

arcutronix

Synchronize the Ethernet

USER GUIDE

FCX4G



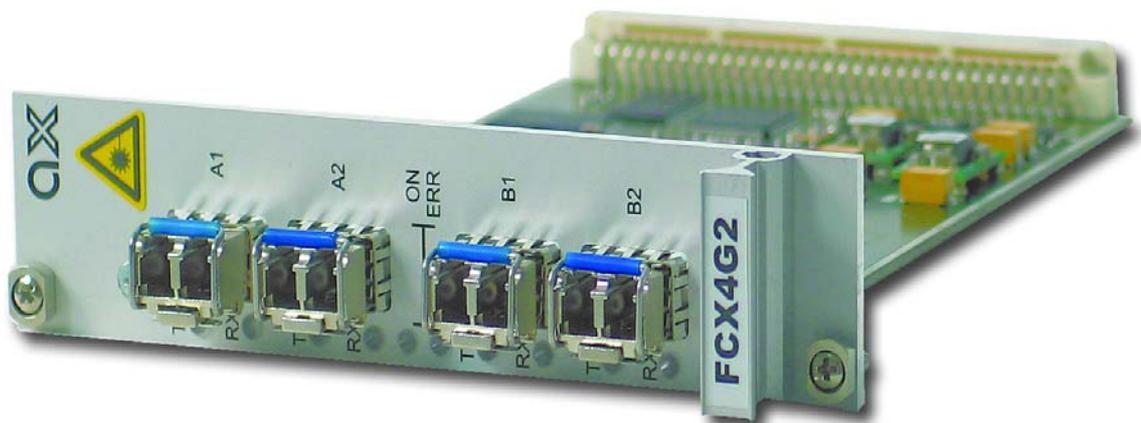
**arcutronix GmbH
Deutschland**

**Installation and
Operation Manual**

Version 1.4

FCX4G - Fibre-Optic Transponder

USER GUIDE



Covered Variants of FCX4G by this User Guide:

| | |
|---------|-------------|
| FCX4G: | 0809 - 3100 |
| FCX4G2: | 0809 - 3200 |

Covered Software Versions of FCX4G by this User Guide:

| | |
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| SW-Version (\geq): | FCX4001V06 |
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Contacts

arcutronix GmbH
Garbsener Landstraße 10
D-30419 Hannover, Germany
Tel.: +49 (0)511 277- 2700
Fax: +49 (0)511 277- 2709
E-Mail: info@arcutronix.com
<http://www.arcutronix.com>

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Document Contents

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About this Book

Document Organization

This guide describes the hardware components of the FCX4G - Fibre-Optic Transponder 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 FCX4G. 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, **Abstract:** Description of arcutronix MSP and the FCX4G Copper Converter.

Chapter 2, **Getting Started:** Short form about installation, mounting and configuration of FCX4G-family.

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

Chapter 4, **Installation and Test:** Installation procedures.

Chapter 5, **Control Software FCX4G:** Control and configuration of the FCX4G-family.

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

Chapter 7, **SSH and CLI:** Explains the SSH access to the FCX4G and the usage of the Command Line Interface (CLI).

About this Book

Appendix A, **Technical Specifications**: Provides the general technical data of the FCX4G-family.

Appendix EC, **EC Declaration of Conformity**: For all FCX4G - Fibre-Optic Transponder products.

Conventions

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

Normal text is written in Albany font.

Commands and Arguments are done in `Courier New`.

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

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

WARNING:



DANGER

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

Release History

- 2014-05-09 Version 1.4 Editor: mjz
Added and changed the following topics:
- The LPT-feature is now supported by the FCX4G - Fibre-Optic Transponder.
 - Each transponder can be disabled to reduce alarms.
- 2013-04-25 Version 1.3 Editor: mjz
Added and changed the following topics:
- Added document version for better traceability.
 - Order of Release History changed from bottom-up to top-down.
 - Front page updated to “Synchronize the Ethernet”
 - Power requirements and options for SFP updated.
- 2011-03-25 Added and changed the following topics:
- ssh-support (chapter 7) added.
- 2010-12-14 The FCX4G does not support 10M-Ethernet transport, as there is no SFP module available, which does operate it correct. For this reason, we removed this option from manual.
- 2010-10-14 First issue of the FCX4G User Guide.

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Chapter 0

Safety, Instructions, Statements

Safety Precautions

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

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

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

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

Power Precautions



WARNING:

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

Handling Precautions

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

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

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

Preventing Damage From Electrostatic Discharge



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

Card Protection

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

Grounding Procedure

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

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

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

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

- 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.

Fibre Optic Precautions



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

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

WARNING: Do not look into the fibre optic output. Looking into the fibre 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 fibre optic cables while power is applied. Disconnecting the fibre 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

Abstract

FCX4G Description

General

The FCX4G - Fibre-Optic Transponder is a flexible fibre optic converter and repeater with integrated management for broadband transport. It is a wide range device, which can be operated for services in the range of 100 MBit/s up to 4.25 Gigabit/s. FCX4G has one or two independent channels, each supporting data rates of many applications including Ethernet, SDH/Sonet and Fibre Channel. Full 3R-Regeneration (re-amplification, re-shaping, re-timing) for each channel in both directions making the FCX4G to an unique member of arcutronix Transmission family. The following protocols (data-rates) can be selected for operation:

| Type | Detail | Data-Rate |
|-----------------|--|--------------|
| Ethernet | | |
| | Fast Ethernet (100Base-FX) | 125.00 Mbps |
| | Gigabit Ethernet (1000Base-SX/-LX/-LH/-ZX) | 1250.00 Mbps |
| Telecom | | |
| ITU-T G.707 | STM-1, OC-3, STS-3 | 155.52 Mbps |
| | STM-4, OC-12, STS-12 | 622.08 Mbps |
| | STM-16, OC-48, STS-48 | 2488.32 Mbps |
| ITU-T G.709 | OTU1 | 2666.00 Mbps |
| FDDI | | |
| | FDDI, 100M | 125.00 Mbps |
| Storage | | |
| Fibre Channel | Fibre Channel (1/4 rate) • also called FC25 (25MByte/s) | 265.60 Mbps |
| | Fibre Channel (1/2 rate) • also called FC50 (50MByte/s) | 531.30 Mbps |
| | Fibre Channel (1G FC) • also called FC100 (100MByte/s) | 1.0625 Gbps |

| Type | Detail | Data-Rate |
|--------------------------|--|-------------------|
| | Fibre Channel (2G FC) | 2.1250 Gbps |
| | • also called FC200 (200MByte/s) | |
| | Fibre Channel (4G FC) | 4.2500 Gbps |
| | • also called FC400 (400MByte/s) | |
| ESCON | ESCON / SBCON | 200.00 Mbps |
| Video | | |
| | SMPTE 292M | 1.485 Gbps |
| Media Independent | | |
| | Infiniband | 2.500 Gbps |
| | XAUI | 3.125 Gbps |
| Customer Demand | | |
| | Any data-rate in the range of 100-4250 Mbps can be added by SW-update. Please ask your sales-representative for details. | 100 ... 4250 Mbps |

With 3R-regeneration, the FCX4G can de-jitter a degraded input signal and re-transmit a clean signal. Service Providers may choose data-rate with monitor option. This allows Service Providers to monitor bandwidth-specific services, while remaining transparent to protocols used by the end user. The status of receiver and transmitter operations, such as the quality of the input optical signal or the health of the transmitter, can be monitored.

The option to plug on any port a free and individually selectable fibre optic SFP module makes the FCX4G suitable for use in a wide range of applications.

Moreover, as part of arcutronix's Multi Service Platform, the FCX4G 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 (SCX2). 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 SHX3-15W.

The management capability of the FCX4G devices offers a wide range of features like performing loops, software update and performance monitoring.

3R Regeneration

Optical signal regeneration is a key function needed for scalable all-optical networks. All-optical 3R regeneration

- **Re-Amplification**,
- **Re-Shaping** and
- **Re-Timing**

are important issues for future networks to achieve bit-rate flexible operation and ultra-fast locking.

3R regeneration is the re-processing of signals in optical systems. The optical signal must be reprocessed because it is distorted by the attenuation and the dispersion of the fibre optic.

A simple amplifying of the optical signal does not fit the high demands for optical transport systems the 3R regeneration is required. Only with this method a distorted signal can be renewed. It is the restoration of the waveform by Reshaping, the attenuation is cleared by the Re-amplification and the clock signal is stabilized by re-timing.

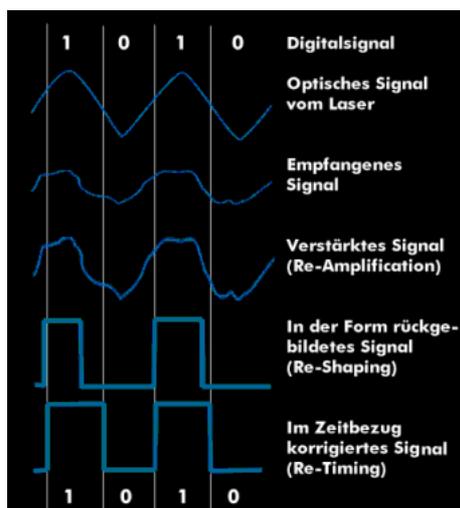


Figure 1-1 3R Regeneration

LPT - Link Fault Pass Through

General

The LPT feature allows to “inform” one side of the transceiver about the link status of the other side. If a Loss-of-Signal is detected by port A, this is forwarded to Port B of the same transponder and vice versa. Using this feature, a link failure can be propagated to the next hop. This is helpful, in case the device does not have real good management

supervision, which could lead to a loss of information. With LPT enabled, the device acts really like one piece of fibre optic!

The figure below shows the operation of LPT. If the upper port (SFP) detects LOS, it will inform the lower port and this port will disable its transmitter. through this, the LOS is propagated across the device. This works in both directions.

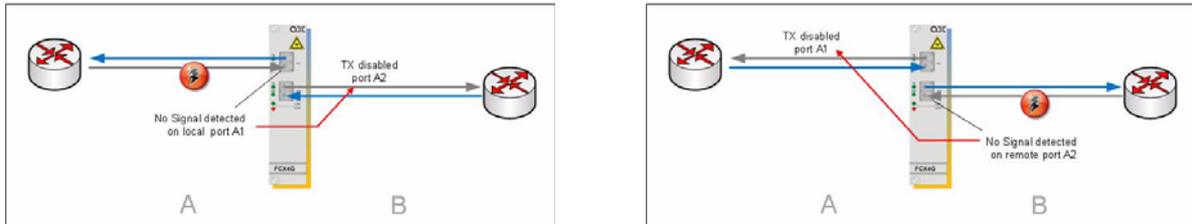


Figure 1-2 LPT - Link Failure Pass Through

RFD - Remote Failure Detection

In a typical modem application, the feature RFD is very common. RFD is to indicate a failure on the remote device and inform the other end of the application. when LPT is enabled on two FCX4G, operated in a back-to-back manner, the RFD feature is very simple available.

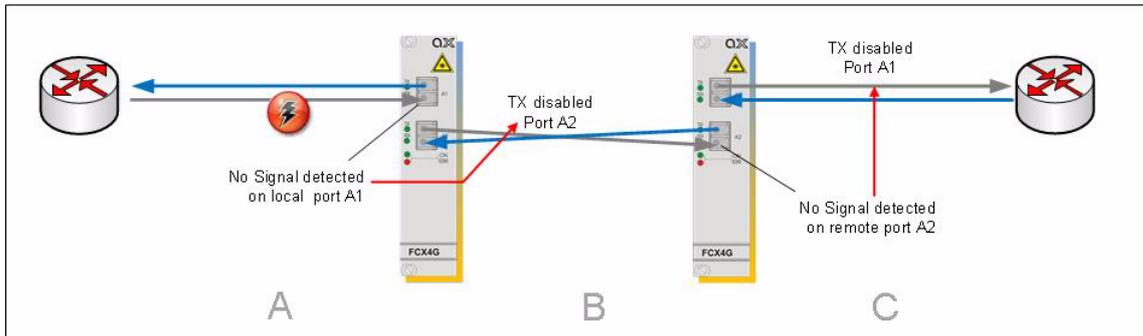


Figure 1-3 RFD - Remote Failure Detection

Functional Description

The FCX4G is a single transponder with 2 SFP-based optical interfaces connected via a 3R block to renew the optical signal in both directions.

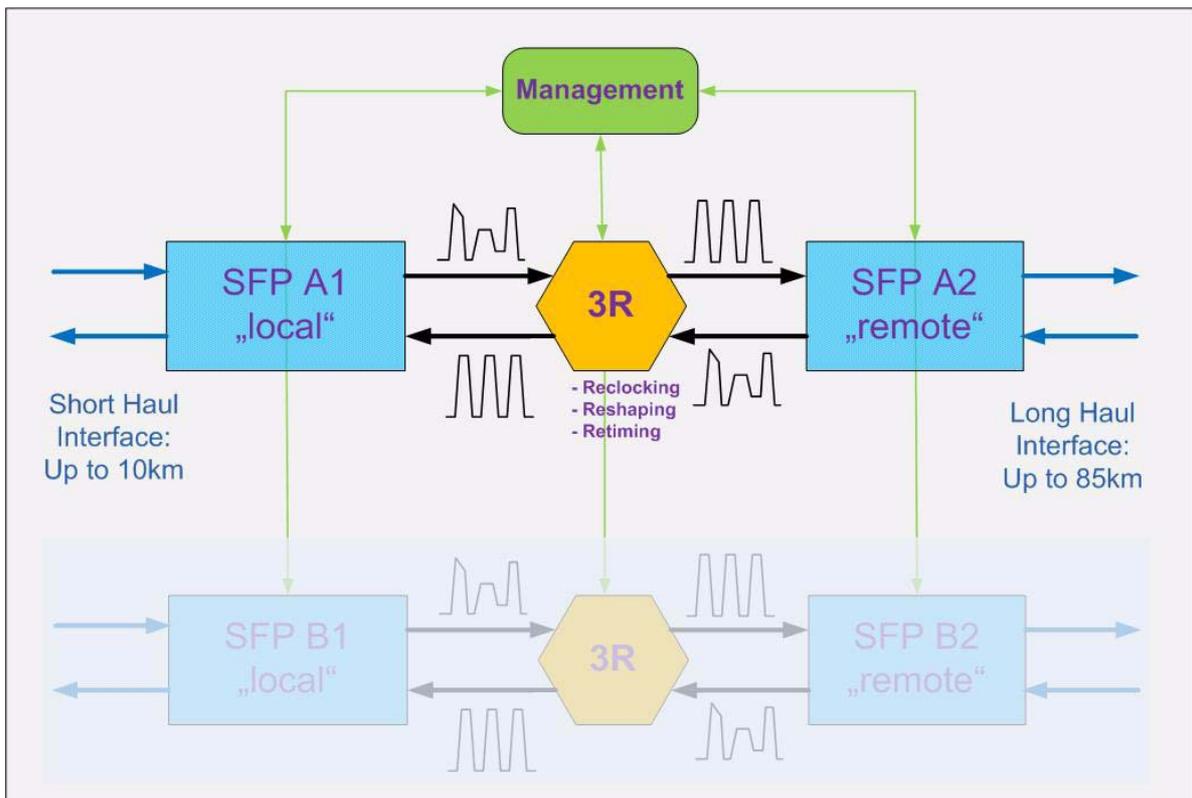


Figure 1-4 FCX4G Block Diagram

The Management can control and configure the operation of the SFPs as well as the 3R regeneration.

