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Scientific / Technical Note

The AIDA DCS2 System

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The AIDA DCS2 System

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December 5, 2014

1 Abstract

The AIDA DCS2 system was built to support testbeam activities in the framework of the AIDA activities. The system is adapted to the needs of pixel detectors. It is an enhancement of AIDA DCS1, but a completely independent new system. The AIDA DCS2 system consists of a MPod crate (housing 2 HV and 1 LV power supply modules), an environmental monitoring system BBM (building block monitoring), and a DCS PC. A WinCC OA 3.11 based program is running on the DCS PC and provides the user interface for the shifters. It allows for monitoring, controlling and archiving the DCS parameters.

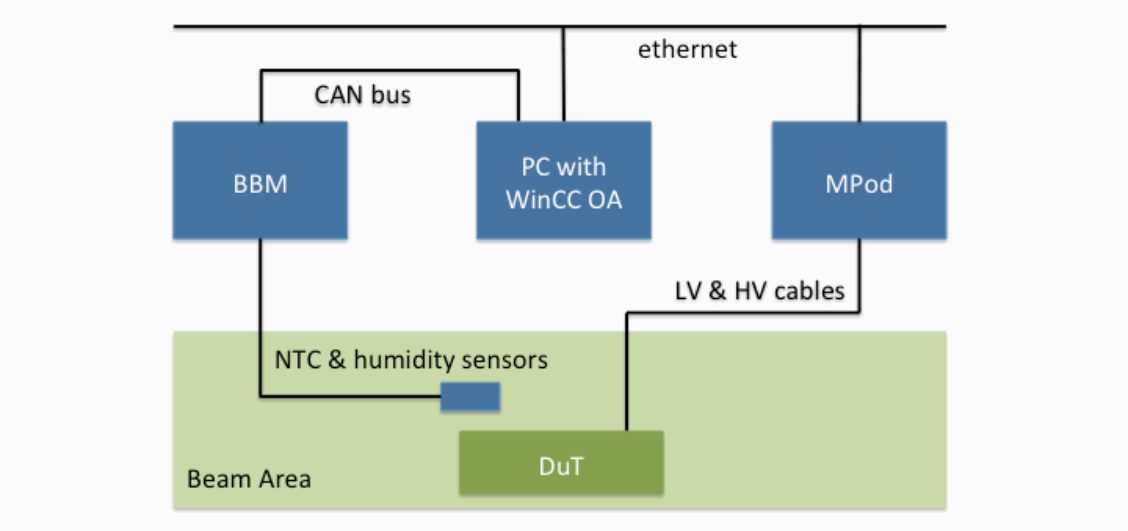

Figure 1: DCS Overview

2 Inventory

- 1 PC labeled testbeam DCS (CAN PCI Interface card installed) + screen, keyboard, mouse
- 1 WIENER MPod Mini Crate (Figure 11)
  - 1 MPod 8 channel LV module (MPV 8008LI 8V/5A)
  - 1 iseg 8 channel HV module (EHS 8205n 500V/10mA)
  - 1 iseg 8 channel HV module (EHS 8220n 2kV/4mA)
  - this crate can be powered with 110 or 230 VAC
- 1 BBM crate ('Testbeam DCS BBM', Figure 12)
  - NTC module
  - Hum module
  - 1 ELMB ('CAN')
  - 1 power module ('CAN')
  - this crate can be powered with 110 or 230 VAC
- 1 NTC cable with 4 NTCs (Semitec 10 kΩ), 5m long (Figure 14)
- 2 Hum sensor cables, each one humidity sensor (Honeywell) + one NTC, 5m long (Figure 13)
- 1 USB cable (required only for configuration of MPod crate)

- 1 CANbus cable (colored flat cable with subD9 connectors on it)
- 1 CANbus adapter (black cable, 1x subD37 connector to 4 x subD9 connectors)
- 'Make be happy' cable, short grey flat cable with 3 subD9 connectors (Figure 13)

You should also have:

- ethernet cables
- 3 power cables
- HV cables with Suhner connectors
- LV cable with subD37 male connector

3 Account

Due to the lack of time for preparation, only the local account "Administrator" can be used to run all the software. As the computer is part of the CERN NICE network, it may be necessary to type "pc-atlas-tb-03\Administrator" to log in. The password is provided separately.

