MHV-4

Datasheet V1.3

4 channel, 400 V
detector bias supply

The mesytec MHV-4 is a modern 4-channel high precision bias supply unit for detector bias voltages up to 400 V. It is designed to supply highly stable bias voltage for all types of silicon detectors. The output current is limited to 20uA.
Several features are added to allow an easy survey of experiments with a large number of high voltage channels. The standard problem with silicon detectors is the rising current which occurs in beamtime with increasing damage in the crystal lattice. The MHV provides adjustable current warning thresholds for the individual channels. When the current goes beyond this threshold the voltage is not shut down (this would interrupt the experiment) but an acoustical and optical warning is emitted. The device can be remote controled by RS232, by analog voltages and by mesytec event bus.

Features:

- 4 large and bright LED displays allow simultaneous survey of all currents or voltages
- Full 4 digit display
- Output connectors: SHV or BNC
- Current display resolution 1nA
- Adjustable current warning threshold for each channel. Acoustical and optical current warning.
- Individual polarity select for each channel at the rear side.
- Remote control: by external voltage and RS232 serial interface. Optional: via mesytec event bus with MRC-1.
- Noise on high voltage < 1mV at 200V
- Only ±6 V power supply needed

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Technical Data:

Power consumption

- +6V +700mA
- -6V -70mA
- due to low power consumption cooling fans are not necessary

Voltage Output

- Voltage range: 0 … +/-100 V or 0 … +/-400V (selectable with front switch)
- High quality five turn potentiometer for voltage adjust
- Typical noise N < 1mV (200V, 5Hz to 100MHz)
- Voltage stability: typ 0.015%/^{0}C
- Calibration precision ±0.25%
- Output current max. 20uA per channel, limited
- Slow voltage ramp up and down of 5s to protect preamplifiers.
- Slow ramp up after power failure

Display

- Full 4 digit display
- Current display has 1 nA resolution (0.000uA) to 20.00 uA
- Voltage display:
  400V range 0.0 to 400.0V (0.2V steps)
  100V range 0.0 to 100.0V

Current warning

- Individual warning thresholds adjustable from 10 nA to 20 uA
- thresholds are displayed when pressing the display switch
- when a current exceeds the current warning threshold, an acoustical warning is emitted and the power on LED of the respective channel starts blinking

Connector pinout for remote control:

SubD-9 connector, female:

RS232, standard cable can be used:

TXD (Module Data output)	pin 2
RXD (module data output)	pin 3
ground	pin 5

Analog voltage control:
ext1,ext2,ext3,ext4 (channel 1 to 4):
pin 6..9
Pins1 and 4 not connected.

Remote control with external voltage:

- Remote mode is set when one of the input voltages (ext1... ext4) gets positive.
- Input voltage range: 0 to 4.0 V
- Input resistance: 1kOhm
- 4V corresponds to the maximum voltage which is selected by the range switch (100 or 400V)

Remote control with RS232:

- Can be remote controlled via standard ASCII terminal program.
- Baud rate: 9.600 Bd
- Data Format: 8N1 (8 bit, no parity, 1 stoppbit), input characters are echoed
- Command set:
  `n` = channel number (1…4),
  `<cr>` = carriage return

  `Un<cr>:` read voltage of channel `n`
  e.g.: `U1<cr>` returns:
  `0831<cr>`, which means:
  channel 1 voltage is 83.1 V.

  `In<cr>`: read current of channel `n`

  `Ln<cr>`: read limit of channel `n`

  `Sn xxxx<cr>`:
  set remote control voltage register for channel `i`
  e.g.: `S1 0800<cr>` is:
  "set channel 1 remote control voltage to 80.0 V"

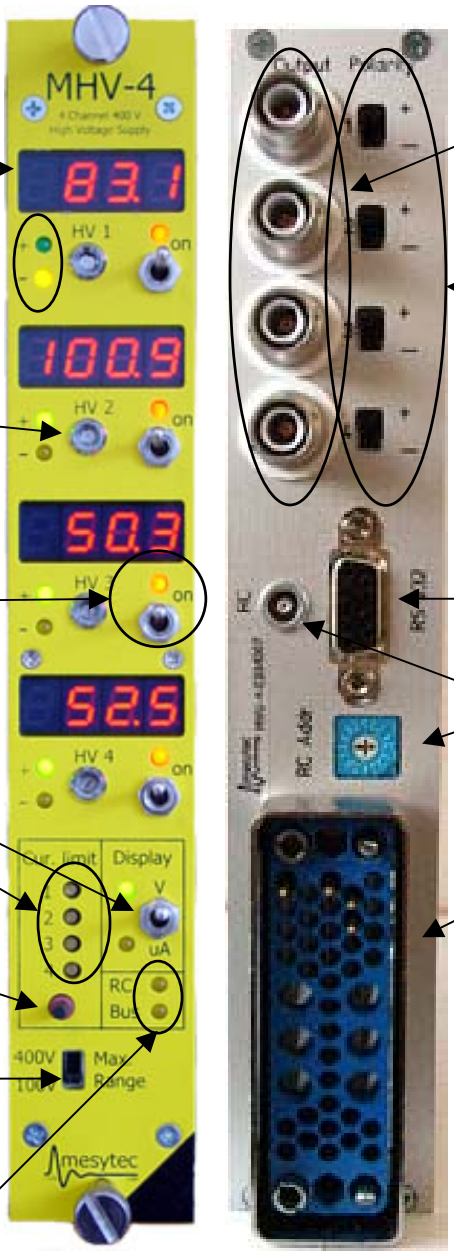
  `Rn<cr>`: read remote control voltage register for channel `n`

