

# General Standards Corporation

## High Performance Bus Interface Solutions

### 66-16AISS16AO2

#### 16-Bit, 18-Channel, 1.0 MSPS PMC Analog Input/Output Board With 16 Simultaneously Sampled Analog Inputs, and Two Analog Outputs

Available in PMC, PCI, cPCI and PC104-Plus and PCI Express form factors as:

<b>PMC66-16AISS16AO2:</b>	<b>PMC, Single-width</b>
<b>PCI66-16AISS16AO2:</b>	<b>PCI, short length</b>
<b>Cpci66-16AISS16AO2:</b>	<b>cPCI, 3U</b>
<b>PC104P66-16AISS16AO2:</b>	<b>PC104-Plus</b>
<b>PCle66-16AISS16AO2:</b>	<b>PCI Express</b>
<b>PCle10466-16AISS16AO2:</b>	<b>PCle, one-lane on PC/104 form factor</b>

See Ordering Information for details.

Call for availability of other form factors, such as XMC, CCPMC, etc.

#### FEATURES:

- **Analog Inputs:**
  - 16 Differential Analog Inputs with Dedicated 16-Bit SAR ADC per Channel
  - True Simultaneous Input Sampling to 1.0 MSPS per channel
  - SAR Architecture; No Minimum Sample Rate
- **Analog Outputs:**
  - Two Single-Ended Analog Outputs with Dedicated 16-Bit DAC per Channel
  - Simultaneous Output Clocking Rates to 1.0 MSPS per Channel
  - Selectable Direct-Write or FIFO-Buffered Access
  - Buffer Configurable as Open for Data Streaming, or Circular for Periodic Functions
- **Common Analog I/O Features:**
  - Software-Selectable Input/Output Ranges:  $\pm 10V$ ,  $\pm 5V$ ,  $\pm 2.5V$
  - Independent 256-Ksample Input and Output FIFO Data Buffers
  - Independent or synchronous input/output clocking
  - Hardware Clock and Sync I/O for Multiboard Operation
  - Internal Power Conversion; Single 5-Volt PCI Power Requirement
  - DMA Engine Minimizes Bus Congestion
  - Timing Controlled by Internal Rate Generator, by Software Clocking, or Externally
  - Three Independent 24-Bit frequency dividers.
  - Internal Autocalibration
- Six Bidirectional Digital I/O lines
- 66 MHz 32-Bit PCI Support, with Universal 5V/3.3V Signaling
- Single-Width PMC Form Factor with Integral EMI Shield.

#### TYPICAL APPLICATIONS:

- |                                     |                 |                       |
|-------------------------------------|-----------------|-----------------------|
| ✓ High Performance Data Acquisition | ✓ Event Capture | ✓ Robotics            |
| ✓ Arbitrary Waveform Generation     | ✓ Ultrasound    | ✓ Positioning Systems |

REV: 113010

---

### General Standards Corporation

8302A Whitesburg Drive · Huntsville, AL 35802

Phone: (256) 880-8787 or (800) 653-9970 FAX: (256) 880-8788 Email: Solutions@GeneralStandards.com

## FUNCTIONAL DESCRIPTION

The 16-Bit PMC-16AISS16AO2 analog I/O module samples and digitizes 16 input channels simultaneously at rates up to 1.0 million samples per second per channel, and the resulting 16-bit sampled data is available to the PCI bus through a 256K-Sample FIFO buffer. Sampling can be controlled in groups of 1 through 16 channels, and the sample clock can be generated either from an internal rate generator, or by software or an external source. Both burst and continuous sampling modes are supported, and input ranges are software-selectable as  $\pm 10V$ ,  $\pm 5V$  or  $\pm 2.5V$ . The inputs are divided into two channel groups, with an independent software-controlled range assignable to each group.

Two analog output channels provide software-selected output ranges of  $\pm 2.5V$ ,  $\pm 5V$  or  $\pm 10V$  that are independent of the input range assignments. The outputs are accessed either directly through two dedicated control registers, or through a 256K-Sample FIFO buffer for waveform generation. Six bidirectional digital I/O lines are programmable as inputs or outputs. Output clocking can be synchronized to analog input sampling.

On-demand autocalibration determines and applies offset and gain correction values for all input and output channels. A selftest input switching network routes output channels or calibration reference signals to the analog inputs, and permits board integrity to be verified by the host.

