Features

Connects to one AiT 16-channel SiPM Passive Base

2-stage wideband DC-coupled amplifier per channel

- 1.8ns minimum rise time
- Stage 1 = transimpedance amplifier (500Ω gain) or voltage amplifier (50Ω shunt, x10 gain)
- Stage 2 = Output driver with selectable gain
- Contact us for customization

Sum of 16 SiPM signals for triggering

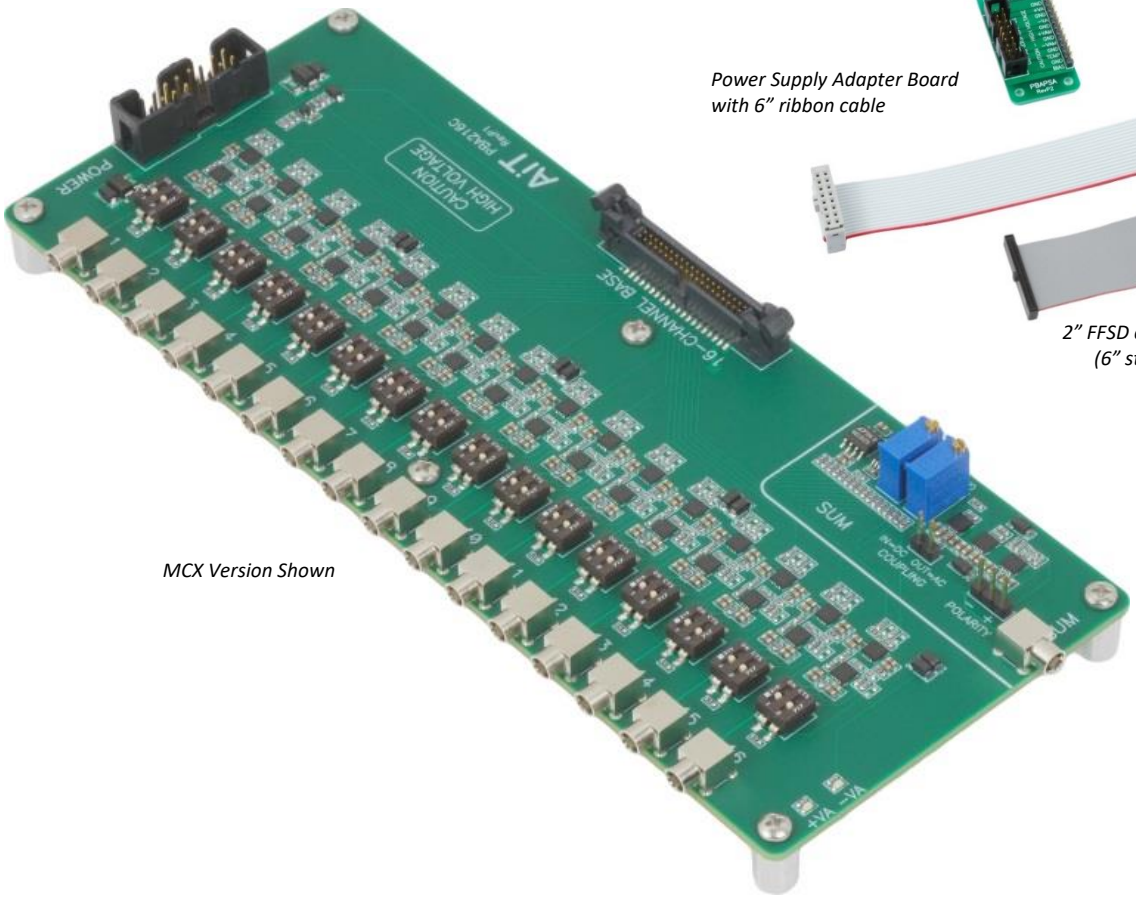
- Gain adjustment potentiometer
- Offset adjustment potentiometer
- DC or AC coupling selection jumper
- Polarity selection jumper

Standard Accessories

- 40-conductor Samtec FFSD ribbon cable assembly, 152.4mm (6”) length standard
- 16-conductor standard ribbon cable assembly, 152.4mm (6”) length standard
- Power supply breakout board
- Six threaded standoffs with #4-40 screws

Part Number

PBA216 *{V/T} {connector} - Lxx*
{V/C}: V = Voltage amplifier
T = Transimpedance amplifier
{connector}: Output connector type
M=MCX, A=SMA, B=SMB, L=LEMO
Lxx: xx is the FFSD cable length in inches
Example: PBA216TM-L6
Transimpedance amplifier,
MCX connectors, 6” cable

