

WIENER, Plein & Baus, Ltd. LCLS Service Training



Agenda

1. Company Introduction
2. WIENER crates used at SLAC / LCLS
3. VME 6023 Crates
 1. Bin Specifications
 2. Fan Tray
 3. Backplanes
 4. Power Supplies
 5. Software Interfaces
4. VME Mini Crates
 1. Bin Specifications
 2. Power Supplies

WIENER Company Information



- Located 25 Km East of Cologne in Burscheid Germany.
- ~30 Employees for production, design, and quality control
- Most development is driven by the Nuclear & HEP community.

WIENER-US

- 1997 Wiener Plein & Baus in Springfield, OH established
- WIENER USA: 3 employees for sales, administration and service + maintenance,
- Sales / Support and Maintenance:
 - Mid / East : Andreas Ruben
 - West: Tim Hoagland
- Order processing / Shipping: Katrin Ruben
- South East: SETS



WIENER VME Crates

- Determined by the needs of experimental physics
- Allows for the high level of flexibility and reliability.
- Crate styles
 - **4000 Series:** 1989 – 1995
only Europe
 - **5000 Series:** 1996 – 2000
BABAR, STAR, CDF (2)
 - **6000 Series:** since 2000
MINOS – VME crates, PL6021)
US CMS / LHC – VME crates
D0 - crates, PL500
Tevatron BLM – VME crates



Crates at SLAC / LCLS

- BABAR DIRAC crates :
 - 5000 Series Crates
- SSRL :
 - 6000 Series Crates (some with Split backplanes)
 - VME Mini Crates (both old and new style)
- LCLS:
 - VME 6000 Series Crates (JLAB mechanics)
 - New Style VME Mini Crates



LCLS Crates – 6023 JLab



- 19" wide x 11U height with 21 slots.
- VME-64x backplane
- Front air intake (with filter) and rear air exhaust
- Ethernet and CANbus remote control
- Full(6U) transition cage
- Low noise, 3U power supply mounted behind Fantray
- 3 fan fantray with intelligent control and alphanumeric display

LCLS Crates – 195x VME Mini

- 19" wide x 5U height, 7 slots
- VME64x Backplane
- Side air intake and rear exhaust
- Ethernet and CANbus control
- Integrated power-supply
- 6U transition cage
- Mechanics and Power supply redesigned in 2005 to provide more reliability and increase the ease of maintenance
- Uses same power supply concepts as 21 slot crates but different parts

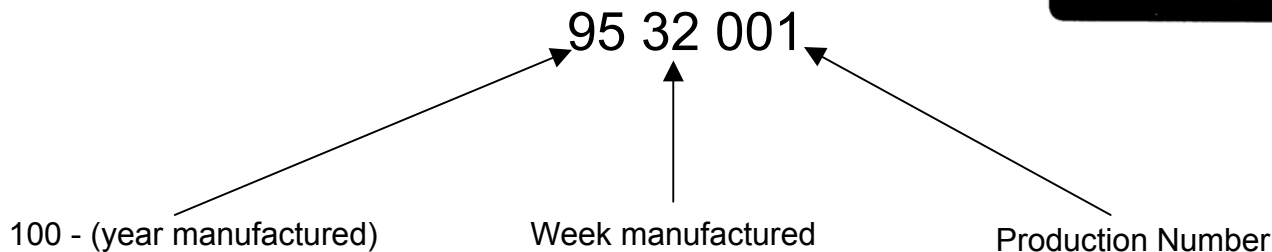
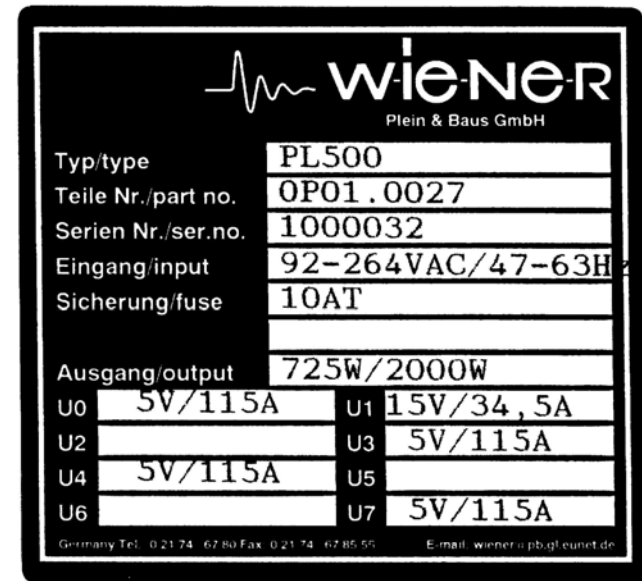


VME crate components

- 21 Slot VME crates are made up of 4 parts:
 - Bin:
 - Provides the mechanical support for the VME cards, backplane, fantray, power supply and rack mounting hardware.
 - Backplane:
 - A variety of backplanes are available, VME, VME430, VME64x, VXI, VXS, PXI, CPCI or customer provided.
 - Fantray:
 - Provides cooling for the VME modules plugged into the crate and the interface between remote monitoring applications and the power supply.
 - Power Supply:
 - Provides power to the Backplane and the fantray.

