

## PCI-bus Analog Input Multi-Function Board AD12-16(PCI)E

This board is interface board of the PCI bus conformity which inputs analog signal and performs conversion (A/D translation) to a digital signal.

A general-purpose type is Conversion speed: 10μsec/ch, resolution: A/D conversion is performed by 12 bits. By using attached API function library API-PAC(W32), the application software for Windows can be created by the various programming languages which are supporting Win32API functions, such as Visual Basic, and Visual C/C++.

### Features

- Single end 16ch, 8ch differential(Analog input function)  
Selection of a single, and input and differential input is possible at the jumper on board. The turn of the channel to change can be beforehand set as an exclusive register arbitrarily. Moreover, extension (a maximum of 32 channels) of the number of input channels and a simultaneous sampling are realizable by using optional unit.
- Buffer memory loading(Analog input function)  
The buffer memory for 256K data which can be used in FIFO or ring form is carried on board. The sampling as background processing independent of the throughput of a personal computer is possible.
- Colorful sampling control function(Analog input function)  
A start/stop of a sampling can detect and control the size of not only the command of software but analog signal, and the signal of TTL level. Moreover, selection of the internal sampling clock which uses the clock generator of board loading, and the external sampling clock which uses the digital signal inputted from the outside is possible for the sampling clock which determines sampling speed.
- Analog output function  
Analog output function of one channel is carried.
- Digital I/O function  
It has four digital inputs of TTL level, and four digital outputs, and the monitor of external apparatus and control can be performed.
- Abundant Option  
Furthermore, the option apparatus which extends a function can be used.  
By using option apparatus, a functional rise and connection can be performed easily.  
Please refer to "cable connector" and "accessories" about an option.



### Accessories (Option)

#### Accessories (Option)

- Terminal unit for solderless terminal : DTP-3(PC)
- Terminal unit for leads : DTP-4(PC)
- BNC connector relay terminal unit : ATP-16 \*2
- Solderless terminal relay terminal stand : FTP-15 \*3
- Solderless relay terminal unit : EPD-37 \*2
- Simultaneous sampling functional extension board : ATSS-16 \*2
- Insulated functional extension board : ATII-8A \*2
- Low path filter extension board : ATLF-8 \*2
- Channel extension board : ATCH-16(PCI)

\*2 Option cable of PCB37PS-\*P is required (0.5m is recommended).

\*3 Option cable of DT/E2 and PCB15P-1.5 are required.

### Cable & Connector (Option)

#### Cable (Option)

- 37pin D-SUB 37-pin flat cable : PCA37P-1.5
- 37pin D-SUB 37-pin shield cable : PCA37PS-\*P (0.5m, 1.5m)
- 37pin D-SUB 37 pin D-SUB shield cable : PCB37PS-\*P (0.5m, 1.5m)
- 15pin D-SUB 15pin flat cable : PCA15P-1.5
- 15pin D-SUB both-ends connector flat cable : PCB15P-1.5 \*1
- Coaxial cable for single end input (16ch) : PCC16PS-\* (1.5m, 3m)
- 2pin shield cable for 16ch (8ch) : PCD8PS-\* (1.5m, 3m)
- 16pin flat cable(1.5m) : DT/E1
- 15pin D-SUB conversion cable : DT/E2

\*1 FTP-15 is required only at the time of use.

### Packing List

- Board [AD12-16(PCI)E] - 1
- User's Guide - 1
- CD-ROM [API-PAC(W32)] - 1

## Specification

Item	Specification
Digital I/O	
Number of Output Channels	TTL Level 4 channels (One is shared by counter output)
Number of Input Channels	TTL Level 4 Channels (Two of these are also used as counter control signals)
Counter	
Counter Device	i8254 compatible
Counter Clock	Internal 4MHz or external signal
Interrupt	
Interrupt Request Level	One of IRQ resources
Interrupt Request Causes	Up to 15 causes
Interface Connectors	
CN1	D-Type 37-Pin female connector #4-40UNC
CN2	16-Pin Pin-header connector
I/O Address	8 bits, 16 ports
Warm Up Time	15 minutes
Operation Environment	Temperature = 0~50°C Humidity : 20~90% (No-condensing)

