100KSPS 16-bit Analog Input Board
for PCI Express Low Profile

# AI-1664LA-LPE

This product is a Low Profile, PCI Express bus-compliant interface board used to provide an analog signal input function on a PC. This product is multi-channels and multifunction type with 16-bit analog input 64 channels (single-ended input 64 channels or differential input 32 channels), digital I/O and counter function. This product carries buffer memory for 1K of data, allowing sampling to be performed in a variety of trigger / clock conditions. Windows/Linux driver and full-fledged data logger software "C-LOGGER" is bundled with this product.
Possible to be used as a data recording device for MATLAB and LabVIEW, with dedicated libraries.

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

## Features

**High-precision analog input 64 channels, each 4 channels for digital I/O and counter 1 channel**

This product has analog input (10μsec / channel, 16-bit, 64 channels), analog input control signal (LVTTL level 3 channels), digital I/O (each 4 channels for LVTTL level) and counter (32-bit, LVTTL level 1 channel). Capable of setting the analog input at single-ended input 64 channels and differential input 32 channels.

**The start/end of sampling can be controlled by software, comparison of conversion data, an external trigger, etc.**

You can select from software, comparison of conversion data or an external trigger to control the start of sampling. You can select from completion of sampling for a specified number of sessions, comparison of conversion data, an external trigger or software to control forcibly the end of sampling. The sampling cycle can be selected from the internal clock or an external clock.

**Equipped with buffer memory (1K data) that can be used in the FIFO or RING format**

The analog input / output block contains buffer memory (1K data) that can be used in the FIFO or RING format. This allows for background analog I/O that does not depend on the operation status of the software or PC.

**Digital filter function included to prevent misdetection due to chattering on external signals**

A digital filter is included to prevent misdetection due to chattering on the control signal (external trigger input signal, sampling clock input signal, etc.), digital input signal and counter input signal. (Except from external clock input signal and counter gate signal)

**Functions and connectors are compatible with PCI compatible board AD16-64(LPCI)LA.**

The functions same with PCI compatible board AD16-64(LPCI)LA are provided. In addition, as there is compatibility in terms of connector shape and pin assignments, it is easy to migrate from the existing system.

**Support for both of low-profile and standard PCI slots (interchangeable with a bundled bracket)**

This product has each bracket for both low-profile size slot and standard size slot. If you wish to mount this product in a standard size slot, replace this with the standard size bracket.

**Software-based calibration function**

Calibration 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.

**Data logger software, Windows/Linux compatible driver libraries are attached.**

Using the bundled data logger software "C-LOGGER" allows you to display recorded signal data in graphs, save files without any special program. In addition, the driver library API-PAC(W32) which makes it possible to create applications of Windows/Linux is provided.

**MATLAB and LabVIEW is supported by a plug-in of dedicated library VI-DAQ.**

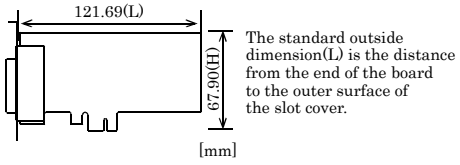
Using the dedicated library MATLAB and VI-DAQ makes it possible to make a LabVIEW application.

## Specification

| Item | Specification |
|---|---|
| Analog input | |
| Isolated specification | Un-Isolated |
| Input type | Single-Ended Input or Differential Input (by software) |
| Input channel | 64ch (single-ended input), 32ch (differential input) |
| Input range | Bipolar ±10V |
| Absolute max. input voltage | ±20V |
| Input impedance | 1MΩ or more |
| Resolution | 16Bit |
| Non-Linearity error *1 *2 | ±5LSB |
| Conversion speed | 10μ sec/ch |
| Buffer memory | 1k Word |
| Conversion start trigger | Software / external trigger |
| Conversion stop trigger | Number of sampling times / external trigger / software |
| External start signal | LVTTL-level (Rising or falling edge can be selected by software)<br>Digital filter (select 1μ sec by software) |
| External stop signal | LVTTL-level (Rising or falling edge can be selected by software)<br>Digital filter (select 1μ sec by software) |
| External clock signal | LVTTL－level (Rising or falling edge can be selected by software) |
| Digital I/O | |
| Number of input channels | Un-Isolated input 4 channels (LVTTL-level positive logic) |
| Number of output channels | Un-Isolated output 4 channels (LVTTL-level positive logic) |
| Counter | |
| Number of channels | 1ch |
| Counting system | Up count |
| Max. count | FFFFFFFFh (Binary data,32bit) |
| Number of external inputs | 2 LVTTL (Gate/Up)　Gate (High level), Up (Rising edge) |
| Number of external outputs | LVTTL　Count match output (positive logic, pulse output) |
| Response frequency | 10MHz (Max.) |
| Common | |
| I/O address | 64 ports boundary |
| Interruption level | Errors and various factors, One interrupt request line as INTA |
| Connector | 68 pin 0.8mm pitch connector<br>HDRA-E68W1LFDT-SL [HONDA] or equivalent to it |
| Power consumption | 3.3VDC 620mA (Max.) |
| Operating condition | 0 - 50°C, 10 - 90%RH (No condensation) |
| Bus specification | PCI Express Base Specification Rev. 1.0a　x1 |
| Dimension (mm) | 121.69(L) x 67.90(H) |
| Weight | 90g |
| Certification | RoHS,VCCI |

