CONTEC

PC-HELPER Series

Reference Manual

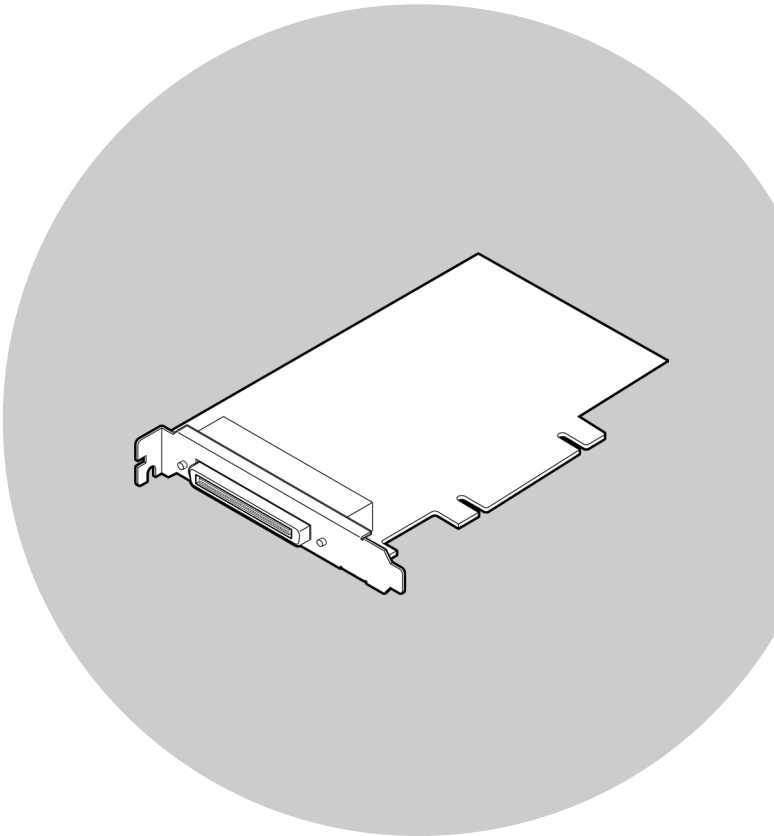
64 Channel Analog to Digital Input Board for PCI

AD12-64(PCI)

16 Channel Analog to Digital Input Board for PCI

AD12-16(PCI)

CONTENTS



CONTEC CO., LTD.

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Table of Contents

Introduction

This section provides necessary information of the product such as the outline, bundled items and manuals before actual use.

1.Related Manuals

The manuals related to the product are listed below.

Read them as necessary along with this document.

◆ Must Read the Following Manuals.

Name	Purpose	Contents	How to get
Please read the following	Must read this after opening the package.	This introduces related materials that are made available on the CONTEC website, such as those for the included items, manuals, and software.	Included in the package (Printed matter)
Reference Manual (This Document)	Read this when operating the product.	This describes the hardware aspects such as functions and settings.	Download from the Contec website (PDF)

◆ Download Manuals

Download the manuals accordingly from the following URL.

Download https://www.contec.com/download/

2.About the Product

AD12-64(PCI) and AD12-16(PCI) are PCI-compliant interface boards that convert analog input signals to digital equivalents (performing analog-to-digital conversion).

AD12-64(PCI) and AD12-16(PCI) can perform A-D conversion at a conversion speed of 10μsec [100KSPS] per channel and a resolution of 12bit.

Windows/Linux device driver is supported with this product.

3.Features

■ Multi-channel analog input

< AD12-64(PCI) > can perform an analog input of single-ended input 64 channels and differential input 32 channels.
< AD12-16(PCI) > can perform an analog input of single-ended input 16 channels and differential input 8 channels.
Selection of single-ended input and differential input can be set up by the device driver function.

■ Input range setup by device driver function

Input range can be selected for each channel from the following ranges and can be set up by the device driver function.
±10V, ±5V, ±2.5V, ±1.25V, 0 - +10V, 0 - +5V, 0 - +2.5V, 0 - +1.25V

■ Sampling control function

The board can perform sampling either at arbitrary timings under control of software or periodically in synchronization with a sampling clock signal.
The sampling clock signal can be selected between the internal one based on the on-board clock generator and the external one using a digital signal input from an external source.

■ Windows/Linux support device driver

Using the device driver API-TOOL makes it possible to create applications of Windows/Linux. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

■ Digital input/output function

The board has four digital input and four digital output pins for TTL-level signals, allowing an external device to be monitored and controlled.

■ Optional units

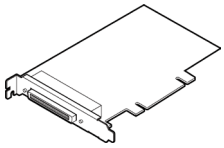
Using optional units facilitates connections.
For more details on the option, please refer to "**Optional Products(page10)**".

4.Included Items

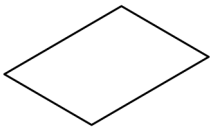
The product consists of the items listed below.

Check, with the following list, that your package is complete.

If you discover damaged or missing items, contact your retailer.



Product…1



Please read the following…1

5.Support Software

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

For more details on the supported OS, applicable languages, or to download the latest version of software, visit the CONTEC Web site.

Name	Contents	How to get
Windows version High-efficiency Analog I/O Driver API-AIO(WDM)	The API-AIO(WDM) is the Windows version driver 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.	Download from the CONTEC website *1
Analog I/O Driver for Linux API-AIO(LNX)	This is the Linux version driver software provided in API function formats. The software includes various sample programs such as gcc (C, C++) and Python programs.	Download from the CONTEC website *1
Software Development Tool Kits (SDK) and Support Software	In addition to the device drivers, we offer many software programs for using CONTEC devices in an easier manner.	Download from the CONTEC website *2

*1 Download the files from the following URL.

Download https://www.contec.com/download/

*2 For supported software, search the CONTEC website for this product and view the product page.

Website https://www.contec.com/

6.Optional Products

Optional product items are as follows:

Use these items with the main product as necessary.

Product Name	Model type	Description
Shielded Cable with Two 96-Pin Half-Pitch Connectors	PCB96PS-0.5P	0.5m
	PCB96PS-1.5P	1.5m
Flat Cable with 96-pin Half-Pitch Connectors at Both Ends	PCB96P-1.5	1.5m
Shielded Cable with One 96-pin Half-Pitch Connector	PCA96PS-0.5P	0.5m
	PCA96PS-1.5P	1.5m
Flat Cable with One 96-pin Half-Pitch Connector	PCA96P-1.5	1.5m
Screw Terminal (M3 * 96)	EPD-96A	*1*2
Terminal Unit for Relay Terminal Banks	EPD-96	*1
Screw Terminal	DTP-64A	*1

*1 PCB96P-0.5P or PCB96PS-0.5P optional cable is required separately.

*2 "Spring-up" type terminal is used to prevent terminal screws from falling off.

Visit the CONTEC website for the latest optional products.

Website https://www.contec.com/

Safety Precautions

Understand the following definitions and precautions to use the product safely.
Never fail to read them before using the product.

1.Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources.

Understand the meanings of these labels to operate the equipment safely.

⚠DANGER	Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

2.Handling Precautions

⚠ DANGER

Do not use the product in locations exposed to a flammable or corrosive gas. It may cause explosion, fire, electrical shock, or malfunction.

⚠ CAUTION

- There are switches and jumpers on this product that need to be set in advance. Be sure to check these before installing this product.
- Only set the switches and jumpers on this product to the specified settings. Otherwise, this product may malfunction, overheat, or cause a failure.
- Do not strike or bend this product. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- This product contains precision electronic elements and must not be used in locations subject to physical shock or strong vibration. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not use or store this product in high temperature or low temperature surroundings, or do not expose it to extreme temperature changes. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not use or store this device where it is exposed to direct sunlight or near stoves or other sources of heat. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not use the product in the vicinity of devices that generate strong magnetic force or noise. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not touch this product's metal plated terminals (edge connector) with your hands. Otherwise, this product may malfunction, overheat, or cause a failure. If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
- As this product contains components that are designed to operate at high temperature, please do not touch this product when it is in use.
- Do not install this product to the expansion slot and do not plug or unplug the cables which are connected to this product while the PC or expansion unit is still turned on. Otherwise, this product may malfunction, overheat, or cause a failure. Be sure that the personal computer power is turned off.
- Do not touch the external connector when the power is on. Otherwise, this may malfunction, cause a failure due to static electricity.
- Make sure that your PC or expansion unit can supply ample power to all the products installed. Insufficiently energized products could malfunction, overheat, or cause a failure.

- The specifications of this product are subject to change without notice for enhancement and quality improvement. Even when using the product continuously, be sure to read the manual and understand the contents.
- Do not modify the product. CONTEC will bear no responsibility for any problems, etc., resulting from modifying the product.
- Regardless of the foregoing statements, CONTEC is not liable for any damages whatsoever (Including damages for loss of business profits) arising out of the use or inability to use this CONTEC product or the information contained herein.
- Regarding "CE EMC Directive Notice".
  Please connect the Interface Connector with a shielded cable to meet the mentioned standard above.
- Regarding "KC EMC Notice".
  Please connect the Interface Connector with a shielded cable to meet the mentioned standard above.

