



MPOD HV Power Supply System

Technical Manual

General Remarks

The only purpose of this manual is a description of the product. It must not be interpreted as a declaration of conformity for this product including the product and software.

W-Ie-Ne-R revises this product and manual without notice. Differences of the description in manual and product are possible.

W-Ie-Ne-R excludes completely any liability for loss of profits, loss of business, loss of use or data, interrupt of business, or for indirect, special incidental, or consequential damages of any kind, even if **W-Ie-Ne-R** has been advised of the possibility of such damages arising from any defect or error in this manual or product.

Any use of the product which may influence health of human beings requires the express written permission of **W-Ie-Ne-R**.

Products mentioned in this manual are mentioned for identification purposes only. Product names appearing in this manual may or may not be registered trademarks or copyrights of their respective companies.

No part of this product, including the product and the software may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form by any means with the express written permission of **W-Ie-Ne-R**.

Control Cabinet

In the context of this user manual, the control cabinet must fulfill the requirements on fire-protective enclosures according to EN 60950 / IEC 60950 / UL 60950.

All devices are intended for operation in control cabinets or in closed areas. The LAN connection and all wire connections between the different system parts must be done via shielded cable with conductive connector shells, which are fixed with screws.

Furthermore, an additional fire-protective enclosure is required which must not affect proper air circulation.

Mains Voltage and Connection

The Power supplies are equipped with a "World"- mains input (rated voltage range: 100-240 VAC, frequency: 50-60 Hz, rated current: 16 A). Before connecting to the mains please double-check correspondence.

Mains input connection at the power supply side is done with a 3-pin HIRSCHMANN connector or power terminals. There is no main fuse inside. A circuit breaker for overcurrent protection 16A, type B or C (EN / IEC 60898, VDE 0641), has to be installed externally.

Before disconnection the HIRSCHMANN connector, the power supply should be switched into standby state. (Use the ON/OFF-Switch of the front panel of the MPOD system)

Hirschman n.	Signal	Description	Color of the Wire
Pin 1	L	Phase	black or brown
Pin 2	N	Return, Neutral	blue
Pin 3		not connected	
Earth	PE	Protective Earth	green/yellow

Connection to Earth

Safety

After connecting the Power box to the mains, the mains input module is powered permanently. Filter and storage capacitors of the power factor correction module are charged with about **400VDC**. Any DC-On-Signal as well as a power switch at control board (if any installed) operates as a low voltage DC on/off switch only and not as a mains breaker. **Therefore it becomes dangerous if the box cover is open. In this case a lot of components on high voltage potential get touchable!**

Before starting any kind of work inside the power box remove the unit from mains and wait a couple of minutes with your activities! Discharge the primary DC Filter-capacitors by use of a well isolated 22 ohm 10W resistor.

We recommend in case of any malfunction to send the power box to Wiener or to one of our representative for service



The backplane is connected to 385 V DC voltage. So never touch the backplane or its connectors!

The HV-Modules produce very high voltage which may be mortal danger if handled improperly. Please read the separate manuals of the HV modules for detailed information!

Declaration of Conformity

Low Voltage Directive 73/23/EEC and EMC Directive Art. 10.1 of 89/336/EEC

W-IE-NE-R

Plein & Baus GmbH

declare under our own responsibility that the product

MPOD Power Supply System

Items: 0MPV.xxxx, 0BP0.9003, 0316.0070, 0R00.0002

is in accordance with the following standards or standardized documents:

- | | | |
|----|--|---|
| 1. | EN 60 950-1:2001
+ Corr:2004-09 | Niederspannungsrichtlinie [low voltage directive] |
| 2. | EN 61 000-6-3:2001

EN 55 022:1998
+ Corr:2001 + A1:2000 Kl. B
EN 55 022:1998
+ Corr:2001 + A1:2000 Kl. B
EN 61 000-3-2:2001
EN 61 000-3-3:1995 +Corr:1997
+A1:2001 | Störaussendung EMA [RF emission]
Störspannung [conducted noise]
Störfeldstärke [radiated noise]
Oberschwingungen [harmonics]
Spannungsschwankungen [flicker] |
| 3. | EN 61 000-6-2:2001
EN 61 000-4-6:1996 + A1:2001
EN 61 000-4-3:1996 + A1:1998 + A2:2001
EN 61 000-4-4:1995 + A1:2001
EN 61 000-4-5:1995 + A1:2001
EN 61 000-4-11:1994 + A1:2000

EN 61 000-4-2:1995 + A1:1998 + A2:2001 | Störfestigkeit EMB [immunity]
HF-Einströmung [injected HF currents]
HF-Felder [radiated HF fields] incl. "900MHz"
Burst
Surge
Spannungs-Variationen [voltage variations]
ESD |

Conditions:

This unit is not a final product and is foreseen for use inside a closed cabinet. The supplying of loads over long distances (>3m) needs possibly additional RF rejection hardware to get in conformity of the definition.

Contents

Declaration of Conformity.....	iii
1 General Information.....	1
1.1 MPOD Features	1
1.2 MPOD Crate - standard types.....	2
2 HV Modules	3
3 MPOD Controller.....	5
4 Remote Control / Software.....	7
4.1 Software Setup for Microsoft Windows.....	7
4.2 Script files.....	8
4.3 Web Browser.....	9
4.4 NetSNMP.....	10
4.5 ISEG High voltage module special commands.....	16
4.6 ISEG Load unit module commands.....	21
4.7 Module commands.....	21
4.8 Change of community names / setting of passwords.....	23
4.9 MIB Browser.....	24
4.10 A BASH Simple Script for SNMP.....	25
4.11 MPOD SNMP Parameter List (most common).....	26
4.12 iseg SNMP Control Program (NETSNMP).....	27
4.13 C++ programming (NetSNMP).....	28
5 MPOD Crate.....	30
6 Primary Power Supply.....	30
6.1 Power Box Data Sheet.....	30
7 SNMP examples for MPOD and high voltage EHS/EDS module.....	31
8 WIENER SNMP Parameter structure.....	34
9 MPOD Firmware Update.....	45
10 HV Modules Firmware Update.....	49

Figures

Tables

1 General Information



MPOD LX crate with mixed low and high voltage modules

1.1 MPOD Features

MPOD is a mainframe for multi-channel high voltage (HV) power supply modules. A unique flexibility is given by outfitting the MPOD crate with HV backplane only. The full size MPOD crate has 10 slots for power modules which provides a high number of output channels. Its modular design makes the customer able to easily replace the fan tray, the controller, the primary power supply or the optional air filter.

- 10 module slots for up to 320 HV channels
- 8U high for bottom cooling air intake, optional as desktop or front / side intake with dust filter
- Modules and controller outputs can be placed either at front or rear side (picture above shows front side)
- HV: 320/240/160/80 channels (0- 2,5/4/6kV/8kV), channel- or module wise floating or common ground
- Low noise and ripple
- Individually controlled output channels (voltage and current), programmable warning and trip levels
- MPOD Controller with Ethernet (TCP/IP) / CANbus / USB Combi-interface, Interlock
- Ethernet port with integrated Web server, programmable with SNMP protocol via TCP/IP, OPC Server
- CE conform EN 50 081/82 part 1 (EN 50 022 B)
- safety in accordance with EN 60 950
- Sinusoidal mains current EN 61000-3-2

1.2 MPOD Crate - standard types

The following crate types are standardized configurations with 8U high chassis. Optionally a filter frame is available with bottom or front air inlet which increases the height to 9U.

Other configurations and mixed system with part of the crate outfitted with PCI or VME backplanes are available on request.

Type	Slots	Remote control interface	Local control / Backplane display	HV	HV power	Output Position
MPOD 2H	10	Ethernet, CAN, USB	-	HV	1200W	front
MPOD 2H-R	10	Ethernet, CAN, USB	-	HV	1200W	rear
MPOD 2H-LX	10	Ethernet, CAN, USB	Yes, LCD	HV	1200W	front
MPOD 2H-LX-R	10	Ethernet, CAN, USB	Yes, LCD	HV	1200W	rear

(CAN-bus for HV modules only, disabling Ethernet communication may be necessary for ISEG CAN-HV control software)



MPOD EC-LV crate with low voltage modules

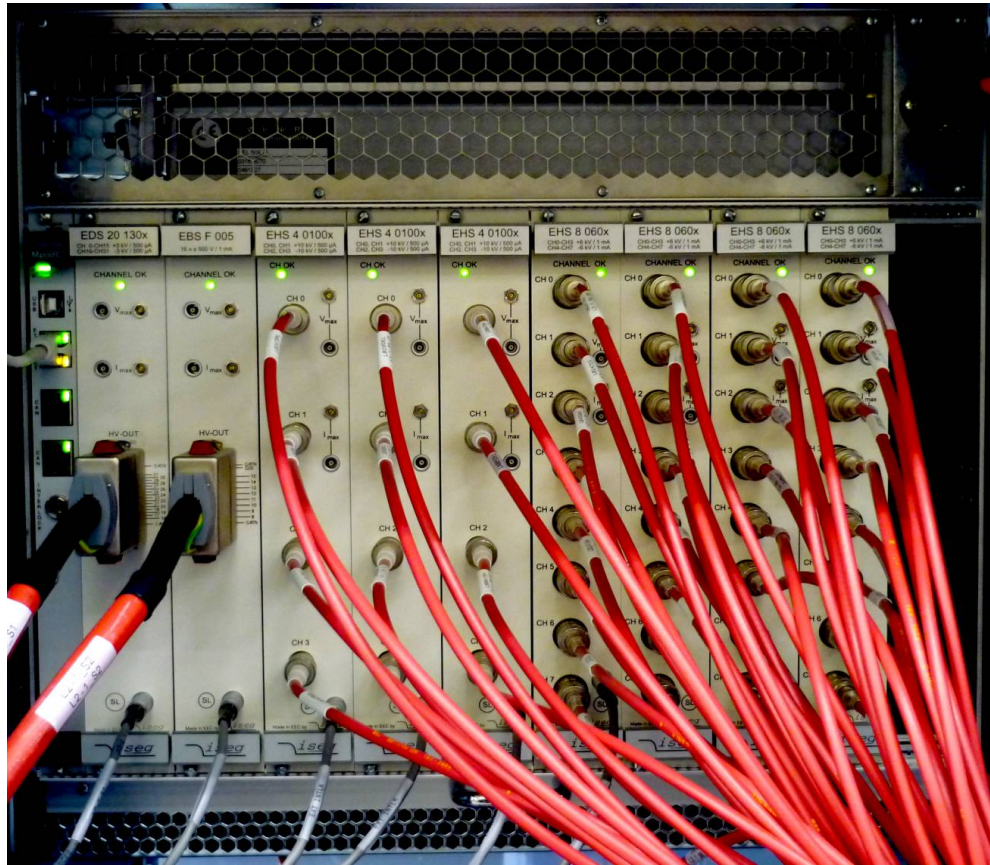
2 HV Modules

MPOD high voltage modules are manufactured by ISEG. For technical details please refer to the ISEG manuals and data sheets of the EHS, EBS, EDS and EHQ (discontinued) multi channel high voltage modules. General features are:

- High Voltage modules with 4, 8, 16, 24 or 32 individually controlled channels
- Maximum voltage range from 500V up to 10 kV
- Extremely low noise and ripple: <5mVpp to <10mVpp
- All DC outputs floating or common ground depending on module type
- Voltage and current settings / monitoring for each channel, 16 to 21 bit resolution
- Current monitoring and limiting for each channel, 16 to 21 bit resolution
- Programmable channel parameters, group features
- output connectors:
 - 8 channel modules SHV or REDEL (<4kV) multi pin
Kings for 8kV and 10kV (4 channels only)
 - 16 channel modules SHV or REDEL (<4kV) multi pin
 - 24 channel modules REDEL (<4kV) multi pin or AMP 201311-3
 - 32 channel modules REDEL multi pin



ISEG high voltage modules with 4 channels KINGS (10kV), 8 and 16 channels SHV, and 8 / 16 channels REDEL multi-pin connectors (from left to right)



MPOD crate with rear side module option and air filter outfitted with ISEG EDS, EBS and EHS high voltage modules and wired safety loop.

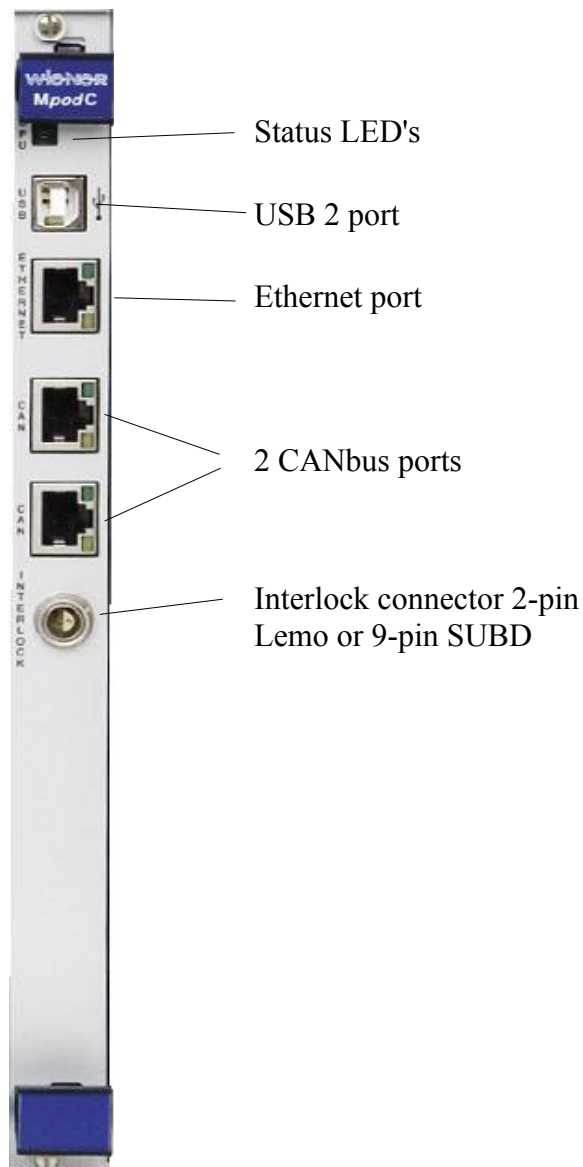
Status LED's for all 8 channels

3 MPOD Controller


The MPOD controller which is plugged into the first half slot of the crate controls the primary power supply as well as all inserted HV-modules. Further it connects these to remote controlling interfaces / services in a unique way.

MPOD Controller features:


- TCP/IP 10M/100M port, auto ranging
- Built-in HTTP server
- TCP/IP protocol with SNMP v.2c for full control of all module parameters
- 2 CAN-Bus ports, wired in parallel for daisy-chaining
- USB 2 interface
- 3 status LED's
- Interlock connector



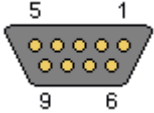
Ethernet port, standard NIC pin layout

RJ45	Pin	Signal	Comment
	1	TX+	
	2	TX-	
	3	RX+	
	4	GND 1	75 Ohm
	5	GND 1	
	6	RX-	
	7	GND 2	75 Ohm
	8	GND 2	

CAN-bus ports

RJ45	Pin	Signal	Comment
	1	CAN-H	
	2	CAN-L	
	3	GND	
	4	n.c.	
	5	n.c.	
	6	reserved	
	7	GND	
	8	n.c.	

Interlock connector

DSUB9 female	Pin	Signal	Comment
	1	CRATE_ENABLE	TTL input (1 kOhm resistor to GND) A high level allows the channels to be switched on by software A low level forces all channels to switch off with their specified down ramp.
	2	CRATE_FAST_OFF	TTL input (1 kOhm resistor to GND) A high level forces all channels to switch off as fast as possible. Any ramp-down settings are ignored.
	3	reserved	
	4	reserved	
	5	GND	Ground reference
	6	CRATE_STATUS	TTL output (1 kOhm resistor to GND, 100 Ohm resistor to protect the output buffer) This signal is driven high, if one or more channels of the MPOD system do have a non-zero output voltage
	7	reserved	
	8	reserved	
	9	reserved	

4 Remote Control / Software

Please check the download section at www.wiener-d.com for the latest version of MPOD software and documentation!

4.1 Software Setup for Microsoft Windows

Before the MPOD Controller can be used, it may have to be configured according to the network environment. The factory default configuration is DHCP (IP address of 0.0.0.0).

This is done locally via display or by running the MUSEcontrol utility, which allows access via the USB-port of the MPOD Controller with a computer running 32-bit Windows XP, VISTA or Windows 7.

Please download the latest version from the download area at www.wiener-d.com. Run the MUSEControl.msi Program to install all drivers and the USB program itself. It is recommended to define a short path for the driver location during installation. Connecting the MPOD Controller via USB it should be automatically detected and the Silicon Labs USB drivers (SiLib.sys and SiUSBXp.sys) loaded



Starting the program, the main window gives a quick overview of the MPOD and its connected MPV low voltage modules. Please note that the MPOD crate has to be switched off in order to do configurations!

