

Isolated high precision analog input module
for USB2.0

ADI16-4(USB)



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

Features

Conversion speed voltage : 10μsec/ch+20μsec, current : 40μsec/ch+20μsec, 16 bit resolution, differential input 4ch

This product includes analog inputs (voltage : 10μsec/ch+20μsec, current : 40μsec/ch+20μsec, 16 bit resolution, differential input 4ch). Compatible to USB1.1/USB2.0 and capable to achieve high speed transfer at HighSpeed (480 Mbps). The voltage or current output range can be set independently for each channel (voltage : +/-10V, current : 0 - 20mA). The range is set by software and switch.

Isolated from the bus by a digital isolator

This product is isolated by a digital isolator which improves the noise performance with respect to the PC.

Equipped with the buffer memory (256K data) which can be used in either FIFO or ring format

This product includes buffer memory (256K data for analog input) which can be used in either FIFO or ring format. You can perform analog input in the background, independent of software and the current status of the PC.

Windows compatible driver libraries are attached.

Using the attached driver library API-USBP(WDM) makes it possible to create applications of Windows. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

Sampling can be driven by a clock or by various triggers

Sampling can be started and stopped by software and level comparison (compares the level of a specified channel with a specified compare level value) triggers. The sampling period can be controlled by the internal clock (high-precision timer included on the board).

Easy to increase the input channels using an expansion module

Adding optional modules (up to 3 units) can easily increase the input channels. The unique structure for connection by stacking enables easy and compact system configuration.

Capable of being mounted on 35-mm DIN rails

This product is equipped with an attachment for mounting on 35-mm DIN rails on the back, allowing the module to be attached onto and detached from DIN rails.

LabVIEW is supported by a plug-in of dedicated library

Using the dedicated library makes it possible to create each application for LabVIEW.

This product is a USB2.0 compatible terminal module that extends the analog input function of USB port of PCs. This product features 4ch 16-bit analog input and is isolated from the bus line to the PC. The signal lines can be connected directly to the terminals on this product. To simplify use in embedded applications, this product includes a bracket for attaching to a 35mm DIN rail. The number of input channels can be increased by purchasing an optional device module. Windows driver is bundled with this product.

Specification

Hardware Specification

Item	Specification
Analog input	
Input format	Bus-isolated voltage / current input
Input range	Voltage: Bipolar ±10V Current: 0 - 20mA
Maximum input rating	Voltage: ±20V Current: 30mA
Input impedance	Voltage: 1MΩ (Min.) Current: 250Ω (Typ.)
Input channel	Differential input 4 channels
Resolution	16 bits
Non-linear error	Voltage: ±8LSB(±0.012% of FSR) *1 Current: ±20LSB(±0.030% of FSR) *1
Conversion rate	Voltage: 10μsec/ch +20μsec *2 Current: 40μsec/ch +20μsec *2
Data buffer	256K data (262,144 data)
Internal sampling timer	10μsec - 1,073,741,824μsec *3
Communication	
USB transmission speed	12Mbps(full speed), 480Mbps(high speed) *4
Current consumption	+5VDC 600mA (Max.) *5
Others	
Number of modules used at the same time	127 modules (Max.) *6
Use condition	0 - 50°C, 10 - 90%RH(No condensation)
Physical dimensions (mm)	50.4(W) x 64.7(D) x 94.0(H) (exclusive of protrusions)
Weight of the module itself	100g
Module installation method	One-touch connection to 35mm DIN rails (standard connection mechanism provided in the system)
Expansion module	ADI16-4(FIT)GY : 3 modules (Max.), Current consumption per one module : +5VDC 300mA(Max.)
Connectors	FRONT-MC1,5/12-STF-3,81(made by PHOENIX CONTACT) 3.81mm-pitch nominal current: 4A(Max.)
Applicable wire	AWG28 - 16
Bundled AC adapter (POA200-20)	90 - 264VAC 5.0VDC±5% 2.0A (Max.) Length of cable is about 1.5m. Length of AC cable is about 1.5m.