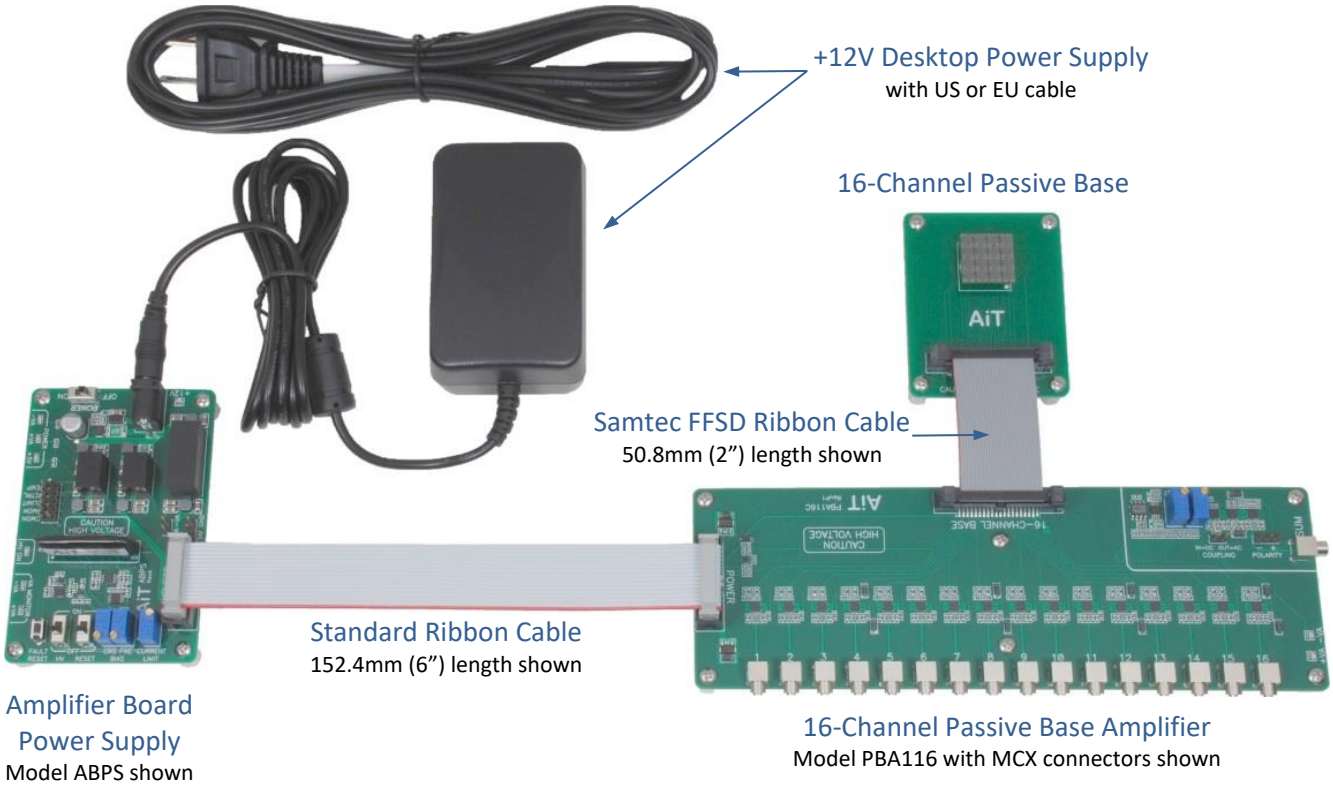


MCX Version Shown

Power Supply Adapter Board with 6” ribbon cable

2” FFSD cable shown (6” standard)

