Rev. 2 - 10/01/2018

SP5600

Power Supply and Amplification Unit

CAEN
Tools for Discovery

User Manual
UM2626

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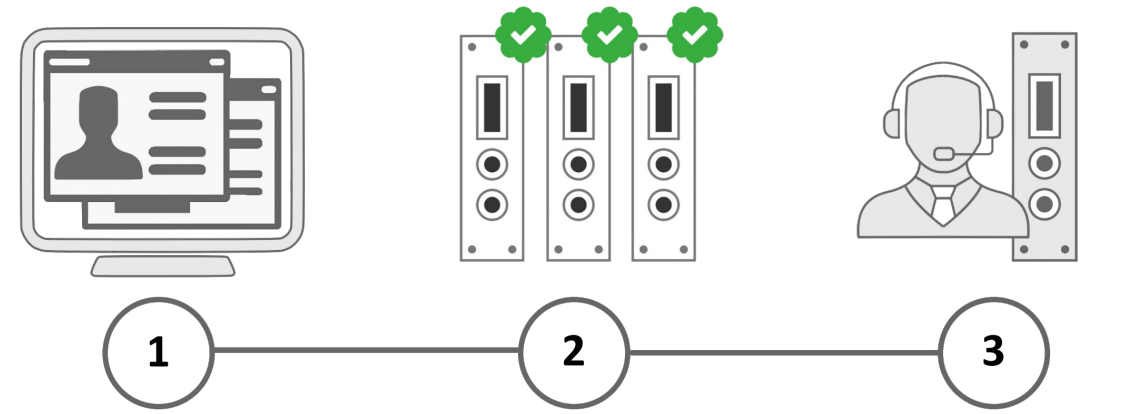

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Purpose of this Manual

This User's Manual contains the full description of the SP5600 Power Supply and Amplification Unit.

Change Document Record

Date	Revision	Changes
2 February 2012	00	Initial release
10 January 2018	01	Completed revised layout and Removed Firmware Upgrade Section

