AXX155A R 2.0

Technical Reference

61017-02BA

Including Service Modules

Credits
This technical reference could not have been created without the help from people involved in developing the AXX155A.

V.Sebjørnsen
Technical author

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Mechanics & other Characteristics

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Dual Optical L-1.2 Module 2xL-1.2-LC

Dual Optical Module 2xS-1.1-LC+21xE1-LFH

Dual Optical Module 2xL-1.2-LC+21xE1-LFH

Octal E1 Tributary Module 8xE1-RJ45

High Density 63xE1 Module 63xE1-LFH

Tri E3/T3 Tributary Module 3xE3/T3-1.0/2.3

Hex E3/T3 Tributary Module 6xE3/T3-1.0/2.3

Tri E3/T3 Tributary Module 21xE1+3xE3/T3-1.0/2.3

Quad LAN 10/100Base-TX Module 4xFE/MAP-RJ45

Octal LAN 10/100Base-TX Mapper 8xFE-16xSMAP-RJ45

Remote Module - AXX10

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1 INSTALLATION OF AXX155A

1.1 PRE-INSTALLATION PROCEDURES

This chapter provides pre-installation procedures for the AXX155A.

1.1.1 Shipment verification

When the AXX155A equipment is received, please verify that the shipment is according to order.

NOTE! *Ship equipment from one site to another in the original packing including the antistatic bags.*

NOTE! *Keep the AXX155A system equipment in the original shipping containers if storage is required. Storage more than 12 months is not recommended. The equipment should be stored in a ventilated and static-safe location.*

1.1.2 Preliminary inventory check

Verify that the packing list information is equal to the information provided on the shipping labels. Please notify contact resource if any discrepancies must be reported.

1.1.3 Reporting damage

Damage to shipped articles must be reported to contact resource. Please see “Repair and return procedure” on page 1-31.

1.2 SITE PREPARATION

Verify that the installation site meets the following criteria:

- The site conforms to all environmental specifications
- The floor or mounting area where you will install the equipment can support the equipment.

NOTE! *The following tables are based on typical AXX155A system configurations and may vary in specific customer configurations.*

1. Power supply for the AXX155A equipment must be as described in Table 4.2. Electrical specifications of DC module and Table 4.3. Electrical specifications of AC module
2. Power consumption for the AXX155A equipment must be supported as described in Table 4.2. and Table 4.3.
3. Circuit breakers for the AXX155A equipment must be according to Table 4.2. and Table 4.3.
4. Recommended clearance for accessing the AXXEGDE equipment during and after installation must be according to Table 1.1.

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

Table 1.1. Recommended Access Clearance

1.3 UNPACKING

1.3.1 Introduction

When unpacking and storing AXX155A equipment:

- Leave equipment packed until it is needed for immediate installation.
- Store packed equipment in a ventilated and static-safe location
- Store the packaging material in case the equipment must be re-shipped.
- If the packaging and/ or equipment is damaged, preserve as much of the packaging as possible for shipment and damage analysis.
- Report damage to shipped articles to dedicated contact resource
(See also “Repair and return procedure” on page 1-31)

1.3.2 Unpack the AXX155A base unit

This section contain specific instructions for unpacking AXX155A system equipment.

CAUTION! *Open the subrack container with caution to avoid damage to the contents.*

CAUTION! *Wear a grounding wrist strap while unpacking, handling and interconnecting the AXX155A equipment modules, to discharge any static buildup.*

1. Open the top of the cardboard shipping container.
2. Take the box containing the AXX155A accessory kit out of the shipping container.
3. Lift the AXX155A out of the packaging box and remove the anti-static bag and foam inserts.

1.3.3 Unpack the AXX155A Service modules

CAUTION! *Opening the module container with caution to avoid damaging the content.*

CAUTION! *Wear a grounding wrist strap while unpacking,handling and interconnecting the AXX155A equipment modules, to discharge any static buildup.*

1. Open the container and remove the module(s) and packing material.
2. Carefully remove anti-static bag from the module(s).
3. If any optical adapters are included in the container, remove them and save them for use while installing the module front-panel optical fiber jumper cables.

1.4 INSTALLATION

This section provides instructions before installing AXX155A unit.

NOTE! *The instructions in this section primarily address the installation of the AXX155A, and modules supplied by AXXESSIT. Codes and regulations for installing racks, electrical wiring, raceways, and other equipment is not covered in this manual,*

CAUTION! *Wear a grounding wrist strap while unpacking,handling and interconnecting the AXX155A equipment modules, to discharge any static buildup.*

1.4.1 Installation Overview

You should be thoroughly familiar with the instructions in this manual before starting any work. Use the following general order of work when installing a site:

1. Read and observe all safety cautions and warnings in Chapter 1, “Safety Summary.”
2. When you arrive at the site, first verify the AXX155A equipment according to the procedures in “Pre-Installation Procedures” on page 1-2. If there is a problem with the equipment, use the dedicated contact resources for your support
3. If you do not install the equipment when it arrives, store as specified in “Pre-Installation Procedures” on page 1-2
4. Unpack equipment only after preparing the site as described in “Pre-Installation Procedures” on page 1-2
5. When installing equipment at a site, follow the procedures in this chapter in the order presented.
6. Make connections using the information in “Interconnections and cable handling” on page 1-22

1.4.2 Installation Planning

Based on the system to be installed, determine the size, number, and location of racks, as well as the AXX155A requires. The AXX155A will fit in 485 mm (19-in.) equipment racks, and can be adapted for 600 mm ETSI (23.6-in.) racks. The racks must be accessible from the front and rear for equipment installation.

NOTE! *You need 500 mm (19.6-in.) space of rear access for installation of the equipment.*

NOTE! *The interfaces cables (especially E1 interfaces) must not run in the same pipes as the power cables*

WARNING! *If mains AC power feeding is employed, the socket outlet must have protective earth and be installed near the equipment and be easy accessible.*

Plan rack and unit installation based on the following considerations:

- Install the lowest unit in a rack first.
- Determine wire size based on cable length and local engineering standards and practices.
- Plan the power cable from the power distribution panel (PDP) to units, proceeding down along the right side of the equipment rack.
- Plan grounding cable runs from the ground window down along the right side of the rack to the units.
- Plan to route the electrical cables to and from the units along the right side of the rack to the overhead cable transport tray.
- Plan to route the optical cables to and from the units along the left side of the rack to the overhead cable transport tray.

Recommended items

To install an AXX155A system, customary installation and electrical tools are required. The following items are also recommended:

- Multimeter
- Phillips screwdriver (PH3) to attach the AXX155A to the rack, and Phillips screwdriver (PH1) to attach the brackets to the AXX155A,
- Pozidrive (PZ3, PZ1) as an alternative screwdriver
- Allen wrench
- Yellow green flexible ground cable (1.25 - 2.50 sqmm, 16 - 14 AWG)
- Cletop cleaning cassette (type A for SC connectors)
- Video fiber connector inspection instrument
- Caps for optical connectors
- Plugs for optical adapters
- Tie wraps

1.4.3 Installation Guidelines

When installing AXX155A equipment into racks, follow these guidelines:

- Consider the effect of additional electronic equipment and its generated heat on the AXX155A system equipment.
- Make sure the equipment rack is properly bolted to the ground and, if required, to the ceiling.
- Ensure that the weight of the equipment does not make the rack unstable.
- When mounting the equipment between two posts or rails, ensure that the minimum clearance between the sides is 485 mm (19 in.).
- Maintain a minimum clearance of 500 mm (19.7 in.) in front of the equipment and 500mm (19.7 in.) at the back of the equipment.

Grounding Considerations for 48 V

It is vital that the AXX155A is properly grounded. The AXX155A may be connected to ground in the power connector.

For location of the power connector on the AXX155A, see Figure 1-1.

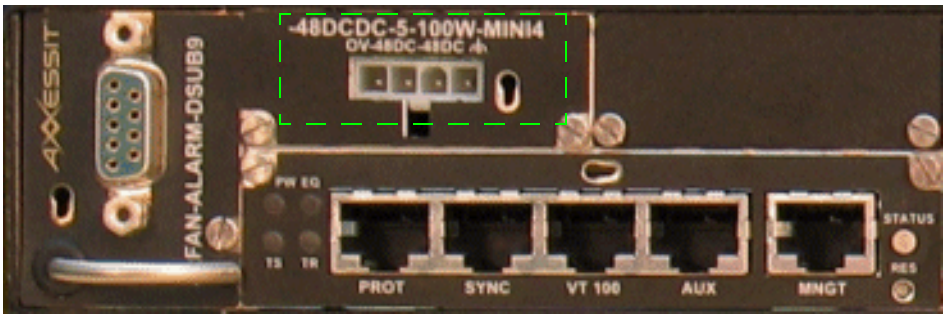


Figure 1-1. AXX155A- Location of the power connector

1.4.4 Power Considerations

The AXX155A can be powered using a regular telecommunication power supply of –48 VDC with a VDC return. Two independent power supplies can be attached to the AXX155A equipment. If two different supplies are used, they should be independently powered.

1.5 AXX155A INSTALLATION

Use the following procedures to install The AXX155A in an equipment rack, verify that at least 3 RU of space is available.

When installing the AXX155A, you can also use the extension brackets, included in the AXX155A accessory kit, to convert a 485-mm (19-inch) rack to a 600-mm (23.6-inch) rack.

NOTE! *1 RU is 44.45 mm.*

CAUTION! *Wear a grounding wrist strap while unpacking,handling and interconnecting the AXX155A equipment modules, to discharge any static buildup.*

1.5.1 Mount the AXX155A in a 19” rack

Decide which side do you want to use as the front side. You can use the side with the connectors (depends on rear access) or the AXXESSIT branded side as the front side.

See Figure 1-2. and Figure 1-3.

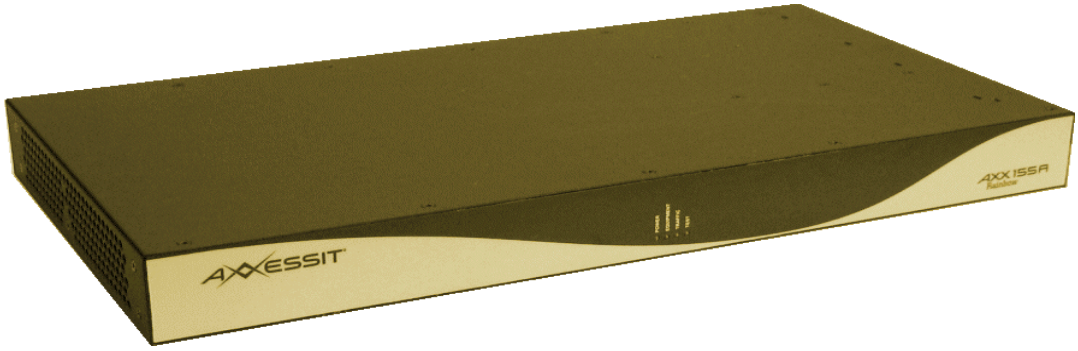


Figure 1-2. AXXESSIT branded side of the AXX155A

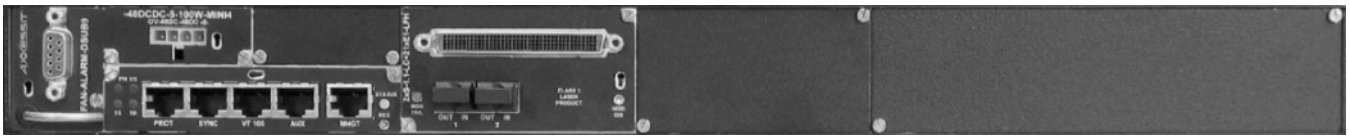


Figure 1-3. AXX155A- Connector side

1. Remove the two phillips screws on the left and right and install the brackets with longer phillips screws that are also in the plastic bag.
2. Move the AXX155A to the desired rack position
3. Align four M6 cage nuts in the equipment rack with the mounting holes on the front of the AXX155A.
4. Align the AXX155A with the equipment rack and cage nuts.
5. Insert the AXX155A into the equipment rack.
6. Connect the AXX155A to the equipment rack with four M6 screws.

1.5.2 Mount the AXX155A in a 600 MM rack with ETSI brackets

The shelf assembly is also possible to install in a 600-mm (23.6-in.) rack, for this installation you can use extension brackets. You will need two 1 RU extension brackets for this procedure.

Decide which side do you want to use as the front side. You can use the side with the connectors (depends on rear access) or the AXXESSIT branded side as the front side.

1. Remove the two phillips screws on the left and right and install the extension brackets with longer phillips screws that are also in the plastic bag.
2. Follow step 2-6 in “Mount the AXX155A in a 19” rack” on page 1-10.

1.5.3 Installation in Restricted Access Location (RAL)

The AXX155A can be installed in a restricted access location (RAL) or outside of an RAL.

After installation in a RAL, such as in a telecommunication center, the AXX155A must be properly installed in a rack with brackets or in other ways properly connected to a safety ground.

The AXX155A 48V DC must not be powered from a source external to the RAL. All communication interfaces used must be limited to SELV. E1 interface used should be limited to SELV.

Installation outside of a Restricted Access Location

After installation, the AXX155A 48V power and all communication ports used must be connected to SELV circuits, for example a port on a personal computer or 10/100 Mbit Ethernet hub/router or other Information Technology (IT) equipment.

The 48V DC power must not exceed 60 VDC and must be powered from an certified external power supply unit (PSU) or a battery unit (no connection to -48 V telecom voltage).

The optical ports (if present) has no limitations regarding safety recommendations.

Definitions

Restricted Access Location (RAL)

A location for equipment where both of the following paragraphs apply:

- access can only be gained by service persons or by users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that must be taken; and
- access is through the use of a Tool or lock and key, or other means of security, and is controlled by the authority responsible for the location.

SELV Circuits

SELV Circuits are ports that have maximum DC working voltage level less than 60Volt (42.4 VAC). In addition, the ports must not be connected to telecommunication networks in the EN 60950 meaning of the term (see CEI/ IEC 60950-1 2001-10 standard clause 1.2.13.8).

In practice, the electrical cables must not exit the building. In addition, the electrical cables shall connect to equipment that either:

- are installed in RAL or
- shall not have electrical cables that exits the building unless those ports are TNV circuits or
- shall have a written consent or in other ways evident that its connecting port towards the SELV circuit port is not a telecommunication network.

Telecommunication Network

A metallically terminated transmission medium intended for communication between equipment that may be located in separate buildings, excluding:

- the mains system for supply, transmission and distribution of electrical power, if used as a telecommunication transmission medium;
- Cable Distribution System;
- SELV Circuits connecting units of information technology equipment.

TNV Circuit

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

1.6 INSTALLATION OF POWER MODULES

This section consists of procedures to explain how to install AXX155A power connections.

Please follow the safety precautions when installing or removing any of the power modules.

Common safety precautions

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

NOTE! *To prevent equipment damage and injury, do not reverse the polarity of the AXX155A power connections.*

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

1.6.1 Install the AXX155A – 48 VDC Power Module

Please follow “Common safety precautions” on page 1-14 when installing or removing a power module.

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

AXX155A power connection

1. Insert the wires into the desired connector and fix the wire on the connector. The following color-coding applies:

Wire colour coding		Wire carrying
	Brown wire	O V
	Blue wire	- 48 VDC
	Black wire	- 48 VDC
	Green/yellow wire	GND

Table 1.2. Power cable - wire color coding

2. Connect the AXX155A power cable (with the ground) to power connector of the back of the AXX155A as shown in Figure 1-4.

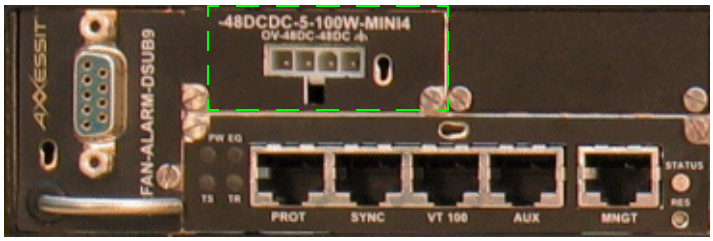


Figure 1-4. AXX155A- Location of power connector

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

NOTE! *The power supply has been connected correctly when the green LED is lit.*

1.6.2 Install the AXX155A –AC 230V Power Module

WARNING! *The AXX155A should always be connected to: 1. ground in the power connector and 2. earth contact.*

Please follow “Common safety precautions” on page 1-14 when installing or removing a power module.

AC 230V Module Not Installed in AXX155A

WARNING! *If the AC Power 230 module is not installed in AXX155A, do not connect the power cable to mains. This will cause capacitors inside the module to charge. Even if the power cable is removed from an un-installed module, the discharge time will be long. Thus, touching the module will cause a hazardous discharge.*

Power On

NOTE! *Make sure the AXX155A is only connected to mains outlet with safety ground.*

WARNING! *Insert the AC 230V module into AXX155A before connecting the power cable to mains.*

1. Insert the AC 230V module into the AXX155A device.
2. Insert the AC power cable to mains.

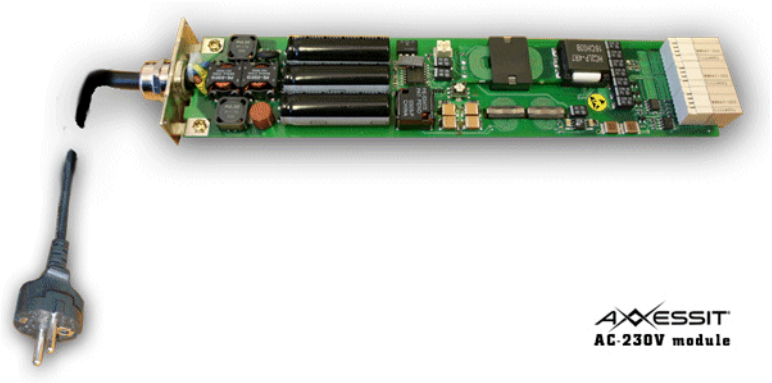


Figure 1-5. AC power module

Power Off

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

CAUTION! *To avoid hazardous discharge, please wait some minutes before removing the module.*

1. Remove the cable from the mains.
2. Please wait some minutes before removing the module, to avoid hazardous discharge.
3. Remove the AC 230V module if necessary. Thus the module will be hazardous to touch.

1.7 INSTALLATION OF SERVICE MODULES

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

See Table 1.3. List of available service modules to AXX155A.

See “Interconnections and cable handling” on page 1-22.

1.7.1 General

Slot 1 is used for the aggregate module (2xSTM-1+ 21xE1). Slot 2 is used for the interface module.

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

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

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

All modules support hot insertion and removal. The modules contain a switch that is activated when a module is removed. It is not possible to activate this switch by accident (e.g. self-test failure). A special tool like a small screwdriver or a pencil may be used to activate this switch.

When a module is replaced the switch is activated and the user must wait for the LED to extinguish before the module is removed. It is also be possible to deactivate the module from the craft terminal and from the management system.

A temperature sensor is available in all modules. This sensor is connected to the fan module and used to control the temperature in the AXX155A.

The modules is fed with a +5V supply voltage. All other voltages is generated locally in the module.

1.7.2 Available service modules to AXX155A

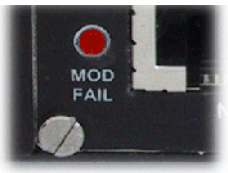
Service modules[a] with links to dedicated description
“Dual Optical S-1.1 Module 2xS-1.1-LC”
“Dual Optical L-1.2 Module 2xL-1.2-LC”
“Dual Optical Module 2xS-1.1-LC+21xE1-LFH”
“Dual Optical Module 2xL-1.2-LC+21xE1-LFH”
“Octal E1 Tributary Module 8xE1-RJ45”
“Tri E3/T3 Tributary Module 21xE1+3xE3/T3-1.0/2.3”
“High Density 63xE1 Module 63xE1-LFH”
“Tri E3/T3 Tributary Module 3xE3/T3-1.0/2.3”
“Hex E3/T3 Tributary Module 6xE3/T3-1.0/2.3”
“Quad LAN 10/100Base-TX Module 4xFE/MAP-RJ45”
“Octal LAN 10/100Base-TX Mapper 8xFE-16xSMAP-RJ45”
“Remote Module - AXX10”
“Remote Module - AXX11”

a. Including remote unit

Table 1.3. List of available service modules to AXX155A

1.7.3 LEDs

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



RED

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

GREEN

Module In-Service.

Extinguished

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

Figure 1-6. LED for module failure located in lower left corner

A module is taken Out-of-Service by an operator shutdown-command or by activation of the shutdown button, as described in “Hot insertion and removal” on page 1-20

NOTE! *Flashing green LED on Ethernet related modules during shutdown*

1.7.4 Hot insertion and removal

The AXX155A service modules support hot insertion and removal. Each module contain a switch that is activated when the module is to be removed, see Figure 1-7.

A special tool, the Card Extraction Tool must be used to activate the switch, see Figure 1-8.

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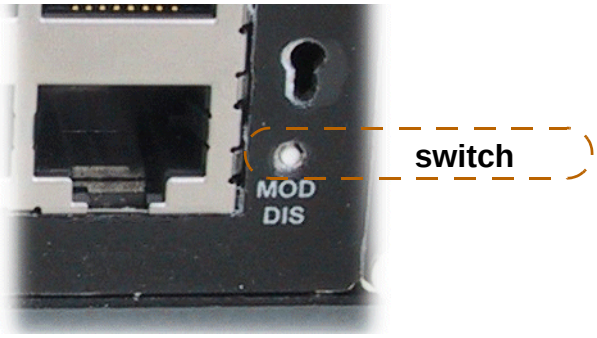


Figure 1-7. Switch to be activated when the module is removed

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

CAUTION! *When activating the switch, ensure that it is not pressed too far in*

It is also possible to deactivate the module from the AXXCRAFT or higher-level management systems within the AXXTMN product family.

When the switch is activated, the module is disabled in SW, and the MOD FAIL LED is switched off (for modules carrying IP, the LED blinks during SW cleanup, and extinguishes afterwards).The module can now be removed. Please see Figure 1-8.

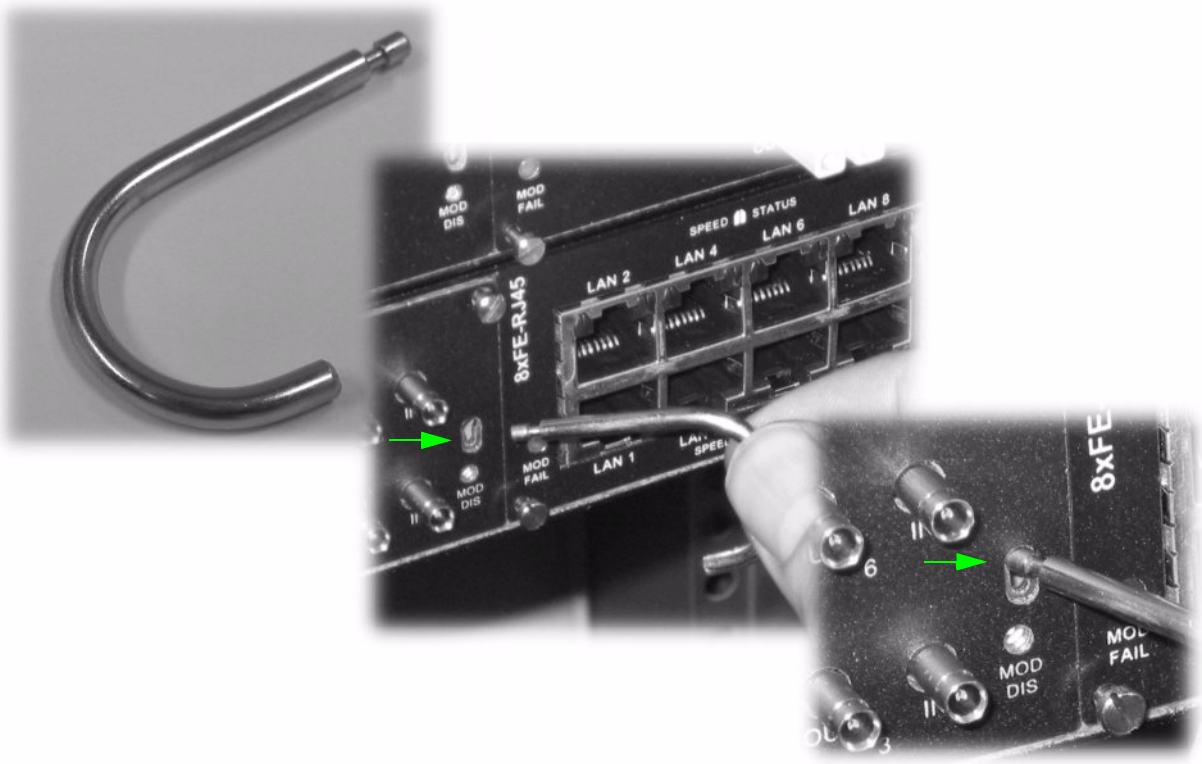


Figure 1-8. Remove module using the Card Extraction Tool

1.8 INTERCONNECTIONS AND CABLE HANDLING

1.8.1 Power cables

A power cable is provided together with the AXX155A Base Unit. The cable is optimized for use in racks but can also be used in wall mount and desktop applications.

The -48V cable connects the AXX155A to the internal -48V power-rails inside the rack. It has a mini- fit connector in one end and is not terminated in the other end. The customer must add the preferred type of connector.

The length of the power cable is 3m.

1.8.2 Alarm cable

AXXESSIT does not provide an alarm cable. The physical connector is a 9 pin DSUB. The alarm cable would typically be used to connect the AXX155A to the rack-top alarm indicators or to external alarm input sources.

1.8.3 VT-100 cable

The cable connecting the AXX155A to a workstation is delivered with the AXX155A Base Unit.

This cable has RJ-45 connector in one end and a 9 pins DSUB connector in the other end. The length of the cable is 2m.

1.8.4 LAN cables

Use shielded cables for all LAN interfaces.

NOTE! Ordinary UTP cable can be used in Management port.

1.8.5 E1 cables

The E1 interface uses standard ISDN cabling. A balun is provided if a 75-ohm interface is needed.

1.8.6 E3/T3

The Electrical interfaces for the AXX155A E3/T3 module are based on the 1.0/2.3 coax connector.

Different connectors can be obtained using patch with a 1.0/2.3 and perfer connector (BNC).

1.8.7 Management cable

UTP Cable.

1.8.8 Synchronization cable

Standard ISDN cabling.

1.8.9 AUX Port cable

Standard ISDN cabling.

1.8.10 Fibre cables

The optical interfaces for the AXX155A are based on the LC connector. In case other connector types is preferable by an operator, a patch cord can be utilized to convert physical interfaces e.g. LC-FC/PC, LC-SC/PC, LC-E2000 etc. The LC connector used in patch cords are of a 90-degree type. The cable diameter is 1.6mm.

The fibre handling should have a minimum bending radius of 30mm. It also supports a physical load of 60N.

A possible solution is shown in Figure 1-9.

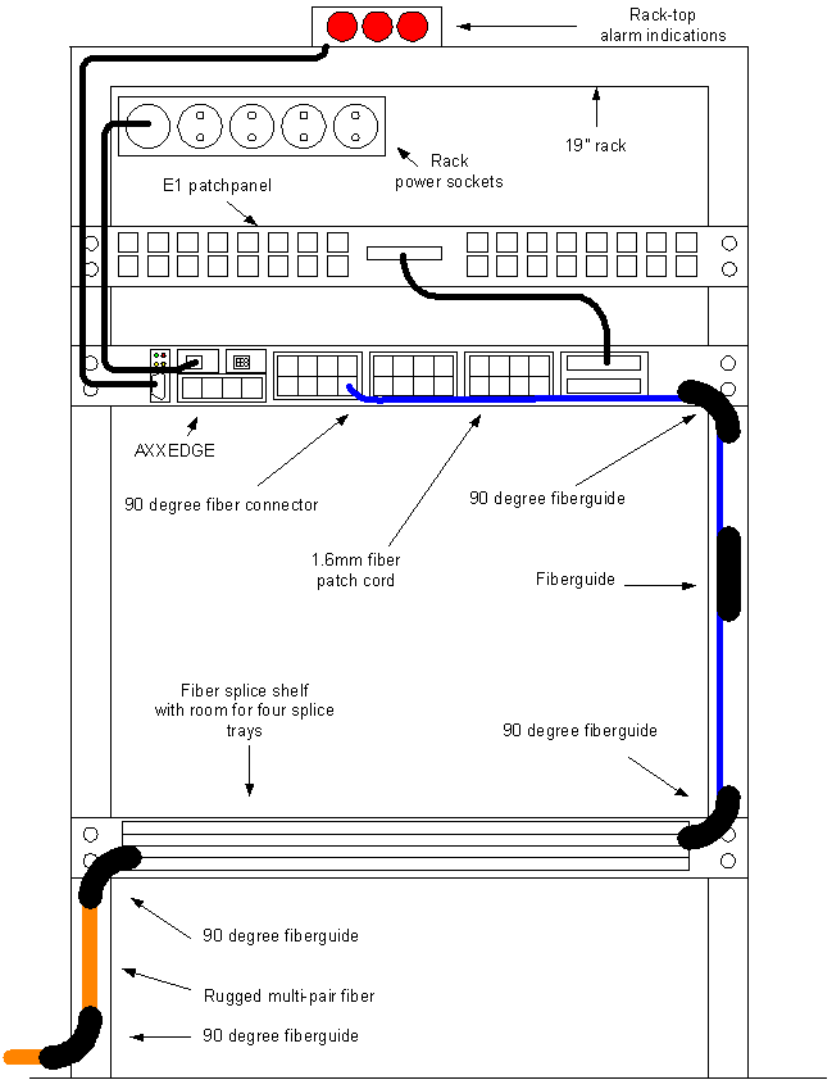


Figure 1-9. Proposed fiber handling

1.8.11 Fiber Cleaning

You will need a Cletop cleaning cassette (type A for SC connectors) to clean the fiber connectors and adapters before installing fiber. You will need a video inspection instrument (with optical adapters for LC connectors) to inspect the fiber connectors and adapters before installing fiber.

NOTE! *Clean and inspect the fiber before use to prevent equipment damage. Any dust particle will affect the optical transmission. Any damage fibers connector have to be removed immediately. Damaged fiber connectors will affect the optical transmission.*

Clean Fiber Connectors

WARNING! *Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not stare into the beam or view directly with optical instruments.*

1. Remove the dust cap from the fiber connector.
2. Inspect connector for damage or dirt with a proper inspection tool.
3. Insert the connector into the Cletop cleaning cassette slot, rotate one quarter turn, and gently swipe downwards. Repeat inspection and cleaning until satisfactory results are achieved.
4. Insert the fiber connector into the applicable adapter.
5. Place dust caps on the fiber connectors when not in use.

Clean Fiber Adapters

1. Remove the dust plug from the fiber adapter.
2. Inspect connector for damage or dirt with a proper inspection tool.
3. Insert a cleaning stick into the adapter opening.
4. Inspect results. Continue until satisfactory results are achieved.
5. Place dust plugs on the fiber adapters when not in use.

1.8.12 Install the AXX155A Fiber Cable

CAUTION! *Wear a grounding wrist strap while unpacking,handling and interconnecting the AXX155A equipment modules, to discharge any static buildup.*

To install fiber-optic cables in the AXX155A, connect a fiber cable with LC connector type to the transmit and receive ports of the transmission system. On a the AXX155A module, the transmit and receive ports are located at the back of the module. The receive port is named IN and the transmit port is named OUT.