Crate Components

- Each crate component has its own serial Number (Power supply, Fan tray, & Bin).
- Serial Number, Part number, & Type are given on label
 - For power supplies, input and output power is also included
- Serial Number decoding



Bin Features

- Very rigid mechanical construction with 5mm side panels according to IEEE1101.1, 1101.10, 1101.11
- Additional transversal stiffing members, screwed to the module guides for heavy duty
- Stripline technology backplane installed.
- Current distribution by **multilayer- current- sheet**, keeps cool even at highest currents
- **All connectors are Metric!**

Bin Details



- **5mm side panel** powerful locked to the transversal members by allen-screws, zero tolerance mechanics
- Machined for recessed mounting brackets

2 Bin configurations

6023 Crates



6021 Crates



6023



- For 6U and 9U cards
- flexible divided 20 slot or 21 slot 9U format only
- Power Supply situated behind Fan Tray in bottom
- full access to rear J1/J2 (and J3 for 9U format)
- 3U Fan Tray space with plenum chamber for airflow homogenization
- Power Supply and Fan Tray easy to exchange

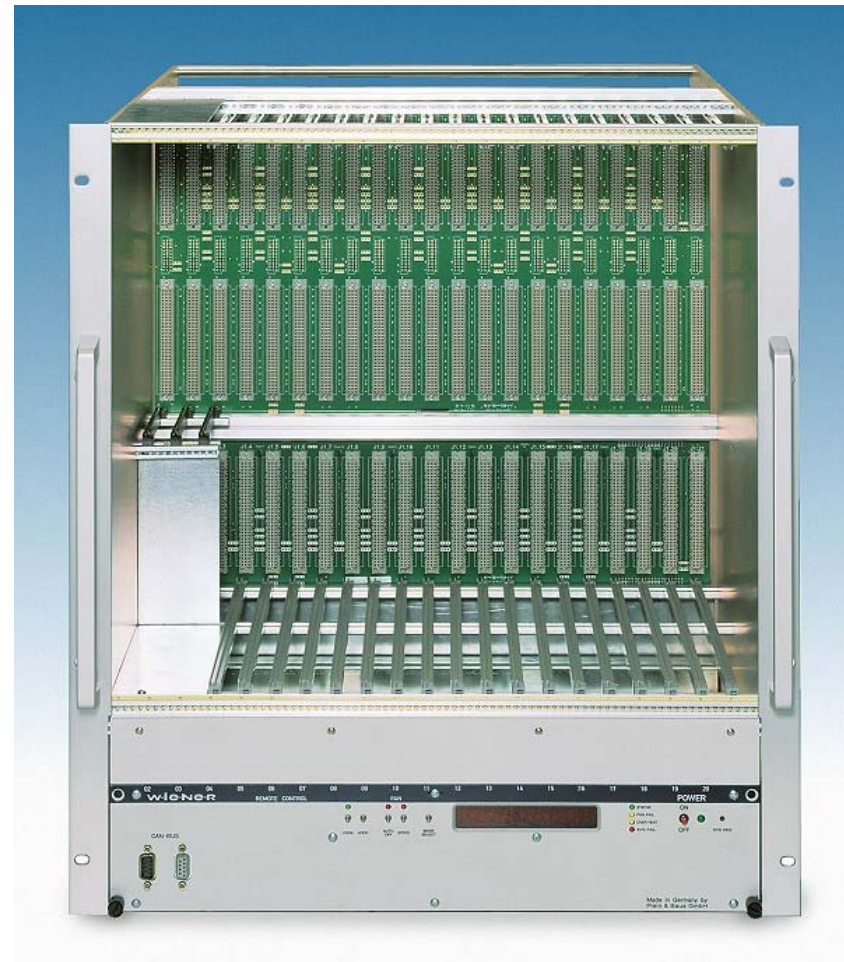
6021



- For 6U and 9U cards
- 21 slot or flexible divided 20 slot 6U / 9U
- Power Supply in top behind J1
free access to rear J2/J3
- 2U Fan Tray space
- Power Supply and Fan Tray easy to exchange

Bins, 9U & Split Crates

- Bins are available for 6U or 9U VME cards
- Possible to split the the card cage between 6U & 9U cards providing any combination.