16-Channel Passive Base Readout Kit



Components

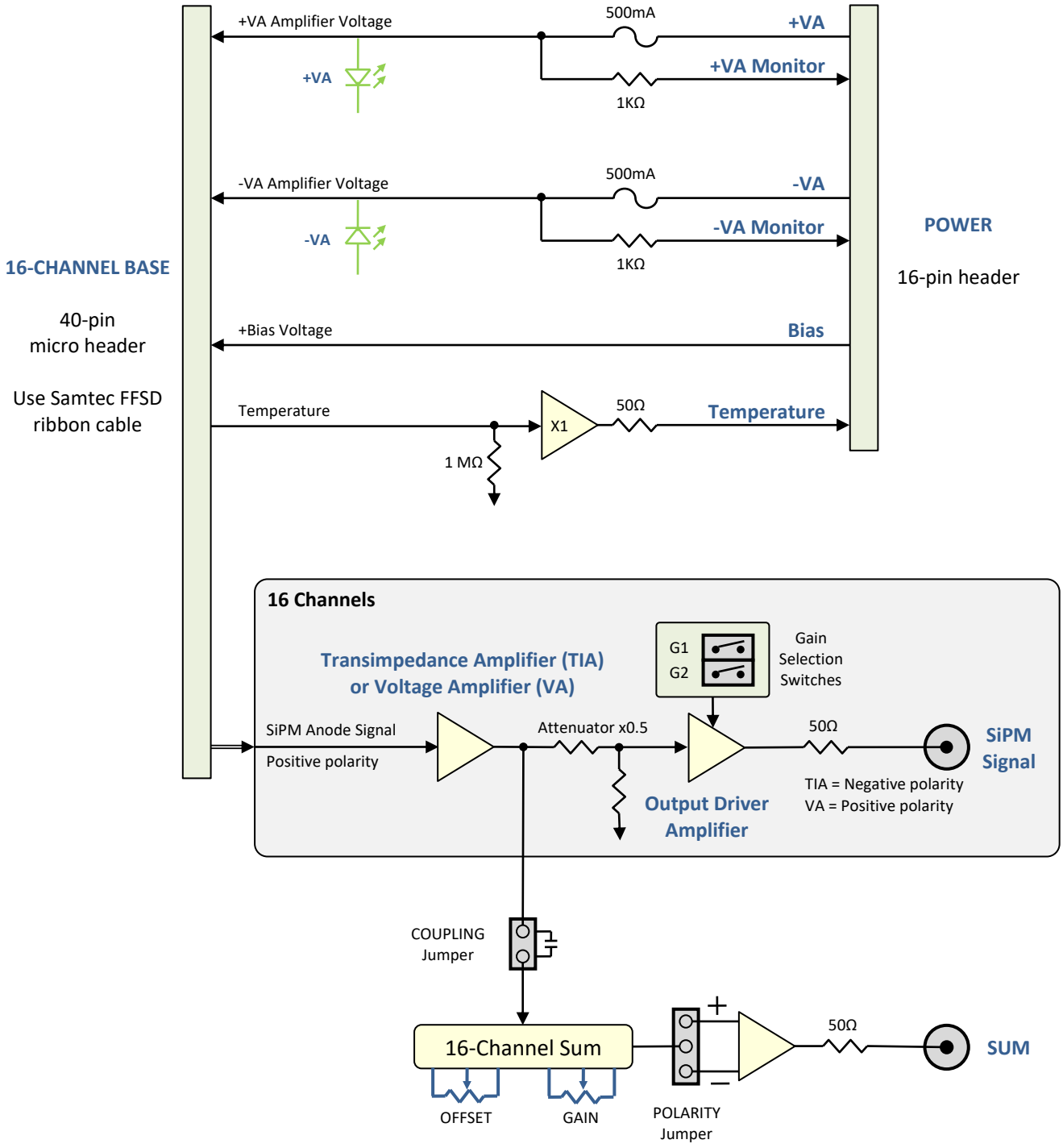
Each component is available separately. Refer to each datasheet for details.

No accessories are included with the Passive Base.

The Amplifier Board Power Supply includes a 12V desktop power supply and a HV80 bias voltage power supply.

The 16-channel Passive Base Amplifier includes a 152.4mm (6”) FFSD cable to connect the passive base, a 152mm (6”) power supply ribbon cable, and a breakout board to connect any external power supply. For fast rise times, a 50.8mm (2”) FFSD cable is recommended.

