

User Guide

*SIB2316
2 x 16 Channel SiPM Interface Board
SensL SPMArray2*



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General Safety Precautions

Use Proper Power Source

The SIB2316 is powered with a +5V power source directly from Vertilon's PhotoniQ multi-channel data acquisition systems. Use with any other power source may result in damage to the product.

Operate Inputs within Specified Range

To avoid electric shock, fire hazard, or damage to the product, do not apply a voltage to any input outside of its specified range.

Electrostatic Discharge Sensitive

Electrostatic discharges may result in damage to the SIB2316. For these reasons, the SIB2316 board is intended to be operated in a user's conductive instrument enclosure.

Do Not Operate in Wet or Damp Conditions

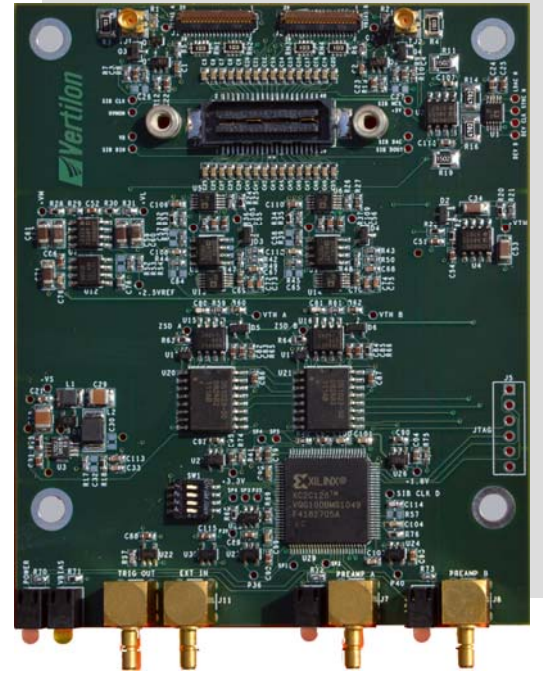
To avoid electric shock or damage to the product, do not operate in wet or damp conditions.

Do Not Operate in Explosive Atmosphere

To avoid injury or fire hazard, do not operate in an explosive atmosphere.

Product Overview

- Interface board for two SensL SPMArray2 4 x 4 silicon photomultipliers
- Provides 32 channel interface to data acquisition systems
- High speed preamplifiers & discriminators for pulse detection
- Adjustable discriminator gain and energy threshold
- Programmable coincidence detection to less than 5 nsec
- Threshold crossing and coincidence indicator LEDs
- On-board negative high voltage supply for SiPM bias
- 100% compatible with Verton's PhotoniQ multichannel DAQs
- No external power supply required
- Simplified control through PhotoniQ graphical user interface



The SIB2316 silicon photomultiplier (SiPM) interface board provides the mechanical and electrical connectivity between two SensL 16 element SPMArray2s and external signal processing electronics such as a Verton PhotoniQ multichannel data acquisition system. Each SPMArray2 connects to the SIB2316 through a 39 pin FPC cable connector that carries the 16 SiPM detector channels and the common anode negative high voltage bias. Two additional FPC cable connectors on the backside of the board allow the user to reverse-mount the SPMArray2s if necessary. The 32 detector signals from the SiPM arrays are routed to a connector on the top of the board that connects to a specialized high density coaxial cable assembly (SIB cable). This arrangement allows the SIB2316 to be conveniently mounted into the user's optical setup with the FPC cables connecting to the SPMArray2s and the SIB cable connecting to the data acquisition system. The SIB cable carries the detector signals from the silicon photomultipliers to the PhotoniQ where the charge from each is separately integrated, digitized, and sent to a PC for display or further signal processing. The negative high voltage bias to the SPMArray2s is generated on the SIB2316 and can be trimmed for matching the two arrays. For applications such as PET imaging that require pulse timing pickoff, circuitry included within the high voltage bias generator monitors the total current delivered to the 16 elements of each SPMArray2. A preamplifier and discriminator on each array process the current signals and feed the results to coincidence detection logic where a trigger signal is output when a pulse from each discriminator is detected within a user-programmable time-coincidence window. Several user adjustments are included for optimizing system gain, energy level thresholds, and the coincidence detection window width. The full functionality and operation of the SIB2316 is conveniently controlled through the PhotoniQ's graphical user interface. Intelligent software in the PhotoniQ constantly monitors the status of its SIB connectors to determine the type of sensor interface board attached to them. Once recognized, a dialog box specific to the recognized SIB is made available in the GUI through which the user has complete control over its operation.

The various functions on the SIB2316 are described in greater detail on the following pages. When necessary, refer to the functional block diagram shown in Figure 1 on the next page.

