High Resolution&Speed Analog I/O Card

ADA16-32/2(CB)F

with Driver Library [API-PAC(W32)]

This card is a multi-function PC Card containing analog inputs, analog outputs, digital inputs, digital outputs, and counters. The card is a Type II size PC Card Standard CardBus card.
The PC Card 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 PC Card to write Windows application programs in any programming language (such as Visual Basic, Visual C/C++, etc.) that supports the calling of Win32 API functions.

* If your PC has two TYPE II size PC Card slots one on top of the other, you cannot use ADA16-32/2(CB)F cards in both slots at the same time. This is because of the shape of the cable connector. However, you can use the ADA16-32/2(CB)F together with another PC Card that does not require an external connector such as a memory card.

Features

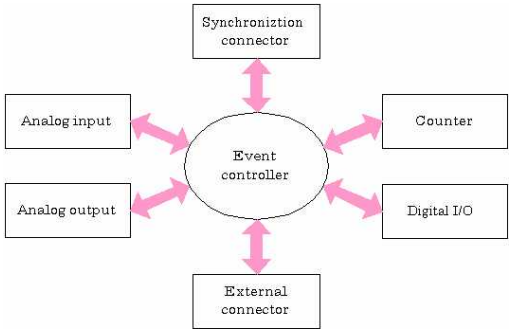
- Multi-function

The PC Card contains analog inputs (16-bit, 32ch), analog outputs (16-bit, 2ch), digital inputs (4ch), digital outputs (4ch), and counters (32-bit binary, 1ch). Combining all these features on one PC Card 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 PC Card incorporates an event controller for integrated hardware control. The event controller can use the external control signals and the events generated by the PC Card functions to start and stop analog input operation and perform clock control. This enables high-precision synchronization of the various PC Card functions without requiring software. Also, each function can be operated separately.

Overview of event controller



The arrows in the figure indicate the flow of control signals.
The main control signals included clock signals and the operation start and stop signals.

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 reaches a preset 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 PC Card 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 calibration

Setting and calibrating the analog input and output ranges can be performed completely by software.
No tricky jumper settings are required. You can also set your own calibration data in place of the default data set at the factory and use different calibration data depending on the operating conditions.
Software-based calibration

- 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.

- The same systems can be implemented on either desktop or notebook PCs

The "Analog F Series" PC Cards (ADA16-32/2(PCI)F and ADA16-32/2(CB)F) have equivalent functionality.
Systems developed on a desktop PC can be ported directly to a notebook PC with minimal changes.

Hardware specification

Specification (1/2)

Item		Specification
Analog input		
	Isolated specification	Un-Isolated
	Input type	Single-Ended Input or Differential Input
	Number of input channels	32 channels (Single-Ended Input) 16 channels (Differential Input)
	Input range	Bipolar ±10V
	Absolute max. input voltage	±13V
	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 levels Sampling clock output
Analog output		
	Isolated specification	Un-Isolated
	Number of output channels	2ch
	Output impedance	Bipolar ±10V
	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)

Specification (2/2)

Item		Specification
Digital I/O		
	Number of input channels	4 LVTTL levels (positive logic)
	Number of output	4 LVTTL levels (positive logic)
Counter		
	Number of channels	1ch
	Counting system	Up count
	Max. count	FFFFFFFFh(Binary data,32bit)
	Number of external inputs	2 LVTTL levels (Gate/Up)/ch Gate (High level), Up (Rising edge)
	Number of external outputs	LVTTL level 1 output/ch Count match output (positive logic, pulse output)
	Response speed *2	10MHz (Max.)
Bus master section		
	DMA channels	2 channels (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
Common section		
	I/O address	64 ports x 1, 256 ports x 1 Boundary
	Interruption level	1 level use
	Power consumption	3.3VDC 600mA (Max.)
	Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
	PC Card slot specifications	PC Card Standard CardBus
	Dimension (mm)	85.6(W) x 54.0(D) x 5.0(H) TYPE II
	Weight	80g

*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.
The error can be reduced by calibrating under the actual temperature conditions.
*2: However, it is the case that not use the digital filter.

Support Software

You should use CONTEC support software according to your purpose and development environment.

