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USER GUIDE

CSX - Family

arcutronix GmbH
Deutschland

Installation and Operation Manual

Version 1.2

CSX - G.SHDSL.bis (EFM) Copper Modem

USER GUIDE

Covered Variants of CSX - Family by this User Guide:

CSX5-FE	1405 - 1001
CSX5-V.24	1405 - 1120

Covered Software Versions of CSX - Family by this User Guide:

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Document Contents

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About this Book

Document Organization

This guide describes the hardware components of the CSX - G.SHDSL.bis (EFM) Copper Modem Devices. It provides information on configuration, system installation and the technical data.

The intended audience of this document is anyone who is responsible for installing, maintaining or operating the CSX - G.SHDSL.bis (EFM) Copper Modem. This person must be aware of the risks, affected with these actions and must be qualified and trained. **Observe the safety precautions in chapter "Safety, Instructions, Statements".**

The manual is designed as printable book, therefore chapters start at an odd page (the last even page of the chapter before may be empty). The headlines of the pages contain chapter name, chapter count, and chapter headline. The foot lines of the pages contain chapter page count, the revision date and the document title.

Chapters

Chapter 0**, Safety, Instructions, Statements:** Handling, precautions and warnings.

Chapter 1**, Abstract:** Description of arcutronix MSS and the CSX Copper Converter.

Chapter 2**, Getting Started:** Short form about installation, mounting and configuration of CSX-family.

Chapter 3**, Hardware & Interfaces:** Description of hardware and front panel elements.

Chapter 4**, Power Management:** Installation procedures.

Chapter 5**, Control Software CSX & gCLI:** Control and configuration of the CSX-family.

Chapter 6**, SNMP and MIBs:** Description of SNMP access.

Chapter 7**, Menu-Structure (Directory-Tree) of CSX - Family:** Explains the SSH access to the CSX and the usage of the Command Line Interface (CLI).

Appendix A**, Technical Specifications:** Provides the general technical data of the CSX-family.

Appendix B**, Additional Information:** More details about DSL technique.

Appendix EC**, EC Declaration of Conformity:** For all CSX - G.SHDSL.bis (EFM) Copper Modem products.

Conventions

This manual uses the following text conventions to convey instructions and information:

Normal text is written in Albany font.

Commands and Arguments are done in `Courier New`.

Notes, cautions, and tips use these conventions and symbols:

NOTE: Means reader take note. Notes contain helpful suggestions or references to materials not contained in this manual.

WARNING:

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

Release History

2015-05-15 Version 1.3 Editor: mjz
Added and changed the following topics:

- Change some formats.

2015-03-20 Version 1.2 Editor: mjz
Added and changed the following topics:

- SDSL loops added.
- Enhancements to CLI added:
  - In the CLI hints a given, when a new alarm, an acknowledged alarm and/or a new log-entry is available.
  - Factory Reset is available.
- DSL line length added for different cables.
- Manual fits to SW V1_2_0.

2014-12-02 Version 1.1 Editor: mjz
Added and changed the following topics:

- CSX5-V24 added to the manual.
- Correction of typos.

2014-09-24 Version 1.0 Editor mjz
First issue of the CSX User Guide.

Referenced and Related Documents

[axManual_SCX2e_gs2]	arcutronix GmbH (2014): SCX2e, User Manual.
[axRefGuide_CLI_SCX2E]	arcutronix GmbH (2014): SCX2e, Reference Guide for CLI.
[ETSI TS 101 524]	Technical Specification ETSI TS 101 524 (2003), Access transmission system on metallic access cables; Symmetric single pair high bitrate Digital Subscriber Line (SDSL).
[IEC 60825-1]	IEC 60825-1 - 2007: Safety of laser products - Part 1: Equipment classification and requirements
[IEEE 802.3ah]	IEEE Std 802.3ah™-2004: Media Access Control Parameters, Physical Layers, and Management Parameters for Subscriber Access Networks
[IEEE 802.3]	IEEE Std 802.3™-2012: Part3: Carrier sense multiple access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
[ITU-T G.823]	Recommendation ITU-T G.823 (2000), The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy.
[ITU-T G.991.2]	Recommendation ITU-T G.991.2 (2003), Single-pair high-speed digital subscriber line (SHDSL) transceivers.
[ITU-T G.991.2__Amd3]	Recommendation ITU-T G.991.2 (2003)– Amendment 3.
[ITU-T G.994.1]	Recommendation ITU-T G.994.1 (2003), Handshake procedures for digital subscriberline (DSL) transceivers.
[ITU-T G.8261]	Recommendation ITU-T G.8261/Y.1361 (2008), Timing and synchronization aspects of packet networks.
[ITU-T G.8262]	Recommendation ITU-T G.8262/Y.1362 (2007), Timing characteristics of synchronous Ethernet equipment slave clock (EEC).
[INF-8074i]	SFF Commitee, INF-8074i Specification for SFP (Small Formfactor Pluggable) Transceiver, Rev 1.0, May 12, 2001
[SFP MSA]	Small Form-factor Pluggable (SFP) Transceiver Multi Source Agreement (MSA) (2000)

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Chapter 0
Safety, Instructions, Statements

Safety Precautions

The following sections provide the safety precautions for the supplied device. You must always observe the power precautions for the device. You must follow all warning notes to ensure that the procedures are performed safely. You must follow all caution notes to ensure that the device is operated correctly.

WARNING: Serious injury or loss of life is possible, if instructions are not carried out.

CAUTION: Serious damage or destruction is possible, if instructions are not followed.

NOTE: Before installing the device find out if any local technical rules must be observed. These may be defined by ANSI, ITU, IEC, your PTT, or other similar organizations.

Power Precautions

WARNING:

- Disconnect the power cord before opening the device.
- Always plug the power cords into properly grounded receptacles. An improperly wired receptacle could place hazardous voltage on the accessible metal parts of the device.
- Use only approved power cords.
- Use only manufacturer supplied power supplies.
- The power supply must match the power specifications for the device.
- Do not work on the equipment during periods of lightning activity.

Handling Precautions

Note: Precautions for transporting, installing, and operating the device:

- Avoid excessive shocks and vibrations. Install shock absorbers, if you need to use the device for mobile applications.
- Avoid contact with any liquid (e.g. water) or dust or dirt.
- Avoid exposing the device to excessive direct sunlight.

- Ensure sufficient cooling of the device.
- Prevent loose items from falling into the device.
- Avoid damage to components when installing or setting switches or jumpers of the device.
- Always place protective covers on all fibre optic cables and connectors that are not in use to prevent breakage and contamination.
- Inspect all fibre optic connections and clean contaminated surfaces before use.
- Attach a wrist strap and follow ESD procedures, see next paragraph.

Preventing Damage From Electrostatic Discharge

CAUTION: Discharge of static electricity (ESD) can damage or degrade electronic components. The electrostatic potential of a person can be several thousand Volt and a discharge to semiconductor components may have severe consequences. Observe the precautions below when you are handling any hardware with electronic components.

Card Protection

Each card is shipped in a separate, reusable, and anti-static shielding bag. Leave each card in its bag until you are ready to install it into the system. Do not remove the card from its bag unless you are grounded. Do not place a bag on exposed contacts where it can cause short circuits.

Grounding Procedure

Before attempting to install or remove any part of the chassis, ensure that you, the equipment chassis, and the rack mount cards are at ground potential to prevent electrostatic discharge (ESD). Electrostatic discharges can damage the components of the system. To place yourself at ground potential, connect the chassis with a ground wire or via the power cord with a grounded mains socket and clip your wrist strap to the chassis.

The following advice will help you to prevent ESD damage to electrical components:

- Always use an ESD wrist strap with a metal clip for grounding.
- Limit your movement as much as possible. Movement can cause a build-up of static electricity.
- Handle the system and its components carefully. Never touch the circuitry. Place your hands only on the edges, rails, or frame of the unit.
- Touch a spare component - while it is still in the anti-static wrapping - to an unpainted metal portion of the chassis for at least two seconds. This allows the static electricity to discharge harmlessly from your body and the spare.
- Install the spare directly into the chassis after removing it from the anti-static wrapping. Do not remove the anti-static wrapping until you are ready to do the install. If you must set down an unwrapped spare, set it down on an anti-static mat or on its anti-static wrapping.

Caution: Do not place the spare component on the top of the chassis, rack, or on a metal table. Either action could cause severe damage to the spare.

- Be aware of weather conditions. Cold weather increases the likelihood of static electricity build-up.
- Be aware of your own conductivity level. Wear ESD shoes to diminish personal static electricity build-up. Wear e.g. an electrostatic dissipative lab coat.

Fibre Optic Precautions

Caution: An optical fiber may carry (invisible) light from the remote system.

This device may contain Laser Class 1 components, like laser transmitters or light emitting diodes LED (refer to technical data). Operating components emits (invisible) laser radiation. Be careful when you are working with these components. The following safety precautions must be followed when working with fibre optics and Laser Class 1 components:

WARNING: Do not look into the fiber optic output. Looking into the fiber optic output can cause injury to the eye. When observation is necessary eye protection must be worn and precautions must be taken to avoid exceeding the limits recommended in ANSI Z136.1-1981.

WARNING: Use caution when working with the laser components of the device. The device is designed to protect the user against optical powers beyond laser class 1.

WARNING: Ensure that the incoming signal from the remote device does not exceed the power defined for laser class 1 when the cabling is disconnected. The device will also become unsafe, if any unsafe equipment is connected to the system.

WARNING: Do not disconnect the fiber optic cables while power is applied. Disconnecting the fiber optic cables could expose the user to optical powers beyond laser class 1.

Caution: Use Of Controls Or Adjustments Or Performance Of Procedures Other Than Those Specified Herein May Result In Hazardous Laser Light Exposure.

CAUTION Laser Class 1. Complies with FDA radiation standards, 21CFR subcategory J. DANGER (Invisible) laser radiation when open and / or interlock defeated. Avoid direct exposure to beam!

Technical Instructions to User

Do not use this product for other applications than suggested in this manual!

The international standards and the technical rules of your local PTT company must be observed.

All interface cables to this equipment must be shielded and designed in accordance with proper EMI techniques to ensure compliance with EMC requirements. arcutronix will provide cable shielding specifications on request.

Inspection

Before commissioning, check the content of the consignment for completeness and note whether any damage has occurred during transport. If so, do not use the parts and contact your arcutronix representative.

Commissioning

Work may be carried out only by qualified personnel. The relevant precautions must be taken.

Cleaning

To clean the outer surfaces, use a soft damp (not wet) cloth. Do not let moisture go inside. Please consider the properties of the housing and other material used!

Table 0-1 *Effects of Cleaning Liquids*

Valuation	ABS/ABS+PC/PC/PPE+PS
well resistant	water, aqueous saline solutions, sud, diluted acid and alkali
conditionally resistant	alcohol, aliphatics, oil and fat
not resistant	concentrated mineral acid, aromatic and halogenated hydrocarbon, ester, ether, ketone

Quality

The quality management of arcutronix is certified to DIN ISO 9001:2000.

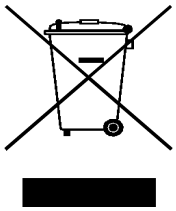
This product is manufactured to the arcutronix quality standards

Repair

There are no repairable parts in the device. Defective parts must be sent to arcutronix for repair. The power supplies of a device may contain fuses. Blown-up mains fuses must be replaced by fuses of the same type and the same ratings. Using repaired fuses or short-circuit the fuse holder are not permitted.

Disposal and Recycling

This symbol on the product or on the packaging indicates that it is can be recycled. To save our environment please hand it over to your next recycling point.



This symbol on the product or on its packaging indicates that it shall not be treated as household waste. Instead it shall be handled over to the applicable collection point for the recycling of electronic equipment.

For more detailed information about recycling contact your local city office, your waste disposal service or where you purchased the product.

CE Conformity

arcutronix products complies with the European standard regulation. They are tested to the Council guideline for harmonizing the legal regulations of the member states on electromagnetic compatibility.

Electromagnetic Immunity Statement

This equipment has been tested and found to comply with the limits of EN 50082-2 (Electromagnetic Immunity for heavy industry).

Instructions to User

All interface cables must be shielded and designed in accordance with proper EMI techniques ensuring compliance with EMC requirements. arcutronix will provide cable shielding specifications on request.

Electromagnetic Emissions Statements

To achieve satisfactory EMC performance, all interface cables to this equipment must be shielded and designed in accordance with proper EMI techniques. Rack mount cards has to be inserted into the designated chassis. Chassis slots that are not used

have to be covered with a blanking plate. The chassis must be bonded to earth. This is usually achieved by installing the power cord to the chassis. An extra earth terminal may be provided. If this device is used in a residential setting, resulting interference must be corrected by the user. Any user modification made to the unit voids the user's authority to operate the unit under the FCC rules.

WARNING: This is a Class A product. In a domestic environment, this product may cause interference in which case the user may be required to take adequate measure. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

United States Federal Communications Commission (FCC) Electromagnetic Emissions Statement

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions in this manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference in which case the user at his own expense will be required to take whatever measures may be required to correct interference.

Canadian Department of Communications (DOC) Statement

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions in this manual, may cause interference to radio communications. This digital apparatus has been tested and does not exceed the Class A limits for radio noise for digital apparatus set out in the DOC Radio Interference Regulations. The regulations are designed to provide reasonable protection against radio noise interference in which case the user at his own expense will be required to take whatever measures may be required to correct interference.

European Communities

WARNING: This equipment has been tested and found to comply with the limits of CISPR 22 and EN 55022 Class A for information technology equipment. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Chapter 1
Abstract

CSX - Family Description

General

The CSX - G.SHDSL.bis (EFM) Copper Modem is a flexible modem to transport a wide bunch of different interfaces over long haul copper infrastructure by the use of SHDSL technique as recommended in ITU-T G.SHDSL ([ITU-T G.991.2]). It offers bandwidth capability up to 20 Mbps and is based on a modular design to achieve an efficient and flexible concept. The support of variable customer interface modules with similar configuration and maintenance views is an advantageous feature for handling and operation.

Several user-interfaces are available for the CSX - Family:

- Fast Ethernet
- PDH acc. to ITU-T G.703/G.704 (E1/T1)
- ISDN Digital Leased Line (I.430)
- Serial data according to different global standards
  - ITU-T V.24 (RS-232)
  - ITU-T X.21

The line side of the CSX - G.SHDSL.bis (EFM) Copper Modem can be either

- 1x SHDSL over twisted pair TP,
- 2x SHDSL over dual TP or
- 4x SHDSL over quad TP.

Each SHDSL line over one twisted pair is good for 5Mbps, so that there are 3 basic implementation of the CSX - Family order matrix:

- CSX5, CSX10 and CSX20.

Each SHDSL line can spread several kilometers, depending on given diameters and noise on the line. In case the distance to too long for direct connection between the both locations of the modem-pair, a SHDSL repeater is available. The “BRX1 - SHDSL Repeater” can be placed in between to double the distance. Several repeaters can be cascaded to spread the distance more and more.

The management capability of the CSX - Family devices offers a wide range of features like a local and remote management, software update and performance monitoring.

Remote management capability makes it easy to configure, operate and maintain units, which are even far away from the ISP's management access point.

Moreover, as part of arcutronix's Multi Service Platform, the CSX - Family benefits from the future-proof system architecture and management features. This includes various chassis and housing options with optional redundant power supplies and centralized management via a rack agent (SCX2e). Thus, the entire management system can easily be maintained and supervised by carriers or ISPs via a single access point.

The device is available as a 3RU rack mount card, which can be modified without the slightest effort to a stand-alone unit by using arcutronix' unique table-top housing SHX3.

Remote Power Feeding

Remote feeding is a technology which enables operators to power remote sites from a central location by delivering that power via twisted pair cable. Remote feeding is by far the most cost effective solution for powering remote sites and gives the service provider independence from any local power at the CPE location.

The CSX - Family supports this feature in cooperation with the "Feeding Unit" RPX16 to feed the repeaters BRX1 from central location.

The arcutronix remote feeding implementation offers many additional benefits to operators and service providers:

- Safety

Deploying our system provides the safest powering solution for active equipment installed in street-side locations. Indeed in the event of any failure of the system the power source is shut down rendering the installation harmless to people.

- Size

With its original design arcutronix offers a highly compact solution to powering equipment in street cabinets.

- Very high reliability without remote batteries
- Ease of planning

A major advantage for operators is the ease with which the system can be deployed.

Nomenclature

There are several standards about SHDSL technology available. Unfortunately, these standards do not use the same terminology for the different units within a DSL transmission system. Within this document, we will mainly refer to the ITU-T terminology. For cross reference, use the following list:

Table 1-1 *Denominations*

ITU [ITU-T G.991.2]	ETSI [ETSI TS 101 524]	Manual
SHDSL: Single-Pair High-Speed DSL	SDSL: Symmetric single pair high bit rate Digital Subscriber Line	SHDSL
STU: SHDSL Transceiver Unit	TU: SDSL Termination Unit	STU
STU-C: SHDSL Transceiver Unit - Central Office	LTU: Line Termination Unit	STU-C
STU-R: SHDSL Transceiver Unit - Remote End	NTU: Network Termination Unit	STU-R
SRU: SHDSL Regenerator Unit	REG: Signal Regenerator	SRU
SRU-C: SHDSL Regenerator Unit - Central Office	REG-C: NTU side of the signal regenerator	SRU-C, downstream
SRU-R: SHDSL Regenerator Unit - Remote End	REG-R: LTU side of the signal regenerator	SRU-R, upstream

Application Areas for the CSX

The CSX offers transport and conversion of several service interface onto a copper network. All this gives a wide bouquet of combinations, which will not all available or mentioned in the order matrix. Please check with your local arcutronix partner for your needs and possible options.

The user-side is variable and can support different types of applications, which will be depicted in more detail below.

Ethernet First Mile

For bridging Ethernet packets directly from the central office side (CO) to the end user (CPE) over voice-grade copper pairs, the Ethernet community standardized in [IEEE 802.3ah] the EFM PHY 2BASE-TL referring to [ITU-T G.991.2] (192kbps to 5.7Mbps).

The PHY aggregation function (PAF) allows channel bundling of EFM PHYs to either increase the data rate or the maximum achievable loop length.

The incoming packets are transported along the (bundle of) SHDSL line(s). To reduce the required bandwidth, the FCS checksum of each packet is removed at the ingress and recalculated at the egress. Flow control (PAUSE frames) are generated, in case the ingress buffer is full and next packets must be discarded.

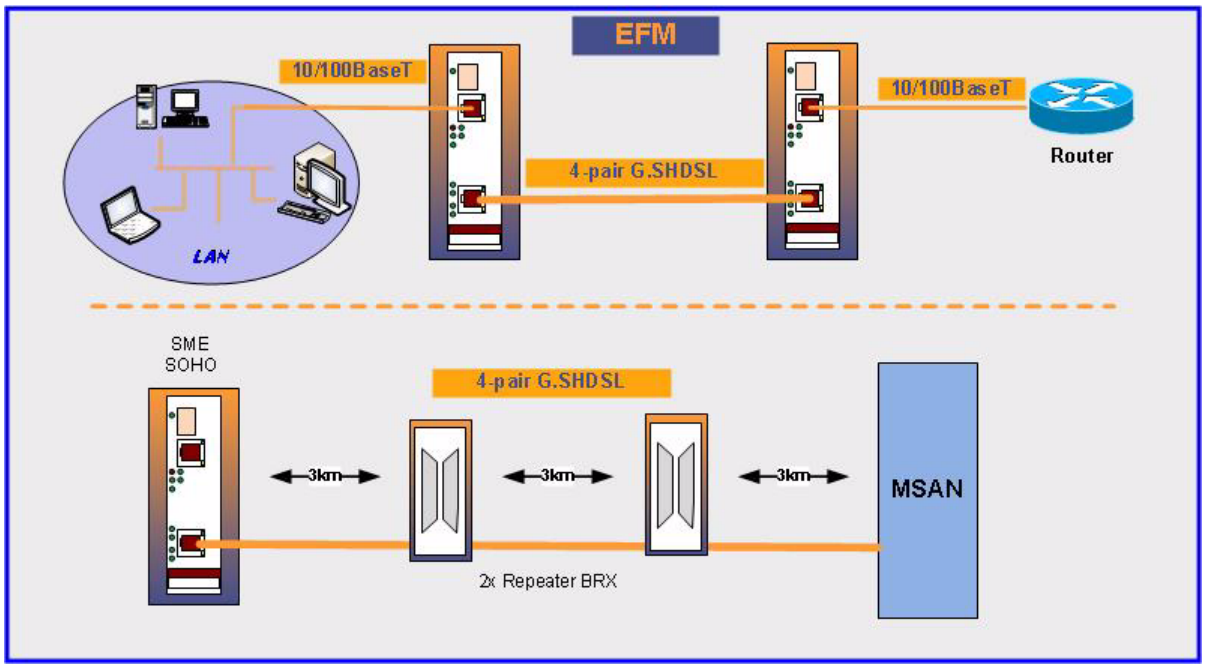


Figure 1-1 *CSX EFM application*

The CSX - Family can be used as Central Office (CO) equipment as well as Customer Premise Equipment (CPE). A quick configuration to operate as STU-C (CO mode, also called LTU = Line Termination Unit) or STU-R (CPE mode, also called NTU = Network Termination Unit) makes it very easy to adopt the unit to the given needs.

Mobile Backhauling with SyncE

The support of SyncE for CSX - Family is considering the need to bring synchronisation to the Ethernet world. The synchronisation feature makes it perfectly fitting for mobile back-hauling of the 4G LTE standard. Realization of mobile back-hauling for next generation of eNodeB (LTE). The synchronous feature supports the extending demand for clock accuracy.

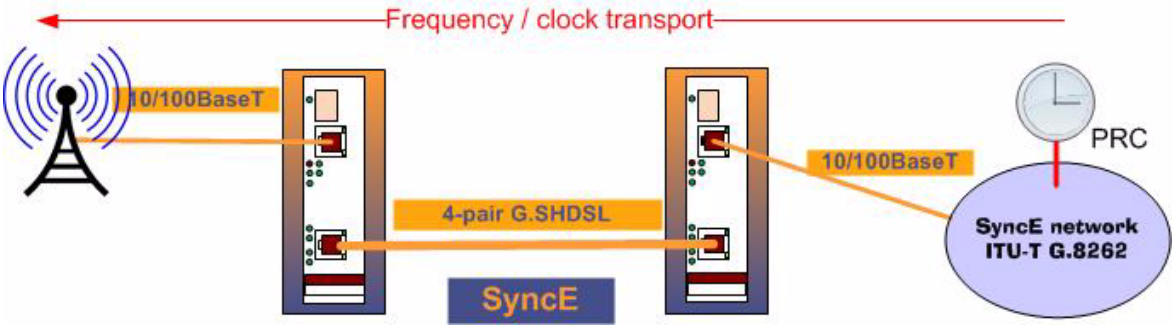


Figure 1-2 *CSX SyncE application*

Legacy Services

The CSX - Family supports the transport of legacy interface via copper infra-structure. The legacy interfaces were very popular but today the most carriers do not longer offer service-interfaces with this special characteristics. For this reason, a converter is required to adopt the legacy services towards the carriers network to allow transportation and reduce the customer's need for changes.

The legacy services and there main usage are:

V.24	Remote control and maintenance (RS-232)

CSX Functions at a Glance

The CSX - G.SHDSL.bis (EFM) Copper Modem is made to transport Ethernet or legacy user traffic over telephone copper infrastructure. The devices are made to fit into the arcutronix Multi-Service Platform, which allows the reuse of existing installation.

CSX - Family incorporates the following features:

Interfaces

- SHDSL modem according EFM standard
- STU-C (LTU) and STU-R (NTU) mode supported
- Support for synchronous Ethernet (Copper and Fibre)
- Support of a wide range of different interfaces, including Ethernet (Copper and Fibre) and V.24.
- Several LED indicators for easy service diagnostics.
- Local and remote loop-back, BER test and performance monitoring on line and interface ports.

Management

- Fully management configuration via
  - RS232 / VT100 in the SHX3 single-slot housing or with the arcutronix system controller and agent card SCX2e.

  - Ethernet/ SSH with the Agent SCX2e
  - SNMP with the Agent SCX2e
- Web-based GUI (http/https) with the Agent SCX2e
- Software update support also remote over the line

Housing and Power Supply

- Universal 3RU rack mount card for 19” chassis or single slot housing
- Less than 5W power demand
- Power input (5VDC) via backplane connector

Order Information

NOTE: All order matrices will be regularly updated. Asked your arcutronix representative for the latest publications.

The order table shows the available variants of the CSX - G.SHDSL.bis (EFM) Copper Modem. Further options are possible on request.

