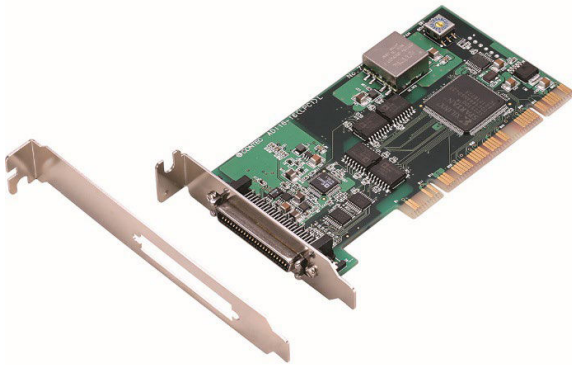## Isolated Low price high precision analog input board for Low Profile PCI
ADI16-16(LPCI)L

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

This product is a PCI-compliant interface board that incorporates high-precision analog inputs, digital inputs, digital outputs, and a counter function.　Noise tolerance is enhanced by the bus isolation.

This product supports a Low Profile size slot and, if replaced with the supplied bracket, supports a standard size slot, too.　The board can make your space-saving PC into a cost-effective analog input/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++.

It can also collect data easily without a program when the data logger software [C-LOGGER] stored on the bundled disk is used.　With plug-ins for the dedicated libraries, the board also supports LabVIEW.

* The contents in this document are subject to change without notice.
* Visit the CONTEC website to check the latest details in the document.
* The information in the data sheets is as of August, 2022.

Features

Rich set of basic functions
Compact system providing high-precision bus isolation analog inputs. This product is a control signal (Isolation TTL level 3 points) of analog input(16bits, 16ch), analog input. Digital inputs (Isolation TTL level four points), digital outputs (Isolation TTL level four points), and a counter (32-bit, Isolation TTL level one point) common to the three models.

Bus isolation between PC and external I/O signals by a digital isolator
Isolation between PC and external I/O circuit by a digital isolator improves noise tolerance.

Substantial control functions
Capable of analog input/output in either time-based mode or external-signal synchronous mode.

Filter function facilitating external signal connection
Digital filters provided for external control analog I/O signals, preventing chattering

Buffer memory
The analog inputs and outputs each have their own buffer memory. You can also perform analog input and output in the background, independent of software and the current status of the PC.

Software-based calibration function
Calibration of analog input/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).

Supported to the data logger software [C-LOGGER] (Analog input only)
Supporting the data logger software [C-LOGGER] that enables the graph display of recorded signal data, file saving, and dynamic transfer to the spreadsheet software program "Excel"

Plug-ins for the dedicated libraries, the board also supports LabVIEW.
We offer a dedicated library [DAQfast for LabVIEW], which allows you to use the product on LabVIEW.

Specification

Item		Specifications
Analog input		
	Isolated specification	Bus-Isolated
	Input type	Single-Ended Input
	Number of input channels	16ch
	Input range	Bipolar ±10V
	Absolute max. input voltage	±20V
	Input impedance	1MΩ or more
	Resolution	16bit
	Non-Linearity error *1*2	±16LSB
	Conversion speed	10μsec/ch *3 [100KSPS]*4
	Buffer memory	1k Word
	Conversion start trigger	Software / external trigger
	Conversion stop trigger	Number of sampling times / external trigger/software
	External start signal	Isolation TTL level (Rising or falling edge can be selected by software) Digital filter (1μsec can be selected by software)
	External stop signal	Isolation TTL level (Rising or falling edge can be selected by software) Digital filter (1μsec can be selected by software)
	External clock signal	Isolation TTL level (Rising or falling edge can be selected by software) Digital filter (1μsec can be selected by software)
Digital I/O		
	Number of input channels	Isolated input 4ch (TTL level positive logic)
	Number of output channels	Isolated input 4ch (TTL level positive logic)
Counter		
	Number of channels	1ch
	Counting system	Up count
	Max. count	FFFFFFFFh (Binary data,32bit)
	Number of external inputs	2 Isolation TTL level (Gate/Up) Gate (positive logic/level), Up (Rising edge)
	Number of external outputs	1 Isolation TTL level　Count match output (positive logic, pulse output)
	Response frequency	1MHz (Max.)
Common section		
	I/O address	64 ports
	Interruption level	Errors and various factors, One interrupt request line as INTA
	Connector	10250-52A2JL[3M]
	Power consumption	5VDC 400mA (Max.)
	Operating condition	0 - 50℃, 10 - 90%RH (No condensation)
	PCI bus specification	32bit, 33MHz, Universal key shapes supported　*5
	Dimension (mm)	121.69 (L) x 63.41 (H)
	Weight	65g
	Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA, KC

*1:　The non-linearity error means an error of approximately 0.1% occurs over the maximum range at 0℃ and 50℃ ambient temperature.

*2:　At the time of the source use of a signal which built in the high-speed operational amplifier.