*1 For this product, as the analog signal is input to A/D converter without being processed in order not make the frequency characteristics to deteriorate, if the connection cable is affected by noise, correct analog input may not be achieved.

*2 Converting speed of A/D converter. The minimum executable sampling period is depending on internal processing time and is about 200msec (using one channel) - 1msec (using 16 channels). (Measured values: The period may be longer due to factors such as the load on the USB link.)

*3 It takes the unit of 1000msec (1000msec, 2000msec, 3000msec,...) when expansion module being used.

*4 USB module executes API function by USB communication. The executing time of API function by USB communication is about several msec in practice (Depending on the contents handled by API function, it may be longer than that). The responding speed of USB module is based on the environment of the host PC being used.

*5 Always use the supplied AC adapter or power supply unit (option).

*6 The USB interface can accommodate up to 127 devices on the bus. As a USB hub itself is counted as one device, however, 127 USB modules cannot be connected together.

Windows Driver Specification

Item	Specification
Support OS	Microsoft Windows 98 or Second Edition Microsoft Windows Me Microsoft Windows 2000 Professional Microsoft Windows XP Professional, Home Edition Microsoft Windows Vista
Support language	Microsoft Visual C++ Ver 5.0, Ver 6.0 Microsoft Visual C++ .NET 2002, 2003 Microsoft Visual Basic Ver 5.0, Ver 6.0 Microsoft Visual Basic .NET 2002, 2003 Microsoft Visual C# .NET 2002, 2003 Borland Delphi Ver 5.0, Ver 6.0 Borland C++ Builder Ver 5.0, Ver 6.0
System requirement	-PC (IBM PC/AT compatibility, DOS/V) with USB port -CD-ROM drive -Recommend the environment on which the using language can run smoothly

Support Software

Driver Library API-USBP(WDM) (Bundled)

It is the library software, and which supplies command of hardware produced by our company in the form of standard Win32 API function (DLL). Using programming languages supporting Win32API functions, such as Visual Basic and Visual C++ etc., you can develop high-speed application software with feature of hardware produced by our company. In addition, you can verify the operation of hardware using Diagnostic programs. CONTEC provides download services (at <http://www.contec.com/apiusbp/>) to supply the updated drivers and differential files.

Further details may be found in the help within supplied CD-ROM or the homepage of our company.

< Operating environment >

OS Windows Vista, XP, Server 2003, 2000, Me, 98

Adaptation language Visual Basic, Visual C++, Visual C#, Delphi, C++ Builder

Accessories

Accessories (Option)

- Isolated analog input module : ADI16-4(FIT)GY
(Expansion module for ADI16-4(USB))
- AC adapter
(input: 90 - 264VAC, output: 5VDC 2.0A) : POA200-20
- AC-DC power supply unit
(input: 85 - 132VAC, output: 5VDC 3.0A) : POW-AC13GY
- AC-DC power supply unit
(input: 85 - 264VAC, output: 5VDC 2.0A) : POW-AD22GY
- DC-DC power supply unit
(input: 10 - 30VDC, output: 5VDC 3.0A) : POW-DD10GY
- DC-DC power supply unit
(input: 30 - 50VDC, output: 5VDC 3.0A) : POW-DD43GY