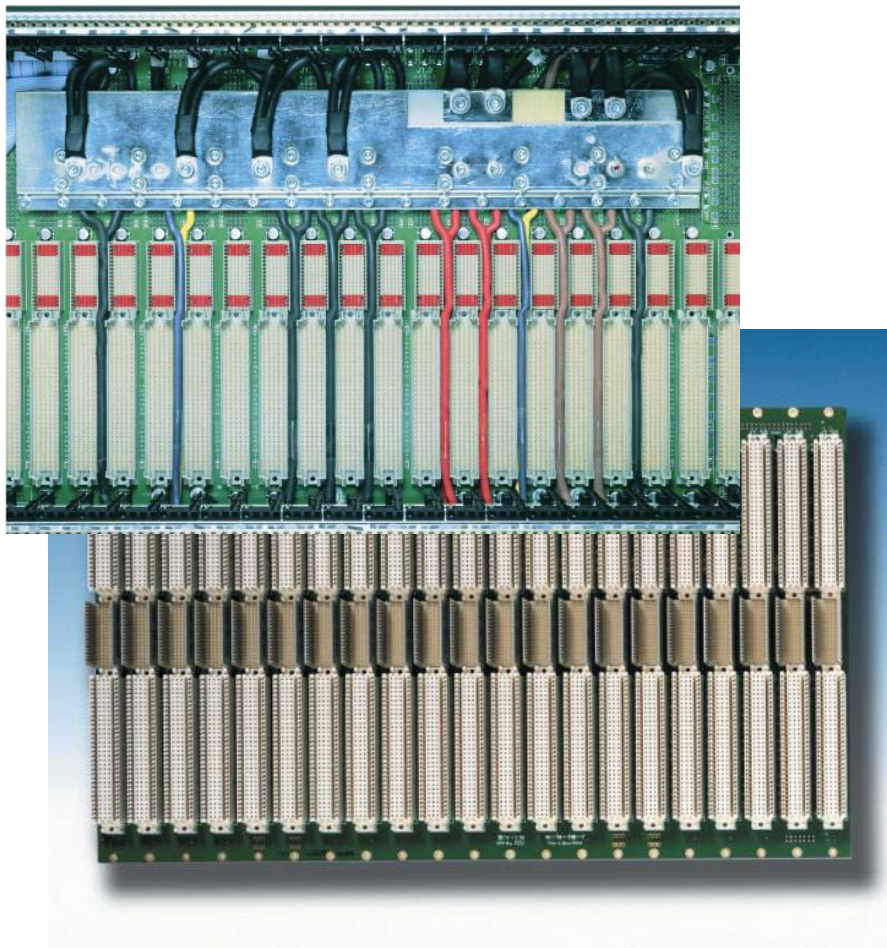


Bins, Power Protection Memory (PPM)



- EEPROM behind between fantray and power supply ensures proper power supply configuration.
- If power supply is plugged into crate with different configuration than the configuration stored in EEPROM, crate won't start.
- Wrong power supply gives "plug and play" error.

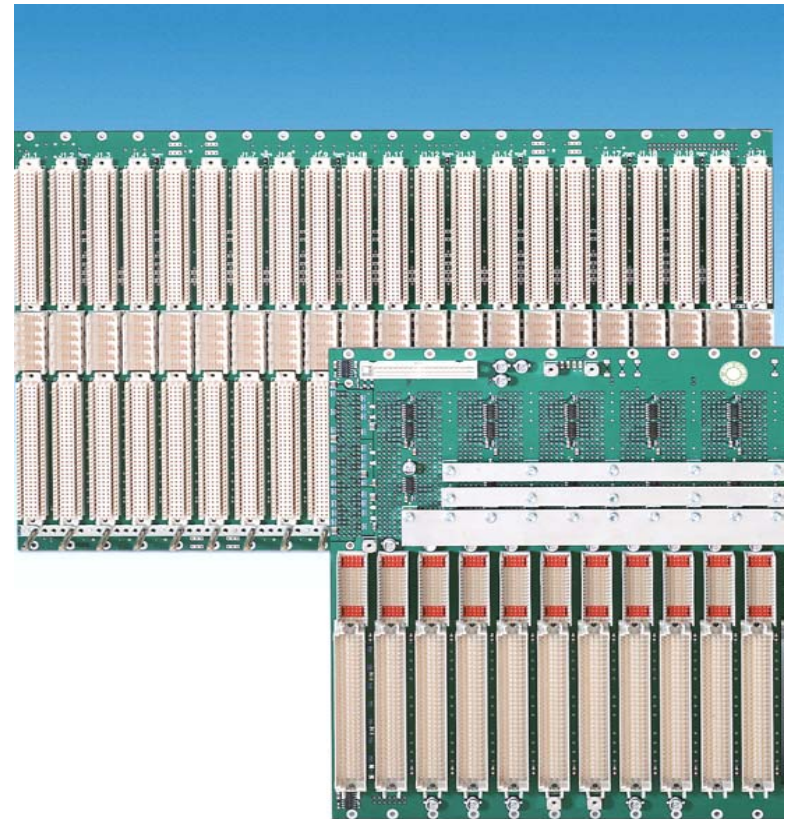
Backplanes



- WIENER provides a range of standard VME Backplanes or can install customer provided backplanes
- 21 slot crates can have split backplanes:
 - 1x21 slot backplane
 - 2x10 slot backplanes
 - 3x 7 slot backplanes