*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




## Support Software

### Windows version of analog 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.
You can download the updated version from the CONTEC's Web site (http://www.contec.com/apipac/).　For more details on the supported OS, applicable language and new information, please visit the CONTEC's Web site.

### Linux version of analog 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.
You can download the updated version from the CONTEC's Web site (http://www.contec.com/apipac/).　For more details on the supported OS, applicable language and new information, please visit the CONTEC's Web site.

### Data Logger Software C-LOGGER (Supplied: Stored on the API-PAC(W32) Disk)

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.
CONTEC provides download services (at http://www.contec.com/clogger) to supply the updated drivers. For details, refer to the C-LOGGER Users Guide or our website.

### 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.
See http://www.contec.com/mldaq/ for details and download of ML-DAQ.

### 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)

Shielded cables with two-ended connector
for 68-pin half-pitch connector : PCB68PS-0.5P (0.5m)
: PCB68PS-1.5P (1.5m)

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)

* Two sets of cables are required to use both connector CNA and CNB.

## Accessories

### Accessories (Option)

Screw Terminal (M2.5 x 96P) : DTP-64(PC) *1*3
Screw Terminal (M3 x 68P) : EPD-68A *2*3*4
Screw Terminal (M3 x 96P) : EPD-96A *1*3*4
Screw Terminal (M3.5 x 96P) : EPD-96 *1*3
BNC Terminal Unit (analog input 32ch) : ATP-32F *1*3
BNC Terminal Unit (analog input 8ch) : ATP-8 *1*3*5

*1 ADC-68M/96F optional cable is required separately.
*2 PCB68PS-0.5P or PCB68PS-1.5P optional cable is required separately.
*3 Two sets of cables are required to use both connector CNA and CNB.
*4 "Spring-up" type terminal is used to prevent terminal screws from falling off.
*5 Can be used in CNA channels 0 - 7 or CNB channels 32 - 39.

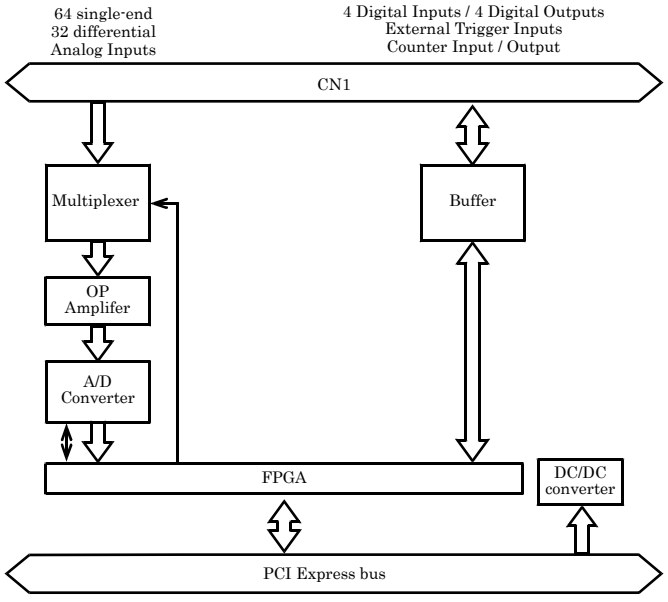
* For details on the range channels available to each terminal panel, see Page 3 "Connecting example of option".
* Check the CONTEC's Web site for more information on these options.

## Packing List

Board [AI-1664LA-LPE] …1
First step guide … 1
Disk *1 [API-PAC(W32)] …1
Standard-sized bracket …1
Serial number label…1
Product Registration Card & Warranty Certificate…1

*1 The Disk contains the driver software and User's Guide.