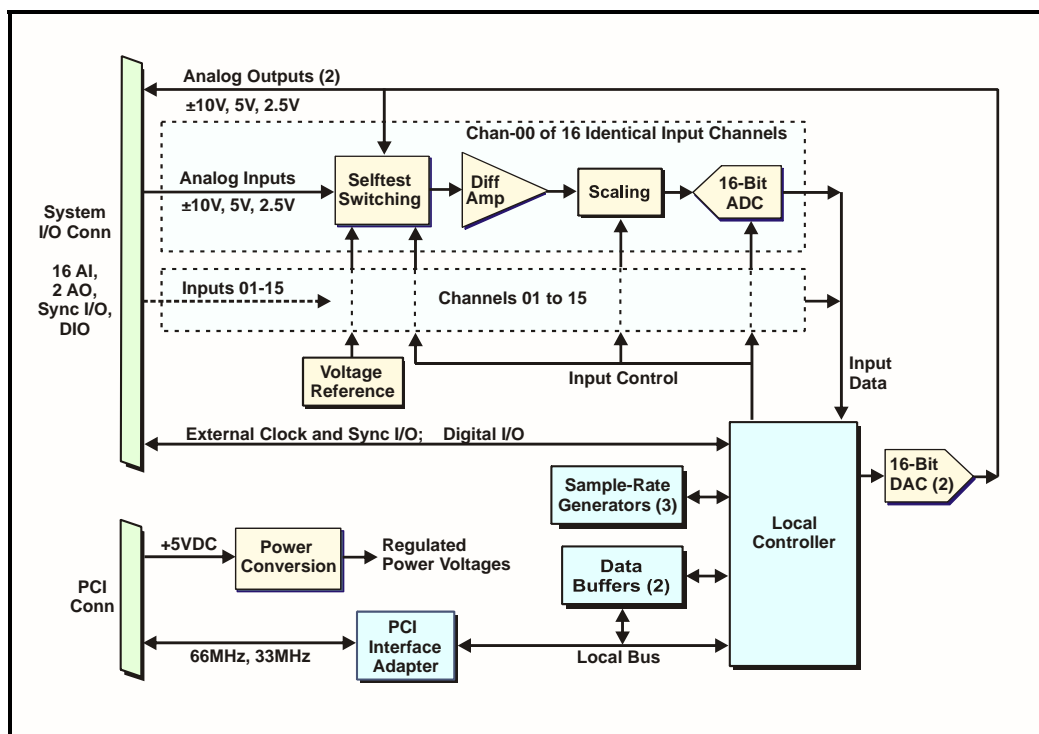


Figure 1. PMC-16AISS16AO2; Functional Organization

This product is functionally compatible with the IEEE PCI local bus specification Revision 2.3, and supports the "plug-n-play" initialization concept. System connections are made at the front panel through a high-density dual-ribbon 80-pin connector. Power requirements consist of +5 VDC in compliance with the PCI specification, and analog power voltages are generated internally. All operational parameters are software configurable. Operation over the specified temperature range is achieved with conventional air cooling.

**General Standards Corporation**

8302A Whitesburg Drive · Huntsville, AL 35802

Phone: (256) 880-8787 or (800) 653-9970 FAX: (256) 880-8788 Email: Solutions@GeneralStandards.com

## PERFORMANCE SPECIFICATIONS

At +25 °C, with specified operating voltages

### Analog Input Characteristics:

Configuration:	16 differential analog input channels; Dedicated 16-Bit ADC per channel. Optional 8-Channel version available.
Voltage Ranges:	Independently assignable between two groups of input channels as: $\pm 10V$ , $\pm 5V$ or $\pm 2.5V$ full scale.
Input Impedance:	2 Megohms Line-Line in parallel with 40pF.
Input Leakage Current:	30 nanoamps typical, all ranges
Crosstalk Rejection:	84dB, DC-10kHz. 70dB at 100kHz.
Signal/Noise Ratio (SNR):	82 dB typical; 10Hz - 500kHz
Common Mode Rejection:	70dB DC-10kHz; 50dB at 500kHz. Typical with CMV = $\pm 10V$ , $V_{in}$ = Zero.
Overvoltage Protection:	$\pm 25V$ with power applied, $\pm 15$ Volts with power removed.

