High-precision Analog input board
(Low Profile size) for PCI Express

AI-1616L-LPE

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

This product is a multi-function, PCI Express bus-compliant interface board that incorporates high-precision 16-bit analog inputs, digital inputs/ outputs (LVTTL level each 4ch), and a counter (32-bit, 1ch) function.
This product supports a Low Profile size slot and, if replaced with the supplied bracket, supports a standard size slot, too.
You can use the driver library (API-PAC(W32)) supplied with the board to write Windows application programs in any programming language (such as Visual Basic, Visual C++, etc.) that supports the calling of Win32 API functions.
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 MATLAB and LabVIEW.

Features

Multi-function
High-precision analog I/O can be implemented in a compact system. This product contains the analog input (16bit, 16ch). This product include digital inputs and outputs (4 each, LVTTL level) and a counter (32-bit 1ch).

Analog I/O can be synchronized with an internal timer or external clock
Analog I/O can both be performed at fixed time intervals or synchronized with an external signal.

Buffer memory available for background processing independent of software
The boards include buffer memory (1K Word each for analog input and output) which can be used in either FIFO or ring format. This allows analog I/O to be performed independently of the operating state of the PC or software.

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.

Filter function for easy connection of external signals
The digital input signals, counter input signals, and the external control signals for analog I/O incorporate a digital filter to prevent problems such as chattering.

Support for both of Low Profile and standard size slots
Support for both of Low Profile 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”.

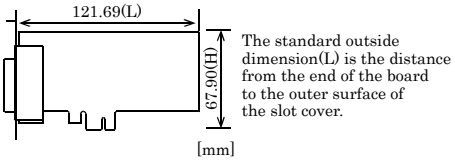
Plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.
We offer a dedicated library [ML-DAQ], which allows you to use this product on MATLAB by The MathWorks as well as another dedicated library [VI-DAQ], which allows you to use the product on LabVIEW.
These dedicated libraries are available, free of charge (downloadable), on our web site.

Specification

Item		AI-1616L-LPE
Analog input		
	Isolated specification	Non-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	±5LSB
	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	LVTTL level (Rising or falling edge can be selected by software) Digital filter (1μ sec can be selected by software)
	External stop signal	LVTTL level (Rising or falling edge can be selected by software) Digital filter (1μ sec can be selected by software)
	External clock signal	LVTTL level (Rising or falling edge can be selected by software)
Digital I/O		
	Number of input channels	Non-isolated input 4ch (TTL level positive logic)
	Number of output channels	Non-isolated output 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 LVTTL level (Gate/Up)/ch Gate (High level), Up (Rising edge)
	Number of external outputs	1 LVTTL level, Count match output (positive logic, pulse output)
	Response frequency	10MHz (Max.)
Common section		
	I/O address	64 ports
	Interruption level	Errors and various factors, One interrupt request line as INTA
	Used Connector	10250-52A2JL[3M] or equivalent to it
	Power consumption	3.3VDC 400mA,12VDC 120mA
	Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
	Bus specification	PCI Express Base Specification Rev. 1.0a x1
	External dimension (mm)	121.69 (L) x 67.90 (H)
	Weight	60g
Certification		RoHS,CE,VCCI

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

Product Dimensions



Support Software

Windows version of analog I/O driver API-AIO(WDM)
[Stored on the bundled Disk driver library API-PAC(W32)]
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)
[Stored on the bundled Disk driver library API-PAC(W32)]
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
[Stored on the bundled Disk driver library API-PAC(W32)]
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.

Data Acquisition library for MATLAB ML-DAQ
(Available for downloading (free of charge) from the CONTEC web site.)
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.

Data acquisition VI library for LabVIEW VI-DAQ
(Available for downloading (free of charge) from the CONTEC web site.)
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.
For more details on the library and download of VI-DAQ, please visit the CONTEC's Web site.

Cable & Connector (Option)

Shield Cable with Two 50-Pin Mini-Ribbon Connector
:PCB50PS-0.5P (0.5m) , :PCB50PS-1.5P (1.5m)

Shield Cable with One 50-Pin Mini-Ribbon Connector
:PCA50PS-0.5P (0.5m) , :PCA50PS-1.5P (1.5m)

Accessories (Option)

Screw Terminal Unit(M3 terminal block, 50 points)
:EPD-50A *1

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 Connector Screw Terminal Unit :ATP-8L *1*5

*1 PCB50PS-0.5P or PCB50PS-1.5P optional cable is required separately.
*2 Only AIO-160802L-LPE, AI-1616L-LPE can be used.
*3 An external power supply is necessary (optional AC adaptor POA200-20 prepared.)
*4 As for the AI-1616L-LPE, 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.
* Check the CONTEC's Web site for more information on these options.

