

General Standards Corporation

High Performance Bus Interface Solutions

66-16AO16CM2

16-Channel, 16-Bit, 2.5MSPS Low-Glitch Analog Output Board *With Software-Disconnectable Outputs*

PMC66-16AO16CM2:	PMC, Single-width
PCI66-16AO16CM2:	PCI, short length
CPCI66-16AO16CM2:	cPCI, 3U
PC104P66-16AO16CM2:	PC104-Plus
PCIe66-16AO16CM2:	PCI Express
PCIe10466-16AO16CM2:	PCIe, one-lane on PC/104 form factor

See Ordering Information for details.

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

Features Include:

- Sixteen Precision 16-Bit Low-Glitch analog output channels: DAC per Channel
- Outputs are available either as 3-wire differential or as 2-wire single-ended
- Output data rates to 2.5 Megasamples per second per channel; 40MSPS aggregate
- Optional *Disconnectable Outputs* for parallel redundancy applications
- Low glitch impulse; 2nV-sec on $\pm 10V$ range
- Software-selectable output ranges of $\pm 10V$ or $\pm 5V$
- 66MHz PCI Bus support with DMA buffer transactions
- Simultaneous or sequential output clocking
- 256K-Sample output data FIFO buffer; Configurable as open or closed (circular)
- Multiboard synchronization supported
- Continuous and Triggered-Burst output modes support seamless waveform sequencing
- Data clocking rate can be controlled either internally or externally
- High accuracy is ensured by on-demand Autocalibration of all channels

Applications Include:

- | | | |
|---------------------------|-----------------------|-----------------------|
| ✓ Precision Voltage Array | ✓ Parallel Redundancy | ✓ Waveform Synthesis |
| ✓ High Density Outputs | ✓ Process Control | ✓ Industrial Robotics |

ADVANCE INFORMATION

REV:113011

General Standards Corporation

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Overview:

The 66-16AO16CM2 board contains sixteen 16-bit D/A converters (DAC's), and all supporting functions necessary for providing precision high-speed differential or optionally single-ended analog output capability. Output ranges are software-selectable as ± 10 Volts or ± 5 Volts. PCI, PC104P and PMC versions are functionally compatible with the IEEE PCI local bus specification Revision 2.3, and support both 66MHz and 33MHz PCI bus speeds with universal signaling. Unique FIFO buffer controls support the seamless sequencing of successive waveforms through a single buffer port. In less demanding applications, the outputs can be updated individually. Hardware clock and sync I/O permits synchronization of multiple boards.

A PCI interface adapter provides the interface between the controlling PCI bus and the internal local controller for PMC, PC104P and PCI versions (Figure 1). The output channels are controlled through an analog output FIFO buffer, and can be updated either simultaneously or sequentially. The output clocking rate can be controlled by an internal rate generator or by an external clock. On-demand autocalibration ensures maximum accuracy under all conditions. An optional outputs-disconnect feature supports redundancy applications and eliminates output activity during autocalibration. Analog output levels are initialized to zero (midrange).