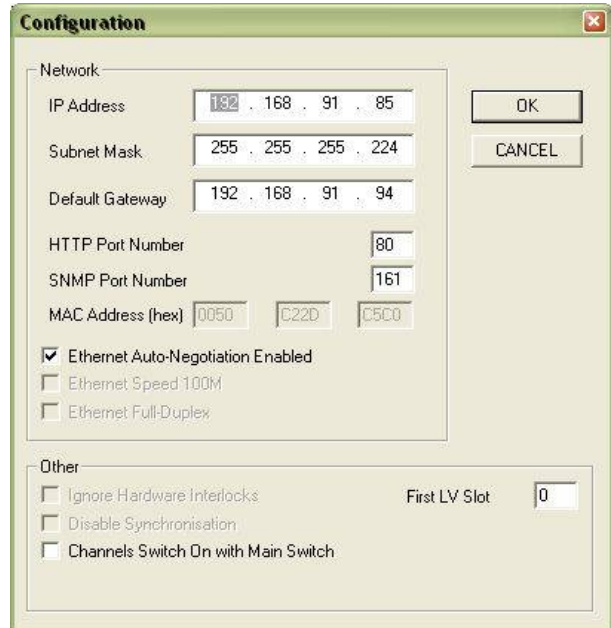
An error message “No module found” will pop up which should be ignored. Note, all ISEG high voltage modules will not be shown and can not be controlled via USB!

To prepare the MPOD controller select System → Configuration which starts the network configuration dialog as shown below. Here you enter the TCP/IP network settings (IP address, subnet mask and default gateway). You have to use the parameters of your local network here. Please contact your network administrator for details. In order to use DHCP (factory default) an IP address of 0.0.0.0 has to be selected.



It is recommended to configure larger systems in one IP address range. For instance a system of 50 MPOD crates should allocate the IP addresses from 192.168.17.101 until 192.168.17.150. The advantage of such a configuration is that many of our programs and script files controls a number of MPOD's beginning with the first IP address until the last IP address.

IP address of 0.0.0.0 will enable DHCP.
 HTTP and SNMP port numbers should only be modified if you know what you do. Setting any ports to 0 disables the server.



4.2 Script files

The default IP base is 192.168.17.xxx defined in the file snmpOptions. Please change these value according to your network configuration.

\$./sysDescr

Syntax: ./sysDescr FirstIpAddress [LastIpAddress]

Gets the sysDescription for all crates in the given IP range.

Example: ./sysDescr 101 120

\$./moduleDescription

Syntax: ./moduleDescription firstIpAddress [lastIpAddress]

Reads the moduleDescription for all slots

Example: ./moduleDescription 101 120

\$./outputVoltage

Syntax: ./outputVoltage voltage firstIpAddress [lastIpAddress]

Sets the outputVoltage for all channels to voltage.

Only the last Byte of the IP address has to be given!

(The base is automatically added)

Example: ./outputVoltage 2500 101 120

\$./outputSwitch

Syntax: ./outputSwitch { 0 | 1 | 2 | 3 | 10 } firstIpAddress [lastIpAddress]

Sets the outputSwitch for all channels to 0(off), 1(on),

2(setEmergency), 3(resetEmergency) or (10)clearEvents.

Only the last Byte of the IP address has to be given!

(The base is automatically added)

Example: ./outputSwitch 1 101 120

\$./outputStatus

Syntax: ./outputStatus firstIpAddress [lastIpAddress]

Read the outputStatus for all channels.

Only the last Byte of the IP address has to be given!

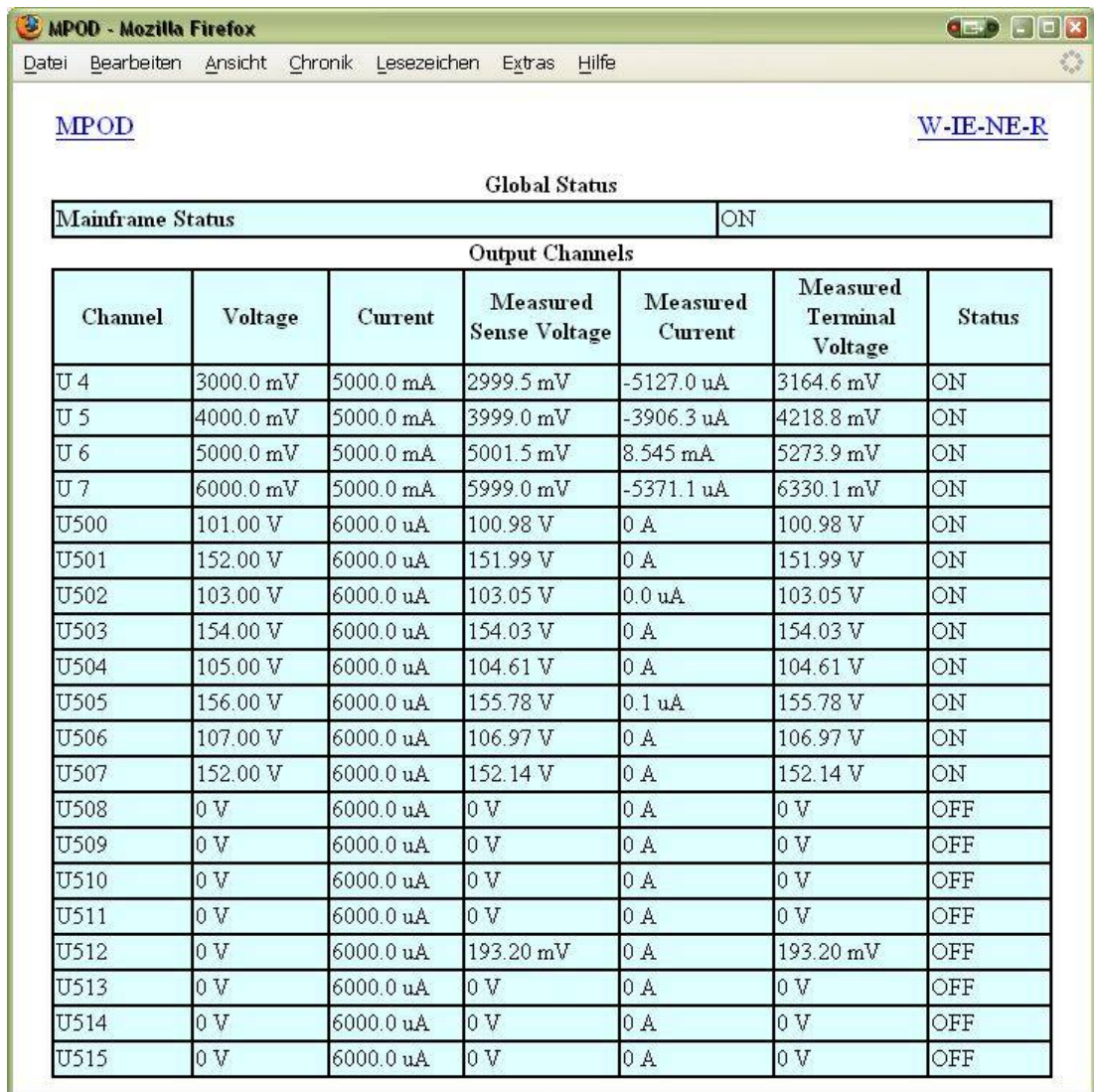
(The base is automatically added)

Example: ./outputStatus 101 120.

\$./outputMeasurementTerminalVoltage
 Syntax: ./outputMeasurementTerminalVoltage firstIpAddress [lastIpAddress]
 Read the outputMeasurementVoltage for all channels.
 Only the last Byte of the IP address has to be given!
 (The base is automatically added)
 Example: ./outputMeasurementTerminalVoltage 101 120

4.3 Web Browser

With a web browser pointing to the IP address as URL it is possible to get an overview of all channels (read only) in a simple way.



Global Status						
Mainframe Status						ON
Output Channels						
Channel	Voltage	Current	Measured Sense Voltage	Measured Current	Measured Terminal Voltage	Status
U 4	3000.0 mV	5000.0 mA	2999.5 mV	-5127.0 uA	3164.6 mV	ON
U 5	4000.0 mV	5000.0 mA	3999.0 mV	-3906.3 uA	4218.8 mV	ON
U 6	5000.0 mV	5000.0 mA	5001.5 mV	8.545 mA	5273.9 mV	ON
U 7	6000.0 mV	5000.0 mA	5999.0 mV	-5371.1 uA	6330.1 mV	ON
U500	101.00 V	6000.0 uA	100.98 V	0 A	100.98 V	ON
U501	152.00 V	6000.0 uA	151.99 V	0 A	151.99 V	ON
U502	103.00 V	6000.0 uA	103.05 V	0.0 uA	103.05 V	ON
U503	154.00 V	6000.0 uA	154.03 V	0 A	154.03 V	ON
U504	105.00 V	6000.0 uA	104.61 V	0 A	104.61 V	ON
U505	156.00 V	6000.0 uA	155.78 V	0.1 uA	155.78 V	ON
U506	107.00 V	6000.0 uA	106.97 V	0 A	106.97 V	ON
U507	152.00 V	6000.0 uA	152.14 V	0 A	152.14 V	ON
U508	0 V	6000.0 uA	0 V	0 A	0 V	OFF
U509	0 V	6000.0 uA	0 V	0 A	0 V	OFF
U510	0 V	6000.0 uA	0 V	0 A	0 V	OFF
U511	0 V	6000.0 uA	0 V	0 A	0 V	OFF
U512	0 V	6000.0 uA	193.20 mV	0 A	193.20 mV	OFF
U513	0 V	6000.0 uA	0 V	0 A	0 V	OFF
U514	0 V	6000.0 uA	0 V	0 A	0 V	OFF
U515	0 V	6000.0 uA	0 V	0 A	0 V	OFF

4.4 NetSNMP

NetSNMP is an open source SNMP program which can be used to access the MPOD controller via the **Simple Network Management Protocol**.

Please see <http://net-snmp.sourceforge.net/> for more details.

Please install netSNMP from the CD-ROM or downloaded from WIENER support web site on the control computer. In order to perform SNMP calls from any WIENER product the WIENER-CRATE-MIB file must be stored somewhere on the PC doing the calls, by default that location should be /usr/share/snmp/mibs (Windows: C:\usr\share\snmp\mibs).

The most commonly used net-snmp calls are:

snmpwalk – returns groups of parameters / items

snmpget – returns a specific parameter (read)

snmpset – sets a specific parameter (write)

Please see the Net-snmp description and help files for detailed instructions and options. All parameters defined for the WIENER MPOD system as well as crates and other power supplies are contained within the WIENER-CRATE-MIB.txt file.

A fast and easy way to begin using SNMP is to use command line arguments. The command line arguments specified in this document are based on netSNMP. The command line syntax is the same for both windows and Linux (and probably MAC OSX).

For all WIENER-CRATE-MIB library calls a quick help text can be shown by using

snmptranslate -On -Td WIENER-CRATE-MIB::xxxx

snmptranslate -On -Td WIENER-CRATE-MIB::outputName

.1.3.6.1.4.1.19947.1.3.2.1.2

outputName OBJECT-TYPE

-- FROM WIENER-CRATE-MIB

-- TEXTUAL CONVENTION DisplayString

SYNTAX OCTET STRING (1..4)

DISPLAY-HINT "255a"

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A textual string containing a short name of the output. If the crate is equipped with an alphanumeric display, this string is shown to identify a output channel."
 ::= { iso(1) org(3) dod(6) internet(1) private(4) enterprises(1) wiener(19947) c rate(1) output(3) outputTable(2) outputEntry(1) 2 }

A first communication with the MPOD crate can be done using the snmpwalk to confirm the existence of the power supply at the given IP address.

snmpwalk -Cp -Oqv -v 2c -M \$path -m +WIENER-CRATE-MIB -c public \$ip

with:

snmpwalk: This command will retrieve a block of information.

-v 2c: This parameter specifies which version of the SNMP to use. WIENER devices use SNMP 2C.

-M \$path: This parameter should be replaced with the path to the WIENER-CRATE-MIB.txt file. It is not needed in case the default path is used.

-m +WIENER-CRATE-MIB: This parameter tells the command to look at the WIENER-CRATE-MIB to resolve the OID name.

-c public: This specifies which community of values can be accessed.

\$ip: This should be replaced with the IP address of the MPOD crate.

Example for crate with IP address 192.168.2.25:

snmpwalk -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25

returns:

SNMPv2-MIB::sysDescr.0 = STRING: WIENER MPOD (4193086, MPOD 1.1.1.6, MPODslave 1.06)

SNMPv2-MIB::sysObjectID.0 = OID: WIENER-CRATE-MIB::sysMainSwitch.0

SNMPv2-MIB::sysUpTime.0 = Timeticks: (13401) 0:02:14.01

SNMPv2-MIB::sysContact.0 = STRING:

SNMPv2-MIB::sysName.0 = STRING:

SNMPv2-MIB::sysLocation.0 = STRING:

SNMPv2-MIB::sysServices.0 = INTEGER: 79

A list of all available parameters or sub-parameters as for instance channels can be obtained using the command snmpwalk with the parameter "crate". To get all parameters use:

snmpwalk -Cp -Oqv -v 2c -M \$path -m +WIENER-CRATE-MIB -c public \$ip crate

example:

snmpwalk -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25 crate

Further it is possible obtain the array of names or values for a specific parameter. The following command provides a list of all existing output channels:

**snmpwalk -Cp -Oqv -v 2c -M \$path -m +WIENER-CRATE-MIB -c public \$ip
outputName**

Example:

snmpwalk -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25 outputName

returns for MPOD system with 2 ISEG EHS HV modules (8 channels each) in slot 2 and 3:

```
WIENER-CRATE-MIB::outputName.u100 = STRING: U100
WIENER-CRATE-MIB::outputName.u101 = STRING: U101
WIENER-CRATE-MIB::outputName.u102 = STRING: U102
WIENER-CRATE-MIB::outputName.u103 = STRING: U103
WIENER-CRATE-MIB::outputName.u104 = STRING: U104
WIENER-CRATE-MIB::outputName.u105 = STRING: U105
WIENER-CRATE-MIB::outputName.u106 = STRING: U106
WIENER-CRATE-MIB::outputName.u107 = STRING: U107
WIENER-CRATE-MIB::outputName.u200 = STRING: U200
WIENER-CRATE-MIB::outputName.u201 = STRING: U201
WIENER-CRATE-MIB::outputName.u202 = STRING: U202
WIENER-CRATE-MIB::outputName.u203 = STRING: U203
WIENER-CRATE-MIB::outputName.u204 = STRING: U204
WIENER-CRATE-MIB::outputName.u205 = STRING: U205
WIENER-CRATE-MIB::outputName.u206 = STRING: U206
WIENER-CRATE-MIB::outputName.u207 = STRING: U207
```

This example returns 16 index numbers. Please note the following geographic module and channel number coding for the SNMP call indexes, where the first digit is defined by the slot number and the following two by the channel of the particular module in this slot:

Slot	Channel	Name	index
1	0 to 99	Uxx	.u00 to .u99
2	0 to 99	U1xx	.u100 to .u199
...
10	0 to 99	U9xx	.u901 to .u999

Please note that both the index as well as the name can be used!

snmpget -v 2c -m +WIENER-CRATE-MIB -c public 192.168.0.80 outputVoltage.u0
WIENER-CRATE-MIB::outputVoltage.u0 = Opaque: Float: 123.000000 V

is identical to

snmpget -v 2c -m +WIENER-CRATE-MIB -c public 192.168.0.80 outputVoltage.1
WIENER-CRATE-MIB::outputVoltage.u0 = Opaque: Float: 123.000000 V

In case of multi crate system there will be an additional digit for the crate number:

Name = 1000 * crate + 100*slot + channel
index = 1000 * crate + 100*slot + channel

(crate: 0 9, slot: 0 ... 9 , channel: 0 ... 99)

To see all output channel set voltage values use snmpwalk with outputVoltage:

snmpwalk -Cp -Oqv -v 2c -M \$path -m +WIENER-CRATE-MIB -c public \$ip outputVoltage

Example:

```
snmpwalk -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25 outputVoltage
```

returns for a MPOD system with one 8 channel ISEG EHS HV module in slot 3:

```
WIENER-CRATE-MIB::outputVoltage.u200 = Opaque: Float: 0.000000 V
```

```
WIENER-CRATE-MIB::outputVoltage.u201 = Opaque: Float: 0.000000 V
```

```
WIENER-CRATE-MIB::outputVoltage.u202 = Opaque: Float: 0.000000 V
```

```
WIENER-CRATE-MIB::outputVoltage.u203 = Opaque: Float: 0.000000 V
```

```
WIENER-CRATE-MIB::outputVoltage.u204 = Opaque: Float: 0.000000 V
```

```
WIENER-CRATE-MIB::outputVoltage.u205 = Opaque: Float: 0.000000 V
```

```
WIENER-CRATE-MIB::outputVoltage.u206 = Opaque: Float: 0.000000 V
```

```
WIENER-CRATE-MIB::outputVoltage.u207 = Opaque: Float: 0.000000 V
```

After obtaining information about the power supplies or a list of channels and parameters, it is useful to be able to write or read information about it. This can be done using the **snmpget** and **snmpset** commands.

```
snmpget -Oqv -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip name.index
```

```
snmpset -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip name.index format value
```

The most common kind of call you will want is to get data from the power supply. This is easily done via the **snmpget** command. The example below retrieves information about whether the main power for the crate is on. If you wish to test this example on your own system replace “\$path” with the path to WIENER-CRATE-MIB.txt (/usr/share/snmp/mibs by default and “\$ip” with the ip address of your MPOD (see following examples).

```
snmpget -v 2c -M $path -m +WIENER-CRATE-MIB -c public $ip sysMainSwitch.0  
WIENER-CRATE-MIB::sysMainSwitch.0 = INTEGER: OFF(0)
```

This indicates that the MPOD crate is currently off. To better understand the call above we will break it down by parameter:

snmpget: This command will retrieve a value about the MPOD crate or one of the channels it houses..

