppm		GBd
Wavelength (range)	770 to 860		nm
Average receive power (max)	0		dBm
Receive sensitivity	-17		dBm
Return loss (min)	12		dB
Stressed receive sensitivity	-12.5	-13.5	dBm
Vertical eye-closure penalty	2.60	2.20	dB
Receive electrical 3 dB upper cutoff frequency (max)	1500		MHz

20.3.3 1000Base-LX

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

Table 20-4 Operating range for 1000Base-LX over each optical fiber type

Fiber type	Modal bandwidth @ 1300 nm (min. overfilled launch) (MHz · km)	Minimum range (meters)
62.5 μ m MMF	500	2 to 550
50 μ m MMF	400	2 to 550
50 μ m MMF	500	2 to 550
10 μ m SMF	N/A	2 to 5000

Operating range and transmitter characteristic for 1000Base-LX are found in [Table 20-4](#) and [Table 20-5](#).

The receiver characteristic is found in [Table 20-6](#).

Table 20-5 Transmitter characteristic for 1000Base-LX

Description	62.5 μ m MMF	50 μ m MMF	10 μ m SMF	Unit
Transmitter type	Longwave Laser			
Signaling speed (range)	1.25 \pm 100 ppm			GBd
Wavelength (range)	1270 to 1355			nm
Trise/Tfall (max, 20-80% response time)	0.26			ns

Table 20-5 Transmitter characteristic for 1000Base-LX

Description	62.5 µm MMF	50 µm MMF	10 µm SMF	Unit
RMS spectral width (max)	4			nm
Average launch power (max)	-3			dBm
Average launch power (min)	-11.5	-11.5	-11.0	dBm
Average launch power of OFF transmitter (max)	-30			dBm
Extinction ratio (min)	9			dB
RIN (max)	-120			dB/Hz
Coupled Power Ratio (CPR) ¹	28 < CPR < 40	12 < CPR < 20	N/A	dB

1. Due to the dual media (single-mode and multimode) support of the LX transmitter, fulfillment of this specification requires a single-mode fiber offset-launch mode-conditioning patch cord described in 802.3 chapter 38.11.4 for MMF operation. This patch cord is not used for single-mode operation.

Table 20-6 Receiver characteristic for 1000Base-LX

Description	Value	Unit
Signaling speed (range)	1.25 ± 100 ppm	GBd
Wavelength (range)	1270 to 1355	nm
Average receive power (max)	-3	dBm
Receive sensitivity	-19	dBm
Return loss (min)	12	dB
Stressed receive sensitivity	-14.4	dBm
Vertical eye-closure penalty	2.60	dB
Receive electrical 3 dB upper cutoff frequency (max)	1500	MHz

20.4 SFP Modules

The SFP modules to be used together with the GigE-WAN-2 service module are available from Cisco.



Warning

If using other SFP modules than delivered from Cisco, Cisco disclaim responsibility of possible damage or malfunction that might occur to involved equipment

For details on installation of SFP modules, please see the documents listed below:

Installing GBIC, SFP and XFP Optics Modules in Cisco ONS 15454, 15327, 15600, and 15310 Platforms:

<http://www.cisco.com/univercd/cc/td/doc/product/ong/15400/454spint/gbicsfp.htm>

and *Cisco Small Form-Factor Pluggable Modules Installation Notes:*

http://www.cisco.com/en/US/products/hw/modules/ps5000/products_installation_guide_chapter09186a008011c581.html#81099



CHAPTER 21

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

21.1 Module Description

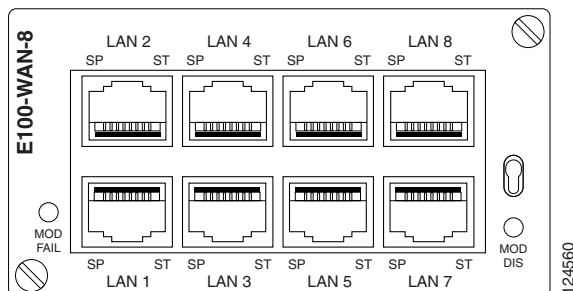
The module is a tributary module that supports both optical and electrical Ethernet interfaces, see [Figure 21-1](#). The module contains 8 LAN Ethernet interfaces that support both 10Base-T and 100Base-TX according to the IEEE 802.3 specification. The interface supports both the half-duplex and the full-duplex modes.

