

Isolated Analog Output Board for PCI
AO-1604CI3-PCI



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

Features

Analog output 4ch, 16bit-resolution, conversion speed 20μsec

This product has the Analog output (4ch, 16bit, 20μsec). Additionally, the voltage/current output range (voltage : ±10V, 0 - +10V, current : 0 - 20mA) can be set by jumper for each channel.

PC bus line, opto-coupler isolation between channels

The opto-couplers mounted for each channel provide electric isolation between channels as well as between the inside of the board (PC) and output pins.

Simultaneous output of voltage to a specified channel or all channels

This product can generate output voltage either for a specified channel only or for all of the channels simultaneously. This can be selected or set by software.

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.

Control of sampling start/stop can be selected by an external trigger or other factor

Control of sampling start can be selected by software or an external trigger. Control of sampling start and control of sampling stop are independent from each other; therefore, they can be set separately. Control of sampling stop can be selected by completion of a specified number of sessions or an external trigger. In addition, when an error occurs, sampling is stopped, regardless of the settings for sampling stop conditions.

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).

Relay provided to control output voltage

The mounted relay prevents unstable output voltage from being generated upon power-up. This protects the connected devices from damage and malfunction, as the output voltage for all the channels is generated via the relay.

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 output functions of a PC. Equipped with four channels of 16-bit analog output, the product is an individual isolation model using a D/A converter for each channel to provide isolation for the bus line with PC and between channels. The voltage/current output range (voltage : ±10V, 0 - +10V; current : 0 - 20mA) can be set by jumper for each channel. This product can generate signals that are synchronized with the internal timer or an external clock. Windows/Linux driver is bundled with this product.

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

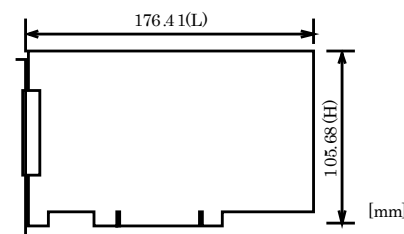
Specifications

Item	Specification
Analog Output	
Isolated specification	Isolated independently
Number of output channels	4ch
Output range	Bipolar ±10V, Unipolar 0 - +10V 0 - 20mA (Jumper setting by channel)
Absolute max. output current	±5mA (Voltage output) ±10V, 0 - +10V
Load register (Max)	500Ω (Current output)
Output impedance	100Ω or less (Voltage output)
Resolution	16bit
Non-Linearity error *1	±5LSB (±10V, 0 - +10V), ±15LSB (0 - 20mA)
Conversion speed	20μsec (Max)
Voltage output control relay	AQY221N2SX (Matsushita Electric Works, Ltd.) or equivalent to it
Sampling clock	Internal sampling clock : 20,000 - 1,073,741,824,000nsec (Can be set in 250n sec units) External sampling clock : opto-coupler isolated input (corresponding to current sink output)
Programmable timer	
Setting frequency	500 - 1,073,741,824,000nsec (Can be set in 250n sec units)
Timer output signal	Opto-coupler isolated open collector output (current sink type)
External trigger input	
External trigger input signal	Opto-coupler isolated input (corresponding to sink output)
Status	Trigger input, trigger input overrun
I/O address	32 ports boundary
Interrupt level	1 point
Isolation voltage	500Vrms
Power consumption	+5VDC 2400mA (Max)
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Bus specification	PCI (32bit, 33MHz, Universal key shapes supported *2)
External dimensions (mm)	176.4(L) x 105.68(H)
Used connector	37-pin D-SUB connector [F(Male) type] DCLC-J37SAF-20L9E [mfd. by JAE] equivalent to it
Weight	160g
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive)

*1 When the environment temperature is near 0°C or 50°C, the non-linearity error may become larger. The error can be reduced by calibrating under the actual temperature conditions.