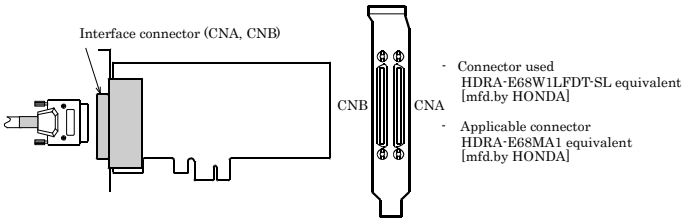
## Block Diagram




## How to connect the connectors

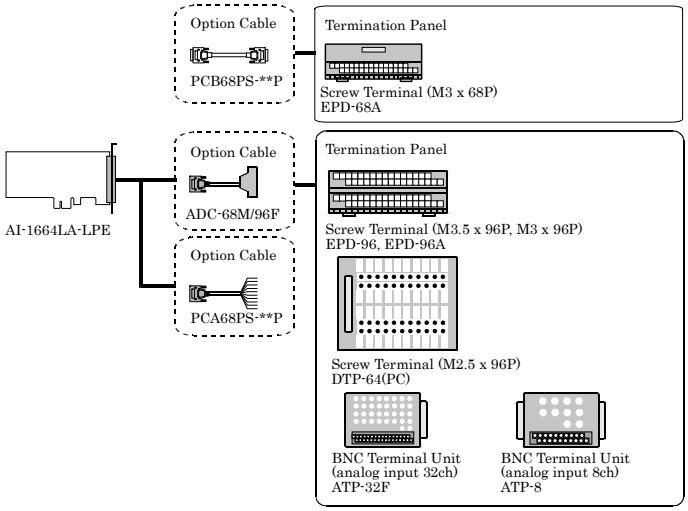
### Connector shape

The optional connector cable (PCB68PS-**P, ADC-68M/96F or PCA68PS-**P) is used to connect the board to external devices. The cable is used together with a terminal block to connect external devices.Two sets of cables are required depending on the number of channels used.




* Please refer to Page 3 for more information on the supported cable and accessories.

### Connecting example of option




Each terminal block accepts the following ranges of channels.

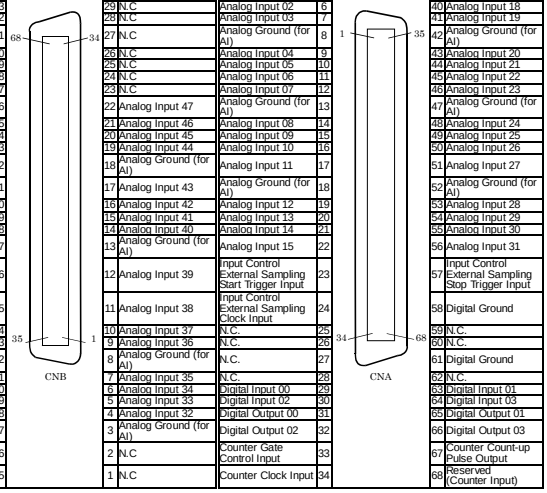
| | Connector at board side connection destination | Analog input | | Analog input control signal *1 | Digital input Digital output | Counter I/O *2 |
|---|---|---|---|---|---|---|
| | | Single-ended input | Differential input | | | |
| EPD-96A EPD-96 EPD-68A DTP-64 | Only CNA is used. | channel 0 - 31 | channel 0 - 15 | O | O | O |
| | Only CNB is used. | channel 32 - 63 | channel 16 - 31 | -- | -- | -- |
| | CNA/B is used *3 | channel 0 - 63 | channel 0 - 31 | O *4 | O *4 | O *4 |
| ATP-32F | Only CNA is used. | channel 0 - 31 | -- | O | O | O |
| | Only CNB is used. | channel 32 - 63 | -- | -- | -- | -- |
| | CNA/B is used *3 | channel 0 - 63 | -- | O *4 | O *4 | O *4 |
| ATP-8 | Only CNA is used. | channel 0 - 7 | -- | O | O | O |
| | Only CNB is used. | channel 32 - 39 *5 | -- | -- | -- | -- |
| | CNA/B is used *3 | channel 0 - 7, 32 - 39 *5 | -- | O *4 | O *4 | O *4 |

*1: AI External Start Trigger Input, AI External StopTrigger Input, AI External Clock Trigger Input
*2: Counter Gate Control Input, Counter Up Clock Input, Counter Output
*3: Two sets of terminal blocks and optional cables are required each.
*4: Make wiring on the CAN side.
*5: Two or more only of channel 32 - 39 sampling cannot be done.