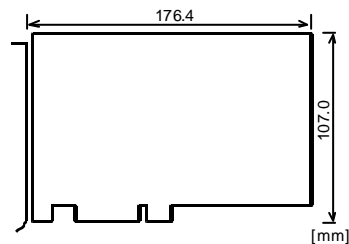
Item	Specification
Analog Input	
Number of Channels	16 single-ended channels or 8 differential
Input Range	Un-isolated $\pm 10V$ , or 0~10V
Absolute Max. Input Voltage	$\pm 20V$
Input Impedance	More than 1M $\Omega$
Resolution	12 bits
Conversion Speed	10 $\mu$ sec/ch. Max.
Conversion Accuracy	$\pm 2LSB$ (Gain= x 1 and x 2)
Non-linearity error (Note 1)	$\pm 4LSB$ (Gain= x 4 and x 8)
Buffer Memory	256K Words FIFO or 256K Words Ring
Conversion Start Trigger	Software command, analog input signal
Conversion Stop Trigger	Software command, storage data number
Analog Output	
Number of Channel	1 single-ended channel
Output Range	Un-isolated $\pm 10V$ , $\pm 5V$ or 0~10V
Output Current Ability	$\pm 5mA$ Max.
Resolution	12 bits
Non-Linearity Error (Note 1)	$\pm 1/2LSB$
Conversion Speed	6 $\mu$ sec Max.
Power consumption (Note 2)	+5VDC, 1100mA Max.
Dimensions (inch)	6.9 x 4.2 (176.4mm x 107mm)

Note 1: When the environment temperature is near 0° C or 50° C, the non-linearity error may become larger. A maximum  $\pm 0.1\%$  FSR non-linearity error is possible.

We suppose you to calibrate the board under the work environment that will give you a better accuracy.

Note 2: If an external device requires this AD12-16 (PCI)E board to supply +5VDC from the CN1 or CN2 connectors, the power consumption of this board will be bigger than what this specification has defined.

## Board size



## Support Software

### Attached support software

API Function Library API-PAC(W32)

It is the library software which offers the command to the hardware of our company in standard Win32API function (DLL) form for Windows.

By the various programming languages which are supporting Win32API functions, such as Visual Basic, and Visual C/C++, the high-speed application software which harnessed the special feature of the hardware of our company can be created.

Moreover, it can use also for the check of hardware of operation by the installed diagnostic program.

For details, please refer to Help or the homepage of our company in appending CD-ROM.

Main correspondences OS Windows XP, 2000, NT, Me, 98, etc.

Main adaptation languages Visual C/C++, Borland C++, Visual Basic, etc.

Others The hard disk which has 20MB empty domain for every library software is required.

The newest driver and download service (<http://www.contec.co.jp/apipac/>) of difference file are also offered.

### Optional Support Software

Collection for measurement systems development of ActiveX components

ACX-PAC(W32)BP

It is convenient measurement systems development tool for Windows in which collection of examples which can be used immediately, and collection (collection of software parts) of components which can program easily only by combining were mentioned.

Component for control of the input-and-output board (card) of our company is made the one package. Analog I/O, digital I/O, control of each interface of GPIB communication and X-Y graph display, and file preservation are possible.

Collection for measurement systems development of ActiveX components

ACX-PAC(W32)AP

It is convenient measurement systems development tool for Windows in which collection of examples which can be used immediately, and collection (collection of software parts) of components which can program easily only by combining were mentioned.

In addition to the function of ACX-PAC(W32)BP, components, such as display systems, such as various graph, switch, and lamp, and operation / analysis, serve as a package.

DDE server DDE SERVER(W32)

It is the software which transmits to DDE client by the cycle which specified the data from the hardware of our company, or setup. Data collection / analysis system can be easily created combining DDE client software, such as Excel97, and Wonderware InTouch, Visual Basic.

