

Non-insulated type high precision multi-channel analog output board for Low Profile PCI

## DA16-16(LPCI)L



\* Specifications, color and design of the products are subject to change without notice.

### Features

#### Multi-channels analog output

This product is capable of outputting 16 channels.

#### Rich set of basic functions

Compact system providing high-precision analog outputs. Analog output control signal (3 channels), digital inputs (TTL level 4 channels), digital outputs (TTL level 4 channels), and a counter (32bit TTL level 1 channel) other than analog output are provided.

#### Substantial control functions

Capable of analog output in either time-based mode or external-signal synchronous mode.

#### Filter function facilitating external signal connection

Digital filters provided for external control analog output signals, preventing chattering

#### Safety design to adjust output voltage to 0V when power supply is turned on

To prevent the unstable voltage and the connected device of D/A converter from fault and malfunctions when the power supply is turned on, the circuit is designed to adjust output voltage of the analog output to 0V.

#### Software-based calibration function

Calibration of analog output can be all performed by software. Apart from the adjustment information prepared before shipment, additional adjustment information can be stored according to the use environment.

#### Exchangeable Low Profile size and standard size slots

Support for both of Low Profile size and standard size slots (interchangeable with a bundled bracket).

#### Plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.

We offer a dedicated library [ML-DAQ], which allows you to use this product on MATLAB by The MathWorks as well as another dedicated library [VI-DAQ], which allows you to use the product on LabVIEW.

These dedicated libraries are available, free of charge (downloadable), on our web site.

This product is a PCI-compliant interface board that incorporates high-precision 16bit analog outputs, digital I/O (TTL level, 4 channels each), and a counter (32bit, 1 channel) function.

This product supports a low-profile size slot and, if replaced with the supplied bracket, supports a standard size slot, too. This product can make your space-saving PC into a cost-effective analog output system.

Using the bundled API function library package [API-PAC(W32)], you can create Windows application software for this board in your favorite programming language supporting Win32 API functions, such as Visual Basic or Visual C++.

With plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.

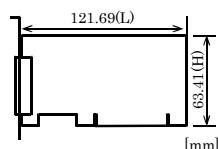
### Specification

Item	Specification
<b>Analog output</b>	
Isolated specification	Non-isolation
Number of output channels	16 channels
Output range	Bipolar $\pm 10V$
Absolute max. output current	$\pm 3mA$
Output impedance	$1\Omega$ or less
Resolution	16bit
Non-Linearity error *1	$\pm 5LSB$
Conversion speed	$10\mu sec$ [100KSPS] (Max.)
Buffer memory	1K data
Conversion start trigger	Software / external trigger
Conversion stop trigger	Number of sampling times / external trigger/software
External start signal	TTL level (Rising or falling edge can be selected by software) Digital filter (1 $\mu sec$ can be selected by software)
External stop signal	TTL level (Rising or falling edge can be selected by software) Digital filter (1 $\mu sec$ can be selected by software)
External clock signal	TTL level (Rising or falling edge can be selected by software) Digital filter (1 $\mu sec$ can be selected by software)
<b>Digital I/O</b>	
Number of input channels	Non-isolated input 4 channels (TTL level positive logic)
Number of output channels	Non-isolated output 4 channels (TTL level positive logic)
<b>Counter</b>	
Number of channels	1 channel
Counting system	Up count
Max. count	FFFFFFFF (Binary data, 32bit)
Number of external inputs	2 TTL level (Gate/Up)/ch Gate (High level), Up (Rising edge)
Number of external outputs	TTL level Count match output (positive logic, pulse output)
Response frequency	10MHz (Max.)
<b>Common section</b>	
I/O address	64 ports
Interruption level	Errors and various factors, One interrupt request line as INTA
Connector used	50-pin mini-ribbon connector 10250-52A2JL [mfd. by 3M] or equivalence to it
Power consumption (Max.)	5VDC 1100mA
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Bus specification	32bit, 33MHz, Universal key shapes supported *2
Dimension (mm)	121.69 (L) x 63.41 (H)
Weight	60g
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA

\*1 A linearity error approximately 0.1% of full-range may occur when operated at 0°C or 50°C ambient temperature.

\*2 This product requires power supply at +5V from an expansion slot (it does not work on a machine with a +3.3V power supply alone).

## Board Dimensions



The standard outside dimension(L) is the distance from the end of the board to the outer surface of the slot cover.

## Support Software

### Windows version of analog I/O driver API-AIO(WDM)

The API-AIO(WDM) is the Windows version driver library software that provides products in the form of Win32 API functions (DLL). Various sample programs such as Visual Basic and Visual C++, etc and diagnostic program useful for checking operation is provided.

For more details on the supported OS, applicable language and how to download the updated version, please visit the CONTEC's Web site.

### Linux version of analog I/O driver API-AIO(LNX)

The API-AIO(LNX) is the Linux version driver software which provides device drivers (modules) by shared library and kernel version. Various sample programs of gcc are provided.

For more details on the supported OS, applicable language and how to download the updated version, please visit the CONTEC's Web site.