1. EN55032Class A Notice

Warning:
Operation of this equipment in a residential environment could cause radio interference.

Addendum

Use shielded cables to ensure that this product complies with the CE EMC Directive.

3.Environment

Use this product in the following environment. If used in an unauthorized environment, this product may overheat, malfunction, or cause a failure.

Operating Temperature

0 - 50ºC

Humidity

10 - 90%RH (No condensation)

Corrosive Gases

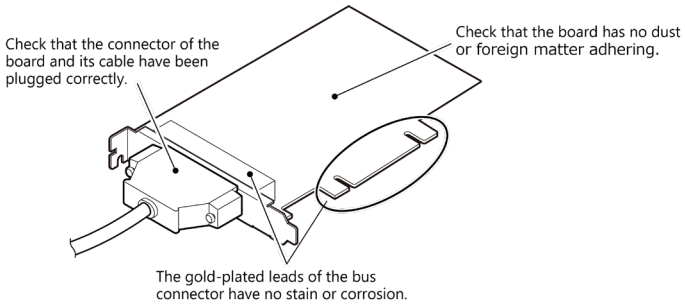
None

Floating Dust Particles

Not to be excessive

4.Inspection

Inspect the product periodically as follows to use it safely.



5.Storage

When storing this product, keep it in its original packing form.

- Put this product in the storage bag.
- Wrap it in the packing material, and then put it in the box.
- Store the package at room temperature at a place free from direct sunlight, moisture, shock, vibration, magnetism, and static electricity.

6.Disposal

When disposing of the product, follow the disposal procedures stipulated under the relevant laws and municipal ordinances.

Setup

This section explains how to set up the product.

1.What Is Setup?

Setup means a series of steps to take before the product can be used.
Different steps are required for device driver and hardware.

The setup procedure will depend on your combination of OS and device driver. For details, refer to the help for the device driver you will use. This section describes the procedure to start the application program development using the Windows version of the device driver API-AIO(WDM).

The basic procedure is also the same when using the Linux device driver API-AIO(LNX). However, the installation procedure for the device driver and some other steps are different. For details, refer to "Driver Environment Construction" and "Tutorial" in **the API-AIO(LNX) help**.

Online Help [API-AIO(LNX)]
https://help.contec.com/link/drv/lnx/aio/en/

2. Setup Instructions

Taking the following steps sets up the device driver. You can use the diagnosis program later to check whether the setup function normally.

Step 1 Device Driver Installation (page18)
Step 2 Hardware Setting (page19)
Step 3 Hardware Installation (page19)
Step 4 Device Driver Initialization (page21)
Step 5 Operation Check (page22)

If Setup fails to be performed properly, see the "**Setup Troubleshooting (page24)**" section at the end of this chapter.

2.Device Driver Installation

This manual describes how to install the Windows device driver.
Before connecting this product to a PC, install the device driver.

Download the "Device driver API-AIO(WDM)" from the CONTEC website.

Download https://www.contec.com/download/

For the device driver installation procedure, refer to the help included in the development environment package you downloaded from the CONTEC website or "**Installing Device Driver**" in the online help made available on the CONTEC website.

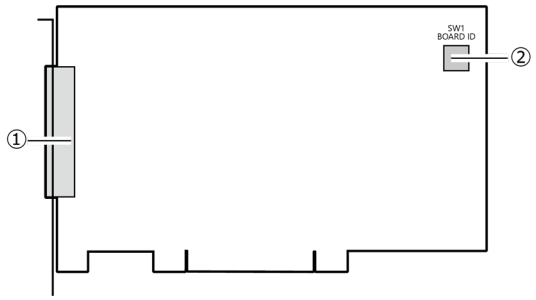
Online Help [Installing Device Driver]
https://help.contec.com/link/drv/wdm/install/en/

3.Hardware Setting

This section describes how to set up the product and how to connect it to a PC.

1. Nomenclature of Product Components

Component names of the product are shown in the figure below.

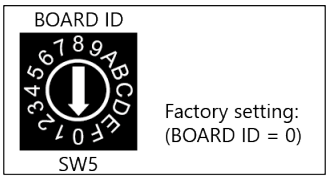


No.	Name
1	Interface Connector (page)
2	Board ID Setting Switch

2. Board ID Setting Switch

If you install two or more products on one personal computer, assign a different ID value to each of the products to distinguish them. Set a different value per product.

The board IDs can be set by 0 - Fh to identify up to sixteen products. If only one product is used, the original factory setting (Board ID = 0) should be used.



4.Hardware Installation

On a PC in a Windows environment, the peripherals need to be recognized by the OS. This is called hardware installation. **When using multiple products, install one product at a time. Complete the setup of the product before starting to install the next one.**

1. Before plugging the product, shut down the system, unplug the power code of your PC.
2. Remove the cover from the PC so that the product can be mounted.
   Plug the product into an expansion slot.
3. Put the cover back into place.
4. Turn on the power to your PC.
5. **After the OS finishes booting, the hardware will be automatically identified and the hardware installation will be complete.**

⚠ CAUTION

- Do not touch the product's metal plated terminals (edge connector) with your hands. Otherwise, the product may malfunction, overheat, or cause a failure.
  If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
- Do not install or remove the product to or from the slot while the computer's power is turned on. Otherwise, the product may malfunction, overheat, or cause a failure.
  Doing so could cause trouble. Be sure that the personal computer or the I/O expansion unit power is turned off.
- Make sure that your PC or expansion unit can supply ample power to all the products installed. Insufficiently energized boards could malfunction, overheat, or cause a failure.
- The product cannot be properly installed unless the resources (I/O addresses and interrupt level) for the product can be allocated. Before attempting to install the product, first determine what PC resources are free to use.

5.Device Driver Initialization

Setting the device name is required to use the device driver. It is called the device driver initialization.

The device name will be assigned automatically during hardware installation. Therefore, if you want to use it, you can skip the setting procedure described below.

How to check the device name and change the device name, refer to the help included in the development environment package you downloaded from the CONTEC website or "**Setting and Confirming Device Name**" in the online help made available on the CONTEC website.

Online Help [Setting and Confirming Device Name]

https://help.contec.com/link/drv/wdm/devicename/en/

6.Operation Check

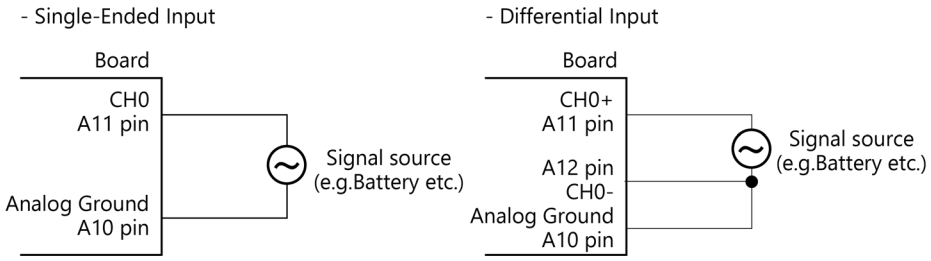
You must make sure that this product and device driver operate properly. By taking this step, you can be certain that this product has been set up appropriately. Check operation by using the diagnosis program when the confirmation device is connected. When connecting the product to the actual device to be used, use caution so that malfunctions do not occur during the input/output test.

1. Connection Method

Connect the product to an external target device to test the communication and check the execution environment.

To connect an external target device, see "**Connecting to an External Device (page26)**".

The diagrams below show examples of using channel 0. Check the board with the factory defaults untouched.



⚠ CAUTION

Input data remains indeterminate when no input pin is connected. The input pin for the channel not connected to the signal source must be connected to the analog ground. For details, see "**Connecting to an External Device(P26)**".

2. Using the Diagnosis Program

◆ Starting the Diagnosis Program

Click [Diagnosis] on the Properties page to start the diagnosis program.

The diagnosis program allows you to check the digital inputs/outputs and to output a diagnosis report.

How to use the diagnostic program and how to output a diagnostic report, refer to the help included in the development environment package you downloaded from the CONTEC website or "**Diagnosis Program**" in the online help made available on the CONTEC website.

Online Help [Diagnosis Program]

https://help.contec.com/link/drv/wdm/aio/diagnostic/en/

7.Setup Troubleshooting

1. Examples and Solution

◆ Data input or output does not operate correctly

- Run the diagnosis program to check that the device is registered and whether any initialization errors have occurred.
- Is there a problem with the device settings, wiring, or similar? Check the I/O range setting. Also, the input data will be undefined if the wiring terminals are not connected. Ensure that the channels you are using are correctly connected. Connect unused channels to analog ground.
- For voltage input, check by connecting a battery or similar if you do not have any other suitable signal source. Also check that connecting to analog ground reads correctly as 0V.

◆ The diagnostic program works properly but the application program does not.

The diagnostic program uses the API-AIO(WDM) functions. If the diagnostic program works properly, other applications should also work properly. If you have a problem, recheck your program taking note of the following points.

- Check the return values of the API functions.
- Refer to the source code for the sample programs.

◆ The OS won't normally get started or detect the device.

Refer to the device driver HELP.