## Connector Pin Assignment

### Single-Ended Input (CNA, CNB)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N.C | 68 | | 34 | N.C | N.C. | 1 | 35 Analog Ground (for AI) |
| N.C | 67 | | 33 | N.C | N.C. | 2 | 36 Analog Ground (for AI) |
| N.C | 66 | | 32 | N.C | Analog Ground (for AI) | 3 | 37 Analog Ground (for AI) |
| N.C | 65 | | 31 | N.C | Analog Input 00 | 4 | 38 Analog Input 16 |
| N.C | 64 | | 30 | N.C | Analog Input 01 | 5 | 39 Analog Input 17 |
| N.C | 63 | | 29 | N.C | Analog Input 02 | 6 | 40 Analog Input 18 |
| N.C | 62 | | 28 | N.C | Analog Input 03 | 7 | 41 Analog Input 19 |
| Digital Ground | 61 | | 27 | N.C | Analog Ground (for AI) | 8 | 42 Analog Ground (for AI) |
| N.C | 60 | | 26 | N.C | Analog Input 04 | 9 | 43 Analog Input 20 |
| N.C | 59 | | 25 | N.C | Analog Input 05 | 10 | 44 Analog Input 21 |
| Digital Ground | 58 | | 24 | N.C | Analog Input 06 | 11 | 45 Analog Input 22 |
| N.C | 57 | | 23 | N.C | Analog Input 07 | 12 | 46 Analog Input 23 |
| Analog Input 63 | 56 | | 22 | Analog Input 47 | Analog Ground (for AI) | 13 | 47 Analog Ground (for AI) |
| Analog Input 62 | 55 | | 21 | Analog Input 46 | Analog Input 08 | 14 | 48 Analog Input 24 |
| Analog Input 61 | 54 | | 20 | Analog Input 45 | Analog Input 09 | 15 | 49 Analog Input 25 |
| Analog Input 60 | 53 | | 19 | Analog Input 44 | Analog Input 10 | 16 | 50 Analog Input 26 |
| Analog Ground (for AI) | 52 | | 18 | Analog Ground (for AI) | Analog Input 11 | 17 | 51 Analog Input 27 |
| Analog Input 59 | 51 | | 17 | Analog Input 43 | Analog Ground (for AI) | 18 | 52 Analog Ground (for AI) |
| Analog Input 58 | 50 | | 16 | Analog Input 42 | Analog Input 12 | 19 | 53 Analog Input 28 |
| Analog Input 57 | 49 | | 15 | Analog Input 41 | Analog Input 13 | 20 | 54 Analog Input 29 |
| Analog Input 56 | 48 | | 14 | Analog Input 40 | Analog Input 14 | 21 | 55 Analog Input 30 |
| Analog Ground (for AI) | 47 | | 13 | Analog Ground (for AI) | Analog Input 15 | 22 | 56 Analog Input 31 |
| Analog Input 55 | 46 | | 12 | Analog Input 39 | Input Control External Sampling Start Trigger Input | 23 | 57 Input Control External Sampling Stop Trigger Input |
| Analog Input 54 | 45 | | 11 | Analog Input 38 | Input Control External Sampling Clock Input | 24 | 58 Digital Ground |
| Analog Input 53 | 44 | | 10 | Analog Input 37 | N.C. | 25 | 59 N.C. |
| Analog Input 52 | 43 | | 9 | Analog Input 36 | N.C. | 26 | 60 N.C. |
| Analog Ground (for AI) | 42 | | 8 | Analog Ground (for AI) | N.C. | 27 | 61 Digital Ground |
| Analog Input 51 | 41 | | 7 | Analog Input 35 | N.C. | 28 | 62 N.C. |
| Analog Input 50 | 40 | | 6 | Analog Input 34 | Digital Input 00 | 29 | 63 Digital Input 01 |
| Analog Input 49 | 39 | | 5 | Analog Input 33 | Digital Input 02 | 30 | 64 Digital Input 03 |
| Analog Input 48 | 38 | | 4 | Analog Input 32 | Digital Output 00 | 31 | 65 Digital Output 01 |
| Analog Ground (for AI) | 37 | | 3 | Analog Ground (for AI) | Digital Output 02 | 32 | 66 Digital Output 03 |
| Analog Ground (for AI) | 36 | | 2 | N.C | Counter Gate Control Input | 33 | 67 Counter Count-up Pulse Output |
| Analog Ground (for AI) | 35 | | 1 | N.C | Counter Clock Input | 34 | 68 Reserved (Counter Input) |




| | |
|---|---|
| Analog Input00 - Analog Input63 | Analog input signal. The numbers correspond to channel numbers. |
| Analog Ground | Common analog ground for analog input 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. |
| 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 output signal. |
| 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