Table 1-2 *Order Matrix*

Art.- No.	Short Name	Description
1405-1000	CSX5-FE, Copper only	G.SHDSL.bis (EFM) Copper Modem: • Fast Ethernet Interface; • up to 5,7Mbps on 1xTP; • 1x G.SHDSL.bis (RJ45); • 1x Ethernet port (10/100BT); • SyncE supported; • 3RU rack mount card.
1405-1001	CSX5-FE	G.SHDSL.bis (EFM) Copper Modem: • Fast Ethernet Interface; • up to 5,7Mbps on 1xTP; • 1x G.SHDSL.bis (RJ45); • 1x Ethernet Combo port (10/100BT and/or 100M SFP); • SyncE supported (copper and fibre); • 3RU rack mount card.
1405-1120	CSX5-V.24	G.SHDSL.bis (EFM) Copper Modem: • Datacom up to 230kbps; • 1x G.SHDSL.bis (RJ45); • 1x V.24 (D-Sub25) port; • synchronous and asynchronous mode supported, • IEC 60870-5-101; • 3RU rack mount card.

Accessories

Housings and Cables

The arcutronix' Multi Service Platform offers a range of accessories for an easy and space saving installation of your device into 19" cabinets or as desktop / wall-mount installation.

Table 1-3 *Accessories Housing & Cables*

Art.- No.	Short Name	Description
0805-9000	SRX10	Rack mount shelf: • 19" chassis, • Height: 3RU, • 10 slots for line-cards, • 1 slot for management, • 2 slots for modular AC (115/230V) and DC (-48V/-60V) power supplies. Ask your sales-partner for additional options for SRX10 like power-units, fan-unit and management-unit.
0805-9010	SRX3	Rack mount stand-alone housing: • 19" chassis, • Height: 1RU, • 3 slots for line-cards, • VT100 Management port (D-Sub9), • with alarm contact, ventilation, • mains supply: AC (115/230V).
0805-9110	SRX3plus	Rack mount housing with agent-functionality: • 19" chassis, • Height: 1RU, • 3 slots for line-cards, • integrated management card • 2x FE management port (SFP + RJ45), • with alarm contact, ventilation, • AC (115/230V) and DC (-48V/-60V) power supplies.
0717-9101	SHX3-15W	Stand-alone housing: • 1 slot for 3RU line-card, • max. 15W power consumption, • VT100 Management port (D-Sub9), • alarm contact, • with ventilation, • integrated wide range power supply, • mains supply: 48VDC…110/230VAC, • power jack included.

Table 1-3 *Accessories Housing & Cables (continued)*

Art.- No.	Short Name	Description
0717-9401	SHX3-10W	Stand-alone housing: • 1 slot for 3RU line-card, • max. 10W power consumption, • VT100 Management port (D-Sub9), • alarm contact, • no ventilation, • integrated wide range power supply, • mains supply: 48VDC...110/230VAC, • power jack included.
0500-001	PC-E	Power cord, European plug.
0500-002	PC-B	Power cord, Great Britain plug.

NOTE: All order matrices will be regularly updated. Asked your arcutronix representative for the latest publications.

SFPs (Small Form-factor Pluggable)

The CSX-series offers one SFP-slot (Small Form-factor Pluggable) for usage of a wide range of different optical transceivers with a speed up to 125Mbit/s. The small form-factor pluggable (SFP) is a compact, “hot-pluggable” optical transceiver used in optical communications for both telecommunication and data communications applications. The SFP transceiver is specified by a multi-source agreement ([SFP MSA]) between competing manufacturers.

Using the right SFP, the CSX can be used in different optical environments with different fibre-types (single-mode or multi-mode) and a wide range of distances.

All SFP ports are compliant with [INF-8074i] and must be connected to SFP modules that are class 1 lasers and are compliant with [IEC 60825-1].

CSX does support all optical modules, which are designed according the SFP MSA. For safe operation, arcutronix recommends the SFPs below. Please ask for special types, if required.

Table 1-4 *Accessories SFPs*

Short Name	Description
Optical Transceiver:	
100Base-FX:	
SFP-155-S13-10	Optical SFP Interface Module: 1310nm SM FO; Fast E, 155 Mbps transceiver; pluggable SFP footprint; LC connector; 10km.

Table 1-4 *Accessories SFPs (continued)*

Short Name	Description
SFP-155-S13-15	Optical SFP Interface Module: 1310nm SM FO; Fast E, 155 Mbps transceiver; pluggable SFP footprint; LC connector; 15km
SFP-155-S13-40	Optical SFP Interface Module: 1310nm SM FO; Fast E, 155 Mbps transceiver; pluggable SFP footprint; LC connector; 40km.

Chapter 2
Getting Started

For the start-up of the CSX please follow the directions in this chapter.
You must keep the operating conditions specified for the devices. In the following read about the start-up preparation, the start-up itself, and the possibility to automate the start-up.

WARNING: Read the safety notes at the beginning of this manual carefully before you start the device!

Delivered Parts

Please check if all the items listed below are included in your delivery.
Your delivery includes:

- CSX system
- optional: Single-slot Housing SHX3
- optional: Power Cord for AC
- optional: SFP fibre module

Preparing the Start-up

Before you switch on the device you need to check the operating conditions and install the CSX into the chassis or the desktop-housing.

Operating Conditions

Read the operating conditions specified in this section carefully to avoid damages to the device or connected systems.

Ambient Conditions

The ambient conditions, which must be maintained for the CSX, are shown in Table 2-1.

Table 2-1 *Ambient Conditions*

Operating Temperature	5°C to 55°C
Max. Relative Humidity (non-condensing)	<100% (30°C)

Table 2-1 *Ambient Conditions*

Input Voltage	+5V DC
Power Consumption	< 4 VA [i]

i. Depends on the given variant and used SFPs.

CAUTION: If operating limits are exceeded, malfunctions and permanent damage to the equipment may result.

NOTE: In order to operate the various interfaces, please ensure that the plugs are firmly engaged in the sockets.

CSX Mounting

In SRX10

To mount the CSX into the ax-chassis SRX10 please follow the subsequent step-by-step instructions.

1. Disconnect all cables from the CSX before mounting the device.
2. Place the CSX right way up on a table with the front panel looking in your direction.
3. Insert the CSX that way into the chassis. Keep eye that the PCBA is sliding inside the mounting rails. Make sure, the CSX is well plugged till the end of the rails, so that the backplane-connector is well connected.
4. Fix the CSX to the chassis using the provided screws.
5. Connect the interface cables to the CSX.

In SHX3-Family

To mount the CSX into the ax-desktop family SHX3 please follow the subsequent step-by-step instructions.

1. Disconnect all cables from the CSX before mounting the device.
2. The CSX is mounted in horizontal way, the handle must be on the right side.
3. Insert the CSX into the SHX3.
4. Fix the CSX to the housing using the provided screws.
5. Connect the interface cables to the CSX.

In SRX3-Family

To mount the CSX into the ax-desktop family SHX3 please follow the subsequent step-by-step instructions.

1. Disconnect all cables from the CSX before mounting the device.

2. The CSX is mounted in horizontal way, the handle must be on the right side.
3. Insert the CSX into the SHX3.
4. Fix the CSX to the housing using the provided screws.
5. Connect the interface cables to the CSX.

Airflow Requirements

There are no fans needed to operate the CSX - Family.

Start-up of the CSX

Switching on the Device

The CSX does not have the capability to be directly powered by either AC or DC input. A power supply is always required to convert the provided (external) power into the 5VDC, which is required by the CSX. The power supply may be a fixed or removable part of the chassis/housing, where the CSX is mounted. As soon as the power supply unit is applied with external power, the slot is powered and a plugged CSX will start.

After power is connected to either chassis or housing, the device boots its software automatically. No extra switch has to been activated. During the boot-process all internal components are roughly tested and the device is initialized. The last setup is restored; in case the unit starts the first time, it starts with the factory defaults.

The boot-process is indicated by the blinking ON-LED and takes about 15 seconds. At the end of this process the unit is fully operational. If there are any settings, which need special adoption, different to the default, the configuration can start now.

Power-Up Sequence

After providing power to the CSX, the device will power-up. The start-up will take several seconds, while internal SW is started and some tests are done to verify the CSX is not damaged and proper operation can be guaranteed.

The power-up sequence is indicated and can be monitored by special behaviour of the LEDs. After finishing the start-up, the LEDs will operate “normal” and indicate status and alarms of the unit, as written in this manual.

The special behaviour of the LEDs allow to user to

1. check, whether all LEDs or operating well and
2. see when the unit’s start-up is finished and the CSX is operational.

LED Start-Up

Shortly after power-up, the device switches on all LEDs. This is for test purposes, so one can check whether the indicators are working well. After several seconds the LEDs turn to “normal” operation.

Configuration Access

After successful start-up process, the unit is ready for data transmission and configuration. A default setup is available as factory settings, but individual settings can be done via several ways. This will be depicted hereafter. All configuration settings are made by using the management I/Fs. For the system configuration you can choose one of the following configuration methods:

1. local access point (RS232/VT100), which is accessible in the SHX3 single-slot housing (Chapter 5, Control Software CSX & gCLI), or
2. centralized/remote access point via the arcutronix system controller and agent card SCX2e.

The local access point is good for stand-alone installations and offers an easy to use VT100 management interface.

For the centralized/remote configuration you can choose one or a mixture of the following configuration methods:

a. SSH2 protocol to get the same CLI interface as for the local access (Chapter 5, Control Software CSX & gCLI).

b. SNMP agent: You can use the SNMP protocol to manage the CSX -- and all the other line-cards, which are in the same rack (Chapter 6, SNMP and MIBs).

c. Web-based GUI. Connect with a standard internet browser (e.g. Firefox) to the IP-management I/F. A html-based GUI will allow easy configuration settings (see “[axManual_SCX2e_gs2]”).

Chapter 3
Hardware & Interfaces

This chapter provides information about the hardware of CSX - G.SHDSL.bis (EFM) Copper Modem. This consist of block-diagram and a detailed description of all external interfaces and function indicators.

The CSX is a compact unit. All external connection points for data lines and some control elements are accessible on the front panel. The indicator elements are also on the front panel. Power supply and some other control connections are via the backplane connector.

Hardware Overview

Block-Diagram

The block-diagram shows the principal parts and functions of the CSX. The main blocks are shown and their logical connections are presented as lines in between.

The CSX can be divided into six functional blocks:

Table 3-1 *System Components*

	Component	Description
1a	Processor (Local Control Point LCP)	The CSX is based on a ARM CortexM4 Microcontroller platform using a Atmel SAM4S.
1b	Flash	The flash is embedded on the Atmel SAM4S.
1c	SDRAM	The flash is embedded on the Atmel SAM4S.
2a	UART	An RS232-interface is accessible via backplane connector. It can be used in the ax housings.
2b	USB	An USB-interface is accessible via backplane connector. It is used in the ax system racks for communication with sytem controller card SCX2e.
2c	FPGA	Rag picker for different tasks.
3	Ethernet-I/F	The Ethernet-Combo I/F with PHY

Table 3-1 *System Components (continued)*

	Component	Description
4	Connector to Interface-Module IM	The flexible concept of CSX provides the option to plug different modules. with the help of these modules, other interfaces than Ethernet can be realized. the IM-connector is proprietary to ax.
5	SHDSL I/F	1 to 4 SHDSL lines can be realized for the CSX - Family. Protection against lightning is placed on the device.
6a	DC/DC-Converter	The DC/DC converter is an own developed block, which generates all required voltage-levels out of the incoming 5V from backplane. It is temperature protected to prevent the device from damage.
6b	Backplane Connector	Via the backplane connector the CSX is connected to all line-cards, the Power-Supply and optional fan unit.

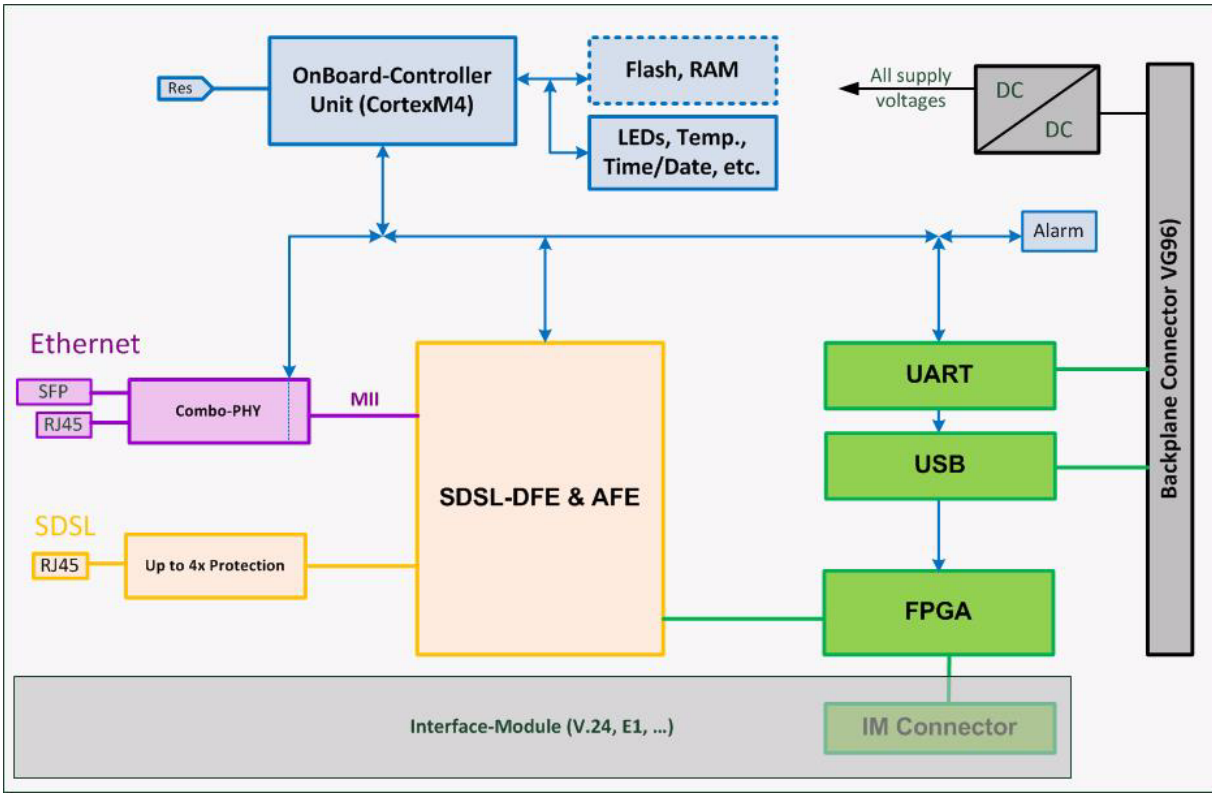


Figure 3-1 *CSX Block-Diagram*

Figure 3-1 gives an overview to the functional blocks. The six main blocks are coloured in different ways to distinguish them better from each other. The (blue) on-board controller runs a simple operating system and is the brain of the device. Several external

connections (front and backplane) are available to get in conntact. Via several buses, the LCP is connected to all other devices to supervise and control them.

The purple components build the external (user-)interface in the “FE” (“Fast Ethernet”) variants. The (combo-) PHY composes the physical interface. A combo-port can be used either for Copper or Fibre Optic infrastructure, respectively. The SFP/Copper combo-port is auto detecting and can accommodate a wide range of Ethernet SFP transceivers, allowing service providers to seamless connect customers located at different distances from the device.

The yellow part is the SHDSL digital part, analog front-end and protection. Either 1 or 4 lines, a single RJ45 is the connection to the TP telephone-cable infrastructure.

FPGA, collecting various tasks and glue logic is marked in green. The traffic to and from the IM-connector is routed across the FPGA to adapt the different possible interfaces to the SHDSL data-pump.

Towards the rack/system, the device does have a VG96 plug. This connector is its internal interface and carries beside the USB and a lot of static lines also the power rail. A 5VDC input to the device is provided and all required voltages are generated on-board.

Front Connectors and LEDs

The CSX has full front access to all the connectors and status indicators which are required for the user. This makes it easy to install and changes in connection can be done without removing the unit from rack. The status indicators are all low-power LEDs, which are available in red, yellow and green.

All the LEDs are labelled, so it is easy to use and understand the intent.

Two mounting screws at both ends of the front-plate are to fix the unit in rack or housing.

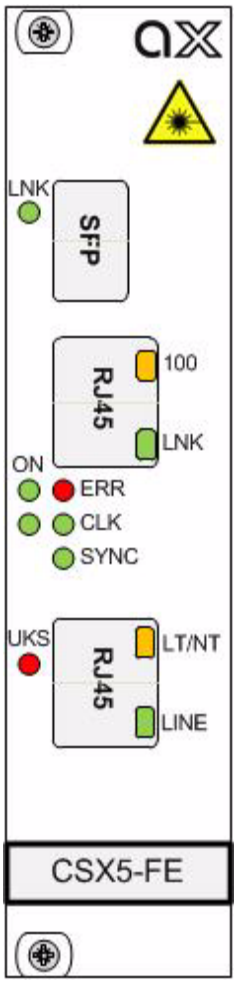
Depending on the given variant, the front panel looks slightly different. In the following the common parts and the differences of the front panels will be depicted.

CSX5-FE

Front Panel

Table 3-2 provides information on the connectors, indicators, and control elements of the CSX System Controller:

Table 3-2 *CSX*5-FE *Front View*

View	Details
	Mounting screw in SRX. 1x 100FX User Port + 1x LINK-LED. 1x 10/100BaseT User Port, 2x integrated LEDs. 1x ON-LED + 1x Alarm-LED. 2x Clock-LED. 1x Sync-LED. 1x SHDSL Port, 2x integrated LEDs. 1x SHDSL status LED. Handle with Label. Mounting screw in SRX.

LEDs

Several LEDs show the (operational) status of the device. During start-up of the device the LED have different meaning than during normal operation (see “LED Start-Up” on page 2-4). In this chapter, the behaviour after successful start-up is depicted.

ON & ALM

The ON-LED is used for power-supply indication, while the ALM-LED shows the alarm status of the device. After Power-On of the device, both LEDs will be on.

Table 3-3 *ON & Alarm LED*

ON-LED	**Display states of the LED:**	
	off	No supply voltage.
	on	Supply voltage available.
	flashing	Power available, but the voltage level is too low. The device did not start (yet) due to this situation. See “Power Management” on page 4-20 for details.
ALM-LED	**Display states of the LED:**	
	off	Neither error nor warning detected.
	on	Device has at least one error detected.
	blinking 1.5 Hz	Device has at least one warning (and no error) detected.

Clock & Sync

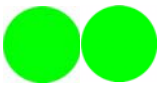
The two Clock-LEDs show the clocking mode of the device.

the Sync-LED indicates the operation mode of Ethernet SyncE.

Table 3-4 *Clock & Sync LEDs*

CLK-LEDs	**Display states of the LED:**	
	off | off	no valid mode.
	on | off	External clock mode. Only possible, when SyncE is enabled.

Table 3-4 *Clock & Sync LEDs (continued)*

	off | on	Remote clock mode. This is the (default) clock mode for STU-R devices.
	on | on	Internal clock mode. This is the default clock mode for STU-C devices, when SyncE is not enabled.
SYNC-LED	**Display states of the LED:**	
	off	No Ethernet-Sync enabled.
	on	Ethernet-Sync achieved.
	blinking 1.5 Hz	Ethernet-Sync not achieved, yet.

SHDSL

The SHDSL port is a RJ45 with integrated 2 LEDs. The label of the 2 LEDs are LT/NT and LINE. A third LED is called UKS.

Table 3-5 *SHDSL LEDs*

LT/NT-LED	**Display states of the LED:**	
	off	The device is in STU-R mode (NTU).
	on	The device is in STU-C mode (LTU).
	blinking 1.5 Hz	SDSL-Loop is activated. • On STU-C (LTU): – The device is in STU-C loop mode (SHDSL terminal loop on the STU-C). • On STU-R (NTU): – The device is in STU-R loop mode (SHDSL facility loop on the STU-R).

Table 3-5 *SHDSL LEDs (continued)*

LINE-LED	Display states of the LED:	
	off	SHDSL line down and no activating in progress.
	flashing 4Hz	SHDSL line is activating.
	blinking 1.5Hz	SHDSL line is established on segment 1. The SHDSL peer (STU-R for STU-C and vice versa) is not detected, yet.
	on	SHDSL line is established end-to-end.
UKS-LED	**Display states of the LED:**	
	on	SHDSL start-up did not happen, yet.
	flashing 4Hz	SHDSL line is activating.
	blinking 1.5Hz	SHDSL line is established on segment 1. The SHDSL peer (STU-R for STU-C and vice versa) is not detected, yet.
	off	SHDSL line is established.

NOTE: In case of CSX10 or CSX20, the UKS-LED is 2x and 4x available. Each UKS-LED shows the status of one SHDSL-link.

Ethernet

The device does have one Ethernet-Combo port, which consists of a copper (10/100BaseT) and a fibre (100BaseFX) port. Only one part of the combo can be used. If a fibre module (SFP) is plugged, the combo is automatically configured to fibre mode, even when no fibre link is detected.

The copper port is a RJ45 with integrated 2 LEDs. The label of the 2 LEDs are 100 and LNK. These LEDs are only used in copper mode.

The fibre port is a SFP-slot plus one LED. The label of the LED is LNK. This LED is only used in fibre mode.

Table 3-6 *Ethernet LEDs*

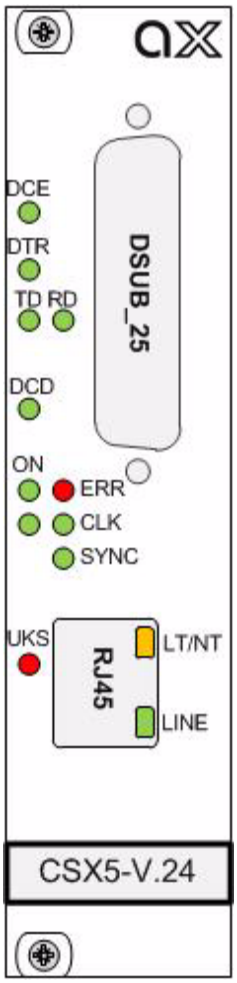
100-LED	**Display states of the LED:**	
	off	The Ethernet port speed is 10Mbps (10BaseT) or the port is in fibre mode.
	on	The Ethernet port speed is 100Mbps (100BaseT).
LNK-LED	**Display states of the LED:**	
	off	No Ethernet link detected or the port is in fibre mode.
	on	Ethernet link is established, and no traffic is ongoing.
	flashing	Ethernet link is established, and traffic is transferred. The LNK-LED blinks for ingressing or egressing packets.
SFP-LNK-LED	**Display states of the LED:**	
	off	Neither SFP nor Fibre-Ethernet link detected.
	blinking 1.5Hz	SFP in slot detected, but no Fibre-Ethernet link is established.
	on	Fibre-Ethernet link is established, and no traffic is ongoing.
	flashing	Ethernet link is established, and traffic is transferred. The LNK-LED blinks for ingressing or egressing packets.

CSX5-V.24

Front Panel

Table 3-7 provides information on the connectors, indicators, and control elements of the CSX System Controller:

Table 3-7 *CSX*5-V.24 *Front View*

View	Details
	Mounting screw in SRX. 1x V.24-User Port + 1x Mode-LED. 4x Status LEDs. 1x ON-LED + 1x Alarm-LED. 2x Clock-LED. 1x Sync-LED. 1x SHDSL Port, 2x integrated LEDs. 1x SHDSL status LED. Handle with Label. Mounting screw in SRX.

LEDs

Several LEDs show the (operational) status of the device. During start-up of the device the LED have different meaning than during normal operation (see “LED Start-Up” on page 2-4). In this chapter, the behaviour after successful start-up is depicted.

ON & ALM

The ON-LED is used for power-supply indication, while the ALM-LED shows the alarm status of the device. After Power-On of the device, both LEDs will be on.

Table 3-8 *ON & Alarm LED*

ON-LED	**Display states of the LED:**	
	off	No supply voltage.
	on	Supply voltage available.
	flashing	Power available, device did not start (yet).
ALM-LED	**Display states of the LED:**	
	off	Neither error nor warning detected.
	on	Device has at least one error detected.
	blinking 1.5 Hz	Device has at least one warning (and no error) detected.

Clock & Sync

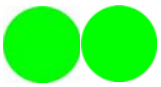
The two Clock-LEDs show the clocking mode of the device.

the Sync-LED indicates the operation mode of Ethernet SyncE.

Table 3-9 *Clock & Sync LEDs*

CLK-LEDs	**Display states of the LED:**	
	off | off	no valid mode.
	on | off	External clock mode. Only possible, when SyncE is enabled.

Table 3-9 *Clock & Sync LEDs (continued)*

	off | on	Remote clock mode. This is the (default) clock mode for STU-R devices.
	on | on	Internal clock mode. This is the default clock mode for STU-C devices, when SyncE is not enabled.

SYNC-LED	**Display states of the LED:**	
	off	V.24 user interface is working in asynchronous mode.
	on	V.24 user interface is working in synchronous mode.

SHDSL

The SHDSL port is a RJ45 with integrated 2 LEDs. The label of the 2 LEDs are LT/NT and LINE. A third LED is called UKS.

Table 3-10 *SHDSL LEDs*

LT/NT-LED	**Display states of the LED:**	
	off	The device is in STU-R mode (NTU).
	on	The device is in STU-C mode (LTU).
	blinking 1.5 Hz	SDSL-Loop is activated. • On STU-C (LTU): – The device is in STU-C loop mode (SHDSL terminal loop on the STU-C). • On STU-R (NTU): – The device is in STU-R loop mode (SHDSL facility loop on the STU-R).

