DETECTION SOLUTIONS

DATASHEET

MP-RS232

CPM Photoncounting Module with integrated RS232 PC Interface

Operating Instructions


```
SK0ACK
>SG0ACK
>SV0ACK
>SV1ACK
>GACK
480;2296;0;0;24.8
470;2296;0;0;24.8
459;2296;0;0;24.8
491;2300;0;0;24.8
481;2300;0;0;24.8
484;2296;0;0;24.8
468;2300;0;0;24.8
482;2300;0;0;24.8
>
```

Introduction

The Photon Counting Unit MPXXX-RS232 series is designed for applications in all fields of single photon detection, e.g. chemo-luminescence, bioluminescence, fluorescence, in vitro assay, environmental measurements or pure research.

It is an easy to use module, containing the Channel Photomultiplier, high voltage power supply, discrimination amplifier, pulse shaper for fast output pulses and a microcontroller unit for data transmission to the RS232 interface of a Personal Computer. All operating functions can be controlled by software commands. Free download demo software is available.

Features and Benefits

- Extremely low noise and highest detection sensitivity
- Cost saving by read out via RS232
- Plug and Play
- Uniquely gateable via electronic shutter
- High dynamic range
- Broad spectral sensitivity

Applications

- Fluoroscopy
- Luminescence
- Hygiene Monitoring
- Particle Sizing

Table of Contents

1. Functional Specification

1.1 Operating Conditions

Parameter	Remark	Min	Typ	Max	Unit
Supply voltage		5	5	5.5	volts dc
Input current	@ max. count rate			300	mA
Settling time	(time to stabilize HV after supply voltage applied)			1	sec
Warm-Up time	with High Voltage switched on)	5			minutes
Over-illumination protection:	active quenching control (internal)		5.5		Mega Counts/sec
Linear count rate:			5		Mega Counts/sec
Active Gate Control	via software command		active high		
GATE voltage V_{gate}					
	h to l set time Vca to Vch-ent +100 V		150		nano sec
	l to h set time Vca to Vch-ent - 100 V		150		nano sec
Maximum ratings					
Input voltage			+5.5		Volts dc
Operating temperature		5		40	°C
Storage temperature		-20		50	°C
Weight	depending on module format	350		450	g
Digital Functions					
Interface	RS232		57,600		bit/sec
Read out Intervalls		10		60000	msec
Output Count Rate				10	Mega Counts/sec
Dead Time	between two reading cycles			10	µsec

Table 1: Functional Specification

1.2 CPM Specification

- The MPRS232 modules can be equipped with all standard PKI CPM types. For individual data, please refer to the CPM Product catalogue or contact PerkinElmer Optoelectronics

1.3 Digital Functions:

- Serial Interface: RS-232, Transmission rate 57.600 bit /s
- Intervals of measurements: 10ms to 1min
- Installation of Read Out pause between two read-out cycles possible
- Max. Counting rate: 10 Mega counts/sec (Mcps, default setting: 5.5 Mcps)
- Setting of Gating-function via terminal program

- Measuring of CPM high voltage via a HV-monitor possible
- Online display of various measuring values:
  - Gating
  - High Voltage
  - Temperature

1.4 Measuring process:

- Overflow detection in counting mode (max. approx 16 Mio. within one Counting interval)
- Max. count rate: approx. 10Mega counts per second
- Dead time between two measuring cycles: approx. 10µsec (Recommendation: measuring time ≥1 sec)

2. Hardware /Software Requirements:

- Personal Computer with Windows™ 9X/2000/XP/VISTA/7 and serial interface (RS232)
- Terminal Program like HyperTerminal®, TeraTerm
- Connecting Cable Serial, 9-pol D-SUB male/female, (V24 – Extension Cable 1:1)
- 5.0 VDC Power Supply, 300mA

3. Definitions:

3.1 Gate:

In case of Gating, the following process happens:
A TTL high signal (internally or externally generated) at the “Gate” input of the High voltage power supply (hvps) triggers an hvps internal circuit which immediately switches cathode potential more positive than Channel Entrance Voltage so the cathode cannot emit photoelectrons into the channel vacuum.

The Gate function fulfils two purposes:

a) Over illumination protection
When accidentally too high light intensities enter the window of the ChannelPhotomultiplier, which would cause count rates, exceeding the maximum specified count rate, the “Gate” TTL pulse is generated internally (by the over illumination detection circuit)

b) Electronic shutter
If operator intends to use the gate function as an electronic shutter (e.g. to switch the cathode blind during illuminating the probe by excitation light) the TTL pulse is sent externally to the “Gate” input or generated via software command.

