

16 Channel Analog to Digital Input Board for PCI AD12-16(PCI)



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

Features

- Multi-channel analog input

< AD12-16(PCI) > can perform an analog input of single-ended input 16 channels and differential input 8 channels.

Selection of single-ended input and differential input can be set up by the device driver function.

- Input range setup by device driver function

Input range can be selected for each channel from the following ranges and can be set up by the device driver function.

$\pm 10V$, $\pm 5V$, $\pm 2.5V$, $\pm 1.25V$, $0 - +10V$, $0 - +5V$, $0 - +2.5V$, $0 - +1.25V$

- Sampling control function

The board can perform sampling either at arbitrary timings under control of software or periodically in synchronization with a sampling clock signal. The sampling clock signal can be selected between the internal one based on the on-board clock generator and the external one using a digital signal input from an external source.

- 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.

- Digital input/output function

The board has four digital input and four digital output pins for TTL-level signals, allowing an external device to be monitored and controlled.

- Optional units

Using optional units facilitates connections.

For more details on the option, please refer to "Optional Products".

Included Items

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

AD12-16(PCI) are PCI-compliant interface boards that convert analog input signals to digital equivalents (performing analog-to-digital conversion).

AD12-16(PCI) can perform A-D conversion at a conversion speed of 10 μ sec [100KSPS] per channel and a resolution of 12bit.

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 July, 2024.

Specifications

Function specification

Item	Specification
Analog input	
Isolated specification	Un-Isolated
Input type	Single-Ended Input or Differential Input
Number of input channels	16 channels (Single-Ended Input) 8 channels (Differential Input)
Input range	Bipolar $\pm 10V$, $\pm 5V$, $\pm 2.5V$, $\pm 1.25V$, or Unipolar $0 - +10V$, $0 - +5V$, $0 - +2.5V$, $0 - +1.25V$ (Software setup per channel)
Absolute max. input voltage	$\pm 15V$
Input impedance	1M Ω or more
Resolution	12bit
Non-Linearity error *1	$\pm 2LSB(\pm 10V, \pm 5V, 0 - 10V, 0 - 5V)$ $\pm 4LSB(\pm 2.5V, \pm 1.25V, 0 - 2.5V)$ $\pm 8LSB(0 - 1.25V)$
Conversion speed	10 μ sec [100KSPS]*2/ch (Max)
Sampling clock	Internal sampling clock: 10,000 - 1,073,741,824,000nsec (Settable in 250 nsec) External sampling clock: TTL level falling edge
Digital I/O	
Number of input channels	Un-Isolated input 4ch (TTL level, positive logic)
Number of output channels	Un-Isolated output 4ch (TTL level, positive logic)
Programmable timer	
Setting period	500 - 1,073,741,824,000nsec (Settable in 250 nsec)
Status	Count up, Count up over run
Timer output signal	TTL level 250nsec Low pulse
External trigger input	
External trigger input signal	Un-Isolated input 1ch (TTL level falling edge)
Status	Trigger input, Trigger input overrun
Common section	
I/O address	32 ports boundary
Interrupt level	Errors and various factors, One interrupt request line as INTA
Current consumption	+5VDC 700mA (Max) *3
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Bus specification	32bit, 33MHz, Universal key shapes supported *4*5
Physical dimensions (mm)	176.41(L) x 105.68(H) *6
Weight	150g

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

*2 SPS = Samplings Per Second. The number of data that can be converted in one second is shown.

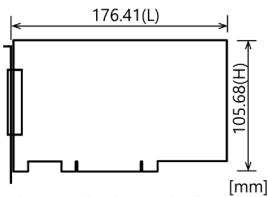
*3 If an external device requires this AD12-16(PCI) product to supply +5VDC from the CN1 or CN2 connectors, the power consumption of this product will be bigger than what this specification has defined.

- *4 This product requires +5V power supply from expansion slots (it does not operate in the environment of only +3.3V power supply).
- *5 AD12-16(PCI): If the board No. is No.7150, PCI bus specification is 32bit, 33MHz, 5V.
- *6 Boards with different board numbers are different in these specifications. See "Different in the specification" at the end of this document.