Backplanes, VME64x (LCLS)

- 10 layers stripline technology
- Crosstalk minimizing design
- 18 ground power-bugs, each for 60A, minimize DC ground shift
- Active automatic daisy chain
- 8 plugs for temperature sensors
(automatic temp. watching of selected slots !)
- Optional assembling for
chained block transfer CBLT
multicast cycles MCST



Fan Tray Units (UEL)

- Front plug-in, optimized design with air compression chamber
- 3, 4, 6 or 9 “Long live” high performance DC fans (MTBF>65,000 hours)
- Integrated monitoring, diagnostic and control
 - individually controlled (pulse / current measurement), fan fail circuit
 - Adjustable, temperature controlled fan speed (8 bin temp. sensors + 1 air inlet)
 - μ P + alphanumeric display, status LED's
 - Programmable hot-swapping
 - Interfaces for remote access (RS232, CAN-bus, **Ethernet,**)



Fan Trays

- Fan Tray plugs into the front of the VME crate, below the VME card cage
- Fan tray can be hot swapped
- Provides the remote interface to the crate
- LEDs report status of the power supply and VME Backplane
- Alphanumeric display panel reports:
 - Power supply information
 - Fan speed information
 - IP/CANbus information



Fan Tray Operation

Switches

- DC-On (Trip-off reset)
- Mode select (programming)
- Fan speed
- Auto off
- Remote address adj.
- Sys reset (protected)

LED's

- Power
- Fan speed
- Auto off
- Local
- Status
- Fan fail
- Overheat
- Sys fail



Fan Tray Display Features

▪Display:

- All voltages (sense levels at backplane) and currents
- Fan speed (RPM)
- Temperatures (optional 8 sensors above modules)
- UV / OV / OC Trip-points (programming mode)
- Operation time of Power Supply and Fan Tray

▪Programming:

- Voltage trip off points U_{min} , U_{max} , U_{nom} , I_{max} , I_{lim}
- Auto power on, fan hot swapping
- Temperature display, temperature limits
- Networking configuration

▪Failures diagnose:

- over- under voltage (per channel)
- over temperature, fan fail, AC-fail
- internal failure (check sums, etc.)
- monitor self-test

Power Supplies

NEVER REMOVE POWER SUPPLY COVER

Removing the cover exposes:

- 385VDC
- High Power Capacitors (can be charged even when unplugged)

Power Supplies (UEP)

- WIENER VME crates include high power, low noise switching power supplies.
- The power supply is microprocessor controlled and with software adjustable outputs.
- Through software it is possible to set voltage windows, set current limits, set temperature limits, and calibrate channels.
- The software interface is a valuable tool in determining the cause of a power supply failure.

Power Supply Details



- Single / dual output power modules (300 ...550W/channel)
- programmable voltage / current settings
- up to 8 independent DC outputs
- world wide auto-range AC input, with power factor correction,
- up to 3 kW(3U) / 6 kW (6U) output power
- Voltages ramp up 50ms, synchronic and monotone
- Voltage ramp down by fast output discharge (crow bar)
- Extremely low noise and low ripple **<15mVpp** <10mVpp typ.

Power Supply Structure



MNPFC16
AC mains input
auto range, PFC
primary switcher

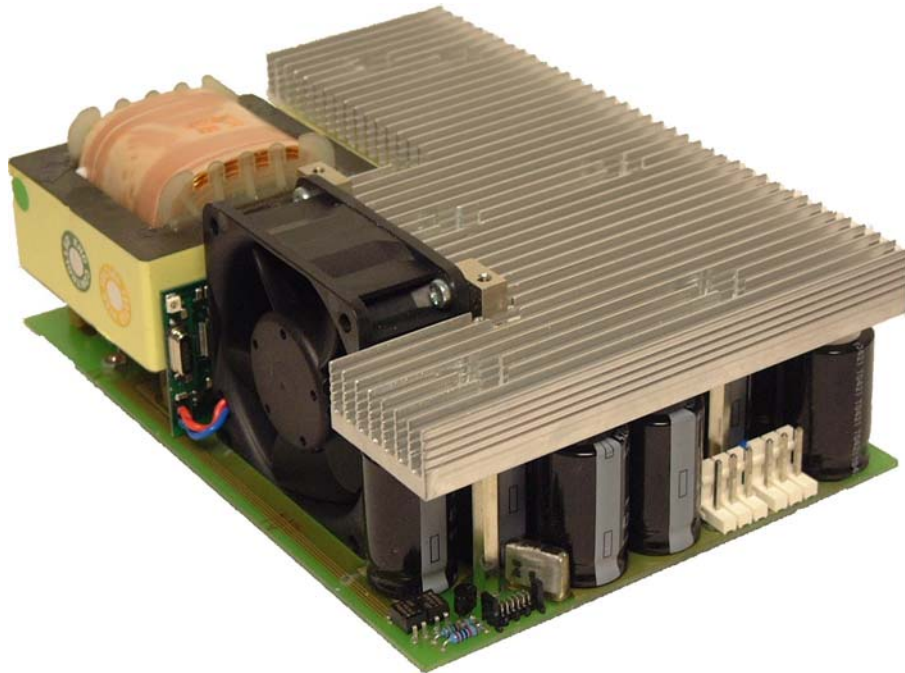
MUH6021
micro processor module
aux power supply

