# Isolated Low price high precision analog output board for Low Profile PCI
# DAI16-4(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 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++.

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

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* Visit the CONTEC website to check the latest details in the document.
* The information in the data sheets is as of July, 2022.

## Features

**Rich set of basic functions**
Compact system providing high-precision bus isolation analog Output.
This product is a control signal (Isolation TTL level 3 points) of analog output(16bits, 4ch), analog Output.
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).

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 output | | |
| | Isolated specification | Bus-Isolated |
| | Number of output channels | 4ch |
| | Output range | Bipolar ±10V |
| | Absolute max. output currency | ±5mA |
| | Output impedance | 1Ω or less |
| | Resolution | 16bit |
| | Non-Linearity error *1 | ±5LSB |
| | Conversion speed | 10μsec [100KSPS]*2 |
| | 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)<br>Digital filter (1μsec can be selected by software) |
| | External stop signal | Isolation TTL level (Rising or falling edge can be selected by software)<br>Digital filter (1μsec can be selected by software) |
| | External clock signal | Isolation TTL level (Rising or falling edge 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)<br>Gate (positive logic/level), Up (Rising edge) |
| | Number of external outputs | 1 Isolation TTL level<br>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 800 mA (Max.) |
| | Operating condition | 0 - 50℃, 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 | 65 g |
| | Standard | VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA |

*1:  The non-linearity error means an error of approximately 0.1% occurs over the maximum range at 0℃ and 50℃ ambient temperature.
*2:  SPS = Samplings Per Second.   The number of data that can be converted in one second is shown.
*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).

## Dimensions



121.69(L)

63.41(H)

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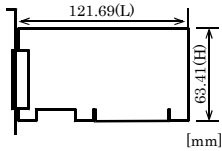
The standard outside dimension(L) is the distance from the end of the board to the outer surface of the slot cover.

## 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.

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
  (Available for downloading (free of charge) from the CONTEC web site. Supports R14 - R2012b in MATLAB 32-bit version.)
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 [DAI16-4(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
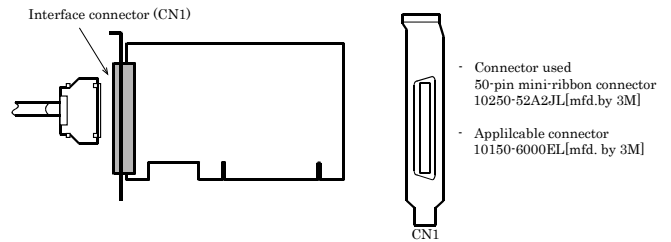
Shield Cable with 50-Pin Mini-Ribbon Connectors
at either Ends                   :PCB50PS-0.5P (0.5m)
                                  :PCB50PS-1.5P (1.5m)
Shield Cable with 50-Pin Mini-Ribbon Connector
at one End                      :PCA50PS-0.5P (0.5m)
                                  :PCA50PS-1.5P (1.5m)
Screw Terminal Unit (M3 x 50P)        :EPD-50A *1*3
BNC Terminal Unit
(for analog input 8ch)             :ATP-8L *1*2

*1 PCB50PS-0.5P or PCB50PS-1.5P optional cable is required separately.
*2 Capable of using the analog input of up to 8ch, and analog output of up to 2ch.
*3 "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)

CN1

- Connector used
  50-pin mini-ribbon connector
  10250-52A2JL[mfd.by 3M]
- Applilcable connector
  10150-6000EL[mfd. by 3M]

Connector Pin Assignment
Pin Assignments of DAI16-4(LPCI)L Interface Connector (CN1)



| Left label | Pin | Pin | Right label |
|---|---|---|---|
| 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 ) |
| Non Connect   N.C. | 46 | 21 | N.C.   Non Connect |
| Non Connect   N.C. | 45 | 20 | N.C.   Non Connect |
| Non Connect   N.C. | 44 | 19 | N.C.   Non Connect |
| Non Connect   N.C. | 43 | 18 | N.C.   Non Connect |
| Reserved   Reserved | 42 | 17 | Reserved   Reserved |
| Reserved   Reserved | 41 | 16 | Reserved   Reserved |
| Non Connect   N.C. | 40 | 15 | N.C.   Non Connect |
| Non Connect   N.C. | 39 | 14 | N.C.   Non Connect |
| Non Connect   N.C. | 38 | 13 | N.C.   Non Connect |
| Non Connect   N.C. | 37 | 12 | N.C.   Non Connect |
| AO External Start Trigger Input   AO START | 36 | 11 | N.C.   Non Connect |
| AO External Stop Trigger Input   AO STOP | 35 | 10 | N.C.   Non Connect |
| AO External Sampling Clock Inpu   AO EXCLK | 34 | 9 | N.C.   Non Connect |
| 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 Output00 - Analog Output03 | Analog output signal. The numbers correspond to channel numbers. |
| Analog Ground | Common analog ground for analog I/O signals. |
| 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 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 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)
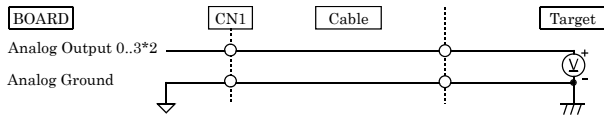
The following figure shows an example of shield cable connection. Use shielded cable if the distance between the signal source and board is long or if you want to provide better protection from noise.   For each analog input channel on CN1, connect the core wire to the signal line and connect the shielding to ground.

Analog Output Connection (Shield Cable)
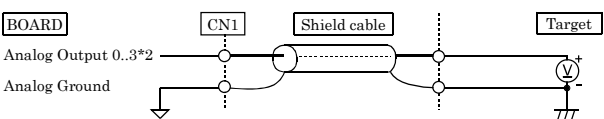
*2   The number of channels depends on each board.   The DAI16-4(LPCI)L has four channels.

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.
- 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
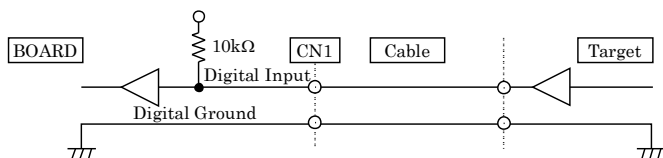
Digital Output Connection
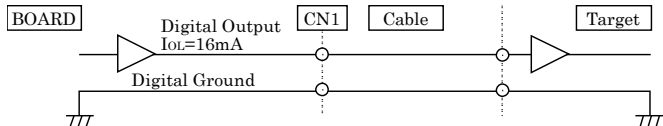
About the counter input control signal
Counter Gate Control Input acts as an input that validate or invalidate the input of an external clock for the counter.   This function enables the control of an external clock input for the counter.   The external clock for the counter is effective when input is "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