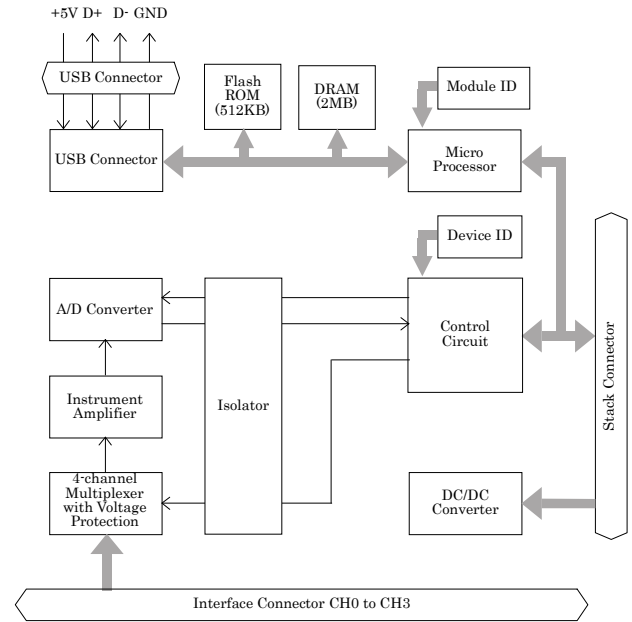
* Check the CONTEC's Web site for more information on these options.

Packing List

- USB module [ADI16-4(USB)] ...1
- First step guide ... 1
- CD-ROM *1 [API-USBP(WDM)] ...1
- Interface connector (plugs) FRONT-MC1,5/12-STF-3,81 ...1
- AC adapter (1.5m)...1
- AC cable (1.5m)...1
- USB cable (1.8m)...1
- Rubber feet...4
- Magnet...2

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

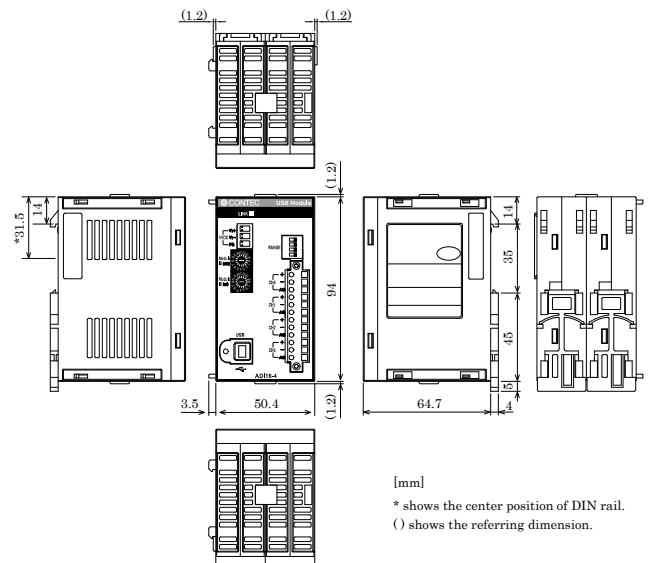
Block Diagram



Point

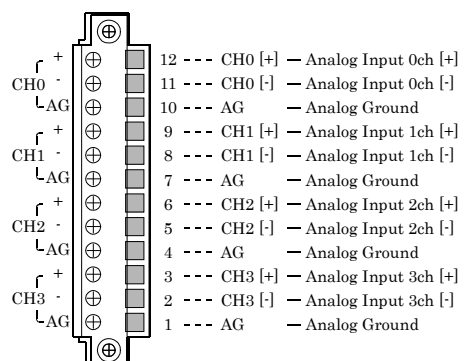
The Device ID of the USB module ADI16-4(USB) is fixed at "0".

Physical Dimensions



Signal Layout

The Module can be connected to an external device using a 12-pin (1 group) connector that is provided on the Module face.

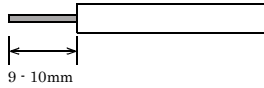
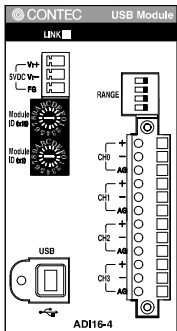


Connection Method

When connecting the Module to an external device, you can use the supplied connector plug. When wiring the Module, strip off approximately 9 - 10 mm of the covering for the cable, and insert the bare wire by pressing the orange button on the connector plug. Releasing the orange button after the wire is inserted fixes the cable. Compatible wires are AWG 28 - 16.