*3:　The required time is indicated in the analog to digital translation of one channel. When AD of two or more channels is converted, time of the a few minutes of the channel is necessary. Conversion time = Number of conversion channelsx10μsec

*4:　SPS = Samplings Per Second.　The number of data that can be converted in one second is shown.

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

Dimensions

121.69(L)

63.41(H)

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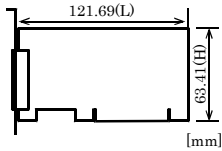
The standard outside dimension(L) is
the distance from the end of the board
to the outer surface of the slot cover.

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 *1useful for checking operation is provided.

For more details on the supported OS, applicable language and new
information, 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 new
information, please visit the CONTEC's Web site.

Data Logger Software C-LOGGER
C-LOGGER is a data logger software program compatible with our
analog I/O products. This program enables the graph display of
recorded signal data, zoom observation, file saving, and dynamic
transfer to the spreadsheet software "Excel". No troublesome
programming is required.

For more details on the supported OS, applicable language and new
information, please visit the CONTEC's Web site.

LabVIEW VI Library for Data Acquisition   DAQfast for LabVIEW
This is a data collection library to use our devices in the LabVIEW by
National Instruments. With Polymorphic VI, our design enables a
LabVIEW user to operate seamlessly. Our aim is for the customers to
perform easily, promptly what they wish to do.

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.
For more details on the supported OS, applicable language and new
information, please visit the CONTEC's Web site.

Packing List

Board [ADI16-16(LPCI)L] …1
First step guide … 1
Disk *1 [API-PAC(W32)] …1
Standard size bracket …1
Warranty Certificate …1
Serial Number Label …1

*1 The bundled disk contains the driver software and User's Guide.

List of Options

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)

Screw Terminal Unit (M3 x 50P)   :EPD-50A *1*6
Buffer Amplifier Box for Analog Input Boards
(8ch type)   :ATBA-8L *1*2*3*4
Buffer Amplifier Box for Analog Input Boards
(16ch type)   :ATBA-16L *1*2*3
BNC Terminal Unit
(for analog input 8ch)   :ATP-8L *1*5

*1 PCB50PS-0.5P or PCB50PS-1.5P optional cable is required separately.
*2 Only ADAI16-8/2(LPCI)L, ADI16-16(LPCI)L can be used.
*3 An external power supply is necessary (optional AC adaptor POA200-20 prepared.)
*4 As for the ADI16-16(LPCI)L, capable of using the analog input of up to 8ch.
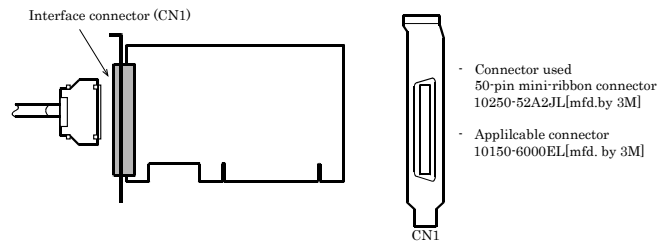*5 Capable of using the analog input of up to 8ch, and analog output of up to 2ch.
*6 "Spring-up" type terminal is used to prevent terminal screws from falling off.

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

How to connect the connectors

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

Interface connector (CN1)

- Connector used
   50-pin mini-ribbon connector
   10250-52A2JL[mfd.by 3M]

- Applilcable connector
   10150-6000EL[mfd. by 3M]

CN1

Connector Pin Assignment
Pin Assignments of ADI16-16(LPCI)L Interface Connector (CN1)

Non Connect	N.C.	50	25	N.C.	Non Connect
Reserved	Reserved	49	24	Reserved	Reserved
Non Connect	N.C.	48	23	N.C.	Non Connect
Reserved	Reserved	47	22	Reserved	Reserved
Analog Input 04	AI 04	46	21	AI 00	Analog Input 00
Analog Input 12	AI 12	45	20	AI 08	Analog Input 08
Analog Input 05	AI 05	44	19	AI 01	Analog Input 01
Analog Input 13	AI 13	43	18	AI 09	Analog Input 09
Analog Ground (for AI)	AGND	42	17	AGND	Analog Ground (for AI)
Analog Ground (for AI)	AGND	41	16	AGND	Analog Ground (for AI)
Analog Input 06	AI 06	40	15	AI 02	Analog Input 02
Analog Input 14	AI 14	39	14	AI 10	Analog Input 10
Analog Input 07	AI 07	38	13	AI 03	Analog Input 03
Analog Input 15	AI 15	37	12	AI 11	Analog Input 11
Non Connect	N.C.	36	11	AI START	AI External Start Trigger Input
Non Connect	N.C.	35	10	AI STOP	AI External Stop Trigger Input
Non Connect	N.C.	34	9	AI EXCLK	AI External Sampling Clock Input
Digital Ground	DGND	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 UPCLK	27	2	CNT GATE	Counter Gate Control Input
Reserved	Reseved	26	1	CNT OUT	Counter Output

|	
Analog Input00 - Analog Input15	Analog input signal. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog I/O signals.
AI External Start Trigger Input	External trigger input for starting analog input sampling.
AI External Stop Trigger Input	External trigger input for stopping analog input sampling.
AI External Sampling Clock Input	External sampling clock input for analog input.
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 Output	Counter output signal.
Digital Ground	Common digital ground for digital I/O signals, external trigger inputs, external sampling clock inputs, and counter I/O signals.
Reserved	Reserved pin,
N.C.	No connection to this pin.