◆ If your problem cannot be resolved

Contact your retailer with diagnostic report that outputted by diagnostic programs.

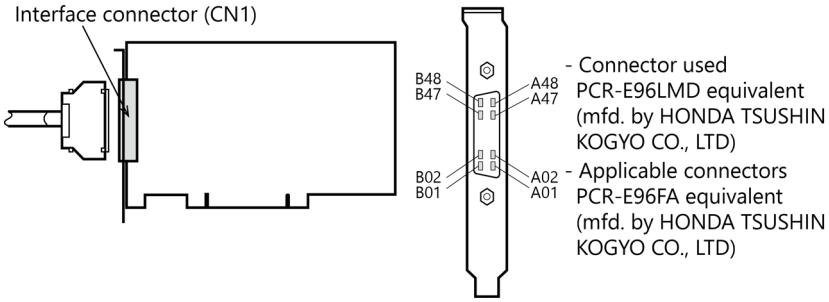
Connection

This section describes how to connect to an external device with a cable.

1.Connecting to an External Device

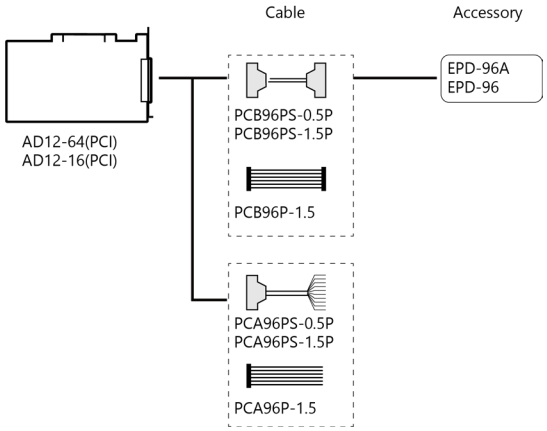
1. Connecting an Interface Connector

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



2. Adding Optional Products

Functions can be expanded by adding various dedicated optional products.

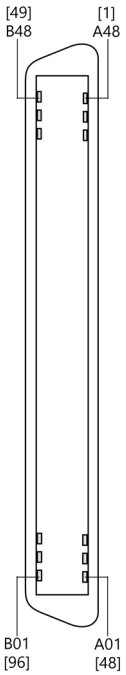


* Please refer to **"Optional Products (P10)"** for more information on the supported cable and accessories.

3. Signal Layout on the AD12-64(PCI) Interface Connector (CN1)

◆ Single-Ended Input

Analog Input 63	B48		A48	Analog Input 59
Analog Input 55	B47		A47	Analog Input 51
Analog Input 62	B46		A46	Analog Input 58
Analog Input 54	B45		A45	Analog Input 50
Analog Input 61	B44		A44	Analog Input 57
Analog Input 53	B43		A43	Analog Input 49
Analog Input 60	B42		A42	Analog Input 56
Analog Input 52	B41		A41	Analog Input 48
Analog Ground	B40		A40	Analog Ground
Analog Ground	B39		A39	Analog Ground
Analog Input 47	B38		A38	Analog Input 43
Analog Input 39	B37		A37	Analog Input 35
Analog Input 46	B36		A36	Analog Input 42
Analog Input 38	B35		A35	Analog Input 34
Analog Input 45	B34		A34	Analog Input 41
Analog Input 37	B33		A33	Analog Input 33
Analog Input 44	B32		A32	Analog Input 40
Analog Input 36	B31		A31	Analog Input 32
Analog Ground	B30		A30	Analog Ground
Analog Ground	B29		A29	Analog Ground
Analog Input 31	B28		A28	Analog Input 27
Analog Input 23	B27		A27	Analog Input 19
Analog Input 30	B26		A26	Analog Input 26
Analog Input 22	B25		A25	Analog Input 18
Analog Input 29	B24		A24	Analog Input 25
Analog Input 21	B23		A23	Analog Input 17
Analog Input 28	B22		A22	Analog Input 24
Analog Input 20	B21		A21	Analog Input 16
Analog Ground	B20		A20	Analog Ground
Analog Ground	B19		A19	Analog Ground
Analog Input 15	B18		A18	Analog Input 11
Analog Input 7	B17		A17	Analog Input 3
Analog Input 14	B16		A16	Analog Input 10
Analog Input 6	B15		A15	Analog Input 2
Analog Input 13	B14		A14	Analog Input 9
Analog Input 5	B13		A13	Analog Input 1
Analog Input 12	B12		A12	Analog Input 8
Analog Input 4	B11		A11	Analog Input 0
Analog Ground	B10		A10	Analog Ground
Analog Ground	B09		A09	Analog Ground
+5VDC from PC	B08		A08	External Sampling Clock Input
+5VDC from PC	B07		A07	Digital Ground
Sampling Busy Output	B06		A06	External Trigger Input
Timer Output	B05		A05	Digital Ground
Digital Output 3	B04		A04	Digital Input 3
Digital Output 2	B03		A03	Digital Input 2
Digital Output 1	B02		A02	Digital Input 1
Digital Output 0	B01		A01	Digital Input 0



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

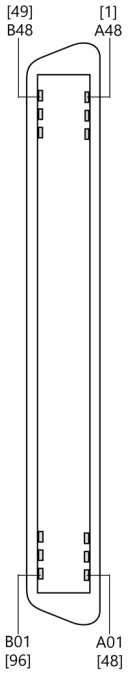
Signal name	Description
Analog Input 0 - Analog Input 63	Analog input signal at the time of single-ended input. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog input signals.
Digital Input 0 - Digital Input 3	Digital input signal.
Digital Output 0 - Digital Output 3	Digital output signal.
External Trigger Input	External trigger input signal.
External Sampling Clock Input	External sampling clock input signal.
Timer Output	Programmable timer output signal.
Sampling Busy Output	Output signal indicating that the board is performing AD conversion.
+5VDC from PC	Output +5V. The total current-carrying capacity that can be supplied from two pins is 1A.
Digital Ground	Digital ground common to those signals other than analog input signals, such as digital I/O signals and external sampling clock input signals, and "+5V DC from PC".

⚠ 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.

◆ Differential Input

Analog Input 31 [-]	B48		A48	Analog Input 27 [-]
Analog Input 31[+]	B47		A47	Analog Input 27 [+]
Analog Input 30 [-]	B46		A46	Analog Input 26 [-]
Analog Input 30[+]	B45		A45	Analog Input 26 [+]
Analog Input 29 [-]	B44		A44	Analog Input 25 [-]
Analog Input 29[+]	B43		A43	Analog Input 25 [+]
Analog Input 28 [-]	B42		A42	Analog Input 24 [-]
Analog Input 28[+]	B41		A41	Analog Input 24 [+]
Analog Ground	B40		A40	Analog Ground
Analog Ground	B39		A39	Analog Ground
Analog Input 23 [-]	B38		A38	Analog Input 19 [-]
Analog Input 23[+]	B37		A37	Analog Input 19 [+]
Analog Input 22 [-]	B36		A36	Analog Input 18 [-]
Analog Input 22[+]	B35		A35	Analog Input 18 [+]
Analog Input 21 [-]	B34		A34	Analog Input 17 [-]
Analog Input 21[+]	B33		A33	Analog Input 17 [+]
Analog Input 20 [-]	B32		A32	Analog Input 16 [-]
Analog Input 20[+]	B31		A31	Analog Input 16 [+]
Analog Ground	B30		A30	Analog Ground
Analog Ground	B29		A29	Analog Ground
Analog Input 15 [-]	B28		A28	Analog Input 11 [-]
Analog Input 15[+]	B27		A27	Analog Input 11 [+]
Analog Input 14 [-]	B26		A26	Analog Input 10 [-]
Analog Input 14[+]	B25		A25	Analog Input 10 [+]
Analog Input 13 [-]	B24		A24	Analog Input 9 [-]
Analog Input 13[+]	B23		A23	Analog Input 9 [+]
Analog Input 12 [-]	B22		A22	Analog Input 8 [-]
Analog Input 12[+]	B21		A21	Analog Input 8 [+]
Analog Ground	B20		A20	Analog Ground
Analog Ground	B19		A19	Analog Ground
Analog Input 7 [-]	B18		A18	Analog Input 3 [-]
Analog Input 7[+]	B17		A17	Analog Input 3 [+]
Analog Input 6 [-]	B16		A16	Analog Input 2 [-]
Analog Input 6[+]	B15		A15	Analog Input 2 [+]
Analog Input 5 [-]	B14		A14	Analog Input 1 [-]
Analog Input 5[+]	B13		A13	Analog Input 1 [+]
Analog Input 4 [-]	B12		A12	Analog Input 0 [-]
Analog Input 4[+]	B11		A11	Analog Input 0 [+]
Analog Ground	B10		A10	Analog Ground
Analog Ground	B09		A09	Analog Ground
+5VDC from PC	B08		A08	External Sampling Clock Input
+5VDC from PC	B07		A07	Digital Ground
Sampling Busy Output	B06		A06	External Trigger Input
Timer Output	B05		A05	Digital Ground
Digital Output 3	B04		A04	Digital Input 3
Digital Output 2	B03		A03	Digital Input 2
Digital Output 1	B02		A02	Digital Input 1
Digital Output 0	B01		A01	Digital Input 0



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

Signal name	Description
Analog Input 0[+] - Analog Input 31[+]	Analog input signal at the time of differential input. The numbers correspond to channel numbers.
Analog Input 0[-] - Analog Input 31[-]	Analog input signal at the time of differential input. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog input signals.
Digital Input 0 - Digital Input 3	Digital input signal.
Digital Output 0 - Digital Output 3	Digital output signal.
External Trigger Input	External trigger input signal.
External Sampling Clock Input	External sampling clock input signal.
Timer Output	Programmable timer output signal.
Sampling Busy Output	Output signal indicating that the board is performing AD conversion.
+5VDC from PC	Output +5V. The total current-carrying capacity that can be supplied from two pins is 1A
Digital Ground	Digital ground common to those signals other than analog input signals, such as digital I/O signals and external sampling clock input signals, and "+5V DC from PC".

