USER'S MANUAL FOR HV POWER SUPPLY TYPE HVS1

INTRODUCTION:

After the power supply start display shows program version and address for comunication. After initialisation display shows measured values of voltages and currents and all outputs are in the off state. There is possible to restore last state which was set before the power suspply was switched off last time. Restore is done by main menu command „Restore last state".

Control of power supply is done by menu and control buttons on the panel of control unit. By pushing ESC button is dispalyed main menu in the down part of the display. By cursor buttons the menu function can be selected and then confirmed by pushing ENTER button. Generally the cursor buttons (up, down) are used for selection of the command, ENTER button confirms the selection and ESC button is for return to the main menu without any other action.

Indication LEDs on the channel cards display preselected voltage level of the output. In case the green lights are binking the undercurrent protection is disabled and is not functional. Blinking of red light means that voltage on the output which is off is higher than 60V

- Output voltage setup:

Select in the menu „Select channel", then confirm by ENTER. By cursor button select channel number which shoud be steered. Confirm by ENTER. Now is possible to select the on/off or range of selected output. Then confirm the selection by ENTER.

- Switch off all channels / SHUTDOWN

By pushing HVOFF button on front panel , all channels are switched off immediately.

- Restore of the last state of the outputs:

Using cursor buttons select „Restore Last State" in the main menu. Then confirm it by ENTER. This command switches on all channels which have been switched off by HVOFF button , by interlock, under or overcurrent protection. Command will not restore the channels which have been switched off by menu commands during off state.

- Setup of communication address

Select *Bus Setup*, then confirm it by ENTER. By cursor buttons select the address in range 0 to 15 . Confirm by ENTER.

- Setup of remote control terminal characters CR,LF

Select *Bus Setup*, and confirm it by ENTER. Select function *CR / LF setup* and confirm by ENTER. By cursor buttons select required combination of CR/LF characters and confirm by ENTER.

- Remote control disable
Stisknout tlačítko MENU. Zvolit položku *Bus Setup*, potvrdit tlačítkem ENTER. Vybrat funkci *Remote Disable* a potvrdit tlačítkem ENTER. Zákaz dálkového ovládání je indikován červenou svítivou diodou na panelu řídící jednotky. V tomto režimu nelze zdroj ovládat pomocí dálkového ovládání lze pouze číst údaje. Ve stavovém slově je k dispozici informace o zákazu dálkového ovládání.

- Remote control enable/disable

For some work can be useful to have the possibility to disable the remote control. So push MENU button. Then select *Bus Setup* and confirm it by ENTER. Select function *Remote Enable* and confirm it by ENTER. Remote control disable is indicated by red LED below the buttons.

- Switching on / off of the undercurrent protection:

Using cursor buttons select *Global settings* in the main menu, and confirm it by ENTER. Then select *Undercurrent* and confirm by ENTER. Select *Enabled or Disabled*, to have the undercurrent protection functional or not. In case the undercurrent protection does not work the green LEDs on channel cards are blinking.

- Setup of voltage tolerances

Push MENU button. Select *Global settings*, and confirm it by ENTER. Select *Lower/Upper limits* and confirm it by ENTER. By cursor buttons then select the voltage thresholds and confirm it by ENTER. Then is possible to set next voltage threshold. Values can be in range 700 to 900V. Threshold levels are working for all channels of power supply which are set to proper range. In case the voltage is out of thresholds the value of the voltage on the display starts to blink and small arrow is displayed after last voltage value character. In case the arrow direction is up, it means over threshold (overvoltage) and vice versa.

Menu overview :

1.- Main MENU

MAIN MENU	Select Channel
-----------------	Restore Last State
Select	Bus Setup
Comand:	Global Settings

- restores last state of all outputs

1.1 - Channel number selection

Select channel number :	Channel number : 1

1.1.1 - Setup of output voltage.