### Data Acquisition library for MATLAB ML-DAQ

This is the library software which allows you to use our analog I/O device products on MATLAB by the MathWorks. Each function is offered in accordance with the interface which is integrated in MATLAB's Data Acquisition Toolbox.

### Data acquisition VI library for LabVIEW VI-DAQ

This is a VI library to use in National Instruments LabVIEW. VI-DAQ is created with a function form similar to that of LabVIEW's Data Acquisition VI, allowing you to use various devices without complicated settings.

## Cable & Connector

### Cable (Option)

Shield Cable with 50-Pin Mini-Ribbon Connectors at either Ends : PCB50PS-0.5P (0.5m)  
: PCB50PS-1.5P (1.5m)

Shield Cable with 50-Pin Mini-Ribbon Connector at one End : PCA50PS-0.5P (0.5m)  
: PCA50PS-1.5P (1.5m)

### Accessories (Option)

Screw Terminal Unit (M3 x 50P) : EPD-50A \*1 \*2

\*1 PCB50PS-0.5P or PCB50PS-1.5P optional cable is required separately.

\*2 "Spring-up" type terminal is used to prevent terminal screws from falling off.

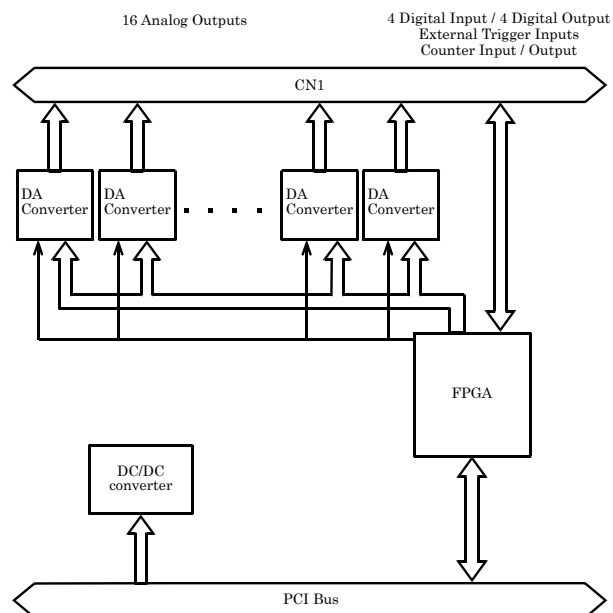
\* Check the CONTEC's Web site for more information on these options.

## Packing List

Board [DA16-16(LPCI)L] ...1  
First step guide ... 1  
CD-ROM \*1 [API-PAC(W32)] ...1  
Standard-sized bracket...1

\*1 The CD-ROM contains the driver software and User's Guide.

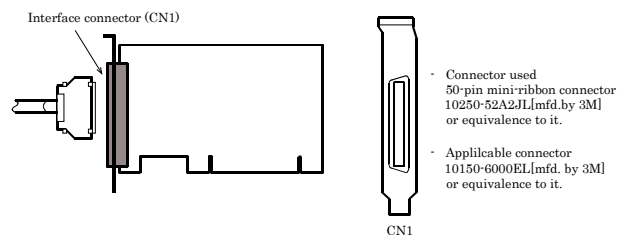
## Block Diagram



## How to connect the connectors

### Connector shape

To connect an external device to this product, plug the cable from the device into the interface connector (CN1) shown below.



- Connector used  
50-pin mini-ribbon connector  
10250-52A2JL[mfd. by 3M]  
or equivalence to it.
- Applicable connector  
10150-6000EL[mfd. by 3M]  
or equivalence to it.

\* Please refer to page 2 for more information on the supported cable and accessories.

### Pin Assignments of Interface Connector (CN1)

Analog Output 02	AO 02	50	25	AO 00	Analog Output 00
Analog Ground (for AO)	AGND	49	24	AGND	Analog Ground (for AO)
Analog Output 03	AO 03	48	23	AO 01	Analog Output 01
Analog Ground (for AO)	AGND	47	22	AGND	Analog Ground (for AO)
Analog Output 06	AO 06	46	21	AO 04	Analog Output 04
Analog Ground (for AO)	AGND	45	20	AGND	Analog Ground (for AO)
Analog Output 07	AO 07	44	19	AO 05	Analog Output 05
Analog Ground (for AO)	AGND	43	18	AGND	Analog Ground (for AO)
Analog Output 10	AO 10	42	17	AO 08	Analog Output 08
Analog Ground (for AO)	AGND	41	16	AGND	Analog Ground (for AO)
Analog Output 11	AO 11	40	15	AO 09	Analog Output 09
Analog Ground (for AO)	AGND	39	14	AGND	Analog Ground (for AO)
Analog Output 14	AO 14	38	13	AO 12	Analog Output 12
Analog Ground (for AO)	AGND	37	12	AGND	Analog Ground (for AO)
Analog Output 15	AO 15	36	11	AO 13	Analog Output 13
Analog Ground (for AO)	AGND	35	10	AGND	Analog Ground (for AO)
Output control External Sampling Stop Trigger Input	OCESSPI	34	9	OCESSPI	Output Control External Sampling Stop Trigger
Output Control External Sampling Clock Input	OCESSCI	33	8	DGND	Digital Ground
Digital Output 00	DO 00	32	7	DI 00	Digital Input 00
Digital Output 01	DO 01	31	6	DI 01	Digital Input 01
Digital Output 02	DO 02	30	5	DI 02	Digital Input 02
Digital Output 03	DO 03	29	4	DI 03	Digital Input 03
Digital Ground	DGND	28	3	DGND	Digital Ground
Counter Up Clock Input	CNT CKI	27	2	CNT GCI	Counter Gate Control Input
Reserved (Counter Input)	Reserved	26	1	CNT CPO	Counter Count-up Pulse Output