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, KC

Physical 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

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(LINX)	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/>

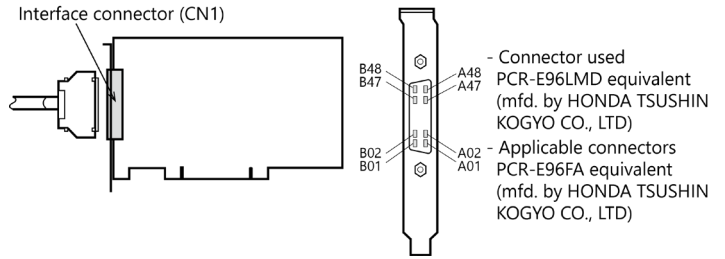
Optional Products

Product Name	Model type	Description
Shielded Cable with Two 96-Pin Half-Pitch Connectors	PCB96PS-0.5P	0.5m
	PCB96PS-1.5P	1.5m
Flat Cable with 96-pin Half-Pitch Connectors at Both Ends	PCB96P-1.5	1.5m
Shielded Cable with One 96-pin Half-Pitch Connector	PCA96PS-0.5P	0.5m
	PCA96PS-1.5P	1.5m
Flat Cable with One 96-pin Half-Pitch Connector	PCA96P-1.5	1.5m
Screw Terminal (M3 * 96)	EPD-96A	*1*2
Terminal Unit for Relay Terminal Banks	EPD-96	*1
Screw Terminal	DTP-64A	*1

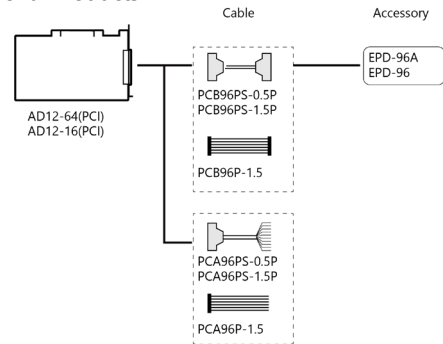
- *1 PCB96P-0.5P or PCB96PS-0.5P optional cable is required separately.
- *2 "Spring-up" type terminal is used to prevent terminal screws from falling off.

Visit the CONTEC website for the latest optional products.

Connecting an Interface Connector



Adding Optional Products



**Layout on the Interface Connector(CN1)
Single-Ended Input**

N.C.	B48	A48	N.C.
N.C.	B47	A47	N.C.
N.C.	B46	A46	N.C.
N.C.	B45	A45	N.C.
N.C.	B44	A44	N.C.
N.C.	B43	A43	N.C.
N.C.	B42	A42	N.C.
N.C.	B41	A41	N.C.
Analog Ground	B40	A40	Analog Ground
Analog Ground	B39	A39	Analog Ground
N.C.	B38	A38	N.C.
N.C.	B37	A37	N.C.
N.C.	B36	A36	N.C.
N.C.	B35	A35	N.C.
N.C.	B34	A34	N.C.
N.C.	B33	A33	N.C.
N.C.	B32	A32	N.C.
N.C.	B31	A31	N.C.
Analog Ground	B30	A30	Analog Ground
Analog Ground	B29	A29	Analog Ground
N.C.	B28	A28	N.C.
N.C.	B27	A27	N.C.
N.C.	B26	A26	N.C.
N.C.	B25	A25	N.C.
N.C.	B24	A24	N.C.
N.C.	B23	A23	N.C.
N.C.	B22	A22	N.C.
N.C.	B21	A21	N.C.
Analog Ground	B20	A20	Analog Ground
Analog Ground	B19	A19	Analog Ground
Analog Input 15	B18	A18	Analog Input 11
Analog Input 7	B17	A17	Analog Input 3
Analog Input 14	B16	A16	Analog Input 10
Analog Input 6	B15	A15	Analog Input 2
Analog Input 13	B14	A14	Analog Input 9
Analog Input 5	B13	A13	Analog Input 1
Analog Input 12	B12	A12	Analog Input 8
Analog Input 4	B11	A11	Analog Input 0
Analog Ground	B10	A10	Analog Ground
Analog Ground	B09	A09	Analog Ground
+5VDC from PC	B08	A08	External Sampling Clock Input
+5VDC from PC	B07	A07	Digital Ground
Sampling Busy Output	B06	A06	External Trigger Input
Timer Output	B05	A05	Digital Ground
Digital Output 3	B04	A04	Digital Input 3
Digital Output 2	B03	A03	Digital Input 2
Digital Output 1	B02	A02	Digital Input 1
Digital Output 0	B01	A01	Digital Input 0

- The numbers in square brackets [] are pin numbers designated by HONDA TSUSHIN KOGYO CO.

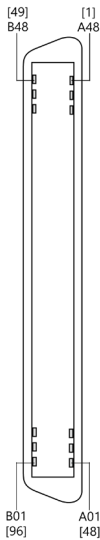
Signal name	Description
Analog Input 0 - Analog Input 15	Analog input signal at the time of single-ended input. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog input signals.
Digital Input 0 - Digital Input 3	Digital input signal.
Digital Output 0 - Digital Output 3	Digital output signal.
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.
+5VDC from PC	Output +5V. The total current-carrying capacity that can be supplied from two pins is 1A.
Digital Ground	Digital ground common to those signals other than analog input signals, such as digital I/O signals and external sampling clock input signals, and "+5V DC from PC".

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.