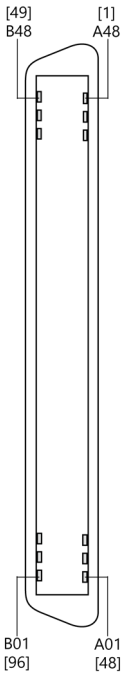
⚠ CAUTION

- 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.

4. Signal Layout on the AD12-16(PCI) Interface Connector (CN1)

◆ Single-Ended Input

N.C.	B48		A48	N.C.
N.C.	B47		A47	N.C.
N.C.	B46		A46	N.C.
N.C.	B45		A45	N.C.
N.C.	B44		A44	N.C.
N.C.	B43		A43	N.C.
N.C.	B42		A42	N.C.
N.C.	B41		A41	N.C.
Analog Ground	B40		A40	Analog Ground
Analog Ground	B39		A39	Analog Ground
N.C.	B38		A38	N.C.
N.C.	B37		A37	N.C.
N.C.	B36		A36	N.C.
N.C.	B35		A35	N.C.
N.C.	B34		A34	N.C.
N.C.	B33		A33	N.C.
N.C.	B32		A32	N.C.
N.C.	B31		A31	N.C.
Analog Ground	B30		A30	Analog Ground
Analog Ground	B29		A29	Analog Ground
N.C.	B28		A28	N.C.
N.C.	B27		A27	N.C.
N.C.	B26		A26	N.C.
N.C.	B25		A25	N.C.
N.C.	B24		A24	N.C.
N.C.	B23		A23	N.C.
N.C.	B22		A22	N.C.
N.C.	B21		A21	N.C.
Analog Ground	B20		A20	Analog Ground
Analog Ground	B19		A19	Analog Ground
Analog Input 15	B18		A18	Analog Input 11
Analog Input 7	B17		A17	Analog Input 3
Analog Input 14	B16		A16	Analog Input 10
Analog Input 6	B15		A15	Analog Input 2
Analog Input 13	B14		A14	Analog Input 9
Analog Input 5	B13		A13	Analog Input 1
Analog Input 12	B12		A12	Analog Input 8
Analog Input 4	B11		A11	Analog Input 0
Analog Ground	B10		A10	Analog Ground
Analog Ground	B09		A09	Analog Ground
+5VDC from PC	B08		A08	External Sampling Clock Input
+5VDC from PC	B07		A07	Digital Ground
Sampling Busy Output	B06		A06	External Trigger Input
Timer Output	B05		A05	Digital Ground
Digital Output 3	B04		A04	Digital Input 3
Digital Output 2	B03		A03	Digital Input 2
Digital Output 1	B02		A02	Digital Input 1
Digital Output 0	B01		A01	Digital Input 0



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

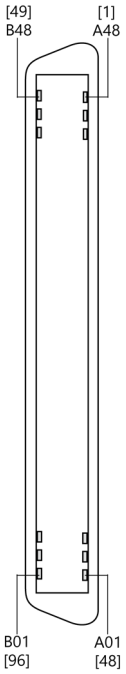
Signal name	Description
Analog Input 0 - Analog Input 15	Analog input signal at the time of single-ended input. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog input signals.
Digital Input 0 - Digital Input 3	Digital input signal.
Digital Output 0 - Digital Output 3	Digital output signal.
External Trigger Input	External trigger input signal.
External Sampling Clock Input	External sampling clock input signal.
Timer Output	Programmable timer output signal.
Sampling Busy Output	Output signal indicating that the board is performing AD conversion.
+5VDC from PC	Output +5V. The total current-carrying capacity that can be supplied from two pins is 1A.
Digital Ground	Digital ground common to those signals other than analog input signals, such as digital I/O signals and external sampling clock input signals, and "+5V DC from PC".
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.

◆ Differential Input

N.C.	B48		A48	N.C.
N.C.	B47		A47	N.C.
N.C.	B46		A46	N.C.
N.C.	B45		A45	N.C.
N.C.	B44		A44	N.C.
N.C.	B43		A43	N.C.
N.C.	B42		A42	N.C.
N.C.	B41		A41	N.C.
Analog Ground	B40		A40	Analog Ground
Analog Ground	B39		A39	Analog Ground
N.C.	B38		A38	N.C.
N.C.	B37		A37	N.C.
N.C.	B36		A36	N.C.
N.C.	B35		A35	N.C.
N.C.	B34		A34	N.C.
N.C.	B33		A33	N.C.
N.C.	B32		A32	N.C.
N.C.	B31		A31	N.C.
Analog Ground	B30		A30	Analog Ground
Analog Ground	B29		A29	Analog Ground
N.C.	B28		A28	N.C.
N.C.	B27		A27	N.C.
N.C.	B26		A26	N.C.
N.C.	B25		A25	N.C.
N.C.	B24		A24	N.C.
N.C.	B23		A23	N.C.
N.C.	B22		A22	N.C.
N.C.	B21		A21	N.C.
Analog Ground	B20		A20	Analog Ground
Analog Ground	B19		A19	Analog Ground
Analog Input 7 [-]	B18		A18	Analog Input 3 [-]
Analog Input 7[+]	B17		A17	Analog Input 3 [+]
Analog Input 6 [-]	B16		A16	Analog Input 2 [-]
Analog Input 6[+]	B15		A15	Analog Input 2 [+]
Analog Input 5 [-]	B14		A14	Analog Input 1 [-]
Analog Input 5[+]	B13		A13	Analog Input 1 [+]
Analog Input 4 [-]	B12		A12	Analog Input 0 [-]
Analog Input 4[+]	B11		A11	Analog Input 0 [+]
Analog Ground	B10		A10	Analog Ground
Analog Ground	B09		A09	Analog Ground
+5VDC from PC	B08		A08	External Sampling Clock Input
+5VDC from PC	B07		A07	Digital Ground
Sampling Busy Output	B06		A06	External Trigger Input
Timer Output	B05		A05	Digital Ground
Digital Output 3	B04		A04	Digital Input3
Digital Output 2	B03		A03	Digital Input2
Digital Output 1	B02		A02	Digital Input1
Digital Output 0	B01		A01	Digital Input0



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

Signal name	Description
Analog Input 0[+] - Analog Input 7[+]	Analog input signal at the time of differential input. The numbers correspond to channel numbers.
Analog Input 0[-] - Analog Input 7[-]	Analog input signal at the time of differential input. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog input signals.
Digital Input 0 - Digital Input 3	Digital input signal.
Digital Output 0 - Digital Output 3	Digital output signal.
External Trigger Input	External trigger input signal.
External Sampling Clock Input	External sampling clock input signal.
Timer Output	Programmable timer output signal.
Sampling Busy Output	Output signal indicating that the board is performing AD conversion.
+5VDC from PC	Output +5V. The total current-carrying capacity that can be supplied from two pins is 1A
Digital Ground	Digital ground common to those signals other than analog input signals, such as digital I/O signals and external sampling clock input signals, and "+5V DC from PC".
N.C.	No connection to this pin.

⚠ CAUTION

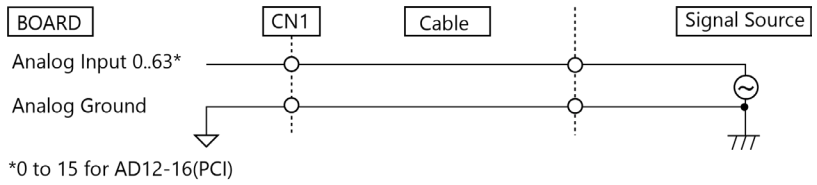
- Do not connect any of the outputs and power outputs to the analog or digital ground. Neither connect outputs to each other. Doing either can result in a fault.
- If analog and digital ground are shorted together, noise on the digital signals may affect the analog signals. Accordingly, analog and digital ground should be separated.

2.Connecting Analog Input Signal

1. Single-ended Input

Single-ended Input Connection (Flat Cable)

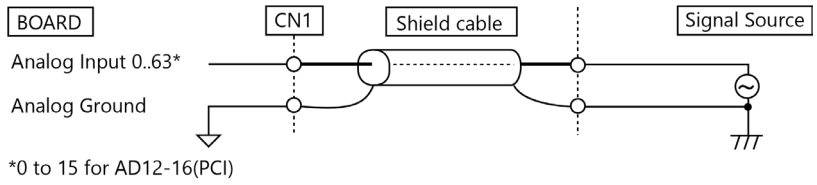
The following figure shows an example of flat cable connection. Each signal source is connected to one analog input channel and the signal common to analog ground pin of CN1.