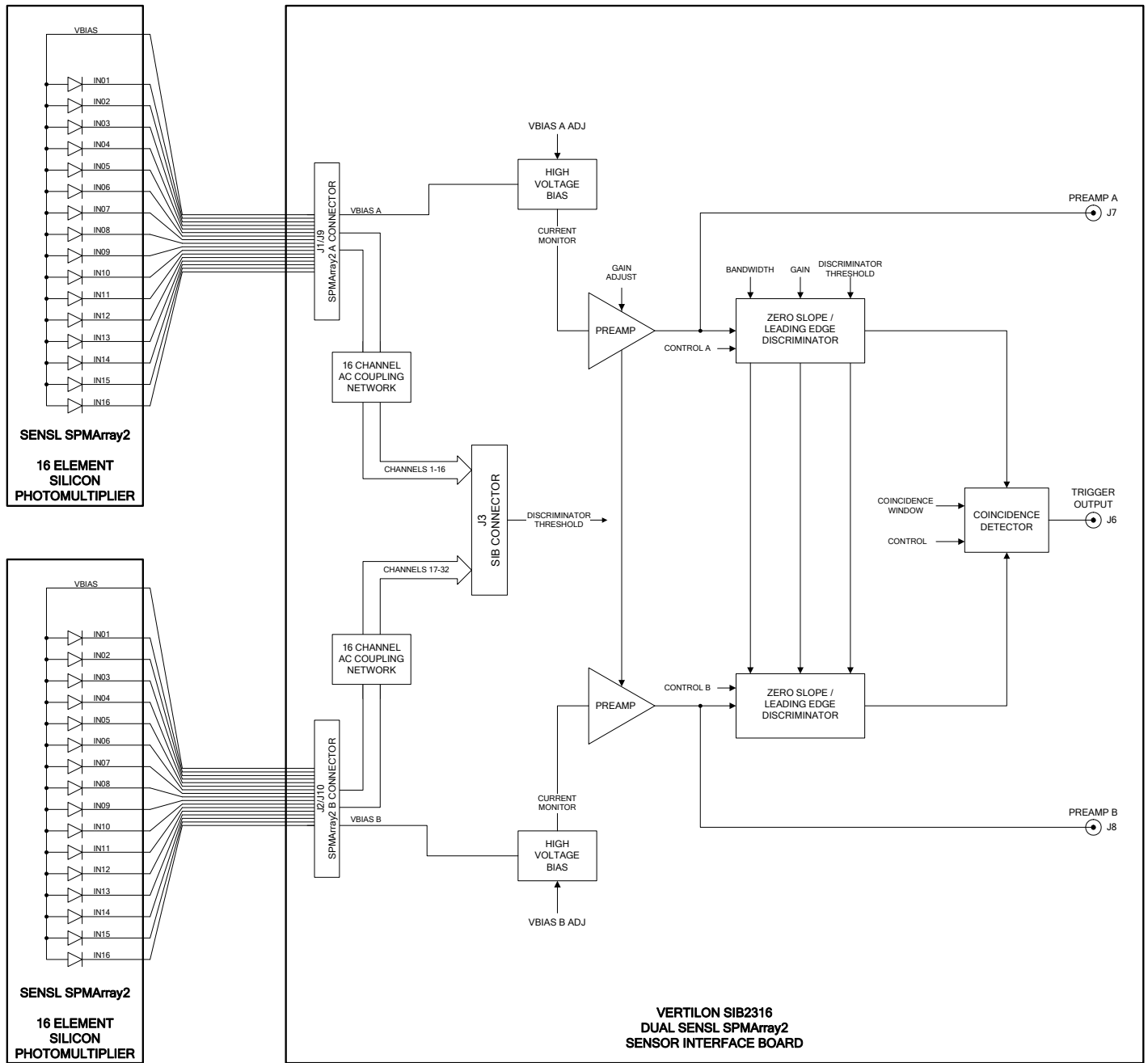


Figure 1: Functional Block Diagram

Typical Setup

A typical setup using a SIB2316 and two SensL SPMArray2 silicon photomultiplier arrays is shown below. The SPMArray2s are positioned to detect incoming light from a scintillator crystal or optical assembly and connected to the SIB2316 by two FPC cables. The sensor interface board cable connects the 32 detector outputs from the SIB2316 to a Vertilon PhotoniQ IQSP480 or IQSP580 32 channel data acquisition system. The trigger output from the SIB2316 supplies the trigger to the PhotoniQ when coincident pulses exceeding a user-programmed energy threshold are detected on the SPMArray2 devices. Alternatively, the coincidence function can be bypassed altogether and the PhotoniQ triggered when a single pulse on either device exceeds the energy threshold. Digitized output data from the PhotoniQ is sent to a PC over a USB 2.0 connection for display, logging, or real time processing. Bias to the detectors as well as the SIB2316 discriminator and coincidence detection parameters are adjusted through the PhotoniQ graphical user interface. In the figure below, the PhotoniQ GUI is set to display a dual 4 x 4 image of the energy levels for each event captured.

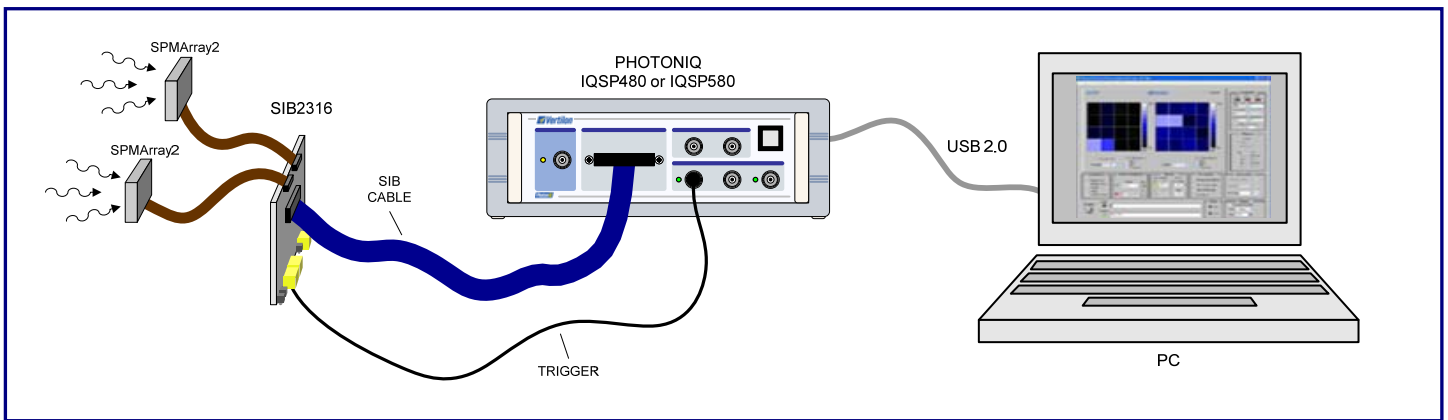


Figure 2: Typical Setup

In a PET application, the PhotoniQ is configured in pre-trigger mode whereby the unit can capture charge data from the detectors that occurred prior to the trigger signal. This powerful triggering mode allows the data acquisition unit to be timed to the pulse peaks yet still collect all of the charge from the particle event — including the charge that preceded the peak of the event. Timing for this mode is shown below.

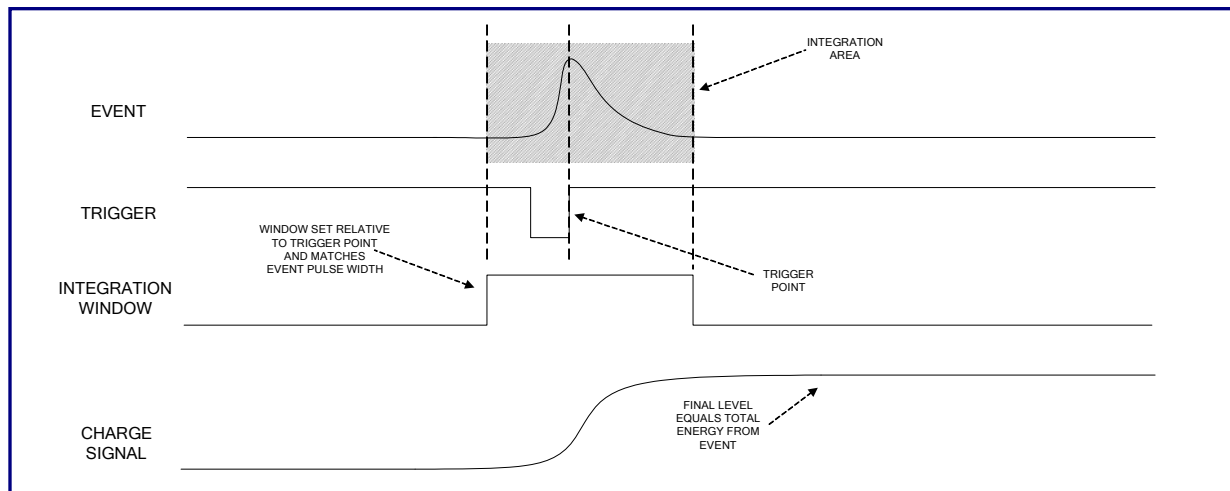


Figure 3: PhotoniQ Pre-Trigger Timing

Detector Common Anode Bias

The SIB2316 is specifically designed to operate with SensL SPMArray2s having a common anode for detector bias. These devices have 16 separate cathode outputs that are compatible with the PhotoniQ charge sensitive preamplifier inputs. Since the SIB2316 biases the detector cathodes at ground voltage, a negative voltage is required on the detector common anode so that an overall reverse bias is applied to the individual SiPM devices in the SPMArray2. It is therefore extremely important that only SensL common anode SPMArray2s are used with the SIB2316. Common cathode or other configurations will not operate with the SIB2316 and may cause permanent damage to it or the device itself.

