DECTRIS
Next Generation X-Ray Detectors

Next Generation X-Ray Detectors

Quick Start Guide

MYTHEN1K Detector System

Version 1.4

Table of Contents

1 Document History

Actual document

Version	Date	Status	Prepared	Checked	released
1.4	07.04.2010	released	ChrH/PetT	EriE	ChrH

1.1 Changes

Version	Date	Changes
1.0	18.03.2009	First public version
1.1	30.04.2009	Mythen Software Update
1.2	08.05.2009	Mythen GUI Improvements
1.3	14.08.2009	New GUI functions: trigger/gate; dynamic range
1.4	07.04.2010	GUI redesign, 6K compatibility, dead-time correction

2 How to use this guide

Before you start to operate the MYTHEN1K detector system please read the Technical Documentation included in the documentation package carefully.

This Quick Start Guide has been designed for the DECTRIS MYTHEN1K detector system.

2.1 Address and Support

DECTRIS Ltd.

Neuenhoferstrasse 107
5400 Baden
Switzerland

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Fax: +41 56 500 21 01
Email: support@dectris.com

www.dectris.com

In case of questions concerning the system or its use, please contact us via phone, mail or fax.

2.2 Explanation of Terms

Term	Description
DAC	Digital to Analog Converter
DCS1	Detector Control System 1
GUI	Graphical User Interface

3 Hardware Setup

- Install the system according to the Technical Documentation (Technical_Documentation_Mythen1K_V1.1.pdf) supplied with the system.
- Install the Mythen Software according to the Linux_Installation_HowTo_V1.1.pdf.

4 Running the Software

4.1 Operating System

The operating system is Scientific Linux 5.2.

4.2 Starting the GUI

To start the MYTHEN GUI double-click on the "MythenGUI" icon on the Desktop (Figure 1).

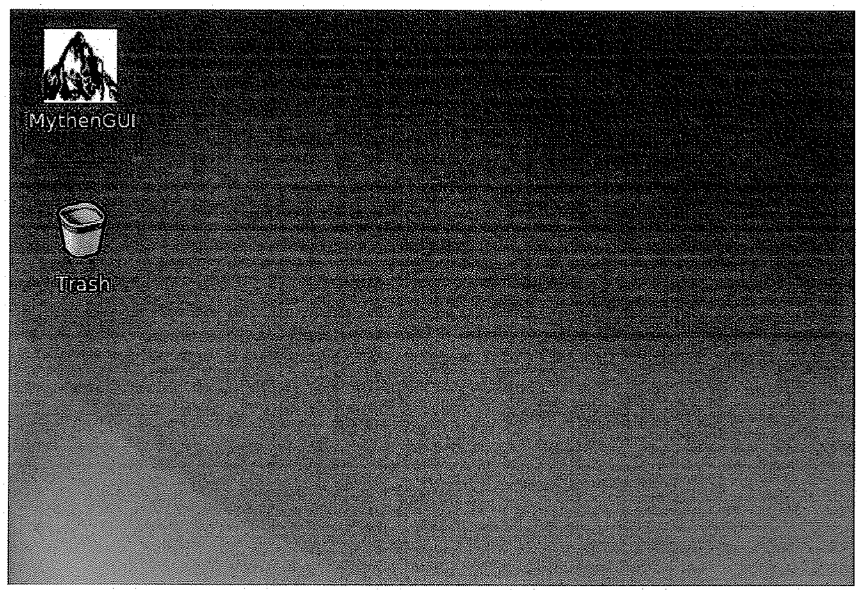

Figure 1 MythenGUI icon

4.3 The Acquisition Tab

After the GUI has started, the acquisition tab is displayed (Figure 2). At initialization the settings for a threshold of 5keV (see 4.4) have been loaded.

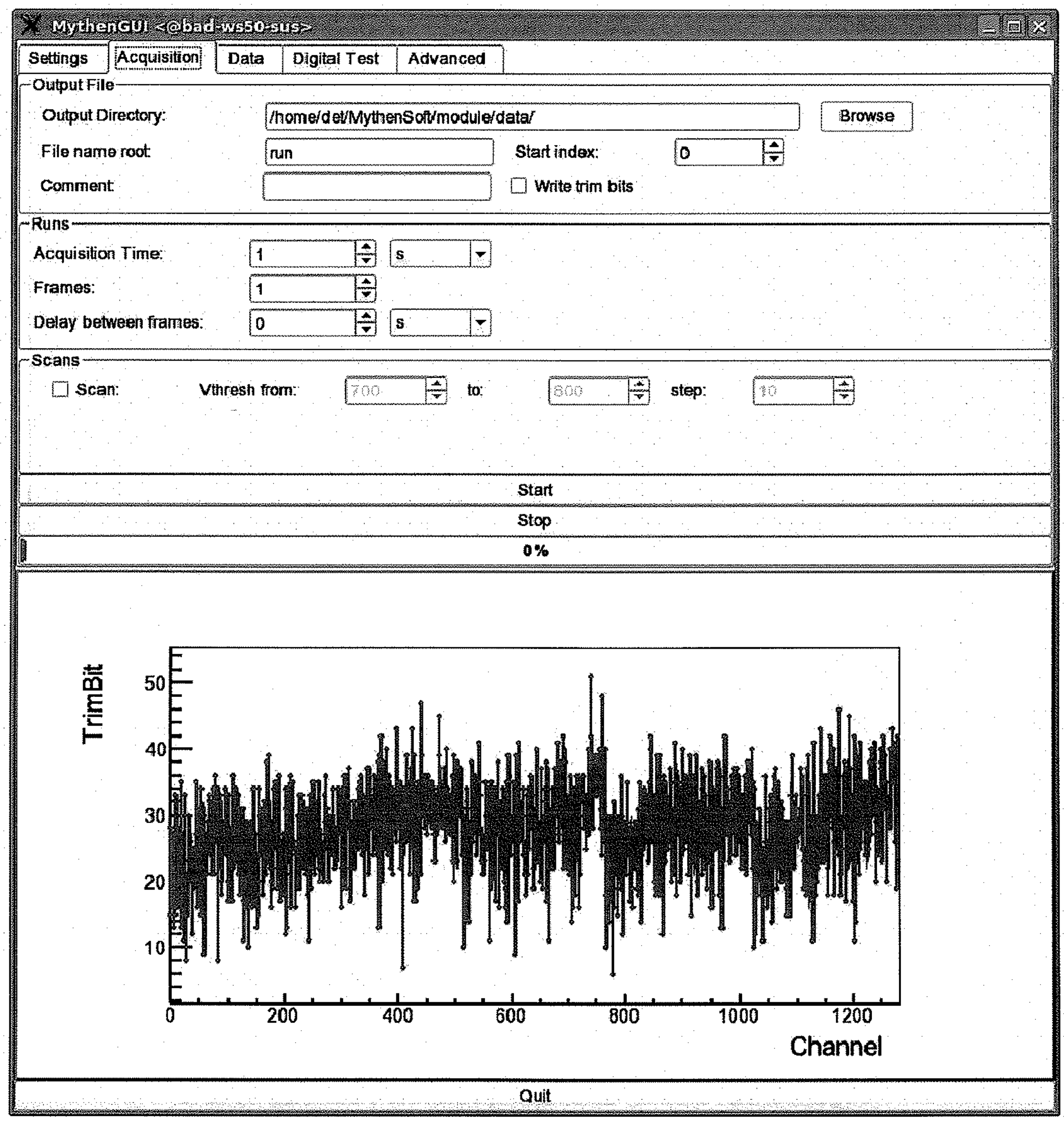

Figure 2 The acquisition tab after starting the GUI

To run a first acquisition, set the acquisition time e.g. to 1 second and click the "Start" button. After exposure, the recorded counts per channel are displayed in the lower part of the GUI.

If you didn't use a X-ray source, you will only see some noise counts, if any, depending on the acquisition time (Figure 3). The abscissa indicates the channel number and the ordinate presents the number of counts.

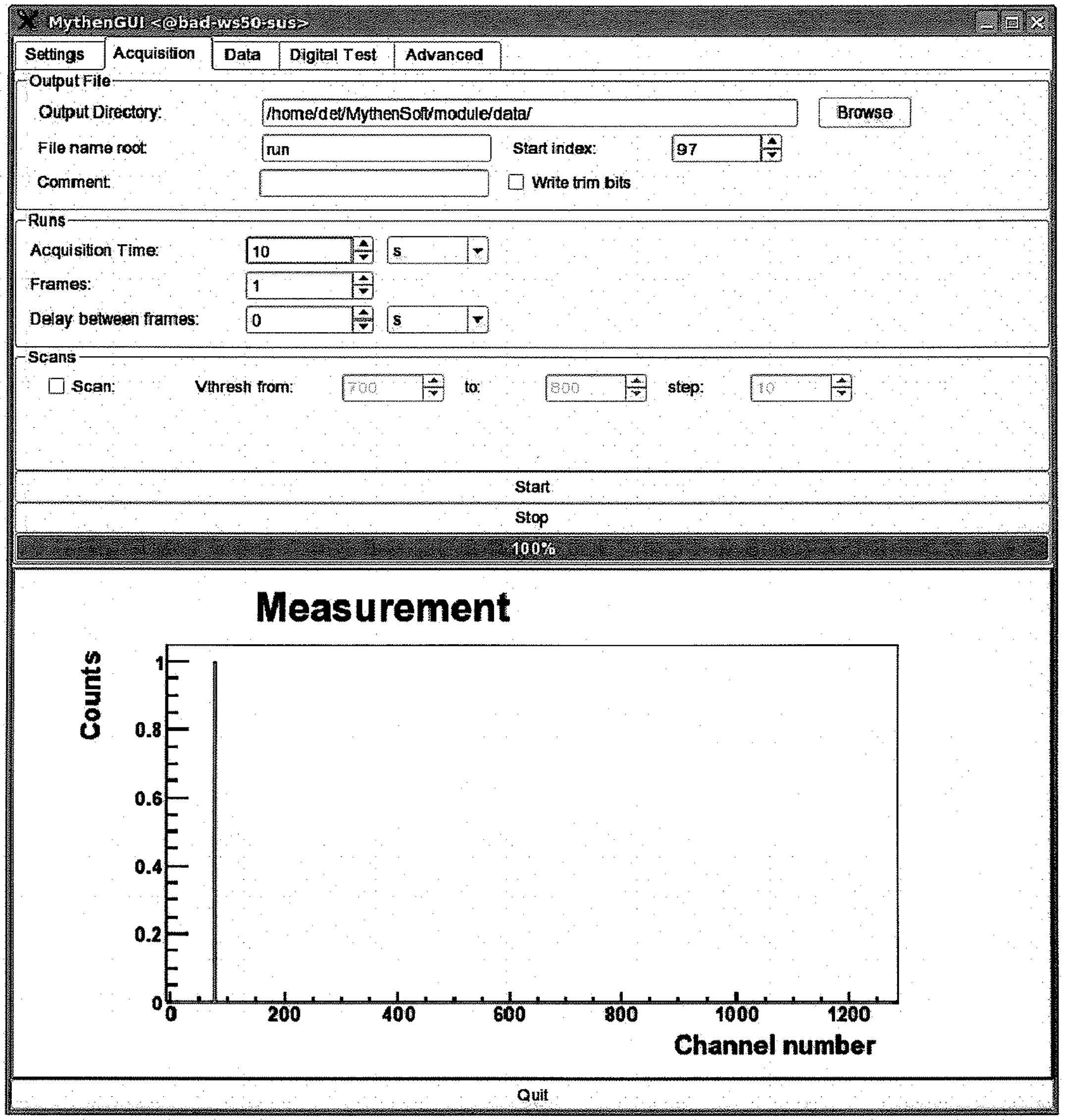

Figure 3 GUI display after a measurement of noise counts

To perform a threshold scan, enable the "Scan" check box and reduce the acquisition time e.g. to 100 ms and click the "Start" button. You should get a plot similar to the one shown in Figure 4 if doing the scan without X-rays.

The numbers on the ordinate are the threshold values in units of the global comparator threshold DAC. A high value corresponds to a low physical threshold and vice versa. The higher the threshold value, the more noise counts are detected. The number of counts is color coded according to the color bar next to the plot.

The start/stop values and the step width of the comparator threshold scan can be changed in the “Scans” field.