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

WARNING! *Follow all directions and warning labels when working with optical fibers. To prevent eye damage, never look directly into a fiber or connector.*

Connect the Fiber Cable

1. Remove the dust plugs from the LC (STM-1) connectors.
2. Clean and inspect the LC jumper cable connectors.
3. Connect the LC module input and output to the customer-specified point.

1.8.13 Install the AXX155A Electrical Cable

CAUTION! *Wear a grounding wrist strap while unpacking,handling and interconnecting the AXX155A equipment modules, to discharge any static buildup.*

To install electrical-connection cables in the AXX155A, connect a electrical cable with to the corresponding ports of the transmission system. On the AXX155A module, the electrical ports are located at the back of the module.

All electrical cables are equipped with RJ-45 connectors. The alarm cable is equipped with a 9 pin D-Sub connector. AXXESSIT recommends that you label the electrical cable at each end to avoid confusion with cables that are similar in appearance.

WARNING! *Follow all directions and warning labels when working with electrical cables.*

Connect the Electrical Cables with RJ-45 Connector

1. Carefully connect the electrical cables with RJ-45 connectors to the customer-specified point.
2. Repeat Step 1 for all other electrical cables.
3. Guide the cables through the cable ties mounted on the sides of the rack. The cable ties hold the cables to the side of the rack to reduce the risk of fiber pinching.

Connect the Alarm Cable

1. Carefully connect the alarm cable to the alarm port.
2. Fix the connector with the retaining screw to the alarm port.
3. Guide the cable through the cable ties mounted on the sides of the rack. The cable ties hold the cables to the side of the rack to reduce the risk of fiber pinching.

1.8.14 LFH cables

Special cables for the high-density modules are provided for connection between the AXX155A and a patch-panel. The cable is terminated in a Molex LFH connector in one end is not terminated in the other end.

Please see “Patch panels” on page 11-7for details.

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

1.9 INITIAL CONFIGURATION

1.9.1 Introduction

Communication and access for AXX155A

Both initial and further configuration for AXX155A is described in the User Guide of AXXCRAFT or higher-level management systems within the AXXTMN product family.

Please see this chapter for instructions on how to set up the necessary communications parameters enabling access to the element through the management system over the Management Port.

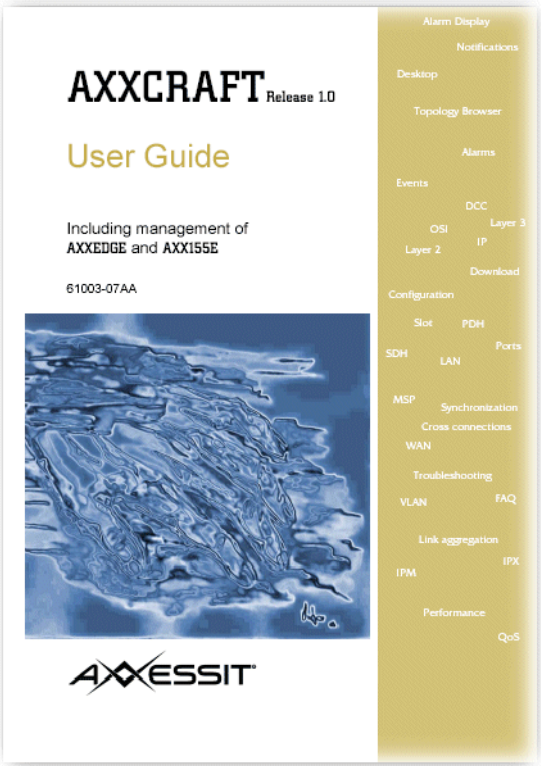


Figure 1-10. Cover page of AXXTMN User Guide- example AXXCRAFT

Feature activation

The embedded software in the AXX155A is capable of supporting all features (licensed or not licensed) finalized at the time of the release.

To activate a specific feature, the device checks whether it has the corresponding licensed right to do it. Licenses can be ordered individually for each available functionality (OSI, HW Routing). This will be a unique file for each NE, generated based on a software key bound to the serial number of each AXX155A device, and they are stored internally in each AXX155A.

Reset device

It is possible to reset (reboot) the device with or without resetting the current configuration. Reboot have minimal impact on traffic processing.

The following situations will affect Ethernet/IP traffic and require a Device reset to become operative:

- erase CDB (Ethernet/IP traffic affecting)
- erase NVRAM (Ethernet/IP traffic affecting)
- after configuration and changes of OSI(CLNP) related parameters (Ethernet/IP traffic affecting)
- when STP mode is changed e.g. from per. Device to per VLAN (Ethernet/IP traffic affecting)
- when decreasing/increasing entries in tunable tables e.g. maxARP, maxIP-forwarding, maxVLAN's, maxDHCP, maxBridge, etc.
- software upgrade without FPGA fix (Ethernet/IP traffic affecting)
- software upgrade with FPGA fix (All traffic affected)

1.10 REPAIR AND RETURN PROCEDURE

1.10.1 General

All our equipment and parts are warranted against defects in material and workmanship for a period as agreed in the order or general agreement.

All faulty parts (equipment, units, modules, boards etc.) returned must have the AXX - Service & Repair Form enclosed in printed format or sent by e-mail. Latest edition of the form can be downloaded from our web site. This requires that login for support web is provided.

The intension for this procedure is to inform and explain how Repair & Return should be handled from both yours and our side. We assume that all general terms for repair in general agreements are already well known. Typically price information for repair and contact information to your Customer Service Manager will be stated there. Following this procedure will benefit quality of response and handling by AXXESSIT.

NOTE!

The instructions above are significant to customers of AXXESSIT ASA. Other readers of this document are recommended to follow the guidelines as agreed in the order or general agreement with the supplier of the equipment.

1.10.2 Repair & Return Process

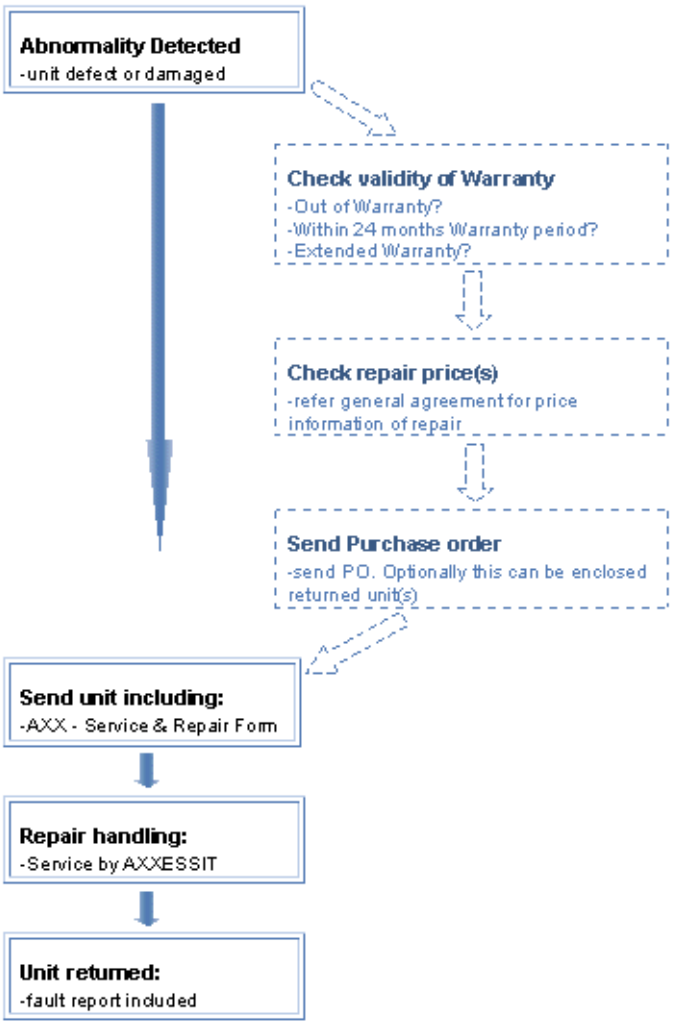


Figure 1-11. Repair & Return Process

1.10.3 Purchase Order for Out of Warranty Repair

After receiving modules, with AXX - Service & Repair Form, the unit will be registered and validity of warranty will be verified. If out of warranty we will send a quotation for the repair cost if purchase order for repair not received in advance.

No repairs will be commenced by AXXESSIT until a purchase order for the amount quoted for repair is received through the normal ordering mechanisms outlined in general agreement, which states all contact information for your Customer Service Manager in AXXESSIT.

Items received by AXXESSIT, without a completed AXX - Service & Repair Form, may be placed on hold and no repair actions will be commenced until all the above documentation is completed.

1.10.4 Packaging

When packaging the item please use anti-static bags especially when using foam chips as packing material. Please ensure that the packaging is sufficient to protect the equipment from damage during shipment. Ideally, equipment should be returned in the same packaging it was supplied in.

Any items that are received in a damaged condition, that appears to have arisen from inadequate packing, will be placed on hold until a new quote has been provided to you to cover repair of the additional damage and a purchase order is received by AXXESSIT.

2 PRODUCT OVERVIEW

AXX155A

2.1 GENERAL

The AXX155A is a traffic concentrator that supports different types of transmission media. It can be used in networks based on fibre media. The AXX155A concentrates both IP-and TDM-traffic and is able to interface to TDM backbone networks. The AXX155A maps both IP and TDM traffic into a TDM data stream.

The TDM part of the AXX155A is a cross-connect that can work as a terminal mux or as an add and drop mux.

The IP part consist of a L2/3 switch/router. It is possible to map IP traffic into TDM virtual containers.

The AXX155A is a flexible device owing to its modular design. The AXX155A consist of a chassis with a motherboard with room for up to six plug-in modules. Two of the plug-in modules are used for interface modules (One fixed aggregate module and a flexible interface module). The remaining four modules are used for two redundant power supply modules, one fan module and a system controller module.

The AXX155A is a very flexible network component that can be used in star networks and ring networks.

System Controller is part of Chassis, see “Chassis” on page 3-59.

2.1.1 Applications of the AXX155A

ADM application

The AXX155A can be used as a standard ADM with support of both TDM tributaries and IP tributaries. This is shown in the figure below.

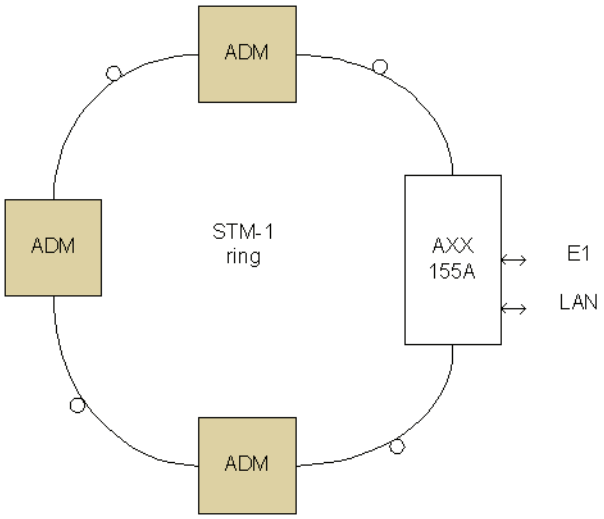


Figure 2-1. Typical ADM application on AXX155A

CPE application

The AXX155A can be used as a CPE (Customer Premises Equipment). The unit has a number of TDM interfaces (E1) and LAN interfaces (10/100Base-T). This application is typical used for large end customers or in a building with a number of smaller end customers. The AXX155A can be connected towards the backbone network via fibre. The application is shown in the figure below.

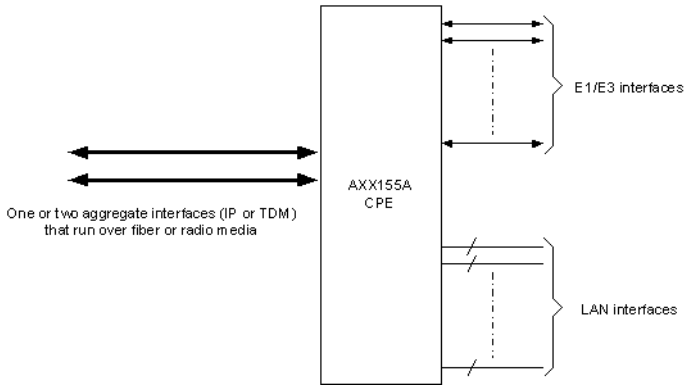
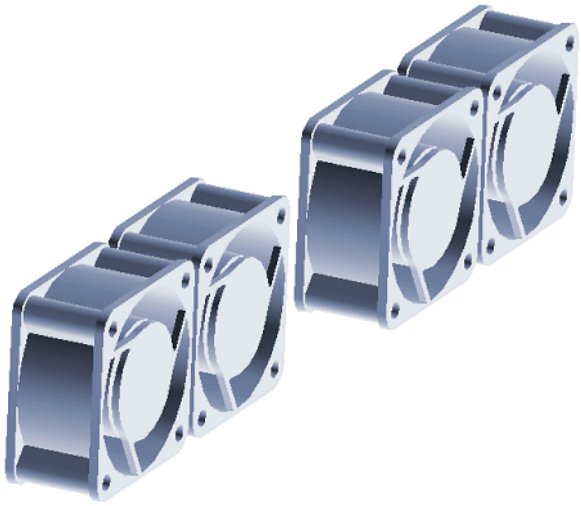


Figure 2-2. CPE application for the AXX155A

2.2 ALARM AND FAN MODULE, 4XFAN-ALARM-DSUB9

2.2.1 Introduction

The main feature of the Fan Unit is to ventilate the 19"/ 1U cabinet used for AXX155A.



The Fan Unit is a plug-in device consisting of a circuit board with 4 fans. The air is sucked in via 4 circular openings in the left sidewall, and emerges via holes in the right side cabinet wall. Four fans are used to improve reliability.

2.2.2 Protection

The Fan Unit consists of four fans. These act as 'main' and 'stand-by' fans. The 'main'/'stand-by' roles are interchanged every 24 hours. The reason is to distribute the wear of the fans evenly.

In case of an abnormal temperature rise, all fans will operate simultaneously.

2.2.3 External alarms

The AXX155A provides facilities to report 4 auxiliary alarm inputs for associated equipment, e.g. power module failure, battery condition, open cabinet door etc.

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

Please see “Auxiliary interface” on page 4-6.

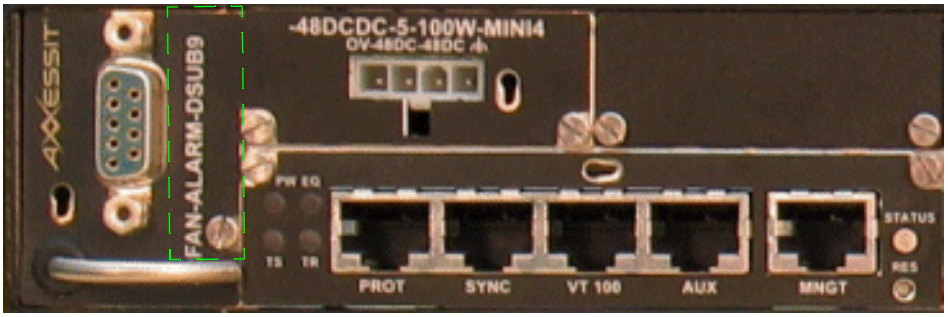


Figure 2-3. AXX155A - Location of Alarm and fan module

2.2.4 State-diagram for the fans

The fans operate in pairs; there are two standby fans and two main fans. The maximum temperature measured in the AXX155A controls the fans. The only modules not containing temperature sensing are the fan unit itself, the power modules and the system controller card. The fan module functions as shown below:

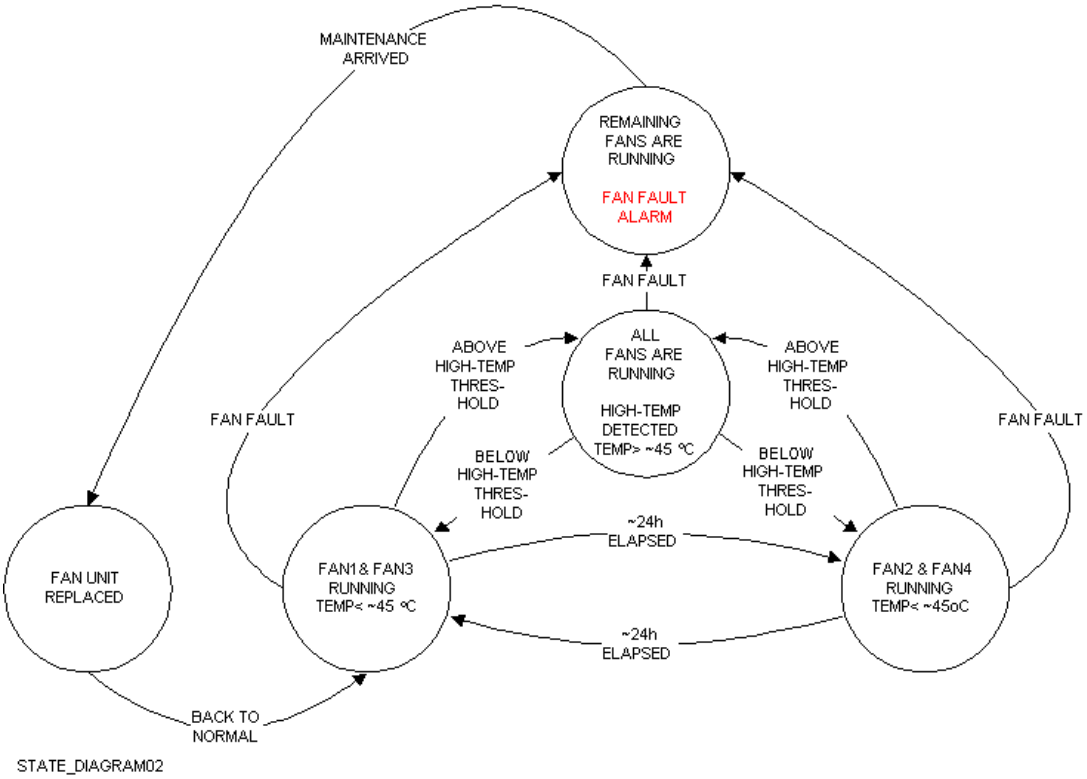


Figure 2-4. State-diagram for the fans.

The FAN module is connected to the main card through the back plane.

The O_TEMP_ALM alarm is detected on the maincard when temperature rises above 85 ^{o}C. The alarm, specific for each fan, is processed and presented “Fan Failure Alarm”.

2.3 POWER MODULE, 48DCDC

- -48 V DCDC-5-100W-MINI-4 supply

2.3.1 Introduction

The main feature of the power module is to convert and isolate primary power, 48V, to 5,25 volts for the modules in the product.

The module has features that allow power sharing and hot plugging.

The module has separate alarms for 2 independent primary supplies (< 40 volts) and alarm for the secondary output (< 4,65 volts). The secondary is short circuit proof and the average s.c. current is less than 1 amp. The maximum secondary current is limited to ab. 26 amps.

The cable connects the AXX155A to the internal 48V power-rails inside the rack. The cable and the power-supply meets the safety requirements from the EN 60950 specification.

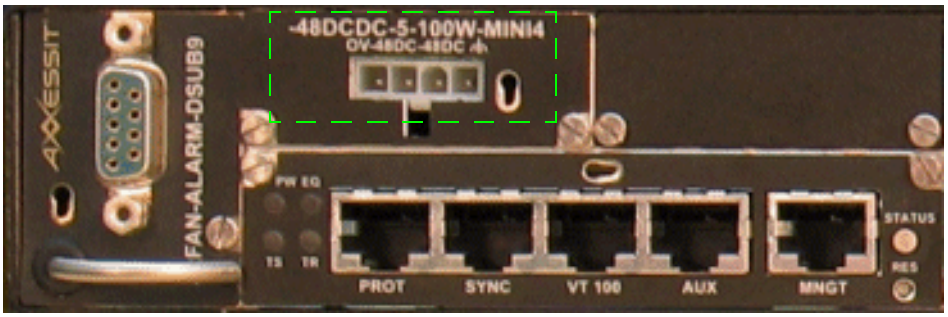


Figure 2-5. AXX155A - Location of DC power module

Please see “Power Interface” on page 4-2

2.3.2 Technical Overview DC/DC

General DC/DC

The -48V DC Power supply covers the -40,5 Vdc to -57Vdc range, also referred to as -48Vdc.

The module generates +5.25Vdc, all other voltages necessary are generated on each module.

If using two power modules, the current sharing between the two modules is between 40% and 60%.

2.4 POWER MODULE, AC 230V

- 230ACDC-5-75W

The cable and the power supply meets the safety requirements from the EN 60950 specification.

Please see “Power Interface” on page 4-2

2.4.1 Introduction

This module contains a 75W AC/DC converter that converts the input voltage from 230V to +5.5V. The module disconnects the output voltage and activates an alarm if the output voltage is outside the specified tolerance (Higher than 6V or less that 5V). The module also limits the maximum output current to 11A.

Two modules is able to share the output current and the current sharing is between 40 and 60%.

The module contains no power-factor correction functionality on the input.

The cable connects the AXX155A to the internal 230V power-sockets rails inside the rack or to external mains sockets.

2.4.2 Power Supply Input

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

2.4.3 Power Supply Output

The AC 230V module can provide 75 W to the AXX155A unit.

See Table 2.1. Power Consumption - AXX155A modules.

Power consumption - AXX155A modules

Module Type and Name	Power Consumption (W)
AXX155A Base Unit	20
“Dual Optical S-1.1 Module 2xS-1.1-LC”	9
“Dual Optical L-1.2 Module 2xL-1.2-LC”	10
“Dual Optical Module 2xS-1.1-LC+21xE1-LFH”	15
“Dual Optical Module 2xL-1.2-LC+21xE1-LFH”	15
“Octal E1 Tributary Module 8xE1-RJ45”	3,5
“High Density 63xE1 Module 63xE1-LFH”	21
“Tri E3/T3 Tributary Module 21xE1+3xE3/T3-1.0/2.3”	14
“Tri E3/T3 Tributary Module 3xE3/T3-1.0/2.3”	11
“Hex E3/T3 Tributary Module 6xE3/T3-1.0/2.3”	11
“Quad LAN 10/100Base-TX Module 4xFE/MAP-RJ45”	9
“Octal LAN 10/100Base-TX Mapper 8xFE-16xSMAP-RJ45”	27,5

Table 2.1. Power Consumption - AXX155A modules

2.5 SERVICE MODULES

This section describes the standardized blocks for the Service modules.

2.5.1 Introduction

The plug-in modules support a number of different external interfaces and different transmission media's. The internal interface with the main card is identical for all Service modules.

Please see Table 1.3. List of available service modules to AXX155A

2.5.2 Common Functions

Memory

All modules stores inventory data in non-volatile memory, e^2prom.

FPGA configuration

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

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

Processor interface

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

DCC

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

G.Link

All modules with IP switching capability are interconnected with a highspeed link, to a central switch on the main board. The link is called G-link.

TDM

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

All modules with IP switching capability are interconnected with a highspeed link, to a central switch on the main board. All modules with TDM-functonality are connected to the cross-connect on the main board.

3 FEATURES

AXX155A

3.1 SDH FEATURES

3.1.1 Multiplexing structure and Mapping modes

The AXX155A complies with the basic multiplexing principles outlined in Clause 6 in ITU-T G.707 and ETSI EN 300147 clause 4.

The AXX155A supports the multiplexing structure outlined in Figure 3-1. This is a subset of the possible multiplexing structures defined in ITU-T G.707 clause 6 and ETSI EN 300 147 clause 4.

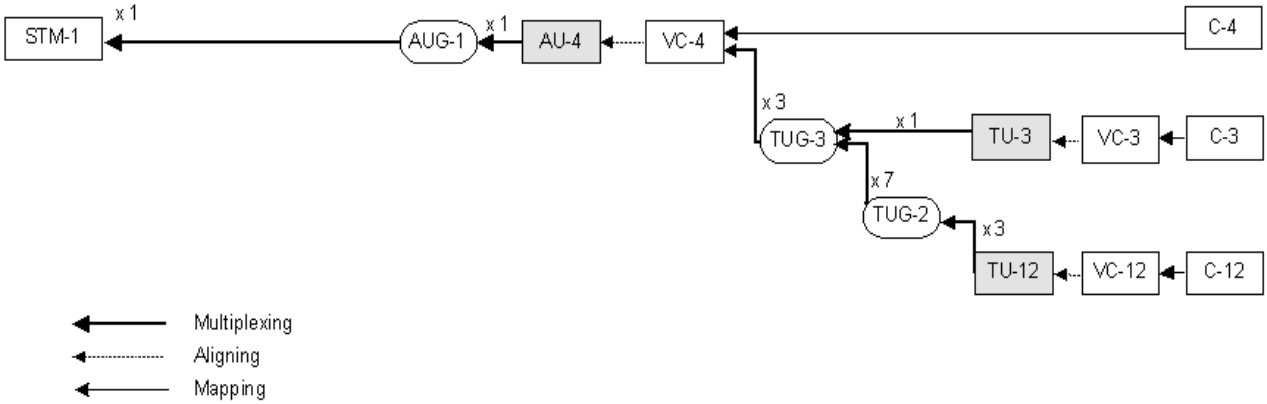


Figure 3-1. Multiplexing/ mapping structure

The AXX155A complies with the multiplexing methods outlined in clause 7 in ITU-T G.707 and ETSI EN 300 147 clause 5 for the supported multiplexing structures.

3.1.2 Mapping of tributaries into VC-n

Asynchronous mapping of 44 736 kbps

The AXX155A supports asynchronous mapping of 44 736 Kbps signal into a VC-3 container as shown in Figure 3-2. The mapping is in accordance to ITU-T G.707 clause 10.1.2.1 and ETSI EN 300 147 Clause 8.

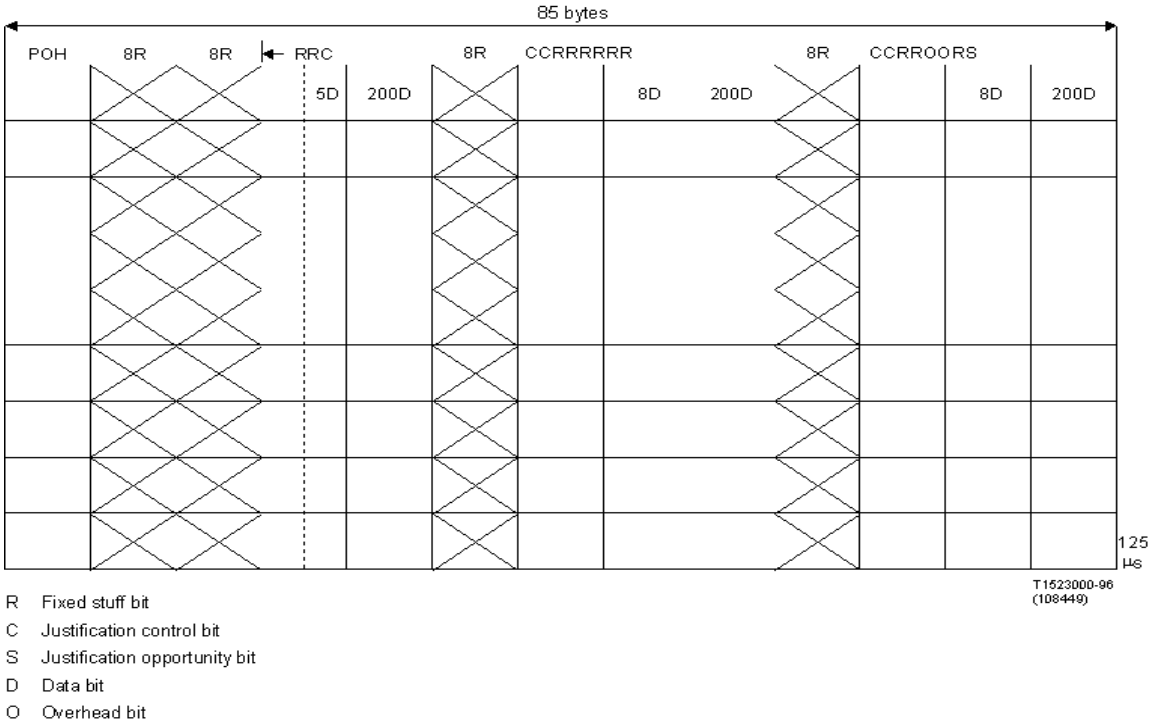


Figure 3-2. Asynchronous mapping of 44 736 kbps tributary into VC-3

Asynchronous mapping of 34 368 kbps

The AXX155A supports asynchronous mapping of 34 368 kbps signal into a VC-3 container as shown in Figure 3-3. The mapping is in accordance to ITU-T G.707 clause 10.1.2.2 and ETSI EN 300 147 Clause 8

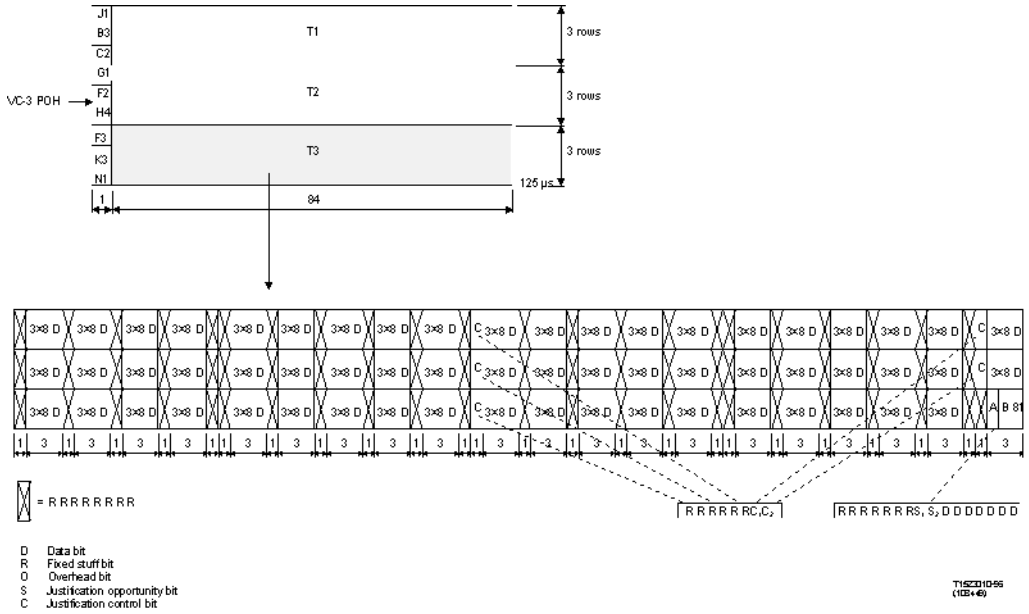


Figure 3-3. Asynchronous mapping of 34 368 kbps tributary into VC-3

Asynchronous mapping of 2048kbps

The AXX155A supports asynchronous mapping of 2048kbps signal into a VC-12 container as shown in Figure 3-4. The mapping is in accordance to ITU-T G.707 clause 10.1.4.1 and ETSI EN 300 147 Clause 8.