The dual transponder variant FCX4G2 offers higher density on the same space. Both transponders work on the same data-rate to achieve undisturbed regeneration and a minimum of jitter.

It is intended to use the inner SFPs (A1 and B1) for short haul SFPs and the outer both (A2 and B2) for long haul and high power SFPs. This gives best result for thermal air-flow. Nevertheless, all 4 SFPs slots are equal and the choice is free for usage.

Application Areas for the FCX4G

The FCX4G offers mode-conversion, repeater and wave-length conversion functionality in one unit. As it is completely protocol-transparent, no special configuration or setting has to be done to bring the unit into operation and integrate it into existing networks.

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

Distance Adaptation

The FCX4G can easily be used for adaptation of distance and gives the provider the opportunity to expand “its” network close to the customer. A short haul SFP on the customer side and a long haul SFP on line-side spreads the network to the edge.

For the end-customer there is no need to use expensive long-haul equipment and the network operator can be sure the right optical power is used for the given infra-structure. This avoids errors and faulty transmission.

For the customer, the provider can guarantee excellent quality of the provided service, as the data-stream is refreshed in meaning of clock, signal and de-jittered.

A typical scenario would be up to 80km distance between CO/PoP and the remote installation. As the FCX4G does fit into 19”-shelf (SRX), high density installation with central NMS access is possible. Using the dual transponder FCX4G2, increases the number of interface per square-meter.

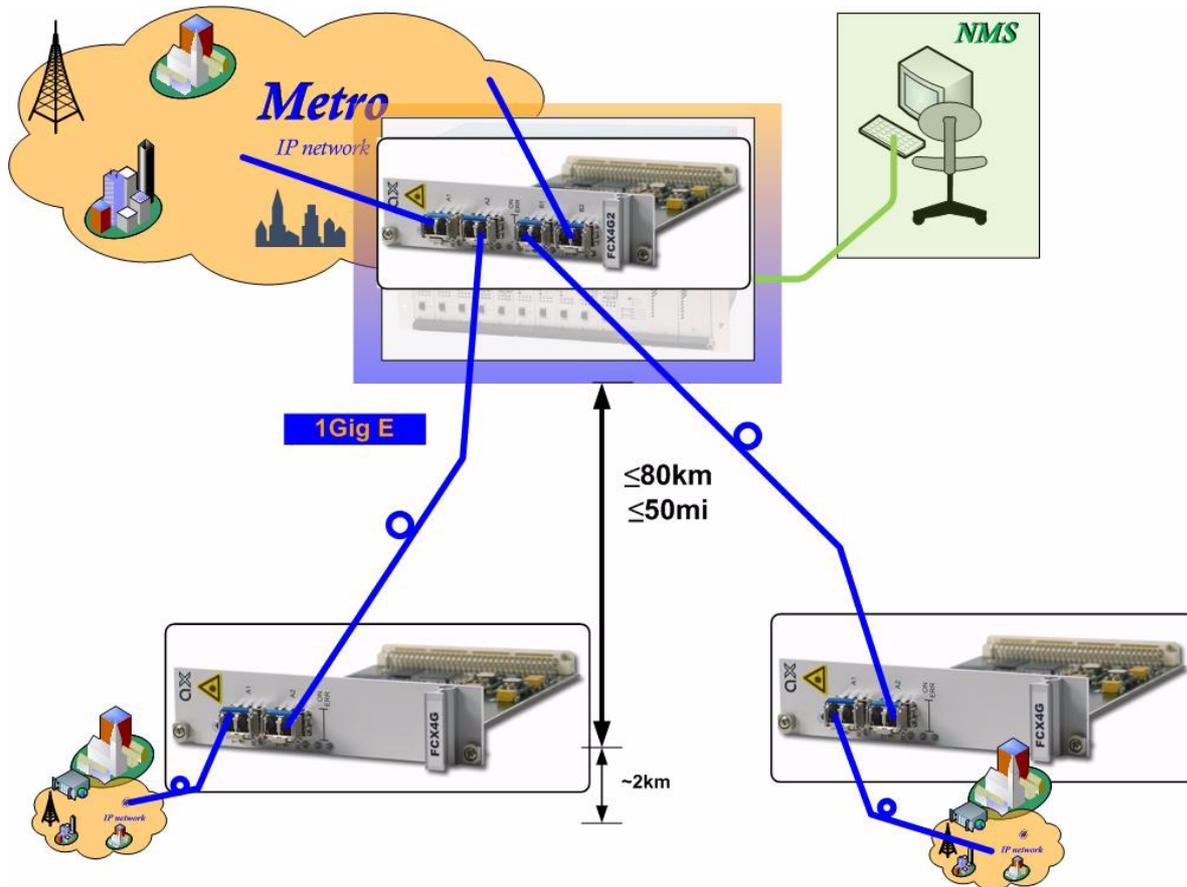


Figure 1-5 FCX4G Distance Adaptation

Repeater Functionality

As an optical repeater, the FCX4G effectively extends an optical signal to cover the desired distance. With the Clock Recovery option, a degraded signal can be de-jittered and re-transmitted to optimize signal quality.

In principle, the application is similar to the “Distance Adaptation”. Just use long-haul fibre optics on both sides.

Fibre-Mode Conversion

Mode conversion is one of the quickest and simplest ways of extending multimode optical signals over greater distances on single mode fibre optics. To achieve Mode Conversion, just install on the local side of FCX4G a MM-SFP, while on the line-side a SM-SFP for long distance is plugged.

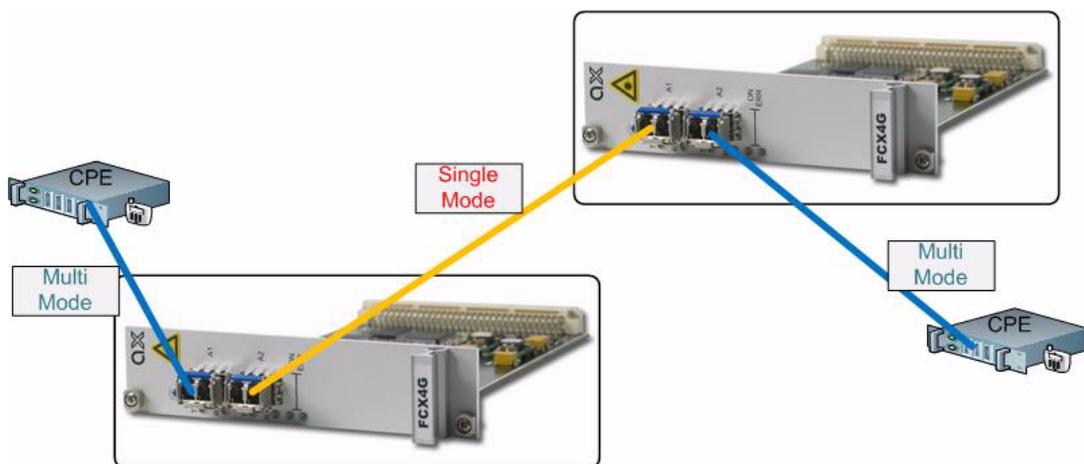


Figure 1-6 FCX4G Fibre-mode Conversion

Wavelength Conversion

To adopt broadband service I/F for DWDM or CWDM infra-structure, the FCX4G is a perfect fitting device. Flexible by the usage of SFP, it is easily to choose the required Lambda for the given location. For installation, only the SFP must be selected, the transponder itself remains always the same. This making the FCX4G a very cost-effective and easy to install solution.

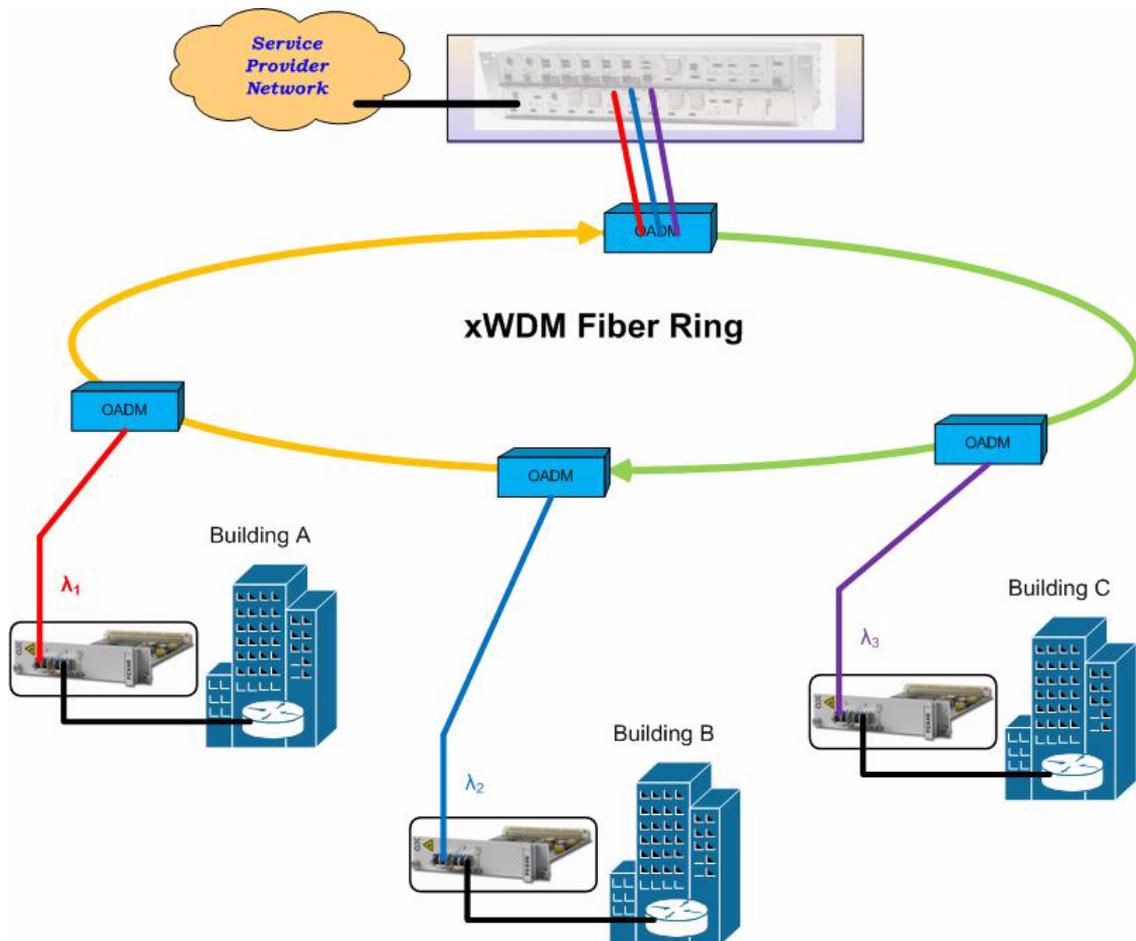


Figure 1-7 FCX4G Wavelength Conversion

FCX4G Functions at a Glance

- Fully flexible "any-to-any" colour/fibre/budget choice for each port on each channel
- Fibre optic 3R Repeater for Long distance Transmission
- Colour generator for passive CWDM/DWDM Systems

- Managed 3R Fibre Optic Converter/Repeater with two independent converter channels, each one provided as a SFP slot pair
- Channel data rate from 100Mbps up to 4.25 Gbps
- Selection of multi-mode, single-mode, WDM, CWDM or DWDM for each port individually
- Fully protocol transparent

- Integrated management via SNMP, Telnet and CLI (VT100)
- Support of test loops via management
- Digital Diagnostic Monitoring (DDM) of the SFP modules

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 FCX4G - Fibre-Optic Transponder. Further options are possible on request.

Table 1-1 Order Matrix

| Art.- No. | Short Name | Description |
|------------------|-------------------|---|
| 0809-3100 | FCX4G | Managed Broadband Multi-protocol Transponder: <ul style="list-style-type: none">• 2x 4.25Gbps ports;• pluggable SFP modules (no modules included);• Data rates<ul style="list-style-type: none">- 100-4500Mbps,- Ethernet,- Telecom,- Fibre Channel,- ESCON,- FDDI,- Video,- Media Independent;• 3R Functionality;• 3RU rack mount card. |
| 0809-3200 | FCX4G2 | Managed Dual Broadband Multi-protocol Transponder: <ul style="list-style-type: none">• 4x 4.25Gbps ports;• pluggable SFP modules (no modules included);• Data rates<ul style="list-style-type: none">- 100-4500Mbps,- Ethernet,- Telecom,- Fibre Channel,- ESCON,- FDDI,- Video,- Media Independent;• 3R Functionality;• 3RU rack mount card. |

Accessories

Housings and Cables

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

Table 1-2 Accessories Housings & Cables

| Art.- No. | Short Name | Description |
|-----------|------------|--|
| 0805-9000 | SRX10 | Rack mount shelf: <ul style="list-style-type: none">• 19" chassis,• Height: 3RU,• 10 slots for line-cards,• 1 slot for management,• 2 slots for modular AC (115/230V) and DC (-48V/-60V) power supplies. |
| 0805-9010 | SRX3 | Rack mount standalone housing: <ul style="list-style-type: none">• 19" chassis,• Height: 1RU,• 3 slots for line-cards,• VT100 Management port (D-Sub9),• with alarm contact, ventilation,• mains supply: AC (115/230V). |
| 0805-9110 | SRX3plus | Rack mount housing with agent-functionality: <ul style="list-style-type: none">• 19" chassis,• Height: 1RU,• 3 slots for line-cards,• integrated management card• 2x FE management port (SFP + RJ45),• with alarm contact, ventilation,• AC (115/230V) and DC (-48V/-60V) power supplies. |
| 0717-9101 | SHX3-15W | Stand-alone housing: <ul style="list-style-type: none">• 1 slot for 3RU line-card,• max. 15W power consumption,• VT100 Management port (D-Sub9),• alarm contact,• with ventilation,• integrated wide range power supply,• mains supply: 48VDC...110/230VAC,• power jack included. |

Table 1-2 Accessories Housings & Cables (continued)

| Art.- No. | Short Name | Description |
|------------------|-------------------|---|
| 0717-9401 | SHX3-10W | Stand-alone housing: <ul style="list-style-type: none"> • 1 slot for 3RU line-card, • max. 10W power consumption, • VT100 Management port (D-Sub9), • alarm contact, • no ventilation, • integrated wide range power supply, • mains supply: 48VDC...110/230VAC, • power jack included. |
| 0500-001 | PC-E | Power cord, European plug. |
| 0500-002 | PC-B | Power cord, Great Britain plug. |

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

SFP - (Small Form Factor Pluggable)

arcutronix offers a wide range of SFPs, which can be used in the FCX4G - Fibre-Optic Transponder. So the FCX4G does support all vendors of SFP, we recommend to use tested and proved devices.