The physical interface is RJ-45connectors. Every interface has two LED's, one LED indicates the link status and the other LED indicates the link speed. The module includes up to sixteen Ethernet to SDH mappers.

The module support both L1 and L2 services. It consists of the following functionality:

- Ethernet features
- SDH features
- Optical interfaces
- Electrical interfaces
- LED indicators
- Inventory EEPROM
- Local power supply
- Back plane interfaces

Figure 21-1 Octal LAN 10/100Base-TX Module with Mapper, E100-WAN-8



21.1.1 Ethernet Features

The module supports both L1 and L2 services. The number of physical interfaces is eight. They can be independent configured as electrical 10/100 Base-TX.

The policer performs the following functions:

- Q in Q tunnelling of data
- L2 control protocol tunneling
- Internal connection between the physical interfaces, mapper and Ethernet switch

The module includes two Ethernet switches of which one is directly connected to the mapper. This switch and mapper provides eight mappers that can be used in a L2 solution.

The other Ethernet switch is connected to the policer. The mapper and physical interfaces are also connected to the policer.

The following options are available in the policer:

- A physical interface can be connected to the mapper, via the policer, for a L1 service
- A physical interface can be connected to the Ethernet switch, via the policer, for a L2 service
- The port of the Ethernet switch can be connected to the mapper, via the policer, for an additional mapper.

Sixteen mappers are available if none of the physical interfaces are used.

21.1.2 SDH Features

The tributary module includes the following SDH functionality:

GFP-F encapsulation of Ethernet traffic

- Support of Virtual Concatenation with VC-12-nV, where n=1.50, VC-4-nV, where n=1 and VC-3-nV, where n=1.3
- Support for up to 16 independent mappers
- Support for LCAS
- AU4, TU-12/3 pointer interpretation/ generation and VC-12/4/3 termination
- Alarm processing

21.1.3 Electrical Interfaces

The module supports up to eight electrical Ethernet interfaces. The interfaces support both 10 Base-T and 100 Base-TX.

21.1.4 LED Indicators

Visual indicators (LED's) provide the status of the module.

21.2 Configuration

In addition to the physical interfaces the module contains two 8 port Ethernet switches, connected together via the internal G-link interface towards the crossbar, and two 8 port mapper circuits. The module is configurable into two main operation modes:

- Grooming mode
- Normal mode

21.2.1 Grooming Mode (2xFE + SMAP)

In this operation mode physical port 1 and 2 (LAN ports) are connected to the Ethernet switch, physical port 3-8 is unused. The 14 remaining Ethernet switch ports (WAN ports) are connected to the mapper circuits; two mapper circuits are left unconnected. In this configuration the module is intended for grooming of traffic from a large number of remotely located devices.

21.2.2 Normal Mode (8xFE +SMAP)

In this operation mode 8 of the Ethernet switch ports are connected to 8 mapper ports (WAN ports). The 8 physical interfaces can independently be configured to operate as a L1 port (LAN port), directly connected to one of the 8 mapper ports, or as a L2 port (LAN port), connected to one of the 8 Ethernet switch ports.

The mapper circuits supports the mapping functionality described in [5.2 Ethernet over SDH mapping, page 5-17](#).

The LAN and WAN ports offers the IP functionality described in [5.4 IP Features, page 5-24](#).

21.3 Power Consumption

The power consumption is 27,5 W.

**Note**

Please see [2.6 Limitations - Module Configurations, page 2-9](#)

21.4 External Interface

The following sub-sections describes the external interface.

21.4.1 Description

The interface is a 10Base-T and 100Base-TX Ethernet interface according to the IEEE 802.3 specification.

21.4.2 Connector type

The connectors are 8x RJ-45 Fast Ethernet

21.4.2.1 Pin Out

Pins available:

- 8x 8pin

Spare pins:

- 8x 4

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

21.4.3 Compliance

10/100Base-T interface compliance is described in [Table 21-1](#).