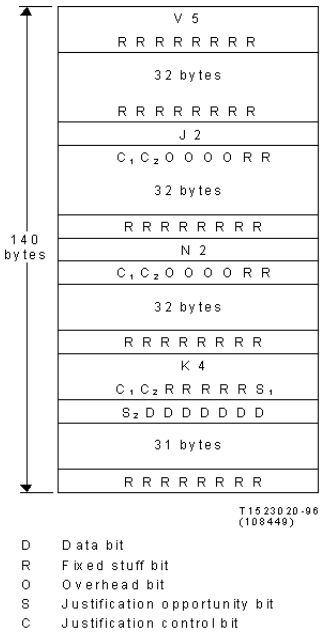


Figure 3-4. Asynchronous mapping 2048 kbps tributary into VC-12

Mapping of GFP frames

The AXX155A supports the generic framing procedure (GFP) to encapsulate variable length payload of various client signals for subsequent transport over SDH networks as defined in ITU-T G.707. The AXX155A supports mapping of a GFP frame stream into a Container-n (n=12,3,4 or 12/3/4-Xv) as shown in Figure 3-5. The mapping is in accordance to ITU-T G.707 clause 10.6.

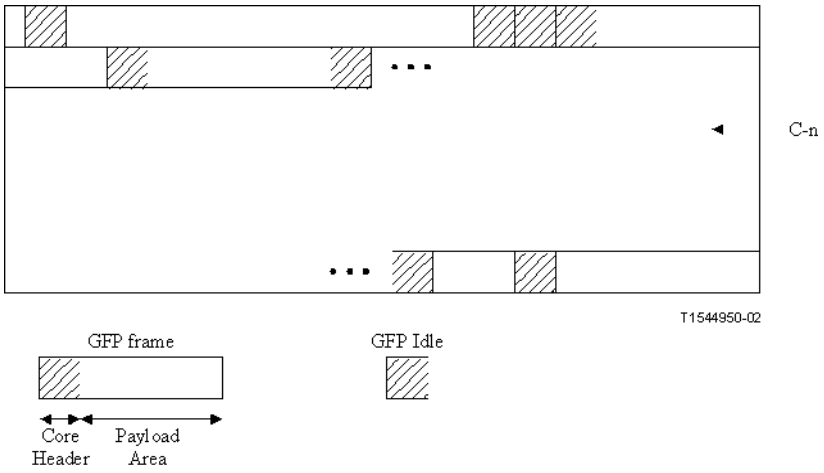


Figure 3-5. Mapping of GFP frames into C-n

AXXESSIT proprietary mapping of HDLC frames

The AXX155A provides a proprietary mapping scheme for mapping of HDLC encapsulated Ethernet frames traffic into C-12 containers. The proprietary mapping scheme used to map the data into a C-12 container is described in Figure 6.

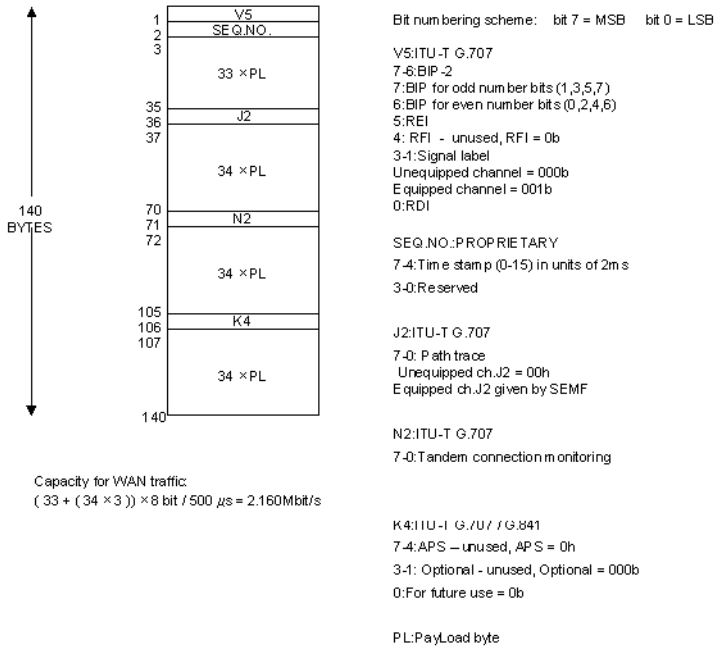


Figure 3-6. proprietary mapping of HDLC frames

STM-N Physical layer

The AXX155A offers the following physical interfaces:

- Optical STM-1 interfaces
- S1.1
- L1.2

The AXX155A implements the supported Physical layer functions in accordance to ITU-T G.783 clause 9.

A detailed specification of each physical interface is given in the chapter “Physical Interfaces.”

STM-N Regenerator and Multiplex Section layer

The AXX155A implements the STM-1 Regenerator and Multiplex Section layer functions in accordance to ITU-T G.783 clause 10 and 11.

SOH implementation

The AXX155A complies with the SOH implementation methods outlined in clause 9 in ITU-T G.707 and ETSI EN 300 147 clause 7. The assignment of the STM-1 SOH is outlined in Figure 3-7.

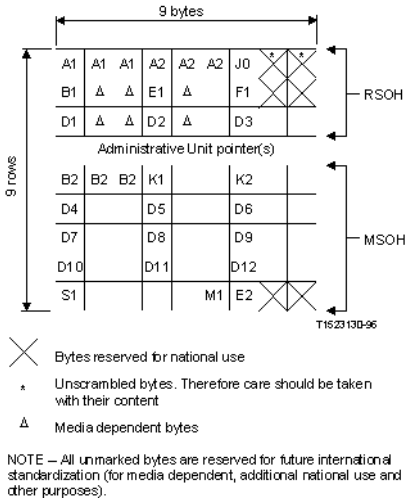


Figure 3-7. SOH-overhead bytes

The AXX155A supports all the SOH bytes as described in ITU-T G.707 Clause 9.2, with the following exceptions:

VC-n/m Path layer

The AXX155A offers the support of the following payloads:

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

The AXX155A implements the supported Path layer functions in accordance to ITU-T G.783 clause 12 for VC-n, where n=4, 3-X, 3.

The AXX155A implements the supported Path layer functions in accordance to ITU-T G.783 clause 13 for VC-m, where m=12-X, 12.

VC-4/VC-3 POH implementation

The AXX155A complies with the POH implementation methods outlined in clause 9 in ITU-T G.707 and ETSI EN 300 147 clause 7. The assignment of the VC-4 POH is outlined in Figure 8.

The AXX155A supports all the VC-4/VC-3 POH bytes as described in ITU-T G.707 Clause 9.3.1, with the following exceptions:

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

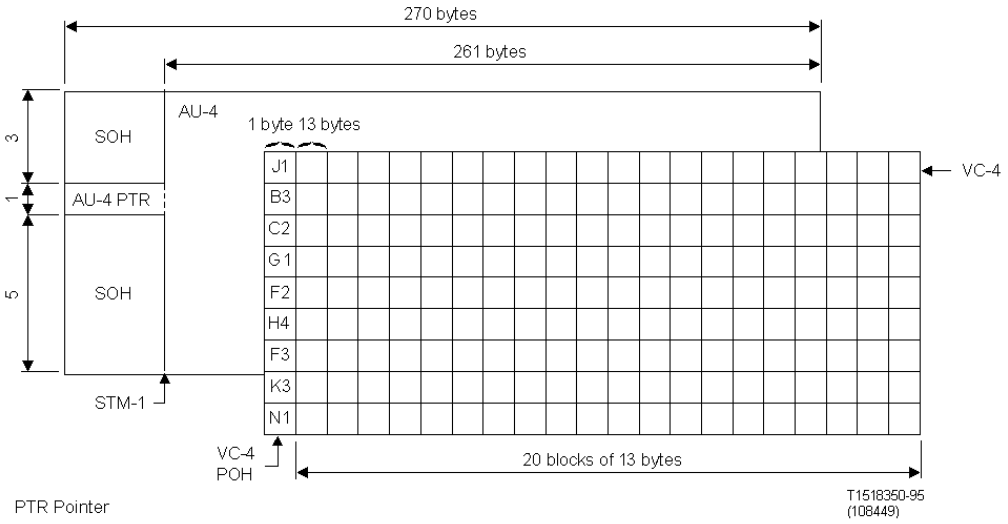


Figure 3-8. VC-4 POH

VC-2/VC-1 POH implementation

The AXX155A complies with the POH implementation methods outlined in clause 9 in ITU-T G.707 and ETSI EN 300 147 clause 7. The assignment of the VC-12 POH is outlined in Figure 3-9.

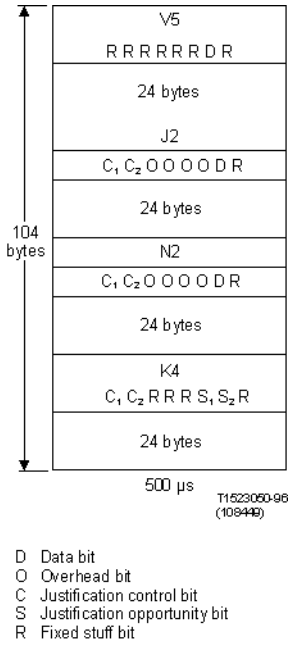


Figure 3-9. VC-12 POH

The AXX155A supports all the VC-2/VC-1 POH bytes as described in ITU-T G.707 Clause 9.3.1, with the following exceptions:

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

3.1.3 Cross-connect

The AXX155A implements a full non-blocking 8x8 STM1 cross connect with VC12, VC-3 and VC-4 granularity.

The following cross connect types are supported:

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

3.1.4 Concatenation schemes

Virtual concatenation

AXX155A supports virtual concatenation and the following VC-n-Xv are supported:

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

The AXX155A implements the supported VC-4-Xv and VC-3-Xv functionality in accordance to ITU-T G.707 clause 11.2 and ETSI EN 300 147 Clause 9.

The AXX155A implements the supported VC-12-Xv functionality in accordance to ITU-T G.707 clause 11.4 and ETSI EN 300 147 Clause 9.

Virtual concatenation is supported in conjunction with Ethernet Over SDH (EOS) mapping and is module dependent. The EOS mapping is described on page 3-17.

3.1.5 Protection

AXX155A offers the following different protection schemes:

- 1+1 MSP protection
- SNC protection

3.1.6 1+1 linear MSP

AXX155A offers 1+1 linear Multiplex Section Protection (MSP) on all optical STM-1 interfaces.

The following rule applies for the 1+1 MSP protection:

- Protection can only be enabled between two ports of the same STM-1 type

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

- Enabled/disabled
- Mode, unidirectional or bi-directional
- Operation Type, revertive or non-revertive

- WTR time (Wait to restore time), configurable from 0-15minutes, default 5 minutes

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

SNC Protection

AXX155A supports two types of SNC protection, SNC/I (Sub Network Connection protection with Inherent monitoring) and SNC/N (Sub Network Connection protection with non-intrusive monitoring). SNC is supported for the following objects:

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

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

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

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

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

3.1.7 Performance monitoring

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

- Errored second (ES) A one second period with one or more errored blocks or at least one defect.

- Severely errored second (SES) A one second period which contains >= 30% errored blocks or at least one defect
- Background block error (BBE) An errored block not occurring as a part of an SES
- Unavailable seconds (UAS) A period of unavailable time begins at the onset of ten consecutive SES events. These ten seconds are considered to be part of unavailable time. A new period of available time begins at the onset of 10 consecutive non-SES events. These ten seconds are considered to be part of available time. UAS is the number of second of unavailable time.

Regenerator and multiplex section performance monitoring

AXX155A offers full performance monitoring on regenerator and multiplex sections according to G.829.

The following parameters are calculated:

- ES
- SES
- BBE
- UAS

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

The available time periods are:

- 15 minutes
- 24 hours

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

- 16x15 minute
- 1x24 hours

AXX155A calculates excessive error and degrade signal defects assuming Poisson distribution of errors, according to ITU-T G.826.

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

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

Path performance monitoring

AXX155A offers full performance monitoring on the SDH path level according to G.828, the following objects are supported:

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

The following parameters are calculated:

- ES
- SES
- BBE
- UAS

Both near end and far end data are presented.

The available time periods are:

- 15 minutes
- 24 hours

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

- 16x15 minute
- 1x24 hours

AXX155A calculates excessive error and degrade signal defects assuming Poisson distribution of errors, according to ITU-T G.826.

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

The degraded signal defect (dDEG) is detected if the equivalent BER exceeds a pre-set threshold of 10E-X, where x=6, 7, 8 or 9. The dDEG is cleared if the equivalent BER is better than 10E-(X+1), according to ITU-T

G.806.The threshold is individually configurable for the different objects, from 10E-6 to 10E-9.

Intermediate path performance monitoring

AXX155A supports IPPM (Intermediate Path Performance monitoring) functions on the following objects:

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

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

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

The following parameters are calculated:

- ES
- SES
- BBE
- UAS

Both near end and far end data are presented.

The available time periods are:

- 15 minutes
- 24 hours

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

- 16x15 minute
- 1x24 hours

AXX155A calculates excessive error and degrade signal defects assuming Poisson distribution of errors, according to ITU-T G.826.

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

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

The number of simultaneous probes supported in the system is 63.

SNC Performance Parameters

AXX155A implements the following SNC Performance Parameters:

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

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

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

MSP 1+1 parameters

AXX155A implements the following MSP 1+1 Performance Parameters:

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

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

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

3.1.8 Pointer justification performance parameters

AXX155A offers pointer justification performance parameters, PJE for the following object:

- AU-4

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

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

3.1.9 Synchronization

The AXX155A offers synchronization from a range of different interfaces.

In addition to the module interfaces it is possible to synchronize from a 2MHz synchronization input source on the controller module. The interface is according to ITU-T G.703 (for further detail see Chapter , “Physical Interfaces.”). The AXX155A also offers a synchronization output port in the same connector, according to ITU-T G703.

The different interfaces allowed for synchronization are listed below.

Synchronization sources:

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

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

The AXX155A offers a list of 5 possible synchronization sources for the T0, selection of the sync source is based upon the quality level.

The AXX155A supports SSM messaging on the STM-N interfaces, this is not supported on the E1 interface.

3.2 ETHERNET OVER SDH MAPPING

AXX155A supports two different modes of Ethernet over SDH (EOS) mapping:

1. AXXESSIT proprietary mapping, see “AXXESSIT proprietary mapping” on page 3-17, combined with inverse multiplexing at VC-12 level
2. GFP-F mapping, see “Mapping of GFP frames.”, combined with VCAT, at VC-12, VC-3 and VC-4 level, and LCAS

The support of the different EOS modes are module dependent.

The following modules are supporting mode 1:

- Quad LAN 10/100Base-TX module with mapper circuit (4xFE-4xMAP-RJ45)
- Octal LAN 10/100Base-TX module with standard mapper circuits (8xFE-8xSMAP-RJ45)

The following modules are supporting mode 2:

- Octal LAN 10/100Base-TX module with standard mapper circuits (8xFE-8xSMAP-RJ45)

3.2.1 AXXESSIT proprietary mapping

The AXX155A provides a proprietary mapping scheme for mapping of Ethernet traffic into a number of VC-12 containers.

The HDLC encapsulated Ethernet frames are mapped into a number of VC-12 containers in a round-robin fashion with an inverse multiplexer function.

A total differential delay of up to 8ms is supported

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

The VC-12 k.l.m reference assignment for the Ethernet WAN port is fully flexible, and controlled in the same way as a VC-12 cross connect.

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

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

3.2.2 Standardised mapping

AXX155A supports standardised ways of mapping Ethernet over SDH. The mapping schemes include mapping protocol, concatenation scheme and control protocols.

GPF

GFP General requirements

AXX155A supports framed mapped GFP (GFP-F) according to ITU-T 7041.The GFP implementation supports the following functions:

- The implementation only supports GFP null extension header
- Client data frames is supported
- Client management frames is supported
- For control frames, the implementation only supports GFP idle frames insertion and processing, other unspecified control frames are dropped
- Standard GFP scrambling is supported, with the polynomial 1+x43
- The implementation supports the optional data FCS insertion and checking via the PFI bit
- The implementation supports frame sizes from 9 bytes up to 64kbytes (only sizes from 64 bytes to 9k bytes are applicable for this implementation)

The mapping of GFP frames in VC-x containers are described in “Mapping of GFP frames” on page 3-5

GFP Alarm and Event Conditions

The GFP implementation supports the following alarm and event conditions:

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

- Extension Header Mismatch, EXM
  - Alarm based on detection of EXI field value in ITU-T G.7041

GFP Performance Monitoring

The GFP implementation collects the following performance parameters:

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

A degrade alarm is available for the following performance parameters:

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

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

VCAT and LCAS

VCAT and LCAS General requirements

AXX155A supports virtual concatenation according to ITU-T 707, the support of VCAT is dependent on module type. The VCAT implementation supports the following functions:

- FE (Fast Ethernet) mapper interface
  - VC-12-nV, where n=1..5
  - VC-3-nV, where n=1..3
  - VC-4-nV, where n=1

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

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

AXX155A supports the LCAS protocol in conjunction with VCAT as defined in ITU-T 7042. The LCAS protocol implemented covers the following functions:

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

VCAT and LCAS

VCAT and LCAS configuration modes

The AXX155A offers two different operation modes for the VCAT and LCAS functionality:

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

Mode 1:

VCAT with LCAS enabled is always uni-directional, which enables the possibility to have different capacity in each direction, but requires a separate cross connect/capacity setup in each direction. The connections will however very often be bi-directional, and to reduce the number of configuration steps it is possible to enable the following parameter:

- Symmetric capacity

If symmetric capacity is enabled the VCG group is automatically set up with the same capacity in each direction, but the symmetric capacity will consist of two uni-directional connections. With the symmetric mode disabled, the capacity of the VCG group will need to be configured separately in each direction.

Mode 2:

When VCAT is used without LCAS, there is no mechanism for removing a faulty VC container in a VCG group. To solve this problem the AXX155A implement a proprietary mode in addition to the standard mode.

The following configuration is available in mode 2:

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

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

This configuration mode is proprietary.

VCAT and LCAS Alarm and Event Conditions

The following alarms related to the VCAT and LCAS are reported by default:

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

In addition to the above default alarms, the following alarms are available if enabled from the management system:

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

3.3 PDH FEATURES

3.3.1 E1 features

General information

AXX155A supports a number of E1 interfaces that is mapped into SDH VC-12 containers. The SDH mapping features is described in the SDH features chapter.

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

The E1 interfaces provides a number of different services as shown below:

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

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

Transparent leased line

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

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

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

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

ISDN Primary rate access

Basic Configuration

ISDN Primary rate access (PRA) is used to provide ISDN access for the end customers of an operator. A block diagram describing the digital line section for PRA is shown in the figure below.

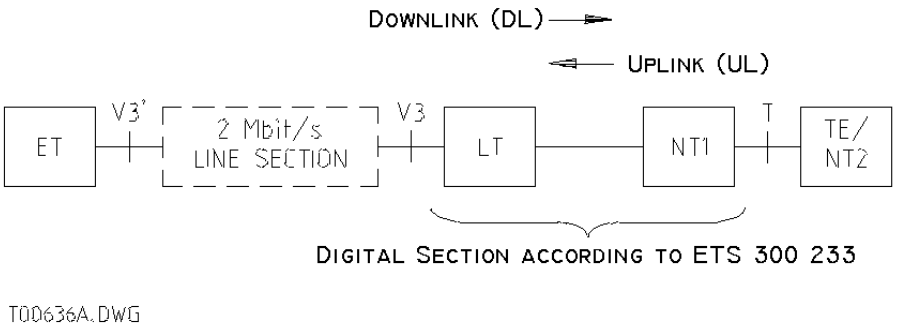


Figure 3-10. digital line section for PRA

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

The interfaces related to the transmission between LT and NT1 are not specified, neither the transmission medium.

- Transmission rate at V3 (V3`) and T is 2.048 kbps +/- 50 ppm with independent clocks for two directions of transmission
- Transmission format is according to G.704 and electrical interface according to G. 703 120 ohm balanced T interface.

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

The LT has no function related to supervision of transmission quality. Note that no LT1 functionality is implemented in AXX155A.

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

- CRC-4 errors are detected and reported for the ET-NT1 CRC-4 segment using E-bits.
- CRC-4 errors are detected and reported for the NT1-TE CRC-4 segment using Sa6 codes.

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

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

ISDN PRA with fixed timing

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

3.3.2 E3/T3 features

General information

AXX155A supports a number of E3/T3 interfaces that is mapped into SDH VC-3 containers. The SDH mapping features is described in “SDH features” on page 3-2.

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

The E3/T3 interfaces provide services as shown below:

- E3 Transparent leased line
- T3 Transparent leased line

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

E3 transparent leased line

The transparent or unstructured leased line service delivers a full digital bit rate of 34.368 Mbps with no restriction on the binary content.

The service is symmetrical in both directions and supports point-to-point connections only.

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

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

T3 transparent leased line

The transparent or unstructured leased line service delivers a full digital bit rate of 44.736 Mbps with no restriction on the binary content.

The service is symmetrical in both directions and supports point-to-point connections only.

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

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

Loopbacks

Two types of loopbacks are supported for the interface;

- Customer Loop (LL3)
- Network loop (LL2).

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

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

The loops can be activated from the craft terminal or from the TMN system.

For E1 tributary configured in ISDN PRA mode loopbacks are set inband.

3.4 IP FEATURES

3.4.1 General

The AXX155A supports Ethernet L1, L2 bridging, L2 Provider Bridging Functionality and HW based L3 routing.

The Ethernet L1 functionality is supported dependent on equipped module type(s) and the port configuration. See individual module description for more info.

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

HW based routing is dependent of a license file downloaded, otherwise only SW based routing for management connectivity is supported. The license file to enable HW based routing is unique per device.

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

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

FE LAN (10/100 Base-Tx) user ports

FE WAN ports, connected to an EOS mapper circuit

The filtering rate of the bridge is able to operate at full wire speed. The forwarding rate is only limited by the forwarding interface speed.

3.4.2 Ethernet L1

The Ethernet L1 is Ethernet mapped over SDH, with the mapping types described in “Ethernet over SDH mapping” on page 3-17

The functionality supported on a LAN port configured to L1 mode:

- Auto negotiation (speed/duplex)
- Fixed Ethernet Port settings i.e. 10/100 half/full duplex
- Auto MDI/MDIX, Ethernet FE interfaces
- RMON counters
- Back pressure and flow control Handling
- IEEE 802.1p priorities (Strict Policy, 4 queues) support

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

The Q in Q/VLAN tunnelling and Protocol tunnelling features are described in more detail in 3.4.4. The reason for offering such features on an Ethernet L1 connection is related to the possibility of interconnection of Ethernet L1 and L2 connections, a typically scenario would be grooming of several L1 connections in an AXX155A offering L2 functionality

3.4.3 L2 Bridging

The bridge is a transparent multi-port remote Ethernet bridge as specified in IEEE 802.3. The AXX155A supports standard bridging functionality, in addition it also supports provider bridge functionality. All modules/ports support standard bridging functionality, the following modules also support the provider bridge functionality:

- Octal LAN 10/100Base-TX module with standard mapper circuits (8xFE-8xSMAP-RJ45)

The standard bridging functionality includes the following features:

- MAC switching
- Static MAC entries
- Support of up to 32k MAC addresses
- Automatic Learning & Ageing for MAC addresses
- Auto negotiation (speed/duplex)
- Fixed Ethernet Port settings i.e. 10/100/1000 half/full duplex
- Auto MDI/MDIX, Ethernet FE/GE interfaces
- MAC Multicast
- Transparent Bridging
- VLAN by Port and VLAN by Port and Protocol
- Full IEEE 802.1Q VLAN tagging compliance, limited to 4000 VLANs.

- Head of Line Blocking prevention
- Back pressure and flow control Handling
- IGMP snooping
- Rapid Spanning Tree Protocol per device (RSTP)
- Mirroring Port
- IEEE 802.1p priorities (Strict Policy, 4 queues)
- GARP VLAN registration protocol (GVRP)
- MTU Size 6144 bytes

The filtering rate of the bridge is able to operate at full wire speed. For FE-modules the maximum pps is 148 kpps for 64 byte packet size.

3.4.4 L2 Provider Bridging functionality

In addition to the standard L2 functionality the following Provider Bridge functionality is supported on the specific modules listed under chapter 3.4.3:

- Tag insertion/removal for Q in Q/ VLAN tunnelling support with the following options:
  -Vid configuration

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

The offering of Q in Q/VLAN tunnelling and protocol tunnelling enables the user to offer transparent Ethernet services in a L2 network with guaranteed security, also called L2 VPN's. The functionality is enabled at the ingress and egress ports in the network, and therefore only supported on LAN ports in the AXX155A. The functionality is individually configurable on a pr. port basis.

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

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

3.4.5 L3 Routing

The AXX155A can be configured as a multi-port router. The router is able to route both IPv4 and IPX traffic.

Parts of the IP-routing functionality in AXX155A are supported even if there is no routing license downloaded to the device. In this case the routing will be performed by CPU and mainly intended for management purpose.

The router supports the following IP features:

- IP Routing *
- IP Redundancy Protocol (Proprietary)
- Address Resolution Protocol (ARP) *
- ARP proxy *
- Internet control message protocol (ICMP) Messages *
- Static IP routes *
- Routing information protocol (RIP) versions I and II *
- RIP subnet filtering *
- Open shortest path first (OSPF) version 2 *
- User datagram protocol (UDP) Relay *
- IP Multicast Routing - PIM Dense Mode
- Internet Group Management Protocol IGMPv2 support

* This feature is included both for SW and HW based routing.

The router has the following IPX features:

- IPX route and socket filters
- RIP and IPX Server Advertisement Protocol (SAP) filters
- Variable RIP and SAP timers
- IPX Get Nearest Server (GNS)
- Novell NetBIOS type 20 propagation support

The filtering rate of the router is able to operate at full wire speed. For FE-modules the maximum pps is 148 kpps for 64 byte packet size.

3.4.6 QOS

The QOS features can be used to allocate bandwidth for users or applications at layer 2 and layer 3.

The AXX155A performs the following functions:

- Classification: Identifying which packet get which treatment
- Metering: Measuring a flow of packets to see if it conforms to desired measurement
- Policing: Taking actions on frames according to whether they conform or not

Traffic shaping is not performed by the AXX155A.

The AXX155A allows the operator full control of each element of the packet/frame handling.

The QOS implementation supports several profile types, where each profile defines the nature of handling applied to frames belonging to that profile (e.g. amount of BW to be provided). A Classifier is a definition of which parts of the frames contents should be used to decide which frame belongs to which profile (e.g. which header bytes are of interest). Rules within each profile detail for each frame with a specific combination of values in the "interesting" bytes, which actions to take.

The following profiles are possible:

- Reserved Bandwidth allocation ("BW guarantee")
  - A specific amount of Bandwidth is reserved for this profile. Traffic will not be allowed to go above this limit.
- Minimum BW guarantee
  - A specific amount of Bandwidth is reserved for this profile, but traffic may use more than the reserved amount, if available, at the best-effort service class.
- Reserved Bandwidth with Minimum Delay Guarantee
  - Traffic in this profile has reserved bandwidth, as explained above, and in addition is forwarded with minimum delay (i.e. sent before traffic belonging to one of the above profiles).
- Reserved Bandwidth with Minimum Delay Guarantee per session
  - Traffic in this profile is composed of a number of Sessions (identified by appropriate classifiers) with each one getting a specified Bandwidth reservation, as defined above, and with traffic for this profile being forwarded with the minimum delay, as explained above.

The two Minimum Delay Guarantee options are only available for Layer 3 (IP) QoS.

The following classifiers are possible:

- For each protocol supported (IP and Bridging) the user should define which header fields are of interest. Each such group of bytes is a classifier.
- Using the Policy MIB the user may specify fields in a general manner, using their offset. Using the Simple MIB, pre-defined possibilities cover the standard header fields of each protocol (e.g. Addresses, Ports, etc).
- In IP the predefined fields are: Source/Destination Addresses and ports, Protocol (TCP/UDP), TOS type.
- For Layer 2 switching, predefined fields are Input Port only.

The following rules are possible:

- After classifiers and profiles are defined, the user uses them to define rules by which frames/packets are assigned to one of the profiles defined, and the actions to be carried out on matching frames/packets.
- Each rule contains a pattern to match (values to match in the fields of interest in the classifier) and action definitions. Actions possible are:
  - Assign to a profile
  - Modifications to frame/packet fields (e.g. re-writing DSCP for IP packets, New VPT for bridged traffic, etc.)
  - Forward, drop, or send to the CPU etc.

3.4.7 DHCP

DHCP is used to provide IP addresses to end nodes. This feature is only supported when L3 license loaded.

It is able to support up to 2679 clients.

The router also provides DHCP relay functions.

3.4.8 BootP

BootP Client is an option to automatically get an IP address and configuration-file from a BootP server during power up. This feature is independent of licenses loaded

The router is also able to provide BootP relay functions.

3.5 DCN FEATURES

3.5.1 Introduction

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

The AXX155A management solution is based on SNMP over IP. The main purpose of the DCN implementation is to provide connectivity to the SNMP Agent inside the AXX155A via different DCN topologies. The DCN implementation however, also supports transport of management traffic between other AXXESSIT or third party nodes.

Although the management application is IP-based, the DCN solution must also support OSI-only and mixed IP/OSI-networks at layer 2 and 3. The various options and features related to different DCN topologies are specified throughout this section.

In general, the term "OSI" in this document is used to denote a CLNP-routed network, i.e. it is only used for L3. Higher level OSI-protocols are not considered. At L2 different protocols are supported, including LAP-D. The AXX155A OSI-implementation supports CLNP, IS-IS Level 1 and Level 2 and ES-IS.

For the "IP In-band" L2 topology the management traffic is switched/routed between LAN/WAN ports. When IP-addressing a VLAN IF (id 100000-104000) the management connectivity is obtained at wire-speed along with the user traffic or on a separate WAN-port dedicated for management.

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

SW based DCN routing does not require a routing licence.

Most topologies in the following sections assume standard numbered IP interfaces, i.e. every interface (IF) connected to the router takes an IP address and a subnet. However the feature called "IP Unnumbered Interfaces" introduced in Release 2.0 will simplify planning, supervision and configuration since one IP address per network element within the same subnet is sufficient. in addition the accompanying OSPF algorithm used for IP un-numbered mode will provide the ability for automatic presentation of the network topology in higher-level management

solutions. This makes it possible to present topological links in maps automatically and simplifies network configuration.

3.5.2 Management Interfaces

The following interfaces may be used to carry management traffic:

- **Management port.** The AXX155A has a dedicated Ethernet port for management, called the "Management Port". This port can be used for local management, e.g. connecting a craft terminal. It can also be used for connecting to a separate external management network. The management port can be turned off to avoid unauthorized local access. The management port cannot be member of a VLAN.
- **LAN ports.** The LAN ports are FE Ethernet ports used for connecting customer IP traffic to the AXX155A. LAN-ports connected to the switch (L2-mode) can be used to carry management traffic.
- **WAN ports.** The WAN ports are device internal FE Ethernet ports that can be mapped into one or more virtual containers of an SDH STM-n signal. WAN-ports can carry management traffic both in L1-and L2-mode.
- **DCC channels.** The SDH architecture defines data communication channels (DCC) for transport of management traffic in the regenerator section (DCCR - 192 kbit/s) and in the multiplexer section (DCCM - 576 kbit/s).
  Each SDH-module may terminate up to 8 DCCR and/or 4 DCCM channels, i.e. an absolute upper limitation on the number of active DCC-channels is 48. For one SDH-port, both DCC channels may be active simultaneously. Activation/deactivation of DCC channels are configurable on a per port basis.
- **Local VT-100 serial port.** Also this RS-232 interface is regarded as a management interface, although it does not relate to the various DCN topologies described throughout the rest of this section. Only a few basic CLI-commands are provided via this interface.

3.5.3 External DCN

Description

"External DCN" means that the management station connects to the AXX155A via a separate DCN. The physical connection to the AXX155A is the Management Port.

