

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 device driver function.

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

- **Windows/Linux support device driver**
Using the device driver API-TOOL 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.

Included Items

Product ...1
Please read the following...1

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 device driver is supported with this product.

- * The contents in this document are subject to change without notice.
- * Visit the CONTEC website to check the latest details in the document.
- * The information in the data sheets is as of December, 2024.

Specifications

Function specification

Item	Description
Analog output	
Isolated specification	Channel to Channel Isolation
Number of output channels	4ch
Output range	Bipolar ±10V or Unipolar 0 - +10V 0 - 20mA (Jumper setting by channel)
Absolute max. output current	±5mA Output range : ±10V, 0 - +10V
Absolute max. load register	500Ω Output range : 0 - 20mA
Output impedance	100Ω or less Output range : ±10V, 0 - +10V
Resolution	16bit
Non-Linearity error *1	±5LSB(±10V, 0 - +10V), ±15LSB(0 - 20mA)
Conversion speed	20μsec (Max)
Voltage output control relay	AQY221N25X (Panasonic INDUSTRY) or equivalent to it
Generating clock	Internal generating clock : 20,000 - 1,073,741,824,000nsec (Can be set in 250nsec units), External generating clock : opto-coupler isolated input (corresponding to current sink output)
Programmable timer	
Setting frequency	500 - 1,073,741,824,000nsec (Can be set in 250nsec units)
Timer output signal	Opto-Isolated Open Collector Output (current sinking type)
External trigger input	
External trigger input signal	Opto-Isolated Input (for current sinking output)
Status	Trigger input, Trigger input overrun
Common section	
I/O address	32 ports boundary
Interruption level	Errors and various factors, One interrupt request line as INTA
Isolation voltage	500Vrms
Power consumption	5VDC 2400mA (Max)
Bus specification	PCI(32bit, 33MHz, Universal key shapes supported *2)
Dimension (mm)	176.41(L) x 105.68(H)
Weight	160g

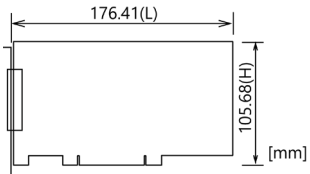
*1 A linearity error approximately 0.1% of full-range may occur when operated at 0°C or 50°C ambient temperature.

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

Installation Environment Requirements

Item	Description
Operating ambient temperature	0 - 50°C
Operating ambient humidity	10 - 90%RH (No condensation)
Floating dust particles	Not to be excessive
Corrosive gases	None
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA

Physical Dimensions



The standard outside dimension (L) is the distance from the end of the card to the outer surface of the slot cover.

Support Software

Name	Contents	How to get
Windows version High-efficiency Analog I/O Driver API-AIO(WDM)	The API-AIO(WDM) is the Windows version driver 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.	Download from the CONTEC website *1
Analog I/O Driver for Linux API-AIO(LNX)	This is the Linux version driver software provided in API function formats. The software includes various sample programs such as gcc (C, C++) and Python programs.	Download from the CONTEC website *1
Software Development Tool Kits (SDK) and Support Software	In addition to the device drivers, we offer many software programs for using CONTEC devices in an easier manner.	Download from the CONTEC website *2

*1 Download the files from the following URL.
<https://www.contec.com/download/>

*2 For supported software, search the CONTEC website for this product and view the product page.
<https://www.contec.com/>

Optional Products

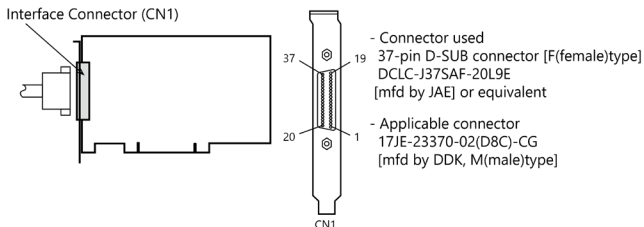
Product Name	Model type	Description
Shield Cable with two 37-pin D-type connectors	PCB37PS-0.5P	0.5m
	PCB37PS-1.5P	1.5m
Flat Cable with 37-Pin D-type Connectors on 2Ends	PCB37P-1.5	1.5m
Shield Cable with One 37pin D-type Connector	PCA37PS-0.5P	0.5m
	PCA37PS-1.5P	1.5m
Flat Cable with a 37Pin D-type Connectors	PCA37P-1.5	1.5m
Screw Terminal (M3 * 37P)	EPD-37A	*1*2
Screw Terminal (M3.5 * 37)	EPD-37A	*2
General Purpose Terminal	DTP-3C	*2
Screw Terminal	DTP-4C	*2

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

*2 PCB37P or PCB37PS optional cable is required separately.

