MPRB-16 / 32

(Data sheet V1.1_01)

16 / 32 channel preamplifier with individual bias supply and temperature compensation for Avalanche Photo Diodes

mesytec **MPRB-16** is a 16 channel charge sensitive preamplifier with integrated bias voltage generators. The device is remote controllable via mesytec control bus, which allows to adjust the 16 bias voltages individually for each channel in 100 mV steps, up to 600 V. It is designed to operate and read out arrays of avalanche photo diodes or strip detectors. A temperature sensor can be connected and allows the MPRB-16 to compensate the APD gain drift with temperature by adapting the bias voltage with temperature. All parameters can be set and read back via mesytec control bus.

Features:

- 16 channel low noise charge sensitive preamplifiers
- Sensitivity selectable in two steps by switch and RC Pulser input
- Differential or unipolar signal output
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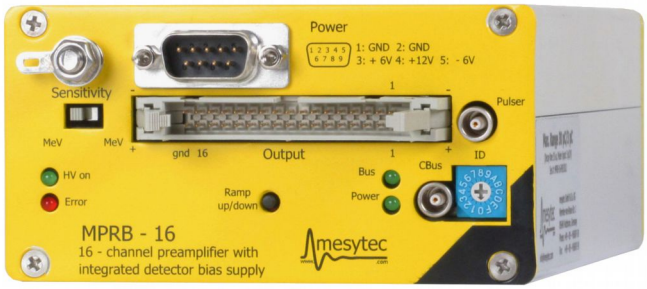
- Bias supply can be adjusted by remote control
- Bias adjustable for each channel in steps of 0.1 V
- Maximum bias 600 V
- Push button for ramp up and down of bias voltages
- Also available as stacked 32 channel amplifier
- With and without mounting latches



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Technical Data

Bias voltage

Prefilter: 50 MΩ
Stability: 100 ppm/ °C (slope = 128, temp sensor not connected)

Maximum voltage difference between channels: 300 V

When set value difference is larger, the channels with too low voltage are increased.
So lowest channel voltage is: highest channel voltage –300 V.

Power consumption with MPR-16-300

+6 V	130 mA
–6 V	–70 mA
+12V	80 mA

Size

55 x 105 x 171 mm

Temperature compensation

The sensor can be connected at the SubD-25 input connector. It occupies the position which is usually used for the guard ring bias. So all mesytec cable sets allow to connect the sensor at the detector site between the guard ring pin and analog ground (neighbour pin)

Sensor type: NTC thermistor, Epcos B57861-S502-F40 (5 kΩ @ 25 °C, B = 3988)

Offset slope adjustment (via RC) for modules with positive bias:

Slope parameter = 0:
voltage is increased by 1.79V /°C

Slope parameter = 128:
slope about 0

Slope parameter = 255:
voltage is decreased by 1.79V /°C

For the MPRB-16-P device (positive bias voltage) the theoretical slope parameter setting for LAAPDs (0.78 V/ °C) is 128 - 56 = 72;

The optimum value measured for large area APDs is 68 (= 0.84 V/ °C).

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Remote control

The module is controled via mesytec control bus.

Addr	Function		Power up default	
0	Voltage0	R/W	0	set voltage : 6000 = 600 V (steps of 100 mV)
1		R/W	0	
2		R/W	0	
3		R/W	0	
4		R/W	0	
5		R/W	0	
6		R/W	0	
7		R/W	0	
8		R/W	0	
9		R/W	0	
10		R/W	0	
11		R/W	0	
12		R/W	0	
13		R/W	0	
14		R/W	0	
15	Voltage 15	R/W	0	
16	Sum current	R		Current of all channels. 0 nA = 2048 1 nA per channel
17	*Pre-voltage*	*R*		*Voltage of main generator, for factory use only*
18	temperature	R		Temp sensor ADC value Typically 2048 @ 26 °C, increases by 61 channels per °C (@reg 23 = 128)
21	Error_code	R		16 bit err for 16 channels
22	Temp_slope	R/W	128	0..255 128 → slope is 0
23	Temp_offset	R/W	128	0..255 128 → offset for about 26 °C correct ADC temperature reading to 2048 at typical operating temperature. At this point correction of bias voltage is 0, change of slope parameter has no effect.
24	Ramp up/down	R/W	0	1 = up, 0 = down
25	Voltage limit	R/W	6000	Maximum allowed voltage When channel voltage limited → error_ code register is set, Error LED lights up
26	Preamp_range	R/W	0	0 = coded by front panel switch 1 = high range (low sensitivity) 2 = low range (high sensitivity)
31	Firmware revision	R	xxxx	// not implemented !! shows 4 digit firmware revision in BCD format

Temperature Adjustment, Temperature reading

A value proportional to the temperature can be read from register 18 "temperature".
It is possible (but not essential) to adjust a temperature offset via register 23 "Temp offset".
When the temperature is shifted via offset register to a reading value of 2048, the output voltage correction value is 0. When the temperature gets different to this calibration value, the output voltage is corrected, depending on temperature difference and Temp_slope.

Offset correction of temperature reading

Set register 23 to 128 . (mid position)

Read temperature register 18

Calculate: temp_offset_val = 128 + (temperature - 2048) / 7

Write temp_offset_val to register 23.

Read temperature register 18, it should now have a value of about 2048