On the desktop, links to the software described here are placed. Also, a folder containing the content of the CDs of the manufacturers (manuals etc.) is placed there.

4 Network Settings

Ask the local network admin for two IP addresses.

As the communication between PC and power supply crate is done via network, correct network settings have to be applied to both, crate and PC. Note that these settings have to be fixed and should not be done via DHCP. The system has been setup at CERN at ATLPIX_SR1 using the following settings.

IP of PC	137.138.5.58
IP of MPod crate	137.138.5.144
Subnet mask	255.255.0.0
DNS	138.138.16.5
Gateway	137.138.1.1

5 MUSEcontrol

This software is used to configure the MPOD via the **USB interface**. When started, it scans for devices for a while (~20s) and after, displays this window:

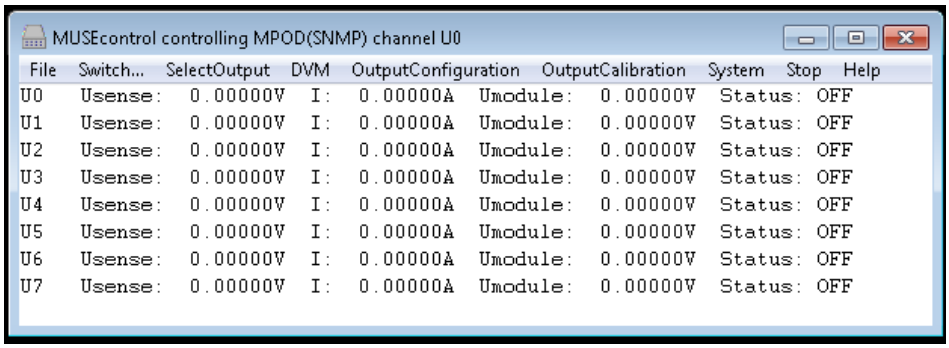

Figure 2: MUSEcontrol

Here, the eight outputs of the LV supply are listed and by clicking on one of the lines, the according channel is switched on or off. By right-click, a panel opens for that channel and allows to set the voltage, current limit, ramping speeds etc.

MUSEcontrol can only display the channels of the LV module , not of the HV module!

Via menu System → Configuration, one can change further settings, whereof the most important are the network settings:

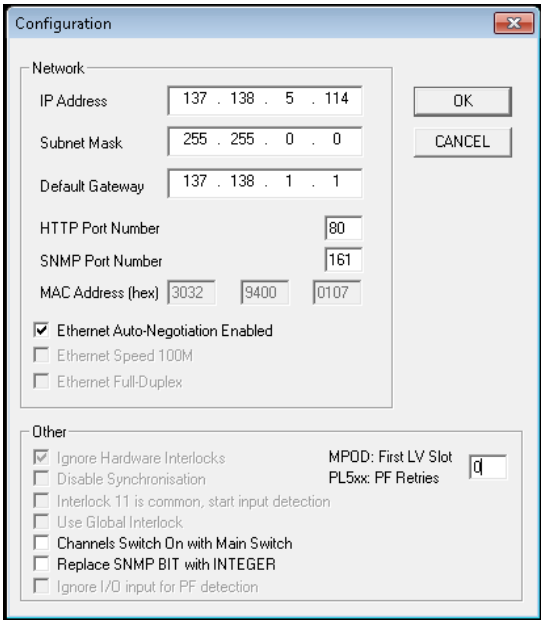

Figure 3: configuration of the MPod IP Address

Check whether the PC can see the crate (command line: ping)!

In addition, the address of the power supply has to be written to the xml file
C:\Program Files (x86)\W-IE-NE-R\WienerOPCS.cfg near the end within the line
<Crate Alias=”PL512” Transport=SNMP” Address=138.138.5.114” />
If the WinCC Project is running, a restart of the process OPC DA client 14 –num 14
should be sufficient to establish the connection between WinCC and the supply.

6 Preparation of the Hardware

The figure below shows how the system should be cabled.