CHANNEL :1	Output 830V
-----------------	Output 950V
Set Output	High Voltage ON
Voltage	High Voltage OFF

1.2 - Restore of the last state

1.3 - Setup of communication parameters

BUS SETUP	BUS Address
-----------------	CR / LF setup
Set Remote	Remote Disable

- address of power supply on the RS422 bus

Control:	Remote Enable

1.3.1 – Address setup

Seting adress for RS422	BUS Address: `1`

1.3.2 – Terminal characters setup CR,LF

CR / LF SETUP	CR
	LF
	CR / LF
	LF / CR

1.4 – Global settings

GLOBAL SETTINGS Select Command:	Undercurrent	- Switches on and off the unercurrent protection
	Lower/Upper limits	- Setups the voltage thresholds

1.4.1 – Undercurrent setup

UNDER CURRENT Protection ON / OFF	`ENABLED`	- Undercurrent protection will work
	DISABLED	- Undercurrent protection will not work

1.4.2 - Nastavení tolerančních mezí

Settings Output Voltage Range	Low limit 830V: `825`	- Low threshold for the range 830V
	High limit 830V: 835	- High threshold for the range 830V
	Low limit 950V: 945	- Low threshold for the range 950V
	High limit 950V: 955	- High threshold for the range 950V

List of error messages

```
NO CHANNEL CARDS !
```

Warning message in case that no one channel card does not communicate with control unit and next control is impossible.

```
WARNING !!!
------------------
At Least one
channel  without
response
```

Warning message that minimally one channel card does not communicate with control unit (only after reset)

```
ERROR !!!
---------------
HV Power supply
failure
```

Error message that power supply has some failure . In this case is not possible to control anything.

```
INTERLOCK OFF !
-------------------------
Check interlock
loop or turn on
Bypass switch
```

Interlock current loop is broken.

Communication via RS422

Transfer speed 9600bd.

Control commands:

-Set 830V:

│ **@** │ adr1 │ adr2 │ **L** │ **V** │ **L** │ **1** │ csum │ **CR** │ **LF** │

```
│   │    │    │                │
│   │    │    │                •——— chksum
│   │    │    •————————————————————— command
│   │    •——————————————————— channel address
│   •———————————————— crate address
•————————————— command
```
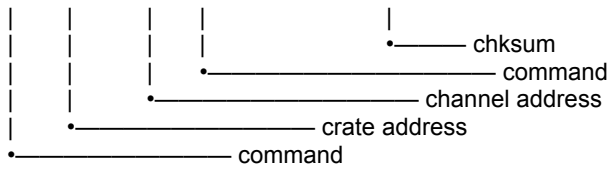
-Set 950V:

│ **@** │ adr1 │ adr2 │ **L** │ **V** │ **L** │ **2** │ csum │ **CR** │ **LF** │

```
│   │    │    │                │
│   │    │    │                •——— chksum
│   │    │    •————————————————————— command
│   │    •——————————————————— channel address
│   •———————————————— crate address
•————————————— command
```
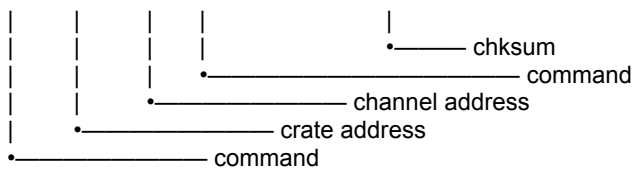
- Channel off:

│ **@** │ adr1 │ adr2 │ **O** │ **F** │ **F** │   │ csum │ **CR** │ **LF** │

```
│   │    │    │                │
│   │    │    │                •——— chksum
│   │    │    •————————————————————— command
│   │    •——————————————————— channel address
│   •———————————————— crate address
•————————————— command
```
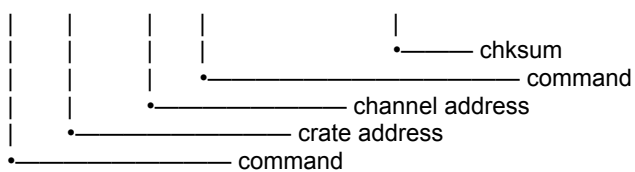
- Channel on:

│ **@** │ adr1 │ adr2 │ **O** │ **N** │   │   │ csum │ **CR** │ **LF** │

```
│   │    │    │                │
│   │    │    │                •——— chksum
│   │    │    •————————————————————— command
│   │    •——————————————————— channel address
│   •———————————————— crate address
•————————————— command
```
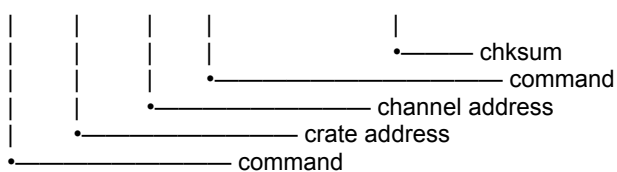
- Local: přepne crate do místního ovládání

│ **@** │ adr1 │ **L** │ **O** │ **C** │ **A** │ **L** │ csum │ **CR** │ **LF** │

```
|   |   |                     |
|   |   |                     •——— chksum
|   |   •————————————————— command
|   |
|   •————————————— crate address
•——————————— command
```
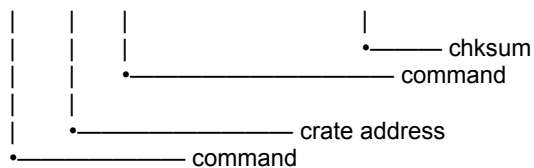

- Remote: switches crate to remote control

│ **@** │ adr1 │ **R** │ **E** │ **M** │ **O** │ **T** │ csum │ **CR** │ **LF** │

```
|   |   |                     |
|   |   |                     •——— chksum
|   |   •————————————————— command
|   |
|   •————————————— crate address
•——————————— command
```
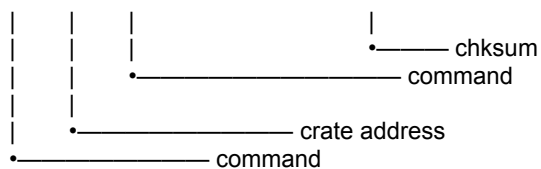

- Set limit: nastaví toleranční pole pro danou hladinu

│ **@** │adr1│**L**│**I**│**M**│**I**│**T**│n│A1│A2│A3│A4│B1│B2│B3│B4│csum│**CR**│**LF**│

```
|   |   |         | |           |           • chksum
|   |   |         | |           •— top margin
|   |   |         | •————————————— bottom margin
|   |   |         •——————————— level number
|   |   •————————————————————————— command
|   •——————————————————————— crate address
•————————————— command
```
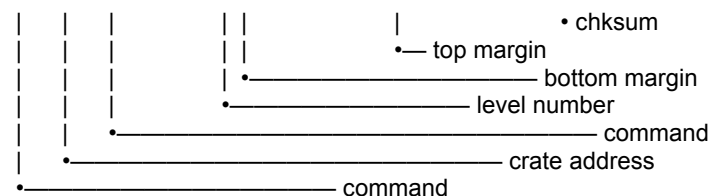
n – number of level for which the margins are set
  1 - 830V
  2 - 950V

bottom margin - 4 digits with minimum voltage (must be written also leading zeros 0825)

top margin - 4 digits with maximum voltage (must be written also leading zeros 0835)