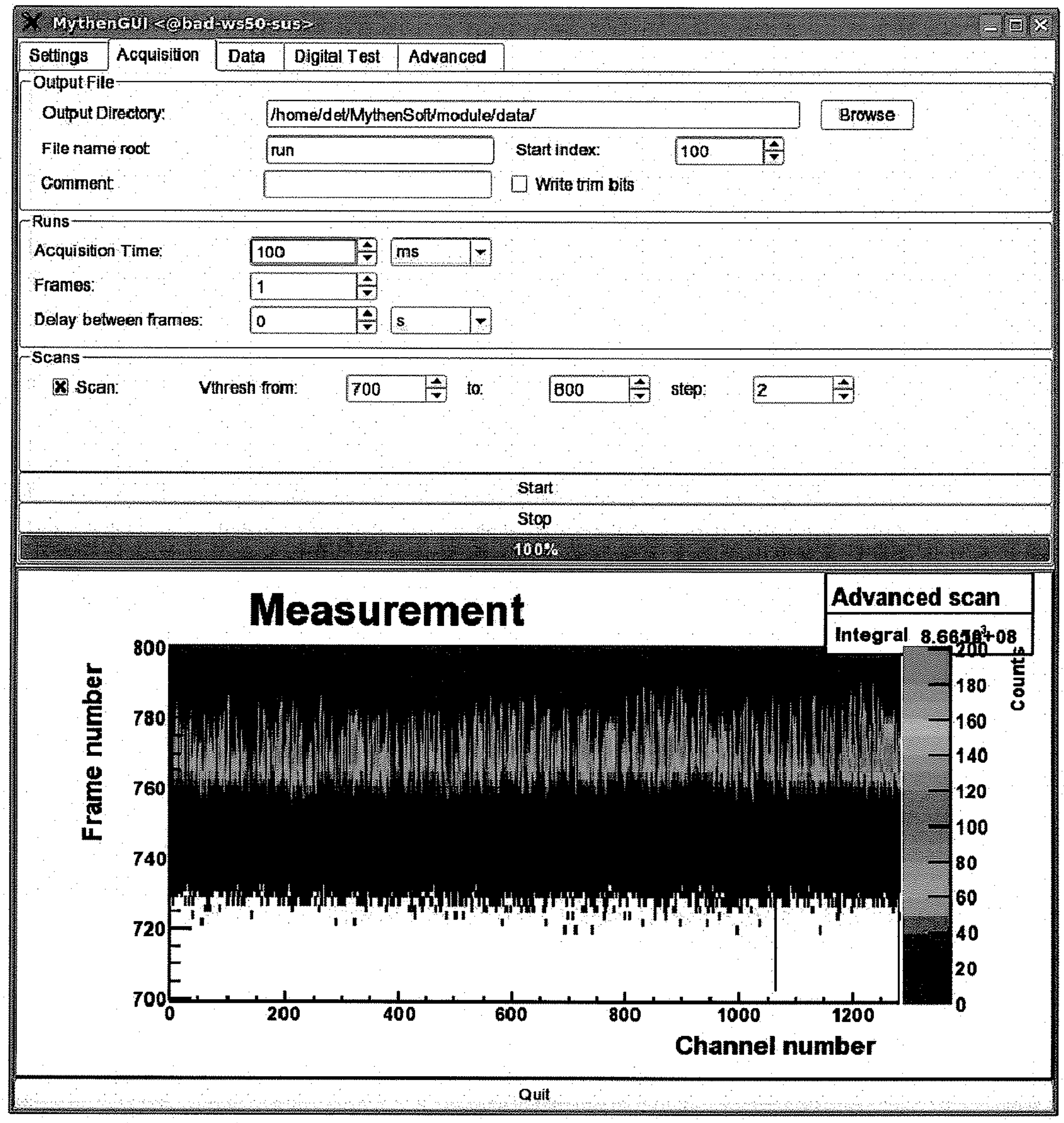

Figure 4 GUI display after performing a threshold scan without X-rays

The different fields of the acquisition tab have the following meaning:

Output File

- Output Directory: The directory path, to which the ASCII data and configuration files are written. The default path is */home/det/MythenSoft/module/data.*
- File name root: The prefix of the output file name. The default prefix is *run*.
- Start index: A running index attached to the file name prefix in order to distinguish between different runs.
- Comment: For each acquisition a configuration file with the suffix .cfg is written to the output directory. A comment (e.g. the purpose of the measurement) can be specified , which will be written to the configuration file.
- Write trim bits: If checked, the trim bits of all channels will be written to the configuration file.

Runs

- Acquisition Time: The duration of each acquisition. In the gated mode, this number specifies the number of gates required for one frame.
- Frames: The number of measurements to be performed. Each frame generates a separate data file with consecutive file names.
- Delay between frames: Adds an additional delay after each frame.

Scans

- Scan: Enables the threshold scanning mode. The allowed range of the global comparator threshold value is 0 to 1023. The number of measurements performed during the scan is determined by the step size. The data file names generated by a scanning measurement have all the same file name root and the same running index. To distinguish the files, the threshold is added to the file name e.g. run_adv762_3.raw.

4.4 The Settings Tab

There are three basic settings (“Standard”, “Fast”, “High Gain”), which are optimized for certain measurements depending on the X-ray energy and the expected count rate per channel (see Table 1). High Gain settings are used for low thresholds, whereas Fast settings allow for a high photon flux.

Settings	Minimum X-ray energy [keV]	Suggested count rate [kHz]	Maximum count rate [kHz]
High Gain	5	50	100
Standard	8	100	500
Fast	10	200	1000

Table 1 Detector Settings

For each setting, two sets of calibration files are provided, which optimise the threshold and uniformity of the detector for the delivered x-ray energies (see system information sheet).

Settings

The settings tab brings up a combo box which provides several operating modes.

- By default the "Automatic" operating mode is selected. In this mode, the user sets the desired threshold energy with the slider below the combo box and the software will subsequently load the recommended settings.

- Furthermore the user can choose one of the six provided calibrations. These calibrations were performed at a given threshold energy, which is loaded together with the corresponding settings. The user is allowed to modify the threshold energy with the slider, but should keep in mind that the uniformity deteriorates the more the threshold departs from the original value.

- In the "Manual" mode, the user can freely chose all DAC and trim bit values of the detector. Since the energy calibration depends on the settings, the threshold slider is disabled in this mode. To set the threshold, the comparator threshold DAC has to be used.

Trim Bits

To obtain a homogeneous threshold energy across all channels, a fine adjustment of the global comparator threshold is necessary. For each channel six trim bits can be programmed, which determine a channel-specific correction to the global threshold. The required correction per channel, and therefore the value of the trim bits, depends on the detector settings and the target threshold energy.

- “Display trimbits”: Shows the current trimbit values either per channel (“Plot”, Figure 5) or as distribution (“Distribution”, Figure 6).
- Load File: Allows to navigate to and load a file with trimbits and DAC settings.

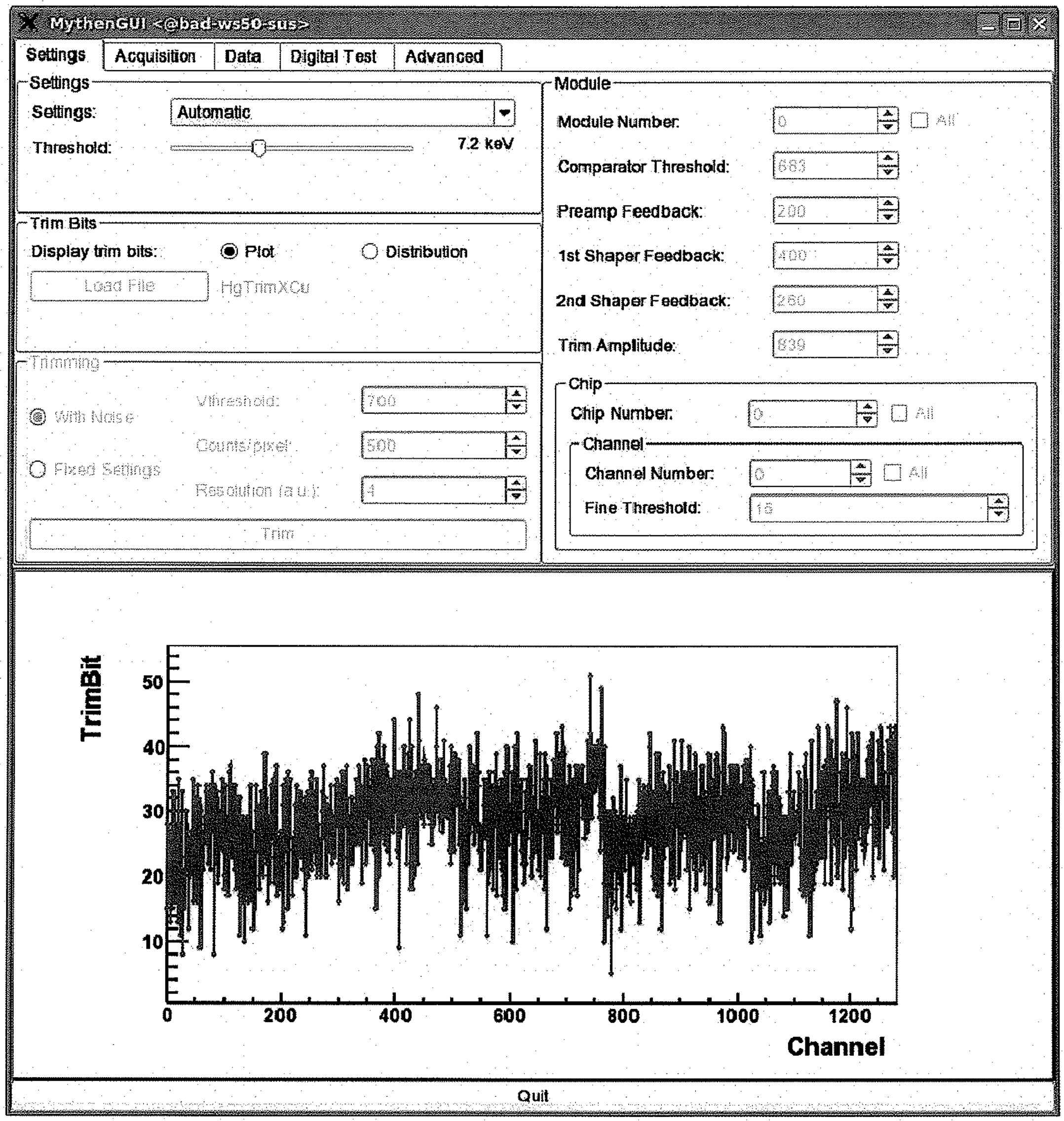

Figure 5 The settings tab showing the trimbits per channel

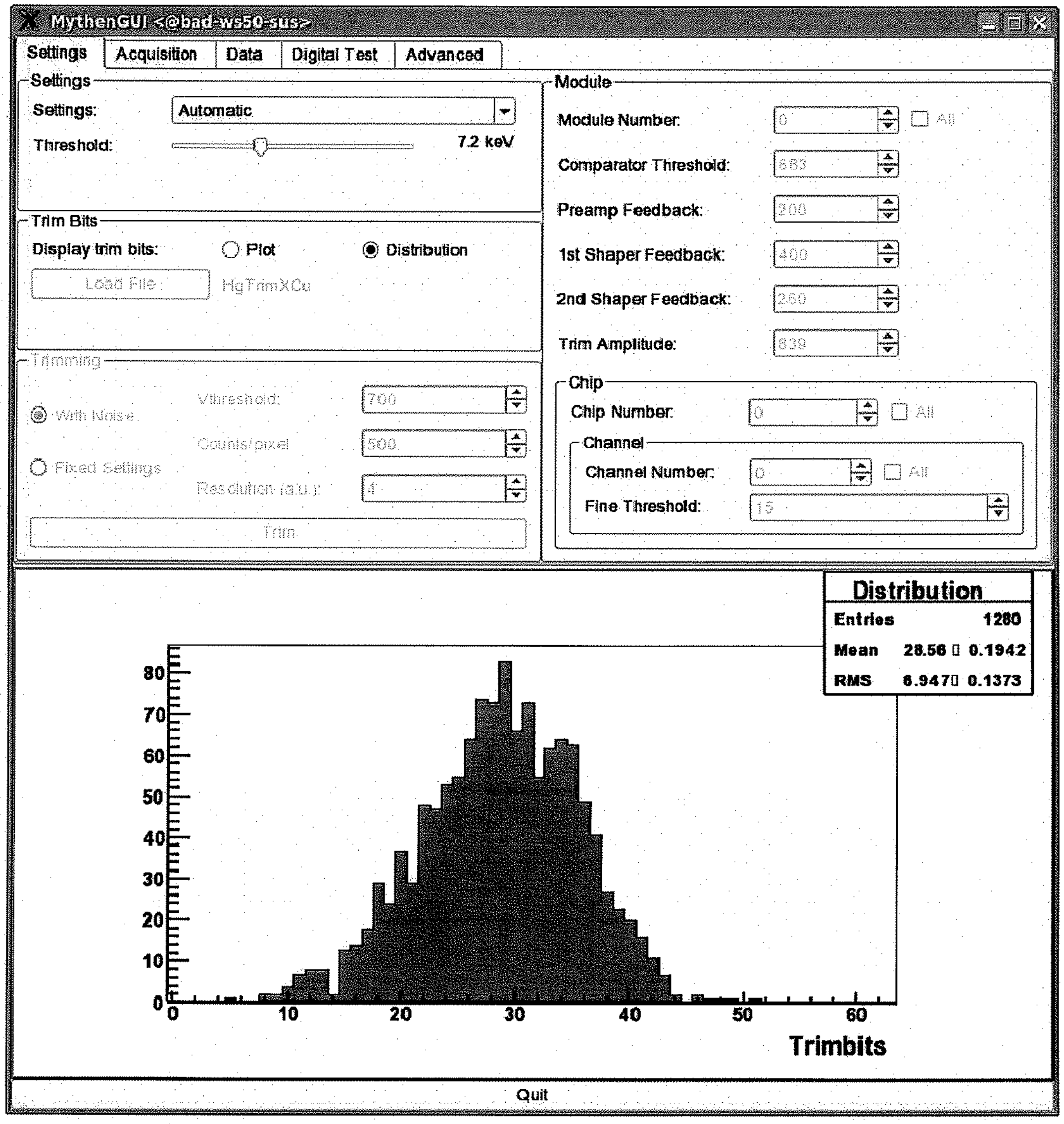

Figure 6 The initialization tab showing the trimbits distribution

Trimming

These settings are only available in the "Manual" mode.

- Trim: Pressing the "Trim" Button starts the execution of the trim algorithm, which tries to find optimal trimbit values for each channel to get a homogenous global threshold.
    - With Noise: The trimbits are chosen so that all channels have the same number of noise counts at a certain global threshold. The parameters "Vthreshold", "Counts/pixel" and "Resolution" have to be set.

  - Fixed Settings: Trimming performed with fixed values of the “Comparator Threshold” and “Trim Amplitude” taken from the “Module” field.
- Vthreshold: Comparator threshold value at the beginning of the trimming
- Counts/Pixel: Number of counts per channel at which the individual channel thresholds are unified.
- Resolution: “Resolution” is equivalent to “Trim Amplitude” in the “Module” field, but it has arbitrary units in the range 1 to 9. For low values the trimming will exploit a greater dynamic range of the trimbits with a higher precision and vice versa. The default value is 4.

Module

This section is only available in the Manual mode. Besides the value of the comparator threshold, the DAC values of the “Preamplifier Feedback”, “1st Shaper Feedback” and the “2nd Shaper Feedback” can be changed. These three DAC values define the maximum count rate and sensitivity of the detector system by changing the shape of the analog signal of the readout electronics. “Trim Amplitude” sets the range of the effectivity of the trimbits. The allowed range of all DAC parameters is 0 to 1023. In the chip section the trimbits of each channel can be set individually or in groups. Since there are 6 trimbits per channel, the range for the trimbits is 0 to 63. The bigger the trim bit value, the more the threshold is lowered compared to the global threshold.