Table 1-3 Accessories SFP

| Short Name | Description |
|-------------------|---|
| SFP-1.25G-S13-40 | Optical SFP module: <ul style="list-style-type: none"> • 1310nm DFB SM FO; • 1.25 Gbps transceiver, 1x FC, GbE; • pluggable SFP footprint; • LC connector; • digital diagnostics; • 40km. |
| SFP-1.25G-S13-10 | Optical SFP Interface Module: <ul style="list-style-type: none"> • 1310nm SM FO; • 1xFC, 1.25 Gbps transceiver; • pluggable SFP footprint; • LC connector; • digital diagnostics; • 10km. |

Table 1-3 Accessories SFP (continued)

| Short Name | Description |
|-----------------|---|
| SFP-622M-S13-40 | Optical SFP Interface Module: <ul style="list-style-type: none">• 1310nm DFB SM FO;• 622 Mbps transceiver• pluggable SFP footprint;• LC connector;• digital diagnostics;• 40km. |
| SFP-622M-S13-15 | Optical SFP module: <ul style="list-style-type: none">• 1310nm SM FO;• up to 622 Mbps multirate transceiver, STM-1, STM-4;• pluggable SFP footprint;• LC connector;• digital diagnostics;• 15km. |
| SFP-155M-S13-40 | Optical SFP module: <ul style="list-style-type: none">• 1310nm SM;• 125/155 Mbps transceiver, FastE, STM-1;• pluggable SFP footprint;• LC connector;• digital diagnostics;• 40km. |
| SFP-155M-S13-10 | Optical SFP Interface Module: <ul style="list-style-type: none">• 1310nm SM FO;• 125/155 Mbps transceiver, FastE, STM-1;• pluggable SFP footprint;• LC connector;• 10km. |

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

Chapter 2

Getting Started

For the start-up of the FCX4G please follow the directions in this chapter. You must keep the operating conditions specified for the devices. In the following read about the start-up preparation, the start-up itself, and the possibility to automate the start-up.



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

Delivered Parts

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

- An FCX4G system
 - single or dual transponder type
- optional: 1-4 SFPs
- optional: Single Slot Housing SHX3
- optional: Power Cord for AC

Preparing the Start-up

Before you switch on the device you need to check the operating conditions and install the FCX4G 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 FCX4G, 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) |
| Input Voltage | +5V DC |
| Power Consumption | < 8 VA ⁱ |

i. Depends on the given variant and the used SFPs. See Appendix A, Technical Specifications, for details.

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.

FCX4G Mounting

The FCX4G is a device, where powerful optical modules can be installed for proper operation. These modules can vary in their demand for power and will produce different amount of heat. The FCX4G is designed to host even powerful SFPs, but attention must be given, that the heat can be drained off the unit and the housing.



WARNING: Make sure, the installation environment is prepared for a high-density card. Sufficient air-flow is required and must not be disrupted.

NOTE: The usage of housing with fans are highly recommended!

NOTE: When using the ax-chassis SRX, please leave the space above the chassis unused to allow better air-flow.

To mount the FCX4G into a chassis or single-slot housing please follow the subsequent step-by-step instructions.

1. Disconnect all cables from the FCX4G before mounting the device.
2. Place the FCX4G right way up on a table with the front panel looking in your direction.
3. Insert the FCX4G that way into the chassis. Keep eye that the PCBA is sliding inside the mounting rails. Make sure, the FCX4G is well plugged till the end of the rails, so that the backplane-connector is well connected.
4. Fix the FCX4G to the chassis using the provided screws.

5. Connect the interface cables to the FCX4G.

Start-up of the FCX4G

Switching on the Device

Switching on the FCX4G, please observe the following instructions:

1. Connect the mains cable to the chassis or single-slot housing containing the FCX4G.
2. Plug the mains plug of the mains cable in a Home Office socket.

Ways of Configuration

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 FCX4G).
2. SNMP agent: You can use the SNMP protocol to manage the FCX4G (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 FCX4G.

The FCX4G 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 FCX4G variants are based on the same basic main board. The main board consists of 6 basic parts:

1. Transponder 1 (2 SFPs) with 3R functionality
2. optional: Transponder 2 (4 SFPs) with 3R functionality
3. PLL for clock reference
4. Micro Controller with Flash, RAM etc.
5. DC/DC Converter
6. Backplane Connector

Figure 3-1 provides an overview of the FCX4G2.

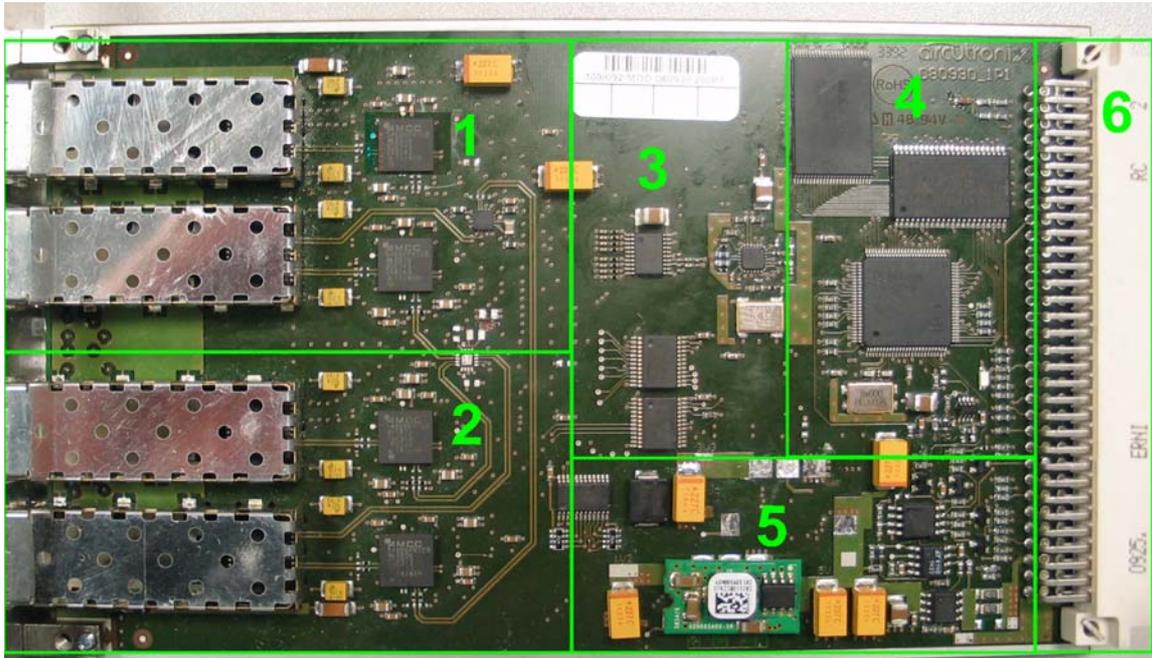


Figure 3-1 FCX4G2 Main Board

FCX4G Front Panel

The FCX4G 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 FCX4G2.

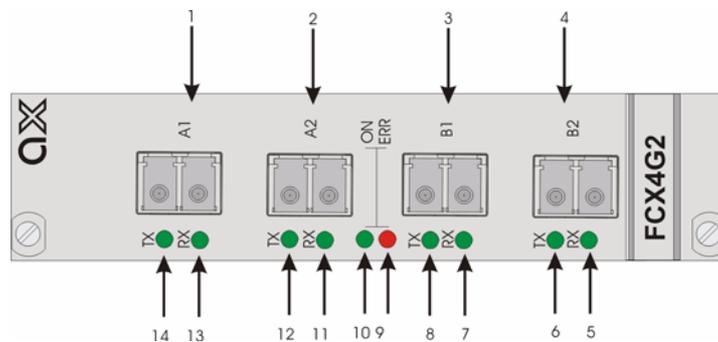


Figure 3-2 Front Panel FCX4G2 Rack Mount Card

Table 3-2 provides information on the front elements (see Figure 3-2) and explanations for the FCX4G - Fibre-Optic Transponder. The table shows, which elements are availa-

ble for FCX4G and which are for FCX4G2, only. More details on the LEDs will be given in the next chapter.

Table 3-1 Front Elements

| # | Name | FCX4G | FCX4G2 | Function |
|----|---------|-------|--------|---|
| 1 | A1 | X | X | SFP-slot for local (short distance) connection. Max. 2.5W for SFP usage is allowed. |
| 2 | A2 | X | X | SFP-slot for remote (long distance) connection. Max. 4.0W for SFP usage is allowed. |
| 3 | B1 | - | X | SFP-slot for local (short distance) connection. Max. 2.5W for SFP usage is allowed. |
| 4 | B2 | - | X | SFP-slot for remote (long distance) connection. Max. 4.0W for SFP usage is allowed. |
| 5 | RX (B2) | - | X | RX indicator for B2 interface |
| 6 | TX (B2) | - | X | TX indicator for B2 interface |
| 7 | RX (B1) | - | X | RX indicator for B1 interface |
| 8 | TX (B1) | - | X | TX indicator for B1 interface |
| 9 | ERR | X | X | Indicator for error-State of the unit. |
| 10 | ON | X | X | Indicator for Power-State of the unit. |
| 11 | RX (A2) | X | X | RX indicator for A2 interface |
| 12 | TX (A2) | X | X | TX indicator for A2 interface |
| 13 | RX (A1) | X | X | RX indicator for A1 interface |
| 14 | TX (A1) | X | X | TX indicator for A1 interface |

Common Indicators

In the front plate of the FCX4G a couple of LEDs are integrated to indicate the status of the unit and the traffic on the SFP interfaces. Table 3-2 provides detailed information on the LED indicators.

Table 3-2 Indicators of the FCX4G - Fibre-Optic Transponder

| LED Name | LED Colour | Function | Normal Operation |
|--|------------|---|------------------|
| ON | green | The ON-LED indicates, whether there is enough power available for the card. If it does not shine, either the housing does not have enough power available or the onboard DC-DC converter is damaged. | On |
| ERR | red | The ERR-LED indicates any indicated error or problem on the unit. This can be either controlled by the SFPs, the 3R-function or the μ Controller part. | Off |
| RX (A1), RX (A2), RX (B1), RX B2) | green | <p>The RX-LED(s) show the status of the optical receiver (SFP):</p> <p>Off: No RX-data detected.</p> <p>Blink (2Hz): RX-data detected, but the SFP can not synchronize!</p> <ul style="list-style-type: none"> In case, RX and TX LEDs are blinking synchronous, the device does not have enough power to feed the SFP and start it. A SFP with less power consumption could help. <p>Blink (2:1): RX-data detected, SFP can synchronize but CDR can not synchronize!</p> <p>On: Rx-data detected and the PLL has locked onto it.</p> | On |
| TX (A1), TX (A2), TX (B1), TX B2) | green | <p>The TX-LED(s) show the status of the optical transmitter (SFP):</p> <p>Off: TX (SFP) disabled.</p> <p>Blink (2Hz): This indicates that the LPT feature did switch of the transmitter due to a detected failure on the other side of the transponder.</p> <ul style="list-style-type: none"> In case, RX and TX LEDs are blinking synchronous, the device does not have enough power to feed the SFP and start it. A SFP with less power consumption could help. <p>Blink (every 4 sec double blink, otherwise On): SFP in Loop-Mode.</p> <p>On: TX (SFP) enabled and operational.</p> | On |

Note: All LEDs are switched on during the power-up test of the FCX4G.

Note: The meaning of the LEDs is the same for all FCX4G variants.

SFP Interfaces

SFP

From Wikipedia, the free encyclopedia:

The small form-factor pluggable (SFP) is a compact, hot-pluggable transceiver used for both telecommunication and data communications applications. It interfaces a network device mother board (for a switch, router, media converter or similar device) to a fiber optic or copper networking cable. It is a popular industry format supported by several network component vendors.

SFP transceivers are designed to support SONET, Gigabit Ethernet, Fibre Channel, and other communications standards.

The SFP transceiver is specified by a multi-source agreement (MSA) between competing manufacturers.

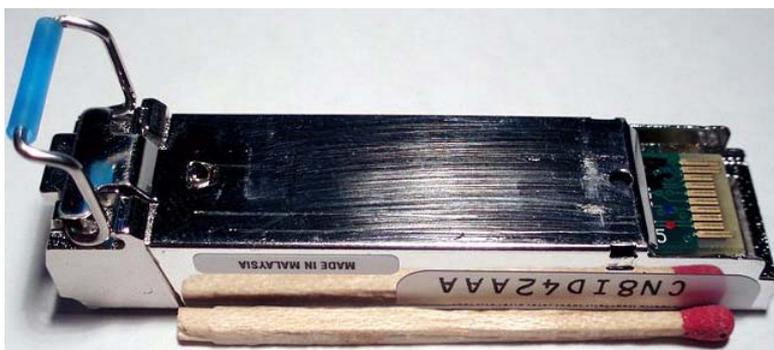
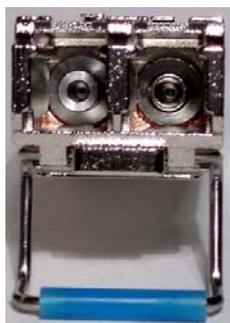


Figure 3-3 SFP Transceiver

FCX4G Rear Connector

The FCX4G 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 FCX4G 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 FCX4G allows to provide status information and to manage the devices (via a processing unit).