Differential Input

N.C.	B48	A48	N.C.
N.C.	B47	A47	N.C.
N.C.	B46	A46	N.C.
N.C.	B45	A45	N.C.
N.C.	B44	A44	N.C.
N.C.	B43	A43	N.C.
N.C.	B42	A42	N.C.
N.C.	B41	A41	N.C.
Analog Ground	B40	A40	Analog Ground
Analog Ground	B39	A39	Analog Ground
N.C.	B38	A38	N.C.
N.C.	B37	A37	N.C.
N.C.	B36	A36	N.C.
N.C.	B35	A35	N.C.
N.C.	B34	A34	N.C.
N.C.	B33	A33	N.C.
N.C.	B32	A32	N.C.
N.C.	B31	A31	N.C.
Analog Ground	B30	A30	Analog Ground
Analog Ground	B29	A29	Analog Ground
N.C.	B28	A28	N.C.
N.C.	B27	A27	N.C.
N.C.	B26	A26	N.C.
N.C.	B25	A25	N.C.
N.C.	B24	A24	N.C.
N.C.	B23	A23	N.C.
N.C.	B22	A22	N.C.
N.C.	B21	A21	N.C.
Analog Ground	B20	A20	Analog Ground
Analog Ground	B19	A19	Analog Ground
Analog Input 7 [-]	B18	A18	Analog Input 3 [-]
Analog Input 7 [+]	B17	A17	Analog Input 3 [+]
Analog Input 6 [-]	B16	A16	Analog Input 2 [-]
Analog Input 6 [+]	B15	A15	Analog Input 2 [+]
Analog Input 5 [-]	B14	A14	Analog Input 1 [-]
Analog Input 5 [+]	B13	A13	Analog Input 1 [+]
Analog Input 4 [-]	B12	A12	Analog Input 0 [-]
Analog Input 4 [+]	B11	A11	Analog Input 0 [+]
Analog Ground	B10	A10	Analog Ground
Analog Ground	B09	A09	Analog Ground
+5VDC from PC	B08	A08	External Sampling Clock Input
+5VDC from PC	B07	A07	Digital Ground
Sampling Busy Output	B06	A06	External Trigger Input
Timer Output	B05	A05	Digital Ground
Digital Output 3	B04	A04	Digital Input 3
Digital Output 2	B03	A03	Digital Input 2
Digital Output 1	B02	A02	Digital Input 1
Digital Output 0	B01	A01	Digital Input 0



- The numbers in square brackets [] are pin numbers designated by HONDA TSUSHIN KOGYO CO.

Signal name	Description
Analog Input 0[+] - Analog Input 7[+]	Analog input signal at the time of differential input. The numbers correspond to channel numbers.
Analog Input 0[-] - Analog Input 7[-]	Analog input signal at the time of differential input. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog input signals.
Digital Input 0 - Digital Input 3	Digital input signal.
Digital Output 0 - Digital Output 3	Digital output signal.
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.
+5VDC from PC	Output +5V. The total current-carrying capacity that can be supplied from two pins is 1A.
Digital Ground	Digital ground common to those signals other than analog input signals, such as digital I/O signals and external sampling clock input signals, and "+5V DC from PC".

CAUTION

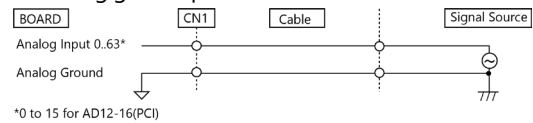
- Do not connect any of the outputs and power outputs to the analog or digital ground. Neither connect outputs to each other. Doing either can result in a fault.
- If analog and digital ground are shorted together, noise on the digital signals may affect the analog signals. Accordingly, analog and digital ground should be separated.

Connecting Analog Input Signal

Single-ended Input

Single-ended Input Connection (Flat Cable)

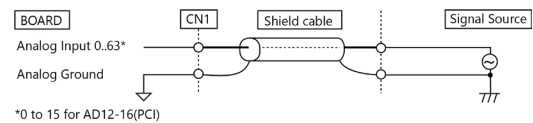
The following figure shows an example of flat cable connection. Each signal source is connected to one analog input channel and the signal common to analog ground pin of CN1.



Single-ended Input Connection (Shielded Cable)

The following figure shows an example of shielded cable connection. When the distance between the signal source and the product is long or you want to increase the noise tolerance, a shield cable is suggested.

Connect the signal by the core wire and common signal by the shield braids.



