High Resolution & Speed Analog I/O Board for PCI

ADA16-32/2(PCI)F

This product is a multi-function, PCI bus compliant interface board that incorporates high-precision analog inputs, high-precision analog outputs, digital inputs, digital outputs, and a counter function.

The board includes an event controller for integrated management of control signals by hardware and a bus master data transfer function for transferring large volumes of data at high speed. Together, these features provide all you need to build a high-performance PC-based measurement and control system.

Windows/Linux device driver is supported with this product.

* Specifications, color and design of the products are subject to change without notice.
* 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, 2025.

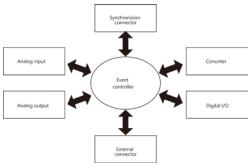
Features

- Multi-function

The board contains analog inputs (16-bit, 32ch), analog outputs (16-bit, 2ch), digital inputs (8ch), digital outputs (8ch), and counters (32-bit binary, 2ch). Combining all these features on one board allows complex systems to be implemented even on PCs with few spare expansion slots.

- The event controller can be used to implement a wide range of different sampling control schemes

The board incorporates an event controller for integrated hardware control. The event controller can use the external control signals and the events generated by the board functions to start and stop analog input operation and perform clock control. This enables high-precision synchronization of the various board functions without requiring software. Also, each function can be operated separately.



Scenario 1: Analog input and output synchronized with an external clock signal.

Scenario 2: Analog input performed whenever the counter value reaches the set value.

- Bus master transfer function and combined data I/O function

Bus master data transfer can be used for the analog inputs and outputs either separately or at the same time. This can be used to transfer large volumes of data between the board and PC without placing a load on the CPU.

When using bus master data transfer for analog input data, you can also transfer the analog output, digital input, digital output, and counter data at the same time synchronized with the analog input clock signal.

This function ensures reliable data synchronization in the systems you implement.

- Buffer memory available for background processing independent of software

The analog inputs and outputs each have their own buffer memory which can be used when not using bus master transfer.

You can also perform analog input and output in the background, independent of software and the current status of the PC.

- Software-based adjustment function

Adjustment of analog input 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.

- Synchronization control connector provided for synchronizing operation

A synchronization control connector is provided for synchronized control of multiple boards. You can expand the number of channels simply by adding more boards. This makes it easy to synchronize operation with other CONTEC boards that have a synchronization control connector.

- Filter function for easy connection of external signals

The digital input signals, counter input signals, and the external control signals for analog I/O incorporate a digital filter to prevent problems such as chattering.

- 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

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/

Specifications

Function specification

Item	Description
Analog input	
Isolated specification	Un-Isolated
Input type	Single-Ended Input or Differential Input
Number of input channels	32ch (Single-Ended Input) 16ch (Differential Input)
Input range	Bipolar ±10V, ±5V, ±2.5V or Unipolar 0 - +10V, 0 - +5V, 0 - +2.5V
Absolute max. input voltage	±15V
Input impedance	1MΩ or more
Resolution	16bit
Non-Linearity error *1*2	Within ±5LSB
Conversion speed	2µsec/ch (Max.)
Buffer memory	64k Word FIFO or 64k Word RING
Conversion start trigger	Software, conversion data compare, external trigger, and event controller output.
Conversion stop trigger	Data save complete, conversion data compare, external trigger, event controller output, and software.
External start signal	TTL level (Rising or falling edge can be selected by software)
External stop signal	TTL level (Rising or falling edge can be selected by software)
External clock signal	TTL level (Rising or falling edge can be selected by software)
External status output signal	1 TTL level Sampling clock output
Analog output	
Isolated specification	Un-Isolated
Number of output channels	2ch
Output range	Bipolar ±10V, ±5V, ±2.5V, ±1.25V or Unipolar 0 - +10V, 0 - +5V, 0 - +2.5V
Output current ability	±5mA
Output impedance	1Ω or less
Resolution	16bit
Non-Linearity error *1	Within ±3LSB
Conversion speed	10µsec (Max.)
Buffer memory	64k Word FIFO or 64k Word RING
Conversion start trigger	Software, External trigger, and Event controller output.
Conversion stop trigger	Settings include data save complete, External trigger, Event controller output, and Software.
External start signal	TTL level (Rising or falling edge can be selected by software)
External stop signal	TTL level (Rising or falling edge can be selected by software)
External clock signal	TTL level (Rising or falling edge can be selected by software)
External status output signal	1 TTL level, Generating clock output
Digital I/O section	
Number of input channels	Un-Isolated input 8ch (TTL positive logic)
Number of output channels	Un-Isolated output 8ch (TTL positive logic)
Counter	
Number of channels	2ch
Counting system	Up count
Max. count	FFFFFFFFh (Binary data, 32bit)
Number of external inputs	2 TTL level (Gate/Up Clock)/ch, Gate (High level), Up Clock (Rising edge)
Number of external outputs	1 TTL level output/ch, Count match output (positive logic, pulse output)
Bus master section	
DMA channels	2ch (one each for input and output)
Transfer bus width	32bit
Transfer data length	8 PCI Words length (Max.)
FIFO	1K Word/ch
Scatter/Gather function	64M Byte/ch
Synchronization bus section	
Control output signal	Selection of output signal with the software when specifying a sync master product.
Control input signal	Selection of sync factor with the software when specifying sync slave products.
Max. product count for connection	16 products including the master product
Common section	
I/O address	64 ports x 1,256 ports x 1 region
Interruption level	Errors and various factors, One interrupt request line as INTA
Power consumption	5VDC 1100mA (Max.)
Operating condition	0 - 50℃, 10 - 90%RH (No condensation)
Bus specification	32bit, 33MHz, Universal key shapes supported *3
Dimension (mm)	176.41(L) x 105.68(H)
Weight	130g