-v 2c: This parameters specifies which version of the SNMP to use. WIENER devices use SNMP 2C.

-M \$path: This parameter should be replaced with the path to the WIENER-CRATE-MIB.txt file.

-m +WIENER-CRATE-MIB: This parameter tells the command to look at the WIENER-CRATE-MIB to resolve the OID name.

-c public: This specifies which community of values can be accessed.

\$ip: This should be replaced with the IP address of the MPOD crate.

sysMainSwitch.0:

This is the register you wish to retrieve.

Since we we know from the call above that the crate is off, we may want to turn it on. (Software power cycling is only possible of the green mains switch on the MPOD is “ON”, this is to prevent a remote user to override a local user and adds a level of safety to the unit.) To turn MPOD on, we can use the command:

snmpset -v 2c - path -m +WIENER-CRATE-MIB -c public \$ip sysMainSwitch.0 i 1

Most of the parameters for snmpset are the same as snmpget, the new parameters are highlighted below.

i: Since sysMainSwitch.0 is an integer value, we specify the value to be an integer with.

1: This is the value we wish to write. In this case we write 'one' to set the main switch to on.

For most of the write commands (snmpset) the access type has to be changed from public to guru.

A complete list of value names that can be written or read via SNMP can be found in the WIENER-CRATE-MIB but commonly needed values are:

Value Name	Type	Access	Comments
outputVoltage	Float	R/W	The Channel set Voltage
outputCurrent	Float	R/W	The channel current limit
outputMeasurementSenseVoltage	Float	R	Actual channel Voltage
outputMeasurementCurrent	Float	R	Actual channel current
outputSwitch	Integer	R/W	Turns channel ON / OFF, emergency off, reset error flags
outputVoltageRiseRate	Float	R/W	Channel ramp rate
outputStatus	Bits	R	Channel Status information

For example, to set a channel set voltage use:

snmpset -Oqv -v 2c -M \$path -m +WIENER-CRATE-MIB -c guru \$ip outputVoltage.index F 200.5

Example:

snmpget -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25 outputVoltage.u0
WIENER-CRATE-MIB::outputVoltage.u0 = Opaque: Float: 0.000000 V

Write and read individual set voltages, "guru" access needed to write!

snmpset -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25 outputVoltage.u101 F 200
WIENER-CRATE-MIB::outputVoltage.u101 = Opaque: Float: 200.000000 V

Note the "F" before the 200, this indicates that the value is a floating point number. This value can be read back via:

snmpget -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25 outputVoltage.u101
WIENER-CRATE-MIB::outputVoltage.u101 = Opaque: Float: 200.000000 V

Turning Channels ON/OFF - The individual channels of an MPOD system low or high voltage module can be turned on or off using the snmpset command. To turn on channel Ux:

```
snmpset -Oqv -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip  
outputSwitch.index i 1
```

The same channel can be turned off with:

```
snmpset -Oqv -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip  
outputSwitch.index i 0
```

Example:

```
snmpset -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25 outputSwitch.u101  
i 1
```

The outputSwitch can also be used for emergency-off and to reset error flags. The matching values are: {off(0), on(1), resetEmergencyOff(2), setEmergencyOff(3), clearEvents(10)}

MPOD low and high voltage modules have programmable voltage ramp speeds. The WIENER low voltage modules allow different ramp up and down values for each channel whereas for ISEG modules with common ramp the channel-ID can be any channel of the module! For write access "guru" is needed:

```
snmpset -Oqv -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip  
outputVoltageRiseRate.index F value
```

Example:

```
snmpset -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25  
outputVoltageRiseRate.u101 F 10  
WIENER-CRATE-MIB::outputVoltageRiseRate.u101 = Opaque: Float: 10.000000 V/s
```

```
snmpget -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25  
outputVoltageRiseRate.u101  
WIENER-CRATE-MIB::outputVoltageRiseRate.u101 = Opaque: Float: 10.000000 V/s
```

To access multiple units the groupsSwitch function provides access to all modules in the MPOD crate (index 0), all ISEG HV modules (index 64), or to all WIENER low voltage modules (index 128). In addition groups can be defined for low voltage modules.

Item	Type	Access	Switch functions
groupsSwitch	integer	write	Off (0), On (1), resetEmergencyOff (2), setEmergencyOff (3), disableKill (4), enableKill (5), clearEvents (10)

Examples:

switch all channels of all modules on:

```
snmpset -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.0.80 groupsSwitch.0 i 1  
WIENER-CRATE-MIB::groupsSwitch.0 = INTEGER: on(1)
```

switch all channels off:

```
snmpset -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.0.80 groupsSwitch.0 i 0  
WIENER-CRATE-MIB::groupsSwitch.0 = INTEGER: off(0)
```

switch all high voltage channels (iseg modules) off:
snmpset -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.0.80
groupsSwitch.64 i 0
 WIENER-CRATE-MIB::groupsSwitch.64 = INTEGER: off(0)

RESET ISEG HV Modules after Safetyloop error:
snmpset -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.0.80
groupsSwitch.64 i 10
 WIENER-CRATE-MIB::groupsSwitch.64 = INTEGER: clearEvents(10)

4.5 ISEG High voltage module special commands

Item	Type	Access	Unit	Range
outputVoltageRiseRate	float	read-write	[V/s]	2V/s - 20% Vnom 1% (KILL enabled)

ISEG high voltage modules have one common value for ramping up and down for all channels. This value can be set or read by using any channel number of the particular module as index. For ISEG high voltage modules with 2 PCB's each of the sub-grups of one PCB may have one ramp value. In this case one should set the ramp twice by using a low and high channel number. ISEG EHQ, EHS, EDS and EBS modules typically have a ramp rate range from 1V/s 20% of Vnom (max. nominal voltage). In case KILL is enabled the maximum ramp rate is reduced to 1% in order to lower the risk of unwanted trips during voltage ramp cycles.

snmpset -Oqv -v 2c -M \$path -m +WIENER-CRATE-MIB -c guru \$ip
outputVoltageRiseRate.index F value

Item	Type	Access	Unit	Range
outputCurrentRiseRate	float	read-write	[A/s]	2 - 100% nom. Val.
outputCurrentFallRate	float	read-write	[A/s]	2 - 100% nom. Val.

DESCRIPTION

The **outputCurrentRiseRate** and **outputCurrentFallRate** accesses one data point of the HV modules and therefore will be reply always the same value.

outputTripTimeMaxCurrent	integer	read-write	[ms]	16 – 4000 ms
---------------------------------	----------------	-------------------	-------------	---------------------

DESCRIPTION

The **outputTripTimeMaxCurrent** defines a span for the time out function. The activity is depending of the programmed bit field **outputFailureMaxCurrent** of the item **outputSupervisionBehavior**. A write value of **0** is switching off the delayed trip function which was defined in the bit field **outputFailureMaxCurrent** of **outputSupervisionBehavior** before.

Item	Type	Access	Status bits / Switch functions
outputStatus	bits	read	outputEnableKill (13) outputEmergencyOff (14)
outputSwitch	integer	read-write	Off (0), On (1), resetEmergencyOff (2), setEmergencyOff (3), clearEvents (10)

DESCRIPTION

Read: An enumerated value which shows the current state of the output channel.

Write: Change the state of the channel.

If the channel is On, and the write value is **Off**, then the channel will switch off.
 If the channel is Off, and the write value is **On**, and if no other signals (mainInhibit, outputInhibit, outputEmergencyOff or outputFailureMaxCurrent) are active, then the channel will switch on.

If the write value is **resetEmergencyOff**, then the channel will leave the state EmergencyOff.

A write of **clearEvents** is necessary before the voltage can ramp up again.

If the write value is **setEmergencyOff**, then the channel will have the state EmergencyOff, which means that the High Voltage will switch off without a ramp and reset of the outputVoltage to null volt.

If the write value is **clearEvents**, then all failure messages of the outputStatus will be reset (all channel events and the state EmergencyOff).

Item	Type	Access	Switch functions
groupsSwitch.64	integer	write	Off (0), On (1), resetEmergencyOff (2), setEmergencyOff (3), disableKill (4), enableKill (5), clearEvents (10)

DESCRIPTION

Read: This function is not defined with groups of output channels.

Write: Switch the state of all channels of group 64 (all high voltage modules).

If any channel is On, and the write value is **Off**, then all channels will switch off. If any channel is Off, and the write value is **On**, and if no other signals (mainInhibit, outputInhibit, outputEmergencyOff or outputFailureMaxCurrent) are active, then all channels will switch on.

If the write value is **resetEmergencyOff**, then all channels will leave the state EmergencyOff.

A write of **clearEvents** is necessary before the voltage can ramp up again.

If the write value is **setEmergencyOff**, then all channels will have the state EmergencyOff, which means that the High Voltage will switch off without a ramp and reset of the outputVoltage to null volt.

If the write value is **disableKill**, then all channels will switch to disableKill.

If the write value is **enableKill**, then all channels will switch to enableKill.

If the write value is **clearEvents**, then all failure messages of the outputStatus will be reset (all channel events, all module events and the state EmergencyOff).

Item	Type	Access
outputSupervisionBehavior	integer	read-write
DESCRIPTION		
A bit field packed into an integer which define the behavior of the output channel / power supply after failures.		

For each supervision value, a two-bit field exists. The enumeration of this value (..L+..H*2) is:

WIENER LV devices

0 ignore the failure

1 switch off this channel

2 switch off all channels with the same group number

3 switch off the complete crate.

iseg HV devices

0 ignore the failure

1 switch off this channel by ramp down the voltage

2 switch off this channel by set a internal EmergencyOff

3 switch off the whole board of the HV module by set EmergencyOff.

The position of the bit fields in the integer value are:

Bit 0, 1: **outputFailureMinSenseVoltage**

Bit 2, 3: **outputFailureMaxSenseVoltage**

Bit 4, 5: **outputFailureMaxTerminalVoltage**

Bit 6, 7: **outputFailureMaxCurrent**

Bit 8, 9: **outputFailureMaxTemperature**

Bit 10, 11: **outputFailureMaxPower**

Bit 12, 13: **outputFailureInhibit**

Bit 14, 15: **outputFailureTimeout**

The iseg HV devices can use the bit fields:

outputFailureMaxCurrent

support of the function delayed trip

The programmed activity will start when the actual current exceeded permanently the value of the item **outputCurrent** over the span of the programmed time out (set via the item **outputTripTimeMaxCurrent**).

outputFailureInhibit

support of the optional hardware function

EXTERNAL INHIBIT per channel

The programmed activity will start when an external channel inhibit occurs

The channel state have to be in disableKill for a proper work of the configuration of the behavior for the functions above.

Settings for **outputSupervisionBehavior**:

Action	outputFailureMaxCurrent	outputFailureInhibit
ignore the failure	0	0
switch off this channel by ramp down the voltage	64	4096
switch off this channel by set a internal EmergencyOff	128	8192
switch off the whole board of the HV module by set EmergencyOff	192	12288

Attention: In order to use delayed software trips please make sure to have a firmware on the ISEG high voltage modules which supports this feature. Please see the following table of supported firmware releases. In case of older firmware the software trip will not act, i.e. the error will be detected but no action (ram down of channel) will happen.

Name of firmware	Release	Date	Description	Device class
E24D1	01.05.21	02.22.13	EDS 24/48 channel distributor module,	21
E16D0	4.25	05/08/09	EDS 16/32 channel distributor module, with V_{max} from $V_{O_{max}}$ to $(V_{O_{max}} - 1kV)$	21
E16D1	4.25	05/08/09	EDS 16/32 distributor module	21
E08C0	2.22	02/23/09	EHS 4/8/16 channel, common GND module	24
E08F0	2.27	12/18/08	EHS 4/8/16 channel, floating GND module	25
E08F2	4.06	06/23/09	EHS 4/8/16 channel, floating GND module, 2 ranges for measurement of current	26
E08B0	1.02	07/10/09	EBS 8/16 bipolar channels, distributor module	28

Example of necessary SNMP commands for the delayed trip function:

snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25 groupsSwitch.64 i 4

WIENER-CRATE-MIB::groupsSwitch.64 = INTEGER: disableKill(4)

snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25 outputVoltage.u100 F 60

WIENER-CRATE-MIB::outputVoltage.u100 = FLOAT: 60.000000 V

snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25 outputSwitch.u100 i 1

WIENER-CRATE-MIB::outputSwitch.u100 = INTEGER: On(1)

snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25 outputVoltage.u100

WIENER-CRATE-MIB::outputVoltage.u100 = FLOAT: 60.000000 V

snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25 outputMeasurementTerminalVoltage.u100

WIENER-CRATE-MIB::outputMeasurementTerminalVoltage.u100 = FLOAT: 60.104 V

```

snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputMeasurementCurrent.u100
WIENER-CRATE-MIB::outputMeasurementCurrent.u100 = FLOAT: 0.000001 A
snmpgetx -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputMeasurementCurrent.u100
WIENER-CRATE-MIB::outputMeasurementCurrent.u100 = FLOAT: 0.000000735 A
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputSupervisionBehavior.u100
WIENER-CRATE-MIB::outputSupervisionBehavior.u100 = INTEGER: 0
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25
outputSupervisionBehavior.u100 i 64
WIENER-CRATE-MIB::outputSupervisionBehavior.u100 = INTEGER: 64
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputSupervisionBehavior.u100
WIENER-CRATE-MIB::outputSupervisionBehavior.u100 = INTEGER: 64
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputTripTimeMaxCurrent.u100
WIENER-CRATE-MIB::outputTripTimeMaxCurrent.u100 = INTEGER: 0 ms
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25
outputTripTimeMaxCurrent.u100 i 3000
WIENER-CRATE-MIB::outputTripTimeMaxCurrent.u100 = INTEGER: 3000 ms
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputStatus.u100
WIENER-CRATE-MIB::outputStatus.u100 = INTEGER: 80 /* outputOn */
snmpgetx -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputMeasurementCurrent.u100
WIENER-CRATE-MIB::outputMeasurementCurrent.u100 = FLOAT: 0.000000735 A
snmpsetx -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25
outputCurrent.u100 F 0.0000007
WIENER-CRATE-MIB::outputCurrent.u100 = FLOAT: 0.000000700 A
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputStatus.u100
"04 08 " /*outputFailureMaxCurrent, outputRampDown */
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputStatus.u100
WIENER-CRATE-MIB::outputStatus.u100 = INTEGER: 04
/*outputFailureMaxCurrent*/
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25
outputSwitch.u100 i 10
WIENER-CRATE-MIB::outputSwitch.u100 = INTEGER: clearEvents
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.2.25
outputSwitch.u100 i 1
WIENER-CRATE-MIB::outputStatus.u100 = INTEGER: On
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputStatus.u100
WIENER-CRATE-MIB::outputStatus.u100 = INTEGER: 80 10
/* outputOn, outputRampUp */
/* a load has been switched on channel 0 to bring them in state CC constant current
limited */
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputStatus.u100
WIENER-CRATE-MIB::outputStatus.u100 = INTEGER: 80 20
/* outputOn, outputCurrentLimited */
/* the delayed trip function ramps the voltage after 3 seconds to zero */
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.2.25
outputStatus.u100
WIENER-CRATE-MIB::outputStatus.u100 = INTEGER: 04 08
/* outputFailureMaxCurrent, outputRampDown */

```

4.6 ISEG Load unit module commands

Item	Type	Access	Unit
outputMeasurementTerminalVoltage	float	read	[V]
outputMeasurementCurrent	float	read	[A]

DESCRIPTION

The items **outputMeasurementTerminalVoltage** and **outputMeasurementCurrent** return the voltage and current measured internally by the the load unit. These values are only measured if the external measurement and ripple measurement are turned off.