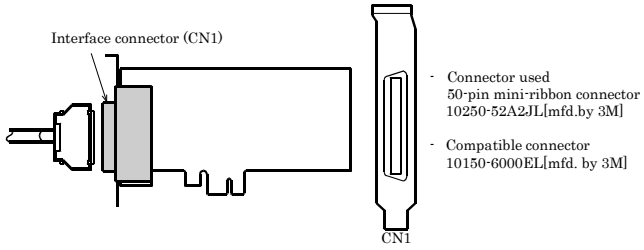
Packing List

Board[AIO-160802L-LPE] …1
First step guide …1
Disk *1 [API-PAC(W32)] …1
Standard size bracket …1
Serial number label…1
Warranty Certificate…1

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

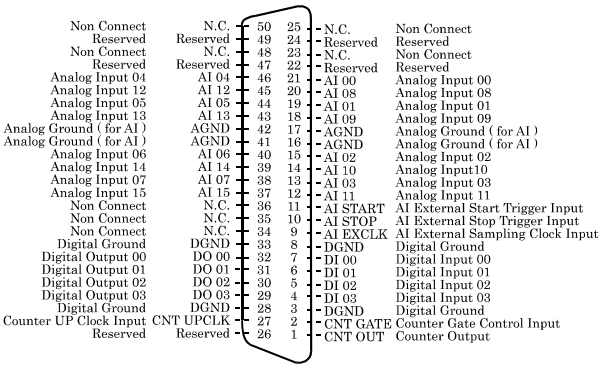
How to connect the connectors

The on- product interface connector (CN1) is used when connecting this product and the external devices.



* Please refer to page 3 for more information on the supported cable and accessories.

Connector Pin Assignment



Analog Input00 - Analog Input15	Analog input signal. The numbers correspond to channel numbers.
Analog Ground	Analog ground.
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.

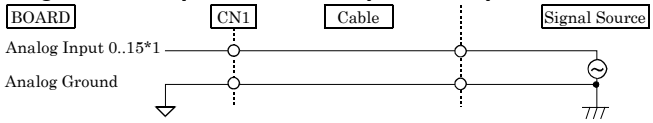
Leave "Reserved" pins unconnected. Connecting these pins may cause a fault in the product.

Analog Input Signal Connection

Single-ended Input

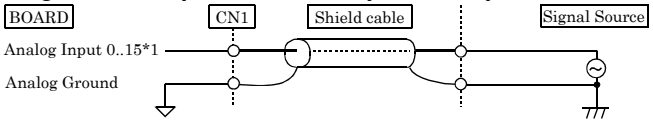
The following figure shows an example of flat cable connection.
Connect separate signal and ground wires for each analog input channel on CN1.

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 product 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 (Flat Cable)



*1The number of channels depends on each product. The AI-1616L-LPE has 16 channels.

⚠ CAUTION

If the signal source contains over 1MHz signals, the signal may effect the cross-talk noise between channels.

If the product and the signal source receive noise or the distance between the product 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 product analog ground). If it exceeds the maximum voltage, the product may be damaged.

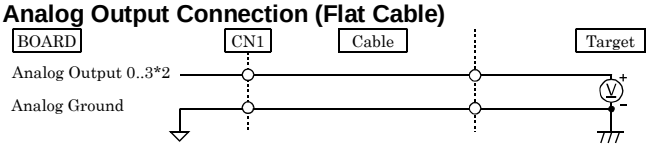
Connect all the unused analog input channels to analog ground.

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.

Analog Output Signal Connection

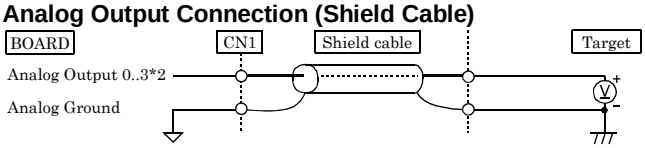
This section shows how to connect the analog output signal by using a flat cable or a shielded cable.
The following figure shows an example of flat cable connection.
Connect the signal source and ground to the CN1 analog output.

Analog Output Connection (Flat Cable)



The following figure shows an example of shield cable connection. Use shielded cable if the distance between the signal source and product 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.

Analog Output Connection (Shield Cable)



*2 The number of channels depends on each product. The AI-1616L-LPE has no channel.

⚠ CAUTION

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

For analog output signal, the current capacity is ±3mA (Max.). Check the specification of the connected device before connecting the product.

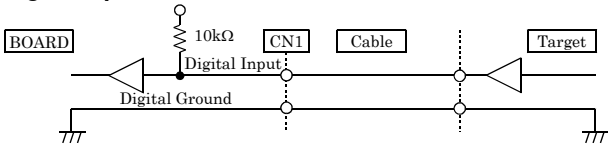
Do not short the analog output signal to analog ground, digital ground, and/or power line. Doing so may damage the product.

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

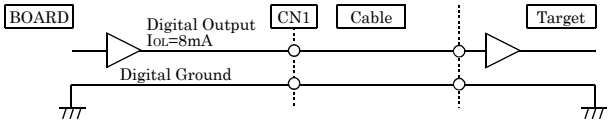
Digital I/O signals, Counter signals and Control Signals Connection

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 LVTTL level signals.

Digital input connection



Digital output connection



About the counter input control signal

Counter Gate Control Input (refer to the chapter 3 Connector Pin Assignment) 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 product.

Block Diagram