*1 A linearity error approximately 0.1% of full-range may occur when operated at 0℃ or 50℃ ambient temperature. The error can be reduced by calibrating under the actual temperature conditions.

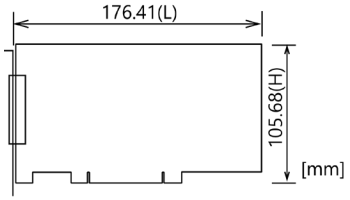
*2 When using a signal source with a built-in high-speed operational amp.

*3 This board requires +5V power supply from expansion slots (it does not operate in the environment of only +3.3V power supply).

Installation Environment Requirements

Item	Description
Operating ambient temperature	0 - 50℃
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.

Optional Products

Product Name	Model type	Description
Shielded Cable with One 96-pin Half-Pitch Connector	PCA96PS-0.5P	0.5m
	PCA96PS-1.5P	1.5m
Shielded Cable with Two 96-Pin Half-Pitch Connectors	PCB96PS-0.5P	0.5m
	PCB96PS-1.5P	1.5m
Flat Cable with One 96-pin Half-Pitch Connector	PCA96P-1.5	1.5m *1
Flat Cable with 96-pin Half-Pitch Connectors at Both Ends	PCB96P-1.5	1.5m *1
Buffer Amplifier Box for Analog Input Boards	ATBA-32F	*2*3
	ATBA-8F	*2*3*4
Screw Terminal	DTP-64A	*2
Terminal Unit for Relay Terminal Banks	EPD-96	*2
Screw Terminal (M3 * 96)	EPD-96A	*2*5
Termination Panel with BNC connectors for Analog I/O Boards	ATP-32F	*2
	ATP-8	*2*4*6

*1 Flat cables are not compliant with CE EMC Directive. Use shielded cables to ensure compliance with these standards.

2 A PCB96PS - optional cable is required separately. (0.5m is recommended.)

*3 An external power supply is necessary (optional AC adaptor POA200-20-2 prepared.)

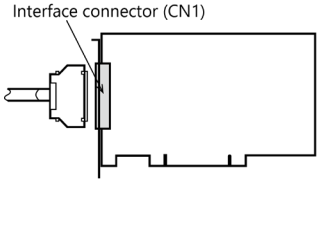
*4 The analog input could have 8 channels to be used.

*5 "Screw upright terminal panel" is used to prevent terminal screws from falling off.

*6 The digital input can be used up to four points, the digital output up to four points and the counter I/O up to 1 channel.

Visit the CONTEC website for the latest optional products.