4.5 The Data Tab

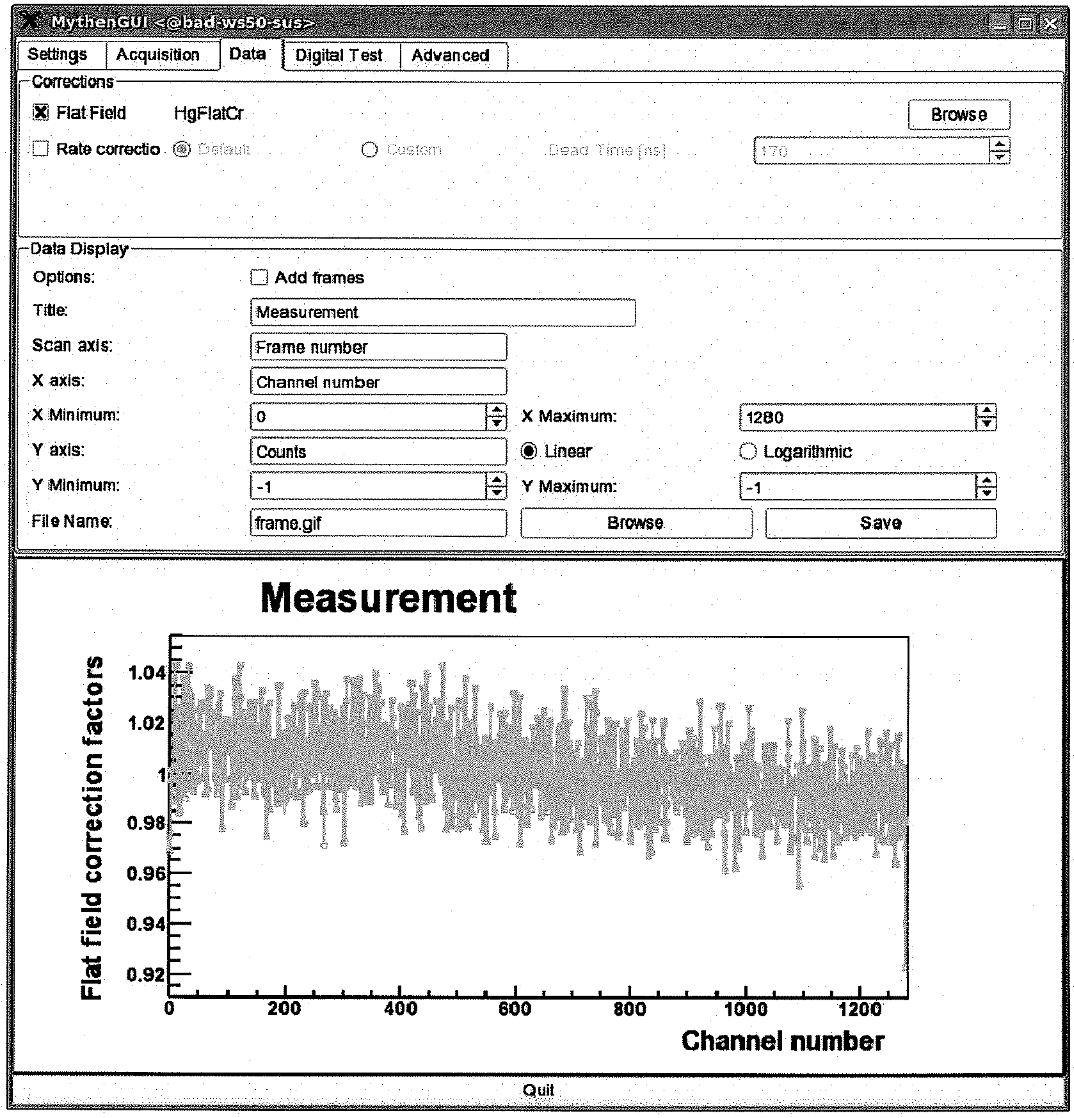

Figure 7 Data tab showing correction factors of the flatfield correction

Corrections

Flatfield: Even with an ideally trimmed detector (i.e. with exactly the same threshold energy for all channels) the channels show variations in the number of observed counts due to different detection efficiencies in the sensor. By illuminating the detector with homogeneous radiation, these effects can be quantified and corrected in subsequent measurements.

- Flat Field: Decides whether a flatfield correction is applied to the measured data. If the user does not use the manual mode, the software suggests to use one of the six supplied flatfield corrections. The raw data of a measurement is saved in .raw files, the corrected data in .dat files
- Browse: Used to select a user specific .raw data file, from which the flatfield correction factors will be computed (Figure 7).

Rate Corrections: At high photon fluxes (around 10^5 counts/channel/s, depending on the settings) the counter starts to miss some fraction of the incoming photons. As long as the flux is not too high, this error can be accounted for by applying a rate correction.

- Rate Correction: Enables the rate correction. The corrected values will be written to the .dat file.
- Default: Uses predefined correction factors depending on the settings
- Custom: Allows the user to set a custom dead time, from which the correction factors are computed

Data Display

Provides several options to adapt the display of the acquired data

- Add frames: For multi-frame measurements, the display will show the summed result of all frames.
- File name: Allows the user to save the current plot in one of several graphic formats (gif, xpm, png, jpg, tiff). After browsing to the place in the directory structure where the file should be saved and defining the file name, the “Save” button has to be clicked.

4.6 The Digital Test Tab

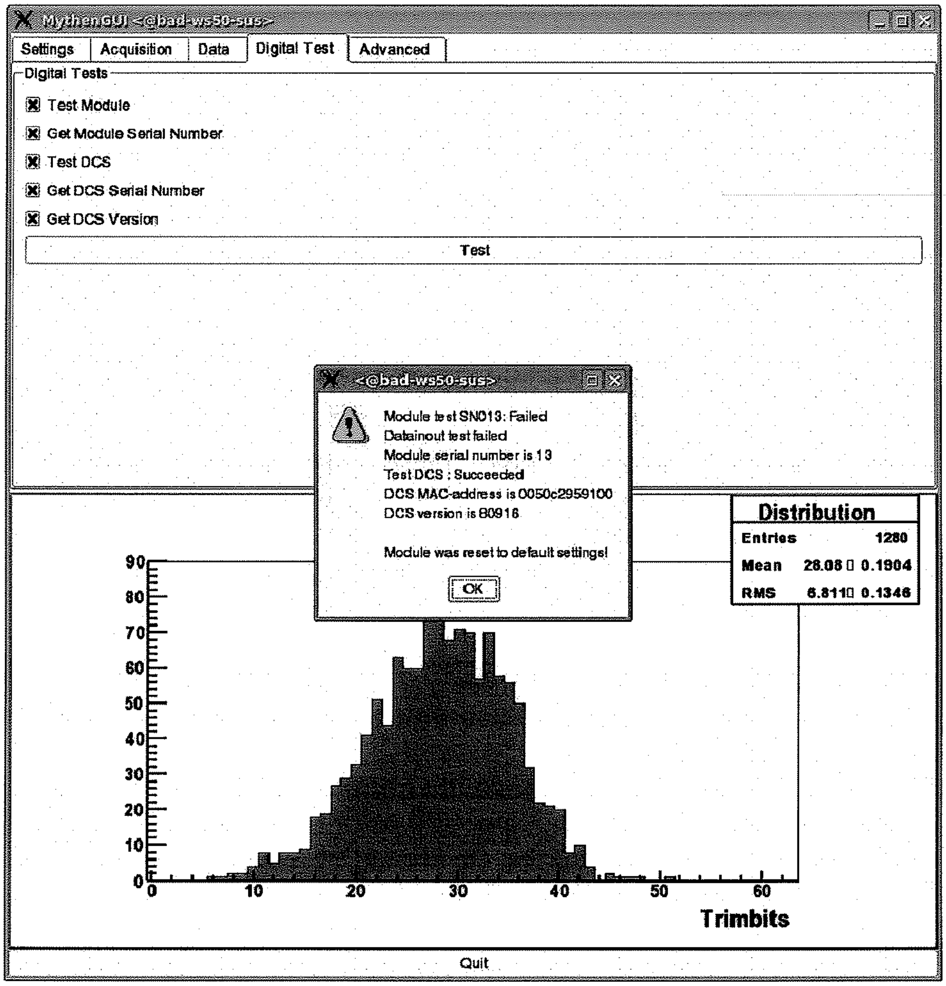

Figure 8 The digital test tab showing the result of all digital tests

The digital test tab allows to run six basic digital tests:

- Test Module: Tests the digital part of the module and displays potential errors.
- Get Module Serial Number: Returns the serial number of the module.
- Test DCS: The communication with the DCS and the programming of the FPGA are tested.
- Get DCS Serial Number: Returns the MAC-address of the DCS.
- Get DCS Version: Returns the FPGA software version of the DCS.

The resulting window of the digital test is shown in Figure 8.

4.7 The Advanced Tab

The advanced tab allows one to choose from different trigger and gating modes. By default the trigger and gating modes are not active (see Figure 9).

Each sensor channel is connected to a 24-bit binary counter (up to 16777216 counts per channel). In the case of lower X-ray flux or short acquisition time the dynamic range can be restrictred to 16-, 8- or 4-bits. This results in a higher frame rate.

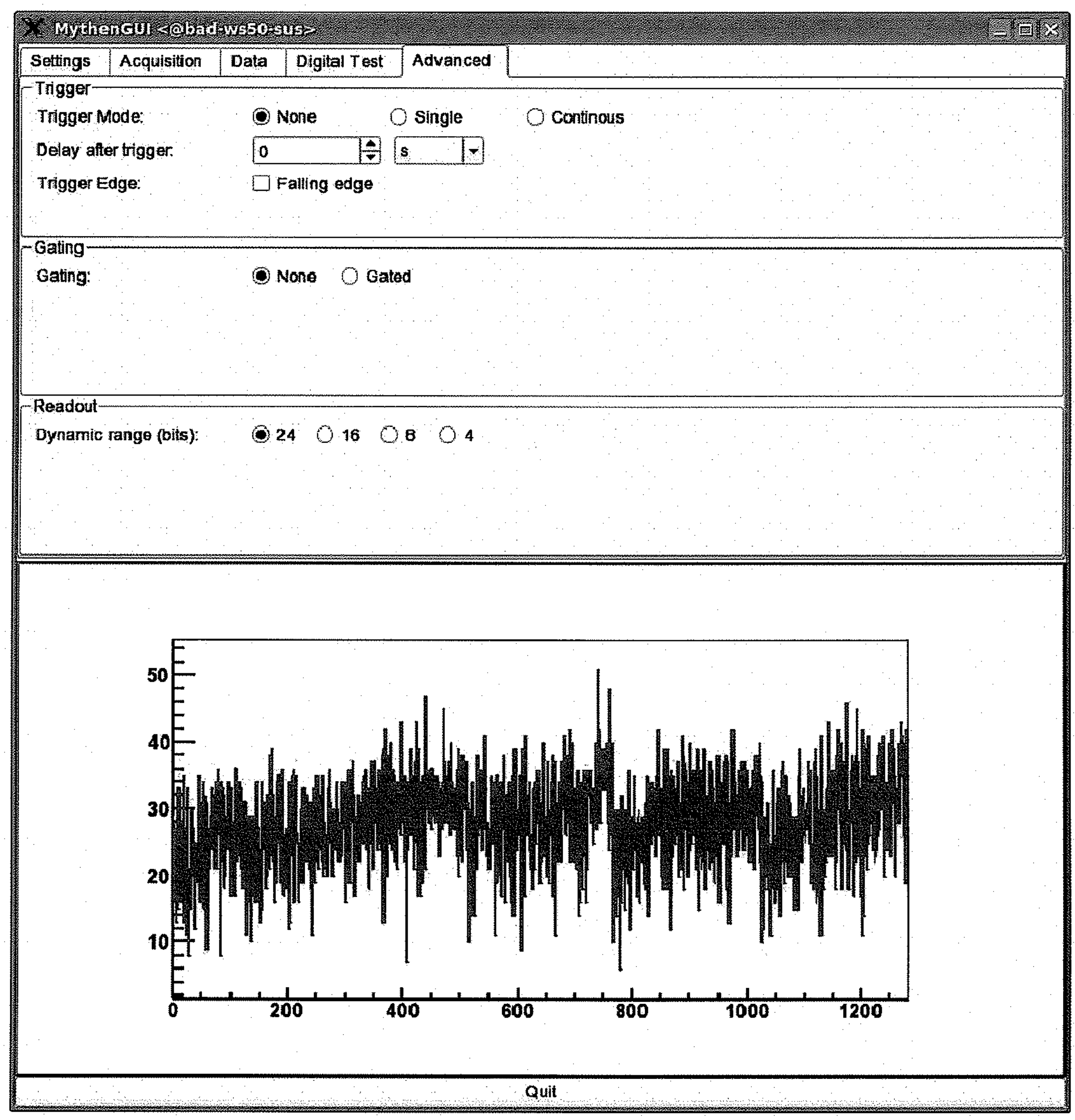

Figure 9 The advanced tab allows one to choose from different trigger and gating modes

Trigger and Gating

The trigger and gating modes are described in more detail in the Trigger_Gate_Application_Note_V1.0.pdf.

Readout

By default the dynamic range is set to 24-bit.

5 Appendix

5.1 Table of Figures

Technical Documentation

MYTHEN1K Detector System

Version 1.1

Table of Contents

1 Document History

Actual document

Version	Date	status	prepared	checked	released
1.1	30.04.2010	Released	ChrH	EriE	ChrH

1.1 Changes

Version	Date	Changes
1.0	12.03.2009	First public revision
1.1	30.04.2010	Update; First released version

2 How to use this technical documentation

Before you start to operate the Mythen1K detector system please read this document carefully.

This document has been designed for the DECTRIS Mythen1K detector system.

2.1 Address and support

DECTRIS Ltd.

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Email: support@dectris.com

www.dectris.com

Should you have questions concerning the system or its use, please contact us via phone, mail or fax.