Single-ended Input Connection (Shielded Cable)

The following figure shows an example of shielded cable connection. When the distance between the signal source and the product is long or you want to increase the noise tolerance, a shield cable is suggested.

Connect the signal by the core wire and common signal by the shield braids.



⚠ CAUTION

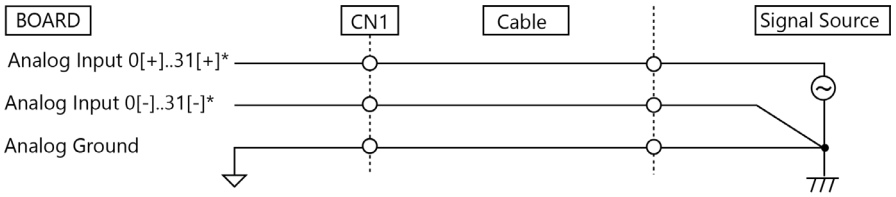
- When a frequency of 1MHz or higher is contained in the source signal, the cross talk between channels may occur.
- If the product and the signal source receive noise or the distance between the product and the signal source is too long, data may not be input properly.
- An input analog signal should not exceed the maximum input voltage (relate to the product analog ground). If it exceeds the maximum voltage, the product may be damaged.
- Connect all the unused analog input channels to analog ground.

2. Differential Input

Differential Input Connection (Flat Cable)

The following figure shows an example of flat cable connection.

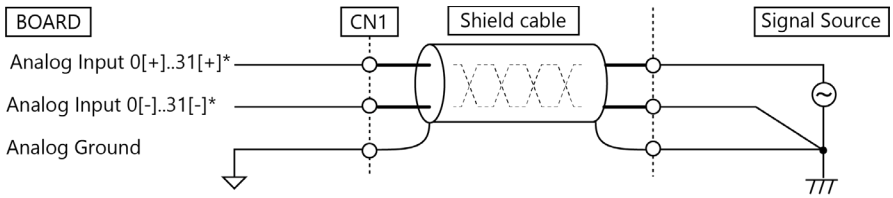
Each signal source is connected to a [+] pin of analog input channel and the signal common of this source to the [-] pin of this input channel of CN1. In addition, the signal common must be connected to the pin of the analog ground of CN1 by a third wire.



*0[+] to 7[+] and 0[-] to 7[-] for AD12-16(PCI), respectively.

Differential Input Connection (Shielded Cable)

The following figure shows an example of shielded cable connection. When the distance between the signal source and the product is long or you want to increase the noise tolerance, a shield cable connection is preferred. Each signal source is connected to a [+] pin of analog input channel and the signal common of this source to the [-] pin of this input channel of CN1. In addition, the signal common must be connected to the pin of the analog ground of CN1 by the shielded braids.



*0[+] to 7[+] and 0[-] to 7[-] for AD12-16(PCI), respectively.

⚠ CAUTION

- When a frequency of 1MHz or higher is contained in the source signal, the cross talk between channels may occur.
- The input data would be uncertain if the analog ground is not connected.
- If the product and the signal source receive noise or the distance between the product and the signal source is too long, data may not be input properly.
- The input voltage from the [+] input or [-] input should not exceed the maximum input voltage (based on the product analog ground). If it exceeds the maximum voltage, the product may be damaged.
- Because the input data will be uncertain if the [+] pin or the [-] pin of CN1 is not connected, all the unused input pins of CN1 should be connected to the analog ground, AGND.

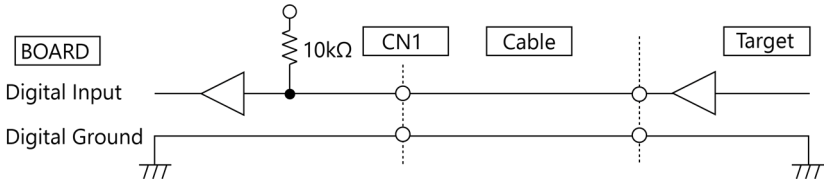
3.Connecting Digital I/O Signals

This section shows how to connect the digital I/O signal and control signal ("External Sampling Clock Input", "External Trigger Input" and so on) by using a flat cable.

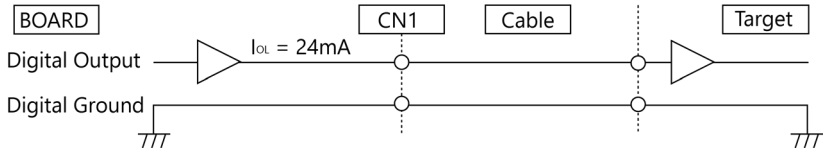
Connect CN1 to the external device by using the optional flat cable (PCA96P-1.5).

All the digital I/O signals and control signals are TTL level signals.

Connecting the Digital Input



Connecting the Digital Output



⚠ CAUTION

Do not short the outputs to analog or digital ground. In addition, do not connect two outputs together. Doing either can result in a fault.

Reference

For the operation timings for control signal input, see "**Control Signal Timings (page57)**".

Function

This section describes the features achieved by combining hardware and device driver functions. These features can be implemented by calling the API functions provided by the device driver. For the functions and the features to use, refer to the help for the device driver.

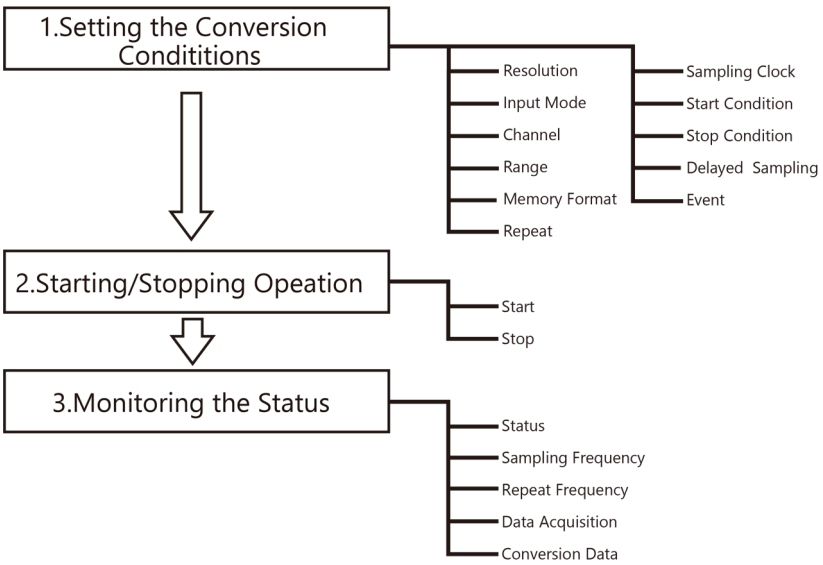
1.Analog Input Function

The analog input function makes it possible to acquire analog signals by converting the signals into digital data according to the resolution.

In this product, sampling refers to the acquisition of continuously converted data at a precise frequency using the device's internal hardware clock.

You can set a variety of conditions for analog input, including the input channel, sampling period, and sampling start/stop conditions.

Analog input processes are classified as follows:



1. Setting the Conversion Conditions

First, set the conditions for executing analog input.

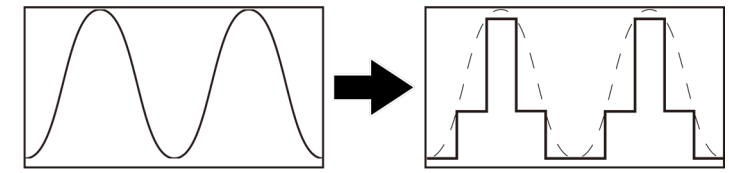
◆ Resolution

"Resolution" signifies the number of bits used by an analog input device to represent analog signals. The higher the resolution, the more finely the voltage range is segmented, allowing the device to convert analog values to digital equivalents more precisely.

A device with a resolution of 12-bit divides the range width into 4096 segments.

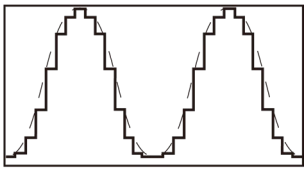
When the device covers the range of 0 - 10V, the minimum unit of converted voltages is 10÷4096 ≈ 2.44mV.

If the device has a resolution of 16-bit, it is 10÷65536 ≈ 0.153mV instead.



Analog Voltage before Conversion

Low Resolution Unite



High Resolution Unite

* AD12-64(PCI) : The resolution is 12bit. (Resolution cannot be changed)
* AD12-16(PCI) : The resolution is 12bit. (Resolution cannot be changed)

◆ Input Mode

"Input Mode" indicates the method of connecting analog input signals.

The input modes available are single-ended input and differential input.

The single-ended input mode is suitable for the environment in which the potential difference between the signal source and ground and noise components can be ignored. For the environment in which they cannot be ignored, the differential input mode is suitable.