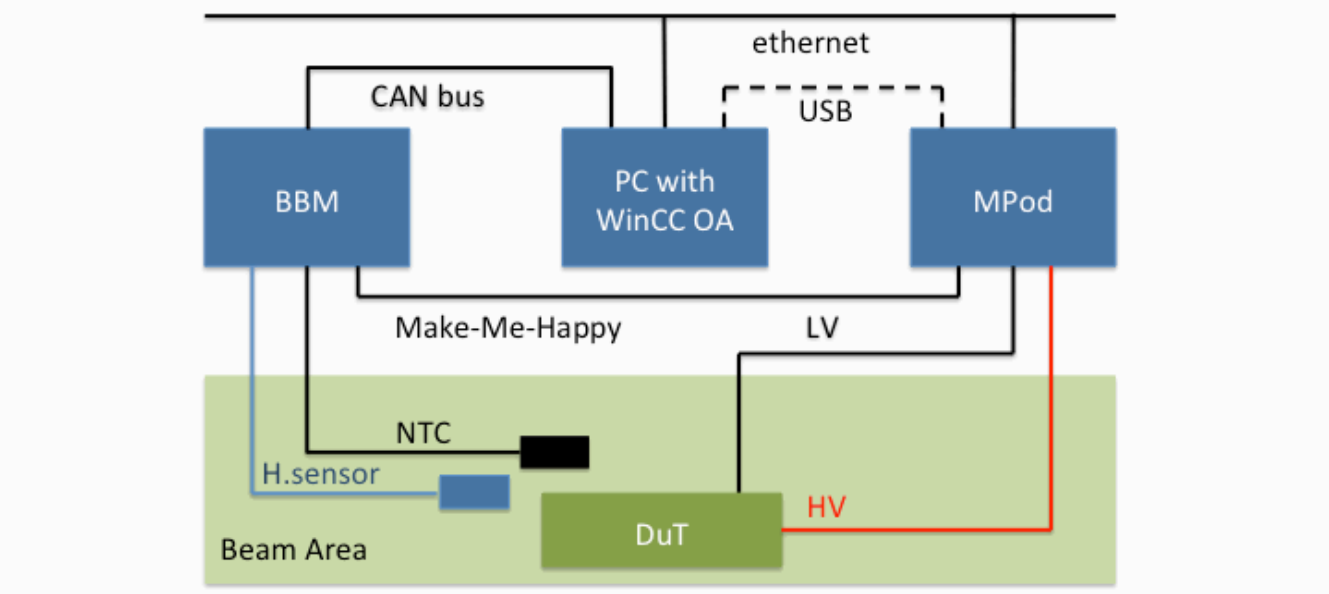

Figure 4: DCS cabling

- Connect the USB cable between PC and MPod (for configuration omly)
- Connect black adapter cable subD37 to PCI CAN interface, which is installed in the PC
- connect flat CANbus cable to
  CAN#1 of black adapter cable
  both CAN modules of BBM crate (see Figure 13)
- connect the Make-me-happy cable
  PwrIn connector to iseg-happy cable, which is coming from the BBM crate
  the 2 iseg connectors to the inhibit connectors of the iseg modules
  the MPod connector to the control connector of the MPod controller module
- Connect
  LV, HV cables to the MPod system
  NTC and humidity sensors to the BBM

7 iseg SNMP Control

While MUSEcontrol only displays the LV channels, iseg SNMP Control allows to display and control all, LV and HV channels. However, it uses the network connection, which has to be set up correctly before. On the left, there is a list of the connected modules and on the right, the channels of the selected module are displayed. (Unfortunately, this screenshot was made when there was no network connection, so no modules are shown.)