LINE-LED	**Display states of the LED:**	
	off	SHDSL line down and no activating in progress.

Table 3-10 *SHDSL LEDs (continued)*

	flashing 4Hz	SHDSL line is activating.
	blinking 1.5Hz	SHDSL line is established on segment 1. The SHDSL peer (STU-R for STU-C and vice versa) is not detected, yet.
	on	SHDSL line is established end-to-end.
UKS-LED	**Display states of the LED:**	
	on	SHDSL start-up did not happen, yet.
	flashing 4Hz	SHDSL line is activating.
	blinking 1.5Hz	SHDSL line is established on segment 1. The SHDSL peer (STU-R for STU-C and vice versa) is not detected, yet.
	off	SHDSL line is established.

Datacom User Port V.24

The device does have one datacom port, operating in V.24 mode. A 25-pin D-sub Menu and Submenu Entry|Read Eligibility|Write Eligibility plug (DB-25S) is used as physical interface to the device. The port can be operated with data-rates between 2400bps and 230kbps. Auto-sensing of the speed makes it very easy to use the port without further configurations. Synchronous as well as asynchronous modes are supported, where

- synchronous mode means a clock is used on the V24 interface,
- asynchronous mode means no clock is used on the V.24 interface.

The port can be configured to act as DCE (default) or DTE. The configuration between the two modes is done with the help of jumpers on the module.

Five LEDs show the configuration (DCE vs. DTE) and the status of the V.24 port.

Table 3-11 *V.24 LEDs*

DCE-LED	**Display states of the LED:**	
	off	Datacom user port (V.24) operates in DTE mode. The pinning is according to DTE.
	on	Datacom user port (V.24) operates in DCE mode. The pinning is according to DCE.
DTR-LED	**Display states of the LED:**	
	off	Indicator for DTR-signal: DCE-mode: the DTR-LED is on, when DTR from the connected DTE is detected. As long as no DTR signal is detected, the LED is off. DTE-mode: the DTR-LED is on, as soon as the device sets the DTR signal active. This is the case, as soon as the SHDSL line/bundle is (completely) established.
	on	
TD-LED	**Display states of the LED:**	
	off	No traffic on TD-line detected. DCE-mode: the TD-line is an input. DTE-mode: the TD-line is an output.
	blinking 10Hz	Incoming traffic detected.
	blinking 1,5Hz	Terminal Loop on V.24 interface is active.
RD-LED	**Display states of the LED:**	
	off	No traffic on RD-linedetected. DCE-mode: the RD-line is an output. DTE-mode: the RD-line is an input.
	blinking 10Hz	Outgoing traffic detected.

Table 3-11 *V.24 LEDs (continued)*

	blinking 1,5Hz	Facility Loop on V.24 interface is active.
DCD-LED	**Display states of the LED:**	
	off	Indicator for DCD-signal: DCE-mode: the DCD-LED is on, as soon as the device sets the DCD signal active. This is the case, as soon as the SHDSL line/bundle is (completely) established. DTE-mode: the DCD-LED is on, when DCD from the connected DCE is detected. As long as no DCD signal is detected, the LED is off.
	on	

Pinouts

The CSX - Family consists of various variants with a wide bunch of different interfaces. Some are common to all members, like the SHDSL port, some are only available on a limited number of family members (e.g. Ethernet port). The following chapter lists all the available interfaces.

SHDSL

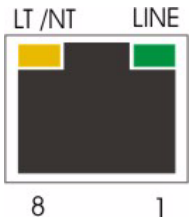
All variants of the CSX - Family do have at least a single SHDSL line interface. Up to 4 SHDSL interfaces on one CSX are possible. No matter of one, two or four SHDSL interfaces are available, the connector is always a single RJ45 connector. The particular SHDSL ports are operating all in the same way, so it is sufficient to depict a single port here.

The operation mode of the SHDSL port can be either STU-C (LTU), which is the “master” unit, normally placed in a central office location - or STU-R (NTU), which is the “slave” unit, normally placed at remote and/or customer site.

A pair of SHDSL partner need to on one side STU-C and on the other side STU-R. A [STU-C -- STU-C] or [STU-R -- STU-R] configuration will not work!

The pin-assignment of the RJ45 is as follows:

Table 3-12 *Pinning SHDSL RJ45 Connector*

RJ45	Pin	Assignment
	1	4: TIP DSL4
	2	4: RING DSL4
	3	2: TIP DSL2
	4	1: TIP DSL1
	5	1: RING DSL1
	6	2: RING DSL2
	7	3: TIP DSL3
	8	3: RING DSL3

TIP/RING crossing and TP-Cross-Connect are supported. The interface is able to recognize

- a polarity inversion of the receiving signals (TIP <--> RING),
- a crossover of twisted pairs (e.g. TIP1/RING1 <--> TIP2/RING2),

Note: Crossover between pairs is only possible for CSX10 (pairs 1/2) and CSX20 (pairs 1/2/3/4).

and corrects it automatically ensuring that the operation continues smoothly. This makes installation very robust against simple faults.

Table 3-13 *SHDSL Standards*

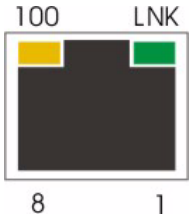
Item	Values
Standards:	ITU-T G.991.2; IEEE 802.3
Ports:	1, 2 or 4 SHDSL ports.
Data rate:	192kbps - 5,7Mbps per port.
Range:	depends on given cable-infrastructure and noise.
Connectors:	RJ45 8-pin.

10/100BaseTX (RJ45)

The CSX5-FE provides one copper Ethernet interfaces as part of a combo-port. The device negotiates the operating mode of the corresponding interface automatically with the remote station using Auto Negotiation (if activated). Half-duplex and full-duplex connections are supported. The data rate is either 10 Mbit/s or 100 Mbit/s. The protocol is

according to [IEEE 802.3].The connector is a RJ45 plug with 2 LEDs, which indicate speed, link and activity. The pin-assignment of the RJ45 is as follows:

Table 3-14 *Pinning Ethernet RJ45 Connector*

RJ45	Pin	Assignment
	1	TD+
	2	TD-
	3	RD+
	4	-
	5	-
	6	RD-
	7	-
	8	-

NOTE: If the CSX detects an SFP in a combo-port, the adjacent copper-port will be disabled! If a SFP is detected the LNK-LED of the SFP will blink until the FO-link is established.

Auto negotiation and auto crossover are supported. The interface is able to recognize

- a polarity inversion of the receiving signals (RD+ <--> RD-)
- a crossover of transmitting/receiving signals (RD+/RD- <--> TD+/TD-)

and corrects it automatically ensuring that the operation continues smoothly. This allows the usage of 1:1 cables in any case.

CAUTION: For access it is recommended to use twisted-pair cables of the category 5 and an impedance value of 100 Ω. The maximum cable length is 100 metres. Using cables of lower quality or different impedances may result in a restriction of the maximum cable length. In addition the employment of unshielded cables can have negative effect on the reliability of the data transmission.

Table 3-15 *Ethernet Standards*

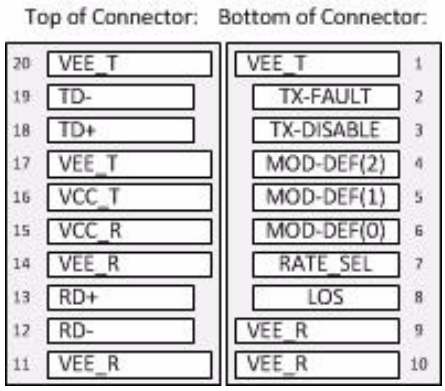
Item	Values
Standards:	IEEE 802.3
Ports:	1x 10/100BaseT
Data rate:	10Mbit/s or 100Mbit/s auto negotiation, full- or half-duplex
Range:	Up to 100m over UTP-5 cable
Connectors:	RJ45 8-pin

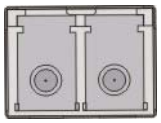
100Base-X (SFP)

The CSX5-FE provides one optical Ethernet interfaces as part of a combo-port. The device supports 100 Mbit/s, full-duplex, only. The protocol is according to [IEEE 802.3].The connector is according [INF-8074i] and [SFP MSA]:

Table 3-16 *Pinning SFP Connector*

SFP	Pin	Assignment
Electrical Socket:	1	Transmitter Ground
	2	Transmitter Fault Indication
	3	Transmitter Disable
	4	Module Definition 2 = I2C-data
	5	Module Definition 1= I2C-clock
	6	Module Definition 0 = /SFP-detect
	7	Select between full or reduced bandwidth. always configured to full BW.
	8	Loss Of Signal
	9	Receiver Ground
	10	Receiver Ground
	11	Receiver Ground
	12	Inv. Received Data Out
	13	Received Data Out
	14	Receiver Ground
Optical Port:	15	Receiver Power
	16	Transmitter Power
	17	Transmitter Ground
	18	Transmit Data In
	19	Inv. Transmit Data In
	20	Transmitter Ground





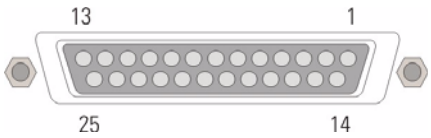
NOTE: If the CSX detects an SFP in a combo-port, the adjacent copper-port will be disabled! If a SFP is detected the LNK-LED of the SFP will blink until the FO-link is established.

Datacom V.24 (DSUB-25, Menu and Submenu Entry|Read Eligibility|Write Eligibility)

The datacom V.24 interface is a 25-pin D-sub Menu and Submenu Entry|Read Eligibility|Write Eligibility connector (DB-25S). It can be used for DCE as well as for DTE appli-

cations. The configuration and corresponding pin-swapping is done by jumpers. There is no SW or management based re-configuration possible

Table 3-17 *Pinning V.24 DB-25S Connector*



Pin	Signal	DTE Direction	DCE Direction
1	Shield	-	-
2	TXD	Out	In
3	RXD	In	Out
4	RTS	Out	In
5	CTS	In	Out
6	DSR	In	Out
7	Ground	-	-
8	DCD	In	Out
15	TXC	In	Out
17	RXC	In	Out
20	DTR	In	Out
24	EXTCLK	Out	In
rest	not used	-	-

Configuration of the V.24 Interface-Module

The V.24-I/F can be operated in DCE or DTE mode (see “DCE and DTE” on page 4-9). The operating mode is selected by a number of jumper-blocks (M1 to M11), which must be change at the same time. Figure 3-2 and Figure 3-3 show the location of the jumper-blocks and the settings for DCE or DTE operation. The PCB is labelled, so the correct placement for DCE and DTE is easily to find.

NOTE: the default configuration for the V.24 interface is DCE mode.

Connecting SHIELD and Digital Ground

A twelfth jumper (called X3) is located close to the front connector (DB-25S). It is used to connect the digital ground (DG) of the chassis to the shielded ground of the interface connector. When the ON position is selected for M3, SHIELD and DG is connected to each other, In the OFF position the two signals are not connected.

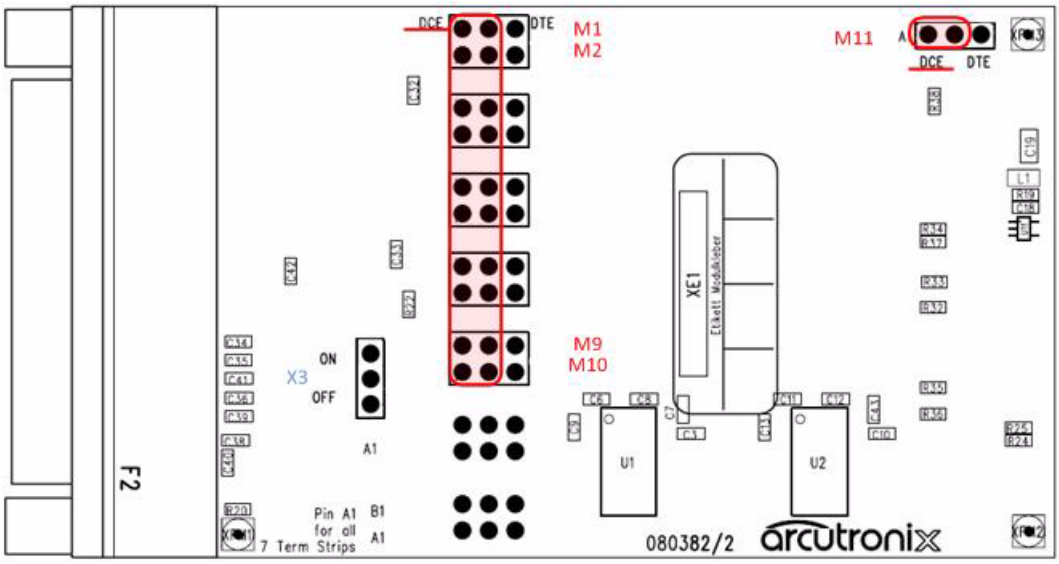


Figure 3-2 *V.24 Interface Board, DCE Configuration*

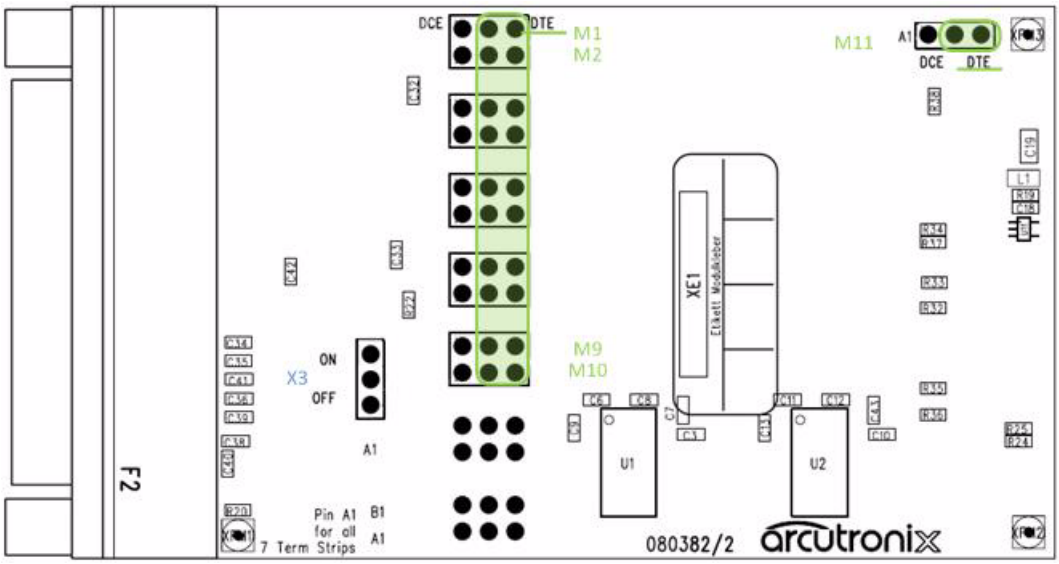


Figure 3-3 *V.24 Interface Board, DTE Configuration*

CSX Backplane Connector

The CSX series has a connector on the rear-side offering the possibility to use the devices either in 19-inch racks or desktop housing.

On the connector, the ports for local management (RS-232), power supply and rack-management are placed.

RS-232 Interface

The internal management port of the CSX is placed on the card's bus connector at the rear side of the unit. You need an agent card in the chassis or a single-slot housing with management connector. Also, SNMP management and web-based GUI according to the new advanced management concept is supported. The CSX allows to provide status information and to manage the devices (via a processing unit). The remote unit can be accessed via the line port. In-band management via the copper G.SHDSL data stream is used for the management of the remote unit.

The asynchronous RS-232 interface is used for the out-of-band administration of the device. It is only available if the CSX is placed in a single-slot housing.

The standard transmission parameters for the out-of-band interface is shown in Table 3-18.Function Indicators

Table 3-18 *Transmission Rate of the RS-232 Interface*

Transmission Rate (Baud)	Data Bits	Parity	Stop Bits
57600	8	none	1

Power Supply

For the CSX the operating voltage is fed through the backplane connector of the device. 5VDC must be applied to the unit for proper operation.

Labels

The unit carries 1 label with all the required data on it.

Figure 3-4 *CSX Label: Example CSX5-FE*

Chapter 4
Functionality

User & Line Ports

G.SHDSL Line-Interface

G.SHDSL Standard

Single-Pair high-speed digital subscriber line (SHDSL) is a telecommunications technology for Digital Subscriber Line (DSL) subscriber lines. It describes a transmission method for signals on copper pair lines, being mostly used in access networks to connect subscribers to Telephone exchanges or POP Access Points.

G.SHDSL was standardized in February 2001 internationally by ITU-T with recommendation [ITU-T G.991.2].

G.SHDSL features symmetrical data rates from 192 kbit/s to 5,7 Mbit/s of payload per pair. The reach varies according to the loop rate and noise conditions (more noise or higher rate means decreased reach) and may be up to 3,000 meters on a standard telecom cable (AWG26). The M-pair feature may alternatively be used for increased reach applications by keeping the data rate low (halving the data rate per pair will provide similar speeds to single pair lines while increasing the error/noise tolerance).

STU-C and STU-R Mode

For proper operation, the standard G.SHDSL (G.991.2) defines two modes, which are used on the two different sides of the copper line.

- STU-C mode (LTU) and
- STU-R mode (NTU).

STU-C (SHDSL Transceiver Unit, Central) or LTU mode (Line termination) is the master unit. The C-side is acting as the master for clock-system and is starting the SHDSL line after fail.

STU-R (SHDSL Transceiver Unit, Remote) or NTU mode (Network termination) is normally located close to the customer and is the slave unit in the system. The remote device is waiting for the start-up indication from the central part and derives the clock information from the STU-C, so generating an synchronous system.

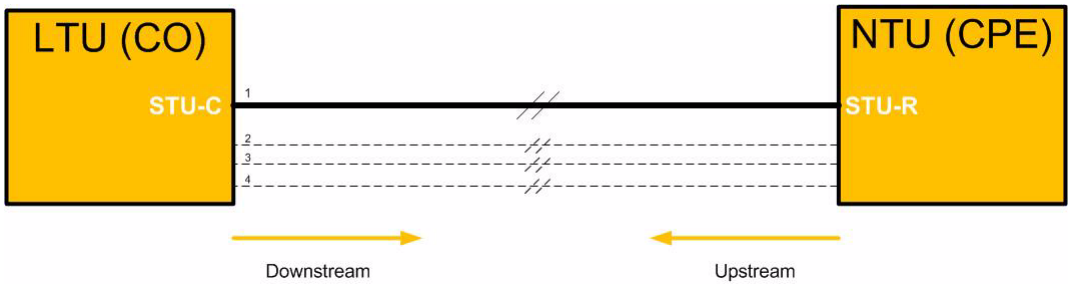


Figure 4-1 *CSX Overview*

During start-up, the two units (LTU and NTU) find the best filters to get optimised throughput for the given infra-structure. The principal functions are:

- symbol timing generation and recovery;
- coding and decoding;
- modulation and demodulation;
- echo cancellation;
- line equalization.

Repeater

In case the reach is not sufficient for the given application / infrastructure, a SHDSL repeater can be used to increase the possible distance.

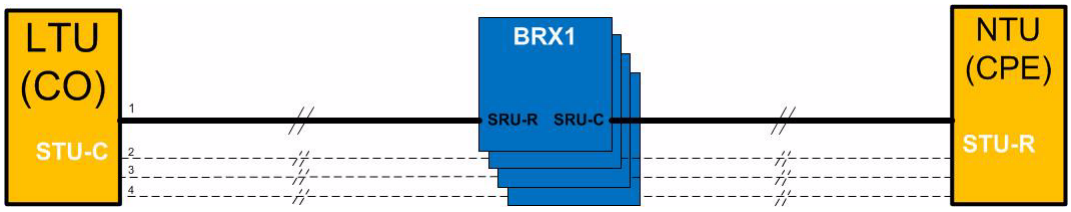


Figure 4-2 *CSX Overview with repeater BRX1*

Crossing of Copper Pair and Lines

The CSX - Family does support the operation of 1, 2 or 4 copper pairs, where all are used for bidirectional transport. During installation, a mismatch of the for copper lines can occur, which will be automatically detected and resolved by the CSX - Family. This makes is very easy and robust during installation.

These two mismatches do have no influence on the operation of the CSX - Family:

- Crossing of a/b pairs within one line and
- Crossing of the lines.

Note: Crossover between lines is only possible for CSX10 (lines 1/2) and CSX20 (lines 1/2/3/4).

Please see the two next figures for details on the mentioned wiring mismatches.

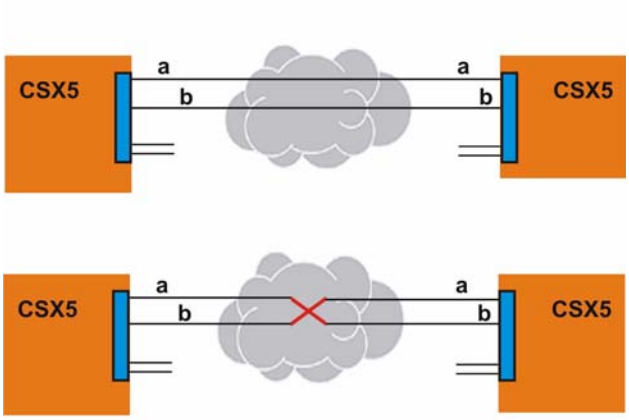


Figure 4-3 *Cross-Over of Copper Pair within one Line*

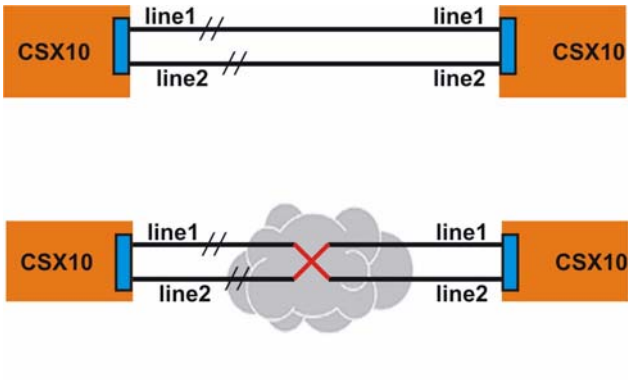


Figure 4-4 *Cross-Over of Copper Lines in n-wire mode*

A mismatch of pairs AND lines can not be resolved by the CSX - Family. This will lead to permanent fail of the line. Please check the wiring in such a case.

Configuration of the G.SHDSL Line-Port

The configuration of the G.SHDSL I/F is done via the management I/F, as depicted in Chapter 5, Control Software CSX & gCLI.

These settings can be defined:

- STR-C (LTU) or STU-R (NTU) mode. Both ends must have different setting for mode. The green LED in the RJ45 connector shows LT mode when lighting.
- The CSX - Family supports rate-adaptive transmission. The date rate is adjusted automatically via the STU-C device to find the best possible transmission rate. The transmission rate can vary from 192kbps to 5696kpbs. The usage of rate-adaptive is according to [ETSI TS 101 524], Annex E and [ITU-T G.991.2], Annex B and G.
- The coding on the line may be either 16-TCPAM or 32-TCPAM. The SHDSL signal on the transmitter output creates a noise signal on adjacent wire pairs in the same cable. To limit the distortion of adjacent DSL systems, we recommend to use only 16-TCPAM coding together with repeaters.

EOC-Channel

The embedded operation channel is specified by the [ITU-T G.991.2] and allows communication between STU-C and the attached devices on the SHDSL line. It is a 3,3kbps channel within the SHDSL frame and permits network operation systems to access essential functionality in the STU-C, STU-R and intermediate elements that are part of the access line. When an SHDSL line is activated, the EOC is established and communication is enabled.

The CSX - Family is fully compatible to the EOC standard and can accept basic orders and does report status via this channel. The access is possible via the STU-C or the STU-R side.

The following EOC-message IDs are supported by the CSX - Family:

Table 4-1 *Supported EOC-Messages*

EOC Msg ID	Message Type	Initiating Unit	Remark
1	Discovery Probe	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.1
2	Inventory Request	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.3
3	Configuration Request – SHDSL	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.5
9	Maintenance request - System Loopback	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.5
10	Maintenance request – Element Loopback	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.19
11	Status Request	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.11
12	Full Status Request	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.12
15	Soft restart/Power backoff disable Request	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.21

Table 4-1 *Supported EOC-Messages*

EOC Msg ID	Message Type	Initiating Unit	Remark
18	STU-R Configuration Request – Management	STU-C	[ITU-T G.991.2], chapter 9.5.5.7.9
112	Dwl-ZWR-IMG-Request	BRX-DL	Proprietary Message. Used for SW-Download via EOC.
114	Dwl-ZWR-IMG-Status-Request	BRX-DL	Proprietary Message. Used for SW-Download via EOC.
115	Dwl-ZWR-Block-Status-Request	BRX-DL	Proprietary Message. Used for SW-Download via EOC.
116	Switch-Image-Request	BRX-DL	Proprietary Message. Used for SW-Download via EOC.
117	Dwl-ZWR-Load-Single-Block-Request	BRX-DL	Proprietary Message. Used for SW-Download via EOC.
129	Discovery Response	SRU	Response to a discovery probe message.
130	Inventory Response	SRU	[ITU-T G.991.2], chapter 9.5.5.7.4
131	Configuration Response – SHDSL	SRU	[ITU-T G.991.2], chapter 9.5.5.7.7
137	Maintenance Status Response	SRU	[ITU-T G.991.2], chapter 9.5.5.7.20
139	Status/SNR	SRU	[ITU-T G.991.2], chapter 9.5.5.7.13
140	Performance Status SHDSL Network Side (SRU-R)	SRU	[ITU-T G.991.2], chapter 9.5.5.7.14
141	Performance Status SHDSL Customer Side (SRU-C)	SRU	[ITU-T G.991.2], chapter 9.5.5.7.15
144	Generic Unable to Comply (UTC)	SRU	[ITU-T G.991.2], chapter 9.5.5.7.26
240	Dwl-ZWR-IMG-Response	BRX1	Proprietary Message. Used for SW-Download via EOC.