The number of channels available in differential input mode is half that in single-ended input mode.

The input mode is set by device driver functions on this product.

◆ Channel

"Channel" represents each point of analog input.

For channel numbers, see **"Signal Layout on the AD12-64(PCI) Interface Connector (CN1)(Page26)"**.

You can specify an arbitrary number of points of analog input by setting the number of channels by means of device driver functions.

◆ Range

"Range" means the range of analog signals at which analog input can be performed.

The analog signal range is set by device driver functions.

◆ Memory Format

Device's or driver's input data storage memory is used to enable advanced analog input processing at high speed. For the memory, the FIFO or ring format can be selected by means of device driver functions.

FIFO (First In First Out) format

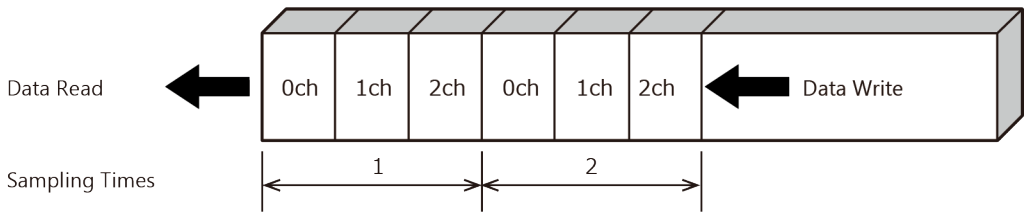
In the FIFO format, conversion data are read from device buffer in the same order in which they were written to the device buffer.

FIFO memory is used to acquire all conversion data.

Writing conversion data to the device buffer always follows the latest data, and reading data from the device buffer always starts with the oldest data.

Statuses are provided for monitoring for certain conditions, such as when a certain number of conversion data entries is stored in the device buffer or when the device buffer is full and conversion data cannot be stored.

A function to notify the application is also provided. For details, refer to the help for the device driver you will use.



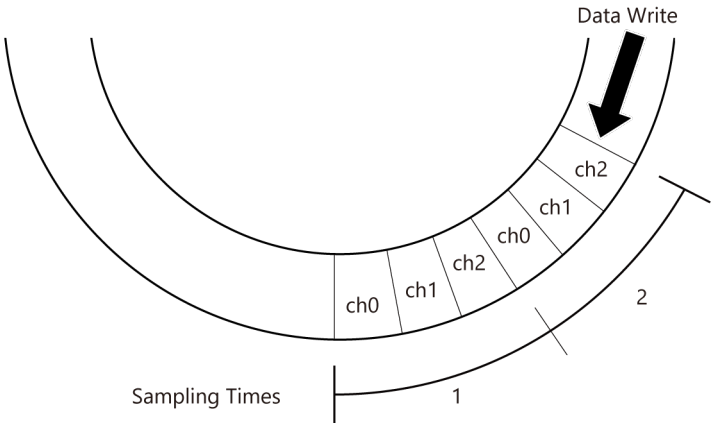
RING format

In the RING format, the device buffer is arranged in a ring shape.

Use RING memory when data is not acquired under normal conditions and conversion data is acquired in the vicinity of where an analog input has stopped due to some event.

Conversion data is written sequentially from the beginning of the device buffer. When storing data that exceeds the upper limit of the device buffer capacity, the data is overwritten in the area where the previous conversion data is stored.

Statuses are provided for monitoring for certain conditions, such as when data is written to a certain location in the device buffer. A function to notify the application is also provided. For details, refer to the help for the device driver you will use.



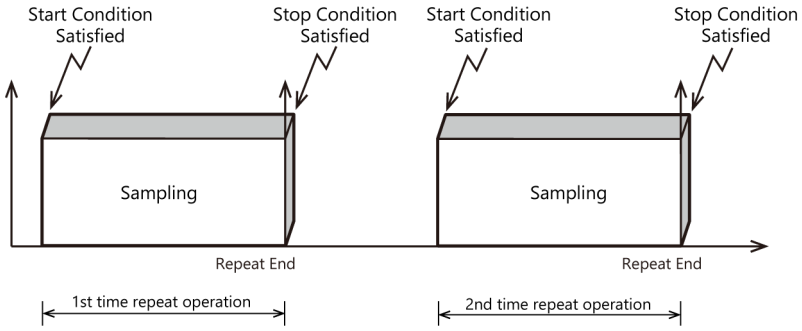
◆ Repeat

The Repeat function repeats sampling from the time the sampling start condition is satisfied until the sampling stop condition, including the delayed sampling condition, is satisfied.

The number of repetitions is set by the device driver function and sampling is repeated the set number of times. It is also possible to set an infinite number of repetitions.

During infinite repetition, the device driver function will stop the operation.

Statuses are provided for monitoring for the repeat conditions. A function to notify the application is also provided. For details, refer to the help for the device driver you will use.



◆ Sampling Clock

The sampling clock controls the sampling frequency. You can select either the internal sampling clock, external sampling clock.

The sampling clock is selected by means of device driver functions.

Internal sampling clock

The clock signal from the on-board clock generator is used.

External sampling clock

The edge of the digital signal input from an external device is used for the sampling clock.

◆ Start Condition

The condition for controlling the start of sampling can be selected from among software, level comparison of converted data and an external trigger. The conditions for controlling the start and stop of sampling are completely independent of each other; they can be set separately.

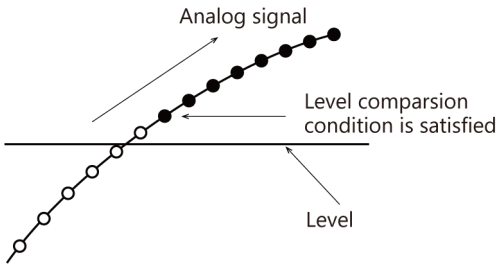
Software

Sampling and acquisition of conversion data begin immediately after the device driver's start function is executed.

Level Comparison

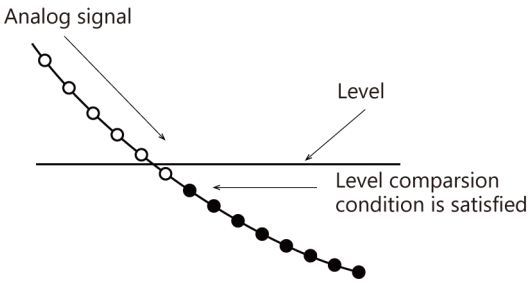
When the device driver's start function is executed, the product compares the analog signal input through a specified channel to the value of the preset comparison level. If the analog signal satisfies the condition, the conversion data is acquired.

Level comparison conditions are set as two conditions: level and direction.



The figure above shows that the level comparison condition is satisfied in the rising direction.

The start condition is satisfied when the analog signal at the specified channel passes the comparison level in the rising direction. Conversion data are stored to memory, starting with those at solid dots.



The figure above shows that the level comparison condition is satisfied in the falling direction.

The start condition is satisfied when the analog signal at the specified channel passes the comparison level in the falling direction. Conversion data are stored to memory, starting with those at solid dots.

If you set the level comparison directions to both directions, the start condition is satisfied when the analog signal passes the level both in the rising and falling directions.

External trigger

Immediately after the device driver's start function is executed, the product enters standby mode and waits for an external control signal.

Sampling and conversion data transfer to memory start when the specified edge (rising edge or falling edge) is input from the external control signal.

◆ Stop Condition

The conditions for stopping sampling can be selected from the last sampling count, conversion data level comparison, in-range comparison, out-range comparison, external trigger, and software abort.

Sampling stops when an error occurs or when the device driver's stop function is executed, regardless of the stop condition settings.

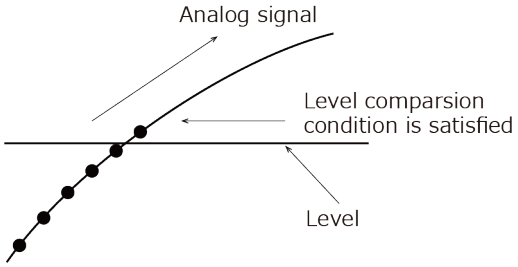
Last sampling count

The product stops sampling after storing conversion data to memory for the specified number of times of sampling.

Level comparison

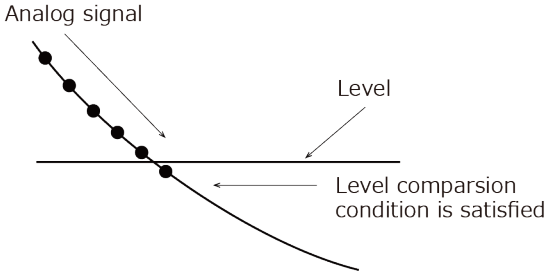
Once the product has started sampling, it compares the analog signal input through a specified channel to the value of the preset comparison level. If the analog signal satisfies the condition, the product stops sampling.

Level comparison conditions are set as two conditions: level and direction.



The figure above shows that the level comparison condition is satisfied in the rising direction.

The start condition is satisfied when the analog signal at the specified channel passes the comparison level in the rising direction. Conversion data items are stored to memory, starting with those at solid dots.



The figure above shows that the level comparison condition is satisfied in the falling direction.