### Analog Input Transfer Characteristics:

Resolution:	16 Bits (0.0015 percent of FSR)												
Sample Rate:	Zero to 1.0 MSPS per channel. (The maximum rate may be reduced by low-value master clock frequencies. See Ordering Options.)												
Sampling Mode:	Simultaneous; Successive-approximation conversion, all active inputs.												
DC Accuracy: (Maximum composite error after autocalibration)	<table><thead><tr><th>Range</th><th>Midscale Accuracy</th><th>Fullscale Accuracy</th></tr></thead><tbody><tr><td><math>\pm 10V</math></td><td><math>\pm 2mV</math></td><td><math>\pm 5mV</math></td></tr><tr><td><math>\pm 5V</math></td><td><math>\pm 1mV</math></td><td><math>\pm 3mV</math></td></tr><tr><td><math>\pm 2.5V</math></td><td><math>\pm 0.8mV</math></td><td><math>\pm 2mV</math></td></tr></tbody></table>	Range	Midscale Accuracy	Fullscale Accuracy	$\pm 10V$	$\pm 2mV$	$\pm 5mV$	$\pm 5V$	$\pm 1mV$	$\pm 3mV$	$\pm 2.5V$	$\pm 0.8mV$	$\pm 2mV$
Range	Midscale Accuracy	Fullscale Accuracy											
$\pm 10V$	$\pm 2mV$	$\pm 5mV$											
$\pm 5V$	$\pm 1mV$	$\pm 3mV$											
$\pm 2.5V$	$\pm 0.8mV$	$\pm 2mV$											
Small Signal Bandwidth:	Zero to 1.3MHz, -3dB, all ranges												
Settling Time:	5 $\mu$ s to 0.1%; halfscale step; typical; all ranges.												
Power Bandwidth:	2.2 Vpp-MHz; -3dB												
Integral Nonlinearity:	$\pm 0.007$ percent FSR (FSR = fullscale range; e.g.: 20V on $\pm 10V$ range).												
Differential Nonlinearity:	$\pm 0.003$ percent FSR.												

### Analog Input Operating Modes and Controls

Input Data Buffer:	256K-sample FIFO
Sample Clock Sources:	Internal rate generator; External Hardware Clock I/O, Software clock.
Sampling Modes:	Continuous sampling, and triggered burst.
Internal Rate Generators:	Two independent rate generators, one for ADC clocking; one for burst triggering. Both programmable from 3-1,000,000 sample clocks per second, using 24-Bit dividers from the master clock frequency.
External Clock I/O:	TTL, bidirectional. Zero to 1,000,000 sample clocks per second.
Principal Status Register:	Consolidates critical status flags at a single Longword location.
Input Data Format:	16 Bits. Selectable as offset binary or two's complement. First-channel and end of-burst tagged.

### **Analog Output Characteristics:**

Configuration:	Two single-ended output channels. (Ordering option)
Voltage Ranges:	$\pm 10$ , $\pm 5$ or $\pm 2.5$ Volts; Independent of analog input ranges.
Output Resistance:	1.0 Ohm maximum at I/O connector pins.
Output protection:	Withstands sustained short-circuiting to ground
Load Current:	Zero to $\pm 3$ ma per channel
Load Capacitance:	Stable with any load capacitance
Noise:	1.0mV-RMS, 10Hz-100KHz typical
Glitch Impulse:	7 nV-s, typical on $\pm 5$ V range

### **Analog Output Transfer Characteristics:**

Resolution:	16 Bits (0.0015 percent of FSR)												
Output Access:	Direct register access or 256K-Sample FIFO buffer.												
DC Accuracy: (Max error, no-load)	<table border="1"><thead><tr><th>Range</th><th>Midscale Accuracy</th><th><math>\pm</math>Fullscale Accuracy</th></tr></thead><tbody><tr><td><math>\pm 10</math>V</td><td><math>\pm 4</math>mV</td><td><math>\pm 8</math>mV</td></tr><tr><td><math>\pm 5</math>V</td><td><math>\pm 2</math>mV</td><td><math>\pm 6</math>mV</td></tr><tr><td><math>\pm 2.5</math>V</td><td><math>\pm 1.5</math>mV</td><td><math>\pm 4</math>mV</td></tr></tbody></table>	Range	Midscale Accuracy	$\pm$ Fullscale Accuracy	$\pm 10$ V	$\pm 4$ mV	$\pm 8$ mV	$\pm 5$ V	$\pm 2$ mV	$\pm 6$ mV	$\pm 2.5$ V	$\pm 1.5$ mV	$\pm 4$ mV
Range	Midscale Accuracy	$\pm$ Fullscale Accuracy											
$\pm 10$ V	$\pm 4$ mV	$\pm 8$ mV											
$\pm 5$ V	$\pm 2$ mV	$\pm 6$ mV											
$\pm 2.5$ V	$\pm 1.5$ mV	$\pm 4$ mV											
Settling Time:	3 $\mu$ s to 0.1 percent, typical with halfscale step, no-load.												
Crosstalk Rejection:	70 dB minimum, DC-100 kHz												
Integral Nonlinearity:	$\pm 0.007$ percent of FSR, maximum												
Differential Nonlinearity:	$\pm 0.002$ percent of FSR, maximum												