Both IP/Ethernet and CLNP/802.x are supported. The AXX155A can run both stacks on the Management Port simultaneously.

The AXX155A may also serve as a gateway from an External DCN to other AXXESSIT-nodes in the SDH network, i.e. the External DCN topology may be combined with other topologies described in the next subsections. If External DCN (in OSI mode) is combined with OSI/DCC, the AXX155A implements a Gateway Network Element (GNE) as defined in ITU-T G.784.

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

Example

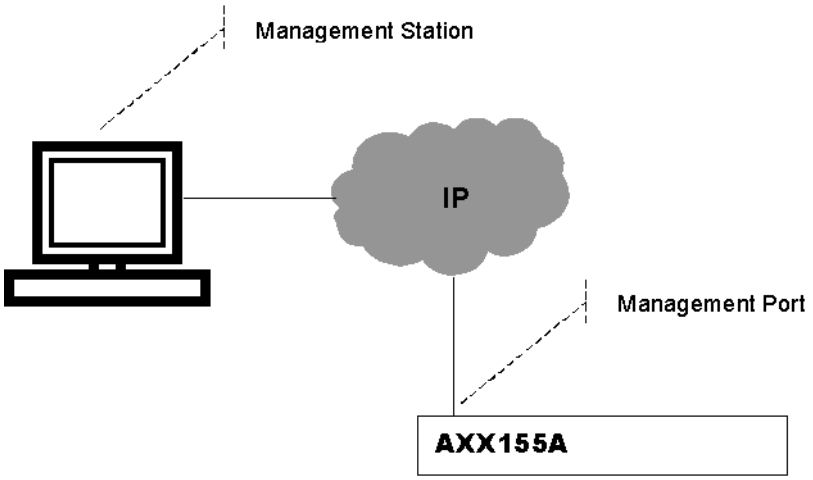


Figure 3-11. External DCN

3.5.4 IP In-band DCN

Description

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

With IP-In-band it is possible to build tunnels between "islands" that have other DCN solutions.

This feature has different restrictions and options depending on whether the ports are in L1-or L2 mode:

L2 Mode:

A LAN- and WAN-port in L2 mode is connected to the switch. Such ports may carry in-band management traffic if an IP-address is assigned to it, or to the VLAN it belongs to. This solution is equivalent to the previous versions of AXX155A.

Between L2 LAN/WAN ports the switching is always at wire-speed. Routing between LAN/WAN at wire-speed requires a routing licence. It is

possible to split management traffic from user traffic by assigning dedicated LAN/WAN ports to management traffic.

L1 Mode:

In AXX155A R2.0 LAN- and WAN-ports can also be in L1-mode in order to support Ethernet L1 services. In this case the ports are not connected to the switch.

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

From a system point of view this feature is similar to PPP/DCC case.

Example

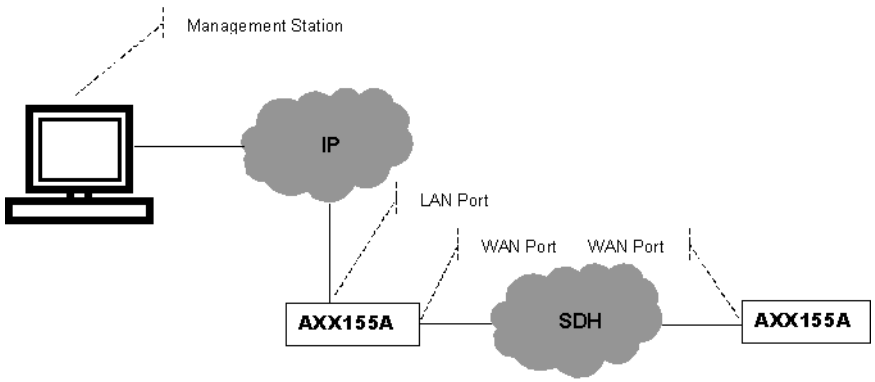


Figure 3-12. IP In-band DCN

3.5.5 OSI/DCC DCN (IP over OSI)

Description

This option is useful if the AXX155A is connected to or part of an OSI-based DCN. The AXX155A IP-based management traffic will be transported through the DCC-channels of a general (multi-vendor) SDH network by means of standard OSI-protocols at layer L2 and L3.

L3 protocols supported are CLNP, IS-IS Level 1 and Level 2 and ES-IS. The L2-protocol in the DCC-channels in OSI-mode is LAP-D.

All the interfaces that have the OSI option enabled will be connected to the internal CLNP router. This implies that also third-party DCC-traffic can be routed across the AXX155A CLNP router.

A CLNP tunnelling mechanism is provided for transport of IP datagrams between the management station and the AXX155A SNMP Agent over an OSI-based network. One AXXESSIT node (AXX155A or other) must be configured to act as a gateway (GW) to an IP-based network for a number of NEs. The NEs must know the NSAP address of its GW. Both ends will encapsulate the IP datagrams in CLNP-frames and transmit them across the OSI network. The encapsulation methods used are mostly in accordance with RFC 3147 Generic Routing Encapsulation over CLNS Networks and RFC 2784 Generic Routing Encapsulation.

The DCC channels connect to CLNP individually, and CLNP is connected to the IP router via one router port. In OSI/DCC mode the AXX155A must have both an NSAP address and (at least) one IP address. From an IP perspective the GW is a router between OSI and the Management port.

The GW maintains an Address Mapping Table between the NEs' IP and NSAP addresses by means of a proprietary protocol.

All NEs associated with a GW are on the same IP subnet.

NOTE

The GW functionality described above, should not be confused with the ITU-T G.784 Gateway Network Element (GNE) function, which is the gateway between the CLNP network on SDH-DCC, and another non-SDH based network.

Example

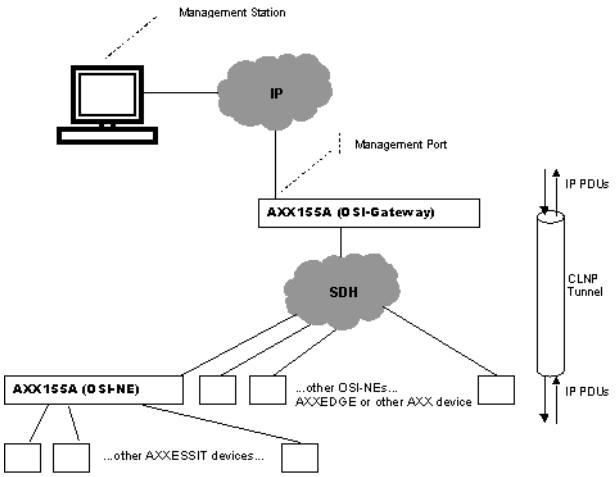


Figure 3-13. OSI/DCC DCN

Limitations

Max number of NEs per GW	32
Max number of entries in the IS-IS L1/L2 routing-table	200
Max number of DCC channels in OSI-mode	8

3.5.6 PPP/DCC DCN (IPoverPPP or ip/ppp/hdlc)

Description

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

Each PPP/DCC channel connects to the IP router individually. Normally this would take one IP subnet per DCC-link, and this is how previous versions of AXX155A implementations would behave.

However, from AXX155A R2.0 a more comprehensive PPP/DCC strategy is supported. This strategy is based on the feature called "IP Unnumbered Interfaces", and the rest of this section assumes this option.

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

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

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

Example

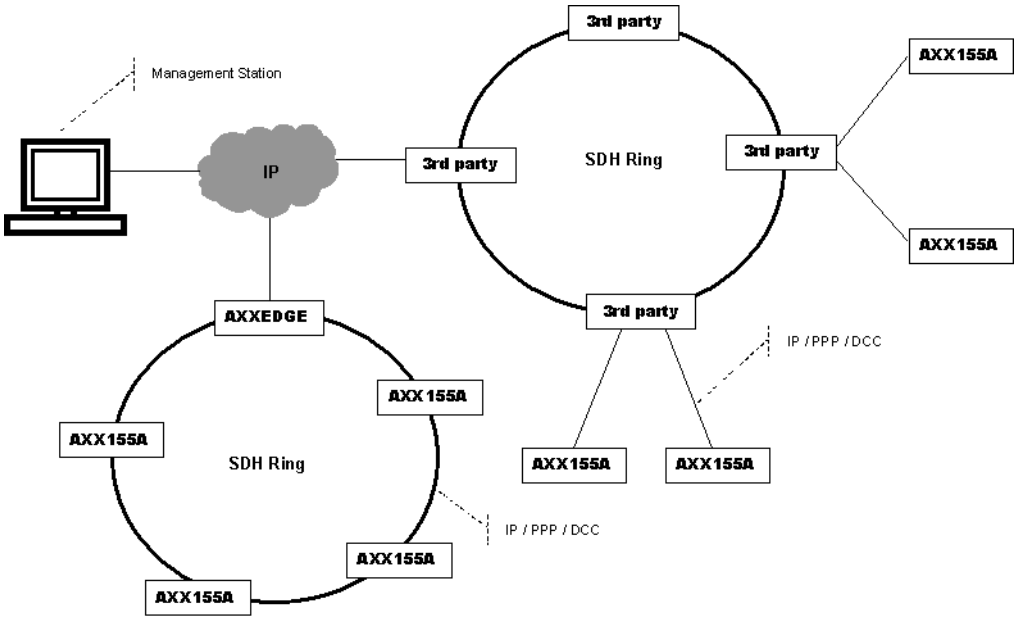


Figure 3-14. PPP/DCC DCN

3.5.7 Compatibility Issues

AXX155A R2.0 is able to provide DCN connectivity with all types of AXXESSIT devices already deployed, including the installed base of AXX155A devices with an earlier SW revision. Hence, two additional DCN options must be supported: PPP/DCC for numbered interfaces and proprietary IP/DCC communication.

PPP/DCC (IP over PPP)

AXX155A supports PPP/DCC also on numbered interfaces. This option cannot co-exist with the IP unnumbered version of PPP/DCC. However, the numbered variant of PPP/DCC has the advantage that it can be used in combination with all other DCN modes.

IP/DCC (IP over HDLC)

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

This configuration is applicable for a user having a subnet of AXXESSIT devices (with the AXX155A in the centre) and an IP based DCN connected to the AXX155A (e.g. the management port).

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

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

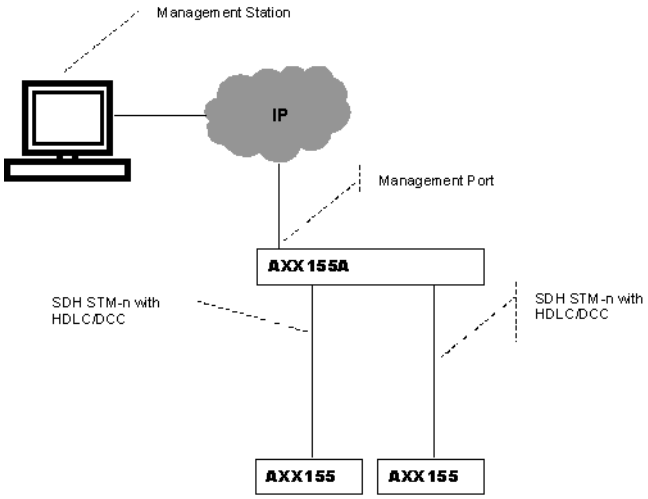


Figure 3-15. IP/DCC DCN

3.5.8 Protection

The AXX155A supports two different SDH protection schemes: MSP (1+1 link protection) and SNCP (intrusive or non-intrusive path protection)

SNCP and DCN are fully independent. If the IP In-band DCN option is used on a protected path, the switchover will be transparent for the higher levels.

For MSP protected links, the DCN behavior depends on the DCN mode:

- If the mode is PPP/DCC (numbered or unnumbered) the management traffic over DCC follows the user traffic, i.e. traffic is sent over both links (working and protecting), but received only from the active link.
- In all other modes, the two DCC channels will be individual interfaces to the router (CLNP and/or IP), and switchover will be handled at routing level.

3.5.9 Security

In order to prevent unauthorized access to the SNMP Agent, the following security and traffic control features are supported

- **Management Port on/off**

The Management Port can be turned on and off, thereby preventing unauthorized local access to the management network.

- **SNMPv1 Community**

The SNMPv1 packet contains a password (called community string) that must be known by both the manager and the agent. Different community names can be defined for read and read/write access. The community string is, however, transferred un-encrypted.

- **SNMP Manager Identity**

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

- **SNMP read/write control**

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

- **VLAN (802.1Q)**

This security mechanism relates to the IP in-band option only: By configuring a separate VLAN for the management traffic and assigning an

IP address to it, the end-users will not be able to access the device or generate traffic into the management VLAN.

- **CLI AccessControl**

CLI is protected by user name and password. CLI is by default a superuser and can block all remote SNMP users by changing the access rights and passwords. Remote CLI access via Telnet must have a Telnet password in addition. Changing CLI passwords is only possible in AXXCLI.

3.6 DCC TRANSPARENCY FEATURES

This section presents the DCC ‘Transparency’ Feature. It provides a description of applications.

3.6.1 General description

To overcome 3rd party vendors proprietary or not commonly used protocols for management connectivity, AXX155A will have the ability to ‘transparently’ forward the management signals through our nodes.

This feature is most typically used when our nodes are supposed to fit into existing ring- configurations. It may also relief heavily loaded data communications channels (D1- D3 or D4- D12) in the network and instead let the existing signals pass through our nodes and take advantage of the potentially second channel for AXX- node(s) utilization. In this case it is required that the existing nodes transparently pass through our signals.

3.6.2 Functional overview

The DCC transparency feature provides the ability to transparently connect to HDLC- layer from a ‘DCC- west’ to ‘DCC- east’. The feature available for AXX155A covers full flexibility for supported STM- n. It can be performed between any SDH- ports, though limited to maximum 4xDCC-m per- and 8xDCC-r per slot.

Protocols based upon either 16- bit or 32- bit HDLC- framing type will be passed through via CPU. Refer figure below for a typical network setup.

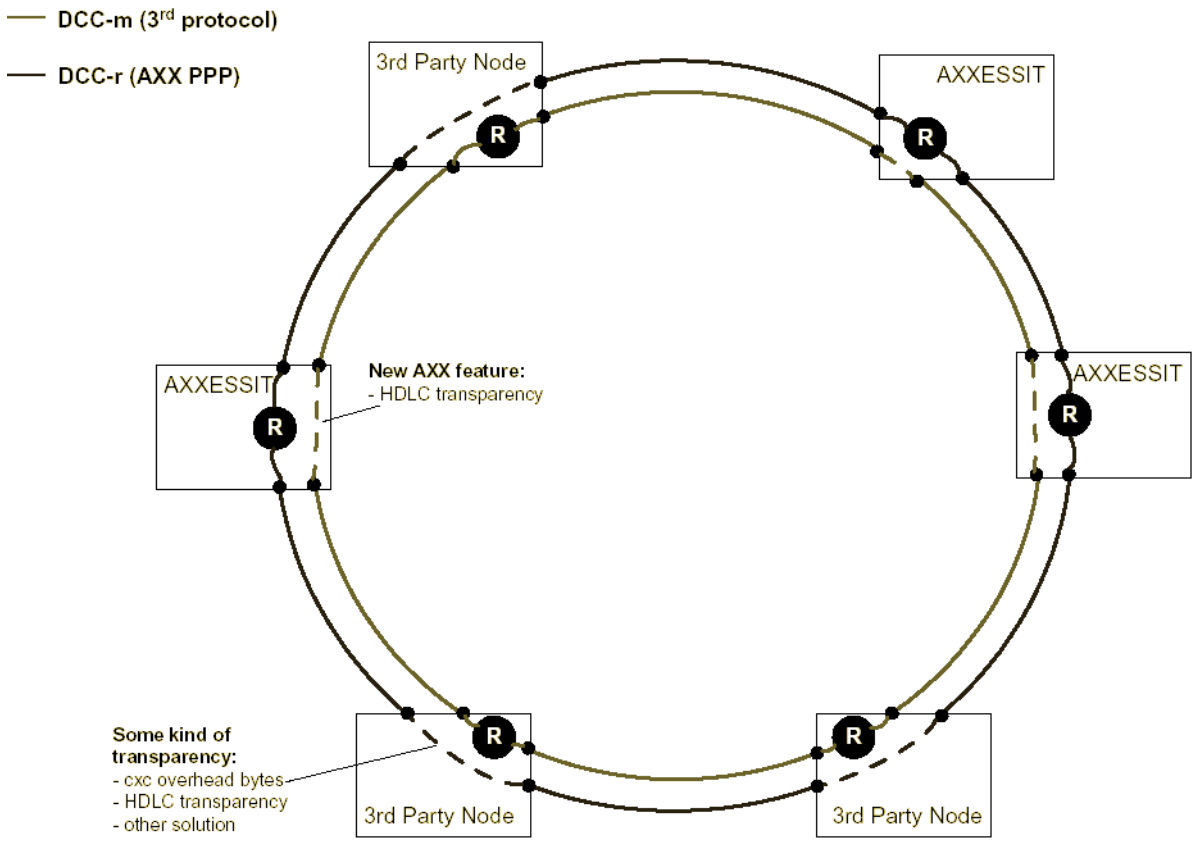


Figure 3-16. Typical network set up

3.6.3 Software Configuration

Software configuration of DCC ‘transparency’ is supported by AXXCRAFT or higher level management systems in the AXXTMN product family. The feature can also be maintained locally by VT100.

3.7 ALARM DEFINITIONS

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

3.7.1 Introduction

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

NOTE! *All alarm IDs with higher severity than "Warning", except "info" which is an event, are on-off alarms. Also "alarmInp (has default severity "Warning") is an on-off alarm.*

3.7.2 Device

Alarm Id	Default Severity	Description
ufail	Critical	Device main unit failure
temp	Major	High temperature alarm
t0HoldOver	Major	T0 in holdover mode
t0Defect	Critical	T0 SETG defect
t0SyncSwitch	Warning	T0 sync switchover
t0QlFailed	Warning	T0 sync candidate in fail
t0QlDnu	Warning	T0 sync candidate received DNU
t4Squelch	Critical	T4 output squelched
inletFail	Critical	DXC inlet failure
inletBitError	Critical	DXC inlet bit error
info	Critical	
rxOverflowHWFault	Warning	RX buffer overflow on LAN interface
txOverflowHWFault	Warning	Interport queue overflow on LAN interface
routeTableOverflow	Warning	Routing table overflow
resetRequired	Warning	Reset required
endTftp	Warning	TFTP session completed
abortTftp	Warning	TFTP session aborted
startTftp	Warning	TFTP session initiated
forwardingTabOverflow	Warning	Layer II Forward Table overflow
errorsDuringInit	Warning	Error during initialisation
vlanDynPortAdded	Warning	Dynamic VLAN port added
vlanDynPortRemoved	Warning	Dynamic VLAN port removed
rsIpZhrNotAllocVirtualIp	Warning	Virtual IP not allocated for source
rsPingCompletion	Warning	Ping sequence completed
rsDhcpAllocationFailure	Warning	DHCP IP address allocation failed
rlIgmpTableOverflow	Warning	IGMP table overflow
rlPimTableOverflow	Warning	PIM table overflow
rlIpFftStnOverflow	Warning	IP SFFT overflow
rlIpFftSubOverflow	Warning	IP NFFT overflow
rlIpxFftStnOverflow	Warning	IPX SFFT overflow
rlIpxFftSubOverflow	Warning	IPX NFFT overflow
rlIpmFftOverflow	Warning	IPM FFT overflow
rlPhysicalDescriptionChanged	Warning	Physical description of device has changed
rlPolicyDropPacketTrap	Warning	Packet is dropped due to qos policy
rlPolicyForwardPacketTrap	Warning	Packet is forwarded based on qos policy

Table 3.1. Device Alarms

3.7.3 SDH

Alarm Id	Default Severity	Description
SDH Port		
los	Critical	Loss Of Signal
RS		
lof	Critical	Loss Of Frame
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
tim	Critical	Trace Identifier Mismatch
csf	Minor	Communication Signal Fail
MS		
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
csf	Minor	Communication Signal Fail
ais	Minor	Alarm Indication Signal
rdi	Minor	Remote Defect Indication
msp	Critical	MSP signalling problem
switchToProt	Warning	MSP switched to protection
switchToWork	Warning	MSP switched to working
mspComTimeOut	Warning	MSP command timed out, removed
mspComOverruled	Warning	MSP command overruled, removed
AU4		
ais	Minor	Alarm Indication Signal
lop	Critical	Loss Of Pointer
VC4		
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
tim	Critical	Trace Identifier Mismatch
rdi	Minor	Remote Defect Indication
lom	Critical	Loss Of Multiframe
uneq	Critical	Un-equipped
plm	Critical	Payload Mismatch
TU3		
ais	Minor	Alarm Indication Signal
lop	Critical	Loss Of Pointer
VC3		
exc	Major	BER excessive error rate
deg	Minor	Signal degrade (BER low)
tim	Critical	Trace Identifier Mismatch

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

Table 3.2. SDH Alarms

3.7.4 LAN/ WAN

Table 3.3. LAN/WAN Alarms

Alarm Id	Default Severity	Description
DCCM		
lanOn	Warning	Link Up
lanOff	Warning	Link Down
DCCR		
lanOn	Warning	Link Up
lanOff	Warning	Link Down
WAN		
wanDelay	Critical	Delay between VC12's above limit
seqFail	Critical	Wrong channel seq. numbering P2P
lanOn	Warning	Link Up
lanOff	Warning	Link Down
rldot1dStpPortStateForwarding	Warning	Bridge port learning to forwarding state transition
rldot1dStpPortStateNotForwarding	Warning	Bridge port forwarding to blocking state transition
TLC	Critical	Total Loss Capacity
TLCR	Critical	Total Loss Capacity, RX
PLC	Major	Partial Loss Capacity,
PLCR	Major	Partial Loss Capacity,RX
e1Port		
lofRx	Major	Loss Of Frame downlink
lofTx	Major	Loss Of Frame uplink
aisRx	Minor	AIS received downlink
los	Critical	Loss Of Signal
loopClosed	Warning	Loop closed
loopOpened	Warning	Loop opened
e3T3Port		
aisRx	Minor	AIS received downlink
los	Critical	Loss Of Signal
eth		
lanOn	Warning	Link Up
lanOff	Warning	Link Down
rldot1dStpPortStateForwarding	Warning	Bridge port learning to forwarding state transistion
rldot1dStpPortStateNotForwarding	Warning	Bridge port learning to forwarding state transistion
osiEncap		
lanOn	Warning	Link Up
lanOff	Warning	Link Down

3.7.5 Miscellaneous

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

Table 3.4. Miscellaneous Alarms

3.7.6 Alarm parameters

Parameters associated with an alarm entry as stored in the alarm log on the network element, are found in Table 3.5.

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

Table 3.5. Alarm Parameters

Alarm severity

It is possible for the operator to assign an alarm severity for each combination of Object Type + Alarm Id. The severity levels are WARNING, MINOR, MAJOR and CRITICAL. Default values are assigned automatically.

Alarm presentation

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

Alarm filtering

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

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

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

Alarm suppression

If an alarm is active, it may also suppress other (lower-order) alarms. How active alarms may suppress other (lower-order) alarms, are defined by Table 3.6. /Table 3.7.

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

Table 3.6. Alarm suppression table for SDH related alarms

NOTE! *Alarm suppression (as stated in Table 3.6.) is only performed for alarms confined to one side of the DXC. Hence, alarm suppression is not provided across the DXC.*

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

Table 3.7. Alarm suppression table for PDH (tributary) Tx-Alarms

Alarm persistency

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

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

Setting of alarm persistency thresholds is provided according to the scheme described in Table 3.8. All alarm types are sorted into three different persistency categories. The sorting of the alarm types into a persistency category depends of the characteristics of each alarm id. The persistency thresholds for each category are individually configurable in steps from 0 - 30 seconds.

Persistency category	Description	Associated probable cause	Managed objects associated with each alarm type
1	This category contains alarms associated with higher order levels.There are few instances of each type.	LOS	SDHPort, E1, E3
		LOF	RS
		AIS	MS
		EXC	RS, MS
		DEG	RS, MS
		TIM	RS
		RDI	MS
		CSF	RS, MS
2	This category contains alarms (normally) not subject to persistency filtering.	LOP	AU-4, TU-3, TU-12
		LOM	VC-4
		LFA	E1, E3
3	This category contains the remaining alarm types. Most of them have many instances.	AIS	AU-4, TU-3, TU-12, E1, E3
		EXC	VC-4, VC-3, VC-12
		DEG	VC-4, VC-3, VC-12
		SSF	VC-4, VC-3, VC-12
		TIM	VC-4, VC-3, VC-12
		RDI	VC-4, VC-3, VC-12
		UNEQ	VC-4, VC-3, VC-12
		PLM	VC-4, VC-3, VC-12

Table 3.8. Alarm persistency categories

3.8 CONFIGURATION MANAGEMENT

3.8.1 Backup and restoration of Configuration Data

It is possible to back-up the configuration data of an AXX155A device. It is possible to reload the configuration from the back up. The back-up media is a central repository.

3.8.2 Software download

It is possible to download new software and FPGA code to the AXX155A device itself and to modules/external modules. For all software and FPGA code items there are capacity of storing two different versions in the device, and switchover from one version to the other one is possible by operator command.

3.8.3 Feature management

The embedded software in the AXX155A is capable of supporting all features (licensed or not licensed) finalised at the time of the release. To activate a specific feature, the device checks whether it has the corresponding licensed right to do it. Licenses can be ordered individually for each available functionality (OSI, HW Routing). This will be a unique file for each NE, generated based on a software key bound to the serial number of each AXX155A device, and they are stored internally in each AXX155A.

3.8.4 Device reset

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

- After configuration and changes of OSI (CLNP) related parameters (Ethernet/IP traffic affecting)
- When decreasing/increasing entries in tunable tables e.g. maxARP, maxIP-forwarding, maxVLAN's, maxDHCP, maxBridge, etc.
- Software upgrade without FPGA fix (Ethernet/IP traffic affecting)
- Software upgrade with FPGA fix (All traffic affected)
- Enabling OSPF requires a software reset.
- Changing the "Router ID" for OSPF requires a software reset

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

3.8.5 Device replacement

It is possible to replace an AXX155A device with a new one with an identical physical configuration. This may be a partial or fully automated process.

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

The AXX155A receives an IP address during during power up by sending BootP request to a BootP server accessible via a network connected the MNGT-port. This will trigger a software reset and a new BootP request will be issued to pick up the configuration file from the same server.

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

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

A TFTP download session can be triggered from any configuration management solution supplied by AXXESSIT.

3.8.6 Network element service state

The network element itself has a service state that can have the values

In Service

- Normal operation, i.e., alarms and events are logged and forwarded to the management system

Out of Service

- The network element enters this state if e.g. the configuration is inconsistent or missing, the element is overheated etc.
- The management system has contact with the network element

Out Of Service By Maintenance

- No alarms and events are generated on the network element
- The network element can be configured

The operator can put the network element out of service by maintenance and back into service. The element itself controls the out of service state.

3.8.7 Module Management

An AXX155A module's configurations are maintained in the AXX155A. If a module is restarted or replaced with a new one of the same type, it is initialised with the right configuration automatically. If a module is replaced with a new one of another type, an alarm is raised. If a module is removed or communication with the module is lost, an alarm is raised.

3.8.8 Managed Object Attributes

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

3.9 PHYSICAL INTERFACE INDICES

3.9.1 Interface Index Reference Numbers

Interface numbers:	
Management-port	1000
OSI	1001
Slot-1	1 - 16
Slot-2	17 - 32
Slot-3	33 - 48
Slot-4	49 - 64
Trunk ports (link aggregation)	65 - 72
VLAN	100000 - 104000
DCC channels and In-band interface numbers	
Slot-1	1002 - 1017
Slot-2	1018 - 1033
Slot-3	1034 - 1049
Slot-4	1050 - 1065

Table 3.9. Interface Index Reference Numbers

3.10 CHASSIS

The AXX155A chassis consists of a main card, system controller and the mechanical chassis.

The chassis has room and physical interfaces for an aggregate (native interfaces) module, an "interface" module, two power modules and one fan and alarm module. The two empty slots are not in use.

The native interface module is delivered as a part of the chassis. This module have 2xSTM-1 and 21xE1 interfaces.

The AXX155A chassis contains four LED's that indicate the status of the unit. They are visible on the front of the unit. The color and functionality of the LED's are described in the table below. The four LED's are also replicated on the system controller on the rear side of the chassis.

Color	LED name	Indicates when illuminated
Green	Power	Power is present and operating correctly.
Red	Equipment	Error with the equipment.
Red	Traffic	Traffic alarm for one of the interfaces.
Yellow	Test	Test-loops are activated on the unit.

Table 3.10. LED indications

The main card stores inventory data in non-volatile memory. The inventory data is accessible from the system controller and the management system.

The system controller module contains the processor system for the AXX155A. It is possible to customize the amount of memory on the module for different applications.

The software of the AXX155A runs in SDRAM. The amount of memory can be configured from 64Mbyte to 512Mbyte. This is done in the factory.

The software is stored in Flash memory devices. The AXX155A uses a Compact Flash card as the storage medium. The module contains a small boot FLASH with the boot software. The module also contains a Compact Flash connector. The connector accepts different cards of different sizes. The size of the Compact Flash cards can be from 8Mbyte to 128Mbyte.

The module supports a serial RS-232 interface used by the craft terminal. The module also supports a 10Base-T LAN interface used for management purposes.

The module contains the local synchronization interface for the AXX155A. This interface is directly connected to the SETS functionality on the motherboard.

The module contains the local user interface for the AXX155A. The interface supports a framed E1 interface. It is possible to select different overhead bytes from all SDH interfaces to the 30 available timeslots.

The system controller also provides a proprietary interface for connection to external switching device "LEAR".

The physical connectors of the five interfaces are all RJ-45 types.

The module also provides four LED's to indicate the status of the AXX155A. The LED's is visible from the rear of the AXX155A and have the same functionality as the LED's in the chassis. The module also have a fifth LED to indicate the link status of the management port.

References

Please see dedicated chapters for service and remote modules or Table 1.3. List of available service modules to AXX155A.

Please see “Product Overview” and “Physical Interfaces” for alarm/ fan unit and power modules.

Please see Table 2.1. Power Consumption - AXX155A modules.

4

PHYSICAL INTERFACES

AXX155A

4.1 POWER INTERFACE

4.1.1 Power Supply

The AXX155A supports two different power supply interfaces:

- Single phase 230 V 50 Hz AC mains supply
- -48 V DC supply

Connectors

The -48V DC supply input is provided via a 4 pin power connector, (Molex Mini-fit 4x1) with the following pin-out:

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

Table 4.1. Pin-out DC connector

Parameters

The -48V DC input conforms to the specifications given in the table below.

Parameter	Limit
Input power dissipation	Less than 120W
Fuse	4A
Battery voltage range	-36 to -72V DC
Output power	105W

Table 4.2. Electrical specifications of DC module

The 220V AC input conforms to the specifications given in the table below.

Parameter	Limit
Input power dissipation	Less than 85W
Fuse	0.5A
Mains voltage	-230V AC +/- 10%
Output power	75W

Table 4.3. Electrical specifications of AC module

Compliance

Standard	Comment
EN/IEC 60950	Safety General information
ETS 300 132-2	Power supply interface at the input to the telecommunication equipment; Part 2: Operated at DC
ETS 300 253	Earthing and bonding of telecommunication equipment in telecommunication centers

Table 4.4. Compliance power supply

4.2 ALARM INTERFACE

The interface have 4 general alarm inputs and 2 dedicated alarm outputs. The alarm outputs are related to the unit alarm indicator and the traffic alarm indicator.