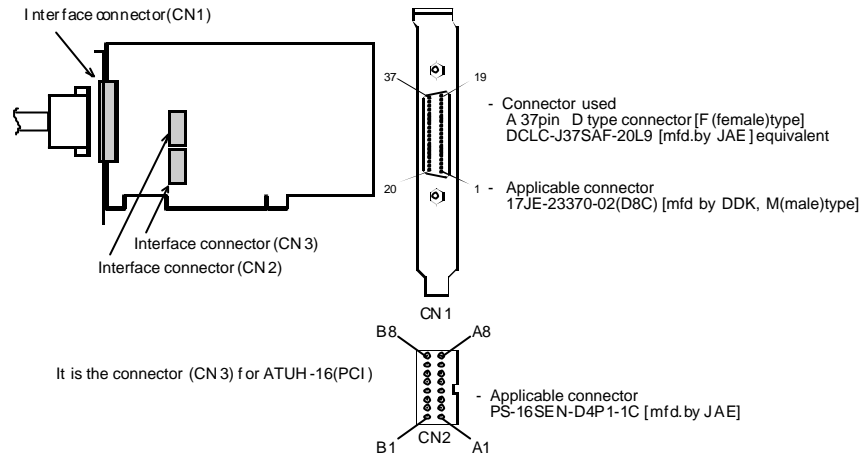
MS-DOS correspondence driver SUPPORT-PAC(PC)306

It is a driver dealing with MS-DOS which supports the hardware of our company. Much high-class language is supported and the function to provide is supplied per command (function).

