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**USER GUIDE**

**CEX2**



**arcutronix GmbH  
Deutschland**

**Installation and  
Operation Manual**



# CEX - Connectivity E1/T1

## USER GUIDE



Product Family:

CEX2

Enclosed Descriptions:

Product Type Number:

CEX2-E1R	0803-2100
CEX2-V.24	0803-2220
CEX2-X.21	0803-2221
CEX2-V.35 (obsolete)	0803-2230
CEX2-I.430	0803-2240
CEX2-FE	0803-2280

SW-Version (≥):

CEXA001V02

and/or (old PDT devices)

286105AA05

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## Document Contents

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# About this Book

## Document Organization

This guide describes the hardware components of the CEX - Connectivity E1/T1 Devices. It provides information on configuration, system installation and the technical data. Also, it provides the procedures to operate or test the components of these devices.

The intended audience of this document is anyone who is responsible for installing, maintaining or operating the CEX2. 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. Font attributes are used to identify single words or chapters with certain content, e.g. screen shots and listings are in Courier, like:

```
This is a line of a screen shot.
```

The information in this manual is divided in several object orientated universal chapters. View and compare to your device to find the individual information: take the information that fits. Ignore the information, which is not relevant in the current case.

## Chapters

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

Chapter 1, **Introduction:** Description of arcutronix MSS and the CEX2 Copper Converter.

Chapter 2, **Getting Started:** Short form about installation, mounting and configuration of CEX2-family.

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

Chapter 4, **Installation, Tests & Basics:** Installation procedures.

Chapter 5, **Control Software CEX2:** Control and configuration of the CEX2-family.

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

Chapter 7, **SSH and CLI:** Explains the SSH access to the CEX2 and the usage of the Command Line Interface (CLI).

## About this Book

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Appendix A, **Technical Specifications**: Provides the general technical data of the CEX2-family.

Appendix EC, **EC Declaration of Conformity**: For all CEX - Connectivity E1/T1 products.

## Release History

- 2008-07-24 First issue of the CEX2 User Guide.
- 2008-10-13 Minor Changes in formatting of book.  
IM-I.430 added.
- 2009-09-29 Added and changed the following topics:
- Chapter 6 (SNMP) changed towards ax-MIBS.
  - Title-picture updated.
  - SW-Version incremented.
  - CEX2-FE: Jumper settings corrected.
  - Frontpage and last page in new design.
- 2010-10-27 Added and changed the following topics:
- New version of CEX2-FE added (HW and SW topics)
  - Obsolete information for out-of-date CEX2-FE added as attachment.
  - Obsolete information for out-of-date CEX2-V.35 added as attachment.
- 2011-02-14 Added and changed the following topics:
- Default Settings for Alarms and Traps added.
- 2011-04-26 Added and changed the following topics:
- ssh-support (chapter 7) added.
  - Settings for E1-service transmission more detailed.
- 2011-12-01 Added and changed the following topics:
- CEX2-E1R added.
- 2012-11-14 Added and changed the following topics:
- Jumper X1 on X.21-Interface is needed for proper termination of differential lines. This is now stated more clearly.
- 2013-04-03 Added and changed the following topics:
- For asynchronous operation, the CEX does now support “Internal” as well as “Remote” clock-mode.
  - The documentation is enhanced by depicting the alarms in more detail.

- The ax pinning overview is added as new “Appendix Pin”.





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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 fiber optic cables and connectors that are not in use to prevent breakage and contamination.
- Inspect all fiber 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.

- Set down cards with their component sides face up.
- 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.

## Fiber 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 fiber 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 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 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.

## 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

## Introduction

### CEX2 Description

#### General

The CEX - Connectivity E1/T1 for serial data stream is a flexible converter between fractional E1/T1 and a wide bunch of different interfaces. It offers bandwidth capability up to 2.048 Mbps and is based on a modular design to achieve an efficient and flexible concept. The support of variable customer interface modules with always the same configuration and maintenance views is an advantageous feature in handling and operating. With the combination of module and E1 interface modems it is possible to transmit various user-data over a standard TDM / PDH link. Several interfaces are possible for the CEX2:

- E1 unframed Leased Line (ITU-T (G.703)
- E1 framed Leased Line (ITU-T G.704)
- Fast Ethernet
- ISDN Digital Leased Line (ITU-T I.430)
- ISDN PRI (ITU-T I.431)
- Serial data in according different global standards
  - ITU-T X.21
  - ITU-T V.24 (RS-232)

Moreover, as part of arcutronix's Multi Service Platform, the CEX2 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, by using the IP forwarding feature 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.

The management capability of the CEX2 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.

## Application Areas for the CEX2

The CEX2 offers conversion and mapping of several interface-types into a TDM-based network. The TDM-side is always build for fractional E1 or fractional T1, which are public interfaces according ITU-T recommendation G.703 and G.704.

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

### Legacy Services

The CEX2 is mainly a copper converter for legacy services to PDH-type interfaces and vice versa. The legacy interfaces were very popular but today the most carries 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:

X.21	Traditional IP-Router I/F
V.24	Remote control and maintenance (RS-232)

### ISDN Digital Leased Circuit

The CEX2 together with the I.430 option is used to offer Digital Leased Circuits (DLC) over a PDH network. More and more carriers do not offer DLC at low bandwidth but the customers do still have equipment in usage. To support this equipment, the CEX2-I.430 can be used. 4 types of DLC are supported:

D64S	1x 64k
D64S2	2x 64k
S01/TS01	1x B-channel, 1x D-channel
S02/TS02	2x B-channel, 1x D-channel

**Note:** The names are common for DTAG. In other countries there are similar services with different names used.

### Ethernet Over PDH

Ethernet is packet-based interface, which is used more and more in the end-user's premise. The possibility to offer Ethernet-services is very important for all service providers. But Ethernet needs total different infra-structure, than a PDH/SDH based network does offer for service transport. To adopt the two divergent worlds, the CEX2-FE can be used. It maps Ethernet-packets into the (framed) E1/T1, to prepare it for further handling in the TDM metro and backbone.

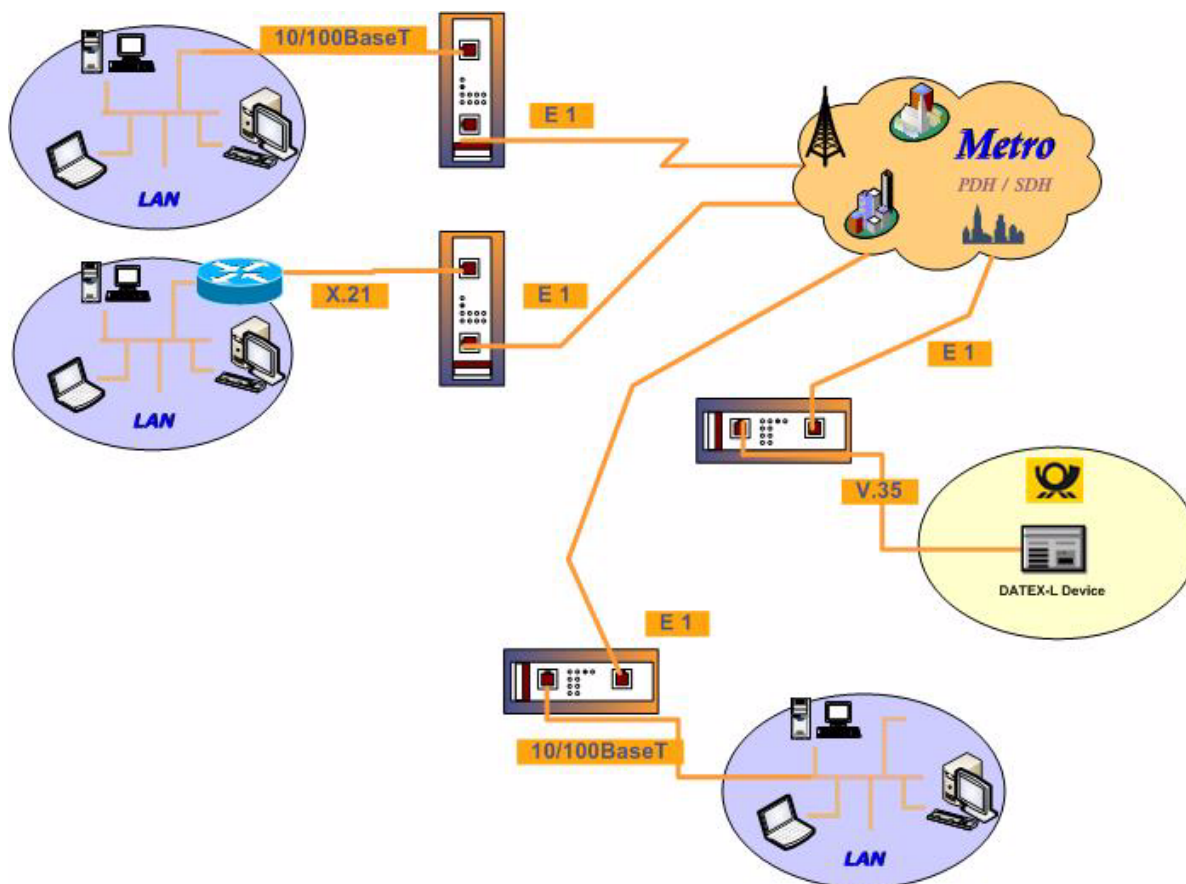


Figure 1-1 CEX2 applications in a modern network

## CEX2 Functions at a Glance

- Support of a wide range of copper interfaces, including E1, Ethernet, X.21, V.24 and I.430.
- Seven LED indicators and a loop button for easy service diagnostics.
- Local and remote loop-back, BER test and performance monitoring on line and interface ports.
- Fully management configuration via
  - RS232 / VT100 in the SHX3 singleslot housing or with the arcutronix system controller and agent card SCX2e.
  - Ethernet/ Telnet with the Agent SCX2e
  - SNMP with the Agent SCX2e
  - web-based GUI (http) with the Agent SCX2e
- Universal 3RU rack mount card for 19" chassis or single slot housing

- Software update support also remote over the line

## Error Recovery

If problems occur or if error messages will be displayed, please check whether the system has been installed as described in the installation instructions and whether all configuration rules have been followed.

## Order Matrix

The order matrix shows the available variants of the CEX - Connectivity E1/T1. Further options are possible on request.

**Table 1-1** Order Matrix

Art.- No.	Short Name	Description
0803-2100	CEX2-E1R	Serial Interface Converter, E1-Demarcation: <ul style="list-style-type: none"><li>• 2.048kbps;</li><li>• nx64kbps;</li><li>• 2x G.703/G.704 (RJ45);</li><li>• ITU-T I.431 (ISDN PRI)</li><li>• 3RU rack mount card.</li></ul>
0803-2220	CEX2-V.24	Serial Interface Converter: <ul style="list-style-type: none"><li>• up to 2.048kbps;</li><li>• 1x G.703/G.704 (RJ45);</li><li>• 1x V.24 (D-Sub25) port;</li><li>• 3RU rack mount card.</li></ul>
0803-2221	CEX2-X.21	Serial Interface Converter: <ul style="list-style-type: none"><li>• up to 2.048kbps;</li><li>• 1x G.703/G.704 (RJ45);</li><li>• 1x X.21 (D-Sub15) port;</li><li>• 3RU rack mount card.</li></ul>
0803-2230 (obsoleted!)	CEX2-V.35	Serial Interface Converter: <ul style="list-style-type: none"><li>• up to 2.048kbps;</li><li>• 1x G.703/G.704 (RJ45);</li><li>• 1x V.35 (Winchester) port;</li><li>• 3RU rack mount card.</li></ul>

**Table 1-1** Order Matrix

Art.- No.	Short Name	Description
0803-2240	CEX2-I.430	Serial Interface Converter: <ul style="list-style-type: none"><li>• up to 2.048kbps;</li><li>• 1x G.703/G.704 (RJ45);</li><li>• 1x DLC (I.430, RJ45);</li><li>• 3RU rack mount card.</li></ul>
0803-2280	CEX2-FE	Serial Interface Converter: <ul style="list-style-type: none"><li>• up to 2.048kbps;</li><li>• 1x G.703/G.704 (RJ45);</li><li>• 1x 10/100BaseTx (RJ45) Bridge-Module with speed auto-negotiation and VLAN support (802.1q);</li><li>• 3RU rack mount card.</li></ul>

## 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 1-2** *Accessories Housings & Cables*

Art.- No.	Short Name	Description
0805-9000	SRX10	Rack mount shelf: <ul style="list-style-type: none"><li>• 19" chassis</li><li>• Height: 3RU</li><li>• 10 slots for line-cards</li><li>• 1 slot for management</li><li>• 2 slots for modular AC (115/230V) and/or DC (-48V) power supplies</li></ul>
0805-9500 (obsolete!)	SRX24	Rack mount shelf: <ul style="list-style-type: none"><li>• 19" high density chassis;</li><li>• Height: 6RU;</li><li>• 24 slots for line-cards;</li><li>• 1 slot for management;</li><li>• 2 slots for modular AC (115/230V) and/or DC (-48V) power supplies.</li></ul>
0717-9001 (obsolete!)	SHX3-7W	Stand-alone housing: <ul style="list-style-type: none"><li>• 1 slot for 3RU line-card;</li><li>• max. 7W power consumption;</li><li>• VT100 Management port (D-Sub9);</li><li>• alarm contact;</li><li>• no ventilation;</li><li>• integrated wide range power supply;</li><li>• mains supply: 48VDC...110/230VAC;</li><li>• power jack included.</li></ul>
0717-9101	SHX3-15W	Stand-alone housing: <ul style="list-style-type: none"><li>• 1 slot for 3RU line-card;</li><li>• max. 15W power consumption;</li><li>• VT100 Management port (D-Sub9);</li><li>• alarm contact;</li><li>• with ventilation;</li><li>• integrated wide range power supply;</li><li>• mains supply: 48VDC...110/230VAC;</li><li>• power jack included.</li></ul>

**Table 1-2** Accessories Housings & Cables

Art.- No.	Short Name	Description
0717-9401	SHX3-10W	Stand-alone housing: <ul style="list-style-type: none"><li>• 1 slot for 3RU line-card;</li><li>• max. 10W power consumption;</li><li>• VT100 Management port (D-Sub9);</li><li>• alarm contact;</li><li>• no ventilation;</li><li>• integrated wide range power supply;</li><li>• mains supply: 48VDC...110/230VAC;</li><li>• power jack included.</li></ul>
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.





# Chapter 2

## Getting Started

For the startup of the CEX2 please follow the directions in this chapter. You must keep the operating conditions specified for the devices. In the following read about the startup preparation, the startup itself, and the possibility to automate the startup.



**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:

- An CEX2 system
- optional: SingleSlot Housing SHX3
- optional: Power Cord for AC

### Preparing the Startup

Before you switch on the device you need to check the operating conditions and install the CEX2 into the chassis or the single-slot 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 CEX2, are shown in Table 2-1.

**Table 2-1** Ambient Conditions

Operating Temperature	5°C to 40°C
Max. Relative Humidity (non-condensing)	85% (30°C)

**Table 2-1** Ambient Conditions

Input Voltage	+5V DC
Power Consumption	< 7 VA <sup>i</sup>

i. Depends on the given variant.

**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.

## CEX2 Mounting

To mount the CEX2 into the chassis please follow the subsequent step-by-step instructions.

1. Disconnect all cables from the CEX2 before mounting the device.
2. Place the CEX2 right way up on a table with the front panel looking in your direction.
3. Insert the CEX2 that way into the chassis. Mount the CEX2 to the chassis using the provided screws.
4. Connect the interface cables to the CEX2.

## Startup of the CEX2

### Switching on the Device

Switching on the CEX2, please observe the following instructions:

1. Connect the mains cable to the chassis or single-slot housing containing the CEX2.
2. Plug the mains plug of the mains cable in a Home Office socket.

## Configuration Methods

All configuration settings are made by using the management user I/F. For the system configuration you can choose one of the following configuration methods:

1. Local agent: To set up a connection to the system login using the telnet/SSH2 protocol or connect a serial terminal to the outband interface. A login screen will be presented to provide access to the local agent menus (Chapter 5, Control Software CEX2).
2. SNMP agent: You can use the SNMP protocol to manage the CEX2 (Chapter 6, SNMP and MIBs).
3. 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.

# Chapter 3

## Hardware

In this chapter beside a list of system components you will find a description of the function indicators and external interfaces for the CEX2.

The CEX2 is a compact unit. All external connection points for data lines and control elements are accessible on the front panel. The indicator elements are also on the front panel.

### Main Board

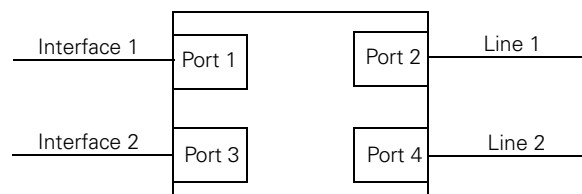
The different hardware variants of all CEX2 variants are based on the same basic main board. The main board consists of 6 basic parts:

- E1/T1 Line I/F
- Space for modular User-I/F
- Micro Controller with Flash, RAM etc.
- DC/DC Converter
- Backplane Connector
- Front-Plate with Connectors and Indicators

The User's interface is provided by a pluggable interface module, offering a wide set of different types of interfaces. The Line interface is according to the ITU-T G.703 specification, thus making the CEX2 to a device for lots of applications.

**NOTE:** There is a unique port numbering over all CEX2 variants (and other Connectivity products) as shown in Figure 3-1. If not all ports are equipped, the corresponding port number is missing in the overview.

E.g. CEX2-xxx: Only port 1 and port 2 can be found in the settings.



**Figure 3-1** Unique Port Numbering

Use a VT100 terminal at the agent's control port or the single-slot housing to configure the unit via the control software. For information on the features and the menu system see Chapter 4, Installation, Tests & Basics.

## CEX2 Front Panel

The CEX2 series offers on the front side the connectors for user and line interfaces plus a number of LEDs to show status of unit and interfaces.

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

Figure 3-2 provides the general front view of the CEX2.

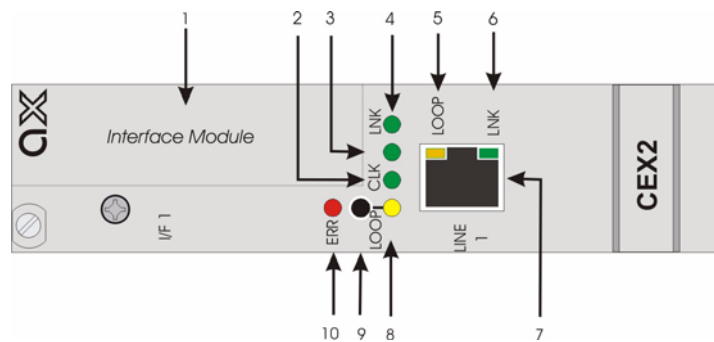


Figure 3-2 Front Panel CEX22 Rack Mount Card

## Common Indicators

Table 3-1 provides information on the indicator positions (see Figure 3-2) and explanations for the CEX - Connectivity E1/T1. The LEDs are related either to an interface port (marked as I/F) or a line port (marked as Line in the table below).

Table 3-1 Indicators of the CEX - Connectivity E1/T1

Pos.	LED	Color	Function	Normal Operation
1	-	-	This is the position of the interface module and its probe connector(s). Normally no LEDs are placed here, but all indicators are on the main-board.	
2	CLK - I/F	green	On, if the clock source is external from the interface port or both CLK-LEDs are on at internal clock source.	Depends on the setting.
3	FN - I/F	green	A signal is received on Interface port or handshake signal from local TE active.	On
4	LNK - I/F	green	Interface port 1 is fully working. Flashes, if no sync or AIS	On
5	LOOP - Line	yellow	Indicates an line loop: On: facility loop (data back to line) Flash: terminal loop (data back to I/F) <b>Note:</b> Both LOOP-LEDs are also on during the BER test and initialization	Off
6	LNK - Line	green	Link Up on the line port	On

**Table 3-1** Indicators of the CEX - Connectivity E1/T1 (continued)

Pos.	LED	Color	Function	Normal Operation
7	-	-	This is the RJ-45 connector of the line interface. Two LEDs are integrated in this connector (LED5 and 6).	
8	LOOP - I/F	yellow	Indicates an interface loop: On: facility loop (data back to I/F) Flash: terminal loop (data back to Line)  <b>Note:</b> Both LOOP-LED are also on during the BER test and initialization.	Off
9	LOOP Key	Push-Button	Loop configuration for service cases. See Chapter 4, Test-Loops for more details.	./.
10	ERR	red	Indicates an (enabled) alarm condition. The alarm output will also be active (alarm relay closed).	Off

**Note:** All LEDs are switched on during the power-up test of the CEX2.

**Note:** The meaning of the LEDs is the same for all CEX2 variants.

Table 3-2 provides the meanings for the indicator colors.

**Table 3-2** Indicator Color Meanings

Color	Meaning	Explanation
Green	Normal operation, signal level detection, mode display.	The LED indicators at the front of the CEX2 card will reveal its overall status. The colour of the LED indicator can help you to determine if there is a problem. The card is operating properly and no intervention is required, if only green LEDs are lit.
Yellow	Warning, indicates unusual operation modes like loop or test activity.	
Red	Indicates that errors and/or malfunctions have been occurred.	

## Loop Mode Key

You can activate respectively change loop modes by pressing the loop mode key (see Figure 3-2, position 6). The selected mode is indicated on the LOOP LEDs at the front panel (see Table 3-1, position 7, 8). A delay of 2 sec. after each pressing is taken, before the selected loop mode will be active. This delay avoids unwanted loops during the selection.

**Note:** Always deactivate a loop mode before you change to a new one.

**Table 3-3** Sequence for the Loop Mode Key Function

Loop Mode Key Pressed	Selected Loop / Result of the Sequence
1 times	facility loop on local interface port
2 times	facility loop on local line port
3 times	facility loop on remote interface port

**Table 3-3** *Sequence for the Loop Mode Key Function*

Loop Mode Key Pressed	Selected Loop / Result of the Sequence
4 times	facility loop on remote line port
5 times	or more will disable all loops

The management is not disturbed by loops. Loops can also be selected or changed via the control software.

## E1/T1 TDM Line-Interface

### G.703 TDM Port

The G.703 TDM port (see Figure 3-2) is capable to transfer data with a payload rate of  $n \times 64$  kbps up to 2.048 Mbps including the remote (inband) management. The line coding is based on the ITU-T G.703 standard (HDB3) which guarantees a balanced ratio on the copper.

For further information see Appendix A, Technical Specifications. Please, feel free to ask for additional options.

#### *G.704 Framing*

The ITU-T recommendation G.704 defines a framing structure for the 2.048kbps data-stream, which is transported over the copper line. The data-stream is divided into 32 channels, each offering a capacity of 64kbps. These channels are also called timeslots (TS0 - TS31). The first timeslot (TS0) is reserved for framing purposes, and alternately transmits a fixed pattern. This allows the receiver to lock onto the start of each frame and match up each channel in turn. The standards allow for a full Cyclic Redundancy Check to be performed across all bits transmitted in each frame, to detect if the circuit is losing bits (information).