The asynchronous RS-232 interface is used for the outband administration of the device. It is only available if the FCX4G is placed in a single-slot housing.

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

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

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

Power Supply

For the FCX4G 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 and Test

This chapter provides the installation and removal procedures for the FCX4G 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 (SRX or 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 analyse the remaining power separately, beginning with the agent and then starting from slot 1.

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.

Plugging / Enabling additional SFPs

When an additional SFP is enabled in the FCX4G, the unit checks with the help of the power management, whether there is enough power available in the system to feed the additional module. If there is not enough power left, the FCX4G will the new module not start and the TX-LED will blink. If enough power is available, the module will be started.

If the power budget in the chassis is too small, the alarm “SFP xx: Power restricted” will be raised to indicated a major issue.

If the power budget is too small, a more power-full system has to be used.

Field Installation of FCX4G Cards

Installation

Procedure to install an FCX4G 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 FCX4G 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 FCX4G 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 FCX4G card’s 2 self-retaining screws.
6. Connect the cabling to the user port and the line port.

After power-on the FCX4G rack mount card initializes itself.

Removal

Procedure to remove an FCX4G 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 FCX4G 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 FCX4G.
2. Using the screwdriver loosen the FCX4G 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 FCX4G by either plugging it into the arcutronix Multi Service System chassis or connecting the AC/DC-converter to the stand-alone chassis, the FCX4G will be powered up. The start-up will take less than 10 seconds, while internal SW is started and some tests are done to verify the FCX4G is not damaged and proper operation can be guaranteed.

The power-up sequence is indicated by special behaviour 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 behaviour of the LEDs allow to user to

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

The start-up flow shown by the LEDs is depicted in the following table.

Table 4-1 LED start up

| State | LED “ON” | Others | after time |
|--|-----------------|------------------|------------|
| S1 (after Power On) | LED is off | all LEDs are off | 0 sec |
| S2 (enough power is available; LED test) | LED is on | all LEDs are on | 1.0 sec |
| S3 (system boots) | LED is blinking | all LEDs are off | 2.0 sec |
| O1 | LED is on | normal operation | 6.0 sec |

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

Setting up, Starting Procedures

This chapter provides procedures for setting up configurations and starting the FCX4G - Fibre-Optic Transponder. All configurations of the FCX4G are made via the control software. For details see Chapter 5, Control Software FCX4G.

Diagnostic Functions of the FCX4G

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 FCX4G card has finished, and the cabling is OK, some LEDs should light green. You can test an FCX4G 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 5-32.

Loops

The FCX4G offers 2 loops per transponder to help operators. The loops give the possibility to locate points-of-failures, bad fibre or wrong installation.

The two loops are mirroring the traffic back to the "local" or "remote" SFP-interface. In the figure below, the loops and the direction of traffic are shown.

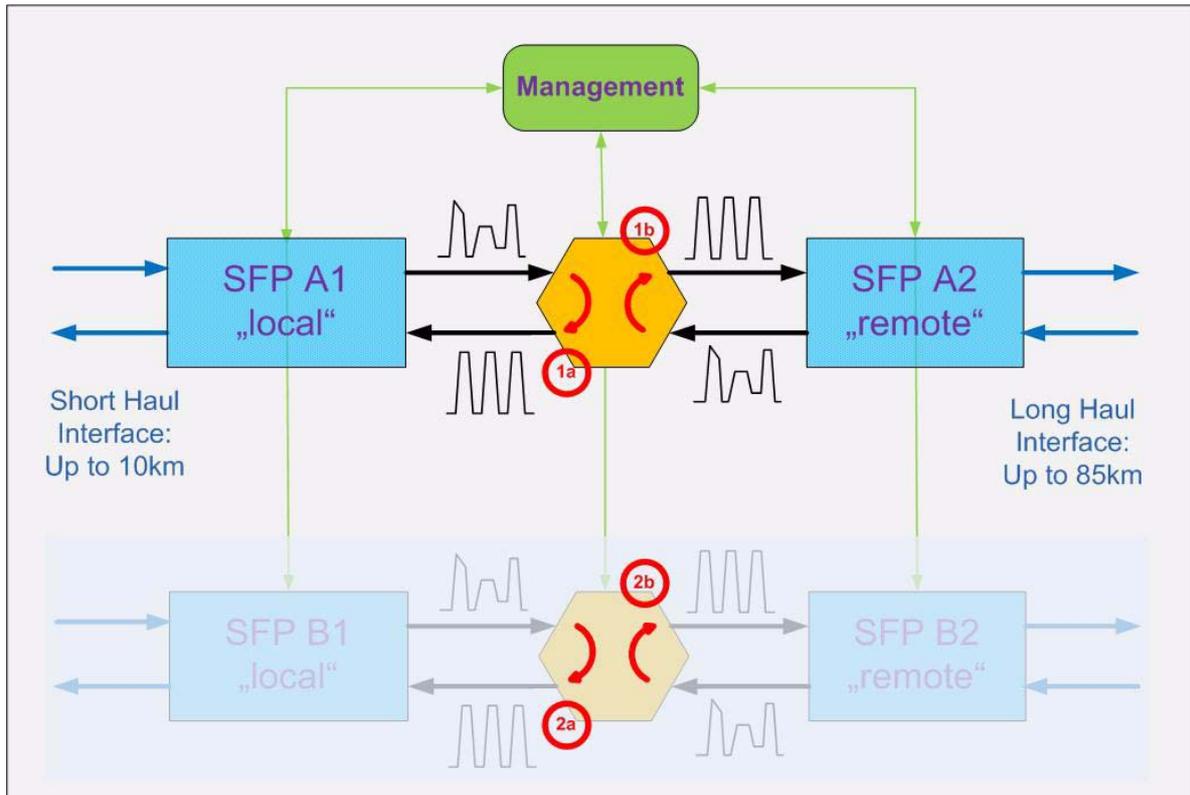


Figure 4-1 Test-Loops

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?
- A common problem during installation occurs, when the LPT feature is enabled during installation. A good practice is, to disable LPT at the beginning and enable it, as soon as everything seems to work fine.

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 mode setup:
Verify the protocol setup (speed) 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 FCX4G

General Information

The control software of the FCX4G - Fibre-Optic Transponder allows you to configure the device. 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 (SCX2e) it is possible to enter the control-software via a SSH-session. Additionally, you have almost all possibilities to configure the unit using SNMP or Web-GUI.

In this chapter, the details of the control-software in the usage of CLI and SSH is depicted. For Details about Web-GUI and SNMP, please refer to the user-manual of SCX2e.

Local RS-232 Interface (SHX)

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 (SCX2e)

For the SSH 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 5-34.

Any time you connect or reconnect to the initialized FCX4G 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 5-34, 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 FCX4G 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.

```
FCX4G 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.

```
FCX4G 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 FCX4G.

Table 5-1 Default Passwords

| Access Level | Password |
|--------------|----------|
| Monitor | monitor |
| Service | service |

Table 5-1 Default Passwords (continued)

| Access Level | Password |
|---------------------|-----------------|
| 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 5-5.

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 FCX4G passwords. The FCX4G 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.

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.

MENU Structure

The menu tree structure of the FCX4G 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 FCX4G.

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 | |
| 2) Operation Mode Transponder A | R | R | R | x | page 5-15 |
| 7) Operation Mode Transponder B ⁱ | R | R | R | x | page 5-15 |
| 13) Configure Transponder A... | x | x | x | x | page 5-17 |
| 7) SFP A1 Details... | R | x | x | x | page 5-19 |
| 12) SFP A2 Details... | R | x | x | x | page 5-19 |
| 16) Loop Mode | | | | | page 5-21 |
| 14) Configure Transponder B... ⁱ | x | x | x | x | page 5-17 |
| 7) SFP B1 Details... | R | x | x | x | page 5-19 |
| 12) SFP B2 Details... | R | x | x | x | page 5-19 |
| 15) Loop Mode | | | | | page 5-21 |
| 15) System Monitor... | R | x | x | x | page 5-22 |
| 4) View Alarm Details... | | | | | page 5-24 |
| 6) View Event Log... | x | x | x | x | page 5-27 |
| 11) Configure Alarms and Traps... | | | | | page 5-27 |
| 16) Maintenance... | - | - | - | x | page 5-29 |
| 1) General Information... | - | - | - | x | page 5-31 |
| 2) Tests... | - | - | - | x | page 5-32 |
| 1) Self Test... | | | | | page 5-32 |
| 3) Extra... | - | - | - | x | page 5-33 |

Table 5-2 Menu Structure (continued)

| LOCAL Menu Item | | Access Level | | | | Page |
|-----------------|---------------------------|--------------|---|---|---|-----------|
| | | 1 | 2 | 3 | 4 | |
| | 4) User Administration... | - | - | - | x | page 5-34 |
| | 5) Software Update | - | - | - | x | page 5-35 |
| 0) | EXIT | x | x | x | x | page 5-5 |

i. Only visible for FCX4G2

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 FCX4G 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 logged into the system. The main menu gives a complete overview to the state and configuration of the transponder and is the entry point for more sub-menus. The two variants FCX4G and FCX4G2 do have slightly different main menus, due to the different number of incorporated transponders.

The two different main menus are shown in the following screen-shots.

Main Menu FCX4G

```
FCX4G ON SLOT 1->Local

2) s Operation Mode Transponder A GigabitEthernet (1000Base-xx) 1.250GHz)
3) R Transponder A RUNNING
4) R SFP Summary Alarm Temp rec.Rx Type
5) R - SFP A1 (local) 49°C -2.3dBm Finisar
6) R - SFP A2 (remote) 47°C -2.7dBm Finisar

=====

13) Configure Transponder A...

15) System Monitor...
16) Maintenance...

0) EXIT

Please enter your choice:
```

Figure 5-1 Screen-Shot FCX4G Main Menu

For details and some explanations, see below.

Main Menu FCX4G2

```
FCX4G ON SLOT 1->Local

 2) s Operation Mode Transponder A      GigabitEthernet (1000Base-xx) 1.250GHz)
 3) R Transponder A                      RUNNING
 4) R SFP Summary                        Alarm Temp rec.Rx  Type
 5) R - SFP A1 (local)                   49°C -2.3dBm Finisar
 6) R - SFP A2 (remote)                   47°C -2.7dBm Finisar
 7) s Operation Mode Transponder B      GigabitEthernet (1000Base-xx) 1.250GHz)
 8) R Transponder B                      RUNNING
 9) R SFP Summary                        Alarm Temp rec.Rx  Type
10) R - SFP B1 (local)                   49°C -2.4dBm Finisar
11) R - SFP B2 (remote)                   47°C -2.7dBm Finisar

13) Configure Transponder A...
14) Configure Transponder B...
15) System Monitor...
16) Maintenance...

 0) EXIT

Please enter your choice:
```

Figure 5-2 Screen-Shot FCX4G2 Main Menu

As shown in the screen shot above, the main menu is divided into 3 basic parts:

1. Operation and Status of Transponder A
2. Operation and Status of Transponder B (if equipped)
3. Entry points for sub-menus and Exit

Transponder / SFP Status Information in Main Menu

The status field for the particular transponder gives a brief and condensed overview to all important informations. This making it very easy to check quick the operation and

function. If more details are required, the sub-menus offer this. The status field and its different informations are shown below:

| | | | | | |
|---|-----------------------------------|--|------|---------|------|
| 1 | 2) s Operation Mode Transponder A | GigabitEthernet (1000Base-xx) 1.250GHz | | | |
| 2 | 3) R Transponder A | RUNNING | | | |
| 3 | 4) R SFP Summary | Alarm | Temp | rec.RX | Type |
| 4 | 5) R - SFP A1 (local) | | 49°C | -2.3dBm | 1.5W |
| 5 | 6) R - SFP A2 (remote) | | 51°C | -2.7dBm | 2.5W |

Figure 5-3 Status field of the FCX4G Main Menu

Four rows can be found for each transponder:

1. Operation Mode of Transponder = Setting for Speed and/or Service
2. Status of Transponder = Summary of operation status
3. Head of Table for SFP value summaries
 - Alarm status,
 - Temperature display,
 - Receive optical input power,
 - SFP type (transmitter optical output)
4. Values for SFP 1 (local)
5. Values for SFP 2 (remote)

NOTE: If the alarm fields requires the complete space in the row, the value summaries line can look different.