Table 21-1 Compliance 10/100Base-T interface

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



Command Line Interface - ONSCLI

22.1 Introduction to ONSCLI

The command line interface, ONSCLI is a line-oriented ASCII-based management interface, by means of which simple commands - possibly with parameters - may be issued to access or modify the device configuration.

22.1.1 Accessing ONSCLI

The ONSCLI is accessed via a serial port or via an IP connection (Telnet). The serial connection communications parameters are fixed: 19200 bit/s, no parity, 8 bits, 1 stop bit, and no hardware flow control. VT100 terminal codes are used.

Step 1 Type **ONSCLI** to invoke a ONSCLI session.

The cli name is presented on the terminal screen after a system restart.

User authentication (password, 8-12 ASCII characters) is required, as the following session start-up sequence shows:

Step 2 Type terminal **password** (default onsccli)

Command Line Interface

Password: *****

22.1.1.1 Default Passwords

Telnet password = telnet

Terminal password = onsccli

22.1.1.2 Incorrect Password

Each password characters is echoed as '*'. An incorrect password is rejected with the message: *invalid password* and the password prompt is re-issued.

22.1.1.3 Exit

The Exit command is used to terminate an ONSCLI session. The ONSCLI session will be automatically terminated after a period of 30 minutes of inactivity. ONSCLI does not accept simultaneous sessions.

An authorized ONSCLI user obtains full access rights to the available management information.

22.1.2 Syntax Rules

An ONSCLI command line begins with a prompt (issued by ONSCLI), which serves to indicate the current position in the command hierarchy.



An ONSCLI command is issued by typing the command followed by ENTER. Optionally, and only at the lowest level in the command hierarchy, one or more parameters may also be supplied. These are identified by keywords. The command name, parameter keywords and parameter values are delimited by one or more spaces.

It is only necessary to type sufficient leading characters of the command name to avoid ambiguity - the same applies to keywords. BACKSPACE or DELETE may be used to edit the command line. Commands and keywords are NOT case-sensitive, although for clarity they are written in this document using both upper- and lowercase letters. A list of valid commands that have been issued in the current session is maintained in a command history.



22.1.2.1 Universal Commands

Table 22-1 list the ONSCLI universal commands:

Table 22-1 ONSCLI Universal commands

Key	Description
.	Return to previous command level.
\	Go to top command level.
?	Issue a list of commands valid at the current level, or show the command usage.
 Arrow key, up	Recall previous command in command history.
 Arrow key, down	Recall next command in command history.
	Exit
	Exit ONSCLI.

Some commands (in particular Show) may potentially produce many lines of output. After a predetermined number of lines of output in response to a single command, the user is prompted to enter y(es) or n(o) to continue the output.

Command lines may be edited by using the  or  keys to position along the line, and by using BACKSPACE or DELETE to remove characters. All other (graphical) characters are inserted at the current position in the line.

22.1.2.2 Basic Command Syntax

A basic ONSCLI command has the following syntax:

<basic command>

= [<path>]<command> [<parameter>]... <CR>

<path>

= [\]<command>[\]<command>]...

<command>

= <command name> |.

<parameter>

= <spaces> <keyword>=<value> |?

<value>

= <integer> |<choice> |<IP address> |<string> |<MAC address> |<NSAP address> |<time> |<date> |<KLM> |<portList> |<port>

<NSAP address>

= <area address>:<system id>:<selector>

<portList>

= <port>[,<port>]

<areaAddressList>

= <area address>[,<area address>]...

Please see [Table 22-2](#) for details on the Command Syntax

Table 22-2 Command Syntax - Details

Syntax	Description
<spaces>	A string of one or more ASCII spaces.
<integer>	A decimal integer in the range [m:n], where the values m and n are context-dependent.
<choice>	A literal string, whose permissible values and their significance are context-dependent and may be obtained by using the help (“?”) parameter;
<IP address>	An IP address of the form ddd.ddd.ddd.ddd, where d is a decimal digit. Leading zeroes in each ddd may be omitted.