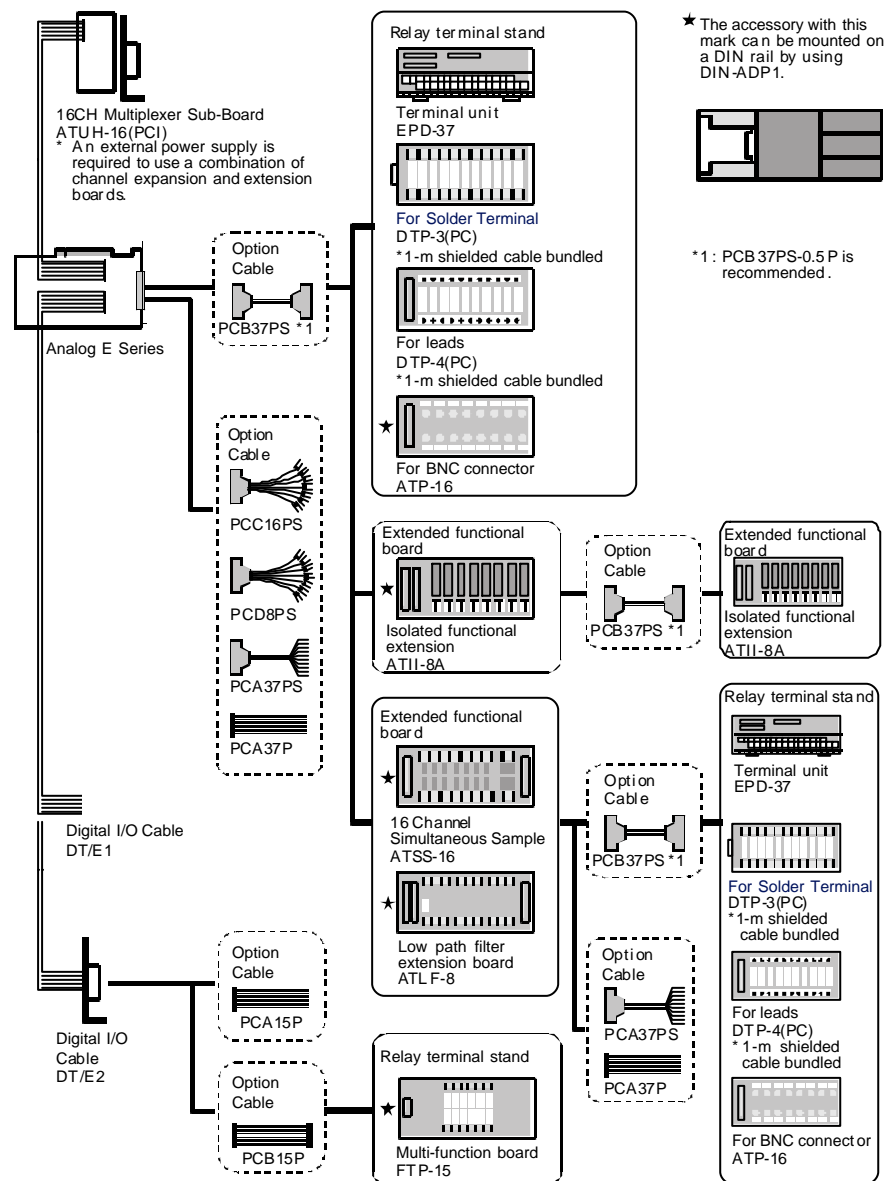
## External Connection

### Connection method with a connector

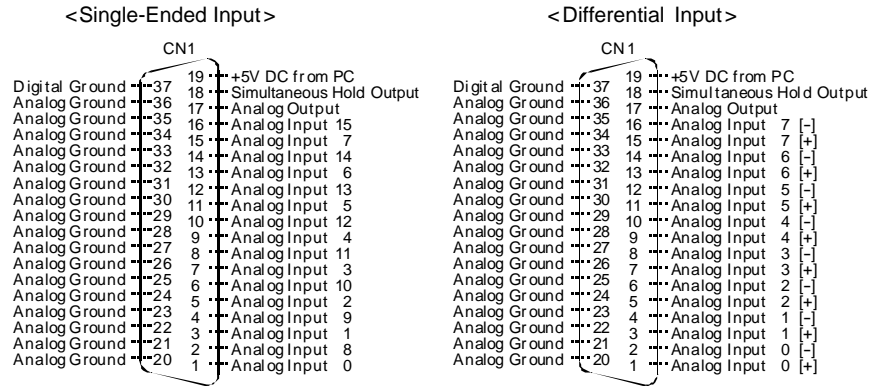
Connection between this board and external apparatus is made by the interface connector on board (CN1 and CN2). Interface connector has two, the object for analog I/O (CN1: D-SUB 37pin Female), and the object for control signals, such as digital I/O and counter control, (CN2: 16pin Pin-header).



### Examples of Connecting Options



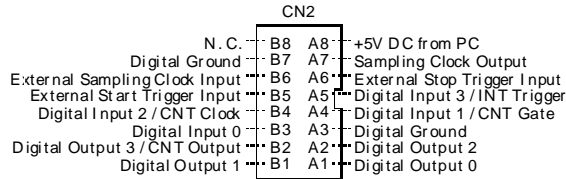
Connector Pin Assignment



Analog Input 0 to Analog Input 15	Analog input signals in single-ended input mode. The numbers correspond to channel numbers.
Analog Input 0[+] to Analog Input 15[+]	Analog input signals in differential input mode. The numbers correspond to channel numbers.
Analog Input 0[-] to Analog Input 15[-]	Analog input signals in differential input mode. The numbers correspond to channel numbers.
Analog Output	Analog output signal
Analog Ground	Analog ground common to analog I/O signals.
Simultaneous Hold Output	Control signal for simultaneous sampling unit ATSS-16 available as an option.
+5V DC from PC	Supplies 3 amperes of current at +5 volts.
Digital Ground	Digital ground common to "Simultaneous Hold Output" and "+5V DC from PC".

Notes!

- Please connect each output and power supply output neither with analog ground nor digital ground too hastily.
- Moreover, please do not connect output and output. It becomes the cause of failure.



Digital Input 0	Digital input signal.
Digital Input 1 /CNT Gate	Digital input signal. Also serving as the counter gate control input signal.
Digital Input 2 /CNT Clock	Digital input signal. Also serving as the clock input signal
Digital Input 3 /INT Trigger	Digital input signal. Also serving as the interrupt input signal.
Digital Out 0 to Digital Out 2	Digital output signal.
Digital Out 3 to CNT Output	Digital output signal. Capable of being jumper-switched to serve as the counter output signal.
External Start Trigger Input	External trigger input signal for sampling start conditions
External Stop Trigger Input	External trigger input signal for sampling stop conditions
External Sampling Clock Input	External sampling clock input signal
Sampling Clock Output	Sampling clock output signal
+5V DC from PC	Supplies 1 ampere of current at +5 volts.
Digital Ground	Digital ground common to the signals and "+5V DC from PC".
N.C.	No connection to this pin.

