

Isolated Analog Input Board for PCI

AI-1604CI2-PCI



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

Features

**Analog input 4channel, 16bit-resolution, conversion speed 20μsec[50KSPS]/ch**

This product has the Analog input (4channel, 16bit, 20μsec[50KSPS] /ch).

Additionally, the voltage input/current input switch is set by jumper and current range (voltage : ±10V, ±5V, 0 - +10V, 0 - +5V) is set by software for each channel.

**Individual isolation model that provides isolation for the bus line with PC and between channels.**

The isolation amplifier provides electric isolation between channels as well as between the inside of the board (PC) and the input circuit. This allows signals with different ground levels to be input to the channels. The isolation voltage is 500V.

**Control of sampling start/stop can be selected by software, comparison of converted data, external trigger or other factor.**

Control of sampling start can be selected by software, comparison of converted data, or external trigger (timing of a control signal entered from outside).

Control of sampling stop can be selected forcibly by completion of sampling sessions, comparison of converted data, external trigger, or software.

A sampling cycle can be selected from the internal clock (high precision timer mounted on the board) or an external clock (control signal entered from outside).

**Windows/Linux compatible driver libraries are attached.**

Using the attached driver library API-PAC(W32) makes it possible to create applications of Windows/Linux. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

**LabVIEW is supported by a plug-in of dedicated library VI-DAQ.**

Using the dedicated library VI-DAQ makes it possible to create each application for LabVIEW.

This product is a PCI bus supported board that extends the analog signal input functions of a PC. Equipped with four channels of 16bit analog input, this product is an individual isolation model that provides isolation for the bus line with PC and between channels. Voltage input and current input are set for each channel by jumper, while the voltage range is set by software. Windows/Linux driver is bundled with this product.

Using the dedicated library VI-DAQ makes it possible to create each application for LabVIEW.

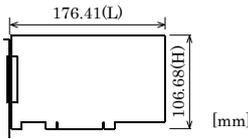
Specification

Item	Specification
Analog Input	
Isolated specification	Channel-isolation
Input Type	Single-Ended Input
Number of input channels	4channel
Input range	Bipolar ±10V, ±5, Unipolar 0 - +10V, 0 - +5V 4 - 20mA (Set the input range using both jumpers and software setting.)
Absolute max. input voltage	±11V (Voltage input based on the analog ground of each channel)
Absolute max. input current	30mA (Current input)
Input impedance	1MΩ or more (Voltage input, power ON) 1kΩ or more (Voltage input, power OFF)
Resolution	16bit
Non-Linearity error *1	±32LSB (±10V) ±64LSB (±5V, 0 - +10V) ±64LSB (0 - +5V) ±80LSB (4 - 20mA)
Conversion speed	20μsec [50KSPS] /ch (Max.)
Buffer memory	None
Conversion start condition	Software / external trigger
Conversion stop condition	Count stop / external trigger / software
Sampling clock	Internal sampling clock : 20,000 - 1,073,741,824,000nsec (Can be set in 250 nanoseconds) External sampling clock : Optocoupler isolated input (corresponding to current sink output)
Passband (-3dB)	1kHz
Programmable timer	
Setup frequency	500 - 1,073,741,824,000nsec (Can be set in 250nsec units)
Status	Count up, count up and over run
Timer output signal	Optocoupler isolated open collector output (current sink type)
External trigger input	
External trigger input signal	Optocoupler isolated input (corresponding to current sink output)
Status	Trigger input, trigger input over run
I/O address	32 ports boundary
Interrupt level	1 level use
Isolation voltage	500Vrms
Power consumption (Max.)	+5VDC 1100mA
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Bus specification	PCI (32bit, 33MHz, Universal key shapes supported *2)
Dimensions (mm)	176.41(L) x 106.68(H)
Used connector	37-pin D-SUB connector [F(female) type] DCLC-J37SAF-20L9E [mfd.by JAE] equivalent to it
Weight	200g

\*1 A linearity error approximately 0.5% of full-range may occur when operated at 0°C or 50°C ambient temperature.