The figure below illustrates how the detector bias is applied to a common anode SPMArray2 by the SIB2316. Since the SIB2316 supports up to two SPMArray2s, the board contains two instances of the circuitry shown in the figure. An FPC cable for each SPMArray2 carries the 16 cathode signals and common anode signal to the SIB2316. A negative high voltage bias generator on the SIB2316 provides an adjustable bias (VBIAS) to each array. The monitor points P3 and P4 should be used when adjusting the bias voltages to SPMArray2 A and SPMArray2 B, respectively.

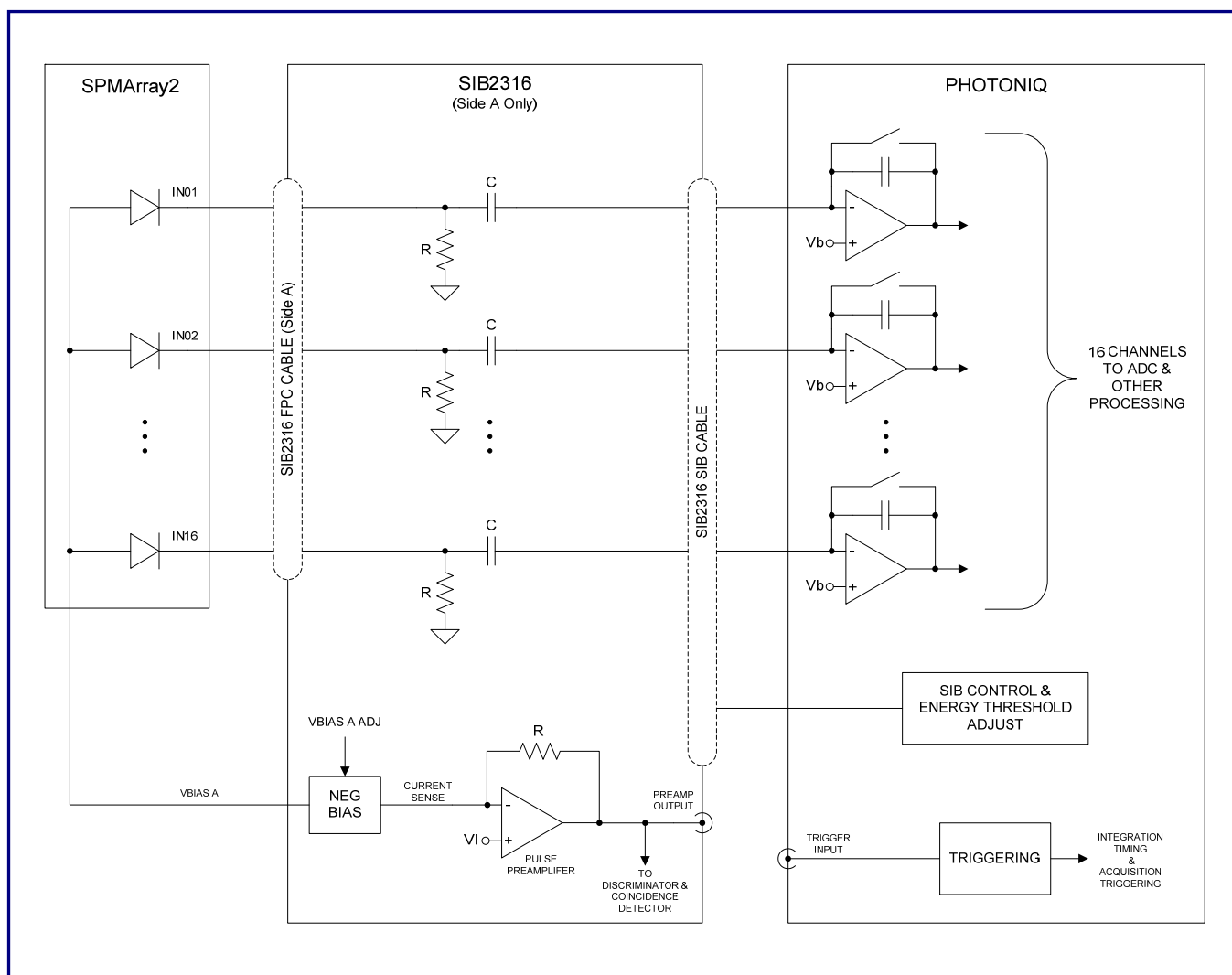


Figure 4: SPMArray2 / SIB2316 Connections

SPMArray2 Cathode Connections

Connection to the SPMArray2 device A and device B can be made using top-side FPC connectors J1 and J2 respectively. These connectors allow the SPMArray2s to face downward when connected to the SIB2316. Alternatively, if the optical setup requires that the SPMArray2s face upward, then the bottom-side FPC connectors J9 and J10 can be used. Regardless of the connectors used, the 16 cathode signals (IN01 – IN16) from each SPMArray2 are routed on the SIB2316 to SIB connector J3 as shown in Figure 4. The cathode signals from device A are AC coupled and map to inputs P1 through P16 on the connector, and likewise cathode signals from device B are AC coupled and map to inputs P17 through P32. The SIB connector mates to a proprietary low-noise, high density SIB cable assembly that carries the detector signals on coaxial connections to a Vertilon PhotoniQ 32 channel data acquisition system. Depending on the required speed and dynamic range, either a PhotoniQ IQSP480 high dynamic range system or an IQSP580 high speed system can be used as the main data acquisition unit. The charge sensitive preamplifiers on the PhotoniQ integrate the current signals from the detectors while maintaining a bias (V_b) near ground on the individual AC coupling capacitors. Because the SPMArray2 devices are of the common anode type, the current polarity to the PhotoniQ preamplifiers is *out of* the inputs. For this reason, the *Input Polarity* under the *Data Configuration* menu in the PhotoniQ GUI should be set to the default value of *positive*. See the PhotoniQ user's manual for more details.

Pulse Preamplifiers

There are many applications including PET and SPECT that require precise event timing pickoff from the SiPM detector device. Specifically, acquisition of the event data needs to be accurately timed and synchronized with the detection of particles on one or more of the elements in the SPMArray2. In fact, PET applications impose an additional condition on event acquisition known as coincidence detection whereby triggering should only occur when near-simultaneous events from each array are detected within a predefined time period. The SIB2316 contains dual event timing chains (one for each SPMArray2) that are used for charge signal measurement, pulse discrimination, coincidence detection, and event acquisition triggering.