The start condition is satisfied when the analog signal at the specified channel passes the comparison level in the falling direction. Conversion data items are stored to memory, starting with those at solid dots.

If you set the level comparison directions to both directions, the start condition is satisfied when the analog signal passes the level both in the rising and falling directions.

External trigger

In the external trigger setting, sampling stops when the specified edge (rising edge or falling edge) is input from the external control signal.

Software

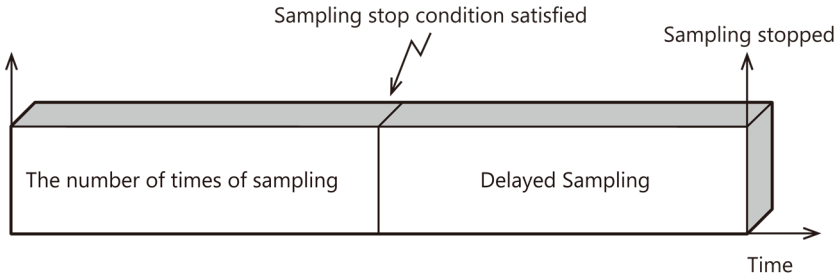
Sampling continues indefinitely in this mode. Sampling only stops in response to execution of device driver functions or an error.

◆ Delayed Sampling

Delayed sampling is performed after the sampling stop condition is satisfied.

When a sampling stop condition other than software abort by the device driver's stop function is satisfied, the product performs delayed sampling the specified number of times to acquire conversion data.

If you set the number of times of delayed sampling to 0, this product stops sampling the moment the sampling stop condition is satisfied.



◆ Event

"Event" works as a function for reporting the occurrence of a certain device state to the application.

For details of event, refer to the help for the device driver you will use.

2. Starting/Stopping Operation

Sampling is started by the device driver function.

When the function is executed, sampling starts based on the start condition.

Once the product has started sampling, sampling can be stopped when the set stop condition is satisfied or by executing the device driver's stop function.

3. Monitoring the Status and Acquiring Data

Software commands are used to monitor the operation status of the device and to acquire conversion data from memory. Status monitoring and data acquisition can be performed even during sampling.

The device can also be reset in addition to checking the status and acquiring the conversion data.

For details of status and reset, refer to the help for the device driver you will use.

◆ Sampling Frequency

The frequency of samplings of conversion data stored in device buffer can be obtained by the device driver function. This device driver function can only be used in "Device buffer mode".

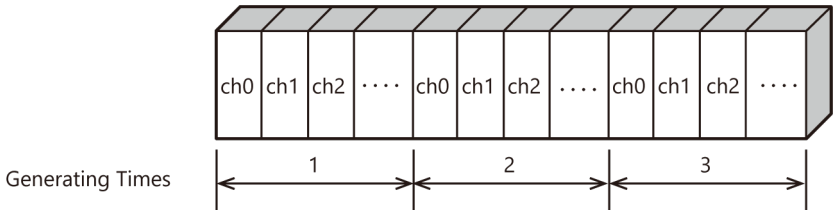
◆ Repeat Frequency

The current repeat count can be obtained by the device driver function.

◆ Data Acquisition

The conversion data stored in device buffer memory can be retrieved using device driver function.

The figure below shows the correspondence between the sampling count and the conversion channel for the conversion data stored in device buffer memory.



Conversion data is acquired differently depending on the memory format used.

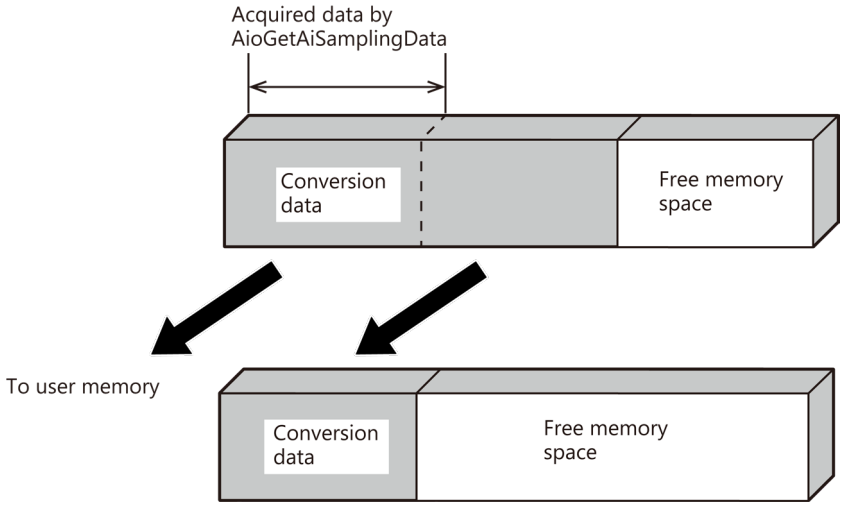
Data Acquisition in FIFO format

When FIFO memory is used, the oldest data read from device buffer is always read first.

The following sketch shows an image of data acquisition in FIFO format.

When data is acquired from the memory, the free device buffer space increases by that data size. When data is acquired next, the oldest one of the existing data items is taken from the memory in the same way.

The FIFO memory deletes data from device buffer once that data is acquired.



Data Acquisition in RING format

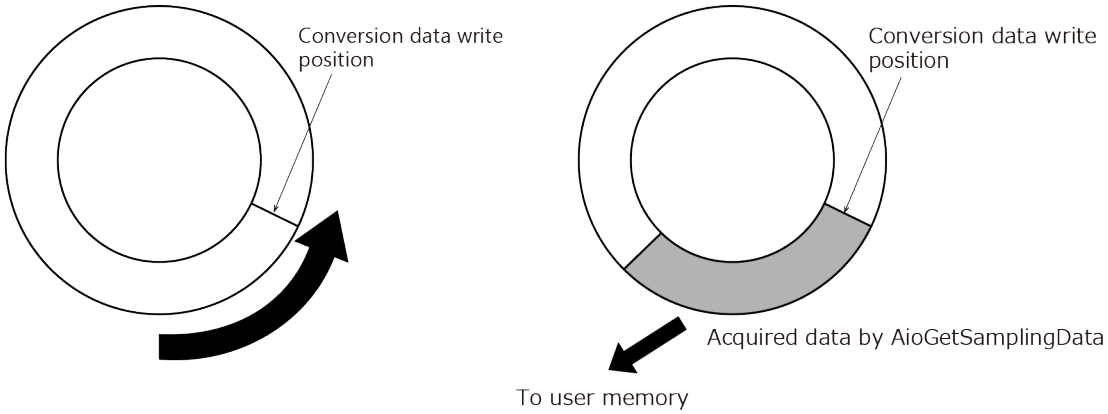
When RING memory is used, the data read from the device buffer is always based on the current conversion data write position.

The following sketch shows an image of data acquisition in ring format.

The sampling count obtained is always the number of times of sampling for up to the latest data (shaded portion below).

The larger the number of sampling data to be acquired, the older the data item acquired first.

As the ring memory retains data even in device buffer after that data is acquired, you can fetch the same data any number of times.



◆ Conversion data

The following equation represents the relation between conversion data and voltage.

Voltage or Current = Conversion data x (Max. range value - Min. range value) ÷ Resolution + Min. range value

The value of resolution for the 12-bit device is 4096; that for the 16-bit device is 65536.

< ±10V range >

The following tables show the relationship between AD conversion data and voltage.

Voltage	Conversion data (12-bit)
+9.995V	4095
:	:
+0.005V	2049
0V	2048
-0.005V	2047
:	:
-10.000V	0

Voltage	Conversion data (16-bit)
+9.99970V	65535
:	:
0.00030V	32769
0V	32768
-0.00030V	32767
:	:
-10.000V	0

Ex.: When conversion data 3072 is input at a resolution of 12-bit in the ±10V range

Voltage = 3072 x (10 - (-10)) ÷ 4096 + (-10)

= 5.0 (V)

2.Digital Input Function

1. Input bit

Individual digital input points are called input bits.
When the number of input points of a device is 8, the bits are determined as bit 0 - bit 7.

	Bit 3	Bit 2	Bit 1	Bit 0

2. Input in Bits

The state 1 (ON) or 0 (OFF) of each input bit can be obtained by specifying the bits.

3. Input in Bytes

Individual input bits can be input in byte units. When the number of input points of the device is 8, the individual input bits are arranged as shown below and the byte data to be input is a value between 0 and 255 depending on the states of the bits.

EX. Input of Bit 3 (OFF), Bit 2 (ON), Bit 1 (OFF), Bit 0 (ON)
Byte data = 5(5H)

	Bit 3	Bit 2	Bit 1	Bit 0
	0 (OFF)	1 (ON)	0 (OFF)	1 (ON)

3.Digital Output Function

1. Output bit

Individual digital output points are called output bits.
When the number of output points of a device is 8, the bits are determined as bit 0 - bit 7.

	Bit 3	Bit 2	Bit 1	Bit 0

2. Output in Bits

The state of each output bit can be changed to ON or OFF by specifying the bits and setting it to 1 or 0.

3. Output in Bytes

Individual output bits can be output in byte units. When the number of output points of a device is 8, the individual output bits are arranged as shown below and byte data to be output is a value between 0 and 255.