The next tables offer an overview to the possible entries in the status fields:

Table 5-3 Main Menu Options

| No | Text | Value | Details |
|----|------------------------------|--|--|
| 2 | Operation Mode Transponder A | Gigabit Ethernet (1000Base-xx) 1.250GHz | Shows selected protocol (service) and the associated frequency. Several protocols/services can be selected, when 2 is pressed: |
| | | Fast Ethernet (100Base-FX) 125.00MHz | |
| | | GigabitEthernet (1000Base-x) 1250.00MHz | default value |
| | | STM-0, OC-1 (STS-1) 51.84MHz | |
| | | STM-1, OC-3 (STS-3) 155.52MHz | |
| | | STM-4, OC-12 (STS-12) 622.08MHz | |
| | | STM-16, OC-48 (STS-48) 2488.32MHz | |
| | | OTU1 2666.06MHz | |
| | | ESCON / SBCON 200.00MHz | |
| | | 1/4G FC 265.63MHz | |
| | | 1/2G FC 531.25MHz | |
| | | 1G FC 1062.50MHz | |
| | | 2G FC 2125.00MHz | |
| | | 4G FC 4250.00MHz | |
| | | FDDI 125.00MHz | |
| | | InfiniBand 2500.00MHz | |
| | | XAUI 3125.00MHz | |
| | | SMPTE 292M 1485.00MHz | |
| | | Disable Transponder | |

Table 5-3 Main Menu Options (continued)

| No | Text | Value | Details |
|----|---------------------------------|--|---|
| 3 | Transponder A | | Read-Only status field for Transponder A: |
| | | RUNNING | Transponder A is working well. |
| | | DISABLED -> SFP power down | Transponder A is disabled --> both associated SFPs are in power-down mode. |
| | | DOWN: SFP disabled | At least one SFP is disabled. Therefore the transponder is still down. |
| | | DOWN: SFP failure | At least one SFP does not work properly. Therefore the transponder is still down. |
| | | DOWN: SFP missing | At least one SFP is not equipped. Therefore the transponder is still down. |
| | | DOWN: CDR not locked | The 3R instance can not lock to the selected Operation Mode. |
| | | DOWN: PLL not locked | The PLL of the FCX4G can not lock to the selected Operation Mode. |
| | Op. Mode incompatible with SFPs | Both SFPs, SFP A1 or SFP A2 are not compatible with the selected Operation Mode. This message is alternating with other status information (normally "RUNNING"). | |
| 4 | SFP Summary | Alarm Temp rec.Rx Type | Headline for next two rows (read-only) |
| 5 | SFP A1 (local) | Alarm - | No alarm detected. The SFP is running well. |
| | | !No SFP detected | No SFP detected |
| | | !Invalid / Defect SFP | Something was detected in the SFP-slot but it is not compatible with SFP MSA. |
| | | !SFP communication failure | The communication between SFP and maintenance unit is errored. |
| | | | |

Table 5-3 Main Menu Options (continued)

| No | Text | Value | Details |
|----|------------------------------|---|---|
| | | !Power down (Vendor name Type) | The transponder A is disabled and the SFP is in power down mode. Some basic information about the plugged SFP is displayed, anyway. |
| | | !FAIL | SFP is not ready for operation, yet. Most probably no signal is detected |
| | | !TXD | SFP is disabled by admin. |
| | | !LPT | The transmitter is disabled due to 8(enabled) LPT feature and the detection of LOS on the other side of the transponder. |
| | Temp | 49°C | Current value of SFP temperature. |
| | rec.RX | <value> dBm | Measured RX-input power. |
| | Type | <value> W | Power level of the SFP as coded in the SFP according MSA. (Max. power dissipation.) |
| 6 | SFP A2 (remote) | Same as written for SFP A1 (local) | |
| 7 | Operation Mode Transponder B | Same as written for Transponder A (field 2) | Shows selected protocol (service) and the associated frequency. Several protocols/services can be selected, when 7 is pressed: |
| 8 | Transponder B | Same as written for Transponder A (field 3) | Read-Only status field for Transponder B |
| 9 | SFP Summary | Alarm Temp rec.Rx Type | Headline for next two rows (read-only) |
| 10 | SFP B1 (local) | Same as written for SFP A1 (local) | |
| 11 | SFP B2 (remote) | Same as written for SFP A1 (local) | |
| 12 | | | <i>not available</i> |

Table 5-3 Main Menu Options (continued)

| No | Text | Value | Details |
|----|----------------------------|-------|---|
| 13 | Configure Transponder A... | - | Enter 13 as your choice and the sub-menu for detailed configuration and supervision of transponder A and the two associated SFPs will be entered. |
| 14 | Configure Transponder B... | - | Enter 14 as your choice and the sub-menu for detailed configuration and supervision of transponder A and the two associated SFPs will be entered. Only available for FCX4G2. |
| 15 | System Monitor... | - | Enter 15 as your choice and the sub-menu for alarms and event monitoring will be entered. |
| 16 | Maintenance... | - | Enter 16 as your choice and the sub-menu for General Maintenance will be entered. |
| 0 | | | Exit the main menu. |

To select a menu function type the number of the desired function and press the Enter key.

OPERATION MODE Menu

Enter 1 in the main menu command line prompt and press the Enter key to access the OPERATION MODE menu. In the OPERATION MODE menu, the user can select the service type of the FCX4G. The following screen will be displayed:

```

FCX4G ON SLOT 1->Local->Operation Mode Transponder A

 1) Fast Ethernet (100Base-FX)      125.00MHz
 2) * GigabitEthernet (1000Base-x) 1250.00MHz
 3) STM-0, OC-1 (STS-1)            51.84MHz
 4) STM-1, OC-3 (STS-3)            155.52MHz
 5) STM-4, OC-12 (STS-12)          622.08MHz
 6) STM-16, OC-48 (STS-48)         2488.32MHz
 7) OTU1                            2666.06MHz
 8) ESCON / SBICON                  200.00MHz
 9) 1/4G FC                         265.63MHz
10) 1/2G FC                         531.25MHz
11) 1G FC                           1062.50MHz
12) 2G FC                           2125.00MHz
13) 4G FC                           4250.00MHz
14) FDDI                            125.00MHz
15) InfiniBand                      2500.00MHz
16) XAUI                            3125.00MHz
17) SMPTE 292M                      1485.00MHz
18) Disable Transponder

0) return to Local-Menu

Please enter your choice:

```

An asterix (***) indicates the selected mode.

Table 5-4 provides information on the OPERATION MODE menu options.

Table 5-4 OPERATION MODE Menu Options

| Selecti on | Service Type | Frequency | Details |
|---------------|-----------------------------------|-------------|-----------------|
| 1 | Fast Ethernet (100Base-FX) | 125.00 MHz | IEEE Std 802.3u |
| 2 | Gigabit Ethernet (1000Base-xx) | 1250.00 MHz | IEEE Std 802.3z |

Table 5-4 OPERATION MODE Menu Options (continued)

| Selecti on | Service Type | Frequency | Details |
|-----------------------|---------------------------|------------------|--|
| 3 | STM-0, OC-1 (STS-1) | 51.84 MHz | ITU-T G.707 and its extension G.708. |
| 4 | STM-1, OC-3 (STS-3) | 155.52 MHz | GR-253-CORE from Telcordia and T1.105 from American National Standards Institute |
| 5 | STM-4, OC-12 (STS-12) | 622.08 MHz | |
| 6 | STM-16, OC-48 (STS-48) | 2488.32 MHz | |
| 7 | OTU1 | 2666.00 Mhz | ITU-T Standard G.709 |
| 8 | ESCON / SBCON | 200.00 MHz | ESCON: IBM proprietary SBCON: X3.271 |
| 9 | 1/4G FC | 265.60 MHz | T11 Technical Committee of the InterNational Committee for Information Technology Standards (INCITS). |
| 10 | 1/2G FC | 531.30 MHz | |
| 11 | 1G FC | 1.0625 GHz | |
| 12 | 2G FC | 2.1250 GHz | |
| 13 | 4G FC | 4.2500 GHz | |
| 14 | FDDI | 125.00MHz | ANSI X3T9.5 |
| 15 | InfiniBand | 2500.00MHz | Standard by ITBA |
| 16 | XAUI | 3125.00MHz | IEEE 802.3ae |
| 17 | SMPTE 292M | 1.485 GHz | HS-SMI |
| 18 | Disable Transponder | | This disable the transponder and surpresses all alarms. |
| 0 | Exit | | Leaves this menu. |

TRANSPONDER CONFIGURATION Menu

Enter 13 or 14 in the command line prompt of the main menu and press the Enter key to access the TRANSPONDER CONFIGURATION menu for Transponder A or B. The following screen will be displayed

```
FCX4G ON SLOT 1->Local->Configure Transponder A

 1) R Transponder A Current Status           Running
 2) s Transponder A Operation Mode           GigabitEthernet (1000Base-x) 1250MHz
 3) t LPT Mode                               disabled

 5) R SFP A1 (local) Summary                 Alarm Temp rec.Rx Type
 6) R SFP A1 Current Status                  50°C -2.3dBm 1.5W
 7) t SFP A1 Admin Status                   enabled
 8) SFP A1 Details...

10) R SFP A2 (remote) Summary               Alarm Temp rec.Rx Type
11) R SFP A2 Current Status                  47°C -2.7dBm 2.5W
12) t SFP A2 Admin Status                   enabled
13) SFP A2 Details...

15) s Loop Mode                             off

 0) return to Local-Menu

Please enter your choice:
```

The screen contains general information about the transponder and its associated SFPs. Both, the transponder and the SFPs can be enabled or disabled here, to spare power or to stop optical transmission in case of repair or stand-by.

More details about the (plugged) SFPs can be seen in the sub-menu ““SFP xy Details...””.

Loops for failure detection and proof of proper work is offered in “Loop Mode” for selection.

Table 5-5 *Transponder Configuration Menu Options*

| No | Text | Value | Meaning |
|-----------|----------------------------|--|--|
| 1 | Current Transponder Status | | Read-Only status field for Transponder: Same values possible as written above in Table 5-3. |
| 2 | Transponder Operation Mode | Gigabit Ethernet (1000Base-xx) 1.250GHz | Shows selected protocol (service) and the associated frequency. Several protocols/services can be selected, when 3 is pressed. Same values as given in Table 5-4. |
| 3 | LPT Mode | disbled enabled | To enable or disable the LPT feature for the transponder. when LPT is enabled, a LOS will be forwarded to the other side of hte transponder (by disabling the corresponding transmitter TX). |
| 4 | | | <i>not available</i> |
| 5 | SFP A1 (local) Summary | Alarm Temp Locked rec.Rx Type | Headline for next row (read-only). |
| 6 | SFP A1 Current State | | Read-Only status field for SFP A1: Same values possible as written above in Table 5-3. |
| 7 | SFP A1 Admin Status | enabled disabled | Enter 6 as your choice and the admin status for the SFP will be toggled between the possible values. |
| 8 | SFP A1 Details... | | Enter 7 as your choice and the sub-menu for detailed information about the SFP A1 will be entered. |
| 9 | | | <i>not available</i> |
| 10 | SFP A2 (remote) Summary | Alarm Temp Locked rec.Rx Type | Headline for next row (read-only). |
| 11 | SFP A2 Current State | | Read-Only status field for SFP A2: Same values possible as written above in Table 5-3. |

Table 5-5 Transponder Configuration Menu Options (continued)

| No | Text | Value | Meaning |
|----|------------------------|---------------------------------------|---|
| 12 | SFP A2 Admin Status | enabled disabled | Enter 11 as your choice and the admin status for the SFP will be toggled between the possible values. |
| 13 | SFP A2 Details... | | Enter 12 as your choice and the sub-menu for detailed information about the SFP A2 will be entered. |
| 14 | | | <i>not available</i> |
| 15 | Loop Mode | off local SFP remote SFP | Shows selected loop mode for the transponder. Different modes can be selected, when 14 is pressed. |
| 0 | | | Leaves the menu. |

SFP DETAILS Menu

Enter 7 or 12 in the command line prompt of the Transponder Configuration menu and press the Enter key to access the SFP DETAILS menu for SFP. The following screen will be displayed:

```

FCX4G ON SLOT 1->Local->Configure Transponder A-> SFP A1 Details

 1) R Vendor                               FINISAR CORP. FTRJ1319P1BTL A
 3) R RX Received Optical Power            0.589mW / -2.3dBm
 4) R TX Output Power                      0.537mW / -2.7dBm
 5) R VCC                                  3.3V
 6) R Tx Bias                              22.7mA (start value: 22.4mA)
 7) R Temp (Max)                           40°C (max 41°C)

10) R Serial number                        084301102
11) R Connector                            LC
12) R Max. Bitrate                         2100 Mbit

14) R Max. Link Length                     smf 10km

16) R SFP Runtime                          12:34h since 2009/12/2

 0) return to Configure Transponder A-Menu

Please enter your choice:

```

The possible entries are listed below in more detail.

Table 5-6 SFP Details Menu Options

| No | Text | Value | Meaning |
|-----------|---------------------------|--|---|
| 1 | Vendor | Value read from the SFP. | According to SFP MSA. |
| 2 | | | <i>not available</i> |
| 3 | RX Received Optical Power | Value read from SFP. | The SFP's measured received optical energy (in mW and dBm). |
| 4 | TX Output Power | Value read from SFP. | The SFP's measured transmitted optical energy (in mW and dBm). |
| 5 | VCC | Value read from SFP. | The SFP's supply power. |
| 6 | Tx Bias | The Tx Bias value, read from SFP. | The Tx Bias value must be compared to the value at the beginning of SFP operation. If the Tx Bias value does change more than 1000mA, the life-cycle of the SFP does turn to its end. |
| 7 | Temp (Max) | Actual and maximum measured temperature. Value read from the SFP. | Both, the actual and the maximum temperature of the past is displayed. --> History function! |
| 8 | | | <i>not available</i> |
| 9 | | | <i>not available</i> |
| 10 | Serial Number | Value read from the SFP. | According to SFP MSA. |
| 11 | Connector | Value read from the SFP. | Connector type. According to SFP MSA. |
| 12 | Max. Bitrate | Value read from the SFP. | Range of supported data-rates. According to SFP MSA ("BR, nominal"). |
| 13 | | | <i>not available</i> |
| 14 | Max. Link Length | Value read from the SFP: | According to SFP MSA: |
| 15 | | | <i>not available</i> |
| 16 | SFP Runtime | Runtime of the SFP since start. | Reports the runtime of the SFP. As the runtime can be different to the runtime of the FCX4G, one can check here very easy. |

Table 5-6 SFP Details Menu Options (continued)

| No | Text | Value | Meaning |
|----|------|-------|------------------|
| 0 | | | Leaves the menu. |

LOOP MODE Menu

Enter 14 in the Transponder Configuration menu command line prompt and press the Enter key to access the LOOP MODE menu. In the LOOP MODE menu, the user can select 3 different loops for the FCX4G. The following screen will be displayed:

```
FCX4G ON SLOT 1->Local->Configure Transponder A->Loop Mode

1) * off
2) SFP_A1 (local)
3) SFP_A2 (remote)

0) return to Configure Transponder A-Menu

Please enter your choice:
```

An asterisk (*) indicates the selected mode.

Table 5-7 provides information on the SELF TEST menu options.

Table 5-7 LOOP MODE Menu Options

| Selectio n | Loop Mode | Details |
|---------------|----------------------------|---|
| 1 | off | no loop activated |
| 2 | local SFP loop-back | Local loop (called 1a or 2a) is active. |
| 3 | remote SFP loop-back | Remote loop (called 1b or 2b) is active. |
| 0 | | Leaves this menu. |

The next figure gives more detail on the loops:

This screen gives condensed information about the system and offers the sub-menu “View Event Log” for detailed view on history. The possible entries are listed below in more detail.