SHDSL Test-Loops

The cause of transmission problems can be localised by activation of test loops. One can check the SHDSL transmission line and all components connected, when a loop back is activated. During activation of the test loop the incoming data signal is re-transferred into the opposite direction.

There are test loops available, to locate problems on the line and the repeater. The following figure presents possible test loop:

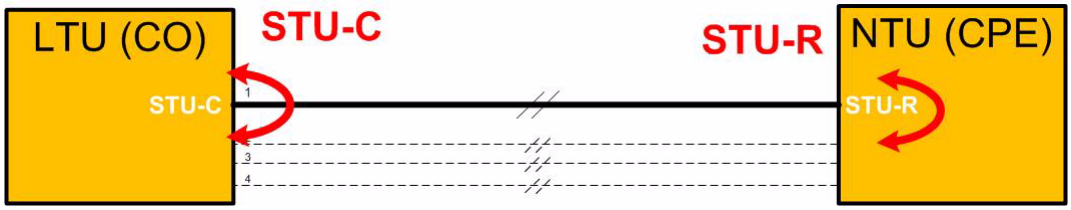


Figure 4-5 *SHDSL Loops for CSX*

In case there one or more repeaters in the SHDSL line, each repeater can be forced to switch on a loop.

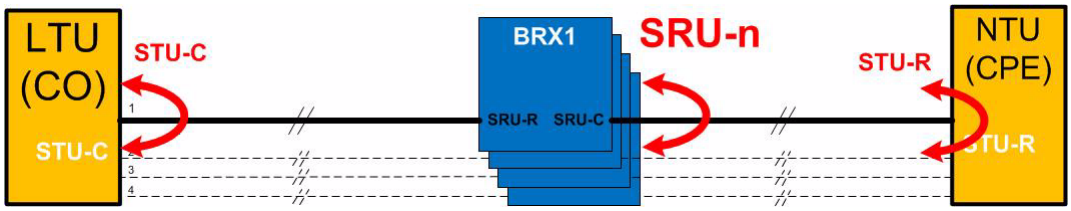


Figure 4-6 *SHDSL Loops for CSX* with Repeater

The test loops can be activated from the STU-C side (LT, MSAN), only. A loop is always activated per line, never per bundle!

In case a CSX is used on the STU-C side, the activating of the loop is done in the management SW (see “Configuration (Line Interface)” on page 5-20).

In case a foreign vendor’s device is used on the STU-C side, the correct message has to be sent to the STU-R. EOC-message ID 9 (“Maintenance request – Element Loopback”) and the special command within the message ID 9 is “Initiate Loopback toward Network” (Bit3). See [ITU-T G.991.2], chapter 9.5.5.7.19 for details.

- L1 = Terminal Loop, which loops all data that should be send out on the STUR-C back to the upstream direction.

Ethernet Remote Bridge Functionality

Basic

The CSX-FE version with Ethernet bridge is able to connect two networks over a long distance. It supports automatic detection of the connection speed (10/100 Mbps auto-sensing) and also the transmission of jumbo frames up to 2048 bytes frame size.

The CSX-FE provides interconnection and mapping functionality between Ethernet Systems and WAN Time-Division Multiplexed (TDM) systems. Ethernet traffic is encapsulated with HDLC to be transmitted over the WAN Serial Interfaces. The WAN Serial Interfaces also receive encapsulated Ethernet frames and transmit the extracted frames over the Ethernet port.

The LAN frame interface can be configured via the management application. In normal operation, the default settings need no change for a proper operation. In the following chapters a short overview of the possible settings and their impact are given.

Auto Negotiation

Modern Ethernet interfaces support a mechanism called Auto-negotiation to allow connection of ports with different capabilities. During the auto-negotiation process

- Speed (10 or 100Mbps),
- Duplex mode (full duplex or half duplex),
- Flow Control capabilities and
- Clock Settings

are defined for the established link.

Speed and Duplex

Auto-negotiation is part of [IEEE 802.3], the Ethernet standard. It was first defined in 1995 as IEEE 802.3u and was an optional implementation. Unfortunately at this time the standard gave partly space for interpretation and so different implementation in older equipment can be found. In 1998 the debatable portions were eliminated and a year later the standard was extended for Gigabit-Ethernet.

In the market, there is still a lot of the older equipment, where auto-negotiation was not clear defined, so there may occur problems when devices try to do auto-negotiation. So some devices do still expect to “talk” auto-neg, even when the port’s speed and duplex mode are strictly defined by the user. For this reason, CSX - Family supports to enable and/or disable the auto-neg communication, when the port’s speed or duplex mode is not really matter of negotiation but fixed by the user.

Please see table below for the possible settings and the resulting behaviour.

Table 4-2 *Settings Auto-Negotiation*

Setting (Port Speed)	Result		
	Speed	**Duplex**	**Remark**
Automatic	10 or 100 Mbps [i]	Full or Half Duplex [ii]	Full Auto-neg takes place; no limitations are given. The variable “Autonegotiation” is not changeable, but always “ON”.
10 Half Duplex	10 Mbps	Half Duplex	Auto-neg communication with peer can be enabled via the “Autonegotiation” variable.
10 Full Duplex	10 Mbps	Full Duplex	Auto-neg communication with peer can be enabled via the “Autonegotiation” variable.
100 Half Duplex	100 Mbps	Half Duplex	Auto-neg communication with peer can be enabled via the “Autonegotiation” variable.
100 Full Duplex	100 Mbps	Full Duplex	Auto-neg communication with peer can be enabled via the “Autonegotiation” variable.

i. Depending on ports capability and auto-negotiation result.
ii. Depending on auto-negotiation result. All CSX - Family ports do support full duplex mode.

Flow Control

Flow control is a process of managing the rate of data transmission between two nodes to prevent a fast sender from outrunning a slow receiver. The CSX - Family provides this mechanism for the FE-interface to control the receive data, so that the EFM bridge is not overwhelmed with data from the transmitting node. The FE-port will send a so-called PAUSE frame, which halts the transmission of the sender for a specified period of time.

The usage of PAUSE frames is defined by IEEE 802.3x and uses MAC Control frames to carry the PAUSE commands.

Datacom V.24 Interface

Basic

The V.24 interface is mainly used for EIA-232 standard interface. In the early 1960s, a standards committee, today known as the Electronic Industries Association, developed a common interface standard for data communications equipment. At that time, data communications was thought to mean digital data exchange between a centrally located mainframe computer and a remote computer terminal, or possibly between two terminals without a computer involved. These devices were linked by telephone voice lines, and consequently required a modem at each end for signal translation. From these ideas, the RS232 standard was born. It specified signal voltages, signal timing, signal function, a protocol for information exchange, and mechanical connectors.

Over the 40+ years since this standard was developed, the Electronic Industries Association published three modifications, the most recent being the EIA232F standard introduced in 1997. Besides changing the name from RS232 to EIA232, some signal lines were renamed and various new ones were defined, including a shield conductor.

DCE and DTE

If the full EIA232 standard is implemented as defined, the equipment at the far end of the connection is named the DTE device (Data Terminal Equipment, usually a computer or terminal), has a 25-pin D-sub plug (DB-25P), and utilizes 22 of the 25 available pins for signals or ground. Equipment at the near end of the connection (the telephone line interface) is named the DCE device (Data Circuit-terminating Equipment, usually a modem), has a DB-25 socket, and utilizes the same 22 available pins for signals and ground. The cable linking DTE and DCE devices is a parallel straight-through cable with no cross-over or self-connects in the connector hoods.

This drawing shows the orientation and connector types for DTE and DCE devices:

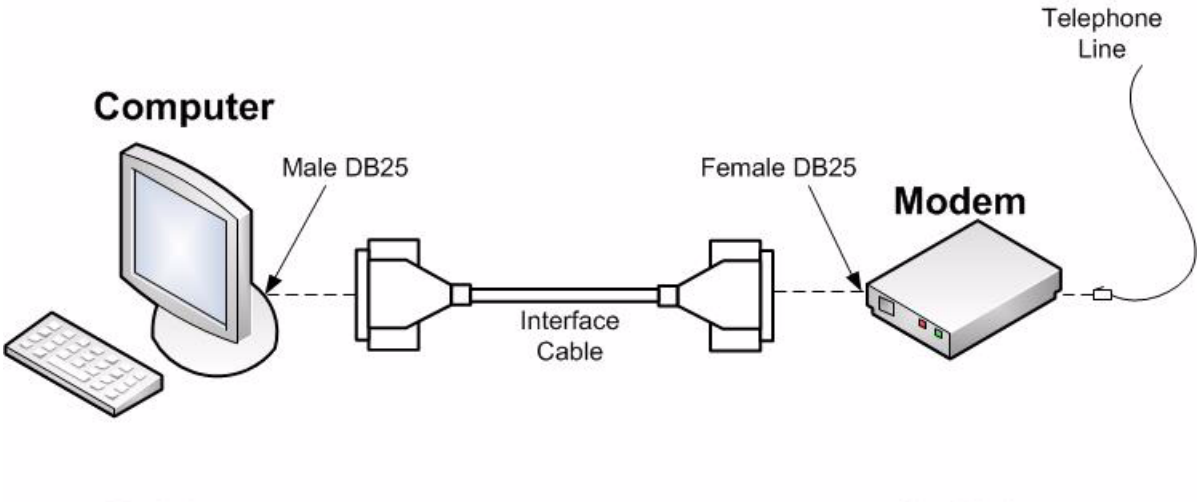


Figure 4-7 *DCE and DTE*

The CSX5-V.24 is acting as a modem and so it is configured as DCE by default on both ends of the SHDSL line to allow the transport of data. This default is depicted in the figure below:

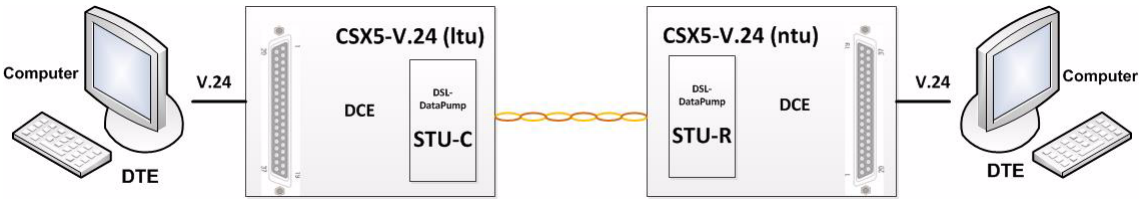


Figure 4-8 *DCE--DCE Configuration (Default)*

In other scenarios it can happen, that on the central side an IP-router is located, which has an DCE interface as well. In this case, the STU-C can be configured as DTE (see “Configuration of the V.24 Interface-Module” on page 3-18). This scenario would look like this:

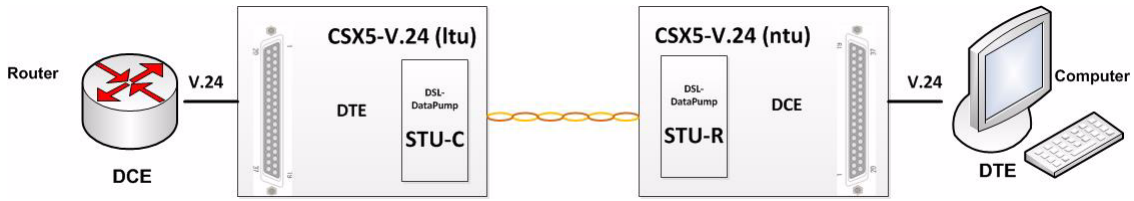


Figure 4-9 *DTE--DCE Configuration*

Synchronous and Asynchronous Operation

The EIA232 interface can be operated in synchronous and asynchronous mode. The difference in the both modes is the presence or absence of clock-information on dedicated clock signal-lines.

The CSX5-V.24 does support both modes, without any additional configuration. Self-detecting of clock-rates in synchronous mode or Baudrate in asynchronous mode makes is needless to configure anything. The detected mode on both sides much match in a DCE--DCE-scenario (see above), otherwise an alarm is raised. In the DTE--DCE scenarios (see above) the DTE (STU-C) forwards the clock information to the remote side.

NOTE: This is a difference to the former ax product CSX4-V.24, where clock configuration was mandatory to operate the device.

in synchronous mode the CSX5-V.24 does a clock-recovery on the far end to rebuild the clocking information, if required. Due to technical limitations, in synchronous mode, the lowest data-rate, which is supported is 2400 Baud per second. Lower transmission rates are possible on demand.

NOTE: In asynchronous mode, the CSX5-V.24 supports **0bps to 230.000kbps**. In synchronous mode, the CSX5-V.24 supports **2400bps to 230.000kbps**.

Likely Problems when Using an EIA232 Interface

During this 40-year-long, rapidly evolving period in electronics, manufacturers adopted simplified versions of this interface for applications that were impossible to envision in the 1960s. Today, virtually all contemporary serial interfaces are EIA232-like in their signal voltages, protocols, and connectors, whether or not a modem is involved. Because no single “simplified” standard was agreed upon, however, many slightly different protocols and cables were created that obligingly mate with any EIA232 connector, but are incompatible with each other. Most of the difficulties you will encounter in EIA232 interfacing include at least one of the following:

- The absence or misconnection of flow control (handshaking) signals, resulting in buffer overflow or communications lock-up.
  - Solution: ax CSX - Family supports handshaking to overcome the problem.
- Incorrect communications function (DTE versus DCE) for the cable in use, resulting in the reversal of the Transmit and Receive data lines as well as one or more handshaking lines.
  - Solution: ax CSX - Family supports the configuration of DCE and DTE. This allows the usage of the devices in all applications. When changing from DCE (default config) to DTE, the direction of signals is swapped as required.
- Incorrect connector gender or pin configuration, preventing cable connectors from mating properly.
  - Solution: Gender changer are available from ax.

Fortunately, EIA232 driver circuitry is highly tolerant of misconnections, and will usually survive a drive signal being connected to ground, or two drive signals connected to each other. In any case, if the serial interface between two devices is not operating correctly, disconnect the cable joining this equipment until the problem is isolated.

V.24 Test-Loops

The cause of transmission problems can be localised by activation of test loops. Two loops are available for the V.24 user interface:

- Facility Loop, and
- Terminal Loop.

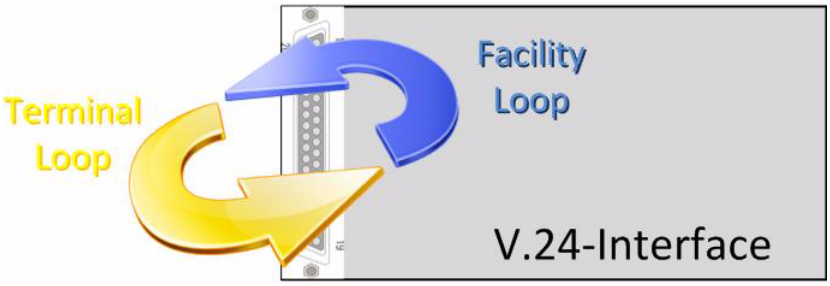


Figure 4-10 *V.24 Loops*

In case one of the two loops is activated, this is indicated by the V.24 LEDs (see “V.24 LEDs” on page 3-13):

- Facility Loop: RD-LED is blinking
- Terminal Loop: TD-LED is blinking

Clocking Modes

Introduction

The clock mode for the CSX can be configured via the management access, see Chapter 5, Clock Mode, but in many cases the default fits for the given application. The clock mode depends on the given variant of the CSX - Family and/or the given SHDSL mode. Restrictions of usable clock modes are listed below.

Four different modes are available in principle. Due to technical restrictions, not all modes are for each variant of the CSX - Family available.

AUTO	In most cases the devices on both ends of the SHDSL-line can be operated in AUTO clock mode. In this case, the devices determine the correct mode by evaluating the used user-interface and the settings like DCE/DTE, STU-C/STU-R etc.
Internal	The clock source for the SHDSL line is the onboard oscillator. In case, there is a clock required for the user interface (egress), this user-clock is derived by the onboard oscillator, as well.

External The clock source for the SHDSL line is taken from the user interface's incoming clock information. Not all variants of user interfaces do have the ability to derive the clock from.

The egress clock for the user interface is also derived from the incoming clock information (formally called "Single Clock Mode").

Remote The clock source for the user interface's egress data is taken from the SHDSL line, which is always(!) synchronized to the far end. The REMOTE mode is only available on units configured as STU-R (NTU).

It is expected, that the incoming clock at the user interface is the same clock as the (derived) egressing clock (formally called "Single Clock Mode").

Asynchronous This mode is very similar to the INTERNAL mode: The clock source for the SHDSL line is the onboard oscillator. The ASYNCHRONOUS mode is selected, when neither an incoming nor an egressing clock at the user interface is available. This is true for some legacy interfaces as V.24.

The following figure will show the difference in operating the 4 clock modes (internal, ..., asynchronous).

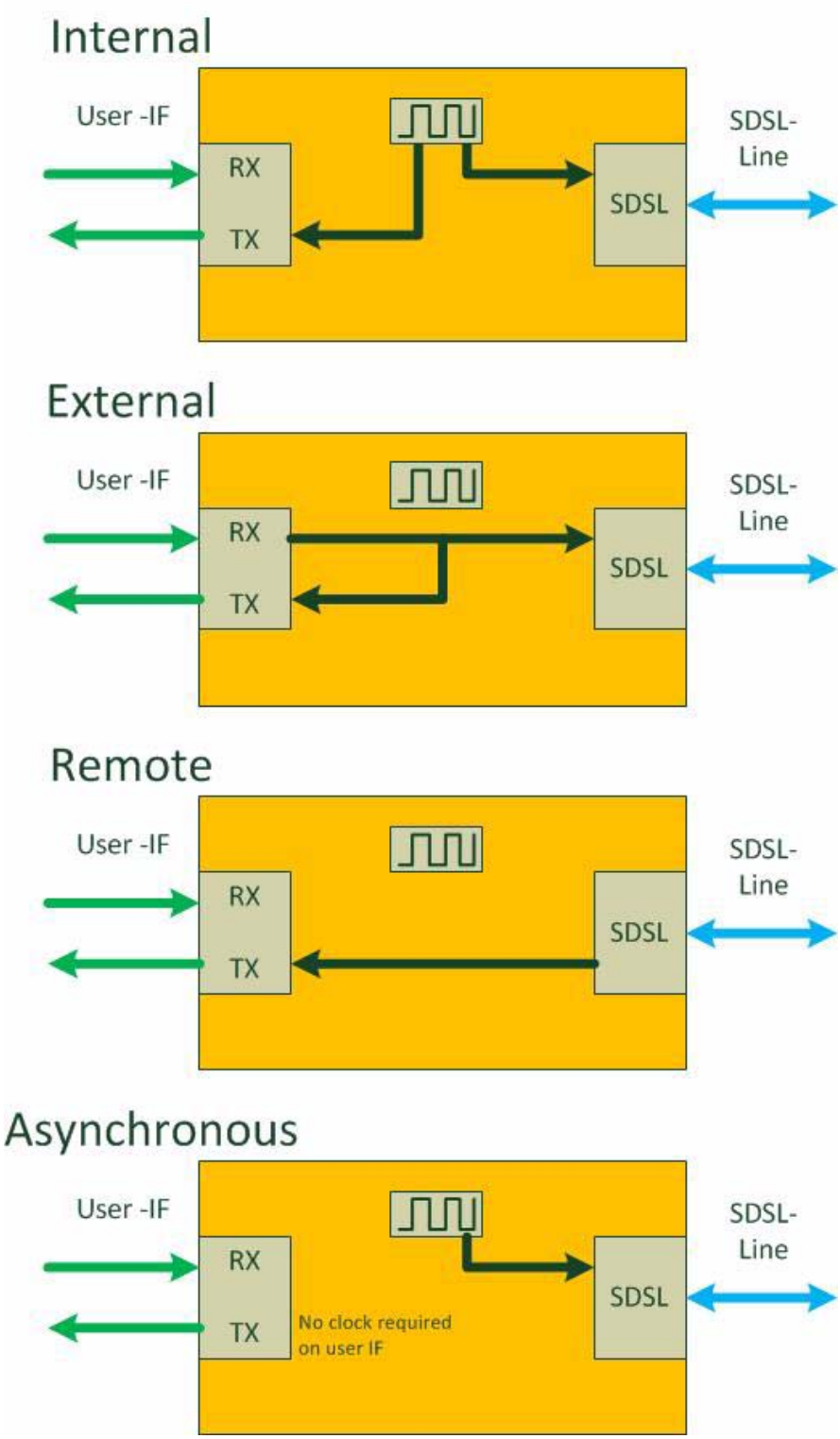


Figure 4-11 *CSX Clock Modes*

Restrictions of Usable Clock Modes (Ethernet)

For standard Ethernet connections, the external clock is not defined and not available. An onboard 25MHz oscillator is clock source for the PHY.

In case, synchronous Ethernet (SyncE) is available, the device can be synchronized upon the incoming clock at the LTU-side (STU-C) and the clock is identically provided at the remote end NTU (STU-R).

Clock	Ethernet Interface used on:	
	STU-C (LTU)	STU-R (NTU)
internal	standard	standard
external	SyncE	no
remote	no	SyncE
asynchronous	no	no

Restrictions of Usable Clock Modes (V.24)

The V.24 user interface supports a maximum transmission speed of 230kbps (asynchronous and synchronous mode). In synchronous clock modes, the device does auto-sense the speed of the interface and transports the clock to the far end. In asynchronous clock mode, no clock is available nor is it generated for the egressing part of the user interface.

Clock	V.24 Interface used on:	
	STU-C (LTU)	STU-R (NTU)
internal	no	no
external	available	no
remote	no	available
asynchronous	available	available

User & Access Administration

Access-Options to the CSX - Family

Local Access

The CSX - Family offers several ways to get access to the device.

- Serial port (RS-232) in desktop-housing.
  - A “graphical Command Line Interface” (gCLI) is offered for local management access.

  - See Chapter 5, Control Software CSX & gCLI.
  - Settings: 57600kBaud, 8N1.
- Extended management access in the ax 19-inch rack via the central management blade SCX2e.
  - SNMP, http, https, and ssh are provided.

Remote Access

A inband management from STU-C to STU-R side is available to have single access point for the complete modem link. Settings can be done on the local side (STU-C) and these are transferred to the remote end (STU-R). Also alarms from remote to local side are transmitted.

User Administration

The serial access-option to the CSX - Family is protected by user-name and password. Up to four users can be configured on the CSX - Family and stored locally. Each user can have one of three different levels of authority:

- admin,
- user,
- guest.

A new user can be created on the CSX - Family locally with access-level, user-name and password.

Locally Stored Users

Locally stored users can be created, modified and deleted by the administrator. The number of locally stored users is limited to 4. If a locally stored user shall be inactive, it must be disabled.

NOTE: After the creation of a new user together with password, only the user itself can change its password. If the password was lost, the user must be deleted and re-created again.

When delivered, the CSX - Family does have three locally stored user, where only one is activated and two are inactive:

- user-name: ’admin’, password: ’private’ active
- user-name: ’service’, password: ’service’ inactive
- user-name: ’monitor’, password: ’monitor’ inactive

WARNING: It is highly recommended to change the password of ’admin’ due to security reason!

NOTE: At least one user must be available on the device. In case the last user shall be deleted, the device will refuse to do so.

Rules for Usernames

When a new user has to added to the user-list, some simple rules must be considered:

- The (new) user name must consist of at least 3 characters.
- The following characters are allowed:
  - Capital letters: A...Z,
  - Lower case characters: a...z,
  - Digits: 0...9,
  - additional characters: ‘_’, ’.’, ’-’, ’!’, ’;’, ’$’, ’%’, ’&’, ’/’, ’(’, ’)’.

Rules for Passwords

The password given to a user or other usage must reach a certain level of “password strength” to protect the system from hackers. The strength of a password is a function of length, complexity, and unpredictably and this is verified by several security rules. If a new password does not fulfil this rules, it will be not accepted by the CSX - Family. The rules are as follows:

- Minimum password length is 3 characters (, maximum password length is 32 characters),
- Character set is 7-Bit ASCII, allowed characters:
  - Capital letters: A...Z,
  - Lower case characters: a...z,
  - Digits: 0...9,
  - additional characters: ‘_’, ’.’, ’-’, ’!’, ’;’, ’$’, ’%’, ’&’, ’/’, ’(’, ’)’.
- The password may contain any of these characters.