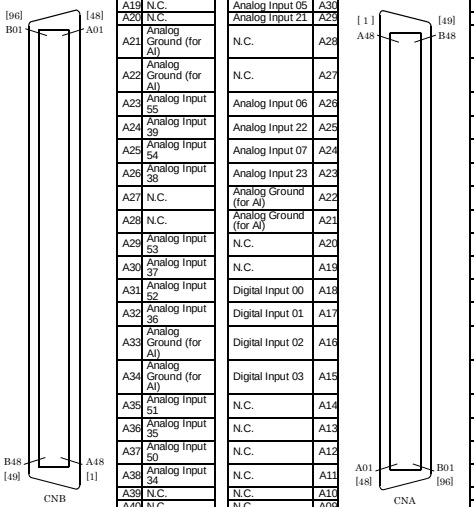
Do not connect any of the outputs and power outputs to the analog or digital ground.
Neither connect outputs to each other. Doing either can result in a fault.

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 board.

### Single-Ended Input (ADC-68M/96F)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N.C. | B01 | | A01 | N.C | N.C. | A48 | B48 N.C. |
| N.C. | B02 | | A02 | N.C | Analog Ground(for AI) | A47 | B47 N.C. |
| N.C. | B03 | | A03 | N.C | N.C. | A46 | B46 N.C. |
| N.C. | B04 | | A04 | N.C | Analog Ground(for AI) | A45 | B45 N.C. |
| N.C | B05 | | A05 | N.C | Analog Input 00 | A44 | B44 Analog Input 08 |
| N.C | B06 | | A06 | N.C | Analog Input 16 | A43 | B43 Analog Input 24 |
| N.C | B07 | | A07 | N.C | Analog Input 01 | A42 | B42 Analog Input 09 |
| Digital Ground | B08 | | A08 | Digital Ground | Analog Input 17 | A41 | B41 Analog Input 25 |
| N.C | B09 | | A09 | N.C | N.C. | A40 | B40 N.C |
| N.C | B10 | | A10 | N.C | N.C. | A39 | B39 N.C |
| N.C. | B11 | | A11 | N.C. | Analog Input 02 | A38 | B38 Analog Input 10 |
| N.C. | B12 | | A12 | N.C. | Analog Input 18 | A37 | B37 Analog Input 26 |
| N.C. | B13 | | A13 | N.C. | Analog Input 03 | A36 | B36 Analog Input 11 |
| N.C. | B14 | | A14 | N.C. | Analog Input 19 | A35 | B35 Analog Input 27 |
| N.C | B15 | | A15 | N.C | Analog Ground (for AI) | A34 | B34 Analog Ground (for AI) |
| N.C | B16 | | A16 | N.C | Analog Ground (for AI) | A33 | B33 Analog Ground (for AI) |
| N.C | B17 | | A17 | N.C | Analog Input 04 | A32 | B32 Analog Input 12 |
| N.C | B18 | | A18 | N.C | Analog Input 20 | A31 | B31 Analog Input 28 |
| N.C. | B19 | | A19 | N.C. | Analog Input 05 | A30 | B30 Analog Input 13 |
| N.C. | B20 | | A20 | N.C. | Analog Input 21 | A29 | B29 Analog Input 29 |
| Analog Ground (for AI) | B21 | | A21 | Analog Ground (for AI) | N.C. | A28 | B28 N.C. |
| Analog Ground (for AI) | B22 | | A22 | Analog Ground (for AI) | N.C. | A27 | B27 N.C. |
| Analog Input 63 | B23 | | A23 | Analog Input 55 | Analog Input 06 | A26 | B26 Analog Input 14 |
| Analog Input 47 | B24 | | A24 | Analog Input 39 | Analog Input 22 | A25 | B25 Analog Input 30 |