Event timing begins with the pulse preamplifiers. The input signals to the preamplifiers are the current sense outputs from the detector common anode bias generators. The current sense is a measure of the total current to all 16 detectors in an SPMArray2 and is therefore a practical and precise means for detecting charge generated from particles that hit the SiPM device. The SIB2316 pulse preamplifiers are variable gain transimpedance devices designed to accurately produce a positive-going voltage output in response to a high speed input charge pulse. Their gain as well as all other SIB2316 parameters is adjusted using the dialog box shown on the next page available through the PhotoniQ GUI. Precision low skew timing is achieved by using matched high bandwidth, low noise amplifiers. For diagnostic and monitoring purposes, the outputs from the A and B preamps are available on SMB jacks J7 and J8, respectively. These outputs can also be used as inputs to other external equipment such as time-of-flight measurement systems.

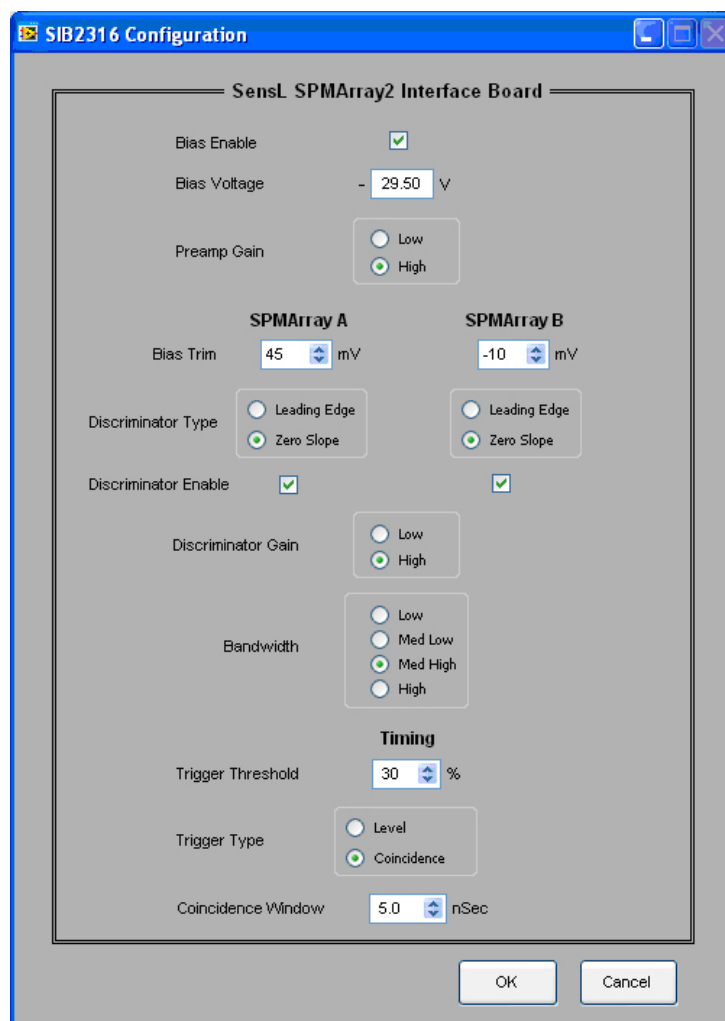


Figure 5: SIB2316 Dialog Box

Zero Slope Discriminator

Timing extraction from the charge pulse is accomplished by means of a zero slope discriminator whose timing is shown in Figure 6. Using the preamplifier output as its input, the discriminator works by generating a positive-going digital timing signal (ZSD) at the inflection point of the charge pulse input. It is at this point where the pulse is at its peak and its slope transitions from positive to negative. The internal signal DIFF is effectively the derivative of the input pulse and therefore crosses zero when the slope of its input is zero. This point is the *trigger point* in the figure. The actual digital timing output from the discriminator goes high after a small delay (t_d) relative to the *trigger point*. To minimize the effects of noise and other particle events not of interest, a comparator in the discriminator compares DIFF to a user-adjustable energy threshold (V_{th}) so that only events exceeding the threshold result in a signal on ZSD — all other events are ignored. The energy threshold adjustment to the SIB2316 is provided through the SIB cable so that the user can vary the threshold using the SIB2316 dialog box in the PhotoniQ graphical user interface. The zero slope discriminators have four bandwidth settings which along with the discriminator gain can similarly be adjusted through the GUI. For certain applications the discriminator type can be switched to leading edge discrimination instead of zero slope discrimination.