Architecture



Specifications

Test conditions: VA = ±5.0V

Amplifier Voltage	±2.5V → ±5.5V DC
Current	±480mA at ±5.0V (Iq, no base, no load)
Current limit	500mA resettable fuses
Voltage clamp	±5.6V Zener diode
Bias Voltage	
Voltage clamp	+82V Zener diode 375mW maximum
Caution	This device does not limit bias current
Transimpedance Amplifier Option	
Input rise time	1.8ns minimum ≥ 5.0ns recommended Performance depends on SiPM technology and signal source. Refer to Passive Base datasheets for performance of specific SiPMs.
Gain	500Ω transimpedance gain standard Contact us for custom gains
Input polarity	Bipolar capable, normally positive
Coupling	DC
Voltage Amplifier Option	
Input rise time	1.8ns minimum ≥ 5.0ns recommended Performance depends on SiPM technology and signal source. Refer to Passive Base datasheets for performance of specific SiPMs.
Gain	x10 standard Contact us for custom gains
Input impedance	50Ω Contact us for different impedances
Input polarity	Bipolar capable, normally positive
Coupling	DC
Output Driver Amplifiers	
Gains	x1, x2, x3, x4, switch selectable per channel Gain setting of x2 is equivalent to the PBA116 standard gain
Output rise time	1.8ns minimum at gain = x1
Output polarity	Negative with transimpedance amplifier option Positive with voltage amplifier option Contact us for different polarity
Output voltage range	±3.4V maximum (±1.7V into 50Ω) with VA = ±5.0v
Output current	±100mA maximum

Output impedance	50Ω

Attenuator

Description	Attenuator between stage-1 and stage-2 amplifiers
Function	Reduces stage-1 gain to accommodate applications with reduced dynamic range
Gain	x0.5 (attenuation factor of 2)
PBA116 compatibility	The PBA216 output driver gain of x2 provides an overall gain equivalent to the standard PBA116

Signal Sum

Minimum output rise time	1.8ns
Output polarity	Positive or negative, jumper selectable
Gain adjustment	x0 → x2, referred to one output channel at channel gain = 1 25-turn potentiometer
Input offset adjustment	±200mV at sum gain = 1 25-turn potentiometer Sum gain adjusted to match an output channel at channel gain = 1
Coupling	AC or DC, jumper selectable
AC coupling time constant	1.9μs
Output voltage range	±3.4V maximum (±1.7V into 50Ω) with VA = ±5.0V
Output current	±100mA maximum
Output impedance	50Ω

Channel-to-Channel Timing

Signal length between output channels	500ps maximum skew Channels 1 to 8 are symmetrical to channels 16 to 9 Minimum skew is between channels 1 and 16, 2 and 15, …, 7 and 8 Maximum skew is between channels 1 and 7, 8 and 16
Signal length between output and sum	500ps maximum skew Minimum for channel 16 and maximum for channel 1 Minimum skew is between adjacent channels Maximum skew is between channels 1 and 16

Passive Base Cable Length

Recommended lengths	50.8mm (2”) recommended for most applications. Up to 304.8mm (12”) can be used for slower signals. Cable lengths exceeding 304.8mm (12”) have not been tested.
Excessive cable lengths	Long cables can be used if the application can tolerate increased signal distortion. Signal distortion depends on signal edge speed, cable length, SiPM technology, and channel. Slower signals can be transmitted over longer cables with less distortion.
Note	Refer to individual Passive Base datasheets for measurements

Temperature Monitor Buffer

Input voltage	+3.0V maximum
Output voltage	+3.0V maximum
Output current	10mA maximum
Input impedance	1MΩ
Output impedance	50Ω

LEDs

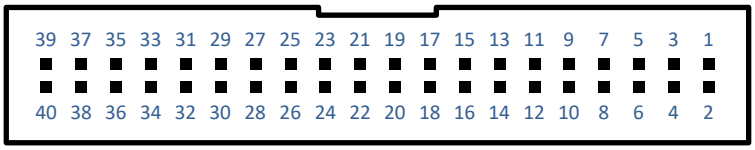
+VA	Green = Positive amplifier voltage
-VA	Green = Negative amplifier voltage

Connectors

16-CHANNEL BASE	Vertical 40-pin, 2-row latch-eject header, 0.050” pin pitch Mating assembly = Samtec FFSD-20-D-XX.XX-01-N (XX.XX = length in inches)
POWER	Vertical 16-pin shrouded header, 0.100” pin pitch

Connectors

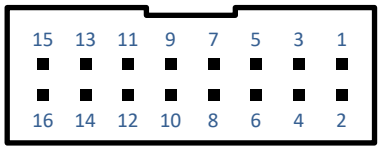
16-CHANNEL BASE



40-pin 0.050" vertical latch-eject header

Pin	Function	Pin	Function
1	Bias	2	Ground
3	Temperature	4	Ground
5	Anode 1	6	Ground
7	Anode 2	8	Ground
9	Anode 3	10	Ground
11	Anode 4	12	Ground
13	Anode 5	14	Ground
15	Anode 6	16	Ground
17	Anode 7	18	Ground
19	Anode 8	20	Ground
21	Anode 9	22	Ground
23	Anode 10	24	Ground
25	Anode 11	26	Ground
27	Anode 12	28	Ground
29	Anode 13	30	Ground
31	Anode 14	32	Ground
33	Anode 15	34	Ground
35	Anode 16	36	Ground
37	-VA	38	Ground
39	+VA	40	Ground

