Isolated Small-Signal Analog Input Board
for PCI

ADI16-4L(PCI)

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

This product is a PCI-compliant interface boards that convert analog input signals to digital equivalents (performing analog-to-digital conversion).

This product is that performs A-D conversion at a conversion speed of 10 millisecond [100SPS] per channel and a resolution of 16bit.

Using the bundled Driver Library [API-PAC(W32)], you can create Windows application software for this board in your favorite programming language supporting Win32 API functions, such as Visual Basic or Visual C++.

Features

Capable of low level Voltage Measurement

This product can low level voltages in the input ranges of ±1.25V, ±0.125V, 0 - +2.5V, and of 0 - 0.25V at a resolution of 16bit. The board is provided with a discontinuity detection circuit for thermocouple input in the range of ±0.125V or of 0 - +0.25V.

Inter-channel Insulation

The input channel for each channel is insulated by an Optocoupler, allowing different ground-level signals to be input to individual channels.

On-board Temperature Sensor

This product has a board temperature sensor that can be used for cold junction reference during thermocouple measurement.

Sampling Control Function

This product can perform sampling at any software-controlled timings or periodical sampling in synchronization with a sampling clock. The board offers a choice of sampling clocks selectable to determine the sampling speed: the internal sampling clock using the on-board clock generator and the external sampling clock using the digital signal input from an external device.

Optional Units

Using optional units facilitates connections.
For these options, see the "Cables & Connectors" and "Accessories" section of this chapter.

Specification

Item	Specification
Analog Input	
Isolated specification	Channel-isolated
Input type	Differential input
Number of input channels	4 channels
Input range	Bipolar: ±1.25V, ±0.125V Unipolar: 0 - +2.5V, 0 - 0.25V (Jumper-setting for every channel)
Absolute max. input voltage	±3.0V (with respect to the analog ground of each channel)
Input impedance	1MΩ or more
Resolution	16bit
Non-Linearity error *1	±15LSB
Conversion speed	10msec [100SPS] /ch (Max.)
Sampling clock	Internal sampling clock: 10,000,000 - 1,073,741,824,000 nsec (Settable in 250 nsec) External sampling clock: Optocoupler input (for current sinking output)
Board temperature input	
Input range	0 - +50°C
Measurement unit	0.0625°C
Tolerance	±3.0°C
Programmable timer	
Cycle setting	500 - 1,073,741,824,000nsec (Settable in 250 nsec)
Status	Count up, Count up over-run
Timer output signal	Optocoupler isolated open collector output (current sinking type)
External trigger input	
External trigger input	Optocoupler isolated input (for current sinking output)1 level
Status	Trigger input, Trigger input overrun
I/O Address	Any 32-byte boundary
Interrupt	1 level use
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Power consumption (Max.)	+5VDC 1200mA
Bus specification	32-bit, 33MHz, 5V
Connector	A 37pin D-SUB connector [F(female)type] DCLC-J37SAF-20L9 [mfd.by JAE] or equivalence to it
Dimension (mm)	176.41(L) × 106.68(H)
Weight	150g

*1   A linearity error approximately 0.5% of full-range may occur when operated at 0°C or
50°C ambient temperature.

Board Dimensions

176.41(L)

106.68(H)

[mm]
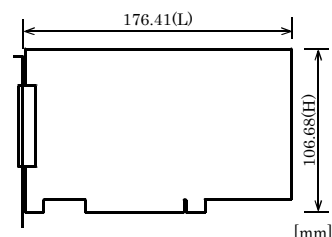
The standard outside dimension (L) is
the distance from the end of the board
to the outer surface of the slot cover.

Support Software

Windows version of analog I/O driver API-AIO(WDM)/API-AIO(98/PC) [Stored on the bundled CD-ROM driver library API-PAC(W32)]

These drivers are 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.

< Operating environment >
OS   Windows Vista, XP, Server 2003, 2000
Adaptation language   Visual Basic, Visual C++, Visual C#, Delphi, C++ Builder

For more details on the supported OS, applicable language and how to download the updated version, please visit the CONTEC's Web site (http://www.contec.com/apipac/).

Linux version of analog I/O driver   API-AIO(LNX) [Stored on the bundled CD-ROM 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.

< Operating environment >
OS   RedHatLinux, TurboLinux
                        (For details on supported distributions, refer to Help available after installation.)
Adaptation language   gcc

For more details on the supported OS, applicable language and how to download the updated version, please visit the CONTEC's Web site (http://www.contec.com/apipac/).

Data acquisition VI library for LabVIEW   VI-DAQ (Available for downloading (free of charge) from the CONTEC web site.)