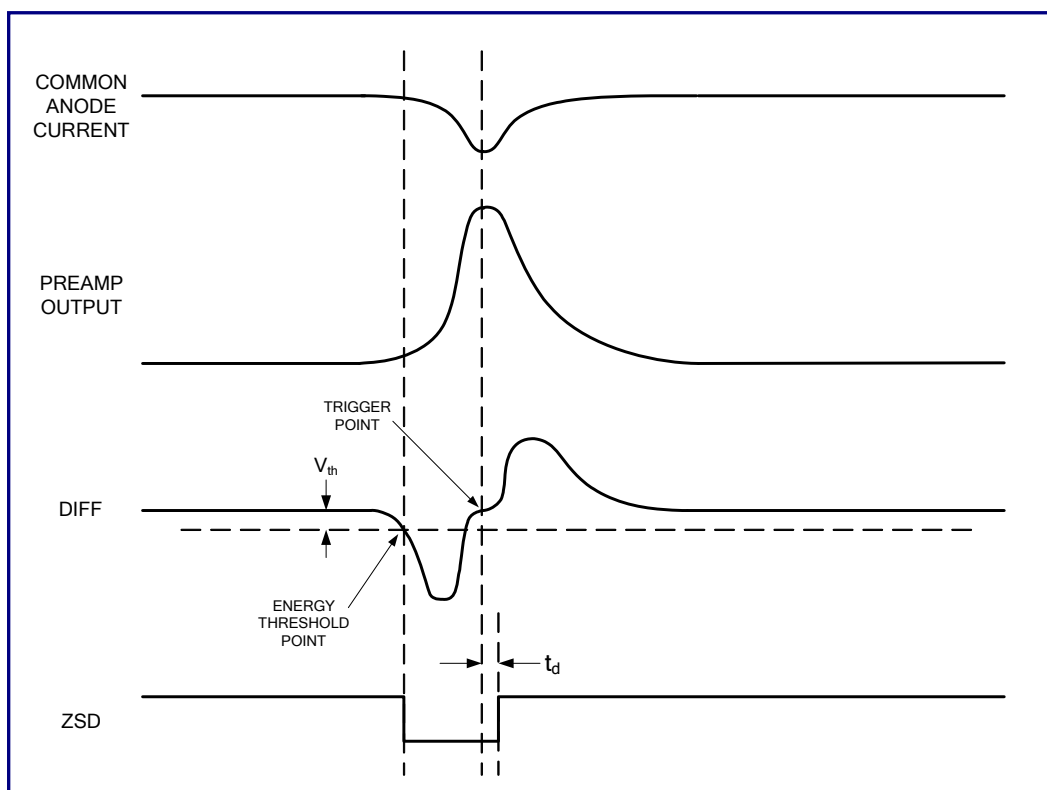


Figure 6: Zero Slope Discriminator Timing

Coincidence Detector

The coincidence detector uses the outputs from discriminators A and B to determine coincidence between particle events on SPMArray2 devices A and B. As shown in Figure 7, events occurring within a user-defined coincidence time window (t_{cw}) result in the generation of a trigger signal on connector J6. This signal can be used to trigger the capture of the 32 SiPM detector signals by a data acquisition system or other electronics. Two LEDs are used to indicate that the coincidence detector has determined a coincidence condition. When coincidence occurs due to an event on SPMArray2 A followed by an event on SPMArray2 B, LED LD3 flashes green. In the reverse condition when an event on SPMArray2 A follows an event on SPMArray2 B, LED LD4 flashes green. Generally both LEDs will flash equally when events occur near simultaneously. If however a particle event on one array continually precedes an event on the other array, then the LED associated with the array that detected the later event will flash red instead of green. When an event is detected on a particular SPMArray2 but with no coincidence, then the LED associated with the SPMArray2 that detected the event will flash red. The coincidence detector LEDs can be quite useful for system setup, diagnostics, and timing alignment.

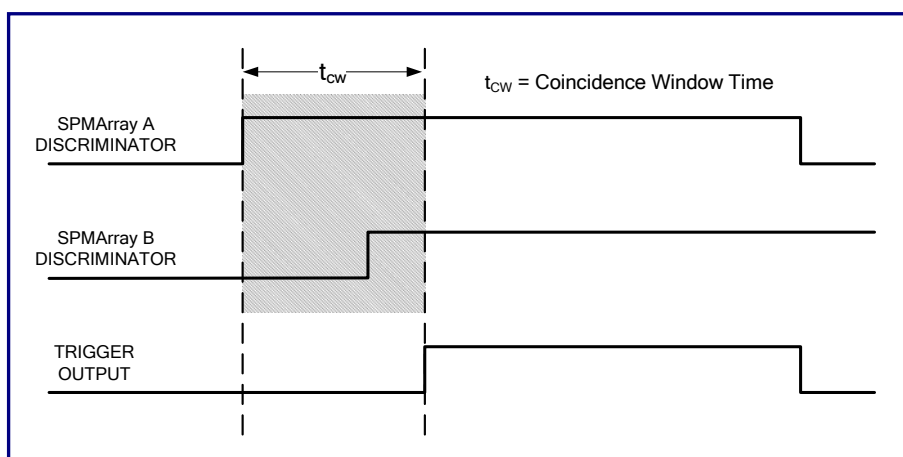


Figure 7: Coincidence Detector Timing

For applications requiring simple energy threshold triggering instead of event coincidence triggering, the coincidence detector can be configured to generate a trigger signal if a threshold-crossing event is detected on either SPMArray2. This is done by setting *Trigger Type* in the dialog box to *Level*.

Setup

Jumpers & Switches

Make sure that all switches in the configuration switch, SW1, are set to *on*.

Power

Connect a sensor interface board cable to connector J3 on the SIB2316. Connect the other side of the cable to a Vertilon PhotoniQ data acquisition system. Turn on the PhotoniQ and verify that the power LED, LD1, glows green. The power LED will temporarily glow red when power is first applied. This is normal and indicates that the SIB2316 has not yet loaded configuration data. Open the SIB2316 dialog box in the PhotoniQ GUI to load the data.

Detector Bias

Select the *Bias Enable* in the SIB2316 dialog box to enable the bias voltage generator. Verify that the bias enable LED, LD2, glows yellow indicating that the negative bias voltage generator is on. Use the *Bias Voltage* and *Bias Trim* control boxes to set the detector bias voltage to the desired voltage. The bias voltage can be monitored at test points P3 and P4.

SPMArray2 Connection

Turn off the bias to the SIB2316. Connect an SPMArray2 to channel A of the unit using an FPC cable. Connection to the SIB2316 can be made using either the top side (J1) or bottom side (J9) FPC connector. Reapply the bias and reconfirm that the bias voltage to the detector is correct. A second SPMArray2 device can be added in a similar way to channel B using connectors J2 or J10.

Detector Bias Optimization

Connect the preamp output (J7) to an oscilloscope with a 50 ohm termination. With the SPMArray2 positioned in a typical configuration in front of a particle source, adjust the detector bias so that the pulse height is about 1 volt peak. If it is not possible to reach 1 volt peak under the maximum bias conditions, increase the gain of the preamp. Make sure that there are no pulses that exceed 1.2 volts peak. If so, reduce the magnitude of the detector bias.

Energy Threshold

Using the SIB2316 dialog box in the PhotoniQ graphical user interface, set the *trigger threshold* to 5%. Verify that the channel A coincidence LED, LD3 is blinking red. Increase the *trigger threshold* to the point when the LED just turns off. Set the final *trigger threshold* to about 5 to 10% below this point.

Trigger Generation

When coincidence triggering is not required, a trigger signal can be generated on J6 any time the input signal crosses the energy threshold. To disable coincidence triggering — and thus enable level triggering — set the *Trigger Type* in the dialog box to *Level*. The output on SMB connector J6 can then be connected directly to the PhotoniQ trigger input to trigger the data acquisition process. Each time a particle that exceeds the energy threshold is detected, the LED will blink green and a trigger pulse will appear on J6. Note, although a trigger signal can be generated at rates exceeding 100 KHz, the LED will only blink at a 2 Hz maximum rate. Depending on signal conditions, it may be necessary to increase the coincidence window slightly to generate a trigger output. This is required even if coincidence detection is not used.

Coincidence Triggering

Connect a second SPMArray2 to the channel B FPC connector on the SIB2316. The channel B coincidence LED, LD4 will blink red if particles exceeding the energy threshold are detected. Set the coincidence window to the desired time. With the *Trigger Type* set to *Coincidence*, the LEDs will now blink green only when events detected on channel A and B are within the coincidence time window. Trigger generation will only occur on coincidence.

Performance Optimization

Improved coincidence detection accuracy can be achieved by optimizing the gain and bandwidth settings for the preamp and discriminators. In general the detector bias should be adjusted to get the maximum signal from the SPMArray2 devices without saturating the preamp. Furthermore, it is best to achieve this using the minimum gain setting. The discriminator gain should normally be set to the high gain mode but there are some applications where the low gain is more desirable. The bandwidth of the discriminator should be selected to minimize the time walk that results from detecting pulses of greatly differing pulse heights. When the expected pulse height varies greatly and small coincidence windows are required, the highest discriminator bandwidth should be selected. There is a trade-off between time walk and coincidence window jitter so the discriminator bandwidth should be chosen to meet the requirements of the application.

