harris stratex

Eclipse® 4.6

User Manual

260-668066-001

Eclipse Microwave Radio System

User Manual

Revision 024 for Eclipse Software Release 4.6

February 2009

Eclipse User Manual

260-668066-001 Rev 024 February 2009

This manual incorporates features and functions provided with Eclipse Software release 4.6.

Warranty

Harris Stratex Networks makes no representation or warranties with respect to the contents hereof and specifically disclaims any implied warranties or merchantability or fitness for any particular purpose. Further, Harris Stratex Networks reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of Harris Stratex Networks to notify any person of such revision or changes.

Safety Recommendations

The following safety recommendations must be considered to avoid injuries to persons and/or damage to the equipment:

1. *Installation and Service Personnel:* Installation and service must be carried out by authorized personnel who have the technical training and experience necessary to be aware of any hazardous operations during installation and service, and of measures to avoid any danger to themselves, to any other personnel, and to the equipment.
2. *Access to the Equipment:* Access to the equipment in use must be restricted to service personnel only.
3. *Safety Norms:* Recommended safety norms are detailed in the Health and Safety sections of this manual. Local safety regulations must be used if mandatory. Safety instructions in this document should be used in addition to the local safety regulations. In the case of conflict between safety instructions stated in this manual and those indicated in local regulations, mandatory local norms will prevail. Should local regulations not be mandatory, then the safety norms in Volume 1 will prevail.
4. *Service Personnel Skill:* Service personnel must have received adequate technical training on telecommunications and in particular on the equipment this manual refers to.

Trademarks

All trademarks are the property of their respective owners.

Contact Information

Sales and Sales Support:

For sales information, contact one of the Harris Stratex Networks headquarters, or find your regional sales office at **http://www.harrisstratex.com/contact**.

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Or you can contact your local Harris Stratex Networks office. Contact information is available on our website at: **www.harrisstratex.com/support/contact-support.asp**

WARNING

Making adjustments and/or modifications to this equipment that are not in accordance with the provisions of this instruction manual or other supplementary documentation may result in personal injury or damage to the equipment, and may void the equipment warranty.

AVERTISSEMENT

Tout réglage ou modification faits à cet équipement hors du cadre édicté par ce guide d'utilisation ou par toute autre documentation supplémentaire pourraient causer des blessures ou endommager l'équipement et peut entraîner l'annulation de sa garantie.

WARNUNG

Die an diesen Geräten gemachte Einstellungen und/oder Änderungen, welche nicht gemäß dieser Bedienungsanleitung, oder gemäß anderen zusätzlichen Anleitungen, ausgeführt werden, können Verletzungen oder Materialschäden zur Folge haben und eventuell die Garantie ungültig machen.

ATENCIÓN

Llevar a cabo ajustamientos y/o modificaciones a este equipo, sin seguir las instrucciones provistas por este manual u otro documento adicional, podría resultar en lesiones a su persona o daños al equipo, y anular la garantía de este último.

警告

不按该说明书有关条例或其它补充文件对该设备
所做的调整和／或改型可能会引起人身伤害
或损坏设备，并且设备保修也将失效。

Product Compliance Notes

Eclipse has been tested for and meets EMC Directive 89/336/EEC. The equipment was tested using screened cable; if any other type of cable is used, it may violate compliance.

Eclipse is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. This equipment is intended to be used exclusively in telecommunications centers.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WEEE Directive

In accordance with the WEEE Directive (2002/96/EC), Eclipse is marked with the following symbol:

This symbol indicates that this equipment should be collected separately for the purposes of recovery and/or recycling. For information about collection and recycling of Harris Stratex Networks equipment please contact your local Harris Stratex sales office. If you purchased your product via a distributor please contact the distributor for information regarding collection and recovery/recycling.

More information on the WEEE Directive is available at our website: www.harrisstratex.com/wt/products/weee.asp.

(WEEE is the acronym is for Waste Electrical and Electronic Equipment)

RoHS Directive

The RoHS (Restriction of Hazardous Substances) Directive (2002/95/EC) was implemented on 1 July, 2006. Eclipse meets the requirements of this directive, as at the implementation date.

RoHS Compliance: China

Material Disclosure Table of Hazardous Substances or Elements
有毒有害物质或元素名称及含量标识格式

Part name 部件名称	Toxic or Hazardous Substances and Elements 有毒有害物质或元素					
	Lead (Pb) 铅	Mercury (Hg) 汞	Cadmium (Cd) 镉	Hexavalent Chromium (Cr^{6+}) 六价铬	Polybrominated biphenyls (PBB) 多溴联苯	Polybrominated diphenyl ethers (PBDE) 多溴二苯醚
ODU	X	O	O	O	O	O
IDU	X	O	O	O	O	O
RAC card	X	O	O	O	O	O
DAC card	X	O	O	O	O	O
Aux card	X	O	O	O	O	O
NPC card	X	O	O	O	O	O
IDC	X	O	O	O	O	O
IDCe	X	O	O	O	O	O
NCC card	X	O	O	O	O	O
Fan card	X	O	O	O	O	O

O: Indicates that this toxic or hazardous substance contained in all of the homogenous materials for this part is below the limit requirement in SJ/T11363-2006.
O：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006标准规定的限量要求以下。
X: Indicates that this toxic or hazardous contained in at least one of the homogenous materials used for this part is above the limit requirement in SJ/T11363-2006.
X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

Eclipse date of manufacture information is controlled by serial number. Please contact the Harris Stratex helpdesk for information regarding serial number format and date of manufacture.

Declaration of Conformity, R&TTE Directive, 1999/5/EC

Česky [Czech]	Harris Stratex Networks tímto prohlašuje, že tento point-to-point radio je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Dansk [Danish]	Undertegnede Harris Stratex Networks erklærer herved, at følgende udstyr point-to-point radio overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch [German]	Hiermit erklärt Harris Stratex Networks, dass sich das Gerät point-to-point radio in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab Harris Stratex Networks seadme point-to-point radio vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, Harris Stratex Networks, declares that this point-to-point radio is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]	Por medio de la presente Harris Stratex Networks declara que el point-to-point radio cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Harris Stratex Networks ΔΗΛΩΝΕΙ ΟΤΙ point-to-point radio ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Français [French]	Par la présente Harris Stratex Networks déclare que l'appareil point-to-point radio est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano [Italian]	Con la presente Harris Stratex Networks dichiara che questo point-to-point radio è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo Harris Stratex Networks deklarē, ka point-to-point radio atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]	Šiuo Harris Stratex Networks deklaruoja, kad šis point-to-point radio atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart Harris Stratex Networks dat het toestel point-to-point radio in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti [Maltese]	Hawnhekk, Harris Stratex Networks, jiddikjara li dan point-to-point radio jikkonforma mal-?ti?ijiet essenzjali u ma provvedimenti o?rajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar [Hungarian]	Alulírott, Harris Stratex Networks nyilatkozom, hogy a point-to-point radio megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Polski [Polish]	Niniejszym Harris Stratex Networks oświadcza, że point-to-point radio jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Português [Portuguese]	Harris Stratex Networks declara que este point-to-point radio está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovensko [Slovenian]	Harris Stratex Networks izjavlja, da je ta point-to-point radio v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky [Slovak]	Harris Stratex Networks týmto vyhlasuje, že point-to-point radio spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi [Finnish]	Harris Stratex Networks vakuuttaa täten että point-to-point radio tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Svenska [Swedish]	Härmed intygar Harris Stratex Networks att denna point-to-point radio står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Íslenska [Icelandic]	Hér með lýsir Harris Stratex Networks yfir því að point-to-point radio er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
Norsk [Norwegian]	Harris Stratex Networks erklærer herved at utstyret point-to-point radio er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.

CE0678!

The Eclipse radio is classified under the R&TTE Directive 99/5/EC as a class 2.8 radio (microwave fixed link) product. Point-to-point radio relay equipment is intended to be used for interconnecting private and public networks and for interconnecting mobile base stations back to the PSTN point of presence (POP).

For details of where the equipment is intended to be used, refer to the country matrix below. It should be noted that a licence to operate this equipment is likely to be necessary, and the appropriate regulatory administration should be contacted.

Harris Stratex Networks intends to market this equipment where a cross (X) is shown. The information contained in this document has been gathered from the relevant government authorities and relates only to European countries participating in the R&TTE directive.

	Austria	Belgium	Bulgaria	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Iceland	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Norway	Poland	Portugal	Romania	Slovak Republic	Slovenia	Spain	Sweden	Switzerland	United Kingdom
Eclipse L6GHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eclipse U6GHz	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eclipse 7GHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Eclipse 8GHz	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X	X		X	X	X	X		X	X	X		
Eclipse 10GHz	X		X	X			X	X	X	X			X		X		X	X	X					X	X		X		X	
Eclipse 11GHz		X	X	X	X	X	X		X	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X		X	
Eclipse 13GHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eclipse 15GHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eclipse 18GHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eclipse 23GHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eclipse 26GHz	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eclipse 28GHz	X	X	X	X			X	X	X	X			X			X	X	X	X	X	X	X		X	X	X	X		X	
Eclipse 32GHz			X	X		X	X	X		X					X		X		X	X		X		X	X	X		X	X	
Eclipse 38GHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Product Obsolescence

As at December 2008, the following products are obsolete with no or limited availability.

Product	Part Number	Availability
IDU 300 8XE1/DS1 + E	EXB-211-001	None
DAC 1xE3/DS3	EXD-130-001	None
DAC 155eM, 1xSTM1/OC3 to 63E1/84DS1, Electrical	EXD-155-001	None
IDU 300 GE XPIC, GIGABIT ETHERNET + 8X, PROTECTABLE	EXG-251-001	None
INTELLIGENT NODE UNIT, INCLUDES IDC, FAN, NCC	EXX-000-001	Limited
INTELLIGENT NODE UNIT 2RU	EXX-000-201	Limited
DAC GE, GIGABIT ETHERNET	EXD-180-001	Limited
RAC 30	EXR-999-001	Limited
FAN CARD	EXF-001	Limited
NODE CONTROLLER CARD, SERIAL MGMT	EXN-001	Limited
IDU 20X, INDOOR UNIT,20XE1, 1+1 PROTECTABLE	EXB-201-001	Limited
INDOOR CHASSIS	EXC-001	Limited
DAC 3 X E3/DS3	EXD-330-001	Limited
RAC 10, 4-16E1/4-28DS1, QPSK	EXR-011-001	Limited
IDU 300, 8 X	EXG-081-001	Limited
INDOOR CHASSIS, 2RU EXTENDED	EXE-001	Limited
IDU 16X, INDOOR UNIT, 16XE1, E100	EXB-161-001	Limited
IDU 8X, INDOOR UNIT, 8XE1, E100	EXB-081-001	Limited
RAC 30 V2	EXR-999-002	Limited
IDU 300, 20 X, 1 + 1 PROTECTABLE	EXG-201-001	Limited
RAC 10V2, 4-32E1/4-28DS1	EXR-011-002	Limited
ODU 100, STD PWR	EBS-xx-xxxx-xxx	None
ODU 100, STD PWR	ECS-xx-xxxx-xxx	None
ODU 300, 06GHZ, EP	EDH-06-xxxx-xxx	None
ODU 300, 07GHZ, EP	EDH-07-xxxx-xxx	None
ODU 300, 08GHZ, EP	EDH-08-xxxx-xxx	None
ODU 300, 18GHZ, EP	EDH-18-xxxx-xxx	None
ODU 300, 23GHZ, EP	EDH-23-xxxx-xxx	None
ODU 300, 11GHZ, STD PWR	EDS-11-xxxx-xxx	None

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GLOSSARY

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Volume I

Eclipse Introduction and Safety

About Eclipse

Welcome to the Eclipse User Manual.

This introduction describes:

- What Is Eclipse? on page -3
- What You Need To Know to Use Eclipse on page -3
- About the Eclipse Documentation on page -4
- Documentation Conventions and Terminology on page -5

What Is Eclipse?

What is Eclipse? Eclipse is your chosen solution for microwave radio transmission. The Eclipse Microwave Radio System consists of the Eclipse Node and the Eclipse Terminal. Both are split-architecture radios with an antenna-mounted outdoor unit and a rack-mounted indoor unit.

The Eclipse Node supports multiple point-to-point radios for PDH, SDH and/or Ethernet on a single rack-mounted platform, to form a complete network node for star or ring configurations on frequency bands 5 to 38 GHz.

The Eclipse Terminal is optimized for single-link installations or where back-to-back network connection of terminals is preferred. Terminals may also be used to spur from an Eclipse Node. Different versions are available for PDH, SDH or Ethernet, on frequency bands 5 to 38 GHz.

For an introduction to the Eclipse system, see the System Overview.

For an introduction to Portal, the Eclipse management software, see the Introduction to Portal.

What You Need To Know to Use Eclipse

To install and commission Eclipse, we recommend you have the following knowledge and skills:

- A basic understanding of the principles of microwave transmission.
- Installation and maintenance experience on PDH and SDH digital microwave radio systems.
- Familiarity with Ethernet and/or SDH multiplexing where these traffic options are to be employed on Eclipse.

Familiarity with the operation of a PC using the Windows operating system.

Follow health and safety procedures at all times! See Health and Safety **for complete details.**

About the Eclipse Documentation

This documentation provides information on installing, commissioning and troubleshooting an Eclipse Microwave Radio system. Technical descriptions are at a module and system level.

Intended Audience

This information is for use by trained technicians or engineers. It does not provide information or instruction on basic technical procedures. Harris Stratex Networks recommends you read the relevant sections of this manual thoroughly before beginning any installation or operational procedures on Eclipse.

Organization

This manual is divided into five volume-level sections:

- Health and Safety Requirements
- Installation
- Configuration and Diagnostics
- Commissioning and Troubleshooting
- Appendices

Additional Resources

The resources identified below contain additional information to assist in installing, commissioning, and troubleshooting Eclipse:

- Harris Stratex Networks ***Microwave Radio System Best Practices Guide*** (PN 260-668029-001).
- The library of Eclipse white papers, available to Harris Stratex users.
- Contact Harris Stratex Networks or your supplier for availability.

Documentation Conventions and Terminology

Caution, Warning and Note Cues

The following cues are used to characterize particular types of associated supporting information.

A caution item identifies important information pertaining to actions that may cause damage to equipment, loss of data, or corruption of files.

A *warning* item identifies a serious physical danger or major possible problem.

A *note* item identifies additional information about a procedure or function.

Chapter 1. Health and Safety

This section includes the following health and safety information:

- General Health and Safety
- Operator Health and Safety
- General Hazards
- RF Exposure Guidelines

All personnel must comply with the relevant health and safety practices when working on or around the Eclipse radio equipment.

The Eclipse system has been designed to meet relevant US and European health and safety standards as outlined in IEC Publication 60950-1.

Local safety regulations must be used if mandatory. Safety instructions in this Volume should be used in addition to the local safety regulations. In the case of conflict between safety instructions stated herein and those indicated in local regulations, mandatory local norms will prevail. Should not local regulations be mandatory, then safety norms herein will prevail.

General Health and Safety

The following table describes general health and safety information about the Eclipse radio.

Topic	Information
Flammability	The equipment is designed and constructed to minimize the risk of smoke and fumes during a fire.
Hazardous Materials	No hazardous materials are used in the construction of the equipment.
Hazardous Voltage	The Eclipse system meets global product safety requirements for safety extra-low voltage (SELV) rated equipment where the input voltage ***must*** be 48 V nominal, 60 V maximum.
Safety Signs	External warning signs or other indicators on the equipment are not required.
Surface Temperatures	The external equipment surfaces do become warm during operation due to heat dissipation. However, the temperatures reached are not considered hazardous.

Operator Health and Safety

The following table describes the precautions that relate to installing or working on the Eclipse radio.