Symbols, abbreviated terms and notation

Not available

Reference Documents

Not available

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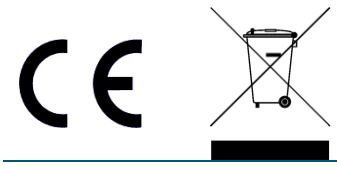
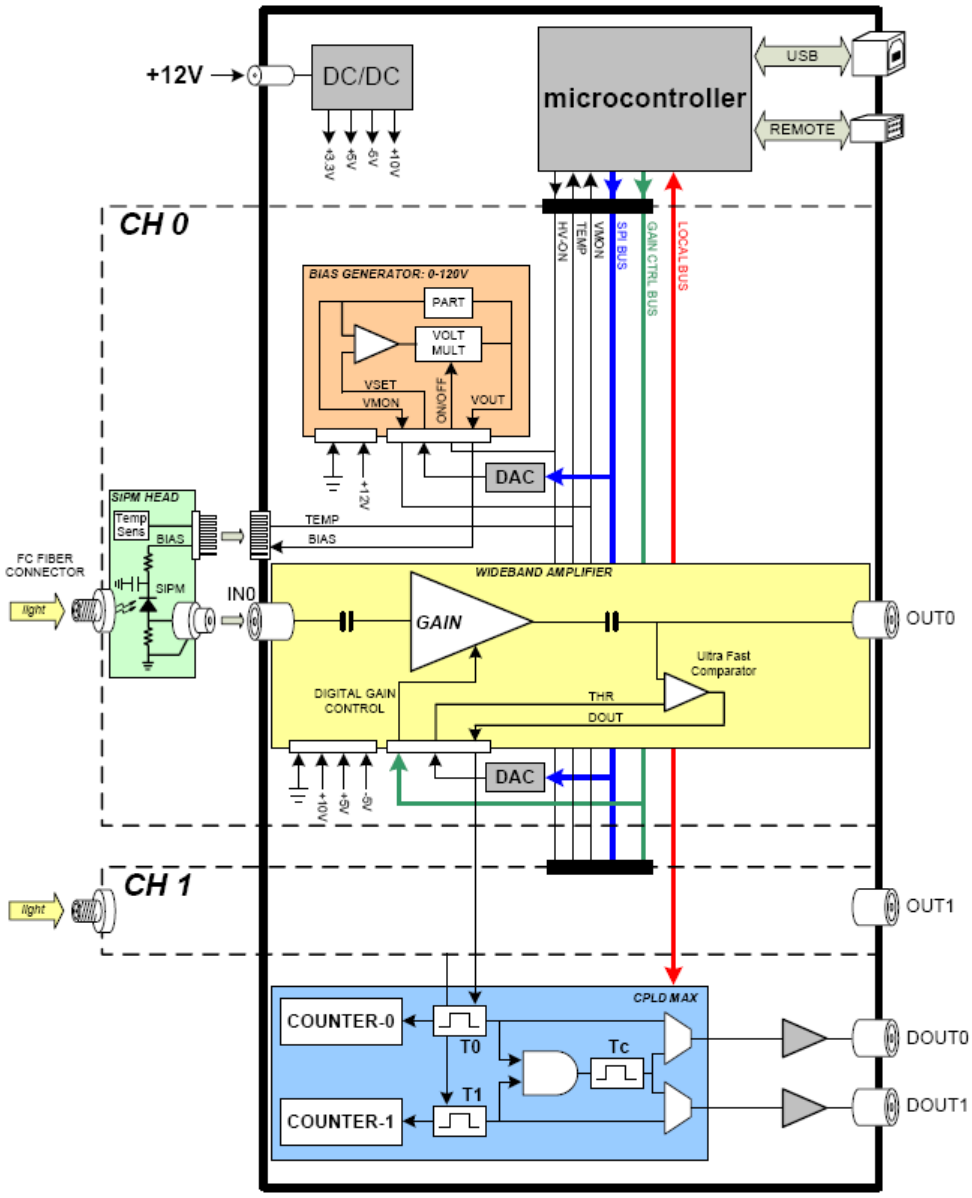


Introduction

The SP5600 Power Supply and Amplification Unit (PSAU) integrates two SiPM's (Silicon Photo Multiplier) mounted in single interchangeable heads, allowing easy mounting and replacement. The PSAU supplies the bias for the sensors, features a variable amplification factor up to 50 dB and integrates a feedback circuit to stabilize the sensor gain against temperature variations. Moreover, the PSAU includes one leading edge discriminator per channel and a coincidence circuit (logic unit) for flexible event trigger logic. All parameters can be programmed and monitored via USB port.

Block diagram

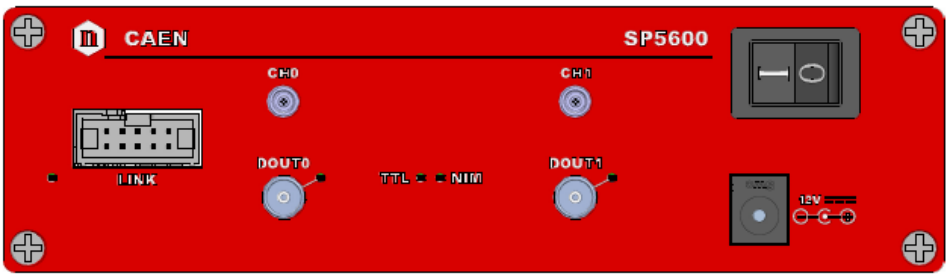


The diagram above shows the SP5600 functional blocks

- Microcontroller: the device is handled by a Microcontroller, PC interfaced via USB; all functional parameters are handled by the Microcontroller and therefore programmable via USB.