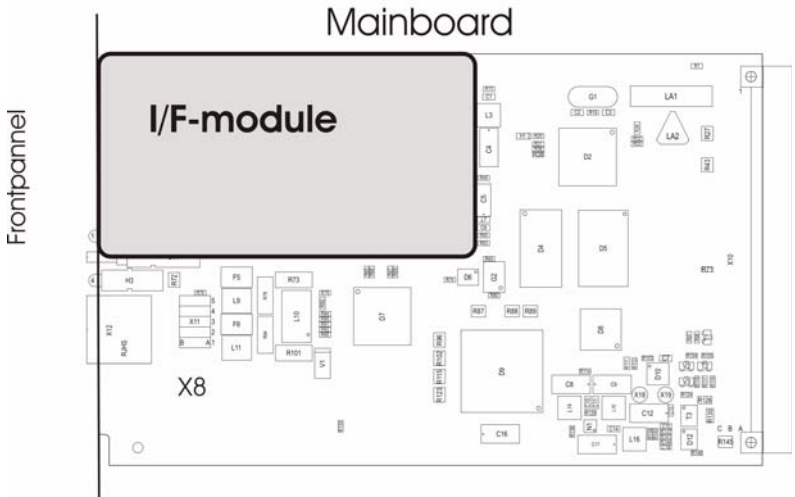
The CEX2 has to be operated in framed mode, if the service is configured to less than  $32 \times 64$  kbps usage. If the CEX2 is configured to an interface data-rate (payload) of  $32 \times 64$  kbps (= 2048kbps) the device automatically switches to unframed (clear channel) mode.

#### *Configuration of the TDM Line-Port*

The TDM Line-port can be operated in TE (Terminal Equipment) or NT (Network Termination) mode. The behavior is not much different, but the usage of the RJ-45 connector is changed. Signals, which are output in TE-mode, will become input in NT-Mode and vice versa.

The operation mode of TDM Line-Port can be set by a jumper block. See table below for the pin assignment in the different modes. The factory default is: TE-Mode.

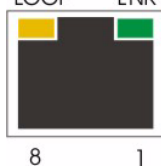
**Table 3-4** Setup Main Board with RJ-45 Interface Port

Position	Function
	
Jumpers A	The jumper block in A position sets the interface to TE (default setting).
Jumpers B	The jumper block in B position sets the interface to NT.

**Pinout**

The TDM interface is connected via RJ-45 plug on the front side of the CEX2. You will find more configuration information in the section “TDM Interfaces Menu” on page 4-60.

The pin assignment is as follows (TE pinning is default):

RJ-45	Pin	Assignment <sup>i</sup>	Direction TE-Mode	Direction NT-Mode
LED: yellow    green	1	TX+	Input	Output
	2	TX-	Input	Output
LOOP    LNK	3	CGND (Shielded ground, optional)	-	-
	4	RX+	Output	Input
	5	RX-	Output	Input
	6	CGND (Shielded ground, optional)	-	-
	7	-	-	-
	8	-	-	-

i. The pin assignment is ajar to PRI interface

The meaning and usage of the integrated LEDs is written above (Chapter 3, Common Indicators).

## **Alarms of the E1 Interface**

The E1 Interface can raise the “Link Down”-alarm, the “RX AIS”- alarm and the “No sync”-alarm. “No Sync” can only be detected, when the interface is operated in G.704 framed mode.

- “Link Down” is raised, when there is no input signal on the E1-Port. No input signal is detected by all-0s.
- “RX AIS” is raised, when there are less than 3 zeros within 512 bits.
- “No Sync” is raised, when the device is configured to use G.704 frame or multiframe mode and there is no valid frame (or multiframe) detected.

## **CEX2-E1B / CEX2-E1R**

### **Front View**

The CEX2-E1x variants offer E1 (G.703/G.704) to E1 modem. It can be used to either change impedance (75Ohm to 120Ohm and vice versa) or as a service demarcation point. The E1 can be delivered in either symmetrical (120 Ohms) or asymmetrical (75 Ohms) characteristic:

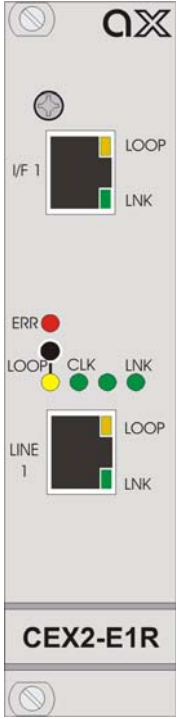
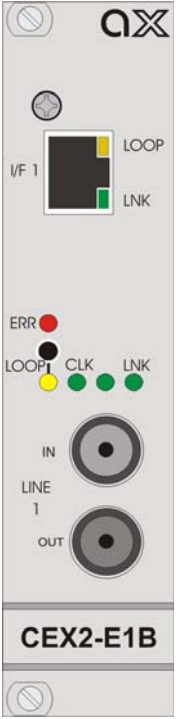
1. CEX2-E1B with 2x BNC connectors for 75 Ohm coax cables and
2. CEX2-E1R with 1x RJ-45 connector for 120 Ohm twisted pair cables.

The configuration for this is done via management.



Table 3-6 provides the front view of the CEX2-E1R and CEX2-E1B.

**Table 3-5** CEX2-E1x Front Views

View	Product Number & Details
	0803-4A00 . . . . . 0803-4L00
	Mounting screw in SRX or SHX.
	1x ITU-T G.703 E1-user port.
	1x ERR-LED.
	1x Loop-Button.
	4 LEDs for status indication.
	1x ITU-T G.703 E1-line port.
<b>CEX2-E1R</b>	Handle with Label.
	Mounting screw in SRX or SHX.
	
<b>CEX2-E1B</b>	

- 1 x ITU-T G.703 / G.704 (RJ45 or BNC),
- 1 x ITU-T G.703 / G.704 (RJ45).

**G.703 TDM Port**

The two G.703 ports on the CEX2-E1B and CEX2-E1R are identically. The behaviour, configuration and pinout is written in chapter above.

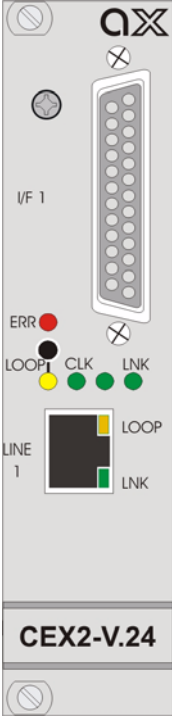
**CEX2-V.24**

**Front View**

The CEX2-V.24 is a converter between ITU-T V.24 (user I/F) and ITU-T G.703 / G.704 (line I/F). The ITU-T V.24 is also very popular named RS-232. The V.24 I/F can be operated and used for slow data-rates, only. The maximum data-rate supported is 230kbps (asynchronous) or 3x64kbps = 192kbps (synchronous). The operating mode and speed is configured via the management GUI. The V.24 I/F can be operated in either DTE or DCE mode. Please see below for details in configuration.

Table 3-6 provides the front view of the CEX2-V.24.

**Table 3-6** CEX2-V.24 Front View

View	Product Number & Details
	0803-2220
	Mounting screw in SRX or SHX.
	1x V.24-user port.
	1x ERR-LED.
	1x Loop-Button.
	4 LEDs for status indication.
1x ITU-T G.703 Line I/F.	
Handle with Label.	
Mounting screw in SRX or SHX.	

- 1 x ITU-T V.24 (D-Sub25),
- 1 x ITU-T G.703 / G.704 (RJ45).

The details about the Line-I/F and the LEDs are given above (Chapter 3, **E1/T1 TDM Line-Interface** and Chapter 3, **Common Indicators**). The electrical details of the V.24 pinning are given below.

### Configuration of the V.24 Interface

The V.24-I/F can be operated in DCE or DTE mode. The operating mode is chosen by a number of jumper-blocks (called X1 and X2), which must be change combined. Figure 3-3 shows the location of the jumper-blocks and the settings for DCE or DTE operation.

A third jumper (called X3) is located close to the front connector (D-Sub25). It is used to connect the digital ground (DG) of the chassis to the shielded ground of the interface connector. In the shown position (bottom), the DG is not connected to Shield.

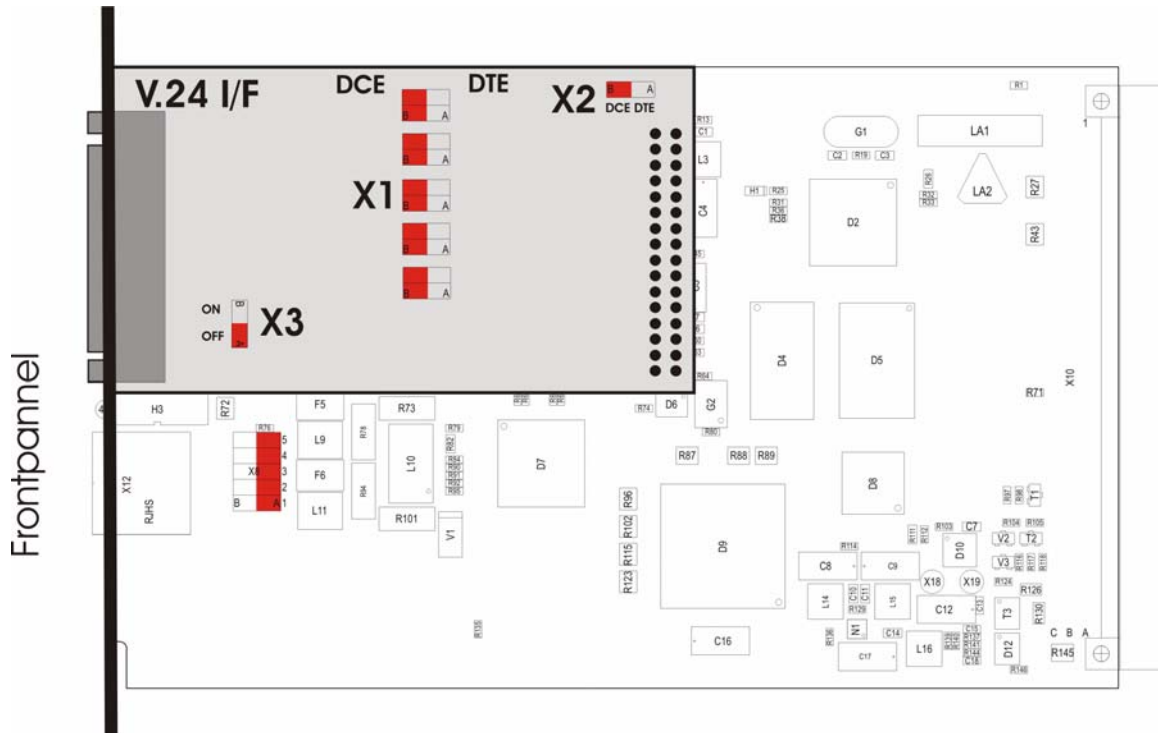


Figure 3-3 V.24 Interface Board

### Pin Assignment of the FemaleD-Sub25 Connector

Table 3-7 Pinning V.24 D-Sub25 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

Figure 3-4 V.24 Interface: D-Sub25 Connector

### Restrictions of Usable Clock Modes

The V.24 module supports a maximum transmission speed of asynchronous 230.2kbps and synchronous 192kbps.

The external clock is not defined and not available for asynchronous connections.

Clock	Mode Port 1 with V.24 Interface used as:	
Single	DCE	DTE
• internal	available	available
• external	not applicable	not applicable
• remote	available	available

### **Alarms of the V.24 Interface**

The V.24 Interface can raise the “Link Down”-alarm. The “RX AIS”- alarm and “No Sync”-alarm can not be raised by the V.24 Interface.

In DCE-mode:

- “Link Down” is raised, when the RTS-signal (pin 4 on the D-Sub25, see above) is 1 or not connected.

In DTE-mode:

- “Link Down” is raised, when the DCD-signal (pin 8 on the D-Sub25, see above) is 1 or not connected.

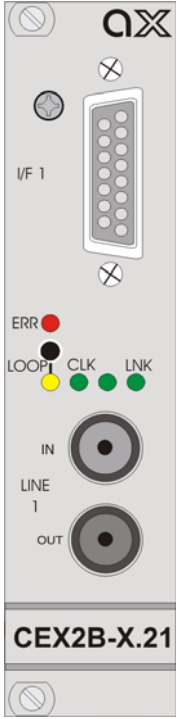
## **CEX2-X.21**

### **Front View**

The CEX2-X.21 is a converter between ITU-T X.21 (user I/F) and ITU-T G.703 / G.704 (line I/F). The X.21 I/F can be operated in N x 64kbps-steps, which is configured via the management GUI. The X.21 I/F can be operated in either DTE or DCE mode. Please see below for details in configuration.

Table 3-8 provides the front view of the CEX2-X.21.

**Table 3-8** CEX2-X.21 Front View

View	Product Number & Details
	0803-2221
	<p>Mounting screw in SRX or SHX.</p> <p>1x X.21-user port.</p> <p>1x ERR-LED.</p> <p>1x Loop-Button.</p> <p>4 LEDs for status indication.</p> <p>1x ITU-T G.703 Line I/F.</p> <p>Handle with Label.</p> <p>Mounting screw in SRX or SHX.</p>

- 1 x ITU-T X.21 (D-Sub15),
- 1 x ITU-T G.703 / G.704 (RJ45).

The details about the Line-I/F and the LEDs are given above (Chapter 3, **E1/T1 TDM Line-Interface** and Chapter 3, **Common Indicators**). The electrical details of the X.21 pinning are given below.

### Configuration of the X.21 Interface

The X.21-I/F can be operated in DCE or DTE mode. The operating mode is chosen by one single jumper called X2. The X.21 interface operates with differential signals with 100Ohm termination. Jumpers X1 (4x) do insert (or remove) termination resistors into the following signals:

Jumper	Signal	Position left ("DCE")	Position right ("DTE")
X1.1	-	unused	unused
X1.2	TA / TB	100 Ohm Termination	No Termination
X1.3	SA / SB	No Termination	100 Ohm Termination
X1.4	RA / RB	No Termination	100 Ohm Termination

Figure 3-3 shows the location of the jumper-blocks and the settings for DCE or DTE operation.

A third jumper (called X3) is located close to the front connector (D-Sub15). It is used to connect the digital ground (DG) of the chassis to the shielded ground of the interface connector. In the shown position (bottom), the DG is not connected to Shield.

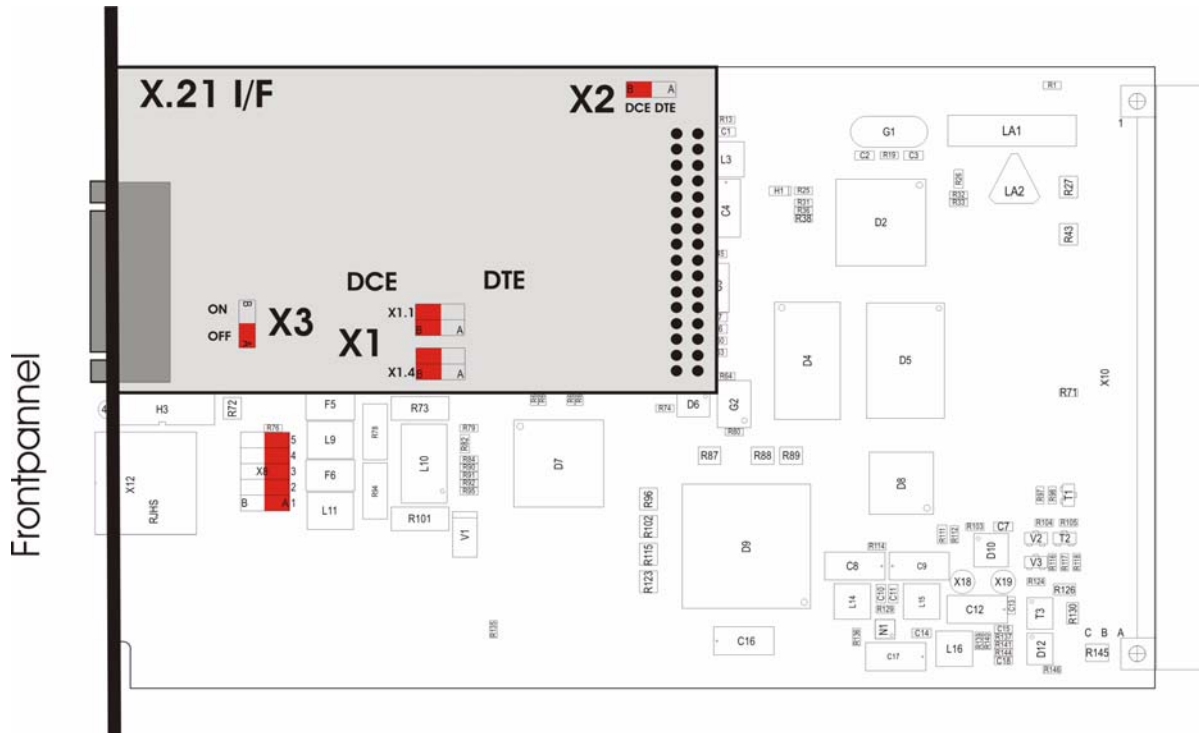
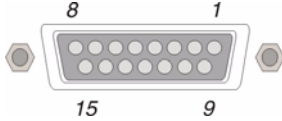


Figure 3-5 X.21 Interface Board

## Pin Assignment of the Female D-Sub15 Connector

**Table 3-9** Pinning X.21 D-Sub15 Connector



Pin	Signal	DTE Direction	DCE Direction
1	Shield	-	-
2	TA (Transmit A)	Out	In
3	CA (Control A)	Out	In
4	RA (Receive A)	In	Out
5	IA (Indication A)	In	Out
6	SA (Signal Timing A)	In	Out
7	unassigned	-	-
8	Ground	-	-
9	TB (Transmit B)	Out	In
10	CB (Control B)	Out	In
11	RB (Receive B)	In	Out
12	IB (Indicator B)	In	Out
13	SB (Signal Timing B)	In	Out
14	unassigned	-	-
15	unused	-	-

**Figure 3-6** X.21 Interface: D-Sub15 Connector

### Restrictions of Usable Clock Modes

Dual clock sources are not defined and not available for X.21 connections.

Single clock setting is conditional available if Port 1 is equipped with an X.21 interface. Conditional available clock mode settings for Port 1 with X.21 are:

Clock	Mode Port 1 with X.21 Interface used as:	
	DCE	DTE
Single		
• internal	available	not applicable
• external	not applicable	available
• remote	available	not applicable

### Alarms of the X.21 Interface

The X.21 Interface can raise the “Link Down”-alarm. The “RX AIS”- alarm and “No Sync”-alarm can not be raised by the X.21 Interface.

In DCE-mode:

- “Link Down” is raised, when the control-signal (CA/CB on pins 3 and 10 on the D-Sub15, see above) is 1 or not connected.

In DTE-mode:

- “Link Down” is raised, when the indication-signal (IA/IB on pins 5 and 12 on the D-Sub15, see above) is 1 or not connected.

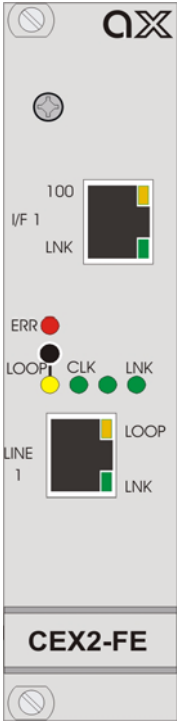
## CEX2-FE

### Front View

The CEX2-FE is a converter between Fast Ethernet IEEE 802.3-2002 (user I/F) and ITU-T G.703 / G.704 (line I/F). The Fast Ethernet I/F can be operated in several modes (Full duplex, Half duplex, 10Mbps, 100Mbps). On the line-side, the CEX2-FE offers payload bandwidth in N x 64kbps-steps, which is configured via the management GUI. Please see below for details in configuration.

Table 3-10 provides the front view of the CEX2-FE.

**Table 3-10** CEX2-FE Front View

View	Product Number & Details
 <p>The image shows the front panel of the CEX2-FE module. At the top left is a mounting screw. To its right is the 'aX' logo. Below the logo is another mounting screw. The main panel features two RJ45 ports: 'I/F 1' (user port) and 'LINE 1' (ITU-T G.703 Line I/F). Between these ports are four LEDs labeled 'ERR', 'LOOP', 'CLK', and 'LNK'. A 'LOOP' button is located between the 'LOOP' and 'LNK' LEDs. The module is labeled 'CEX2-FE' at the bottom, with a mounting screw at the bottom left.</p>	<p>0803-2280</p> <p>Mounting screw in SRX or SHX.</p> <p>1x FE-user port.</p> <p>1x ERR-LED.</p> <p>1x Loop-Button.</p> <p>4 LEDs for status indication.</p> <p>1x ITU-T G.703 Line I/F.</p> <p>Handle with Label.</p> <p>Mounting screw in SRX or SHX.</p>

- 1 x IEEE FE (RJ45),
- 1 x ITU-T G.703 / G.704 (RJ45).

The details about the Line-I/F and the LEDs are given above (Chapter 3, **E1/T1 TDM Line-Interface** and Chapter 3, **Common Indicators**). The electrical details of the FE pinning are given below.



## Ethernet Remote Bridge Functionality

The CEX2 version with an Ethernet bridge module (CEX2-FE) is able to connect two networks over a long distance. It supports automatic detection of the connection speed (10/100 Mbps autosensing) and also the transmission of jumbo frames up to 2048 bytes frame size.

The CEX2-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 the common speed (10 or 100Mbps) and the duplex mode (full duplex or half duplex) are defined for the established link. 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 can always occur problems when devices try to do auto-negotiation. For this reason, CEX2 supports world's widest range of different settings to allow an interoperability with all known vendors of Ethernet devices. There are modes, where no auto-negotiation is done at all ("fixed") and the given settings are used. all other modes do auto-negotiation with the peered interface, but the possibilities are limited to the configured options. If the peered interface does not support auto-neg, too, it is the best to used the fixed mode, while otherwise problematic results can be achieved.

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

**Table 3-11** *Settings Auto-Negotiation*

Setting	Result		Remark
	Speed	Duplex	
Auto Speed, Auto Duplex	10, 100 or 1000 Mbps <sup>i</sup>	Full or Half Duplex <sup>ii</sup>	Auto-neg takes place; no limitations given.
Auto Speed, FDx	10, 100 or 1000 Mbps <sup>i</sup>	Full Duplex	Auto-neg takes place for speed; Duplex mode is given.
Auto Speed, HDx	10, 100 or 1000 Mbps <sup>i</sup>	Half Duplex	Auto-neg takes place for speed; Duplex mode is given.