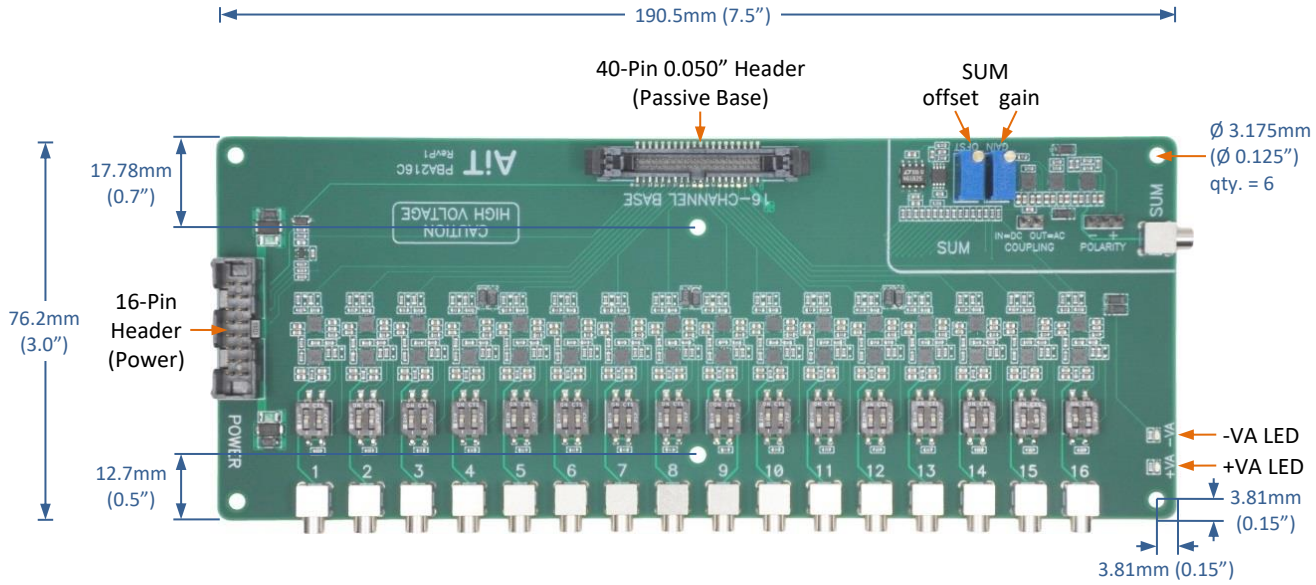
POWER



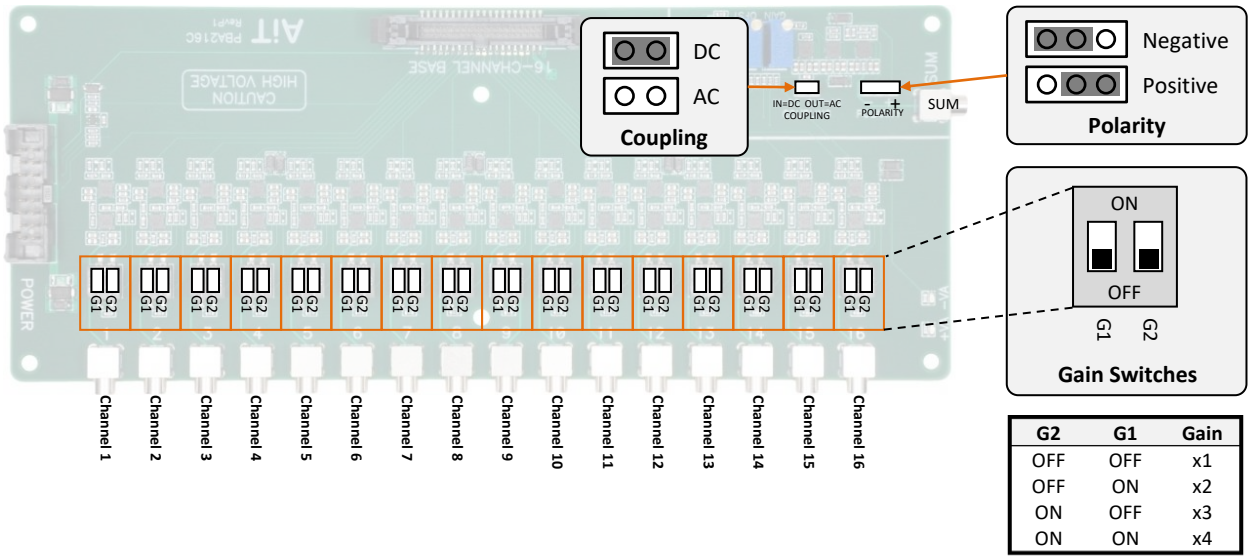
16-pin 0.100" vertical header

Pin	Function	Pin	Function
1	+VA	2	+VA
3	Ground	4	Ground
5	-VA	6	-VA
7	Ground	8	Ground
9	+VA Monitor	10	Ground
11	-VA Monitor	12	Ground
13	Temperature	14	Ground
15	Bias	16	Ground

Mechanical



Jumpers and Gain Switches



G2	G1	Gain
OFF	OFF	x1
OFF	ON	x2
ON	OFF	x3
ON	ON	x4

Operation

Typical Setup Procedure

1. Make sure the Amplifier Board bias voltage and amplifier voltage are off

   Always handle the amplifier and base with bias voltage and amplifier voltage OFF

2. Configure the gain jumpers, sum coupling jumper, and sum polarity jumper

   DC coupling is recommended for most applications

3. Connect the Base
4. Connect an oscilloscope to the SUM output and one or more SiPM signals
5. Apply power to the Amplifier Board
6. With SiPM signals present, adjust the bias voltage, *SUM Offset*, and *SUM Gain* as needed
   a. Adjust the SiPM bias voltage until SiPM signals are present
   b. Adjust the *SUM Offset* until the SUM signal baseline is zero
   c. Adjust the *SUM Gain* to the desired level
7. Changes in bias voltage may require offset adjustment

Sum Coupling Jumper

DC coupling is selected when the jumper is installed. DC coupling is recommended for high-rate signals. AC coupling is selected when the jumper is removed. AC coupling is recommended for low-rate signals.

Sum Polarity Jumper

Placing the jumper in the “- / center” (negative) position will select the same polarity as the first-stage preamplified SiPM signals. Placing the jumper in the “+ / center” (positive) position will select the inverted polarity. A standard Passive Base produces positive output signal polarity. The polarity is inverted by the input transimpedance amplifiers. A negative sum signal polarity is selected by placing the jumper in the negative position.

System Assembly Guidelines

Passive Base FFSD Cable

The Samtec micro-pitch FFSD cable connector must be inserted firmly into the header. During insertion, the header latches will clamp over the edges of the cable connector body and hold it firmly in place. The cable is oriented correctly when the cable exits directly away from the Amplifier Board without interference, and the red index conductor is located on the right side of the FFSD header when facing the header.