Specifications

($V_{\text{supply}} = +5.0\text{V}$, $T_A = +25\text{C}$, unless otherwise noted)

Description	Sym	Min	Typ	Max	Units	Notes
DETECTOR COMMON ANODE BIAS						
Nominal Adjustment Range	VBIAS	-32		-25.5	V	Measured at P3 and P4 with 200uA load.
Trim Range		-500		+500	mV	Added to adjustment range
Current Sink Capability			1		mA	
DETECTOR CATHODE CIRCUITS						
Quantity	P1-P32		32			
Input Resistance	R		10		K Ω	
Coupling Capacitance	C		0.01		μF	AC coupled to transimpedance amp in PhotoniQ.
Input Bias Voltage	VB		+0.250		V	Detector cathode biased at ground. Bias voltage on coupling capacitor supplied from PhotoniQ data acquisition system when SIB cable, J3, connected.
PULSE PREAMPLIFIER						
Transimpedance Gain (Low)	A		+0.37		V/mA	
Transimpedance Gain (High)	A		+0.75		V/mA	
Rise Time			10		nsec	I_{in} is a rectangular current pulse (5 nsec rise time, 5 nsec fall time) applied to detector common anode input. Output voltage swing is +0.8V into 50 ohms measured at J7 and J8.
Output Pulse Height				+0.8	V	
Baseline Voltage			+0.63		V	
Output Impedance			50		Ω	Measured at preamplifier outputs, J7 and J8 into 50 ohms.
ZERO SLOPE DISCRIMINATOR						
Low Gain (Bandwidth = High)			-0.26		V/V/usec	
Low Gain (Bandwidth = Med High)			-0.67		V/V/usec	
Low Gain (Bandwidth = Med Low)			-0.94		V/V/usec	
Low Gain (Bandwidth = Low)			-1.34		V/V/usec	
High Gain (Bandwidth = High)			-0.69		V/V/usec	
High Gain (Bandwidth = Med High)			-1.79		V/V/usec	
High Gain (Bandwidth = Med Low)			-2.51		V/V/usec	
High Gain (Bandwidth = Low)			-3.57		V/V/usec	
3dB Bandwidth (Bandwidth = High)			3.6		MHz	
3dB Bandwidth (Bandwidth = Med High)			1.4		MHz	
3dB Bandwidth (Bandwidth = Med Low)			1.0		MHz	
3dB Bandwidth (Bandwidth = Low)			0.71		MHz	
Trigger Threshold Range		0		100	%	Relative to maximum pulse height in discriminator chain

Description	Sym	Min	Typ	Max	Units	Notes
ZERO SLOPE DISCRIMINATOR TIMING						
Output Delay	t_d		6		nsec	
Time Walk (I_{in} : 100% to 50%)			4	5	nsec	I_{in} is an asymmetric triangular pulse (250 nsec rise time, 750 nsec fall time) that results in a 0.8V pk signal on the preamplifier output. Preamplifier gain and discriminator gain set to maximum. Discriminator bandwidth set to high. Trigger threshold set to 40%.
Time Walk (I_{in} : 100% to 25%)			6	7	nsec	
Jitter			± 0.5	± 1	nsec	
COINCIDENCE DETECTOR						
Nominal Time Window Range	t_{cw}	5.0		128.0	nsec	Actual time window is approximately ± 2 nsec less than nominal setting. The extents of the coincidence window are defined at the points where at least 50% of the coincident events are detected.
Nominal Time Window Resolution			0.5		nsec	
Nominal Time Window Accuracy			± 2		%	
Time Skew Path A to B		-1.0		+1.0	nsec	
Re-arm Time			50		nsec	Trigger rate when using coincidence detector typically limited by the pulse width of the input signal to the discriminator.
Trigger Output Impedance			50		Ω	
Trigger Output Logic High Level	V_{OH}	+4.3	+4.8		V	($I_{OH} = -32mA$)
Trigger Output Logic Low Level	V_{OL}		+0.2	+0.6	V	($I_{OL} = 32mA$)
POWER						
Supply Voltage	V_{supply}	+4.6	+5.0	+5.1	V	
Supply Current	I_{supply}		220		mA	Measured with detector bias enabled
DIMENSIONS						
Width	W		84.0		mm	
Length	L		102.0		mm	(not including SMB connectors which extend past PCB edge)
Thickness	T		1.6		mm	(printed circuit board only)

