Isolated Low price high precision
analog I/O board for Low Profile PCI

ADAI16-8/2(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, high-precision analog outputs, 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 attached CD-ROM is used. With plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.

Features

Rich set of basic functions
Compact system providing high-precision bus isolation analog I/O.
This product is a control signal(TTL level 6 points) of analog input(16bits, 8ch), analog output(16bits, 2ch), analog I/O.
Digital inputs (TTL level four points), digital outputs (TTL level four points), and a counter (32-bit, TTL level one point).

Isolation from external devices
Noise tolerance is enhanced by isolating the PC and external analog I/O circuits with digital isolators.

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”

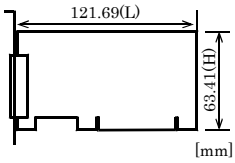
Plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.
We offer a dedicated library [ML-DAQ], which allows you to use this product on MATLAB by the MathWorks as well as another dedicated library [VI-DAQ], which allows you to use the product on LabVIEW.
These dedicated libraries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

Specification

Item		Specification
Analog input		
	Isolated specification	Bus-Isolated
	Input type	Single-Ended Input
	Number of input channels	8ch
	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
	Buffer memory	1k Word
	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 (1μsec can be selected by software)
	External stop signal	TTL level (Rising or falling edge can be selected by software) Digital filter (1μsec can be selected by software)
	External clock signal	TTL level (Rising or falling edge can be selected by software)
Analog output		
	Isolated specification	Bus-Isolated
	Number of output channels	2ch
	Output range	Bipolar ±10V
	Absolute max. input currency	±5mA
	Output impedance	1Ω or less
	Resolution	16bit
	Non-Linearity error *1	±5LSB
	Conversion speed	10μsec
	Buffer memory	1k Word
	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 (1μsec can be selected by software)
	External stop signal	TTL level (Rising or falling edge can be selected by software) Digital filter (1μsec can be selected by software)
	External clock signal	TTL level (Rising or falling edge can be selected by software)
Digital I/O		
	Number of input channels	Unisolated input 4ch (TTL level positive logic)
	Number of output channels	Unisolated 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 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	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 680mA (Max.)
	Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
	PCI bus specification	32bit, 33MHz, Universal key shapes supported *3
	Dimension (mm)	121.69 (L) x 63.41 (H)
	Weight	65g

*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 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).

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) [Stored on the bundled CD-ROM 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 useful for checking operation is provided.

< Operating environment >

OS	Windows Vista, XP, Server 2003, 2000
Adaptation language	Visual Basic, Visual C++, Visual C#, Delphi, C++ Builder

You can download the updated version from the CONTEC's Web site (http://www.contec.com/apipac/). 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 CD-ROM 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.

< Operating environment >

OS	RedHatLinux, TurboLinux (For details on supported distributions, refer to Help available after installation.)
Adaptation language	gcc

You can download the updated version from the CONTEC's Web site (http://www.contec.com/apipac/). 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 CD-ROM 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.
CONTEC provides download services (at http://www.contec.com/clogger) to supply the updated drivers.
For details, refer to the C-LOGGER Users Guide or our website.

< Operating environment >

OS	Windows Vista, XP, Server 2003, 2000

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.
See http://www.contec.com/mldaq/ for details and download of ML-DAQ.

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.
See http://www.contec.com/vidaq/ for details and download of VI-DAQ.

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

Accessories (Option)

Screw Terminal Unit (M3 x 50P) : EPD-50A *1 *6
Buffer Amplifier Box for Analog Input Boards (8ch type) : ATBA-8L *1*3
Buffer Amplifier Box for Analog Input Boards (16ch type) : ATBA-16L *1*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.
*3 An external power supply is necessary (optional AC adaptor POA200-20 prepared.)
*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.

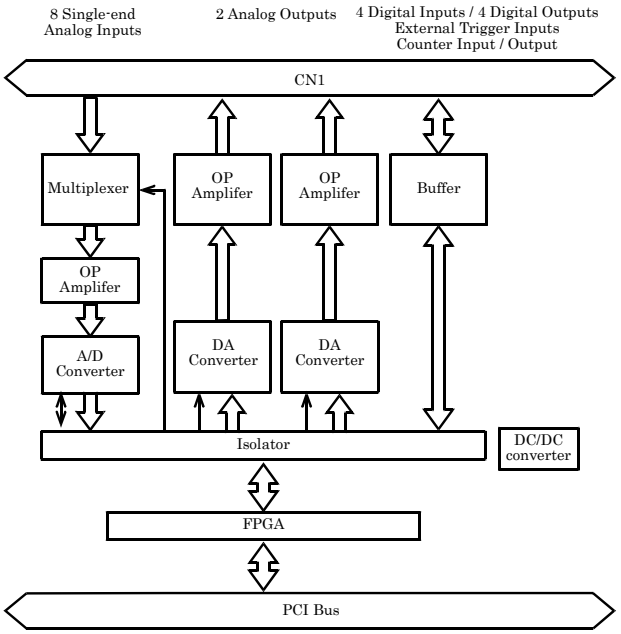
⚠ CAUTION
It may affect the withstanding voltage depending on the cable and terminal unit to be used

Packing List

Board [ADAI16-8/2(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.