Table 5-8 System Monitoring Menu Options

| N o | Text | Value | Meaning |
|----------------|----------------------|--|--|
| 1 | Current Alarm Status | | Displays the alarm status of the system. |
| | | off | No Alarm detected. |
| | | on | The unit has detected one or more alarm conditions. See section “ALARM DETAILS” on page 5-24 for details. |
| 2 | Current Alarms | <ul style="list-style-type: none"> • Sys., • Temp., • Transp. A, • Transp. B <p>Alarms in brackets () are raised, but cleared.</p> | <p>Summary of alarm sources:</p> <ul style="list-style-type: none"> • System alarms • Temperature alarms • Transponder A alarms • Transponder B alarms |
| 3 | Clear Current Alarms | keep | Enter 3 as your choice and all current alarms are cleared. |
| 4 | View Alarm Details | | Enter 4 as your choice and all alarms are shown in a detailed overview. |
| 5 | | | <i>not available</i> |
| 6 | View Event Log... | | Enter 6 as your choice and the sub-menu for detailed information about the detected events will be entered. |
| 7-10 | | | <i>not available</i> |
| 11 | Configure Alarms | | Enter 10 as your choice and the handling of the alarms can be configured. |
| 0 | | | Leaves the menu. |

ALARM DETAILS

Enter 4 in the System Monitoring menu command line prompt and press the Enter key to access the ALARM DETAILS. All possible causes for alarm messages are listed in a very detailed report. Whether an alarm-condition will raise an alarm or not is configured in the menu "CONFIGURE ALARMS" on page 5-27.

NOTE: The system alarms can not be masked. A system alarm will always lead to alarm condition.

Each alarm condition can be easily checked:

| Value | Description |
|---------------|---|
| no alarm | no alarm detected for the specific source. |
| ALARM (n) | alarm detected for specific source. The number in brackets shows, how often the alarm raised (and disappeared). |
| ALARM/cleared | alarm detected, but cleared by user. A cleared alarm will not longer bring the unit in alarm status. |

An alarm can be cleared, which means, the alarm condition is accepted by staff and the condition will not longer lead to alarming state until the alarm will raise again.

:

Control Software FCX4G
SYSTEM MONITOR Menu

FCX4G ON SLOT 1->Local->System Monitor->View Alarm Details

- | | |
|--------------------------------------|----------|
| 1) t Clear All Alarms | keep |
| 2) t Reset Alarm History | |
| 4) R System PLL not locked | no alarm |
| 5) R I2C bus failure | no alarm |
| 6) R I2C bus locked | no alarm |
| 7) t Clear System Alarms | keep |
| 9) t Clear Transponder A Alarms | keep |
| 10) R Transponder A: SFP missing | ALARM |
| 11) R Transponder A: SFP failure | no alarm |
| 12) R Transponder A: SFP power down | no alarm |
| 13) R Transponder A: SFP Tx disabled | no alarm |
| 14) R Transponder A: CDR not locked | no alarm |
| 15) R SFP A1: RX LOS | no alarm |
| 16) R SFP A1: RX NO LOCK | no alarm |
| 17) R SFP A1: TX NO LOCK | no alarm |
| 18) R SFP A1: TX FAULT | no alarm |
| 19) R SFP A1: I2C failure | no alarm |
| 20) R SFP A1: TEMP | no alarm |
| 21) R SFP A1: Power restricted | no alarm |
| 22) R SFP A2: RX LOS | no alarm |
| 23) R SFP A2: RX NO LOCK | no alarm |
| 24) R SFP A2: TX NO LOCK | no alarm |
| 25) R SFP A2: TX FAULT | no alarm |
| 26) R SFP A2: I2C failure | no alarm |
| 27) R SFP A2: TEMP | no alarm |
| 28) R SFP A2: Power restricted | no alarm |
| 29) t Clear Transponder B Alarms | keep |
| 30) R Transponder B: SFP missing | ALARM |
| 31) R Transponder B: SFP failure | no alarm |
| 32) R Transponder B: SFP power down | no alarm |
| 33) R Transponder B: SFP Tx disabled | no alarm |
| 34) R Transponder B: CDR not locked | no alarm |
| 35) R SFP B1: RX LOS | no alarm |
| 36) R SFP B1: RX NO LOCK | no alarm |
| 37) R SFP B1: TX NO LOCK | no alarm |
| 38) R SFP B1: TX FAULT | no alarm |
| 39) R SFP B1: I2C failure | no alarm |
| 40) R SFP B1: TEMP | no alarm |
| 41) R SFP B1: Power restricted | no alarm |
| 42) R SFP B2: RX LOS | no alarm |
| 43) R SFP B2: RX NO LOCK | no alarm |
| 44) R SFP B2: TX NO LOCK | no alarm |
| 45) R SFP B2: TX FAULT | no alarm |
| 46) R SFP B2: I2C failure | no alarm |
| 47) R SFP B2: TEMP | no alarm |
| 48) R SFP B2: Power restricted | no alarm |
| 0) return to System Monitor-Menu | |

Please enter your choice:

NOTE: Navigation in the list is possible with “+” (next page) and “-” (previous page).

NOTE: The entries for Transponder B (29...48) are only visible for FCX4G2.

EVENT LOG

Enter 6 in the System Monitoring menu command line prompt and press the Enter key to access the EVENT LOG. In the EVENT LOG, the user can see the past 25 events of the FCX4G. First entry shows the time, when the event occurred. An example for the event monitor is shown below:

```
FCX4G ON SLOT 1->LOCAL->System Monitor->View Event Log

00:00:00 event: Transponder A: enabled
00:00:00 event: Transponder B: enabled
00:00:00 event: Transponder A: operation mode 1G Base-F (1.25GHz)
00:00:00 event: Transponder B: operation mode 1G Base-F (1.25GHz)
00:00:00 event: SFP A1: detected (OPTOWAYXPM-2100WG #084301102) 0
00:00:00 event: SFP A2: detected (OPTOWAYXPM-2100WG #084301106) 0
00:00:01 event: SFP B1: not detected 0
00:00:01 event: SFP B2: not detected 0
00:00:01 event: FCX: System Start O.K.
00:00:02 event: SFP A1: power down mode 0
00:00:02 event: SFP A2: power down mode 0
00:00:03 event: Transponder A: disabled
00:00:50 event: SFP A1: power up 0
00:00:50 event: SFP A2: power up 0
00:00:50 event: Transponder A: enabled
00:15:00 event: SFP A1: power down mode 0
00:15:00 event: SFP A2: power down mode 0
00:15:01 event: Transponder A: disabled
01:43:00 event: SFP A1: power up 0
01:43:00 event: SFP A2: power up 0
01:43:00 event: Transponder A: enabled

  0) return to System Monitor-Menu

Please enter your choice:
```

NOTE: The event-time (marked with green rectangle) is given in hh:mm:ss.

CONFIGURE ALARMS

Enter 11 in the System Monitoring menu command line prompt and press the Enter key to access the CONFIGURE ALARMS menu. The user can define, whether a trans-

ponder problem will raise an alarm and which temperature for the SFP will raise an alarm.

```
FCX4G ON SLOT 1->Local->System Monitor->Configure Alarms
```

- ```

1) t Transponder A Alarms enabled
2) t Transponder B Alarms enabled
3) w Max SFP Temp Alarm 60 °C
4) t Transponder Status Changed Trap enabled
5) t SFP Signal Status Changed Trap enabled
6) t SFP Temperature Trap enabled
7) t Loopmode Changed Trap enabled

0) return to System Monitor-Menu

```

```
Please enter your choice:
```

The possible entries are listed below.

**Table 5-9** *Configure Alarms Menu Options*

| <b>No</b> | <b>Text</b>                       | <b>Value</b>                | <b>Meaning</b>                                                                                                                                                                             |
|-----------|-----------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | Transponder A Alarms              | enabled   disabled          | Enter 1 as your choice to enable/disable an alarm, when transponder A detects problems.                                                                                                    |
| 2         | Transponder B Alarms <sup>i</sup> | enabled   disabled          | Enter 2 as your choice to enable/disable an alarm, when transponder B detects problems.                                                                                                    |
| 3         | Max SFP Temp Alarm                | 1...90 or<br>0 (to disable) | Enter 3 as your choice to enter the max. allowed temperature (in Celsius!) for all the SFPs. If this value is reached, an alarm will be raised.<br><br>Enter 0 to disable the temp. alarm. |
| 4         | Transponder Status Changed Trap   | enabled   disabled          | Enter 4 as your choice to enable/disable a trap, when transponder A changes its status from locked to unlocked or vice versa.                                                              |
| 5         | SFP Signal Status Changed Trap    | enabled   disabled          | Enter 5 as your choice to enable/disable a trap, when one SFP changes its status from up to down or vice versa.                                                                            |

**Table 5-9** Configure Alarms Menu Options (continued)

| No | Text                  | Value              | Meaning                                                                                            |
|----|-----------------------|--------------------|----------------------------------------------------------------------------------------------------|
| 6  | SFP Temperature Trap  | enabled   disabled | Enter 6 as your choice to enable/disable a trap, when one SFP reports excess of temperature limit. |
| 7  | Loopmode Changed Trap | enabled   disabled | Enter 7 as your choice to enable/disable a trap, when the loop mode of one transceiver did change. |
| 0  |                       |                    | Leaves the menu.                                                                                   |

i. This menu is only visible for FCX4G2

## MAINTENANCE Menu

Enter 16 in the command line prompt of the main menu and press the Enter key to access the MAINTENANCE menu for FCX4G. The MAINTENANCE menu gives access to several sub-menu for configuration and system overview, like factory settings etc. The following screen will be displayed:

```
FCX4G ON SLOT 1->Local->Maintenance

1) General Information...
2) Tests...
3) Extra...
4) User Administration...
5) Update...

0) return to Local-Menu

Please enter your choice:
```

The possible sub-menus are listed below.

**Table 5-10** *Maintenance Menu Options*

| <b>No</b> | <b>Text</b>            | <b>Value</b> | <b>Meaning</b>                                                                                                     |
|-----------|------------------------|--------------|--------------------------------------------------------------------------------------------------------------------|
| 1         | General Information... |              | Enter 1 as your choice and the sub-menu for factory settings, like serial-number, SW-version etc. will be entered. |
| 2         | Tests...               |              | Enter 2 as your choice and the sub-menu for HW-tests will be entered.                                              |
| 3         | Extra...               |              | Enter 3 as your choice and the sub-menu for time-settings will be entered.                                         |
| 4         | User Administration... |              | Enter 4 as your choice and the sub-menu for user administration and password handling will be entered.             |
| 5         | Update...              |              | Enter 5 as your choice and the sub-menu for SW update will be entered.                                             |
| 0         |                        |              | Leaves the menu.                                                                                                   |

## GENERAL INFORMATION Menu

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

```

FCX4G ON SLOT 1->Local->Maintenance->General Information

1) R Name FCX4G
2) w User Name <...>
3) R Device Description Dual 4G Transponder
4) R Equipment Variant FCX4G2
5) R Serial Number ar2009005980
6) R Software Revision FCX4001V06 12/03/2009
7) R Article Number 0809-3200
8) R Article Release V1.0
9) R Order Information 0809-3200/GS1
10) R Manufacturer arcutronix GmbH

0) return to Maintenance-Menu

Please enter your choice:

```

The screen contains general information on the FCX4G 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 5-11** GENERAL INFORMATION Menu

| Selecti<br>on | Parameter             | Description                                              | Form<br>at  | Default                                     | Read/Wri<br>te |
|---------------|-----------------------|----------------------------------------------------------|-------------|---------------------------------------------|----------------|
| 1             | Name                  | Name of the device                                       | Displa<br>y | 'FCX4G'                                     | Read only      |
| 2             | User Name             | Description/com<br>ment of the<br>device/applicatio<br>n | Text        | <...>                                       | Read/write     |
| 3             | Device<br>Description | Short<br>description of<br>the device                    | Displa<br>y | 'FCX4G -<br>Fibre-Optic<br>Transponder'     | Read only      |
| 4             |                       | <i>not available</i>                                     |             |                                             |                |
| 5             | Serial<br>Number      | Serial number of<br>the device                           | Displa<br>y | depends on the<br>factory settings          | Read only      |
| 6             | Software<br>Revision  | Revision of the<br>loaded system<br>software             | Displa<br>y | depends on the<br>loaded system<br>software | Read only      |
| 7             | Article<br>Number     | Article number<br>of the device                          | Displa<br>y | depends on the<br>factory settings          | Read only      |

*Table 5-11 GENERAL INFORMATION Menu (continued)*

| <b>Selecti<br/>on</b> | <b>Parameter</b>     | <b>Description</b>                    | <b>Form<br/>at</b> | <b>Default</b>                     | <b>Read/Wri<br/>te</b> |
|-----------------------|----------------------|---------------------------------------|--------------------|------------------------------------|------------------------|
| 8                     | Article<br>Release   | Article release of<br>the device      | Displa<br>y        | depends on the<br>factory settings | Read only              |
| 9                     | Order<br>Information | Order<br>information of<br>the device | Displa<br>y        | depends on the<br>factory settings | Read only              |
| 10                    | Manufacturer         | Manufacturer of<br>the device         | Displa<br>y        | 'arcutronix<br>GmbH'               | Read only              |

## TESTS Menu

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

```
FCX4G ON SLOT 1->Local->Maintenance->Tests

 1) SELF TEST...

 0) return to Maintenance-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:

```
FCX4G ON SLOT 1->Local->Maintenance->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 5-12 provides information on the SELF TEST menu options.

**Table 5-12** SELF TEST Menu Options

| Selectio<br>n | Paramet<br>er | 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.

## EXTRA Menu

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

```
FCX4G ON SLOT 1->Local->Maintenance->Extra

1) R Device Run Time 00000076:19:24
2) w SysTime 00:19:24
3) w SysDate 01/01/2000

0) return to Maintenance-Menu

Please enter your choice:
```

Table 5-13 provides information on the Extra menu options.