High Voltage

This device must be used only by personnel trained and qualified in safe handling, installation, and operation of high voltage equipment. Any optional enclosure provided does not protect against high voltage exposure.

During operation, high voltage will normally be present in the following components:

- Amplifier board, especially the POWER connector and the SiPM BASE connector
- SiPM base signal cable
- SiPM base

Caution: This device does not limit bias current. Take precautions to limit bias current to prevent equipment damage and personnel injury.

Installation

This device is intended for benchtop use or incorporated into another system or product. The circuit board may be installed using standard #4 or M3 hardware. Allow for adequate ventilation space around the circuit board.

Safety Information

WARNING – High Voltage

- High voltage may be present during operation
- High voltage stored on capacitors may be present after power is removed
- Improper handling may result in personnel injury or equipment damage

This high-voltage device must be used only by personnel trained and qualified in safe handling, installation, and operation of high-voltage equipment.

CAUTION – Electrostatic Discharge (ESD) Sensitivity

The circuit board can be damaged by electrostatic discharge. Observe precautions for handling electrostatic sensitive devices. Handle only at static-safe workstations.

High-Gain Photodetectors

High-gain photodetectors such as silicon photomultipliers may conduct damaging currents if exposed to high optical signal levels while the bias voltage is applied, or if the bias voltage exceeds the recommended operating range. These devices must be operated only in low-light conditions, and only within the manufacturer's recommended bias voltage range.

Handling and Disassembly

This product may be provided with a protective enclosure. Disassembled enclosure components and circuit boards may contain sharp edges. Take appropriate safety precautions while assembling or disassembling the enclosure and handling disassembled components.

Indoor Use Only

Do not operate this product in a wet or damp environment. Do not operate in an explosive atmosphere.