Item	Type	Access	Switch functions
outputSwitch	integer	read-write	clearEvents (10) setExternalAndRippleMeasurementOff (20) setExternalMeasurementOn (21) setRippleMeasurementOn (22) setExternalAndRippleMeasurementOn (23)

DESCRIPTION

The item **outputSwitch** allows to activate or deactivate external measurements for a channel via the measurement outputs on the front panel of the load unit.

The value **setExternalMeasurementOn** activates the voltage and current measurement outputs for the channel.

The value **setRippleMeasurementOn** activates the ripple measurement output for the channel.

The value **setExternalAndRippleMeasurementOn** activates all three measurement outputs for the channel.

The value **setExternalAndRippleMeasurementOn** deactivates all measurement outputs for the channel.

Note the measurement output can only be activated for one channel at the same time, i.e. if an output is activated for another channel the previously switched channel is deactivated.

If an external measurement output is activated no internal measurement will be executed. In order to reactivate the internal measurement, the external measurement must be completely deactivated. (If the current output status is unknown this can be done by writing **setExternalAndRippleMeasurementOn** and then **setExternalAndRippleMeasurementOff** for an arbitrary channel.)

All other SNMP items from the branch `outputTable` are readable for the SNMP compatibility but will not be used by the load unit.

4.7 Module commands

Item	Type	Access
moduleDescription	octet string	read

Reply:

company name, firmware name, channel number, serial number
for instance *iseg, E24D1, 24, 713100, 5.03*

Item	Type	Access
moduleAuxiliaryMeasurementVoltage0	float	read
Returns the measurement value of the line supply 24 Volt.		
moduleAuxiliaryMeasurementVoltage1	float	read
Returns the measurement value of the line supply 5 Volt.		

4.8 Change of community names / setting of passwords

For the communication with MPOD modules 4 types of SNMP communities are used, "public", "private", "admin" and "guru". By default the community names are equal to the community types.

```
snmpwalk -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.0.80
```

```
snmpCommunityName
```

```
WIENER-CRATE-MIB::snmpCommunityName.public = STRING: "public"
```

```
WIENER-CRATE-MIB::snmpCommunityName.private = STRING: "private"
```

```
WIENER-CRATE-MIB::snmpCommunityName.admin = STRING: "admin"
```

```
WIENER-CRATE-MIB::snmpCommunityName.guru = STRING: "guru"
```

```
snmpwalk -v 2c -m +WIENER-CRATE-MIB -c private 192.168.0.80
```

```
snmpCommunityName
```

```
WIENER-CRATE-MIB::snmpCommunityName.public = STRING: "public"
```

```
WIENER-CRATE-MIB::snmpCommunityName.private = STRING: "private"
```

In order to secure the MPOD system communication the community names can be used as passwords and be changed accordingly. The following example shows how the change and test the community names. Using a wrong community name will result in a time out error. Please note, that especially the communities with write access (private, admin, guru) should be protected.

```
snmpset -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.0.80
```

```
snmpCommunityName.guru s seCrET
```

```
WIENER-CRATE-MIB::snmpCommunityName.guru = STRING: "seCrET"
```

```
snmpwalk -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.0.80
```

```
snmpCommunityName
```

```
Timeout: No Response from 192.168.0.80
```

```
snmpwalk -v 2c -m +WIENER-CRATE-MIB -c seCrET 192.168.0.80
```

```
snmpCommunityName
```

```
WIENER-CRATE-MIB::snmpCommunityName.public = STRING: "public"
```

```
WIENER-CRATE-MIB::snmpCommunityName.private = STRING: "private"
```

```
WIENER-CRATE-MIB::snmpCommunityName.admin = STRING: "admin"
```

```
WIENER-CRATE-MIB::snmpCommunityName.guru = STRING: "seCrET"
```

4.9 MIB Browser

There are several commercial or open source MIB-Browser programs available which can be used for SNMP communication. These provide often a simple GUI and allow SNMP calls. Following is a list of some free or open source MIB – browsers:

<http://www.ireasoning.com/mibbrowser.shtml>

http://www.serverscheck.com/mib_browser/

<http://www.mibble.org/>

<http://www.ks-soft.net/hostmon.eng/mibbrowser/index.htm>

<http://www.tembria.com/products/snmpbrowser/index.html>

The screenshot shows the iReasoning MIB Browser interface. The top menu bar includes File, Edit, Operations, Tools, Bookmarks, and Help. The address bar shows 192.168.2.84 and the OID is .1.3.6.1.4.1.19947.1. The left pane displays a tree view of MIB objects under the path WIENER-CRATE-MIB.iso.org.dod.internet.private.enterprise. The right pane shows a Result Table with columns for Name/OID, Value, and Type.

Name/OID	Value	Type
outputIndex.4	u3	Integer
outputIndex.5	u4	Integer
outputIndex.6	u5	Integer
outputIndex.7	u6	Integer
outputIndex.8	u7	Integer
outputIndex.9	u8	Integer
outputIndex.10	u9	Integer
outputIndex.11	u10	Integer
outputIndex.12	u11	Integer
outputIndex.13	u12	Integer
outputIndex.14	u13	Integer
outputIndex.15	u14	Integer
outputIndex.16	u15	Integer
outputName.1	U0	OctetString
outputName.2	U1	OctetString
outputName.3	U2	OctetString
outputName.4	U3	OctetString
outputName.5	U4	OctetString
outputName.6	U5	OctetString
outputName.7	U6	OctetString
outputName.8	U7	OctetString
outputName.9	U8	OctetString
outputName.10	U9	OctetString
outputName.11	U10	OctetString
outputName.12	U11	OctetString
outputName.13	U12	OctetString
outputName.14	U13	OctetString
outputName.15	U14	OctetString
outputName.16	U15	OctetString
outputGroup.1	0	Integer
outputGroup.2	0	Integer
outputGroup.3	0	Integer
outputGroup.4	0	Integer
outputGroup.5	0	Integer
outputGroup.6	0	Integer
outputGroup.7	0	Integer
outputGroup.8	0	Integer
outputGroup.9	1	Integer

At the bottom, a status bar shows the name 'crate', OID '.1.3.6.1.4.1.19947.1', MIB 'WIENER-CRATE-MIB', and syntax 'iso.org.dod.internet.private.enterprises.wiener.crate'. The time is 4:57:38 PM and the page is 15M of 24M.

4.10 A BASH Simple Script for SNMP

All of the commands above could be combined into scripts to set and monitor a predefined set of channels. For example a Bash script to read all channels and set the voltages and current limit to the same value for each channel could look like:

```
#!/bin/bash
# Simple Bash Script that will read and set all channels in a MPOD crate

ip=192.168.2.25
path=/usr/share/snmp/mibs
setVoltage=5
setCurrent=.100
setStatus=1
setRamp=100

channelCount=$(snmpget -Oqv -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputNumber.0)
indices=$(snmpwalk -Oqv -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputIndex)
x=(`echo $indices | tr ' ' '\n'`)

COUNTER=0
while [ $COUNTER -lt $channelCount ]; do
  index=$(echo ${x[$COUNTER]})

  voltage=$(snmpset -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputVoltage.$index F $setVoltage)
  iLimit=$(snmpset -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputCurrent.$index F $setCurrent)
  rampspeed=$(snmpset -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputVoltageRiseRate.$index F $setRamp)
  status=$(snmpset -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputSwitch.$index i $setStatus)

  voltage=$(snmpget -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputVoltage.$index)
  iLimit=$(snmpget -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputCurrent.$index)
  sense=$(snmpget -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputMeasurementSenseVoltage.$index)
  current=$(snmpget -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputMeasurementCurrent.$index)
  rampspeed=$(snmpget -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputVoltageRiseRate.$index)
  status=$(snmpget -OqvU -v 2c -M $path -m +WIENER-CRATE-MIB -c guru $ip
outputSwitch.$index)

  echo "$voltage $iLimit $sense $current $rampspeed $status"

  let COUNTER=COUNTER+1
done
```

4.11 MPOD SNMP Parameter List (most common)

Parameter	Multi	Access	Type
sysMainSwitch	1	R/W	INTEGER
sysStatus	1	R/W	INTEGER
sysVmeSysReset	1	R/W	INTEGER
outputNumber	1	R	INTEGER
outputName	320	R	String
outputGroup	320	R	INTEGER
outputStatus	320	R	BitString
outputMeasurementSenseVoltage	320	R	Float
outputMeasurementTerminalVoltage	320	R	Float
outputMeasurementCurrent	320	R	Float
outputMeasurementTemperature	320	R	INTEGER
outputSwitch	320	R/W	INTEGER
outputVoltage	320	R/W	Float
outputCurrent	320	R/W	Float
outputVoltageRiseRate	320	R/W	Float
outputVoltageFallRate	320	R/W	Float
outputSupervisionBehavior	320	R/W	INTEGER
outputSupervisionMinSenseVoltage	320	R/W	Float
outputSupervisionMaxSenseVoltage	320	R/W	Float
outputSupervisionMaxTerminalVoltage	320	R/W	Float
outputSupervisionMaxCurrent	320	R/W	Float
outputSupervisionMaxTemperature	320	R/W	INTEGER
outputConfigMaxSenseVoltage	320	R	Float
outputConfigMaxTerminalVoltage	320	R	Float
outputConfigMaxCurrent	320	R	Float
outputConfigMaxPower	320	R	Float
groupsNumber	1	R	INTEGER
groupsSwitch	320	R/W	INTEGER
moduleNumber	1	R	INTEGER
moduleDescription	10	R	String
moduleAuxiliaryMeasurementVoltage0	10	R	Float
moduleAuxiliaryMeasurementVoltage1	10	R	Float
moduleHardwareLimitVoltage	10	R	Float
moduleHardwareLimitCurrent	10	R	Float
moduleRampSpeedVoltage	10	R/W	Float
moduleRampSpeedCurrent	10	R/W	Float
moduleStatus	10	R	Float
moduleEventStatus	10	R	Float
moduleEventChannelStatus	10	R	BitString
moduleDoClear	10	R/W	INTEGER
moduleAuxiliaryMeasurementTemperature0	10	R	Float
moduleAuxiliaryMeasurementTemperature1	10	R	Float
moduleAuxiliaryMeasurementTemperature2	10	R	Float
moduleAuxiliaryMeasurementTemperature3	10	R	Float
sensorNumber	1	R	INTEGER
sensorTemperature	12	R	INTEGER
sensorWarningThreshold	12	R/W	INTEGER

sensorFailureThreshold	12	R/W	INTEGER
snmpCommunityName	4	R/W	String
psFirmwareVersion	1	R	String
psSerialNumber	1	R	String
psOperatingTime	1	R	INTEGER
psDirectAccess	1	R/W	String
fanFirmwareVersion	1	R	String
fanSerialNumber	1	R	String
fanOperatingTime	1	R	INTEGER
fanAirTemperature	1	R	INTEGER
fanSwicthOffDelay	1	R/W	INTEGER
fanNominalSpeed	1	R/W	INTEGER
fanNumberOfFans	1	R	INTEGER
fanSpeed	6	R	INTEGER

(see SNMP tree structure at end of manual for full structure)

4.12 iseg SNMP Control Program (NETSNMP)

The supplied iseg SNMP Control program allow controlling high voltage channels for configurations of up to 10 HV modules plugged in the MPOD. The programs are provided as executable. All source code is available on the CD-ROM.

4.13 C++ programming (NetSNMP)

Using NetSNMP C++ programs can be easily written for monitoring and control of MPOD high voltage modules. For Windows all needed functions are provided by a dynamically loadable library WIENER_SNMP.DLL. This DLL requires NETSNMP and the WIENER -CRATE-MIB.txt file as described in chapter 4.4!

The following functions are provided in this library (for details see source code):

```
SnmpInit  
SnmpCleanup  
SnmpOpen  
SnmpClose  
  
getMainSwitch  
setMainSwitch  
getMainStatus  
getVmeReset  
setVmeReset  
  
getOutputNumber  
getOutputGroups  
getOutputGroup  
getChannelStatus  
getOutputSenseMeasurement  
getOutputTerminalMeasurement  
getCurrentMeasurement  
getTemperatureMeasurement  
setChannelSwitch  
getChannelSwitch  
getOutputVoltage  
setOutputVoltage  
getOutputCurrent  
setOutputCurrent  
getOutputRiseRate  
setOutputRiseRate  
getOutputFallRate  
setOutputFallRate  
getOutputSupervisionBehavior  
setOutputSupervisionBehavior  
getOutputSupervisionMinSenseVoltage  
setOutputSupervisionMinSenseVoltage  
getOutputSupervisionMaxSenseVoltage  
setOutputSupervisionMaxSenseVoltage  
getOutputSupervisionMaxTerminalVoltage  
setOutputSupervisionMaxTerminalVoltage  
getOutputSupervisionMaxCurrent  
setOutputSupervisionMaxCurrent  
getOutputSupervisionMaxTemperature  
getOutputConfigMaxSenseVoltage  
getOutputConfigMaxTerminalVoltage  
getOutputConfigMaxCurrent  
getOutputConfigMaxPower  
  
getSensorNumber  
getSensorTemp  
getSensorWarningTemperature
```

setSensorWarningTemperature
getSensorFailureTemperature
setSensorFailureTemperature

getPsOperatingTime

getFanOperatingTime
getFanAirTemperature
getFanSwitchOffDelay
setFanSwitchOffDelay
getFanNominalSpeed
setFanNominalSpeed
setFanNominalSpeed
getFanNumberOfFans
getFanSpeed

snmpSetDouble
snmpGetDouble
snmpSetInt
snmpGetInt

5 MPOD Crate

Powered chassis for multichannel high voltage modules

Construction	8 U x 19" crate	max.10 modules, up to3 kW output power / 3,6kW input power
	Slots:	10 + ½ (MPOD controller)
	Dimensions (w, h, d)	483 mm x 460mm x 355 mm
	Weight:	31,5 kg

6 Primary Power Supply

The power supply provides all necessary supply voltages for the HV-Modules. It is connected to the mains (World wide input 100..240V AC, 50..60 Hz).

- World wide input: 100..240V AC, 50..60 Hz, single phase
- Sinusoidal current input, up to 16A, depending on the used modules

6.1 Power Box Data Sheet

3U box with max. 6 power modules.

Mains Input

Rated Input Voltage:	106 – 230 V AC, +/- 15% variation allowed
Rated Input Current:	16 A
Sinusoidal: (230VAC)	CE CE EN 60555, IEC 555 pow. fact. 0,98
Inrush current:	16 A, cold unit
Input protection:	An external fuse or circuit breaker has to be installed (16A max.)
RF rejection:	EN 55 022 Class B, Input and Output
Output protection overload:	current limiting for booster circuits, 90°C cut off temperature
Dimensions:	4U x 14 PU width acc. to IEC 60297, 450 mm deep
Weight:	4,7 kg
Operation temperature:	0...45°C without derating, storage: -30°C ... + 85°C
M T B F electronics:	40°C ambient: > 100 000 h
integrated fan:	40°C ambient: ca. 65 000 h, 25° ambient
>85000h	