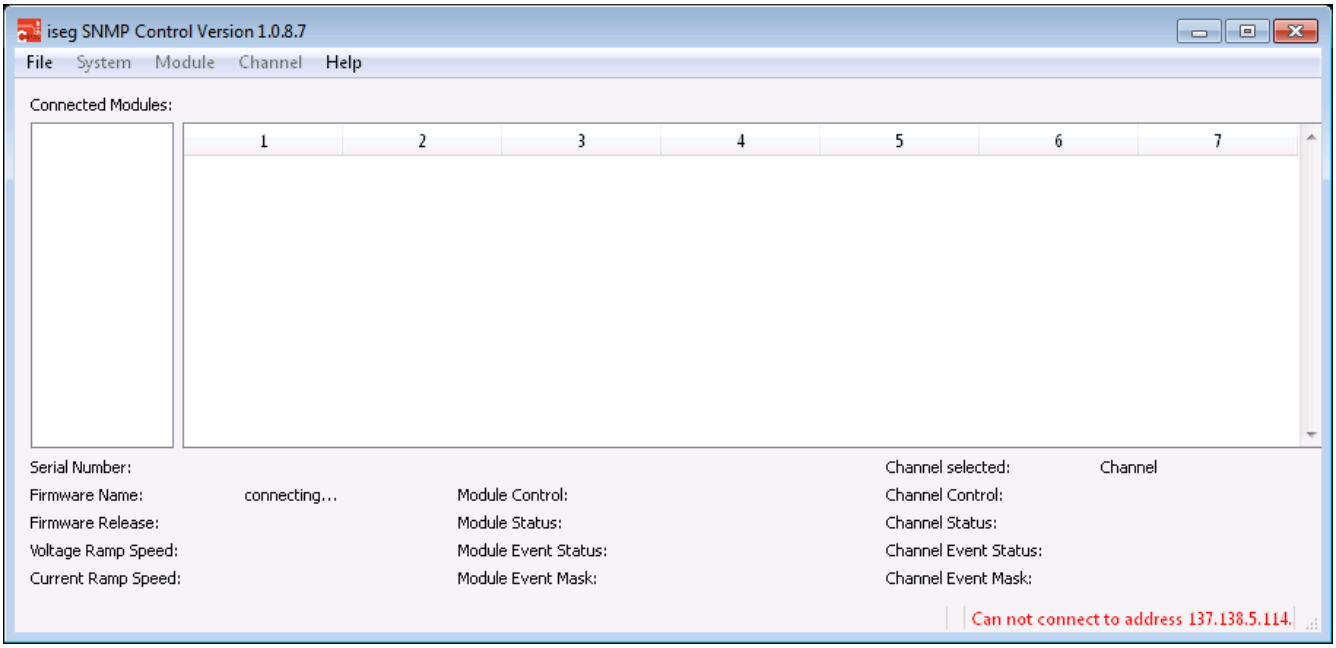

Figure 5: SNMP control

8 MPOD Integrated web server

By typing the IP address of the MPOD into a web browser, one gets a very simple table with the most important information, refreshing every 5s. Although there's no option to control the crate, the web site is the simplest way to check that the MPOD is available via network and that all output channels are accessible.

The channels of the power supplies are numbered 0...7 for the lowest module (LV), 100...107 for the second (iseg 500V) and 200...207 for the third (iseg 2kV).

9 WinCC project

While the software described before is used for configuration or as fallback-solution, it is foreseen to operate the power supply using WinCC, as it gives a better overview over all parameters and allows for recording them to disk. In addition, it handles the BBM for humidity and temperature monitoring.

When opening the WinCC Console, the project “testbeam_HV_LV”, which has been developed to this setup, is not yet running. It can be started by the green traffic light right to the field “testbeam_HV_LV”. Note that even when all WinCC windows are closed, the project is still running in the background and one can open the WinCC OA Console again to control the project. As a running project can prevent the computer from shutting down, it has to be stopped before by the red traffic light right to the green one. The third icon in the row can be used to open the Log Viewer of WinCC, if it is not already opened.

When clicking the green traffic light, the processes shown in the table inside the WinCC Console start up and the color of the first column in the table turns green (number changes to 2) Only the line

Control manager 3 -f fwScripts.lst

should stop again and signal it by red color, as shown in Figure 6.

At the end of the startup procedure, a simple main window providing three buttons described below appears. When closing

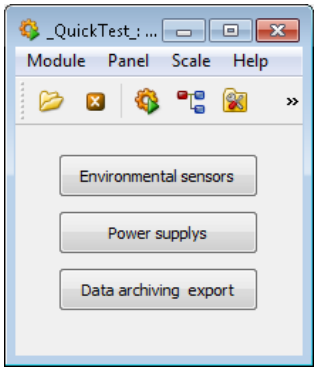

Figure 7: main panel

this window, it will be opened again automatically.

If necessary, individual processes can be stopped and started manually by selecting them and clicking the button with the red or green circle on the right side.