It can either be enabled (command: “SG “ or disabled, command “SG0”) or by striking keyboard key “g” which toogles between **enabled** and **disabled**

3.2 Kill:

In case of Kill – function is activated, the power supply switches to stand-by mode with main output voltage turning to 0 volts thus all related potentials turning to 0, too.
This mode may be useful for repair-, maintenance- or safety purposes.

It can either be enabled (command: “SK1“ or disabled, command “SK0”) or by striking keyboard key “k” which toogles between enabled and disabled

3.3 HighVoltage

High Voltage is the internal high voltage power supply.
The voltage output displayed on the screen is in Volts.
It can either be enabled (command: “SV1 “ or disabled, command: “SV0”)

3.4 Counting time

Counting time (msec) defines the period of time, the microcontroller accumulates the incoming photons. Default value is 1000msec. It can be changed by command (Set Time) “STxxx”, where xxx is between 10ms min. and 60000ms max..

3.5 Pause Time

Pause time (msec) defines the period of time between two measuring cycles.
Default value is 0ms.
During Pause time, no signals (counts) are read out.

3.6 Number of count intervals

Number of count intervals defines the number of read outs to be taken by the microcontroller.
Default value is 0 (infinite).
So duration of one measurement cycle is determined by counting time, Pause time and number of count intervals.

4. Set Up Conditions of Terminal Program

(e.g. Hyperterminal™, TeraTerm)

1. Select your communication Port
Please check if communication port either is COM1, COM2 or any other existing COM port.

The matching CPM port has to be configured as:

Baudrate	57600 (Bits per sec)
Databits	8
Parity :	No
Stopbits	1
Steam Control:	Hardware

If you run Hyperterminal for the first time, you may be asked to enter a name for the new connection.
Please select a distinct name like e.g. “CPMRSModule”. Any time you re-run this program, just double click the icon, you saved the configuration under.

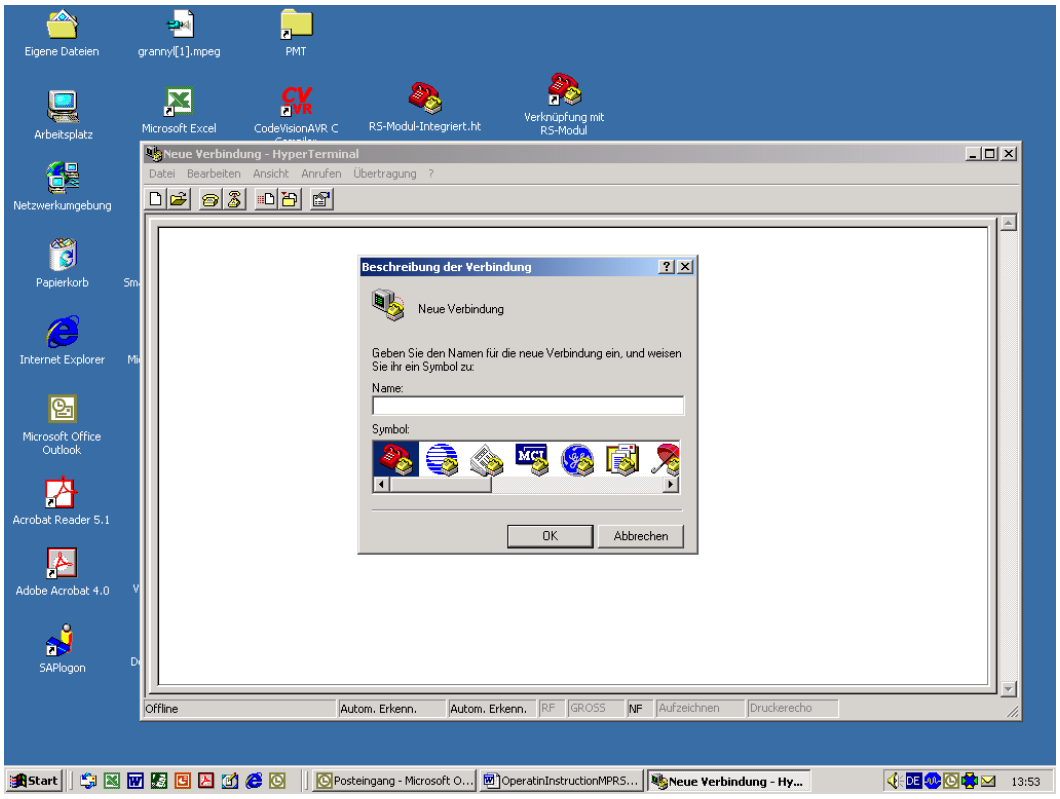


Fig. 1: Start Screen when first time using HyperTerminal®

Once the above step has been completed, you can enter, change or modify the Set-Up parameters according the above described requirements.