⚠ CAUTION

Removing the connector plug by grasping the cable can break the wire.



- Connector used:
3.81mm pitch 12 pin type of rated current 8A
MC-1,5/12-GF-3,81 (made by Phoenix Contact Corp.)
- Compatible plug :
Front-operable spring gauge type
FRONT-MC 1,5/12-STF-3,81 (made by Phoenix Contact Corp.)
Compatible wires : AWG 28 - 16

Making a connection using the differential input format

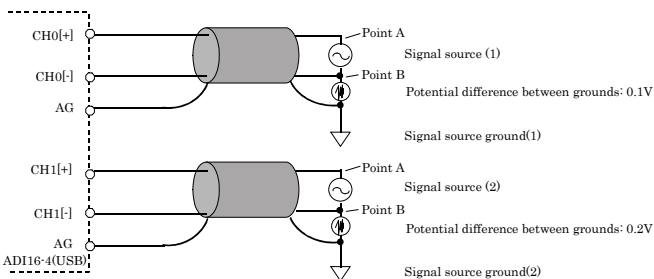
This is a method of measuring the voltage of signal source by connecting the 3 wires (2 signal wires- plus input pin[+] and minus input pin[-], analog ground[AG]) of the module.

How to connect:

- (1) Connect the analog ground to the signal source ground.
- (2) Connect [+] input to signal source plus pin (Point A).
- (3) Connect [-] input to signal source minus pin (Point B).

Minus pin and ground are both connected to a same point for the signal source. In this case, connect both module's minus input and analog ground to signal ground. You must connect 3-wires to take an accurate measurement.

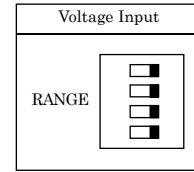
Even when the module ground and the signal source have a potential difference in between, using a 3-wire connection eliminates its effect from the measurement results. In addition, the 3-wire input offers better noise immunity than the 2-wire input (single-end input).



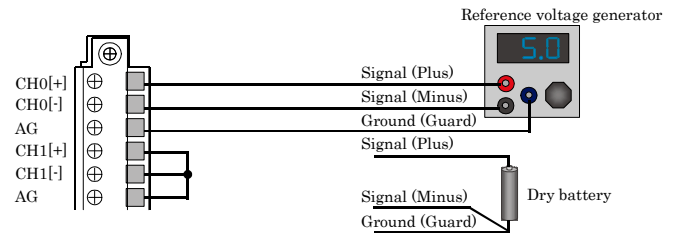
As shown in the image above, when several signal sources are measured, the potential differences between the module's ground and signal source's ground may be different, such as 0.1V or 0.2V. 0.1V offset voltage higher than the voltage of the signal source is added on CH0[+] and 0.2V on CH1[+]. Similarly, the offset voltage of the potential difference between grounds is added on CH0[-] and CH1[-] individually. However, with the connecting of 3-wires differential input, the value of voltage to be converted is the value between point A and point B, the potential difference between grounds can be canceled, so the measuring without error can be performed. Although the maximum value of voltage on each input pin is $\pm 20V$, you should use the module with the potential difference of $\pm 2V$ between grounds.

Measuring voltage

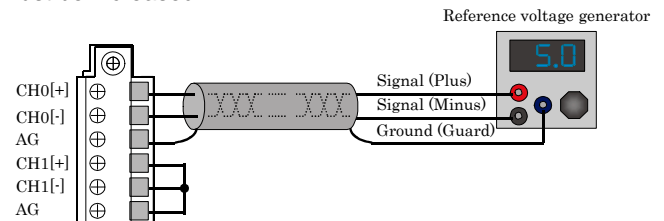
Set the range setting switch and software setting to voltage input.



The figure below shows an example of using flat cable to connect a reference voltage generator. As a two-wire connection is used when measuring a device such as a battery that only has positive and negative terminals, connect the negative terminal to CH0 (-) and AG. Also connect unused channel inputs to analog ground.