NOTE: It is allowed to have the user-name as part of the password (forwards and backwards, not case sensitive!). BUT the system will remove this string from the password before it is verified.

  - E.g. the user-name is “weakuser”. Then a password “12weakUser!” would lead to strength-verification of “12!”. The password would be too weak and not accepted!
  - The same user-name in combination with password “12weakuser!_ButStrongPassword” would be ok, as the strength-verification is done on the reduced password “12!_ButStrongPassword” and this fulfils the requirements for a strong password.

Auto-Logout

At the end of a management session it is highly recommended to stop the connection and logout from the unit. This is a safety requirement to make sure nobody else can use

the current login without authorization. Nevertheless it can happen that this security demand is not observed, due to:

- Problems of your Computer,
- Problems in the network,
- Laxness of user,
- etc.

To make sure, a forgotten or incomplete logout, or a still open connection is closed there are some features to enforce auto-logout.

Hardware-Based Auto-Logout

A CLI session via the CONS-port will be terminated, when the RS-232 cable is removed. Important is, that the DTR-signal was properly connected between PC and device. After successful setup of the RS-232 connection, the device checks whether the DTR-signal is established. If not, the auto-logout can not work. If the DTR-signal is present in the device it will terminate the session, as soon as the DTR-signal disappears.

Miscellaneous

Firmware-Update

It might be necessary to update the software (firmware) on the CSX - Family. In this case the new firmware can be uploaded to the device via several ways:

- Y-Modem (serial) in the desktop housing
- via agent-card in the 19-inch rack.

The update-file has the extension “*.pkg” and is a special arcutronix file format. It is secured by a checksum and other mechanism to make sure only correct files will be accepted for firmware update. If the file transfer did not work properly or any other damage of the update-file is discovered, the new file will not be accepted for update.

NOTE: A corrupted file can be uploaded to the CSX - Family, but it will not be used for update. The security check can only be done, when the file is on the device.

After successful upload, the new SW is immediately installed and the unit will do a reset right after successful installation of the new firmware. If the update process did not work properly, or the new firmware does not start correct, the old FW-version will be used instead.

Remote SW-Update

An inband (via EOC) SW update from local (STU-C) to remote (STU-R) is available.

An inband (via EOC) SW update from local (STU-C) to repeater (BRX1) is available.

Alarm Management

The CSX - Family does have an outstanding alarm management, which allows users to get a quick overview of the current device status, but also to get detailed information about individual alarm states. The alarms are grouped by function or hardware component, each group can be configured and acknowledged as group. Or one can navigate into the groups and configure each alarm in detail for the personal preferences.

CSX Alarms

Several alarms can be raised by the device:

- System Status Alarm, raised for on-board problems,
- SHDSL Link Failure Alarm, raised when the SHDSL link detects problems,
- Ethernet Link Failure Alarm, raised when the Ethernet link detects problems,
    - This alarm is not available for all variants.
- V.24 Clock Failure, raised when the V.24 clock is missing though a synchronous clock is expected.
    - This alarm is not available for all variants.

On the STU-C side, all this alarms are shown for the STU-C, as well as for the STU-R. The STU-R alarms are indicated by the prefix “Rem.” in the alarm list.

Maintenance Mode

A special maintenance mode is available, which allows in special cases deep debugging of the device. To activate this mode, cooperation between the customer (you!) and arcutronix (us!) is required. When the maintenance mode is started, a one-time password is required to proceed. This password is calculated by arcutronix using

- the serial number of the unit,
- plus a special random signature, which is generated each time the maintenance mode is entered.

The maintenance mode can only be entered, when a user with ’admin’ privileges is logged into the device. This way of securing the maintenance mode makes sure, only admin users can entered the mode, and only arcutronix can allow to do proceed.

Date & Time Settings

The CSX - Family does have an internal clock, which can be set by either user or via SCX2e. This gives the CSX - Family the chance to provide proper time-stamps in logging and alarms. In case of power-failure, the CSX - Family will keep the correct date and time for a period of at least 10 days.

NOTE: After 10 days without power supply, the internal clock of the CSX - Family has to be re-set again.

Event Monitoring

The CSX - Family provides a logging function, which notices all events in a log-file. This file is stored onboard and the last 99 entries can be (re-)viewed.

The events, which are added to the log-file, are divided into 4 groups:

- Information: Messages from the SW about system status and successful started or stopped applications. An information entry is indicated by the <INFO> label.
- Alarm: All variables, which can raise an alarm, will be logged, when the alarm gets error-, warning- or idle-state. An alarm entry is indicated by the <ALARM> label, followed by <ERR>, <WARN> or <OFF>.
  An alarm-variable, which is configured as “ignore” will not be added to the log-file, independent from its status. It is ignored.

Each entry in the log-file has the date/time information, when the event did occur, followed by the type-label and a short description about the event. Some examples are listed below:

<INFO>

```
06.10.14 13:43:44  INFO   Cold Start CSX5 #golden-8
06.10.14 13:43:44  INFO   FPGA firmware download (4b0a050e V41) successful
06.10.14 13:43:45  INFO   ETH PHY initialized (COPPER MODE)
```

- The <INFO>-entry gives information about started applications and attempts to login.

<ALARM>

```
06.10.14 13:43:46  ALARM  Ethernet link failure alarm On
06.10.14 13:43:46  ALARM  SHDSL line failure alarm On
```

- The <ALARM>-entry traces the alarm status of the system.

<ERROR>

```
06.10.14 13:44:00  ERROR   SHDSL line Down
```

- The <ERROR>-entry reports severe failures.

Power Management

The intelligent arcutronix Multi Service System power management is to prevent a system-fail in case a new line-card is plugged as well as a permanent check on the voltage-level at each slot.

When a new line-card is plugged, the overall power demand could be higher, than the available power, provided by the plugged power supply card(s) of type SPX. Without the arcutronix power management, the complete system would fail due to the overload situation. Existing services, established maybe already for years, would be effected, just because the power budget planing of the operator were wrong.

To prevent such failures, each card will not start completely when plugged. It will start only a small part, which checks the value of the supply voltage on the used slot. This value may differ from slot to slot due to the distance between slot and position of power supply. If the measured voltage has an sufficient value, the line-card will start completely, otherwise it will remain in the pre-started mode until the voltage raises above the required level. The pre-started mode is indicated by the flashing ON-LED.

After leaving the pre-started mode, the device will activate the main DC/DC converter and the unit is booting and activates all services. Whenever the pre-started mode is left, the device stays in the activated mode until the power fails. In the activated mode, the device will measure incoming voltage and current to check permanently the required power and the provided voltage. Any problems can be reported and alarmed.

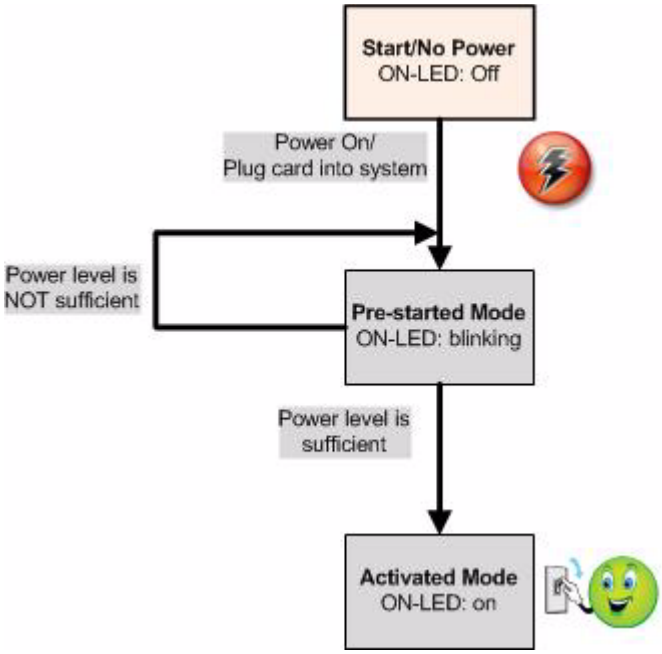


Figure 4-12 *Flow Diagram Power Management*

NOTE: Read the following descriptions of the arcutronix Multi Service System power management and the management rules carefully, in order to prevent malfunctions.

Rules of the Power Management

- If the remaining power is not sufficient in the arcutronix Multi Service System, a rack card, e.g. agent or modem card, will not power up.
- The decision whether a unit will be powered up or not is taken, when a new card is inserted into the chassis (SRX) or if the whole system is powered up simultaneously.
- Once positively taken, this decision will not be revised. That means, if a rack mount card has been powered up once it stays operating, even if the whole power resources are used and an additional unit with priority status is inserted.

- On the other side, if the card has been rejected to start, it will stay in the pre-started mode and checks permanaetly the voltage on the bus. As soon as enough power is available, it will “grep” it and start.
- If the whole system is powered up simultaneously, e.g. by switching on the mains power, cards with priority will be started first. Then the agent and rack mount cards will begin to analyse the remaining power separately, beginning with the agent and then starting from slot 1. **Therefore, it is mandatory to remove a card which has been rejected by the power management. After changing the power consumption in the chassis, the card may be installed successfully.**

NOTE: Violation of the rules can cause overloads in the power management.

Performance Monitoring

Each CSX interface port has a performance monitoring module for supervision of the received data. The performance monitoring works independently and can be activated at the same time. Performance monitoring enables data traffic checks according to the protocol standards.

Chapter 5
Control Software CSX & gCLI

In this chapter the graphical Command Line Interface (gCLI), which is a very easy way to configure and monitor the unit, will be presented. In spite to a classical CLI, one does not have the need to learn cryptic instruction sets and has to move in thousands of sub-directories.

General Information

The control software of the CSX - G.SHDSL.bis (EFM) Copper Modem allows you to configure the device via management access. There are different ways to get access to the unit:

- In a single-slot housing (SHX) you can use the serial control port placed on the rear side.
- In a system rack (SRX) via the agent (SCX2e). This central management card for the rack offers OAM functionality via SNMP, ssh, Web-GUI, etc.

Local RS-232 Interface

Connect it to the control port of the single-slot housing or to agent's control port. The control port (designed as DCE) is an asynchronous RS232 interface with the following parameters:

- 57600 baud
- 8 data bit
- no parity
- 1 stop bit
- no flow control

The default password for the serial access see Table 5-1: Default User-Names and Passwords.

Access to SCX2e

Please see [axManual_SCX2e_gs2].

Security Issues

The serial port is only accessible via direct contact to the 9-pin D-sub socket (DE-9S) but it might be that other persons than the intended ones get connection and will see the login screen. To avoid forbidden configuration or burglary of information, the access is protected against intruders via user-name and password. Any not successful attempt to login to the device is stored in the log-file.

Any time you connect or reconnect to a device of the CSX - Family the login-window is displayed and a password request turns up on the terminal.

Be careful with passwords! If you write them down, keep them in a safe place. Do not choose strings easy to hack. In particular, do not use the default strings which were valid when you received the device.

Do not forget your password. If you forget your password the device will be rendered useless and will have to contact the vendor to reset the passwords (see Chapter 4, Maintenance Mode).

NOTE: Three different access-level are selectable with different access rights:

1. Admin (full access inclusive user administration)
2. Service (limited view plus limited modify)
3. Monitor (only limited view)

When the device is started-up the very first time, three users are defined, where only one is activated and two are inactive. See in “User Administration” on page 5-12, how to define the other users and how to change the user password.

Table 5-1 provides the default user-names, passwords and delivery status for the CSX.

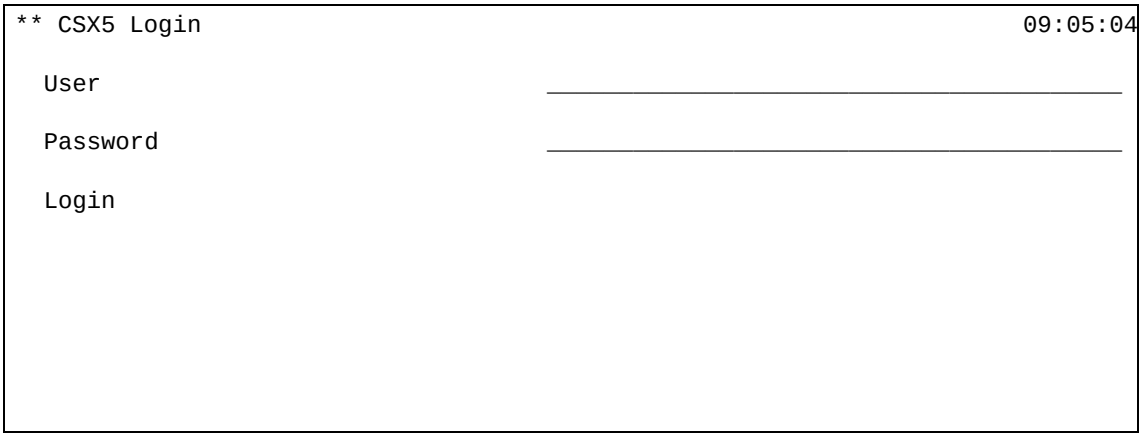
Table 5-1 *Default User-Names and Passwords*

User Name	Password	Access Level	Delivery Status
admin	private	admin	active
service	service	service	inactive
monitor	monitor	monitor	inactive

Login Menu

After a management connection has been established between the CSX plugged in a single slot housing (SHX3) and a Laptop/PC, the login screen will be displayed. It is used to protect the access against unwanted access.

The Login screen is shown in the figure below. Enter user-name and password and then select “Login” and press <enter>.



The password will not be displayed. Each character will be replaced by an asterisk (*). An error message will be displayed for any unsuccessful login. The application continues with the login screen.

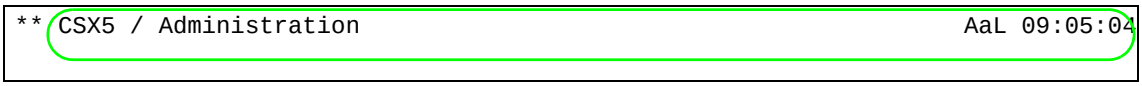
Depending on the access level, menu settings may not be accessible for the user. Which menu is displayed and/or accessible for the different access levels will be described in the menu structure, see page 5-7.

NOTE: The Main Agent SCX2e has its own passwords. To get a login to the SCX2e you have to know the passwords of the Main Agent. The SCX2e passwords will differ from the CSX passwords. The CSX passwords are only used for the access via the serial port of the single-slot housing.

Information

In the top line of the CLI, important information fpr the user is displayed:

- Device type: e.g. CSX5
- Name of sub-menu: for better navigation
- Alarm status A: new alarm available; a: new acknowledged alarm
- New log-entry L: new entry in event-log added
- Actual time



Navigation

The CLI is a graphic oriented user menu. Using the keyboard of your PC you can select menu entries, leave and update the menu-pages and get to some special sites. Please see below the actions and an overview to the keys.

Select a menu entry

All menu lines which are accessible by the cursor are shown in a different manner than un-accessible lines [1]. Select any menu text of interest by cursor-up/ -down keys and press the Enter key. This will give access to the item of the line.

NOTE: Within this manual, the accessible lines are written in blue coloured text, depict with italic letters in the screens shots. All un-accessible lines are standard black.

In some cases, you will find lists to select an entry. Use also the cursor-up/ -down keys or 'l'/ 'h' to navigate in these list. Press Enter, when the right entry is highlighted to select it.

Very long (user-) entries (like names of location etc.) which are longer than the screen space are indicated by an '>' at the end of line. Use also the cursor-left/ -right keys or 'j'/ 'k' to move the complete screen to the left or right to make these entries visible.

Edit Text-Entries

When editing a user-entry, the default mode is over-write. A new text-entry will overwrite the existing text. Pressing 'Insert' will toggle between insert- and overwrite-mode. If the entered text is longer than the screen-wide, automatic scroll is activated.

Page Update

Pressing a CTRL-L causes the actual shown page to be updated and rebuild. This will be helpfully in case the view is damaged or information has (occasionally) changed.

Scrolling in Event-List

The event monitoring is a list of all events, logged by the device. The list can be scrolled up and down by the arrow-up and arrow-down key.

Exit

The selection of "Go Up" always returns to the next higher menu, finally to the login menu. If you are at the main menu, this will bring you back to the login entry prompt.

1. The colors depend on the settings of your terminal program.

Overview to keys

Table 5-2 provides information on the different keys for navigating and editing.

Table 5-2 *Overview to key-strokes*

Key	Action	Remark
Enter (CR)	Selects the chosen entry.	Depending on the type of entry, different actions will happen: • A new menu-page is opened • Open a pull-down menu and select one of the offered entries. • Enter a proper value or a string in a edit-line.
TAB	Jumps to next entry.	
Shift-TAB	Jumps to previous entry.	
ArrowDown or 'h' ('hotel')	Moves cursor down in the menu.	The cursor moves only from selectable to selectable entry. At the bottom entry of the menu, the cursor will be set to the top entry, after pressing ArrowDown.
ArrowUp or 'l' ('lima')	Moves cursor up in the menu.	The cursor moves only from selectable to selectable entry. At the top entry of the menu, the cursor will be set to the bottom entry, after pressing ArrowUp.
ArrowLeft or 'j' ('juliett')	Moves the screen to the left.	In case very long entries must be shown in the menu (like names of location etc.), one can move the complete screen to the left to see these long names.
ArrowRight or 'k' ('kilo')	Moves the screen to the right.	In case very long entries must be shown in the menu (like names of location etc), one can move the complete screen to the right to see these long names.
Page Up	Leaves the current menu-page.	'PageUp' can not be used to leave pull-down menus or edit-lines.
Insert	Toggles between insert- and overwrite- mode.	
Backspace	Character left of cursor is deleted.	
Delete	Character below cursor is deleted.	

Table 5-2 *Overview to key-strokes (continued)*

Key	Action	Remark
HOME or CTRL-a	Cursor jumps to begin of field.	
END or CTRL-e	Cursor jumps to end of field.	
ESCAPE or CTRL-c	Cancel entry and leave line without change.	
CTRL-k	Delete all characters from cursor to end-of-line.	
CTRL-u	Delete all characters from start-of-line to cursor.	

MENU Structure

The menu structure (“menu-tree”) of the CSX - Family is shown in Chapter 7, Menu-Structure (Directory-Tree) of CSX - Family. There possible entries plus all access rights for reading and writing are listed.

Main Menu

After the login, the Main menu will be displayed, which provides a general overview of the menu structure.

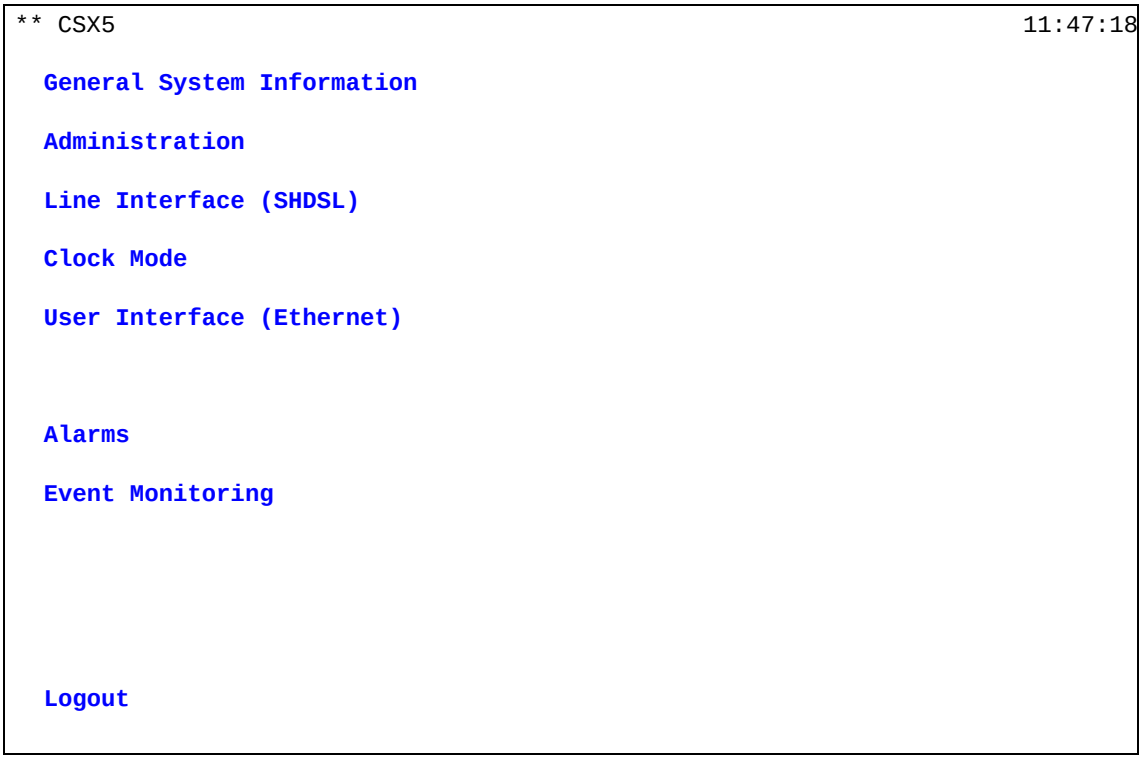


Figure 5-1 *Main Menu*

Select a menu line with the cursor keys and press the Enter key to open the selected submenu or to logout from the CSX's gCLI.

Table 5-3 provides information on the menu options.

Table 5-3 *CSX Main Menu Options*

Parameter	Description	Format
General System Information	Set and get global static information.	Menu
Administration	Configuration of global parameters.	Menu
Line Interface (SHDSL)	Configuration of the SHDSL line(s).	Menu
Clock Mode	Configuration of Clock Mode.	Menu

Table 5-3 *CSX Main Menu Options (continued)*

Parameter	Description	Format
User Interface (xxx)	Configuration of the present User-Interface. Several interfaces are possible for the CSX - Family. In the given example (above), it is an Ethernet-interface. This is interface-type is written in brackets.	Menu
Alarms	Configuration and Display of the device's alarms.	Menu
Event Monitoring	List of the last 99 events.	List of events
Logout	Leave CLI and terminate the session.	Exit

General System Information

Select "General System Information" in the Main menu and press the Enter key to access the General System Information menu. The following screen will be displayed.

```
** CSX5 / General System Information                                  12:37:45

  Device Type                      CSX5
  Order No.                        1405-1000
  Serial Number                    2014006366
  Article Revision                 GS1
  Hardware Revision                140510/000
  Date of Production               01.09.2014
  Manufacturer                     arcutronix GmbH
  Vendor ID                        UN341185881

  MAC Addr [i]                     00:1E:16:00:01:01
  Bootloader Version               V1.08
  FPGA Version                     V77
  Software Version                 V 1_2_1

  User Interface                   V.24
  Remote System Information [ii]



  Go up
```

i. Only visible for variants with Ethernet interface(s).
ii. Only visible on a STU-C device.

Figure 5-2 *General System Information Menu*

This screen contains general information of the CSX unit. Most of these are factory settings. They cannot be changed by normal users.

Table 5-4 *General System Information Menu*

Parameter	Description	Format	Default
Device Type	Indicates the device type.	Display	CSX
Order No.	Order information for the device.	Display	Depends on the device type. See Order Matrix (Table 1-2 on page 1-6).
Serial Number	Serial number of the device.	Display	Depends on the factory settings.
Article Revision	The release number of the device.	Display	Depends on the factory settings.
Hardware Revision	Revision of the device hardware.	Display	Depends on the factory settings.
Date of Production	Date of the device's production.	Display	Depends on the factory settings.
Manufacturer	Manufacturer of the Device (normally arcutronix GmbH).	Display	arcutronix GmbH
Vendor ID	International unique ID for arcutronix GmbH. Issuing agency is Dun & Bradstreet using D-U-N-S (R).	Display	UN341185881
MAC Address	Displays the MAC address of the user port. Only visible for CSXn-FE!	Display	*00:1E:16:aa:bb:cc*
Bootloader Version	Revision of the loaded boot-loader.	Display	Depends on the loaded software.
FPGA Version	Revision of the FPGA firmware.	Display	Depends on the loaded software.
Software Version	Revision of the loaded system software.	Display	Depends on the loaded software.
User Interface	Displays the type of user interface.	Display	Depends on assembly option.

The following submenu is available:

Table 5-5 *General System Information: Submenus*

Submenu	Description
Remote System Information	Displays all the above mentioned information for the STU-R. This submenu is only visible on STU-C! As long as the SHDSL line is not established, yet, the information in the submenu will be empty.

Administration

Select “Administration” in the Main menu and press the Enter key to access the administrationmenu. The following screen will be displayed.

```
** CSX5 / Administration                                          13:15:36

  Contact Person                    < ... >
  Device Location                   < ... >
  Device Name                       < ... >

  Current Date                      13.03.2015
  Current Time                      13:15:36
  User Administration

  Reboot

  Factory Reset

  Software Update

  Remote Update Status [i]          Remote Software up-to-date

  Maintenance Mode


  Go up
```

i. Only visible on a STU-C device.