*2 The board 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 digital 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 useful 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 digital 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 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

Cable (Option)

Shielded Cable with Two 37-pin D- SUB Connectors

: PCB37PS-0.5P (0.5m), PCB37PS-1.5P (1.5m)

Flat Cable with Two 37-pin D- SUB Connectors

: PCB37P-1.5 (1.5m)

Shielded Cable with One 37-pin D- SUB Connector

: PCA37PS-0.5P (0.5m), PCA37PS-1.5P (1.5m)

Flat Cable with One 37-pin D- SUB Connector

: PCA37P-1.5 (1.5m)

Accessories

Accessories (Option)

Screw Terminal (M3 x 37P) : EPD-37A *1*2

Screw Terminal (M3.5 x 37P) : EPD-37 *1

General Purpose Terminal (M3 x 37P) : DTP-3C *1

Screw Terminal (M2.5 x 37P) : DTP-4C *1

*1 PCB37PS-*P optional cable is required separately (0.5m is recommended).

*2 "Spring-up" type terminal is used to prevent terminal screws from falling off

Packing List

Board [AO-1604CI3-PCI] ...1

First step guide ... 1

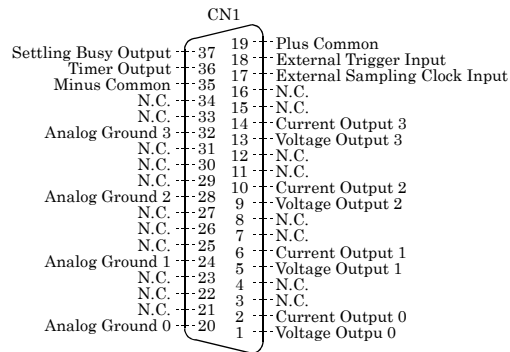
Disk *1 [API-PAC(W32)] ...1

Warranty Certificate ...1

Serial number label ...1

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

Connector Pin Assignment



Voltage Output 0 - Voltage Output 3	Analog voltage output signal. The numbers correspond to channel numbers.
Current Output 0 - Current Output 3	Analog current output signal. The numbers correspond to channel numbers.
Analog Ground 0 - Analog Ground 3	Analog grounds for identically numbered output signals.
External Trigger Input	External trigger input signal
External Sampling Clock Input	External sampling clock input signal.
Timer Output	Output signal of programmable timer
Settling Busy Output	Output signal indicating that the board is performing DA conversion.
Plus Common	Connect the plus side of external device. Common for each "External Trigger Input", "External Sampling Clock Input", "Timer Out", "Settling Busy Output" signal.
Minus Common	Connect the minus side of external device. Common for each "Timer Out", "Settling Busy Output" signal.
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.

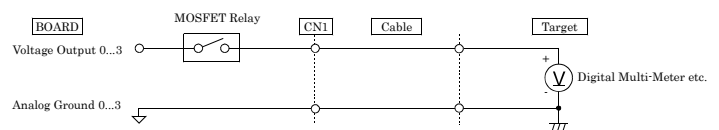
Analog Output Signal Connection

The sections below describe how to connect the signals using flat cable and shielded cable.

Connecting example of voltage output

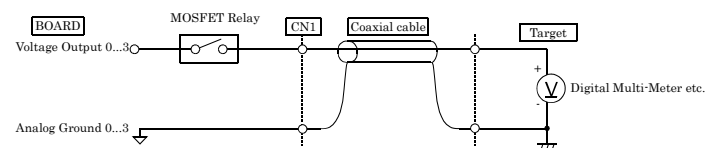
The following figure shows an example of optional flat cable (PCA37P) connection. Connect the CN1 analog output channels and ground to the external device's input and ground.

Connection of voltage output (Flat Cable)



The following example connects a signal source to the board using a shielded cable. Use shielded cable if the distance between the board and loading is long or if you want to provide better protection from noise. Use the core of the shielded cable to connect the analog output of CN1 to the input of the external device and use the shield braid to connect the CN1's analog ground to the external device's ground.

Analog Output Connection (Shield Cable)



▼CAUTION

- If the board and the target receive noise or the distance between the board and the signal source is too long, data may not be input properly.
- The maximum output current-carrying capacity of the analog output signal is ±5 mA. Check the specifications of the target before connecting the board to it.

- Do not connect any of the outputs and power outputs to the analog or digital ground.
- Do not connect the analog output signal to the other analog output signal and output signal of external device. Doing so may malfunction.
- Do not plug or unplug the interface connector to or from while the PC or external device power is turned on. Doing so may malfunction.
- The DA converter may cause glitches as it contains no deglitcher.