■ **Driver Library API-PAC(W32) (Bundled)**

API-PAC(W32) is the library software that provides the commands for CONTEC hardware products in the form of Windows standard Win32 API functions (DLL). It makes it easy to create high-speed application software taking advantage of the CONTEC hardware using various programming languages that support Win32 API functions, such as Visual Basic and Visual C/C++.
It can also be used by the installed diagnosis program to check hardware operations.
CONTEC provides download services (at http://www.contec.com/apipac/) to supply the updated drivers and differential files.
For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.
< Operating environment >
OS Windows XP, 2000, Me, 98, etc..
Adaptation language Visual C/C++, Visual Basic, Delphi, Builder, etc..
Others Each piece of library software requires 50 megabytes of free hard disk space.

■ **Linux version of analog I/O driver API-AIO(LNX) (Supplied: Stored on the API-PAC(W32) CD-ROM)**

This driver is used to control CONTEC analog I/O boards (cards) from within Linux.
You can control CONTEC I/O boards easily using the shared library used by gcc and Kylix, the device driver (module) for each kernel version, and the board (card) configuration program (config).
CONTEC provides download services (at http://www.contec.com/apipac/) to supply the updated drivers and differential files.
For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.

Cables

◆Cables (Option)

Shielded cables with single-ended connector for 68-pin half-pitch connector

:PCA68PS-0.5P (0.5m)

: PCA68PS-1.5P (1.5m)

68/96-pin conversion shielded cable for analog input/output

:ADC-68M/96F (0.5m)

Accessories

◆Accessories (Option)

Digital I/O 64CH Series Terminal Panel :DTP-64(PC)*1

Screw Terminal :EPD-96*1

Termination Panel with BNC connectors for Analog I/O Boards :ATP-32F*1

Termination Panel with BNC connectors for Analog I/O Boards :ATP-8*1

*1 ADC-68M/96F optional cable is required separately.

* Check the CONTEC's Web site for more information on these options.

Product Configuration List

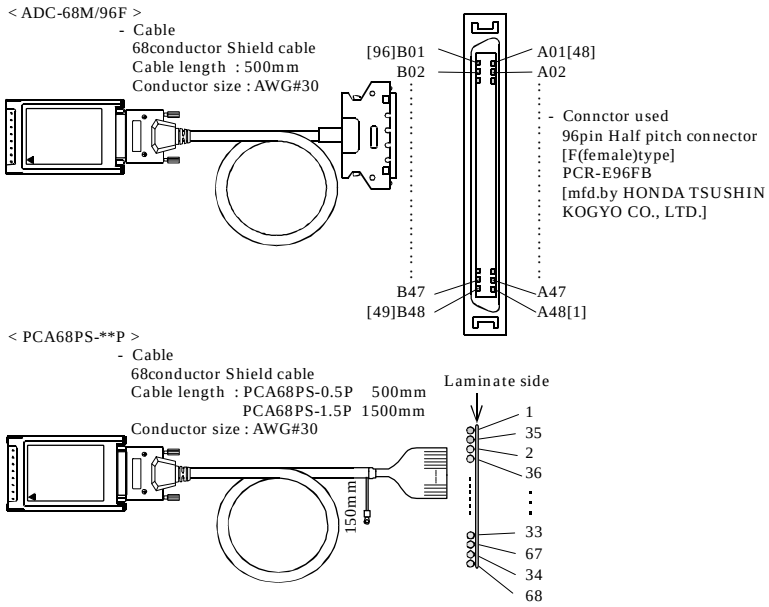
- PC Card [ADA16-32/2(CB)F] ···1
- First step guide ···1
- CD-ROM *1 [API-PAC(W 32)]···1

*1: The CD-ROM contains the driver software and User's Guide.