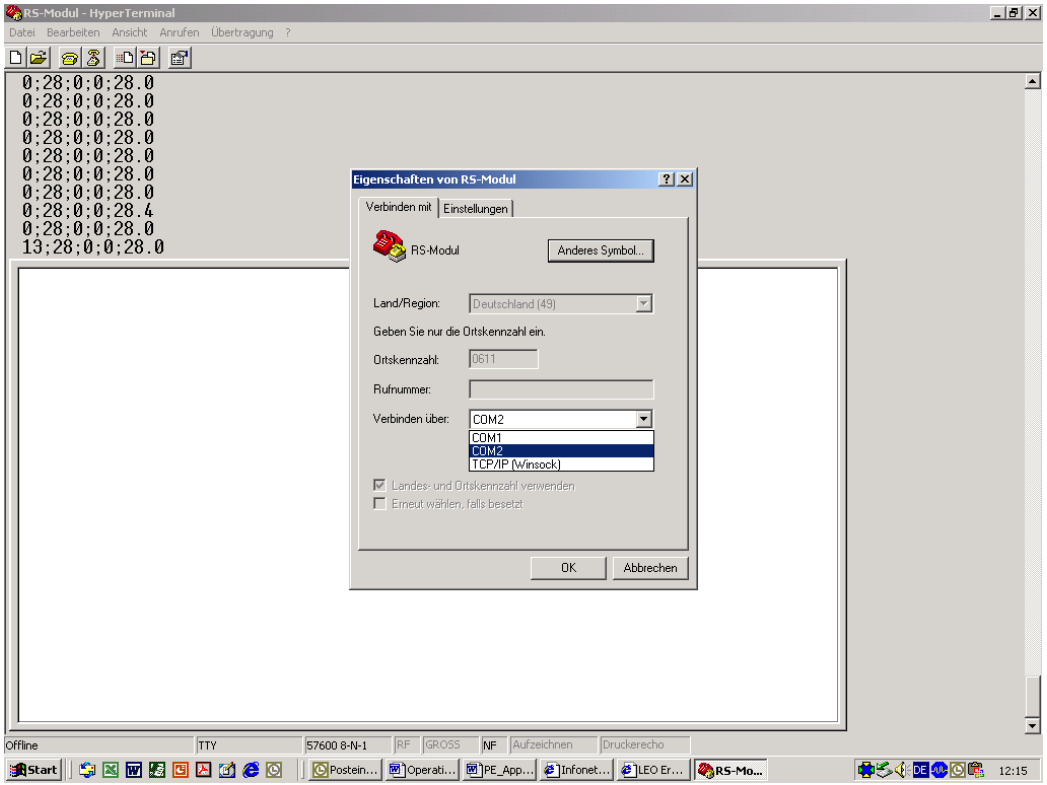


Fig. 2: Menu for Serial Port Selection

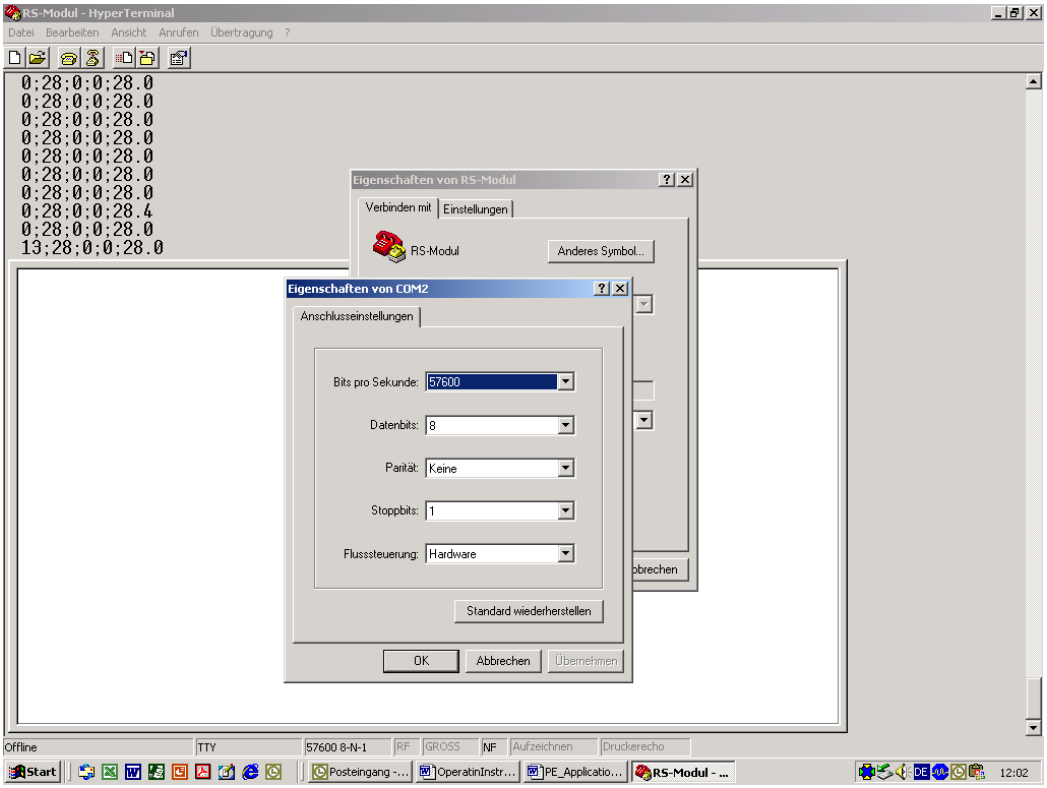


Fig.3: Set-Up Menu for Serial Port configuration

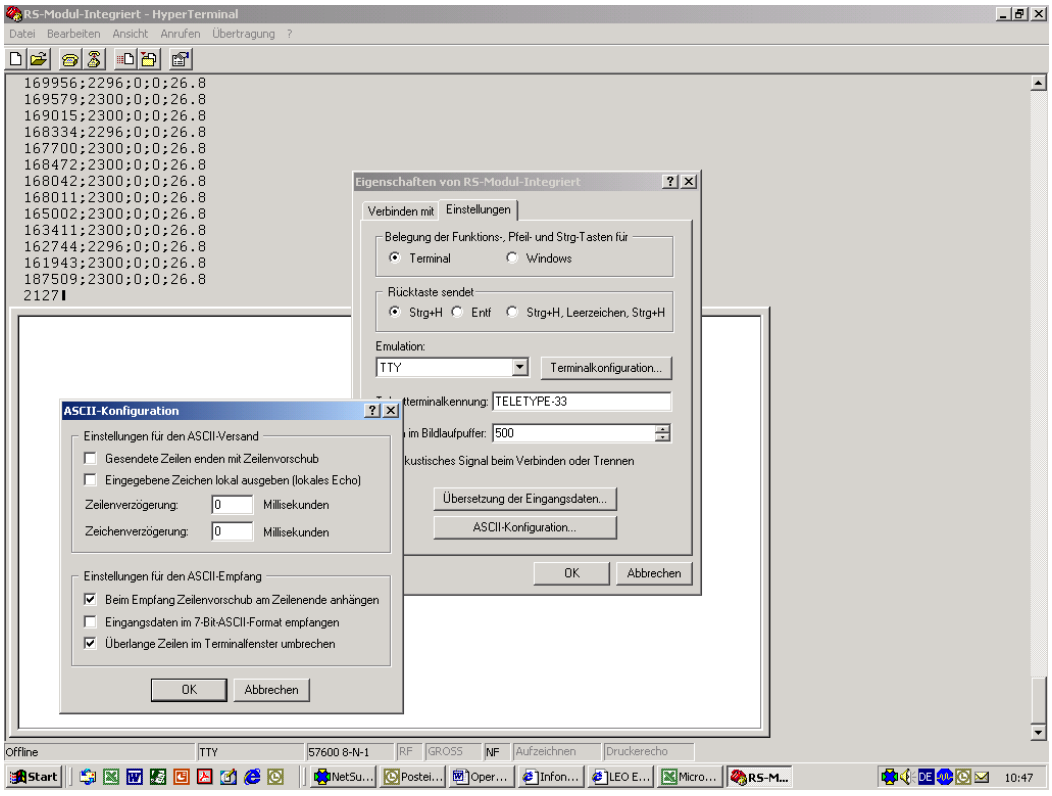


Fig.4: Configuration of appropriate Line Feed function

5. Software Description for MPRs Photoncounting Modules

5.1 Starting Measurements

If you are using the provided input power adapter cable, leads are determined as follows:

Red:	+5 Vdc
Black:	0 Vdc (Ground)
Orange (optional):	external Gate input (TTL level, active high)
Black (optional):	Ground external Gate input

Connect the module according the following schematics:

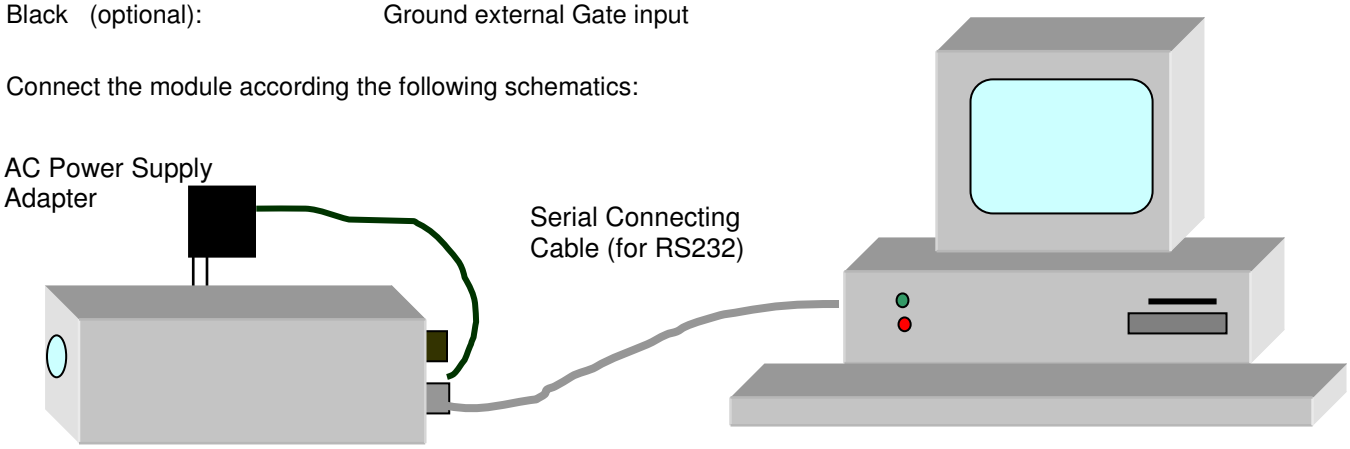


Fig.5: Connecting Diagram CPM module MP-RS232

- (If not done already) Start terminal Program (e.g. Hyperterminal)
- Connect MPxxxRS module to 5 volts power supply (red: +5 volts, black: Ground)
- Ensure Linefeed (LF) is added to End of Line (EOL) of each line received (-> Set up of Terminal Program, fig. 3)
- Switch on 5 volts Power Supply
  Starting (default) conditions are:
  a) Communication Mode = 0x07 (response).
  b) Output Mode = 0x15 (counts, high voltage, Kill status, Gate status, temperature).
  c) Gate is activated.
  d) Kill is disabled.
  e) High Voltage = 0V.
  f) Counting time = 1000 msec.
  g) Pause time = 0 msec.
  h) Number of Counting intervals = infinite (0).
- Enter Command for Communication Mode (only if needed)
  SC[B] - Set Communication Mode
  Example: Command < SC7 > (bit 0, 1, 2 high) (See command overview) will echo:
- Enter Command for Output Mode (only if needed)
  SO[B] - Set Output Mode

Example: SO15 (bit 0, 1, 2, 3 high) (See command overview)

- Enter “Kill” disabling
  “Kill” function switches off high voltage power supply completely.
  (See command overview)
  SK0 – Disables Kill

- Enable pre-adjusted High Voltage
  Set Voltage SV0 (when operating first time, voltage enable/disable needs to be set on a pre- defined status
  Set Voltage SV1
  Pre-adjusted high voltage will be switched on