5 power slots

MEH
single channel
power module

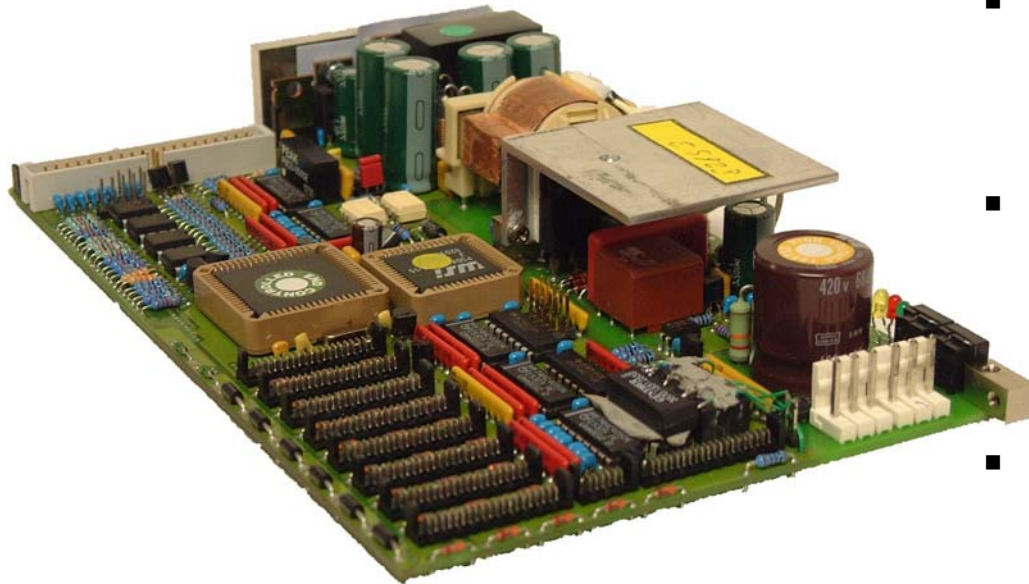
MDL / MDH
dual channel
power module

Power Supply, MNPFC



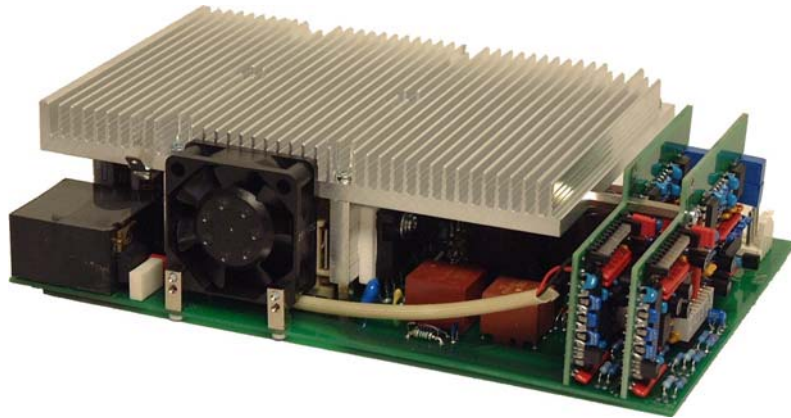
- MNPFC is main rectifier for the power supply with power factor correction.
- Supplies 385V DC to power the rest of the modules in the power supply.
- Has a small relay which “clicks” when AC power is connected.

Power Supply, MUH



- MUH board is the microprocessor board which controls the power supply.
- It contains the CANbus and RS232 interface electronics used to communicate with the power supply
- Contains an EEPROM which holds the power supply configuration and calibration data

Power Supply, Power Modules



- The power modules produce the output voltages
- A variety of modules exist to cover from 2-30V.
- Single channel modules (MEH) provide the highest power.
- MDL modules are low power dual channel modules
- MDH modules are high power dual channel modules
- Modules can be run in series or parallel for higher power or voltages.