9.1 Environmental sensors

This button opens a window showing the environmental data measured by the connected BBM crate and its sensors. The arrangement of the values on the window corresponds to the arrangement of the slots and connectors on the crate. Temperatures below -70°C and a relative humidity above 100% indicate that no sensor is connected. On the right, the status of the ELMB (the measurement device inside the BBM) is shown and should be “operational” (“Op.”). If it is “preoperational” or “stopped”, the button below may be used to put the ELMB into operational state. However, it takes several seconds until the status changes. If the background of a data field is black, this indicates a non operational ELMB or an other problem. In this case, check the hardware and restart the process

OPC DA client 7 -num 7

as described above.

A right-click on a data field opens a “trend”, which is a simple graph showing current and past values of the data.

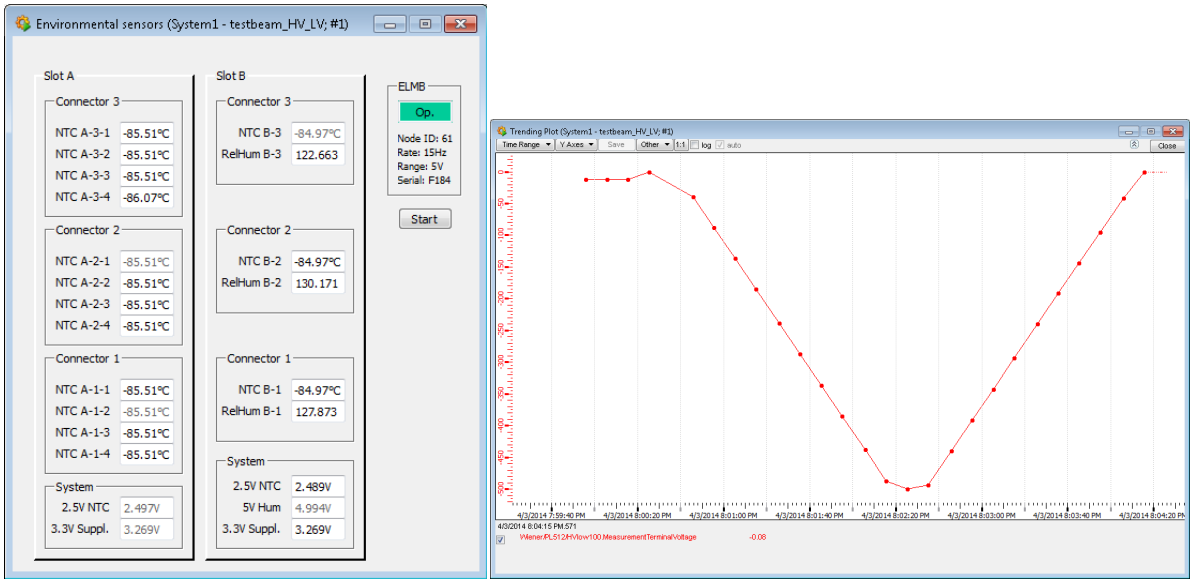

Figure 8: left environmental monitoring/ right trending

9.2 Power supplies

The power supply panel offers monitoring and control functions for each of the three times eight outputs of the MPOD crate. Although the display elements are identical, LV and HV channels have partially a different behavior

- **Status** can be “Inhibit” or “Active”. It denotes if an output is disabled due to an external signal supplied to the SubD9 connector of the crate.
  - LV: As soon as the external signal is “good” again, the status changes to “Active” and the channel can be switched on.
  - HV: The status remains until it is acknowledged (button “Ackn”) and the channel can be switched on. However, the first four channels can be switched on if the external signal is “good” and the status is still “Inhibit” for unknown reason
- **Power** indicates if a channel is on or off. (read back from hardware)
  - HV: If the voltage is set to 0V, it indicates Off, even when switched on. In this case, it changes to On as soon as a value different from 0V is set.
- **Vset** set output voltage (read back from hardware)
  - LV: keeps setting after power cycle
  - HV: after power cycle, the setting is lost and set to 0V.
- **Vterm/Vsense** The LV supply has sensor lines which allow for measuring the voltage outside the supply. But this setting is not configured. So, both fields show the same value, the measured output voltage.
- **I** is the current in A for LV and mA for HV
- **Vset (control)** can be set by the user. The value is then send to the hardware, but also stored within WinCC. So, it is kept even in the case of a power cycle, but then still has to be sent to the hardware again.
- **On/Off** Well...
- **Ackn** has an effect on the HV only, see “Status” above
- **More...** opens a window with further settings. It seems that the HV is not correctly supported. So, it is

recommended not to use it. Current limits etc. should be set using the other software tools described above.