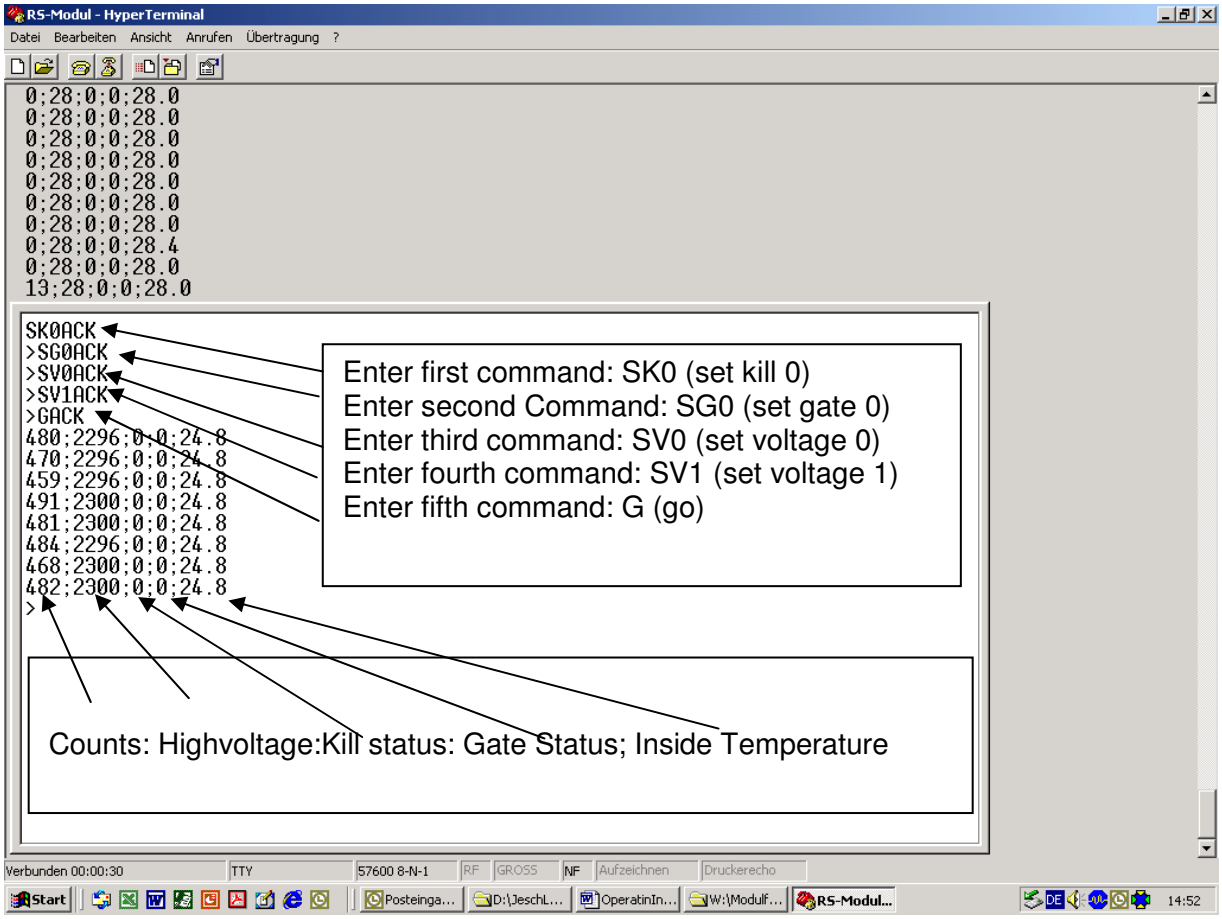


Fig.: 6 Displayed echoed input commands and module’s sent data after start of operating

5.2 Command Overview:

Definitions

Parameters between 0..65535 are represented by [nn]
Parameters with only one digit are represented with [n]
Parameters which are interpreted bitwise [B]
Additional characters appended on a valid command are ignored.
All normal commands are closed with return, except the commands of the counting mode.

Power on Conditions (default setting after switching power supply on)

Communication Mode = 0x00 (no response).
Output Mode = 0x00 (only counts).
High Voltage = 0V.
Gate is activated.
Kill is activated.
Counting time = 1000 msec.
Pause time = 0 msec.
Number = infinite (0).

5.2.1 The Adjustment Commands

All adjustment commands start with “S” for SET

***SC[B]* - Set Communication Mode**

The communication mode determines the information displayed on the screen entered by the operator.

Bit 0: Module echoes incoming characters
Bit 1: Module sends Prompt > when waiting for input
Bit 2: Module responds acknowledge ‘ACK’ or ‘ NACK’ after command.
(Please enter only the decimal value!)