Topic	Information
Equipment Protrusions	The equipment has been designed to be free of unnecessary protrusions or sharp surfaces that may catch or otherwise cause injury during handling. However, always take care when working on or around the equipment.
Laser and Fiber Optic Cable Hazards	Eclipse fiber optic transmitters are IEC60825-1 / 21CFR1040-1 Class I compliant and present no danger to personnel in normal use. However: Do not look into active unterminated optical ports or fibers. If visual inspection is required ensure the equipment is turned off or, if a fiber cable, disconnect the far end. Follow the manufacturer's instructions when using an optical test set. Incorrect calibration or control settings could result in hazardous levels of radiation. Protect/cover unconnected optical fiber connectors with dust caps. Place all optical fiber cuttings in a suitable container for safe disposal. Bare fibers and fiber scraps can easily penetrate the skin and eyes.
Lifting Equipment	Be careful when hoisting or lifting the ODU or its antenna during installation or maintenance. The ODU is nominally 10 kg (22 lb). However, antennas with their mounting hardware can weigh in excess of 100 kg (220 lb) and require specialized lifting equipment and an operator trained and certified in its use.
Protection from RF Exposure: Eclipse	The Eclipse radio does not generate RF fields intense enough to cause RF burns. However, when installing, servicing or inspecting an antenna always comply with the Protection from RF Exposure guidelines under General Hazards.
Safety Warnings	When a practice or procedure poses implied or potential harm to the user or to the radio equipment, a warning is included in this manual.

General Hazards

The following table describes the general hazards that must be addressed when planning and installing an Eclipse system.

For more information on health and safety when using Harris Stratex Networks products, refer to Harris Stratex Networks' ***Best Practices Guide***.

Topic	Information
Airflow Requirements	Rack installations must be made so the airflow required for safe and correct operation of Eclipse is not compromised. For the Eclipse Node, unobstructed air passage must be maintained to each side of the indoor unit, which requires a minimum of 50 mm (2 inches) of side spacing to any rack panels, cable bundles or similar.
Circuit Overloading	When connecting the Eclipse, determine the effect this will have on the power supply circuit protection devices, and supply wiring. Check Eclipse power consumption specifications and the supply capability of the power supply system. This check of capacity must extend to the dc power supply and not just to an intermediate connection point.
Eclipse Indoor Unit Earthing	The Eclipse indoor unit earth must be connected directly to the dc supply system earthing conductor, or to a bonding jumper from an earthing terminal bar, or bus to which the dc supply system earthing is connected.
ESD	ESD (electrostatic discharge) can damage electronic components. Even if components remain functional, ESD can cause latent damage that results in premature failure. Always wear proper ESD grounding straps when changing or handling the plug-in cards and avoid hand contact with the PCB back-plane and top-plane. Connect your ESD grounding strap to the combined ESD and ground connector on the INU rack ear. Spare plug-in cards or cards to be returned for service must be enclosed in an anti-static bag. When removing a card from the anti-static bag for installation in an INU, or placing a card in a bag, do so at the INU and only when connected to the INU via your ESD grounding strap.

Topic	Information
Protection from RF Exposure	When installing, servicing or inspecting an antenna always comply with the following: • Locate the antenna such that it does not infringe the RF exposure guidelines for general public. Refer to General Public Compliance Boundary in RF Exposure Guidelines. • Stay aware of the potential risk of RF exposure and take appropriate precautions. Refer to Occupational Compliance Boundary in RF Exposure Guidelines. • Do not stand in front of or look into an antenna without first ensuring the associated transmitter or transmitters are switched off. • At a multi-antenna site ask the site owner or operator for details of other radio services active at the site and for their requirements/recommendations for protection against potentially harmful exposure to RF radiation. • When it is not possible to switch transmitters off at a multi-antenna site and there is potential for exposure to harmful levels of RF radiation, wear a protective suit. • Do not look into the waveguide port of an ODU when the radio is active.
Fiber Optic Cables	Handle optical fibers with care. Keep them in a safe and secure location during installation. Do not attempt to bend them beyond their minimum bend radius. Protect/cover unconnected optical fiber connectors with dust caps.
Ground Connections	Reliable grounding of the Eclipse system must be maintained. Refer to instructions in the manual for grounding of the ODU, ODU cable, lightning surge suppressor, and indoor unit.
Lightning Surge Suppressor	All Eclipse ODU cables must be fitted with the specified surge suppressor(s).
Mains Power Supply Routing	Eclipse dc power, IF, tributary, auxiliary and NMS cables are not to be routed with any AC mains power lines. They are also to be kept away from any power lines which cross them.
Maximum Ambient Temperature	The maximum ambient temperature (Tmra) for an Eclipse indoor unit is +45° C (113° F), and +55° C (131° F) for an ODU. To ensure correct operation and to maximize long term component reliability, ambient temperatures must not be exceeded. Operational specification compliance is not guaranteed for higher ambients.
Mechanical Loading	When installing an indoor unit in a rack, ensure the rack is securely anchored. Ensure that the additional loading of an Eclipse indoor unit or units will not cause any reduction in the mechanical stability of the rack.

Topic	Information
Power Supply Connection	The Eclipse radio has the +ve pin on its dc power supply connector fastened directly to the chassis. It must be used with a -48 Vdc power supply which has a +ve earth; the power supply earth conductor is the +ve supply to the radio. • There must be no switching or disconnecting devices in this earth conductor between the dc power supply and the point of connection to an Eclipse system. • The power supply must be located in the same premises as the Eclipse system.
Power Supply Disconnect	An appropriate power supply disconnect device should be provided as part of the building installation.
Rack Mount Temperature Considerations	If the Eclipse indoor unit is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. The maximum ambient temperature (Tmra) of +45° Celsius (113° F) applies to the immediate operating environment of the Eclipse indoor unit, which, if installed in a rack, is the ambient within the rack.
Restricted Access	The Eclipse system must be installed in restricted access sites. The indoor unit and associated power supply must be installed in restricted areas, such as dedicated equipment rooms, closets, cabinets, or the like. Access to the tower and ODU/antenna location must be restricted **Note:** For USA: In restricted access areas install the Eclipse system in accordance with articles 110-26 and 110-27 of the 2002 National Electrical Code ANSI/NFPA 70, or to any subsequent update to this code for the relevant articles.

RF Exposure Guidelines

The following MPE (maximum permissible exposure) calculations have been produced in accordance with the guidelines of EN 50383/EN 50385. These calculations represent examples only and do not include every possible combination of output power and antenna gain.

Occupational is defined as: “The occupationally exposed population consists of adults who are generally exposed under known conditions and are trained to be aware of potential risk and to take appropriate precautions”.

Table 1-1. MPE Guidelines

5 GHz (4.4 - 5.0 GHz)

Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
30.5	39.3	8.77	3.91
30.5	32.6	4.06	1.81
0.5	39.3	0.28	0.12
0.5	32.6	0.13	0.06
L6/U6 GHz (5.925 - 7.11 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
30.5	41.5	11.30	5.03
30.5	31.2	3.45	1.54
0.5	41.5	0.36	0.16
0.5	31.2	0.11	0.05
7/8 GHz (7.125 - 8.5 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
30.5	42.9	13.28	5.91
30.5	30.24	3.15	1.40
5.0	42.9	0.71	0.31
5.0	30.4	0.17	0.07
10 GHz (10.0 - 10.68 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
26.0	34.3	2.94	1.31
26.0	33.7	2.74	1.22
-4.0	34.3	0.09	0.04
-4.0	33.7	0.09	0.04
11 GHz (10.7 - 11.7 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)

25.0	46.2	10.31	4.59
25.0	27.7	1.23	0.55
2.5	46.2	0.77	0.34
2.5	27.7	0.09	0.04
13 GHz (12.75- 13.25 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
28.0	47.3	16.53	7.36
28.0	29.6	2.15	0.96
0.0	47.3	0.66	0.29
0.00	47.3	0.66	0.29
0.00	29.6	0.09	0.04
15 GHz (14.4- 15.35 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
27.0	46.4	13.28	5.91
27.0	30.8	2.20	0.98
-1.0	46.4	0.53	0.24
-1.0	30.8	0.09	0.04
18 GHz (17.7-19.7 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
21.5	48.0	8.48	3.77
21.5	32.8	1.47	0.66
-3.0	48.0	0.50	0.22
-3.0	32.8	0.09	0.04
23 GHz (21.2-23.632 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
21.5	49.2	9.73	4.33
21.5	34.4	1.77	0.79

-3.0	49.2	0.58	0.26
-3.0	34.4	0.11	0.05
26 GHz (24.52- 26.483 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
15.5	46.0	3.37	1.50
15.5	35.9	1.05	0.47
-4.5	46.0	0.34	0.15
-4.5	35.9	0.11	0.05
28 GHz (27.5- 29.5GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
15.0	48.1	4.06	1.81
15.0	36.5	1.07	0.48
-5.0	48.1	0.41	0.18
-5.0	36.5	0.11	0.05
32 GHz (31.8- 33.4 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
17.5	43.5	3.19	1.42
17.5	37.5	1.60	0.71
-5.0	43.5	0.24	0.11
-5.0	37.5	0.12	0.05
38 GHz (37.0- 39.46 GHz)			
Transmit Power (dBm)	Antenna Gain (dBi)	Compliance Boundary General Public (m)	Compliance Boundary Occupational (m)
17.5	48.1	5.41	2.41
17.5	39.3	1.96	0.87
-5.0	48.1	0.41	0.18
-5.0	39.3	0.15	0.07

Volume II

Eclipse System Description

Chapter 1. System Overview

This section overviews the features and capabilities of Eclipse. It describes:

- Eclipse Platforms on page 1-1
- Eclipse Configuration and Management on page 1-17
- Antennas on page 1-17
- Power Supply on page 1-18
- Platform Layout and Interoperation Data on page 1-18

Eclipse Platforms

Eclipse is available on two platform types, Terminal and Node. Both employ a split-mount architecture with a rack-mounted indoor unit and direct-mounted ODUs connected by a single coaxial cable. Refer to:

- Eclipse Terminal on page 1-1
- Eclipse Node on page 1-6
- Eclipse ODUs on page 1-14

Eclipse Terminal

Eclipse Terminals are single-link radios, comprising an IDU and ODU. Multiple IDUs are in the IDU 300 product group. Three ODUs are available for these IDUS.

Terminals may be operated as single links, or networked where IDUs are back-to-back connected via their tributary ports at intermediate sites.

Most Terminals can be paired for protected link operation.

Terminals may also be over-air interfaced to like Terminals of higher or lower ultimate capacity and, with the exception of the IDUsp, to Eclipse Node.

Refer to:

- 300 Series Indoor Units on page 1-2
- Eclipse Node on page 1-6

Figure 1-1. Eclipse Terminal

300 Series Indoor Units

The IDU 300 is available in variants to transport PDH, SDH or Ethernet on ETSI and ANSI bands.

Table 1-1. IDU 300 Variants

Application	Variant	Capacities	Modulation
E1 / DS1	IDU 300 8x	4x, 5x, 8xE1, or 4x, 8xDS1	QPSK to 32QAM
	IDU 300 20x	4x, 5x, 8x, 10x, 16x, 20xE1, or 4x, 8x, 16xDS1	QPSK to 128QAM
	IDU 300 20xV2	5x, 10x, 20x, 32x, 40xE1, or 4x, 8x, 16x, 28x, 32xDS1	QPSK to 128QAM
	IDUsp 4x	4xE1	QPSK
	IDUsp 16x	4x, 8x, 16xE1	QPSK
STM1 / OC3	IDU 155o	STM1/OC3	16/64/128QAM
Ethernet	IDU ES	10/100Base-T to 200 Mbps with up to 8xE1/DS1 tribs	QPSK to 256QAM
	IDU GE 20x	10/100/1000Base-T plus 1000Base-LX or 1000Base-T SFP option. Throughputs to 360 Mbps and up to 20xE1tribs.	QPSK to 256QAM

ODU options support operation on bands 5 to 38 GHz:

IDU 300 Series Overview

IDU 300 20x and IDU 300 8x

IDU 300 20x supports capacities to 20xE1 or 16xDS1 with modulation options from QPSK to 128 QAM, depending on the selected capacity/bandwidth.

IDU 300 8x supports capacities of 4x, 5x, 8xE1, or 4x, 8xDS1 with modulation options from QPSK to 32 QAM, depending on the selected capacity/bandwidth.

Figure 1-2. IDU 300 20x

Tributaries are ported on individual RJ-45 connectors and are software configured for E1 or DS1 operation.

Synchronous or asynchronous auxiliary data and alarm I/O options are included.

Both IDUs may be paired to support 1+1 hot-standby operation. Y cables are used to provide single-point Tx and Rx tributary connections. Tx and Rx switching is not hitless.

Requires ODU 300hp, ODU 300ep, or ODU 300sp.

IDU 300 20x and 8x can be over-air interfaced to an Eclipse Node comprising the INU, DAC 16x and ODU 300. An AUX is included where auxiliary channel services are also required. This applies only to non-protected 1+0 link operation. Where 1+1 IDU operation is required, protected IDUs must be installed at both link ends.

IDU300 20xV2

IDU 300 20xV2 supports 20 tributaries on individual RJ-45 connectors for E1 or DS1 operation, modulation options to 128 QAM, and over-air capacities to 40xE1 or 32xDS1. Features include:

- Capacities to 20xE1 / 16xDS1 for single link non-protected operation.
- Capacities to 20xE1 or 16xDS1 for hot-standby or space diversity operation.
- Capacities to 40xE1 or 32xDS1 for hot-standby operation.
  - IDUs are paired for protected/diversity operation.
  - For capacities to 20xE1 / 16xDS1 normal IDU equipment and path protection applies, with Y cables used on the tribs.
  - For higher capacities, traffic from the standby IDU is routed to the online IDU to support termination of up to 40xE1 or 32xDS1 tribs. In this configuration trib and PSU protection is not supported, however RAC/ODU and path protection functions are retained.
  - Tx switching is not hitless.
  - Rx path switching (voting) is hitless (errorless) for capacities to 20xE1 /16xDS1. It is not hitless when configured for 40xE1 / 32xDS1 operation.

Figure 1-3. IDU 300 20xV2

IDU 300 20xV2 is capacity licensed. The base configuration supports 20xE1/16xDS1, with capacities to 40xE1 or 32xDS1 obtained by requesting additional capacity upgrades at time of order or as field-downloadable software licenses. See IDU 300 20xV2 License and Steps on page 5-7 of the Portal section.

Synchronous or asynchronous auxiliary data and alarm I/O options are included.

Requires ODU 300ep, ODU 300hp, or ODU 300sp.

IDU 300 20xV2 can be over-air interfaced to an Eclipse Node comprising the INU, DAC 16x and ODU 300. An AUX is included where auxiliary channel services are also required. This applies only to non-protected 1+0 (20xE1 / 16xDS1 max) link operation. Where 1+1 IDU operation is required, protected IDUs must be installed at both link ends.

IDUsp 16x and IDUsp 4x

These IDUs are cost optimized for basic E1 services:

- IDUsp 4x: 4xE1 with QPSK modulation.
- IDUsp 16x: 4x, 8x, 16xE1 with QPSK modulation.

Figure 1-4. IDUsp 16x

Paired IDUsp 16x IDUs support hot-standby operation; Tx and Rx switching is not hitless. The IDUsp 4x is not protectable.

A single 64 kb synchronous auxiliary data connection is included; there is no alarm I/O.

IDUsp requires an ODU 300sp or ODU 300hp; ODU 300ep is not supported.

NMS connection is Ethernet-only; there is no serial interface for Portal PC connection. Instead the IDU is configured as a DHCP (Dynamic Host Configuration Protocol) server and the Portal PC as a client.