**Table 3-11** Settings Auto-Negotiation

Setting	Result		
	Speed	Duplex	Remark
100Mbit/s, Auto Duplex	100 Mbps (FastE)	Full or Half Duplex <sup>ii</sup>	Auto-neg takes place for duplex mode; speed is given.
100Mbit/s, FDx	100 Mbps (FastE)	Full Duplex	Auto-neg takes place; Speed and Duplex mode are given.
100Mbit/s, HDx	100 Mbps (FastE)	Half Duplex	Auto-neg takes place; Speed and Duplex mode are given.
100Mbit/s, FDx fixed	100 Mbps (FastE)	Full Duplex	No Auto-neg is done; Speed and Duplex mode are given.
100Mbit/s, HDx fixed	100 Mbps (FastE)	Half Duplex	No Auto-neg is done; Speed and Duplex mode are given.
10Mbit/s, Auto Duplex	10 Mbps	Full or Half Duplex <sup>ii</sup>	Auto-neg takes place for duplex mode; speed is given.
10Mbit/s, FDx	10 Mbps	Full Duplex	Auto-neg takes place; Speed and Duplex mode are given.
10Mbit/s, HDx	10 Mbps	Half Duplex	Auto-neg takes place; Speed and Duplex mode are given.
10Mbit/s, FDx fixed	10 Mbps	Full Duplex	No Auto-neg is done; Speed and Duplex mode are given.
10Mbit/s, HDx fixed	10 Mbps	Half Duplex	No Auto-neg is done; Speed and Duplex mode are given.

i. Depending on ports capability and auto-negotiation result.

ii. Depending on auto-negotiation result. All CEX2 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 CEX2-FE provides this mechanism for the FE-interface to control the receive data, so that the TDM-bridge is not overwhelmed with data from the transmitting node. The CEX2-FE 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.

### **Restrictions of Usable Clock Modes**

The external clock is not defined and not available for Ethernet connections.


### Pin Assignment Ethernet 10/100BaseTx I/F Connector RJ-45

The CEX2-FE has one electrical Fast-Ethernet port. For the interface two indicators give information on the Link state (LNK) and 10/100BaseTX (100). 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 (see above). The data rate is either 10 Mbit/s or 100 Mbit/s. The protocol is according to IEEE 802.3 10BaseT or 100BaseTX. Auto negotiation and auto cross-over are supported.

**Table 3-12** Electrical Interfaces

Item	Values
Standards:	IEEE802.3, 802.3u, 801.1 p&Q
Ports:	up to 8x 10/100BaseT
Data rate:	10Mbit/s or 100Mbit/s auto negotiation, full- or half-duplex, bandwidth limitation
Range:	Up to 100m over UTP-5 cable
Connectors:	RJ-45 8-pin

The connector is a RJ-45 plug with 2 LEDs, which indicate established Link (green LED on the left side) and the data rate (green LED, right). The pin assignment of the RJ45 is as follows:

RJ-45	Pin	Assignment
LED:	1	TD+
yellow    green	2	TD-
100        LNK	3	RD+
	4	-
	5	-
	6	RD-
	7	-
	8	-

- The green LED (right, 'LNK') indicates, when the link is established and packets are transferred.
- The yellow LED (left, '100') indicates a 100BaseT link. if the LED does not lid, the link is established with 10BaseT, only.

The device 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 to ensure 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  $\Omega$ . 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.

**NOTE:** All LEDs are switched on during the power-up test of the CEX2.

### **Alarms of the FE Interface**

The FastEthernet Interface can raise the “Link Down”-alarm. The “RX AIS”- alarm and “No Sync”-alarm can not be raised by the FE Interface.

- “Link Down” is raised, when the Ethernet PHY does not detect a link.

## **CEX2-I.430**

### **Front View**

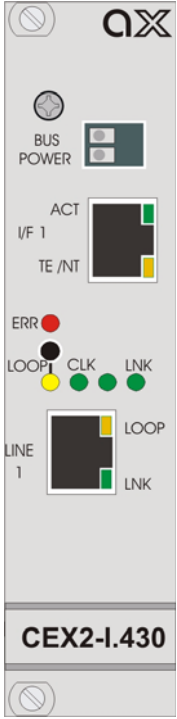
The CEX2-I.430 is a converter between ITU-T I.430 (ISDN S0-user I/F) and ITU-T G.703 / G.704 (line I/F). The ISDN-S0 I/F includes 2x B-channels (64kbps) and one D-channel (16kbps). On the I/F the baud-rate is 192kbps, including frame and overhead. Both B-channels and the D-channel can be selected to be mapped into the line I/F, where the configuration is done via the management GUI.

The ISDN-S0 I/F can be operated in either TE or NT mode. Please see below for details about the configuration.

The power connector on the front can be used to feed the ISDN-S0 I/F towards the connected terminals.

Table 3-13 provides the front view of the CEX2-I.430.

**Table 3-13** CEX2-I.430 Front View

View	Product Number & Details
	0803-2240
	Mounting screw in SRX or SHX.
	Power Connector for 48VDC input (feeding of ISDN-bus)
	1x I.430 (ISDN-S0)-user port.
	1x ERR-LED, 1x Loop-Button. 4 LEDs for status indication.
	1x ITU-T G.703 Line I/F.
<b>CEX2-I.430</b>	Handle with Label. Mounting screw in SRX or SHX.

- 1 x Power Connector,
- 1 x ITU-T I.430 (RJ45, ISDN-S0),
- 1 x ITU-T G.703 / G.704 (RJ45).

The details about the Line-I/F and the LEDs are given above (Chapter 3, **E1/T1 TDM Line-Interface** and Chapter 3, **Common Indicators**). The electrical details of the ISDN-S0 pinning are given below.

### Configuration of the ISDN-S0 Interface

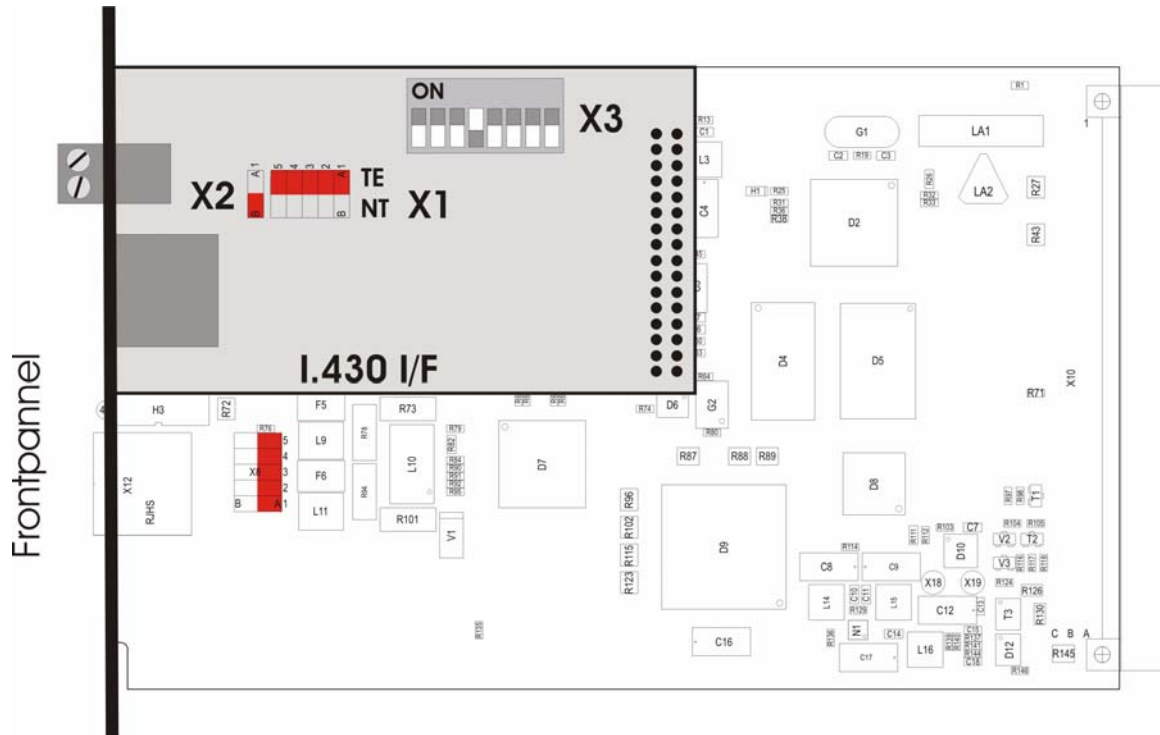
The ISDN-S0-I/F can be operated in TE or NT mode. The operating mode is chosen by a jumper-block (called X1), which must be set accordingly. Figure 3-7 shows the location of X1-block and the settings for TE or NT operation.

**NOTE:** Set this unit to NT mode if the user equipment is a TE, and vice versa. Ensure that the ISDN bus contains only one piece of user equipment which operates as NT.

A second jumper (called X2) is used to disconnect the front power-connector durable from the S0-I/F. This gives you safety in case the unit shall not feed the bus. Any

attached cable on the front will have no influence to the bus! The position shown in the picture below, disables the feeding current! This is normally used for TE-setting.

**NOTE:** Jumper X2 operates mirror inverted to jumper X1: In TE-mode X2 must be in the shown position. In NT-mode, X2 must be placed to the top position.



**Figure 3-7** I.430 Interface Board

The setting, which of the 2 B-channels and the D-channel will be transported via the line-I/F is done with the help of DIP-switch X3. See Table 3-14 for details.

**NOTE:** Only slide 1-4 are used. The rest (5-8) are unused but must be left in given position (“OFF”).

**NOTE:** Corresponding settings must be configured via management to guarantee proper operation!

Slide 1-3 define the used channel capacity. The standard usage is all 3 slides set to OFF.

**Table 3-14** I.430 Settings

Mode	DIP-Switch			Mgmt-Settings			
	SW1	SW2	SW3	NT		TE	
				Clock Source	Time Slots	Clock Source	Time Slots
S0/256k: 2xB + D	off	off	off	remote	4	external	4
S0/192k: 2xB + D	on	on	on	remote	3	external	3
I.430/B1 only	on	off	off	remote	1	external	1

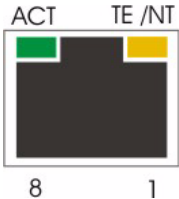
**Table 3-14** I.430 Settings

Mode	DIP-Switch			Mgmt-Settings			
	SW1	SW2	SW3	NT		TE	
				Clock Source	Time Slots	Clock Source	Time Slots
I.430/B2 only	off	on	off	remote	1	external	1
I.430/B1 + D	on	off	on	remote	2	external	2
I.430/B2 + D	off	on	on	remote	2	external	2
n.a.	-	off	off				

Slide 4 defines whether the 100Ohm termination is enabled or not. Set slide 4 to ON to enable 100Ohm S0-Termination. This setting is the default value and recommended.

### Pin Assignment ISDN-S0 Connector RJ-45

The pin assignment is as follows (TE pinning is default):

RJ-45	Pin	Assignment <sup>i</sup>	Direction TE-Mode	Direction NT-Mode
LED:	1	-	-	-
	2	-	-	-
	3	TX+	Output	Input
	4	RX+	Input	Output
	5	RX-	Input	Output
	6	TX-	Output	Input
	7	-	-	-
	8	-	-	-


i. The pin assignment is ajar to PRI interface

- The yellow LED (right, 'TE /NT') provides information about the selected mode
  - on: the S0-I/F is operated in TE-mode
- The green LED (left, 'ACT') indicates whether the S0-bus is activated:
  - on: S0-bus is activated.
  - flashing: S0-bus is not activated

### Pin Assignment of the Power Connector

**Table 3-15** Pinning Power Connector

Pin	Signal	TE Mode
1	GND	Input
2	-48VDC	Input



**Figure 3-8** ISDN-S0: Power Connector

## Restrictions of Usable Clock Modes

Dual clock sources are not defined and not available for ISDN-S0 connection.

Single clock setting is conditional available for ISDN-S0 interface. Conditional available clock mode settings for ISDN are:

Clock	Mode ISDN-S0 Interface used as:	
Single	NT	TE
internal	available	not applicable
external	not applicable	available
remote	available	not applicable

## Alarms of the I.430 Interface

The I.430 Interface can raise the “Link Down”-alarm. The “RX AIS”- alarm and “No Sync”-alarm can not be raised by the ISDN Interface.

- “Link Down” is raised, when the S0-Port does not detect a link.

# CEX2 Rear Connector

The CEX2 series has a connector on the rear-side offering the possibility to use the devices either in 19” racks or single-slot housing.

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

## RS-232 Interface

### Management Port

The internal management port of the CEX2 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 singleslot housing with management connector. Also, SNMP management and web-based GUI according to the new advanced management concept is supported. The CEX2 allows to provide status information and to manage the devices (via a processing unit). The remote unit can be accessed via the line port. Inband management via the copper E1 data stream is used for the management of the remote unit.

The asynchronous RS-232 interface is used for the outband administration of the device. It is only available if the CEX2 is placed in a single-slot housing.



The standard transmission parameters for the outband interface is shown in Table 3-16. Function Indicators

**Table 3-16** *Transmission Rate of the RS-232 Interface*

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

## Power Supply

For the CEX2 the operating voltage is fed through the backplane connector of the device. 5VDC must be applied to the unit for proper operation.



# Chapter 4

## Installation, Tests & Basics

This chapter provides the installation and removal procedures for the CEX2 rack mount cards in an arcutronix Multi Service System. It also provides hints for testing and troubleshooting.

### Preparation

The installation of an arcutronix Multi Service System or a singleslot housing is described in the documentation of these parts. Care has to be taken to meet the requirements of power supply, air conditioning and proper environmental conditions.

1. Install the rack mount cards and other components.  
Connect the cabling: Data cabling first, control cabling last. Do not connect any cables before the system has been mounted.
2. Configure the system.  
Use a PC with VT100 emulation software at the singleslot housing's or agent card's RS-232 control port to configure the unit.

### ESD Protection of Cards



**CAUTION:** Discharge of static electricity (ESD) can damage or degrade electronic components. Follow proper ESD procedures when working with the components of the arcutronix Multi Service System. For further information on ESD refer to the section "Preventing Damage From Electrostatic Discharge" on page 0-2.

**NOTE:** Always use an ESD wrist strap with a metal clip for grounding.

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.

### Environmental Conditions

Environmental conditions must be met. The air condition must be capable of keeping the temperature inside the allowed ranges. Observe that the allowed temperature ranges during storage and operation are different. Furthermore, the air condition must keep the humidity within the allowed range. High air temperature and low system temperature can cause condensation. Condensation must be prevented under any circumstances. The maximum thermal load of the unit equals the maximum effective power dissipation of the system, as explained in the previous chapter.

## Installation Hints

**CAUTION:** The air flow concept requires closed card slots. Always mount cover plates on empty slots to avoid local increase of temperature.

All arcutronix Multi Service System devices offer hot-swap capability and can be replaced while power is applied to the system.

## Power Management

The intelligent arcutronix Multi Service System power management is a power share bus, indicating the available power which is left to feed the rack mount cards. This allows an effective utilization of the power supply capabilities.

Each chassis has its specific power to feed the rack mount cards. This power depends on the capabilities of the power supply used. The remaining power of the chassis will be recalculated after a card has been inserted.

**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 (SHX) or if the whole system is powered up simultaneously. Once 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. This also means that if a rack mount card was rejected, it stays rejected, even if later the whole power resources are released.
- 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 analyze 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. Such a failure will be indicated by an acoustic alarm (1 kHz) activated by the main agent. Furthermore, the “PS” LED of the “Alarm Out” component will be switched on.

## Field Installation of CEX2 Cards

### Installation

Procedure to install an CEX2 rack mount card in the arcutronix Multi Service System:



**CAUTION:** Prevent electrostatic discharge. Observe the ESD procedures and precautions below when you are handling the CEX2 hardware.

**NOTE:** Always use an ESD wrist strap with a metal clip for grounding. Ground the ESD wrist strap to the chassis.

**Tools Required:** A medium head Phillips (“Crosshead”) screwdriver is required. Use screwdrivers with the correct size.

1. Unscrew the cover plate of the slot you want to use and remove the cover plate.
2. Take the CEX2 card out of the anti-static bag.
3. Insert the card into the rails of the chassis (make sure that it slides in the rails).
4. Slide it in until you feel resistance and set the card into place.
5. Using the screwdriver secure the CEX2 card’s 2 self-retaining screws.
6. Connect the cabling to the user port and the line port.

After power-on the CEX2 rack mount card initializes itself.

### Removal

Procedure to remove an CEX2 rack mount card from the arcutronix Multi Service System:



**CAUTION:** Prevent electrostatic discharge. Observe the ESD procedures and precautions below when you are handling the CEX2 hardware.

**NOTE:** Always use an ESD wrist strap with a metal clip for grounding. Ground the ESD wrist strap to the chassis.

**Tools Required:** A medium head Phillips (“Crosshead”) screwdriver is required. Use screwdrivers with the correct size.

1. Disconnect all cables from the CEX2.
2. Using the screwdriver loosen the CEX2 card’s 2 self-retaining screws, until you can feel that the screws have left the thread.
3. Pull out the card. Place it in an anti-static bag.
4. Close the gap of the card slot with a cover plate or with a spare rack card.
5. Fasten the fixing screws.

## Power-Up Sequence

After providing power to the CEX2 by either plugging it into the arcutronix Multi Service System chassis or connecting the AC/DC-converter to the stand-alone chassis, the CEX2 will be powered up. The start-up will take several seconds, while internal SW is started and some tests are done to verify the CEX2 is not damaged and proper operation can be guaranteed.

The power-up sequence is indicated by special behavior of the LEDs in the front-plate. after finishing the start-up, the LEDs will operate “normal” and indicate status and alarms of the unit, as written in this book.

The special behavior 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 it is operational.

**NOTE:** After finishing the start-up, the unit is operational in meaning of data transmission and all services are running. The management access will be started a little later, as additional tasks have to be started here for.

### LED start up

All LEDS are grouped together in 2 groups which offer the same behavior during start-up:

- Build-in RJ-45 connectors, (E1/T1 LEDs for LOOP and LNK)
- all other LEDs (ERR, CLK, LOOP, LNK)

The flow of these LED groups is depicted in the following table.

**Table 4-1** LED start up

State	Build-in RJ45	Others	after time
S1 (after Power On)	both LEDs are off	all LEDs are off	0 sec
S2	both LEDs are off	all LEDs are on	2 sec
O1	LED LNK is on, LED LOOP is off.	LED ERR is off, LED LOOP is off, LED CLK is off (depending on Clock-Settings), LED LNK is on.	14 sec

**Note:** Sx = Startup state; O1 = Operational State reached.

## Setup Sequence & Starting Procedures

This chapter provides procedures for setting up configurations and starting the CEX - Connectivity E1/T1. All configurations of the CEX2 are made via the control software. For details see Chapter 5, Control Software CEX2.

### Clock Mode Diagrams

The clock mode for the CEX2 can be set by the software, see Chapter 4, Installation, Tests & Basics. It depends on the installed module at PORT 1 I/F, if a clock mode is applicable. Restrictions of usable clock modes are found in the interface description. The default values for clock settings are internal clock, single clock source.

The CEX2 supports synchronous and asynchronous clock modes on the datacom interfaces (V.35, X.21 and V.24).

### Clock Mode Comments

In synchronous communication, a periodic clock signal is used to synchronize transmission and reception of data and control characters.

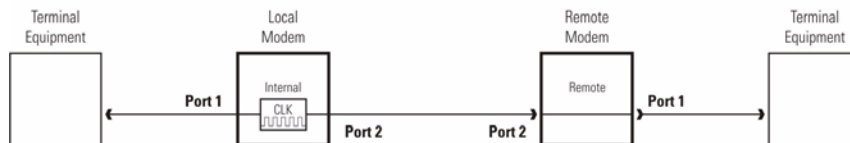
- 1 Internal** The clock is generated by the internal clock generator.
- 2 External** The clock is provided by the local terminal equipment.
- 3 Remote** The local channel receives the clock via the link from the distant channel.

### Single Clock Source

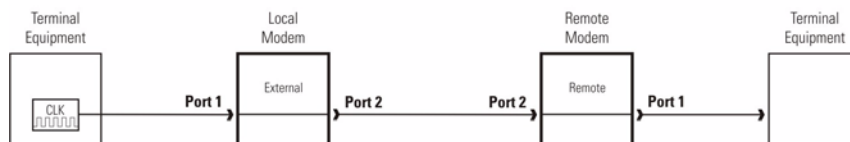
Transmit and receive data operate with the same clock source.

Single clock source for transmit and receive

Variant 1:



Variant 2:



**Figure 4-1** Single Clock Source



## Dual Clock Sources

Dual Clock means, that the CEX2 does operate in “plesio-chronous” clock-mode: The two data-streams are operated with different clock (external) sources. This is the case, when the two connected Terminals do both operate with internal clock-source and are not synchronized to each other.

Dual clock sources for transmit and receive

Variant 3:

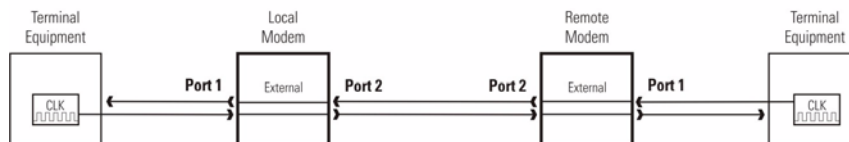


Figure 4-2 Dual Clock Sources

For Dual Clock Source it is recommended to operate both modem (local and remote) in the “External” clock mode. “Internal” is allowed, but not recommended. “Remote” clock mode is not allowed, as this would lead to a clock-loop!

**NOTE:** It is mandatory that the two Terminals are operating with clocks not more than 50ppm difference.

## Asynchronous Clock-Mode

Neither transmission nor reception on I/F-port has dedicated clock-signal. The clocking information comes within the data.

CEX2 works with over-sampling of the incoming data-stream, so all possible modes of asynchronous data-transmission can be supported. Please configure the CEX2 to “Internal” or “Remote” clocking mode in case asynchronous clock mode is selected. The over-sampling frequency is defined by the number of used times-slots. Use more than double frequency for over-sampling (according Nyquist-Shannon sampling theorem), recommended is a over-sampling rate of 6 times to reduce jitter at the egress.