Visit the CONTEC website for the latest optional products.

Connecting an Interface Connector



Layout on the Interface Connector(CN1)

Settling Busy Output	37	19	Plus Common
Timer Output	36	18	External Trigger Input
Minus Common	35	17	External Generating Clock Input
N.C.	34	16	N.C.
N.C.	33	15	N.C.
Analog Ground 3	32	14	Current Output 3
N.C.	31	13	Voltage Output 3
N.C.	30	12	N.C.
N.C.	29	11	N.C.
Analog Ground 2	28	10	Current Output 2
N.C.	27	9	Voltage Output 2
N.C.	26	8	N.C.
N.C.	25	7	N.C.
Analog Ground 1	24	6	Current Output 1
N.C.	23	5	Voltage Output 1
N.C.	22	4	N.C.
N.C.	21	3	N.C.
Analog Ground 0	20	2	Current Output 0
		1	Voltage Output 0

Signal name	Description
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 Generating Clock Input	External generating clock input signal.
Timer Output	Output signal of programmable timer.
Settling Busy Output	Output signal indicating the time (settling time) from the start of DA conversion until the analog output stabilizes to a specific value.
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.

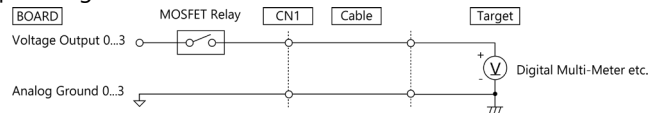
CAUTION

Do not short any of the outputs to the analog ground or plus common or minus common. Neither connect outputs to each other. Doing either can result in a fault.

Analog Output Signal Connection

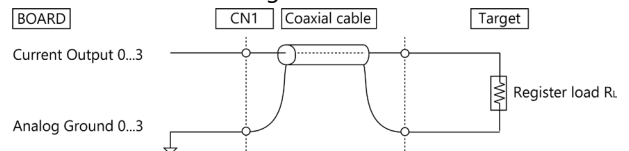
Connecting example of voltage output Analog Output Connection (Flat Cable)

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



Analog Output Connection (Shielded Cable)

The following figure shows an example of shielded cable connection. 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.



CAUTION

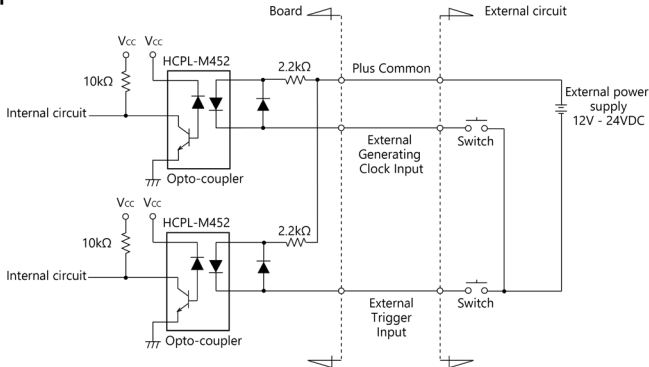
- When the power supply is turned on, output (0mA) of data 0000h is output as for the output signal.
- Do not short circuit any of the output signals to analog ground or plus common or minus common. Doing either can cause a malfunction.
- Do not connect the output signal to that of other channel and of external device. Doing either can cause a malfunction.
- Do not detach the interface connector (CN1) with the power supply of a PC or an external device turned on. Doing either can cause a malfunction.
- If the connection cable is affected by noise, it may fail to output the accurate current data. Route the connection cable as far apart from noise sources as possible.

Control signals Connection

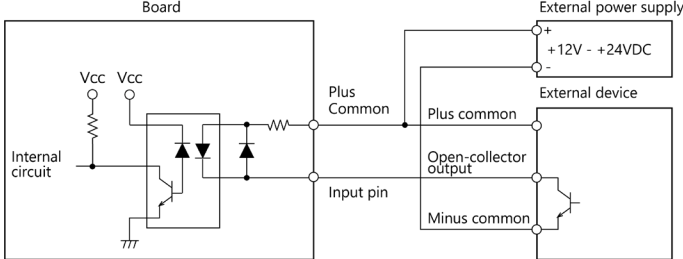
Input signals connection

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 11mA per input channel at 24VDC (or about 5.5mA at 12VDC).