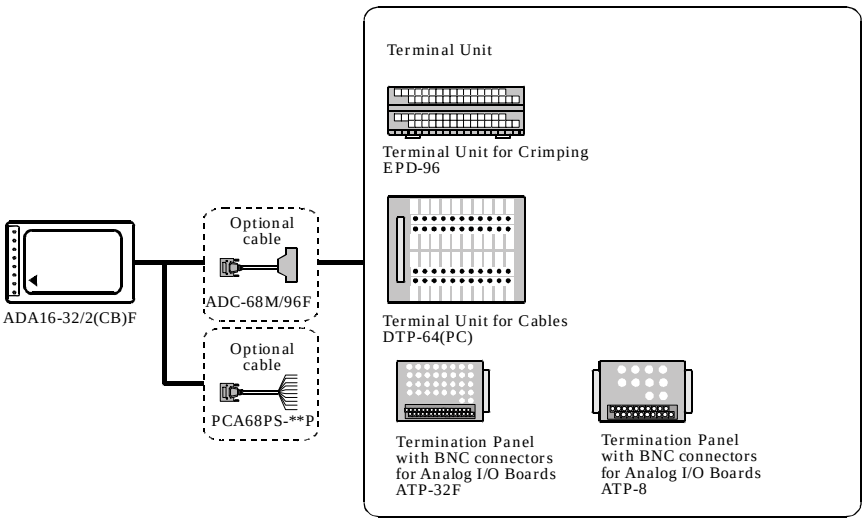
Using the On-PC Card Connectors

◆Connecting a Device to a Connector

An optional connection cable (ADC-68M/96F or PCA68PS-**P) is used to connect the PC Card to external devices. Use these cables in conjunction with a terminal block and so on to connect external devices.

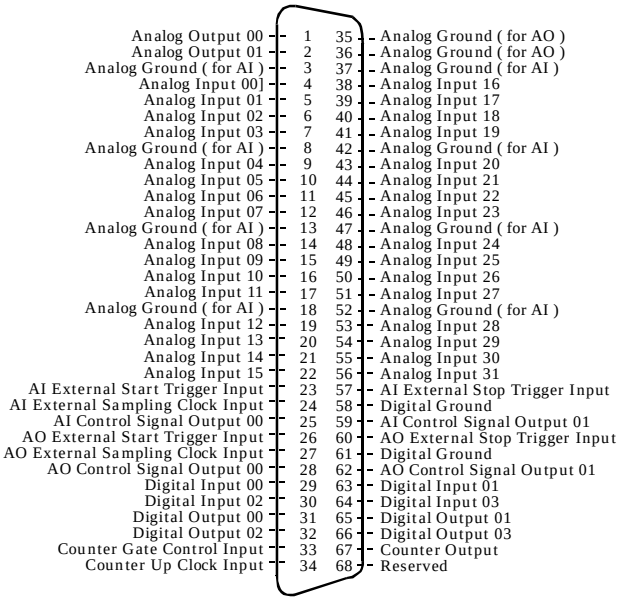


Examples of Connecting Options



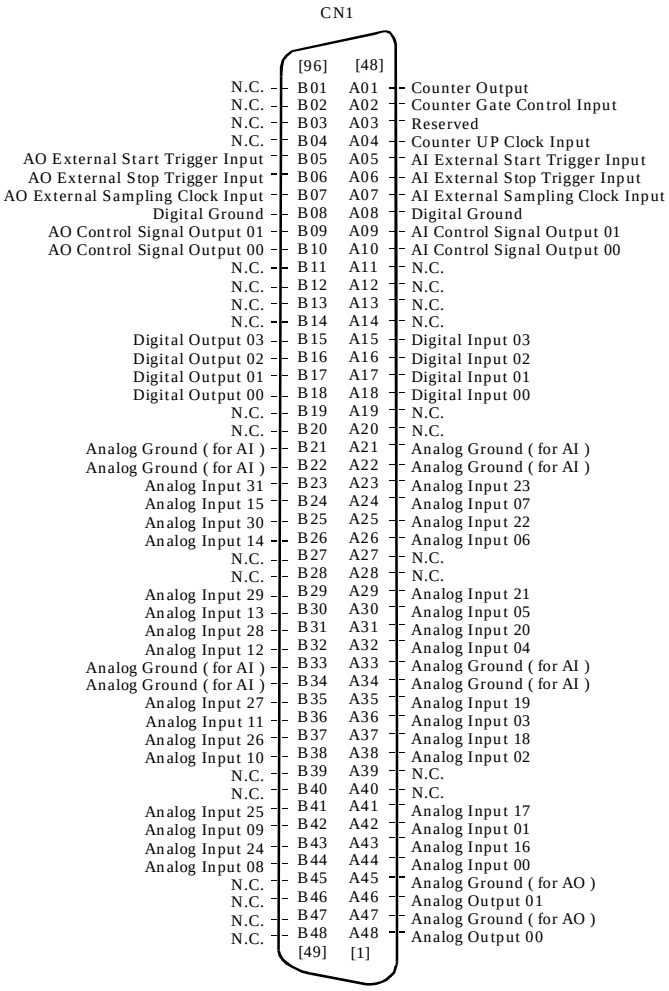
◆Connector Pin Assignment < Single-Ended Input >