Bit Setting for
communication mode:

Bit	**2**	**1**	**0**	Decimal	Output:
command 1	0	0	0	0	incoming characters are not echoed
command 2	0	0	1	1	incoming characters are echoed
	0	1	0	2	not defined
command 3	0	1	1	3	Module sends Prompt > when waiting for input / with echo
command 4	1	0	0	4	Module responds acknowledge ‘ACK’ or ‘ NACK’ after command / no echo / no Promt
command 5	1	0	1	5	Module responds acknowledge ‘ACK’ or ‘ NACK’ after command / with echo
command 6	1	1	0	6	Module responds acknowledge ‘ACK’ or ‘ NACK’ after command / no echo/no Promt
command 7	1	1	1	7	Module responds acknowledge ‘ACK’ or ‘ NACK’ after command / with echo/with Promt

Example: <SC7> <ENTER> will echo keyboard characters, output a Promt “>” while waiting for an input and finally responds with “ACK” for input command accepted or “NACK” for input command not accepted.

***SO[B]* - Set Output Mode**

The Output mode determines the data displayed on the screen, sent by the module.

Bit 0: Module adds High Voltage Value after each measurement.
Bit 1: Module adds Kill status after each measurement.
Bit 2: Module adds Gate status after each measurement.
Bit 3: Module adds temperature after each measurement. If parameter = 15 (everything switched on), the counting time should be at least 12ms.
(Only the decimal value is entered!)

Bit Setting for output (display) mode:

Bit	3	**2**	**1**	**0**	Decimal	Output
command 1	0	0	0	0	0	Counts
command 2	0	0	0	1	1	Counts / High Voltage
command 3	0	0	1	0	2	Counts / Kill
command 4	0	0	1	1	3	Counts / High Voltage / Kill
command 5	0	1	0	0	4	Counts / Gate
command 6	0	1	0	1	5	Counts / High Voltage / Gate
command 7	0	1	1	0	6	Counts / Kill / Gate
command 8	0	1	1	1	7	Counts / High Voltage / Kill / Gate
command 9	1	0	0	0	8	Counts / Temp
command 10	1	0	0	1	9	Counts / High Voltage / Temp
command 11	1	0	1	0	10	Counts / Kill / Temp
command 12	1	0	1	1	11	Counts / HV / Kill / Temp
command 13	1	1	0	0	12	Counts / Gate / Temp
command 14	1	1	0	1	13	Counts / HV / Gate / Temp
command 15	1	1	1	0	14	Counts / Kill / Gate / Temp
command 16	1	1	1	1	15	Counts / HV / Kill / Gate / Temp

Example: <S07> <ENTER> will display the counts, adjusted high voltage value, the Kill status and the Gate status.

***SG[n]* - Set Gate**

0: deactivates the Gate function
>0: activates Gate function

***SK[n]* - Set Kill**

0: deactivates the Kill function
>0: activates Kill function

***SV[nn]* - Set Voltage**

0: set High Voltage of Module to 0 Volt and resets kill caused by over current
>0: set the factory programmed High-Voltage value

***ST[nn]* - Set Time**

nn: Counting time for counter in msec. Minimum counting time: 10 msec

***SP[nn]* - Set Pause**

nn: Time between two measurements in msec.

***SN[nn]* - Set Number**

0: Module takes an infinite number of measurements until stop signal.
nn: nn Measurements will be taken.

5.2.2 The Output Commands

All Output commands start with “D” for DISPLAY

***DG* - Display Gate**

0: Gate deactivated.
1: Gate activated by Module.
2: Gate activated by external Signal (only when not activated by Module).
(Optional available, not implemented by standard)

***DK* - Display Kill**

0: Kill disabled.
1: Kill activated by Module.
2: Kill activated by Module over current.

***DV* - Display Voltage**

Output of High Voltage in V

***DT* - Display Temperature**

Output of temperature in ℃

***DI* - Display Information**

Output of following Module Information:
Date of programming as day.mon.year.
Module ID as Number.
CPM Number as String.
HV-Supply Number as Number.
Hardware Revision as number.number.
Software Revision as number.number.
Over current limit as kilo counts/ sec.

5.2.3 The Counting Commands

Counting Commands consist only of one character:

***G* - Go**

The module enters counting mode and starts counting.
The module sends the counts and additional values as set by command SO after each measurement.

While counting, the module accepts only the below described commands. These commands are single character commands which are executed immediately without return. Also these commands produce no output echo. The Prompt will appear after leaving the counting mode when Bit 2 of Communication Mode is set.