CAUTION

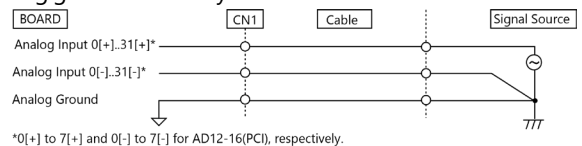
- When a frequency of 1MHz or higher is contained in the source signal, the cross talk between channels may occur.
- If the product and the signal source receive noise or the distance between the product and the signal source is too long, data may not be input properly.
- An input analog signal should not exceed the maximum input voltage (relate to the product analog ground). If it exceeds the maximum voltage, the product may be damaged.
- Connect all the unused analog input channels to analog ground.

Differential Input

Differential Input Connection (Flat Cable)

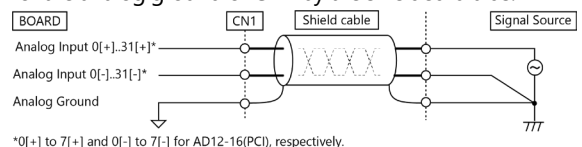
The following figure shows an example of flat cable connection.

Each signal source is connected to a [+] pin of analog input channel and the signal common of this source to the [-] pin of this input channel of CN1. In addition, the signal common must be connected to the pin of the analog ground of CN1 by a third wire.



Differential Input Connection (Shielded Cable)

The following figure shows an example of shielded cable connection. When the distance between the signal source and the product is long or you want to increase the noise tolerance, a shield cable connection is preferred. Each signal source is connected to a [+] pin of analog input channel and the signal common of this source to the [-] pin of this input channel of CN1. In addition, the signal common must be connected to the pin of the analog ground of CN1 by the shielded braids.



CAUTION

- When a frequency of 1MHz or higher is contained in the source signal, the cross talk between channels may occur.
- The input data would be uncertain if the analog ground is not connected.
- If the product and the signal source receive noise or the distance between the product and the signal source is too long, data may not be input properly.
- The input voltage from the [+] input or [-] input should not exceed the maximum input voltage (based on the product analog ground). If it exceeds the maximum voltage, the product may be damaged.
- Because the input data will be uncertain if the [+] pin or the [-] pin of CN1 is not connected, all the unused input pins of CN1 should be connected to the analog ground, AGND.

Connecting Digital I/O Signals

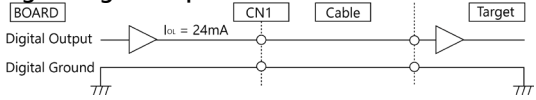
This section shows how to connect the digital I/O signal and control signal ("External Sampling Clock Input", "External Trigger Input" and so on) by using a flat cable. Connect CN1 to the external device by using the optional flat cable (PCA96P-1.5).

All the digital I/O signals and control signals are TTL level signals.

Connecting the Digital Input



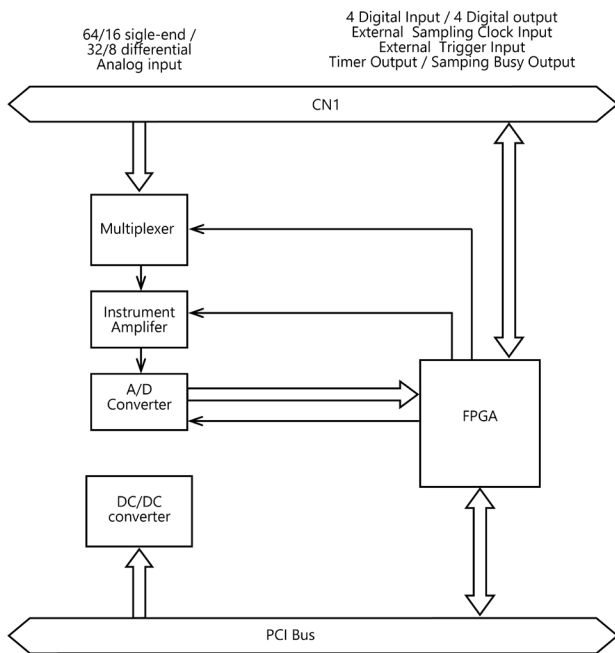
Connecting the Digital Output



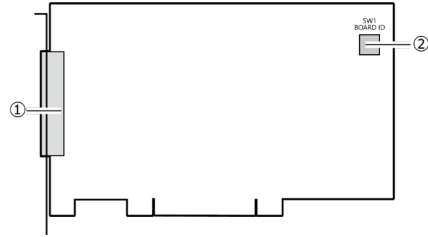
CAUTION

Do not short the outputs to analog or digital ground. In addition, do not connect two outputs together. Doing either can result in a fault.

Circuit Block Diagram



Component Name



No.	Name
1	Interface Connector (page)
2	Board ID Setting Switch

Different by board number

The AD12-16(PCI) are different in specifications, depending on the board number as listed below.

Different in the specification

Board No.	No.7150	No.7150A	No.7150C
Physical dimensions (mm)	176.41(L) x 106.68(H)	176.41(L) x 106.68(H)	176.41(L) x 105.68(H)