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.
See http://www.contec.com/vidaq/ for details and download of VI-DAQ.

Cable & Connector

Cable(Option)
Flat Cable with 37-Pin D-SUB Connector at One End
                                : PCA37P-1.5 (1.5m)
Shield Cable with 37-Pin D-SUB Connector at One End
                                : PCA37PS-0.5P (0.5m)
                                : PCA37PS-1.5P (1.5m)
Flat Cable with 37-Pin D-SUB Connectors at either Ends
                                : PCB37P-1.5 (1.5m)
Shielded Cable with 37-pin D-SUB connectors at either ends
                                : PCB37PS-0.5P (0.5m)
                                : PCB37PS-1.5P (1.5m)

Connector (Option)
37-pin D-SUB (Male) Connector Set (5 Pieces)
                                : CN5-D37M

Accessories

Accessories (Option)

General Purpose Terminal (M3 x 37P)   : DTP-3A *1
Screw Terminal (M2.6 x 37P)   : DTP-4A *1
Screw Terminal Unit (M3 x 37P)   : EPD-37A*1 *2
Screw Terminal Unit (M3.5 x 37P)   : EPD-37 *1
1   PCB37P- or PCB37PS-* optional cable is required separately.
*2   "Spring-up" type terminal is used to prevent terminal screws from falling off.
*   Check the CONTEC's Web site for more information on these options.

Packing List

Board [ADI16-4L(PCI)] …1
First step guide … 1
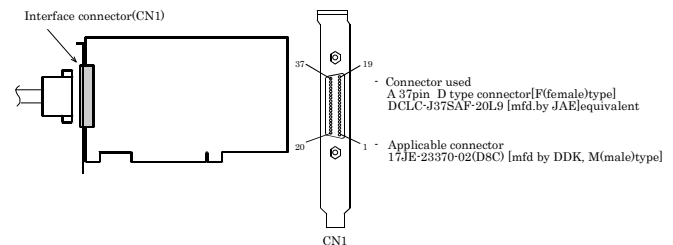CD-ROM *1 [API-PAC(W32)] …1
*1   The CD-ROM contains the driver software and User's Guide.
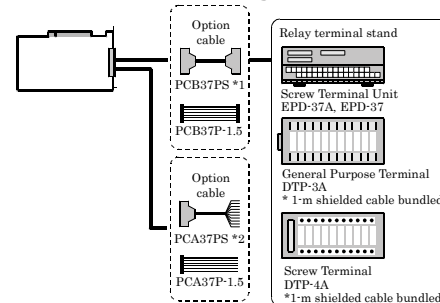
How to connect the connectors

Connector shape
To connect an external device to this product, plug the cable from the device into the interface connector (CN1) shown below.

Interface connector(CN1)

37   19
       - Connector used
         A 37pin D type connector[F(female)type]
         DCLC-J37SAF-20L9 [mfd.by JAE]equivalent
20   1   - Applicable connector
         17JE-23370-02(D8C) [mfd by DDK, M(male)type]

CN1

* Please refer to page2 for more information on the supported cable and accessories.

Examples of Connecting Options

Option cable
PCB37PS *1
PCB37P-1.5

Relay terminal stand
Screw Terminal Unit
EPD-37A, EPD-37

*1 PCB37PS-0.5P/1.5P is recommended.
*2 PCA37PS-0.5P/1.5P is recommended.

Option cable
PCA37PS *2
PCA37P-1.5

General Purpose Terminal
DTP-3A
* 1-m shielded cable bundled.

Screw Terminal
DTP-4A
*1-m shielded cable bundled.

Connector Pin Assignment

CN1

Left signal	Pin	Pin	Right signal
Settling Busy Output	37	19	Plus Common
Timer Output	36	18	External Trigger Input
Minus Common	35	17	External Sampling Clock Input
N.C.	34	16	N.C.
N.C.	33	15	N.C.
Analog Ground 3	32	14	Analog Input 3[-]
N.C.	31	13	Analog Input 3[+]
N.C.	30	12	N.C.
N.C.	29	11	N.C.
Analog Ground 2	28	10	Analog Input 2[-]
N.C.	27	9	Analog Input 2[+]
N.C.	26	8	N.C.
Analog Ground 1	25	7	N.C.
	24	6	Analog Input 1[-]
N.C.	23	5	Analog Input 1[+]
N.C.	22	4	N.C.
N.C.	21	3	N.C.
Analog Ground 0	20	2	Analog Input 0[-]
		1	Analog Input 0[+]