| Analog Input 62 | B25 | | A25 | Analog Input 54 | Analog Input 07 | A24 | B24 Analog Input 15 |
| Analog Input 46 | B26 | | A26 | Analog Input 38 | Analog Input 23 | A23 | B23 Analog Input 31 |
| N.C. | B27 | | A27 | N.C. | Analog Ground (for AI) | A22 | B22 Analog Ground (for AI) |
| N.C. | B28 | | A28 | N.C. | Analog Ground (for AI) | A21 | B21 Analog Ground (for AI) |
| Analog Input 61 | B29 | | A29 | Analog Input 53 | N.C. | A20 | B20 N.C. |
| Analog Input 45 | B30 | | A30 | Analog Input 37 | N.C. | A19 | B19 N.C. |
| Analog Input 60 | B31 | | A31 | Analog Input 52 | Digital Input 00 | A18 | B18 Digital Output 00 |
| Analog Input 44 | B32 | | A32 | Analog Input 36 | Digital Input 01 | A17 | B17 Digital Output 01 |
| Analog Ground (for AI) | B33 | | A33 | Analog Ground (for AI) | Digital Input 02 | A16 | B16 Digital Output 02 |
| Analog Ground (for AI) | B34 | | A34 | Analog Ground (for AI) | Digital Input 03 | A15 | B15 Digital Output 03 |
| Analog Input 59 | B35 | | A35 | Analog Input 51 | N.C. | A14 | B14 N.C. |
| Analog Input 43 | B36 | | A36 | Analog Input 35 | N.C. | A13 | B13 N.C. |
| Analog Input 58 | B37 | | A37 | Analog Input 50 | N.C. | A12 | B12 N.C. |
| Analog Input 42 | B38 | | A38 | Analog Input 34 | N.C. | A11 | B11 N.C. |
| N.C. | B39 | | A39 | N.C. | N.C. | A10 | B10 N.C. |
| N.C. | B40 | | A40 | N.C. | N.C. | A09 | B09 N.C. |
| Analog Input 57 | B41 | | A41 | Analog Input 49 | Digital Ground | A08 | B08 Digital Ground |
| Analog Input 41 | B42 | | A42 | Analog Input 33 | Input Control External Sampling Clock Input | A07 | B07 N.C. |
| Analog Input 56 | B43 | | A43 | Analog Input 48 | Input Control External Sampling Stop Trigger Input | A06 | B06 N.C. |
| Analog Input 40 | B44 | | A44 | Analog Input 32 | Input Control External Sampling Start Trigger Input | A05 | B05 N.C. |
| N.C. | B45 | | A45 | Analog Ground (for AI) | Counter Clock Input | A04 | B04 N.C. |
| N.C. | B46 | | A46 | N.C | Reserved (Counter Input) | A03 | B03 N.C. |
| N.C. | B47 | | A47 | Analog Ground (for AI) | Counter Gate Control Input | A02 | B02 N.C. |
| N.C. | B48 | | A48 | N.C | Counter Count-up Pulse Output | A01 | B01 N.C. |