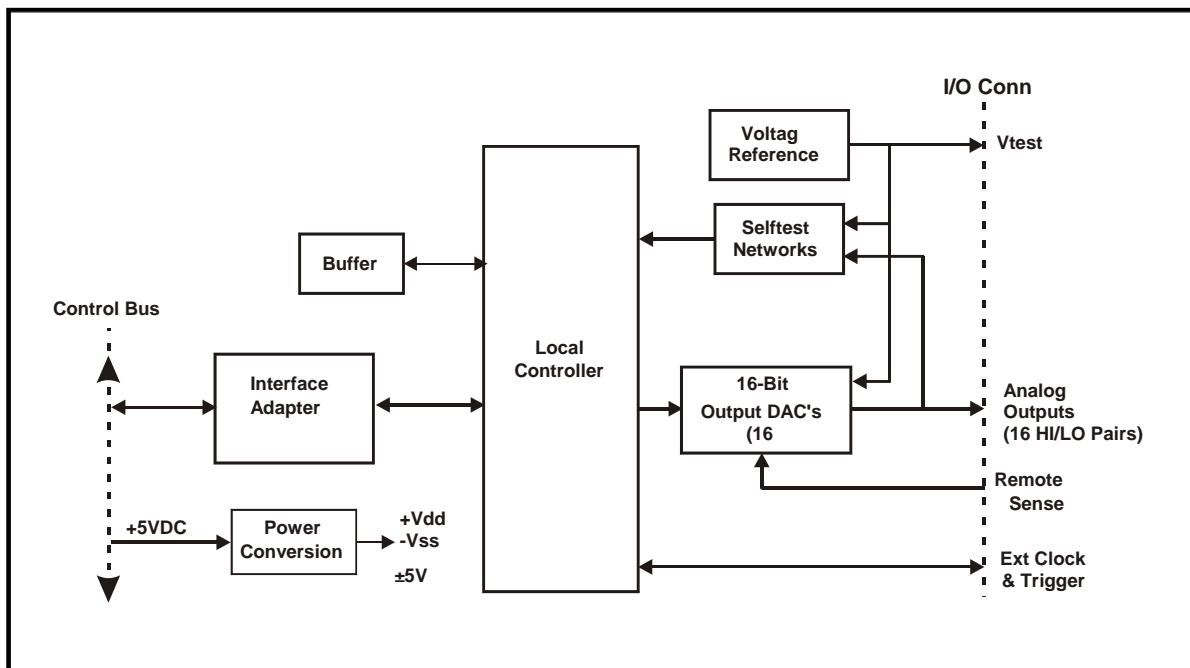


Figure 1. 66-16AO16CM2 Board; Functional Organization

This product is designed for minimum off-line maintenance. On-demand autocalibration eliminates the need for disconnecting or removing the module from the system for calibration. All analog output system connections are made through a single 68-pin I/O connector. Power requirements consist of +5VDC for PMC, PC104P and PCI versions, in compliance with the PCI specification, and operation over the specified temperature range is achieved with conventional convection cooling.

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Electrical Specifications

(At +25 °C, with specified operating conditions)

Analog Output Channels

Output Characteristics:

Configuration:	Sixteen 3-wire balanced differential analog output channels, with a dedicated 16-Bit DAC per channel. Each 3-Wire output consists of complementary 'HI' and 'LO' signal lines, with 'output return' as the center (balance) reference. All output returns are electrically common internally. Optional Single-ended outputs are available as a factory option. 8-Channel and 4-Channel configurations also are available.
Voltage Ranges:	Software-selected as $\pm 10V$ or $\pm 5V$, Line-to-Line for differential configuration. Line-to-Ground with Single-Ended option (Output-HI relative to output return). See Ordering information.
Output Resistance:	Standard: 1.0 Ohm maximum; Outputs-Disconnect option: 3 Ohms max connected; 10Kohms disconnected.
Protection:	Withstands sustained short-circuiting to ground without damage
Load Current:	± 3 ma maximum; ± 2 ma recommended for minimal crosstalk and line loss
Load Capacitance:	Stable with zero to 2,000 pF shunt capacitance; all ranges, all loads.
Settling Time (Typical):	No Filter : 1 us to 1%, 1.5 us to 0.01% 1.0 MHz Filter: 1.5 us to 1%, 2 us to 0.01% 100 kHz Filter: 10 us to 1%, 17 us to 0.01%
Noise:	No Filter: 1.3 mVRMS, 10Hz-10MHz 10 kHz Filter: 0.4 mVRMS, 10Hz-10MHz
Glitch Impulse:	$\pm 2.5V$ Range: 3 nV-Sec max.. $\pm 10V$ Range: 8 nV-Sec
Remote Sensing: (Single-ended outputs)	Single input pin compensates for ground potential at load. Max functional range $\pm 1.0V$. Max sustained overvoltage is $\pm 20V$. Correction error ± 1 percent maximum. Input resistance: 15K typical. Enabled or disabled through application software.