IDU 155o

IDU 155o supports a single 155 Mbps STM1/OC3 tributary on optical SC connectors. Modulations options are 16, 64 or 128 QAM.

Figure 1-5. IDU 155o

IDUs are paired to support 1+1 hot-standby or space diversity operation. Optical Y cables are used to provide common Tx and Rx interfaces.

- Tx switching is not hitless.
- Rx switching (voting) is hitless (errorless).

Synchronous or asynchronous auxiliary data and alarm I/O options are included.

Requires ODU 300hp or ODU 300ep.

IDU 155o can be over-air interfaced to an Eclipse Node comprising the INU, DAC 155o, 2x155o, or 2x155e, and ODU 300. An AUX is included where auxiliary channel services are also required. This applies only to non-protected 1+0 link operation. Where 1+1 IDU operation is required, protected IDUs must be installed at both link ends.

IDU ES

IDU ES supports Fast Ethernet to 200 Mbps to provide an uncomplicated and cost effective alternative to fiber. Its Layer 2 switch supports four customer 10/100base-T ports, two over-air transport channels and comprehensive QoS options.

Data throughput options range from 20 to 200 Mbps, and depending on the selected throughput, channel bandwidth ranges from 7 to 56 MHz, with modulation options from QPSK to 256 QAM.

Link capacity may be fully assigned to Ethernet traffic, or between Ethernet and up to 8 wayside E1/DS1 circuits.

Inter-frame gap (IFG) and preamble stripping and re-insertion is used across the link to maximize Ethernet throughputs.

Capacity is licensed. The base configuration supports a 20 Mbps data throughput, with higher capacities to 200 Mbps obtained by requesting additional capacity upgrades at time of order, or as field-downloadable software licenses.

Protected 1+1 operation is not supported.

Figure 1-6. IDU ES

IDU ES is included in Harris Stratex Networks' Connect ES link package; a package comprising two terminals, each with one IDU ES, and one ODU 300 outdoor unit, which depending on the required throughput can be ODU 300sp, hp or ep.

Synchronous or asynchronous auxiliary data and alarm I/O options are included.

Requires ODU 300ep, ODU 300hp, or ODU 300sp.

IDU ES can be over-air interfaced to an Eclipse Node comprising the INU, DAC ES and ODU 300. Where E1/DS1 side channels are required a DAC 4x or DAC 16x is included. Similarly an AUX is included where auxiliary channel services are required.

IDU GE 20x

IDU GE 20x supports Gigabit Ethernet plus up to 20xE1 or 20xDS1 waysides.

Its Layer 2 switch supports two customer 10/100/1000base-T electrical ports, and an optional SFP port for either 1000Base-X optical or 1000Base-T electrical. These interface to one or two transport (link) channels using transparent, VLAN or mixed operational modes.

Switch features include RWPR (Resilient Wireless Packet Ring), layer 2 link aggregation, and comprehensive QoS options with VLAN tagging and jumbo frame support.

Depending on the required Ethernet throughput, channel bandwidth ranges from 7 to 56 MHz for ETSI, and 5 to 80 MHz for ANSI, with modulation options from QPSK to 256 QAM. Maximum Ethernet throughput is 360 Mbps using one or both transport channels.

Configured link capacity may be fully assigned to Ethernet, between Ethernet and up to 20xE1 or 20xDS1 side circuits, or to E1 or DS1 circuits only for a maximum of 20xE1 or 16xDS1.

Inter-frame gap (IFG) and preamble stripping and re-insertion is used to maximize data throughput.

Capacity is licensed. The base configuration (no license required) supports 20xE1 or 20xDS1 circuits. The licensed extensions enable Ethernet in steps to 50, 100, 150, 200, or 360 Mbps, each with up to 20xE1 or 20xDS1 waysides.

Protected 1+1 hot-standby or space diversity operation is configured by adding a second IDU GE 20x. Ethernet traffic is supported on a single interface to one of the IDUs. E1/DS1 traffic is supported on interfaces to both IDUs using Y-cables.

The 1RU IDU GE 20x complies with ETSI half-rack mechanical specifications with a rack depth of 240 mm (9.4”).

Figure 1-7. IDU GE 20x

IDU GE 20x is also available in a ‘Connect’ link package, where a package comprises two terminals, each with one IDU GE 20x, and one ODU 300 outdoor unit, which depending on the required throughput and band, can be ODU 300sp, hp or ep.

Alarm I/O options are included.

An IDU GE 20x 1+0 terminal can be over-air interfaced to an Eclipse Node comprising the INU, RAC 30 or RAC 3X, DAC GE or DAC ES, and ODU 300. Where E1 or DS1 side channels are required, a DAC 4x or DAC 16x is included. Similarly an AUX is included where external Alarm I/O interfaces are required.

For protected IDU GE 20x operation, both ends of the link must be IDU GE 20x.

Eclipse Node

Eclipse Node replaces the traditional terminal or single-link based approach to networking with a *nodal* solution. One Eclipse platform directly supports up to six links, on frequency bands from 5 to 38 GHz.

Radio paths and customer interfaces are customized by plug-in cards. A high-speed backplane bus provides traffic and services interconnection.

The figure below shows an Eclipse Node comprising an INU (Indoor Node Unit) with three ODUs.

Figure 1-8. Eclipse Node: INU with Three ODUs

The Node is software configurable for Ethernet and /or PDH or SDH link capacities of:

- 10 to 300 Mbps Ethernet.
- 5 to 100xE1, or 4 to 127xDS1.
- 1 to 4xDS3.
- 1xSTM1/OC3 or 2xSTM1/OC3.

Where higher capacities are needed, two or more nodes are co-located for parallel-path operation.

Link options include:

- 1+0 non-protected operation.
- Hot-standby, space diversity, frequency diversity, or ring protected operation.
- Dual protection, with options of:
  - Frequency diversity on hot-standby links
  - Frequency diversity on space diversity links
- Co-channel dual-polarized (CCDP) XPIC operation.

For information on the indoor units and plug-in cards, refer to:

- Node Indoor Units on page 1-7
- Node Plug-in Cards on page 1-9

Node Indoor Units

There are two indoor units, the INU, and INUe (Extended INU). The INU is a 1RU chassis, the INUe is 2RU.

Mandatory plug-ins are the NCC (Node Control Card) and FAN (Fan card). The optional plug-ins comprise RAC (Radio Access Card), DAC (Digital Access Card), AUX (Auxiliary) and NPC (Node Protection Card).

INU

The INU requires one NCC and one FAN, and has provision for up to four option plug-ins. It supports a maximum of three ODUs for three non-protected links, or one protected/diversity link and one non-protected link. Each ODU is supported by a RAC via a single coax cable.

Figure 1-9. INU

INUe

The INUe requires one NCC and one 2RU FAN or two 1RU FANs. The INUe has provision for up to ten option cards and supports a maximum of six ODUs for six non-protected links, or up to three protected/diversity links.

Figure 1-10. INUe

The current production IDCe (INUe chassis) accepts a 2RU FAN or two 1RU FANs.

One 2RU FAN is now supplied as standard with the IDCe.

Node Plug-in Cards

This section highlights current plug-in cards for an INU/INUe.

NCC

The NCC is a mandatory plug-in for an INU/INUe. It performs key node management and control functions, and provides various dc rails from the -48 Vdc input. It also incorporates a plug-in flash card, which holds Node configuration and license data.

Figure 1-11. NCC

FAN

The FAN is a mandatory plug-in. There are two variants, 2RU and 1RU. Each is fitted with two long-life axial fans plus monitoring and control circuits.

- One 1RU FAN is fitted in an INU.
- One 2RU FAN or two 1RU FANs are fitted in the INUe. The 2RU FAN is standard.

Figure 1-12. FAN (1RU)

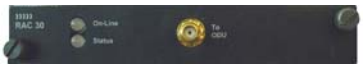
RAC 30v3

RAC 30v3 interfaces to an ODU 300hp/ep/sp for channel bandwidths up to 28 MHz (ETSI) or 30 MHz (ANSI) for capacities of:

- 10 to 150 Mbps Ethernet
- 5x to 75xE1
- 4x to 100xDS1
- 1x, 3x, 4xDS3
- 1xSTM1/OC3

Where transport of E3 rates is required, the DAC 3xE3/DS3M is used in E13 mode to multiplex the E3 data to NxE1 on the backplane bus.

Figure 1-13. RAC 30



RAC 30A

RAC 30A supports adaptive and non-adaptive modulation options.

For adaptive modulation it uses one of three automatically and dynamically switched modulations - QPSK, 16 QAM or 64 QAM so that for a given RF channel bandwidth of 7, 14 or 28 MHz, a twofold improvement in data throughput is provided for a change from QPSK to 16 QAM, and a threefold improvement to 64 QAM. Modulation switching is hitless for priority traffic.

Adaptive modulation capacity options extend over:

- 10 to 130 Mbps Ethernet
- 5x to 63xE1
- 8x to 84xDS1

For non-adaptive modulation operation, its capacity options are the same as RAC 30v3.

RAC 30A interfaces to an ODU 300hp/ep/sp for ETSI channel bandwidths to 28 MHz, or with ODU 300hp/ep for ANSI channel bandwidths to 30 MHz.

RAC 30A is compatible with RAC 30v3 or RAC 30v2 for non-adaptive operation.

Figure 1-14. RAC 30A

RAC 3X

RAC 3X interfaces to an ODU 300hp or ep for channel bandwidths from 28 to 56 MHz (ETSI), or 30 to 50 MHz (ANSI), for capacity options of:

- 50 to 300 Mbps Ethernet
- 64/75/93/106xE1
- 32/70/84/100xDS1
- 4xDS3
- 1/2xSTM1/OC3

Figure 1-15. RAC 3X

RAC 40

RAC 40 interfaces to an ODU 300hp or ep to support co-channel XPIC operation for:

- Two 100, 130, or 150 Mbps Ethernet links on one 28 MHz or 30 MHz channel.
- Two STM1, 75xE1, 64xE1 or 52xE1 links on one 28 MHz channel.
- Two OC3, 100xDS1, 84xDS1 or 70xDS1 links on one 30 MHz channel.

Figure 1-16. RAC 40

RAC 4X

RAC 4X interfaces to an ODU 300hp or ep to support co-channel XPIC operation for:

- Two 150 Mbps Ethernet links on one 28, 40, 50 or 56 MHz channel.
- Two 190 Mbps Ethernet links on one 28 MHz channel.
- Two 200 Mbps Ethernet links on one 40 or 56 MHz channel.
- Two 300 Mbps Ethernet links on one 50 or 56 MHz channel.
- Two 75xE1, 93xE1 or STM1 links on one 28 MHz channel.
- Two 100xE1, 127xDS1, STM1 or OC3 links on one 40 MHz channel.
- Two 127xDS1, OC3 or 2xOC3 links on one 50 MHz channel.
- Two 75xE1, 100xE1, STM1 or 2xSTM1 links on one 56 MHz channel.

Figure 1-17. RAC 4X

DAC 4X

DAC 4x supports 4xE1 or 4xDS1 tributaries on individual RJ-45 connectors.

Figure 1-18. DAC 4X

DAC 16X

DAC 16x supports 16xE1 or 16xDS1 tributaries on Mini RJ-21 connectors.

Figure 1-19. DAC 16x

DAC 3xE3/DS3

DAC 3xE3/DS3 supports 3xE3 or 3xDS3 tributaries on paired BNC connectors.

Figure 1-20. DAC 3xE3/DS3

DAC 3xE3/DS3M

DAC 3xE3/DS3M supports four operational modes:

- Normal E3/DS3 tributary operation (as for DAC 3xE3/DS3)
- E13 multiplexer mode. One or two E3 interfaces are multiplexed to an NxE1 backplane.
- M13 multiplexer mode. One or two DS3 interfaces are multiplexed to an NxDS1 backplane.
- 34 Mbps transparent E3 mode for video (MPEG) transport. One or two transparent E3 tributaries are each mapped to a 34xE1 backplane.

Figure 1-21. DAC 3xE3/DS3M

DAC 2x155e

DAC 2x155e supports two STM1 electrical tributaries on paired BNC connectors.

Figure 1-22. DAC 2x155e

DAC 1x155o

DAC 1x155o supports one STM1/OC3 single-mode optical tributary on SC connectors.

Figure 1-23. DAC 1x155o

DAC 2x155o

DAC 2x155o supports two STM1/OC3 single-mode optical tributaries on SC connectors.

Figure 1-24. DAC 2x155o

DAC 155oM

DAC 155oM multiplexes an SDH/OC3 single-mode optical tributary to an NxE1 or NxDS1 backplane.

Figure 1-25. DAC 155oM

DAC ES

DAC ES interfaces four 10/100Base-T Ethernet ports to one or two radio and/or fiber transport channels. Features include:

- Advanced QoS settings.
- Transparent, VLAN and mixed modes of operation.
- Throughputs to 100 Mbps per transport channel.
- Assignment to radio or fiber links.
- Assignment of total link capacity to Ethernet, or split between Ethernet and E1/DS1 traffic.
- Inter-frame gap (IFG) and preamble stripping and re-insertion.
- Compatibility with DAC GE, IDU ES and IDU GE 20x.

Figure 1-26. DAC ES

DAC GE

DAC GE interfaces three 10/100/1000Base-T electrical ports and one 1000Base-LX optical port, to one or two transport channels. Features include:

- Advanced QoS settings.
- Transparent, VLAN and mixed modes of operation.
- Enhanced, fast-switched RSTP.
- Layer 2 link aggregation.
- VLAN tagging.
- Throughputs to 300 Mbps per transport channel.
- Assignment to radio or fiber links.
- Assignment of total link capacity to Ethernet, or split between Ethernet and E1/DS1 traffic.
- Inter-frame gap (IFG) and preamble stripping and re-insertion.
- Compatibility with DAC ES, IDU ES and IDU GE 20x.

Figure 1-27. DAC GE

AUX

AUX provides synchronous and/or asynchronous auxiliary data channels, NMS porting, and alarm input and output functions. Data options are sync at 64 kbps or async to 19.2 kbps.

Figure 1-28.

NPC

NPC provides redundancy for the NCC TDM bus management and power supply functions.

Figure 1-29. NPC

For more information on Eclipse Nodes, refer to Chapter 3.

Eclipse ODUs

There are three mechanically similar ODUs. They are band specific and supplied with diplexers for Tx high *or* Tx low working. The one exception is at 5 GHz, where ODU 300ep is software-switched for Tx high or Tx low, and a 7/16" female DIN connector replaces the waveguide port used on all higher bands.

- ODUs for 6 to 38 GHz are designed for direct-antenna mounting, but can be remote mounted.
- The 5 GHz ODU 300ep requires remote mounting, and is supplied with a remote-mount installation kit.

All ODUs support ATPC.

ODUs are frequency-band specific, but within each band are capacity independent up to their design maximums. Main performance characteristics of the ODU 300 series summarized in Table 1-2.

ODU 300

There are three ODUs for Eclipse INUs and IDUs:

- ODU 300sp
- ODU 300hp
- ODU 300ep

Channel bandwidths range from 3.5 to 56 MHz depending on the ODU, band-plan, and capacity/modulation option selected.

ODU 300ep availability is now limited to 5, 13 and 15 GHz. It is required for 5 GHz, and is an option at 13 and 15 GHz.

Within their band limitations the ODU 300hp and ODU 300ep are over-air compatible. Both are supported from RAC 30, RAC 40, RAC 3X, RAC 4X, or 300 series IDUs, except IDUsp for the ODU 300ep.

The lower capacity ODU 300sp is only over-air compatible with another ODU 300sp, and is supported from RAC 30, and all 300 series IDUs except IDU 155o.