Power Supply, Module Types

Type	Voltage Range	Channels	Peak Power / channel
MEH	2V ... 7V	1	115A / 550W
MEH	6V ... 10V	1	80A / 550W
MEH	7V ... 16V	1	46A / 550W
MEH	12V ... 30V	1	23A / 550W
MEH	30V ... 60V	1	13.5A / 650W
MDH	2V ... 7V	2	30A / 210W
MDH	7V ... 16V	2	20A / 250W
MDL	7V ... 24V	2	11.5A / 275W

Software Control

- CANbus
 - EPICS (BABAR)
- Ethernet
 - SNMP
 - Built in webserver
 - OPC Server
- RS232 (power supply only)
 - Diagnose power supply problems
 - Adjust power supply parameters

The screenshot displays the UEP6000 software control interface. It includes a configuration window for the power supply, a crate monitoring window, and a web browser view of the control page.

UEP6000 (Measurement 84) Configuration:

- Power Supply Version: UEP6000 2.02
- Network: CAN1.02: Address 9. General Call 127. Speed Code 1
- Power Supply ID: 2106235/99
- Channel Name: +5V0 +12V CHAN.2 CHAN.3 5V2 -12V CHAN.6 -2V0
- Calibration (U-Monitor): 750 1079 6924 569 767 1004 6840 761
- Calibration (I-Monitor): 16673 2047 1169 12429 17446 2052 2722 17902
- Modul Current [A]: 115.00 11.50 23.00 115.00 115.00 11.50 23.00 115.00
- Modul Current Limit [A]: 115.00 11.50 22.50 112.50 115.00 11.50 22.50 115.00
- Modul OVP (DAC):
- Modul Unom (DAC):
- min. Voltage [V]:
- max. Voltage [V]:
- max. Current [A]:
- Current limit [A]:
- OVP (DAC):
- Unom (DAC):
- Unom (adjustment):
- max. Temperature:
- Operating Time Status:
- POWER ON:
- AC OK:
- TRIP OFF ENABLED:
- Voltage [V]:
- Current [A]:

W.I.E.N.E.R. Crate Remote Control Version 1.32.3

Host Computer

Crate Monitoring

W.I.E.N.E.R. Crate Remote Monitoring

Crate Number: 4 Crate on

Channel	Voltage	Current	Crate Temperatures
0	5.02	10.29	1 30 °C
1	12.0	1.49	2 29 °C
2	0.00	0.00	3
3	0.00	0.00	4
4	5.21	0.84	5
5	12.0	1.49	6
6	0.00	0.00	7
7			

UEP6000/PL500 - Microsoft Internet Explorer

W.I.E.N.E.R.

MAIN POWER VME SYSRESET FAN SLOWER FAN FASTER

Global Status

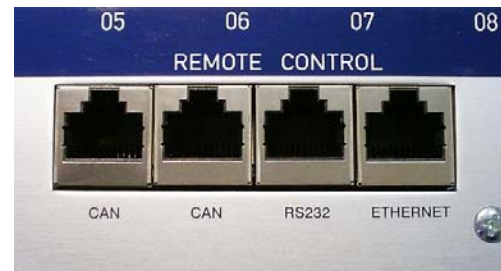
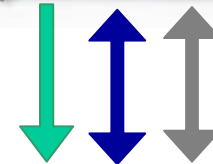
Power Supply Status	OFF
Fan Tray Status	OK
Fan Speed	0 RPM
Fan Temperature	-24°C

Output Voltages

Channel	Name	Voltage	Current	Status
U0	+5V0	0.00V	0A	OK
U1	+12V	0.0V	0.0A	OK
U5	-12V	0.0V	0.0A	OK

Software interfaces

- **RS232:**
 - internal communication between UEP / UEL CPU's
 - External monitoring / programming (no UEL!)
- **CAN-bus:**
 - Built into UEP MUH
 - For remote monitoring & control
- **Ethernet**
 - UEL CPU (new version)
 - Translated to CAN-bus internally
- **Front RS232 / USB**
 - UEL CPU



Software Interface- CANbus

- CANbus was developed by the automotive industry for slow engine control. Is now a popular bus in Physics and industry.
- Allows full control and monitoring of crates on the bus.
- CANbus address is set via switches on UEL front panel.
- Currently BABAR is using CANbus (along with EPICS) to monitor DIRAC crates

W-IE-NE-R Crate Remote Control Version 1.32.3

File CAN-Bus Interface Crate Control Options

Host Computer

Crate : 0 Crate on

Crate : 2 Crate on

Crate : 4 ext. OFF

Crate : 6 Crate on

Crate : 8 Crate on

Crate : 10 Crate on

Crate : 12 Crate on

Crate : 14 ext. OFF

Crate : 16 Crate on

Crate : 18 Crate off

Crate : 20 Crate on

Crate : 22 ???