4.2.1 Connectors

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

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

Table 4.5. Pin-out Alarm connector

4.2.2 Electrical parameters alarm input

Parameter	Value
Nominal open contact voltage	3.3V
Nominal closed contact current	1 mA
Max. closed contact resistance	0.8 kohm
Min. open contact resistance	10 kohm

Table 4.6. Electrical specification at Alarm input

4.2.3 Electrical parameters alarm output

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

Table 4.7. Electrical specification at alarm output

4.3 AUXILIARY INTERFACE

The AXX155A offers a proprietary Auxiliary interface for termination of overhead bytes selected from the different STM-N interfaces. Each STM-N interface can be configured to terminate one of the following overhead bytes: E1,F1 or E2. The byte to be terminated is selected from the network management system together with a unique timeslot number n, where n equals 1-15 or 17-31. The Auxiliary interface is a framed E1 interface, according to ITU-T G.704, where timeslot 1-15 and 17-31 can carry one overhead byte each, according to the configuration described above.

The interface is synchronous which means that the incoming STM-N need to be synchronized with the T0 reference clock in the AXX155A and the incoming framed E1 need to be synchronized with the outgoing framed E1. Bit slips will occur if one of the interfaces are free running.

4.3.1 Connector

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

Pin	Signal
1	RxD+
2	RxD--
3	GND
4	TxD+
5	TxD--
6	Screen, Note 1
7	NC
8	NC

Table 4.8. Pin-out Auxiliary interface

NOTE! *Pin 6 is always AC connected to ground*

4.3.2 Compliance

Standard	Comment
ETS 300 246	Connector
ETS 300 247	Connector
ETS 300 011	Impedance towards groundTolerable longitudinal voltage
ETS 300 126	Output signal balance
ITU-T G.703	Cable attenuationInput reflection lossInput port immunity against reflectionOutput pulse mask
ITU-T G.704	Framing

Table 4.9. Compliance Auxiliary interface

4.4 VT-100 TERMINAL INTERFACE

The AXX155A offers a VT-100 interface for connection of a Craft Terminal/CLI interface. The interface is running at a data rate of 19.200 baud. The interface is in accordance with the specifications given in the Compliance chapter below.

4.4.1 Connector

The RS232 interface for AXX155A is provided via a RJ-45 connector, with the following pin-out:

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

Table 14 Pin-out VT-100 connector

NOTE! *Pin 4 and 7 are only used for debug purposes.*

4.4.2 Compliance

Standard	Comment
EIA RS-232	Physical interface

Table 4.10. Compliance RS-232 interface

4.5 SYNCHRONIZATION INTERFACE

4.5.1 Synchronization

The interface is a 120 ohm 2048 kHz synchronization input and output port, with specifications according to ITU-T G.703

Connectors

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

Pin	Signal
1	Sync output +
2	Sync output --
3	GND
4	Sync input +
5	Sync input -
6	Screen, Note 1
7	NC
8	NC

Table 4.11. Pin-out Synchronization port

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

Compliance

Standard	Comment	
ETS 300 246	Connector	
ETS 300 247	Connector	
ETS 300 011	Impedance towards groundTolerable longitudinal voltage	
ETS 300 126	Output signal balance	
ITU-T G.703	Cable attenuation	Return lossOutput pulse maskOutput jitterInput jitter

Table 4.12. Compliance Synchronization interface

4.6 OTHER INTERFACES

For other interface descriptions, please see Table 1.3. List of available service modules to AXX155A

MECHANICS & OTHER CHARACTERISTICS

5

AXX155A

5.1 MECHANICAL PARAMETERS

5.1.1 Chassis

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

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

Width	445mm
Height	43.6mm
Length	280mm

The depth of the sub-rack is 240 mm.

The total weight of the AXX155A fully equipped will not exceed 5Kg.

Different mounting brackets are available for both 19" and ETSI cabinets/ racks (as specified in ETS 300 119, IEC 60917 and IEC 60297).

The thermal design of the unit meets the requirements of EN/IEC 60950.

The AXX155A can be mounted on a desktop.

A wall mount kit is also available.

5.1.2 Aggregate and interface modules

The service modules in the AXX155A have the following physical dimensions:

Length	175mm
Height	41mm
Width	75mm

5.1.3 Power modules

The two power modules in the AXX155A have the following physical dimensions:

Length	230mm
Height	19mm
Width	44mm

5.1.4 System controller modules

The system controller module in the AXX155A has the following physical dimension:

Length	175mm
Height	19mm
Width	95mm

5.1.5 Fan modules

The Fan module in the AXX155A has the following physical dimensions:

Length	236mm
Height	41mm
Width	28mm

5.2 OTHER CHARACTERISTICS

5.2.1 Reliability, MTBF

MTBF values, as listed in Table 5.1. are based on:

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

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

Item	MTBF (years)
AXX155A Base Unit	46,2
Power Module, 48DCDC	150,9
Power module, AC 230V	150,7
4xFAN-ALARM-DSUB9	74,8
“Dual Optical S-1.1 Module 2xS-1.1-LC”	136,6
“Dual Optical L-1.2 Module 2xL-1.2-LC”	138
“Dual Optical Module 2xS-1.1-LC+21xE1-LFH”	101,5
“Dual Optical Module 2xL-1.2-LC+21xE1-LFH”	100,5
“Octal E1 Tributary Module 8xE1-RJ45”	207,4
“Tri E3/T3 Tributary Module 21xE1+3xE3/T3-1.0/2.3”	105,6
“High Density 63xE1 Module 63xE1-LFH”	88
“Tri E3/T3 Tributary Module 3xE3/T3-1.0/2.3”	167,3
“Hex E3/T3 Tributary Module 6xE3/T3-1.0/2.3”	125,2
“Quad LAN 10/100Base-TX Module 4xFE/MAP-RJ45”	137
“Octal LAN 10/100Base-TX Mapper 8xFE-16xSMAP-RJ45”	74,4
“Remote Module - AXX10”	112,5
“Remote Module - AXX11”	95,2

Table 5.1. MTBF values- 40oC ambient temperature Ground Benign

5.2.2 Environmental conditions

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

EN 50082-1

EN 50081-1

EN 55022

EN 55024

EN 61000-3-2

EN 61000-3-3

EN 61000-4-2

EN 61000-4-3

EN 61000-4-4

EN 61000-4-5

EN 61000-4-6

EN 61000-4-11

In order to apply the 'CE' mark to the equipment, the equipment must comply with the following standards:

EN50081-1,

EN50082-1

EN60950,

The Low Voltage Directive.

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

5.2.3 Health and safety

The equipment meets the requirements in EN/IEC 60950 and EN60825.

The equipment meets the requirements in ETS 300 753 for acoustic noise.

5.2.4 Storage and transport

The equipment meets the requirements in ETS 300 019, Class 1.1 and class 2.2.

Supported storage temperature range: -40^{O}C to +70^{O}C.

5.3 REFERENCED SPECIFICATIONS

5.3.1 ITU-T Recommendations

G.652

Single Mode Optical Fibre

G.701

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

G.702

Digital Hierarchy Bit Rates

G.703

Physical/Electrical Characteristics of Hierarchical Digital Interfaces

G.704

Synchronous Frame Structures at Primary and Secondary Hierarchical levels.

G.706

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

G.707

Network node interface for the synchronous digital hierarchy (SDH)

G.783

Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks

G.784

Synchronous digital hierarchy (SDH) management

G.810

Definition and terminology for synchronization networks

G.811

Timing characteristic of primary reference clocks

G.812

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

G.813

Timing characteristics of SDH equipment slave clocks (SEC)

G.823

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

G.825

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

G.832

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

G.841

Types and characteristics of SDH network protection architectures

G.957

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

G.958

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

X.150

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

5.3.2 Cenelec Documents

EN 50082-1

Generic immunity standard Industrial environment

EN 55022

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

EN 55024

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

EN 60825

Radiation Safety of Laser Products

EN 60950

Safety of Information Technology Equipment Including Electrical Business Equipment

EN 61000-3-2

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

EN 61000-3-3

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

EN 61000-4-2

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

EN 61000-4-3

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

EN 61000-4-4

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

EN 61000-4-5

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

EN 61000-4-6

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

5.3.3 ETSI documents

ETS 300 011

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

ETS 300 019-2-1

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

ETS 300 019-2-2

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

ETS 300 019-2-3

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

ETS 300 119-4

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

ETS 300 132-2

Environmental engineering (EE): Power supply interface at the input to the telecommunication equipment: Part 2 Operated by direct current (dc)

ETS 300 147

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

ETS 300 233

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

ETS 300 253

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

ETS 300 386

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

ETS 300 752

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

5.3.4 IEC documents

IEC 60917-2

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

IEC 60297-3

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

5.3.5 Bellcore documents

SR-332

Reliability prediction procedure for electronic equipment

DUAL OPTICAL S-1.1 MODULE

2XS-1.1-LC

6

6.1 FUNCTIONAL DESCRIPTION OF MODULE

6.1.1 Brief description

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

6.1.2 Power consumption

9 W.

6.2 EXTERNAL STM-1 S-1.1 INTERFACE

6.2.1 Description

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

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

6.2.2 Connector

The physical connector is a LC connector.

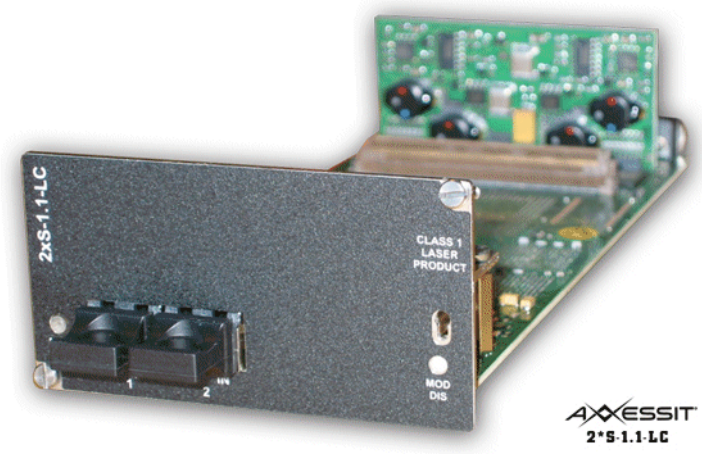


Figure 6-1. Connector type

Pinout

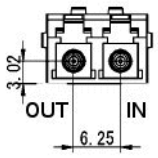


Figure 6-2. General LC connector illustration

6.2.3 Optical budget

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

Table 6.1. Optical budget S-1.1 interface

6.2.4 Compliance

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

Figure 6-3. Compliance optical S-1.1 interface

DUAL OPTICAL L-1.2 MODULE

2XL-1.2-LC

7

7.1 FUNCTIONAL DESCRIPTION OF MODULE

7.1.1 Brief description

This is a dual port STM1 module for long haul transmission at 1550nm optical wavelength.

The main functions of the module are O/E- E/O conversion and SDH multi-/de multiplexing with VC-12, VC3 and VC-4 granularity.

Please see “Multiplexing structure and Mapping modes” on page 3-2.

The module supports TDM traffic only.

7.1.2 Power consumption

10W.

7.2 EXTERNAL INTERFACE

7.2.1 External L-1.2-LC Interface

The 2xL-1.2-LC line interface bit rate is bi-directional with a transmit (Tx) and a receive (Rx) direction. Tx and Rx directions are transmitted on separate fibres. The optical interfaces are compliant to ITU-T Rec. G.957 L-1.2 Long Haul specification for transmission on Single Mode (SM) fibre.

Connector

The physical connector is a LC connector.

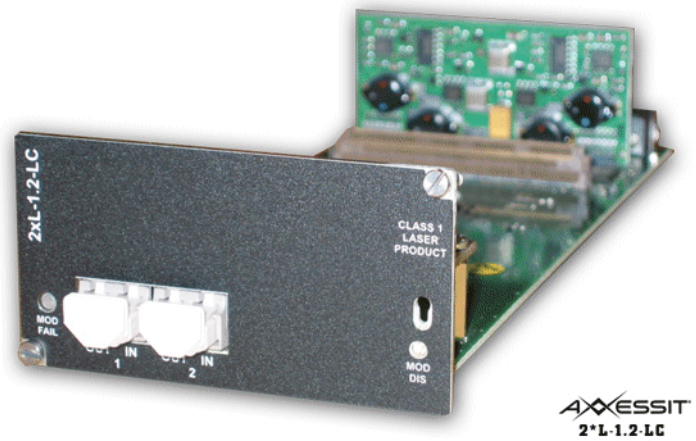


Figure 7-1. Connector- LC

Compliance

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

Table 7.1. Compliance optical L-1.2 interface

Optical Budget

Parameter	Value
Modulation rate on optical line	155 520 kbit/s
Wavelength range	1480- 1580 nm
Transmitter at reference point S	
Source type	SLM
Spectral characteristics (max. RMS width)	NA
Maximum -20 db width	1
Minimum side mode suppression ratio	30
Mean launched power (max.)	0 dBm
Mean launched power (min.)	-5 dBm
Min. extinction ratio	10 dB
Optical path between S and R	
Attenuation range	10 - 28 dB
Max. tolerable dispersion	NA
Min. optical return loss	20
Max. discrete reflectance between S and R	-25
Receiver at reference point R	
Min. sensitivity (BER < 1 in 1010)	-34 dBm
Min. overload	-10 dBm
Max. optical path penalty	1 db
Max. reflectance at R	-25 dB

Table 7.2. Optical budget L-1.2 interface

Optical Rx Power Monitoring

The optical input power of the Rx interface is monitored and can be read from the from AXXCRAFT or higher-level management systems within the AXXTMN product family.

DUAL OPTICAL MODULE
2XS-1.1-LC+21XE1-LFH

8

8.1 FUNCTIONAL DESCRIPTION OF MODULE

8.1.1 Brief description

The module contains two optical STM-1 short-haul interfaces and 21 E1 interfaces.

The main functions of the module are O/E- E/O conversion and SDH multi-/de multiplexing with VC-12, VC3 and VC-4 granularity of the STM-1 traffic and VC-12 mapping/demapping demultiplexing of the E1 traffic.

Please see “Multiplexing structure and Mapping modes” on page 3-2.

The module supports both transparent E1 data transmission according to ITU-T Rec. G.703 as well as the NT functionality of ISDN PRA according to ETSI 300 233. The optical STM-1 interfaces meet the specification in ITU-T G.957.

8.1.2 Power Consumption

15 W.

8.2 EXTERNAL INTERFACE

8.2.1 External STM-1 S-1.1 Interface

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

The module can also be used for transmission on Multi Mode (MM) fibres.

Connector Type

The physical connector is a LC connector.

One high density LFH type connector is used to interface the 21 E1's and a dual fiber LC connector, one fibre in each direction, is used on the two STM1 interfaces.

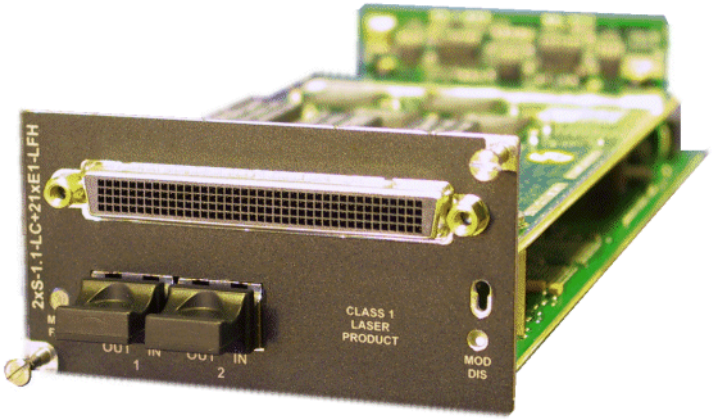


Figure 8-1. 2xS-1.1-LC+21xE1-LFH Module

Optical Budget

Parameter	Value
Type of fibre: SM acc. ITU-T Rec. G.652	10/125 µm
Modulation rate on optical line	155 520 kbit/s

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

Table 8.1. Optical Budget S-1.1 Interface

Compliance

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

Table 8.2. Compliance Optical S-1.1 Interface

Optical Rx Power Monitoring

The optical input power of the Rx interface is monitored and can be read from the from AXXCRAFT or higher-level management systems within the AXXTMN product family.

8.2.2 External E1 Interface

The E1 traffic is mapped into VC-12 containers and multiplexed together according to “Multiplexing/ mapping structure” on page 3-2.

E1 interfaces can individually be configured to be a transparent G.703 interface or an ISDN PRA interface.

Connectors

One connector is used for all 21 interfaces.

The connector is a high density 160 pins LFH connector(Molex). Two types of patch panels are available for patching the 21 E1's interface. See “Patch panels” on page 11-7 for more details

NOTE! *When the LFH connector/ Patch panels are used together with the 2xS1.1-LC+E1x21 module, only the first 21 ports are used.*

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

Pin Out

Lower connector

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1		41	RxD2-	81		121	RxD4-
2		42	RxD2+	82		122	RxD4+
3	GND	43	GND	83	GND	123	GND
4		44	TxD2-	84		124	TxD4-
5		45	TxD2+	85		125	TxD4+
6		46	TxD6-	86		126	TxD8-
7		47	TxD6+	87		127	TxD8+
8	GND	48	GND	88	GND	128	GND
9		49	RxD6-	89		129	RxD8-
10		50	RxD6+	90		130	RxD8+
11	RxD21-	51	RxD10-	91		131	RxD12-
12	RxD21+	52	RxD10+	92		132	RxD12+
13	GND	53	GND	93	GND	133	GND
14	TxD21-	54	TxD10-	94		134	TxD12-
15	TxD21+	55	TxD10+	95		135	TxD12+
16	TxD17-	56	TxD14-	96	TxD19-	136	TxD16-
17	TxD17+	57	TxD14+	97	TxD19+	137	TxD16+
18	GND	58	GND	98	GND	138	GND
19	RxD17-	59	RxD14-	99	RxD19-	139	RxD16-
20	RxD17+	60	RxD14+	100	RxD19+	140	RxD16+
21	RxD13-	61	RxD18-	101	RxD15-	141	RxD20-
22	RxD13+	62	RxD18+	102	RxD15+	142	RxD20+
23	GND	63	GND	103	GND	143	GND
24	TxD13-	64	TxD18-	104	RxD15-	144	TxD20-
25	TxD13+	65	TxD18+	105	RxD15+	145	TxD20+
26	TxD9-	66		106	TxD11-	146	
27	TxD9+	67		107	TxD11+	147	
28	GND	68	GND	108	GND	148	GND
29	RxD9-	69		109	RxD11-	149	
30	RxD9+	70		110	RxD11+	150	
31	RxD5-	71		111	RxD7-	151	
32	RxD5+	72		112	RxD7+	152	
33	GND	73	GND	113	GND	153	GND
34	TxD5-	74		114	RxD7-	154	
35	TxD5+	75		115	RxD7+	155	
36	TxD1-	76		116	TxD3-	156	
37	TxD1+	77		117	TxD3+	157	
38	GND	78	GND	118	GND	158	GND

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

Table 8.3. Pin-out of multi-interface connector

Compliance

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

Table 8.4. Compliance multi-interface E1 interface (21 interfaces)

DUAL OPTICAL MODULE
2XL-1.2-LC+21XE1-LFH

9

9.1 FUNCTIONAL DESCRIPTION OF MODULE

9.1.1 Brief description

The module contains two optical STM-1 long-haul interfaces and 21 E1 interfaces.

The main functions of the module are O/E- E/O conversion and SDH multi-/de multiplexing with VC-12, VC3 and VC-4 granularity of the STM-1 traffic and VC-12 mapping/demapping demultiplexing of the E1 traffic.

Please see “Multiplexing structure and Mapping modes” on page 3-2

The optical STM1 interfaces are long haul interfaces, according to ITU-T Rec. G.957, bi-directional transmission on two Single Mode (SM) fibres. The module can also be used for transmission on Multi Mode (MM) fibres.

The E1 traffic is mapped into VC-12 containers and multiplexed together according to “Multiplexing structure and Mapping modes” on page 3-2. E1 interfaces can individually be configured to be a transparent G.703 interface or an ISDN PRA interface.

The module supports both transparent E1 data transmission according to ITU-T Rec. G.703 as well as the NT functionality of ISDN PRA according to ETSI 300 233. The optical STM-1 interfaces meet the L-1.2 specification in ITU-T G.957.

The module only supports TDM traffic.

9.1.2 Power consumption

15 W.

9.2 EXTERNAL INTERFACE

9.2.1 External STM-1 L-1.2 interface

Connector

The physical connector is a LC connector.

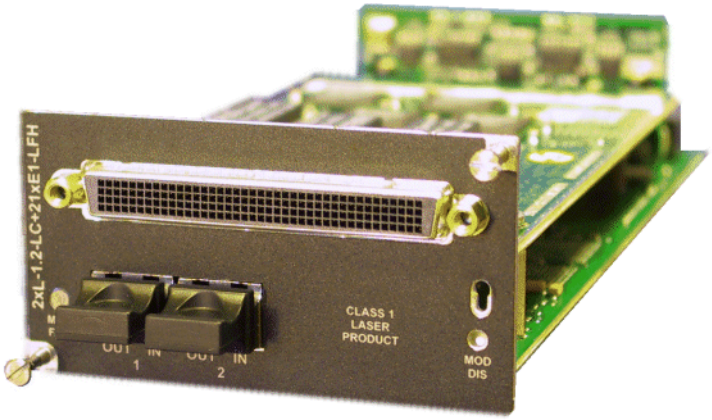


Figure 9-1. Connector Type 2xL-1.2-LC+21xE1-LFH

One high density LFH type connector is used to interface the 21 E1's and a dual fiber LC connector, one fibre in each direction, is used on the two STM1 interfaces.

Compliance

Standard	Comment
ITU-T G.652	Type of optical fibre
ITU-T G.707	Optical line signal
ITU-T G.783	RX pull-in and hold range
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter

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

Table 9.1. Compliance optical L-1.2 interface

Optical Budget

Parameter	Value
Modulation rate on optical line	155 520 kbit/s
Wavelength range	1480- 1580 nm
Transmitter at reference point S	
Source type	SLM
Spectral characteristics (max. RMS width)	NA
Maximum -20 db width	1
Minimum side mode suppression ratio	30
Mean launched power (max.)	0 dBm
Mean launched power (min.)	-5 dBm
Min. extinction ratio	10 dB
Optical path between S and R	
Attenuation range	10 - 28 dB
Max. tolerable dispersion	NA
Min. optical return loss	20
Max. discrete reflectance between S and R	-25
Receiver at reference point R	
Min. sensitivity (BER < 1 in 1010)	-34 dBm
Min. overload	-10 dBm
Max. optical path penalty	1 db
Max. reflectance at R	-25 dB

Table 9.2. Optical budget L-1.2 interface

Optical Rx Power Monitoring

The optical input power of the Rx interface is monitored and can be read from the from AXXCRAFT or higher-level management systems within the AXXTMN product family.

9.2.2 External E1 Interface

Connectors

One connector is used for all 21 interfaces.

The connector is a high density 160 pins LFH connector(Molex). Two types of patch panels are available for patching the 21 E1's interface. See “Patch panels” on page 11-7 for more details

NOTE! *When the LFH connector/ Patch panels are used together with the 2xL-1.2-LC+21xE1, only the first 21 ports are used.*

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

Compliance

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

Table 9.3. Compliance multi-interface E1 interface (21 interfaces)

Pin Out

Lower connector

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1		41	TxD2-	81		121	TxD4-
2		42	TxD2+	82		122	TxD4+
3	GND	43	GND	83	GND	123	GND
4		44	RxD2-	84		124	RxD4-
5		45	RxD2+	85		125	RxD4+
6		46	TxD6-	86		126	TxD8-
7		47	TxD6+	87		127	TxD8+
8	GND	48	GND	88	GND	128	GND
9		49	RxD6-	89		129	RxD8-
10		50	RxD6+	90		130	RxD8+
11	TxD21-	51	TxD10-	91		131	TxD12-
12	TxD21+	52	TxD10+	92		132	TxD12+
13	GND	53	GND	93	GND	133	GND
14	RxD21-	54	RxD10-	94		134	RxD12-
15	RxD21+	55	RxD10+	95		135	RxD12+
16	TxD17-	56	TxD14-	96	TxD19-	136	TxD16-
17	TxD17+	57	TxD14+	97	TxD19+	137	TxD16+
18	GND	58	GND	98	GND	138	GND
19	RxD17-	59	RxD14-	99	RxD19-	139	RxD16-
20	RxD17+	60	RxD14+	100	RxD19+	140	RxD16+
21	TxD13-	61	TxD18-	101	TxD15-	141	TxD20-
22	TxD13+	62	TxD18+	102	TxD15+	142	TxD20+
23	GND	63	GND	103	GND	143	GND
24	RxD13-	64	RxD18-	104	RxD15-	144	RxD20-
25	RxD13+	65	RxD18+	105	RxD15+	145	RxD20+
26	TxD9-	66		106	TxD11-	146	
27	TxD9+	67		107	TxD11+	147	
28	GND	68	GND	108	GND	148	GND
29	RxD9-	69		109	RxD11-	149	
30	RxD9+	70		110	RxD11+	150	
31	TxD5-	71		111	TxD7-	151	
32	TxD5+	72		112	TxD7+	152	
33	GND	73	GND	113	GND	153	GND
34	RxD5-	74		114	RxD7-	154	
35	RxD5+	75		115	RxD7+	155	
36	TxD1-	76		116	TxD3-	156	
37	TxD1+	77		117	TxD3+	157	
38	GND	78	GND	118	GND	158	GND

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

Table 9.4. Pin-out of multi-interface connector

OCTAL E1 TRIBUTARY MODULE

8XE1-RJ45

10

10.1 FUNCTIONAL DESCRIPTION OF MODULE

10.1.1 Brief description

This module contains eight E1 interfaces.

The E1 traffic are mapped into VC-12 containers and multiplexed together according to “Multiplexing structure and Mapping modes” on page 3-2.

The physical interface uses a RJ-45 connector and only supports120-ohm differential interface.

The module does not contain any IP functionality.

The interface supports both transparent data (G.703) and the NT functionality of ISDN PRA according to ETSI 300 233.

10.1.2 Power consumption

3,5 W

10.2 EXTERNAL INTERFACE

10.2.1 8 x E1

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

Connectors

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

.

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

Table 10.1. Pin-out E1 interface

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

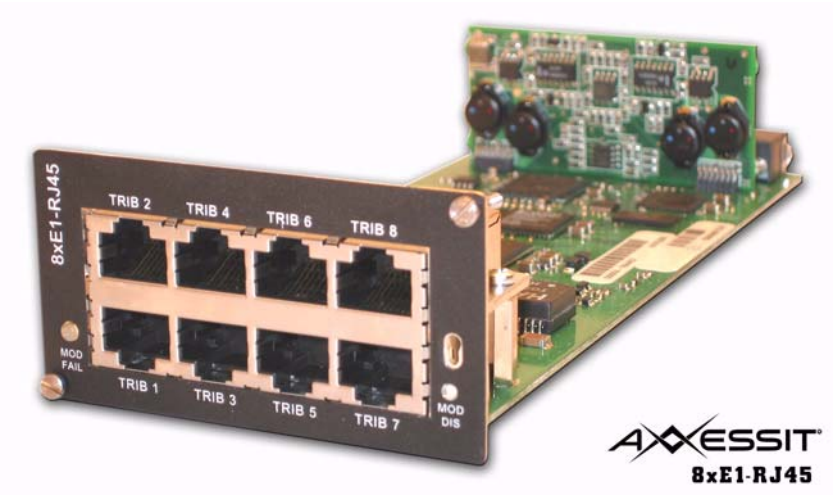


Figure 10-1. Octal E1 tributary module, 8xE1-RJ45

Pinout

Please see Table 10.2.

Compliance

STANDARD	Comment
ETS 300 246	Connector
ETS 300 247	Connector
ETS 300 011	Impedance towards ground Tolerable longitudinal voltage
ETS 300 126	Output signal balance
ITU-T G.703	Cable attenuation Input reflection loss Input port immunity against reflection Output pulse mask
ITU-T G.783	Output jitter in the absence of input jitter Output combined jitter
ITU-T G823	Max. tolerable input jitter

Figure 10-2. Compliance E1 interface

Signal name	Pin	I/O	Signal Description
PORT1			
RJ_TX1+	A1	O	Transmit+ Port1
RJ_TX1-	A2	O	Transmit- Port1
RJ_RX1+	A4	I	Receive+ Port1
RJ_RX1-	A5	I	Receive- Port1
PORT 2			
RJ_TX2+	B1	O	Transmit+ Port 2
RJ_TX2-	B2	O	Transmit- Port 2
RJ_RX2+	B4	I	Receive+ Port 2
RJ_RX2-	B5	I	Receive- Port 2
PORT 3			
RJ_TX3+	C1	O	Transmit+ Port 3
RJ_TX3-	C2	O	Transmit- Port3
RJ_RX3+	C4	I	Receive+ Port3
RJ_RX3-	C5	I	Receive- Port 3
PORT 4			
RJ_TX4+	D1	O	Transmit+ Port 4
RJ_TX4-	D2	O	Transmit- Port 4
RJ_RX4+	D4	I	Receive+ Port4
RJ_RX4-	D5	I	Receive- Port 4
PORT5			
RJ_TX5+	E1	O	Transmit+ Port 5
RJ_TX5-	E2	O	Transmit- Port5
RJ_RX5+	E4	I	Receive+ Port 5
RJ_RX5-	E5	I	Receive- Port 5
PORT 6			
RJ_TX6+	F1	O	Transmit+ Port 6
RJ_TX6-	F2	O	Transmit- Port 6
RJ_RX6+	F4	I	Receive+ Port6
RJ_RX6-	F5	I	Receive- Port 6
PORT 7			
RJ_TX7+	G1	O	Transmit+ Port 7
RJ_TX7-	G2	O	Transmit- Port7
RJ_RX7+	G4	I	Receive+ Port7
RJ_RX7-	G5	I	Receive- Port 7
PORT 8			
RJ_TX8+	H1	O	Transmit+ Port 8
RJ_TX8-	H2	O	Transmit- Port8
RJ_RX8+	H4	I	Receive+ Port8
RJ_RX8-	H5	I	Receive- Port 8

Table 10.2. Pinout - 8xRj45 2Mb

HIGH DENSITY 63XE1 MODULE

63XE1-LFH

11

11.1 FUNCTIONAL DESCRIPTION OF MODULE

11.1.1 Brief description

This module contains 63 E1 interfaces. The E1 traffic is mapped into VC-12 containers and multiplexed together according to chapter “Multiplexing structure and Mapping modes” on page 3-2.

2 high density LFH type connectors are used to interface the 63 E1's, 32 interfaces in the bottom connector and 31 interfaces in the top connector (one pair left unconnected)

This module supports transparent data (G.703) and ISDN PRA.