ODU 300sp supports:

- 7 to 38 GHz
- Standard power transceiver
- 2x to 40x E1
- Up to 80 Mbps Ethernet
- QPSK or 16 QAM modulation[1]
- RAC 30, IDU 300 series except IDU 155o

ODU 300hp supports:

- 6 to 38 GHz
- High power transceiver

[1] *A QPSK-only variant is available for 8, 13, and 15 GHz bands.*

- 4x to 106x E1 or 4x to 127xDS1
- 1x to 4x E3 or 1x to 4xDS3
- 1/2x STM1/OC3
- Up to 300 Mbps Ethernet
- QPSK to 256QAM modulation
- RAC 30, RAC 40, RAC 3X, RAC 4X, IDU 300 series

ODU 300ep supports:

- 5, 13 or 15 GHz
- Extended high power transceiver
- 4x to 106x E1 or 4x to 127x DS1
- 1x to 4x E3 or 1x to 4x DS3
- 1/2x STM1/OC3
- Up to 300 Mbps Ethernet
- QPSK to 256QAM modulation
- RAC 30, RAC 40, RAC 3X, RAC 4X, IDU 300 series except IDUsp

Table 1-2. ODU Characteristics for Eclipse INU/INUe Operation

Item[1]	ODU 300ep	ODU 300hp	ODU 300sp
Frequency Bands	5 to 23 GHz	6 to 38 GHz	7 to 38 GHz
Capacity	5 to106xE1, 1 to 4xE3 4 to 127xDS1, 1 to4xDS3 2xSTM1/OC3 10 to 360 Mbps Ethernet	5 to 106xE1, 1 to 4xE3 4 to 127xDS1, 1 to4xDS3 2xSTM1/OC3 10 to 360 Mbps Ethernet	4 to 40xE1 (ETSI only) 10 to 80 Mbps Ethernet
Modulation Options	QPSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM	QPSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM	QPSK or 16QAM[2]
Bandwidths Supported	3.5 to 56 MHz ETSI 2.5 to 80 MHz ANSI	7 to 56 MHz ETSI 2.5 to 80 MHz ANSI	7 to 28 MHz
Tx Power	Extended power (except 11 GHz. 30 dB (QPSK) to 22 dB (256 QAM) power control range	High power 20 dB (QPSK) to 14 dB (256 QAM) power control range	Standard power 20 dB (QPSK) or 18 dB (16 QAM) power control range
Max Tuning Range	Typically (depending on T/R spacing) 56 MHz at 6 / 7 GHz to 230 MHz at 15 GHz. 340 to 380 MHz on higher bands.		
IF Interface	RAC 30, RAC 3X, RAC 40, RAC 4X, IDU 300 series except IDU 300sp	RAC 30, RAC 3X, RAC 40, RAC 4X, IDU 300 series	RAC 30, IDU 300 series except IDU 155o

Item[1]	ODU 300ep	ODU 300hp	ODU 300sp
Power Consumption	50W	40W	30W
Mechanical HxWxD	287mm (11.3 in) x 287mm (11.3 in) x 175mm (6.9 in)	287mm (11.3 in) x 287mm (11.3 in) x 119mm (4.7 in)	287mm (11.3 in) x 287mm (11.3 in) x 119mm (4.7 in)
	8.3 kg (18.7 lb.)	6.4 kg (14 lb.)	6.4 kg (14 lb.)

1. ODU 300ep availability is now restricted to 5, 13 and 15 GHz. It is required for 5 GHz and is an option for 13 and 15 GHz.
2. A QPSK-only ODU 300sp is available for frequency bands 8, 13, 15 GHz.

Tx Power Control Range

Tx power is programmable in 0.1 dB steps, with an accuracy of +/-2dB over range and temperature. Table 1-3 shows the ODU 300 output power attenuation ranges for manual control and ATPC.

Table 1-3. ODU 300 Tx Power Control Range

Modulation	ODU 300sp	ODU 300hp	ODU 300ep
QPSK	20 dB	20 dB	30 dB
16 QAM	18 dB	18 dB	26 dB
32 QAM	N/A	17.5 dB	25.5 dB
128 QAM	N/A	16 dB	24 dB
256 QAM	N/A	14 dB	22 dB

ODU 300hp and ODU 300ep Compatibility

These units are air-compatible, but the following points should be considered:

- When sparing an ODU 300hp with an ODU 300ep (or vice-versa), both ODUs must be on the same frequency band and the selected sub-band option must support the carrier spot frequencies. In some cases the sub-band options differ. Refer to the Eclipse Tuning Guide for guidance, which is available from HSX Help Desks.
- ODU 300hp weighs 6.4 kg, whereas the ODU 300ep weighs 8.3kg.
- ODU 300hp power consumption is nominally 40W, whereas the ODU 300ep consumption is 50W. Where appropriate, consider the impact on site power supply loading when sparing an ODU 300hp with an ODU 300ep.
- The Tx power control range for the ODU 300hp and the ODU 300ep differ. See Table 1-3. The manual Tx control range must be considered for heavily (manually) attenuated links when substituting an ODU 300ep with an ODU 300hp.
- The Tx output power and Rx sensitivity figures for ODU 300hp and ODU 300ep vary depending on the ODU frequency band. Refer to the Eclipse datasheets for specific details. Differences should be considered to ensure target design fade margins are maintained when substituting ODU 300ep for ODU 300hp, and vice-versa.
- In a *protected RAC40/RAC 4X* pairing, support is provided from SW release 4.3, for mixed ODU 300hp and ODU 300ep operation. Mixed hp/ep operation in protected RAC 40/4X configurations prior to this release is not recommended.

Eclipse Configuration and Management

Eclipse is a software-driven product; there are no manual controls. Configuration and management is achieved via Portal and ProVision.

- Portal is a PC based configuration and diagnostics tool for Eclipse.
- ProVision is the Eclipse network element manager. ProVision also supports other Harris Stratex products, including legacy products.

Portal is supported in the Eclipse system software, such that once installed on a PC, it automatically downloads support from the radio as needed to ensure Portal always matches the version of system software supplied, or subsequently downloaded in any radio upgrade.

Portal has the look and feel of a Windows environment with screen-based views and prompts for all configuration and diagnostic attributes.

A Portal PC connects to an INU/INUe/IDU using Ethernet or V.24 options.

For more information on Portal, see Introduction to Portal.

ProVision is the network element manager for Eclipse, TRuepoint, Constellation, and ADR. It also provides management for legacy radios such as Altium, XP4, DXR, Megastar and Spectrum.

ProVision is installed on a Windows or Solaris server, typically at a network operating center, and communicates with network elements using standard LAN/WAN IP addressing and routing; each radio has its own unique IP address.

For more information about ProVision, see the separate ***ProVision User Guide documentation.***

Antennas

Antennas for direct mounting an Eclipse ODU are available in diameters from 0.3m (1ft) to 1.8m (6ft), depending on the frequency band. These antennas are high performance, low profile shielded types and are supplied complete with a customized ODU mounting collar and feed-point.

A polarization rotator is included within the antenna collar, and direct-mounting equal or unequal loss couplers are available for single antenna protected operation.

Antenna mounts are designed for use on industry-standard 115 mm OD (4.5 inch) pipe-mounts.

An Eclipse ODU can also be used with standard antennas via a remote-mount kit and flexible waveguide.

Power Supply

Eclipse is designed to operate from a -48 Vdc power supply (+ve earth) but will operate to specification over a voltage range of -40.5 to -60 Vdc.

The dc power supply must be UL or IEC compliant for a -48 Vdc SELV (Safety Extra Low Voltage) output (60 Vdc maximum limited).

Platform Layout and Interoperation Data

300 Series IDUs

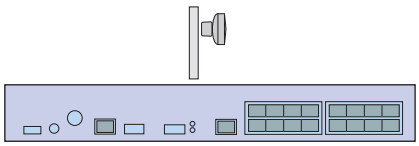
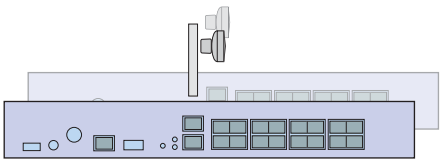
The table below describes the IDU 300 series platform support for non-protected and protected operation, ODU options, and capacity and modulation.

Table 1-5, “Eclipse 300 Series IDU and ODU Parameters,” on page 20 summaries IDU/ODU options and over-air compatibility.

To view detailed compatibility data for the IDU GE 20x, see IDU GE 20x Compatibility on page 1-21.

Protected IDUs cannot be used to link to an INU/INUe. Where protected IDUs are to be used they must be installed at both ends of the link.

Table 1-4. 300 Series Platforms

IDU	Characteristics
IDU 300sp 4x 	• Requires ODU 300sp or ODU 300hp • QPSK modulation only • Non-protected operation • Cannot be linked to Eclipse Node • Includes auxiliary data (sync only)
IDU 300sp 16x 	• Requires ODU 300sp or ODU 300hp • QPSK modulation only • Non-protected or hot-standby • Cannot be linked to Eclipse Node • Includes auxiliary data (sync only)

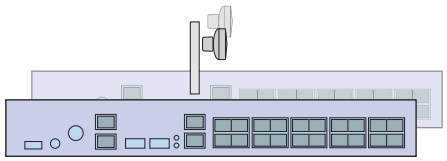
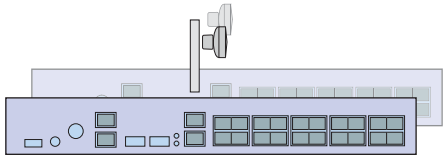
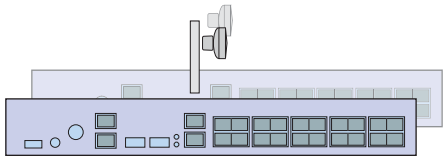
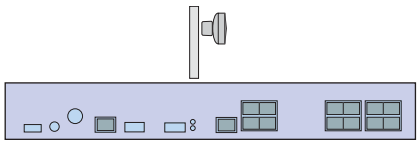
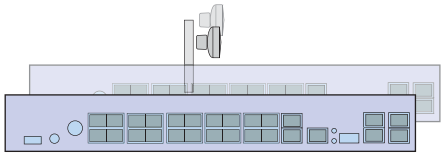
IDU	Characteristics
IDU 300 8x, 20x 	• ODU 300sp/hp/ep • QPSK or 16 QAM modulation for 4x to 20x E1/DS1 • Non-protected or hot-standby • Can be linked to Eclipse Node (ODU 300, RAC 30v1/ v2, DAC 4/16x, AUX) • Includes auxiliary data and alarm I/O
IDU 300 20xV2 	• ODU 300sp/hp/ep • QPSK to 64 QAM modulation for 5x to 40xE1, 4x to 32xDS1 • Non-protected, hot-standby, space diversity • Can be linked to Eclipse Node (ODU 300, RAC 30v3, DAC 4/16x, AUX) • Can be linked to IDU GE 20x • Includes auxiliary data and alarm I/O
IDU 155o 	• ODU 300hp/ep • 16/64/128 QAM modulation for 1xSTM1/OC3 • Non-protected, hot-standby, space diversity • Can be linked to Eclipse Node (ODU 300, RAC 30v3, RAC 3X, DAC 155o, AUX) • Includes auxiliary data and alarm I/O
IDU ES 	• ODU 300sp/hp/ep • QPSK to 256 QAM modulation • Non-protected operation • Ethernet throughputs from 10 to 200 Mbps with up to 8xE1/DS1 waysides • Can be linked to Eclipse Node (ODU 300, RAC 30v3, RAC 3X, DAC ES/GE, DAC 4/16x, AUX) • Can be linked to IDU GE 20x • Includes auxiliary data and alarm I/O
IDU GE 20x 	• ODU 300sp/hp/ep • QPSK to 256 QAM modulation for 10 to 200 Mbps Ethernet • Up to 20xE1 or 20xDS1 tribs • Non-protected, hot-standby, space diversity • Can be linked to Eclipse Node (ODU 300, RAC 30v3, RAC 3X, DAC GE/ES, DAC 4/16x, AUX I/O) • Can be linked to IDU ES and to IDU 300 20xV2 • Includes alarm I/O

Table 1-5. Eclipse 300 Series IDU and ODU Parameters

IDU	ODU[1]	Capacity	Modulation	Protection	Over-Air Compatibility[2]	Additional Data
IDUsp 4x	ODU 300sp/hp	4xE1	QPSK	No	IDUsp 16x	Cannot be linked to Eclipse Node Includes auxiliary data (sync only)
IDUsp 16x	ODU 300sp/hp	4x, 8x, 16E1	QPSK	Hot standby	IDUsp 4x	Cannot be linked to Eclipse Node Includes auxiliary data (sync only)
IDU300 8x	ODU 300sp/ hp/ep	4x to 8xE1/ DS1	QPSK or 16 QAM	Hot standby	IDU 300 20x Eclipse Node	Eclipse Node: ODU 300, RAC 30v1/v2, DAC 4/16x, AUX Includes auxiliary data and alarm I/O
IDU300 20x	ODU 300sp/ hp/ep	4x to 20xE1/ DS1	QPSK or 16 QAM	Hot standby	IDU 300 8x Eclipse Node	Eclipse Node: ODU 300, RAC 30v1/v, DAC 4/16x, AUX) Includes auxiliary data and alarm I/O
IDU 300 20xV2	ODU 300sp/ hp/ep	5xE1 to 40xE1 4xDS1 to 32xDS1 (20xE1/DS1 trib access)	QPSK to 64 QAM	Hot standby, space diversity	Eclipse Node with RAC 30v3[3] IDU GE (tribs only)	Eclipse Node: ODU 300, RAC 30v3, DAC 4/16x, AUX Includes auxiliary data and alarm I/O
IDU 155o	ODU 300hp/ep	1xSTM1/ OC3	16/64/ 128QAM	Hot standby, space diversity	Eclipse Node with RAC 30v3[3], RAC 3X	Eclipse Node: ODU 300, RAC 30v3, RAC 3X, DAC 155o, AUX Includes auxiliary data and alarm I/O
IDU ES	ODU 300sp/ hp/ep	Up to 196 Mbps Ethernet with up to 8xE1/DS1	QPSK to 256 QAM	Non-protected	INU, RAC 3X, RAC 30v3[3] IDU GE	Fast Ethernet to 200 Mbps with up to 8xE1/DS1 wayside Eclipse Node: ODU 300, RAC 30v3/3X, DAC ES/GE, DAC 4/ 16x, AUX Includes auxiliary data and alarm I/O
IDU GE 20x	ODU 300sp/ hp/ep	Up to 360 Mbps Ethernet. Up to 20xE1/ DS1 tribs.	QPSK to 256 QAM	Hot-standby, space diversity	Eclipse Node with RAC 3X or RAC 30v3[3] IDU ES IDU 300 20xV2 (tribs)	Gigabit Ethernet to 360 Mbps. Up to 20xE1/DS1 waysides. Eclipse Node: ODU 300, RAC 30v3/3X DAC GE/ES, DAC 4/ 16x, AUX I/O Includes alarm I/O

1. ODU 300sp: 7 to 38 GHz. ODU 300hp: 6 to 38 Ghz. ODU 300ep: 5 to 23 GHz.

2. Over-air compatibility for like capacity with *other* Terminals and/or Eclipse Node (INU/INUe + ODU). IDU E1/DS1 tribs are end-end compatible with INU DAC 4x and DAC 16x plug-ins. The auxiliary function provided on IDUs is end-end compatible with the INU/INUe AUX plug-in. Over-air interoperability is supported between ODU 300ep and hp; ODU 300sp is only interoperable with another ODU 300sp. IDU-to-INU compatibility **does not apply to protected operation**; where protected IDUs are to be installed they must be at both ends of the link.
3. Compatibility includes RAC 30v2 from SW release 3.5 (RAC 30v3 compatible mode). Applies to ETSI rates only.