Connecting an Interface Connector



- Connector used
PCR-E96LMD equivalent
[mfd. by HONDA TSUSHIN KOGYO CO.,LTD.]
- Applicable connectors
PCR-E96FA equivalent
[mfd. by HONDA TSUSHIN KOGYO CO.,LTD.]

Layout on the Interface Connector(CN1)

Single-Ended Input

N.C.	B48		A48	Analog Output 00
N.C.	B47		A47	Analog Ground (for AO)
N.C.	B46		A46	Analog Output 01
N.C.	B45		A45	Analog Ground (for AO)
Analog Input 08	B44		A44	Analog Input 00
Analog Input 24	B43		A43	Analog Input 16
Analog Input 09	B42		A42	Analog Input 01
Analog Input 25	B41		A41	Analog Input 17
Analog Ground (for AI)	B40		A40	Analog Ground (for AI)
Analog Ground (for AI)	B39		A39	Analog Ground (for AI)
Analog Input 10	B38		A38	Analog Input 02
Analog Input 26	B37		A37	Analog Input 18
Analog Input 11	B36	[49] B48 [1] A48	A36	Analog Input 03
Analog Input 27	B35		A35	Analog Input 19
Analog Ground (for AI)	B34		A34	Analog Ground (for AI)
Analog Ground (for AI)	B33		A33	Analog Ground (for AI)
Analog Input 12	B32		A32	Analog Input 04
Analog Input 28	B31		A31	Analog Input 20
Analog Input 13	B30		A30	Analog Input 05
Analog Input 29	B29		A29	Analog Input 21
Analog Ground (for AI)	B28		A28	Analog Ground (for AI)
Analog Ground (for AI)	B27		A27	Analog Ground (for AI)
Analog Input 14	B26		A26	Analog Input 06
Analog Input 30	B25		A25	Analog Input 22
Analog Input 15	B24		A24	Analog Input 07
Analog Input 31	B23		A23	Analog Input 23
Analog Ground (for AI)	B22		A22	Analog Ground (for AI)
Analog Ground (for AI)	B21		A21	Analog Ground (for AI)
Digital Ground	B20		A20	Digital Ground
N.C.	B19		A19	N.C.
Digital Output 00	B18		A18	Digital Input 00
Digital Output 01	B17		A17	Digital Input 01
Digital Output 02	B16		A16	Digital Input 02
Digital Output 03	B15		A15	Digital Input 03
Digital Output 04	B14		A14	Digital Input 04
Digital Output 05	B13		A13	Digital Input 05
Digital Output 06	B12		A12	Digital Input 06
Digital Output 07	B11		A11	Digital Input 07
AO Control Signal Output 00	B10		A10	AI Control Signal Output 00
AO Control Signal Output 01	B09		A09	AI Control Signal Output 01
Digital Ground	B08		A08	Digital Ground
AO External Generating Clock Input	B07		A07	AI External Sampling Clock Input
AO External Stop Trigger Input	B06		A06	AI External Stop Trigger Input
AO External Start Trigger Input	B05		A05	AI External Start Trigger Input
Counter UP Clock Input 01	B04		A04	Counter UP Clock Input 00
Reserved	B03		A03	Reserved
Counter Gate Control Input 01	B02		A02	Counter Gate Control Input 00
Counter Output 01	B01	B01 [96] A01 [48]	A01	Counter Output 00

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

Signal name	Description
Analog Input 00 - Analog Input 31	Analog input signal with single-ended input. The numbers correspond to channel numbers.
Analog Output 00 - Analog Output 01	Analog output signal. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog I/O signals.
AI External Start Trigger Input	External trigger input for starting analog input.
AI External Stop Trigger Input	External trigger input for stopping analog input.
AI External Sampling Clock Input	External sampling clock input for analog input.
AI Control Signal Output 00	External sampling clock output signal for analog input.
AI Control Signal Output 01	External output signal for analog input status. Currently Reserved.
AO External Start Trigger Input	External trigger input for Generating analog output.
AO External Stop Trigger Input	External trigger input for Generating analog output.
AO External Generating Clock Input	External Generating clock input for analog output.
AO Control Signal Output 00	External Generating clock output signal for analog output.
AO Control Signal Output 01	External output signal for analog output status. Currently Reserved.
Digital Input 00 - Digital Input 07	Digital Input signal. The numbers correspond to input bits.
Digital Output 00 - Digital Output 07	Digital Output signal. The numbers correspond to output bits.
Counter Gate Control Input00 - Counter Gate Control Input01	Gate control input signal for counter
Counter Up Clock Input00 - Counter Up Clock Input01	External Up-Clock Input Signal for Counter.
Counter Output 00 - Counter Output 01	Count match output signal for counter
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 product.