Moreover, you should connect the module by using a 2-core shielded cable in situations where the signal source is at a considerable distance from the module or the noise immunity must be increased.



⚠ CAUTION

When an analog ground is not connected, the conversion data can be unpredictable.

In situations where the connecting cable is subject to noise, accurate analog input can fail to occur. To avoid this problem, the connecting cable should be installed away from any sources of noise.

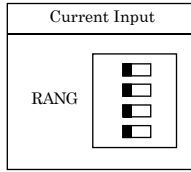
An excessively long connecting cable can fail to ensure accurate analog input. The connecting cable should be as short as possible.

The analog signals that are input into the [+] input or [-] input should not exceed the maximum input voltage relative to the module analog ground. A voltage greater than the input voltage can damage the equipment.

If either the [+] or [-] input pin is not connected, the resulting conversion data can be unpredictable. If a channel is not connected to a signal source, both its [+] input and [-] input pins must be connected to the analog ground.

Measuring current

Set the range setting switch and software setting to current input.



The following figure shows an example of flat or shielded cable connection.

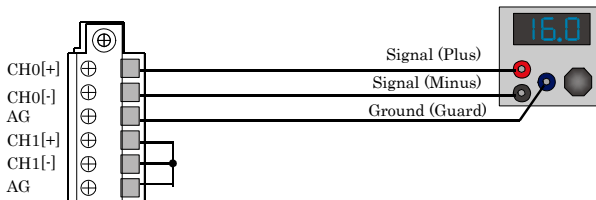
The figure below shows an example connection using a flat cable.

Connect the positive terminal of the current source to the channel's [+] input and the negative terminal to the [-] input. Also connect the module's analog ground to ground on the signal source.

If using more than one current source, you need to connect GND on each current source so that no potential difference is generated.

Although the CPU in the ADI16-4(USB) module is isolated from external devices, there is no isolation between analog input channels and a common analog ground is used.

If the measurement is affected by the potential difference between channels, use an isolating transformer or similar to provide inter-channel isolation.



⚠ CAUTION

When an analog ground is not connected, the conversion data can be unpredictable.

In situations where the connecting cable is subject to noise, accurate analog input can fail to occur. To avoid this problem, the connecting cable should be installed away from any sources of noise.

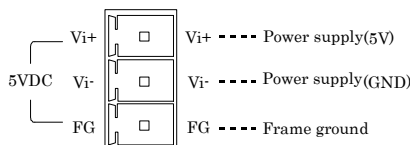
The analog signals that are input into the [+] input or [-] input should not exceed the maximum input voltage relative to the module analog ground. A voltage greater than the input voltage can damage the equipment.

If either the [+] or [-] input pin is not connected, the resulting conversion data can be unpredictable. If a channel is not connected to a signal source, both its [+] input and [-] input pins must be connected to the analog ground.

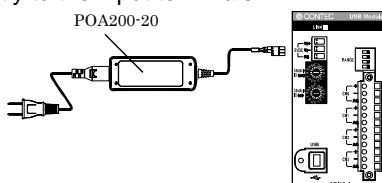
Connecting an External Power Supply

This module must be connected with an external power supply (in a self-powered state).

Connect the external power supply to the +5 VDC input terminal.



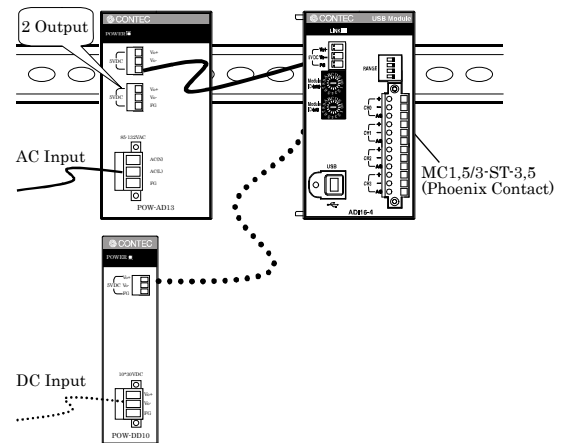
When using the supplied AC adapter [POA200-20], please connect directly to the input terminals.