Notes!

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- Moreover, please do not connect output and output. It becomes the cause of failure.

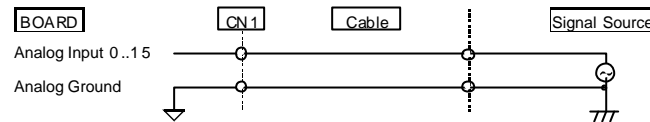
## Analog Input Connection

The input form of analog signal has a single and input, and differential input, and the connection methods with a signal differ, respectively. Here, the example in the case of connecting using a flat cable or a shield cable is shown.

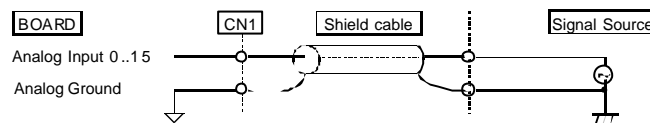
### Single-ended Input

It is example of connection when using cables, such as optional flat cable (PCA37P).

The source of a signal and a ground are connected to 1 to 1 to each analog input channel of CN1.



It is the example of connection which used shield cables, such as an optional coaxial cable (PCC16PS). When the distance of the source of a signal and a board is long, please use it to enlarge noise-proof nature. To each analog input channel of CN1, wire line is connected to signal line and the group edited by the shield is connected to a ground.



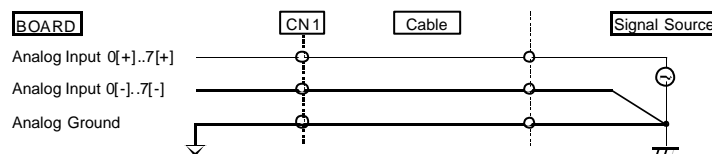
#### Notes!

- When a frequency ingredient 1MHz or more is contained in the source of signal, the cross talk between channels may occur.
- When a board and the source of a signal are influenced of a noise, or when the distance of a board and the source of a signal is long, it may be unable to input in exact data by the connection method.
- Analog signal to input must not exceed the maximum input voltage on the basis of the analog ground of a board. It may damage, when it exceeds.
- Conversion data is unknown when input terminal is not connected. Please connect with analog ground too hastily the input terminal of a channel which is not connected to the source of a signal.

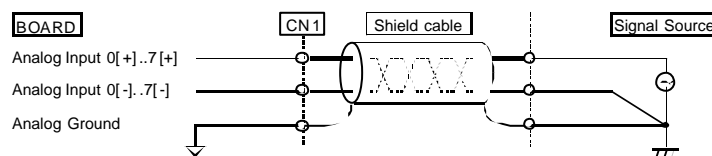
### Differential Input

It is example of connection when using cables, such as optional flat cable (PCA37P).

[+] input of each analog input channel of CN1 is connected to a signal, and [-] input is connected to the ground of the source of a signal. Furthermore, the analog ground of a board and the ground of the source of a signal are connected.



It is the example of connection which used shield cables, such as optional 2 heart shield cable (PCD8PS). When the distance of the source of a signal and a board is long, please use it to enlarge noise-proof nature. [+] input of each analog input channel of CN1 is connected to a signal, and [-] input is connected to the ground of the source of a signal. Furthermore, the analog ground of a board and the ground of the source of a signal are connected in the group edited by the shield.

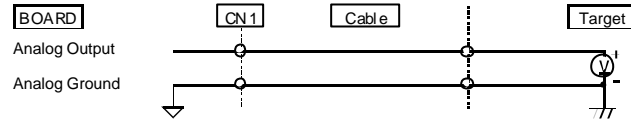


#### Notes!

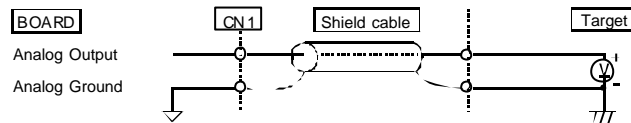
- When a frequency ingredient 1MHz or more is contained in the source of signal, the cross talk between channels may occur.
- Conversion data becomes unfixed when analog ground is not connected.
- When a board and the source of a signal are influenced of a noise, or when the distance of a board and the source of a signal is long, it may be unable to input in exact data by the connection method.
- Analog signal inputted into [+] input and [-] input must not exceed the maximum input voltage on the basis of the analog ground of a board. It may damage, when it exceeds.
- Conversion data when having not connected terminal of [+] input or [-] input is unfixed. Both should connect with an analog ground too hastily the terminal of [+] input of the channel which does not connect with the source of a signal, and [-] input.