***S* – Stop**

The module quits counting mode.

***G* – Gate**

Toggles Gate status of the module.

***K* – Kill**

Toggles Kill status of the module

6. In Case of Overcurrent Detection

When light levels enter the Photocathode, generating more than the pre-adjusted max. count rate (5.5 Mcps), the internal Over-illumination protection circuit will activate the “Kill” function and all voltages are switched down to stand-by-mode (0 volts)

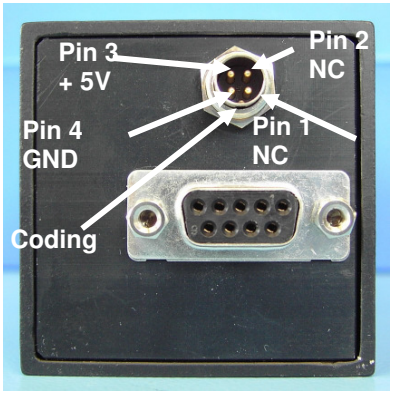
In this case, the “Kill” output shows the status “2”.

How to re-activate counting mode?

The Counting function can be re-activated only by entering:

<SV0> (set voltage 0)
<ENTER>
<SV1> (set voltage1)
<ENTER>

7. Power Supply Connection



Pin	Signal	Function	Direction	Comment
1		NC		
2		NC		
3	+ 5V	Power Supply	Input	
4	0 V	Ground	Input	

Fig. 7: Rear view of MPRS module, showing SUB D connector and four pin power supply connector

8. Dimensions

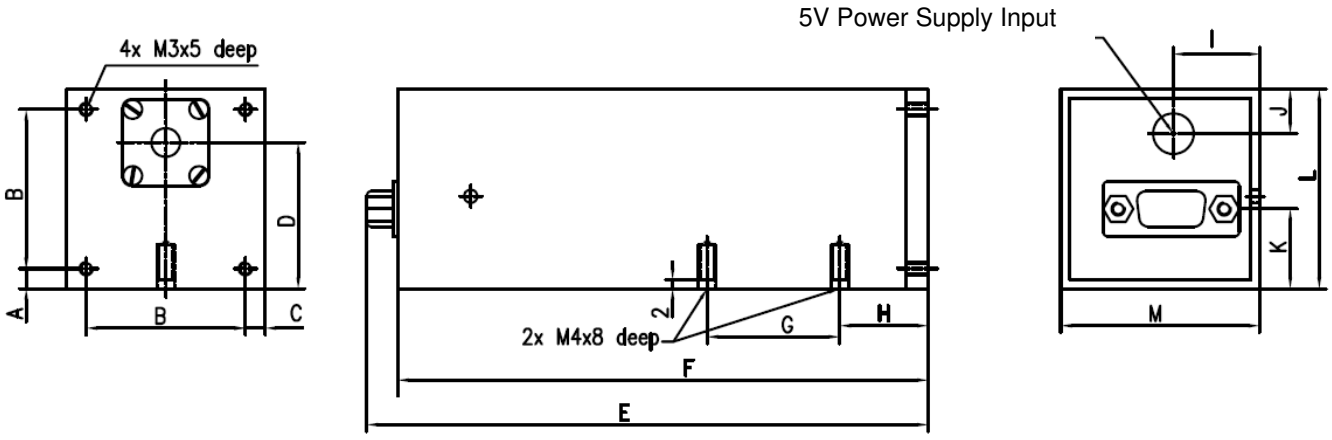


Fig. 8: Outline dimensions of MPRS module

Module Type Dimension/mm	A	B	C	D	E	F	G	H	I	J	K	L	M
MPRS 9xx	4,5	36	4,5	33	127	120	30	20	19,5	10	18	45	45
MPRS 13xx	4,5	36	7	33	132	125	30	20	19	10	22,1	50	50
MPRS 19xx	4,5	36	7	33	137	130	30	20	19	10	22,1	50	50

Table 2: Dimensions of 9mm, 13mm and 19mm module type

Warning: HIGH VOLTAGE

This product operates at high voltage. Extreme care must be taken to ensure operator safety and to avoid damage to other instruments. Avoid direct contact with the CPM when high voltage is applied.

Ensure that no light levels are applied, generating higher anode currents than specified.
All given values are nominal/typical @ 20 °C ambient temperature; specification subject to change without notice

Warranty

A standard 12-month warranty following shipment applies. Any warranty is null and void if the Module case has been opened.

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