11.1.2 Power consumption

8 W.

11.2 EXTERNAL INTERFACE

11.2.1 Connectors

The connector is a high density LFH connector

Figure 11-1. Connector type

Lower connector							
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
1	RxD29-	41	RxD2-	81	RxD31-	121	RxD4-
2	RxD29+	42	RxD2+	82	RxD31+	122	RxD4+
3	GND	43	GND	83	GND	123	GND
4	TxD29-	44	TxD2-	84	TxD31-	124	TxD4-
5	TxD29+	45	TxD2+	85	TxD31+	125	TxD4+
6	TxD25-	46	TxD6-	86	TxD27-	126	TxD8-
7	TxD25+	47	TxD6+	87	TxD27+	127	TxD8+
8	GND	48	GND	88	GND	128	GND
9	RxD25-	49	RxD6-	89	RxD27-	129	RxD8-
10	RxD25+	50	RxD6+	90	RxD27+	130	RxD8+
11	RxD21-	51	RxD10-	91	RxD23-	131	RxD12-
12	RxD21+	52	RxD10+	92	RxD23+	132	RxD12+
13	GND	53	GND	93	GND	133	GND
14	TxD21-	54	TxD10-	94	TxD23-	134	TxD12-
15	TxD21+	55	TxD10+	95	TxD23+	135	TxD12+
16	TxD17-	56	TxD14-	96	TxD19-	136	TxD16-
17	TxD17+	57	TxD14+	97	TxD19+	137	TxD16+
18	GND	58	GND	98	GND	138	GND
19	RxD17-	59	RxD14-	99	RxD19-	139	RxD16-
20	RxD17+	60	RxD14+	100	RxD19+	140	RxD16+
21	RxD13-	61	RxD18-	101	RxD15-	141	RxD20-
22	RxD13+	62	RxD18+	102	RxD15+	142	RxD20+
23	GND	63	GND	103	GND	143	GND
24	TxD13-	64	TxD18-	104	TxD15-	144	TxD20-
25	TxD13+	65	TxD18+	105	TxD15+	145	TxD20+
26	TxD9-	66	TxD22-	106	TxD11-	146	TxD24-
27	TxD9+	67	TxD22+	107	TxD11+	147	TxD24+
28	GND	68	GND	108	GND	148	GND
29	RxD9-	69	RxD22-	109	RxD11-	149	RxD24-
30	RxD9+	70	RxD22+	110	RxD11+	150	RxD24+
31	RxD5-	71	RxD26-	111	RxD7-	151	RxD28-
32	RxD5+	72	RxD26+	112	RxD7+	152	RxD28+
33	GND	73	GND	113	GND	153	GND
34	TxD5-	74	TxD26-	114	TxD7-	154	TxD28-
35	TxD5+	75	TxD26+	115	TxD7+	155	TxD28+
36	TxD1-	76	TxD30-	116	TxD3-	156	TxD32-
37	TxD1+	77	TxD30+	117	TxD3+	157	TxD32+
38	GND	78	GND	118	GND	158	GND
39	RxD1-	79	RxD30-	119	RxD3-	159	RxD32-
40	RxD1+	80	RxD30+	120	RxD3+	160	RxD32+

Table 11.1. Pinout of lower multi-interface connector

Upper connector							
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	RxD61-	41	RxD34-	81	RxD63-	121	RxD36-
2	RxD61+	42	RxD34+	82	RxD63+	122	RxD36+
3	GND	43	GND	83	GND	123	GND
4	TxD61-	44	TxD34-	84	TxD63-	124	TxD36-
5	TxD61+	45	TxD34+	85	TxD63+	125	TxD36+
6	TxD57-	46	TxD38-	86	TxD59-	126	TxD40-
7	TxD57+	47	TxD38+	87	TxD59+	127	TxD40+
8	GND	48	GND	88	GND	128	GND
9	RxD57-	49	RxD38-	89	RxD59-	129	RxD40-
10	RxD57+	50	RxD38+	90	RxD59+	130	RxD40+
11	RxD53-	51	RxD42-	91	RxD55-	131	RxD44-
12	RxD53+	52	RxD42+	92	RxD55+	132	RxD44+
13	GND	53	GND	93	GND	133	GND
14	TxD53-	54	TxD42-	94	TxD55-	134	TxD44-
15	TxD53+	55	TxD42+	95	TxD55+	135	TxD44+
16	TxD49-	56	TxD46-	96	TxD51-	136	TxD48-
17	TxD49+	57	TxD46+	97	TxD51+	137	TxD48+
18	GND	58	GND	98	GND	138	GND
19	RxD49-	59	RxD46-	99	RxD51-	139	RxD48-
20	RxD49+	60	RxD46+	100	RxD51+	140	RxD48+
21	RxD45-	61	RxD50-	101	RxD47-	141	RxD52-
22	RxD45+	62	RxD50+	102	RxD47+	142	RxD52+
23	GND	63	GND	103	GND	143	GND
24	TxD45-	64	TxD50-	104	TxD47-	144	TxD52-
25	TxD45+	65	TxD50+	105	TxD47+	145	TxD52+
26	TxD41-	66	TxD54-	106	TxD43-	146	TxD56-
27	TxD41+	67	TxD54+	107	TxD43+	147	TxD56+
28	GND	68	GND	108	GND	148	GND
29	RxD41-	69	RxD54-	109	RxD43-	149	RxD56-
30	RxD41+	70	RxD54+	110	RxD43+	150	RxD56+
31	RxD37-	71	RxD58-	111	RxD39-	151	RxD60-
32	RxD37+	72	RxD58+	112	RxD39+	152	RxD60+
33	GND	73	GND	113	GND	153	GND
34	TxD37-	74	TxD58-	114	TxD39-	154	TxD60-
35	TxD37+	75	TxD58+	115	TxD39+	155	TxD60+
36	TxD33-	76	TxD62-	116	TxD35-	156	
37	TxD33+	77	TxD62+	117	TxD35+	157	
38	GND	78	GND	118	GND	158	GND
39	RxD33-	79	RxD62-	119	RxD35-	159	
40	RxD33+	80	RxD62+	120	RxD35+	160	

Table 11.2. Pinout of upper multi-interface connector

11.2.2 Compliance

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

Table 11.3. Compliance multi-interface E1 interface

11.3 PATCH PANELS

11.3.1 Introduction

Two patch panels and a LFH cable are available for patching the 63 E1's interface on the High Density 63xE1 module.

11.3.2 32XE1 LFH - LFH Cable

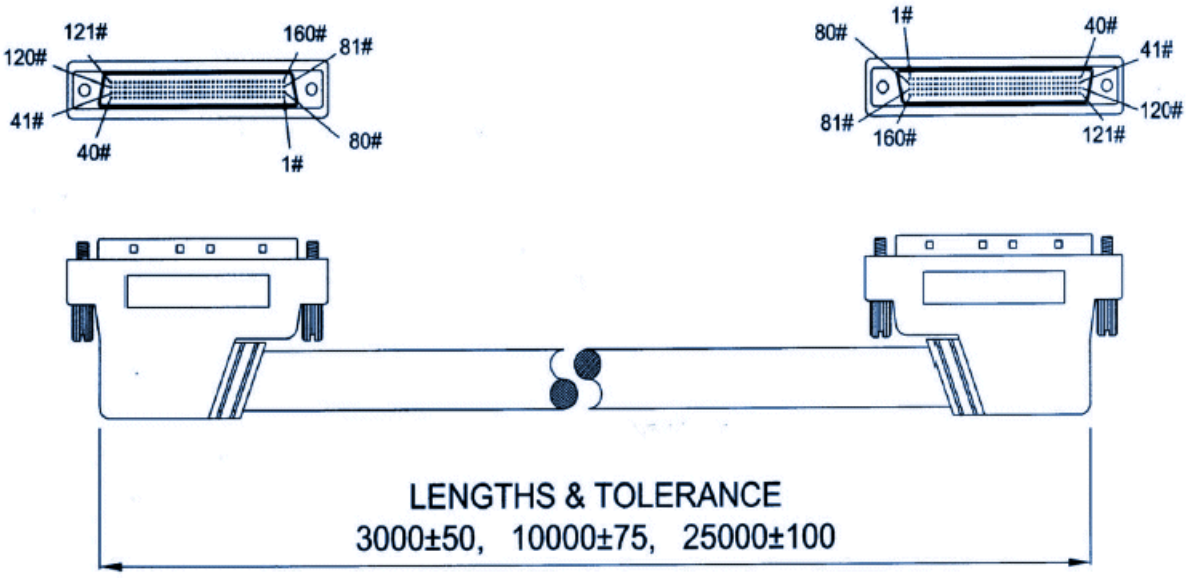


Figure 11-2. 32XE1 LFH - LFH Cable

Available patch cable lengths are:

- 3 M
- 10 M
- 25 M

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

11.3.3 32xE1-LFH-RJ45 panel

Figure 11-3. Overview 32xE1-LFH-RJ45 Panel

Figure 11-4. Detail 32xE1-LFH-RJ45 Panel

Pin Out

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

Table 11.4. RJ-45 Connector Pin Out

11.3.4 32xE1-LFH-1.0/2.3 panel

Figure 11-5. Overview 32xE1-LFH-1.0/2.3

Figure 11-6. Detail 32xE1-LFH-1.0/2.3

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

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

TRI E3/T3 TRIBUTARY MODULE

3XE3/T3-1.0/2.3

12

12.1 FUNCTIONAL DESCRIPTION OF MODULE

12.1.1 Brief description

This module contains three E3 interfaces. The E3 traffic is mapped into VC-3 containers and multiplexed together as described in “SDH features” on page 3-2. The interfaces can be configured to E3 or T3.

The physical connector for the interface is the miniature 1.0/2.3 type.The module does not contain any IP functionality.The interface supports transparent data (G.703).

The E3/T3 traffic is mapped into VC-3 containers and multiplexed together according to “Multiplexing/ mapping structure” on page 3-2.

The E3/T3 interfaces can individually be configured to be an E3 or a T3 interface. The E1 interfaces can individually be configured to be a transparent G.703 interface or an ISDN PRA interface.

The physical connector for the E3/T3interface is the miniature 1.0/2.3 type, the interface supports transparent data (G.703).

12.1.2 Power consumption

6 W.

12.2 EXTERNAL INTERFACE

12.2.1 E3/T3 75 Ohm Electrical interface

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

Connectors

The connector used is a 75 ohm coaxial connector type 1.0/2.3.

The screen on the input and on the output connector is always DC coupled to ground.

Figure 12-1. Connector Type 3xE3/T3- 1.0/2.3

Compliance

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

Table 12.1. Compliance E3 interface

HEX E3/T3 TRIBUTARY MODULE

6XE3/T3-1.0/2.3

13

13.1 FUNCTIONAL DESCRIPTION OF MODULE

13.1.1 Brief description

This module contains six E3 interfaces. The E3 traffic is mapped into VC-3 containers and multiplexed together as described in “SDH features” on page 3-2. The interfaces can be configured to E3 or T3.

The physical connector for the interface is the miniature 1.0/2.3 type.The module does not contain any IP functionality.The interface supports transparent data (G.703).

13.1.2 Power consumption

11 W.

13.2 EXTERNAL INTERFACE

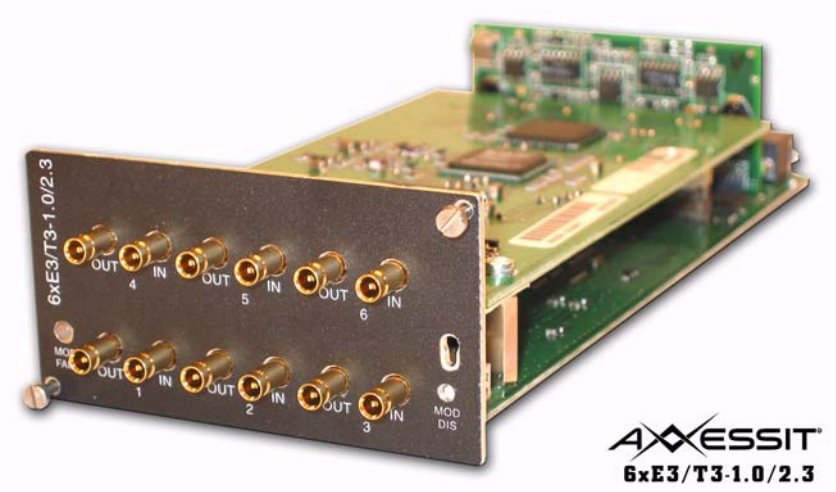
13.2.1 E3/T3 75 Ohm Electrical interface

Description

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

Connectors

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



Compliance

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

Table 13.1. Compliance E3 interface

TRI E3/T3 TRIBUTARY MODULE

21XE1+3XE3/T3-1.0/2.3

14

14.1 FUNCTIONAL DESCRIPTION OF MODULE

14.1.1 Brief description

This is a combination module containing 21xE1 interfaces and 3xE3/T3 interfaces.

The E1 traffic is mapped into VC-12 containers and multiplexed together according to “Multiplexing/ mapping structure” on page 3-2.

The physical connector for the E1 interface is a high density LFH type connector.

The E3/T3 traffic is mapped into VC-3 containers and multiplexed together according to Figure 3-1. The E3/T3 interfaces can individually be configured to be an E3 or a T3 interface. The E1 interfaces can individually be configured to be a transparent G.703 interface or an ISDN PRA interface. The interface is a 34Mbit/s E3 or 45Mbit/s T3 interface (configurable) according to ITU-T G.703.

The physical connector for the E3/ T3 interface is the miniature 1.0/2.3 type, the interface supports transparent data (G.703).

14.1.2 Power consumption

14 W.

14.2 EXTERNAL INTERFACE

14.2.1 External E1 Interface

Connectors

The connector is a high density LFH connector.

One high density LFH type connector is used to interface the 21 E1's.

Figure 14-1. 21xE1+3xE3/ T3 module

Two types of patch panels are available for patching the 21 E1's interface.

See “Patch panels” on page 11-7 for more details

NOTE! *When the LFH connector/ Patch panels are used together with the 21xE1+3xE3/T3 module, only the first 21 ports are used.*

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

Compliance

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

Table 14.1. Multi-Interface E1 Compliance

14.2.2 E3/T3 75 Ohm Electrical interface

Connectors

The connector used is a 75 ohm coaxial connector type 1.0/2.3.

The screen on the input and on the output connector is always DC coupled to ground.

Compliance

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

Table 14.2. Compliance E3 interface

QUAD LAN 10/100BASE-TX MODULE 4XFE/MAP-RJ45

15

15.1 FUNCTIONAL DESCRIPTION OF MODULE

15.1.1 Brief description

This module contains 4 Ethernet interfaces that support both 10Base-T and 100Base-TX according to the IEEE 802.3 specification. The interface supports both the half-duplex and the full-duplex modes.

The interfaces are connected to an integrated Ethernet switch.

The module only support the AXXESSIT proprietary mapping scheme.

The module also contains 4 mapper circuits connected to the Ethernet switch, allowing mapping of the Ethernet traffic from the four interfaces into a number of VC-12 containers. Since the mapper circuits are connected to the matrix, the mapper circuits are global resources that mean that the traffic to be terminated may come from other modules in the system.

15.1.2 Power consumption

9 W

15.2 EXTERNAL INTERFACE

15.2.1 10Base-T and 100Base-TX Ethernet Interface

Connectors

The physical interface uses a 4x RJ-45 Fast Ethernet connector.

Figure 15-1. 4xFE/ MAP- RJ45

Traffic and link status are indicated in a LED (light pipe) which is formed as an arrow, pointing on the actual port. Every interface has two LED's that signal the status of the interface. The rightmost LED indicates the link status and the leftmost indicates the link speed.

LAN1 to LAN4 are numbered from the left.

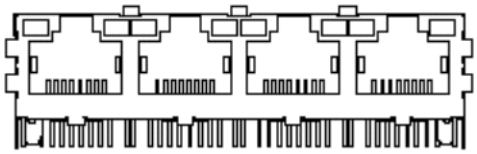


Figure 15-2. Connector illustration- 4xFE

Pin Out

Signal name	Pin	I/O	Signal Description
LAN 1			
RJ_TX1+	1	O	Transmit+ LAN 1
RJ_TX1-	2	O	Transmit- LAN 1
RJ_RX1+	3	I	Receive+ LAN 1
RJ_RX1-	6	I	Receive- LAN 1
LAN 2			
RJ_TX2+	1	O	Transmit+ LAN 2
RJ_TX2-	2	O	Transmit- LAN 2
RJ_RX2+	3	I	Receive+ LAN 2
RJ_RX2-	6	I	Receive- LAN 2
LAN 3			
RJ_TX3+	1	O	Transmit+ LAN 3
RJ_TX3-	2	O	Transmit- LAN 3
RJ_RX3+	3	I	Receive+ LAN 3
RJ_RX3-	6	I	Receive- LAN 3
LAN 4			
RJ_TX4+	1	O	Transmit+ LAN 4
RJ_TX4-	2	O	Transmit- LAN 4
RJ_RX4+	3	I	Receive+ LAN 4
RJ_RX4-	6	I	Receive- LAN 4

Table 15.1. Pinout Fast Ethernet ports

Compliance

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

Table 15.2. Compliance 10/100Base-T interface

OCTAL LAN 10/100BASE-TX MAPPER 8XFE-16XSMAP-RJ45

16

16.1 FUNCTIONAL DESCRIPTION OF MODULE

16.1.1 Brief description

The module is a tributary module that supports both optical and electrical Ethernet interfaces. The module contains 8 LAN Ethernet interfaces that support both 10Base-T and 100Base-TX according to the IEEE 802.3 specification. The interface supports both the half-duplex and the full-duplex modes.

The physical interface is RJ-45connectors. Every interface has two LED's, one LED indicates the link status and the other LED indicates the link speed.

The module includes up to sixteen Ethernet to SDH mappers.

The module support both L1 and L2 services.

It consists of the following functionality:

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

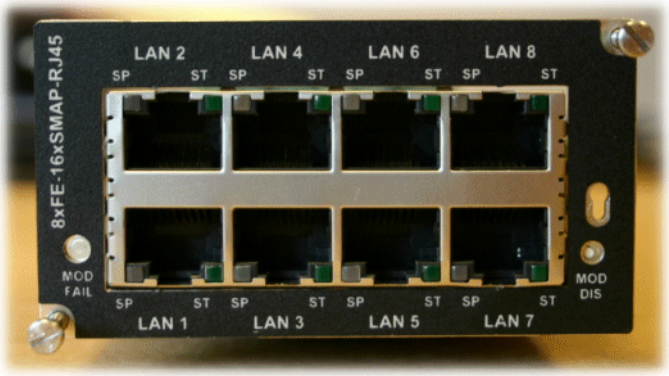


Figure 16-1. Octal LAN 10/100Base-TX Mapper - 8xFE-16xSMAP-RJ45

Ethernet features

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

The policer performs the following functions:

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

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

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

The following options are available in the policer:

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

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

SDH features

The tributary module includes the following SDH functionality:

- GFP-F encapsulation of Ethernet traffic
- Support of Virtual Concatenation with VC-12-nV, where n=1..50, VC-4-nV, where n=1 and VC-3-nV, where n=1..3
- Support for up to 16 independent mappers
- Support for LCAS and the AXXESSIT proprietary mapping scheme.
- AU4, TU-12/3 pointer interpretation/ generation and VC-12/4/3 termination
- Alarm processing

Electrical interfaces

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

LED indicators

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

16.1.2 Configuration

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

- Grooming mode
- Normal mode

2xFE + SMAP mode

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

8xFE+SMAP mode

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

The mapper circuits supports the mapping functionality described in “Ethernet over SDH mapping” on page 3-17.

The LAN and WAN ports offers the IP functionality described in .“IP features” on page 3-26

16.1.3 Power consumption

27,5 W

NOTE! *Please see “Power module, AC 230V” on page 2-9*

16.2 EXTERNAL INTERFACE

16.2.1 Description

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

16.2.2 Connector type

The connectors are 8x RJ-45 Fast Ethernet

Pin Out

Pins available

8x 8pin

Spare pins

8x 4

LAN1 to LAN8 are numbered from lower left corner.

Traffic and link status are indicated in a LED (light pipe) which is formed as an arrow, pointing on the actual port.

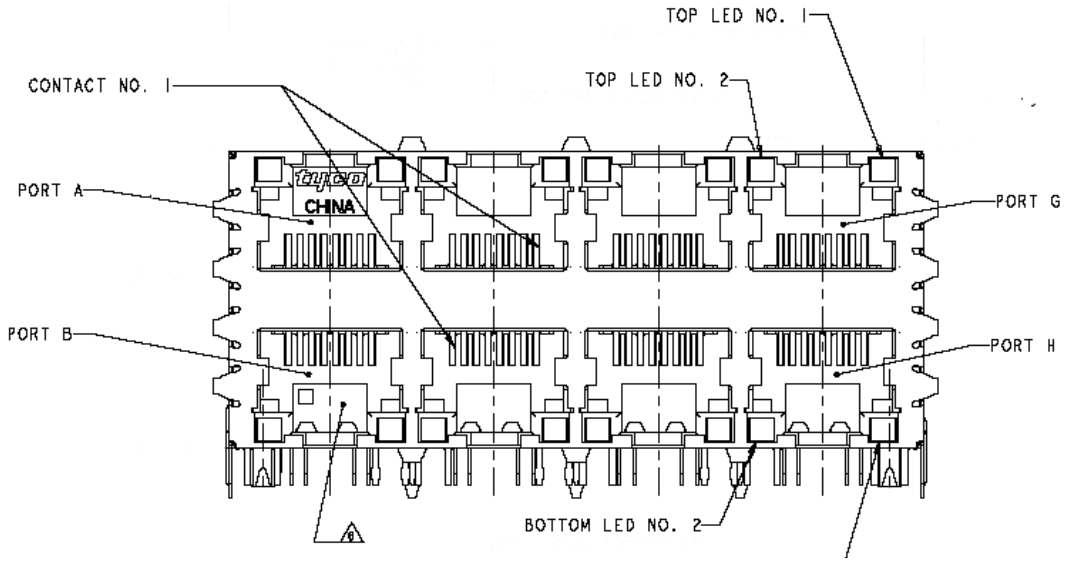


Figure 16-2. Connector illustration

16.2.3 Compliance

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

Table 16.1. Compliance 10/100Base-T interface

REMOTE MODULE - AXX10

17

17.1 AXX10 - SYSTEM OVERVIEW

17.1.1 Brief description

The AXX10 is an Integrated Access Device for use in fibre optic networks. The AXX10 combines IP traffic and TDM traffic, in a cost-efficient way, by running IP channels along with TDM channels inside an SDH-frame structure that can be easily carried across the network. The bandwidth of the IP channel is configurable from 2 Mbit/s to 100 Mbit/s true “wire-speed” in steps of 2 Mbit/s.

The AXX10 is optimised for very low cost solutions and therefore have limited functionality. The AXX10 supports only one customer per unit.

The AXX10 must be used together with the NE consolidation unit (CU). It is not a fully working standalone SDH network element, but a remote module to AXXEDGE/AXX155A.

The AXX10 has four E1 tributary ports, 4 Fast Ethernet LAN ports, and one Ethernet WAN port.

The AXX10 is managed remotely by a management system that supervises both the IP-and TDM-parts of the system..

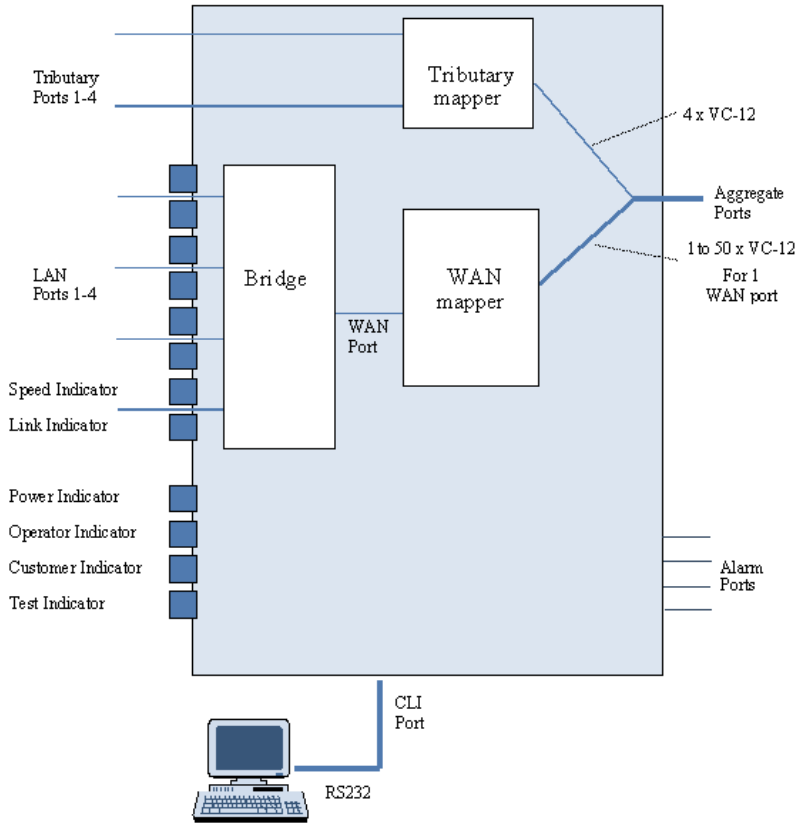


Figure 17-1. AXX10 Overview

17.1.2 AXX10 - In brief

- The cdb-file is a part of the NE configuration
- Does not support any configuration without the NE
- Auto-discovery algorithm and continuous communication between NE and AXX10 utilise the DCC channel in the RSOH
- Does not support any protection schemes
- Is a cost optimized - one customer CPE
- Can connect to all kinds of STM-1 modules supported by NE
- No alarm outputs, just inputs
- Performance data is sent to NE every 15 minutes and status of alarms every second
- Recognised in management as an remote module
- Synchronisation is always locked to the aggregate port
- Processing of S1 byte to report; Real time clock (RTC) sync downwards and immediate failure upwards)
- Transparent forwarding of Ethernet packets up to 1916 bytes
- CoS 802.1p support
  - two ques (high and low)
  - ToS bit
  - strict or weighted
  - Port Priority without any look at the Ethernet frame
  - 802.1p, check of priority on ingress
  - diffserv
  - enable/disable per port
  - classification per device
  - check of ToS field
- Rate limiting
  - per port
  - one second intervall
  - one mac-address per device
  - supports loop setting locally through VT100.Reset on system restart.
- Software is updated if downloading Network on NE

17.1.3 Applications

The AXX10 must be connected to the NE. The AXXEDGE/AXX155A is placed in the operator's point of presence. This is shown in the figure below. The AXXEDGE/AXX155A integrates the functionality of the ADM, IP switch/router and connects to the number of AXX10 at the customer sites. The AXXEDGE/AXX155A may also function as a drop-shelf that is connected to an external ADM.

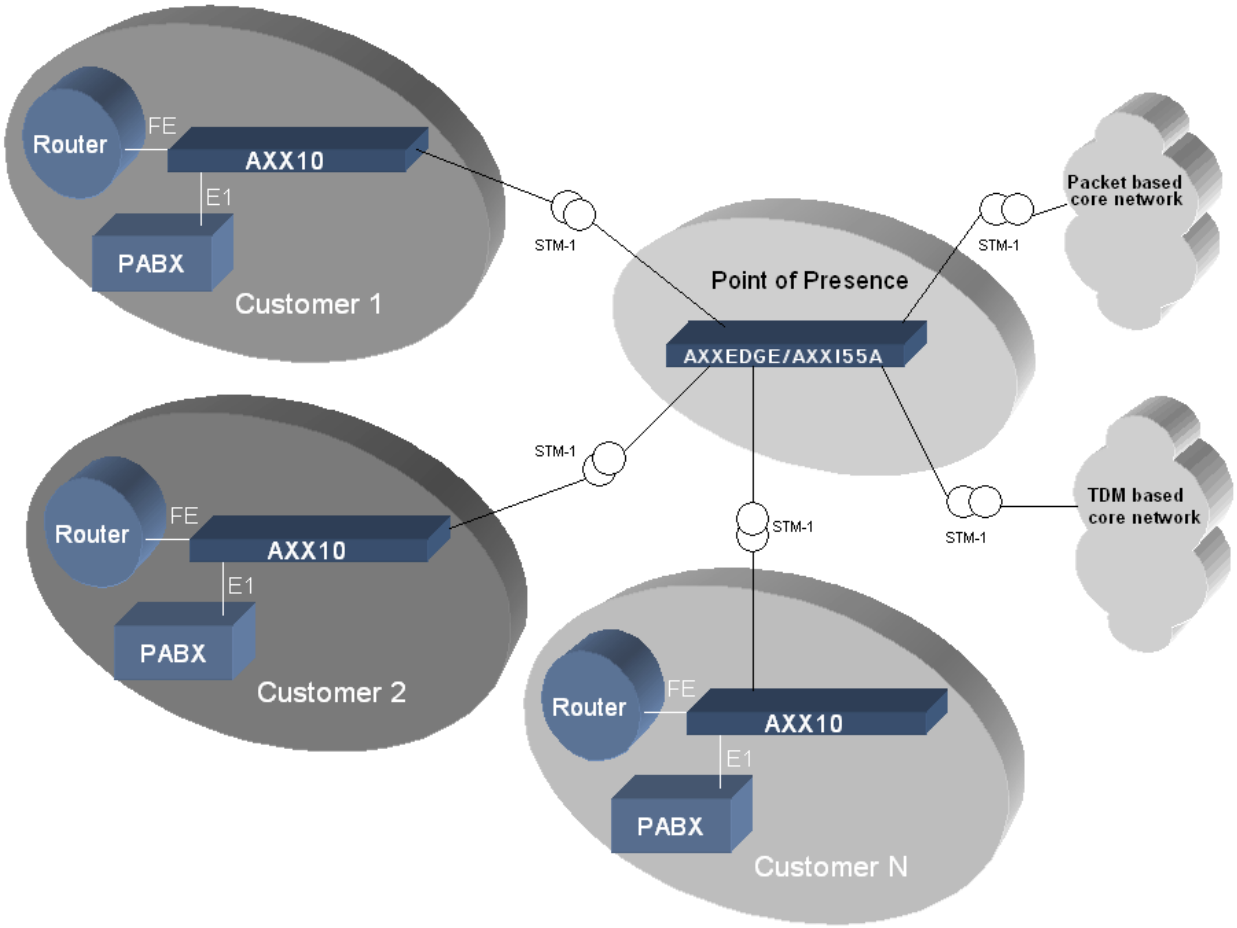


Figure 17-2. Typical system with AXX10 connected to an AXXEDGE or AXX155A

17.2 SDH FEATURES

17.2.1 Multiplexing structure and Mapping modes

The aggregate interface supports only terminal multiplexer functions, and 63xVC-12 mapping. The module only support the AXXESSIT proprietary mapping scheme.

The figure below shows the internal structure of AXX10. The bridge receives an Ethernet frame/IP datagram on one of the ports and decides on which port to send it out. The Ethernet Mapper converts between Ethernet frames and VC-12s while the Tributary Mapper converts between E1 signals and VC-12s. The SDH Multiplexer is responsible for the multiplexing of VC-12s into STM-1. The VC-12s are sent to - and received from - either the Tributary Mapper or the Ethernet Mapper.