Analog Output00 - Analog Output15	Analog output signal. The numbers correspond to channel numbers.
Analog Ground *1	Common analog ground for analog I/O signals.
AO External Start Trigger Input *1	External trigger input for starting analog output sampling.
AO External Stop Trigger Input *1	External trigger input for stopping analog output sampling.
AO External Sampling Clock Input	External sampling clock input for analog output.
Digital Input00 - Digital Input03	Digital input signal.
Digital Output00 - Digital Output03	Digital output signal.
Counter Gate Control Input	Gate control input signal for counter.
Counter Up Clock Input	Count-up clock input signal for counter.
Counter Count-up Pulse Output	Counter output signal.
Digital Ground *1	Common digital ground for digital I/O signals, external trigger inputs, external sampling clock inputs, and counter I/O signals.
Reserved (Counter Input)	Reserved pin.
N.C.	No connection to this pin.

\*1 Pin Assignments is different from High-Resolution Analog Output Board for Low Profile PCI DA16-4 (LPCI)L.

#### CAUTION

Do not connect any of the outputs and power outputs to the analog or digital ground. Neither connect outputs to each other. Doing either can result in a fault.

If analog and digital ground are shorted together, noise on the digital signals may affect the analog signals. Accordingly, analog and digital ground should be separated.

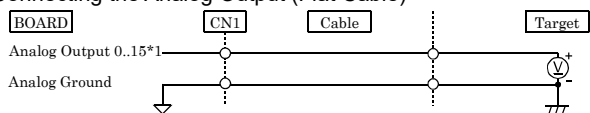
Leave "Reserved" pins unconnected. Connecting these pins may cause a fault in the board.

### Connecting the Analog Output Signal

This section shows how to connect the analog output signal by using a flat cable or a shielded cable.

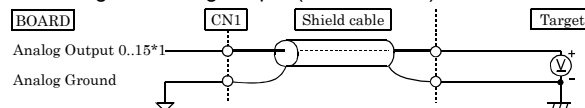
The following figure shows an example of flat cable connection. Connect the signal source and ground to the CN1 analog output.

#### Connecting the Analog Output (Flat Cable)



The following figure shows an example of shield cable connection. Use shielded cable if the distance between the signal source and this product is long or if you want to provide better protection than noise. For each analog input channel on CN1, connect the core wire to the signal line and connect the shielding to ground.

#### Connecting the Analog Output (Shield Cable)



\*1 The number of channels depends on each board.  
This product has 16 channels.

#### CAUTION

If this product or the connected wire receives noise, or the distance between this product and the target is long, data may not be outputted properly.

For analog output signal, the current capacity is  $\pm 3\text{mA}$  (Max.). Check the specification of the connected device before connecting this product.

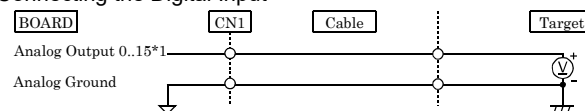
Do not short the analog output signal to analog ground, digital ground, and/or power line. Doing so may damage this product.

Do not connect an analog output signal to any other analog output, either on this product or on an external device, as this may cause a fault on this product.

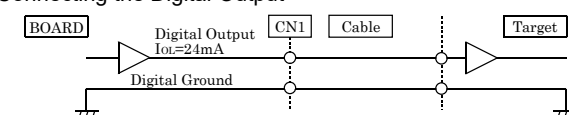
### Connecting the Digital I/O, Counter and Control Signal

The following sections show examples of how to connect digital I/O signals, counter I/O signals, and other control I/O signals (external trigger input signals, sampling clock input signals, etc.). All the digital I/O signals and control signals are TTL level signals.

#### Connecting the Digital Input



#### Connecting the Digital Output



#### About the counter input signal control

Counter Gate Control Input (refer to the page 3 Connector Pin Assignment) allows the input of the external clock for the counter to be enabled and disabled. This function can be used to control the input of the external clock for the counter. When the input level is "High", the input of the external clock for the counter is enabled. It is, on the other hand, disabled, when the input level is "Low". Note that when it is not connected, the input level is set to "High" as the board (card) pins are pulled up. Therefore, the input of the external clock for the counter is enabled when it is not connected.

#### CAUTION

Do not short the output signals to analog ground, digital ground, and/or power line. Doing so may damage this product.