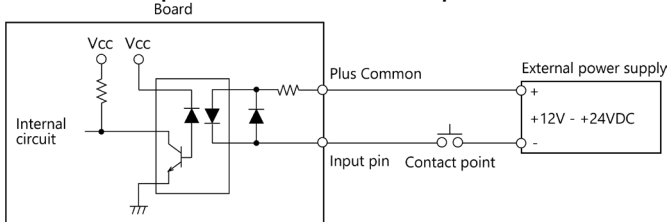
Input Circuit



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

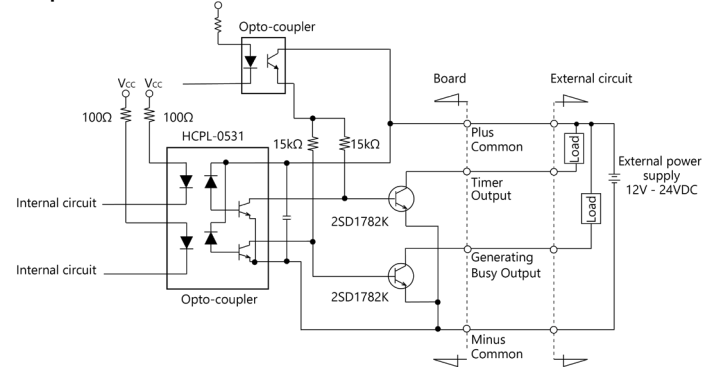
Internal logic	Contact point	Input pin voltage level
0	OFF	High
1	ON	Low

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.

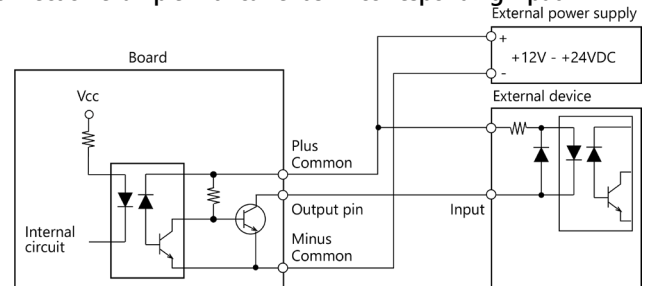
Output Circuit



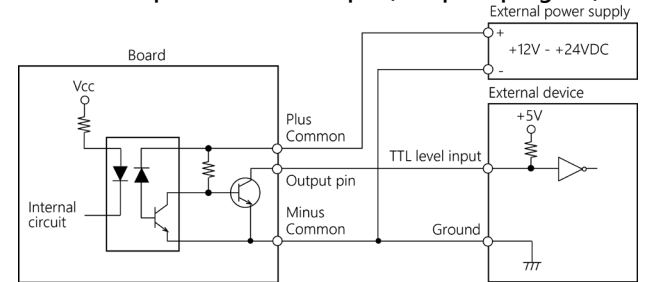
CAUTION

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

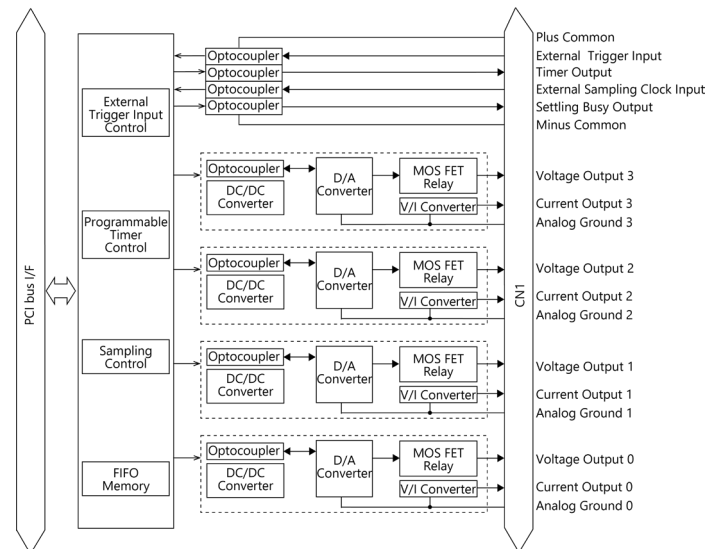
Connection example with current sink corresponding input



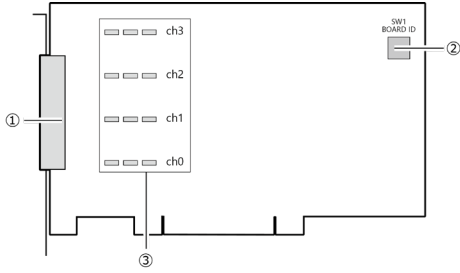
Connection example with TTL level input (with pull-up register)



Circuit Block Diagram



Component Name



No.	Name	No.	Name
1	Interface Connector	3	Analog Output Setting Jumper
2	I Board ID Setting Switch		

Differences from Conventional Products

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)".