### **Analog Output Operating Modes and Controls**

Output Data Buffer:	256K-sample FIFO
Sample Clock Sources:	Internal rate generator; External Clock I/O, Software clock. 1MHz max. (The maximum rate may be reduced by low-value master clock frequencies. See Ordering Options)
Burst Triggering Sources:	TTL external Trigger I/O (shared with analog inputs), Software trigger.
Clocking Modes:	Continuous or periodic clocking, and triggered burst.
Internal Rate Generator:	Programmable from 3-1,000,000 output clocks per second. Divides Master Clock frequency to clocking rate using a 24-bit divider.
External Clock I/O:	TTL, bidirectional. Zero to 1,000,000 sample clocks per second.
Output Data Format:	16-Bits. Selectable as offset binary or two's complement.

### **Digital Input/Outputs:**

Six TTL I/O lines, individually configurable as inputs or outputs. 0.2ma maximum input loading as current source, 4ma output loading as either sink or source. Direct register control.

### **PCI Compatibility:**

Conforms to PCI Specification 2.3, D32 read/write, 33/66MHz, universal (5V/3.3V) signaling, Supports block-mode and demand-mode DMA data transfers in two channels as bus master.

### **Power Requirements**

+5VDC  $\pm 0.25$  VDC at 1.3 Amp typical, 1.5 Amp maximum.

Maximum Power Dissipation: Side-1: 6.5 Watts. Side 2: 1.0 Watt.

---

## **General Standards Corporation**

8302A Whitesburg Drive · Huntsville, AL 35802

Phone: (256) 880-8787 or (800) 653-9970 FAX: (256) 880-8788 Email: Solutions@GeneralStandards.com

## ***PHYSICAL PARAMETERS***

---

### ***Mechanical Characteristics (PMC Form Factors)***

Height: 13.5 mm (0.53 in)  
Depth: 149.0 mm (5.87 in)  
Width: 74.0 mm (2.91 in)  
Shield: Side-1 is protected by an EMI shield.

### ***Environmental Specifications***

Ambient Temperature Range:

Standard Temperature: Operating: 0 to +70 Degrees Celsius \*  
Storage: -40 to +85 Degrees Celsius

Extended Temperature: Operating: -40 to +80 Degrees Celsius \*  
Storage: -40 to +85 Degrees Celsius

\* Air temperature at board surface.

Relative Humidity: 0 to 95%, non-condensing

Altitude: Operation to 10,000 ft.

Cooling: Conventional air cooling; 150 LFPM

## ORDERING INFORMATION

Specify the basic product model number followed by an option suffix "-A-B-C-D", as indicated below. For example, model number **PMC66-16AISS16AO2-16-2-45.00M** describes a PMC module with 16 input channels, two output channels, a 45MHz master clock frequency, and no custom features.

Basic Model Number	Form Factor
PMC66-16AISS16AO2	PMC (Native)
PCI66-16AISS16AO2 <sup>1</sup>	PCI, short length
Cpci66-16AISS16AO2 <sup>1</sup>	cPCI, 3U
PCle66-16AISS16AO2 <sup>1</sup>	cPCI, 3U
PC104P66-16AISS16AO2	PC104-Plus
PCle10466-16AISS16AO2 <sup>1,2</sup>	PCle, one-lane on PC/104 form factor

<sup>1</sup> Module installed and tested on an adapter, with mechanical and functional equivalency. Contact factory for availability in native form factors.

<sup>2</sup> PCle104 supports only the PCle bus.

Optional Parameter	Value	Specify Option As:
Number of Input Channels	16 Input Channels	A = 16
	8 Input Channels	A = 8
Number of Output Channels	2 Output Channels	B = 2
	No Analog Outputs	B = 0
Master Clock Frequency <sup>1</sup>	45.000MHz	C = 45.000M
	32.768MHz <sup>2</sup>	C = 32.768M
Custom Feature	---	D <sup>3</sup>

<sup>1</sup> Custom frequencies available from 44-47MHz for rated performance. Contact Sales for details.