\*2 This product requires +5V power supply from the expansion slot (it does not work in a +3.3V environment).

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)/API-AIO(98/PC)  
[Stored on the bundled Disk driver library API-PAC(W32)]

These drivers are 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 (<http://www.contec.com/apipac/>).

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 how to download the updated version, please visit the CONTEC's Web site (<http://www.contec.com/apipac/>).

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)

- Flat Cable with 37-Pin D-SUB Connector at One End : PCA37P-1.5 (1.5m)
- Shield Cable with 37-Pin D-SUB Connector at One End : PCA37PS-0.5P (0.5m)  
: PCA37PS-1.5P (1.5m)
- Flat Cable with 37-Pin D-SUB Connectors at either Ends : PCB37P-1.5 (1.5m)
- Shielded Cable with 37-pin D-SUB connectors at either ends : PCB37PS-0.5P (0.5m)  
: PCB37PS-1.5P (1.5m)

Connector (Option)

37-pin D-SUB (Male) Connector Set (5 Pieces) : CN5-D37M

Accessories

Accessories (Option)

- Screw Terminal Unit (M3 x 37P) : EPD-37A \*1 \*2
- Screw Terminal Unit (M3.5 x 37P) : EPD-37 \*1
- General Purpose Terminal (M3 x 37P) : DTP-3A \*1
- Screw Terminal (M2.6 x 37P) : DTP-4A \*1

\*1 PCB37P-\* or PCB37PS-\* optional cable is required separately (0.5m is recommended).  
\*2 "Spring-up" type terminal is used to prevent terminal screws from falling off.

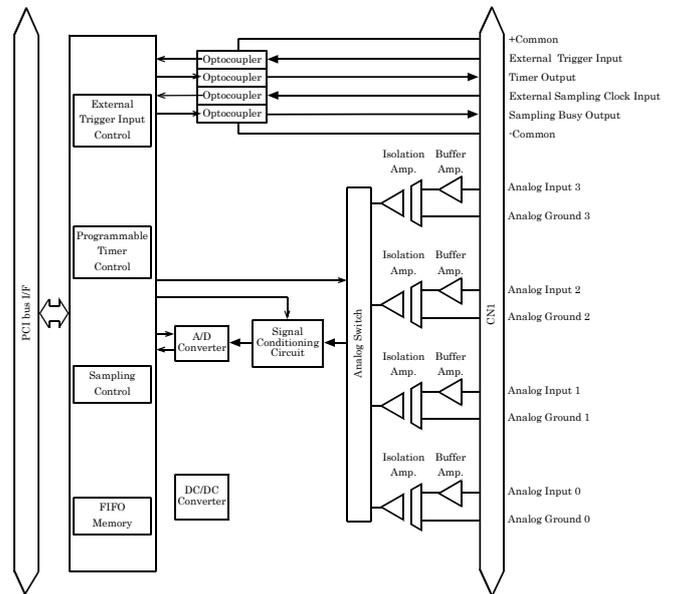
\* Check the CONTEC's Web site for more information on these options.

Packing List

- Board [AI-1604CI2-PCI] ...1
- First step guide ...1
- Disk \*1 [API-PAC(W32)] ...1
- Serial number label ...1
- Product Registration Card & Warranty Certificate ...1