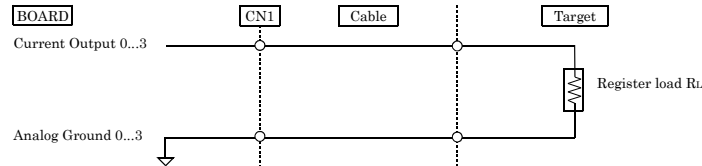
Connecting example of current output

The figure below shows an example connection using a flat cable as the optional one (PCA37P).

The load register is connected. Please adjust the register load RL connected with the current output of each channel to 500Ω or less including the resistance of wiring.

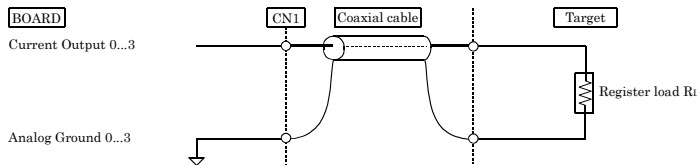
Each current output of CN1 and analog ground is connected to the resistor load RL.

Current output connection (Flat cable)



The following figure shows an example of shielded cable connection. Use shielded cable if the distance between the loading and board is long or if you want to provide better protection from noise. Connect the each current output of CN1 to the register load in the core wire of shielded cable and connect the each analog ground of CN1 to the register load in the shielding of shielded cable.

Current output connection (Shielded cable)



▼CAUTION

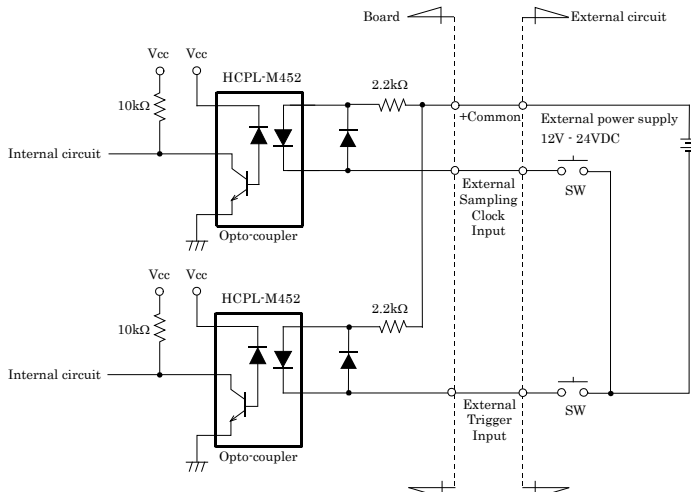
- Do not short the output signals to analog ground, digital ground, and/or power line. Doing so may damage the board.
- If connected to each output, a pull-up resistor must be about 10 kΩ to pull up with a 3.3V power source.
- Each input accepts 5V TTL signals.

Control signals Connection

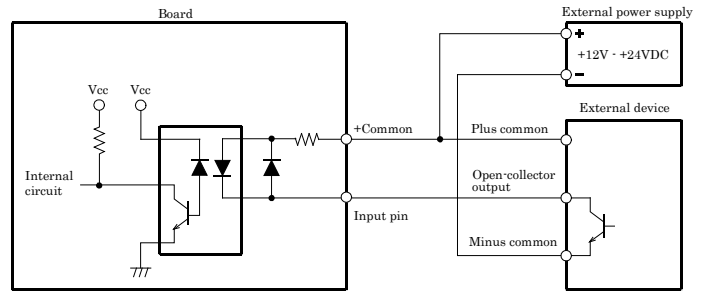
Input signals connection

To the "External Sampling Clock Input" and "External Start Trigger Input", 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).

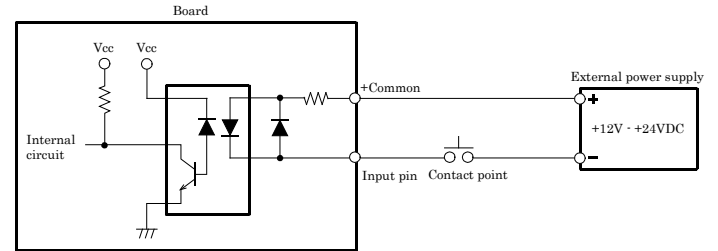
Input circuit



Connection example with open-collector output (current sink type)



Connection example with mechanical contact point



The relation of the data (internal logic) seen from the input signal and the PC side as an example of the above figure is shown below.