<sup>2</sup> A 32.768MHz frequency reduces the maximum input and output data rates to 740kHz..

<sup>3</sup> Numeric code determined by specific feature. Blank or zero (0) if no custom feature applies.

## General Standards Corporation

8302A Whitesburg Drive · Huntsville, AL 35802

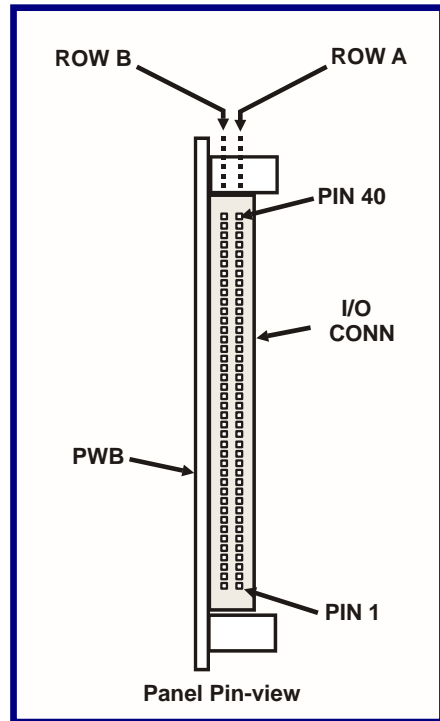
Phone: (256) 880-8787 or (800) 653-9970 FAX: (256) 880-8788 Email: Solutions@GeneralStandards.com

# SYSTEM INTERFACE CONNECTOR

Table 1. System I/O Connector

ROW-A		ROW-B	
PIN	SIGNAL	PIN	SIGNAL
1	INP00 LO *	1	INP10 LO **
2	INP00 HI *	2	INP10 HI **
3	INPUT RTN	3	INPUT RTN
4	INPUT RTN	4	INPUT RTN
5	INP01 LO *	5	INP11 LO **
6	INP01 HI *	6	INP11 HI **
7	INPUT RTN	7	INPUT RTN
8	INPUT RTN	8	INPUT RTN
9	INP02 LO **	9	INP12 LO *
10	INP02 HI **	10	INP12 HI *
11	INPUT RTN	11	INPUT RTN
12	INPUT RTN	12	INPUT RTN
13	INP03 LO **	13	INP13 LO *
14	INP03 HI **	14	INP13 HI *
15	INPUT RTN	15	INPUT RTN
16	INPUT RTN	16	INPUT RTN
17	INP04 LO *	17	INP14 LO **
18	INP04 HI *	18	INP14 HI **
19	INPUT RTN	19	INPUT RTN
20	INPUT RTN	20	INPUT RTN
21	INP05 LO *	21	INP15 LO **
22	INP05 HI *	22	INP15 HI **
23	INPUT RTN	23	OUTPUT RTN
24	INPUT RTN	24	ANA OUT 01
25	INP06 LO **	25	DIGITAL RTN
26	INP06 HI **	26	DIO 00
27	INPUT RTN	27	DIGITAL RTN
28	INPUT RTN	28	DIO 01
29	INP07 LO **	29	DIGITAL RTN
30	INP07 HI **	30	DIO 02
31	INPUT RTN	31	DIGITAL RTN
32	INPUT RTN	32	DIO 03
33	INP08 LO *	33	DIO 04
34	INP08 HI *	34	DIO 05
35	INPUT RTN	35	DIGITAL RTN
36	INPUT RTN	36	OUTPUT CLK I/O
37	INP09 LO *	37	DIGITAL RTN
38	INP09 HI *	38	TRIGGER I/O
39	OUTPUT RTN	39	DIGITAL RTN
40	ANA OUT 00	40	INPUT CLK I/O

\* Input Group-A. \*\* Input Group-B.  
The 8 input-channel configuration contains input Channels 00-07.



### System Mating Connector:

Standard 80-pin 0.050" dual-ribbon socket:  
Robinson Nugent **P50E-080S-TG**, or equivalent

General Standards Corporation assumes no responsibility for the use of any circuits in this product. No circuit patent licenses are implied. Information included herein supersedes previously published specifications on this product and is subject to change without notice.