## Analog Output Connection

The example in the case of connecting an analog output signal using a flat cable or a shield cable is shown. It is an example of connection when using cables, such as optional flat cable (PCA37P). The analog output and analog ground of CN1 are connected to the input and ground of external apparatus.



It is an example of connection which uses a shield cable. Please use it to enlarge the case where the distance of a board and external apparatus is long, and noise-proof nature. To the analog output of CN1, a wire line is connected to a signal line and the group edited by the shield is connected to a ground.



### Notes!

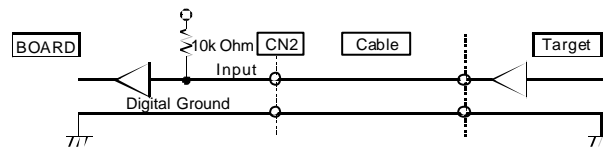
- When a board and a target are influenced by noise, or when the distance of a board and a target is long, exact data may be unable to be outputted depending on the connection method.
- The maximum output current capacity of an analog output signal is  $\pm 5\text{mA}$ . Please connect with a board after checking the specification for connection.
- Please connect an analog output signal neither with analog ground nor digital ground too hastily. It becomes the cause of failure.

## Digital I/O Connection

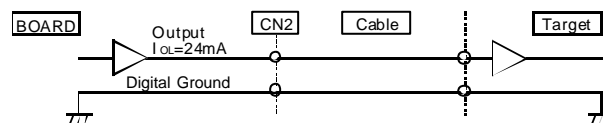
The example in the case of connecting a digital I/O signal and control signals (external trigger input signal, sampling clock output signal, etc.) using a flat cable is shown.

CN2 and external apparatus are connected using optional flat cable (DT/E1), 15p in D-SUB connector (DT/E2) with a bracket, etc. All of these digital I/O signals and a control signal are the signals of TTL level.

### Digital Input Connection



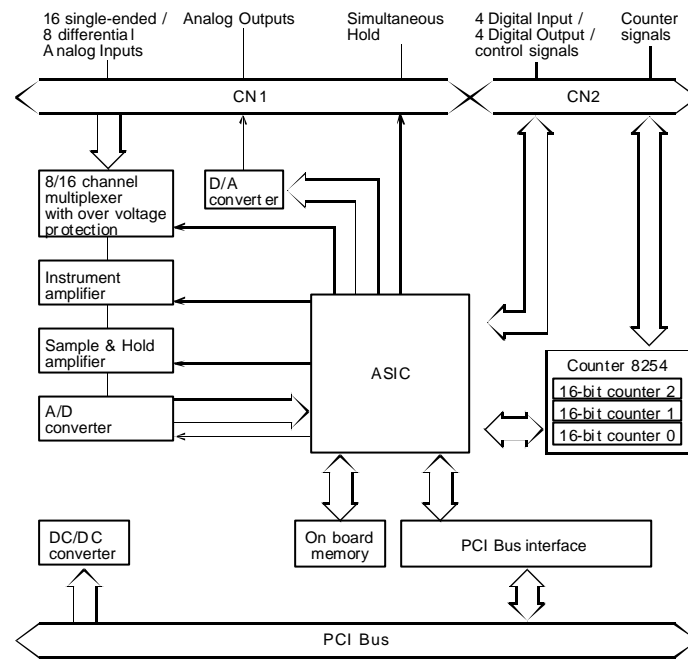
### Digital Output Connection



### Note!

- Please connect each output neither with analog ground nor a digital ground too hastily. It becomes the cause of failure.

### Block Diagram



All data subject to change without notice.