2.2 Explanation of symbols

Symbol	Description
	Important or helpful notice
	Caution. Please follow the instruction carefully to prevent equipment damage or personal injury.
	DC-current
	AC-current
	Functional earth

2.3 Explanation of terms

Term	Description
MCB	Module Control Board
DCS1	Detector Control System 1

3 Technical specifications

3.1 Technical data

Detector Head	
Sensor	Reverse biased silicon diode array
Sensitive area	8 x 64 mm^2
Format	1280 strips
Sensor Thickness	320 µm
Strip width	50 µm
Strip length	8 mm
Energy range	5 – 30 keV
Quantum Efficiency (calculated)	5 keV: ~ 90 % 8 keV: ~ 96 % 15 keV: ~ 49 % 30 keV: ~ 8 %
Dynamic range	24 bit (1 : 16’777’216)
Counting rate	2 x 10^5 counts/s/strip (E_{Cu}; standard gain settings)
Readout time	0.3 ms
Frame rate	24 bit ~ 200 Hz 16/8 bit ~ 300 Hz 4 bit ~ 400 Hz
Power consumption	6 W total
Cooling	cooling not required
Detector dimensions (WHD)	74 x 100 x 25 mm^3
Detector weight	300 g
Detector Control System	
Dimensions (WHD)	176 x 200 x 50 mm^3
Weight	1630 g (data cable additional 420 g)

3.2 Normal operation

The Mythen1K detector system has been designed for the detection of X-rays from synchrotron sources or laboratory sources.
For other applications, please contact DECTRIS Ltd. for additional information.

3.3 Ratings

Device	Definition
Power supply	Input range specified on the back of the power supply. Input: 100 – 240 V~ / 50 – 60 Hz / 400 mA ⚠ **Connecting to the wrong supply voltage will destroy the power supply and could damage the detector.** The output voltage is 5.0 V DC.
Detector External Trigger Input	3.3 V LVTTL, 50 Ω load ⚠ **5.0 V maximum voltage** ⚠ **Applying a higher voltage will destroy the input.**
Detector Enable output	3.3 V LVTTL signal

3.4 Ambient conditions

The Mythen1K detector is designed only for indoor use according the following ambient conditions.

Condition	Range
Operating temperature:	20 ° C to 35 ° C
Operating humidity:	< 70 %RH at 20 ° C
Storage temperature	15 ° C to 40 ° C
Storage humidity	< 75 %RH at 20 ° C

⚠ **If the detector system is stored at low temperature, make sure that no condensation moisture develops.**

4 Housing and Connectors

4.1 Detector

The detector is delivered with a protective cover for the X-ray entrance window. This cover should be removed after mounting the detector system for regular operation.

The sensor is located behind a 20 µm thick aluminized Mylar® foil to protect it from dust, touch and light.

⚠ **Do not touch, damage or penetrate the Mylar® foil.**

⚠ **If the screw of the cover is positioned above the Mylar® foil, the Mylar® foil could be damaged or penetrated.**

Figure 1: Mythen1K detector with cover in place (left) and removed.

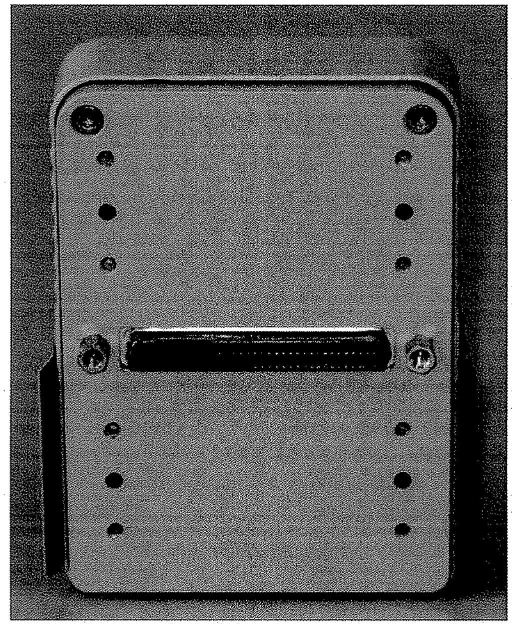

Figure 2: Mythen1K detector viewed from the back.

Connector	Description
	Data connection of detector to DCS1 via data cable

⚠ The data cable should be pulled onto the detector connector with the screws, rather than forcefully pushed on.

⚠ Use only the DECTRIS Ltd. delivered data cables.

4.2 Detector control system 1

Figure 3: Front panel of the detector control system 1.

Connector	Description
DETECTOR	Data connection of DCS1 to detector via data cable
EXT IN	3.3 V LVTTL External trigger input (LEMO connector: EPL.00.250.NTN; appropriate plug e.g. LEMO FFA.00.250.NTAC22) ⚠ **5.0 V maximum voltage.** ⚠ **Applying a higher voltage will destroy the input.**
EN OUT	3.3 V LVTTL Output signal: high when detector is making an exposure (LEMO connector: EPL.00.250.NTN; appropriate plug e.g. LEMO FFA.00.250.NTAC22)

LED	Description
EN OUT	Active when detector is making an exposure
ERROR	Active when data taking failed

⚠ The data cable should be pulled onto the DCS1 connector with the screws, rather than forcefully pushed on.

⚠ Use only the DECTRIS Ltd. delivered data cables.

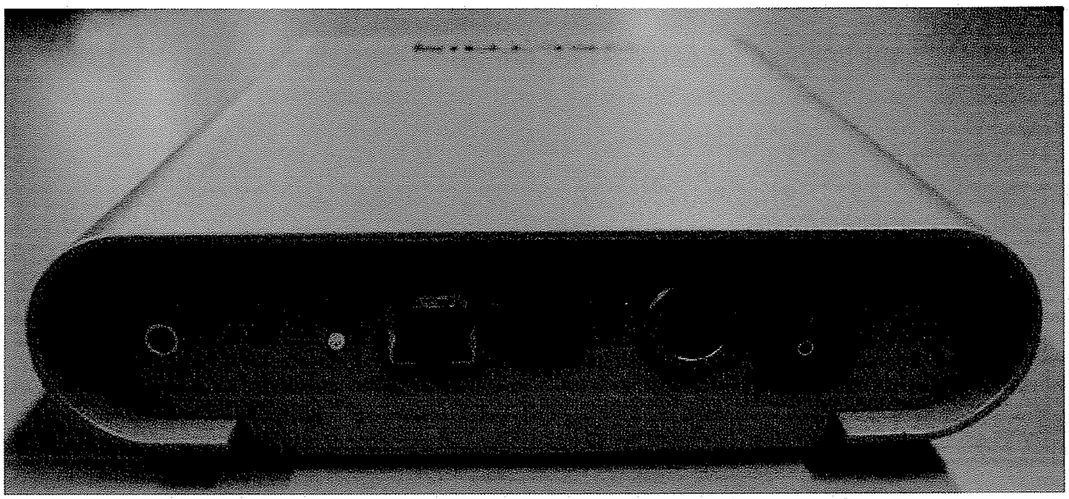

Figure 4: Rear panel of the detector control system 1.

Labeling	Description
I ↔ O	Power switch
+5V DC	+5V DC power connection (LEMO connector: ERA.2S.302.CLL). For operation it has to be connected with the 5.0V DC output cable of the power supply (3.3, 4.4).
1.6 A	Fuse carrier: use 1.6 A slow-blow fuse (e.g. SCHURTER part number: 0001.2506)
ETH0	Local area network connector (RJ45); cat 5 network cable is recommended
RESET	Reset switch for the DCS1. ⚠ **Pressing the RESET switch reboots the operating system of the DCS1.**
BOOT	Boot switch for the DCS1. The BOOT switch is needed for reprogramming the operating system of the DCS1. ⚠ **Use the boot switch only for reprogramming the system. Inproper use will result in malfunction of the system.**

⏚	Functional earth of the detector system (M4 screw-in tap hole). **Although the detector may be grounded via the mounting bolts, the detector system can be grounded additionally via this functional earth connector to establish a defined grounding.**

LED	**Description**
POWER	+5 V DC voltage on

4.3 Data cable

The data cable length is 3m and the diameter of the cable is 9.8mm.

⚠ The data cable connector should be pulled onto the connector of the detector and the DCS1 with the screws, rather than forcefully pushed on.

⚠ Use only by DECTRIS Ltd. delivered data cables.

4.4 Power Supply

The input cable length is 2m. Alternatively, a plug is provided.

The output cable length is 2m and a LEMO connector FFA.2S.302.CLAC52Z is assembled. For operation it must be connected to the power connector of DCS1 (4.2) that is labeled +5V DC.

⚠ Use only the DECTRIS Ltd. delivered power supply and cables.

5 Dimensions and mounting of the detector system

The power supply and the detector control system can be mounted in any position. For mounting the DCS1, the holes in its baseplate can be used (M4 screws).

⚠ **Make sure that the power supply and the detector control system have adequate ventilation.**

The detector can be mounted in any position using the holes in the rear panel (M3 screws).

⚠ **Make sure that the data cable connecting the detector and the detector control system has a proper strain relief at both connectors.**

⚠ **Make sure the detector has enough space for proper ventilation.**

⚠ **Do not use the detector system in vacuum.**

⚠ **Although the entire detector system might be grounded via the mounting bolts, the detector system can be grounded additionally via the functional earth connector on the rear panel of the DCS1 to establish a defined grounding.**

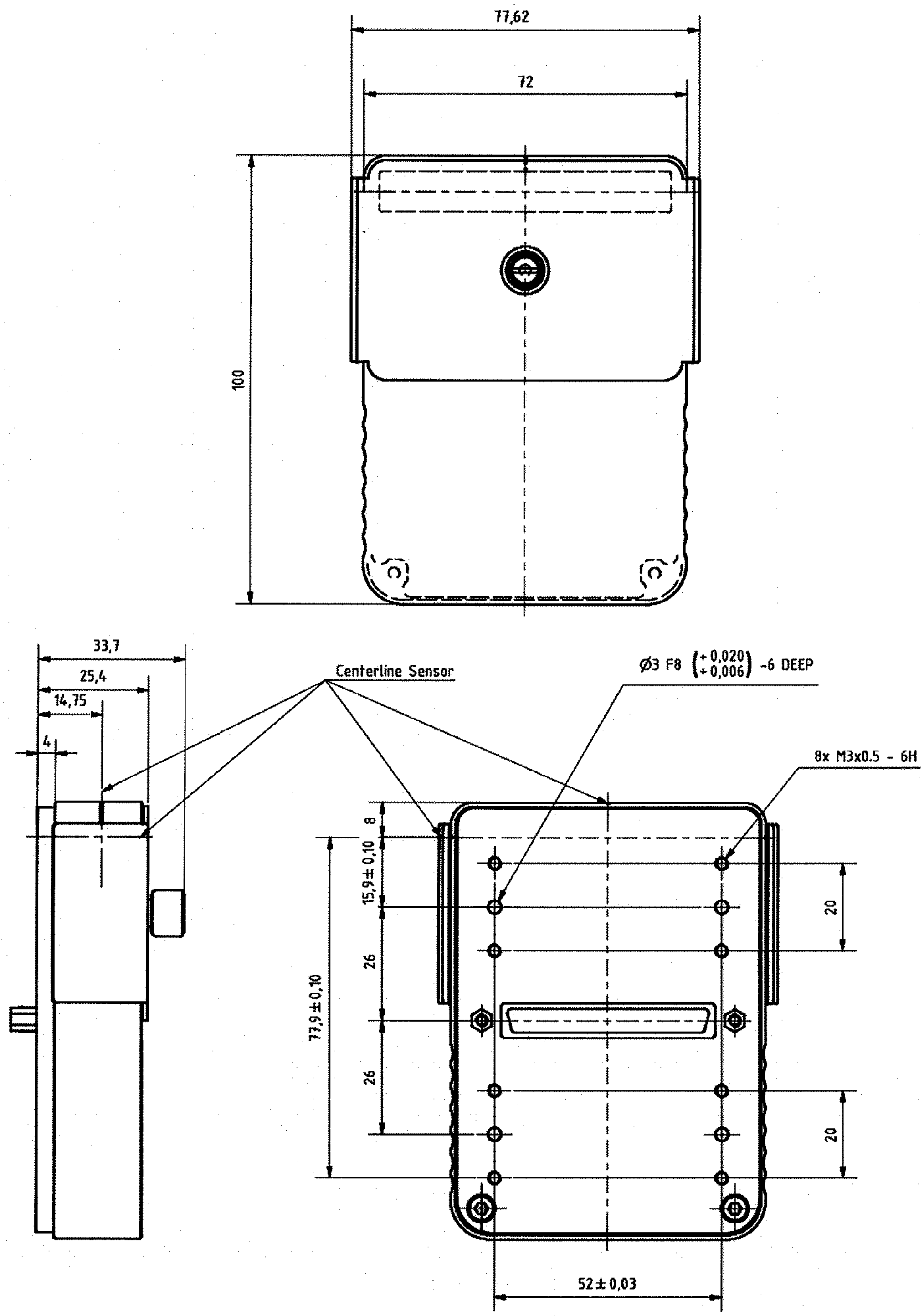

Figure 5: Dimensions of detector housing and position of the tap holes for mounting the system.