IDU GE 20x Compatibility

IDU GE 20x can be over-air interfaced to:

- INU/INUe fitted with a RAC 30v3, RAC30A [non-adaptive modulation] or RAC 3X. For ETSI bands it also applies to RAC 30v2+.
  - Ethernet traffic is terminated on a DAC GE or DAC ES.
  - E1/DS1 traffic is terminated on a DAC 16x or DAC 4x.
  - External alarm I/O interfaces are terminated on an AUX.
- IDU ES for Ethernet and up to 8xE1.
- IDU 300 20xV2 for up to 20xE1 only.

Table 1-6 shows compatibility for ETSI rates.

Table 1-7 shows compatibility for ANSI rates.

Table 1-6. IDU GE 20x Compatibility with INUs and IDUs: **ETSI**

Ethernet BW Mbit/s	BW MHz	Modulation	RAC 30v3 RAC30A & RAC 30v2+	RAC3X	IDU ES	IDU 20xV22
10	7	QPSK	X	N/A	X	X
10	3.5	16 QAM	X	N/A	X	N/A
20	7	16 QAM	X	N/A	X	X
20	14	QPSK	X	N/A	N/A	X
30	7	64 QAM	X	N/A	X	X
40	14	16 QAM	X	N/A	X	X
40	28	QPSK	X	N/A	X	X
50	14	32 QAM	X	N/A	X	N/A
65	14	64 QAM	X	N/A	X	N/A
80	28	16 QAM	X	N/A	X	N/A
105	28	32 QAM	X	N/A	N/A	N/A
130	28	64 QAM	X	X	N/A	N/A
150	28	128 QAM	X	N/A	X	N/A
150	56	16 QAM	N/A	X	N/A	N/A
190	28	256 QAM	N/A	X	X	N/A

Ethernet BW Mbit/s	BW MHz	Modulation	RAC 30v3 RAC30A & RAC 30v2+	RAC3X	IDU ES	IDU 20xV22
200	40	128 QAM	N/A	X	N/A	N/A
200	56	64 QAM	N/A	X	X	N/A

Table 1-7. IDU GE 20x Compatibility with INUs and IDUs: **ANSI**

Ethernet BW Mbit/s	BW MHz	Modulation	RAC 30v3 & RAC30A	RAC3X	IDU ES	IDU 20xV21
25	5	128 QAM	X	N/A	N/A	X
25	10	16 QAM	X	N/A	N/A	X
25	20	QPSK	X	N/A	N/A	X
50	20	16 QAM	X	N/A	X	N/A
50	40	QPSK	N/A	X	X	N/A
100	20	128 QAM	N/A	N/A	X	N/A
100	20	64 QAM	N/A	N/A	X	N/A
100	30	32 QAM	X	N/A	X	N/A
100	40	16 QAM	N/A	X	X	N/A
130	30	64 QAM	X	N/A	N/A	N/A
150	30	128 QAM	N/A	X	X	N/A
150	40	32 QAM	N/A	X	X	N/A
150	50	16 QAM	X	N/A	X	N/A
200	40	128 QAM	N/A	N/A	X	N/A
200	50	64 QAM	N/A	N/A	X	N/A

Chapter 2. Eclipse Terminals

This chapter describes features and capabilities of Eclipse Terminals. Refer to:

- PDH and SDH IDUs on page 2-1
- Ethernet IDUs on page 2-11
- IDU Protection on page 2-44
- Platform Layout and Interoperation Data on page 2-53
- Configuration and Diagnostics on page 2-57

For information on Eclipse ODUs refer to Chapter 4.

PDH and SDH IDUs

This section introduces traffic and auxiliary interfaces and functions for:

Table 2-1. 300 Series IDUs

IDU	Maximum Capacity
IDU 300 8x	8xE1/DS1
IDU 300 20x	20xE1 or 16xDS1
IDU 300 20xV2	20xE1 or 16 xDS1 40xE1 or 32xDS1[1]
IDUsp 4x	4xE1
IDUsp16x	16xE1
IDU 155o	STM1/OC3

1. IDU 300 20xV2 operation for capacities greater than 20xE1 or 16xDS1 is capacity licensed. Two IDUs are used, linked by an expansion cable.

Refer to:

- Capacity and Bandwidth Options on page 2-2
- Traffic and Auxiliary Interfaces on page 2-4
- Front Panel Layout on page 2-7

IDUsp and IDU 155o may be individually ordered, or ordered as a ‘Connect’ link comprising two terminals, each with one IDU, and one ODU 300 outdoor unit to provide a basic link package. Direct-mount antenna and ODU cable options are separately ordered.

Capacity and Bandwidth Options

Depending on the IDU/ODU and its capacity/bandwidth options, modulation rates are programmed for QPSK, 16 QAM, 32 QAM, 64 QAM, or 128 QAM:

- QPSK is supported on all 300 series PDH IDUs.
- 16QAM is supported on IDU 300 8x, IDU 300 20x, IDU 300 20xV2.
- Higher QAM (to 128 QAM) is supported on IDU 300 20xV2, IDU 155o (requires ODU 300ep or ODU 300hp).

Table 2-2, “IDU PDH System Options: ETSI,” on page 2 lists the ETSI capacity, modulation, and bandwidth options for PDH IDUs.

Table 2-3, “IDU PDH System Options: ANSI,” on page 3 lists capacity, modulation, and bandwidth options for North American (ANSI) Common Carrier PDH IDUs.

Table 2-4, “IDU 155o System Options,” on page 4 lists ETSI and ANSI capacity, modulation, and bandwidth options for IDU 155o.

Table 2-2. IDU PDH System Options: ETSI

Capacity	Channel Bandwidth	Modulation	IDU 300 8x	IDU 300 20x	IDU 300 20xV2	IDUsp 4x	IDUsp 16x	IDU 8x	IDU 16x	IDU 20x
4xE1	7 MHz	QPSK	X	X		X	X	X	X	X
4xE1	3.5 MHz	16 QAM	X	X						
5xE1	7 MHz	QPSK	X	X	X					X
5xE1	3.5 MHz	16 QAM	X	X						
8xE1	13.75 / 14 MHz	QPSK	X	X			X	X	X	X
8xE1	7 MHz	16 QAM	X	X						
10xE1	13.75 / 14 MHz	QPSK		X	X					X
10xE1	7 MHz	16 QAM		X	X					
16xE1	27.5 / 28 MHz	QPSK		X			X		X	X
16xE1	13.75 / 14 MHz	16 QAM		X						
16xE1	7 MHz	64 QAM		X						
20xE1	27.5 / 28 MHz	QPSK		X	X					X
20xE1	13.75 / 14 MHz	16 QAM		X	X					
32xE1	13.75 / 14 MHz	64 QAM			X					
40xE1	27.5 / 28 MHz	16 QAM			X					

Table 2-3. IDU PDH System Options: ANSI

Capacity	Channel Bandwidth	Modulation	IDU 300 8x	IDU 300 20x	IDU 300 20xV2
4xDS1	5 MHz	QPSK	X	X	X
4xDS1	2.5 MHz	16 QAM	X	X	
8xDS1	10 MHz	QPSK	X	X	X
8xDS1	5 MHz	16 QAM	X	X	X
8xDS1	3.75 MHz	32 QAM	X	X	X
16xDS1	20 MHz	QPSK		X	X
16xDS1	10 MHz	16 QAM		X	X
16xDS1	5 MHz	128 QAM		X	X
28xDS1	30 MHz	QPSK			X
28xDS1	10 MHz	64 QAM			X
32xDS1	20 MHz	16 QAM			X

For the SDH IDU 155o, the 128 QAM and 64 QAM modulation options support ETSI and ANSI channel bandwidths, but for 16 QAM the resulting 55 MHz bandwidth is only applicable on ETSI bands.

Table 2-4. IDU 155o System Options

Capacity	Channel Bandwidth	Modulation
STM1/ OC3	28 MHz ETSI 30 MHz ANSI	128 QAM
STM1/ OC3	40 MHz ETSI 40 MHz ANSI	64 QAM
STM1	56 MHz ETSI	16 QAM

Traffic and Auxiliary Interfaces

Data is provided for:

- PDH Trib Ports on page 2-4
- SDH Trib Ports on page 2-5
- Auto Insertion of AIS or PRBS on Tribs on page 2-5
- E1 Trib Performance Monitoring on page 2-5
- Aux Data Port on page 2-6
- Ethernet IDUs on page 2-11

PDH Trib Ports

Tribs on all 300 series PDH IDUs are on individual RJ-45 connectors.

- E1 trib options are 75 ohm unbalanced or 120 ohms balanced.
- DS1 trib encoding options are AMI or B8ZS. Line impedance is fixed at 100 ohms balanced and line length is selectable.

Trib cable options include:

- An RJ-45 to 2xBNC cable assembly.
- An RJ-45 to RJ-45 straight cable assembly for extension to an RJ-45 patch panel.
- An RJ-45 to RJ-45 cross-over cable assembly for use between IDUs at repeater or branch sites.
- An RJ-45 to wire-wrap cable assembly.
- Splitter Y-cables for protected hot-standby operation.

For more information on cable assemblies and connector pin-outs refer to Appendix D.

SDH Trib Ports

The IDU 155o supports one STM1/OC3, optical tributary. The connectors are SC type, and cable options are available, as accessories, for extension to SC, FC or LC types.

The receive-level range is -31 dBm (max sensitivity) to -7 dBm (max input power). Transmit output is within limits of -15 dBm to -8 dBm.

For protected operation optical splitter Y-cables are available to provide extensions from SC to SC, FC or LC connectors.

The SDH optical line code is Binary Scrambled NRZ (Non Return to Zero).

Auto Insertion of AIS or PRBS on Tribs

When a link demodulator-unlock occurs, it inserts an alarm signal (AIS or PRBS15) on all trib circuits *towards* the customer. (Demodulator unlock may occur under severe fading or an equipment fault).

- For all E1 or DS1, tribs AIS is inserted.
- For STM1/OC3 tribs a PRBS15 pattern (15 bit pseudo-random bit sequence) is inserted.

An on-board master clock maintains customer-facing clocking references when the expected signal input and associated clocking reference from its link is missing, or below the minimum level required.

AIS/PRBS15 may be *forced* onto a tributary using the Systems Control screen.

E1 Trib Performance Monitoring

A CRC (Cyclic Redundancy Check) function is supported on the DAC module in the IDU GE 2ox and IDU 300 20xV2 to provide a background error performance indicator for a selected E1 trib circuit.

The check process accesses the G.704, CRC4 Multiframe, which is a background error check function provided between devices operating with G.704 framing.

- The circuit being monitored must be end-to-end terminated on framed-rate multiplexers, or similar, to generate the G.704 framing, which includes the CRC function. In other words, the *circuit* supported by the IDUs must be operational for user traffic to provide the multiframe needed for the monitoring process.
- The errors detected by the monitoring process are *circuit* errors. That is, they may have been generated by any device within the circuit, which includes all upstream or downstream devices from the IDUs.
- Separate monitoring options are provided for upstream and downstream traffic directions.
- Traffic on the selected trib is not affected.

For more information, refer to E1 Trib Performance on page 13-22 of Volume IV.

Aux Data Port

All PDH/SDH IDUs with the exception of the IDUsp support synchronous or asynchronous auxiliary data. The IDUsp only supports the synchronous option. The data connector is a DB-9 female.

- **Synchronous** conforms to TIA/EIA-422 / V.11 at 64kbps, with selectable clock. The source of the transmit clock can be set to internal (provided by the auxiliary card) or external (provided by the user). For an external clock, channel synchronization is supported by a selectable clock phase (rising or dropping edge of the clock pulse).
- **Asynchronous** conforms to TIA/EIA-562 (electrically compatible with RS-232 / V.24)
- **Asynchronous** baud rates are 1200, 2400, 4800, 9600, or 19200bps, with parity and stop bit selection.

Auxiliary data is transported within the link overhead, which is shared with NMS data.

Aux Data cable options include:

- Async DB-9 to wire-wrap.
- Sync DB-9 to wire-wrap.
- Async DB-9 to DB-9 crossover.
- Sync DB-9 to DB-9 crossover.

For more information on cable assemblies refer to Appendix D.

Alarm I/O Port

All IDUs, with the exception of the IDUsp, include a front panel Alarm I/O connector. (IDUsp does not support an Alarm I/O function).

The Alarm I/O function supports two TTL alarm inputs and four Form C relay outputs. The connector is an HD-15 female.

Input events are mapped to outputs:

- Individual AUX alarm inputs or internal alarm events may be mapped to any output within the network.
- Multiple inputs or internal events may be mapped to a common output.

Mapping is achieved using IP addressing for the destination Terminal, or if the destination is an Eclipse Node, to its IP address plus the slot location and output number for the AUX plug-in.

Individual alarm inputs and relay outputs can be named. A severity level can also be assigned to alarm inputs.

An HD-15 to wire-wrap Alarm I/O cable assembly is available as an option. For details refer to Appendix D.

Alarm Inputs

The active state of each TTL alarm input is configurable to be active if the voltage on the input is high, or active if the voltage is low. The alarm software detects a change in the state of each input circuit, and raises or clears an input accordingly. The nominal alarm polling rate is 1 second. Fleeting changes are ignored.

- Input state changes are captured in the event log as an alarm.

- TTL input thresholds are specified at 2V min high, and 0.8V min low. High voltage (spike) protection to 48V is included.

Alarm Outputs

The output relays may be configured to be energized or de-energized on receipt of an alarm event. A user can also select on the Alarm I/O connector a normally closed, or normally open contact pair. The relay contacts are specified at:

Maximum Voltage 250 Volts

Maximum Current 2 Amps (applies up to 30 Volts)

Maximum Power 60 Watts

Note: These are maximum values, which require de-rating if the relay is to be used for frequent-switch applications.

The contact voltage must be restricted to less than 60 Volts for compliance with SELV regulations.

Front Panel Layout

Front panels are shown for IDUsp, IDU300 20x, and IDU 155o.

- Figure 2-1 shows the front panel for an IDUsp 16x.
- Figure 2-2 shows the front panel for an IDU 300 20x, which is identical to the IDU 300 20xV2.
- Figure 2-3 shows the front panel for an IDU 155o.

Refer to Table 2-5 for names and descriptions of numbered components.