Ex. Output of Bit 3 (ON), Bit 2 (OFF), Bit 1 (ON), Bit 0 (OFF)
Byte data = 10 (AH)

	Bit 3	Bit 2	Bit 1	Bit 0
	1 (ON)	0 (OFF)	1 (ON)	0 (OFF)

Appendix

This section lists the specifications and the physical dimensions of the product.

1.Hardware Specification

Function Specifications(1/2)

Item		AD12-64(PCI)	AD12-16(PCI)
Analog input			
	Isolated specification	Un-Isolated	
	Input type	Single-Ended Input or Differential Input	
	Number of input channels	64 channels (Single-Ended Input) 32 channels (Differential Input)	16 channels (Single-Ended Input) 8 channels (Differential Input)
	Input range	Bipolar ±10V, ±5V, ±2.5V, ±1.25V, or Unipolar 0 - +10V, 0 - +5V, 0 - +2.5V, 0 - +1.25V (Software setup per channel)	
	Absolute max. input voltage	±15V	
	Input impedance	1MΩ or more	
	Resolution	12bit	
	Non-Linearity error *1	±2LSB(±10V, ±5V, 0 - 10V, 0 - 5V) ±4LSB(±2.5V, ±1.25V, 0 - 2.5V) ±8LSB(0 - 1.25V)	
	Conversion speed	10µsec [100KSPS]*2 /ch (Max.)	
	Sampling clock	Internal sampling clock: 10,000 - 1,073,741,824,000nsec (Settable in 250 nsec) External sampling clock: TTL level falling edge	
Digital I/O			
	Number of input channels	Un-Isolated input 4ch (TTL level, positive logic)	
	Number of output channels	Un-Isolated output 4ch (TTL level, positive logic)	
Programmable timer			
	Setting period	500 - 1,073,741,824,000nsec (Settable in 250 nsec)	
	Status	Count up, Count up over run	
	Timer output signal	TTL level 250nsec Low pulse	
External trigger input			
	External trigger input signal	Un-Isolated input 1ch (TTL level falling edge)	
	Status	Trigger input, Trigger input overrun	

Function Specifications(2/2)

Item	AD12-64(PCI)	AD12-16(PCI)
Common section		
I/O address	32 ports boundary	
Interrupt level	Errors and various factors, One interrupt request line as INTA	
Current consumption	+5VDC 700mA (Max.) *3	
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)	
Bus specification	32bit, 33MHz, Universal key shapes supported *4*5	
Physical dimensions (mm)	176.41(L) x 105.68(H) *6	
Weight	150g	

*1 A linearity error approximately 0.1% of full-range may occur when operated at 0ºC or 50ºC ambient temperature

*2 SPS = Samplings Per Second. The number of data that can be converted in one second is shown.

*3 If an external device requires this AD12-64(PCI), AD12-16(PCI) product to supply +5VDC from the CN1 or CN2 connectors, the power consumption of this product will be bigger than what this specification has defined.

*4 This product requires +5V power supply from expansion slots (it does not operate in the environment of only +3.3V power supply).

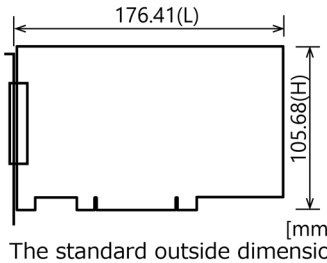
*5 AD12-64(PCI): If the board No. is No.7149A, PCI bus specification is 32bit, 33MHz, 5V.
AD12-16(PCI): If the board No. is No.7150, PCI bus specification is 32bit, 33MHz, 5V.

*6 Boards with different board numbers are different in these specifications. See "Different in the specification (page59)" at the end of this document.

Installation Environment Requirements

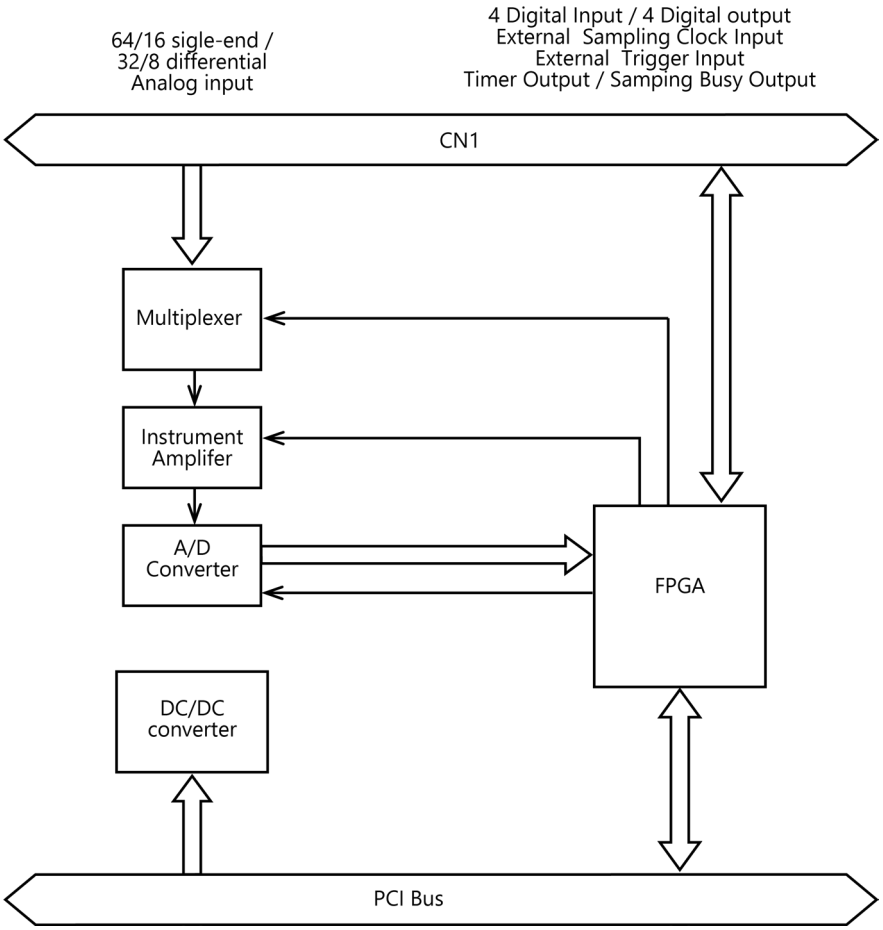
Item	Description
Operating ambient temperature	0 - 50°C
Operating ambient humidity	10 - 90%RH (No condensation)
Floating dust particles	Not to be excessive
Corrosive gases	None
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA, KC

2.Physical Dimensions



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

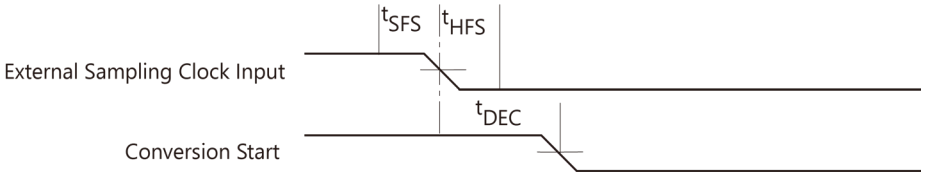
3.Circuit Block Diagram



4.Control Signal Timings

Figures and a Table below show the control signal timings for the analog input function.

Timing for External Sampling Clock



Control Signal Timings

Parameter	Symbol	Time	Unit
External sampling clock signal falling setup time	tSFS	100	nsec
External sampling clock signal falling hold time	tHFS	100	nsec
Delay from the fall of external sampling clock signal to the AD conversion start pulse of the first channel	tDEC	100	nsec

⚠ CAUTION

The times listed in Table above are for standard operating conditions.

5.About Adjustment

This product is adjusted before shipment.

Contact your retailer if this product does not provide its prescribed performance.

6.Different by board number

The AD12-64(PCI), and AD12-16(PCI) are different in specifications, depending on the board number as listed below.

◆ Different in the specification

AD12-64(PCI)

Board No.	No.7149A	No.7149B	No.7149D
Physical dimensions (mm)	176.41(L) x 106.68(H)	176.41(L) x 106.68(H)	176.41(L) x 105.68(H)

AD12-16(PCI)

Board No.	No.7150	No.7150A	No.7150C
Physical dimensions (mm)	176.41(L) x 106.68(H)	176.41(L) x 106.68(H)	176.41(L) x 105.68(H)

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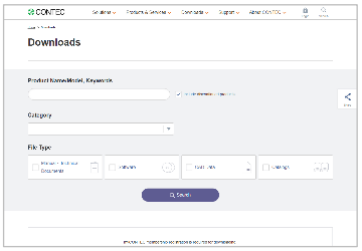
Download

https://www.contec.com/download/

You can download updated device driver, firmware, and differential manuals in several languages. Membership registration (myCONTEC) is required to use the services.



Revision History

MONTH YEAR	Summary of Changes
November 1999	The First Edition.
April 2024	Changed the layout of the manual.

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AD12-64(PCI), AD12-16(PCI) Reference Manual

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