Table 22-2 Command Syntax - Details (continued)

Syntax	Description
<string>	A string of graphical ASCII characters, excluding quotation marks (“”). If the string contains one or more spaces, then it MUST be enclosed in quotation marks. The maximum length of the string is context-dependent.
<MAC address>	Exactly 12 hexadecimal digits.
<time>	A time-of-day of the form hh:mm:ss, where h, m and s are decimal digits.
<date>	A date of the form dd/mm/yy, where d, m and y are decimal digits.
<KLM>	A string of the form k.l.m, where k is a decimal digit in the range [1:3], l is a decimal digit in the range [1:7], and m is a decimal digit in the range [1:3].
<port>	A decimal integer.
<area address>	A hexadecimal string.
<system id>	A hexadecimal string.
<selector>	A hexadecimal string.

Overview of the ONSCLI command hierarchy is following subsections. A detailed overview of all commands is found in [22.2 Command Reference, page 22-7](#).

Optional parameters are enclosed in square brackets. For clarity, parameter command keywords are written in capital letters, for example [IP-ADDRESS=<IP address>].

The order of parameters (keyword/value pairs) is not significant. The help command “?” will display all available commands at the current level, each with a short description.

22.1.2.2.1 The Help Command

The Help command “?” will display all available commands at the current level, each with a short description. E.g. typing “?” at the root level will list the commands which are available at this level:

Step 1 ONSCLI>?

*** current menu path:

<root>

*** valid commands:

IP-Configuration (Management-Port):

Show-Current-Alarms:

Change-Passwords: Manage CLI/TELNET passwords

Erase-CDB:

Reset-Device:

Community-Handler:

Management-Modes:

Running-Config:

Exit:

ONSCLI - available commands:

22.1.2.2.2 IP-Configuration (Management-Port):

The following example configures the device by setting IP address to the management port:

Step 1 ip ip=192.168.2.2 sub=255.255.255.252 def=192.168.2.1

Step 2 --- Change IP address, are you sure (y/n)? Y

IP-ADDRESS: 192.168.2.2

SUBNET-MASK: 255.255.255.252

DEFAULT-GATEWAY: 192.168.2.1

MANAGEMENT-MODE: ip

ADMIN-STATUS: up

STATUS: down



Note DEFAULT-GATEWAY cannot be configured from ONSCLI if routing feature is enabled.

22.1.2.2.3 Show-Current-Alarms

By this command all active alarms are displayed.

22.1.2.2.4 Change-Passwords

By this command, TELNET and ONSCLI passwords can be changed. Both passwords can be changed in the same command or they can be changed one by one.

22.1.2.2.5 Erase-CDB

By this command the complete configuration file is erased. The device is also automatically restarted.

22.1.2.2.6 Reset-Device

By this command the device is restarted.

22.1.2.2.7 Running-Config

Shows all relevant configuration data. Running config contains 9 sections that correspond with the configuration blocks in the device. Each section can be started separately or all at once.

22.1.2.2.8 Community-handler:

These set of commands are used to add, change, remove or display community entries.

Example of adding a new community entry:

Step 1 ONSCLI>Community-handler\add?

Usage:

Add

MANAGER=<IP address>

COMMUNITY=<string[1:20]>

ACCESS=<readOnly/readWritelsuper>

TRAPS=<enable/disable>

Step 2 ONSCLI>Community-handler\add ma=0.0.0.0 commu=test access=readOnly traps=di

MANAGER: 0.0.0.0

COMMUNITY: test

ACCESS: readOnly

TRAPS: disable

22.1.2.2.9 Management-Modes:

Commands used to set system mode, management-port mode and DDC-channels modes. These commands are useful in installation phase.

22.2 Command Reference

This section describes available CLI commands for the ONS 15305.

