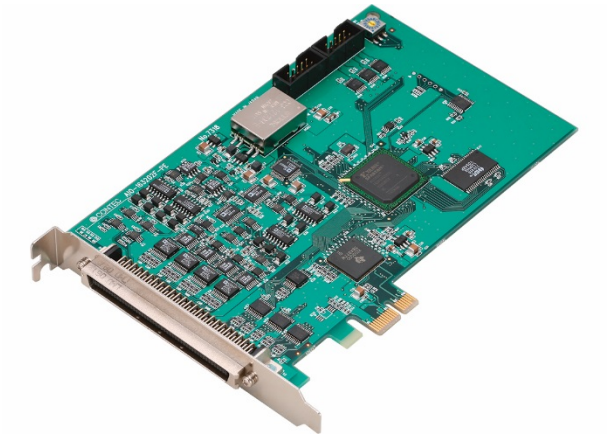
Bus master transfer/multi-functions
Analog I/O board for PCI Express

AIO-163202F-PE



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

This product is a multi-function, PCI Express bus-compliant interface board that incorporates

high-precision 16-bit analog inputs (32ch), high-precision 16-bit analog outputs (2ch), digital inputs/outputs (LVTTL level each 8ch), and a counter (32-bit, 2ch) 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.

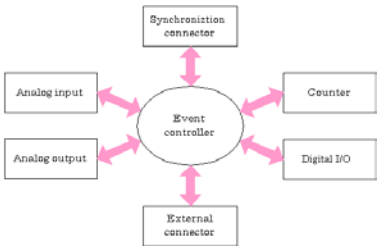
You can use the driver library (API-PAC(W32)) supplied with the board to write Windows application programs in any programming language (such as Visual Basic, Visual C++, etc.) that supports the calling of Win32 API functions. It can also collect data easily without a program when the data logger software [C-LOGGER] stored on the attached Disk is used. With plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.

Features

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

Overview of event controller



Each I/O function can be synchronized by the operation starting/stopping signal and the clock signal etc. of each I/O function.

Example 1: Synchronize the timing of analog input and analog output based on an external clock signal.

Example 2: Start analog input operation each time the counter value reaches a constant one.

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 to the PC without placing a load on the CPU.
When using bus master data transfer for analog input data, you can transfer the analog output, digital input, digital output, and counter data at the same time synchronized with the analog input clock signal.

Buffer memory available for background processing independent of software
The analog inputs and outputs each have their own buffer memory (64k Word) which can be used when not using bus master transfer. The buffer memory can be used as FIFO or RING form.
You can also perform analog input and output in the background, independent of software and the current status of the PC.

Software-based calibration function
Calibration of analog input/output 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.

Equipped with the synchronization control function
The operation of each I/O function can be synchronized with two or more (Max. 16 pieces) boards equipped with the synchronous control function as the analog input is started at the same time.

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.

Supported to the data logger software [C-LOGGER]
Supporting the data logger software [C-LOGGER] that enables the graph display of recorded signal data, file saving, and dynamic transfer to the spreadsheet software program "Excel"

Plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.
We offer a dedicated library [ML-DAQ], which allows you to use this product on MATLAB by The MathWorks as well as another dedicated library [VI-DAQ], which allows you to use the product on LabVIEW.
These dedicated libraries are available, free of charge (downloadable), on our web site.