Asynchronous Clock Mode

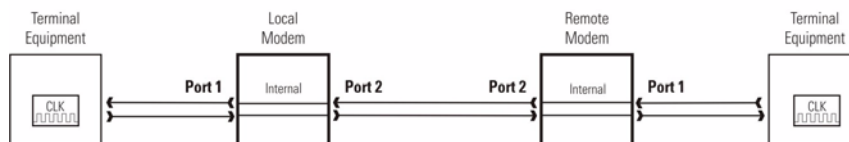


Figure 4-3 Asynchronous Clock Mode

Table 4-2 shows the recommended number of time-slots and the resulting over-sampling rate for asynchronous data-rates:

Data-Rate	Time-Slots	Oversampling Rate
<= 9600 kBaud/s	1	64 kbps
14400 kBaud/s	2	128 kbps
19200 kBaud/s	2	128 kbps
38400 kBaud/s	4	256 kbps
57600 kBaud/s	6	384 kbps
115200 kBaud/s	11	704 kbps
230400 kBaud/s	22	1408 kbps

**Table 4-2** *Oversampling of Asynchronous Data-Rates*

## E1 Transmission Standard

### E1-Basics

A 2.048 Mbps circuit provides high speed, digital transmission for voice, data, and video signals. 2.048 Mbps transmission systems are based on the ITU-T specifications G.703 and G.704. The 2.048 Mbps standards are now firmly established for transmission systems and used by telecommunication network suppliers, international carriers and end users.

The line code to transmit the 2.048 Mbps signal is known as HDB3 (High Density Bipolar 3) which is a bipolar code with a specific zero suppression scheme where no more than three consecutive zeros are allowed to occur.

The 2.048 Mbps signal typically consists of multiplexed data and/or voice which requires a framing structure for receiving equipment to properly associate the appropriate bits in the incoming signal with their corresponding time slots. Framing for the 2.048 Mbps signal as defined in ITU-T Recommendation G.704 is broken up into 32 timeslots numbered 0-31. Each timeslot contains 8 bits in a frame, and since there are 8000 frames per second, each time slot corresponds to a bandwidth of  $8 \times 8000 = 64$  kbps.

Time slot 0 is allocated entirely to the frame alignment signal (FAS & NFAS) pattern, which can contain a remote alarm (FAS Distant Alarm) indication bit and CRC4 checksum bit.

If there are voice channels on the 2.048 Mbps signal, it is necessary to take up additional bandwidth to transmit the signaling information. ITU-T Recommendation G.704 allocates time slot 16 for the transmission of the channel-associated signaling (CAS) information. However, the 8 bits in time slot 16 are not sufficient for all 30 channels to signal in one frame. Therefore, a multiframe structure is required where channels can take turns using time slot 16.

The E1 interface can be operated in a transparent (non-fractional) or fractional mode to offer a wide range of different applications / services. In fractional mode only a subset of timeslots are transported via the G.SHDSL-Line to reduce the required bandwidth and increase the possible distance to reach. On the ingress side, the not-needed timeslots are removed and filled with All-1s on the egress-side.

Based on these basics the CEX2 supports the following transmission modes for E1:

**Table 4-3** E1 Transmission modes of the CEX2

Mode	Frame Description	Note
E1-unframed	Plain 2048 Mbps transmission. Also known as "Clear Channel" mode.	Transparent transmission of each bit. Can be used for structured and unstructured data streams.
E1-PCM31 fractional and non-fractional	TS0 contains the G.704 framing pattern. TS1-31 contain the payload.	G.704-doubleframe-detection and -supervision at the CEX2-ingress.  If the (transparent) transport of TS0 is disabled, the G.704-frame is renewed at the CEX2-egress, otherwise TS0 is unchanged.

**Table 4-3 E1 Transmission modes of the CEX2**

Mode	Frame Description	Note
E1-PCM31C fractional and non-fractional	TS0 contains the G.704 framing pattern with CRC4 checksum. TS1-31 contain the payload.	G.704-multiframe-detection and -supervision at the CEX2-ingress.  If the (transparent) transport of TS0 is disabled, the G.704-multiframe is renewed at the CEX2-egress, otherwise TS0 is unchanged.  The CRC error statistic can be monitored in the performance monitor.
E1-PCM30 fractional and non-fractional	TS0 contains the G.704 framing pattern. TS16 is reserved for signalling (CAS). TS1-15 & 17-31 contain the payload.	G.704-doubleframe-detection and -supervision at the CEX2-ingress.  If the (transparent) transport of TS0 is disabled, the G.704-frame is renewed at the CEX2-egress, otherwise TS0 is unchanged.  If the (transparent) transport of TS16 is disabled, it will be renewed at the CEX2-egress <sup>i</sup> , otherwise TS16 is unchanged.
E1-PCM30C fractional and non-fractional	TS0 contains the G.704 framing pattern with CRC4 checksum. TS16 is reserved for signalling. TS1-15 & 17-31 contain the payload.	G.704-multiframe-detection and -supervision at the CEX2-ingress.  If the (transparent) transport of TS0 is disabled, the G.704-multiframe is renewed at the CEX2-egress, otherwise TS0 is unchanged.  If the (transparent) transport of TS16 is disabled, it will be renewed at the CEX2-egress <sup>i</sup> , otherwise TS16 is unchanged.

i. The TS16 generation pattern in the CEX2 is defined as  
Frame 0: 00001011  
Frame 2-15: 01100110

### **Convert Serial Data To E1 and vice versa**

The CEX - Connectivity E1/T1 offers the possibility to map serial data into E1, a common PDH interface. Though it is possible to transmit serial data streams through a PDH/SDH network.

To adapt the serial data stream to the E1 frame, it is necessary to configure the timeslots used as follows:

**Table 4-4** Timeslot Configuration

Item	Values	Note
Start Timeslot	0..31	Begin of the serial data stream in the E1 frame. Do not use 0 for this application, because TS0 is needed for the frame word.
Number of used Timeslots	1..32	The number of the timeslots used is equal to the data rate of the serial stream in 64 kbps steps.

**Table 4-5** Example

A CEX2 with X.21 module shall convert 1024kbps (X.21) into 2048kbps (E1):

Settings for CEX2-X.21:

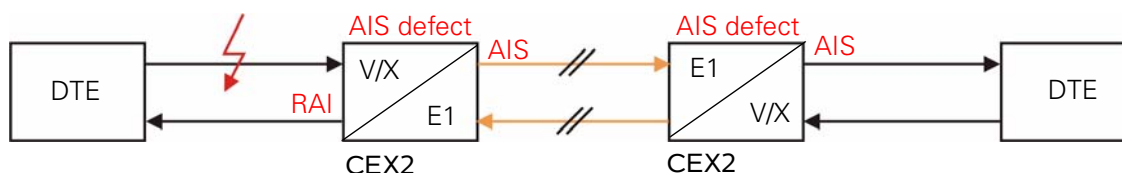
==> 16 timeslots must be allocated in E1 stream

See the timeslots below, to be used.

TS0	1	2	3	4	5	...	15	16	17	18	19	29	...	29	30	31
FAS			D1	D2	D3	...	D13	CAS	D14	D15	D15		...			
NFAS																

## Link Loss Indication

The CEX2 provides the Alarm Indication Signal (AIS) for the Link Loss detection. The CEX2 can generate an SNMP trap and switch the alarm signal on the AIS event. These functions are selectable via the software configuration.

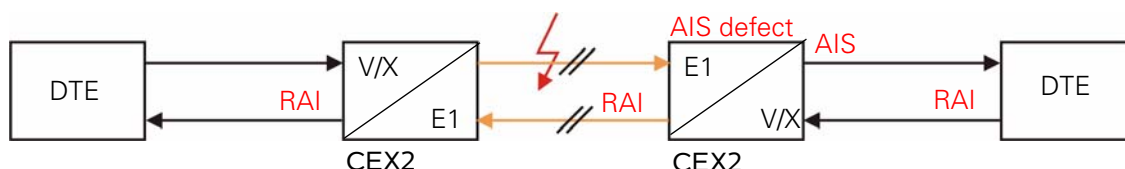


**Figure 4-4** Link Loss Indication: Example 1

In case of a broken copper cable on the user interface (even if just the transmit path is cut) the CEX2 generates an alarm indication signal and informs the end equipment. In framed mode the remote alarm indication bit (RAI) in TS0 will also be generated.

**NOTE:** The transmission from the right to the left side is still able to transmit valid data.

**NOTE:** The link loss indication is only possible for datacom interfaces (X.. and V..). For the Ethernet/Bridge module, no link loss is shown.



**Figure 4-5** Link Loss Indication: Example 2

If the TDM line is broken (also even only the transmit path is cut), the CEX2 generates an alarm indication signal and informs the end equipment. Depending on the mode of the end equipment it should generate the RAI bit, which will be transmitted through the CEX2 transmission line.

**NOTE:** The transmission from the right to the left side will also be able to transmit valid data.

## Special Functions

The CEX - Connectivity E1/T1 supports permanent remote inband management via overhead bits and remote SW update.

## Diagnostic Functions of the CEX2

You can start testing your system, once the local and remote unit are fully installed. All cabling and connections must be completed prior to testing the system. If the power-on initialization process of the CEX2 card has finished, and the cabling is OK, some LEDs should light green. You can test an CEX2 card using the following methods.

### Self Test

The self test performs a memory test of the controller chip. This includes the RAM test and the FLASH Test, and some input/output functions such as internal bit error ratio tests.

Use the self test menu to perform a self test. The self test menu is accessible using the control software. You can access the control software by connecting a VT100 to the device's control port on the single slot housing. For instructions on how to run a self test refer to the section "SELF TEST Menu" on page 5-11.

### Performance Monitoring

Each CEX2 interface port has a performance monitoring module for supervision of the received data. The performance monitoring modules work independently and can be activated at the same time. Performance monitoring enables data traffic checks accord-

ing to the protocol standards. You will find the menu description in the section “PERFORMANCE MONITORING Menu” on page 5-28.

### Test-Loops

Several loops can be activated on an CEX2 to offer a wide bunch of diagnostic options in case of any problems in the network. You can activate respectively change loop modes by pressing the loop mode push button (see Figure 3-2, position 8) or via management access. The selected mode is indicated by the LOOP LEDs on the front panel (see Figure 3-2, position 9, 10) and of course visible in the management variables.

Using the loop-button will be explained hereafter. The loop becomes active within 2 seconds after the selection. This delay of 2 seconds avoids unwanted loops during the selection. You can activate the loop-back test via the LOOP mode key on the front panel or via the control software of the card. The following loop tests can be performed:

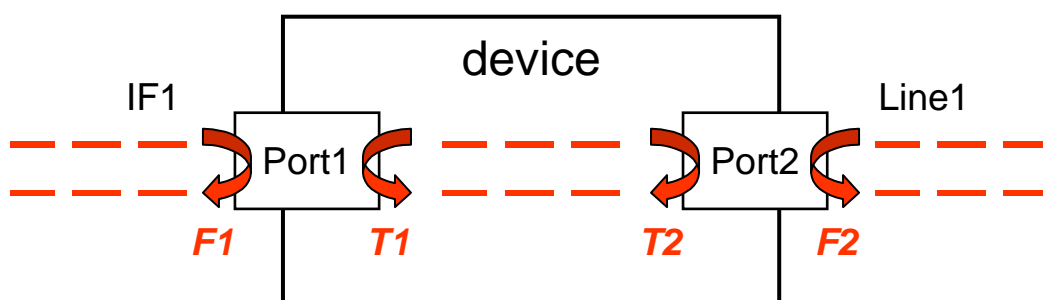
- Facility loop
- Terminal loop

To determine if you have activated the correct loop test, you need to look at the front panel of the CEX2 or in the control software of your device, see “Loop Mode” on page 5-21.

**NOTE:** Always deactivate a loop mode before you change to a new one. Only one loop in the unit will be activated via the loop mode button. Other loops which are active before using the push-button will be deactivated. Loop configuration via control software will deactivate a loop which was initiated by the push-button.

**NOTE:** Loop modes can also be selected or changed via the control software.

#### CEX2 Loops



**Figure 4-6** Terminal and Facility Loops for CEX2

The CEX2 does have 1 user interface and 1 line interface. The following table indicates the possible loops and how to invoke them using the loop-button in the front.

**Table 4-6** Sequence for the Loop Mode Key Function CEX2

Loop number (refer to Figure 4-6)	Loop Mode Button Pressed	elected Loop / Result of the Sequence	LOOP LEDs	
			Loop-I/F	Loop-Line
F1	1 time	facility loop on interface port 1	On	off
T1	2 times	terminal loop on interface port 1	Flash	off
T2	3 times	terminal loop on line port 2	off	Flash
F2	4 times	facility loop on line port 2	off	On
	≥ 5 times	Loops off	off	off

## BER Testing

The **Bit Error Rate** test is built inside the CEX2 with a **Pseudo-Random Binary Sequence (PRBS)** generator and monitor. You can perform a BER test by using the BER test control menu. For more information on this menu refer to the section “BER TEST Menu” on page 5-12 of this user guide.

During a BER test the PRBS generator creates a continuous bit-pattern on the selected port according to ITU-T O.150/O.151. The test sequence  $2^{15-1}$  with a length of 32,767 bits is primarily intended for error and jitter measurements at bit rates of 1544, 2048, 6312, 8448, 32 064 and 44 736 kbps (see Recommendation O.151). The ITU-T defined the inverted sequence signal as standard. With the CEX2 PRBS generator you can either create the inverted or normal signal. The PRBS monitor in the CEX2 will synchronize on both the inverted and non-inverted sequence. Additionally, the CEX2 generator can crate a  $2^{20-1}$  sequence, which is primarily used in US standards.

A permanently updated statistic lists the test results in the CEX2 menu or in an SNMP table. Once started the BER test is running in the background until the test will be stopped manually.

**NOTE:** The CEX2 can perform a BER test with loops or in co-operation with an external BER-Tester or two CEX2 devices with a running BER test.

The data transmission is interrupted during the BER test for the selected port and the loop key of the unit is disabled.

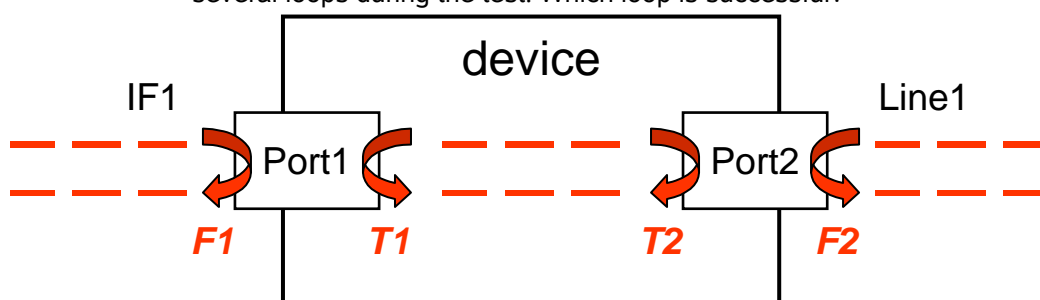
**NOTE:** The PRBS generator inside the CEX2 always uses 31 timeslots (TS1...31 including TS16 independent from the selected data format).

## Troubleshooting Guide

This chapter provides a troubleshooting guide. Follow the checklist to find a reason for malfunctions:



- Check the cabling. Connection, isolation, plugs, length, impedance OK?
- Is the configuration of the end units (auto speed negotiation mode, line configuration) according to the application scheme?
- Replace the units with another unit having the same setup. Does it work?
- Do the end units work back-to-back?
- Follow the step-by-step plan in order to find the error:
  - Connect the local and remote units via the line and view the performance monitoring screens, see the section “PERFORMANCE MONITORING Menu” on page 5-28.
  - Connect the arcutronix A and B units via the line. Run BERT on unit A and try several loops during the test. Which loop is successful?



## Troubleshooting / Frequent Errors

- Distance too long:  
Check the attenuation of the line. Measure the line.
- Cable too bad:  
Check the attenuation of the line. Measure the line.
- Wrong cables:  
Verify the cable type and the pinout.
- Mismatch of DCE/DTE and TE/NT setting. Changing the jumpers can adopt the unit to your application.
- Wrong mode setup:  
Verify the protocol setup (speed and auto speed negotiation mode) of each unit. Make sure that the line protocol is identical. The interfaces must have the same speed setting.
- Wrong clock:  
Verify the clock setting of each unit.
- Usage of the wrong documentation:  
Only the manual with the correct article number shows the correct information.
- Loss of password:  
Always keep your password! At the moment there is no way to reset the password by your own.



# Chapter 5

## Control Software CEX2

### General Information

The control software of the CEX - Connectivity E1/T1 allows you to configure the device via a control terminal. There are different ways to get access to the unit:

- In a singleslot housing (SHX) you can use the control port placed on the rear side.
- In a system rack (SRX) via the agent (SCX) it is possible to enter the software via a control port or a telnet session. Additionally, you have almost all possibilities to configure the unit using SNMP.

### Local RS-232 Interface

Connect it to the control port of the singleslot 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

### Local Ethernet Interface

For the Telnet access you have to connect the ethernet port of the Main Agent to your network.

First, you must configure the IP parameters, at least the IP address and the IP subnet mask via the control port to get a valid ethernet access to your agent.

Start the Telnet program on your PC with the IP address of the Main Agent. The telnet program nowadays is a component of the operating system (e.g. Windows).

You get access to the agent and start at the Login screen.

Under certain circumstances, when routing the terminal signals via a network, the following may occur: Hitting the Enter key results in an endless redraw of the menu. In this case disconnect and use CTRL-J instead.

**NOTE:** If you get access via the singleslot housing do not press the ESC key. Pressing the ESC key deactivates the input of numbers. When this occurs press any letter key on the keyboard to regain menu control.

## Security Issues

If only a few people shall be allowed to make changes in your system, it is possible to assign different access level and passwords. Refer to Chapter 5, Change a Password on page 5-30.

Any time you connect or reconnect to the initialized CEX2 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 unit.

Do not forget your password. If you forget your password the device will be rendered useless and will have to be sent back to the factory for basic re-configuration.

**NOTE:** Four different access-level are selectable with different access rights:

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

If the device is started-up the very first time, only the user "admin" is defined. See in "USER ADMINISTRATION Menu" on page 5-30, how to define the other users and how to change the user password.

## Login via Serial Port on Singleslot Housing

After a management connection has been established towards the CEX2 plugged in a single slot housing (SHX), 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. The user selects his login level (1-4) from the following screen by entering the corresponding number and then the password.

```
CEX2 ON SLOT 1

Serial Number 20082207

Please Select your Access Level

1) Monitor
2) Service
3) Standard
4) Administrator

Please enter your choice:
```

After entering the corresponding number (1-4) a new line appears, asking for the password.

```
CEX2 ON SLOT 1

Serial Number 20082207

Please Select your Access Level

1) Monitor
2) Service
3) Standard
4) Administrator

Please enter your choice: 1
Please Enter your Password:*****
```

Table 5-1 provides the default passwords of the CEX2.

**Table 5-1** Default Passwords

Access Level	Password
Monitor	monitor
Service	service
Standard	standard
Administrator	admin

**CAUTION:** Observe the section “Security Issues” above.

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 has its own passwords. To get a login to the SCX you have to know the passwords of the Main agent. The SCX passwords can differ from the CEX2 passwords. The CEX2 passwords are only used for the access via the control port of the singleslot housing.

**NOTE:** The device returns to the screen “Please Select your Access Level” as soon as you leave the last menu or disconnect the terminal.

After the login you have to decide, if you want to get access to the local CEX2 unit or to its counterpart. The remote unit can be accessed, when the line is established and the the Line is configured to G.704 framed mode. See next screen-shot for CEX2 first screen.

```
CEX2 ON SLOT 1

1)  LOCAL...
2)  REMOTE 1 (LINE PORT 1)...

0)  EXIT

Please enter your choice:
```

**NOTE:** The entry for the remote management can only be accessed, if there is a link to the remote device AND the Line is configured to Framed (G.704) mode (=default). This item allows the access to the remote unit. The header LOCAL is changed to REMOTE. The remainder of the screen is similar to the local mode but the data of the remote device is shown. In remote mode, EXIT terminates the remote mode and changes to local mode.

## 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 entries can be accessed by typing the number, which is displayed in front of the entry. After typing the number, the next level is entered.

## Display and User Actions

Values which can be read and/or changed by the user are marked with number followed by a single character. The characters distinguish the type of variable, please see table below. If you want to access the item, type the number and press the Enter key.

The meanings of the shortages are:

...	Sub-Menu
R	Read only
s	Select
t	Toggle
w	Writable

## Exit

The selection of '0' (or just <Enter>) always leads to a menu one level above.

## Login via the Main Agent

**NOTE:** Please, also read the Main Agent user documentation for further information.

After having logged into the main agent the following screen will be displayed:

```
MAIN MENU

AGENT
SYSTEM

EXIT

zzz i
```

i. This line provides a short message concerning the highlighted command.

A user name and a valid password have to be entered before access to the configuration parameters is granted.

Login via telnet can be deactivated in the menu.

The local agent provides access either to the local CEX2 or to a remote CEX2.

## Display and User Actions

Agent menu lines are accessible by the cursor. Select (highlight) the menu line of interest by the cursor-up/-down keys and press the Enter key. This will give access to the item of the line. Pressing two times the ESC key without selecting a menu line will lead you to the menu one level above. If you are in the MAIN MENU, pressing two times the ESC key will bring you back to the password entry prompt. The bottom line of each screen may display text with additional information on the selected line (where the cursor is positioned).



## MENU Structure

The menu tree structure of the CEX2 is almost the same for the access via the control port of the singleslot housing or via the agent, but the menus look different as a result of different navigation procedures. The preceding numbers are omitted in the agent menus. Some items are only available via the local control port of CEX2.

The write- or change- access to many items depends on the access levels: 1) Monitor, 2) Service, 3) Standard, 4) Administrator.

**Table 5-2** Menu Structure

LOCAL Menu Item	Access Level				Page
	1	2	3	4	
1) GENERAL INFORMATION...	R	R	R	x	page 5-9
2) TESTS...	x	x	x	x	page 5-10
1) SELF TEST...	R	x	x	x	page 5-11
2) BER TEST	R	x	x	x	page 5-12
3) EXTRA...	R	x	x	x	page 5-13
4) CONNECTION 1	x	x	x	x	page 5-13
1) CLOCK...	R	R	x	x	page 5-15
2) INTERFACE SETTINGS...	R	R <sup>i</sup>	x	x	page 5-16
7) LINE SETTINGS...	R	R <sup>i</sup>	x	x	page 5-22
1) MANAGEMENT CHANNEL...	R	R	R	x	page 5-23
11) TRAPS...	R	R	x	x	page 5-24
12) ALARMS...	R	R	x	x	page 5-26
6) EVENT MONITORING...	x	x	x	x	page 5-27
7) PERFORMANCE MONITORING...	x	x	x	x	page 5-28
2) LINE 1...	x	x	x	x	page 5-28
1) LOCAL MONITORING...	R	x	x	x	page 5-29
2) CURRENT MONITORING...	x	x	x	x	page 5-29
3) LAST 15 MN PERIOD RESULTS...	x	x	x	x	page 5-29
8) USER ADMINISTRATION	-	-	-	x	page 5-30
9) UPDATE	-	-	-	x	page 5-31
5) SOFTWARE UPDATE "CEXA"	-	-	-	x	page 5-32
0) EXIT	x	x	x	x	page 5-5

i. Only loops can be activated

Caption:

- x** full access
- R** read only
- no access

**NOTE:** This chapter describes the menu access via the control port of the singleslot housing. All examples are based on an CEX2 unit to depict the menu screens. In case of differences with other variants, this will be depicted in detail, where necessary.