■Pin assignment of ADA16-32/2(CB)F interface connector< Single-Ended Input >



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 Input03	Digital input signal.
Digital Output00 - Digital Output03	Digital output signal.
Counter Gate Control Input	Gate control input signal for counter.
Counter Up Clock Input	Count-up clock input signal for counter.
Counter Output	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

■ Pin assignment of ADC-68M/96F< Single-Ended Input >



- [ ] shows the pin No. specified by HONDA TSUSHIN KOGYO Co., Ltd.

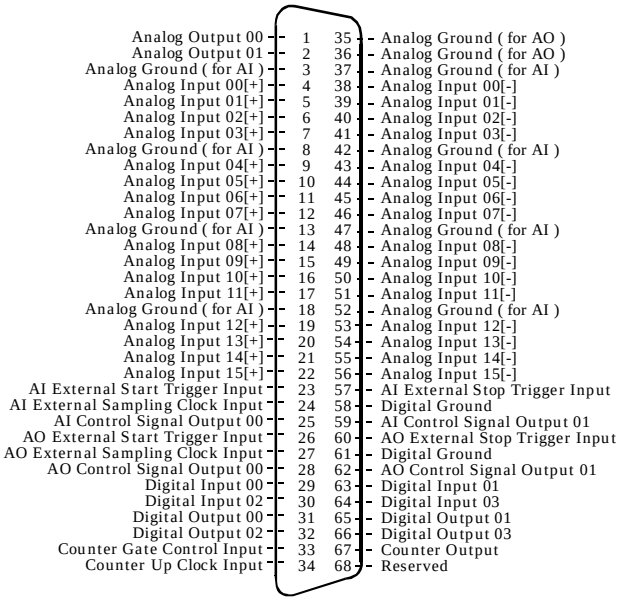
Analog Input00 - Analog Input31	Analog input signal. The numbers correspond to channel numbers.
Analog Output00 - Analog Output01	Analog output signal. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog I/O signals.
AI External Start Trigger Input	External trigger 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 Input03	Digital input signal.
Digital Output00 - Digital Output03	Digital output signal.
Counter Gate Control Input	Gate control input signal for counter.
Counter Up Clock Input	Count-up clock input signal for counter.
Counter Output	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 PC Card.**