At the top region, the crate itself can be monitored and switched on/off. There are also buttons to switch all channels on/off, acknowledge all “Inhibit” states and send all Vset values to the hardware.

As for the environmental window, black background means that the value has been marked bad as e.g. the connection to the hardware has been lost. (However, switching the crate off gives a black background, too). A right-click also opens a simple trend for each value.

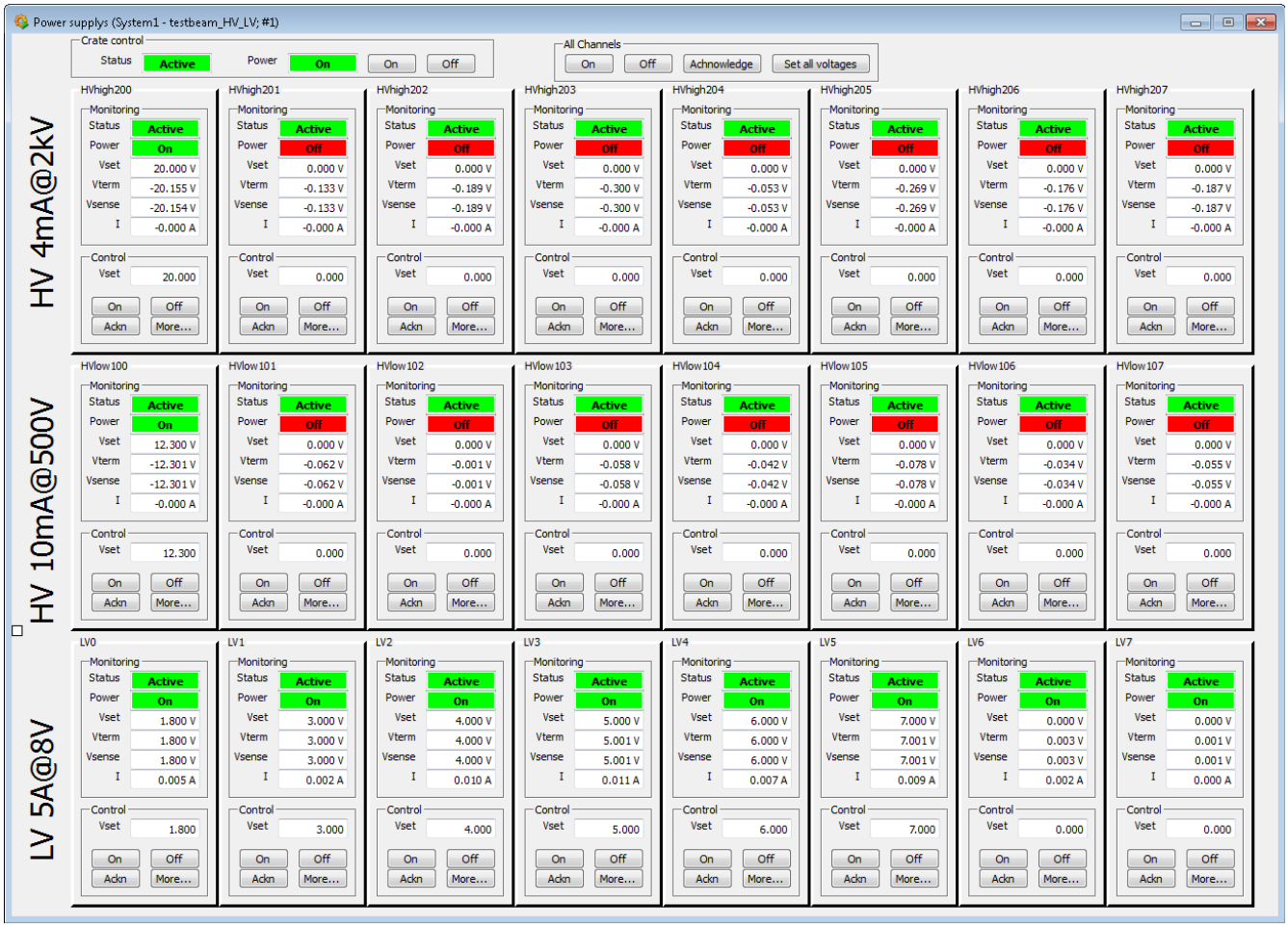

Figure 9: Power Supplies Overview Panel

9.3 Data archive export

All environmental values as well as all values of all power supply channels are permanently recorded to a WinCC internal database (and thus can be displayed in the trends also for the past). The data can be exported to a simple text file table by the window shown below. A header at the beginning of the file describes the content of each column. Beneath time range and file name the data to be exported can be selected. For the environmental data, it can be selected on a per-connector base, for the power supplies per channel.