Crate : 24 Crate on

Crate : 26 Crate off

Crate : 28 Crate on

Crate : 30 Crate on

Crate : 32 Crate on

Crate : 34 Crate on

Crate : 36 Crate on

Crate : 38 Crate on

Crate : 40 Crate on

Crate : 42 Crate on

Crate : 44 Crate on

Crate : 46 Crate on

Crate : 48 Crate on

Crate : 50 Crate on

Crate : 52 Crate on

Crate : 54 Crate on

Crate : 56 Crate on

Crate : 58 Crate on

W-IE-NE-R Crate Remote Control - Selected Crate : 0

Crate Monitoring

W-IE-NE-R Crate Remote Monitoring

Crate Number: 4 Crate on

Channel	Voltage	Current	Crate Temperatures	
0	5.02	10.29	1	30 °C
1	12.0	1.49	2	29 °C
2	0.00	0.00	3	—
3	0.00	0.00	4	—
4	5.21	0.84	5	—
5	12.0	1.49	6	—
6	0.00	0.00	7	—
7	2.02	1.16	8	—

Set	Fan1	Fan2	Fan3	Fan4	Fan5	Fan6	RPM
1200	1620	1620	1680	0	0	0	

Fan tray software version : UEL6000 3.00
CAN-bus software version : CAN1.04

Software Interface- Ethernet

- IP Address is set via UEL front panel switches.
- Built in webserver allows access from any web browser. (Password protected)
- Supports SNMP to allow quick data collection from many crates.

The screenshot shows a Microsoft Internet Explorer browser window displaying the UEP6000/PL500 web interface. The address bar shows the local file path. The interface has a light blue background and includes several control buttons: MAIN POWER, VME SYSRESET, FAN SLOWER, and FAN FASTER. Below these are two tables.

Global Status

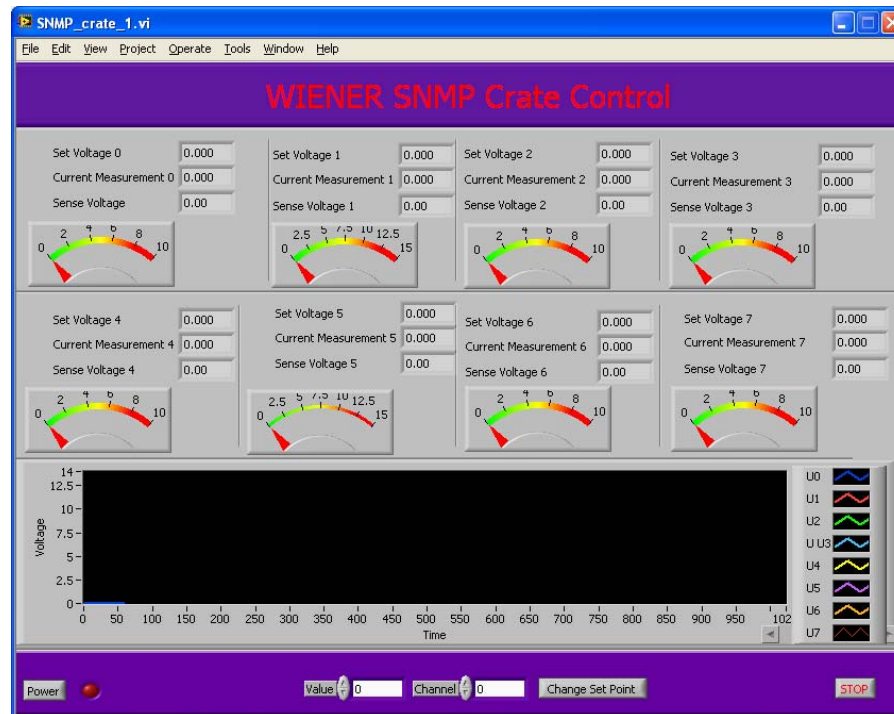
Power Supply Status	OFF
Fan Tray Status	OK
Fan Speed	0 RPM
Fan Temperature	-25°C

Output Voltages

Channel	Name	Voltage	Current	Status
U0	+5V0	0.00V	0A	OK
U1	+12V	0.0V	0.0A	OK
U5	-12V	0.0V	0.0A	OK