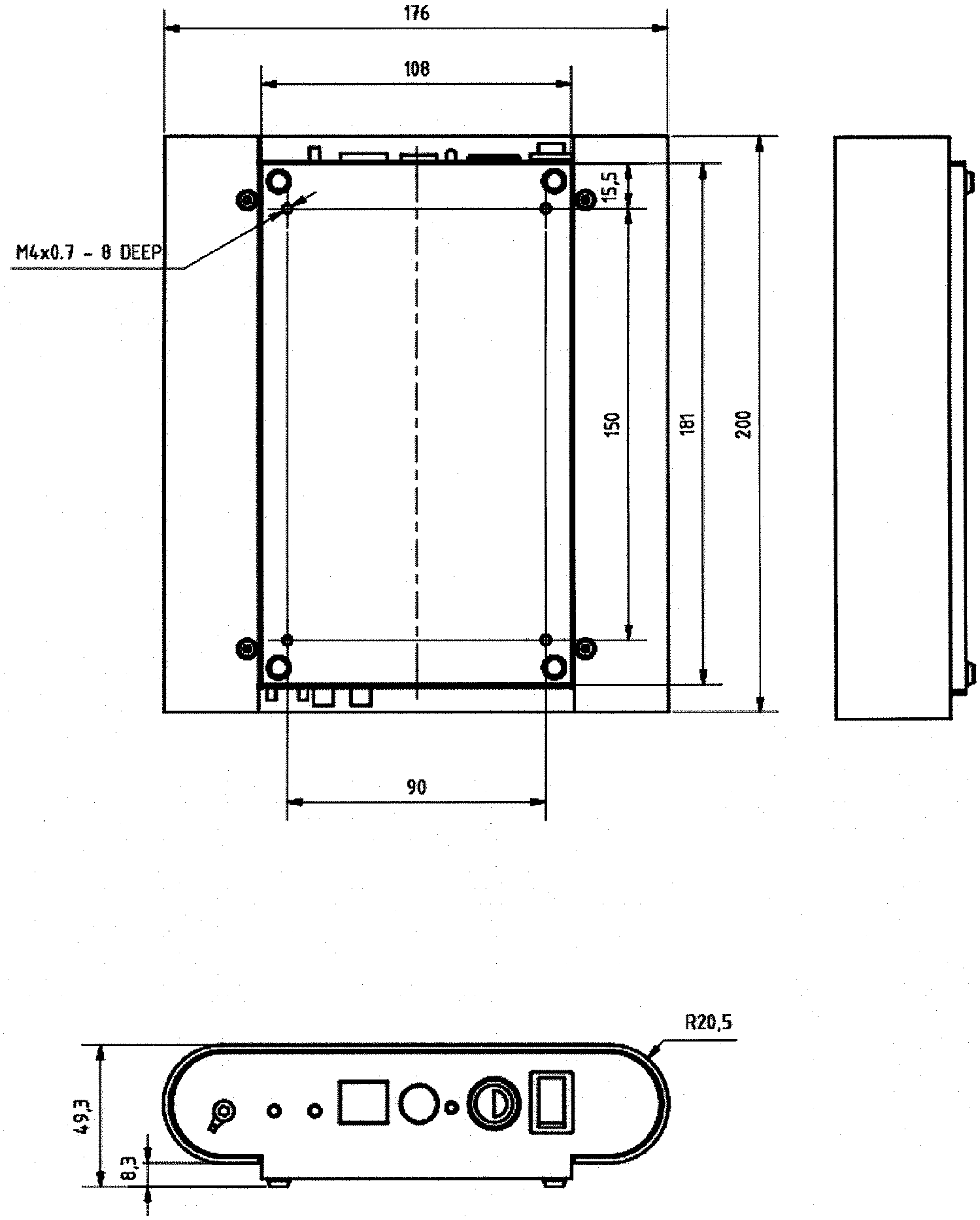

Figure 6: Dimensions of detector control system with position of tap holes for mounting the DCS1.

6 Getting started

- Mount the detector system according to the instructions given in the previous section. The data cable must be connected to the DCS1 and the detector.
- Connect the DCS1 to a local network using a cat 5 network cable.
- Connect the external power supply to the power connector of the DCS1.
- Connect the DCS1 to the detector and to the local network.
- Power up the system.

By default the network interface is configured with fixed IP address 192.168.0.90.

⚠ **Before connecting/disconnecting the data cable power-down the system.**

⚠ **Operate only a detector with a DCS1, which has the matching system number, e.g. D-M105-DCS1-nnn with D-M105-DET-nnn, since the appropriate configuration files for the detector are supplied by the DCS1.**

7 Cleaning and maintenance

The housing should be cleaned with a soft tissue.

⚠ **The Mylar® foil should not be touched or cleaned.**

The Mythen1K detector system is essentially maintenance free.

8 Certification tests

The Mythen1K X-ray detector system has passed the following Electromagnetic Compatibility tests.

Standards	Result
EN 61000-6-3 + EN 61000-6-1 (residental)	**Pass**
EN 61000-6-4 + EN 61000-6-2 (industrial)	**Pass**
EN 61326-1 (equipment for measurement, control and laboratory use)	**Pass**
EN 61010-1:2001	**Pass**

8.1 CE Certificate

DECTRIS
Next Generation X-Ray Detectors

CE Konformitätserklärung

Wir, die

DECTRIS AG
Neuenhoferstrasse 107
5400 Baden
Schweiz

Erklären in alleiniger Verantwortung, dass das Detektorsystem vom Typ

Mythen 1K

die folgenden Richtlinien erfüllt:

- Niederspannungsrichtlinie 73/23/EWG
- EMV Richtlinie 204/108/EG

Die Erfüllung dieser Richtlinien wird aus der Konformität mit den folgenden, harmonisierten Normen abgeleitet:

- EN 61010-1: Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Allgemeine Anforderungen.
- EN 61000-6-2: Elektromagnetische Verträglichkeit (EMV) - Teil 6-2: Fachgrundnormen - Störfestigkeit – Industriebereich
- EN 61000-6-3: Elektromagnetische Verträglichkeit (EMV) - Teil 6-3: Fachgrundnormen - Fachgrundnorm Störaussendung - Wohnbereich, Geschäfts- und Gewerbebereich sowie Kleinbetriebe
- EN 61326-1: Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV Anforderungen. Teil 1: Allgemeine Anforderungen: Klasse B; Anforderungen betreffend der Störfestigkeit von Geräten, welche für eine industrielle Umgebung vorgesehen sind

Die folgenden Prüfstellen wurden beigezogen:

Montena emc AG
EMV-Labor Turgi
Postfach 48
5300 Turgi
Schweiz

EMC Testcenter Zürich AG
Schaffhauserstrasse 580
Postfach 268
8052 Zürich
Schweiz

Baden, 22.12.2008

DECTRIS AG

Dr. Christian Brönnimann
CEO

Markus Näf
Leitung Produktion

9 Appendix

9.1 Table of Figures

DECTRIS
Next Generation X-Ray Detectors

Linux Installation HowTo

for the

MYTHEN Detector System Software

Version 1.1

Table of Contents

1 Document History

Actual document

Version	Date	Status	Prepared	Checked	released
1.1	07.04.2010	Released	ChrH/PetT	EriE	ChrH

1.1 Changes

Version	Date	Changes
1.0	13.08.2009	First public version
1.1	07.04.2010	Mythen GUI Installation updated

2 How to use this HowTo

Before you start to operate the MYTHEN detector system please read the Technical Documentation included in the documentation package carefully.

This document has been designed for the DECTRIS MYTHEN detector system.

2.1 Address and Support

DECTRIS Ltd.

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Email: support@dectris.com

www.dectris.com

In case of questions concerning the system or its use, please contact us via phone, mail or fax.

2.2 Explanation of Terms

Term	Description
GUI	Graphical User Interface
DCS	Detector Control System
System CD	CD delivered with MYTHEN detector system
<CD>	path to System CD inserted in your PC
HD	hard drive

3 Hardware Setup

- Install the detector system according to the Technical Documentation
- Turn on the power of the detector system
- Turn on the power of the PC

4 Linux Installation

4.1 Operating System

The proposed linux installation procedure was tested with Scientific Linux 5.2. Use SL-52-062608-i386-DVD.iso for installation (download it from http://ftp.scientificlinux.org/linux/scientific/52/iso/i386/).

To check the correctness of the downloaded image create the checksum with the command *sha1sum SL-52-062608-i386-DVD.iso* (Linux sytem) and compare the result with the content of the SL-52-062608-i386-DVD.SHA1SUM file, which can be downloaded also from http://ftp.scientificlinux.org/linux/scientific/52/iso/i386/.

For further information see www.scientificlinux.org.

Other linux installations may work, but are not tested.

If you have Linux already running, go on with chapter 4.2.3.

DECTRIS
Next Generation X-Ray Detectors

4.2 Installation Process

4.2.1 Basic Installation

- insert DVD and reboot PC
- select graphical installation process
- HD: *remove all partitions on selected drives and create default layout*
- Boot loader: *The GRUB boot loader will be installed on /dev/sda.*
- set Network Devices
  - *active on Boot*
  - *Hostname: automatically via DHCP*
- time:
  - *time at your place*
  - *System clock uses UTC*
- user: *root* - set *root password*
- software packages (selection):
  - select customize now
  - select SL Addons
    - Misc Scientific Linux Packages
    - Multimedia
    - Yum Utilities
  - Desktop Environments - choose either:
    - GNOME Desktop Environment
    - KDE Desktop Environment
  - Applications:
    - Editors
    - Emacs
    - Engineering and Scientific
    - Games and Entertainment
    - Graphical Internet
    - Graphics
    - Office Productivity
    - Sound and Video
    - Text-based Internet
  - Development:
    - Development Libraries
    - Development Tools
    - Java Development
    - KDE Software Development
    - Ruby
    - X Software Development
  - Servers
    - MySQL Database
    - Printing Support

- Base System:
  - Administrative Tools
  - Base
  - Java
  - System Tools
  - X Window System
- Installation log files:
  - /root/install.log
  - /root/anaconda-ks.cfg

4.2.2 After Reboot

- Login screen
  - Sessions: KDE
- Firewall enabled
  - FTP
  - SSH
  - Secure WWW (HTTPS)
  - Telnet
  - WWW (HTTP)
- SE Linux (security enhanced linux) → disable
- Kdump
  - enable kdump
  - 128 MByte
- Date and Time
  - adjust to your local time
- User
  - username: user
  - full name: user
  - password

4.2.3 First Boot

4.2.3.1 Adapt .bashrc as user

- **adapt existing .bashrc** (or copy it from the system CD: cp *CD*/software/linux_files/bashrc .bashrc)
- finally .bashrc should look like:
  - *# .bashrc*
  -
  - *# Source global definitions*
  - *if [-f /etc/bashrc]; then*
  - *. /etc/bashrc*
  - *fi*
  -
  - *# User specific environment and startup programs*

- *export ROOTSYS=/usr/local/root*
- *export QTDIR=/usr/lib/qt-3.3/*
-
- *export PATH=$QTDIR/bin:$ROOTSY/bin:$PATH:$HOME/bin*
- *export LD_LIBRARY_PATH=$QTDIR/lib:$ROOTSYS/lib:$LD_LIBRARY_PATH*

o source .bashrc

4.2.3.2 Network Configuration

o **Network Configuration for P2P connection to Mythen system**
  - K Menu → Administration → Network
  - Network Configuration
    - select DNS tab
      - Hostname: your hostname
      - primary DNS: your primary DNS
      - secondary DNS: your secondary DNS
      - DNS search path: your search path
    - Devices tab
      - edit device eth0
        - Nickname: P2P_Mythen
        - Activate device when computer starts
        - Allow all users to enable and disable the device
        - Statically set IP addresses:
          - Address: 192.168.0.100
          - Subnet mask: 255.255.255.0
  - File → Save
  - File → Quit

o in shell as root
  - /etc/init.d/network restart
  - /sbin/ifconfig → IP address should be 192.168.0.100

5 Software Installation

Mythen Software requires QT3 and ROOT version less or equal to version 5.18.

5.1 ROOT Installation

- in a shell as user root
    - cd /usr/local
    - cp *CD*/software/root/root_v5.18.00.source.tar.gz . (or download it from ftp://root.cern.ch/root/root_v5.18.00.source.tar.gz)
    - gunzip root_v5.18.00.source.tar.gz
    - tar -xvf root_v5.18.00.source.tar
    - rm root_v5.18.00.source.tar
    - cd /usr/local/root
    - configure with qt enabled:
        - ./configure --enable-qt
    - compile:
        - make
    - add <dir>**pathToRoot**/fonts</dir> to /etc/fonts/fonts.conf (e.g. <dir>/usr/local/root/fonts</dir>)
- as user
    - cd ~
    - root → test starting root
    - .q (in root shell to quit)

5.2 Mythen Software

- in a shell as user
    - cd /home/user/
    - cp *CD*/software/Mythensoft/MythenSoft.tar.gz .
    - gunzip MythenSoft.tar.gz
    - tar -xvf MythenSoft.tar
    - rm MythenSoft.tar
    - cd ~/MythenSoft/src/MythenGUI
    - compile:
        - make
    - cd ~/MythenSoft
    - cp *CD*/software/module/module_SNxyz.tar.gz . (replace xyz by the module number delivered to you according to the system information sheet)
    - gunzip module_SNxyz.tar.gz
    - tar -xvf module_SNxyz.tar
    - rm module_SNxyz.tar
- create icon on Desktop for MythenGUI
    - right click → Create New → Link to Application ...
    - select general tab:
        - MythenGUI
        - Icon: → Other icons: Browse → /home/user/MythenSoft/src/MythenGUI/MythenGUI_1.png
    - select application tab:
        - Command: Browse → /home/user/MythenSoft/src/MythenGUI/StartMythenGUI.sh
    - adapt StartMythenGUI.sh z.B. MythenGUI -scale 1.4
- do a power-off, reboot and test all
- have fun ...

DECTRIS
Next Generation X-Ray Detectors

Socket Interface Specification

MYTHEN1K Detector System

Version 1.3

DECTRIS
Next Generation X-Ray Detectors

Table of Contents

DECTRIS
Next Generation X-Ray Detectors

1 Document History

Actual document

Version	Date	Status	Prepared	Checked	released
1.3	07.04.2010	released	ChrH/PetT	EriE	ChrH

1.1 Changes

Version	Date	Changes
1.0	01.07.2009	First version
1.1	26.11.2009	Introduction, Status command
1.2	21.12.2009	Unix application
1.3	07.04.2010 25.05.2010	New command to set dynamic range Version command, Auto-Readout command Bug fix: -read does not accept an argument

2 How to use this guide

Before you start to operate the MYTHEN1K detector system please read the Technical Documentation included in the documentation package carefully.

This document has been designed for the DECTRIS MYTHEN1K detector system.

2.1 Address and Support

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In case of questions concerning the system or its use, please contact us via phone, mail or fax.

2.2 Explanation of Terms

Term	Description
DCS	Detector Control System

3 Introduction

The DCS hosts an embedded Linux system, on which the Mythen Socket Server is running. A client can open a socket connection to the server and control the Mythen detector by sending the commands described below. The details on how to establish the socket connection (e.g. port, protocol, ...) can be figured out from the example application. A *spec* implementation for the Mythen1K based on this socket interface is available from http://www.certif.com.