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

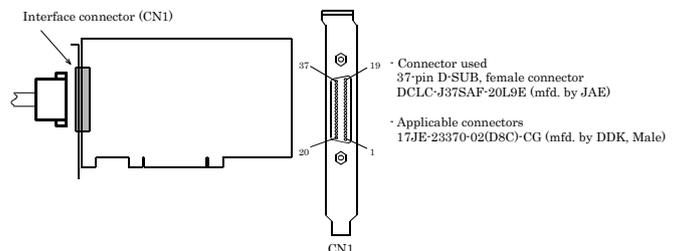
Block Diagram



How to connect the connectors

Connector shape

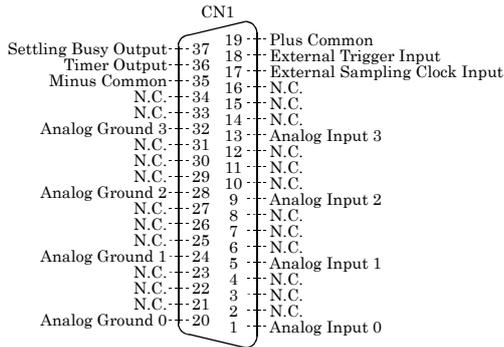
To connect an external device to this product, plug the cable from the device into the interface connector (CN1) shown below.



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

## Connector Pin Assignment

### Pin Assignments of Interface Connector (CN1)

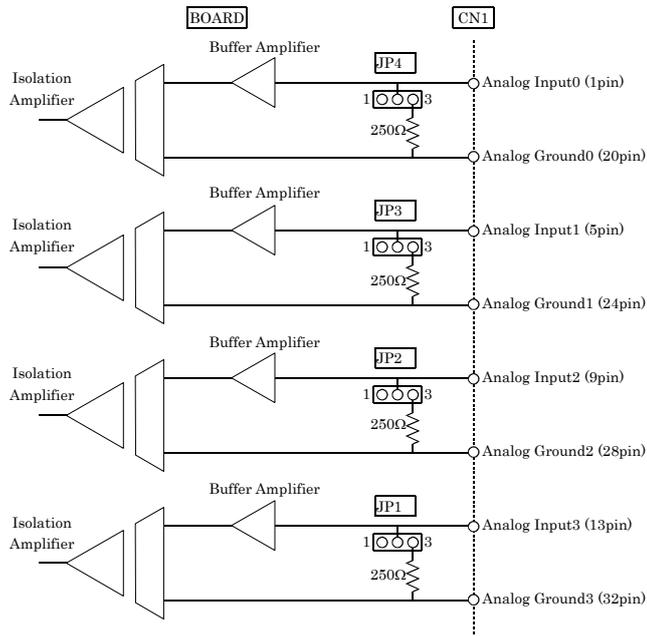


Analog Input 0 - Analog Input 3	Analog input signal. The numbers correspond to channel numbers.
Analog Ground 0 - Analog Ground 3	Analog grounds for identically numbered analog input signals.
External Trigger Input	External trigger input signal
External Sampling Clock Input	External sampling clock input signal
Timer Output	Programmable timer output signal
Sampling Busy Output	Output signal indicating that the board is performing AD conversion.
Plus Common	Connect the plus side of external power supply. Common for each "External Trigger Input", "External Sampling Clock Input", "Timer Out", "Sampling Busy Output" channel.
Minus Common	Connect the minus side of external power supply. Common for each "Timer Out", "Sampling Busy Output" channel.
N.C.	No connection to this pin.

## Connecting the Analog Input Signal

### Input Circuit of Analog Input Signal

Input equivalent circuit is as follows.



Analog signals are input to each channel via the isolation amplifier. This electrically isolates the channels from one another and this product's internal circuitry (PC) from the input pin.

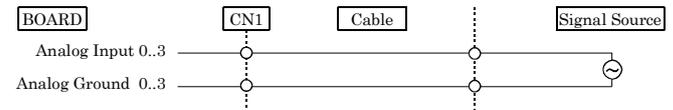
The 250Ω resistor in the circuit is a precision resistor that converts current to voltage when current input has been set with jumpers.

## Connection Example of Voltage Signal Source

The following figure shows an example of optional flat cable (PCA37P) connection.

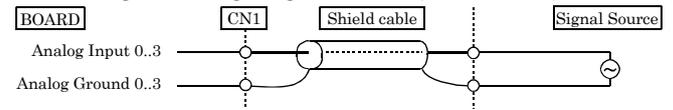
Connect each input channel in CN1 and the corresponding analog ground in pairs to the signal source.