Table 1: Specifications

Top and Bottom Views

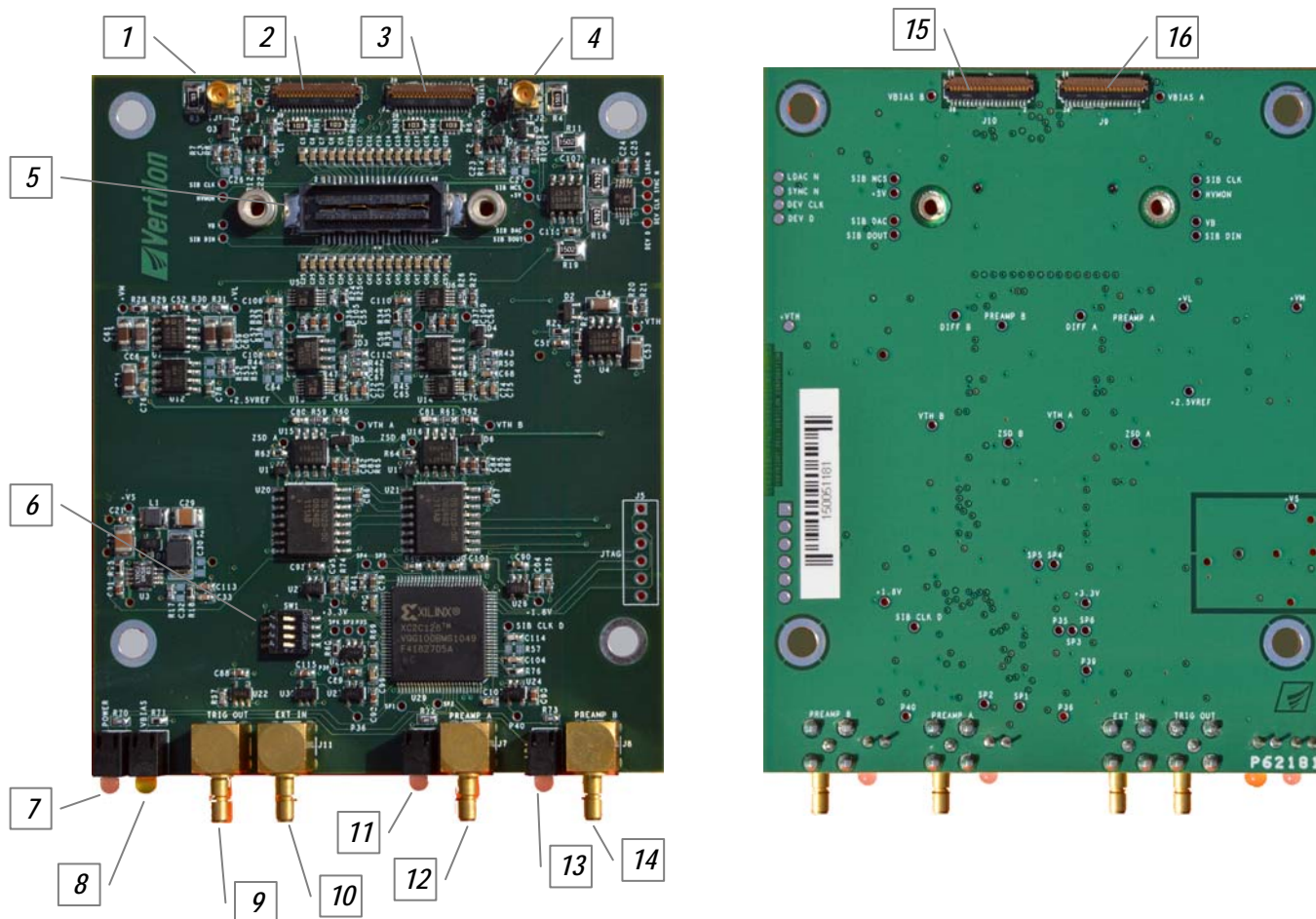


Figure 8: Top and Bottom Views

- | | |
|---|--|
| 1. SPMArray2 A Detector Test Input | 2. SPMArray2 A Top Side FPC Connector (J1) |
| 3. SPMArray2 B Top Side FPC Connector (J2) | 4. SPMArray2 B Detector Test Input |
| 5. Sensor Interface Board Connector (J3) | 6. Configuration Switch (SW1) |
| 7. Main Power LED | 8. Detector Bias Enable LED |
| 9. Trigger Output (J6) | 10. External Input (J11) |
| 11. SPM Array A Coincidence Detector LED | 12. Preamp A Output (J7) |
| 13. SPM Array B Coincidence Detector LED | 14. Preamp B Output (J8) |
| 15. SPMArray2 B Bottom Side FPC Connector (J10) | 16. SPMArray2 A Bottom Side FPC Connector (J9) |

Component Locations and Functions

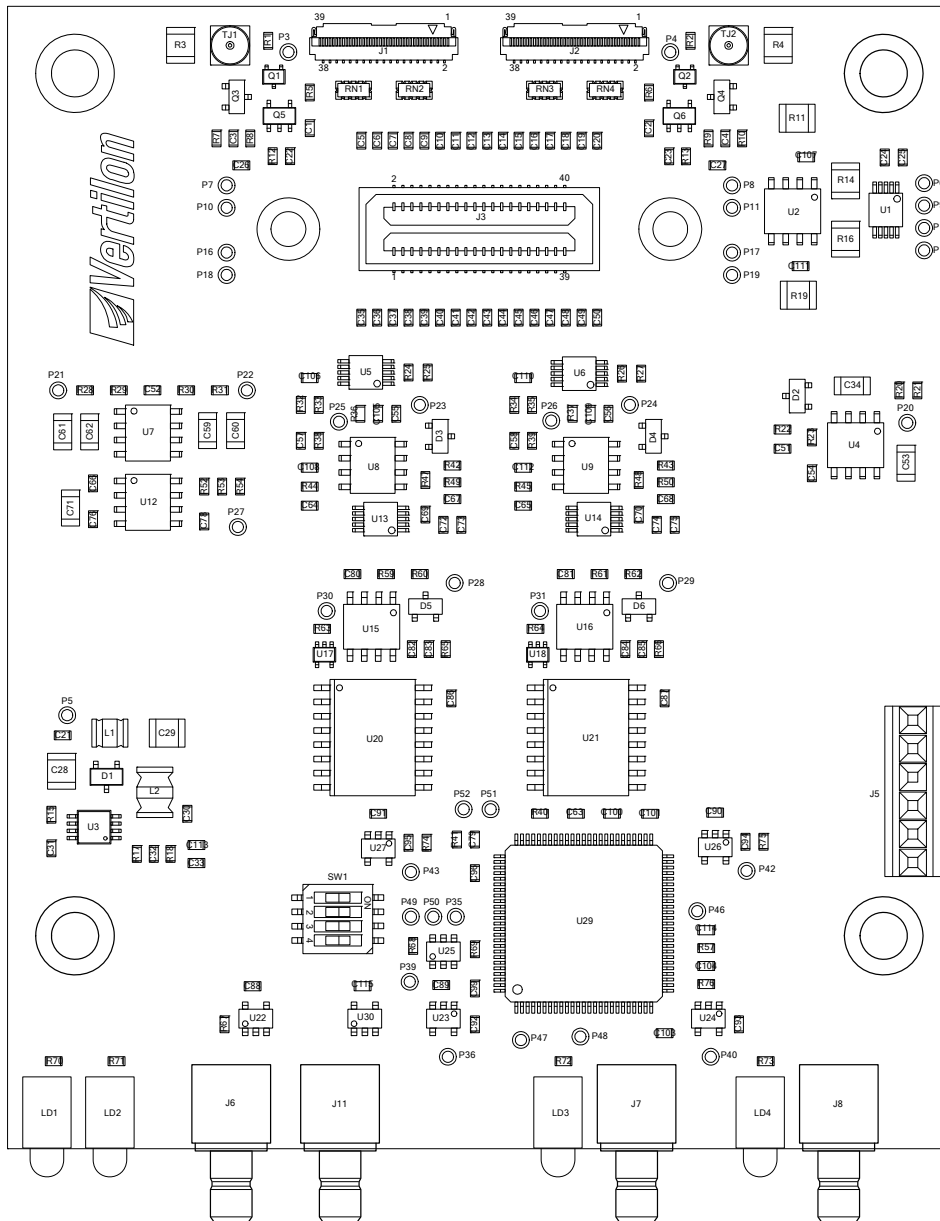


Figure 9: Component Locations and Functions

Name	Function	Description
J1 / J9	SPMArray2 A (top / bottom)	FPC cable connector for SPMArray2 A (channels 1 - 16)
J2 / J10	SPMArray2 B (top / bottom)	FPC cable connector for SPMArray2 B (channels 17 - 32)
J3	CHANNELS 1-32	SIB cable connector to PhotoniQ (channels 1 – 32)
J5	JTAG	Reserved for JTAG interface connector
J6	TRIGGER	Trigger output from coincidence detector
J7	PREAMP A	Preamp output from SPMArray2 A
J8	PREAMP B	Preamp output from SPMArray2 B
J11	EXT IN	External input (unused)

Table 2: Connectors

Name	Function	Description
LD1	POWER	Green LED indicator for power. Glows red when unit not configured.
LD2	VBIAS	Yellow LED indicator for detector bias on.
LD3	ARRAY A	Bicolor (red/green) for Array A trigger status
LD4	ARRAY B	Bicolor (red/green) for Array B trigger status
SW1: 1-2	DEV ADDR 1:0	Sets the device address for control by the PhotoniQ. Set both switches to "ON".
SW1: 3-4	DEV TYPE 1:0	Sets the device type for control by the PhotoniQ. Set both switches to "ON".