4 File Structure

The software expects the following directories at /mnt/flash/data/ on the embedded linux system running on the DCS: bad (for the bad channel lists), calibration (for the energy calibration files) and trimfile (for the trim files and flatfield correction files). These directories contain the files listed in the following table ("xxx" stands for the three-digit module number in hexadecimal format):

bad/standard.snxxx, bad/highgain.snxxx	Contain a list of bad channels for standard and highgain settings
calibration/standard.snxxx, calibration/highgain.snxxx	Contain the energy calibration constants for standard and highgain settings
trimfile/TrimCr.snxxx	Trim file for Cr X-rays (5.4 keV) using highgain settings
trimfile/TrimCu.snxxx	Trim file for Cu X-rays (8.04 keV) using standard settings
trimfile/TrimMo.snxxx	Trim file for Mo X-rays (17.5 keV) using standard settings
trimfile/FlatCr.snxxx	Flatfield correction file for Cr X-rays
trimfile/FlatCu.snxxx	Flatfield correction file for Cu X-rays
trimfile/FlatMo.snxxx	Flatfield correction file for Mo X-rays

5 Commands

Command	**Description**
-start	Starts the programmed acquisition. By default the first frame is read out automatically, if the

	aquisition time is smaller than 2 s. For subsequent frames or longer measurements the –readout command has to be used. This behaviour can be changed by using the –autoreadouttime command.
-stop	Stops the acquisition
-readout	Reads out data. If the readout fails, the counts of all channels are equal to -1.
-time n	Sets acquisition time (units of 100ns)
-autoreadouttime n	Sets the time in units of 100 ns, above which the first frame is not read out automatically, n = -1 disables the automatic readout completely.
-delbef n	Sets delay between trigger and acquisition start (units of 100ns)
-delafter n	Sets delay after frame (units of 100ns)
-frames n	Sets number of frames
-nbits n	Sets the number of bits to be read out, which determines the dynamic range and the maximum frame rate. Valid values are 4, 8, 16 and 24; default is 24.
-gates n	Sets number of gates to n (for 1 measurement)
-inpol n	Sets input polarity for trigger and gate signals (n = 1 falling edge, n = 0 rising edge)
-outpol n	Sets output polarity for trigger and gate signals (n = 1 active low, n = 0 active high)
-gateen n	Enables (n = 1) or disables (n = 0) gated measurement
-trigen n	Enables (n = 1) or disables (n = 0) triggered measurement (1 trigger for programmed number of frames)
-conttrigen n	Enables (n = 1) or disables (n = 0) repeated triggered measurement (each frame needs a trigger signal)
-trimfile filename	Loads trimfile with name filename (TrimCr, TrimCu or TrimMo) and the corresponding calibration file, bad channel file and flatfield file; overwrites energy threshold set by -kthresh x.
-kthresh x	Sets threshold to energy x (in keV)
-read	Reads the currently loaded flatfield file
-get status	Returns the system status as a bit pattern. Bit 0: Run busy Bit 3: Waiting for trigger Bit 16: All FIFO empty

-get version	Returns the current software version
-get modnum	Returns the module number

For the trim file, the calibration file, the bad channel file and the flatfield file the module serial number is always added by the DCS1 (it checks which module is connected and then adds the serial number to the file name).

Commands without a return value send an acknowledge (0) if the command was successful and -1 otherwise.

6 Operation

Before the first acquisition is performed the -trimfile command has to be executed. This command initializes all settings of the module. Example:

-trimfile TrimCr	Loads the trim file TrimCr.snxxx, the calibration file highgain.snxxx, the bad channel file highgain.snxxx and the flatfield correction file FlatCr.snxxx.

Each acquisition has to be initialized. Example:

-delbef 0	sets the delay before the first measurement
-delafter 0	sets the delay between measurements
-time 10000000	sets the acquisition time to 1 s

If more than one measurement (with a fixed timing given by delbef and delafter) have to be performed then the number of frames has to be programmed. Example:

-frames 100	sets the number of frames to 100 (for a single measurement this would be 1)

If the threshold energy needs to be changed (e.g. in case of a sample emitting fluorescent X-rays which would be cut away with a higher threshold) this can be done with the command –kthresh. Example:

-kthresh 10	sets the threshold to an energy of 10 keV

Executing the -trimfile command resets the threshold set by -kthresh.

The detector can be electronically gated (i.e. the acquisition time is determined by an external signal) and triggered (i.e. the programmed acquisition sequence is started by an external signal). For the gated measurement the number of gate signals before the data is read out has to be programmed. Example for 100 measurements, each requiring 100 gate signals of an arbitrary length:

-gateen 1	enables the gated measurement
-gates 100	sets the number of gate signals for one measurement (read out) to 100
-frames 100	sets the number of frames to 100

Example: 100 measurements with an acquisition time of 1s, where the series is started with a single external trigger pulse:

-trigen 1
-frames 100
-time 10000000

In order to individually start each acquisition with a trigger signal in a programmed series of acquisitions (requiring the same number of trigger signals as aquisitions) conttrigen has to be called:
-conttrigen

The polarity of the input (trigger and gate signals) can be set by

-inpol 0	sets the input polarity for trigger and gate signals to be positive (rising edge)
-inpol 1	sets the input polarity to be negative (falling edge)

The detector also provides output signals which can be used to trigger or gate external components. The polarity can be changed like this:

-outpol 0	sets the output polarity to be positive (gate output signal high during acquisition)

The acquisition is started with the –start command. By default the first frame is read out automatically, if the aquisition time is smaller than 2s. For subsequent frames or longer measurements the –readout command has to be used. Do not send another –start command before the previous acquisition is finished (this command will be ignored by the server).

The result of the –readout command is an array of the uncorrected counter values of all channels. If there should be isolated dead channels, the returned count value is the average of the two neighbouring channels. Compared to the

MythenGUI, the channel numbering is flipped, i.e. the first entry in the array corresponds to channel 1279 in the MythenGUI.

To correct for small differences in the detection efficiency of the channels, the data should be corrected with a flatfield measurement. Such measurements are stored on the DCS for the three predefined settings (FlatCr, FlatCu, FlatMo). They can be read out with help of the –read command and the uncorrected can be corrected according to

$$n_{corr,i} = n_{uncorr,i} \frac{f_{ave}}{f_i}$$

where $n_{(un)corr,\, i}$ is the (un-)corrected value of channel i and f_{ave} is the average of all flatfield values f_i. Dead channels have to be treated separately, their flatfield value f_i is -1.

7 Example Applications

As a starting point a Unix and a Windows C application with some comments are provided. They set up a socket connection to the DCS and read back the module serial number. Afterwards a short acquisition is performed, whose result is printed on the command prompt. The Windows version was developed with the freely available Microsoft Visual C++ 2008 Express Edition.

7.1 Windows Application

```
//
// Example of a Windows application, which controls the Mythen 1K Detector using the socket interface
//
// File: socket_client.cpp
// Programming Framework: Microsoft Visual C++ 2008 Express Edition
// Project-Type: Console Application
//
// Author: Peter Trüb, DECTRIS Ltd.
// Date: 26.11.2009
// Version 1.1
//


#include "stdafx.h"    // Precompiled Visual C++ Header
#include <winsock.h>   // Requires wsock32.lib


bool debug = false;
int sockfd, len, buffer[10000];
struct sockaddr_in serverName = { 0 };
char sendBuffer[100];


// Socket Initialization
bool init()
{
    char host[100] = "192.168.0.90";  // If you use the DCS with its preconfigured static IP, use 192.168.0.90
    int port = 1030;
```

```
    WSADATA wsa;
    if (WSAStartup(MAKEWORD(1, 1), &wsa)) return false;

    if ( (sockfd = socket(AF_INET, SOCK_DGRAM, 0)) < 0 )
    {
        printf("Error: Could not create socket\n");
        return false;
    }

    struct hostent *hostPtr = gethostbyname(host);
    if (NULL == hostPtr)
    {
        hostPtr = gethostbyaddr(host, strlen(host), AF_INET);
        if (NULL == hostPtr)
        {
            printf("Error: Could not get host address");
            return false;
        }
    }

    serverName.sin_family = AF_INET;
    serverName.sin_port = htons(port);
    (void) memcpy(&serverName.sin_addr, hostPtr->h_addr, hostPtr->h_length);
    return true;
}


// Send a command to the DCS
bool send(char *message)
{
    memset( &sendBuffer, 0, sizeof(sendBuffer));
    sprintf_s(sendBuffer, message);
    int n = sendto(sockfd, sendBuffer, sizeof(sendBuffer), 0, (struct sockaddr*)&serverName , sizeof(serverName));
    if (n < 0)
```

```
    {
        printf("Sending error\n");
        return false;
    }
    return true;
}


// Receive the response from the DCS and save it in the buffer
bool receive()
{
    struct sockaddr_in addrRemote;
    int cbAddr = sizeof(addrRemote);
    memset( &buffer, 0, sizeof(buffer) );
    len = recvfrom(sockfd, (char*)buffer, sizeof(buffer), 0, (struct sockaddr*)&addrRemote, &cbAddr);
    if (len <= 0)
    {
        printf("Receipt error\n");
        return false;
    }

    if (debug) printf("%i bytes read\n", len);
    return true;
}


// Send a command to the DCS and receive its response
void command (char *command)
{
    send(command);
    receive();
}
```

```
// Data acuisition for some milliseconds
void acquireRun(long long duration) // duration in milliseconds
{
    command("-frames 1");    // 1 measurement
    command("-delbef 0");    // no delay before the measurement
    command("-delafter 0");  // no delay after the measurement
    char timeCommand[100];
    sprintf_s(timeCommand, "-time %lld", duration * 10000);  // set the acquisition time in units of 100 ns
    command(timeCommand);
    command("-start");      // start the acquisition, data is returned immediately, if the acquisition time is below
or equal to 2 s
    if (duration > 2000)
    {
        Sleep(duration);
        command("-readout");  // reads the data from the aquisition
    }
}


int _tmain(int argc, _TCHAR* argv[])
{
    if (!init()) return -1;                  // socket initialization

    command("-get modnum");                  // get the module number
    printf("Module SN%03x found\n", buffer[0]);  // print module number in hex-format

    command("-trimfile TrimCr");             // load the settings for measuring Cr fluorescence
    command("-kthresh 3.5");                 // lower the threshold to 3.5 keV, to see some noise hits

    acquireRun(5000);                        // take data for 5 seconds
    for (int i = 0; i < 1280; i++) printf("%04i %i\n", i, buffer[i]);  // print the hits in each channel on the
screen

    WSACleanup();
```

```
    return 0;
}
```

7.2 Unix application

```
//
// Example of a Unix application, which controls the Mythen 1K Detector using the socket interface
//
// File: socket_client.c
//
// Author: Peter Trüb, DECTRIS Ltd.
// Date: 21.12.2009
// Version 1.0
//

#include <sys/types.h>
#include <sys/socket.h>
#include <sys/time.h>
#include <netinet/in.h>
#include <netdb.h>
#include <unistd.h>
#include <stdlib.h>
#include <stdio.h>
#include <time.h>
#include <string.h>


bool debug = false;
int sockfd, len, buffer[10000];
struct sockaddr_in serverName = { 0 };
char sendBuffer[100];


// Socket Initialization
```

```
bool init()
{
	char host[100] = "192.168.0.90";  // If you use the DCS with its preconfigured static IP, use 192.168.0.90
	int port = 1030;

    struct hostent *hostPtr = NULL;

	sockfd = socket(AF_INET, SOCK_DGRAM, 0);
    if (sockfd < 0 )
    {
            printf("Error: Could not create socket\n");
            return false;
    }

    hostPtr = gethostbyname(host);
    if (NULL == hostPtr)
    {
        hostPtr = gethostbyaddr(host, strlen(host), AF_INET);
        if (NULL == hostPtr)
        {
            printf("Could not get host address");
            return false;
        }
    }

    serverName.sin_family = AF_INET;
    serverName.sin_port = htons(port);
    (void) memcpy(&serverName.sin_addr, hostPtr->h_addr, hostPtr->h_length);

    return true;
}

// Sleep some milliseconds
```

```
void Sleep(int s)
{
    usleep(s*1000);
}


// Send a command to the DCS
bool send(char *message)
{
    memset( &sendBuffer, 0, sizeof(sendBuffer));
    sprintf(sendBuffer, message);
    int n = sendto(sockfd, sendBuffer, sizeof(sendBuffer), 0, (struct sockaddr*)&serverName , sizeof(serverName));
    if (n < 0)
    {
        printf("Sending error\n");
        return false;
    }
    return true;
}


// Receive the response from the DCS and save it in the buffer
bool receive()
{
    struct sockaddr_in addrRemote;
    socklen_t *cbAddr;
    memset( &buffer, 0, sizeof(buffer) );
    len = recv(sockfd, (char*)buffer, sizeof(buffer), 0);
    if (len <= 0)
    {
        printf("Receipt error\n");
        return false;
    }
```

```
    if (debug) printf("%i bytes read\n", len);
    return true;
}


// Send a command to the DCS and receive its response
void command (char *command)
{
    send(command);
    Sleep(1000);
    receive();
}


// Data acuisition for some milliseconds
void acquireRun(long long duration) // duration in milliseconds
{
    command("-frames 1");     // 1 measurement
    command("-delbef 0");     // no delay before the measurement
    command("-delafter 0");   // no delay after the measurement
    char timeCommand[100];
    sprintf(timeCommand, "-time %lld", duration * 10000);  // set the acquisition time in units of 100 ns
    command(timeCommand);
    command("-start");        // start the acquisition, data is returned immediately, if the acquisition time is below
or equal to 2 s
    if (duration > 2000)
    {
        Sleep(duration);
        command("-readout");  // reads the data from the acquisition
    }
}


int main(int argc, char** argv)
```

```
{
    if (!init()) return -1;                    // socket initialization

    command("-get modnum");                    // get the module number
    printf("Module SN%03x found\n", buffer[0]);  // print module number in hex-format

    command("-trimfile TrimCr");               // load the settings for measuring Cr fluorescence
    command("-kthresh 3.5");                   // lower the threshold to 3.5 keV, to see some noise hits

    acquireRun(5000);                          // take data for 5 seconds
    for (int i = 0; i < 1280; i++) printf("%04i %i\n", i, buffer[i]);  // print the hits in each channel on the
screen

      close(sockfd);
    return 0;
}
```

DECTRIS
Next Generation X-Ray Detectors

Firmware Update

MYTHEN Detector System

Version 1.0

Table of Contents

1 Document History

Actual document

Version	Date	Status	Prepared	Checked	released
1.0	07.04.2010	released	ChrH/PetT	EriE	ChrH

1.1 Changes

Version	Date	Changes
1.0	07.04.2010	First released version

2 How to use this guide

Before you start to operate the MYTHEN detector system please read the Technical Documentation included in the documentation package carefully.