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.

Analog Input Signal Connection

Single-ended Input
The following figure shows an example of flat cable connection. Connect separate signal and ground wires for each analog input channel on CN1.

Single-ended Input Connection (Flat Cable)
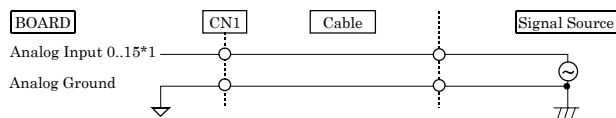
The following figure shows an example of shield cable connection. Use shielded cable if the distance between the signal source and board is long or if you want to provide better protection from noise.   For each analog input channel on CN1, connect the core wire to the signal line and connect the shielding to ground.

Single-ended Input Connection (Shield Cable)
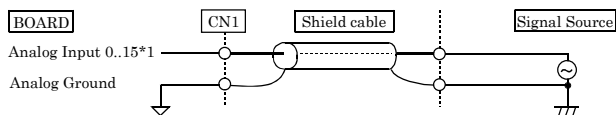
*1   The number of channels depends on each board.   The ADI16-16(LPCI)L has 16 channels.

CAUTION

- If the signal source contains over 1MHz signals, the signal may effect the cross-talk noise between channels.
- If the board and the signal source receive noise or the distance between the board and the signal source is too long, data may not be input properly.
- An input analog signal should not exceed the maximum input voltage (relate to the board analog ground).   If it exceeds the maximum voltage, the board may be damaged.
- Connect all the unused analog input channels to analog ground.
- The signal connected to an input pin may fluctuate after switching of the multiplexer.   If this occurs, shorten the cable between the signal source and the analog input pin or insert a high-speed amplifier as a buffer between the two to reduce the fluctuation.
- An input pin may fail to obtain input data normally when the signal source connected to the pin has high impedance.   If this is the case, change the signal source to one with lower output impedance or insert a high-speed amplifier buffer between the signal source and the analog input pin to reduce the effect.
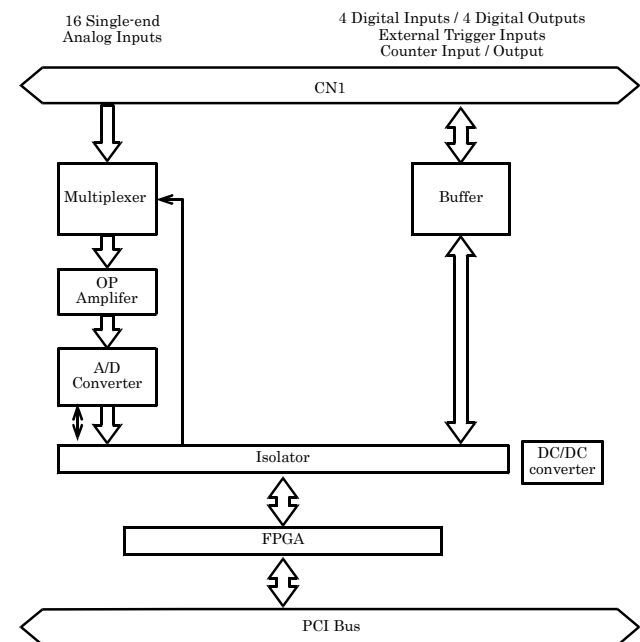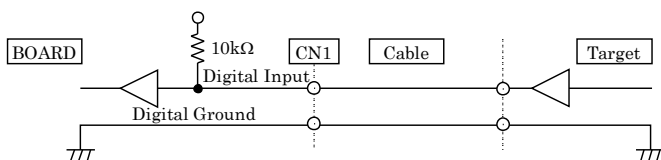- Analog ground of CN1 is isolated from the ground in the PC.

Digital I/O signals, Counter signals and Control signals Connection

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.

Digital Input Connection

Digital Output Connection

About the counter input control signal
Counter Gate Control Input acts as an input that validate or invalidate the input of an external clock for the counter.   This function enables the control of an external clock input for the counter.   The external clock for the counter is effective when input is "High", and invalid when input is "Low".   If unconnected, it is a pull-up in the board (card) and remains "High". Therefore the external clock for the counter is effective when the counter gate control input is not connected.

CAUTION
- Do not short the output signals to analog ground, digital ground, and/or power line.   Doing so may damage the board.
- Do not connect a digital output signal to any other digital output, either on the board or on an external device, as this may cause a fault on the board.
- Analog ground of CN1 is isolated from the ground in the PC.

Block Diagram