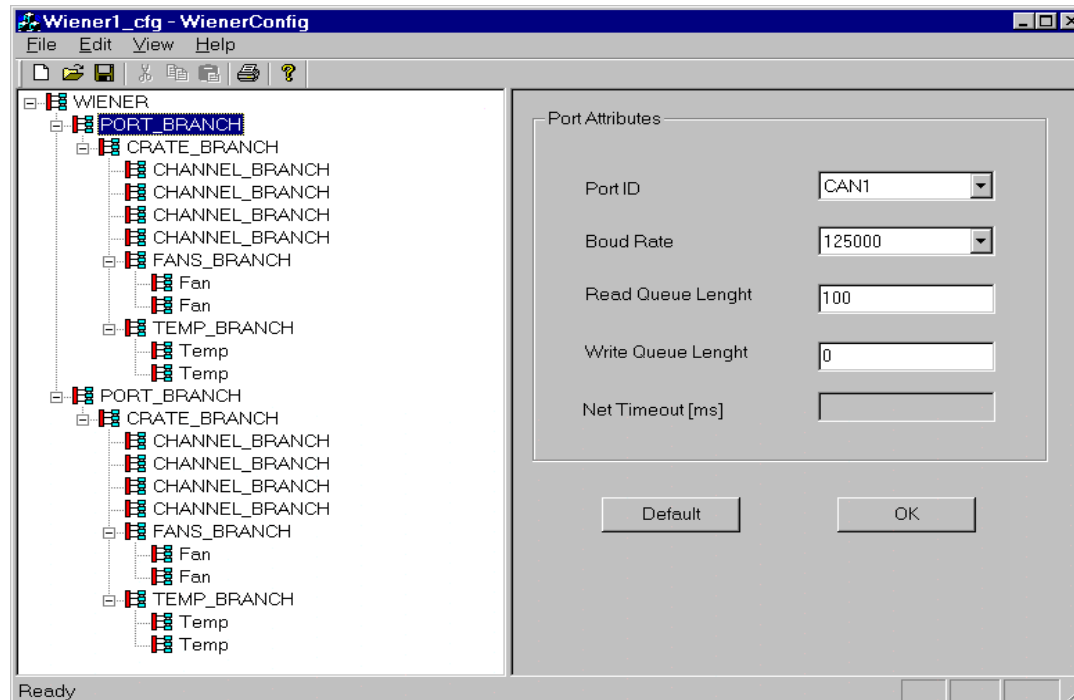
Software Interfaces- Ethernet(SNMP)

- Provides a great interface to build custom controls
- Use of NetSNMP allows for platform independent scripts (Win32 or Linux)
- Could be tied into EPICS



Software Interface- Ethernet(OPC)

- **!NEW!** open software systems: **OPC server**
(OLE for Process Control / Win NT/2k/XP) for CAN-bus & Ethernet



Software Interfaces- RS232

- RS232 Interface allows for quick diagnosing of power supply problems
- Can be used to make changes to power supply configuration
- Must be used with special RS232 adapter

The screenshot shows a software window titled "UEP6000 (Measurement 84)" with a menu bar (File, Options, Configuration, Help). The main display area shows the following data:

Channel Name	+5V0	+12V	CHAN.2	CHAN.3	-5V2	-12V	CHAN.6	-2V0
Power Supply Version	UEP6000 2.02							
Network	CAN1.02: Address 9, General Call 127, Speed Code 1							
Power Supply ID	2106235/99							
Calibration (U-Monitor)	758	1879	6924	569	767	1884	6848	761
Calibration (I-Monitor)	16673	2047	1169	12429	17446	2052	2722	17902
Modul Current [A]	115.00	11.50	23.00	115.00	115.00	11.50	23.00	115.00
Modul Current Limit [A]	115.00	11.50	22.50	112.50	115.00	11.50	22.50	115.00
Modul OVP [DAC]	234	186	231	154	243	186	231	93
Modul Unom [DAC]	239	196	220	146	240	196	220	75
min. Voltage [V]	4.87	11.69	23.37	3.04	5.07	11.69	23.37	1.89
max. Voltage [V]	5.25	12.60	27.00	4.00	5.46	12.60	27.00	2.09
max. Current [A]	115.00	11.50	23.00	115.00	115.00	11.50	23.00	115.00
Current limit [A]	115.00	11.50	22.50	112.50	115.00	11.50	22.50	115.00
OVP [DAC]	234	186	231	154	243	186	231	93
Unom [DAC]	239	196	220	146	171	196	220	75
Unom [adjustment]	120	123	128	128	118	119	128	141
max. Temperature	127	127	127	127	127	127	127	127
PS Temperature	25	OK	OK	OK	OK	OK	OK	OK
Operating Time	498525 minutes [346 days, 4 hours, 45 minutes]							
Status	OK	OK	OK	OK	OK	OK	OK	OK
POWER ON								
AC OK								
TRIP OFF ENABLED								
Voltage [V]	4.99	12.07	0.06	0.00	5.20	11.99	0.06	2.01
Current [A]	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.17

VME Mini-Crate

- Integrated Power Supply and Fan Tray
- Same Power Supply setup, Special modules
- Same software interfaces and control





Mini Crate Airflow