Beside the AC adapter, a power supply for installation on a DIN rail is also available (as an option).

Use the appropriate power supply depending on the operating environment and application.

Type	Model	Input	Output	Physical dimension (mm)	DIN rail
AC adapter	POA200-20 (Bundled)	90 - 264VAC	5.0VDC±5% 2.0A(Max.)	40.0(W) x 105.0(D) x 30.0(H) (No protrusion)	-
AC-DC power supply	POW-AD13GY	85 - 132VAC	5.0VDC±5% 3.0A(Max.)	52.4(W) x 64.7(D) x 94.0(H) (No protrusion)	Corresponding
AC-DC power supply	POW-AD22GY	85 - 265VAC	5.0VDC±5% 2.0A(Max.)	52.4(W) x 64.7(D) x 94.0(H) (No protrusion)	Corresponding
DC-DC power supply	POW-DD10GY	10 - 30VDC	5.0VDC±5% 3.0A(Max.)	25.2(W) x 64.7(D) x 94.0(H) (No protrusion)	Corresponding
DC-DC power supply	POW-DD43GY	30 - 50VDC	5.0VDC±5% 3.0A(Max.)	25.2(W) x 64.7(D) x 94.0(H) (No protrusion)	Corresponding



For the power supply for installation on a DIN rail, use the connector MC1,5/3-ST-3,5 (Phoenix Contact).

Connecting method

To connect the external power supply and USB cable to the unit, take the steps below:

- (1) Connect the external power supply connector to supply power to the USB module.
- (2) Use the USB cable to connect the USB module to the PC.

To remove the external power supply and USB cable from the unit, take the steps below:

- (1) Unplug the USB cable.
- (2) Remove the external power supply connector to stop power supply to the USB module.

⚠ CAUTION

To use the AC adapter, connect it to the USB module first, then plug the AC adapter's connector into a wall outlet.

When the USB module is not used, leave the AC adapter unplugged.

Continuously using the AC adapter heated affects its life.

Use the AC adapter not in a closed place but in a well-ventilated place not to be heated. The AC adapter heats up itself when loaded heavily. If the AC adapter is exposed to high temperature or used continuously, you should keep the load at about 80% of the maximum load (at 1.6 A for the POA200-20).

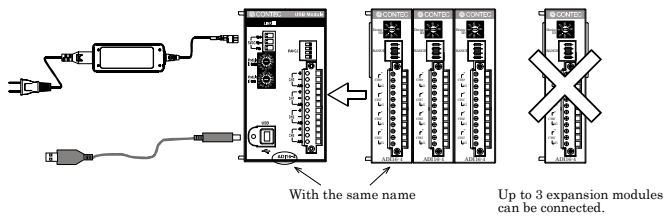
Connecting with Expansion Accessories

When lacking of analog input channel used to connecting external device, you have to purchase a new same module, and thus it not only increases cost but also doubles installation space. At the same time, adding channels is considered when designing this module, and additional module can be connected by the connector on module side, so that not only the cost but also the installation space is controlled.

Up to 3 modules ADI16-4(FIT)GY can be connected when adding channels.

In the case of combination of the USB module “ADI16-4(USB)” and three expansion modules “ADI16-4(FIT)GY”, it is possible to control 16 channels input by way of one USB port.

Type	Input channel	Current consumption	Function
ADI16-4(FIT)GY	4	+5VDC 300mA (Max.)	Expansion module for ADI16-4(USB)



Point

Up to 3 modules can be connected.

Please use the supplied AC adapter when adding modules.

Modules with different function from the USB module can not be connected.

The analog grounds of both USB module and expansion module are isolated from each other.