- SIPM Head: the SIPM Head (one per channel) hosts the Silicon photo multiplier; a Temperature probe inside the Head senses variations, routing them to the Microcontroller, thus allowing this one to compensate for gain instability (such function can be disabled via software).
- Bias Generator: the Bias Generator (one per channel), provides the bias for the Silicon photo multiplier, programmable in the 0 ÷ 120V range with 16 bit resolution (step = 1.8mV).
- Wideband Amplifier: the Silicon photo multiplier output is collected by the Wideband Amplifier (one per channel), whose gain is programmable (0 ÷ 50 dB); the amplifier analog output (±2V dynamics) is available for pulse processing on output connector (CHx), while an ultra fast comparator, as the amplifier output exceeds a programmable threshold (±800mV, 16 bit resolution), provides a discriminator signal to the Coincidence circuit (logic unit).
- Coincidence circuit: the Coincidence circuit may provide on DOUTx output a logic level (NIM or TTL) in presence of comparator output as well as the coincidence (within a 10 ÷ 320 ns programmable window) of the two comparators output; output level and width are programmable via USB. DOUTx signals are useful for triggering the PSAU output digitization. The unit hosts also two scalers (one per channel, 16 bit counting depth), that count the incoming pulses; their value can be readout as the programmable counting gate signal is sent. A typical application of the counters is the “Staircase”: the Dark Count Rate variation as a function of the discriminator threshold.

Back panel components



CHx OUT: Analog output, MCX connector

DOUTx: Coincidence circuit output (NIM or TTL); LEMO connector and Led: the Led is off as the analog signal is under discriminator threshold, lights up “bright” as the signal is above threshold and “weak” in the vicinities of the threshold.

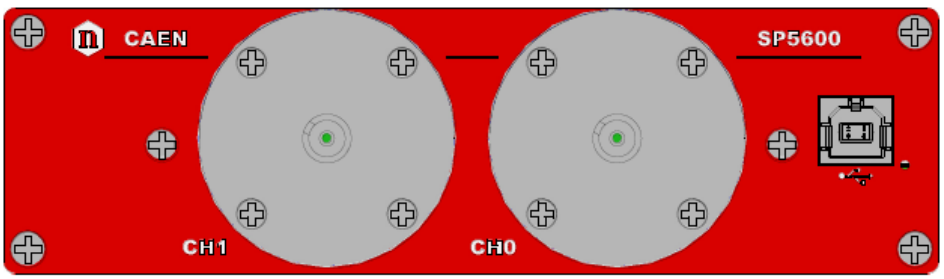
Link: 3M-7610-5002 connector (reserved for future implementation)

12V: 2.1mm DC Power Jack (+12V DC Input)

ON / OFF: power switch

NIM / TTL LEDs: Green Leds, signal the DOUTx logic level

Front panel components



CHx IN: FC Connector (input)

USB Port: B type USB connector (USB 2.0 and USB 1.1 compliant)

+12V DC External Power Supply

The module is powered via the external AC/DC stabilized power supply (Mod. FRA045-S12-4, 12V DC Output, 3.75A).

Technical specifications

Packaging	
Size	154x71x43 mm^3
Power Requirements	
External power supply	11.5V ÷ 18V (typ. 12V) @ 0.5A
SiPM bias	
V bias	0 ÷ 120 V range; 100 µA max current
V bias Setting resolution	16bit
Temperature Feedback Resolution	0.1 °C
Wide band amplifier and fast leading edge discriminator	
Gain	0 ÷ 50 dB
Gain setting step	1 dB
Bandwidth (-3dB)	100 kHz ÷ 500 MHz
Output dynamic range	±2V
Discriminator threshold	±800mV; 25µV min. step
Coincidence unit and scaler	
Coincidence window	From 10 to 320 ns
Max frequency	100 MHz
Delay from analog IN to DOUT	20 ns
DOUT width	From 10 to 320 ns
DOUT level	NIM or TTL
Internal counters	16 bit
SiPM detachable header	
Temperature sensor	0.1 °C
Link	
USB interface	USB2.0 and USB1.1 compliant

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