| Signal	Description
Analog Input 0 - Analog Input 3	Analog Input signal. The numbers correspond to channel numbers.
Analog Input 0[-] - Analog Input 3[-]	Analog Input signal. The numbers correspond to channel numbers.
Analog Input 0 - Analog Input 3	Analog grounds corresponding to the identically numbered analog input signals
External Trigger Input	External trigger Input signal.
External Sampling Clock Input	External sampling clock Input signal.
Time Out	Programmable timer output signal
Sampling Busy Output	Output signal indicating that the board is performing AD conversion
Plus Common	Connect the positive side of the external power supply to this pin. It is common to the "External Trigger Input", "External Sampling Clock Input", "Timer Out", and "Sampling Busy Out" signals.
Minus Common	Connect the negative side of the power supply to this pin. It is common to the "Timer Out" and "Sampling Busy Output" signals.
N.C.	No connection to this pin

Connecting the Analog Input Signal

The following figure shows an example of flat cable connection. Connect the [+] input of each analog input channel in CN1 to the signal source and connect the [-] input to the ground of the signal source. In addition, connect the analog ground of the same channel to the ground of the signal source.

Connecting the Analog Input (Flat Cable)
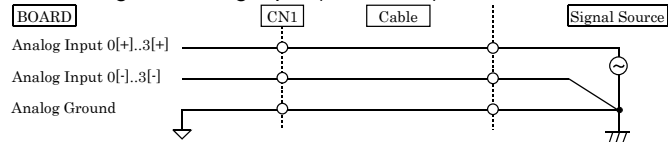
The following sketch shows an example of connection using a two-conductor shielded cable. A shielded cable should be used when the signal source is rather away from this product or when the connection requires better noise immunity. Connect the [+] input of each analog input channel in CN1 to the signal source and connect the [-] input to the ground of the signal source. In addition, connect the analog ground of the same channel to the ground of the signal source using a shield braid.

Connecting the Analog Input (Shield Cable)
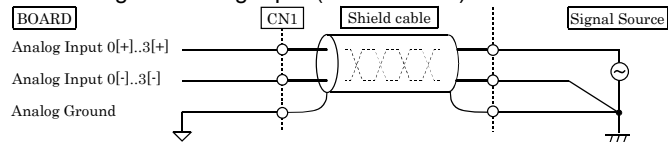
⚠ CAUTION

Input data remains indeterminate with the analog ground unconnected.

The analog signals input to the [+] and [-] inputs must not exceed the maximum input voltage with respect to the corresponding analog ground. Otherwise, this product may break.

Input data remains indeterminate with either the [+] or [-] input pin unconnected. Connect both of the [+] and [-] input pins of a channel not connected to the signal source to the corresponding analog ground.

A long connection cable may prevent this product from performing accurate analog input. The connection cable should be as short as possible.

A connection cable affected by noise may prevent this product from performing accurate analog input. Route the connection cable away from the noise source.

Connecting the Control signal

Connecting the Input Signal

To "External Sampling Clock Input" or "External Trigger Input", connect a device which can be current-driven, such as a switch or transistor output device. The input circuit is given below. An external power supply is required to drive the input circuit. The power requirement for each input channel is about 11 mA at 24 VDC (about 5.5 mA at 12 VDC).
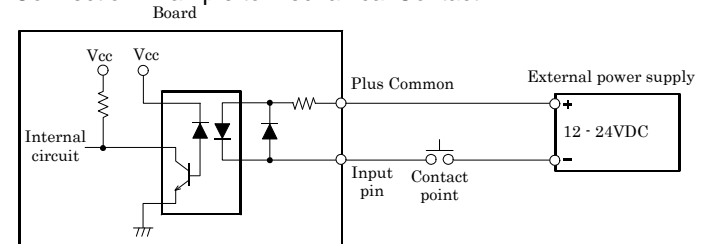
Input circuit
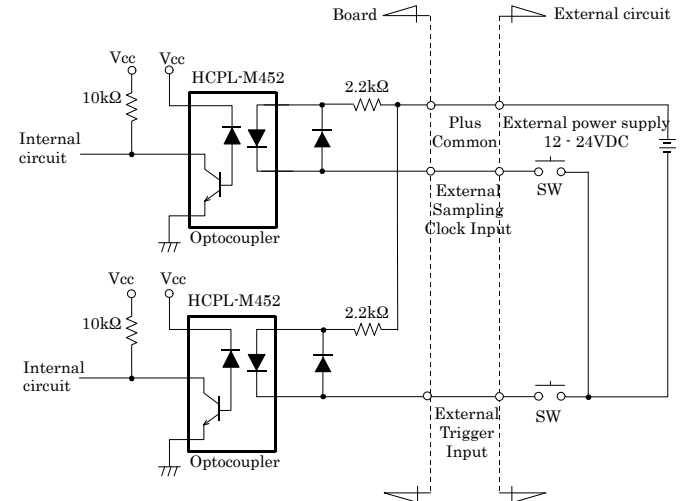
Connection Example to Open Collector Output
(Current Sink Type)
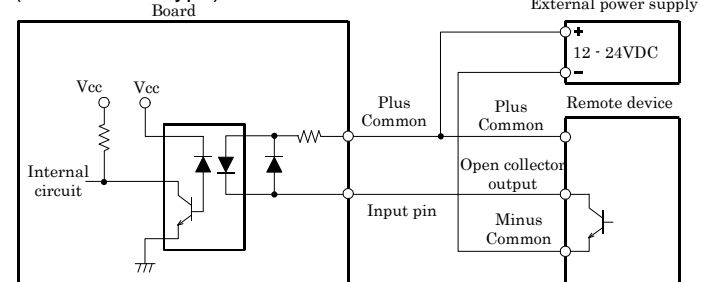
Connection Example to Mechanical Contact