7 SNMP examples for MPOD and high voltage EHS/EDS module

```
/*
/*
/* *****/
/*
/* SNMP example for control of iseg Multi-Channel High Voltage Power Supply Modules in
/* a W-IE-NE-R MPOD crate
/*
/*
/* snmpget -Oqv -v 2c -M $path -m +WIENER-CRATE-MIB -c public 192.168.16.222 outputVoltage.u100 */
/* This command will request the value from datapoint set voltage.
/*
/* snmpget: starts a SNMP request
/*
/* -v 2c: This parameter specifies which version of the SNMP to use. WIENER devices use SNMP 2C. */
/* -M $path: This parameter should be replaced with the path to the WIENERCRATE-MIB.txt file.
/*
/* It is not needed in case the default path is used.
/*
/* -m +WIENER-CRATE-MIB: This parameter tells the command to look at the WIENER-CRATE-MIB
/* to resolve the OID name.
/*
/* -c public: This specifies which community of values can be accessed
/*
/* 192.168.16.222: The IP address of the MPOD crate.
/*
/* outputVoltage.u100: The SNMP item to the data point set voltage of a module in the second
/* slot of the MPOD crate HV channel 0.
/*
/*
/* snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222 outputVoltage.u100 F 60 */
/* This command writes a floating point value to the datapoint set voltage.
/*
/* snmpset: starts a SNMP write instruction
/*
/* -c guru: This specifies the community for write accesses
/*
/* F 60: The F specifies the write value as a floating point formatted value.
/*
/* The 60 is the write value 60 Volt.
/*
/*
/* snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222 outputSwitch.u100 i 1 */
/* This command write a switch on of the HV for one channel.
/*
/* outputSwitch.u100 i 1: Write of an integer formatted value to the item outputSwitch.
/*
/* With that item it is possible to switch differnt functions for instance
/* set On(1).
/*
/* *****/
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputVoltage.u100
200.000000 V
```

```
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222
outputVoltage.u100 F 60
60.000000 V
```

```
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222
outputSwitch.u100 i 1
On
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputVoltage.u100
60.000000 V
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputMeasurementSenseVoltage.u100
60.104588 V
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputMeasurementSenseVoltage.u100
60.104713 V
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputMeasurementCurrent.u100
0.000001 A
```

```
snmpgetx -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputMeasurementCurrent.u100
0.000000735 A
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputSupervisionBehavior.u100
0
```

```
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222
outputSupervisionBehavior.u100 i 64
64
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputSupervisionBehavior.u100
64
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputTripTimeMaxCurrent.u100
0 ms
```

```
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222
outputTripTimeMaxCurrent.u100 i 3000
3000 ms /* delay of 3 sconds */
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"80 " /* outputOn */
```

```
snmpgetx -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputMeasurementCurrent.u100
0.000000735 A
```

```
snmpsetx -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222
outputCurrent.u100 F 0.0000007
0.000000700 A
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"04 08 " /*outputFailureMaxCurrent, outputRampDown */
```

```
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"04 " /* outputFailureMaxCurrent */
```

```
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222
outputSwitch.u100 i 10
clearEvents
```

```
snmpsetx -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222
outputCurrent.u100 F 0.00001
0.000010000 A
```

```
snmpset -Oqv -v 2c -m +WIENER-CRATE-MIB -c guru 192.168.16.222
outputSwitch.u100 i 1
On
```

```

snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"80 10 " /* outputOn, outputRampUp */

/* a load has been switched on channel 0 to bring them in state CC current limited */
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"80 20 " /* outputOn, outputCurrentLimited */

snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"80 20 " /* outputOn, outputCurrentLimited */

snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"80 20 " /* outputOn, outputCurrentLimited */

snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"80 20 " /* outputOn, outputCurrentLimited */

/* the delayed trip fuction pamps the voltage after 3 seconds to zero */
snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"04 08 " /* outputFailureMaxCurrent, outputRampDown */

snmpget -Oqv -v 2c -m +WIENER-CRATE-MIB -c public 192.168.16.222
outputStatus.u100
"04 08 " /* outputFailureMaxCurrent, outputRampDown */

```

8 WIENER SNMP Parameter structure

```
// GENERATED WITH
// snmptranslate -w 120 -Tp WIENER-CRATE-MIB::crate > SnmpTree.txt
//

+--crate(1)
  +--system(1)
    | +-- -RW- EnumVal sysMainSwitch(1)
    | | Values: off(0), on(1)
    | +-- -R-- BitString sysStatus(2)
    | | Values: mainOn(0), mainInhibit(1), localControlOnly(2), inputFailure(3), outputFailure(4),
    | | fantrayFailure(5), sensorFailure(6), vmeSysfail(7), plugAndPlayIncompatible(8), busReset(9),
    | | supplyDerating(10), supplyFailure(11), supplyDerating2(12), supplyFailure2(13)
    | +-- -RW- EnumVal sysVmeSysReset(3)
    | | Values: trigger(1)
    | +-- -RW- INTEGER sysHardwareReset(4)
    | +-- -RW- BitString sysConfigDoMeasurementCurrent(10)
    | | Values: ch0(0), ch1(1), ch2(2), ch3(3), ch4(4), ch5(5), ch6(6), ch7(7)
    | +-- -RW- Integer32 sysOperatingTime(11)
    | +-- -RW- Integer32 sysDebugMemory8(1024)
    | | Range: 0..255
    | +-- -RW- Integer32 sysDebugMemory16(1025)
    | | Range: 0..65535
    | +-- -RW- Integer32 sysDebugMemory32(1026)
    | | Range: -2147483648..2147483647
    | +-- -RW- String sysDebug(1027)
    | | Size: 520
    | +-- -RW- String sysDebugDisplay(1028)
    |
    +--input(2)
    +--output(3)
      +-- -R-- Integer32 outputNumber(1)
      | Range: 0..1999
      |
      +--outputTable(2)
      | |
      | | +--outputEntry(1)
      | | | Index: outputIndex
      | | |
      | | | +-- ---- EnumVal outputIndex(1)
      | | | | Values: u0(1), u1(2), u2(3), u3(4), u4(5), u5(6), u6(7), u7(8), u8(9), u9(10), u10(11), u11(12),
      | | | | u12(13), u13(14), u14(15), u15(16), u16(17), u17(18), u18(19), u19(20), u20(21), u21(22),
      | | | | u22(23), u23(24), u24(25), u25(26), u26(27), u27(28), u28(29), u29(30), u30(31), u31(32),
      | | | | u32(33), u33(34), u34(35), u35(36), u36(37), u37(38), u38(39), u39(40), u40(41), u41(42),
      | | | | u42(43), u43(44), u44(45), u45(46), u46(47), u47(48), u48(49), u49(50), u50(51), u51(52),
      | | | | u52(53), u53(54), u54(55), u55(56), u56(57), u57(58), u58(59), u59(60), u60(61), u61(62),
      | | | | u62(63), u63(64), u64(65), u65(66), u66(67), u67(68), u68(69), u69(70), u70(71), u71(72),
      | | | | u72(73), u73(74), u74(75), u75(76), u76(77), u77(78), u78(79), u79(80), u80(81), u81(82),
      | | | | u82(83), u83(84), u84(85), u85(86), u86(87), u87(88), u88(89), u89(90), u90(91), u91(92),
      | | | | u92(93), u93(94), u94(95), u95(96), u96(97), u97(98), u98(99), u99(100), u100(101),
      | | | | u101(102), u102(103), u103(104), u104(105), u105(106), u106(107), u107(108), u108(109),
      | | | | u109(110), u110(111), u111(112), u112(113), u113(114), u114(115), u115(116), u116(117),
      | | | | u117(118), u118(119), u119(120), u120(121), u121(122), u122(123), u123(124), u124(125),
      | | | | u125(126), u126(127), u127(128), u128(129), u129(130), u130(131), u131(132), u132(133),
      | | | | u133(134), u134(135), u135(136), u136(137), u137(138), u138(139), u139(140), u140(141),
      | | | | u141(142), u142(143), u143(144), u144(145), u145(146), u146(147), u147(148), u148(149),
      | | | | u149(150), u150(151), u151(152), u152(153), u153(154), u154(155), u155(156), u156(157),
      | | | | u157(158), u158(159), u159(160), u160(161), u161(162), u162(163), u163(164), u164(165),
      | | | | u165(166), u166(167), u167(168), u168(169), u169(170), u170(171), u171(172), u172(173),
      | | | | u173(174), u174(175), u175(176), u176(177), u177(178), u178(179), u179(180), u180(181),
      | | | | u181(182), u182(183), u183(184), u184(185), u185(186), u186(187), u187(188), u188(189),
      | | | | u189(190), u190(191), u191(192), u192(193), u193(194), u194(195), u195(196), u196(197),
```


u197(198), u198(199), u199(200), u200(201), u201(202), u202(203), u203(204), u204(205),
u205(206), u206(207), u207(208), u208(209), u209(210), u210(211), u211(212), u212(213),
u213(214), u214(215), u215(216), u216(217), u217(218), u218(219), u219(220), u220(221),
u221(222), u222(223), u223(224), u224(225), u225(226), u226(227), u227(228), u228(229),
u229(230), u230(231), u231(232), u232(233), u233(234), u234(235), u235(236), u236(237),
u237(238), u238(239), u239(240), u240(241), u241(242), u242(243), u243(244), u244(245),
u245(246), u246(247), u247(248), u248(249), u249(250), u250(251), u251(252), u252(253),
u253(254), u254(255), u255(256), u256(257), u257(258), u258(259), u259(260), u260(261),
u261(262), u262(263), u263(264), u264(265), u265(266), u266(267), u267(268), u268(269),
u269(270), u270(271), u271(272), u272(273), u273(274), u274(275), u275(276), u276(277),
u277(278), u278(279), u279(280), u280(281), u281(282), u282(283), u283(284), u284(285),
u285(286), u286(287), u287(288), u288(289), u289(290), u290(291), u291(292), u292(293),
u293(294), u294(295), u295(296), u296(297), u297(298), u298(299), u299(300), u300(301),
u301(302), u302(303), u303(304), u304(305), u305(306), u306(307), u307(308), u308(309),
u309(310), u310(311), u311(312), u312(313), u313(314), u314(315), u315(316), u316(317),
u317(318), u318(319), u319(320), u320(321), u321(322), u322(323), u323(324), u324(325),
u325(326), u326(327), u327(328), u328(329), u329(330), u330(331), u331(332), u332(333),
u333(334), u334(335), u335(336), u336(337), u337(338), u338(339), u339(340), u340(341),
u341(342), u342(343), u343(344), u344(345), u345(346), u346(347), u347(348), u348(349),
u349(350), u350(351), u351(352), u352(353), u353(354), u354(355), u355(356), u356(357),
u357(358), u358(359), u359(360), u360(361), u361(362), u362(363), u363(364), u364(365),
u365(366), u366(367), u367(368), u368(369), u369(370), u370(371), u371(372), u372(373),
u373(374), u374(375), u375(376), u376(377), u377(378), u378(379), u379(380), u380(381),
u381(382), u382(383), u383(384), u384(385), u385(386), u386(387), u387(388), u388(389),
u389(390), u390(391), u391(392), u392(393), u393(394), u394(395), u395(396), u396(397),
u397(398), u398(399), u399(400), u400(401), u401(402), u402(403), u403(404), u404(405),
u405(406), u406(407), u407(408), u408(409), u409(410), u410(411), u411(412), u412(413),
u413(414), u414(415), u415(416), u416(417), u417(418), u418(419), u419(420), u420(421),
u421(422), u422(423), u423(424), u424(425), u425(426), u426(427), u427(428), u428(429),
u429(430), u430(431), u431(432), u432(433), u433(434), u434(435), u435(436), u436(437),
u437(438), u438(439), u439(440), u440(441), u441(442), u442(443), u443(444), u444(445),
u445(446), u446(447), u447(448), u448(449), u449(450), u450(451), u451(452), u452(453),
u453(454), u454(455), u455(456), u456(457), u457(458), u458(459), u459(460), u460(461),
u461(462), u462(463), u463(464), u464(465), u465(466), u466(467), u467(468), u468(469),
u469(470), u470(471), u471(472), u472(473), u473(474), u474(475), u475(476), u476(477),
u477(478), u478(479), u479(480), u480(481), u481(482), u482(483), u483(484), u484(485),
u485(486), u486(487), u487(488), u488(489), u489(490), u490(491), u491(492), u492(493),
u493(494), u494(495), u495(496), u496(497), u497(498), u498(499), u499(500), u500(501),
u501(502), u502(503), u503(504), u504(505), u505(506), u506(507), u507(508), u508(509),
u509(510), u510(511), u511(512), u512(513), u513(514), u514(515), u515(516), u516(517),
u517(518), u518(519), u519(520), u520(521), u521(522), u522(523), u523(524), u524(525),
u525(526), u526(527), u527(528), u528(529), u529(530), u530(531), u531(532), u532(533),
u533(534), u534(535), u535(536), u536(537), u537(538), u538(539), u539(540), u540(541),
u541(542), u542(543), u543(544), u544(545), u545(546), u546(547), u547(548), u548(549),
u549(550), u550(551), u551(552), u552(553), u553(554), u554(555), u555(556), u556(557),
u557(558), u558(559), u559(560), u560(561), u561(562), u562(563), u563(564), u564(565),
u565(566), u566(567), u567(568), u568(569), u569(570), u570(571), u571(572), u572(573),
u573(574), u574(575), u575(576), u576(577), u577(578), u578(579), u579(580), u580(581),
u581(582), u582(583), u583(584), u584(585), u585(586), u586(587), u587(588), u588(589),
u589(590), u590(591), u591(592), u592(593), u593(594), u594(595), u595(596), u596(597),
u597(598), u598(599), u599(600), u600(601), u601(602), u602(603), u603(604), u604(605),
u605(606), u606(607), u607(608), u608(609), u609(610), u610(611), u611(612), u612(613),
u613(614), u614(615), u615(616), u616(617), u617(618), u618(619), u619(620), u620(621),
u621(622), u622(623), u623(624), u624(625), u625(626), u626(627), u627(628), u628(629),
u629(630), u630(631), u631(632), u632(633), u633(634), u634(635), u635(636), u636(637),
u637(638), u638(639), u639(640), u640(641), u641(642), u642(643), u643(644), u644(645),
u645(646), u646(647), u647(648), u648(649), u649(650), u650(651), u651(652), u652(653),
u653(654), u654(655), u655(656), u656(657), u657(658), u658(659), u659(660), u660(661),
u661(662), u662(663), u663(664), u664(665), u665(666), u666(667), u667(668), u668(669),
u669(670), u670(671), u671(672), u672(673), u673(674), u674(675), u675(676), u676(677),
u677(678), u678(679), u679(680), u680(681), u681(682), u682(683), u683(684), u684(685),
u685(686), u686(687), u687(688), u688(689), u689(690), u690(691), u691(692), u692(693),
u693(694), u694(695), u695(696), u696(697), u697(698), u698(699), u699(700), u700(701),
u701(702), u702(703), u703(704), u704(705), u705(706), u706(707), u707(708), u708(709),

u709(710), u710(711), u711(712), u712(713), u713(714), u714(715), u715(716), u716(717),
u717(718), u718(719), u719(720), u720(721), u721(722), u722(723), u723(724), u724(725),
u725(726), u726(727), u727(728), u728(729), u729(730), u730(731), u731(732), u732(733),
u733(734), u734(735), u735(736), u736(737), u737(738), u738(739), u739(740), u740(741),
u741(742), u742(743), u743(744), u744(745), u745(746), u746(747), u747(748), u748(749),
u749(750), u750(751), u751(752), u752(753), u753(754), u754(755), u755(756), u756(757),
u757(758), u758(759), u759(760), u760(761), u761(762), u762(763), u763(764), u764(765),
u765(766), u766(767), u767(768), u768(769), u769(770), u770(771), u771(772), u772(773),
u773(774), u774(775), u775(776), u776(777), u777(778), u778(779), u779(780), u780(781),
u781(782), u782(783), u783(784), u784(785), u785(786), u786(787), u787(788), u788(789),
u789(790), u790(791), u791(792), u792(793), u793(794), u794(795), u795(796), u796(797),
u797(798), u798(799), u799(800), u800(801), u801(802), u802(803), u803(804), u804(805),
u805(806), u806(807), u807(808), u808(809), u809(810), u810(811), u811(812), u812(813),
u813(814), u814(815), u815(816), u816(817), u817(818), u818(819), u819(820), u820(821),
u821(822), u822(823), u823(824), u824(825), u825(826), u826(827), u827(828), u828(829),
u829(830), u830(831), u831(832), u832(833), u833(834), u834(835), u835(836), u836(837),
u837(838), u838(839), u839(840), u840(841), u841(842), u842(843), u843(844), u844(845),
u845(846), u846(847), u847(848), u848(849), u849(850), u850(851), u851(852), u852(853),
u853(854), u854(855), u855(856), u856(857), u857(858), u858(859), u859(860), u860(861),
u861(862), u862(863), u863(864), u864(865), u865(866), u866(867), u867(868), u868(869),
u869(870), u870(871), u871(872), u872(873), u873(874), u874(875), u875(876), u876(877),
u877(878), u878(879), u879(880), u880(881), u881(882), u882(883), u883(884), u884(885),
u885(886), u886(887), u887(888), u888(889), u889(890), u890(891), u891(892), u892(893),
u893(894), u894(895), u895(896), u896(897), u897(898), u898(899), u899(900), u900(901),
u901(902), u902(903), u903(904), u904(905), u905(906), u906(907), u907(908), u908(909),
u909(910), u910(911), u911(912), u912(913), u913(914), u914(915), u915(916), u916(917),
u917(918), u918(919), u919(920), u920(921), u921(922), u922(923), u923(924), u924(925),
u925(926), u926(927), u927(928), u928(929), u929(930), u930(931), u931(932), u932(933),
u933(934), u934(935), u935(936), u936(937), u937(938), u938(939), u939(940), u940(941),
u941(942), u942(943), u943(944), u944(945), u945(946), u946(947), u947(948), u948(949),
u949(950), u950(951), u951(952), u952(953), u953(954), u954(955), u955(956), u956(957),
u957(958), u958(959), u959(960), u960(961), u961(962), u962(963), u963(964), u964(965),
u965(966), u966(967), u967(968), u968(969), u969(970), u970(971), u971(972), u972(973),
u973(974), u974(975), u975(976), u976(977), u977(978), u978(979), u979(980), u980(981),
u981(982), u982(983), u983(984), u984(985), u985(986), u986(987), u987(988), u988(989),
u989(990), u990(991), u991(992), u992(993), u993(994), u994(995), u995(996), u996(997),
u997(998), u998(999), u999(1000), u1000(1001), u1001(1002), u1002(1003), u1003(1004),
u1004(1005), u1005(1006), u1006(1007), u1007(1008), u1008(1009), u1009(1010),
u1010(1011), u1011(1012), u1012(1013), u1013(1014), u1014(1015), u1015(1016),
u1016(1017), u1017(1018), u1018(1019), u1019(1020), u1020(1021), u1021(1022),
u1022(1023), u1023(1024), u1024(1025), u1025(1026), u1026(1027), u1027(1028),
u1028(1029), u1029(1030), u1030(1031), u1031(1032), u1032(1033), u1033(1034),
u1034(1035), u1035(1036), u1036(1037), u1037(1038), u1038(1039), u1039(1040),
u1040(1041), u1041(1042), u1042(1043), u1043(1044), u1044(1045), u1045(1046),
u1046(1047), u1047(1048), u1048(1049), u1049(1050), u1050(1051), u1051(1052),
u1052(1053), u1053(1054), u1054(1055), u1055(1056), u1056(1057), u1057(1058),
u1058(1059), u1059(1060), u1060(1061), u1061(1062), u1062(1063), u1063(1064),
u1064(1065), u1065(1066), u1066(1067), u1067(1068), u1068(1069), u1069(1070),
u1070(1071), u1071(1072), u1072(1073), u1073(1074), u1074(1075), u1075(1076),
u1076(1077), u1077(1078), u1078(1079), u1079(1080), u1080(1081), u1081(1082),
u1082(1083), u1083(1084), u1084(1085), u1085(1086), u1086(1087), u1087(1088),
u1088(1089), u1089(1090), u1090(1091), u1091(1092), u1092(1093), u1093(1094),
u1094(1095), u1095(1096), u1096(1097), u1097(1098), u1098(1099), u1099(1100),
u1100(1101), u1101(1102), u1102(1103), u1103(1104), u1104(1105), u1105(1106),
u1106(1107), u1107(1108), u1108(1109), u1109(1110), u1110(1111), u1111(1112),
u1112(1113), u1113(1114), u1114(1115), u1115(1116), u1116(1117), u1117(1118),
u1118(1119), u1119(1120), u1120(1121), u1121(1122), u1122(1123), u1123(1124),
u1124(1125), u1125(1126), u1126(1127), u1127(1128), u1128(1129), u1129(1130),
u1130(1131), u1131(1132), u1132(1133), u1133(1134), u1134(1135), u1135(1136),
u1136(1137), u1137(1138), u1138(1139), u1139(1140), u1140(1141), u1141(1142),
u1142(1143), u1143(1144), u1144(1145), u1145(1146), u1146(1147), u1147(1148),
u1148(1149), u1149(1150), u1150(1151), u1151(1152), u1152(1153), u1153(1154),
u1154(1155), u1155(1156), u1156(1157), u1157(1158), u1158(1159), u1159(1160),
u1160(1161), u1161(1162), u1162(1163), u1163(1164), u1164(1165), u1165(1166),