Connector Pin Assignment < Differential Input >

Pin Assignment of ADA16-32/2(CB)F interface connector < Differential Input >



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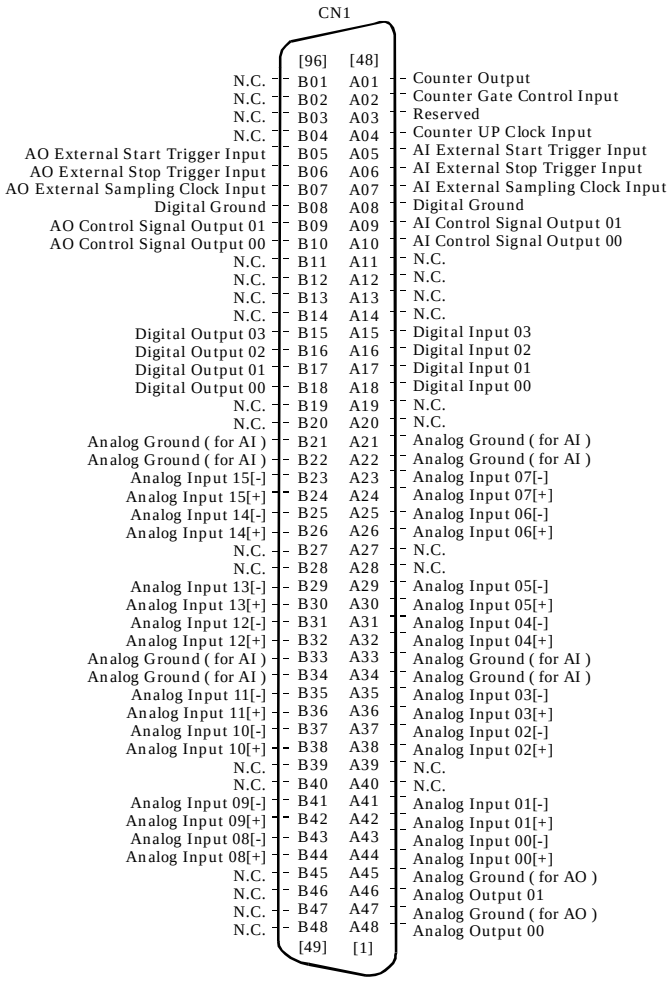
AI External Sampling Clock Input	External sampling clock input for analog input.
AI Control Signal Output 00	External sampling clock output signal for analog input.
AI Control Signal Output 01	External output signal for analog input status. Not currently connected.
AO External Start Trigger Input	External 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 Input03	Digital input signal.
Digital Output00 - Digital Output03	Digital output signal.
Counter Gate Control Input	Gate control input signal for counter.
Counter Up Clock Input	Count-up clock input signal for counter.
Counter Output	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.

Pin Assignment of interface connectoer < Differential Input >

Pin Assignment of ADC-68M/96F < Differential Input >



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Counter Output	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.

Pin Assignment of ADC-68M/96F < Differential Input >

▼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 PC Card.**

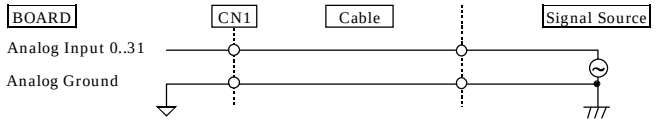
Analog Signal Connection

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

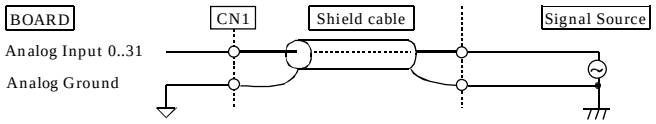
The following figure shows an example of flat cable connection. Connect separate signal and ground wires for each analog input channel on CN1.

Single-ended Input Connection (Flat Cable)



The following figure shows an example of shield cable connection. Use shielded cable if the distance between the signal source and PC Card 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 (Shield Cable)

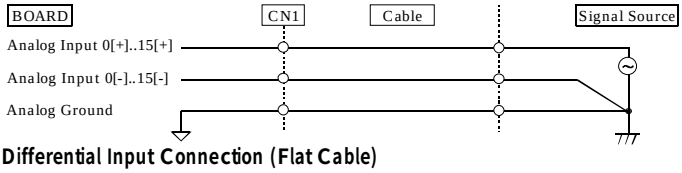


▼CAUTION

- If the signal source contains over 1MHz signals, the signal may effect the cross-talk noise between channels.
- If the PC Card and the signal source receive noise or the distance between the PC Card 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 PC Card analog ground). If it exceeds the maximum voltage, the PC Card may be damaged.
- Connect all the unused analog input channels to analog ground.
- The signal connected to an input channel may fluctuate after switching of the multiplexer. If this occurs, shorten the cable between the signal source and the analog input card or insert a high-speed amplifier as a buffer between the two 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 card to reduce the effect.

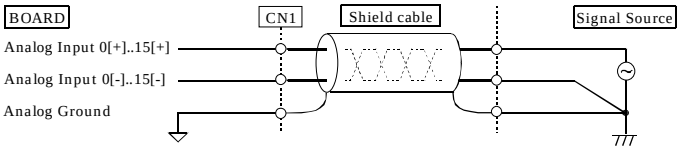
Differential Input

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 PC Card 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 PC Card 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 PC Card and the signal source ground to the shielding.