Figure 2-1. IDUsp 16x Front Panel Layout

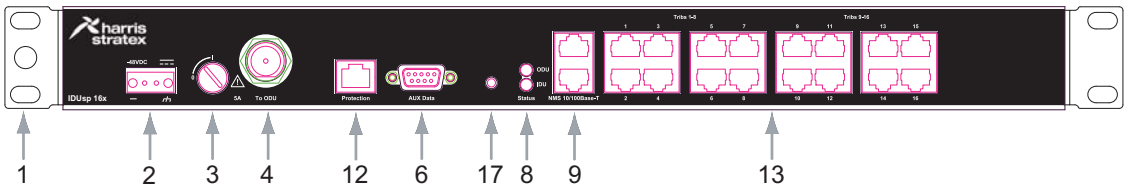


Figure 2-2. IDU 300 20x and IDU 300 20xV2 Front Panel Layout

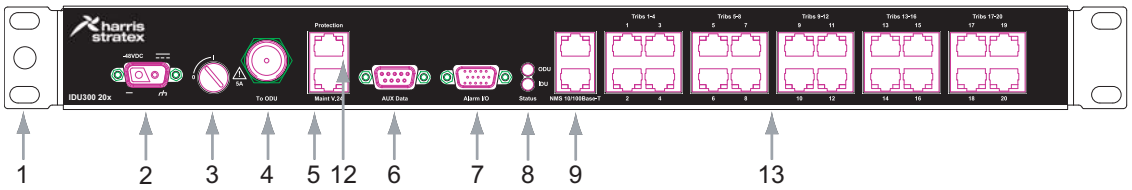


Figure 2-3. IDU 155o Front Panel Layout

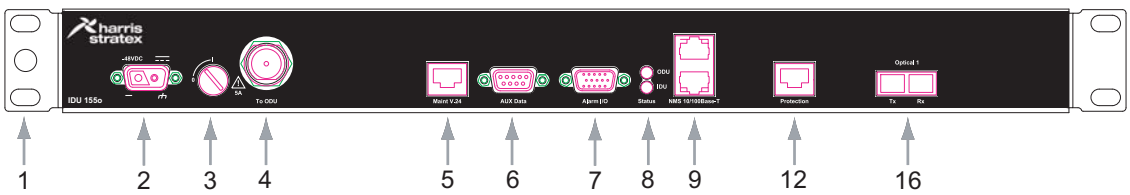


Table 2-5. Front Panel Layout Description

No	Item/Label	Description	
1	Rack Ear and Grounding Stud	Rack attachment bracket for the IDU. One ear has a grounding stud for IDU grounding. The ears can be fitted either side and provide flush-with-rack-front mounting.	
2	-48 Vdc	2-pin D-series 2W2C power connector for all IDUs except IDUsp. Includes screw fasteners.	
		2-pin Phoenix style power connector for IDUsp 16x/4x. Includes screw fasteners.	
3	Fuse	5A time-lag fuse and power on/off switch. ON is when the fuse head is in the vertical position; OFF is when the head is rotated to the horizontal ‘0’ position.	
4	To ODU	Type N female connector for jumper cable connection to the surge suppressor located at the cable entry point to the building.	
5	Maint V.24	RJ-45 connector provides a V.24 serial interface option for Portal. It supports a default IP address, which means knowledge of the Terminal IP address is not required at login.	
6	Aux Data	For all IDUs except IDUsp, the DB-9 connector provides one synchronous or asynchronous data service channel. Selection of synchronous (64 kbps) or asynchronous (max 19.2 kbps) is via Portal.	
		For IDUsp 16x/4x, the port only supports 64 kbps synchronous.	
7	Alarm I/O	HD-15 connector provides access to two TTL alarm inputs and four form C relay outputs. Connections are mapped in Portal.	
8	ODU	ODU Status LED provides indications of:	
		Off	IDU power off
		Green	Normal operation
		Orange flashing	Configuration not supported, software/ hardware incompatible, or diagnostic mode selected, such as Tx Mute.
		Red	Critical alarm (traffic affecting)
	IDU	IDU Status LED provides indications of:	
		Off	IDU power off
		Green	Normal operation
		Orange flashing	Configuration not supported, software/ hardware incompatible, or diagnostic mode selected, such as tributary loopbacks.
		Red	Critical alarm (traffic affecting): LOS on a commissioned trib or a SW/HW failure.

<table>
<tr><th>No</th><th>Item/Label</th><th>Description</th></tr>
<tr><td>9</td><td>NMS 10/ 100Base-T</td><td>
RJ-45 connector provides a port for Ethernet network management access:

For IDUs fitted with a V.24 maintenance port and not user-configured for DHCP, Portal login requires entry of a LAN compatible IP address in your Portal PC TCP/IP settings.
For IDUs fitted with a V.24 maintenance port and DHCP user-configured, DHCP Portal login requires selection of ‘Obtain an IP address automatically’ on your Portal PC TCP/ IP settings.
For IDUs that do not have a V.24 connector the default Ethernet Portal login uses a DHCP connection.

For protectable IDUs a dual RJ-45 connector assembly is fitted to support NMS connectivity to its protection partner, and to a Portal PC.

The assembly is also used to provide NMS connectivity to co-located Harris Stratex or third party radios.

Built-in LEDs provide Ethernet connection-status and activity indications. These indications are IDU dependent, as listed in the following table:
<table>
<tr><th>IDU</th><th>Orange LED (left)</th><th>Green LED (right)</th></tr>
<tr><td>IDU 155o</td><td>Status</td><td>Activity</td></tr>
<tr><td>IDU 300 20x</td><td>Status</td><td>Activity</td></tr>
<tr><td>IDU 300 20xV2</td><td>Status</td><td>Activity</td></tr>
<tr><td>IDUsp</td><td>Status</td><td>Activity</td></tr>
<tr><td>IDU 16x / 8x (100 Series)</td><td>Activity</td><td>Status</td></tr>
</table>
The connection-status LED is on for a valid Ethernet connection. Off indicates no connection or an invalid connection.

The activity LED flashes to indicate Ethernet traffic on the port. The LED does not flash (is solid on) when there is no traffic activity. (Activity LED is off when the connection status LED is off).
</td></tr>
<tr><td>10, 11</td><td>Trib 1-8 and Trib 9 to 16. Applies to IDU 16x</td><td>RJ-45 connector assembly for tributary connection; one RJ-45 port per E1 trib. Termination is set for unbalanced or balanced operation in Portal. Cable options provide extension to BNC connectors for unbalanced, or to RJ-45 plugs or to unterminated wires for balanced.</td></tr>
</table>

No	Item/Label	Description
12	Protection/ expansion port. Applies to: IDU 20x IDU300 8x IDU300 20x IDU 300 20xV2 IDUsp 16x IDU 155o	RJ-45 connector. For the IDU 20x, IDU300 8x, IDU300 20x and IDUsp 16x, it provides interconnection between paired IDUs for 1+1 hot-standby protection. Protection switching is not hitless. For the IDU 300 20xV2 and IDU 155o it provides bus interconnection between paired IDUs for hot-standby or space diversity. Tx switching is not hitless, Rx path switching (voting) is hitless for hot-standby and space diversity operation. For the IDU 20xV2 it also supports trib expansion (interconnection) when configured for protected operation with capacities above 20xE1 / 16xDS1. Traffic from the standby IDU is routed to the online IDU to support termination of up to 40xE1 or 32xDS1 tribs. In this configuration trib and PSU protection is not supported, however ODU protection functions are retained. Capacities above 20xE1 or 16xDS1 require a capacity license. For all IDUs, *except IDUsp 16x*, Tx/Rx online and primary/ secondary status is indicated by the protection connector LEDs as: • Green Online LED is on for an online Tx and/or Rx. (Normally the online IDU is online for Tx and Rx). • Green Online LED is off for the offline IDU (IDU is not transmitting or controlling the Rx diversity bus. (Only IDU 300 20xV2 and IDU 155o have a diversity bus). • Orange Primary LED is on for the primary IDU. (The primary designated IDU is default online for Tx and Rx). • Orange Primary LED is off for the secondary IDU. For the IDUsp 16x the LED indications are reversed, that is the orange LED indicates online status, and the green LED primary/ secondary status.
13	Trib ports 1 to 20. Applies to: IDU 20x IDU300 20x IDU300 20xV2	RJ-45 connector assemblies for tributary connection; one RJ-45 port per E1 (IDU 20x) or per E1/DS1 (IDU300 20x / 20xV2). E1 termination is set for unbalanced or balanced in Portal. DS1 is 100 ohms balanced with options for AMI or B8ZS, and trib cable length. Cable options provide extension to BNC connectors for unbalanced, or to RJ-45 plugs or to unterminated wires for balanced.
16	Optical 1	SC type single mode optical trib connector assembly. The receive-level range is -31 dBm (max sensitivity) to -7 dBm (max input power). Transmit output is within limits of -15 dBm to -8 dBm. Cable options are available to provide extensions to SC, FC or LC connectors. With protected IDUs, Y-cables are fitted to provide common Tx and Rx optical interfaces.

No	Item/Label	Description
17	IP Reset recessed switch	IP Reset enables: • A temporary DHCP Ethernet connection. Used where the IDU has not been configured (no IP address set). • IDU reset; the IDU is reset to a factory default configuration. For information on the operation of this switch refer to Factory Reset on page 2-59.

Ethernet IDUs

This section introduces the IDU ES and IDU GE 20x. Both IDUs may be ordered separately or included in an Eclipse 'Connect' link package, where a package includes two IDUs with companion ODUs. Connect options are designed to to provide an uncomplicated and cost effective product solution for link installations.

Refer to:

- IDU ES
- IDU GE 20x

IDU ES

IDU ES supports Fast Ethernet connections to 200 Mbps with up to 8xE1/DS1 wayside circuits. Depending on the ODU and required capacity, over-air channel bandwidths are selected using modulation options from QPSK to 256 QAM.

IDU ES includes a Layer 2 switch to support four customer 10/100base-T ports, two over-air transport channels and comprehensive QoS options.

Base capacity licences apply, with access to the higher capacities provided by an additional software-keyed license.

An IDU ES can be over-air interfaced to an Eclipse Node or IDU GE 20x.

Refer to:

- Connect ES Link Package on page 2-12
- Connect ES Capacity and Bandwidth Options on page 2-12
- IDU ES Compatibility on page 2-15
- Ethernet Module on page 2-16
- Wayside Traffic Module on page 2-21
- Auxiliary Data and Alarm I/O Module on page 2-21
- IDU ES Layout on page 2-22
- IDU ES Applications on page 2-23

For more information, refer to:

- Outdoor Units on page 4-1.

- IDU ES License and Steps, Volume IV, Chapter 5.
- Configuring Node and Terminal Plug-ins on page 7-1 of Volume IV.

Connect ES Link Package

IDU ES is promoted as a 'Connect ES' link package. The package comprises two terminals (2x IDU ES with license, and 2x ODU).

- Direct-mount antenna and ODU cable options are separately ordered.
- Depending on the required Ethernet capacity, capacity upgrade path, and frequency band, Connect ES is supplied with ODU 300sp, hp, or ep.

Connect ES links may be operated back-to-back in networked applications

Connect ES Capacity and Bandwidth Options

For IDU ES with ODU 300sp, capacity and bandwidth options are indicated in Figure 2-4 and detailed in Table 2-6.

For IDU ES with ODU 300hp or ODU 300ep, capacity and bandwidth options are indicated in Figure 2-5 and detailed in Table 2-7.

- ODU 300sp options are available for *ETSI* bands from 7 to 38 GHz.
- ODU 300hp options are available for all bands except 5 GHz.
- ODU 300ep options are available for 5, 13 or 15 GHz bands.
- Capacity is licensed.
  - With ODU 300sp the base Connect license is 40 Mbps. An upgrade is available to 80 Mbps.
  - With ODU 300hp or ODU 300ep the base Connect license supports up to 65 Mbps. Upgrades are available to 100, 150, or 200 Mbps.
  - Upgrades are placed at time of order, or ordered subsequently as downloadable software licenses.
- Licenses are up-to licences. For example a 100 Mbps license may be configured to support throughputs from 20 to 100 Mbps.

  NOTE: When ordered as an IDU ES, as distinct from a Connect ES link package, the base license begins at 20 Mbps for ETSI and 50 Mbps for ANSI.
- The maximum capacity for each option may be used for Ethernet traffic, or assigned between Ethernet and wayside E1/DS1 circuits. For configurations where available link capacity is fully assigned to Ethernet, capacity for Ethernet is reduced by 2 Mbps (2.048 Mbps) for each E1 assigned, or by 1.5 Mbps (1.544 Mbps) for each DS1 assigned, up to a maximum 8xE1/DS1 waysides.
- For maximum 200 Mbps licensed options, Ethernet is constrained to the channel maximums of the Ethernet module to provide 196.6 Mbps (96x2.048 Mbps) for an ETSI configuration, or 196 Mbps (127x1.544 Mbps) for ANSI.
  - The *ETSI* 200 Mbps option supports an over-air capacity of 217 Mbps. The balance of this capacity may be assigned to waysides without impacting maximum Ethernet throughput; for example this option supports 196.6 Mbps Ethernet *and* up to 8xE1 waysides.

Ethernet capacity (bandwidth) is assigned in 2.048 Mbps or 1.544 Mbps steps to align with the capacity needed for E1 or DS1 waysides. Eclipse incorporates a universal modem design that does not distinguish between the type of data to be transported, Ethernet or TDM; data is simply mapped into byte-wide frames to provide a particularly efficient and flexible wireless transport mechanism, with the result that when configured for Ethernet data, or Ethernet and TDM data, the full configured, native capacity is available for user throughput.

Figure 2-4. Connect ES Options with ODU 300sp: **ETSI**

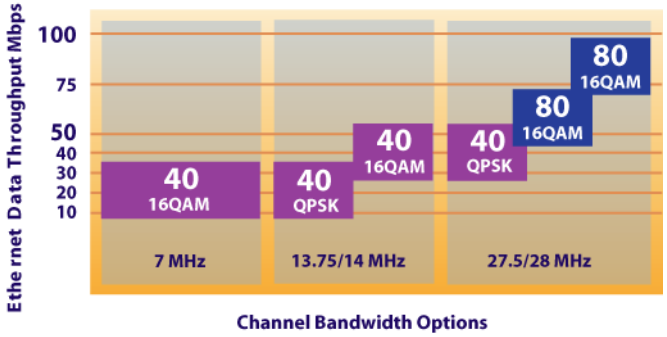


Table 2-6. Connect ES Options with ODU 300sp: **ETSI**

Ethernet BW, Mbps	Channel BW, MHz	Modulation	License	Connect ES Option
20	7	16 QAM	Base	Connect ES 40
20	14	QPSK	Base	Connect ES 40
40	14	16QAM	Base	Connect ES 40
40	28	QPSK	Base	Connect ES 40
64	28	16 QAM	Upgrade	Connect ES 80
82	28	16 QAM	Upgrade	Connect ES 80

Figure 2-5. Connect ES Options with ODU 300hp or ODU 300ep: **ETSI**

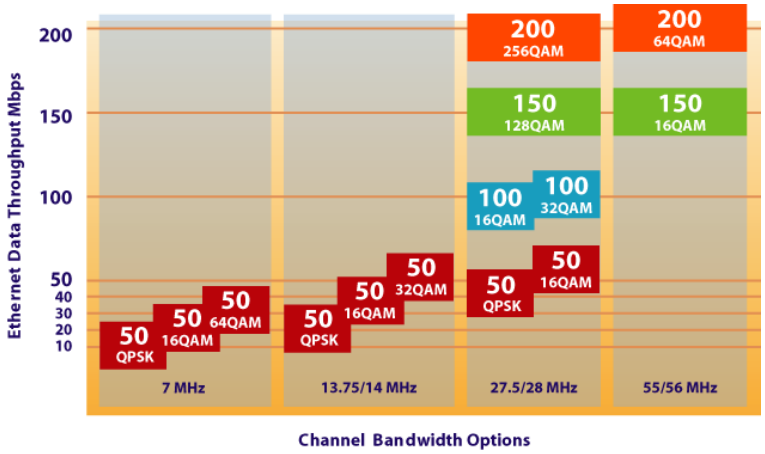


Table 2-7. Connect ES Options with ODU 300hp or ODU 300ep: **ETSI**

Ethernet BW, Mbps	Channel BW, MHz	Modulation	License	Connect ES Option
10 [1]	7	QPSK	Base	Connect ES 50
20	7	16 QAM	Base	Connect ES 50
20	14	QPSK	Base	Connect ES 50
32	7	64QAM	Base	Connect ES 50
40	28	QPSK	Base	Connect ES 50
40	14	16QAM	Base	Connect ES 50
55	14	32QAM	Base	Connect ES 50
64	28	16 QAM	Base	Connect ES 50
82	28	16 QAM	Upgrade 1	Connect ES 100
106	28	32 QAM	Upgrade 1	Connect ES 100
150	28	128 QAM	Upgrade 2	Connect ES 150
150	56	16 QAM	Upgrade 2	Connect ES 150
190	28	256QAM	Upgrade 3	Connect ES 200
196	56	64 QAM	Upgrade 3	Connect ES 200

1. A 10 Mbps, 3.5 MHz, 16 QAM option is planned for later release. Contact Harris Stratex Networks or your supplier for details.