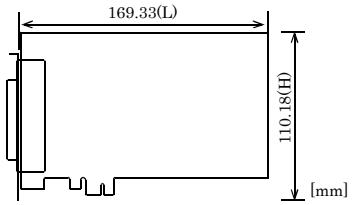
Specifications

Item	Specifications
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	±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	Settings include data save complete, conversion data compare, external trigger, event controller output, and software.
External start signal	LVTTL level (Rising or falling edge can be selected by software)
External stop signal	LVTTL level (Rising or falling edge can be selected by software)
External clock signal	LVTTL level (Rising or falling edge can be selected by software)
External status output signal	2 LVTTL 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	±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	LVTTL level (Rising or falling edge can be selected by software)
External stop signal	LVTTL level (Rising or falling edge can be selected by software)
External clock signal	LVTTL level (Rising or falling edge can be selected by software)
External status output signal	2 LVTTL level, Sampling clock output
Digital I/O	
Number of input channels	Un-Isolated input 8ch (LVTTL level positive logic)
Number of output channels	Un-Isolated output 8ch (LVTTL level positive logic)
Counter	
Number of channels	2ch
Counting system	Up count
Max. count	FFFFFFFFh (Binary data, 32bit)
Number of external inputs	2 LVTTL level (Gate/Up)/ch, Gate (High level), Up (Rising edge)
Number of external outputs	LVTTL level output/ch, Count match output (positive logic, pulse output)
Frequency response	10MHz (Max.)
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 board.
Control input signal	Selection of sync factor with the software when specifying sync slave boards.
Max. board count for connection	16 boards including the master board
Connector	PS-10PE-D4T1-B1 (JAE) or equivalent x 2
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
Connector	96-pin half pitch connector [M(male)type] PCR-96LMD [HONDA TSUSHIN KOGYO CO., LTD.] or equivalent
Power consumption (Max.)	3.3VDC 500mA, 12VDC 300mA
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Bus specification	PCI Express Base Specification Rev. 1.0a x 1
Dimension (mm)	169.33(L) x 110.18(H)
Weight	140g
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive)

*1 The non-linearity error means an error of approximately 0.1% occurs over the maximum range at 0°C and 50°C ambient temperature.

*2 At the time of the source use of a signal which built in the high-speed operational amplifier.

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 Logger Software C-LOGGER
[Stored on the bundled disk driver library API-PAC(W32)]

C-LOGGER is a data logger software program compatible with our analog I/O products. This program enables the graph display of recorded signal data, zoom observation, file saving, and dynamic transfer to the spreadsheet software "Excel". No troublesome programming is required.
For more details on the supported OS, applicable language and new information, please visit the CONTEC's Web site.

Data Acquisition library for MATLAB ML-DAQ
(Available for downloading (free of charge) from the CONTEC web site.)

This is the library software which allows you to use our analog I/O device products on MATLAB by the MathWorks. Each function is offered in accordance with the interface which is integrated in MATLAB's Data Acquisition Toolbox.
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.)*1

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.

*1 The bus master transmission (analog input and output), the analog input in-range and out-range function and the event controller function of analog F series are not supported. It is impossible to synchronize the AIO-163202F-PE with another board only when the synchronous connector was used.

Cable & Connector

Cable (Option)

Shield Cable with 96-Pin Half-Pitch Connectors at Both Ends
: 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)

Shield Cable with 96-Pin Half-Pitch Connectors at One End
: PCA96PS-0.5P (0.5m), PCA96PS-1.5P (1.5m)

Flat Cable with 96-Pin Half-Pitch Connectors at One End
: PCA96P-1.5 (1.5m)

Accessories

Accessories (Option)

Buffer Amplifier Box for Analog Input Boards (32ch type)	: ATBA-32F *1*2
Buffer Amplifier Box for Analog Input Boards (8ch type)	: ATBA-8F *1*2*3
Terminal Unit for Cables (M3 x 96P)	: DTP-64A *1
Screw Terminal Unit (M3.5 x 96P)	: EPD-96 *1
Screw Terminal Unit (M3 x 96P)	: EPD-96A *1*4
BNC Terminal Unit (for analog input 32ch)	: ATP-32F *1
BNC Terminal Unit (for analog input 8ch)	: ATP-8 *1*3*5

1 PCB96PS- optional cable is required separately (0.5mm is recommended).
*2 An external power supply is necessary (optional AC adaptor POA200-20 prepared.)
*3 The analog input could have 8 channels to be used.
*4 "Spring-up" type terminal is used to prevent terminal screws from falling off.
*5 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.

Packing List

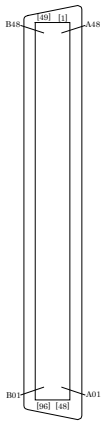
Board [AIO-163202F-PE] ...1
First step guide ... 1
Disk *1 [API-PAC(W32)] ...1
Synchronization Control Cable (10cm) ...1
Warranty Certificate ...1
Serial number label ...1

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

Connector Pin Assignment

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		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 Sampling 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
Control Output 01	B01		A01	Counter Output 00

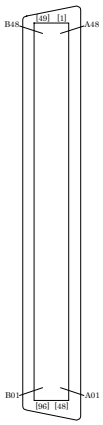


- The numbers in square brackets [ ] are pin numbers designated by HONDA TSUSHIN KOGYO CO., LTD.