Differential Input Connection (Shield Cable)

▼CAUTION

- If the signal source contains over 1MHz signals, the signal may effect the cross-talk noise between channels.
- If the PC Card and the signal source receive noise or the distance between the PC Card 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 PC Card analog ground). If it exceeds the maximum voltage, the PC Card may be damaged.
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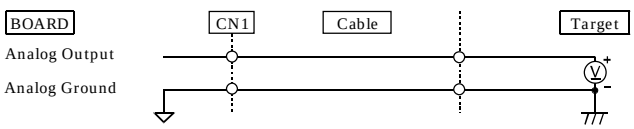
- The signal connected to an input channel may fluctuate after switching of the multiplexer. If this occurs, shorten the cable between the signal source and the analog input card or insert a high-speed amplifier as a buffer between the two to reduce the fluctuation.
- An input pin may fail to obtain 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 card to reduce the effect.

Analog Output Connection

This section shows how to connect the analog output signal by using a flat cable or a shielded cable.

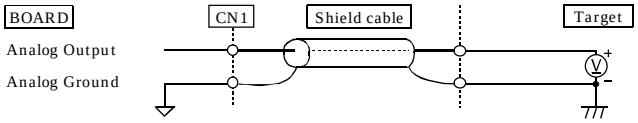
The following figure shows an example of flat cable connection.

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 PC Card 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.



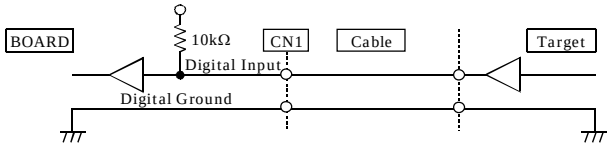
Analog Output Connection (Shield Cable)

▼CAUTION
- If the PC Card or the connected wire receives noise, or the distance between the PC Card 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 PC Card.
- Do not short the analog output signal to analog ground, digital ground, and/or power line. Doing so may damage the PC Card.
- Do not connect an analog output signal to any other analog output, either on the PC Card or on an external device, as this may cause a fault on the PC Card.

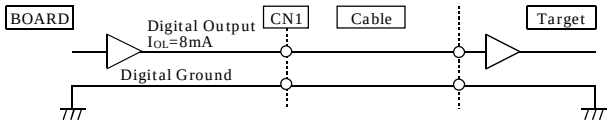
Digital I/O signals, Counter signals and Control signals Connection

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

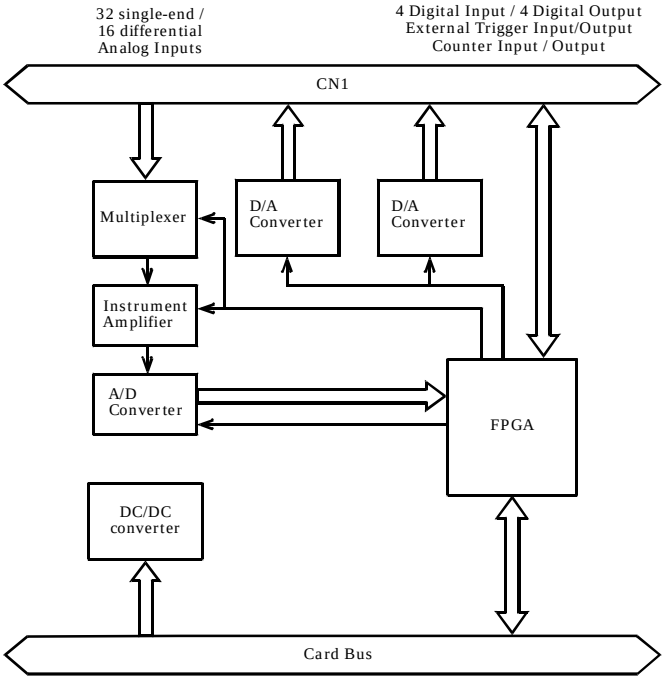


Digital Output Connection



▼CAUTION
- Do not short the output signals to analog ground, digital ground, and/or power line. Doing so may damage the PC Card.
- 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.

Block Diagra



The specification, color, and design of a product may be changed without a preliminary announcement.