Table 3: LEDs and Switches

P #	Label	Description
P3	VBIAS A	Detector bias voltage to SPMArray2 A. Used when trimming SPMArray2 A bias.
P4	VBIAS B	Detector bias voltage to SPMArray2 B. Used when trimming SPMArray2 B bias.
P5	-VS	Internal negative power supply, nominally -33.5V.
P10	HVMON	Reserved for indirectly monitoring detector bias through the SIB cable.
P11	+5V	Main +5V power to the SIB2316 supplied by the PhotoniQ through SIB connector J3.
P16	VB	Bias voltage on detector cathode coupling capacitor. Supplied through SIB connector J3, nominally +0.250V.
P20	+VTH	Energy threshold voltage to discriminators A and B.
P21	+VM	Internal baseline voltage for detector common anode signal processing chain. Nominally +2.5V.
P22	+VL	Internal baseline voltage for detector common anode signal processing chain. Nominally +1.25V.
P23	DIFF A	Internal test point for zero slope discriminator A.
P24	DIFF B	Internal test point for zero slope discriminator B.
P27	+2.5VREF	Internal reference voltage, +2.50V.
P28	VTH A	Internal energy threshold point for discriminator A.
P29	VTH B	Internal energy threshold point for discriminator B.
P30	ZSD A	Output of discriminator A.
P31	ZSD B	Output of discriminator B.
P42	+1.8V	Internal digital supply voltage, +1.8V
P43	+3.3V	Internal digital supply voltage, +3.3V

Table 4: Test Points

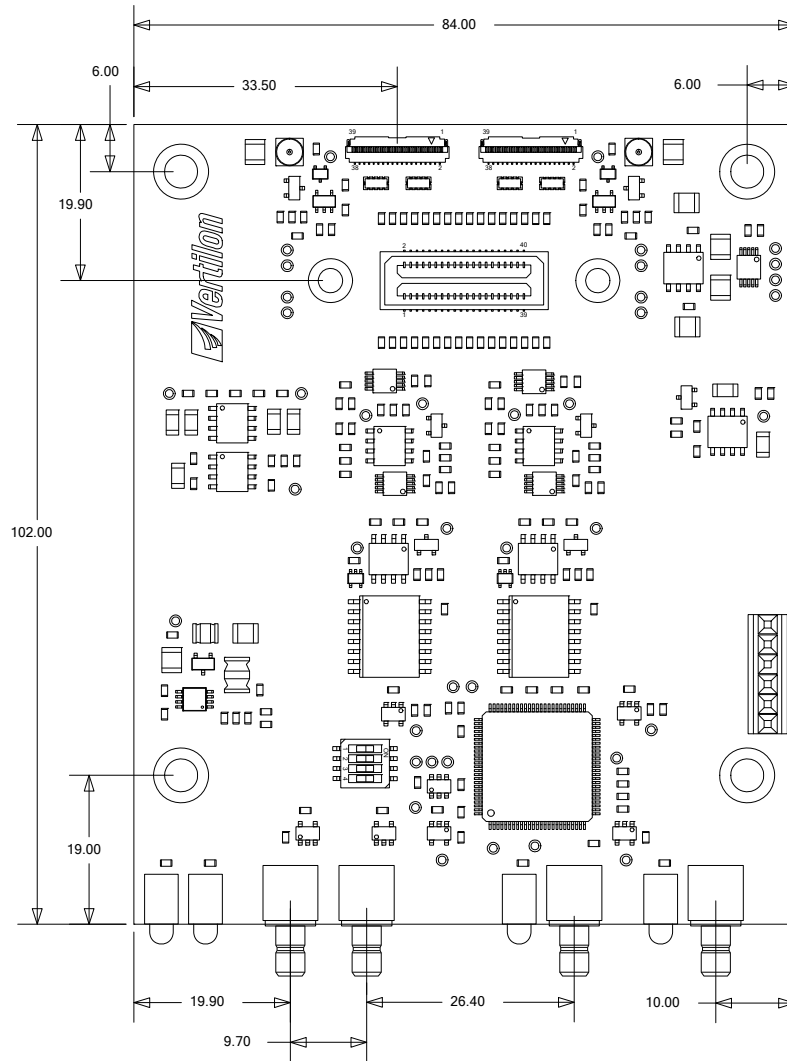
SIB Connector Pinout

The SIB2316 connectors and cables are fully compatible with all Vertilon PhotoniQ systems. For applications utilizing data acquisition systems other than Vertilon's PhotoniQ series, the pinout for connector J3 is provided in Table 5 as a reference.

Pin #	Signal Name	Signal Function	Pin #	Signal Name	Signal Function
1	VB	Detector Cathode Bias (+0.250V)	2	HVMON	Detector Anode Bias Monitor
3	SIB_DIN	Serial Data Input	4	SIB_CLK	Serial Clock
5	P16	SPMArray2 A — J1:IN02 / J10:IN16	6	P32	SPMArray2 B — J2:IN02 / J9:IN16
7	P15	SPMArray2 A — J1:IN01 / J10:IN15	8	P31	SPMArray2 B — J2:IN01 / J9:IN15
9	P14	SPMArray2 A — J1:IN04 / J10:IN14	10	P30	SPMArray2 B — J2:IN04 / J9:IN14
11	P13	SPMArray2 A — J1:IN03 / J10:IN13	12	P29	SPMArray2 B — J2:IN03 / J9:IN13
13	P12	SPMArray2 A — J1:IN06 / J10:IN12	14	P28	SPMArray2 B — J2:IN06 / J9:IN12
15	P11	SPMArray2 A — J1:IN05 / J10:IN11	16	P27	SPMArray2 B — J2:IN05 / J9:IN11
17	P10	SPMArray2 A — J1:IN08 / J10:IN10	18	P26	SPMArray2 B — J2:IN08 / J9:IN10
19	P9	SPMArray2 A — J1:IN07 / J10:IN09	20	P25	SPMArray2 B — J2:IN07 / J9:IN09
21	P8	SPMArray2 A — J1:IN10 / J10:IN08	22	P24	SPMArray2 B — J2:IN10 / J9:IN08
23	P7	SPMArray2 A — J1:IN09 / J10:IN07	24	P23	SPMArray2 B — J2:IN09 / J9:IN07
25	P6	SPMArray2 A — J1:IN12 / J10:IN06	26	P22	SPMArray2 B — J2:IN12 / J9:IN06
27	P5	SPMArray2 A — J1:IN11 / J10:IN05	28	P21	SPMArray2 B — J2:IN11 / J9:IN05
29	P4	SPMArray2 A — J1:IN14 / J10:IN04	30	P20	SPMArray2 B — J2:IN14 / J9:IN04
31	P3	SPMArray2 A — J1:IN13 / J10:IN03	32	P19	SPMArray2 B — J2:IN13 / J9:IN03
33	P2	SPMArray2 A — J1:IN16 / J10:IN02	34	P18	SPMArray2 B — J2:IN16 / J9:IN02
35	P1	SPMArray2 A — J1:IN15 / J10:IN01	36	P17	SPMArray2 B — J2:IN15 / J9:IN01
37	SIB_DOUT	Serial Data Output	38	SIB_NCS	Serial Chip Select
39	SIBDAC	Discriminator Energy Threshold Adjust	40	+5V	+5V Power

Table 5: Connector J3: Sensor Interface Board (SIB)

Mechanical Information



ALL DIMENSIONS IN MILLIMETER

Figure 10: SIB2316 Printed Circuit Board Dimensions



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Jun 2011