There are two options which need some attention:

Output: When writing the file, two methods are available. In update mode, a new line is written for each time stamp where one of the values changed. If the BBM updates its 26 values during 6 seconds, 26 lines will be written for every 6 seconds To reduce file size, it is possible just to write one line at given, equip-distant time steps.

Database query interval: The internal function to retrieve values from the database takes a list of the desired datasets and a

time range. However, it crashes if the number of values is too large. Unfortunately, there is no way to automatically circumvent this. The solution is to divide the time interval in several smaller intervals, given by this option. On the other side, the time to extract the data increases with the number of used intervals. During extraction, the WinCC Log Viewer should be monitored. There are lines stating the time intervals being processed. If there are (colored) messages saying that there were too many values, one should close the panel, open it again, and try a smaller query interval.

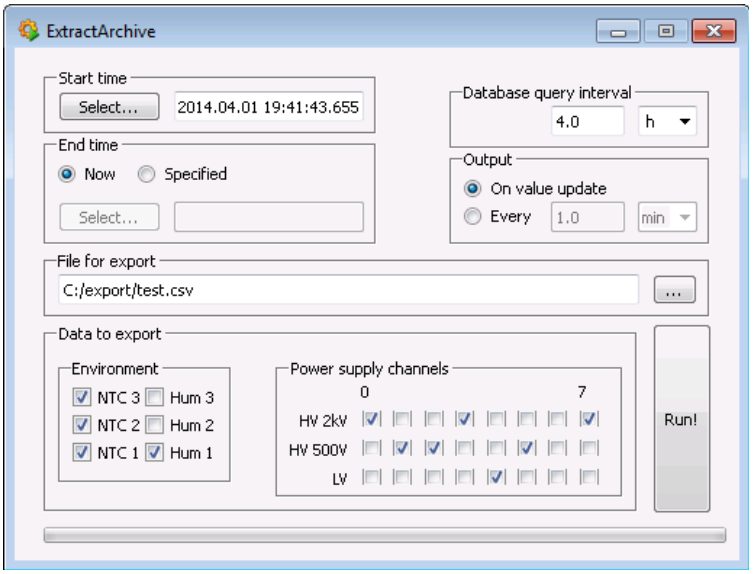

Figure 10: extract archives

10 What if a power supply module does not show up?

It seems that the startup of the MPOD module has a problem. When switching the crate off and on again either by the main power switch, by software (either of them shuts the crate down completely!) or by power-cycling it via the power cord, one or two power supply modules may not be fully recognized by the MPOD controller. In this case, these modules are not visible within iseg SNMP control, web browser nor WinCC. It seems that MUSEcontrol always works (uses USB instead of network) but as said before, it only supports the LV module.

Most times, switching off and on the crate on any of the three ways does not help. What does help, is pulling the modules out of the crate and pushing them in again.