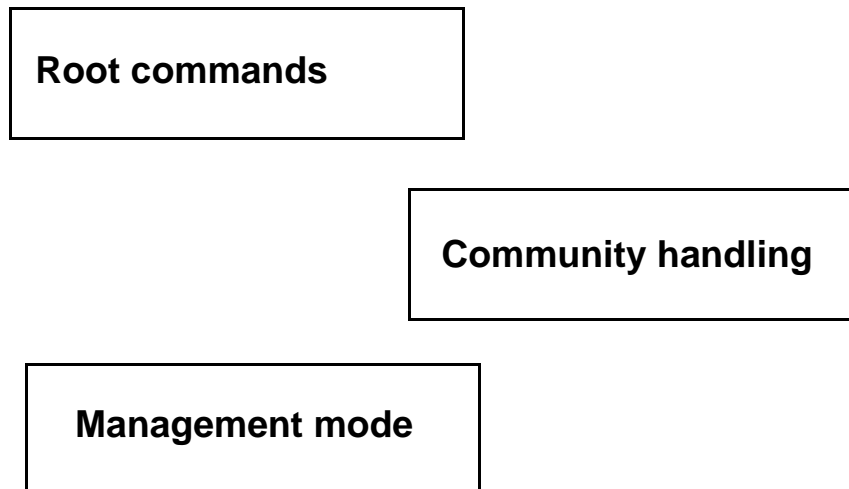


Tip

The following illustrations are hyperlinked with the command table in the end of this section. If you view the PDF version, you can click on desired command in [Figure 22-1](#), [Figure 22-2](#), [Figure 22-3](#) and [Figure 22-4](#) to view corresponding parameters. Use “Previous View” button in the PDF browser to return to the illustrations.

The basic ONSCLI Commands are grouped as depicted in [Figure 22-1](#).

Figure 22-1 Basic CLI commands



An overview of available commands within these groups, is found in [Figure 22-2](#), [Figure 22-3](#) and [Figure 22-4](#). See [Table 22-3 ONSCLI Command Parameters, page 22-10](#) for descriptions on all commands mentioned in this section.