Differential Input

N.C.	B48		A48	Analog Output 00
N.C.	B47		A47	Analog Ground (for AO)
N.C.	B46		A46	Analog Output 01
N.C.	B45		A45	Analog Ground (for AO)
Analog Input 08[+]	B44		A44	Analog Input 00[+]
Analog Input 08[-]	B43		A43	Analog Input 00[-]
Analog Input 09[+]	B42		A42	Analog Input 01[+]
Analog Input 09[-]	B41		A41	Analog Input 01[-]
Analog Ground (for AI)	B40		A40	Analog Ground (for AI)
Analog Ground (for AI)	B39		A39	Analog Ground (for AI)
Analog Input 10[+]	B38		A38	Analog Input 02[+]
Analog Input 10[-]	B37		A37	Analog Input 02[-]
Analog Input 11[+]	B36	[49] B48 [1] A48	A36	Analog Input 03[+]
Analog Input 11[-]	B35		A35	Analog Input 03[-]
Analog Ground (for AI)	B34		A34	Analog Ground (for AI)
Analog Ground (for AI)	B33		A33	Analog Ground (for AI)
Analog Input 12[+]	B32		A32	Analog Input 04[+]
Analog Input 12[-]	B31		A31	Analog Input 04[-]
Analog Input 13[+]	B30		A30	Analog Input 05[+]
Analog Input 13[-]	B29		A29	Analog Input 05[-]
Analog Ground (for AI)	B28		A28	Analog Ground (for AI)
Analog Ground (for AI)	B27		A27	Analog Ground (for AI)
Analog Input 14[+]	B26		A26	Analog Input 06[+]
Analog Input 14[-]	B25		A25	Analog Input 06[-]
Analog Input 15[+]	B24		A24	Analog Input 07[+]
Analog Input 15[-]	B23		A23	Analog Input 07[-]
Analog Ground (for AI)	B22		A22	Analog Ground (for AI)
Analog Ground (for AI)	B21		A21	Analog Ground (for AI)
Digital Ground	B20		A20	Digital Ground
N.C.	B19		A19	N.C.
Digital Output 00	B18		A18	Digital Input 00
Digital Output 01	B17		A17	Digital Input 01
Digital Output 02	B16		A16	Digital Input 02
Digital Output 03	B15		A15	Digital Input 03
Digital Output 04	B14		A14	Digital Input 04
Digital Output 05	B13		A13	Digital Input 05
Digital Output 06	B12		A12	Digital Input 06
Digital Output 07	B11		A11	Digital Input 07
AO Control Signal Output 00	B10		A10	AI Control Signal Output 00
AO Control Signal Output 01	B09		A09	AI Control Signal Output 01
Digital Ground	B08		A08	Digital Ground
AO External Generating Clock Input	B07		A07	AI External Sampling Clock Input
AO External Stop Trigger Input	B06		A06	AI External Stop Trigger Input
AO External Start Trigger Input	B05		A05	AI External Start Trigger Input
Counter UP Clock Input 01	B04		A04	Counter UP Clock Input 00
Reserved	B03		A03	Reserved
Counter Gate Control Input 01	B02		A02	Counter Gate Control Input 00
Counter Output 01	B01	B01 [96] A01 [48]	A01	Counter Output 00

- 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 with differential input. The numbers correspond to channel numbers.
Analog Input 0[-] - Analog Input 15[-]	Analog input signal with differential input. The numbers correspond to channel numbers.
Analog Output00 - Analog Output01	Analog output signal. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog I/O signals.
AI External Start Trigger Input	External trigger input for starting analog input.
AI External Stop Trigger Input	External trigger input for stopping analog input.
AI External Sampling Clock Input	External sampling clock input for analog input.
AI Control Signal Output 00	External sampling clock output signal for analog input.
AI Control Signal Output 01	External output signal for analog input status. Currently Reserved.
AO External Start Trigger Input	External trigger input for generating analog output.
AO External Stop Trigger Input	External trigger input for generating analog output.
AO External Generating Clock Input	External generating clock input for analog output.
AO Control Signal Output 00	External generating clock output signal for analog output.
AO Control Signal Output 01	External output signal for analog output status. Currently Reserved.
Digital Input 00 - Digital Input 07	Digital input signal. The numbers correspond to input bits.
Digital Output 00 - Digital Output 07	Digital output signal. The numbers correspond to output bits.