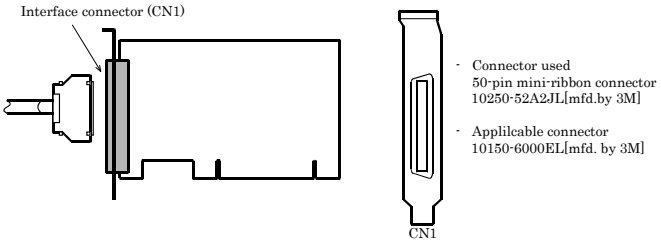
Block Diagram



How to connect the connectors

Connector shape

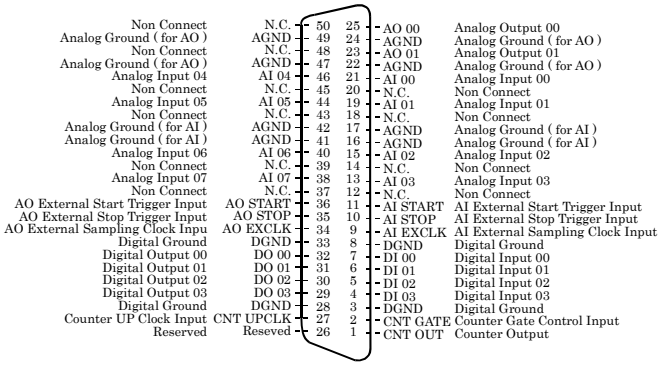
To connect an external device to this board, plug the cable from the device into the interface connector (CN1) shown below.



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

Connector Pin Assignment

Pin Assignments of Interface Connector



Analog Input00 - Analog Input07	Analog input signal. The numbers correspond to channel numbers.
Analog Output00 - Analog Output01	Analog output 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.
AO External Start Trigger Input	External trigger input for starting analog output sampling.
AO External Stop Trigger Input	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 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 is 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

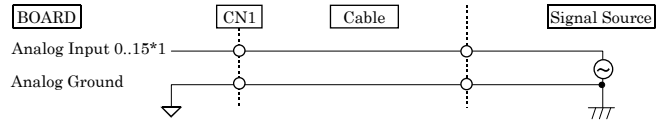
Analog signal input types are divided into single-ended input and differential input. This board uses single-ended input fixed. The following examples show how to connect analog input signals using a flat cable and a shielded cable

Single-ended Input

The following figure shows an example of flat cable connection.

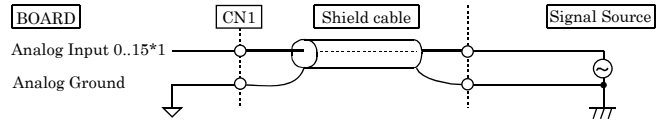
Connect separate signal and ground wires for each analog input channel on CN1.

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)



* The number of channels depends on each board.
This product has eight 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.

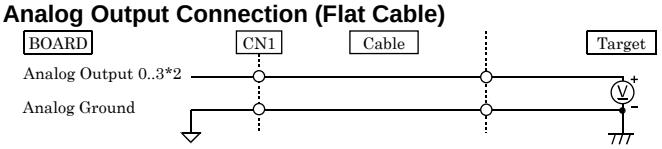
The signal connected to an input pin may fluctuate after switching of the multiplexer. If this occurs, shorten the cable between the signal source and the analog input pin or insert a high-speed amplifier as a buffer between the two to reduce the fluctuation.

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 Output Signal Connection

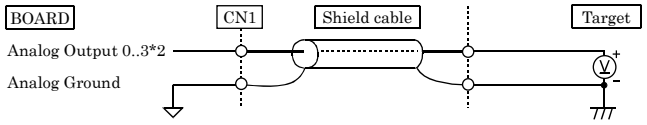
This section shows how to connect the analog output signal by using a flat cable or a shielded cable.
The following figure shows an example of flat cable connection. Connect the signal source and ground to the CN1 analog output.

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 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.

Analog Output Connection (Shield Cable)



* The number of channels depends on each board.
This product has two channels.

⚠ CAUTION

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

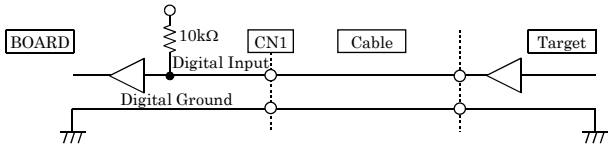
Do not short the analog output signal to analog ground, digital ground, and/or power line. Doing so may damage the board.

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

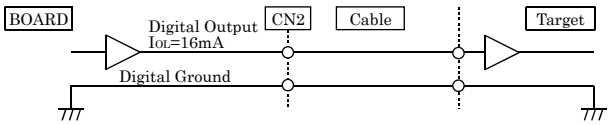
Digital I/O signals, Counter signals and Control signals Connection

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 (refer to page 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 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.