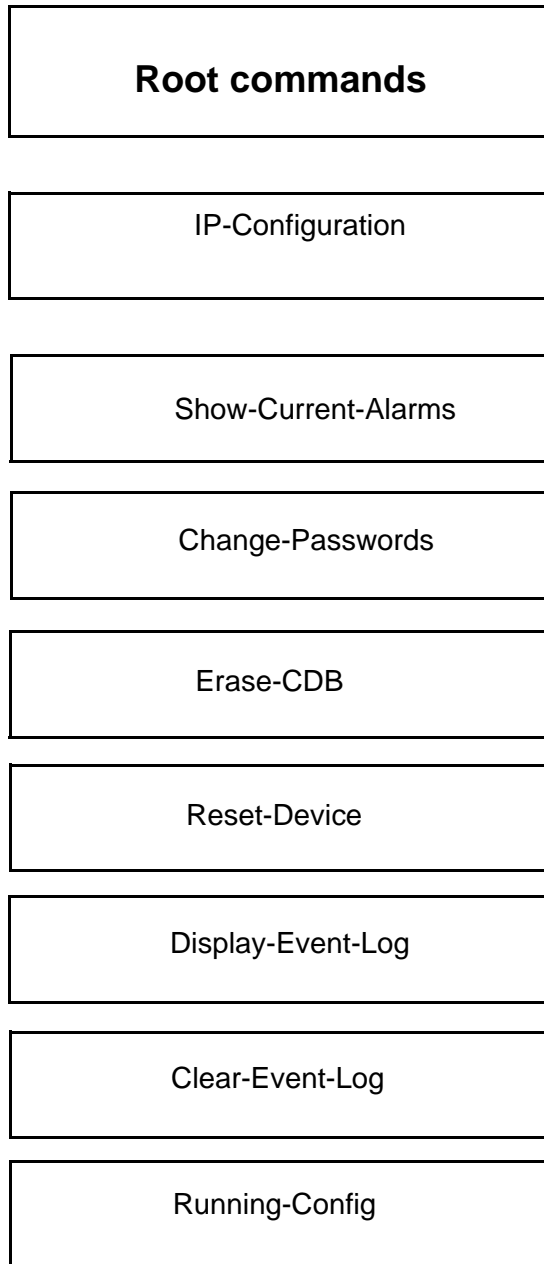
Figure 22-2 ONSCLI Root Commands

Figure 22-3 ONSCLI Commands - Community Table

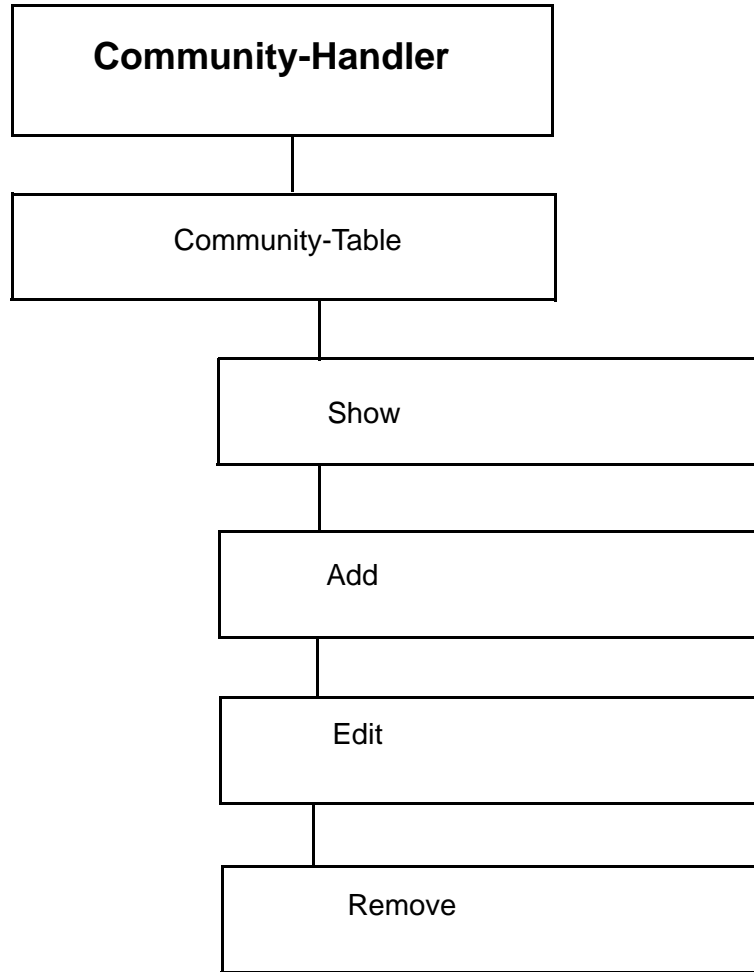


Figure 22-4 ONSCLI commands - Management modes

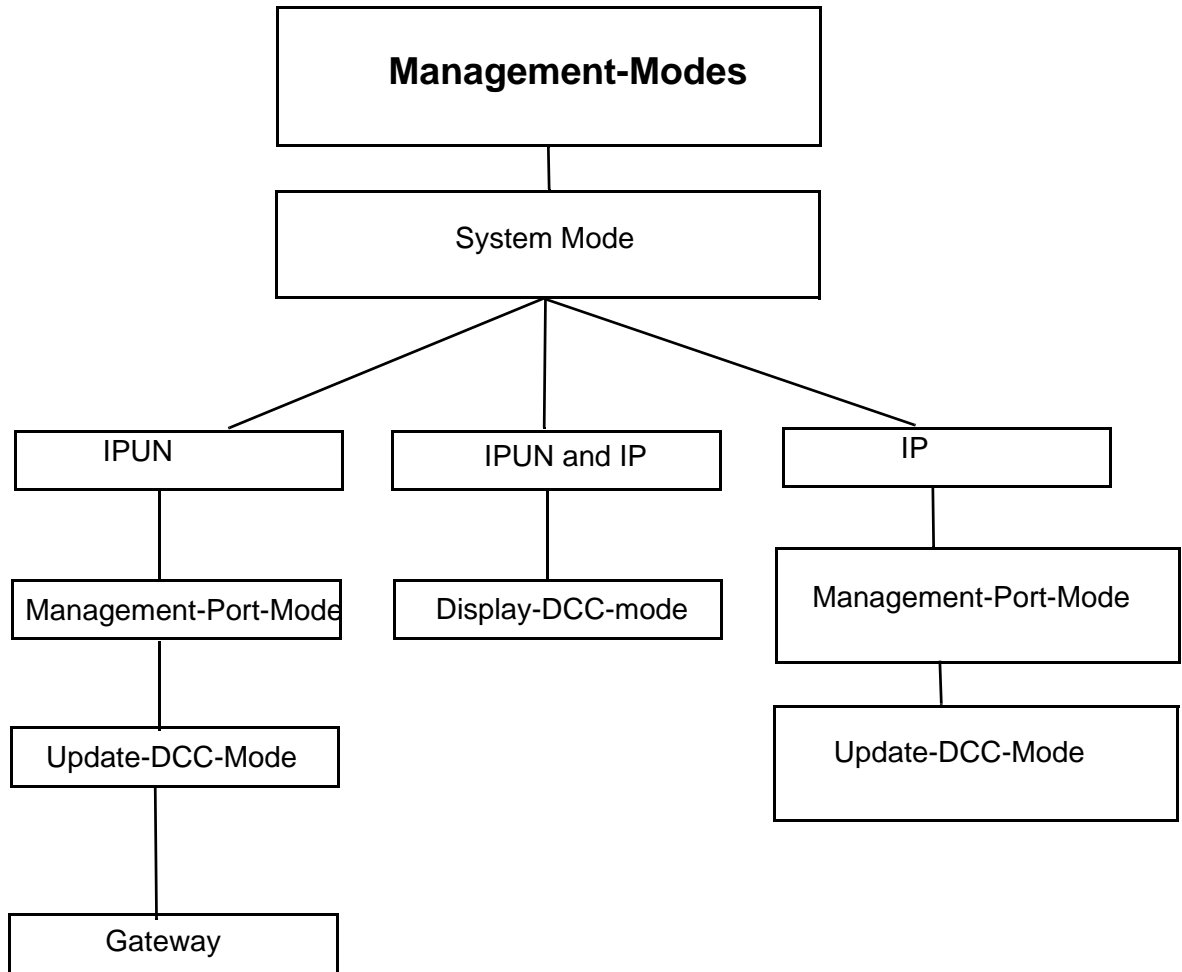


Table 22-3 ONSCLI Command Parameters

Command	Parameters
System-Mode	[SYSTEM-MODE=<iplipunnumbered>]
IP-Configuration	[IP-ADDRESS=<IP address>] [SUBNET-MASK=<IP address>] [DEFAULT-GATEWAY=<IP address>]
Management-Port-Mode	[MANAGEMENT-MODE=<notUsedlip>] [ADMIN-STATUS=<onloff>]

Table 22-3 ONSCLI Command Parameters (continued)

Command	Parameters
Update-DCC-Mode	A-SLOT=<integer value 1:4> A-PORT=<integer value 1:8> A-CHANNEL=<dccR dccM> [DCC-MODE=<notUsed lipOverDcc remoteModule transparent inband>] [IP-MODE=<ppp crc32 ppp crc16>] [B-SLOT=<integer value 1:4>] [B-PORT=<integer value 1:8>][B-CHANNEL=<dccR dccM>]
Show	[MANAGER=<IP address>]