## MAIN Menu

The main menu is entered after the user has selected, whether to access the local or remote device. It contains all common software functions. The main menu is shown in the following screen:

```
CEX2 ON SLOT 1->LOCAL

1) GENERAL INFORMATION...
2) TESTS...
3) EXTRA...
4) CONNECTION 1...

6) EVENT MONITORING...
7) PERFORMANCE MONITORING...
8) USER ADMINISTRATION...
9) UPDATE...

0) EXIT

Please enter your choice:
```

To select a menu function type the number of the desired function and press the Enter key. Table 5-3 provides information on the main menu options:

**Table 5-3** Main Menu Options

Option	Result
1	This menu shows the CEX2 production details. The screen displays the CEX2 serial number and the software revision, see page 5-9.
2	Enters the TESTS menu, with the SELF and BER Test, see page 5-10.
3	Enters the EXTRA menu including the date, time, run-time and actual alarm status, see page 5-13.
4	Enters the CONNECTION 1 menu, see page 5-14. Configuration and status of the connection will be displayed.

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

Option	Result
5	This entry is neither visible nor selectable. It is due to the compatibility to other arcutronix Multi Service System devices, (e.g. CFX) that this menu entry is foreseen.
6	Enters the EVENT MONITORING menu with the last 16 event messages, see page 5-27.
7	Enters the PERFORMANCE MONITORING menu, where the statistic counters of each E1 framer will be displayed, see page 5-28.
8	Enters the USER ADMINISTRATION menu, where you can change the passwords, see page 5-30.
9	Enters the UPDATE menu, which gives you the possibility to update a new software and reboot the unit, see page 5-31.
0	Leaves the main menu.

## GENERAL INFORMATION Menu

Enter 1 in the command line prompt of the main menu and press the Enter key to access the GENERAL INFORMATION menu. The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->GENERAL INFORMATION

 1) R Name                CEX2
 2) w User Name           <...>
 3) R Device Description  CEX - Connectivity E1/T1
 4) R Equipment Variant   CEX2-V.24
 5) R Serial Number       20080300
 6) R Software Revision   CEXA001V00 19/07/2009
 7) R Article Number      0803-2220
 8) R Article Release     V2.0
 9) R Order Information   0803-2220/GS1
10) R Manufacturer        arcutronix GmbH

 0) return to LOCAL-Menu

Please enter your choice:

```

This screen contains general information on the CEX2 unit. Most of these are factory settings. They cannot be changed by the user (as indicated by the "R"). The only exception is the 'User Name' parameter.

**Table 5-4** GENERAL INFORMATION Menu

Selection	Parameter	Description	Format	Default	Read/Write
1	Name	Name of the device	Display	'CEX2'	Read only
2	User Name	Description/comment of the device/application	Text	<...>	Read/write

**Table 5-4 GENERAL INFORMATION Menu (continued)**

Selection	Parameter	Description	Format	Default	Read/Write
3	Device Description	Short description of the device	Display	'CEX - Connectivity E1/T1'	Read only
4	Equipment Variant	Description of the device variant	Display	depends on the factory settings	Read only
5	Serial Number	Serial number of the device	Display	depends on the factory settings	Read only
6	Software Revision	Revision of the loaded system software	Display	depends on the loaded system software	Read only
7	Article Number	Article number of the device	Display	depends on the factory settings	Read only
8	Article Release	Article release of the device	Display	depends on the factory settings	Read only
9	Order Information	Order information of the device	Display	depends on the factory settings	Read only
10	Manufacturer	Manufacturer of the device	Display	'arcutronix GmbH'	Read only

## TESTS Menu

Enter 2 in the command line prompt of the main menu and press the Enter key to access the TESTS menu. The following screen will be displayed:

```
CEX2 ON SLOT 1->LOCAL->TESTS

 1) SELF TEST...
 2) BER TEST...

 0) return to LOCAL-Menu

Please enter your choice:
```

## SELF TEST Menu

Enter 1 in the TESTS menu command line prompt and press the Enter key to access the SELF TEST menu. The self test performs an internal test of all circuits that can be tested by the software. The following screen will be displayed:

```
CEX2 ON SLOT 1->LOCAL->TESTS->SELF TEST

  1) R RAM Test                wait-for-start
  2) R FLASH Test              running
  3) t Test Action              start

  0)  return to TESTS-Menu

Please enter your choice:
```

Table 5-5 provides information on the SELF TEST menu options.

**Table 5-5** SELF TEST Menu Options

Selection	Parameter	Description	Format	Default
1	RAM Test	Displays the current RAM test status	Display (never-started/wait-for-start-running/pass/failed)	'never-started'
2	FLASH Test	Displays the current FLASH test status	Display (never-started/wait-for-start-running/pass/failed)	'never-started'
3	Test Action	Starts and stops testing	Toggle (start/stop)	'stop'

**NOTE:** Data traffic will not be interrupted, if you are in test mode.

## BER TEST Menu

Enter 2 in the TESTS menu command line prompt and press the Enter key to access the BER TEST menu. The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->TESTS->BER TEST

  1) s BER Test Action           no-action
  2) s BER Test Port            line-port-1
  3) t BER Test PRB Sequence    2^15-1
  4) t BER Test Logic           invert
  5) R BER Test Status          stopped
  6) R Elapsed Time             00:00:00
  7) R With Error Time          00:00:00
  8) R Without Error Time       00:00:00
  9) R Sync Status              no-sync
 10) R Sync Losses              0
 11) R Received kbit            0.000000E+00
 12) R Bit Errors               0.000000E+00
 13) R Bit Error Rate           0.000000E+00

  0) return to TESTS-Menu

Please enter your choice:

```

Table 5-6 provides information on the BER Test menu options.

**Table 5-6** BER Test Menu Options

Option	Result
1	<p>Stops or starts the BER Test. If the BERT is started it continues running in the background. When the BERT control menu is reentered, the statistics will be updated.</p> <ul style="list-style-type: none"> <li>• <b>no-action:</b> No change in the BER Test</li> <li>• <b>start:</b> A bit pattern will be sent out automatically. A permanently updated statistics shows the test results.</li> <li>• <b>stop:</b> The transmission of the test pattern is stopped. The results will still be displayed.</li> <li>• <b>reset-counters:</b> The counters will be set to zero.</li> </ul>
2	<p>Selects the port on which the BERT will be executed. The selection will be marked by an asterisk (*).</p> <ul style="list-style-type: none"> <li>• <b>no-BERT-port:</b> No port is selected for BERT.</li> <li>• <b>interface-port-1:</b> The BER Test will be running at interface 1 ("port 1").</li> <li>• <b>line-port-1:</b> The BER Test will be running at line 1 ("port 2").</li> <li>• <b>interface-port-2:</b> The BER Test will be running at interface ("port 3").</li> <li>• <b>line-port-2:</b> The BER Test will be running at line 2 ("port 4").</li> </ul>
3	Toggles between two possible BER Test PRB sequences: $2^{15} - 1$ or $2^{20} - 1$
4	Toggles the BER Test Logic: normal or invert (ITU-T sequence)
5	Displays the actual status of the BER Test, <running>, <stopped>.
6... 13	Continuously updated display of the test results.

**Note:** The BERT will be running with the selected clock. Refer to the section “CLOCK Menu” on page 5-15, for further information.

## EXTRA Menu

Enter 3 in the command line prompt of the main menu and press the Enter key to access the EXTRA menu. The following screen will be displayed:

```
CEX2 ON SLOT 1->LOCAL->EXTRA

1) R Device Run Time           00002130:02:24
2) R Alarm Status              off
3) w SysTime                   00:02:08
4) w SysDate                   29/12/2006

0) return to LOCAL-Menu

Please enter your choice:
```

Table 5-7 provides information on the Extra menu options.

**Table 5-7** Extra Menu Options

Option	Result
1	Displays the total run time of the device in hhhhhhhh:mm:ss (hours, minutes, seconds).
2	Displays the overall alarm status of the unit. Any enabled alarm condition in Connection 1 or 2 sets the status to „on“ and activates the alarm output.
3	Shows the local time and allows to enter the local time. Enter the current time in the format “hh:mm:ss”. <b>Note:</b> If the device has an active connection to any agent SCX2e, time and date will be copied from the agent and overwrite the device time and date.
4	shows the local date and allows to enter the date, e.g. 30/06/2005. Enter the date in the format “MM-DD-YYYY”. <b>Note:</b> If the device has an active connection to any agent SCX2e, time and date will be copied from the agent and overwrite the device time and date.

If the device has an active connection towards any SCX2e agent, time and date will be copied from the agent and overwrite the device time and date.

## CONNECTION 1 Menu

Enter 4 in the command line prompt of the main menu and press the Enter key to access the CONNECTION 1 menu. The following screen will be displayed:

```
CEX2 ON SLOT 1->LOCAL->CONNECTION 1

 1)  CLOCK...
 2)  INTERFACE SETTINGS...
 3)  R Interface Link Status           down
 4)  R Interface Sync Status          not-available
 5)  R Interface AIS Status           no-AIS
 6)  s Local Carrier Detect Status    down
 7)  LINE SETTINGS...
 8)  R Line Link Status               down
 9)  R Line Sync Status              no-sync
10)  R Line AIS Status                no-AIS
11)  TRAPS...
12)  ALARMS...

    0) return to LOCAL-Menu

Please enter your choice:
```

Table 5-8 provides information on the Connection 1 menu options.

**Table 5-8** Connection 1 Menu Options

Option	Result
1	Enters the CLOCK menu for connection 1, where you can select the clock source and the clock system, see page 5-15.
2	Enters the INTERFACE SETTINGS menu for the configuration of the interface 1 ("port1"), see page 5-16
3	Displays the Link Status of interface 1 ("port 1"): <up, down>.
4	Displays the Sync Status of the interface 1 ("port 1"): <no-sync, in-sync, not-available>.
5	Displays the AIS Status of interface 1 ("port 1"): <no-AIS, AIS-detect, not-available>.
6	Displays the Local Carrier Detect Status of connection 1: <up, down>.
7	Enters the LINE SETTINGS menu for the configuration of the line 1 ("port 2"), see page 5-22.
8	Displays the Link Status of the line 1 ("port 2"): <up, down>.
9	Displays the Sync Status of the line 1 ("port 2"): <no-sync, in-sync, not-available>.
10	Displays the AIS Status of line 1 ("port 2"): <no-AIS, AIS-detect, not-available>.
11	Enters the TRAPS menu where you can select all necessary traps, see page 5-24.
12	Enters the ALARMS menu for the selection of separate alarm handling, see 4-.page.



## CLOCK Menu

Enter 1 in the command line prompt of the CONNECTION menu and press the Enter key to access the CLOCK menu. The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->CONNECTION 1->CLOCK

  1) t Clock System                dual-clock
  2) s Clock Source                external
  3) t Tx Clock Polarity i       normal

  0)  return to CONNECTION 1-Menu

Please enter your choice:

```

i. This entry is only visible for datacom variants (X.21, V.24, V.35).

Table 5-9 provides information on the Clock menu options.

**Table 5-9** Clock Configuration Menu Options

Option	Result
1	<p>Toggles between the Clock System settings:</p> <ul style="list-style-type: none"> <li>• <b>Dual-clock</b> Dual clock system for the link. Two different clock sources may exist within the system. Transmit clock and receive clock have different sources <b>Note:</b> This option is not selectable for X.21 interfaces.</li> <li>• <b>Single-clock</b> Single clock system for the link. One clock source exists within the system. Transmit clock and receive clock are locked and have the same source. <b>Note:</b> This option is selected by default for X.21 interface.</li> <li>• <b>Asynchron</b> The user-interface is operated in asynchronous mode (valid for V.24, X.21, V.35 IM). <b>Note:</b> This option is selected by default for V.24 interface.</li> </ul>
2	<p>Changes the Clock Source configuration:</p> <ul style="list-style-type: none"> <li>• <b>Internal</b> The transmit clock is generated internally by the device.</li> <li>• <b>External</b> The transmit clock is generated by the user equipment connected to the device (not with Ethernet). <b>Note:</b> This option is not selectable when Ethernet interface module is equipped.</li> <li>• <b>Remote</b> The transmit clock is taken from the remote device via the optical line.</li> </ul>
3	<p>Toggles the polarity of the TX-clock: (this entry is only visible for datacom variants)</p> <ul style="list-style-type: none"> <li>• <b>Normal</b> Data is updated with rising clock edge of TX-clock.</li> <li>• <b>Invert</b> Data is updated with falling clock edge of TX-clock</li> </ul>

As the different clocking modes and possible settings are not the same for all available modules, the next table gives an overview of limitations:

**Table 5-10 Possible Clock Settings**

Variable/Options	G.703/G.704	X.21	V.35	V.24	I.430	Ethernet
<b>Clock System</b>						
Dual-Clock	yes	no	yes	yes	no	yes
Single-Clock	yes	yes	yes	yes	yes	yes
Asynchron	no	yes	yes	yes	no	no
<b>Clock Source</b>						
Internal	yes	DCE only	yes	yes	NT only	yes
External	yes	DTE only	yes	yes	TE only	no
Remote	yes	DCE only	yes	yes	NT only	yes
<b>Tx Clock Polarity</b>						
Normal	no	yes	yes	yes	yes	no
Invert	no	yes	yes	yes	no	no

## INTERFACE SETTINGS Menu

Enter 2 in the command line prompt of the CONNECTION menu and press the Enter key to access the INTERFACE SETTINGS menu. Depending on the chosen variant (plugged interface module) different screens will appear.

### INTERFACE SETTINGS Menu for Datacom Variants

This chapter is valid for X.21, V.35 and V.24 interface modules.

The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->CONNECTION 1->INTERFACE SETTINGS

  1) R Interface Type      IF 1          ITU-T V.24
  2) R Connector Type     IF 1          db-25-f
  3) R Interface Emulation IF 1          DTE

                                     1
  8) w Start Timeslot
  9) w Number of Used TS    3
10) R Timeslot 16          disabled
11) R Used Data Rate       192kBit/s
12) s Loop Mode            off

14) t Local Carrier Detect Mode    line-link

  0) return to CONNECTION 1-Menu

Please enter your choice:

```

Table 5-13 provides information on the Interface Settings menu options.

**Table 5-11** Interface Settings Menu Options Datacom I/Fs

Option	Result
1	Displays the interface type at IF 1 ("port 1"): 'ITU-T X.21', 'ITU-T V.24', 'ITU-T V.35'.
2	Displays the connector type at IF 1 ("port 1"): 'db-25-f', 'db-15-f', 'winch-f'.
3	Displays the interface emulation at IF 1 ("port 1"): 'DCE', 'DTE'
8	Input of the start timeslot, which will be the first timeslot used for the payload. The Input range is 1 ... 31. <b>Note:</b> TS0 will be automatically used if 32 TS are selected to be used (see below). <b>Note:</b> Check the value of "Number of Used TS" if your entry is not accepted.
9	Input of the 'Number of Used TS' which will be occupied by the payload. The highest regular value depends 'Start Timeslot'. <b>Note:</b> Number of TS can be 32. In this case, the value of "Start Timeslot" is automatically changed to "0". <b>Note:</b> For V.24 interface module, the number of TS is limited to 3, as the max. data-rate for the V.24 module is 192kbps.
10	Displays the usage of Timeslot 16 for payload transmission.
11	Displays the data rate used for the module variant which is equal to the 'Number of Used TS' x 64kbps
12	Enters the Loop Mode configuration menu, see page 5-21.
14	Toggles between Local Carrier Detect Mode options: <line link, remote hardware handshake>.

## INTERFACE SETTINGS Menu for ISDN-S0

This chapter is valid for ISDN-S0 variant: CEX2-I.430.

The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->CONNECTION 1->INTERFACE SETTINGS

  1) R Interface Type      IF 1          BRI-S0
  2) R Connector Type     IF 1          RJ45
  3) R Interface Emulation IF 1          TE

                                     1
  8) w Start Timeslot
  9) w Number of Used TS    4
 10) R Timeslot 16         enabled
 11) R Used Data Rate      256kBit/s
 12) s Loop Mode           off

 14) t Local Carrier Detect Mode    line-link

  0) return to CONNECTION 1-Menu

Please enter your choice:

```

Table 5-13 provides information on the Interface Settings menu options.

**Table 5-12** Interface Settings Menu Options ISDN-S0 I/F

Option	Result
1	Displays the interface type at IF 1 ("port 1"): 'BRI-S0'.
2	Displays the connector type at IF 1 ("port 1"): 'RJ45'.
8	Input of the start timeslot, which will be the first timeslot used for the payload. The Input range is 1 ... 4. <b>Note:</b> Check the value of "Number of Used TS" if your entry is not accepted.
9	Input of the 'Number of Used TS' which will be occupied by the payload. The highest regular value depends 'Start Timeslot'. <b>Note:</b> Number of TS can be 4.
10	Displays the usage of Timeslot 16 for payload transmission.
11	Displays the data rate available for the payload which is equal to the 'Number of Used TS' x 64kbps
12	Enters the Loop Mode configuration menu, see page 5-21.
14	Toggles between Local Carrier Detect Mode options: <line link, remote hardware>.

## INTERFACE SETTINGS Menu for Ethernet I/F

This chapter is valid for Fast Ethernet variant: CEX2-FE.

The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->CONNECTION 1->INTERFACE SETTINGS

  1) R Interface Type      IF 1          IEEE 802.3 FE-Bridge
  2) R Connector Type     IF 1          RJ45

      8) w Start Timeslot                1
      9) w Number of Used TS            31
     10) R Timeslot 16                  enabled
     11) R Used Data Rate                1984kBit/s
     12) s Loop Mode                    off

     14) t Local Carrier Detect Mode     line-link

     16)  Details FE Module (IF1)...

      0) return to CONNECTION 1-Menu

Please enter your choice:

```

Table 5-13 provides information on the Interface Settings menu options.

**Table 5-13** Interface Settings Menu Options Ethernet I/F

Option	Result
1	Displays the interface type at IF 1 ("port 1"): 'IEEE 802.3 FE-Bridge'.
2	Displays the connector type at IF 1 ("port 1"): 'RJ45'.
8	Input of the start timeslot, which will be the first timeslot used for the payload. The Input range is 1 ... 31. <b>Note:</b> TS0 will be automatically used if 32 TS are selected to be used (see below). <b>Note:</b> Check the value of "Number of Used TS" if your entry is not accepted.
9	Input of the 'Number of Used TS' which will be occupied by the payload. The highest regular value depends 'Start Timeslot'. <b>Note:</b> Number of TS can be 32. In this case, the value of "Start Timeslot" is automatically changed to "0".
10	Displays the usage of Timeslot 16 for payload transmission.
11	Displays the data rate available for the payload which is equal to the 'Number of Used TS' x 64kbps
12	Enters the Loop Mode configuration menu, see page 5-21.
14	Toggles between Local Carrier Detect Mode options: <line link, remote hardware handshake>.
16	Enter the menu for detailed settings and counters of the FE-module.

*DETAILS Menu for Ethernet I/F*

This chapter is valid for Fast Ethernet interface option, only.

The following screen will be displayed:

```

CEX22 ON SLOT 1->LOCAL->CONNECTION 1->INTERFACE SETTINGS->Details FE Module (IF1)

 1) w I/F Name                <...>
 2) R Current Status          up
 3) R Current Speed / Mode    100Mbit/s, FDx
 4) s I/F Mode                Auto Speed, Auto Duplex
 5) t Flow Control            enabled
 6) t Admin Status            enabled
 7) t Bridge Filter            enabled
 8) R Counters:
 9) R  -RX Good Frames        0000000000
10) R  -RX Error Frames       0000000000
11) R  -RX Overflow           0000000000
12) R  -TX Good Frames        0000000000
13) R  -TX Error Frames       0000000000
14) R  -TX Overflow           0000000000
15) t Reset Error Counters    No Reset

 0) return to CONNECTION 1-Menu

Please enter your choice:

```

Table 5-14 provides information on the Interface Settings menu options.

**Table 5-14** *Details Menu Options Ethernet I/F*

Option	Result
1	An unique name can be given for the interface.
2	Displays the current state of the interface (up   down).
3	Displays the current speed and duplex mode of the interface.
4	A sub-menu is opened which gives opportunity to select the speed and duplex mode. See chapter "Auto Negotiation" on page 3-15 for details.
5	Press '5' to enable or disable the Flow control feature.
6	Press '6' to enable or disable the interface.
7	Press '7' to enable or disable the MAC-learning.
8	Headline for the below counters:
9	RX Good Frames: Sum of all received good frames (Unicast, Multicast and Broadcast).
10	RX Error Frames: Sum of all received errored frames (CRC error, Alignment error, Runt error, Jabber, Undersize frames, Oversize frames, Wrong length field).
11	RX Overflow: Sum of frames discarded due to a receive FIFO overflow.
12	TX Good Frames: Sum of all transmitted good frames (Unicast, Multicast and Broadcast).

**Table 5-14** Details Menu Options Ethernet I/F

Option	Result
13	TX Error Frames: Sum of all transmitted errored frames (Excessive collision, Carrier error, excessive deferral).
14	TX Overflow: Sum of frames discarded due to a transmit FIFO overflow.
15	Enter '15' to reset all the above counters to zero.

### I/F Mode Menu for Ethernet I/F

This chapter is valid for Fast Ethernet interface option, only.

The following screen will be displayed:

```
CEX22 ON SLOT 1->LOCAL->CONNECTION 1->INTERFACE SETTINGS->Details FE Module
(IF1)->I/F Mode

  1) * Auto Speed, Auto Duplex
  2) Auto Speed, FDx
  3) Auto Speed, HDx
  4) 100Mbit/s, Auto Duplex
  5) 10Mbit/s, Auto Duplex
  6) 100Mbit/s, FDx
  7) 100Mbit/s, HDx
  8) 10Mbit/s, FDx
  9) 10Mbit/s, HDx
 10) 100Mbit/s, FDx, fixed
 11) 100Mbit/s, HDx, fixed
 12) 10Mbit/s, FDx, fixed
 13) 10Mbit/s, HDx, fixed

  0) return to Details FE Module (IF1)-Menu

Please enter your choice:
```

See chapter “Auto Negotiation” on page 3-15 for details.

### Loop Mode

Enter 12 in the command line prompt of the INTERFACE SETTINGS menu and press the Enter key to access the Loop Mode configuration menu. The following screen will be displayed:

```
ON-F ON SLOT 1->LOCAL->CONNECTION 1->INTERFACE SETTINGS->Loop Mode

  1) * off
  2) facility
  3) terminal

  0) return to INTERFACE SETTINGS-Menu

Please enter your choice:
```

Select either 'facility' or 'terminal' to activate the desired loop mode. You will find more detailed information on the available loop modes in the section "Test-Loops" on page 4-13.

Table 5-15 provides information on the Loop Mode configuration menu options.