Counter Gate Control Input00 - Counter Gate Control Input01	Gate control input signal for counter
Counter Up Clock Input00 - Counter Up Clock Input01	External Up-Clock Input Signal for Counter.
Counter Output00 - Counter Output01	Count match output signal for counter
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

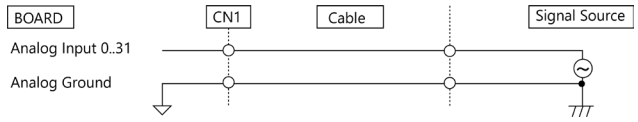
- Do not connect any of the outputs and power outputs to the analog or digital ground. Neither connect outputs to each other. Doing either can result in a fault.
- If analog and digital ground are shorted together, noise on the digital signals may affect the analog signals. Accordingly, analog and digital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

Connecting Analog Input Signal

Single-ended Input

Single-ended Input Connection (Flat Cable)

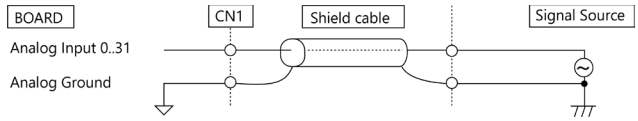
The following figure shows an example of flat cable connection. Each signal source is connected to one analog input channel and the signal common to analog ground pin of CN1.



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

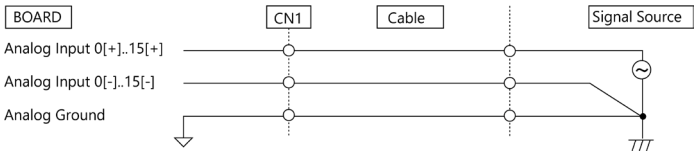
- When a frequency of 1MHz or higher is contained in the source signal, the cross talk between channels may occur.
- If the product and the signal source receive noise or the distance between the product and the signal source is too long, data may not be input properly.
- An input analog signal should 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.
- In the channel switching, the multiplexer does the electrical charge and discharge on the internal capacitor according to the signal voltage. Therefore, the voltage from the previous switching state may go into the next channel. It might cause the error of the signal source action. If this occurs, insert a high-speed amplifier as a buffer between the signal source and the analog input pin to reduce the fluctuation.
- An input pin may fail to obtain input data normally when the signal source connected to the pin has high impedance. If this is the case, change the signal source to one with lower output impedance or insert a high-speed amplifier buffer between the signal source and the analog input pin to reduce the effect.

Differential Input

Differential Input Connection (Flat Cable)

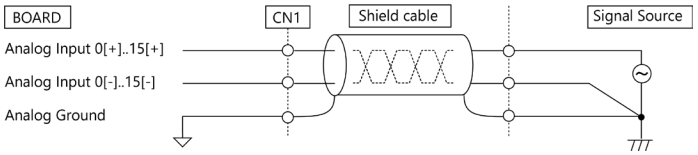
The following figure shows an example of flat cable connection.

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.



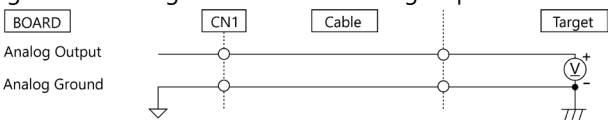
⚠ CAUTION

- 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.
- In the channel switching, the multiplexer does the electrical charge and discharge on the internal capacitor according to the signal voltage. Therefore, the voltage from the previous switching state may go into the next channel. It might cause the error of the signal source action. If this occurs, insert a high-speed amplifier as a buffer between the signal source and the analog input pin to reduce the fluctuation.
- An input pin may fail to obtain input data normally when the signal source connected to the pin has high impedance. If this is the case, change the signal source to one with lower output impedance or insert a high-speed amplifier buffer between the signal source and the analog input pin to reduce the effect.