Add	MANAGER=<IP address> COMMUNITY=<string[1:20]> ACCESS=<readOnly readWrite super> TRAPS=<enable disable>
Edit	MANAGER=<IP address> COMMUNITY=<string[1:20]> [ACCESS=<readOnly readWrite super>] [TRAPS=<enable disable>]
Remove	MANAGER=<IP address> COMMUNITY=<string[1:20]>
Running-Config	[SECTION-LIST=<integer value 1:9,...>] No input parameter starts all sections. 1 - Section 1 General information. 2 - Section 2 Alarms. 3 - Section 3 Routing (IP) information. 4 - Section 4 Management configuration. 5 - Section 5 Bridge configuration. 6 - Section 6 Ports configuration. 7 - Section 7 VLAN configuration. 8 - Section 8 Statistics. 9 - Section 9 X-Connects.
Change-Passwords	[ONSLI-PASSWORD=<string[6:12]>] [TELNET-PASSWORD=<string[6:12]>]
Display-DCC-Mode	[A-SLOT=<integer value 1:4>] [A-PORT=<integer value 1:8>] [A-CHANNEL=<dccR dccM>]
Gateway	[GATEWAY-ENABLED=<true false>]
Show-Current-Alarms	None
Erase-CDB	None
Reset-Device	None
Display -Event-Log	None
Clear-Event-Log	None