Figure 2-6. Connect ES Options with ODU 300hp or ODU 300ep: **ANSI**

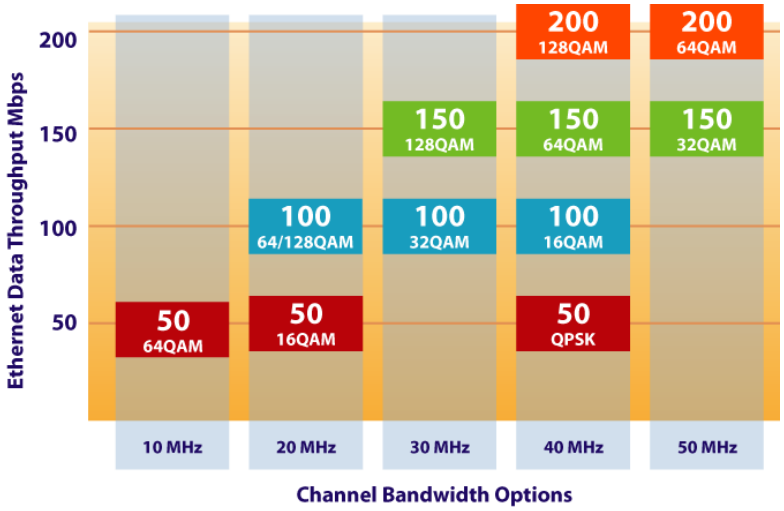


Table 2-8. Connect ES Options with ODU 300hp or ODU 300ep: **ANSI**

Ethernet BW, Mbps	Channel BW, MHz	Modulation	License	Connect ES Option
43	10	64 QAM	Base	Connect ES 50
49	20	16 QAM	Base	Connect ES 50[1]
49	40	QPSK	Base	Connect ES 50[1]
94	20	64 QAM	Upgrade 1	Connect ES 100
108	20	128 QAM	Upgrade 1	Connect ES 100
108	30	32 QAM	Upgrade 1	Connect ES 100[1]
108	40	16 QAM	Upgrade 1	Connect ES 100[1]
154	30	128 QAM	Upgrade 2	Connect ES 150
154	40	32 QAM	Upgrade 2	Connect ES 150
154	50	16 QAM	Upgrade 2	Connect ES 150
196	40	128 QAM	Upgrade 3	Connect ES 200
196	50	64 QAM	Upgrade 3	Connect ES 200

1. FCC frequency efficiency restrictions mean these options are not available for use in the 6 and 11 GHz Common Carrier bands.

IDU ES Compatibility

IDU ES can be over-air interfaced to an INU/INUe fitted with a RAC 30v3, RAC 30A (non-adaptive modulation) or RAC 3X. For ETSI bands it also applies to RAC 30v2+.

IDU ES can also be over-air interfaced to an IDU GE 20x. Refer to IDU GE 20x Compatibility on page 2-31.

Table 2-9 indicates current INU compatibility for ETSI rates; Table 2-10 indicates ANSI rates.

At the INU/INUe:

- Ethernet traffic is terminated on a DAC ES or DAC GE.

- E1/DS1 traffic is terminated on a DAC 16x or DAC 4x.
- Auxiliary data traffic and/or alarm I/O actions are terminated on an AUX.

Table 2-9. IDU ES Compatibility with RAC 30 and RAC 3X: ETSI

Ethernet Assignment	BW MHz	Modulation	IDU ES	RAC30v3 RAC 30A & RAC30v2+	RAC3X
10 Mbps	7 MHz	QPSK	X	X	N/A
20 Mbps	7 MHz	16QAM	X	X	N/A
20 Mbps	14 MHz	QPSK	X	X	N/A
32 Mbps	7 MHz	64QAM	X	X (RAC 30v3 only)	N/A
40 Mbps	28 MHz	QPSK	X	X	N/A
40 Mbps	14 MHz	16QAM	X	X	N/A
80 Mbps	28 MHz	16QAM	X	X	N/A
106 Mbps	28 MHz	32QAM	X	X	N/A
150 Mbps	56 MHz	16QAM	X	N/A	X
150 Mbps	28 MHz	128QAM	X	X	N/A
190 Mbps	28 MHz	256QAM	X	N/A	X
196 Mbps	56 MHz	64QAM	X	N/A	X

Table 2-10. IDU ES Compatibility with RAC 30 and RAC 3X: ANSI

Ethernet Assignment	BW	Modulation	IDU ES	RAC 30v3 RAC 30A	RAC 3X
43 Mbps	10 MHz	64 QAM	X	X	N/A
49 Mbps	20 MHz	16 QAM	X	X	N/A
49 Mbps	40 MHz	QPSK	X	N/A	X
108 Mbps	30 MHz	16 QAM	X	X	N/A
108 Mbps	40 MHz	32 QAM	X	N/A	X
154 Mbps	30 MHz	128 QAM	X	X	N/A
154 Mbps	40 MHz	32 QAM	X	N/A	X
154 Mbps	50 MHz	16 QAM	X	N/A	X

Ethernet Module

The Ethernet module incorporates an intelligent layer 2 (L2) switch, to provide the switching, prioritization and queuing functions between ports P1 to P4 and transport channels, C1 and C2. It supports address learning for efficient management of Ethernet traffic in multi-host situations, and advanced L3 and L2 settings for traffic prioritization.

A gate array supports channel assignment and mux/demux to the digital baseband.

The MAC address register supports 2048 entries.

Inter-frame gap (IFG) and preamble stripping and re-insertion is used across the link to maximize Ethernet throughputs. Its benefit is most noticeable with small frame sizes where the IFG and preamble represents a more significant part of the total frame space. Requires SW release 4.3 or later. Auto negotiation is used between the DAC ES modules at each end of the IDU ES link to determine SW level compatibility. If one end uses a pre 4.3 SW release, IFG and preamble stripping is not used across the link.

The four 10/100Base-T Fast Ethernet ports may be connected to the transport channels in transparent, VLAN or mixed operational modes. Channel capacity is incremented in 2 Mbps (2.048 Mbps) or 1.5 Mbps (1.544 Mbps) steps.

Refer to:

- Modes of Operation on page 2-17
- Transport Channel Configuration on page 2-18
- Basic Port Settings on page 2-18
- Priority Mapping on page 2-19
- Flow Control on page 2-19
- Disable Address Learning on page 2-19
- Maximum Frame Size on page 2-20
- Latency on page 2-20
- Ethernet Diagnostics on page 2-20

Modes of Operation

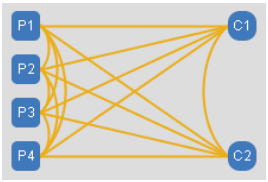
IDU ES is configured using Portal, the Eclipse craft tool. User-friendly screens prompt for channel size (Ethernet bandwidth), modes of operation, QoS settings, and interface options.

Three modes of operation are supported, which define the connection fabric between ports and channels. These modes are Transparent, VLAN or Mixed:

Transparent Mode

This is the default, broadcast mode; all ports and channels are interconnected. It supports four customer connections (ports 1 to 4) with bridging to and between the two transport channels (C1, C2).

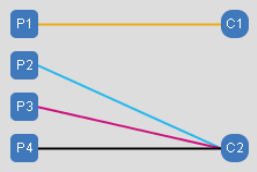
Figure 2-7. Transparent Mode Port and Channel Assignment



VLAN Mode

VLAN or transport mode supports four separate LAN connections. Port 1 is dedicated to channel 1, and ports 2 to 4 are multiplexed to channel 2 to provide three virtual LANs (VLANs 2, 3 and 4). Internal VLAN port tagging of packets provides correct end-to-end matching of port traffic over the channel 2 link. Tags are removed before port egress at the far end.

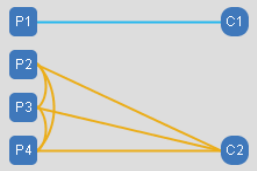
Figure 2-8. VLAN Mode Port and Channel Assignment



Mixed Mode

Mixed or hybrid mode provides a two-LAN connection solution. The first provides a dedicated port 1 to channel 1 connection. The second provides a transparent (broadcast) connection, tying ports 2, 3 and 4 to channel 2. Packets received on any of these ports will be allowed to broadcast to the other three ports, but not to port 1 or channel 1.

Figure 2-9. Mixed Mode Port and Channel Assignment



Transport Channel Configuration

Selection is provided for channel capacity on a per-channel basis:

Channel capacity is selected in multiples of 2 Mbps or 1.5 Mbps.

- For an ETSI selection each channel supports a maximum 98 Mbps. Where both channels are used the combined maximum extends to 196 Mbps.
- For an ANSI selection one channel (either) can be configured to support a maximum 100 Mbps. Both channels can be configured to support a combined total of 196 Mbps.
- Both channels can be sent over the same radio path. Each can operate as separate fast Ethernet VLANs, or aggregated (combined) using an external L2 switch.

Basic Port Settings

Customer selection/confirmation is provided for the following port parameters:

Enabled

A port must be enabled to allow traffic flow.

Name

A port name or other relevant port data can be entered.

Speed-Duplex

Provides selection per-port of auto or manual settings for half or full duplex operation on speeds of 10 Mbps or 100 Mbps. In auto a connection is set based on the traffic type detected.

Interface Type

Provides selection per port of auto or manual settings for the interface type; Mdi or MdiX (straight or cross-over respectively).

Port Up

Indicates that a valid Ethernet connection with valid Ethernet framing has been detected.

Resolved

Indicates a port connection has been resolved for an auto speed-duplex setting.

Priority Mapping

A priority mapping screen supports selection of queue-controller operation for mode and mapping. A mode selection applies to *all* ports.

To prioritize ingressing traffic over a DAC ES link a 4-level prioritization of high, medium high, medium low, and low is used with a weighting of 8:4:2:1. For example, 8 high priority packets are sent for every 1 low priority packet. Mapping is used to convert the 4 DAC ES levels to the 8 priority levels of 802.1p, and 64 levels of DiffServ. Mapping is user configurable.

- Port Default enables the Port Priority option. It ignores any 802.1p VLAN CoS priority tags or IP DiffServ priority values. It only has relevance where two or more ports share a common channel.
- 802.1p provides prioritization based on the three-bit CoS field within a VLAN tag. Each of the possible eight tag priority values are mapped into a four-level (2-bit) IDU ES priority level.
- DiffServ provides prioritization based on the six bits of the IP packet DiffServ or Type of Service byte. Each of the possible 64 levels are mapped into a four-level (2-bit) priority level.
- 802.1p-then-DiffServ provides prioritization based first on the 802.1p VLAN tag, and then on the DiffServ or Type of Service byte.
- DiffServ-then-802.1p provides prioritization based first on the IP packet DiffServ or Type of Service byte, then on the 802.1p VLAN tag.

Flow Control

Flow Control is an option for full-duplex links only. It is implemented through use of IEEE 802.3x PAUSE frames, which tell the remote node to stop or restart transmission to ensure that the amount of data in the receive buffer does not exceed a 'high water mark'. The receiver will signal to the transmitter to stop transmitting until sufficient data has been read from the buffer, triggered by a 'low water mark', at which point the receiver signals to the transmitter to resume transmission. To be effective, flow control must be established from the originating source through to the end point, and vice versa, which means the equipment connected to the IDU ES ports and beyond should also be enabled for flow control.

Disable Address Learning

MAC Address Learning is default implemented to support efficient management of Ethernet traffic in multi-host situations. The option to disable Address Learning is primarily for use in an Ethernet ring network where protection is provided by an external RSTP switch. To avoid conflict between the self-learning function within IDU ES and the external RSTP switch during path failure situations, the IDU ES capability *must* be switched off.

Maximum Frame Size

Maximum Frame Size sets the largest size frame for the interface, which determines the largest datagram than can be transmitted without it being broken down into smaller units (fragmented). The IDU ES supports two maximum frame sizes, 1518/1522 bytes (1518 for non-tagged frames, 1522 for tagged frames) or 1536 bytes.

Latency

Network latency refers to the time taken for a data packet to get from source to destination. For an IP network it is particularly relevant to voice (VoIP) or video conferencing; the lower the latency, the better the quality.

For phone conversations a one-way latency of 200 ms is considered acceptable. Other applications are more tolerant; Intranet access should be less than 5 seconds, whereas for non real-time applications such as email and file transfers, latency issues do not normally apply.

Other contributors to overall latency are the devices connected to the Eclipse network, which for a VoIP circuit will include the external gateway processes of voice encoding and decoding, IP framing, packetization and jitter buffers. Contributing to external network latency are devices such as routers and firewalls.

Table 2-11 lists typical one-way performance over a 100 Mbps IDU ES link.

Table 2-11. Typical Performance for a 100 Mbps Hop

Frame Size	Latency	Throughput
64	240 uSec	72 Mbps
128	250 uSec	83 Mbps
256	270 uSec	88 Mbps
512	300 uSec	93 Mbps
1024	390 uSec	95 Mbps
1518	460 uSec	95.5 Mbps

Ethernet Diagnostics

Portal diagnostics screens capture Ethernet performance and history. The data for IDU ES includes:

- Port/channel status.
- Configured capacities.
- Graphed current Rx and Tx throughputs and discards per port and channel.
- Graphed historical Rx and Tx throughputs, frame type and discards per port and channel.
- Historical statistics per port and channel.
- Comprehensive RMON performance statistics per port and channel.
- Event history.

For more information refer to the following topics in Volume IV, Chapter 13.

- Ethernet Performance Screens
- History Screen: Ethernet

Wayside Traffic Module

The Wayside Traffic Module supports 8xE1 or 8xDS1 tributary circuits. Each is accessed on an RJ-45 connector.

- For an E1 selection, options are provided for 75 ohms unbalanced or 120 ohms balanced.
- For a DS1 selection, options are provided for AMI or B8ZS encoding and line length. Line impedance is 100 ohms balanced.
- The module supports trib and radio facing loopbacks, AIS insertion, and a PRBS generator and receiver for trib BER measurement.
- Line isolation and surge protection are included.

Auxiliary Data and Alarm I/O Module

This module supports sync or async data, and TTL alarm inputs and relay outputs:

Auxiliary Data

The DB-9 AUX Data connector supports one synchronous or asynchronous auxiliary data channel, which may be used to transport 3rd party NMS (or other data):

- Synchronous conforms to TIA/EIA-422 / V.11 at 64kbps, with selectable clock. The source of the transmit clock can be set to internal (provided by IDU ES) or external (provided by the user). For an external clock, channel synchronization is supported by a selectable clock phase (rising or dropping edge of the clock pulse).
- Asynchronous conforms to TIA/EIA-562 (electrically compatible with V.24)
- Asynchronous rates are 1200, 2400, 4800, 9600, or 19200 bps, with parity and stop bit selection.

Auxiliary data is transported within the link overhead, which is shared with NMS data.

Alarm I/O

The HD-15 Alarm I/O connector supports two TTL alarm inputs and four Form-C relay outputs.

- Individual alarm inputs can be mapped to any output within an Eclipse network. Similarly, individual internal events can be mapped to any output.
- Multiple input or internal events may be mapped to a common output. Mapping is achieved using IP addressing for the destination IDU ES terminal, or if the destination is an Eclipse INU/INUe, to its IP address plus the slot location and output number for the AUX plug-in.
- Individual alarm inputs and relay outputs can be named. A severity level can also be assigned to alarm inputs.

Alarm Inputs

The active state of each TTL alarm input is configurable to be active if the voltage on the input is high, or active if the voltage is low. The alarm software detects a change in the state of each input circuit, and raises or clears an input accordingly. The nominal alarm polling rate is 1 second.