Figure 5-3 *Administration Menu*

Table 5-6 *Administration Menu*

Parameter	Description	Format	Default
Contact Person	Description/comment of the device.	Display/Input (up to 32 characters)	< ... >
Device Location	Description/comment of the device.	Display/Input (up to 32 characters)	< ... >
Device Name	Description/comment of the device.	Display/Input (up to 32 characters)	< ... >
Current Date	Indicates the current device's date (dd-MM-yyyy). Press enter to change the value.	Display/Input	no default
Current Time	Indicates the current device's time (hh:mm:ss). Press enter to change the value.	Display/Input	no default
Reboot	Pulldown menu to start a reboot (at once).	PullDown Menu • Cancel • Reboot now	Cancel
Factory Reset	All settings of the device will be resetted to the defaults which are stored in the software. Warning: Some products have been configured to STU-R in the factory, but this is not a software default, but a special service for customers. This service is not stored in the software!	PullDown Menu • Cancel • Clear All Settings	Cancel
Software Update	Pulldown menu to start a software update (at once). See "Software Update" on page 5-37 for details.	PullDown Menu • Cancel • Upload new software via XYModem	Cancel

Table 5-6 *Administration Menu (continued)*

Parameter	Description	Format	Default
Remote Update Status	Displays the status of SW update on the remote device. This entry is only visible on STU-C!		
Maintenance Mode	Pulldown menu to start the maintenance mode (at once). See “Maintenance Mode” on page 4-19 for details about the maintenance mode.	PullDown Menu • Cancel • Activate now	Cancel

The following submenu is available:

Table 5-7 *Administration: Submenus*

Submenu	Description
User Administration	This menu allows to define new passwords for users and/or change the password of the current login.

User Administration

This menu gives the administrator the capability to activate/deactivate users and change their passwords if required.

One user (admin) is pre-defined, but can be modified. Three more users are possibly to be configured/added.

Not all of the menu entries are visible for all access-levels. The change of the actual logged in user is always possible!

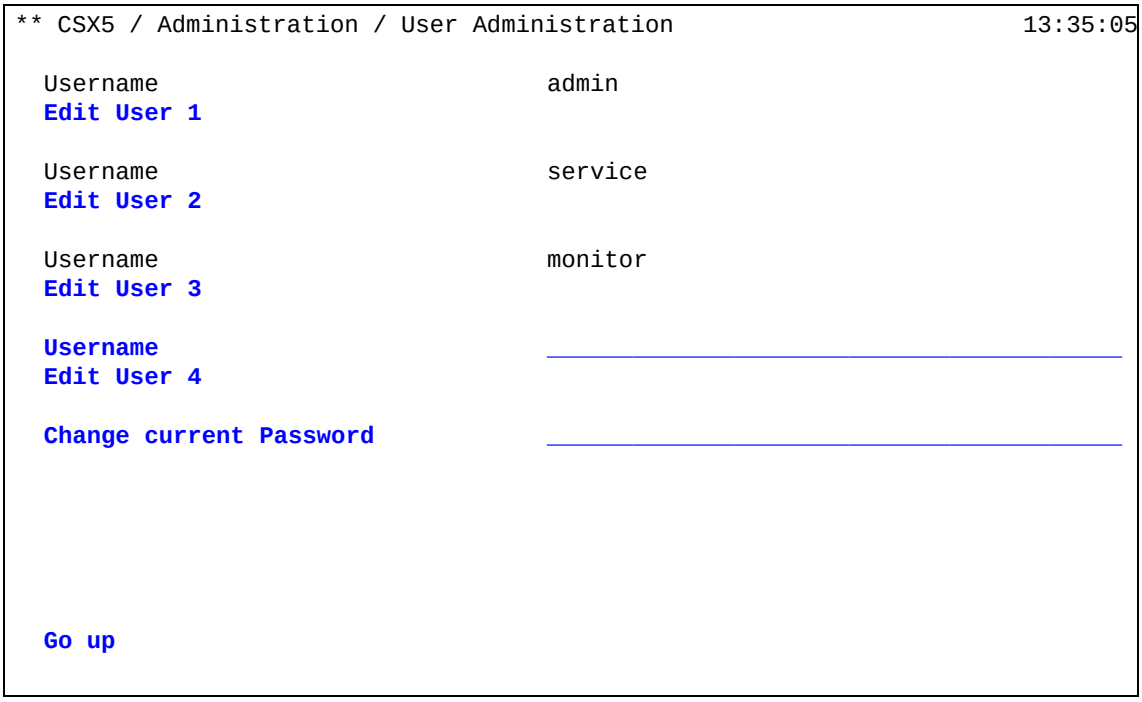


Figure 5-4 *User Administration Menu*

When a user's data-base shall be changed, select "Edit User x" and press enter. A new menu is displayed, where name, password and access-level can be changed:

```
** CSX5 / Administration / User Administration / Edit User 1          13:37:50

  Username                          admin

  Password                          ********

  Access                            admin

  Enabled                           Enabled









  Go up
```

Figure 5-5 *Edit User Menu*

Table 5-8 *User Administration Menu*

Parameter	Description	Format	Default
Username	Enter a new name for the selected user.	Display/Input (up to 32 characters)	Depends on selected user.
Password	Enter a new name for the selected user.	Display/Input (up to 32 characters)	Depends on selected user.
Access	Access-level for the selected user.	PullDown Menu • admin • service • monitor	Depends on selected user.
Enabled	Each user can be disabled, if the access is not required and/or re-enabled later.	PullDown Menu • Enabled • Disabled	Enabled

Line Interface (SHDSL)

The Line Interface menu gives access to the actual parameters of the (established) link, as well as some performance monitoring data. As soon as the link is established, an overview is presented about the link:

- Resulting data rate on the link,
- Noise margin on each segment (displayed for both ends of the segment),
- Line attentuation on each segment (displayed for both ends of the segment),
- Serial number of all detected units in the link.

A simple 1:1 SHDSL line, without any repeater, like shown in Figure 5-6 will result into this menu, as soon as the link is established:

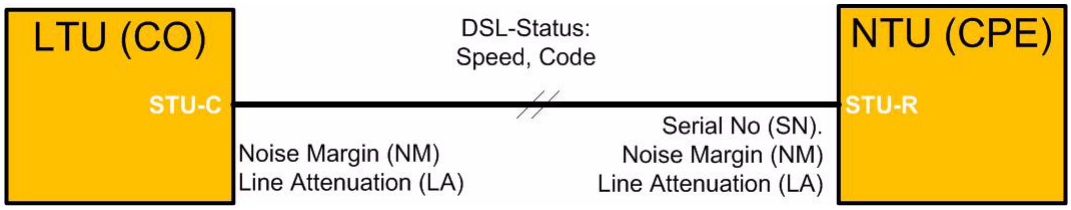


Figure 5-6 *Simple Line w/o repeater*

```
*** CSX5 / Line Interface (SHDSL)                                  14:23:16

  Port Name                          SHDSL Port
  Current DSL Status                 Link Up (5696kbit/s, PAM32)

  STU-C                              arcutron CSX5 #2014006366 (this device)
  Noise Margin / Line Attenuation    19 dB / 1 dB  (14:23:17)


  SRU-1                              ---



  SRU-2                              ---


  Noise Margin / Line Attenuation    18 dB / 1 dB  (14:23:16)
  STU-R                              arcutron CSX5 #2014006387
  Performance Monitoring
  Configuration

  Go up
```

Figure 5-7 *Line Interface (SHDSL) Menu (no repeater detected)*

The noise margin (NM) and line attenuation (LA) is shown for both ends of the link (here link = segment). The shown values at the two ends can be equal, but this is not always the case, as the noise and disturbance on the line may be different for the two ends.

NOTE: The information about the complete link is only visible on the STU-C device. when the user is logged onto an STU-R device, only the local information is presented!

When one or two repeaters are detected in the line, this leads to more segments, which all are presented in the overview:

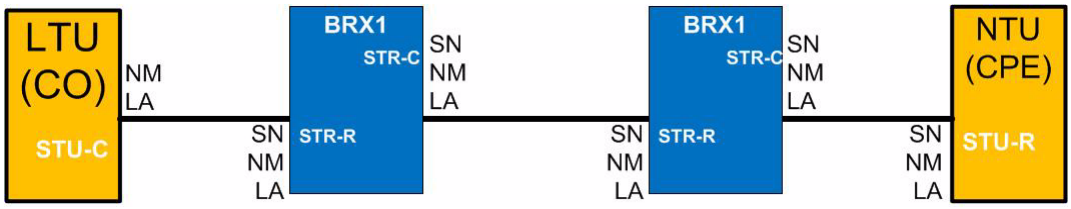


Figure 5-8 *Line w 2x repeaters*

```
*** CSX5 / Line Interface (SHDSL)                                  14:23:16

  Port Name                              SHDSL Port
  Current DSL Status                     Link Up (2304kbit/s, PAM16)


  STU-C                                  arcutron CSX5 #2014006366 (this device)
  Noise Margin / Line Attenuation        19 dB / 1 dB  (14:23:17)

  Noise Margin / Line Attenuation        23 dB / 23 dB  (14:04:04)
  SRU-1                                  arcutron ZWR-BRX1 #20145001
  Noise Margin / Line Attenuation        19 dB / 22 dB  (14:04:04)

  Noise Margin / Line Attenuation        18 dB / 22 dB  (14:04:00)
  SRU-2                                  arcutron ZWR-BRX1 #20145010
  Noise Margin / Line Attenuation        17 dB / 0 dB  (14:04:00)

  Noise Margin / Line Attenuation        18 dB / 1 dB  (14:23:16)
  STU-R                                  arcutron CSX5 #2014006367
  Performance Monitoring
  Configuration

  Go up
```

Figure 5-9 *Line Interface Menu (2x repeater detected)*

As the information from the far ends are not really updated in each mill-second, each value carries a time-field to know how old it is.

Table 5-9 provides information about the options.

Table 5-9 *Line Interface Menu*

Parameter	Description	Format
Port Name	Name for this port. It can be free advised by user.	String
Current DSL Status	Summary for the SHDSL line: • LinkUp /Down • (Resulting) Data-rate • Coding (PAM16 or PAM32)	Display
STU-C	Information about vendor, type, and serial number of the STU-C device. If the user is logged onto the STU-C, this is indicated by the string “(this device)”.	Display
Noise Margin / Line Attenuation	The (actual) values for noise margin and line attentuation, as calculated at the corresponding side of the SHDSL line/segment. Up to 6 entries of “Noise Margin / Line Attentuation” are possible: • STU-C side, • SRU-C and SRU-R side (if repeater is present), • SRU-C and SRU-R side (if 2nd repeater is present), • STU-R side. The time-field shows how old the information is.	Display
SRU-1	Information about vendor, type, and serial number of the first repeater device.	Display
SRU-2	Information about vendor, type, and serial number of the second repeater device.	Display
STU-R	Information about vendor, type, and serial number of the STU-R device. If the user is logged onto the STU-R, this is indicated by the string “(this device)”.	Display

The following submenus are available:

Table 5-10 *Line Interface: Submenus*

Submenu	Description
Performance Monitoring	This menu presents the performance counter for the SHDSL line.
Configuration	This menu allows to configure (global) settings of the SHDSL line.

Performance Monitoring

The Performance Monitoring menu for the Line Interface (SHDSL) presents the performance.

```
** CSX5 / Line Interface (SHDSL) / Performance Monitoring            15:51:40

  Performance Monitoring Interval    Local Monitoring
  Last Update                        15:51:39

  Current DSL Status                 Link Up (5696kbit/s, PAM32)

  Elapsed Seconds                    9422
  Erroneous Seconds (ES)             2
  Severely Errored Seconds (SES)     2
  Unavailable Seconds (UAS)          0
  Loss of Sync word (LOSW) Counter   0
  Code Violation Error Counter       0
  Link Loss Counter                  0

  Reset All Counter




  Go up
```

Figure 5-10 *Performance Monitoring Menu*

Table 5-11 *Performance Monitoring Menu*

Parameter	Description	Format
Performance Monitoring Interval	Select the interval and location of monitoring. For the time being, only the values since last reset for the local port is available.	Display
Last Update	In case the performance monitoring is shown for a far end interface, the update is not done every mill seconds due to performance reasons. The given time indicates, when the last update was read from source.	Display
Current DSL Status	Summary for the SHDSL line: • LinkUp /Down • (Resulting) Data-rate • Coding (PAM16 or PAM32)	Display
Elapsed Seconds	Counter of seconds, since restart of the monitoring.	Display

Table 5-11 *Performance Monitoring Menu (continued)*

Parameter	Description	Format
Erroneous Seconds (ES)	Counter of seconds, in which an error was detected on the SHDSL line.	Display
Severely Errored Seconds (SES)	Counter of seconds, in which severe errors were detected on the SHDSL line.	Display
Unavailable Seconds (UA)	Counter of seconds, in which the SHDSL line was unavailable.	Display
Loss of Sync Word Counter (LOSW)	Counter which is incremented each time, the SHDSL sync word is not found by the SHDSL framer.	Display
Code Violation (CV) Error Counter	Counter which is incremented each time a code violation is detected by SHDSL framer.	Display
Link Loss Counter	Counter which is incremented each time a link loss is detected by SHDSL framer.	Display
Reset All Counter	Pulldown menu to clear all counters.	PullDown Menu • Cancel • Reset Counter

Configuration (Line Interface)

The SHDSL line can be configured in some basic options. Normally the default settings are correct and no change is required. Any changes made on the STU-C side is transferred to the remote end, even when the SHDSL line is not established yet!

```
** CSX5 / Line Interface (SHDSL) / Configuration                    16:17:52

  Admin Status                          Enabled

  Line Emulation Mode                   LTU (STU-C)

  Loopmode                              Off

  DSL Data Rate  i                      Auto

  PAM Mode                              Auto

  Lineprobing Mode                      Current Condition Target Margin

  Downstream Target SNR Margin(dB)      3

  Upstream Target SNR Margin (dB)       3



  Go up
```

i. Only visible for variants with Fast Ethernet interface

Figure 5-11 *Configuration (Line Interface) Menu*

Table 5-12 *Configuration Menu (Line Interface)*

Parameter	Description	Format	
Admin Status	Enables or disables the port.	PullDown-Menu • Enabled • Disabled	Enabled
Line Emulation Model	Pulldown menu to define the operation mode of the unit.	PullDown-Menu • LTU (STU-C) • NTU (STU-R)	depends on factory setting
Loop Mode	Pulldown menu to switch the test-loops on/off at different locations on the SHDSL line. See “SHDSL Test-Loops” on page 4-6 for details.	PullDown-Menu • Off • STU-C • STU-R • SRU-1 • SRU-2	off

Table 5-12 *Configuration Menu (Line Interface) (continued)*

Parameter	Description	Format	
DSL Data Rate	Menu to enter the data rate (speed) on the DSL link. A wide range of entries is possible here, see table below. If automatic mode is selected, just enter “Auto”.	Enter value	Auto
PAM Mode	Pulldown menu to define the “pulse amplitude modulation” on the SHDSL line.	PullDown-Menu • Auto • Only PAM16 • Only PAM32	Auto
Line Probing Mode	Pulldown menu to define the line probing on the SHDSL line. Line probing is good to estimate the possible values of speed on the link. As on both sides of the link (segment) different margin can be resulting due to noise and attenuation, one can select, whether the worst defined value or the local defined value shall be used. Off: No Line Probing. Current Condition Target Margin: Line probing is on and specified target margin is relative to noise measured during line probe. Worst Case Target Margin: Line probing is on and target margin is relative to reference worst-case crosstalk.	PullDown-Menu • Off • Current Condition Target Margin • Worst Case Target Margin	Current Condition Target Margin
Downstream Target SNR Margin (dB)	This value is used when Line Probing is enabled. A value between 0 to 99 is possible.	Enter value	3
Upstream Target SNR Margin (dB)	This value is used when Line Probing is enabled. A value between 0 to 99 is possible.	Enter value	3

The configuration of the DSL data-rate can be either automatic (AUTO), a fixed data-rate or a range in which the data-rate must be. If the modem cannot establish the link with the desired value or in the defined range, the link will not be established.

The entry of the value and/or range can be done in several formats. The example below is given for the data-rate 192kbit/s (which is the overall minimum data-rate) and 2,048Mbit/s:

Table 5-13 *Entry of DataRate*

Format	192kbit/s	2,048Mbit/s
value only	192000	2048000
value and prefix	192k	2048k
Note: Only integer values possible.		
value, prefix, unit	192kb	2048kb
	192kbit	2048kbit
	192kbit/s	2048kbit/s
value, blanc, prefix, unit	192 kb	2048 kb
	192 kbit	2048 kbit
	192 kbit/s	2048 kbit/s
number of TDM-timeslots	3TS	32TS
(1 TS = 64kbit/s)	3 TS	32 TS

When a maximum, minimum or a range shall be entered, the following formats can be used:

Table 5-14 *Entry of DataRate Ranges*

Format	192kbit/s	2,048Mbit/s
min DATARATE	min 192000,	min 2048000,
	min 192k,	min 2048k,
	...	...
	min 3TS	min 32TS
max DATARATE	see above	see above
DATARATE1 - DATARATE2	192000 - 2048000,	
	192kb - 2048kb,	
	...	
	3TS - 32TS	
	any mixture is possible:	
	3TS - 2048000	

Clock Mode

The clock mode defines the source of the unit in meaning of the SHDSL clock and/or user-interface clock. See “Clocking Modes” on page 4-12 for details. The clock mode can only be configured on the STU-C. The STU-R is always configured to operate in “remote” clock mode. “Remote” clock mode means, the STU-R is synchronized to the STU-R.

Ethernet Remote Bridge

A CSX with FE-Interface (-FE vatiants) can be operated in standard Ethernet manner or in synchronoue Ethernet. Standard Ethernet means, there is no synchronisation to the incoming user-data. The Ethernet interface on the STU-C and the STU-R are operated with the onboard 50MHz oscillator for transmitting Ethernet data. The incoming Ethernet packets can use a different clock, which is up to +/- 100ppm different.

In synchronous Ethernet mode (SyncE), the STU-C is synchronized to the incoming Ethernet data-rate (125MHz). This clock is used to operate the Ethernet PHY and the transmitted Ethernet packets will use this clock. The 125MHz are transferred across the G.SHDSL line and re-build on the STU-R side. the recovered clock is also used to operate the EthernetPHY and packets are transferred synchromized to the STU-C. This reduces packet loss due to deviation of oscillators.

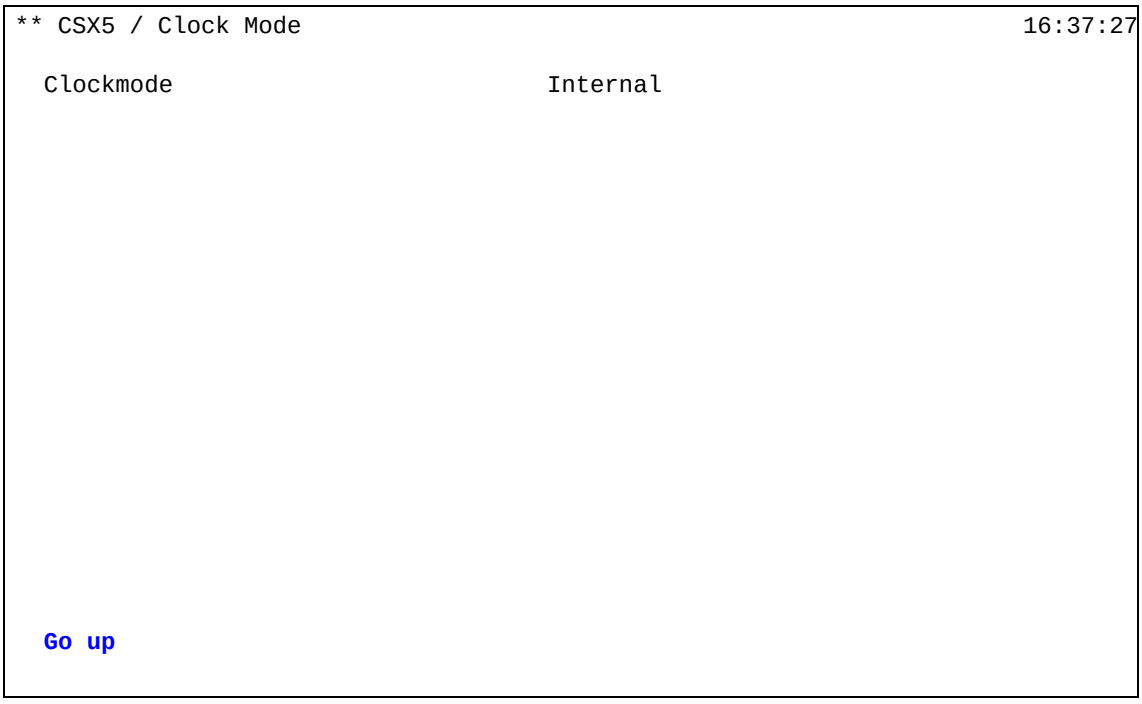


Figure 5-12 *Clock Mode Menu CSX5-FE*

Table 5-15 *Clock Mode Menu*

Parameter	Description	Format	
Clockmode	Configuration of the clock mode. [i]	PullDown-Menu • Internal • SyncE	Internal

i. The Clock Mode can only be configured on a STU-C device. The STU-R device is always configured from the far end.

Datacom V.24 Interface

The datacom interface V.24 can be operated in Synchronous and Asynchronous mode. This two modes are independant from the clock mode of the device. It does not matter in which mode the V.24 interface is operated, the CSX5 device itself is always in “internal” clock mode.

```
** CSX5 / Clock Mode                                              16:37:27

  Clockmode                          Internal

  Go up
```

Figure 5-13 *Clock Mode Menu CSX5-V.24*

Table 5-16 *Clock Mode Menu*

Parameter	Description	Format	
Clockmode	Configuration of the clock mode. [i]	Read-Only • Internal	Internal

i. The Clock Mode can only be configured on a STU-C device. The STU-R device is always configured from the STU-C side.

User Interface

The CSX - Family supports different user interfaces. Each type of user interface has its “own” menu to configure and monitor the port. Each user port menu shows not only the local information, but also the information about the remote unit’s user port (as soon as the SHDSL line is established). This makes it very easy to get an overview of the service status (end-to-end)!

NOTE: The configuration of the remote port is only possible, when logged onto the STU-C device.

Ethernet Remote Bridge

This menu gives first an overview of link and status of the Ethernet port(s). A next menu opens the option to configure the Ethernet port(s).

```
** CSX5 / User Interface (Ethernet)                                  16:51:37


  -- Local Port Information --
  Port Name                          Port 1
  Media Mode                         Copper Mode
  Port Status                        RJ45: Link Down
  Auto Crossover                     No Crossover

  Port Configuration

  -- Remote Port Information --
  Port Name                          Port 1
  Media Mode                         Copper Mode
  Port Status                        RJ45: Link Down
  Auto Crossover                     No Crossover

  Remote Port Configuration



  Go up
```

Figure 5-14 *User Interface (Ethernet) Menu*

Table 5-17 *User Interface (Ethernet) Menu*

Parameter	Description	Format	
Port Name	Enter the name of the selected port.	Display/Input	Port 1
Media Mode	Indicates the type of the port. (Copper-Port 10/100/1000BaseT |SFP-Port 1000Base-X).	Display	no default
Port Status	Indicates the current status of the port. (down |up| disabled).	Display	no default
Auto Crossover	Indicates whether the port has detected Crossover mode or not.	Display	no default

The following submenus are available:

Table 5-18 *User Interface (Ethernet): Submenus*

Submenu	Description
Port Configuration	This menu allows to configure the local Ethernet port.
Remote Port Configuration	This menu allows to configure the remote Ethernet port. **Note:** Only possible on the STU-C device.