Analog Input00 - Analog Input31	Analog input signal. 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 sampling.
AI External Stop Trigger Input	External trigger input for stopping analog input sampling.
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. Not currently connected.
AO External Start Trigger Input	External trigger input for starting analog output sampling.
AO External Stop Trigger Input	External trigger input for stopping analog output sampling.
AO External Sampling Clock Input	External sampling clock input for analog output.
AO Control Signal Output 00	External sampling clock output signal for analog output.
AO Control Signal Output 01	External output signal for analog output status. Not currently connected.
Digital Input00 - Digital Input07	Digital input signal.
Digital Output00 - Digital Output07	Digital output signal.
Counter Gate Control Input00 - Counter Gate Control Input01	Gate control input signal for counter.
Counter Up Clock Input00 - Counter Up Clock Input01	Count-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.

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		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 Sampling 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		A01	Counter Output 00



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

Analog Input00 - Analog Input15	Analog input signal. 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 sampling.
AI External Stop Trigger Input	External trigger input for stopping analog input sampling.
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. Not currently connected.
AO External Start Trigger Input	External trigger input for starting analog output sampling.
AO External Stop Trigger Input	External trigger input for stopping analog output sampling.
AO External Sampling Clock Input	External sampling clock input for analog output.
AO Control Signal Output 00	External sampling clock output signal for analog output.
AO Control Signal Output 01	External output signal for analog output status. Not currently connected.
Digital Input00 - Digital Input07	Digital input signal.
Digital Output00 - Digital Output07	Digital output signal.
Counter Gate Control Input00 - Counter Gate Control Input01	Gate control input signal for counter.
Counter Up Clock Input00 - Counter Up Clock Input01	Count-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.

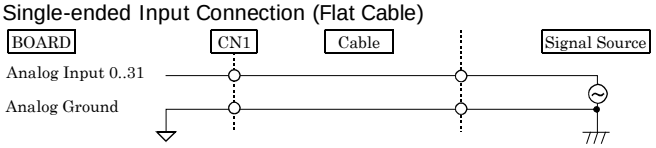
Analog Input Signal Connection

The procedure for connecting analog signals depends on whether the analog input signals are
single-ended or differential. The sections below describe how to connect the signals using flat cable and shielded cable.

Single-ended Input

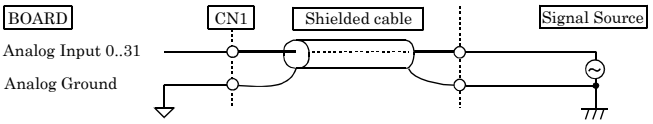
The following figure shows an example of flat cable connection.
Connect separate signal and ground wires for each analog input channel on CN1.

Single-ended Input Connection (Flat Cable)



The following figure shows an example of shielded cable connection.
Use shielded cable if the distance between the signal source and board is long or if you want to provide better protection from noise. For each analog input channel on CN1, connect the core wire to the signal line and connect the shielding to ground.

Single-ended Input Connection (Shielded Cable)



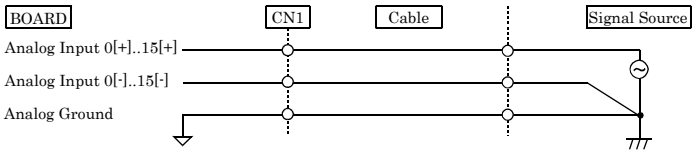
▼CAUTION

- If the signal source contains over 1MHz signals, the signal may effect the cross-talk noise between channels.
- If the board and the signal source receive noise or the distance between the board 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 board analog ground). If it exceeds the maximum voltage, the board 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

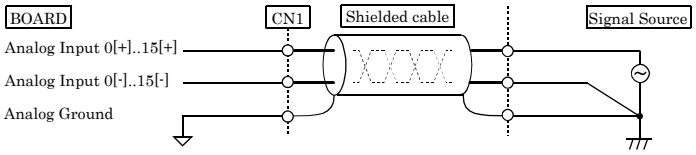
The following figure shows an example of flat cable connection.
For each analog input channel on CN1, connect the "+" input to the signal and connect the "-" input to the signal source ground. Also connect the analog ground on the board to the signal source ground.