**Table 5-15** Loop Mode Configuration Menu Options

Option	Result
1	Deactivates the chosen loop mode.
2	Activates the facility loop. The entered loop status is shown in the configuration overview. The yellow interface LED on the front panel is lit.
3	Activates the terminal loop. The entered loop status is shown in the configuration overview. The yellow interface LED on the front panel flashes.

## LINE SETTINGS Menu

Enter 7 in the command line prompt of the CONNECTION menu and press the Enter key to access the LINE SETTINGS menu. The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->CONNECTION 1->LINE SETTINGS

  1) R Interface Type      Line 1      G.703 E1
  2) R Connector Type     Line 1      rj45
  3) R Connector Emulation Line 1      TE

  6) R Data Format                E1-PCM31C
  7) s Loop Mode                  off
  8) t Send AIS                    no
  9)  MANAGEMENT CHANNEL...

  0) return to CONNECTION 1-Menu

Please enter your choice:
  
```

Table 5-16 provides information on the Line Settings menu options.

**Table 5-16** Line Settings Menu Options

Option	Result
1	Displays the interface type at Line 1 ("Port 2"), e.g. 'G.703 E1'
2	Displays the connector type at Line 1 ("Port 2"), e.g. 'rj45'
3	Displays the connector type at Line 1 ("Port 2"), 'NT' or 'TE'
4	Due to compatibility this menu entry is left free. It is neither selectable nor visible.
5	Due to compatibility this menu entry is left free. It is neither selectable nor visible.
6	Displays data format at Line 1 ("Port 2"), e.g. 'E1-PCM31C'



**Table 5-16** Line Settings Menu Options (continued)

Option	Result
7	Enters the Loop Mode configuration menu, see page 5-21.
8	Sends an AIS (all Ones) via the line port.
9	Enters the Management Channel configuration menu, see page 5-23.

## MANAGEMENT CHANNEL Menu

Enter 9 in the command line prompt of the LINE SETTINGS menu and press the Enter key to access the MANAGEMENT CHANNEL menu. The communication between local and remote unit is done via this management channel. The user can select which of two optional channels should be used:

- A 64kbps-channel, which occupies one timeslot in the G.704 frame,
- Up to 5 x 8kbps-channels, using the Sa-Bits in TS0 of G.704 frame.

The Sa-Bits should only be used, if they are free in provider's network. If there is any specific handling done on Sa-Bits (e.g. loops), please use one timeslot.

**NOTE:** Remote communication is only possible when the Line is configured to framed mode (PCM31, PCM30, PCM31C or PCM30C). In unframed mode, no management channel is available.

The default for management channel are the Sa-Bits of TS0.

The following screen will be displayed:

```
CEX2 ON SLOT 1->LOCAL->CONNECTION 1->LINE SETTINGS->MANAGEMENT CHANNEL

 1) s Channel-Type           Sa-Bits
 2) R State                  available
 3) w Timeslot               1
 4) t SA4-Bit                enabled
 5) t SA5-Bit                enabled
 6) t SA6-Bit                enabled
 7) t SA7-Bit                enabled
 8) t SA8-Bit                enabled

 0) return to LINE SETTINGS-Menu

Please enter your choice:
```

Table 5-16 provides information on the Management Channel menu options.

**Table 5-17 Management Channel Menu Options**

Option	Result
1	Enters the Loop Mode configuration menu, where the user can select which channel is used for remote communication:  none: No channel is activated  timeslot: A special timeslot (64kbps) is used. The used timeslot is defined in menu entry 3) of the Management Channel menu  Sa-Bits: The Sa-Bits in TS0 are used. Each Sa-Bit is valid for 8kbps, up to 5 Sa-Bits can be selected for usage.
2	Displays the state of the management channel link.
3	Input of the timeslot, which will be used for the management channel. The Input range is 1 ... 31.
4	Toggles between use or do not use the specific Sa-Bit for management Channel usage: <disable, enable>.
5	
6	
7	
8	

## TRAPS Menu

Enter 11 in the command line prompt of the CONNECTION menu and press the Enter key to access the TRAPS menu. The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->CONNECTION 1->TRAPS

 1) t Link Status IF 1           enabled
 2) t Sync Status IF 1           enabled
 3) t RX AIS      IF 1           enabled
 4) t Link Status Line 1         enabled
 5) t Sync Status Line 1         enabled
 6) t RX AIS      Line 1         enabled
 7) t Local Carrier Detect Status disabled

 0) return to CONNECTION 1-Menu

Please enter your choice:
    
```

**NOTE:** This menu is visible in single-slot housing, but it makes only sense together with an SNMP-agent board, e.g. SCX2e.

Table 5-18 provides information on the Traps menu options.

**Table 5-18** Traps Menu Options

Option	Selection	Result
1	enabled	A trap is generated, if the Link Status at Port 1 has changed.
	disabled	Disables the link trap generation at Port 1.
2	enabled	A trap is generated, if the Sync Status (TS0 detection) at Port 1 has changed.
	disabled	Disables the sync trap generation at Port 1.
3	enabled	A trap is generated, if the AIS Status at Port 1 has changed.
	disabled	Disables the AIS trap generation at Port 1.
4	enabled	A trap is generated, if Link Status changed at Port 2.
	disabled	Disables link trap generation for Port 2.
5	enabled	A trap is generated, if the frame Sync Status (TS0 detection) at Port 2 has changed.
	disabled	Disables the sync trap generation at Port 2.
6	enabled	A trap is generated, if the AIS Status at Port 2 has changed.
	disabled	Disables the AIS trap generation at Port 2.
7	enabled	A trap is generated, if the Local Carrier Detect Status has changed.
	disabled	Disables the trap generation.

## Default (Factory-) Trap-Settings

Depending on the given variant, not all traps-sources are available and the Defaults may vary:

**Table 5-19** Trap Defaults

Variant	CEX2-V.24	CEX2-X.21	CEX2-I.430	CEX2-FE
ID	0803-2220	0803-2221	0803-2240	0803-2280
Link Status changed IF 1	enabled	enabled	enabled	enabled
Sync Status changed IF 1	n.a.	n.a.	n.a.	n.a.
RX AIS changed IF1	n.a.	n.a.	n.a.	n.a.
Link Status changed Line1	enabled	enabled	enabled	enabled
Sync Status changed Line1	enabled	enabled	enabled	enabled

**Table 5-19** Trap Defaults (continued)

Variant	CEX2-V.24	CEX2-X.21	CEX2-I.430	CEX2-FE
ID	0803-2220	0803-2221	0803-2240	0803-2280
RX AIS changed Line 1	enabled	enabled	enabled	enabled
Local Carrier Detect changed	disabled	disabled	disabled	disabled

## ALARMS Menu

Enter 12 in the command line prompt of the CONNECTION menu and press the Enter key to access the ALARMS menu. The following screen will be displayed:

```

CEX2 ON SLOT 1->LOCAL->CONNECTION 1->ALARMS

  1) R Alarm Status Connection 1           off
  2) t Link Down IF 1                     enabled
  3) t No Sync   IF 1                     enabled
  4) t RX AIS   IF 1                     enabled
  5) t Link Down Line 1                   enabled
  6) t No Sync   Line 1                   enabled
  7) t RX AIS   Line 1                   enabled
  8) t Local Carrier Detect Down          disabled

  0) return to CONNECTION 1-Menu

Please enter your choice:

```

Table 5-20 provides information on the Alarm configuration options.

**Table 5-20** Alarm Configuration Menu Options

Option	Selection	Result
1	on	The alarm status for Connection 1 and the alarm relay are active. If an alarm is generated, the alarm LED will be lit.
	off	No alarm is active and the LED is not on.
2	enabled	An alarm will be generated, if there is no link at Port 1.
	disabled	Disables the alarm generation at Port 1.
3	enabled	An alarm will be generated, if there is no frame synchronization at Port 1.
	disabled	Disables the alarm generation at Port 1.
4	enabled	An alarm will be generated, if an AIS is received at Port 1.
	disabled	Disables the AIS alarm generation at Port 1.
5	enabled	An alarm will be generated, if there is no link at Port 2.
	disabled	Disables the link alarm generation at Port 2.

**Table 5-20 Alarm Configuration Menu Options**

Option	Selection	Result
6	enabled	An alarm will be generated, if there is no frame synchronization at Port 2.
	disabled	Disables the sync alarm generation at Port 2.
7	enabled	An alarm will be generated, if an AIS is received at Port 2.
	disabled	Disables the AIS alarm generation at Port 2.
8	enabled	An alarm will be generated, if the Local Carrier Detection is down.
	disabled	Disables this alarm generation.

## Default (Factory-) Alarm-Settings

Depending on the given variant, not all traps-sources are available and the Defaults may vary:

**Table 5-21 Trap Defaults**

Variant	CEX2-V.24	CEX2-X.21	CEX2-I.430	CEX2-FE
ID	0803-2220	0803-2221	0803-2240	0803-2280
Link Down IF 1	enabled	enabled	enabled	enabled
No Sync IF 1	n.a.	n.a.	n.a.	n.a.
RX AIS IF1	n.a.	n.a.	n.a.	n.a.
Link Down Line1	enabled	enabled	enabled	enabled
No Sync Line1	enabled	enabled	enabled	enabled
RX AIS Line 1	enabled	enabled	enabled	enabled
Local Carrier Detect Down	disabled	disabled	disabled	disabled

## EVENT MONITORING Menu

Enter 6 in the command line prompt of the main menu and press the Enter key to access the EVENT MONITORING menu. A list with the last 14 events is shown. First

entry shows the time, when the event occurred. An example for the event monitor is shown below:

```
CEX2 ON SLOT 1->LOCAL->EVENT MONITORING

00:00:00 CEX2: Interface Port # 1 Link down
00:00:00 CEX2: Interface Port # 1 AIS off
00:00:00 CEX2: Interface Port # 1 no sync
00:00:01 CEX2: Line Port # 1 Link down
00:00:01 CEX2: Line Port # 1 AIS off
00:00:01 CEX2: Line Port # 1 no sync
00:03:59 CEX2: Interface Port # 1 Loop mode off

0) return to LOCAL-Menu

Please enter your choice:
```

The list will be appended as soon as a new event happens. Enter 0 to leave this menu and to return to the Main-Menu.

**NOTE:** The SCX2e Main Agent offers the possibility to view the history log of all events.

## PERFORMANCE MONITORING Menu

Enter 7 in the command line prompt of the main menu and press the Enter key to access the PERFORMANCE MONITORING menu. The following screen will be displayed:

```
CEX2 ON SLOT 1->LOCAL->PERFORMANCE MONITORING

2) LINE 1...

0) return to LOCAL-Menu

Please enter your choice:
```

**NOTE:** Only the available ports are shown in the PERFORMANCE MONITORING menu. Due to compatibility to other arcutronix Multi Service System devices, (e.g. CFX) that more menu entries are foreseen.

Select the number of the port statistics which you are interested in and press the Enter key. The following screen is equal for all ports. Only the header will differ and gives an indication on the selected port. As an example Line 1 ("Port2") is shown:

```
CEX2 ON SLOT 1->LOCAL->PERFORMANCE MONITORING->LINE 1

1)  LOCAL MONITORING...
2)  CURRENT 15 MIN PERIOD...
3)  LAST 15 MIN PERIOD RESULTS...

0) return to PERFORMANCE MONITORING-Menu

Please enter your choice:
```

The performance monitoring is split into two main function.

1. A manually start /stop error statistics without any time limit. This statistics can be opened by entering '1' in the command line prompt.
2. The second function is a continuously running error statistics with a test period of 15 minutes. The current running test period can be monitored by entering '2' in the command line prompt. The result of the last 15 min. test period is stored and will be displayed, if you enter '3' in the command line prompt.

## LOCAL MONITORING Menu

Enter 1 in the command line prompt of the PERFORMANCE MONITORING menu and press the Enter key to access the LOCAL MONITORING screen.

```
CEX2 ON SLOT 1->LOCAL->PERFORMANCE MONITORING->LINE 1->
LOCAL MONITORING

1) s Performance Monitoring Action          start
2) R Elapsed Time                          7
3) R Error Free Seconds (EFS)              7
4) R Errored Seconds (ES)                  0
5) R Severely Errored Seconds (SES)        0
6) R Block Errors                           0
7) R Loss Of Sync Word (LOSW) Seconds      0
8) R Unavailable Seconds (UAS)             0

0)  return to Line 1-Menu

Please enter your choice:
```

Enter 1 in the command line prompt of the LOCAL MONITORING screen in order to activate the local monitoring.

You can select between: <1) no-action, 2) start, 3) stop, 4) reset-counter,>.

## 15 MIN PERIODS RESULTS Menus

Enter 2 or 3 in the command line prompt of the PERFORMANCE MONITORING menu and press the Enter key to access the CURRENT 15 MIN PERIOD or the LAST 15 MIN PERIOD RESULTS screen.

```
CEX2 ON SLOT 1->LOCAL->PERFORMANCE MONITORING->LINE 1->CURRENT 15 MIN PERIOD

1) R Elapsed Time                               209
2) R Error Free Seconds (EFS)                   0
3) R Errored Seconds (ES)                       0
4) R Severely Errored Seconds (SES)             0
5) R Block Errors                               0
6) R Loss of Sync Word (LOSW) Seconds           0
7) R Unavailable Seconds (UAS)                  209

0) return to LINE 1-Menu

Please enter your choice:
```

All entries are read-only and can just displayed.

## USER ADMINISTRATION Menu

Enter 8 in the command line prompt of the main menu to access the USER ADMINISTRATION menu. This menu allows the definition respectively change of passwords.

**NOTE:** This menu is only accessible for users, logged in as “admin”.

```
CEX2 ON SLOT 1->LOCAL->USER ADMINISTRATION

1) w Monitor Password                           monitor
2) w Service Password                           service
3) w Standard Password                          standard
4) w Administrator Password                     admin

0) return to LOCAL-Menu

Please enter your choice:
```

**CAUTION:** The given passwords are shown in clear text. Be careful who can see the screen, when you enter it.

## Change a Password

The following two steps are necessary to change a password:

1. Enter the number of the password to be changed in the command line prompt and press the Enter key.



2. Enter your password (up to 31 characters) in the command line prompt and press the Enter key.

The new password is stored and must be used at the next password inquiry.

## UPDATE Menu

Enter 9 in the command line prompt of the main menu and press the Enter key to access the UPDATE menu. The following screen will be displayed:

**NOTE:** This menu is only accessible for users, logged in as “admin”

```
CEX2 ON SLOT 1->LOCAL->UPDATE

 1) R Actual Software Revision          CEXA001V00 19/07/2009 (1)
 2) R Flash 1 Software Revision        CEXA001V00 19/07/2009
 3) R Flash 2 Software Revision        CEXA001V00 17/07/2009
 4) s Reboot                           no reboot
 5)   Software Update                  CEXA

 0) return to LOCAL-Menu

Please enter your choice:
```

Table 5-22 provides information on the Update menu options.

**Table 5-22** Update Menu Options

Option	Result
1	Displays the running software version. The version is shown with version-number and release date. The number in brackets shows the flash-bank, used.
2	Displays the software version stored in Flash 1. The version is shown with version-number and release date.
3	Displays the software version stored in Flash 2. The version is shown with version-number and release date.
4	Selection menu for an CEX2 reboot.
5	Enters the Software Update menu, where you can start the upload process to store a new SW-file in one of the flash-banks. (See page 5-32.) <b>Note:</b> The CEXA indicates, that only SW for CEX2 is accepted.

## Reboot

Enter 4 in the command line prompt of the UPDATE menu and press the Enter key to access the Reboot menu. The following screen will be displayed:

```
CEX2 ON SLOT 1->LOCAL->UPDATE->Reboot

1) * no reboot
2)  reboot flash 1 software
3)  reboot flash 2 software

0)  return to UPDATE-Menu
```

The CEX2 offers two program memories (flash 1 and flash 2) from which you can reboot the unit. You can select, which SW-version (stored in flash 1 or flash 2) is used to run on CEX2 after reboot.

**CAUTION:** After having selected one of the two items of the reboot (flash 1 or flash 2), the unit automatically starts the re-initialisation process.

**CAUTION:** Interruptions and errors in the data transmission will occur!

## Software Update

Enter 5 in the command line prompt of the UPDATE menu and press the Enter key to access the Software Update menu. The following screen will be displayed:

```
Software-Update via serial line

Kindly note that:
- Your Terminalprogram (e.g. HyperTerminal) must provide the file transfer
  with the Y-Protocol.
- Please make sure that the file to transfer is a real software file.
  If the file is not a software file designated for this device the result is
  not foreseeable.

Would you like to transfer the software file ? (y/n)
```

After pressing 'y' (or 'Y') the CEX2 is waiting to receive the new SW-image.

### Update via Y-Modem

Load a new software-image via Y-Modem using the serial interface. The terminal emulation software must be able to transfer files using Y-Modem protocol. The new software is stored as file in the flash memory of the CEX2.

After confirming the update process by entering 'y' for yes, you have to initiate the Y-modem transmission of the new software file in your terminal program. Other key strokes stop the process and return to the UPDATE menu.

```
Software-Update via Serial Line

Kindly note that:
- Your Terminalprogram (e.g. HyperTerminal) must provide the file transfer
  with the Y-Protocol.
- Please make sure that the file to transfer is a valid software file.
  If the file is not a software file designated for this device the result is
  not foreseeable.

Would you like to transfer the software file ? (y/n) y
- Send software file named
  CEXA*.BIP
  with Y-Protocol. CCCCCC
```

**NOTE:** A new software will always be loaded into the free flash memory.

After the data transmission has been successful and the file is valid, the following screen will be displayed:

```
Software-Update via Serial Line

Kindly note that:
- Your Terminalprogram (e.g. HyperTerminal) must provide the file transfer
  with the Y-Protocol.
- Please make sure that the file to transfer is a valid software file.
  If the file is not a software file designated for this device the result is
  not foreseeable.

Would you like to transfer the software file ? (y/n) y
- Send software file named
  CEXA*.BIP
  with Y-Protocol. CC
- Load successful
- Software Update successful
To continue strike any key !
```

Press a key to return to the Update menu.

If the software has been loaded successfully into the flash, you can start the software by a reboot, see page 5-32.

For more information on the update process via the rack agent, refer to the control software description of the SCX2e user guide.

## Abort Update

You can interrupt the update process manually by typing two times the ESC key or a cancel button of your terminal program. A hint is shown and you have to press a key to return to Update menu.

```
Software-Update via Serial Line

Kindly note that:
- Your Terminalprogram (e.g. HyperTerminal) must provide the file transfer
  with the Y-Protocol.
- Please make sure that the file to transfer is a valid software file.
  If the file is not a software file designated for this device the result is
  not foreseeable.

Would you like to transfer the software file ? (y/n) y
- Send software file named
  CEXA*.BIP
  with Y-Protocol. C
- Abort by Terminalprogram / User
  To continue strike any key !
```

## Example

Example of a software update with HyperTerminal© (Hilgreave Inc.):

**NOTE:** The example is done for CFX, but flow is the same for CEX2. Just replace CFX (CFXA) specific download file (CFXA\*\*\*\*.bip) with CEX2 download image (CEXA\*\*\*\*.bip).

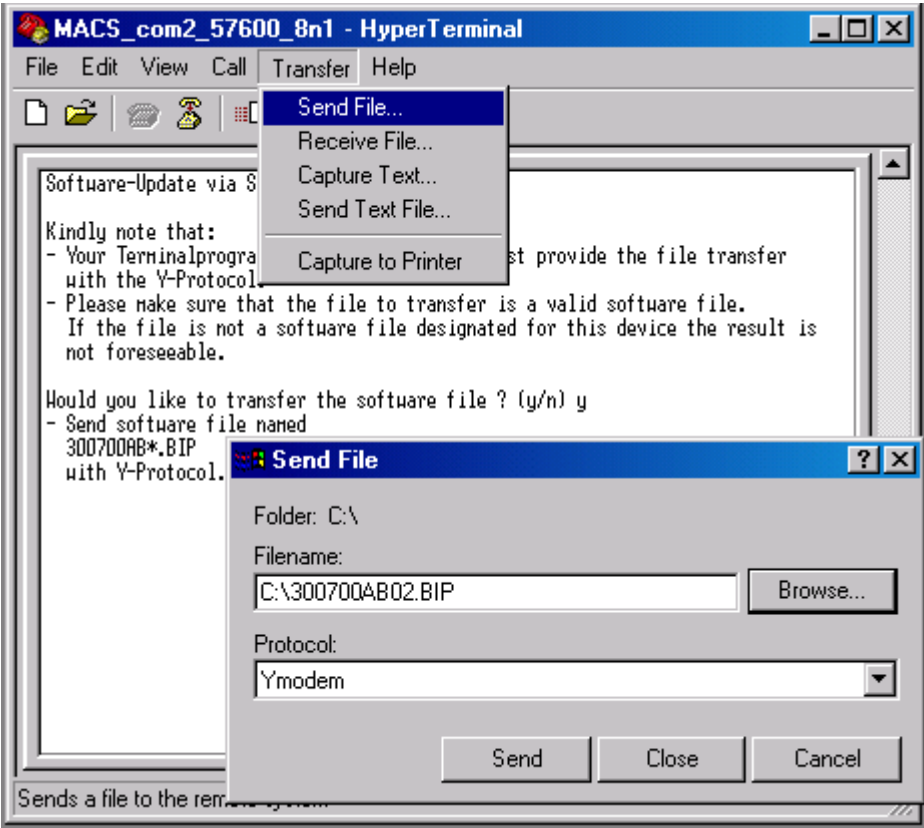


Figure 5-1 Update with HyperTerminal

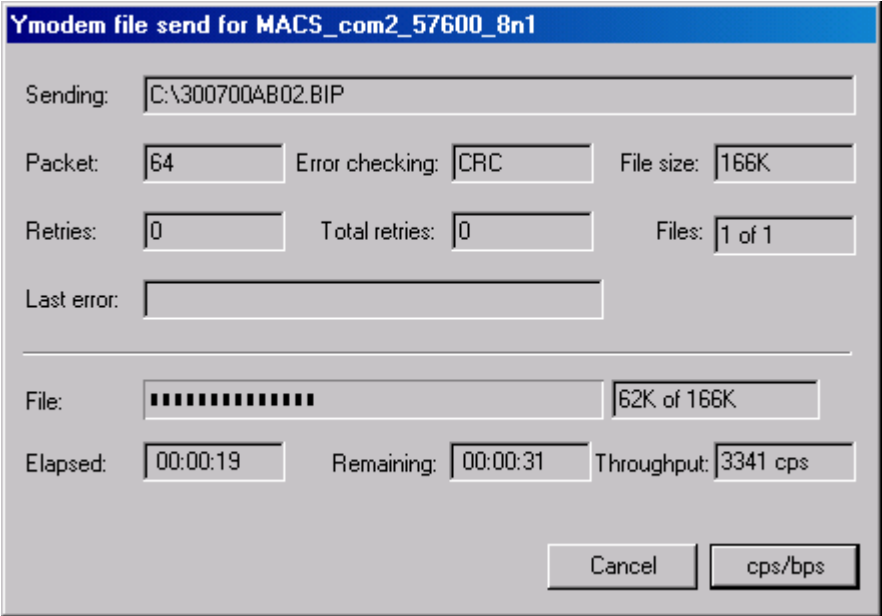


Figure 5-2 Send File



# Chapter 6

## SNMP and MIBs

This chapter provides information on the SNMP and the management information bases (MIBs) used by the CEX2.