Port Configuration

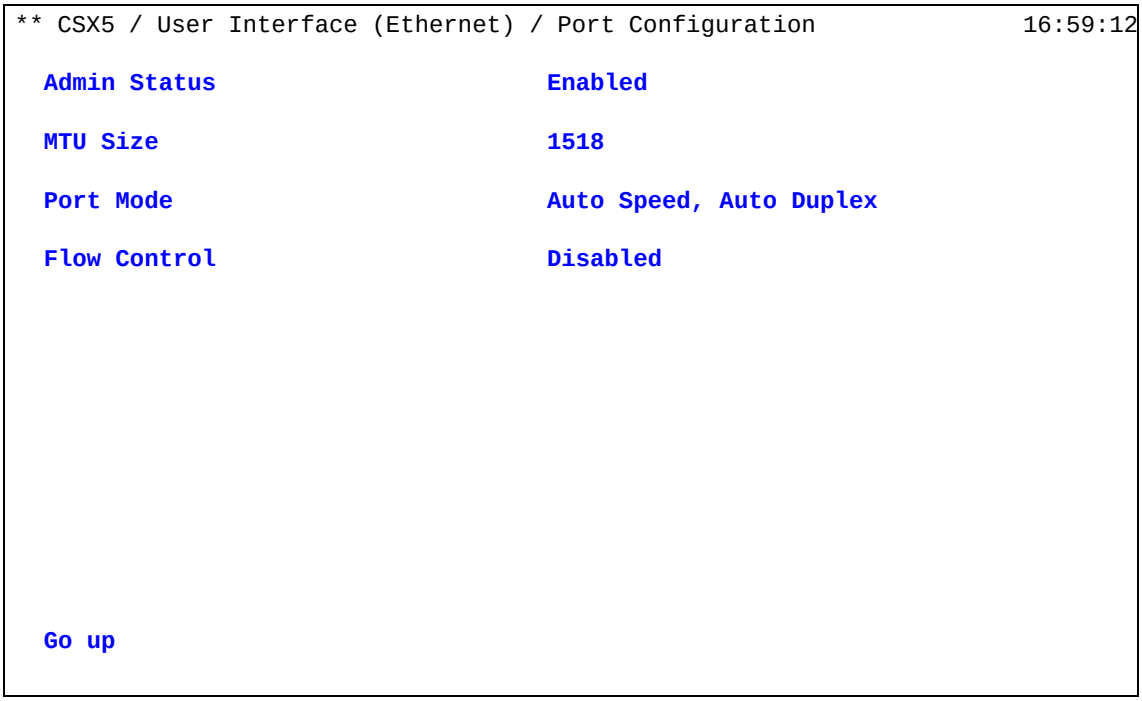


Figure 5-15 *Port Configuration (Ethernet) Menu*

Table 5-19 *Port Configuration (Ethernet) Menu*

Parameter	Description	Format	
Admin Status	Enables or disables the port.	PullDown-Menu • Enabled • Disabled	Enabled
MTU Size	Two values can be selected for Maximum Transmission Size on the Ethernet port.	PullDown-Menu • 1518 • 2047	1518
Port Mode	Configures the data transmission mode for the Ethernet port. [i]	PullDown-Menu • Auto Speed, Auto Duplex • ...	Auto Speed, Auto Duplex
Flow Control	The status of the Flow Control functionality can be set to 'Enabled' or 'Disabled'.	PullDown-Menu • Enable • Disable	Disable

i. See Table 4-2 for explanation on the settings.

Datacom V.24 Interface

This menu gives first an overview of link and status of the V.24 interface. A next menu opens the option to configure the interface.

```
** CSX5 / User Interface (V.24)                                  16:51:37

  Port Name                          V.24 Port
  Type                               DCE
  Current Status                     Async Mode
  Interface Data Rate                19200bit/s (internal)
  Loopback                           Off
  Port Configuration

  -- Remote Port Information --
  Port Name                          V.24 Port
  Type                               DCE
  Current Status                     Async Mode
  Detected Interface Data Rate       19200bit/s
  Loopback                           Off
  Port Configuration




  Go up
```

Figure 5-16 *User Interface (V.24) Menu*

Table 5-20 *User Interface (V.24) Menu*

Parameter	Description	Format	
Port Name	Enter the name of the selected port.	Display/Input	V.24 Port
Type	Indicates the (jumpered) configuration of the V.24 port. (DCE | DTE).	Display	DCE
Current Status	Indicates the current clock status of the port. As long as there is nothing connected to the interface, the value is Async Mode. (Async Mode | Sync Mode).	Display	Async Mode
Interface Data Rate	Indicates the speed of the V.24 interface. This entry is visible, when the CSX-device is acting as clock-source for the interface (in DCE-mode).	Display	no default

Table 5-20 *User Interface (V.24) Menu (continued)*

Parameter	Description	Format	
Detected Interface Data Rate	Indicates the detected speed of the V.24 interface. This entry is visible, when the CSX-device is acting as clock-sink from the interface (in DTE-mode).	Display	no default
Loopback	Configuration switch to enable/disable test-loops. See “V.24 Test-Loops” on page 4-12 for details.	PullDown-Menu • Off • Terminal • Facility	Off

The following submenus are available:

Table 5-21 *User Interface (V.24): Submenus*

Submenu	Description
Port Configuration	This menu allows to configure the local Ethernet port.
Remote Port Configuration	This menu allows to configure the remote Ethernet port. **Note:** Only possible on the STU-C device.

Port Configuration

```
** CSX5 / User Interface (V.24) / Port Configuration              16:59:12

  Port Name                          V.24 Port

  Admin Status                       Enabled

  Mode                               Asynchron

  Interface Data Rate                19200









  Go up
```

Figure 5-17 *Port Configuration (V.24) Menu*

Table 5-22 *Port Configuration (V.24) Menu*

Parameter	Description	Format	
Port Name	Enter the name of the selected port.	Display/Input	V.24 Port
Admin Status	Enables or disables the port.	PullDown-Menu • Enabled • Disabled	Enabled
Mode	Configures the clock mode for the V.24 interface.	PullDown-Menu • Asynchron • Synchron • Auto	Asynchron
Interface Data Rate	Configures the speed of the interface, in case the CSX-device is acting as clock-source for the interface (in DCE-mode).	Enter value • 2400...230k	

The configuration of the serial data-rate can be done in several formats. The example below is given for the data-rate 115200bit/s:

Table 5-23 *Entry of Interface Data Rate*

Format	**115200bit/s** [i]
value only	115200
value and prefix	115k
Note: Only integer values possible.	
value, prefix, unit	115kb
	115kbit
	115kbit/s
value, blanc, prefix, unit	115 kb
	115 kbit
	115 kbit/s
number of TDM-timeslots	3TS
(1 TS = 64kbit/s)	3 TS

i. The value must be between 2400bps and 230000bps.

Alarms

The CSX - Family supports different alarms, which can be raised. The alarms can be enabled or repressed by configuration. The LTU-C device shows not only the local information, but also the information about the remote unit's alarm status (as soon as the SHDSL line is established). This makes it very easy to get an overview of the service status (end-to-end)!

NOTE: The configuration of the remote unit is only possible, when logged onto the STU-C device.

The Alarm conditions is used to trigger the Alarm LED, the Alarm relay and the SNMP-traps. As source for the Alarm can be either the SHDSL port(s) and/or the user-port.

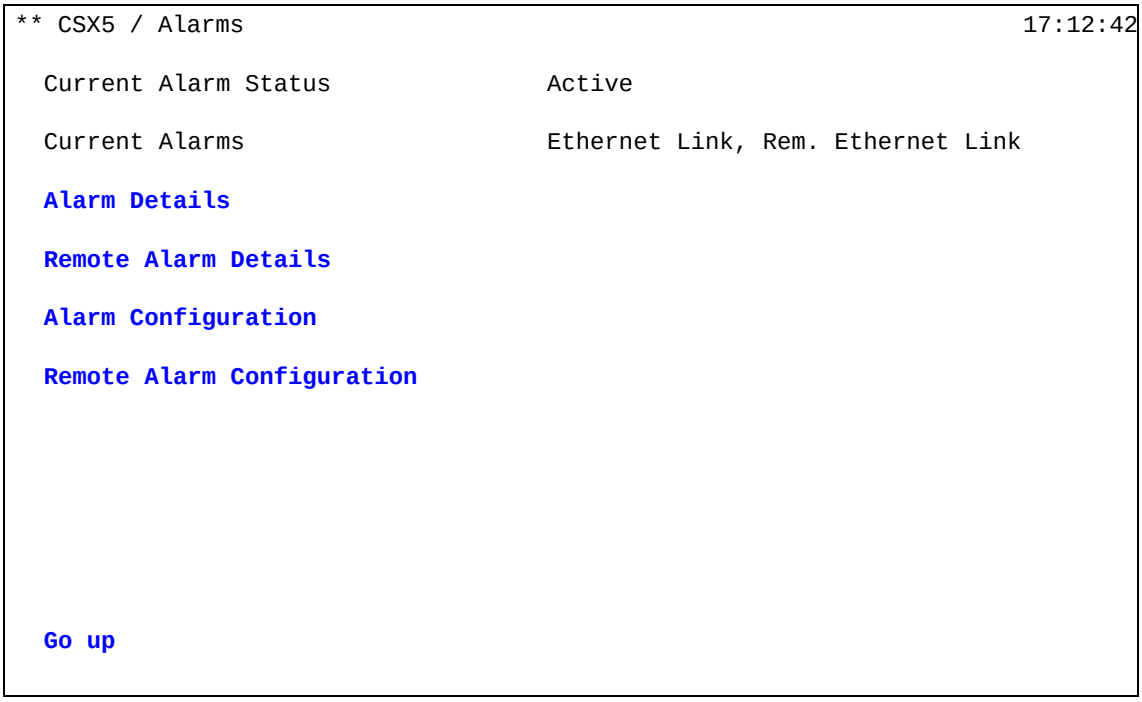


Figure 5-18 *Alarms Menu*

Table 5-24 *Alarms Menu*

Parameter	Description	Format
Current Alarm Status	Display the alarm status of the unit. Possible values are: • Active • Inactive	Display
Current Alarms	List of all active alarms. Local as well as remote. See “Alarm Management” on page 4-19 for details.	Display

The following submenus are available:

Table 5-25 *Alarms: Submenus*

Submenu	Description
Alarm Details	Configuration menu for alarms and list of active alarms.
Remote Alarm Details	Configuration menu for alarms and list of active alarms. **Note:** Only possible on the STU-C device.

Table 5-25 *Alarms: Submenus (continued)*

Submenu	Description
Alarm Configuration	This menu allows to configure the local alarm handling.
Remote Alarm Configuration	This menu allows to configure the remote alarm handling. **Note:** Only possible on the STU-C device.

Alarms Details

The Alarm Details list all possible alarms and the actual status of the alarms. Each alarm can be cleared here. A cleared alarm will be raised again, only after a “good-period”.

The different user interfaces, which are available for the CSX - Family can raise different alarms. Depending on the present variant, different alarms can be raised.

```
** CSX5 / Alarms / Alarm Details                                  17:19:26

  System Status Alarm                Off
  Clear System Status Alarm

  SHDSL Link Failure                 Off
  Clear SHDSL line Alarm

  Ethernet Link Failure [i]           On
  Clear Link Failure Alarm

  V.24 Clock Failure [ii]            Off
  Clear V.24 Clock Failure Alarm









  Go up
```

i. Only visible on variants with Fast Ethernet interface(s).
ii. Only visible on variants with V.24 interface.

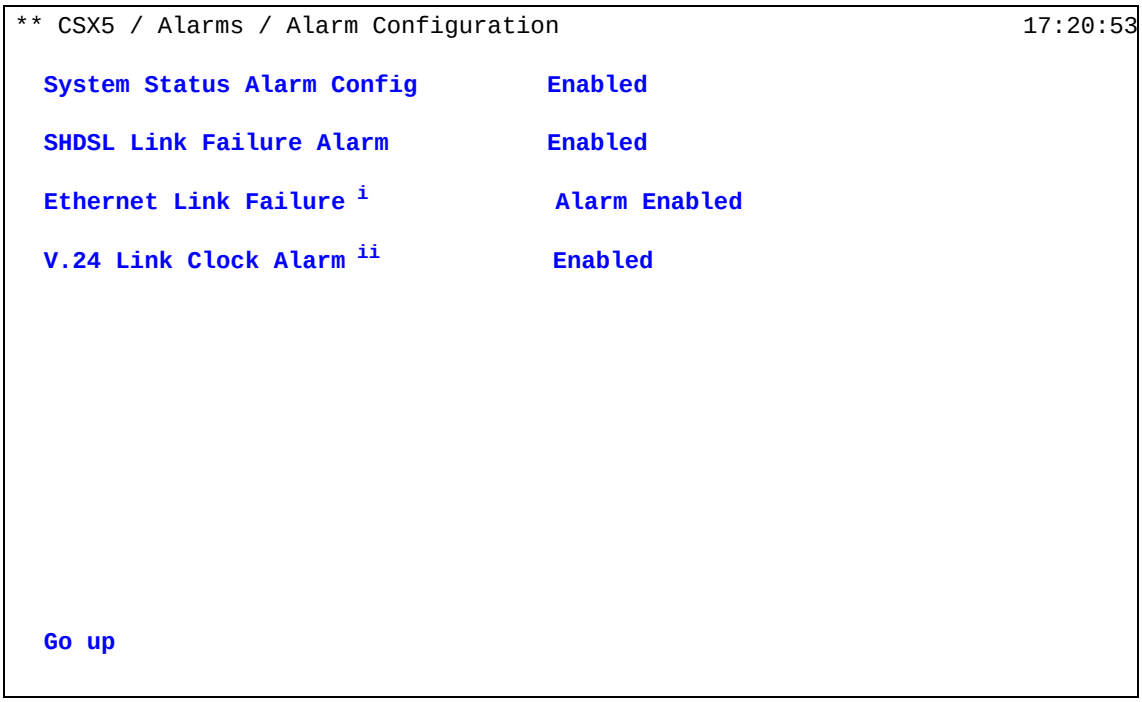
Figure 5-19 *Alarm Details Menu*

Table 5-26 *Alarm Details Menu*

Parameter	Description	Format
System Status Alarm	Display to show the actual alarm status of the device. **Note:** This alarm is available in all variants of CSX - Family.	Display
Clear System Status Alarm	Pulldown menu to clear the mentioned alarm. Possible values are: • Cancel • Acknowledge	PullDown-Menu
SHDSL Link Failure	Display to show the actual alarm status of the SHDSL line. **Note:** This alarm is available in all variants of CSX - Family.	Display
Clear SHDSL Line Alarm	Pulldown menu to clear the mentioned alarm. Possible values are: • Cancel • Acknowledge	PullDown-Menu
Ethernet Link Failure	Display to show the actual alarm status of the Ethernet link. **Note:** This alarm is only available in the Ethernet variants of CSX - Family.	Display
Clear Ethernet Link Alarm	Pulldown menu to clear the mentioned alarm. Possible values are: • Cancel • Acknowledge	PullDown-Menu
V.24 Clock Failure	Display to show the actual alarm status of the V.24 link. **Note:** This alarm is only available in the Ethernet variants of CSX - Family.	Display
Clear V.24 Clock Failure Alarm	Pulldown menu to clear the mentioned alarm. Possible values are: • Cancel • Acknowledge	PullDown-Menu

Alarm Configuration

The Alarm Configuration menu allows to enable and disable the available alarms. A disabled alarm will not raise and action like LED-light, relay or traps in the SCX2e agent card.



i. Only visible on variants with Fast Ethernet interface(s).
ii. Only visible on variants with V.24 interface.

Figure 5-20 *Alarm Configuration Menu*

Table 5-27 *Alarm Configuration Menu*

Parameter	Description	Format	
System Status Alarm	Enables or disables the alarm.	PullDown-Menu • Enabled • Disabled	Enabled
SHDSL line Failure Alarm	Enables or disables the alarm.	PullDown-Menu • Enabled • Disabled	Enabled
Ethernet Link Failure Alarm	Enables or disables the alarm.	PullDown-Menu • Enabled • Disabled	Enabled

Event Monitoring

All events are stored in a list, which can be viewed in this menu. The list has a capacity of 99 entries. In case the onboard storage for the event-list is full, the oldest event is removed from the list to free buffer space.

One can scroll in the list with the <ArrowUp> and <ArrowDown> keys. To leave the list, press <enter>.

```
** CSX5 / Event Monitoring                                          13:05:46

13.10.14 13:13:23  INFO   Cold Start CSX5 #golden-8
13.10.14 13:13:23  INFO   FPGA firmware download (4b0a050e V41) successful
13.10.14 13:13:24  INFO   ETH PHY initialized (COPPER MODE)
13.10.14 13:13:25  ALARM  Ethernet link failure alarm On
13.10.14 13:13:25  ALARM  SHDSL line failure alarm On
13.10.14 13:13:33  INFO   SHDSL firmware download (DFE Fw 190_001, IDC Fw
v1.1_1.9.0) successful
13.10.14 13:13:35  INFO   SHDSL line Down
13.10.14 13:13:40  ERROR  SHDSL line Down
13.10.14 13:13:40  INFO   Applied new DSL config
13.10.14 13:13:40  ERROR  SHDSL line Down
13.10.14 13:13:40  INFO   SHDSL line Startup
13.10.14 13:13:42         1 more identical entry
13.10.14 13:14:18  INFO   SHDSL line Up with 5696kbit/s (PAM32)
13.10.14 13:14:28  INFO   SHDSL line failure alarm Off
13.10.14 13:14:29  INFO   Found compatible STU-R: remote management enabled
13.10.14 13:14:38  ALARM  Remote Ethernet link failure alarm On



  Go up
```

Figure 5-21 *Event Monitoring Menu*

More details about the list is presented in “Event Monitoring” on page 4-20.

Software Update

Local SW Update

Start SW Update & Enter Boot-Loader

To update the SW of the local device, select the “Software Update” in the “Administration” menu and choose the option “Upload new software via XYModem”.

The unit will restart automatically and enter the boot-loader after selecting the above mentioned option. A text will indicate the user to start the file-transfer now.

```
System is rebooting ...


Bootloader V1.7 (#2)
Reboot to install new software image
Activating xymodem handler...ok
Start data transmission within 100s...  C
```

Figure 5-22 *XY-Modem Started*

When the file-transfer does not start within 100 seconds, the device will leave the boot-loader and re-start with the “old” software.

```
System is rebooting ...


Bootloader V1.7 (#2)
Reboot to install new software image
Activating xymodem handler...ok
Start data transmission within 100s...  C
XYMODEM timeout as data transmission was not started.
Restarting system

Bootloader 1.7 (#2)
Active partition: V1_0_0d
```

Figure 5-23 *XY-Modem Time-Out*

File Transfer

As the menu option says, one can select either X-modem or Y-modem protocol for the transfer. The device will detect automatically the selected protocol option. Which protocol your terminal program supports is not part of the manual.

arcutronix has tested several terminal programs (TeraTerm, putty, HyperTerm, etc.).

For TeraTerm, the command to start an YMODEM transfer is

- File -> Transfer -> YMODEM -> Send

A new window is opened and the file to be transferred to the device can be selected.

The file must have the extension *.pkg and will carry the device type and SW-version in the file-name:

- e.g. csx5-V1_0_0d.pkg

The file transfer will take ~40 seconds. After the transfer, the file is checked, whether it really fits and can be used (error check etc.). If everything is fine, the device will restart again and the boot-loader will start the new software.

```
System is rebooting ...


XYMODEM transmission successful.
Restarting system

Bootloader 1.6 (#9)
Activating new software image
Active partition: V1_0_0d
```

Figure 5-24 *File Transfer Successful*

One can check in the terminal window the new software, which is active now.

Errors

Several errors can occur during the SW update:

File transfer interrupted or erroneous

When the file transfer is interrupted or many errors are on the link, the transfer is stopped and a new try will be started:

```
System is rebooting ...


Bootloader V1.7 (#4)
Reboot to install new software image
Activating xymodem handler...ok
Start data transmission within 100s...  CCCCCC
Transmission cancelled by remote side.
Restarting system
Bootloader V1.7 (#5)
Reboot after error in xymodem handler, restarting xymodem handler.
Activating xymodem handler...ok
Start data transmission within 100s...  C
```

Figure 5-25 *File Transfer Interrupted*

File is not correct

A file, which does not fit onto a CSX will not be accepted by the boot-loader. The file transfer is interrupted and the transfer of the correct file is expected.

Remote SW Update

A SW update from local (STU-C) to remote (STU-R) is possible. It is assumed that the same (update-) file as for the STU-C is valid for the STU-R. As soon as the new SW is installed on the STU-C, it is also available to be downloaded to the STU-R. A check is done on the STU-C whether the remote unit does already have the latest (installed) SW. In case, this is true, a repeated update is not necessary and not allowed.

The download process to the remote end uses the SHDSL in-band channel (EOC) which has very low capacity. The advantage of this channel is that the payload transport is not effected by the download. The disadvantage is the long time it takes to transport the file to the remote site. But once started, the flow is done automatically and the new file is installed without further need of assistance by the admin.

To be done ...

Chapter 6
SNMP and MIBs

This chapter provides information on the SNMP and the management information bases (MIBs) used by the CSX - Family.

The CSX - Family does not have an SNMP-agent on-board. SNMP access is only possible in cooperation with an ax main agent SCX2e. See [axManual_SCX2e_gs2] for more details about SNMP than it is presented here after.

SNMP Access Generally

The growing global network ‘Internet’ was the home of plans to simplify network maintenance by defining a maintenance protocol, which would allow network managers to control network equipment via the network itself. This protocol was given the name SNMP (Simple Network Management Protocol). As the name implies, SNMP was originally planned as an intern solution. However, SNMP became widely used and is now a universal standard.

What is the difference between equipment with and without SNMP? Generally, SNMP featured equipment has:

- Added intelligence to talk SNMP and to get and set unit parameters
- An own unique network address
- Some kind of local management port

Network management by SNMP requires at least two partners:

- Network equipment with SNMP software, called ‘agent’
- A network station, running some kind of network management software

The two partners communicate via the net using SNMP. The network management station sends configuration commands and data requests to the network equipment. The network equipment responds to requests by sending the requested data. Additionally, traps are triggered by certain events in the network equipment. Traps are data packets containing information about these events. Their destination is a (or multiple) network management station, where the information is collected. SNMP traps enable an agent to notify the management station(s) of significant events by way of an unsolicited SNMP message.

Network configuration information, in particular configuration commands, is sensitive data and must therefore be protected against prying eyes. SNMP deals with this problem by implementing something called a ‘community’. A community is comparable to a password and gets attached to each SNMP message. The attached community allows the receiving SNMP partner to decide if the transmitting partner is allowed to force the execution of the command.

Management Information Bases (MIBS)

The MIBs (Management Information Bases) define the variables which are used to control an SNMP device or to retrieve operational data from the device. The MIB hierarchy can be depicted as a tree with a nameless root, the levels of which are assigned by different organizations. This model permits management across all layers of the OSI reference model.

The format of the MIBs as well as global sections are defined in the SNMP standard. MIBs are written in a special language (ASN.1 = Abstract Syntax Notation One) and are plain ASCII text. Thus they can be read using any available editor.

The global MIB sections contain variables which should be served by any SNMP agent. Each MIB object is assigned a name. These names are shown in the following MIB explanation. However, these names may show up somewhat extended or abbreviated on your screen, depending on the network management software you use. This is no malfunction but a feature of your software.

CSX - Family MIBs

You can download the MIB from the ax extranet (www.arcutronix.com/customer):

Login: **User = p49170644-0**
Password = 1qayxsw2

Chapter 7
CSX - Family Menu-Tree

The CSX - Family offers several ways to manage the unit, as written in the chapters before. These different ways do not use each a different management core, but there is one common core in use. The different ways of management are different interfaces to this common managment core.

The benefit is, that all information is available on different ways and the learning rate of using and managing the devices is very short. If one knows how to navigate in the gCLI, it will be easy to learn how to navigate in the Web-GUI etc.

Within this chapter the common menu-tree of the CSX - Family is shown.