Transfer Characteristics:

Resolution:	16 Bits (0.0015 percent of FSR)									
Sample Clocking Rate:	Internal Rate Clock: 172 to 2,500,000 samples per second per channel External Rate Clock: 0 to 2,500,000 samples per second per channel									
DC Accuracy, Line-Line: (Max error, no-load)	<table><thead><tr><th>Range</th><th>Midscale Accuracy</th><th>\pmFullscale Accuracy</th></tr></thead><tbody><tr><td>$\pm 10V$</td><td>$\pm 2.4mv$</td><td>$\pm 3.3mv$</td></tr><tr><td>$\pm 5V$</td><td>$\pm 1.7mv$</td><td>$\pm 2.2mv$</td></tr></tbody></table>	Range	Midscale Accuracy	\pm Fullscale Accuracy	$\pm 10V$	$\pm 2.4mv$	$\pm 3.3mv$	$\pm 5V$	$\pm 1.7mv$	$\pm 2.2mv$
Range	Midscale Accuracy	\pm Fullscale Accuracy								
$\pm 10V$	$\pm 2.4mv$	$\pm 3.3mv$								
$\pm 5V$	$\pm 1.7mv$	$\pm 2.2mv$								
Output Balance:	10mV maximum HI/LO unbalance.									
Bandwidth	100 kHz, 1.0 MHz and No-Filter (>1.5 MHz) options, Typical at -3dB. (Single-pole lowpass)									
Crosstalk Rejection:	80 dB minimum, DC-50 kHz									
Integral Nonlinearity:	± 0.008 percent of FSR, maximum									
Differential Nonlinearity:	± 0.004 percent of FSR, maximum									

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Operating Modes and Control

DAC Clocking Source:	Internal rate generator, external hardware input, or software clock.
Multiboard Clocking Configurations:	To support the simultaneous clocking of DAC outputs on multiple boards, the 16AO16CM2 can be software-designated as either a clock initiator or a clock target. Initiators provide an output clock for target boards, each of which can retransmit the clock signal to subsequent boards connected in a daisy-chain configuration.
Burst Trigger:	Software control bit, or external TTL/LVDS trigger input (Same as clock I/O option). Burst triggering also can be obtained from an external source.
Update Mode:	Simultaneous or channel-sequential output updating
Data Buffer:	256K-Sample FIFO.
Buffer Mode:	Selected as Circular for periodic waveforms, or as Open for one-shot functions
Data Format:	Software selected as Offset Binary or Two's complement

PCI Compatibility

Conforms to PCI Specification 2.3, with 66 MHz or 33 MHz bus and D32 read/write transactions.
Universal I/O supports both 3.3V and 5V signaling.
Multifunction interrupt.
Supports DMA transfers as bus master.

Power, Mechanical and Environmental Specifications

Power Requirements:

+5VDC \pm 0.25 VDC at 1.5Amps maximum, 1.1 Amp typical. Outputs fully loaded.
Power Dissipation: 7.5 Watts max; 5.5 Watts typical

Mechanical Characteristics: (PMC Form Factor)

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.

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Power, Mechanical and Environmental Specifications (Continued)

Environmental Requirements:

Ambient Temperature Range:

Standard Temperature:

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

Extended Temperature:

Operating: -40 to +85 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 model number followed by an option suffix "-A-B", as indicated below. For example, model number PMC66-16AO16CM2-8-F1M-DF describes a PMC module with 8 differential output channels and 1 MHz output filters.

Basic Model Number	Form Factor
PMC66-16AO16CM2	PMC (Native)
PCI66-16AO16CM2 ¹	PCI, short length
Cpci66-16AO16CM2 ¹	cPCI, 3U
PCle66-16AO16CM2 ¹	cPCI, 3U
PC104P66-16AO16CM2	PC104-Plus
PCle10466-16AO16CM2 ^{1,2}	PCle, one-lane on PC/104 form factor

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

² PCle104 supports only the PCle bus.

Optional Parameter	Value	Specify Option As:
Number of Output Channels:	4 Channels	A = 4
	8 Channels	A = 8
	16 Channels	A = 16
Output Lowpass Filter: (Single-pole)	No output Filters (>1.5 MHz)	B = F0
	100 kHz Output Filters	B = F100K
	1.0 MHz Output Filters	B = F1M
Output Configuration:*	Differential	C = DF
	Single-Ended	C = SE

* Differential outputs are essentially immune to ground potential differences, and do not implement compensation for ground potential at the load. Single-ended outputs are affected by remote ground potentials however, and are supported with a Remote Ground Sense input to compensate for potential differences between the 66-16AO16CM2 and the load.