### 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.

The arcutronix Multi Service System supports two versions of SNMP: SNMPv1 (version 1) and SNMPv2c (version2, community-based).

### SNMPv1

SNMPv1 first appeared in 1988 and is defined in IETF RFC1065, RFC1066 and RFC1067. It supports a basic set of commands (get, set and the possibility to send traps). Authentication of clients is performed only by a "community string", in effect a type of password, which is transmitted in clear text.

### SNMPv2c

Community-Based Simple Network Management Protocol version 2, or SNMP v2c, is defined in IETF RFC 1901-RFC1908. SNMP v2c revises version 1 and includes improvements in the areas of performance, confidentiality, and manager-to-manager communications. It introduced GETBULK, an alternative to iterative GETNEXTs for retrieving large amounts of management data in a single request. SNMPv2c uses the same simple community-based security scheme as SNMP v1. While officially only a "Draft Standard", this is widely considered the de facto SNMP v2 standard.

### Traps

SNMPv1 and SNPv2c encourage trap-directed notification. The idea behind trap-directed notification is as follows: if a manager is responsible for a large number of devices, and each device has a large number of objects, it is impractical for him to poll or request information from every object on every device. The solution is for each agent on the managed device to notify the manager without solicitation. It does this by sending a message known as a trap of the event or NOTIFICATION.

After receiving the event, the manager displays it and may choose to take an action. For instance, the manager can poll the agent directly, or poll other associated device agents to get a better understanding of the event.

Trap-directed notification can result in substantial savings of network and agent resources by eliminating the need for frivolous SNMP requests. However, it is not possible to totally eliminate SNMP polling. SNMP requests are required for discovery and topology changes. In addition, a managed device agent can not send a trap, if the device has had a catastrophic outage.

## Installation Prerequisites

This section provides the installation prerequisites for SNMP.

Prerequisites for SNMP management:

- A management station with an Ethernet 10/100BaseT respectively RS232 interface.
- Management software for SNMP management (e.g. SNMPc, HP Openview).
- A VT100 compatible terminal or PC with terminal software (only used for initial installation).



## Preparing the SNMP Management System

Before managing the CEX2 by SNMP, one has to prepare the SNMP management system. First install the MIBs for the CEX2 and second configure the correct access parameters.

You can download the MIB from the ax intranet ([www.arcutronix.com/customer](http://www.arcutronix.com/customer)):

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

A MIB (Management Information Base) is a kind of database, which tells the network management station about specific capabilities of the new equipment. Add the contained MIBs to the MIBs already known to your management system. Generally, you have to recompile the MIB database to include the new information.

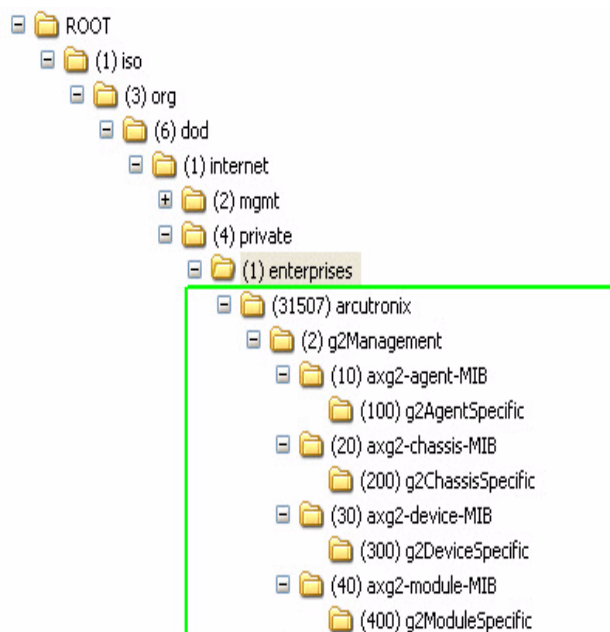
Configure your management station to use SNMPv2c for read and write access mode and enter the community strings for read/write and read-only access.

## 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 MIBs for arcutronix's SNMP management Generation 2 are based on the arcutronix naming convention. The root-OID tree structure is accessible via

iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).arcutronix(30507).g2Management(2)



**Figure 6-1** The SNMP Generation 2 MIB Tree

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.

The following MIB explanations will provide a quick overview about the available features. However, you might find useful additional information when inspecting the MIBs themselves.

axg2.mib

This MIB specifies the general OIDs for arcutronix g2Management.

axg2-agent.mib

This MIB describes the ax SNMP-agent, which runs on several platforms (SCX2e, EDX1000-family, etc.).

axg2-chassis.mib

This MIB describes all physical chassis of arcutronix. A chassis may be a stand-alone box as well as a cabinet consisting of several racks and other components that contain lots of slots and modules.

axg2-device.mib

This MIB describes general information about all devices from arcutronix (CEX2, EDX1000-family etc.).

---

axg2-modules.mib

This MIB describes general information about plugable modules from arcutronix.  
**This MIB is not required for CEX2.**

axg2-cex-ds.mib

This MIB describes device specific details of CEX2.



# Chapter 7

## SSH and CLI

When the CEX2 is mounted in an arcutronix sub-rack (e.g. SRX10) with an arcutronix System Controller Card (SC-SC) it can be configured via a text-based Command Line Interface (CLI). The arcutronix-CLI can be reached over a Secure Shell (SSH) connection, which has to be established between the host (SC-SC) and your PC. Only a SSH-client and an IP-connection to the SC-SC is needed.

The SC-SC-Manual (axManual\_SC-SC.pdf) explains in detail how to connect the agent via ssh and how to use the CLI. Within this chapter a short introduction to the CLI is given and the menu-tree of the CEX2 is shown.

**NOTE:** The CEX2-CLI menu-tree is the same as shown in Table 5-2 in chapter “Menu Structure” on page 5-7. The details of the menu and usage of variables are given there, too.

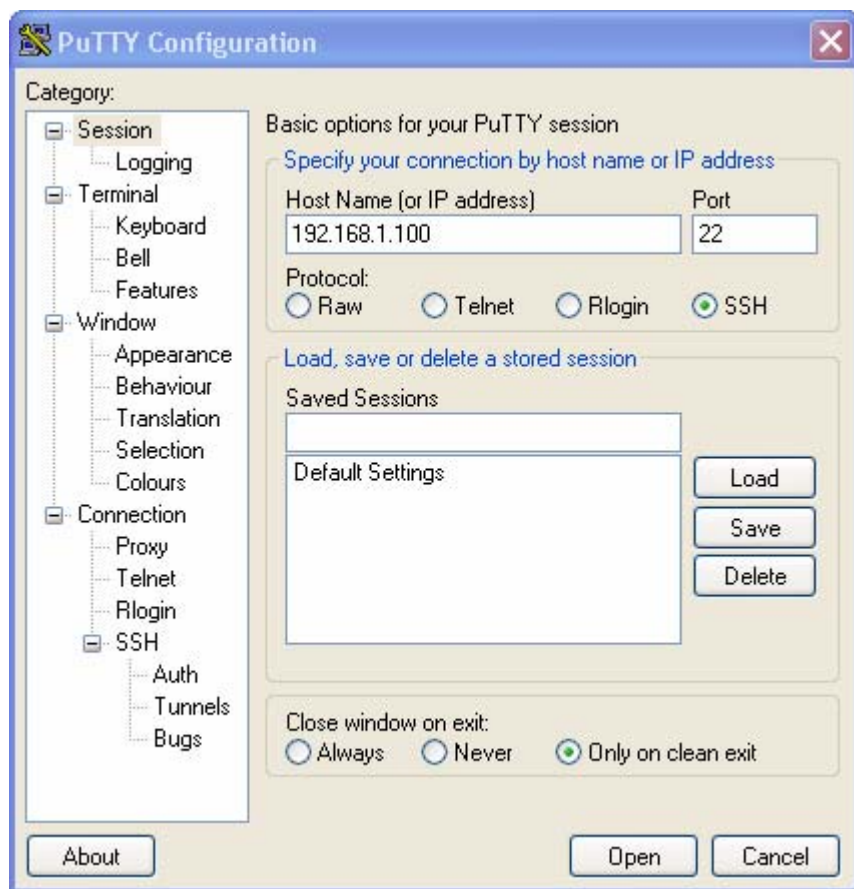
## Access to the Device

The arcutronix-CLI can only be accessed via the system controller card (SC-SC) in a sub-rack.

## SSH connection

There are many SSH client-SW on market, which are mainly freeware. We at arcutronix use normally the putty-ssh client and or the Tera Term. All the following examples are related to puTTY-ssh and or TeraTerm-ssh.

To connect to the SC-SC SSH-server establish a link via TCP/IP:



**Figure 7-1** PuTTY ssh-Connection

After pressing “Open”, the Secure Shell will be opened and a prompt is visible.



**Figure 7-2** Secure Shell

Now enter the username, which shall be used for the communication (e.g. admin) and enter the password (e.g. private).

The next message is "Welcome <username> !" and the connection is established.

## Security Issues

The SSH/CLI is accessible via any TCP/IP link to the device, so it might be that other persons than the intended ones get connection and will see the login prompt. To avoid forbidden configuration or burglary of information, the access is protected against intruders via username and password.

Any time you connect or reconnect to the initialized CEX2 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 be sent back to the factory for basic re-configuration.

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

1. Guest (only view)
2. User (view and modify)
3. Admin (full access inclusive user administration)

If the device is started-up the very first time, only the user “admin” is defined. See in “USER ADMINISTRATION Menu” on page 5-36, how to define the other users and how to change the user password.

## Command Line Interface (CLI)

The CLI is organized just in the same way as the “Control Software CEX2”. It has the same menu-structure and options. The “navigation” within the CLI-menus and the access to the management-variables will be depicted in the next chapter.

### CLI Editor Features

#### Context Sensitive Help

arcutronix-CLI offers context sensitive help. This is a useful tool for a new user because at any time during an ssh-session, a user can type a question mark (?) to get help. Two types of context sensitive help are available - word help and command syntax help.

Word help can be used to obtain a list of commands that begin with a particular character sequence. To use word help, type in the characters in question followed immediately by the question mark (?). Do not include a space before the question mark. The router will then display a list of commands that start with the characters that were entered.

Command syntax help can be used to obtain a list of command, keyword, or argument options that are available based on the syntax the user has already entered. To use command syntax help, enter a question mark (?) in the place of a keyword or argument. Include a space before the question mark. The router will then display a list of available command options with <cr> standing for carriage return.

#### Command Syntax Check

If a command is entered improperly (e.g. typo or invalid command option), the CLI will inform the user and indicate where the error has occurred.

#### Command Completion

Commands can not be abbreviated but a commands and keywords can always be completed with <TAB>. For example, you can abbreviate the "config" command to "c<TAB>" because "config" is the only command that begins with "c" and the <TAB> will complete it. If there are more than one possible completion, the CLI will show them to give you help. For example, "s<TAB>" can be "show" and/or "select". Both commands will be shown.



## Hot Keys

For many editing functions, the arcutronix-CLI editor provides hot keys. Table 7-2 lists some editing shortcuts that are available.

**Table 7-1** CEX2 CLI Hot Keys

Hot Key	Description
Delete	Removes one character to the right of the cursor.
Backspace	Removes one character to the left of the cursor.
<b>TAB</b>	<b>Completes a partial command.</b>
Ctrl-A	Moves the cursor to the beginning of the current line.
Ctrl-B	Moves the cursor one word to the left.
Ctrl-D	Removes one character to the right of the cursor.
Ctrl-I	Finishes a partial command.
Ctrl-J	Repeats the last command.
Ctrl-H	Removes one character to the left of the cursor.
Ctrl-N	Erases a line.
Ctrl-M	<CR>.
Up Arrow	Allows user to scroll forward through former commands.
Down Arrow	Allows user to scroll backward through former commands.

**NOTE:** The most helpful Hot-Key is the TAB. It allows unexperienced users to complete commands, gives correct syntax and shows possible entries at all stages!

## Commands

Once an ssh-session is established, one can navigate within CEX2-CLI like in a hierarchically structured tree. The CEX2-CLI menu-tree is shown in “Menu-Structure (Directory-Tree) of CEX2” on page 7-12. The tree is just the same as depicted in Table 5-2. Handling and meaning of the variables are the same and here it will not be presented in detail again.

To assist users in navigation through arcutronix-CLI, the command prompt will change to reflect the position of a user within the command hierarchy. This allows users to easily identify where within the command structure they are at any given moment. Also a <Tab> shows all possible options at the given position. This gives easy possibility to identify “Tab-by-Tab” the correct command.

**NOTE:** A <blanc> inside a string must be preceded by a back-slash (\) or the string must be wrapped by quotes. E.g.  
`$> mode "Rack View" or`

```
$> mode Rack\ View
```

The “Tab-by-Tab”-feature helps here a lot to build always the correct syntax.

Table 7-2 is a summary of commands and the corresponding syntax.

**Table 7-2** CEX2 CLI Commands

Command	Syntax / Explanation
help	<p>help [COMMAND]</p> <hr/> <p>HELP is in any context available and lists the possible commands in the given context. If HELP is used with a command, it shows the syntax of the command together with a short help-text.</p> <ul style="list-style-type: none"> <li>• ARG COMMAND - any available command.</li> </ul>
log	<p>log</p> <hr/> <p>LOG shows the last entries of agent's log file.</p>
config	<p>config [ go up root SUBPAGE  set OPTION VALUE   do COMMAND   [OPTION] ]</p> <hr/> <p>CONFIG shows and changes configuration settings. Configurations are grouped and this command can also be used to display/change configuration group. Without an argument CONFIG shows the current configuration group and its settings/subgroups.</p> <ul style="list-style-type: none"> <li>• ARG go up root SUBPAGE - Go to another config page. Choose a SUBPAGE from the current config page, go UP to the parent page or go to the ROOT page. Type config to see available subpages (marked with '&gt;').</li> <li>• ARG set OPTION VALUE - Set a new VALUE for a writable OPTION</li> <li>• ARG do COMMAND - Execute a config command (displayed with config as [Command])</li> <li>• ARG OPTION - Show config OPTION</li> </ul>
select	<p>select [ agent   [rack RACK] slot SLOT   serial SERIAL   DEVICENAME ]</p> <hr/> <p>SELECT a device which should be configured in Cardview-mode.</p> <ul style="list-style-type: none"> <li>• ARG agent - Select the agent card.</li> <li>• ARG rack RACK - Select device from RACK (integer).</li> <li>• ARG slot SLOT - Select device in slot SLOT (integer).</li> <li>• ARG serial SERIAL - Select device with serial number SERIAL.</li> <li>• ARG DEVICENAME - Select device DEVICENAME.</li> </ul>
show	<p>show</p> <hr/> <p>SHOW presents the information about all available racks.</p>
mode	<p>mode [MODE]</p> <hr/> <p>With MODE one can easily switch between RACKVIEW and CARDVIEW.</p> <ul style="list-style-type: none"> <li>• ARG MODE - Select mode MODE; available modes are: <ul style="list-style-type: none"> <li>- MODE Card View</li> <li>- MODE Rack View</li> </ul> </li> </ul>

**Table 7-2** CEX2 CLI Commands

Command	Syntax / Explanation
quit	quit
	Quit the current CLI session.

## arcutronix-CLI Usage

Two modes are defined for the CEX2-CLI:

- Rackview-Mode and
- Cardview-Mode

Rackview-mode is to get mainly information about the rack, the plugged cards, power supply etc. In Cardview-mode one can select one single card and gets direct access to it. One can configure, supervise and control cards only in Cardview-mode. To switch between the two modes, one has to use the `mode` command.

### Rackview - Mode

In the Rackview-mode, one can get information about (all) the discovered racks and plugged cards.

**NOTE:** Rackview-mode is the Default after first login.

The Rackview-mode can be reached from any point within the CLI using the command `MODE`:

```
cardview $> mode Rack\ View
rackview $>
```

In Rackview-mode no settings or changes are possible. One can see all racks and cards and has the option to navigate to one of the discovered cards via “select”-command or to change to CardView-mode via “mode”-command.

### Example SELECT

The command `SELECT` gives you the chance to change into the Cardview-mode of a single card. If you want to select a CEX2, which is plugged in slot 7, the following ways are possible.

#### *SELECT by rack/slot address*

```
rackview $> select rack Rack1 slot 7
Rack1:7 CEX2 "Test Device7" $>
```

#### *SELECT by name*

```
rackview $> select "Test Device7"
Rack1:7 CEX2 "Test Device7" $>
```

SELECT by serial number:

```
rackview $> select serial 2010002229  
Rack1:7 CEX2 "Test Device7" $>
```

The 3 ways are identical by result. The mode is changed to Cardview-mode and the CEX2-device in slot 7 is selected.

## Cardview - Mode

The Cardview-mode can be reached from any point within the CLI using the command MODE:

```
rackview $> mode Card\ View  
Agent SCX2e "Main Agent"$>
```

or by using the SELECT command (see examples above):

```
rackview $> select rack Rack1 slot 7  
Rack1:7 CEX2 "Test Device7" $>
```

**NOTE:** The default card, which is selected, when no other card is explicitly selected is the agent card.

## Example CONFIG

The command CONFIG is the most mighty tool in the CEX2 CLI. It is only available in Cardview-mode and gives access to the menu-structure of the selected card. Within this document, the following examples will mostly depend on the CEX2 itself. The menu-structure of the CEX2 is shown in "Menu-Structure (Directory-Tree) of CEX2" on page 7-12.

When entering the command CONFIG apart in any context (of the Cardview-mode), the available menu-entries are shown:

```
Rack1:7 CEX2 "Test Device7" $> config  
--Login  
> Local
```

The first 1-2 signs in the resulting overview are type-indicators which shows can be done with this entry and which config-command can be used.

**Table 7-3** Menu Indicators and corresponding CONFIG Commands

Type	Explanations / Examples
--	<p>Headline:</p> <p>This is the name of the shown menu. Nothing can be done with CONFIG; it is only a text.</p> <p>Example:</p> <pre>\$&gt; config --LOGIN . . \$&gt;</pre>
>	<p>Sub-Menu:</p> <p>"&gt;" indicates a sub-menu, which can be accessed via CONFIG GO &lt;sub-menu-name&gt;</p> <p>Example:</p> <pre>\$&gt; config --Login &gt; General System Information &gt; Administration &gt; Alarm Management &gt; Firmware Update \$&gt; config go Administration /Administration \$&gt;</pre>
*	<p>Changeable Management Variable</p> <p>"*" indicates a menu-entry which can be changed via CONFIG SET &lt;variable-name&gt; &lt;value&gt;</p> <p>Example:</p> <pre>/General System Information \$&gt; config --General System Information * Device Name: "Main Agent" . . . /General System Information \$&gt; config set Device\ Name "New Name" /General System Information \$&gt; config --General System Information * Device Name: "New Name" . . . /General System Information \$&gt;</pre>
+	<p>Command</p> <p>"+" indicates a command-entry which can be invoked via CONFIG DO &lt;command-name&gt;</p> <p>Example:</p>

**Table 7-3** Menu Indicators and corresponding CONFIG Commands

```
/Administration/Reset System $> config
--Reset System
  Reset State: No reset scheduled
* Reset Mode: Immediate reset
+ [Start Reset]
/Administration/Reset System $> config do Start\ Reset
```

---

*blanc* Read-Only Variable

No sign (or blanc character " ") indicates a read-only variable which can be read via  
CONFIG <variable-name>

Example:

```
/General System Information $> config
--General System Information
.
.
.
Device Temperature: "35.5"
.
/General System Information $> config Device\ Temperature
"35.5"
/General System Information $>
```

---

There are some special CONFIG commands, which help to navigate:

**Table 7-4** Special CONFIG Commands

Type	Explanations / Examples
	Go back one directory in the directory-tree of the selected device in Cardview-mode. Example: <pre>/Administration/Reset System \$&gt; config go up /Administration \$&gt; config go up \$&gt;</pre>
	Goto root directory of the selected device in Cardview-mode. Example: <pre>/Administration/Reset System \$&gt; config go root \$&gt;</pre>

## Quick Usage Guide for CLI-Commands

**Table 7-5** Quick Reference

---

Select Agent:  

```
$> select agent
```

---

**Table 7-5** Quick Reference

---

Select Card in Slot 1:

```
$> select slot 1
```

---

Select Local/Remote Instance of Connectivity Products:

```
$> config go Local
$> config go Remote
```

---

Show options in actual menu:

```
$> config
```

---

Change (User-) Name (e.g. FCX10G): [Local -> Maintenance -> General Information -> User Name]

```
$> config go root
$> config go Local
$> config go Maintenance
$> config go General\ Information
$> config set User\ Name "new Name"
```

---

Reboot Device (e.g. FCX10G): [Local -> Maintenance -> Update]

```
$> config go root
$> config go Local
$> config go Maintenance
$> config go Update
$> config set Reboot\ flash\ 1\ software
```

---

View Alarms (e.g. FCX10G): [Local -> System Monitor]

```
$> config go root
$> config go Local
$> config go system\ Monitor
$> config
```

---

Clear Alarms (e.g. FCX10G): [Local -> System Monitor -> Clear Current Alarms]

```
$> config go root
$> config go Local
$> config go system\ Monitor
$> config set Clear\ Current\ Alarms clear_now
```

---

Go back 1 Step in Menu:

```
$> config go up
```

---

Go back to Top-Level Menu (/):

```
$> config go root
```

---

## Menu-Structure (Directory-Tree) of CEX2

Level	1	2	3	4	5
--	LOGIN				
>	GENERAL INFORMATION				
		Name			
	*	User Name			
		Device Description			
		Equipment Variant			
		Serial Number			
		Software Revision			
		Article Number			
		Article Release			
		Order Information			
		Manufacture			
>	TESTS				
	>	SELF TEST			
			RAM Test		
			FLASH Test		
		*	Test Action		
	>	BER TEST			
		*	BER Test Action		
		*	BER Test Port		
		*	BER Test PRB Sequence		
		*	BER Test Logic		
			BER Test Status		
			Elapsed Time		
			With Error Time		
			Without Error Time		
			Sync Status		
			Sync Losses		
			Received kbits		
			Bit Errors		
			Bit Error Rate		
>	FACTORY TEST				

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>	<b>EXTRA</b>		
		Device Run Time	
		Alarm Status	
>	<b>CONNECTION 1</b>		
	>	<b>CLOCK</b>	
		* Clock System	
		* Clock Source	
		* Tx Clock Polarity	only for CEX2-X.21, CEX2-V.24
	>	<b>INTERFACE SETTINGS</b>	
		Interface Type IF 1	
		Connector Type IF 1	
		Interface Emulation IF 1	not for CEX2-FE
		* Start Timeslot	
		* Number of Used TS	
		Timeslot 16	not for CFX2-I.430
		Used Data Rate	
		* Loop Mode	
		* Local Carrier Detect Mode	
	>	<b>Details FE Module (IF1)</b>	\
		* I/F Name	
		Current Status	
		Current Speed / Mode	
		* I/F Mode	
		* Flow Control	
		* Admin Status	
		* Bridge Filter	only for CEX2-FE
		Counters:	
		-RX Good Frames	
		-RX Error Frames	
		- RX Overflow	
		-TX Good Frames	
		-TX Error Frames	
		- TX Overflow	
		* Reset Error Counters	/
		Interface Link Status	

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	Interface AIS Status	only for CEX-E1
	Local Carrier Detect Status	
>	<b>LINE SETTINGS</b>	
	Interface Type	Line 1
	Connector Type	Line 1
	Interface Emulation	Line 1
	Data Format	
	* Loop Mode	
	* Send AIS	
>	<b>MANAGEMENT CHANNEL</b>	
	* Channel-Type	
	State	
	* Timeslot	
	* SA4-Bit	
	* SA5-Bit	
	* SA6-Bit	
	* SA7-Bit	
	* SA8-Bit	
	Line Link Status	
	Line Sync Status	
	Line AIS Status	
>	<b>TRAPS</b>	
	* Link Status IF 1	
	* Link Status Line 1	
	* Sync Status Line 1	
	* <b>RX AIS</b> Line 1	
	* Local Carrier Detect Status	
>	<b>ALARMS</b>	
	Alarm Status	Connection 1
	* Link Down IF 1	
	* No Sync IF 1	
	* RX AIS IF 1	
	* Link Down Line 1	
	* No Sync Line 1	
	* RX AIS Line 1	

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	* Local Carrier Detect Down
>	<b>PERFORMANCE MONITORING</b>
	Loss of Sync Word (LOSW) Seconds
	Unavailable Seconds (UAS) RAM Test
>	<b>LINE 1</b>
>	<b>LOCAL MONITORING</b>
	* Performance Monitoring Action
	Elapsed Time
	Error Free Seconds (EFS)
	Errored Seconds (ES)
	Severely Errored Seconds (SES)
	Block Errors
	Loss of Sync Word (LOSW) Seconds
	Unavailable Seconds (UAS)
>	<b>CURRENT 15 MIN PERIOD</b>
	Elapsed Time
	Error Free Seconds (EFS)
	Errored Seconds (ES)
	Severely Errored Seconds (SES)
	Block Errors
	Loss of Sync Word (LOSW) Seconds
	Unavailable Seconds (UAS)
>	<b>LAST 15 MIN PERIOD RESULTS</b>
	Elapsed Time
	Error Free Seconds (EFS)
	Errored Seconds (ES)
	Severely Errored Seconds (SES)
	Block Errors
	Loss of Sync Word (LOSW) Seconds
	Unavailable Seconds (UAS)
>	<b>UPDATE</b>
	Actual Software Revision
	Flash 1 Software Revision
	Flash 2 Software Revision
	* Reboot

Figure 7-3 Menu Structure CEX2



# Appendix A

## Technical Specifications

### CEX2 Technical Data

Table A-1 provides the general technical data of the CEX - Connectivity E1/T1.