Alarm Outputs

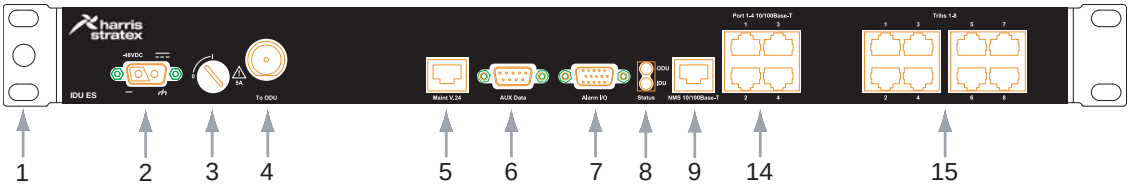
Outputs are user configurable to be normally high or normally low. Default is normally low (relay inactive). Additionally, a user can select on the Alarm I/O connector, a normally closed or normally open contact pair.

For information on TTL input limits and relay output voltage and current maximums, refer to Alarm I/O Port on page 2-6.

IDU ES Layout

Figure 2-10 illustrates IDU ES front panel layout and interfaces.

Figure 2-10. IDU ES Front Panel Layout



No	Item/Label	Description	
1	Rack Ear and Grounding Stud	Rack attachment bracket for the IDU. One ear has a grounding stud for IDU grounding. The ears can be fitted either side and provide flush-with-rack-front mounting.	
2	-48 Vdc	2-pin D-series 2W2C power connector. Includes screw fasteners.	
3	Fuse	5A time-lag fuse and power on/off switch. ON is when the fuse head is in the vertical position; OFF is when the head is rotated to the horizontal ‘0’ position.	
4	To ODU	Type N female connector for jumper cable connection to the surge suppressor located at the cable entry point to the building.	
5	Maint V.24	RJ-45 connector provides a V.24 serial interface option for Portal. It supports a default IP address, which means knowledge of the Terminal IP address is not required at login.	
6	Aux Data	The DB-9 connector provides one synchronous or asynchronous data service channel. Selection of synchronous (64 kbps) or asynchronous (max 19.2 kbps) is via Portal.	
7	Alarm I/O	HD-15 connector provides access to two TTL alarm inputs and four form C relay outputs. Connections are mapped in Portal.	
8	ODU	ODU Status LED provides indications of:	
		Off	IDU power off
		Green	Normal operation
		Orange flashing	Configuration not supported, software/ hardware incompatible, or diagnostic mode selected, such as Tx Mute.
		Red	Critical alarm (traffic affecting)

No	Item/Label	Description
	IDU	IDU Status LED provides indications of: Off — IDU power off Green — Normal operation Orange flashing — Configuration not supported or software/ hardware incompatible, or diagnostic mode selected, such as tributary loopbacks. Red — Critical alarm (traffic affecting)
9	NMS 10/ 100Base-T	RJ-45 connector provides a port for Ethernet network management access. Unless DHCP has been configured, Portal login requires entry of a LAN compatible IP address on your PC. Port may also be used to provide NMS connectivity to co-located Harris Stratex or third party radios. The green connection-status LED is on for a valid Ethernet connection. Off indicates no connection or an invalid connection. The orange activity LED flashes to indicate Ethernet traffic on the port. The LED does not flash (is solid on) when there is no traffic activity. (Activity LED is off when the connection status LED is off).
14	Ethernet traffic ports 1 to 4	RJ-45 connector assembly for 10/100Base-T Ethernet traffic connection. Port connection-status and activity LED indications are as for the NMS port.
15	Trib 1-4 and Trib 5 to 8	RJ-45 connector assemblies for wayside tributary connections; one RJ-45 port per E1/DS1. E1 termination is set for unbalanced or balanced in Portal. DS1 is 100 ohms balanced with options for AMI or B8ZS, and trib cable length. Cable options provide extension to BNC connectors for unbalanced, or to RJ-45 plugs or unterminated wires for balanced.

IDU ES Applications

IDU ES may be used to provide single-hop connections or used as a radio backbone in multiple-hop star or ring networks.

Refer to:

- Basic Network Applications on page 2-23.
- Ring Applications on page 2-25

Basic Network Applications

Simple Link

Figure 2-11 illustrates basic link operation where the IDU ES directly supports up to 4 hosts, which may all be on a common LAN, or prioritized in VLAN mode on up to four LANs over two independent link transport channels, C1 and C2.

Figure 2-11. Basic IDU ES Link

Using one transport channel, IDU ES supports Ethernet capacities to 98 Mbps (ETSI) or 100 Mbps (ANSI). Using both channels, IDU ES supports two separate LANs to a combined Ethernet maximum of 196 Mbps.

Link capacity may be configured to support Ethernet together with E1 or DS1 wayside tribs, up to a maximum 8 waysides in 1xE1/DS1 increments. For example, a radio configured for a throughput of 106 Mbps may be used to support:

- 106 Mbps Ethernet using both transport channels and no E1 tribs. The split between channel (LAN) assignments may be 53/53 Mbps through to 98/8 Mbps.
- 104 Mbps Ethernet and 1xE1, through to 90 Mbps Ethernet and 8xE1.

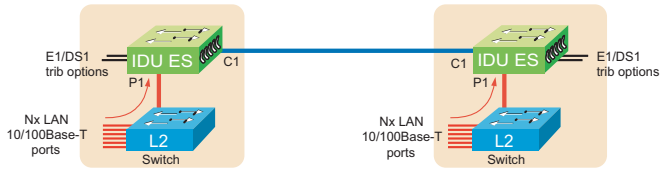
LANs supported on transport channels C1 and C2 cannot be paralleled without use of an external switch with L2 link aggregation, as doing so will create an IP loop.

Simple Link With External Switching

While IDU ES provides full layer 2 switch functionality, it can only support a maximum of four directly connected hosts, which for most office applications is insufficient, bearing in mind each device on the LAN must be directly connected to its own port on the switch (star connected).

The solution is provided by a 3rd party industry-standard multi-port layer 2 (L2) switch, as shown in Figure 2-12

Figure 2-12. IDU ES with External Switch: Single Channel

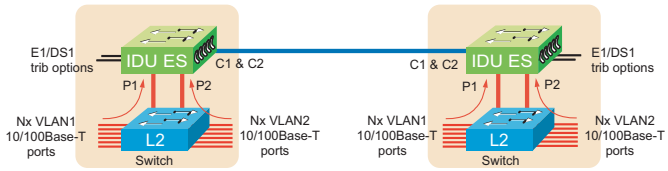


When used in this way, the LAN mode and QoS settings would normally be configured within the external switch, and a single port connection used to the IDU ES.

With just one channel in use (C1 or C2), the maximum Ethernet capacity supported is 98 Mbps (ETSI) or 100 Mbps (ANSI). For this throughput an optimum link solution is provided by 100 Mbps licensed option.

Higher throughputs are provided by IDU ES 150 and 200 Mbps options, but to make use of such capacity both IDU ES channels must be used, as shown in Figure 2-13. The IDU ES is configured for Mixed Mode to support two independent LANs/VLANs on transport channels C1 and C2, and each is separately ported to the external switch.

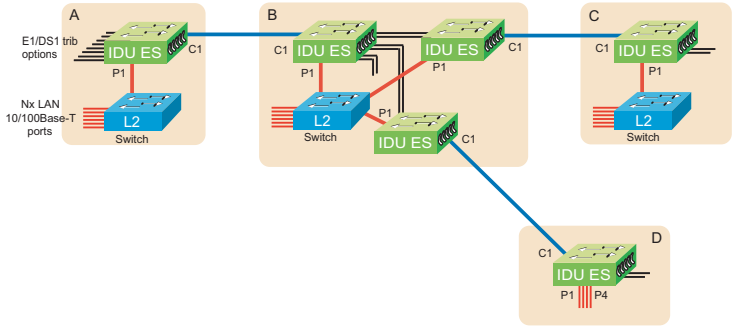
Figure 2-13. IDU ES Link with External Switch: Both Channels



Where IDU ES links are to be networked, they must be physically interconnected at intermediate sites. Figure 2-14 shows a typical small network with back-to-back IDU ES installations at site B.

- External layer 2 multi-port switches are used where more than four host devices are locally connected on the LAN: sites A, B and C.
- Site D shows no external switch. For a small office where no more than four host devices are connected, the IDU ES provides a complete solution.
- Interconnecting trib circuits are cabled as for standard back-to-back E1/DS1 links.
- NMS visibility between all IDU ES terminals requires linking of the Ethernet NMS ports at each site. As the IDU ES has a single Ethernet NMS port, where three or more are grouped at a site, as at Site B, a simple external hub or switch must be used to provide the required porting capacity.

Figure 2-14. Network-connected IDU ES Links

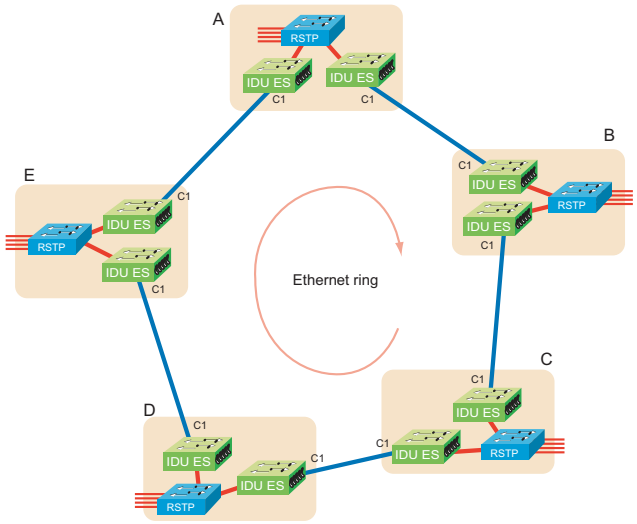


Ring Applications

IDU ES is a 1+0 platform; it does not offer hot-standby or diversity options. However, IDU ES links can be installed in a ring network to support alternate-path protection of Ethernet traffic using external RSTP switches.

- Using one channel, as illustrated in Figure 2-15, ring capacities to 98/100 Mbps are supported.
- Using both channels, C1 and C2, two concentric rings are supported, each up to 98/100 Mbps.
- Where concentric rings are used, link aggregation may be used in the external switch to provide a single LAN interface.
- For NMS visibility around ring, IDU ES terminals are interconnected at each site via their Ethernet NMS ports. Dynamic routing (OSPF or RIP) is required.
- E1/DS1 circuits can also be configured on each link as pt-to-pt connections (not ring protected).

Figure 2-15. IDU ES Links in a Ring



- For product description and application data refer to the Harris Stratex Networks' publication 'Connect ES Product Description'. There are separate descriptions for ETSI and ANSI. Contact Harris Stratex Networks or your supplier for copy.

IDU GE 20x

IDU GE 20x supports Gigabit Ethernet plus up to 20xE1 waysides.

Depending on the required Ethernet throughput, channel bandwidths ranges from 7 to 56 MHz, with modulation options from QPSK to 256 QAM. Maximum Ethernet throughput is 360 Mbps using one or both transport channels.

Configured link capacity may be fully assigned to:

- Ethernet only.
- Between Ethernet and up to 20xE1 or 20xDS1 circuits in 1xE1 or 1xDS1 steps.
- E1 or DS1 circuits only, for link options of 5x, 10x, 16x, 20xE1, or 16xDS1.

Ethernet capacity is licensed; NxE1/DS1 capacity is not.

It includes a Layer 2 switch to support two customer 10/100/1000base-T electrical ports, and an optional SFP port for either 1000Base-X optical or 1000Base-T electrical connections. These interface to one or two transport channels using transparent, VLAN or mixed operational modes.

The switch incorporates:

- Programmable switching fabric: transparent mode, VLAN (secure) mode, or mixed mode.
- Comprehensive QoS policing and prioritization options (802.1p).
- VLAN tagging (802.1Q and 802.1Q-in-Q).
- RWPR^{TM} enhanced RSTP (802.1d).
- Layer 2 link aggregation (802.3ad).
- Flow control through 802.3x pause-frame option.
- Jumbo frames to 9600 bytes.

- Extremely low latency
- Comprehensive RMON and performance indicators.
- Compatibility with the INU DAC GE and DAC ES plug-ins, and with the IDU ES.

Protected 1+1 hot-standby or space diversity operation is configured by adding a second IDU GE 20x. Ethernet traffic is supported on a single interface to one of the IDUs. E1/DS1 traffic is supported on interfaces to both IDUs using Y-cables.

The 1RU chassis complies with ETSI half-rack mechanical specifications with a rack depth of 240 mm (9.4”).

Refer to:

- IDU GE 20x Capacity and Bandwidth Options on page 2-27
- IDU GE 20x Ethernet Module on page 2-32
- IDU GE 20x Wayside Traffic Module on page 2-41
- IDU GE 20x Alarm I/O Module on page 2-41
- IDU GE 20x Layout on page 2-42
- IDU GE 20x Applications on page 2-43

For more information, refer to:

- Outdoor Units on page 4-1.
- IDU GE 20x License and Steps in Volume IV, Chapter 5.
- Configuring Node and Terminal Plug-ins on page 7-1 of Volume IV.

IDU GE 20x Capacity and Bandwidth Options[1]

ETSI IDU GE 20x Ethernet capacity and bandwidth options are indicated in Figure 2-16 and detailed in Table 2-12. PDH capacity and bandwidth options are indicated in Figure 2-17 and detailed in Table 2-12.

ANSI IDU GE 20x Ethernet capacity and bandwidth options are indicated in Figure 2-18 and detailed in Table 2-13. PDH capacity and bandwidth options are indicated in Figure 2-19 and detailed in Table 2-13.

- For Ethernet capacities to 80 Mbps, the ODU 300sp can be used. Applies to ETSI bands, 7 to 38 GHz only. Modulation is QPSK or 16 QAM.
- ODU 300hp operates on all bands, 6 to 38 GHz. Modulation options range from QPSK to 256 QAM.
- ODU 300ep is required for 5 GHz and is an option for 13 and 15 GHz bands. Modulation options range from QPSK to 256 QAM.
- Capacity is licensed. The base license (no license required) supports up to 20xE1 or 20xDS1 PDH operation only. The license options enable Ethernet in steps of 50, 100, 150, 200, or 360 Mbps, each with up to 20xE1 or 20xDS1 waysides.
  - License requirements are placed at time of order, or updated subsequently as downloadable software licenses.
- IDU GE 20x licenses are up-to licences. For example a 100 Mbps license may be configured to support throughputs from 10 to 106 Mbps (ETSI), or 25 to 108 Mbps (ANSI).

[1] *All capacity options may not be available at this time. Check with Harris Stratex or your supplier.*

- The maximum capacity for each Licensed option may be used for Ethernet traffic, or assigned between Ethernet and wayside E1 or DS1 circuits. For configurations where available link capacity is fully assigned to Ethernet, capacity for Ethernet is reduced by 2 Mbps (2.048 Mbps) for each E1 assigned, or by 1.5 Mbps (1.544 Mbps) for each DS1, up to a maximum of 20x E1 or DS1 waysides.

Ethernet capacity (bandwidth) is assigned in 2 Mbps or 1.5 Mbps steps to align with the capacity needed for E1 or DS1 waysides. Eclipse incorporates a universal modem design that does not distinguish between the type of data to be transported, Ethernet or TDM; data is simply mapped into byte-wide frames to provide a particularly efficient and flexible wireless transport mechanism, with the result that when configured for Ethernet data, or Ethernet and TDM data, the full configured capacity is available for user throughput. *The data is transported natively over the wireless link, whether Ethernet or PDH*.

Ethernet physical (layer 1) link capacities/bandwidths used in this section are nominal. For example, actual 100 Mbps link capacities are 106 Mbps for an ETSI configuration, and 108 Mbps for ANSI.
Similarly, Ethernet *throughput* figures are nominal and are specified at *layer 2* in accordance with RFC 2544 recommendations.

Figure 2-16. DU GE 20x Ethernet Capacity/Bandwidth Options: **ETSI**