The table below shows the relationship between input signal and PC-sided data (internal logic), with the above schematic as a connection example.

Internal Logic	Contact	Input pin voltage level
0	OFF	High
1	ON	Low

Connecting the Output Signal

To "Timer Output" or "Sampling Busy Output", connect a device for relay control or for current-driven control such as LED control. The output circuit is given below.

An external power supply is required to drive the output circuit. The rated output current is a maximum of 50 mA per channel.

The output transistor of this product has no surge voltage protector. To drive an inductive load such as a relay or lamp using this product, apply surge voltage protection to the load side.
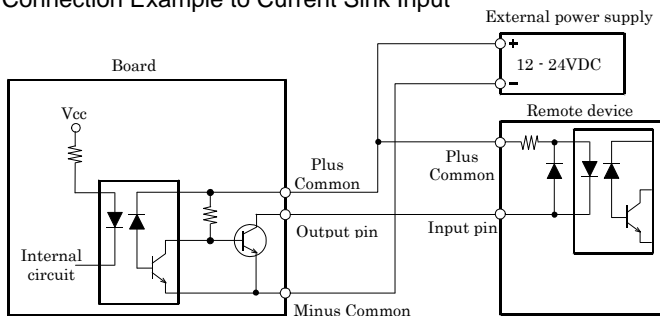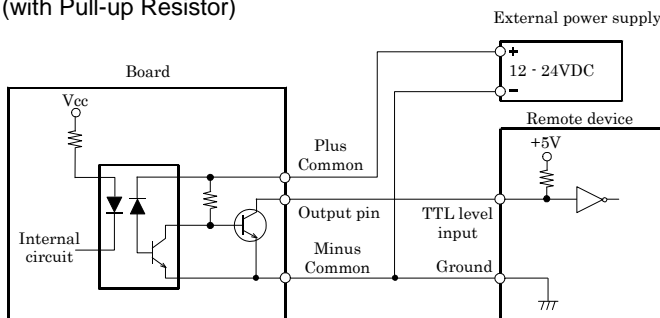
Output Circuit
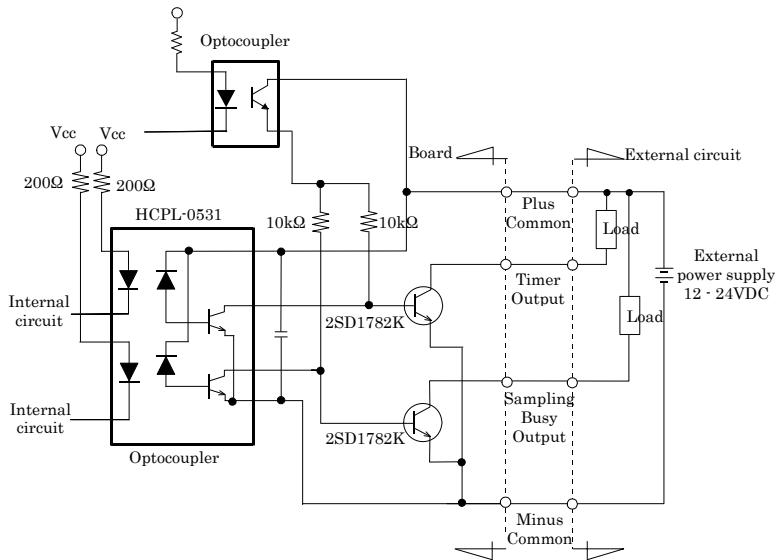
⚠ CAUTION
    All outputs are set to OFF when the power is turned on.

Connection Example to Current Sink Input

Connection Example to TTL level Input
(with Pull-up Resistor)

Block Diagram