**Table 5-13** Extra Menu Options

| Option | Result                                                                                                                                                                                                                                                                       |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Displays the total run time of the device in hhhhhhhh:mm:ss (hours, minutes, seconds).                                                                                                                                                                                       |
| 2      | Shows the local time and allows to enter the local time. Enter the current time in the format "hh:mm:ss".<br><b>Note:</b> If the device has an active connection to any agent SCX2, time and date will be copied from the agent and overwrite the device time and date.      |
| 3      | shows the local date and allows to enter the date, e.g. 30/06/2005. Enter the date in the format "MM-DD-YYYY".<br><b>Note:</b> If the device has an active connection to any agent SCX2, time and date will be copied from the agent and overwrite the device time and date. |

## USER ADMINISTRATION Menu

Enter 4 in the command line prompt of the maintenance 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".

```
FCX4G ON SLOT 1->Local->Maintenance->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 5 in the command line prompt of the maintenance 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”

```
FCX4G ON SLOT 1->Local->Maintenance->Update

1) R Actual Software Revision FCX4001V06 12/11/2009 (2)
2) R Flash 1 Software Revision FCX4001V06 12/10/2009
3) R Flash 2 Software Revision FCX4001V06 12/11/2009
4) s Reboot no reboot
5) Software Update FCX4
6) R Software Update Status

0) return to Maintenance-Menu

Please enter your choice:
```

Table 5-14 provides information on the Update menu options.

**Table 5-14** 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 FCX4G 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 5-36.)<br><br><b>Note:</b> The "FCX4" indicates, that only SW for FCX4G 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:

```
FCX4G ON SLOT 1->Local->Maintenance->Update->Reboot

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

0) return to Update-Menu

Please enter your choice:
```

The FCX4G 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 FCX4G 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 FCX4G 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 FCX4G.

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  
FCX4\*.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  
FCX4\*.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 5-36.

For more information on the update process via the rack agent, refer to the control software description of the SCX 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
  FCX4*.BIP
  with Y-Protocol. C
- Abort by Terminalprogram / User
To continue strike any key !
```

Example

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

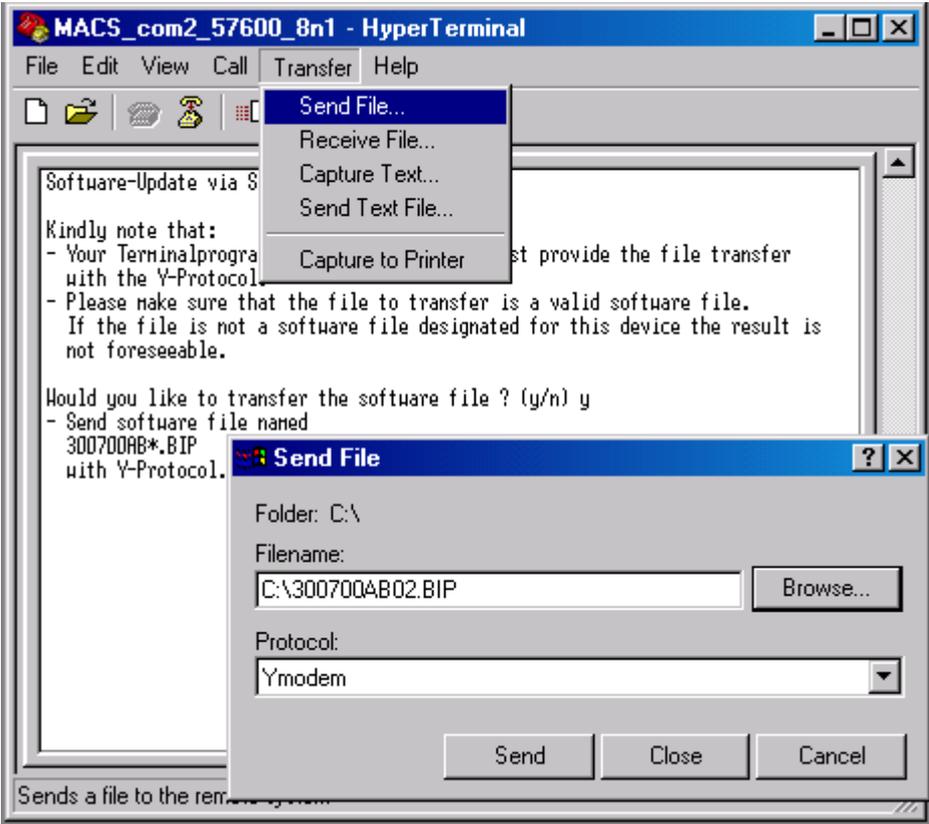


Figure 5-5 Update with HyperTerminal

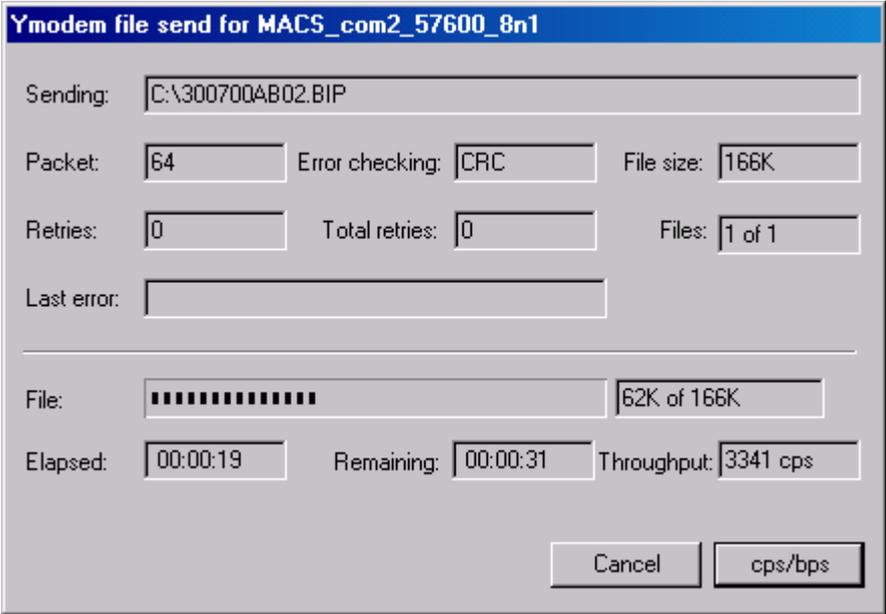


Figure 5-6 Send File

Chapter 6

SNMP and MIBs

This chapter provides information on the SNMP and the management information bases (MIBs) used by the FCX4G.

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 SNMPv2c 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 you can manage the FCX4G using SNMP, you have to prepare the SNMP management system.

You will find a CD-ROM, containing the user guide and the MIBs, along with the FCX4G hardware. 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 new 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)

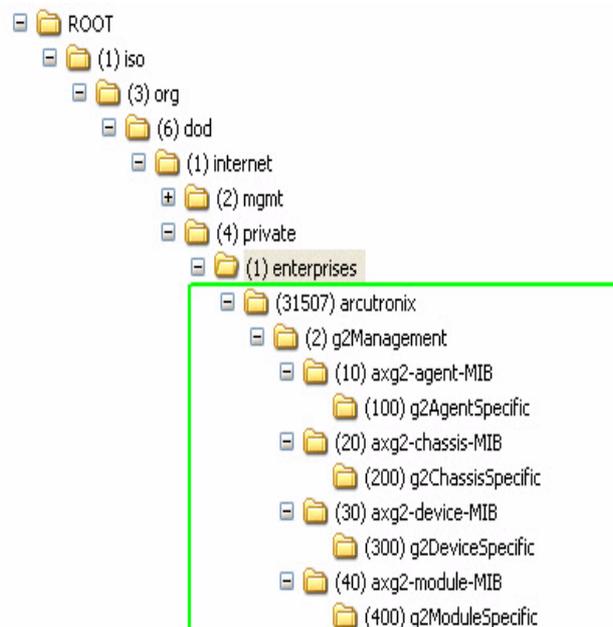


Figure 6-1 The SNMP Generation 2 MIB Tree

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

SNMP and MIBs

Management Information Bases (MIBS)

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 (SCX2, 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 (FCX4G, EDX1000-family etc.).

axg2-modules.mib

This MIB describes general informatino about plugable modules from arcutronix.
This MIB is not required for FCX4G.

axg2-FCX4G-ds.mib

This MIB describes device specific details of FCX4G.

Chapter 7

SSH and CLI

When the FCX4G is mounted in an arcutronix sub-rack (e.g. SRX10) with an arcutronix System Controller Card (SCX2e) 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 (SCX2e) and your PC. Only a SSH-client and an IP-connection to the SCX2e is needed.

The SCX2e-Manual (axManual_SCX2e.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 FCX4G is shown.

NOTE: The FCX4G-CLI menu-tree is the same as shown in Table 5-2 in chapter “Menu Structure” on page 5-5. 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 (SCX2e) 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 SCX2e SSH-server establish a link via TCP/IP:

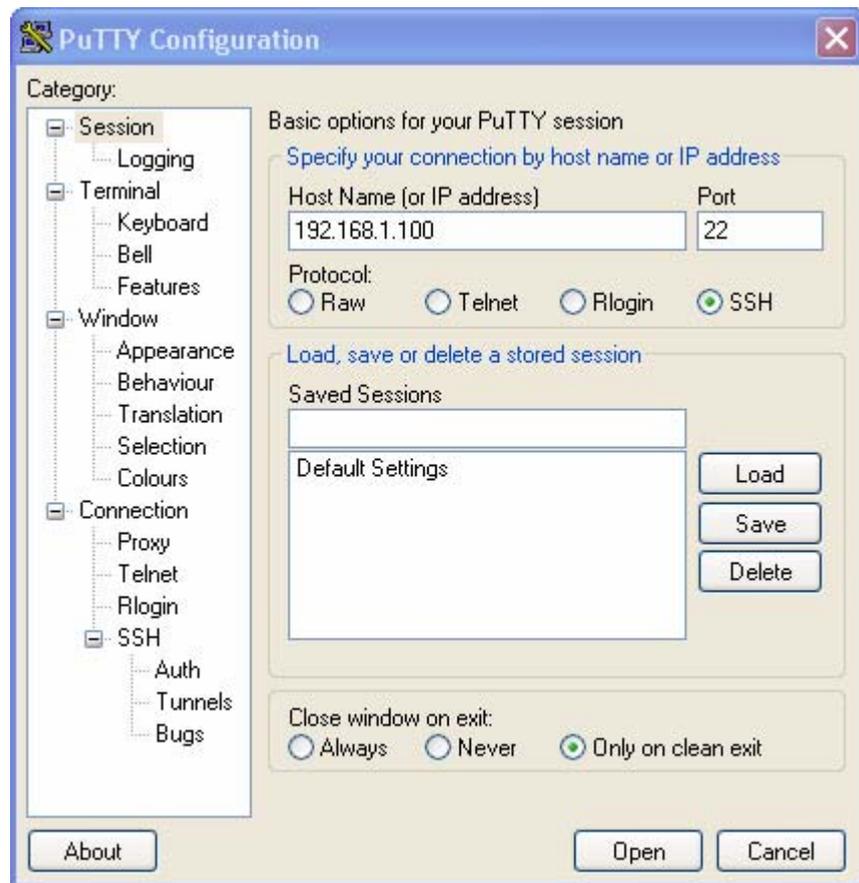


Figure 7-1 PuTTY ssh-Connection

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 FCX4G 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 5-34, 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 FCX4G". 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 FCX4G 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. |
| TAB | Completes a partial command. |
| 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>. |

Table 7-1 FCX4G CLI Hot Keys

| Hot Key | Description |
|------------|---|
| 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 FCX4G-CLI like in a hierarchically structured tree. The FCX4G-CLI menu-tree is shown in “Menu-Structure (Directory-Tree) of FCX4G” 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 FCX4G CLI Commands

| Command | Syntax / Explanation |
|---------|---|
| help | help [COMMAND] HELP is in any context available and lists the possible commands in the given context. If HELP is used with an command, it shows the syntax of the command together with a short help-text. • ARG COMMAND - any available command. |
| log | log LOG shows the last entries of agent's log file. |
| config | config [go up root SUBPAGE set OPTION VALUE do COMMAND [OPTION]] |

Table 7-2 FCX4G CLI Commands

| Command | Syntax / Explanation |
|---------|---|
| | <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"> • 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 '>'). • ARG set OPTION VALUE - Set a new VALUE for a writable OPTION • ARG do COMMAND - Execute a config command (displayed with config as [Command]) • ARG OPTION - Show config OPTION |
| select | <p>select [agent [rack RACK] slot SLOT serial SERIAL DEVICENAME]</p> <p>SELECT a device which should be configured in Cardview-mode.</p> <ul style="list-style-type: none"> • ARG agent - Select the agent card. • ARG rack RACK - Select device from RACK (integer). • ARG slot SLOT - Select device in slot SLOT (integer). • ARG serial SERIAL - Select device with serial number SERIAL. • ARG DEVICENAME - Select device DEVICENAME. |
| show | <p>show</p> <p>SHOW presents the information about all available racks.</p> |
| mode | <p>mode [MODE]</p> <p>With MODE one can easily switch between RACKVIEW and CARDVIEW.</p> <ul style="list-style-type: none"> • ARG MODE - Select mode MODE; available modes are: <ul style="list-style-type: none"> - MODE Card View - MODE Rack View |
| quit | <p>quit</p> <p>Quit the current CLI session.</p> |

arcutronix-CLI Usage

Two modes are defined for the FCX4G-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 FCX4G, which is plugged in slot 7, the following ways are possible.