This document has been designed for the DECTRIS MYTHEN detector system.

2.1 Address and Support

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In case of questions concerning the system or its use, please contact us via phone, mail or fax.

2.2 Explanation of Terms

Term	Description
DCS	Detector Control System

3 Firmware Update

The Mythen DCS hosts an embedded Linux system, on which the Mythen Servers (RPC- and Socket-Server) are running. The embedded system also stores some configuration files for the Mythen module, which are used by the Socket-Server. To take advantage of new functionality and bug fixes for the Mythen Servers you will have to update the DCS firmware. The stored configuration files and the network settings will not be affected by the update.

To update the firmware of your Mythen DCS, please follow these steps:

1. Connect the DSC to your PC and turn it on.

2. Open a browser on your PC.

3. Enter the IP address of the DCS system. The IP can be found on the System Information Sheet, which was delivered with your system. By default, the IP is 192.168.0.90.

4. You should see a screen like this:

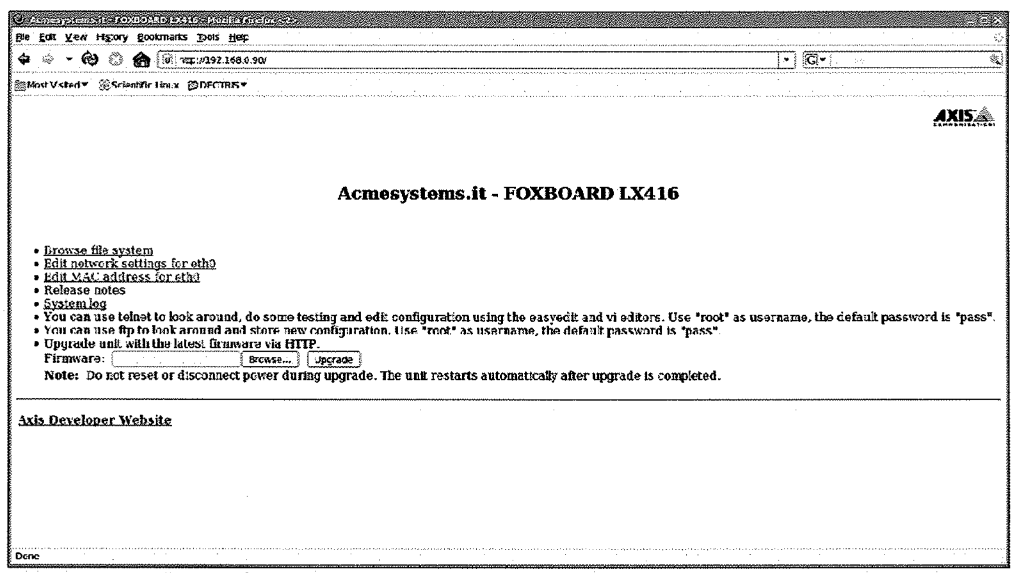

Figure 1 Login to the DCS via your webbrowser.

Press the "Browse ..." button. Select the the firmware image to be flashed to the DCS. The firmware image will have a filename starting with "fimage". If you use a firmware from your Mythen-CD, you will find the firmware images in the directory "software/fimages". Since the network settings will not be changed by the update, it does not matter whether you chose the file with the suffix "fix" or "DHCP".

5. To start the firmware upgrade, press the "Upgrade" button. When you are prompted for the username and password, enter the values given on your System Information Sheet.

⚠ Do not reset or disconnect power during update!

6. Wait until the system has rebooted. Try again to open the IP of the DCS in the browser, to check whether you can communicate with the DCS.

4 Appendix

4.1 Table of Figures

DECTRIS
Next Generation X-Ray Detectors

Text Client Documentation

MYTHEN1K Detector System

Version 1.0

Table of Contents

1 Document History

Actual document

Version	Date	Status	Prepared	Checked	released
1.0	07.04.2010	Release	ChrH/PetT	EriE	ChrH

1.1 Changes

Version	Date	Changes
1.0	07.04.2010	First released version

2 How to use this guide

Before you start to operate the MYTHEN1K detector system please read the Technical Documentation included in the documentation package carefully.

This document has been designed for the DECTRIS MYTHEN1K detector system.

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In case of questions concerning the system or its use, please contact us via phone, mail or fax.

2.2 Explanation of Terms

Term	Description
DCS	Detector Control System

3 Usage

The Text Client allows one to control the Mythen Detector from a Unix shell, which is useful to integrate the detector system in an experimental environment. It is usually convenient to initialize the detector and setup the measurements using the GUI and then acquire the data or change some small parameters (e.g. the acquisition time) using the Text Client.

To run the Text Client execute *bin/text_client host [args]* in your MythenSoft directory.

Example: To start the acquisition and read out a Mythen Detector with IP 192.168.0.90 execute:

bin/text_client 192.168.0.90 -start -fname ouptut.raw

4 Commands

Command	Description
-help	Prints the help text
-start	Starts the acquisition with the current settings and reads out the counters afterwards
-stop	Stops the acquisition
-readout	Reads out the current content of the counters
-fname name	Specifies the filename of the output file
-time n	Sets the acquisition time in s
-delbef n	Sets the delay between trigger and readout in s
-delafter n	Sets the delay between consecutive frames in s
-frames n	Sets the number of consecutive frames
-gates n	Sets the number of gates in the gated acquisition mode
-inpol n	Sets the input polarity to active low (n = 0) or active high (n = 1)
-outpol n	Sets the output polarity to active low (n = 0) or active high (n = 1)
-gateen n	Enables (n = 1) or disables (n = 0) gated measurements
-trigen n	Enables (n = 1) or disables (n = 0) triggered measurements
-conttrigen n	Enables (n = 1) or disables (n = 0) the continuos

	trigger mode
-all	Selects all modules, chips and channels
-chan n	Selects channel n (n = 0 – 127)
-chip n	Selects readout chip n (n = 0 – 9)
-mod n	Selects the nth module
-trimfile name	Loads the specified trimfile
-load name	Loads the last specified trim file
-vthresh n	Sets the threshold (n = 0 – 1023)
-vtrim n	Sets the trim voltage (n = 0 – 1023)
-vcal n	Sets the calibration voltage (n = 0 – 1023)
-rgsh1 n	Sets the Rgsh1 DAC register (n = 0 – 1023)
-rgsh2 n	Sets the Rgsh2 DAC register (n = 0 – 1023)
-rgpr n	Sets the Rgpr DAC register (n 0 – 1023)
-trim n	Sets the trim value for the selected channels (n = 0 – 63)
-coe n	Enables (n = 1) or disables (n = 0) the comparator for the selected channels
-digitest	Runs the digital test for the specified modules
-get name	Gets the value of the corresponding variable (name = frames, gates, gateen, trigen, conttrigen, inpol, outpol, vthresh, vtrim, vcal, rgsh1, rgsh2, rgpr, trim, modnum)

DECTRIS
Next Generation X-Ray Detectors

Network Settings of the

MYTHEN Detector System

Version 1.0

Table of Contents

1 Document History

Actual document

Version	Date	Status	Prepared	Checked	released
1.0	22.04.2010	released	ChrH	PetT/EriE	ChrH

1.1 Changes

Version	Date	Changes
1.0	03.03.2010	First version

2 How to use this guide

Before you start to operate the MYTHEN detector system please read the Technical Documentation included in the documentation package carefully.

This document has been designed for the DECTRIS MYTHEN detector system.

2.1 Address and Support

DECTRIS Ltd.

Neuenhoferstrasse 107
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In case of questions concerning the system or its use, please contact us via phone, mail or fax.

2.2 Explanation of Terms

Term	Description
DCS	Detector Control System
DHCP	Dynamic Host Configuration Protocol
MAC-Address	Media Access Control address
IP-Address	Internet Protocol address

3 Introduction

The Detector Control System (DCS) hosts an embedded Linux system. The DCS is delivered either with DHCP running or with a fixed IP (default 192.168.0.90). The initial configuration of your system is described on the system information sheet under the keyword IP-Address.

If your DCS is configured with DHCP running, ask your IT administrator for the current IP address. The MAC-Address and the hostname of your DCS are described on the system information sheet with the keywords MAC-Address and Hostname.

Changing the network configuration of the DCS can cause serious damage to the DCS communication, in which case the DCS will be no longer accessible. If you are not sure, do not change the network settings. If communication to the DCS is lost, there is no possibility to reset the DCS to delivery settings.

4 Changing the network settings

The method to change the network settings is described in the following for the case that DHCP is running on the DCS. It is assumed that the DCS has the IP address 192.168.20.109. **If this is not the case in your local area network, replace this number by your current IP address.**

Access your DCS with your webbrowser and your current IP address (Figure 1).

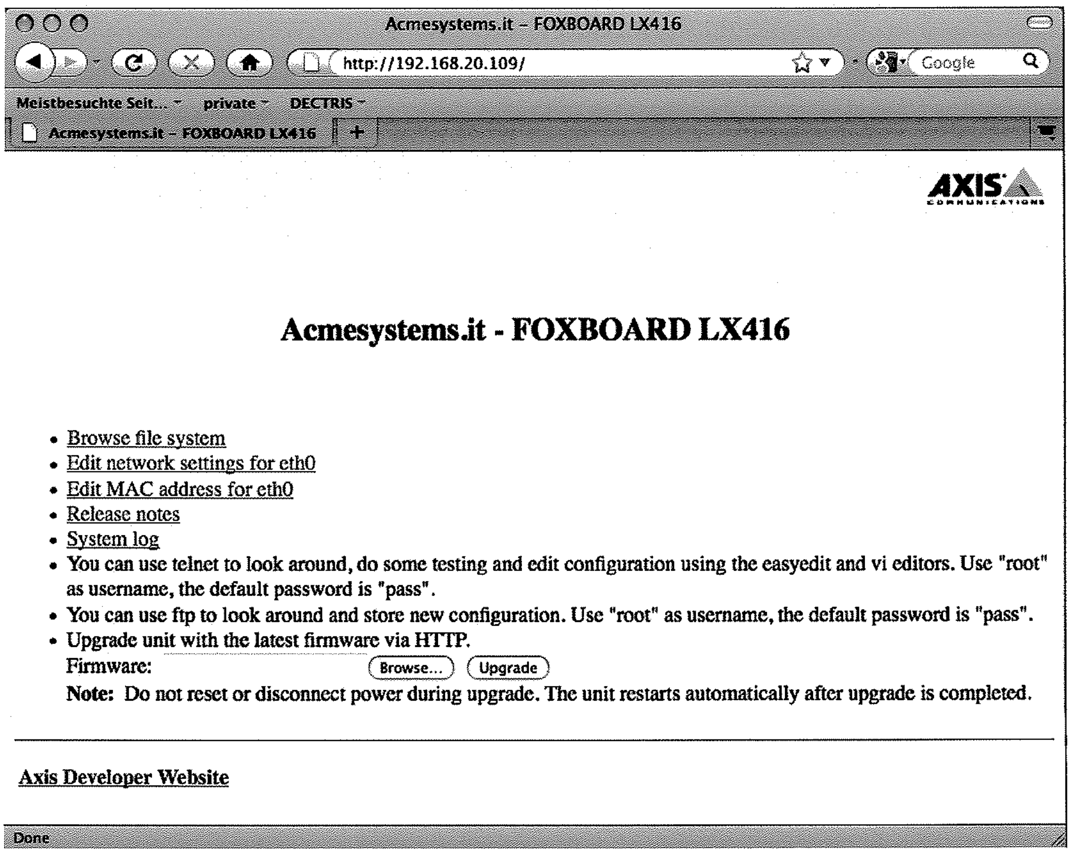

Figure 1 Login to the DCS via your webbrowser.

By clicking on *Edit network settings for eth0* you will be prompted to enter your username and password. The username is “root” and the password is given on the system information sheet (Figure 2 and 3).

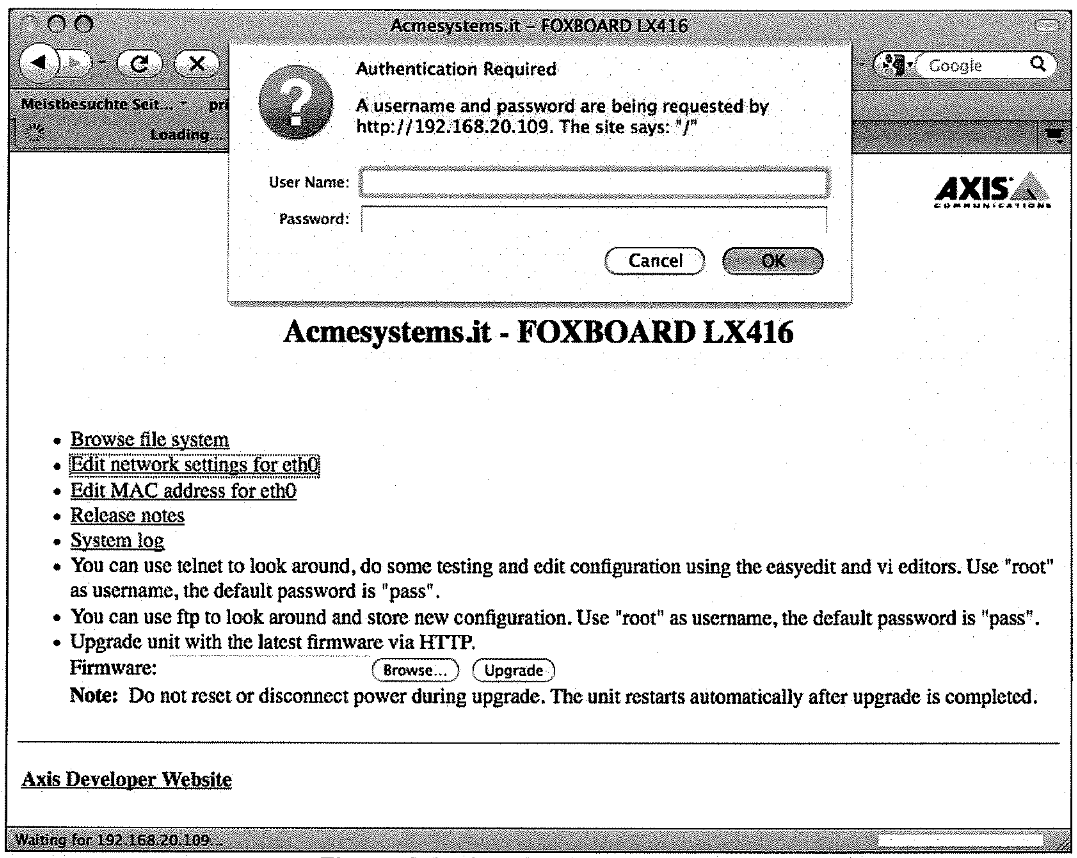

Figure 2 Authentication by the DCS.