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System I/O Connections

I/O CONNECTOR PIN ASSIGNMENTS

ROW-A		ROW-B	
PIN	FUNCTION	PIN	FUNCTION
1	OUTPUT 00 LO	1	OUTPUT 09 LO
2	OUTPUT 00 HI	2	OUTPUT 09 HI
3	OUTPUT RETURN	3	OUTPUT 10 LO
4	OUTPUT RETURN	4	OUTPUT 10 HI
5	OUTPUT 01 LO	5	OUTPUT RETURN
6	OUTPUT 01 HI	6	OUTPUT RETURN
7	OUTPUT RETURN	7	OUTPUT 11 LO
8	OUTPUT RETURN	8	OUTPUT 11 HI
9	OUTPUT 02 LO	9	OUTPUT 12 LO
10	OUTPUT 02 HI	10	OUTPUT 12 HI
11	OUTPUT RETURN	11	OUTPUT RETURN
12	OUTPUT RETURN	12	OUTPUT RETURN
13	OUTPUT 03 LO	13	OUTPUT 13 LO
14	OUTPUT 03 HI	14	OUTPUT 13 HI
15	OUTPUT RETURN	15	OUTPUT 14 LO
16	OUTPUT RETURN	16	OUTPUT 14 HI
17	OUTPUT 04 LO	17	OUTPUT RETURN
18	OUTPUT 04 HI	18	OUTPUT RETURN
19	OUTPUT RETURN	19	OUTPUT 15 LO
20	OUTPUT RETURN	20	OUTPUT 15 HI
21	OUTPUT 05 LO	21	OUTPUT RETURN
22	OUTPUT 05 HI	22	REM GND SENSE
23	OUTPUT RETURN	23	OUTPUT RETURN
24	OUTPUT RETURN	24	VTEST OUT
25	OUTPUT 06 LO	25	VTEST RETURN
26	OUTPUT 06 HI	26	DIGITAL RETURN
27	OUTPUT RETURN	27	TRIG IN HI *
28	OUTPUT RETURN	28	TRIG IN LO *
29	OUTPUT 07 LO	29	TRIG OUT HI *
30	OUTPUT 07 HI	30	TRIG OUT LO *
31	OUTPUT RETURN	31	DAC CLK OUT HI *
32	OUTPUT RETURN	32	DAC CLK OUT LO *
33	OUTPUT 08 LO	33	CLOCK I/O HI **
34	OUTPUT 08 HI	34	CLOCK I/O LO **

The differential analog output configuration is shown. For optional single-ended outputs, OUTPUT XX HI is an output, and OUTPUT XX LO should be left disconnected.

* Software-selectable as LVDS differential pairs. In TTL mode, 'HI' pins are signal pins, and 'LO' inputs should be connected to digital return.

** Bidirectional synchronization signal.

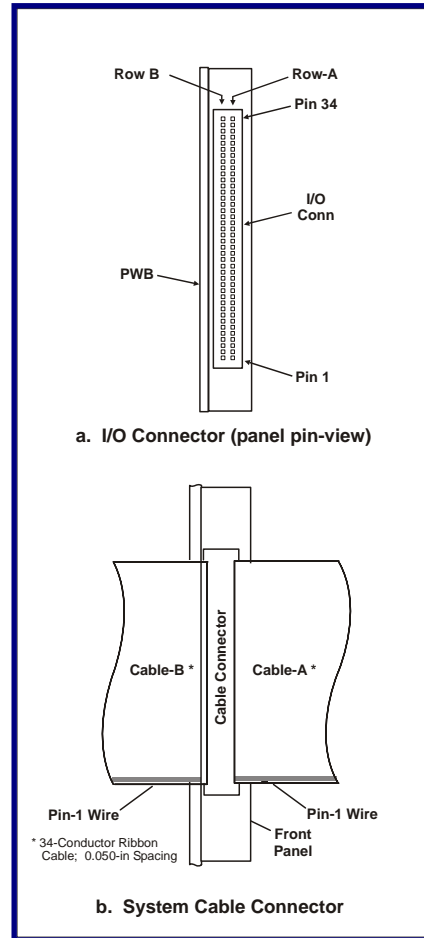


Figure 2. System I/O Connector

System Cable Mating Connector:

68-pin 0.050" Subminiature connector: with metal shield:
AMP #749621-7 or equivalent.

I/O Connector Installed on Board (Ref):

Amp # 787170-7

Channels available in 4-Channel and 8-Channel configurations:

4-Channel Board: Channels 00-03,
8-Channel board: Channels 00-07.

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.

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