[ ] shows the pin No. specified by HONDA TSUSHIN KOGYO CO., LTD.

| | |
|---|---|
| Analog Input00 - Analog Input63 | Analog input signal. The numbers correspond to channel numbers. |
| Analog Ground | Common analog ground for analog input 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. |
| 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 output signal. |
| 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 board.

## Differential Input (CNA, CNB)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N.C | 68 | 34 | N.C | N.C. | 1 | 35 | Analog Ground ( for AI) |
| N.C | 67 | 33 | N.C | N.C. | 2 | 36 | Analog Ground ( for AI ) |
| N.C | 66 | 32 | N.C | Analog Ground ( for AI ) | 3 | 37 | Analog Ground ( for AI ) |
| N.C | 65 | 31 | N.C | Analog Input 00[+] | 4 | 38 | Analog Input 00[-] |
| N.C | 64 | 30 | N.C | Analog Input 01[+] | 5 | 39 | Analog Input 01[-] |
| N.C | 63 | 29 | N.C | Analog Input 02[+] | 6 | 40 | Analog Input 02[-] |
| N.C | 62 | 28 | N.C | Analog Input 03[+] | 7 | 41 | Analog Input 03[-] |
| Digital Ground | 61 | 27 | N.C | Analog Ground ( for AI ) | 8 | 42 | Analog Ground ( for AI ) |
| N.C | 60 | 26 | N.C | Analog Input 04[+] | 9 | 43 | Analog Input 04[-] |
| N.C | 59 | 25 | N.C | Analog Input 05[+] | 10 | 44 | Analog Input 05[-] |
| Digital Ground | 58 | 24 | N.C | Analog Input 06[+] | 11 | 45 | Analog Input 06[-] |
| N.C | 57 | 23 | N.C | Analog Input 07[+] | 12 | 46 | Analog Input 07[-] |
| Analog Input 31[-] | 56 | 22 | Analog Input 31[+] | Analog Ground ( for AI ) | 13 | 47 | Analog Ground ( for AI ) |
| Analog Input 30[-] | 55 | 21 | Analog Input 30[+] | Analog Input 08[+] | 14 | 48 | Analog Input 08[-] |
| Analog Input 29[-] | 54 | 20 | Analog Input 29[+] | Analog Input 09[+] | 15 | 49 | Analog Input 09[-] |
| Analog Input 28[-] | 53 | 19 | Analog Input 28[+] | Analog Input 10[+] | 16 | 50 | Analog Input 10[-] |
| Analog Ground ( for AI ) | 52 | 18 | Analog Ground ( for AI ) | Analog Input 11[+] | 17 | 51 | Analog Input 11[-] |
| Analog Input 27[-] | 51 | 17 | Analog Input 27[+] | Analog Ground ( for AI ) | 18 | 52 | Analog Ground ( for AI ) |
| Analog Input 26[-] | 50 | 16 | Analog Input 26[+] | Analog Input 12[+] | 19 | 53 | Analog Input 12[-] |
| Analog Input 25[-] | 49 | 15 | Analog Input 25[+] | Analog Input 13[+] | 20 | 54 | Analog Input 13[-] |
| Analog Input 24[-] | 48 | 14 | Analog Input 24[+] | Analog Input 14[+] | 21 | 55 | Analog Input 14[-] |
| Analog Ground ( for AI ) | 47 | 13 | Analog Ground ( for AI ) | Analog Input 15[+] | 22 | 56 | Analog Input 15[-] |
| Analog Input 23[-] | 46 | 12 | Analog Input 23[+] | Input Control External Sampling Start Trigger Input | 23 | 57 | Input Control External Sampling Stop Trigger Input |
| Analog Input 22[-] | 45 | 11 | Analog Input 22[+] | Input Control External Sampling Clock Input | 24 | 58 | Digital Ground |
| Analog Input 21[-] | 44 | 10 | Analog Input 21[+] | N.C. | 25 | 59 | N.C. |
| Analog Input 20[-] | 43 | 9 | Analog Input 20[+] | N.C. | 26 | 60 | N.C. |
| Analog Ground ( for AI ) | 42 | 8 | Analog Ground ( for AI ) | N.C. | 27 | 61 | Digital Ground |
| Analog Input 19[-] | 41 | 7 | Analog Input 19[+] | N.C. | 28 | 62 | N.C. |
| Analog Input 18[-] | 40 | 6 | Analog Input 18[+] | Digital Input 00 | 29 | 63 | Digital Input 01 |
| Analog Input 17[-] | 39 | 5 | Analog Input 17[+] | Digital Input 02 | 30 | 64 | Digital Input 03 |
| Analog Input 16[-] | 38 | 4 | Analog Input 16[+] | Digital Output 00 | 31 | 65 | Digital Output 01 |
| Analog Ground ( for AI ) | 37 | 3 | Analog Ground ( for AI ) | Digital Output 02 | 32 | 66 | Digital Output 03 |
| Analog Ground ( for AI ) | 36 | 2 | N.C | Counter Gate Control Input | 33 | 67 | Counter Count-up Pulse Output |
| Analog Ground ( for AI ) | 35 | 1 | N.C | Counter Clock Input | 34 | 68 | Reserved ( Counter Input ) |

CNB CNA

| | |
|---|---|
| Analog Input00 - Analog Input31 | Analog input signal. The numbers correspond to channel numbers. |
| Analog Ground | Common analog ground for analog input 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. |
| 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 output signal. |
| 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 board.

## Differential Input (ADC-68M/96F)

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

[96] [48] B01 A01 B48 [49] A48 [1] CNB

[ 1 ] [49] A48 B48 A01 [48] B01 [96] CNA

[ ] 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 Ground | Common analog ground for analog input 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. |
| 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 output signal. |
| 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.

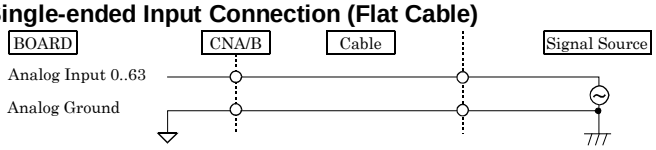
Leave "Reserved" pins unconnected. Connecting these pins may cause a fault in the board.

## Analog Input Signal Connection

### Single-ended Input

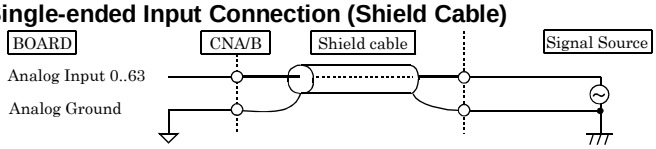
The following figure shows an example of flat cable connection. Connect separate signal and ground wires for each analog input channel on CNA/B.