  `C1<cr>`: switch remote control on
  voltages are set according to the remote control voltage registers

  `C0<cr>`: switch remote control off
  voltages are set according to front panel potentiometers or to external voltages, if applied.

  `ONn<cr>:` switch channel n on
  `OFFn<cr>:` switch channel n off
  Serial on/off is overridden by frontpanel switches for security reasons: if frontpanel is off, `ONn` will have no effect.

MHV-4: Front and rear panels



4 digit voltage / current display

Polarity indicator

5 turn voltage adjust

Main switch, status indicator

Display selector switch / Indicator V / uA

Current warning limit adjust

Limits are displayed, when display selector knob is pressed.

Voltage range selector: 400V / 100V max. range

Remote control indicator (blinking when RC on)
Bus indicator (flashing when receiving valid command)

Voltage output connectors (BNC or SHV)

Polarity select switches

Remote control connector (SubD-9)

Eventbus Lemo-connector
Eventbus address.

NIM crate connector

Remote Control via MRC-1 and Event Bus

As an option MHV-4 can also be remote controlled via the mesytec serial Event Bus using the rc master module MRC-1.
This enables setting up larger systems, also combining different modules (such as the 16 channel shaper STM-16), all being accessed from one command interface. The data for all connected modules can be stored in the MRC-1. After power failure or when the reset pushbutton is pressed it automaticly reinitializes all devices with the stored values.

All MHV-4 parameters that are accessible for remote control are represented in a memory range that can be read and/or written by MRC-1 commands. Read and write areas (that can be taken as presets and measured values) are separated as listed below:

Memory List MHV-4:

	Address		
Value	**Write**	**Read**	**Comment**
Voltage 1	0	32	signed integer value (sign bit 15)
Voltage 2	1	33	0…1000 = 0V…100.0 V or
Voltage 3	2	34	0…4000 = 0V…400.0 V
Voltage 4	3	35	
On/Off 1	4	36	Switch channel on/off or read status.
On/Off 2	5	37	1 = on, 0 = off
On/Off 3	6	38	rx switch is overridden by a hardware
On/Off 4	7	39	switch at "off" for security reasons
CurLim 1	8	40	Current warning limits for channels
CurLim 2	9	41	(in multiple of 10 nA)
CurLim 3	10	42	
CurLim 4	11	43	e.g.: 1000 = 10µA If set to 0: panel poti value is used
RC on/off		44	Remote control on/off
Range	-	45	Max. Voltage range: 1 = 400 V, 0 = 100 V Can only be set by hardware switch for security reasons.
Current 1	-	50	Currents for channels (in nA)
Current 2	-	51	
Current 3	-	52	e.g.: 1000 = 1µA
Current 4	-	53	

The memory positions can be written with SE command and can be read with RE command.
For very safe operation a mirror page is available. It can be written with SM and read with RM and copied to the active page with CP.

The commands RST sets all values to 0.

The ON/OFF command makes the remote control active or inactive. The power up default is inactive. While inactive the manual values from the front panel elements are set.

Identification code for MHV-4 (detected when running the scan bus command "SC") is IDC = 17

Example:

reset all channels of MHV-4 module ID 7 on bus 0 to value 0:
RST 0 7

to set the channel 3 of module with ID 7 on bus 0 to 100.0V and switch the channel on, type:
SE 0 7 2 1000 //set voltage of channel 3 = address 2
SE 0 7 6 1 // set voltage on for channel 3 = address 6

activate remote control
ON 0 7

Command Summary:

data formats:
bus = bus number [0...1]
dev = device number [0...15]
adr = parameter number [0...31]
val = See memory list page 4

Mnemonic	Description
SC *bus*	returns id code: IDC=17
ON bus dev	activate RC
OFF bus dev	deactivate RC
RST bus dev	sets all voltages to 0V
SE *bus dev adr val*	set value to module
RE *bus dev adr*	read value from module
SM *bus dev adr val*	set mirror parameter
RM *bus dev adr*	read mirror cell
CP *bus dev*	copy mirror to active memory