Analog Output Signal Connection

Analog Output Connection (Flat Cable)

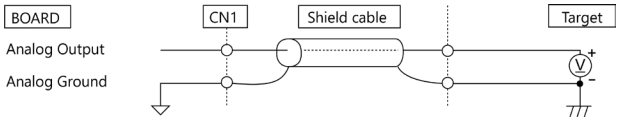
The following figure shows an example of flat cable connection. Connect the signal source and ground to the CN1 analog output.



Analog Output Connection (Shielded Cable)

The following figure shows an example of shielded cable connection. Use shielded cable if the distance between the signal source and product is long or if you want to provide better protection from noise.

For the CN1 analog output, connect the core wire to the signal line and connect the shielding to ground.



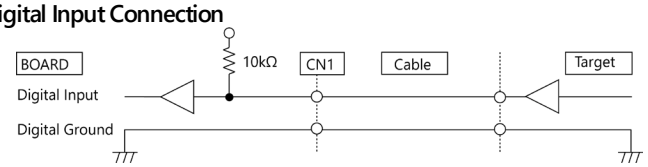
⚠ CAUTION

- If the product or the connected wire receives noise, or the distance between the product and the target is long, data may not be outputted properly.
- For analog output signal, the current capacity is ±5mA (Max.). Check the specification of the connected device before connecting the product.
- Do not short the analog output signal to analog ground, digital ground, and/or power line. Doing so may damage the product.
- Do not connect an analog output signal to any other analog output, either on the product or on an external device, as this may cause a fault on the product.

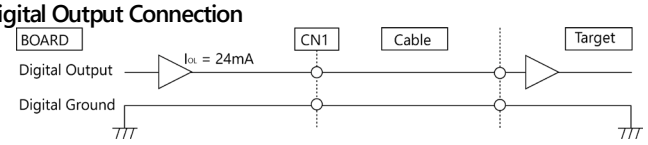
Digital I/O signals, Counter signals and Control signals Connection

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



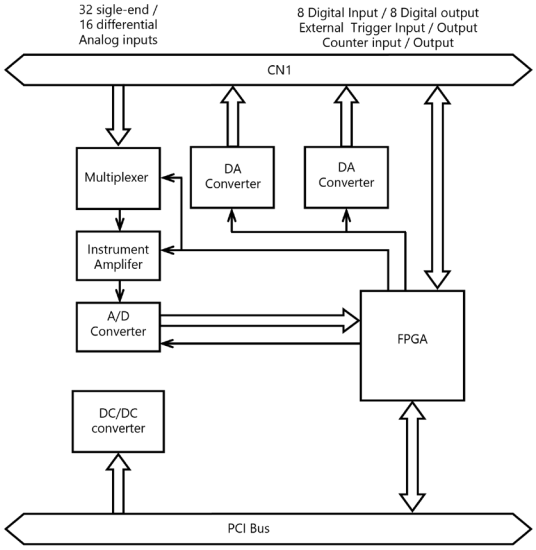
About the counter input control signal

Counter Gate Control Input acts as an input that validate or invalidate the input of an external up-clock for counter. This function enables the control of an external up-clock for counter. The external up-clock for counter is valid when input is "High", and invalid when input is "Low". If unconnected, it is a pull-up in the product and remains "High". Therefore the external up-clock for the counter is valid when the counter gate control input is not connected.

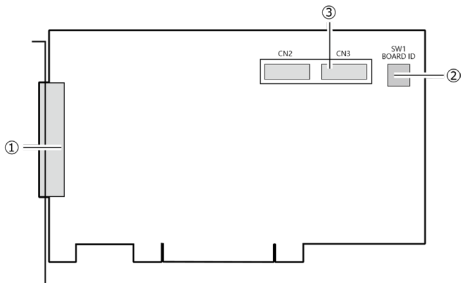
⚠ CAUTION

Do not short the output signals to analog ground, digital ground, and/or power line. Doing so may damage the board.

Circuit Block Diagram



Component Name



No.	Name	No.	Name
1	Interface Connector(For Analog Input)	3	Synchronization Control Connectors
2	Interface Connector (For Digital I/O)		