**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 board is long or if you want to provide better protection from noise. For each analog input channel on CNA/B, 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 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.

The signal connected to an input pin may fluctuate after switching of the multiplexer. If this occurs, shorten the cable between the signal source and the analog input pin or insert a high-speed amplifier as a buffer between the two to reduce the fluctuation.

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.

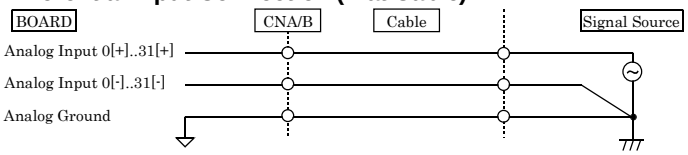
An input pin may fail to obtain input data normally when the signal source connected to the pin has high impedance. If this is the case, change the signal source to one with lower output impedance or insert a high-speed amplifier buffer between the signal source and the analog input pin to reduce the effect.

### Differential Input

The following figure shows an example of flat cable connection.

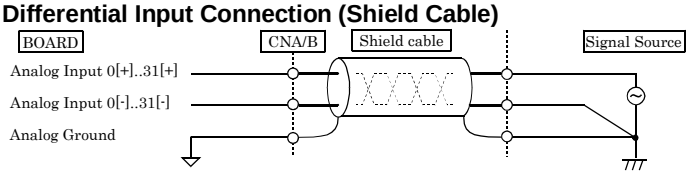
For each analog input channel on CNA/B, connect the "+" input to the signal and connect the "-" input to the signal source ground. Also connect the analog ground on the board to the signal source ground.

**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 CNA/B, 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 (Shield 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.

The signal connected to an input pin may fluctuate after switching of the multiplexer. If this occurs, shorten the cable between the signal source and the analog input pin or insert a high-speed amplifier as a buffer between the two to reduce the fluctuation.

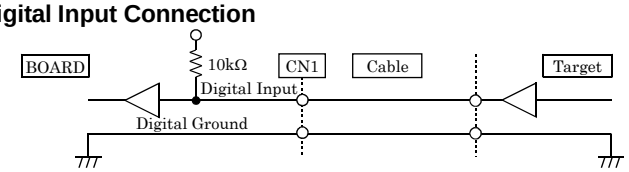
In the channel switching, the multiplexer does the electrical charge and discharge on the internal capacitor according to the signal voltage. Therefore, the voltage from the previous switching state may go into the next channel. It might cause the error of the signal source action. If this occurs, insert 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.

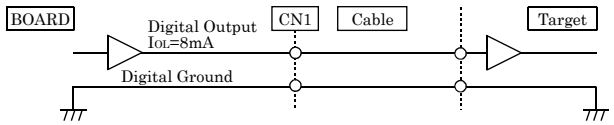
## Digital I/O signals, Counter signals and Control signals Connection

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**




**Counter input signal control**

The counter gate control input (see Connector Pin Assignment in Page4) enables or disables the external clock input to the counter. You can use this function to control the external clock input to the counter. The external clock input to the counter is enabled when the input is "High" and disabled when the input is "Low". As the pin has an internal pull-up on the board (or card), the default if not connected is "High". As a result, the external clock for the counter is enabled if this pin 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.

## Difference from AD16-64(LPCI)LA

The functions same with conventional product of AD16-64(LPCI)LA are provided with this product. In addition, as there is compatibility in terms of connector shape and pin assignments, it is easy to migrate from the existing system. So you can use the same operating procedures as AD16-64(LPCI)LA.

There are some differences in specifications as shown below.

| | AI-1664LA-LPE | AD16-64(LPCI)LA |
|---|---|---|
| Power consumption | +3.3VDC 620 mA (Max.) | +5VDC 450 mA (Max.) |
| Bus specification | PCI Express Base Specification Rev. 1.0a x1 | PCI (32-bit, 33MHz, Universal key shapes supported) |
| External start signal | LVTTL-level | TTL-level |
| External stop signal | LVTTL-level | TTL-level |
| External clock signal | LVTTL-level | TTL-level |
| Digital Input/Output | LVTTL-level positive logic | TTL-level positive logic |
| External Counter Input/Output | LVTTL-level | TTL-level |
| Dimension (mm) | 121.69 (L)×67.90(H) | 121.69(L)×63.41(H) |
| Weight | 90g | 60g |