- Read: reads voltage on the channel output

```
| @ | adr1 | adr2 | R | E | A | D | csum | CR | LF |
  |    |      |     |                  |
  |    |      |     |                  •———————— chksum
  |    |      |     •———————————————————————— command
  |    |      •———————————————————————— channel address
  |    •———————————————— crate address
  •———————————— command
```
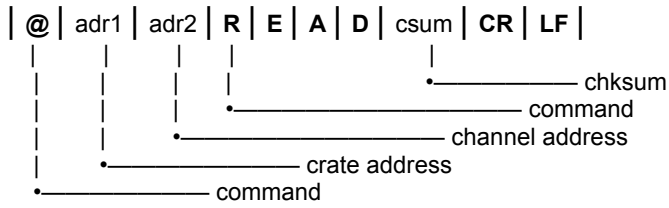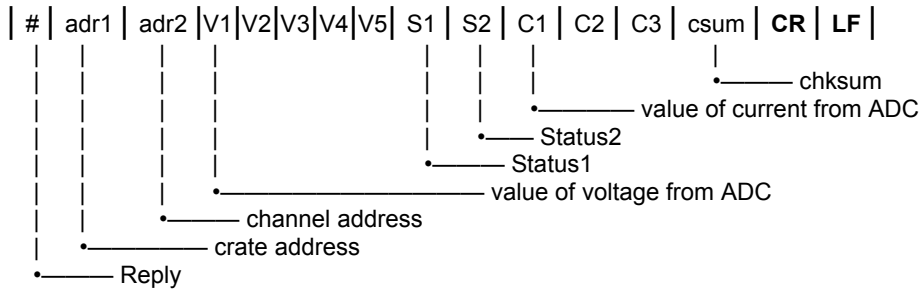
- Response: confirmation of command (READ, Set 830V, Set 950V, Channel ON, Channel OFF)

```
| # | adr1 | adr2 |V1|V2|V3|V4|V5| S1 | S2 | C1 | C2 | C3 | csum | CR | LF |
  |    |      |    |              |    |    |              |
  |    |      |    |              |    |    |              •——— chksum
  |    |      |    |              |    |    •——————— value of current from ADC
  |    |      |    |              |    •——— Status2
  |    |      |    |              •——— Status1
  |    |      |    •——————————————— value of voltage from ADC
  |    |      •——— channel address
  |    •——— crate address
  •——— Reply
```

V1 -   bit0   - MSBit of voltage equivalent to 1000V
        bit1   - X
        bit2   - ADC overflow
        bit3   - voltage polaritz
V2 -   digit for 100V
V3 -   digit for 10V
V4 -   digit of 1V
V5 -   digit of 0.1V

Status1:
bit 0   - L = HV On / H = HV Off
bit 1   - output voltage L = 830V, H = 950V
bit 2   - L = HV On / H = HV Off – preseted value, nonconnected with active status
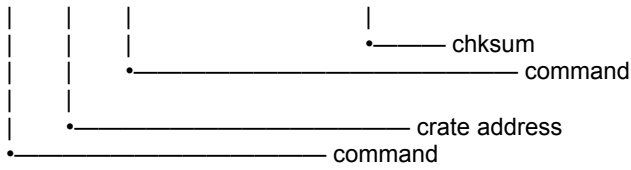bit 3   - H = channel error

Status2:
bit 0 - Under Tolerance limit
bit 1 - Over Tolerance limit
bit 2 - Undercurrent
bit 3 - Overcurrent

C1 -   digit of 10 mA.
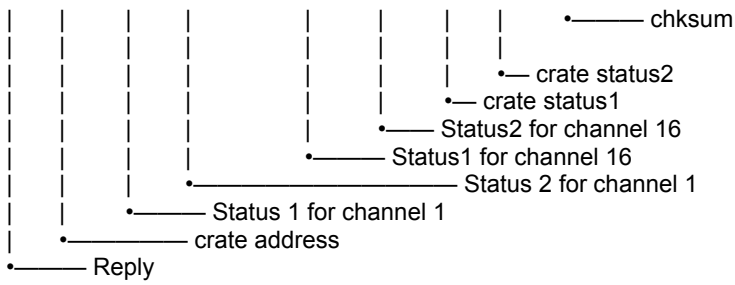C2 -   digit of 1 mA.
C3 -   digit of 0,1 mA.