u1166(1167), u1167(1168), u1168(1169), u1169(1170), u1170(1171), u1171(1172),
u1172(1173), u1173(1174), u1174(1175), u1175(1176), u1176(1177), u1177(1178),
u1178(1179), u1179(1180), u1180(1181), u1181(1182), u1182(1183), u1183(1184),
u1184(1185), u1185(1186), u1186(1187), u1187(1188), u1188(1189), u1189(1190),
u1190(1191), u1191(1192), u1192(1193), u1193(1194), u1194(1195), u1195(1196),
u1196(1197), u1197(1198), u1198(1199), u1199(1200), u1200(1201), u1201(1202),
u1202(1203), u1203(1204), u1204(1205), u1205(1206), u1206(1207), u1207(1208),
u1208(1209), u1209(1210), u1210(1211), u1211(1212), u1212(1213), u1213(1214),
u1214(1215), u1215(1216), u1216(1217), u1217(1218), u1218(1219), u1219(1220),
u1220(1221), u1221(1222), u1222(1223), u1223(1224), u1224(1225), u1225(1226),
u1226(1227), u1227(1228), u1228(1229), u1229(1230), u1230(1231), u1231(1232),
u1232(1233), u1233(1234), u1234(1235), u1235(1236), u1236(1237), u1237(1238),
u1238(1239), u1239(1240), u1240(1241), u1241(1242), u1242(1243), u1243(1244),
u1244(1245), u1245(1246), u1246(1247), u1247(1248), u1248(1249), u1249(1250),
u1250(1251), u1251(1252), u1252(1253), u1253(1254), u1254(1255), u1255(1256),
u1256(1257), u1257(1258), u1258(1259), u1259(1260), u1260(1261), u1261(1262),
u1262(1263), u1263(1264), u1264(1265), u1265(1266), u1266(1267), u1267(1268),
u1268(1269), u1269(1270), u1270(1271), u1271(1272), u1272(1273), u1273(1274),
u1274(1275), u1275(1276), u1276(1277), u1277(1278), u1278(1279), u1279(1280),
u1280(1281), u1281(1282), u1282(1283), u1283(1284), u1284(1285), u1285(1286),
u1286(1287), u1287(1288), u1288(1289), u1289(1290), u1290(1291), u1291(1292),
u1292(1293), u1293(1294), u1294(1295), u1295(1296), u1296(1297), u1297(1298),
u1298(1299), u1299(1300), u1300(1301), u1301(1302), u1302(1303), u1303(1304),
u1304(1305), u1305(1306), u1306(1307), u1307(1308), u1308(1309), u1309(1310),
u1310(1311), u1311(1312), u1312(1313), u1313(1314), u1314(1315), u1315(1316),
u1316(1317), u1317(1318), u1318(1319), u1319(1320), u1320(1321), u1321(1322),
u1322(1323), u1323(1324), u1324(1325), u1325(1326), u1326(1327), u1327(1328),
u1328(1329), u1329(1330), u1330(1331), u1331(1332), u1332(1333), u1333(1334),
u1334(1335), u1335(1336), u1336(1337), u1337(1338), u1338(1339), u1339(1340),
u1340(1341), u1341(1342), u1342(1343), u1343(1344), u1344(1345), u1345(1346),
u1346(1347), u1347(1348), u1348(1349), u1349(1350), u1350(1351), u1351(1352),
u1352(1353), u1353(1354), u1354(1355), u1355(1356), u1356(1357), u1357(1358),
u1358(1359), u1359(1360), u1360(1361), u1361(1362), u1362(1363), u1363(1364),
u1364(1365), u1365(1366), u1366(1367), u1367(1368), u1368(1369), u1369(1370),
u1370(1371), u1371(1372), u1372(1373), u1373(1374), u1374(1375), u1375(1376),
u1376(1377), u1377(1378), u1378(1379), u1379(1380), u1380(1381), u1381(1382),
u1382(1383), u1383(1384), u1384(1385), u1385(1386), u1386(1387), u1387(1388),
u1388(1389), u1389(1390), u1390(1391), u1391(1392), u1392(1393), u1393(1394),
u1394(1395), u1395(1396), u1396(1397), u1397(1398), u1398(1399), u1399(1400),
u1400(1401), u1401(1402), u1402(1403), u1403(1404), u1404(1405), u1405(1406),
u1406(1407), u1407(1408), u1408(1409), u1409(1410), u1410(1411), u1411(1412),
u1412(1413), u1413(1414), u1414(1415), u1415(1416), u1416(1417), u1417(1418),
u1418(1419), u1419(1420), u1420(1421), u1421(1422), u1422(1423), u1423(1424),
u1424(1425), u1425(1426), u1426(1427), u1427(1428), u1428(1429), u1429(1430),
u1430(1431), u1431(1432), u1432(1433), u1433(1434), u1434(1435), u1435(1436),
u1436(1437), u1437(1438), u1438(1439), u1439(1440), u1440(1441), u1441(1442),
u1442(1443), u1443(1444), u1444(1445), u1445(1446), u1446(1447), u1447(1448),
u1448(1449), u1449(1450), u1450(1451), u1451(1452), u1452(1453), u1453(1454),
u1454(1455), u1455(1456), u1456(1457), u1457(1458), u1458(1459), u1459(1460),
u1460(1461), u1461(1462), u1462(1463), u1463(1464), u1464(1465), u1465(1466),
u1466(1467), u1467(1468), u1468(1469), u1469(1470), u1470(1471), u1471(1472),
u1472(1473), u1473(1474), u1474(1475), u1475(1476), u1476(1477), u1477(1478),
u1478(1479), u1479(1480), u1480(1481), u1481(1482), u1482(1483), u1483(1484),
u1484(1485), u1485(1486), u1486(1487), u1487(1488), u1488(1489), u1489(1490),
u1490(1491), u1491(1492), u1492(1493), u1493(1494), u1494(1495), u1495(1496),
u1496(1497), u1497(1498), u1498(1499), u1499(1500), u1500(1501), u1501(1502),
u1502(1503), u1503(1504), u1504(1505), u1505(1506), u1506(1507), u1507(1508),
u1508(1509), u1509(1510), u1510(1511), u1511(1512), u1512(1513), u1513(1514),
u1514(1515), u1515(1516), u1516(1517), u1517(1518), u1518(1519), u1519(1520),
u1520(1521), u1521(1522), u1522(1523), u1523(1524), u1524(1525), u1525(1526),
u1526(1527), u1527(1528), u1528(1529), u1529(1530), u1530(1531), u1531(1532),
u1532(1533), u1533(1534), u1534(1535), u1535(1536), u1536(1537), u1537(1538),
u1538(1539), u1539(1540), u1540(1541), u1541(1542), u1542(1543), u1543(1544),
u1544(1545), u1545(1546), u1546(1547), u1547(1548), u1548(1549), u1549(1550),

u1550(1551), u1551(1552), u1552(1553), u1553(1554), u1554(1555), u1555(1556),
u1556(1557), u1557(1558), u1558(1559), u1559(1560), u1560(1561), u1561(1562),
u1562(1563), u1563(1564), u1564(1565), u1565(1566), u1566(1567), u1567(1568),
u1568(1569), u1569(1570), u1570(1571), u1571(1572), u1572(1573), u1573(1574),
u1574(1575), u1575(1576), u1576(1577), u1577(1578), u1578(1579), u1579(1580),
u1580(1581), u1581(1582), u1582(1583), u1583(1584), u1584(1585), u1585(1586),
u1586(1587), u1587(1588), u1588(1589), u1589(1590), u1590(1591), u1591(1592),
u1592(1593), u1593(1594), u1594(1595), u1595(1596), u1596(1597), u1597(1598),
u1598(1599), u1599(1600), u1600(1601), u1601(1602), u1602(1603), u1603(1604),
u1604(1605), u1605(1606), u1606(1607), u1607(1608), u1608(1609), u1609(1610),
u1610(1611), u1611(1612), u1612(1613), u1613(1614), u1614(1615), u1615(1616),
u1616(1617), u1617(1618), u1618(1619), u1619(1620), u1620(1621), u1621(1622),
u1622(1623), u1623(1624), u1624(1625), u1625(1626), u1626(1627), u1627(1628),
u1628(1629), u1629(1630), u1630(1631), u1631(1632), u1632(1633), u1633(1634),
u1634(1635), u1635(1636), u1636(1637), u1637(1638), u1638(1639), u1639(1640),
u1640(1641), u1641(1642), u1642(1643), u1643(1644), u1644(1645), u1645(1646),
u1646(1647), u1647(1648), u1648(1649), u1649(1650), u1650(1651), u1651(1652),
u1652(1653), u1653(1654), u1654(1655), u1655(1656), u1656(1657), u1657(1658),
u1658(1659), u1659(1660), u1660(1661), u1661(1662), u1662(1663), u1663(1664),
u1664(1665), u1665(1666), u1666(1667), u1667(1668), u1668(1669), u1669(1670),
u1670(1671), u1671(1672), u1672(1673), u1673(1674), u1674(1675), u1675(1676),
u1676(1677), u1677(1678), u1678(1679), u1679(1680), u1680(1681), u1681(1682),
u1682(1683), u1683(1684), u1684(1685), u1685(1686), u1686(1687), u1687(1688),
u1688(1689), u1689(1690), u1690(1691), u1691(1692), u1692(1693), u1693(1694),
u1694(1695), u1695(1696), u1696(1697), u1697(1698), u1698(1699), u1699(1700),
u1700(1701), u1701(1702), u1702(1703), u1703(1704), u1704(1705), u1705(1706),
u1706(1707), u1707(1708), u1708(1709), u1709(1710), u1710(1711), u1711(1712),
u1712(1713), u1713(1714), u1714(1715), u1715(1716), u1716(1717), u1717(1718),
u1718(1719), u1719(1720), u1720(1721), u1721(1722), u1722(1723), u1723(1724),
u1724(1725), u1725(1726), u1726(1727), u1727(1728), u1728(1729), u1729(1730),
u1730(1731), u1731(1732), u1732(1733), u1733(1734), u1734(1735), u1735(1736),
u1736(1737), u1737(1738), u1738(1739), u1739(1740), u1740(1741), u1741(1742),
u1742(1743), u1743(1744), u1744(1745), u1745(1746), u1746(1747), u1747(1748),
u1748(1749), u1749(1750), u1750(1751), u1751(1752), u1752(1753), u1753(1754),
u1754(1755), u1755(1756), u1756(1757), u1757(1758), u1758(1759), u1759(1760),
u1760(1761), u1761(1762), u1762(1763), u1763(1764), u1764(1765), u1765(1766),
u1766(1767), u1767(1768), u1768(1769), u1769(1770), u1770(1771), u1771(1772),
u1772(1773), u1773(1774), u1774(1775), u1775(1776), u1776(1777), u1777(1778),
u1778(1779), u1779(1780), u1780(1781), u1781(1782), u1782(1783), u1783(1784),
u1784(1785), u1785(1786), u1786(1787), u1787(1788), u1788(1789), u1789(1790),
u1790(1791), u1791(1792), u1792(1793), u1793(1794), u1794(1795), u1795(1796),
u1796(1797), u1797(1798), u1798(1799), u1799(1800), u1800(1801), u1801(1802),
u1802(1803), u1803(1804), u1804(1805), u1805(1806), u1806(1807), u1807(1808),
u1808(1809), u1809(1810), u1810(1811), u1811(1812), u1812(1813), u1813(1814),
u1814(1815), u1815(1816), u1816(1817), u1817(1818), u1818(1819), u1819(1820),
u1820(1821), u1821(1822), u1822(1823), u1823(1824), u1824(1825), u1825(1826),
u1826(1827), u1827(1828), u1828(1829), u1829(1830), u1830(1831), u1831(1832),
u1832(1833), u1833(1834), u1834(1835), u1835(1836), u1836(1837), u1837(1838),
u1838(1839), u1839(1840), u1840(1841), u1841(1842), u1842(1843), u1843(1844),
u1844(1845), u1845(1846), u1846(1847), u1847(1848), u1848(1849), u1849(1850),
u1850(1851), u1851(1852), u1852(1853), u1853(1854), u1854(1855), u1855(1856),
u1856(1857), u1857(1858), u1858(1859), u1859(1860), u1860(1861), u1861(1862),
u1862(1863), u1863(1864), u1864(1865), u1865(1866), u1866(1867), u1867(1868),
u1868(1869), u1869(1870), u1870(1871), u1871(1872), u1872(1873), u1873(1874),
u1874(1875), u1875(1876), u1876(1877), u1877(1878), u1878(1879), u1879(1880),
u1880(1881), u1881(1882), u1882(1883), u1883(1884), u1884(1885), u1885(1886),
u1886(1887), u1887(1888), u1888(1889), u1889(1890), u1890(1891), u1891(1892),
u1892(1893), u1893(1894), u1894(1895), u1895(1896), u1896(1897), u1897(1898),
u1898(1899), u1899(1900), u1900(1901), u1901(1902), u1902(1903), u1903(1904),
u1904(1905), u1905(1906), u1906(1907), u1907(1908), u1908(1909), u1909(1910),
u1910(1911), u1911(1912), u1912(1913), u1913(1914), u1914(1915), u1915(1916),
u1916(1917), u1917(1918), u1918(1919), u1919(1920), u1920(1921), u1921(1922),
u1922(1923), u1923(1924), u1924(1925), u1925(1926), u1926(1927), u1927(1928),
u1928(1929), u1929(1930), u1930(1931), u1931(1932), u1932(1933), u1933(1934),

```

| | | | | u1934(1935), u1935(1936), u1936(1937), u1937(1938), u1938(1939), u1939(1940),
| | | | | u1940(1941), u1941(1942), u1942(1943), u1943(1944), u1944(1945), u1945(1946),
| | | | | u1946(1947), u1947(1948), u1948(1949), u1949(1950), u1950(1951), u1951(1952),
| | | | | u1952(1953), u1953(1954), u1954(1955), u1955(1956), u1956(1957), u1957(1958),
| | | | | u1958(1959), u1959(1960), u1960(1961), u1961(1962), u1962(1963), u1963(1964),
| | | | | u1964(1965), u1965(1966), u1966(1967), u1967(1968), u1968(1969), u1969(1970),
| | | | | u1970(1971), u1971(1972), u1972(1973), u1973(1974), u1974(1975), u1975(1976),
| | | | | u1976(1977), u1977(1978), u1978(1979), u1979(1980), u1980(1981), u1981(1982),
| | | | | u1982(1983), u1983(1984), u1984(1985), u1985(1986), u1986(1987), u1987(1988),
| | | | | u1988(1989), u1989(1990), u1990(1991), u1991(1992), u1992(1993), u1993(1994),
| | | | | u1994(1995), u1995(1996), u1996(1997), u1997(1998), u1998(1999), u1999(2000)
| | | | | +-- -R-- String outputName(2)
| | | | | | Textual Convention: DisplayString
| | | | | | Size: 1..4
| | | | | +-- -RW- Integer32 outputGroup(3)
| | | | | | Range: 1..63
| | | | | +-- -R-- BitString outputStatus(4)
| | | | | | Values: outputOn(0), outputInhibit(1), outputFailureMinSenseVoltage(2),
| | | | | | outputFailureMaxSenseVoltage(3), outputFailureMaxTerminalVoltage(4),
| | | | | | outputFailureMaxCurrent(5), outputFailureMaxTemperature(6), outputFailureMaxPower(7),
| | | | | | outputFailureTimeout(9), outputCurrentLimited(10), outputRampUp(11), outputRampDown(12),
| | | | | | outputEnableKill(13), outputEmergencyOff(14), outputAdjusting(15),
| | | | | | outputConstantVoltage(16), outputVoltageBoundsExceeded(17),
| | | | | | outputCurrentBoundsExceeded(18), outputFailureCurrentLimit(19)
| | | | | +-- -R-- Opaque outputMeasurementSenseVoltage(5)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -R-- Opaque outputMeasurementTerminalVoltage(6)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -R-- Opaque outputMeasurementCurrent(7)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -R-- EnumVal outputMeasurementTemperature(8)
| | | | | | Values: ok(-128), failure(127)
| | | | | +-- -RW- EnumVal outputSwitch(9)
| | | | | | Values: off(0), on(1), resetEmergencyOff(2), setEmergencyOff(3), clearEvents(10),
| | | | | | setVoltageRippleMeasurementOff(20), setVoltageMeasurementOn(21),
| | | | | | setRippleMeasurementOn(22), setVoltageRippleMeasurementOn(23)
| | | | | +-- -RW- Opaque outputVoltage(10)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -RW- Integer32 outputAdjustVoltage(11)
| | | | | | Range: -128..127
| | | | | +-- -RW- Opaque outputCurrent(12)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -RW- Opaque outputVoltageRiseRate(13)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -RW- Opaque outputVoltageFallRate(14)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -RW- Integer32 outputSupervisionBehavior(15)
| | | | | | Range: 0..65535
| | | | | +-- -RW- Opaque outputSupervisionMinSenseVoltage(16)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -RW- Opaque outputSupervisionMaxSenseVoltage(17)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -RW- Opaque outputSupervisionMaxTerminalVoltage(18)
| | | | | | Textual Convention: Float
| | | | | | Size:

```

```

| | +-- -RW- Opaque outputSupervisionMaxCurrent(19)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Integer32 outputSupervisionMaxTemperature(20)
| | +-- -RW- Opaque outputConfigMaxSenseVoltage(21)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputConfigMaxTerminalVoltage(22)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputConfigMaxCurrent(23)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputSupervisionMaxPower(24)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputCurrentRiseRate(25)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputCurrentFallRate(26)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- INTEGER outputTripTimeMaxCurrent(27)
| | | Range: 0..4000
| | +-- -R-- Opaque outputHardwareLimitVoltage(28)
| | | Textual Convention: Float
| | | Size:
| | +-- -R-- Opaque outputHardwareLimitCurrent(29)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputConfigGainSenseVoltage(30)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputConfigOffsetSenseVoltage(31)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputConfigGainTerminalVoltage(32)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputConfigOffsetTerminalVoltage(33)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputConfigGainCurrent(34)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Opaque outputConfigOffsetCurrent(35)
| | | Textual Convention: Float
| | | Size:
| | +-- -RW- Integer32 outputUserConfig(37)
| | | Range: 0..15
| | +-- -RW- EnumVal outputRegulationMode(38)
| | | Values: fast(0), moderate(1), slow(2)
| | +-- -RW- Integer32 outputConfigMaxTemperature(39)
| |
| | +-- -R-- Integer32 groupsNumber(3)
| | | Range: 1..1999
| |
| | +--groupsTable(4)
| | |
| | | +--groupsEntry(1)
| | | | Index: groupsIndex
| | | |
| | | +-- ---- Integer32 groupsIndex(1)
| | | | Range: 0..1999

```

```

| | +-- -RW- EnumVal groupsSwitch(9)
| | | Values: undefined(-1), off(0), on(1), resetEmergencyOff(2), setEmergencyOff(3), disableKill(4),
| | | enableKill(5), disableAdjust(6), enableAdjust(7), clearEvents(10)
| |
| | +-- -R-- Integer32 moduleNumber(5)
| | | Range: 1..10
| |
| | +--moduleTable(6)
| | |
| | | +--moduleEntry(1)
| | | | Index: moduleIndex
| | | |
| | | | +-- ---- EnumVal moduleIndex(1)
| | | | | Values: ma0(1), ma1(2), ma2(3), ma3(4), ma4(5), ma5(6), ma6(7), ma7(8), ma8(9), ma9(10)
| | | | +-- -R-- String moduleDescription(2)
| | | | | Size: 0..39
| | | | +--moduleAuxiliaryMeasurementVoltage(3)
| | | | | +-- -R-- Opaque moduleAuxiliaryMeasurementVoltage0(1)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -R-- Opaque moduleAuxiliaryMeasurementVoltage1(2)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | |
| | | | +-- -R-- Opaque moduleHardwareLimitVoltage(4)
| | | | | Textual Convention: Float
| | | | | Size:
| | | | +-- -R-- Opaque moduleHardwareLimitCurrent(5)
| | | | | Textual Convention: Float
| | | | | Size:
| | | | +-- -RW- Opaque moduleRampSpeedVoltage(6)
| | | | | Textual Convention: Float
| | | | | Size:
| | | | +-- -RW- Opaque moduleRampSpeedCurrent(7)
| | | | | Textual Convention: Float
| | | | | Size:
| | | | +-- -R-- BitString moduleStatus(8)
| | | | | Values: moduleIsFineAdjustment(0), moduleIsLiveInsertion(2), moduleNeedService(4),
| | | | | moduleHardwareLimitVoltageIsGood(5), moduleIsInputError(6), moduleIsNoSumError(8),
| | | | | moduleIsNoRamp(9), moduleSafetyLoopsIsGood(10), moduleIsEventActive(11), moduleIsGood(12),
| | | | | moduleSupplyIsGood(13), moduleTemperatureIsGood(14), moduleIsKillEnable(15)
| | | | +-- -R-- BitString moduleEventStatus(9)
| | | | | Values: moduleEventPowerFail(0), moduleEventLiveInsertion(2), moduleEventService(4),
| | | | | moduleHardwareLimitVoltageNotGood(5), moduleEventInputError(6),
| | | | | moduleEventSafetyLoopNotGood(10), moduleEventSupplyNotGood(13),
| | | | | moduleEventTemperatureNotGood(14)
| | | | +-- -R-- BitString moduleEventChannelStatus(10)
| | | | +-- -RW- EnumVal moduleDoClear(11)
| | | | | Values: nothing(0), doClear(1)
| | | | +--moduleAuxiliaryMeasurementTemperature(12)
| | | | | +-- -R-- Opaque moduleAuxiliaryMeasurementTemperature0(1)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -R-- Opaque moduleAuxiliaryMeasurementTemperature1(2)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -R-- Opaque moduleAuxiliaryMeasurementTemperature2(3)
| | | | | | Textual Convention: Float
| | | | | | Size:
| | | | | +-- -R-- Opaque moduleAuxiliaryMeasurementTemperature3(4)
| | | | | | Textual Convention: Float
| | | | | | Size:
| |
| | +--sensor(4)

```

```

| +-- -R-- Integer32 sensorNumber(1)
| |   Range: 0..8
| |
| +--sensorTable(2)
| |
| | +--sensorEntry(1)
| | |   Index: sensorIndex
| | |
| | | +-- ---- EnumVal  sensorIndex(1)
| | | |   Values: temp1(1), temp2(2), temp3(3), temp4(4), temp5(5), temp6(6), temp7(7), temp8(8)
| | | +-- -R-- Integer32 sensorTemperature(2)
| | | |   Range: -128..127
| | | +-- -RW- Integer32 sensorWarningThreshold(3)
| | | |   Range: 0..127
| | | +-- -RW- Integer32 sensorFailureThreshold(4)
| | | |   Range: 0..127
| | | +-- -RW- Integer32 sensorAlarmThreshold(6)
| | | |   Range: 0..127
| | | +-- -RW- String  sensorName(7)
| | | |   Textual Convention: DisplayString
| | | |   Size: 1..7
| | | +-- -RW- String  sensorID(8)
| | | |   Size: 8
| | | +-- -R-- Integer32 sensorStatus(9)
| |
| +--communication(5)
| | +--snmp(1)
| | |
| | | +--snmpCommunityTable(1)
| | | |
| | | | +--snmpCommunityEntry(1)
| | | | |   Index: snmpAccessRight
| | | | |
| | | | | +-- ---- EnumVal  snmpAccessRight(1)
| | | | | |   Values: public(1), private(2), admin(3), guru(4)
| | | | | +-- -RW- String  snmpCommunityName(2)
| | | | | |   Size: 0..14
| | | |
| | | +-- -RW- Integer32 snmpPort(2)
| | | +-- -RW- String  firmwareUpdate(10)
| | | |   Size: 0..30
| | | +-- -R-- IpAddr  ipDynamicAddress(11)
| | | +-- -RW- IpAddr  ipStaticAddress(12)
| | | +-- -RW- String  macAddress(13)
| | | |   Size: 6
| | |
| | +--can(2)
| | | +-- -RW- Integer32 canBitRate(1)
| | | +-- -R-- String  canReceive(2)
| | | |   Size: 14
| | | +-- -RW- String  canTransmit(3)
| | | |   Size: 14
| | | +-- -R-- String  canReceiveHv(4)
| | | |   Size: 14
| | | +-- -RW- String  canTransmitHv(5)
| | | |   Size: 14
| |
| +--powersupply(6)
| | +-- -R-- String  psSerialNumber(2)
| | |   Textual Convention: DisplayString
| | |   Size: 0..255
| | +-- -RW- Integer32 psOperatingTime(3)
| | +-- -R-- Integer32 psAuxiliaryNumber(4)
| | |   Range: 0..8

```



```

| |
| +--psAuxiliaryTable(5)
| | |
| | | +--psAuxiliaryEntry(1)
| | | | Index: psAuxiliaryIndex
| | | |
| | | | +-- ---- EnumVal psAuxiliaryIndex(1)
| | | | | Values: u0(1), u1(2), u2(3), u3(4), u4(5), u5(6), u6(7), u7(8)
| | | | +-- -R-- Opaque psAuxiliaryMeasurementVoltage(3)
| | | | | Textual Convention: Float
| | | | | Size:
| | | | +-- -R-- Opaque psAuxiliaryMeasurementCurrent(4)
| | | | | Textual Convention: Float
| | | | | Size:
| | |
| +-- -RW- String psDirectAccess(1024)
| | Size: 1..14
|
+--fantray(7)
| +-- -RW- String fanSerialNumber(2)
| | Textual Convention: DisplayString
| | Size: 0..14
| +-- -RW- Integer32 fanOperatingTime(3)
| +-- -R-- Integer32 fanAirTemperature(4)
| +-- -RW- Integer32 fanSwitchOffDelay(5)
| | Range: 0..900
| +-- -RW- Integer32 fanNominalSpeed(6)
| +-- -RW- Integer32 fanNumberOfFans(7)
| | Range: 0..12
|
+--fanSpeedTable(8)
| |
| | +--fanSpeedEntry(1)
| | | Index: fanNumber
| | |
| | | +-- ---- Integer32 fanNumber(1)
| | | | Range: 1..12
| | | +-- -R-- Integer32 fanSpeed(2)
| |
| +-- -RW- INTEGER fanMaxSpeed(9)
| +-- -RW- INTEGER fanMinSpeed(10)
| +-- -RW- Integer32 fanConfigMaxSpeed(11)
| +-- -RW- Integer32 fanConfigMinSpeed(12)
|
+--rack(8)
+--signal(9)
| +-- -R-- Integer32 numberOfAnalogInputs(1)
| | Range: 0..8
|
+--analogInputTable(2)
| |
| | +--analogInputEntry(1)
| | | Index: analogInputIndex
| | |
| | | +-- ---- Integer32 analogInputIndex(1)
| | | | Range: 1..8
| | | +-- -R-- Opaque analogMeasurementVoltage(2)
| | | | Textual Convention: Float
| | | | Size:
| | | +-- -R-- Opaque analogMeasurementCurrent(3)
| | | | Textual Convention: Float
| | | | Size:
| |
| +-- -R-- BitString digitalInput(5)

```

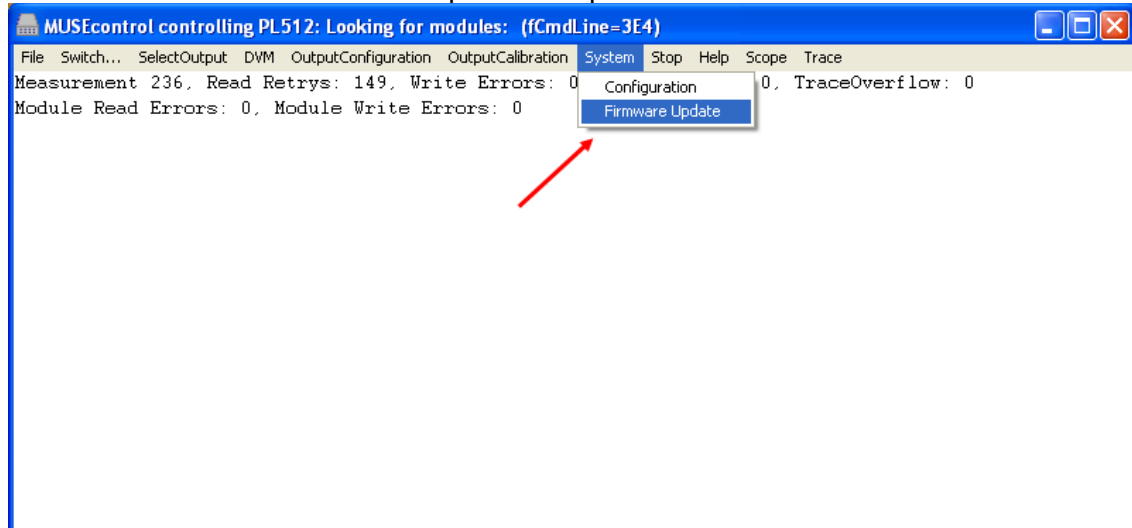
```
| Values: d0(0), d1(1), d2(2), d3(3), d4(4), d5(5), d6(6), d7(7)
+-- -R-- BitString digitalOutput(6)
      Values: d0(0), d1(1), d2(2), d3(3), d4(4), d5(5), d6(6), d7(7)
```

9 MPOD Firmware Update

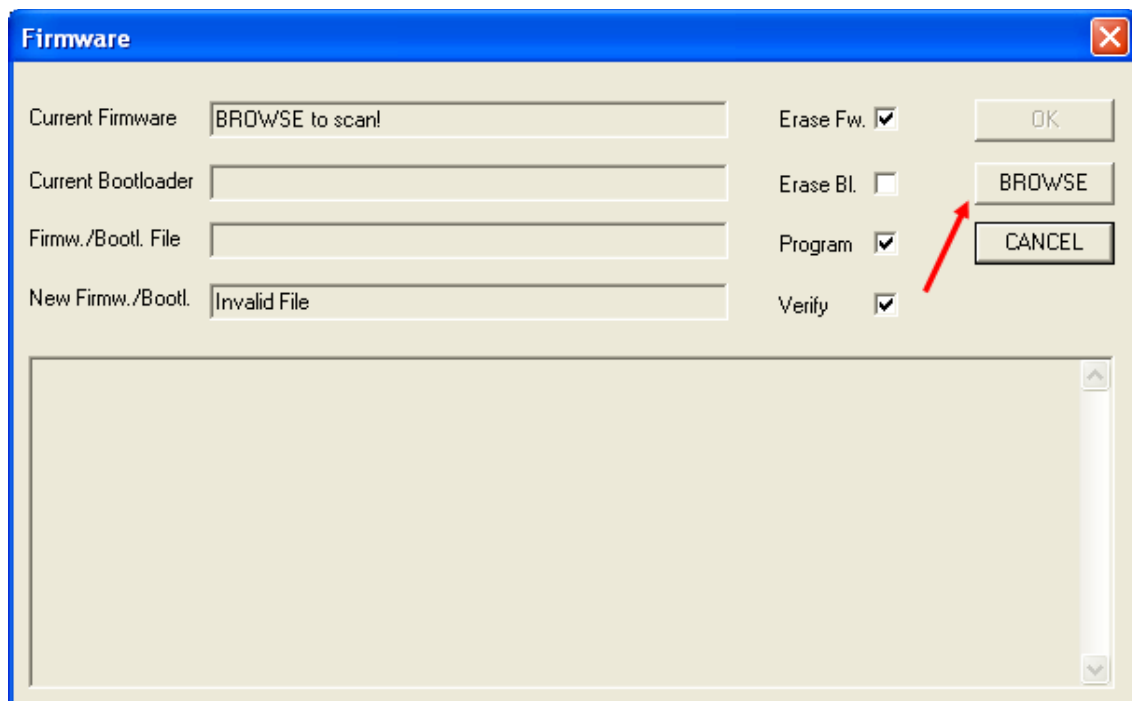
(for Bootloader from revision 1.5 and Firmware from revision 2.*.0.15)

1) You need the MUSEcontrol program form revision 2.0.910.0. You can download it from the wiener web site "www.wiener-d.com" or via the direct link "<http://www.wienerd.com/Support/MUSEcontrol/MUSEcontrolInstall-2.0.910.0.exe>".