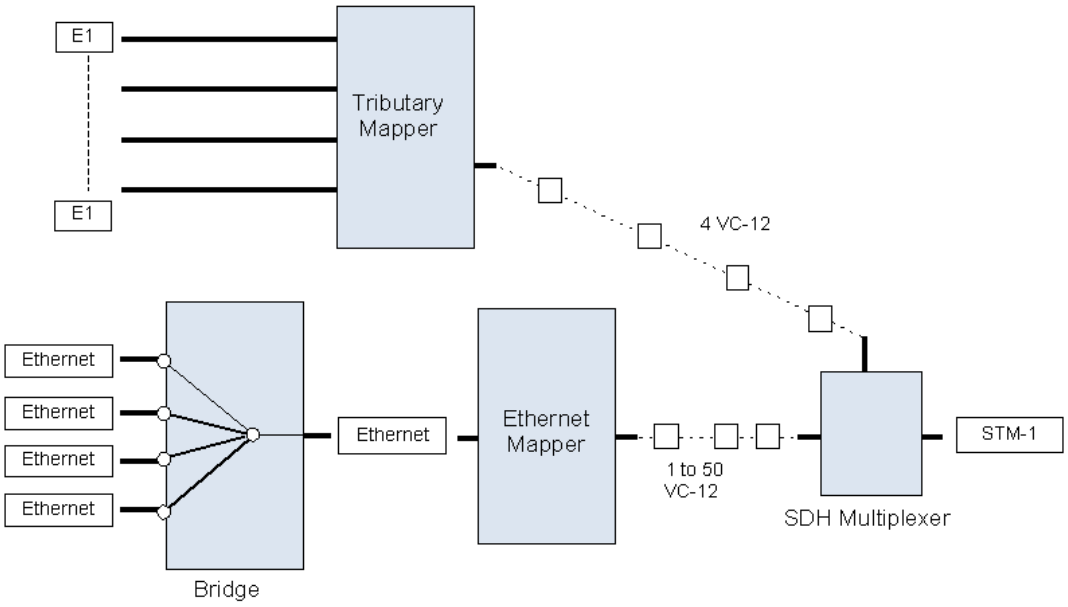


Figure 17-3. Multiplexing and mapping in AXX10.

Multiplexing structure supported in AXX10 R1 is shown in Figure 17-4.

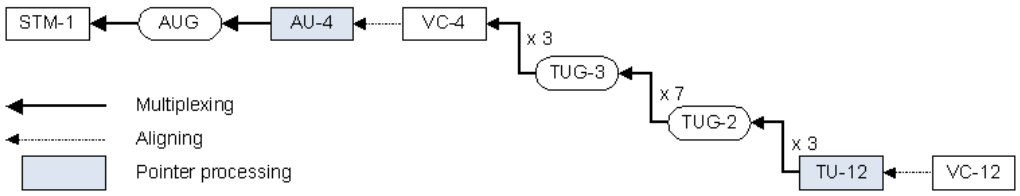


Figure 17-4. Multiplexing structure in STM-1.

The WAN traffic is mapped into a number of VC-12 containers in a round-robin fashion with an inverse multiplexer function. The IP traffic is mapped into 1 to 50 VC-12 containers.

The AXX10 only have one WAN channel. The total bandwidth for one WAN channel cannot be greater than 100 Mbit/s or 47xVC-12 containers.

The mapping between the tributary interfaces and the WAN port is fixed:

Port	KLM
WAN	1.1.1 - 3.3.2
PDH-1	3.3.3
PDH-2	3.4.1
PDH-3	3.4.2
PDH-4	3.4.3

Table 17.1. AXX10 fixed VC-12 mapping

17.2.2 Performance monitoring

The AXX10 R1 offers G.826 performance monitoring at the RS, MS, VC-4, and VC-12 levels in the SDH hierarchy. This includes B1 near end in RSOH section, B2 near and far end in MSOH section, B3 near and far end at VC-4 level and BIP-2 near and far end at VC-12 level.

The AXX10 transfers the content of the error counter to the AXXEDGE/AXX155A and it calculates excessive error and degrade signal defects assuming Poisson distribution of errors, according to ITU-T G.826 for AXX10.

17.2.3 Synchronization

The AXX10 does not support full SDH SETS functionality.

AXX10 R1 can synchronize to the following sources

- The STM-1 interface
- A local oscillator (AIS oscillator with an accuracy of +/- 20ppm).

The STM-1 interface has the highest priority. If it fails then the internal oscillator is used. Switchback to the selected source is performed automatically whenever it becomes possible again.

17.3 IP FEATURES

17.3.1 Bridge

The bridge is a transparent multi-port remote Ethernet bridge as specified in IEEE 802.3. The Bridge consists of one to four LAN ports and one WAN port. Each port may have its own MAC address, but in most configurations one MAC address for the whole bridge is sufficient. The four LAN ports support 10/100BaseT Ethernet for UTP cables. Both 10 Mbit/s and 100Mbit/s are supported with auto-negotiation. The LAN ports are compatible with IEEE 802.3.

The bridge supports the following features:

- MAC switching
- Self-learning MAC Addresses
- Support of up to 1024 MAC addresses
- Automatic Ageing for MAC addresses
- Transparent Bridging
- Back pressure and flow control Handling
- Auto negotiation
- Auto crossover
- 802.1p priority

The filtering rate of the bridge is able to operate at full wire speed. The forwarding rate is only limited by the forwarding interface speed, i.e. the selected WAN channel speed.

17.4 TDM FEATURES

AXX10 R1 provides four 120-ohm 2.048 MHz Tributary ports on the customer side. An external balun supports 75-ohm operation.

Each Tributary Port can be individually configured to run in one of the following modes:

- G.703 Transparent (TRA)
- ISDN Primary Rate Access (PRA)

PRA is implemented according to ETS 300011 and ETS 300233. Note that AXX10 only implements the PRA NTE functions.

Two test loops are provided per Tributary Port, one in the customer direction (LL3) and one in the network direction (LL2), see Figure 5.

One Tributary Port can have only one loop activated at a time.

The test loops can be activated, deactivated and monitored by the management system.

The loop control logic depends on the tributary mode (TRA or PRA).

- In TRA mode the management system can operate the loops at any time as long as the port is enabled.
- In PRA mode the loops are supposed to be controlled by some exchange termination equipment (ET) via inband channel 0 control bits. In this mode it is not possible to operate the loops from the AXX10 management system.

To change the tributary mode, the loop must be cleared.

The Test Indicator LED is ON if any tributary loop is closed, regardless of the tributary mode.

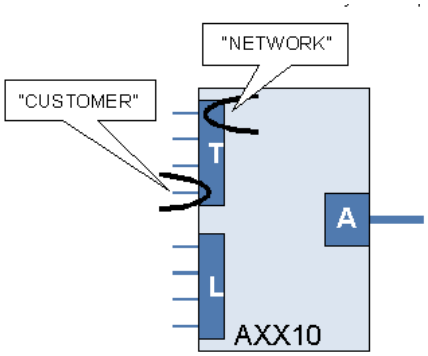


Figure 17-5. Test loops

17.5 ALARM PORTS

17.5.1 Auxiliary alarm input

The AXX10 provides facilities to report four auxiliary alarm inputs for associated equipment, e.g., power unit failure, battery condition, cabinet door, etc. These alarms are activated by an external loop between a pair of contacts.

The polarity of the auxiliary alarm input ports is a configurable parameter, i.e., alarm can be defined either as a loop closed or a loop open condition. The severity of the alarm input ports are the same for all four ports and can be configured from the management system.

The alarms are reported to the management system.

17.6 LED INDICATORS

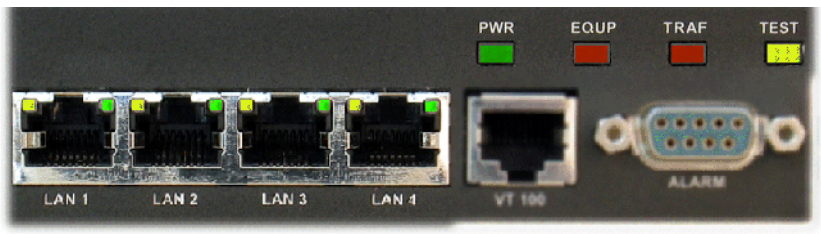
17.6.1 AXX10 Status

The LED indicators are used to visualize the AXX10 status, see Table 17.2.

Indicator	Colour	Function
Speed Indicators	GreenYellow	LAN Speed indicator (one LED per LAN Port)100 Mbit/s10 Mbit/s
Link indicator	GreenBlinking	LAN link status (one LED per LAN port)Link is up and with no trafficLink is up and with traffic
Equipment Indicator	Red	Alarm on the AXX10 customer side, i.e. Tributary Ports
Traffic Indicator	Red	Alarm on the AXX network side (Aggregate Port incl. VC12) or the device itself.
Test Indicator	Yellow	Test loop is present
Power Indicator	Green	Power OK

Table 17.2. LED Indicators

NOTE! *The speed and link indicator LED's are an integral part of the LAN connectors. The upper right LED is the link indicator and the upper left LED is the speed indicator.*



17.7 DCN FEATURES

17.7.1 General

The AXX10 use the SDH DCC channel to communicate with the AXXEDGE/AXX155A. The protocol format is proprietary and AXX10 cannot be connected to other network elements.

17.8 PHYSICAL INTERFACES

This chapter describes the different types of physical interfaces in AXX10. Tthe table below gives the relationship between the type of interface and the logical names used in this document (For example in Figure 17-1.)

Interface	No. of interfaces	Logical Name
Optical	1	Aggregate port
Tributary	4	Tributary port (E1)
Ethernet	4	LAN port
RS232	1	CLI port
Alarm	4	4 Alarm inputs
Power supply	1	-48V DC
Indicators	12	4 Speed Indicators, 4 link indicators, Power Indicator, Equipment Indicator, Traffic Indicator and Test Indicator

Table 17.3. Physical interfaces

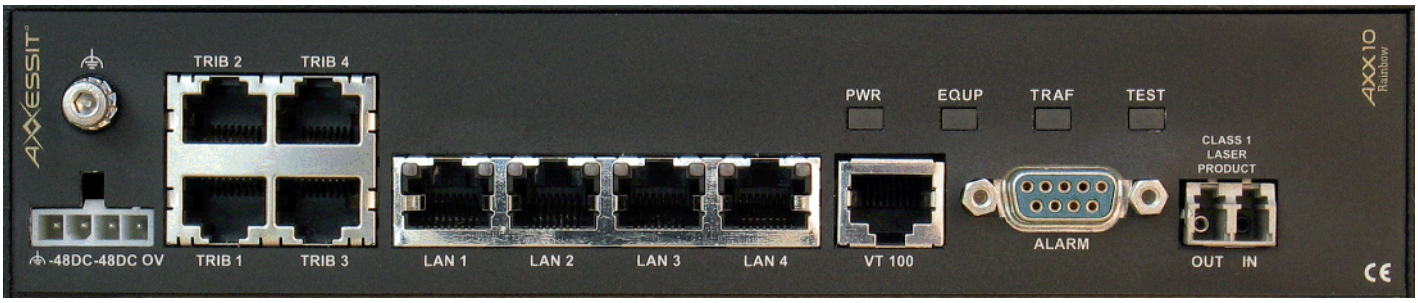


Figure 17-6. Illustration

17.8.1 Optical

For AXX10 the transmission over the optical interface is bi-directional on one fibre or uni-directional on two fibres. Different wavelengths are used in transmit and receiver direction.

The two-fibre interface is a standard S-1.1 interface. The single fibre interface is a proprietary interface with respect to optical parameters.

17.8.2 Connector type

LC - default

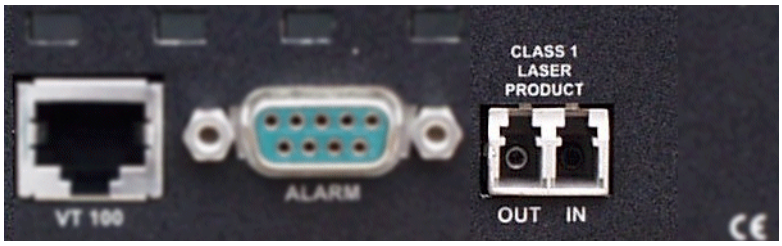


Figure 17-7. AXX10 - S-1.1 interface

Parameters

The definitions of optical parameters and reference points S and R refer to ITU-T G.957. Reference point S means transmit direction while R is the receive direction of the fibre.

Optical budget short haul two-fibre

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

Table 17.4. Optical budget short haul two-fibre parameters

Optical output jitter

Filter bandwidth	Jitter limit
500 Hz - 1.3 MHz	0.50 Uipp
65 kHz - 1.3 MHz	0.10 Uipp

Table 17.5. Optical output jitter parameters

Input jitter

Frequency range	Jitter limit
500 Hz - 6.5 kHz	1.5 Uipp
6.5 kHz - 65 kHz	Decaying, slope equal to 20 dB/decade
65 kHz - 1.3 MHz	0.15 Uipp

Table 17.6. Optical input jitter parameters

Compliance

Standard	Comment
ITU-T G.652	Type of optical fibre (single fibre)
ITU-T G.707	Optical line signal
ITU-T G.783	RX pull-in and hold range
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter
ITU-T G.957	Optical spectrumOptical output power Optical eye diagram (Figure 2 in the specification) Optical extinction ratio (Chapter 6.2.4 in the specification)
ITU-T G.958	Input jitter measurement

Table 17.7. Optical interface compliance

17.8.3 Tributary Ports

Connectors

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

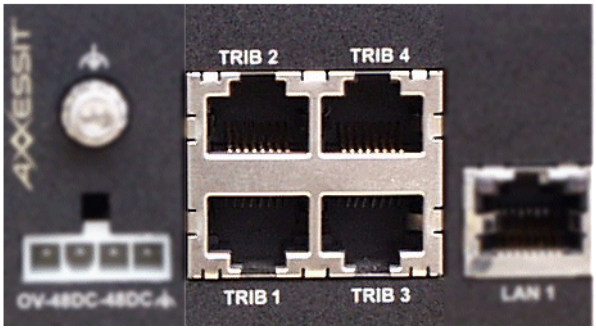


Figure 17-8. AXX10 - Tributary ports (E1)

Pin	Signal
1	P120OUT
2	N120OUT
3	GND
4	P120IN
5	N120IN
6	SHIELD,see Note 1
7	NC
8	NC

Table 17.8. Pin-out tributary interface

NOTE 1 *The outer screen is always connected to ground.*

Parameters

Input jitter

Frequency range	Jitter limit
20 Hz - 2.4 kHz	1.5 Uipp
2.4 kHz - 18 kHz	Decaying, slope equal to 20 dB/decade
18 kHz - 100 kHz	0.2 Uipp

Table 17.9. Tributary input jitter parameters

Input reflection loss

Frequency range	Reflection loss
51 kHz - 102 kHz	12 dB
102 kHz - 2048 kHz	18 dB
2048 kHz - 3072 kHz	14 dB

Table 17.10. Tributary input reflection loss

Output jitter

The requirements for output jitter in the absence of input jitter and pointer movements are:

Filter bandwidth	Jitter output (p-p)
20 Hz - 100 kHz	< 0.25 UI
700 Hz - 100 kHz	< 0.075 UI

Table 17.11. Tributary output jitter without pointer movements

The requirements for output jitter in the absence of input jitter but with pointer movements are:

Filter bandwidth	Jitter output (p-p)
20 Hz - 100 kHz	< 0.4 UI
700 Hz - 100 kHz	< 0.075 UI

Table 17.12. Tributary output jitter with pointer movements

Compliance

Standard	Comment
ETS 300 246	Connector
ETS 300 247	Connector
ETS 300 011	Impedance towards groundTolerable longitudinal voltage
ETS 300 126	Output signal balance
ITU-T G.703	Cable attenuationInput reflection lossInput port immunity against reflectionOutput pulse mask
ITU-T G.783	Output jitter in the absence of input jitter (Chapter 10.2.3.1 in the specification) Output combined jitter (Chapter 10.2.3.3 in the specification)
ITU-T G.823	Max. tolerable input jitter

Table 17.13. Tributary interface conformance

17.8.4 LAN Ports

Connectors

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

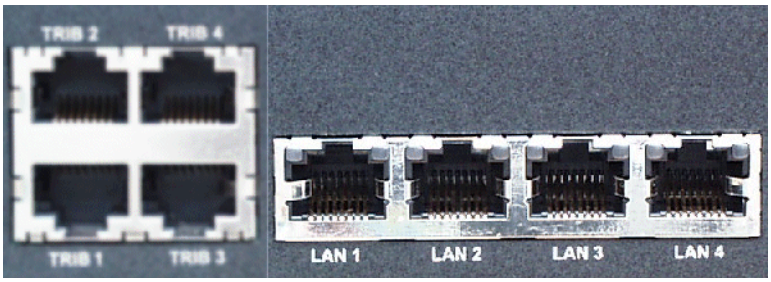


Figure 17-9. AXX10 - LAN ports

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

Table 17.14. Pin-out Ethernet ports

Parameters

The parameters on the Ethernet interface are in accordance with the specifications given in Table 17.15.

Compliance

Standard	Comment
ISO/IEC8877	MAU MDI connector
IEEE 802.3	Section 14 and 24, physical medium.
ANSI X3.263 TP-PMD	Physical medium 100BASE-T

Table 17.15. Ethernet compliance

17.8.5 Alarm interface

Connectors

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

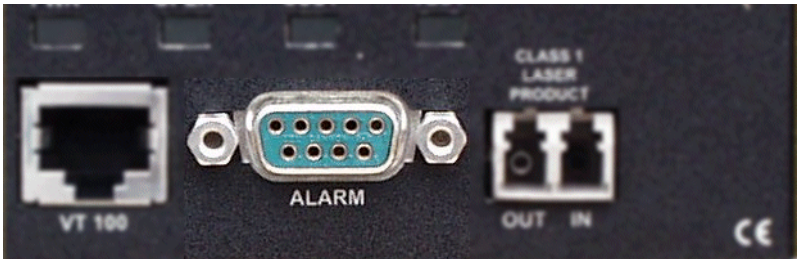


Figure 17-10. AXX10 - Alarm interface connector

Pin	Signal
1	Gnd
2	Alarm input 1 (aux 1)
3	Alarm input 2 (aux 2)
4	Alarm input 3 (aux 3)
5	Alarm input 4 (aux 4)
6	Alarm input return
7	NC
8	NC
9	NC

Table 17.16. Pin-out alarm interface

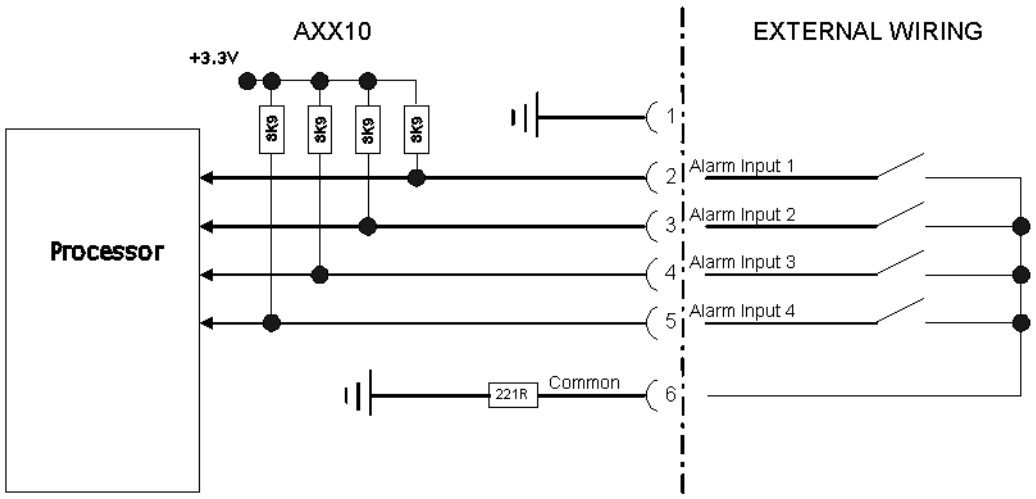


Figure 17-11. Alarm interface - overview

Parameters

Parameter	Value
Nominal open contact voltage	+3.3 V
Nominal closed contact current	1 mA
Max. closed contact resistance	0.8 kohm
Min. open contact resistance	10 kohm

Table 17.17. Electrical specification at alarm input

17.8.6 CLI Port

Connectors

The RS232 interface for AXX10 is provided using a RJ-45 connector, with the following pin-out

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

Table 17.18. Pin-out CLI connector

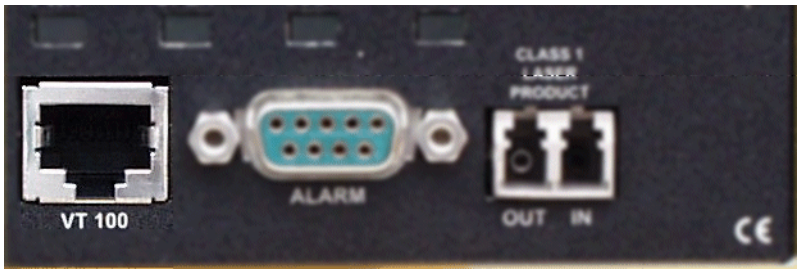


Figure 17-12. AXX10 - RS232 interface

Parameters

The interface is running at a data rate of 19.200 baud.

The interface is in accordance with the specifications given in the Table 17.19.

Compliance

Standard	Comment
EIA RS-232	Physical interface

Table 17.19. CLI port compliance

17.8.7 Power supply (DC)

AXX10 support a dual -48V DC power supply interface. Note that only one power supply is available internally, but it can be feed from two -48V sources.

Connectors

The -48V DC supply input is provided via a 4 pin power connector with the following pin-out

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

Table 17.20. Pin-out DC connector

Parameters

The -48V DC input conforms to the specifications given below.

Parameter	Limit
Power dissipation	Less than 9W
Fuse	0.3A
Battery voltage range	-36 to -72V DC

Table 17.21. Electrical specifications at DC input

NOTE! *Dependent on configuration*

Standard	Comment
ETS 300 132-2	Power supply interface, DC operating
ETS 300 253	Earthing and bonding

Table 17.22. Compliance power supply

17.8.8 Power supply (AC)

The AXX10 uses an external AC power-supply adaptor.

An external AC adapter can be ordered separately from AXXESSIT, order code 50016-02AA.

Any AC-DC adapter with 48V nominal output that fulfills the requirements for AXX10 DC input port may be used. Be sure that the supply is double insulated and conforms to EN 60 950 standard.

Connectors

It is possible to support different markets with the necessary physical connectors.

Parameters

The 230V AC input conforms to the specifications given in Table 17.23. .

Parameter	Limit
Power dissipation	<10W
Fuse	0.3A
Mains voltage	-230V AC +/- 10%

Table 17.23. Power supply parameters

Conformance

Standard	Comment
EN 60950	Single phase 230 V 50 Hz AC mains supply

Table 17.24. Power supply conformance

REMOTE MODULE - AXX11

18

18.1 AXX11 - SYSTEM OVERVIEW

The purpose of this document is to specify the AXX11 product. AXX11 is the second product in a family of products that can be viewed as remote modules to the network element AXXEDGE/AXX155A.

18.1.1 Brief description of AXX11

The AXX11 is a new Integrated Access Device for use in fibre optic networks. The AXX11 combine IP traffic and TDM traffic in a cost-efficient way by running IP channels along with TDM channels inside an SDH-frame structure that can easily be carried across the network.

The bandwidth of the IP channel is configurable from 2 Mbit/s to 100 Mbit/s true “wire-speed” in steps of 2 Mbit/s.

The AXX11 is optimised for very low cost solutions and therefore have limited functionality. The AXX11 supports only one customer per unit.

The AXX11 must be used together with the AXXEDGE/AXX155A consolidation unit (CU). It is not a fully working standalone SDH network element (NE), but a remote module to AXXEDGE/AXX155A.

The AXX11 has four E1 tributary ports, 4 Fast Ethernet LAN ports,2 Legacy Data ports and one Ethernet WAN port.

The AXX11 is managed remotely by a management system that supervises both the IP-and TDM-parts of the system.

In addition to the interfaces described above, two legacy data interfaces are provided . The data interfaces are mapped into E1 before converted to VC-12 containers.

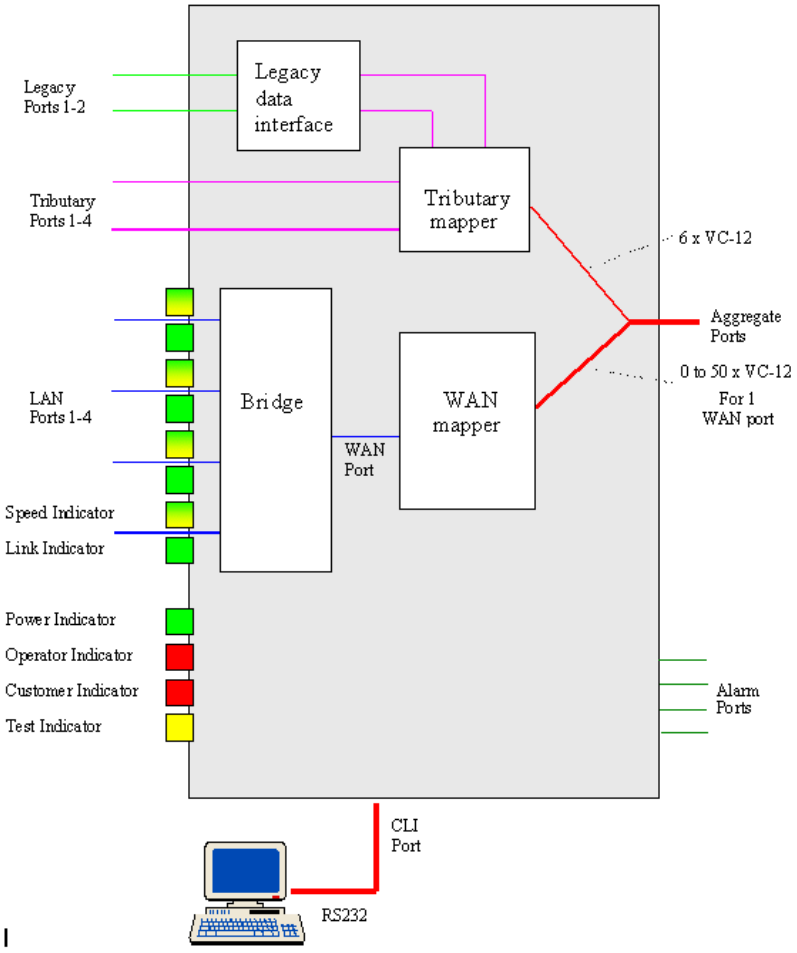


Figure 18-1. AXX11 Overview

18.1.2 AXX11 - In brief

- The cdb-file is part of the AXXEDGE/AXX155A configuration.
- Does not support any configuration without the AXXEDGE/AXX155A.
- Auto-discovery algorithm and continuous communication between AXXEDGE/AXX155A and the remote module utilise the DCC channel in the RSOH.
- Does not support any protection schemes.
- Is a cost optimized - one customer CPE.
- Can connect to all kinds of STM-1 modules supported by AXXEDGE/AXX155A.
- No alarm outputs, just inputs.

- Performance data is sent to AXXEDGE/AXX155A every 15 minutes and status of alarms every second.
- Recognised in management as an remote module.
- Synchronisation is always locked to the aggregate port.
- Processing of S1 byte to report; Real time clock (RTC) sync downwards and immediate failure upwards).
- Transparent forwarding of Ethernet packets up to 1916 bytes.
- CoS 802.1p support
  - two ques (high and low)
  - ToS bit
  - strict or weighted
  - Port Priority without any look at the Ethernet frame
  - 802.1p, check of priority on ingress
  - diffserv
  - enable/disable per port
  - classification per device
  - check of ToS field
- Rate limiting
  - per port
  - one second intervall
  - one mac-address per device
  - supports loop setting locally through VT100.Reset on system restart.
- Software is updated if downloading Network on AXXEDGE/AXX155A.

18.1.3 Applications

The AXX11 must be connected to the AXXEDGE/AXX155A, which is placed in the operator's point of presence. This is shown in the figure below. The AXXEDGE/AXX155A integrates the functionality of the ADM, IP switch/router and connects to the number of AXX11 at the customer sites. The AXXEDGE/AXX155A may also function as a drop-shelf that is connected to an external ADM.

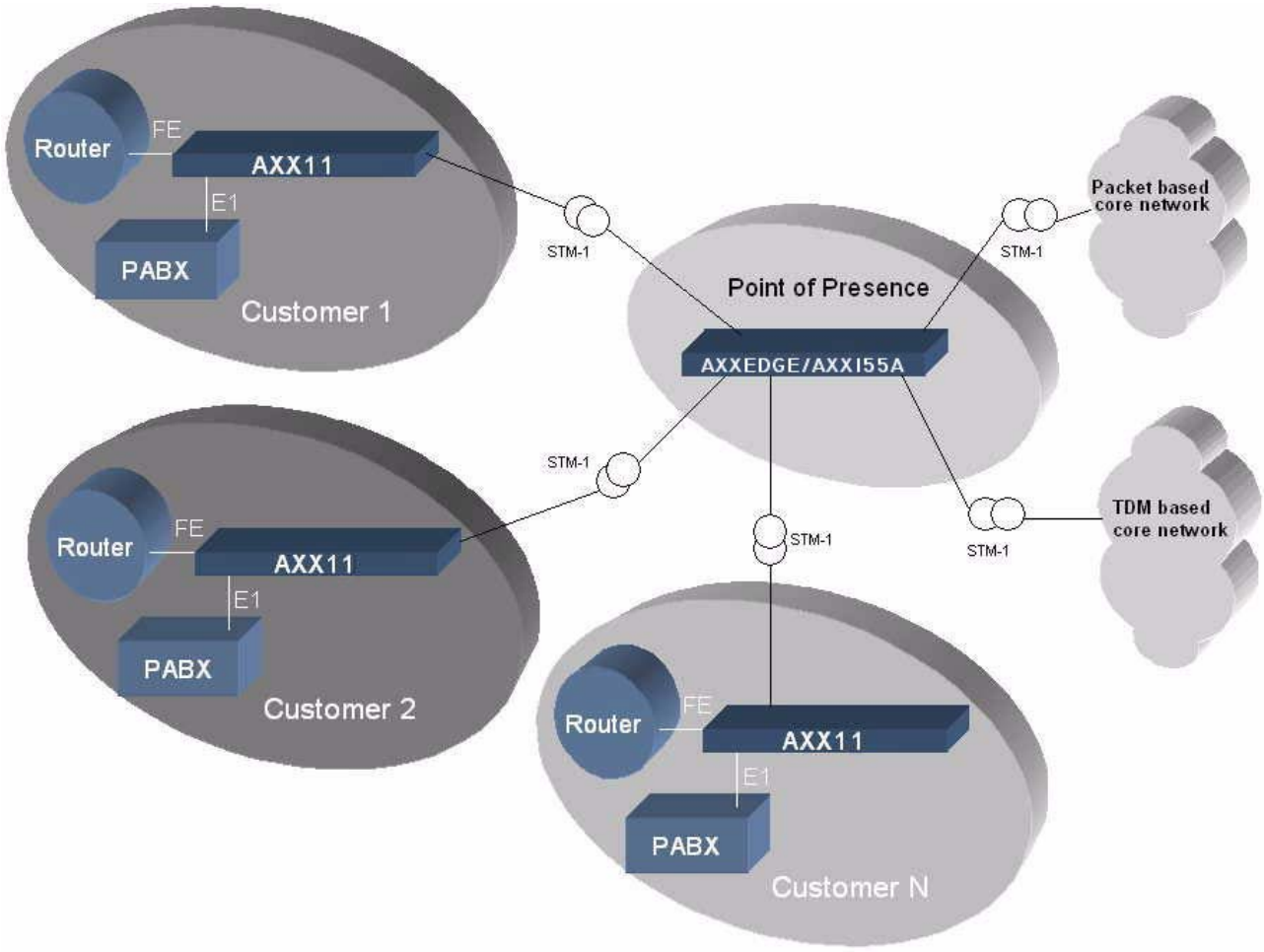


Figure 18-2. Typical system with AXX11 connected to an AXXEDGE/AXX155A

18.2 SDH FEATURES

18.2.1 Multiplexing structure and Mapping modes

The aggregate interface supports only terminal multiplexer functions, and 63xVC-12 mapping. The module only support the AXXESSIT proprietary mapping scheme.