#

- State: reads status of whole crate

│ @ │ adr1 │ S │ T │ A │ T │ E │ csum │ CR │ LF │

```
│    │    │                         │
│    │    │                         •───── chksum
│    │    •─────────────────────────────── command
│    │
│    •─────────────────────────────── crate address
•─────────────────────────────── command
```

- Response: confirms also reception of command (State, Set Limit, Local, Remote)

│ # │ adr1 │S1-1│S2-1│......│S1-16│S2-16│CS1│CS2│csum│**CR**│**LF**│

```
│   │    │    │    │         │     │     │   │     •───── chksum
│   │    │    │    │         │     │     │   │
│   │    │    │    │         │     │     │   •── crate status2
│   │    │    │    │         │     │     •── crate status1
│   │    │    │    │         │     •───── Status2 for channel 16
│   │    │    │    │         •─────── Status1 for channel 16
│   │    │    │    •───────────────────── Status 2 for channel 1
│   │    │    •─────── Status 1 for channel 1
│   │    •─────── crate address
│   •─────── Reply
```

Status1,Status2 are described above

crate status1:
bit 0 - H = Interlock OnLine
bit 1 - H = Interlock bypass on
bit 2 -
bit 3 - H = remote control disabled

crate status2:
bit 0 - H = System shutdown
bit 1 - H = Undercurrent protection disabled
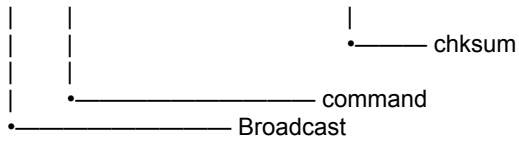bit 2 - H = Error in power unit

<u>Broadcast commands :</u>

This group of commands is without any response and real status must be then polled out.
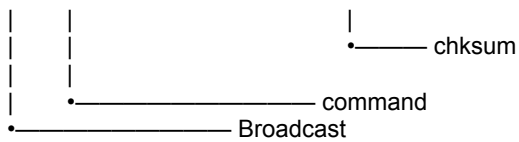

-Shutdown: Switches off all outputs

```
| * | S | D | O | W | N | * | csum | CR | LF |

        |   |                    |
        |   |                    •——— chksum
        |   |
        |   •——————————————— command
        •——————————————— Broadcast
```
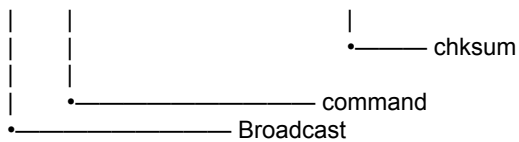

-Start: Returns to the previous state (before SDOWN)

```
| * | S | T | A | R | T | * | csum | CR | LF |

        |   |                    |
        |   |                    •——— chksum
        |   |
        |   •——————————————— command
        •——————————————— Broadcast
```


-Undercurrent On: Switches on undercurrent protection for all crates

```
| * | U | C | O | N | * | csum | CR | LF |

        |   |                    |
        |   |                    •——— chksum
        |   |
        |   •——————————————— command
        •——————————————— Broadcast
```
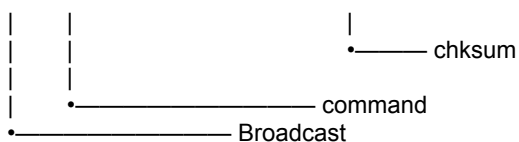

-Undercurrent Off: Switches off undercurrent protection for all crates

```
| * | U | C | O | F | F | * | csum | CR | LF |

        |   |                    |
        |   |                    •——— chksum
        |   |
        |   •——————————————— command
        •——————————————— Broadcast
```

Pinout of interface communication over RS422 with control computer:

```
 _____•              •_____•            •_____
          |8.9  +5V    10,11|  RS422-RS232 |7  GND     5 |
          |—————————————————|  Converter   |—————————————|
HV        |5   GND    14-25 |              |             |
SUPLY     |—————————————————|              |3   RXD    2 |  PC
          |1    A        8  |              |—————————————|
          |—————————————————|              |             |
          |2    B        9  |              |2   TXD    3 |
          |—————————————————|              |—————————————|
          |3    Y        3  |              |             |
          |—————————————————|              |             |
          |4    Z        4  |              |             |
          |—————————————————|              |             |
 —————————•9pol        25pol•—————————————•25pol    9pol •————
```

#