### Connecting the Voltage Signal Source (Flat cable)



The following example connects a signal source to this product using a shielded cable such as a coaxial cable. Use shielded cable if the distance between the signal source and this product is long or if you want to provide better protection from noise. Connect each analog input channel in CN1 and the corresponding analog ground to the signal source, using the core of the shielded cable and its shield braid, respectively.

### Connecting the Voltage Signal Source (Shield cable)



### CAUTION

An input voltage signal should not exceed the maximum input voltage (relative to the analog ground). If it exceeds the maximum voltage, this product may be damaged.

Connect all the unused analog input channels to analog ground.

As a long connection cable may fail to accurately input analog signals, the connection cable should be as short as possible.

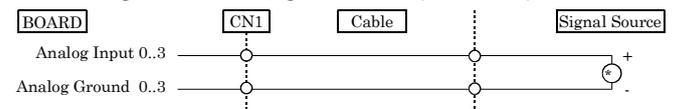
If the connection cable receive noise, analog may not be input properly. Route the connection cable as far apart from noise sources as possible.

## Connection Example of Current Signal Source

The following figure shows an example of optional flat cable (PCA37P) connection.

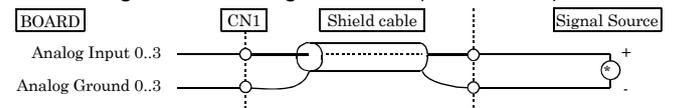
Connect each analog input channel in CN1 and the corresponding analog ground to the + and - sides of the current source, respectively.

### Connecting the Current Signal Source (Flat cable)



The following example connects a signal source to this product using a shielded cable such as a coaxial cable. Use shielded cable if the distance between the signal source and this product is long or if you want to provide better protection from noise. Connect each analog input channel in CN1 to the + side of the current source using the core of the shielded cable and the corresponding analog ground to the - side using the shield braid.

### Connecting the Current Signal Source (Shield cable)



**⚠ CAUTION**

An input current signal should not exceed the maximum input current. If it exceeds the maximum current, this product may be damaged.

Connect all the unused analog input channels to analog ground.

As a long connection cable may fail to accurately input analog signals, the connection cable should be as short as possible.

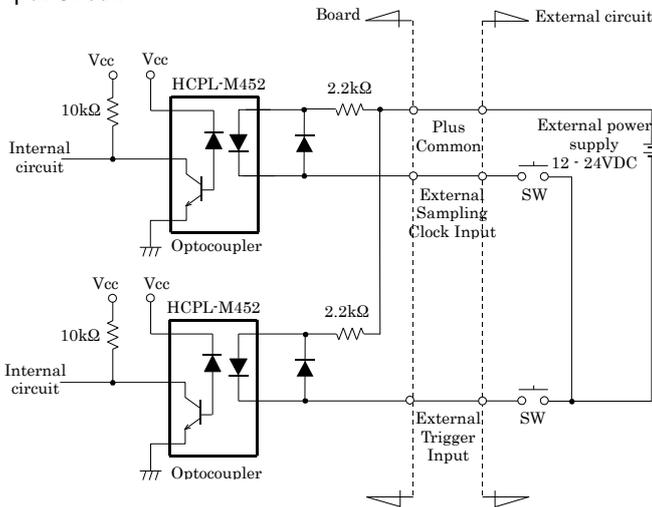
If the connection cable receive noise, analog may not be input properly. Route the connection cable as far apart from noise sources as possible.

**Connecting the Control Signal**

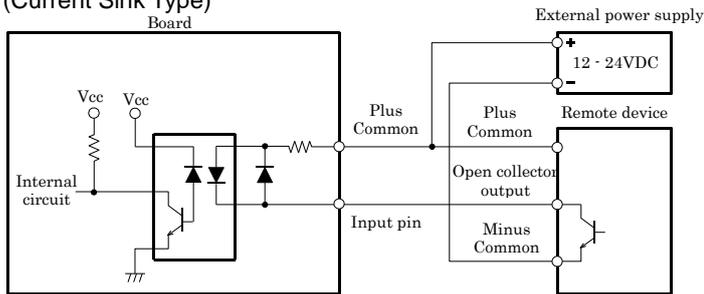
**Connecting the Input Signal**

To the “External Sampling Clock Input” and “External Trigger Input” pins, connect current driven devices such as a switch and a transistor output device. Input circuit is as follows. An external power supply is required to drive the input circuit. The power capacity required at this time is about 11 mA per input channel at 24 VDC (or about 5.5 mA at 12 VDC).