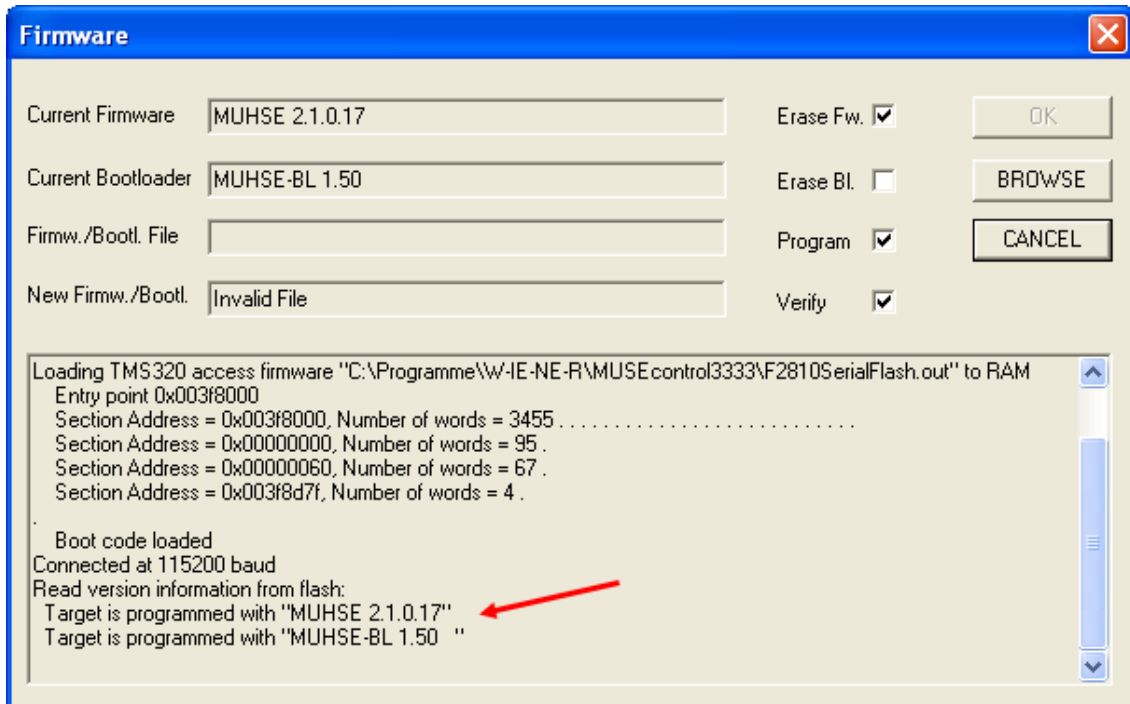
Start the MUSEcontrol program and select the tab "system". In the opened pull down menu select the item "Firmware Update" to update the device via USB.



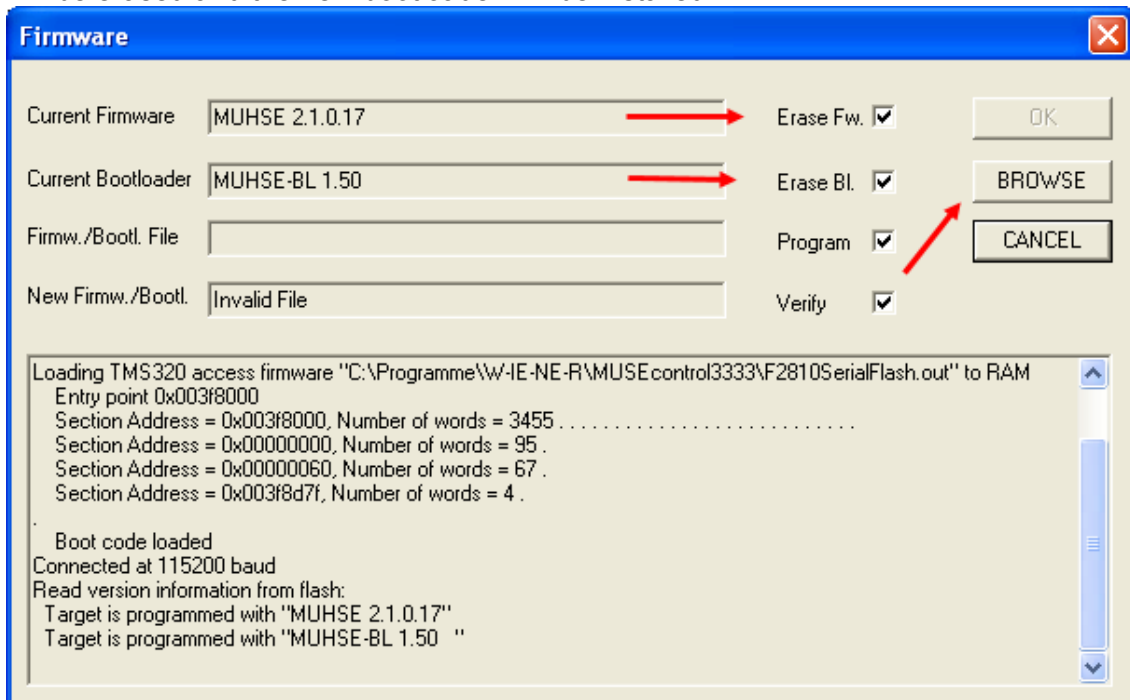
2) Hit the button "browse" to scan the device for current version of bootloader and firmware.



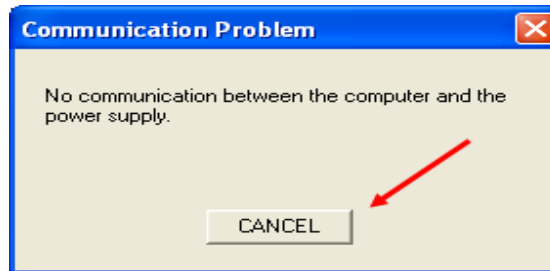
3) Check the version of the current firmware or bootloader. There are three options:



Option 1) Check “Erase Fw.” (erase firmware) and “Erase Bl.” (erase bootloader) if the current firmware is older than 2.*.0.15 or it is a firmware without bootloader. After that push the button “browse” to scan the flash. In some minutes select the new bootloader file in the automatically opened file menu. Press the button “Ok”. Now the whole flash will be erased and the new bootloader will be installed.



When the install process is done hit the button “cancel” to restart the system. It is recommended to close the MUSEcontrol program before restarting. A window which indicates a communication problem appears. The reason for this is that only the bootloader without firmware is installed. Ignore this message by pushing the button “cancel”.

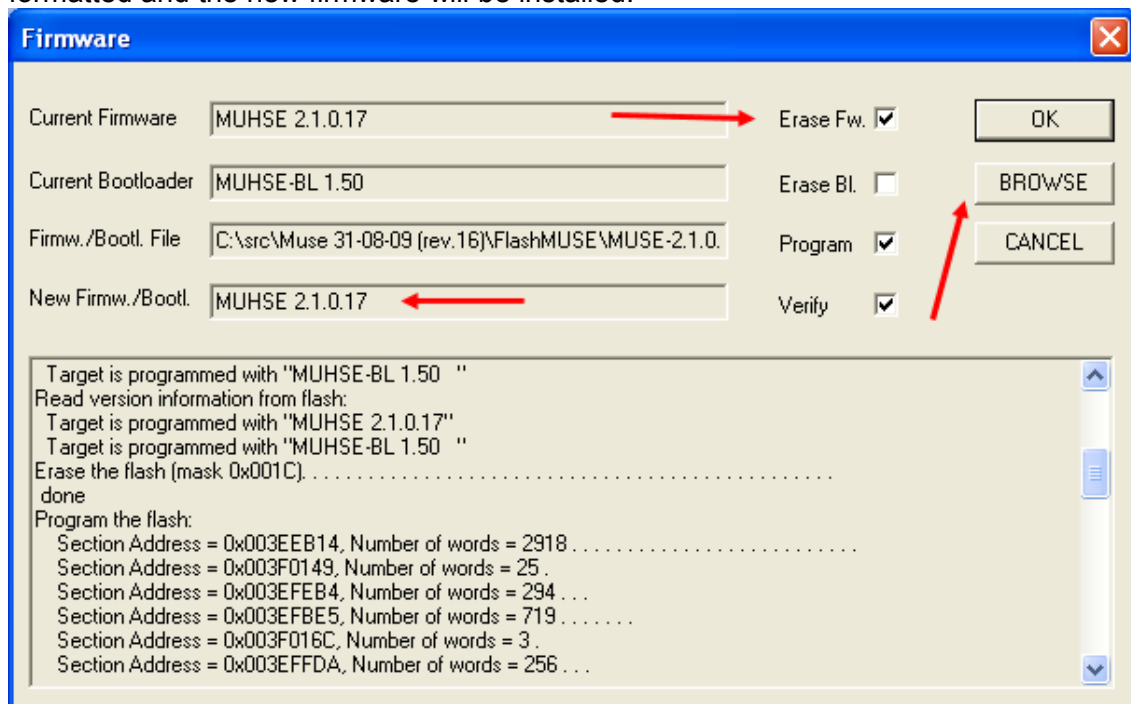


Also ignore the no modules message to hit the button "Ignorieren".



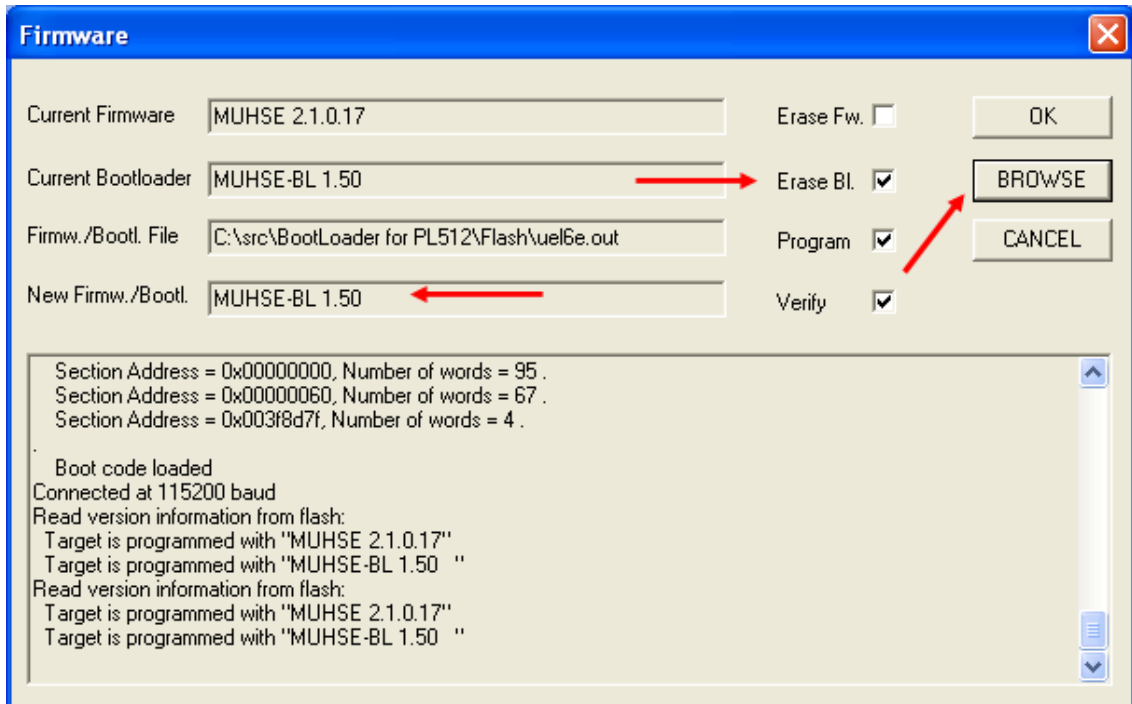
Follow the step 1 and 2. Execute the instructions of option 2.

Option 2) Check "Erase Fw." (erase firmware) if there no current, legal firmware is available or a newer one should be installed. After that push the button "browse" to scan the flash. In some minutes select the new firmware file in the automatically opened file menu. Press the button "Ok". Now the firmware partition in the flash will be formatted and the new firmware will be installed.



When the install process is done hit the button "cancel" to restart the system. It is recommended to close the MUSEcontrol program before restarting.

Option 3) Check "Erase Bl." (erase bootloader) if there an older bootloader (from version 1.5) and a newer one should be installed. If no bootloader is available chose option 1. After that push the button "browse" to scan the flash. In some minutes select the new bootloader file in the automatically opened file menu. Press the button "Ok". Now the bootloader partition in the flash will be formatted and the new bootloader will be installed.



When the install process is done hit the button “cancel” to restart the system. It is recommended to close the MUSEcontrol program before restarting.

10 HV Modules Firmware Update

You need the program **iseg SNMP Multiple Flash** in order to execute a firmware update for the iseg HV modules. Input the first and the last IP address and push the Connect button. Now, the program locate the number of modules per MPOD IP address. After a time period of approximately 10 seconds for the module detection you must select the firmware update file. In this case the file

The screenshot shows the 'iseg SNMP Multiple Flash' application window. At the top, there are input fields for 'First IP Address' (192.168.17.104) and 'Last IP Address' (192.168.17.129), with 'Connect' and 'Disconnect' buttons. Below these is a file path: 'I:/PRODDATA/TOOLS/isegCANHVControl/HEX/E24D1_519.hex' and a 'Select' button. The main area is a table with 26 rows, each representing a module. The table has columns for 'IP Address', 'Module', 'Progress', and 'Stop'. The 'Progress' column shows a green bar and a percentage. The 'Stop' column has a 'Stop' button for each row. At the bottom left, there is a 'Flash' button.

	IP Address	Module	Progress	Stop
1	192.168.17.104	Comparing 3 of 10	10%	Stop
2	192.168.17.105	Comparing 3 of 10	16%	Stop
3	192.168.17.106	Flashing 3 of 10	97%	Stop
4	192.168.17.107	Connecting...		Stop
5	192.168.17.108	Flashing 3 of 10	95%	Stop
6	192.168.17.109	Comparing 3 of 10	11%	Stop
7	192.168.17.110	Flashing 3 of 10	98%	Stop
8	192.168.17.111	Connecting...		Stop
9	192.168.17.112	Connecting...		Stop
10	192.168.17.113	Comparing 2 of 10	96%	Stop
11	192.168.17.114	Connecting...		Stop
12	192.168.17.115	Flashing 3 of 10	99%	Stop
13	192.168.17.116	Comparing 2 of 10	29%	Stop
14	192.168.17.117	Comparing 3 of 10	4%	Stop
15	192.168.17.118	Flashing 3 of 10	95%	Stop
16	192.168.17.119	Flashing 3 of 10	96%	Stop
17	192.168.17.120	Connecting...		Stop
18	192.168.17.121	Flashing 3 of 10	93%	Stop
19	192.168.17.122	Comparing 2 of 10	82%	Stop
20	192.168.17.123	Postflash 2 of 10	100%	Stop
21	192.168.17.124	Flashing 4 of 10	4%	Stop
22	192.168.17.125	Flashing 4 of 10	4%	Stop
23	192.168.17.126	Flashing 4 of 10	4%	Stop
24	192.168.17.127	Flashing 4 of 10	5%	Stop
25	192.168.17.128	Flashing 4 of 10	4%	Stop
26	192.168.17.129	Flashing 4 of 10	4%	Stop

name is E24D1_519.hex.

The firmware update process will be started by pushing the Flash button. Please calculate an update time period of approximately of 30 minutes.