Menu-Structure (Directory-Tree) of CSX - Family

Table 7-1 *Menu Tree CSX - Family*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
** CSX5 Login	ACCESS_ALL	
User	ACCESS_ALL	
Password	ACCESS_ALL	
>Login	ACCESS_ALL	
** CSX5	ACCESS_ALL	
>General System Information	ACCESS_ALL	
** CSX5 / General System Information	ACCESS_ALL	
Device Type	VIEW_ALL	
Order No.	VIEW_ALL	
Serial Number	VIEW_ALL	
Article Revision	VIEW_ALL	
Hardware Revision	VIEW_ALL	
Date of Production	VIEW_ALL	
Manufacturer	VIEW_ALL	
Vendor ID	VIEW_ALL	
Customization	VIEW_ALL	WRITE_FACTORY if DEP #1
-> [Generic / Special Customer]		

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
MAC Addr	VIEW_ALL	
Bootloader Version	VIEW_ALL	
FPGA Version	VIEW_ALL if DEP #2	
Software Version	VIEW_ALL	
Software Details	VIEW_ALL if DEP #3	
User Interface	VIEW_ALL	
-> [Fast Ethernet / V.24 / Unsupported Module]		
>Remote System Information	ACCESS_ALL if DEP #4	
** CSX5 / General System Information / Remote System Information	ACCESS_ALL	
Device Type	VIEW_ALL	
Order No.	VIEW_ALL	
Serial Number	VIEW_ALL	
Article Revision	VIEW_ALL	
Hardware Revision	VIEW_ALL	
Date of Production	VIEW_ALL	
Manufacturer	VIEW_ALL	
Vendor ID	VIEW_ALL	
Customization	VIEW_ALL	WRITE_FACTORY if DEP #1
-> [Generic / Special Customer]		
MAC Addr	VIEW_ALL	
Bootloader Version	VIEW_ALL	
FPGA Version	VIEW_ALL if DEP #2	
Software Version	VIEW_ALL	
Software Details	VIEW_ALL if DEP #3	
User Interface	VIEW_ALL	
-> [Fast Ethernet / V.24 / Unsupported Module]		
>Administration	ACCESS_ALL	
** CSX5 / Administration	ACCESS_ALL	
Contact Person	VIEW_ALL	WRITE_SERVICE
Device Location	VIEW_ALL	WRITE_SERVICE

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
Device Name	VIEW_ALL	WRITE_SERVICE
Current Date	VIEW_ALL	WRITE_SERVICE
Current Time	VIEW_ALL	WRITE_SERVICE
>User Administration	ACCESS_ALL	
** CSX5 / Administration / User Administration	ACCESS_ALL	
Username	VIEW_SERVICE	
>Edit User 1	ACCESS_SERVICE	
** CSX5 / Administration / User Administration / Edit User 1	ACCESS_ALL	
Username	VIEW_ALL	WRITE_ADMIN
Password	ACCESS_ADMIN	
Access	VIEW_ALL	WRITE_ADMIN
-> [admin / service / monitor]		
Enabled	VIEW_ALL	WRITE_ADMIN
-> [Enabled / Disabled]		
Username	VIEW_SERVICE	
>Edit User 2	ACCESS_SERVICE	
** CSX5 / Administration / User Administration / Edit User 2	ACCESS_ALL	
Username	VIEW_ALL	WRITE_ADMIN
Password	ACCESS_ADMIN	
Access	VIEW_ALL	WRITE_ADMIN
-> [admin / service / monitor]		
Enabled	VIEW_ALL	WRITE_ADMIN
-> [Enabled / Disabled]		
Username	VIEW_SERVICE	
>Edit User 3	ACCESS_SERVICE	
** CSX5 / Administration / User Administration / Edit User 3	ACCESS_ALL	
Username	VIEW_ALL	WRITE_ADMIN
Password	ACCESS_ADMIN	
Access	VIEW_ALL	WRITE_ADMIN
-> [admin / service / monitor]		
Enabled	VIEW_ALL	WRITE_ADMIN

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
-> [Enabled / Disabled]		
Username	VIEW_SERVICE	
>Edit User 4	ACCESS_SERVICE	
** CSX5 / Administration / User Administration / Edit User 4	ACCESS_ALL	
Username	VIEW_ALL	WRITE_ADMIN
Password	ACCESS_ADMIN	
Access	VIEW_ALL	WRITE_ADMIN
-> [admin / service / monitor]		
Enabled	VIEW_ALL	WRITE_ADMIN
-> [Enabled / Disabled]		
Change current Password	ACCESS_ALL	
Reboot	ACCESS_SERVICE	
-> [Cancel / Reboot now]		
Software Update	ACCESS_SERVICE	
-> [Cancel / Upload new software via XYMODEM]		
Remote Software Update	ACCESS_SERVICE if DEP #5	
-> [Cancel / Send current software via EOC]		
Remote Update Status	VIEW_ALL if DEP #6	
Maintenance Mode	ACCESS_SERVICE	
-> [Cancel / Activate now]		
>Line Interface (SHDSL)	ACCESS_ALL	
** CSX5 / Line Interface (SHDSL)	ACCESS_ALL	
Port Name	VIEW_ALL	WRITE_SERVICE
Current DSL Status	VIEW_ALL	
STU-C	VIEW_ALL if DEP #7	
Noise Margin / Line Attenuation	VIEW_ALL if DEP #7	
Noise Margin / Line Attenuation	VIEW_ALL if DEP #8	

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
SRU-1	VIEW_ALL if DEP #7	
Noise Margin / Line Attenuation	VIEW_ALL if DEP #8	
Noise Margin / Line Attenuation	VIEW_ALL if DEP #9	
SRU-2	VIEW_ALL if DEP #7	
Noise Margin / Line Attenuation	VIEW_ALL if DEP #9	
Noise Margin / Line Attenuation	VIEW_ALL if DEP #10	
STU-R	VIEW_ALL	
>Performance Monitoring	ACCESS_ALL	
** CSX5 / Line Interface (SHDSL) / Performance Monitoring	ACCESS_ALL	
Performance Monitoring Intervall	VIEW_ALL	
Last Update	VIEW_ALL	
Current DSL Status	VIEW_ALL	
Elapsed Seconds	VIEW_ALL	
Erroneous Seconds (ES)	VIEW_ALL	
Severely Erroneus Seconds (SES)	VIEW_ALL	
Unavailable Seconds (UAS)	VIEW_ALL	
Loss of Sync Word (LOSW) Counter	VIEW_ALL	
Code Violation (CV) Error Counter	VIEW_ALL	
Link Loss Counter	VIEW_ALL	
Reset All Counter	VIEW_ALL	WRITE_SERVICE
-> [Cancel / Reset counter]		
>Configuration	ACCESS_ALL	
** CSX5 / Line Interface (SHDSL) / Configuration	ACCESS_ALL	
Admin Status	VIEW_ALL	WRITE_SERVICE
-> [Enabled / Disabled]		
Line Emulation Mode	VIEW_ALL	WRITE_SERVICE
-> [LTU (STU-C) / NTU (STU-R)]		
Loopmode	VIEW_ALL	WRITE_SERVICE if DEP #7
-> [Off / STU-C / STU-R / SRU-1 / SRU-2]		

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
DSL Data Rate	VIEW_ALL	WRITE_SERVICE if DEP #11
PAM Mode	VIEW_ALL	WRITE_SERVICE if DEP #7
-> [Auto / Only PAM16 / Only PAM32]		
Lineprobing Mode	VIEW_ALL	WRITE_SERVICE if DEP #7
-> [Off / Current Condition Target Margin / Worst Case Target Margin]		
Downstream Target SNR Margin(dB)	VIEW_ALL	WRITE_SERVICE if DEP #7
Upstream Target SNR Margin (dB)	VIEW_ALL	WRITE_SERVICE if DEP #7
>Clock Mode	ACCESS_ALL	
** CSX5 / Clock Mode	ACCESS_ALL	
Clockmode	VIEW_ALL	
-> [Internal / Remote / External]		
>User Interface (Ethernet)	ACCESS_ALL if DEP #16	
** CSX5 / User Interface (Ethernet)	ACCESS_ALL	
-- Local Port Information --	VIEW_ALL	
Port Name	VIEW_ALL	WRITE_SERVICE
Media Mode	VIEW_ALL	
-> [Copper Mode / Fibre Mode]		
Port Status	VIEW_ALL	
Auto Crossover	VIEW_ALL if DEP #12	
-> [No Crossover / Crossover]		
>SFP Info	ACCESS_ALL if DEP #13	
** CSX5 / User Interface (Ethernet) / SFP Info	ACCESS_ALL	
Detected Type	VIEW_ALL	
-> [No SFP / Gigabit Ethernet SFP (Unsupported) / Copper SFP (Unsupported) / 100Fx SFP / Unsupported SFP / Invalid SFP / SFP Disabled]		
Base Area Checksum	VIEW_ALL	
Connector Type	VIEW_ALL	
Ext Area Checksum	VIEW_ALL	

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
Line Coding	VIEW_ALL	
-> [Unspecified / 8B10B / 4B5B / NRZ / Manchester / SONET Scrambled / 64B/66B / Unknown]		
Link Length	VIEW_ALL	
Max Margin	VIEW_ALL	
Min Margin	VIEW_ALL	
Nominal Bit Rate	VIEW_ALL	
Optical Type	VIEW_ALL	
-> [na / 1000BASE-SX / 1000BASE-LX / 1000BASE-CX / 1000BASE-T / Unknown]		
Part Number	VIEW_ALL	
Tranceiver Type	VIEW_ALL	
-> [na / GBIC / Module / SFP / Unknown]		
Date Code	VIEW_ALL	
Vendor Name	VIEW_ALL	
Vendor-Rev	VIEW_ALL	
Serial No	VIEW_ALL	
Wave Length	VIEW_ALL	
>Port Configuration	ACCESS_ALL	
** CSX5 / User Interface (Ethernet) / Port Configuration	ACCESS_ALL	
Admin Status	VIEW_ALL	WRITE_SERVICE
-> [Disabled / Enabled]		
MTU Size	VIEW_ALL	WRITE_SERVICE
-> [1518 / 2047]		
Port Mode	VIEW_ALL	WRITE_SERVICE
-> [Auto Speed, Auto Duplex / Auto Speed, FDx / Auto Speed, HDx / 100Mbit/s, Auto Duplex / 10Mbit/s, Auto Duplex / 100Mbit/s, FDx / 100Mbit/s, HDx / 10Mbit/s, FDx / 10Mbit/s, HDx]		
Flow Control	VIEW_ALL	WRITE_SERVICE
-> [Disabled / Enabled]		
SFP Shut Down	VIEW_ALL	WRITE_SERVICE if DEP #13
-> [Auto SFP ON/OFF / SFP ON / SFP OFF]		
-- Remote Port Information --	VIEW_ALL if DEP #4	

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
Port Name	VIEW_ALL	WRITE_SERVICE if DEP #4
Media Mode	VIEW_ALL if DEP #4	
-> [Copper Mode / Fibre Mode]		
Port Status	VIEW_ALL if DEP #4	
Auto Crossover	VIEW_ALL if DEP #14	
-> [No Crossover / Crossover]		
>Remote SFP Info	ACCESS_ALL if DEP #15	
** CSX5 / User Interface (Ethernet) / Remote SFP Info	ACCESS_ALL	
Detected Type	VIEW_ALL	
-> [No SFP / Gigabit Ethernet SFP (Unsupported) / Copper SFP (Unsupported) / 100Fx SFP / Unsupported SFP / Invalid SFP / SFP Disabled]		
Base Area Checksum	VIEW_ALL	
Connector Type	VIEW_ALL	
Ext Area Checksum	VIEW_ALL	
Line Coding	VIEW_ALL	
-> [Unspecified / 8B10B / 4B5B / NRZ / Manchester / SONET Scrambled / 64B/66B / Unknown]		
Link Length	VIEW_ALL	
Max Margin	VIEW_ALL	
Min Margin	VIEW_ALL	
Nominal Bit Rate	VIEW_ALL	
Optical Type	VIEW_ALL	
-> [na / 1000BASE-SX / 1000BASE-LX / 1000BASE-CX / 1000BASE-T / Unknown]		
Part Number	VIEW_ALL	
Tranceiver Type	VIEW_ALL	
-> [na / GBIC / Module / SFP / Unknown]		
Date Code	VIEW_ALL	
Vendor Name	VIEW_ALL	
Vendor-Rev	VIEW_ALL	
Serial No	VIEW_ALL	
Wave Length	VIEW_ALL	

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
>Remote Port Configuration	ACCESS_ALL if DEP #4	
** CSX5 / User Interface (Ethernet) / Remote Port Configuration	ACCESS_ALL	
Admin Status	VIEW_ALL	WRITE_SERVICE
-> [Disabled / Enabled]		
MTU Size	VIEW_ALL	WRITE_SERVICE
-> [1518 / 2047]		
Port Mode	VIEW_ALL	WRITE_SERVICE
-> [Auto Speed, Auto Duplex / Auto Speed, FDx / Auto Speed, HDx / 100Mbit/s, Auto Duplex / 10Mbit/s, Auto Duplex / 100Mbit/s, FDx / 100Mbit/s, HDx / 10Mbit/s, FDx / 10Mbit/s, HDx]		
Flow Control	VIEW_ALL	WRITE_SERVICE
-> [Disabled / Enabled]		
SFP Shut Down	VIEW_ALL	WRITE_SERVICE if DEP #13
-> [Auto SFP ON/OFF / SFP ON / SFP OFF]		
>User Interface (V.24)	ACCESS_ALL if DEP #18	
** CSX5 / User Interface (V.24)	ACCESS_ALL	
Port Name	VIEW_ALL	
Type	VIEW_ALL	
-> [DCE / DTE]		
Current Status	VIEW_ALL	
Detected Interface Data Rate	VIEW_ALL	
>Port Configuration	ACCESS_ALL	
** CSX5 / User Interface (V.24) / Port Configuration	ACCESS_ALL	
Port Name	VIEW_ALL	WRITE_SERVICE
Admin Status	VIEW_ALL	WRITE_SERVICE
-> [Enabled / Disabled]		
Mode	VIEW_ALL	WRITE_SERVICE
-> [Auto / Asynchron / Synchron]		
Interface Data Rate	VIEW_ALL	WRITE_SERVICE if DEP #17
-- Remote Port Information --	VIEW_ALL if DEP #4	

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
Port Name	VIEW_ALL if DEP #4	
Type	VIEW_ALL if DEP #4	
-> [DCE / DTE]		
Current Status	VIEW_ALL if DEP #4	
Detected Interface Data Rate	VIEW_ALL if DEP #4	
>Port Configuration	ACCESS_ALL if DEP #4	
** CSX5 / User Interface (V.24) / Port Configuration	ACCESS_ALL	
Port Name	VIEW_ALL	WRITE_SERVICE
Admin Status	VIEW_ALL	WRITE_SERVICE
-> [Enabled / Disabled]		
>Alarms	ACCESS_ALL	
** CSX5 / Alarms	ACCESS_ALL	
Current Alarm Status	VIEW_ALL	
-> [Inactive / Active / Acknowledged]		
Current Alarms	VIEW_ALL	
>Alarm Details	ACCESS_ALL	
** CSX5 / Alarms / Alarm Details	ACCESS_ALL	
System Status Alarm	VIEW_ALL	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear System Status Alarm	VIEW_ALL	WRITE_SERVICE
-> [Cancel / Acknowledge]		
SHDSL Link Failure	VIEW_ALL	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear SHDSL Link Alarm	VIEW_ALL	WRITE_SERVICE
-> [Cancel / Acknowledge]		
Ethernet Link Failure	VIEW_ALL if DEP #16	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear Link Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #16
-> [Cancel / Acknowledge]		

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
V.24 Link Failure	VIEW_ALL if DEP #18	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear V.24 Link Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #18
-> [Cancel / Acknowledge]		
V.24 Clock Failure	VIEW_ALL if DEP #18	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear V.24 Clock Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #18
-> [Cancel / Acknowledge]		
>Remote Alarm Details	ACCESS_ALL if DEP #4	
** CSX5 / Alarms / Remote Alarm Details	ACCESS_ALL	
System Status Alarm	VIEW_ALL	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear System Status Alarm	VIEW_ALL	WRITE_SERVICE
-> [Cancel / Acknowledge]		
Ethernet Link Failure	VIEW_ALL if DEP #16	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear Link Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #16
-> [Cancel / Acknowledge]		
V.24 Link Failure	VIEW_ALL if DEP #18	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear V.24 Link Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #18
-> [Cancel / Acknowledge]		
V.24 Clock Failure	VIEW_ALL if DEP #18	
-> [Off / On / Off (ignored) / On (acknowledged)]		
Clear V.24 Clock Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #18
-> [Cancel / Acknowledge]		
>Alarm Configuration	ACCESS_ALL	

Table 7-1 *Menu Tree CSX - Family (continued)*

Menu and Submenu Entry	Read Eligibility	Write Eligibility
** CSX5 / Alarms / Alarm Configuration	ACCESS_ALL	
System Status Alarm	VIEW_ALL	WRITE_SERVICE
-> [Disabled / Enabled]		
SHDSL Link Failure Alarm	VIEW_ALL	WRITE_SERVICE
-> [Disabled / Enabled]		
Ethernet Link Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #16
-> [Disabled / Enabled]		
V.24 Link Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #18
-> [Disabled / Enabled]		
V.24 Link Clock Alarm	VIEW_ALL	WRITE_SERVICE if DEP #18
-> [Disabled / Enabled]		
>Remote Alarm Configuration	ACCESS_ALL if DEP #4	
** CSX5 / Alarms / Remote Alarm Configuration	ACCESS_ALL	
System Status Alarm	VIEW_ALL	WRITE_SERVICE
-> [Disabled / Enabled]		
Ethernet Link Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #16
-> [Disabled / Enabled]		
V.24 Link Failure Alarm	VIEW_ALL	WRITE_SERVICE if DEP #18
-> [Disabled / Enabled]		
V.24 Link Clock Alarm	VIEW_ALL	WRITE_SERVICE if DEP #18
-> [Disabled / Enabled]		
>Event Monitoring	ACCESS_ALL	
** CSX5 / Event Monitoring	ACCESS_ALL	
	VIEW_ALL	

Appendix A
Technical Specifications

CSX Hardware Specification

Hardware & Power

Table A-1 to Table A-7 provide the general technical data of the CSX - G.SHDSL.bis (EFM) Copper Modem.

Table A-1 Mechanic and Environment

Type	CSX5-FE	CSX5-V.24	CSX20-FE
Mechanics			
Design:	Line-Card for rack-mount chassis and single-slot housing.	Line-Card for rack-mount chassis and single-slot housing.	Line-Card for rack-mount chassis and single-slot housing.
Dimensions (LxHxW):	190 x 130 x 30mm	190 x 130 x 30mm	190 x 130 x 30mm
Front plate:	Height: 3U Width: 6TE	Height: 3U Width: 6TE	Height: 3U Width: 6TE
Weight:	130g	150g	150g
Environmental Conditions			
Operation:	ETSI ETS 300 019-1-3, class 3.1E		
Temperature (hardened version) Humidity	-5 ... +55 °C 10 ... 90%, non-cond.		
Storage (in packing)	ETSI ETS 300 019-1-1, class 1.2		
Temperature Humidity	-25 ... +55 °C 10 ... 100%, non-cond.		
Transportation:	ETSI ETS 300 019-1-2, class2.3		
Temperature Humidity	-40 ... +70 °C 10 ... 95%, non-cond.		

Table A-1 Mechanic and Environment (continued)

Type	CSX5-FE	CSX5-V.24	CSX20-FE
Others			
Ingress Protection: DIN EN 60529 (VDE 0470 Part 1)	IP30		
Fan:	none		
Cooling:	Convection cooling		

.

Table A-2 Security and EMC

	CSX - Family
EMC	
	EN 55022:1998 + A1:2000 class B
	EN 61000-3-2:2000
	EN 61000-3-3:1995 + A1:2001
Product Security	
Electrical security:	EN 60950
Sound emission:	None (no build-in fan)
Conformity:	CE

Table A-3 Power Requirements

	CSX - Family		
Power Supply			
Type:	DC		
Input voltage:	+5VDC	+/- 5%	
Connector:	Via backplane		
Power Requirements [i]			
Device	w/o SFP(s)	With Standard SFP (700mW)	Max. power to be used by SFP
CSX5-FE	2.5 W	3.0 W (1x SFP)	1.8 W

Table A-3 Power Requirements (continued)

	CSX - Family		
CSX20-FE	4.0 W	4.5 W (1x SFP)	1.8 W
CSX5-V.24	2.3 W	no SFP pluggable	no SFP pluggable

i. The total power need depends on the used SFP.

Interfaces

Table A-4 Number of Interfaces

CSX-Family		
Number of Interfaces		
CSX5-FE	1x SHDSL (RJ45),	Line Interface,
	1x Fast Ethernet 10/100BaseT (RJ45) and/or 1x Fast Ethernet 100BaseX (SFP),	User Interface (Combo-port),
	1x RS232 (only accessible in SHX and SRX3).	local MGMT.
CSX5-V.24	1x SHDSL (RJ45),	Line Interface,
	1x V.24 (DB-25S),	User Interface,
	1x RS232 (only accessible in SHX and SRX3).	local MGMT.
CSX20-FE	4x SHDSL (RJ45),	Line Interface,
	1x Fast Ethernet 10/100BaseT (RJ45) and/or 1x Fast Ethernet 100BaseX (SFP),	User Interface (Combo-port),
	1x RS232 (only accessible in SHX and SRX3).	local MGMT.

Table A-5 Technical Data of the Interfaces

Interfaces	
SHDSL Interfaces	
Type:	ITU-T G.991.2, Annex B (G.SHDSL)
Data Rate	192kpbs up to 5.7Mbps
Line Code	TC- PAM 16, TC- PAM 32
Connection type:	Twisted-Pair interface (TP)
Impedance:	135 Ohm (balanced)
Transmit level @ 135 Ohm	According TS101524 e.g. 14.5 dBm ±0.5 dB @ 2048 kbps
Connector:	8 pin RJ45 connector according to ISO 8877
Fast Ethernet Interfaces (Copper)	
Type:	IEEE 802.3 (full- and half-duplex, Autonegotiation)
Data-rate	10 or 100Mbps
Connection type:	Twisted-Pair interface (TP)
Function, electrical values, pin assignment:	according to IEEE 802.3i (10BaseT), IEEE 802.3u (100BaseTX)
Impedance:	100 Ohm (balanced)
Connector:	8 pin RJ45 connector according to ISO 8877
Fast Ethernet Interfaces (SFP)	
Type:	IEEE 802.3 (full- and half-duplex, Autonegotiation)
Connection type:	Fibre Optics (FO), SFP
Function, electrical values:	IEEE 802.3u (100BaseFX, 100BaseSX, 100Base-BX, 100Base-LX10)
Connector:	LC
SFP:	According to SFP MSA, Rev 4.5, Aug. 31, 2006 All vendors supported. Max. 100 insertion / extraction.
V.24	
Type:	ITU-T V.24

Table A-5 Technical Data of the Interfaces (continued)

Interfaces	
Data Rate:	asynchronous: up to 230kbps synchronous: 2400bps to 230kbps
Function, electrical values:	ITU-T V.11
Connector:	25-pin D-sub socket (DB-25S)

µController, Display & Clock

Table A-6 Display Functions

Type	
Display Functions	
System:	3 LEDs for clock and error status.
SHDSL interfaces:	1 LED, for Bundle Status, 1 LED for STU-C indication, 1 LED for each SHDSL line (up to four).
Fast Ethernet interface:	Copper: 2 LEDs, for Link Status, Activity and Speed; Fibre: 1 LED, for Link Status and Activity.
V.24 interface:	1 LED for configuration indication, 2 LEDs for incoming and egressing traffic, 2 LEDs for status indication.

Table A-7 µController and Clock

Type	
Electronics	
Main processor:	32-bit ARM Cortex-M4 RISC processor: Atmel SAM4S
Non-volatile memory:	2048 kilobytes
Main memory:	160 kilobytes SRAM
Real Time Clock	
Accuracy	10ppm (<1sec/day)
Hold Time (without ext. power)	min. 11 days

CSX Software Specification

Table A-8 provides the general technical data of theCSX - G.SHDSL.bis (EFM) Copper Modem.

Table A-8 Technical Data of the CSX- Software

Type
CSX
General Information
Valid SW-Version for this manual: V 1_2_1 [i]

i. If you use higher SW-version, please check with arcutronix or your local partner, whether there is a new release of the manual available.

Loop Length and Data Rate for SHDSL

Table A-9 to Table A-10 provides an overview of achievable loop length when using the CSX - G.SHDSL.bis (EFM) Copper Modem. The loop length depends on the line conditions, noise, cable diameters and bit rate. On the other hand, one can say, that the bit-rate depends on the loop length and all the other stuff.

In simpe words: The longer the line is, the lesser will be the achivable data-rate on the line and vice versa.

Table A-9 Loop length and Data-rate for SHDSL on a 0.4 TP (AWG26)

Distance [meter]	PAM16 (G.SHDSL) [kbps]	PAM32 (G.SHDSLbis) [kbps]
500	2304	5696
1000	2304	5696
1500	2304	5696
2000	2304	5696
2500	2304	5696
3000	2304	4608
3500	2304	3584
4000	2304	2816
4500	1792	2048
5000	1280	1536
5500	768	832
6000	640	-
6500	512	-

NOTE: The values given are guide values which were measured under ideal conditions without noise and under optimal environmental conditions (diameter of twisted pair: 0.4 mm, AWG26).

Table A-10 Loop length and Data-rate for SHDSL on a 0.6 TP (AWB22)

Distance [meter]	PAM16 (G.SHDSL) [kbps]	PAM32 (G.SHDSLbis) [kbps]
500	2304	5696
1000	2304	5696
1500	2304	5696
2000	2304	5696
2500	2304	5696
3000	2304	5504
3500	2304	4544
4000	2304	3968
4500	2304	3520
5000	2304	3072
5500	2304	2624
6000	2176	2304
6500	1920	2304

NOTE: The values given are guide values which were measured under ideal conditions without noise and under optimal environmental conditions (diameter of twisted pair: 0.4 mm, AWG22).

Double the possible data rates or quadruple when a CSX10 or CSX20 is used.

Appendix EC
EC Declaration of Conformity

CE

Declaration of EC-Conformity

We arcutronix GmbH

Garbsener Landstr. 10
D – 30419 Hannover
Germany

declare under our sole responsibility that the product group

Name: **CSX –G.SHDSLbis (EFM) Copper Modem**

Members: **CSX5-FE, CSX5-V.24, CSX20-FE**

Number: **1405-xxxx**

to which this declaration relates conforms to the following standards, which have been described in the CE-guideline:

93/68/EEC	CE marking
2004/108/EC	Electromagnetic compatibility (EMC)
2006/95/EC	Safety of low voltage equipment (LVD)
1999/5/EC	Radio & Telecommunications Terminal Equipment (R&TTE)
2002/95/EC	Restriction of the use of certain Hazardous Substances (RoHS)
2002/96/EC	Waste Electrical and Electronic Equipment (WEEE)

The above listed products satisfy all technical regulations, applicable to the products based on following standards:

EN 55022	Electromagnetic compatibility (EMC) for Information technology equipment
EN 55024	Electromagnetic compatibility (EMC) for Information technology equipment
EN 61000-4-1	Electromagnetic compatibility (EMC) for Information technology equipment
EN 61000-4-2	Electrostatic discharge immunity test
EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4	Electrical fast transient/burst immunity test
EN 61000-4-5	Surge immunity test
EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests
EN 61000-6-1	Generic immunity standard – Residential, commercial and light industry
EN 61000-6-2	Generic immunity standard – Industrial environment
EN 60950	Safety of Information technology equipment

Hannover, 20.3.2015

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