11 Figures of Hardware

Figure 11: MPod crate with 1 LV and 2 HV modules

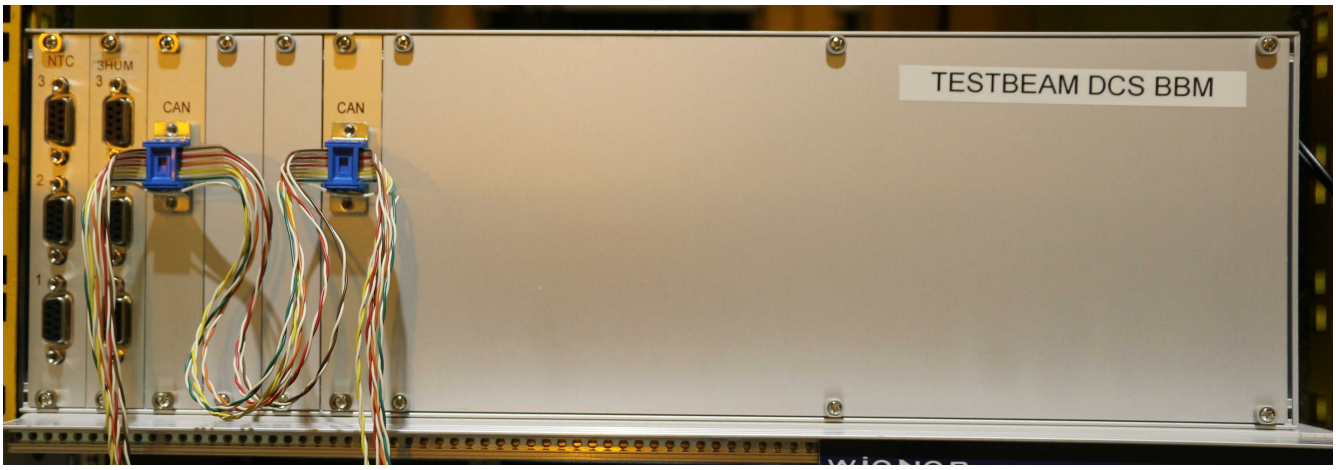

Figure 12: BBM crate with CAN bus connected, ELMB node ID 61

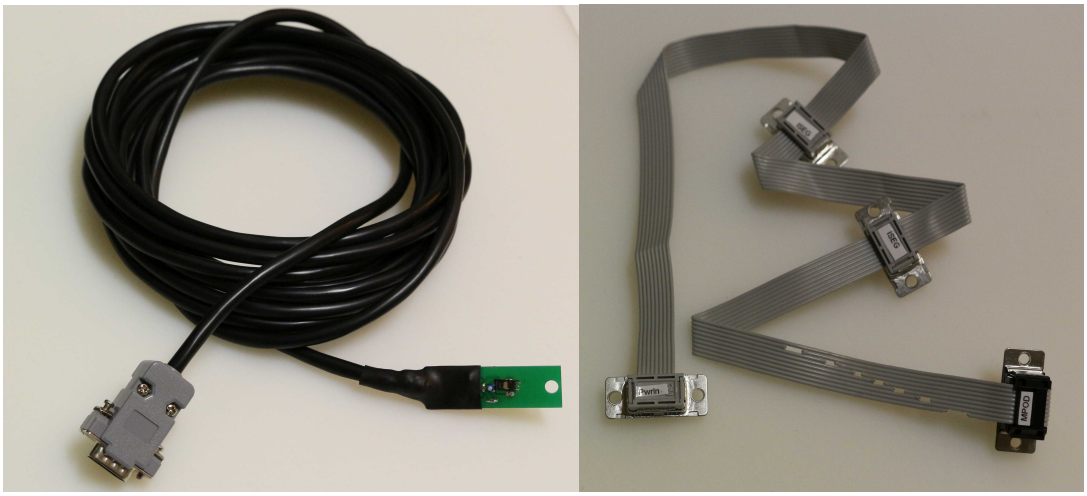

Figure 13 left: cable with humidity sensor
Figure 13 right: Make-Me-Happy cable

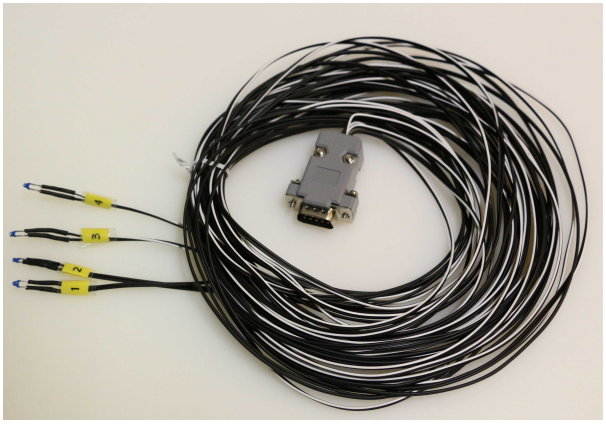

Figure 14: NTC cable (10 kΩ NTCs from Semitec, same calibration factors as ATLAS pixel NTC SMD0603)