SELECT by rack/slot address

```
rackview $> select rack Rack1 slot 7
Rack1:7 FCX4G "Test Device7" $>
```

SELECT by name

```
rackview $> select "Test Device7"
Rack1:7 FCX4G "Test Device7" $>
```

SELECT by serial number:

```
rackview $> select serial 2010002229
Rack1:7 FCX4G "Test Device7" $>
```

The 3 ways are identical by result. The mode is changed to Cardview-mode and the FCX4G-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 FCX4G "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 FCX4G 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 FCX4G itself. The menu-structure of the FCX4G is shown in "Menu-Structure (Directory-Tree) of FCX4G" 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 FCX4G "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

| Typ | 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>\$> config --LOGIN . . \$></pre> |
| > | <p>Sub-Menu:</p> <p>">" indicates a sub-menu, which can be accessed via</p> <p>CONFIG GO <sub-menu-name></p> <p>Example:</p> |

Table 7-3 Menu Indicators and corresponding CONFIG Commands

```
$> config
--Login
> General System Information
> Administration
> Alarm Management
> Firmware Update
$> config go Administration
/Administration $>
```

***** Changeable Management Variable

“*” indicates a menu-entry which can be changed via

CONFIG SET <variable-name> <value>

Example:

```
/General System Information $> config
--General System Information
* Device Name: "Main Agent"
.
.
.
/General System Information $> config set Device\ Name "New Name"
/General System Information $> config
--General System Information
* Device Name: "New Name"
.
.
.
/General System Information $>
```

+ Command

“+” indicates a command-entry which can be invoked via

CONFIG DO <command-name>

Example:

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

Table 7-3 Menu Indicators and corresponding CONFIG Commands

| | |
|-------------|--|
| <i>blan</i> | Read-Only Variable |
| <i>C</i> | No sign (or blanc character “ ”) indicates a read-only variable which can be read via |
| | CONFIG <variable-name> |
| | Example: |
| | <pre>/General System Information \$> config --General System Information . . . Device Temperature: "35.5" . /General System Information \$> config Device\ Temperature "35.5" /General System Information \$></pre> |

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

Table 7-4 Special CONFIG Commands

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

Quick Usage Guide for CLI-Commands

Table 7-5 Quick Reference

| |
|---------------------------------|
| Select Agent: |
| <pre>\$> select agent</pre> |
| Select Card in Slot 1: |
| <pre>\$> select slot 1</pre> |

Table 7-5 Quick Reference

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 FCX4G

| Level | 1 | 2 | 3 | 4 | 5 |
|-------|-------|--------------------------------|------------------------------|---|---|
| -- | LOGIN | | | | |
| > | Local | | | | |
| | * | Transponder A Operation Mode | | | |
| | | Transponder A Current Status | | | |
| | | SFP Summary | | | |
| | | - SFP A1 (local) | | | |
| | | - SFP A2 (remote) | | | |
| | * | Transponder B Operation Mode | | | |
| | | Transponder B Current Status | | | |
| | | SFP Summary | | | |
| | | - SFP B1 (remote) | | | |
| | | - SFP B2 (local) | | | |
| | > | Configure Transponder A | | | |
| | | Transponder A Current Status | | | |
| | | * | Transponder A Operation Mode | | |
| | | SFP A1 (local) Summary | | | |
| | | SFP A1 Current Status | | | |
| | | * | SFP A1 Admin Status | | |
| | | > | SFP A1 Details | | |
| | | Vendor | | | |
| | | RX Received Optical Power | | | |
| | | TX Output Power | | | |
| | | VCC | | | |
| | | Tx Bias | | | |
| | | Temp (Max) | | | |
| | | Serial number | | | |
| | | Connector | | | |
| | | Max. Bitrate | | | |
| | | Max. Link Length | | | |
| | | SFP Runtime | | | |
| | | SFP A2 (remote) Summary | | | |
| | | SFP A2 Current Status | | | |

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| | |
|---|---|
| | * SFP A2 Admin Status |
| > | SFP A2 Details |
| | please refer to "SFP A1 Details" |
| | * Loop Mode |
| > | Configure Transponder B |
| | please refer to "Configure Transponder A" |
| > | System Monitor |
| | Current Alarm Status |
| | Current Alarms |
| | * Clear Current Alarms |
| > | View Alarm Details |
| | * Clear All Alarms |
| | * Reset Alarm History |
| | * Clear System Alarms |
| | System PLL not locked |
| | I2C bus failure |
| | * Clear Transponder A Alarms |
| | Transponder A: SFP missing |
| | Transponder A: SFP Tx disabled |
| | Transponder A: CDR not locked |
| | SFP A1: RX LOS |
| | SFP A1: I2C failure |
| | SFP A1: TEMP |
| | SFP A2: RX LOS |
| | SFP A2: I2C failure |
| | SFP A2: TEMP |
| | Transponder B: SFP missing |
| | Transponder B: SFP Tx disabled |
| | Transponder B: CDR not locked |
| | SFP B1: RX LOS |
| | SFP B1: I2C failure |
| | SFP B1: TEMP |
| | SFP B2: RX LOS |
| | * Clear Transponder B Alarms |
| | SFP B2: I2C failure |

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| | | |
|--|---|-----------------------------------|
| | | SFP B2: TEMP |
| | > | Configure Alarms and Traps |
| | | * Max SFP Temp Alarm |
| | | * Transponder Status Changed Trap |
| | | * SFP Signal Status Changed Trap |
| | | * SFP Temperature Trap |
| | > | Maintenance |
| | | > General Information |
| | | Name |
| | | * User Name |
| | | Device Description |
| | | Equipment Variant |
| | | Serial Number |
| | | Software Revision |
| | | Article Number |
| | | Article Release |
| | | Order Information |
| | | Manufacturer |
| | | > Tests |
| | | > SELF TEST |
| | | RAM Test |
| | | FLASH Test |
| | | * Test Action |
| | | > FACTORY TEST |
| | | > Extra |
| | | Device Run Time |
| | | > Update |
| | | Actual Software Revision |
| | | Flash 1 Software Revision |
| | | Flash 2 Software Revision |
| | | * Reboot |
| | | Software Update Status |

Figure 7-3 Menu Structure FCX4G

Appendix A

Technical Specifications

FCX4G Technical Data

FCX4G

Table A-1 provides the general technical data of the FCX4G - Fibre-Optic Transponder.

Table A-1 Technical Data of the FCX4G

| Type | Description |
|---------------------|--|
| FCX4G | Managed Multirate 100M - 4.25Gigabit Transponder |
| Transmission | Round Trip Delay < 0.02 msec (through 2x FCX4G) |
| Data Rates | 100.0 MHz to 4.25 GHz |
| Timing | Through-timing in both directions Full 3R |

Table A-1 Technical Data of the FCX4G (continued)

| Type | Description |
|---------------------------|--|
| | <p>Protocols SDH, SONET:</p> <ul style="list-style-type: none"> - STM-1, OC-3, STS-3 - STM-4, OC-12, STS-12 - STM-16, OC-48, STS-48 <p>OTN („Digital Wrapper“):</p> <ul style="list-style-type: none"> - OTU 1 <p>Ethernet:</p> <ul style="list-style-type: none"> - 100 Base-FX - 1000 Base-SX/LX/LH/ZX <p>Fiber Channel:</p> <ul style="list-style-type: none"> - 1/4 FC - 1/2 FC - 1G FC - 2G FC - 4G FC <p>ESCON:</p> <ul style="list-style-type: none"> - ESCON / SBCON <p>FDDI:</p> <ul style="list-style-type: none"> - 100M FDDI <p>Video:</p> <ul style="list-style-type: none"> - SMPTE 292M <p>Independent:</p> <ul style="list-style-type: none"> - Infiniband - XAUI <p>Other protocols on demand.</p> |
| System Performance | <p>Bit Error Rate $< 1 \times 10^{-12}$</p> |
| MISC | <p>Local Loop on client interface,</p> <p>Remote Loop on line interface</p> |

| SFP ports | |
|------------|---|
| A1 (local) | <p>according SFP MSA, Sep 14, 2000.</p> <p>All vendors supported.</p> <p>Max. 100 insertion / extraction.</p> |

Table A-1 Technical Data of the FCX4G (continued)

| Type | Description | | |
|-------------|------------------------|--|--|
| A2 (remote) | Max. Power Dissipation | • Up to 3.5W | recommended for A1 "local": • Up to 2.5W |
| | Power supply | +1.8V, +3.3V, +5.0V | available |
| | | according SFP MSA, Sep 14, 2000. All vendors supported. Max. 100 insertion / extraction. | |
| | Max. Power Dissipation | • Up to 3.5W | recommended for A2 "remote": • Up to 3.5W |
| | Power supply | +1.8V, +3.3V, +5.0V | available |

3R Function

| | | |
|----------------|--------------------|---|
| Clock | Operation range | 100 Mbps to 4.25 Gbps operation |
| | Jitter | 25 mUIpp Jitter Generation Complies with ITU-T specifications, 50 mUIpp max. jitter generation (50 KHz - 80 MHz) |
| Service | User Service Types | <ul style="list-style-type: none"> • Storage (Fibre Channel and ESCON) Design • Ethernet Designs • SONET/SDH Test Equipment • SONET/SDH DWDM Equipment • Video • User Defined |

Power Supply & Housing

| | | |
|-------------------|--|----------------|
| Supply Voltage | +5 Vdc (4.8 V...5.2 V) | |
| Power Consumption | < 2.2 VA, without any SFP overcurrent protected, Power management control | |
| Total (typical) | < 2.2 + 0.7 + 1.0 VA = 4.0 VA | |
| Connector | via back plane connector VG64 | |
| Housing | Single Slot | SHX3 |
| | Chassis | SRX3, SRX10 |

Technical Specifications
FCX4G Technical Data

Table A-1 Technical Data of the FCX4G (continued)

| Type | Description | |
|--------------------|--|---|
| | (Please, ask the sales contact for a current list) | |
| Environment | | |
| Climatic | 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 |
| Safety | Norm | acc. to EN60950 |
| EMC | Emission | EN55022 class B |
| | Immunity | EN61000-4-3 10V/m |
| Mechanics | | |
| Dimensions | Rack Mount Card (H x W x D) | 30 x 130 x 190 mm; 3RU |
| | Single Slot Housing | 45 x 145 x 260 mm |
| Weight | Rack Mount Card | < 160 g |
| | Single Slot Housing | 1.3 kg incl. Power Supply |

FCX4G2

Table A-2 provides the general technical data of the dual FCX4G - Fibre-Optic Transponder.

Table A-2 Technical Data of the FCX4G2

| Type | Description | |
|---------------------|---|-------------------------------|
| FCX4G2 | Managed Dual 100M - 4.25Gigabit Transponder | |
| Transmission | Round Trip Delay | 0.02 msec (through 2x FCX4G2) |
| Data Rates | 100.0 MHz to | 4.25 GHz |
| Timing | Through-timing in both directions | Full 3R |

Table A-2 Technical Data of the FCX4G2 (continued)

| Type | Description |
|---------------------------|---|
| Protocols | <p>SDH, SONET:</p> <ul style="list-style-type: none"> - STM-1, OC-3, STS-3 - STM-4, OC-12, STS-12 - STM-16, OC-48, STS-48 <p>OTN („Digital Wrapper“):</p> <ul style="list-style-type: none"> - OTU 1 <p>Ethernet:</p> <ul style="list-style-type: none"> - 100 Base-FX - 1000 Base-SX/LX/LH/ZX <p>Fibre Channel:</p> <ul style="list-style-type: none"> - 1/4 FC - 1/2 FC - 1G FC - 2G FC - 4G FC <p>ESCON:</p> <ul style="list-style-type: none"> - ESCON / SBCON <p>FDDI:</p> <ul style="list-style-type: none"> - 100M FDDI <p>Video:</p> <ul style="list-style-type: none"> - SMPTE 292M <p>Independent:</p> <ul style="list-style-type: none"> - Infiniband - XAUI <p>Other protocols on demand.</p> |
| System Performance | <p>Bit Error Rate $< 1 \times 10^{-12}$</p> |
| MISC | <p>Local Loop on client interface,</p> <p>Remote Loop on line interface</p> |

| SFP ports | |
|------------------------|---|
| A1 (local), B1 (local) | <p>according SFP MSA, Sep 14, 2000.</p> <p>All vendors supported.</p> <p>Max. 100 insertion / extraction.</p> |

Table A-2 Technical Data of the FCX4G2 (continued)

| Type | Description | | |
|--------------------------|------------------------|--|--|
| A2 (remote), B2 (remote) | Max. Power Dissipation | <ul style="list-style-type: none"> Up to 3.5W | recommended for A1 and B1 "local": <ul style="list-style-type: none"> Up to 2.5W |
| | Power supply | +1.8V, +3.3V, +5.0V | available |
| | | according SFP MSA, Sep 14, 2000. All vendors supported. Max. 100 insertion / extraction. | |
| | Max. Power Dissipation | <ul style="list-style-type: none"> Up to 3.5W | recommended for A2 and B2 "remote": <ul style="list-style-type: none"> Up to 3.5W |
| | Power supply | +1.8V, +3.3V, +5.0V | available |

3R Function

| | | |
|----------------|--------------------|---|
| Clock | Operation range | 100 Mbps to 4.25 Gbps operation |
| | Jitter | 25 mUIpp Jitter Generation Complies with ITU-T specifications, 50 mUIpp max. jitter generation (50 KHz - 80 MHz) |
| Service | User Service Types | <ul style="list-style-type: none"> Storage (Fibre Channel and ESCON) Design Ethernet Designs SONET/SDH Test Equipment SONET/SDH DWDM Equipment Video User Defined |

Power Supply & Housing

| | |
|-------------------|--|
| Supply Voltage | +5 Vdc (4.8 V...5.2 V) |
| Power Consumption | < 2.5 VA, without any SFP overcurrent protected, Power management control |
| Total (typical) | < 2.5 + 2x 0.7 + 2x 1.0 VA = 5.9 VA |
| Connector | via back plane connector VG64 |

Table A-2 Technical Data of the FCX4G2 (continued)

| Type | Description | |
|-------------------|-----------------------------|--|
| | Housing | Single Slot SHX3 |
| | | Chassis SRX3, SRX10 |
| | | (Please, ask the sales contact for a current list) |
| Environment | | |
| Climatic | 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 |
| Safety | Norm | acc. to EN60950 |
| EMC | Emission | EN55022 class B |
| | Immunity | EN61000-4-3 10V/m |
| Mechanics | | |
| Dimensions | Rack Mount Card (H x W x D) | 30 x 130 x 190 mm; 3RU |
| | Single Slot Housing | 45 x 145 x 260 mm |
| Weight | Rack Mount Card | < 160 g |
| | Single Slot Housing | 1.3 kg incl. Power Supply |

Technical Specifications
FCX4G Technical Data

Appendix EC

EC Declaration of Conformity



Declaration of EC-Conformity

We arcutronix GmbH
Garbsener Landstr. 10
D – 30419 Hannover
Germany

declare under our sole responsibility that the product group

Name: FCX – Fiber Converter
Members: FCX10Gb, FCX10Gb2, FCX10G, FCX10G2, FCX4G, FCX4G2
Number: 0809-2201, -2202, 2101, -2102, -3100, -3200

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

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

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

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

Hannover, 13.3.2013

Andreas Zimmermann
TD arcutronix GmbH

arcutronix GmbH ☺ Garbsener Landstr. 10 ☺ D-30419 Hannover ☺ Germany
+49 511 277 2700 ☺ sales@arcutronix.com ☺ www.arcutronix.com

Headquarter

arcutronix GmbH
Garbsener Landstrasse 10
30419 Hannover
Germany

Phone: **+49 (511) 277 2700**

Fax: **+49 (511) 277 2709**

Email: **info@arcutronix.com**

Web: **www.arcutronix.com**