Relation between the input signal and the data (internal logic) seen from the PC side

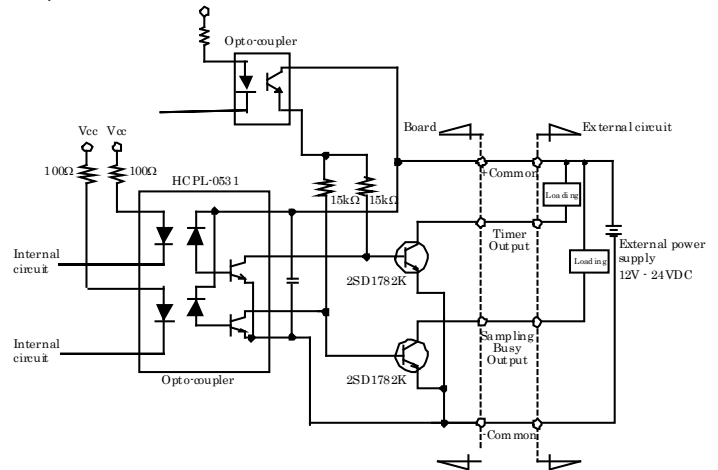
Internal logic	Contact point	Input pin voltage level
0	OFF	High
1	ON	Low

Output signals connection

To the "Timer Output " and "Settling Busy Output", 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. The rated output current is up to 50 mA per channel. The output transistor is not associated with a surge voltage protection circuit. When the output signal is used to drive the inductive load to a relay or lamp, apply surge protection to the load side.

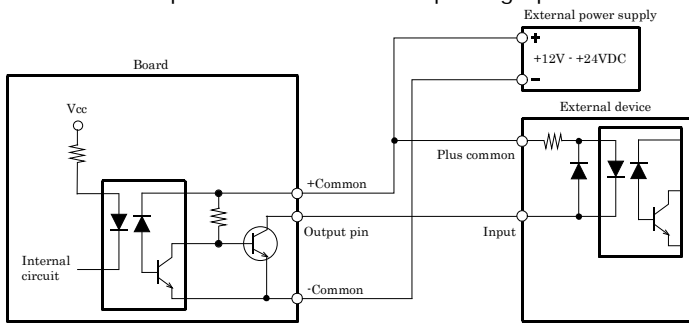
Output circuit



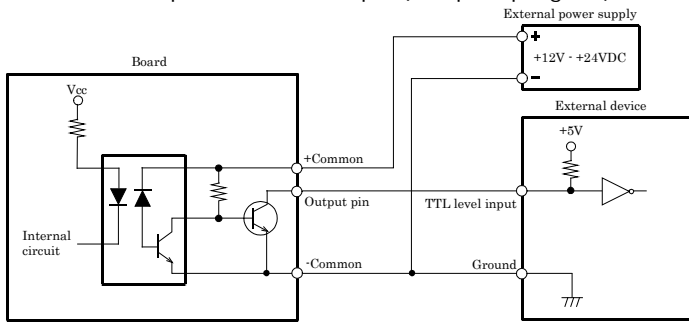
▼CAUTION

When the power supply is turned on, all the outputs are turned off.

Connection example with current sink corresponding input



Connection example with TTL level input (with pull-up register)



Difference from AO-1604CI2-PCI and DAI16-4C(PCI)

This product is a successor of the previous model AO-1604CI2-PCI and DAI16-4C(PCI). So you can use the same operating procedures as AO-1604CI2-PCI and DAI16-4C(PCI).

	AO-1604CI3-PCI	AO-1604CI2-PCI	DAI16-4C(PCI)
About the display of the mounted board name	DAI16-4C(PCI) *1	DAI16-4C(PCI) *1	DAI16-4C(PCI)
Environmental support	Product for RoHS instruction	Product for RoHS instruction	Lead decrease product
Appearance			
External dimensions (mm)	176.41(L)×105.68(H)	176.41(L)×106.68(H)	176.41(L)×106.68(H)

*1: Even if this product is installed, the displayed board name is "DAI16-4C(PCI)".
There is no problem in operation even if the board name is displayed as "DAI16-4C(PCI)".