**Table A-1** Technical Data <sup>i</sup> of the CEX2

Type	Description	
CEX2	Copper Converter for fractional E1/T1	
<b>Transmission</b>		
	Round Trip Delay	0.5 msec (through 2x CEX2)
<b>PDH port (Line)</b>		
	<b>E1</b> Norm	ITU-T G.703 / G.704
	Data Rate	2048 kbps +/-50 ppm
	Jitter	Acc. to ITU-T G.823
	Line Code	HDB3
	Framing	ITU-T G.704 / unframed CRC4 selectable
	Connector	RJ45
	Input Impedance	120 Ohm
	Transmit Amplitude	3.00 V
<b>User Interfaces</b>		
	<b>V.35</b> Norm	ITU-T V.35 / V.28
	Data Rate	n x 64 kbps (n = 1...32) 2048 kbps
	Connector	Winchester (female)
	Supply Current @ 5V	<200mA
	<b>X.21</b> Norm	ITU-T V.11
	Data Rate	n x 64 kbps (n = 1...32) 2048 kbps
	Connector	D-Sub15 (female)
	Supply Current @ 5V	< 210 mA
	<b>V.24</b> Norm	ITU-T V.11

## Technical Specifications

### CEX2 Technical Data

**Table A-1** Technical Data <sup>i</sup> of the CEX2 (continued)

Type	Description	
	Data Rate	n x 64 kbps (n = 1...3) 192 kbps (synchronous) 230kBaud (asynchronous)
	Connector	D-Sub25 (female)
	Supply Current @ 5V	< 210 mA
	<b>I.430</b> Norm	ITU-T I.430
	Data Rate	192kbps
	Connector	RJ45
	Supply Current @ 5V	<200mA
	<b>Fast Ethernet</b> Norm	IEEE802.3 / 802.1d
	Data Rate	10 / 100 Mbps autonegotiation or fix configuration
	Bridge Table Size	10k MAC addresses
	Table Aging Time	300 sec.
	Packet Size	64...1535 bytes (VLAN support)
	Connector	RJ45
	Supply Current @ 5V	< 350 mA
<b>Power Supply</b>		
	Supply Voltage	+5 Vdc (4.8 V...5.2 V)
	Power Consumption	< 5 VA, overcurrent protected Power management control
	Connector	via back plane connector VG64
	Housings	Single Slot            SHX3 Chassis                SRX10 or SRX24  (Please, ask the sales contact for a current list)
<b>Environment</b>		
	<b>Climatic</b> Storage Temperature	-25 °C ...+55 °C ETS300019-1-1; class1.2
	Transport Temperature	-25°C ...+70°C ETS300019-1-2; class2.2
	Operation Temperature	+5°C ...+40°C ETS300019-1-3; class3.1
	Humidity max.	10%...90%, non-condensing
	<b>Safety</b> Norm	acc. to EN60950

**Table A-1** Technical Data<sup>i</sup> of the CEX2 (continued)

Type	Description	
	<b>EMC</b> Emission	EN55022 class B
	Immunity	EN61000-4-3 10V/m
<b>Mechanics</b>		
	<b>Dimensions</b> Rack Mount Card (H x W x D)	30 x 130 x 190 mm; 3RU
	Single Slot Housing	45 x 145 x 260 mm
	<b>Weight</b> Rack Mount Card	< 290 g
	Single Slot Housing	1.3 kg incl. Power Supply

i. Technical specifications are subject to change.





# Appendix B

## Information about Obsolete Variants

### Preface

The products of arcutronix are always further developed and improved to give the customers best equipment and quality. This improvements can be caused by new features, obsoleted components from vendors and customer-specific demands. Some variants of the connectivity-family may be not longer sold, as the provided service is longer required by customers.

the changes in the hardware and software will be reflected in the actual version of the manual, which is also part of the permanent progress if change and improvement.

In the chapters below, one will find important information of obsoleted products, so the actual manual can still be used for the older versions. if a special required information is not found here, please contact us to send you the correct release of the manual.

### CEX2-FE, with DIP-switch configuration

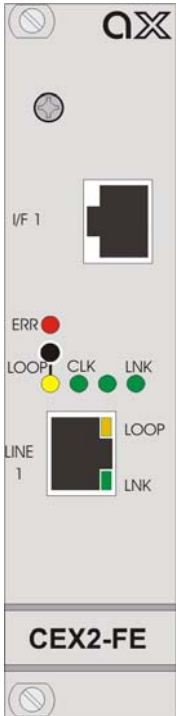
The CEX2-FE in the old version was delivered without management configuration option. The old variant had only DIP-switches to configure the unit.

an easy way to distinguish old and actual variant are the two LEDs in the RJ45 connector. The actual variant does offer two LEDs to indicate speed and traffic, while the old version did not offer these feature and no LEDs can be found in the RJ45 of the Ethernet-port.

## Front View

Table B-1 provides the front view of the CEX2-FE.

**Table B-1** CEX2-FE Front View

View	Product Number & Details
	0803-4080
	Mounting screw in SRX or SHX.
	1x FE-user port.
	1x ERR-LED.
	1x Loop-Button.
	8 LEDs for status indication.
	1x Fiber Optic Line I/F.
	Handle with Label.
	Mounting screw in SRX or SHX.

- 1 x IEEE FE (RJ45),
- 1 x Fiber Optic (different types available).

The details about the Line-I/F and the LEDs are given above (Chapter 3, **G.703 TDM Port**, and Chapter 3, **Common Indicators**, ). The electrical details of the FE pinning is given below.

## Configuration of the FE Interface

### *Ethernet and Auto Negotiation*

If both devices work in the auto-negotiation mode the optimum data transmission will be negotiated. The optimum speed and mode are chosen with the help of a priority sequence.

**Note:** If the corresponding device is manually set to full-duplex mode, the automatic chosen half-duplex mode of the Parallel Detection will result in faulty data transmission. This behavior is according to the standard.

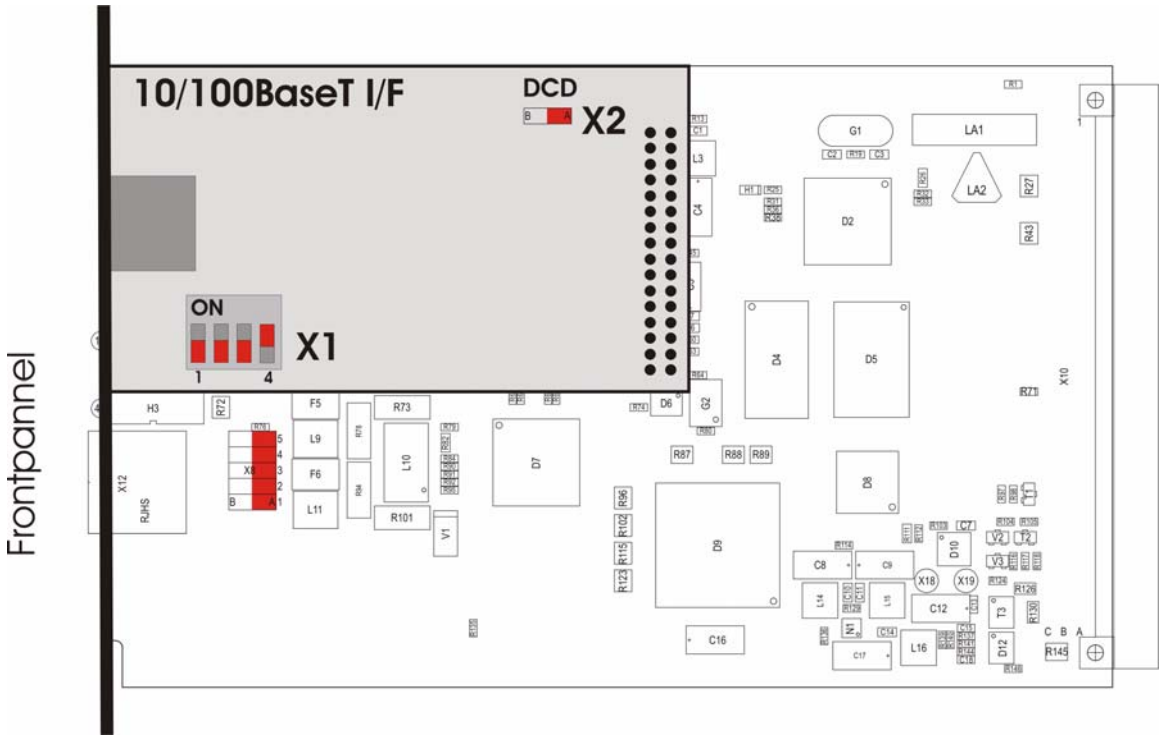
You have to use X1 to configure the FE-I/F to the auto negotiation modes. The following transmission rates are supported:

- 100 Mbps and full-duplex mode
- 100 Mbps and half-duplex mode
- 10 Mbps and full-duplex mode
- 10 Mbps and half-duplex mode.

The table below shows how the I/F settings are done (the Default is shown in **Bold**):

**Table B-2** FE Speed and I/F Settings

Transmission Mode	Status	Switch
Disable Auto Negotiation	Disable Auto-Neg	X1.1 On
	<b>Enable Auto-Neg</b>	<b>Off</b>
Speed Rate 10M	10 Mbps	X1.2 On
	<b>100 Mbps</b>	<b>Off</b>
Duplex Mode	Half-Duplex	X1.3 On
	<b>Full-Duplex</b>	<b>Off</b>
Disable Flow Control	Disable Flow Control	X1.4 On
	Enable Flow Control	Off



**Figure B-1** FE Interface Board

## Information about Obsolete Variants

### CEX2-V.35

---

A second jumper (called X2) is located close to the rear connector of the module. Its setting is fixed and must not be changed.

### Ethernet Bridge Functionality

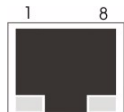
The CEX2 version with an Ethernet bridge module is able to connect two networks over a long distance. It supports automatic detection of the connection speed (10/100 Mbps autosensing) and also the transmission of VLAN frames up to 1522 bytes.

### Restrictions of Usable Clock Modes

The external clock is not defined and not available for Ethernet connections.

### Pin Assignment Ethernet 10/100BaseTx I/F Connector RJ-45

Pin	Signal
1	RD +
2	RD -
3	TD +
6	TD -



**Figure B-2** Ethernet 10/100BaseTx Interface: RJ-45 Connector

This CEX2 device is equipped with an RJ-45 Ethernet connector at the interface. Use standard twisted pair cables to connect it to a copper network.

The female RJ-45 connector is wired as MDIX (media dependent interface with cross-over) port.

**Note:** Automatic MDI-MDIX selection in auto negotiation mode only.

**NOTE:** All LEDs are switched on during the power-up test of the CEX2.

## CEX2-V.35

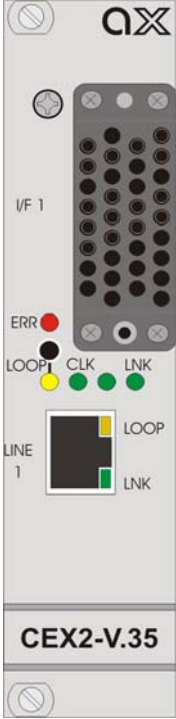
The CEX2-V.35 is not longer part of the ax portfolio.

### Front View

The CEX2-V.35 is a converter between ITU-T V.35 (user I/F) and ITU-T G.703 / G.704 (line I/F). The V.35 I/F can be operated in N x 64kbps-steps, which is configured via the management GUI. The V.35 I/F can be operated in either DTE or DCE mode. Please see below for details in configuration.

Table B-3 provides the front view of the CEX2-V.35.

**Table B-3** CEX2-V.35 Front View

View	Product Number & Details
	0803-2230
	Mounting screw in SRX or SHX.
	1x V.35-user port.
	1x ERR-LED.
	1x Loop-Button.
	4 LEDs for status indication.
1x ITU-T G.703 Line I/F.	
	Handle with Label.
	Mounting screw in SRX or SHX.

- 1 x ITU-T V.35 (Winchester, M-35),
- 1 x ITU-T G.703 / G.704 (RJ45).

The details about the Line-I/F and the LEDs are given above (Chapter 3, **E1/T1 TDM Line-Interface**, and Chapter 3, **Common Indicators**, ). The electrical details of the X.21 pinning are given below.

### Configuration of the V.35 Interface

The V.35-I/F can be operated in DCE or DTE mode. The operating mode is chosen by a number of jumper-blocks (called X1, X2, X3 and X4), which must be change combined. Figure B-3 shows the location of the 4 jumper-blocks and the settings for DCE or DTE operation.

A fifth jumper (called X5) is located close to the front connector (Winchester). It is used to connect the digital ground (DG) of the chassis to the shielded ground of the interface connector. In the shown position (bottom), the DG is not connected to Shield.

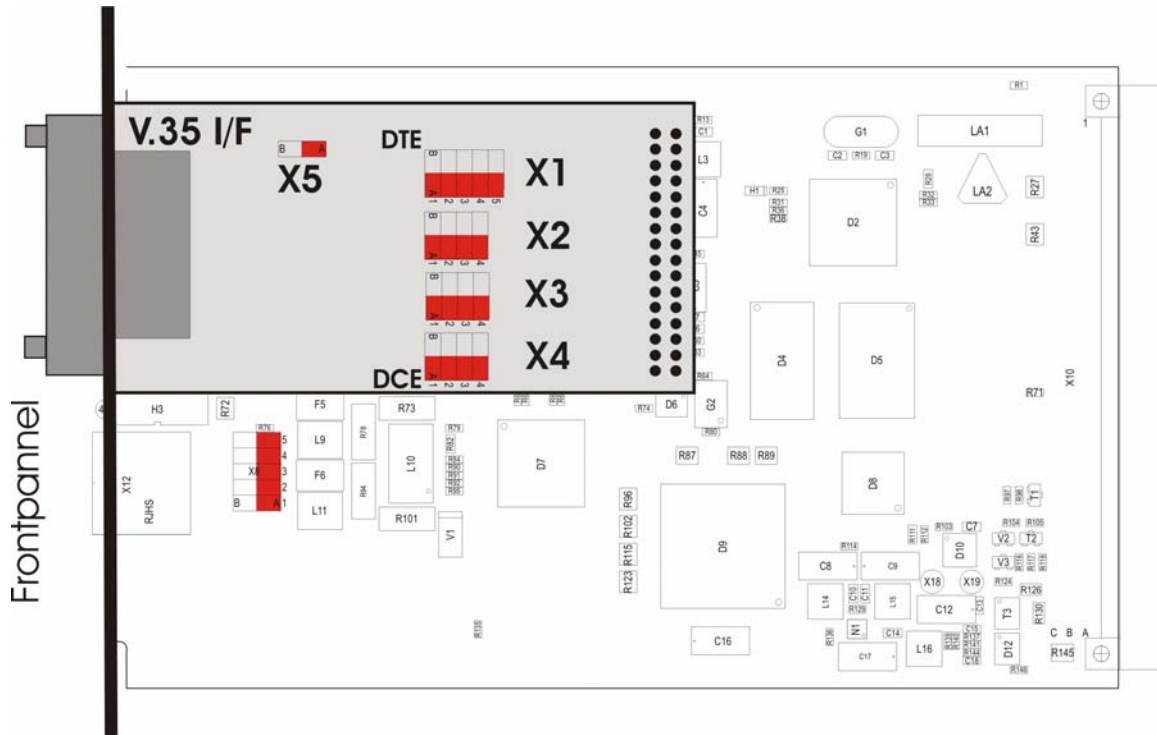


Figure B-3 V.35 Interface Board

### Pin Assignment of the V.35 Female Winchester Connector

This unit default setting is DCE. For DCE pinout see the table below.

Table B-4 Pinning V.35 Winchester Connector (DCE-Mode)

Pin	Signal	Pin	Signal
A	Prot. GND	R	RD A (Out)
B	SG	S	TD B (In)
C	RTS (In)	T	RD B (Out)
D	CTS (Out)	U	SCTE A (In)
E	DSR (Out)	V	SCR A (Out)
F	RLSD (Out)	W	SCTE B (In)
H	DTR (In)	X	SCR B (Out)
J	RI (Out)	Y	SCT A (Out)
P	TD A (In)	AA	SCT B (Out)

DTE / DCE Remark:

The explanations in this table are valid for DCE mode.

If the default setting has been changed to DTE mode please refer to the following table.

**Table B-5** Pinning V.35 Winchester Connector (DTE-Mode)

	Pin	Signal	Pin	Signal
	A	Prot GND	R	TD A (In)
	B	SG	S	RD B (Out)
	C	RLSD (Out)	T	TD B (In)
	D	CTS (In)	U	SCR A (Out)
	E	DTR (In)	V	SCTE A (In)
	F	RTS (In)	W	SCR B (Out)
DTE / DCE Remark:	H	DSR (Out)	X	SCTE B (In)
The explanations in this table are valid for DTE mode.	J	RI (NC)	Y	SCT A (In)
	P	RD A (Out)	AA	SCT B (In)

**Information about Obsolete Variants**

CEX2-V.35

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# arcutronix Pinning Overview



Signal Function	Direction	DTE	DCE	ITU-T	V.24		V.35		V.36		X.21		RS485		HSSI		RS530		RS530a								
					Unbalanced "0" = +5...+15V "1" = -5...-15V	Frame Gnd	V.35	Prot Gnd	A	1	Shield	V.36RS449 V.10-11RS422 ISO4902RS449	Name	DB-25	DB-37	DB-25	X.21-24 X.27 ISO4903	Name	4wire / 2wire	DB-9 DB-15 DB-25	Balanced "0" = 1V (A+B-) "1" = 1V (A-B+)	EIA SP2796 EIA SP2795+6 EIA SP2796	Name	Shield	1	1	Balanced
Shield ground				101																							
Signal ground				102																							
Transmitted data A	Out	In		103																							
Transmitted data B	Out	In		103																							
Received data A	In	Out		104																							
Received data B	In	Out		104																							
Request to send A	Out	In		105																							
Request to send B	Out	In		105																							
Clear to send A	In	Out		106																							
Clear to send B	In	Out		106																							
Data set ready A	In	Out		107																							
Data set ready B	In	Out		107																							
Data terminal ready A	Out	In		108																							
Data terminal ready B	Out	In		108																							
Data carrier detect A	In	Out		109																							
Data carrier detect B	In	Out		109																							
External clock A	Out	In		110																							
External clock B	Out	In		113																							
Transmit clock A	In	Out		114																							
Transmit clock B	In	Out		114																							
Receive clock A	In	Out		115																							
Receive clock B	In	Out		115																							
Ring indicator	In	Out		125																							
Remote loopback	Out	In		140																							
Local loopback	Out	In		141																							
Test mode A	In	Out		142																							
Test mode B	In	Out		142																							
Loopback "A" A	Out	In		143																							
Loopback "A" B	Out	In		143																							
Loopback "B" A	Out	In		144																							
Loopback "B" B	Out	In		144																							
Loopback "C" A	In	Out																									
Loopback "C" B	In	Out																									

PINOUTS/59030/00A

# Appendix EC

# EC Declaration of Conformity



## Declaration of EC-Conformity

We arcutronix GmbH  
Garbsener Landstr. 10  
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Germany

declare under our sole responsibility that the product group

**Name:** CEX – Connectivity E1/T1  
**Members:** CEX2-E1R, CEX2-E1B, CEX2-V.24, CEX2-X.21,  
CEX2-FE, CEX2-V.35, CEX2-I.430  
**Numbers:** 0803-2000, 0803-2100, 0803-22xx

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

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

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

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

Hannover, 31.7.2010

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