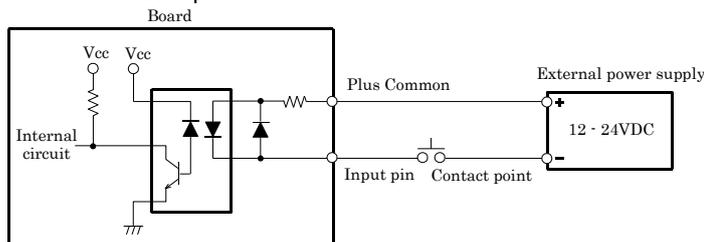
**Input Circuit**



**Connection Example to Open Collector Output (Current Sink Type)**



**Connection Example to Mechanical Contact**



Relationships between input signal and data (internal logic) on the PC

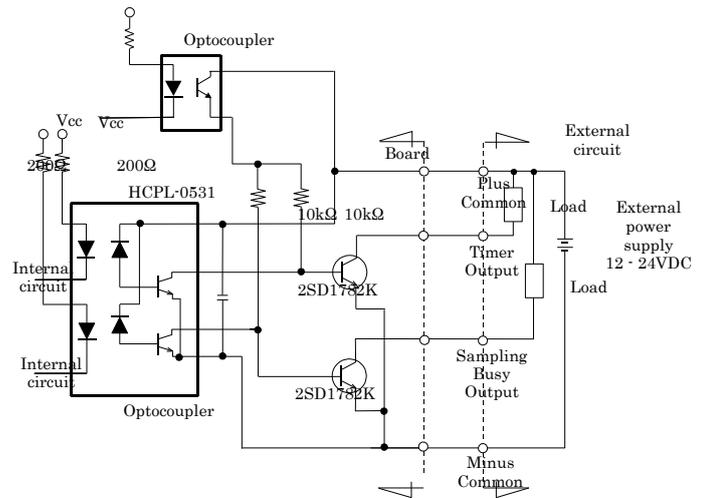
Internal logic	Contact point	Input pin voltage level
0	OFF	High
1	ON	Low

**Connecting the Output Signal**

To the “Timer Output” and “Sampling Busy Output” pins, connect a relay controller or a current driven control device such as a LED. Output circuit is as follows.

An external power supply is required to drive the output circuit. Output current rating is 50 mA (Max.) per 1 point. This product’s output transistor is not associated with a surge voltage protection circuit. When this product is used to drive the inductive load to a relay or lamp, apply surge protection to the load side.

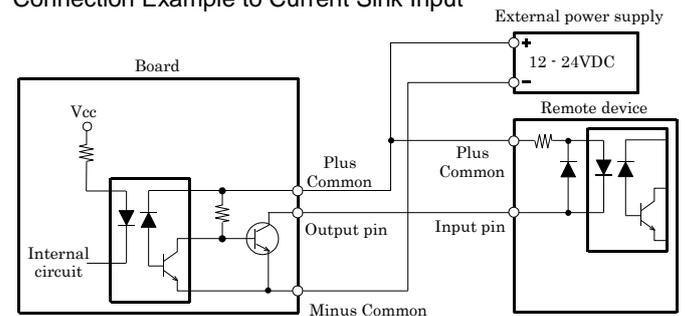
**Output Circuit**



**⚠ CAUTION**

All of the output are turned off when the power is turned on.

**Connection Example to Current Sink Input**



**Connection Example to TTL level Input (with Pull-up Resistor)**