Differential Input Connection (Flat Cable)



The following figure shows an example of shielded cable connection.
Use shielded cable if the distance between the signal source and board is long or if you want to provide better protection from noise. For each analog input channel on CN1, connect the "+" input to the signal and connect the "-" input to the signal source ground. Also connect the analog ground on the board and the signal source ground to the shielding.

Differential Input Connection (Shielded Cable)

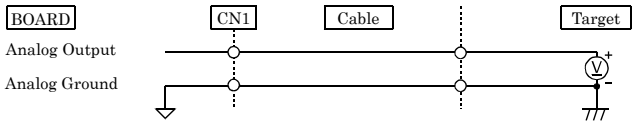


▼CAUTION
- If the signal source contains over 1MHz signals, the signal may effect the cross-talk noise between channels.
- When the analog ground is not connected, the conversion data is not determined.
- If the board and the signal source receive noise or the distance between the board and the signal source is too long, data may not be input properly.
- An input analog signal should not exceed the maximum input voltage (relate to the board analog ground). If it exceeds the maximum voltage, the board 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.

Analog Output Signal Connection

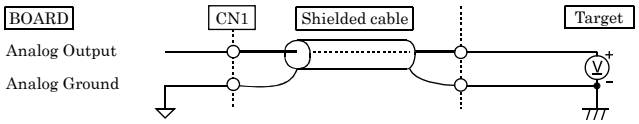
This section shows how to connect the analog output signal by using a flat cable or a shielded cable.
The following figure shows an example of flat cable connection.
Connect the signal source and ground to the CN1 analog output.

Analog Output Connection (Flat Cable)



The following figure shows an example of shielded cable connection.
Use shielded cable if the distance between the signal source and board 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.

Analog Output Connection (Shielded Cable)

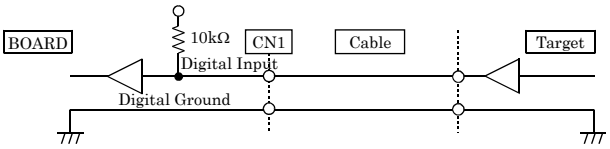


▼CAUTION
- When a frequency of 1MHz or higher is contained in the source signal, the cross talk between channels may occur.
- If the board or the connected wire receives noise, or the distance between the board and the target is long, data may not be outputted properly.
- For analog output signal, the current capacity is ±5mA (Max.). Check the specification of the connected device before connecting the board.
- Do not short the analog output signal to analog ground, digital ground, and/or power line. Doing so may damage the board.
- Do not connect an analog output signal to any other analog output, either on the board or on an external device, as this may cause a fault on the board.
- The signal connected to an input terminal may shake after a multiplexer change. In this case, a shake can be lessened by shortening the cable between the source signal and an analog input board, or inserting high-speed buffer amplifier between the source signal and an analog input board.

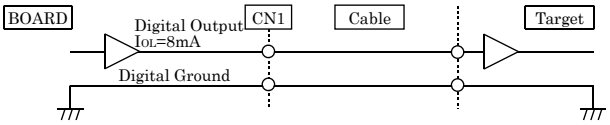
Digital I/O signals, Counter signals and Control signals Connection

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 LVTTL level signals.

Digital Input Connection



Digital Output Connection



About the counter input control signal
Counter Gate Control Input (refer to the chapter 3 Connector Pin Assignment) acts as an input that validate or invalidate the input of an external clock for the counter. This function enables the control of an external clock input for the counter. The external clock for the counter is effective when input is "High", and invalid when input is "Low". If unconnected, it is a pull-up in the board (card) and remains "High". Therefore the external clock for the counter is effective 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.
- If connected to each output, a pull-up resistor must be about 10 k to pull up with a 3.3V power source.
- Each input accepts 5V TTL signals.