The figure below shows the internal structure of AXX11. The bridge receives an Ethernet frame/IP datagram on one of the ports and decides on which port to send it out. The Ethernet Mapper converts between Ethernet frames and VC-12s while the Tributary Mapper converts between E1 signals and VC-12s. The SDH Multiplexer is responsible for the multiplexing of VC-12s into STM-1. The VC-12s are sent to - and received from - either the Tributary Mapper or the Ethernet Mapper.

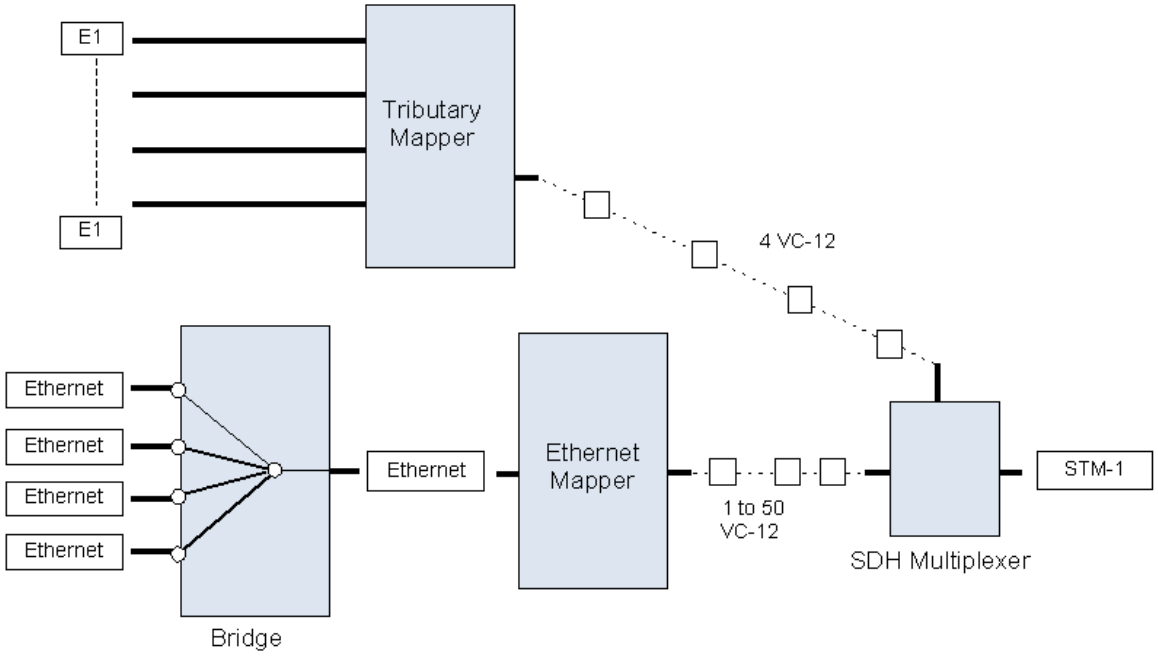


Figure 18-3. Multiplexing and mapping in AXX11.

Multiplexing structure supported in AXX11 is shown in Figure 18-4.

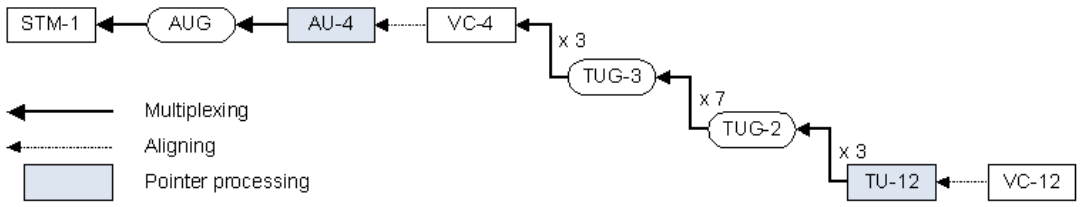


Figure 18-4. Multiplexing structure in STM-1.

The WAN traffic is mapped into a number of VC-12 containers in a round-robin fashion with an inverse multiplexer function. The IP traffic is mapped into 1 to 50 VC-12 containers.

The AXX11 only have one WAN channel. The total bandwidth for one WAN channel cannot be greater than 100 Mbit/s or 47xVC-12 containers.

The mapping between the tributary interfaces and the WAN port is fixed:

Port	KLM
WAN	1.1.1 - 3.3.2
PDH-1	3.3.3
PDH-2	3.4.1
PDH-3	3.4.2
PDH-4	3.4.3

Table 18.1. AXX11 fixed VC-12 mapping

18.2.2 Performance monitoring

The AXX11 offers G.826 performance monitoring at the RS, MS, VC-4, and VC-12 levels in the SDH hierarchy. This includes B1 near end in RSOH section, B2 near and far end in MSOH section, B3 near and far end at VC-4 level and BIP-2 near and far end at VC-12 level.

The AXX11 transfers the content of the error counter to the AXXEDGE/AXX155A and it calculates excessive error and degrade signal defects assuming Poisson distribution of errors, according to ITU-T G.826 for AXX11.

18.2.3 Synchronization

The AXX11 does not support full SDH SETS functionality. AXX11 can synchronize to the following sources:

- The STM-1 interface
- A local oscillator (AIS oscillator with an accuracy of +/- 20ppm).

The STM-1 interface has the highest priority. If it fails, the internal oscillator will be used. Switchback to the selected source is performed automatically whenever it becomes possible again.

18.3 IP FEATURES

18.3.1 Bridge

The bridge is a transparent multi-port remote Ethernet bridge as specified in IEEE 802.3. The Bridge consists of one to four LAN ports and one WAN port. Each port may have its own MAC address, but in most configurations one MAC address for the whole bridge is sufficient. The four LAN ports support 10/100BaseT Ethernet for UTP cables. Both 10 Mbit/s and 100Mbit/s are supported with auto-negotiation. The LAN ports are compatible with IEEE 802.3.

The bridge supports the following features:

- MAC switching
- Self-learning MAC Addresses
- Support of up to 1024 MAC addresses
- Automatic Ageing for MAC addresses
- Transparent Bridging
- Back pressure and flow control Handling
- Auto negotiation
- Auto crossover
- 802.1p priority

The filtering rate of the bridge is able to operate at full wire speed. The forwarding rate is only limited by the forwarding interface speed, i.e. the selected WAN channel speed.

18.4 TDM FEATURES

AXX11 provides four 120-ohm 2.048 MHz Tributary ports on the customer side. An external balun supports 75-ohm operation.

Each Tributary Port can be individually configured to run in one of the following modes:

- G.703 Transparent (TRA)
- ISDN Primary Rate Access (PRA)

PRA is implemented according to ETS 300011 and ETS 300233. Note that AXX11 only implements the PRA NTE functions.

Two test loops are provided per Tributary Port, one in the customer direction (LL3) and one in the network direction (LL2), see Figure 5.

One Tributary Port can have only one loop activated at a time.

The test loops can be activated, deactivated and monitored by the management system.

The loop control logic depends on the tributary mode (TRA or PRA).

- In TRA mode the management system can operate the loops at any time as long as the port is enabled.
- In PRA mode the loops are supposed to be controlled by some exchange termination equipment (ET) via inband channel 0 control bits. In this mode it is not possible to operate the loops from the AXX11 management system.

To change the tributary mode, the loop must be cleared.

The Test Indicator LED is ON if any tributary loop is closed, regardless of the tributary mode.

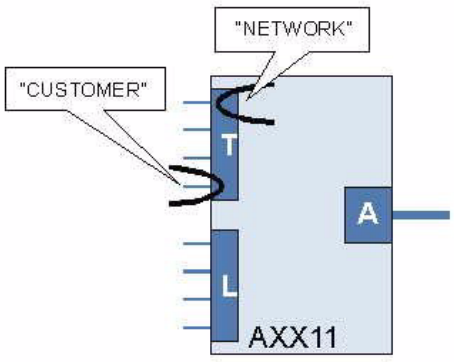


Figure 18-5. AXX11- Test loops

18.5 ALARM PORTS

18.5.1 Auxiliary alarm input

The AXX11 provides facilities to report four auxiliary alarm inputs for associated equipment, e.g., power unit failure, battery condition, cabinet door, etc. These alarms are activated by an external loop between a pair of contacts.

The polarity of the auxiliary alarm input ports is a configurable parameter, i.e., alarm can be defined either as a loop closed or a loop open condition. The severity of the alarm input ports are the same for all four ports and can be configured from the management system[1].

The alarms are reported to the management system.

1. AXXCRAFT or higher-level management systems within the AXXTMN product family.

18.6 LED INDICATORS

18.6.1 AXX11 Status

The LED indicators are used to visualize the AXX11 status, see Table 18.2.

Indicator	Colour	Function
Speed Indicators	GreenYellow	LAN Speed indicator (one LED per LAN Port)100 Mbit/s10 Mbit/s
Link indicator	GreenBlinking	LAN link status (one LED per LAN port)Link is up and with no trafficLink is up and with traffic
Equipment Indicator	Red	Alarm on the AXX11 customer side, i.e. Tributary Ports
Traffic Indicator	Red	Alarm on the AXX network side (Aggregate Port incl. VC12) or the device itself.
Test Indicator	Yellow	Test loop is present
Power Indicator	Green	Power OK

Table 18.2. LED Indicators

NOTE! *The speed and link indicator LED's are an integral part of the LAN connectors. The upper right LED is the link indicator and the upper left LED is the speed indicator.*

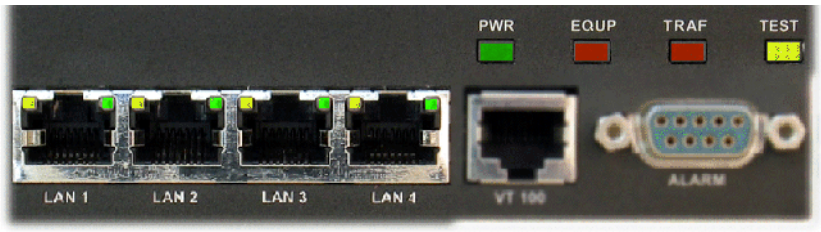


Figure 18-6. LED indicators- link and speed

18.7 DCN FEATURES

18.7.1 General

The AXX11 use the SDH DCC channel to communicate with the AXXEDGE/AXX155A. The protocol format is proprietary and AXX11 cannot be connected to other network elements.

18.8 LEGACY DATA PORTS

AXX11 provides two legacy data ports on the customer side.

The data ports support line-rates from 64 kbps to 2 Mbps in step of 64 kbps (Nx64kbps with N equal to all integer values from 1 to 32). It is possible to individually set the line-rate for the two data ports.

The data traffic is mapped into a G.703 based E1 signal before it is mapped into a VC-12 container for the 2 Mbps line-rate. The data traffic is mapped into a G.704 framed E1 signal for all other line-rates.

The AXX11 does not support grooming and cross connect functions at the 64 kbps level.

Each data port can be individually configured to run in one of the following modes:

- V.35
- V.36
- X.21

The three modes use the same physical connector as specified for V.36 and an adaptor cable must be used for the V.35 and X.21 modes. A standard adaptor cable can be used for the V.35 or X.21 modes.

The AXX11 supports only the DCE mode for the data ports. The following signals are supported for the different modes:

Interchange circuit specified for the data port		
V.24 signals	Name	Remark
102	Signal ground or common return	
102a	DCE common return	Not implemented
102b	DTE common return	
103	Transmitted data	T for X.21
104	Received data	R for X.21
105	Request to send	C for X.21
106	Ready for sending	I for X.21
107	Data set ready	Not used for X.21
109	Data channel received line signal detector	Not used for X.21
113	Transmitter signal element timing (DTE source)	Not implemented
114	Transmitter signal element timing (DCE source)	Not implemented for X.21
115	Receiver signal element timing (DCE source)	S for X.21
140	Loopback/Maintenance test	Not implemented
141	Local loopback	Not used for X.21
142	Test indicator	Not implemented

Table 18.3. Relevant signals for the data port

The definition of the relevant signals is described in ITU-T V.24. The physical interfaces are described in ITU-T V.10, V11, V.28 and V.35.

The data ports can operate in two different timing modes:

- Master mode where the timing is generated from the internal SDH timing source
- Slave mode where the timing is extracted from the received E1 signal

Two test loops are provided per data port, one in the customer direction (LL3) and one in the network direction (LL2). One port can only have one loop activated at a time.

The test loops can be activated, deactivated and monitored by the management system. The local loop can also be activated from the data port by activation the local loop signal in the connector for the V.35 V.36 modes or sending the inband local loop command in the X.21 mode.

It is possible for the management system to release a local loop that has been activated from the data port. To change the data port mode, the loop must be cleared. The test indicator LED is on if any data port loop is closed, regardless of the data port mode.

18.9 PHYSICAL INTERFACES

This section describes the different types of physical interfaces in AXX11. The table below gives the relationship between the type of interface and the logical names used in this description. See Figure 18-1. or Figure 18-7.

Interface	No. of interfaces	Logical Name
Optical	1	Aggregate port
Tributary	4	Tributary port (E1)
Ethernet	4	LAN port
RS232	1	CLI port
Alarm	4	4 Alarm inputs
Power supply	1	-48V DC
Legacy data	2	Data port
Indicators	12	4 Speed Indicators, 4 link indicators, Power Indicator, Operator Indicator, Customer Indicator and Test Indicator

Table 18.4. Physical interfaces

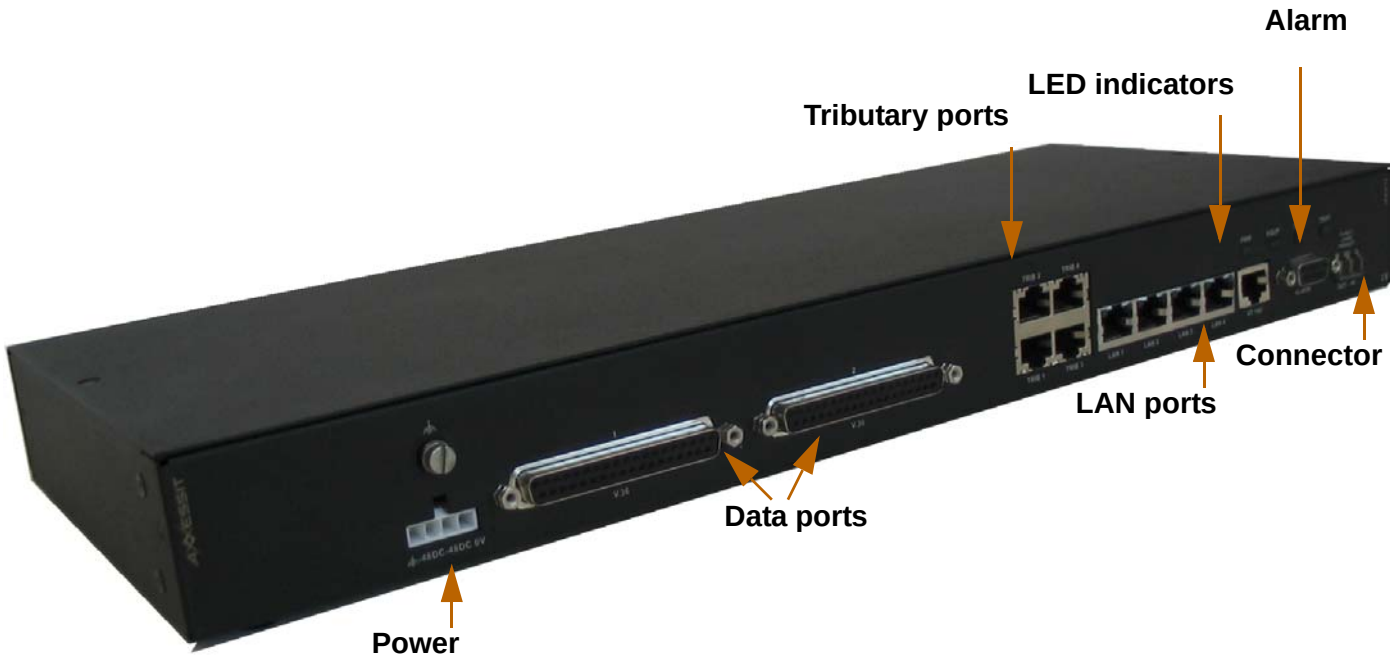


Figure 18-7. AXX11 Device overview

18.9.1 Optical

For AXX11, the transmission over the optical interface is bi-directional on one fibre or uni-directional on two fibres. Different wavelengths are used in transmit and receiver direction.

The two-fibre interface is a standard S-1.1 interface. The single fibre interface is a proprietary interface with respect to optical parameters.

Connector type

The default connector is LC.

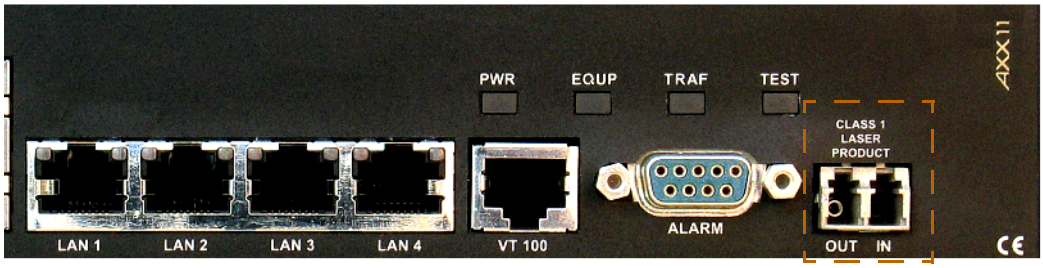


Figure 18-8. AXX11 - S-1.1 interface

Parameters

The definitions of optical parameters and reference points S and R refer to ITU-T G.957. Reference point S means transmit direction while R is the receive direction of the fibre.

Optical budget short haul two-fibre

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

Table 18.5. Optical budget short haul two-fibre parameters

Optical output jitter

Filter bandwidth	Jitter limit
500 Hz - 1.3 MHz	0.50 Uipp
65 kHz - 1.3 MHz	0.10 Uipp

Table 18.6. Optical output jitter parameters

Input jitter

Frequency range	Jitter limit
500 Hz - 6.5 kHz	1.5 Uipp
6.5 kHz - 65 kHz	Decaying, slope equal to 20 dB/decade
65 kHz - 1.3 MHz	0.15 Uipp

Table 18.7. Optical input jitter parameters

Compliance

Standard	Comment
ITU-T G.652	Type of optical fibre (single fibre)
ITU-T G.707	Optical line signal
ITU-T G.783	RX pull-in and hold range
ITU-T G.813	Optical output jitter
ITU-T G.825	Optical input jitter
ITU-T G.957	Optical spectrumOptical output power Optical eye diagram (Figure 2 in the specification) Optical extinction ratio (Chapter 6.2.4 in the specification)
ITU-T G.958	Input jitter measurement

Table 18.8. Optical interface compliance

18.9.2 Tributary Ports

Connectors

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

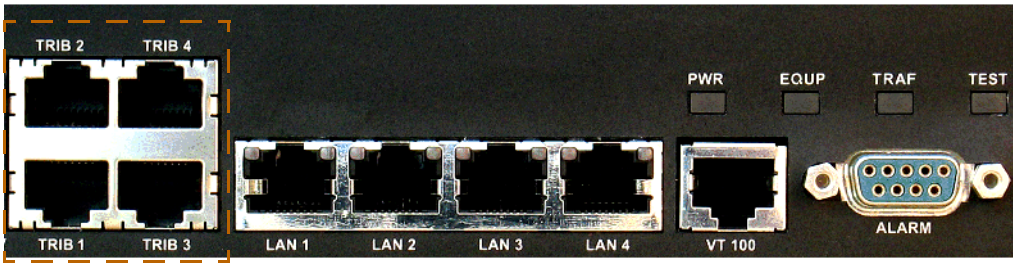


Figure 18-9. AXX11 - Tributary ports (E1)

Pin	Signal
1	P120OUT
2	N120OUT
3	GND
4	P120IN
5	N120IN
6	SHIELD,see Note 1
7	NC
8	NC

Table 18.9. Pin-out tributary interface

NOTE 1 *The outer screen is always connected to ground.*

Parameters

Input jitter

Frequency range	Jitter limit
20 Hz - 2.4 kHz	1.5 Uipp
2.4 kHz - 18 kHz	Decaying, slope equal to 20 dB/decade
18 kHz - 100 kHz	0.2 Uipp

Table 18.10. Tributary input jitter parameters

Input reflection loss

Frequency range	Reflection loss
51 kHz - 102 kHz	12 dB
102 kHz - 2048 kHz	18 dB
2048 kHz - 3072 kHz	14 dB

Table 18.11. Tributary input reflection loss

Output jitter

The requirements for output jitter in the absence of input jitter and pointer movements are:

Filter bandwidth	Jitter output (p-p)
20 Hz - 100 kHz	< 0.25 UI
700 Hz - 100 kHz	< 0.075 UI

Table 18.12. Tributary output jitter without pointer movements

The requirements for output jitter in the absence of input jitter but with pointer movements are:

Filter bandwidth	Jitter output (p-p)
20 Hz - 100 kHz	< 0.4 UI
700 Hz - 100 kHz	< 0.075 UI

Table 18.13. Tributary output jitter with pointer movements

Compliance

Standard	Comment
ETS 300 246	Connector
ETS 300 247	Connector
ETS 300 011	Impedance towards ground Tolerable longitudinal voltage
ETS 300 126	Output signal balance
ITU-T G.703	Cable attenuation Input reflection lossInput port immunity against reflection Output pulse mask
ITU-T G.783	Output jitter in the absence of input jitter (Chapter 10.2.3.1 in the specification) Output combined jitter (Chapter 10.2.3.3 in the specification)
ITU-T G.823	Max. tolerable input jitter

Table 18.14. Tributary interface conformance

18.9.3 LAN Ports

Connectors

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

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

Table 18.15. Pin-out Ethernet ports

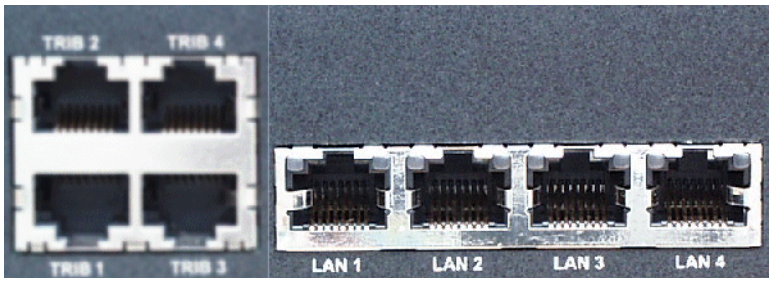


Figure 18-10. AXX11 - LAN ports

Parameters

The parameters on the Ethernet interface are in accordance with the specifications given in Table 18.16.

Compliance

Standard	Comment
ISO/IEC8877	MAU MDI connector
IEEE 802.3	Section 14 and 24, physical medium.
ANSI X3.263 TP-PMD	Physical medium 100BASE-T

Table 18.16. Ethernet compliance

18.9.4 Alarm interface

Connectors

The alarm interface connector is a 9-pin D-type connector.

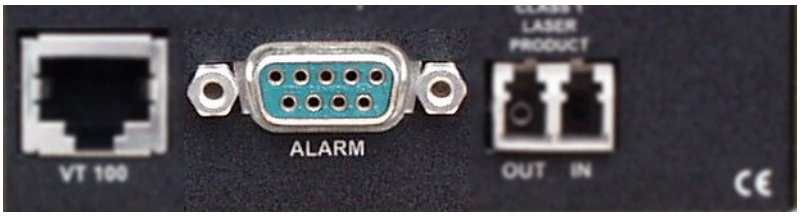


Figure 18-11. AXX11 - Alarm interface connector - example

The pin-out is as follows:

Pin	Signal
1	Gnd
2	Alarm input 1 (aux 1)
3	Alarm input 2 (aux 2)
4	Alarm input 3 (aux 3)
5	Alarm input 4 (aux 4)
6	Alarm input return
7	NC
8	NC
9	NC

Table 18.17. Pin-out alarm interface

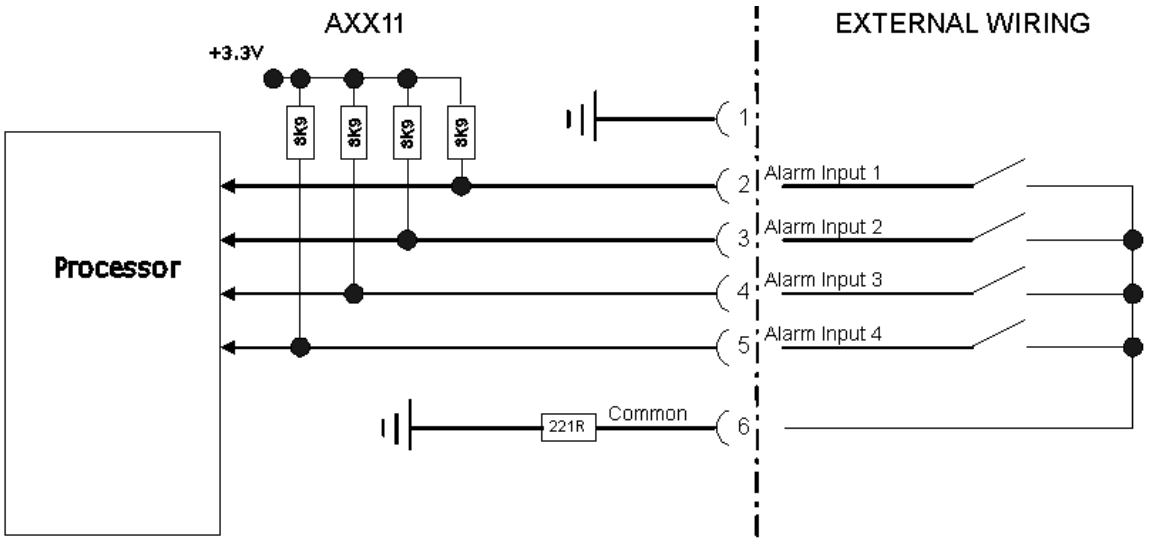


Figure 18-12. Alarm interface - Overview

Parameters

Parameter	Value
Nominal open contact voltage	+3.3 V
Nominal closed contact current	1 mA
Max. closed contact resistance	0.8 kohm
Min. open contact resistance	10 kohm

Table 18.18. Electrical specification at alarm input

18.9.5 CLI Port

Connectors

The RS-232 interface for AXX11 is provided using a RJ-45 connector, with the following pin-out

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

Table 18.19. Pin-out CLI connector

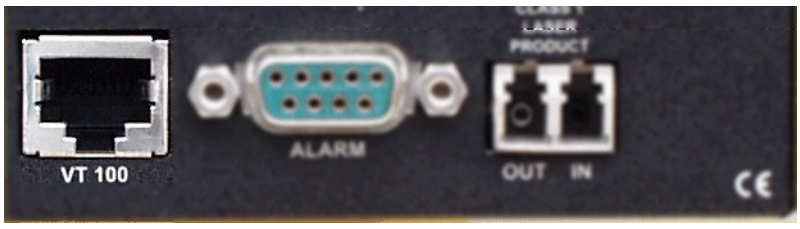


Figure 18-13. AXX11 - RS232 interface

Parameters

The interface is running at a data rate of 19.200 baud.The interface is in accordance with the specifications given in the Table 18.20.

Compliance

Standard	Comment
EIA RS-232	Physical interface

Table 18.20. CLI port compliance

18.9.6 Power supply (DC)

AXX11 supports a dual -48V DC power[1] supply interface.

Connectors

The -48V DC supply input is provided via a 4 pin power connector with the following pin-out

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

Table 18.21. Pin-out DC connector

Figure 18-14. DC connector - illustration

Parameters

The -48V DC input conforms to the specifications given below.

Parameter	Limit
Power dissipation	Less than 13W[a]
Fuse	0.5A
Battery voltage range	-36 to -72V DC

a. Dependent on configuration

Table 18.22. Electrical specifications at DC input

1. Note that only one power supply is available internally, but it can be fed from two -48V sources.

Compliance

Standard	Comment
ETS 300 132-2	Power supply interface, DC operating
ETS 300 253	Earthing and bonding

Table 18.23. Compliance power supply

18.9.7 Power supply (AC)

The AXX11 uses an external AC power-supply adaptor[1].

Any AC-DC adapter with 48V nominal output that fulfills the requirements for DC input port may be used. Be sure that the supply is double insulated and conforms to EN 60 950 standard.

Connectors

It is possible to support different markets with the necessary physical connectors.

Parameters

The 230V AC input conforms to the specifications given in Table 18.24. .

Parameter	Limit
Power dissipation	<16W
Fuse	0.5A
Mains voltage	-230V AC +/- 10%

Table 18.24. Power supply parameters

Conformance

Standard	Comment
EN 60950	Single phase 230 V 50 Hz AC mains supply

Table 18.25. Power supply conformance

1. An external AC adapter can be ordered separately from AXXESSIT (Order code: 50016-02AA.)

18.9.8 Data port

Connectors

The data interface connector is a female 37-pin D-type connector, with the following pin-out:

Pin	Signal	Pin	Signal
1	Shield (connected to gnd)	20	-
2	-	21	-
3	-	22	Transmitted data B
4	Transmitted data A	23	Transmit signal element timing B (DCE)
5	Transmit signal element timing A (DCE)	24	Received data B
6	Received data A	25	Request to send B
7	Request to send A	26	Receive signal element timing -B
8	Receive signal element timing A	27	Clear to send B
9	Clear to send A	28	-
10	Local loopback	29	DCE ready B
11	DCE ready A	30	DTE ready B
12	DTE ready A	31	Receive line signal detect B
13	Receive line signal detect A	32	-
14	-	33	-
15	-	34	-
16	-	35	Transmit signal element timing B (DTE)
17	Transmit signal element timing A (DTE)	36	-
18	-	37	-
19	Gnd		

Table 18.26. Pin-out data interface

Figure 18-15. AXX11- Data ports

Parameters

The line rate can be configured from 64 kbps to Mbps in steps of 64 kbps.

Compliance

Standard	Comment
ISO 4902	Connector for V.36 DCE equipment
ITU-T V.10	Impedance Output levels Rise and fall times Input levels
ITU-T V.11	Impedance Output levels Rise and fall times Input levels
ITU-T V.24	Signal definition
ITU-T V.28	Impedance Output levels Rise and fall times Input levels
ITU-T V.35	Interface specification Impedance Output levels Rise and fall times Input levels
ITU-T V.36	Interface specification
ITU-T X.21	Interface specification
ITU-T G.704	E1 framing
ITU-T G.706	Frame alignment

Table 18.27. Data interface conformance

AXXESSIT

AXXESSIT develops, produces and sells cost efficient Integrated Access Devices (IAD) for the Next Generation Access Network (NGAN).
The organisation has more than 25 years of industry experience from design, development, production, marketing and distribution of Telecom equipment within the access market. Our history together with our innovative future combine into a number of competitive features when moving into NGAN by means of AXXESSIT IADs:

- Hi-end, real broadband solutions
- Open solutions in a multi-vendor environment
- Highly flexible and scalable solutions enable seamless migration towards NGAN
- All Telecom- and networking services over one single link regardless of infrastructure
- Willingness to understand customer needs and ability to meet them
- Support of Remote Network Management makes AXXESSIT's equipment simple to install, maintain and upgrade

We believe that our key success factors; the best quality awareness in all parts of the service chain, high customer confidence and the right competence is the best basis for success when supplying Integrated Access Devices (IADs) for the Next Generation Access Network (NGAN).

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