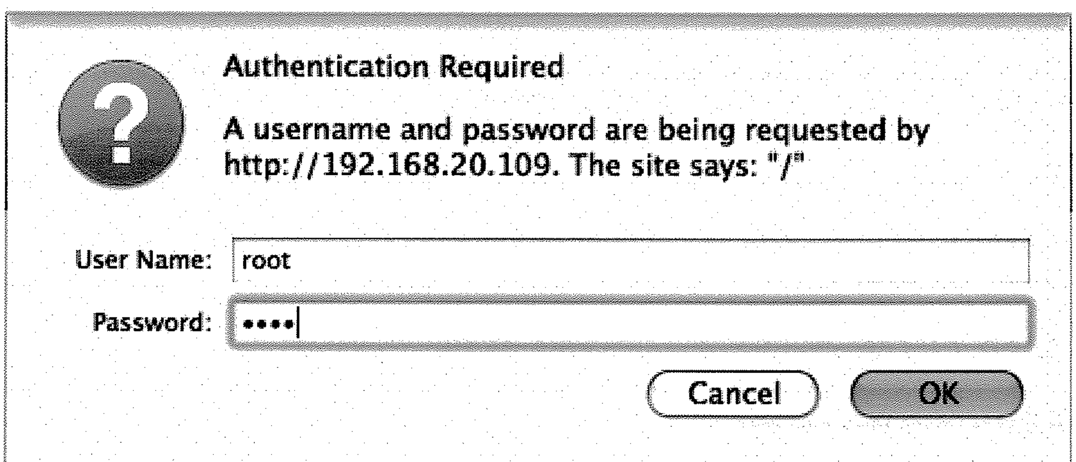

Figure 3 Entering your credentials.

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After entering your credentials the configuration file /etc/conf.d/*net.eth0* is opened in an editable mode.

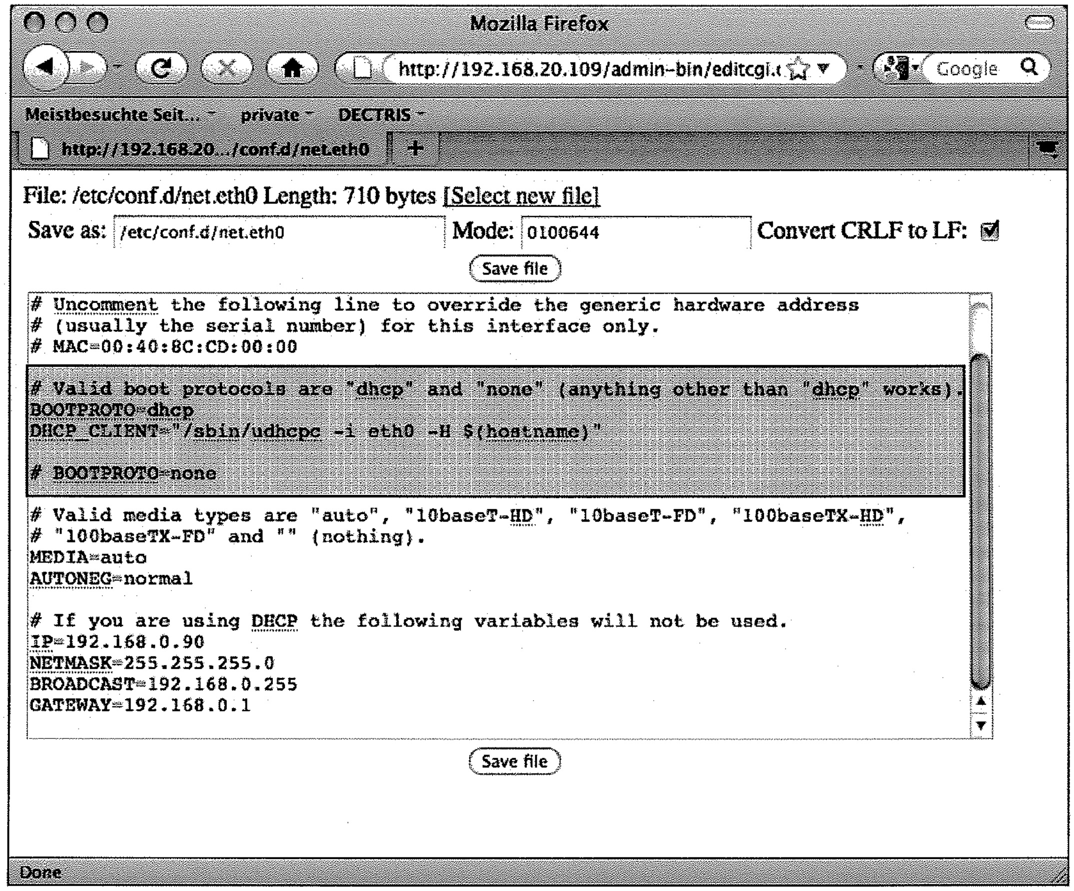

Figure 4 /etc/conf.d/net.eth0 configuration file for DHCP.

Figure 4 shows the configuration file for DHCP settings. The highlighted paragraph should be as shown for DHCP operation.

That means:

 # Valid boot protocols are "dhcp" and "none" (anything other than "dhcp" works).
BOOTPROTO=dhcp
DHCP_CLIENT="/sbin/udhcpc -i eth0 -H $(hostname)"

 # BOOTPROTO=none

The line BOOTPROTO=none is commented out. The lines BOOTPROTO=dhcp and DHCP_CLIENT= … are active.

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If you want to change the network configuration to a fixed IP address e.g. 192.168.0.90, the highlighted paragraph should be as shown in Figure 5.

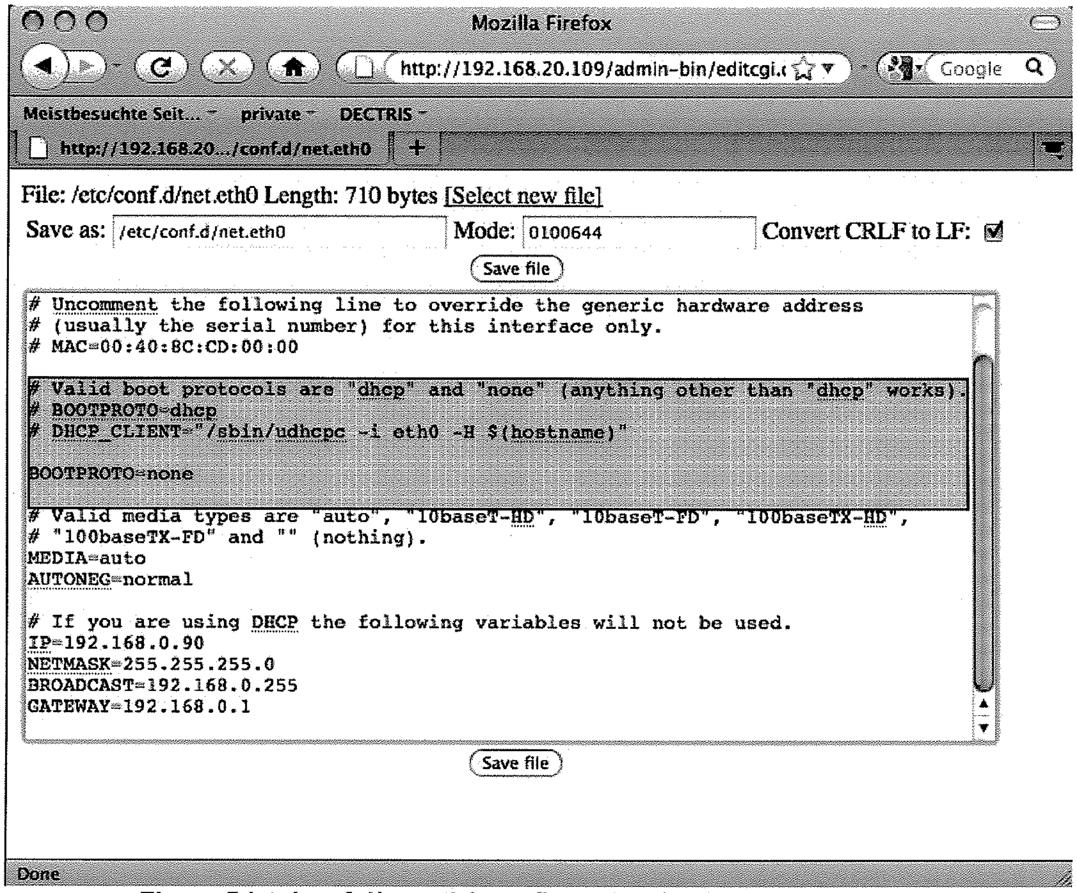

Figure 5 /etc/conf.d/net.eth0 configuration file for a fix IP address.

That means:

 # Valid boot protocols are "dhcp" and "none" (anything other than "dhcp" works).
 # BOOTPROTO=dhcp
 # DHCP_CLIENT="/sbin/udhcpc -i eth0 -H $(hostname)"

BOOTPROTO=none

The line BOOTPROTO=none is active. The lines BOOTPROTO=dhcp and DHCP_CLIENT= … are commented out.

After editing the file and convincing yourself, that there are no bugs left, press the *Save file* button. **To activate the changes, the DCS has to be rebooted by pressing the RESET button on the DCS.**

5 Appendix

5.1 Table of Figures

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System Information Sheet

This system has been thoroughly tested, calibrated and approved.

Client: ANL
Assembling Date: 2010-10-18

Detector

Type	Mythen1K
Serial-no.	160
Sensor thickness	450 μm

DCS

Serial-no	DCS1x055
Firmware	MCS1_261108.pof
Software	fimage_V1.6_SN160_dcs1x055_SN0a1_fix
Hostname	dcs1x055
MAC-Address	00:50:C2:95:90:55
IP-Address	192.168.0.90
Username	root
Password	Mythe055

Calibrations

Settings	Radiation	Energy
Standard	Mo-Fluorescence	17.5 keV
	Cu-Fluorescence	8.05 keV
Highgain	Cu-Fluorescence	8.05 keV
	Cr-Fluorescence	5.41 keV
Fast	Mo-Fluorescence	17.5 keV
	Cu-Fluorescence	8.05 keV

Module SN0a1

Firmware	MCB_SN0a1.pof
Bad Channels Standard	No bad channels
Bad Channels Highgain	No bad channels
Bad Channels Fast	No bad channels

Validation Plots for Standard Settings and Cu-Fluorescence

Module SN0a1

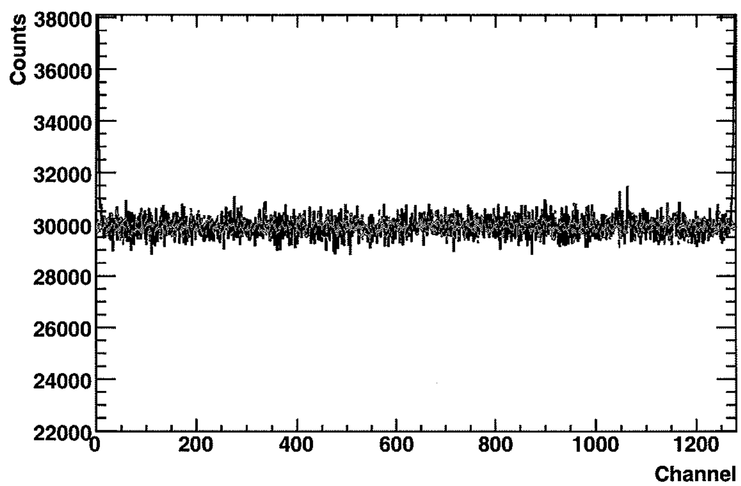

Figure 1: X-ray intensity as a function of the strip position before and after flatfield correction.

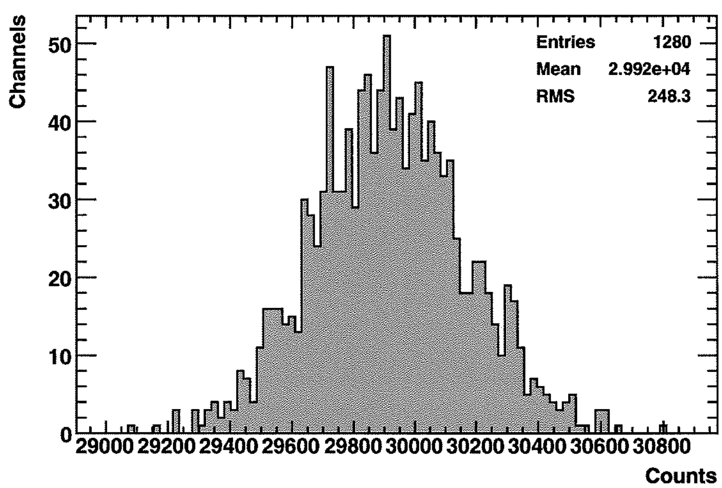

Figure 2: Distribution of the flatfield corrected X-ray intensities. The data taking time was the same as used to determine the flatfield correction.