

N Series for USB
Isolated Analog Input Unit ($\pm 10V$ Voltage Input)
AI-1608VIN-USB
N Series for USB
Isolated Analog Input Unit (0 - 20mA Current Input)
AI-1608AIN-USB



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

Features

< AI-1608VIN-USB >

- 8 channels of analog input (voltage input), and 4 channels of digital input and output respectively are contained with high accuracy
Analog input (10 μ sec/ch, 16bit, 8ch), and digital input and output (Input: TTL level 4 channels, Output: Open-collector 4 channels) are equipped. The analog input supports differential input and the $\pm 10V$ voltage input bipolar.

< AI-1608AIN-USB >

- 8 channels of analog input (current input), and 4 channels of digital input and output respectively are contained with high accuracy
Analog input (20 μ sec/ch, 16bit, 8ch), digital input and output (Input: TTL level 4 channels, Output: Open-collector 4 channels) are equipped. The analog input supports differential input and the 0 - 20mA current input.

< Common >

- Buffer memory available in FIFO format

This product contains buffer memory (8K data) which can be used in FIFO format. You can perform analog input in the background, independent of software and the current status of the PC.

- Sampling can be driven by a clock or by various triggers

Sampling can be started and stopped by software and external (timing of control signals input from external) triggers.

The sampling period can be controlled by the internal clock (high-precision timer included in the product).

- Isolated from the bus by a digital isolator

This product isolates the PC from analog input as well as digital I/O by a digital isolator, which improves the noise performance.

- Open collector output for digital output

The use of open collector output ensures digital outputting with TTL or 12 - 24 V power by the power of the external device.

- Compact design not restricting installation location (188.0(W)×78.0(D)×30.5(H))

Compact design of 188.0(W) × 78.0(D) × 30.5(H) does not require special installation location.

This product is an analog input unit supporting USB2.0 to provide the input function of analog signal from USB port on the computer.

Compact design, (188.0(W)×78.0(D)×30.5(H)mm), features flexibility in installation. The product can be set on the floor, wall, and inside the console or equipment with the DIN rail.

Windows/Linux device driver is supported with this product.

For AI-1608VIN-USB, 8 channels of 16-bit analog input, and digital input and output (4 channels respectively) are equipped, and these circuits are isolated from the computer.

As the analog input supports differential input, accurate measurement can be performed even when potential differences with the signal source occur. The input range supports $\pm 10V$ voltage input bipolar.

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- * The contents in this document are subject to change without notice.
- * Visit the CONTEC website to check the latest details in the document.
- * The information in the data sheets is as of July, 2024.

- Compatible to USB2.0/USB1.1

Compatible to USB2.0/USB1.1 and capable to achieve high speed transfer at High Speed (480 Mbps)

- Diverse installations such as screw fastening, magnet (option), DIN rail are possible

Installation on the floor / wall / ceiling is possible by screw fastening, magnet, rubber feet, etc. In addition, DIN rail mounting mechanism is equipped as standard with the product, making it easy to install the product within the panel or the device.

- Diverse installations such as screw fastening, magnet (option), DIN rail are possible

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- Easy-to-wire terminal connector adopted

Adoption of terminal connector (with screws) enables to achieve easy wiring.

- 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.

- Software-based adjustment function

Adjustment 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.

Included Items

Product ...1
Interface Connector...3
USB Cable (1.8m)...1
USB Cable Attachment on the main unit's side (For Mini B connector side)...1
Rubber feet...4
AC Adapter...1
AC Cable...1
Please read the following...1

Specifications

Function specification

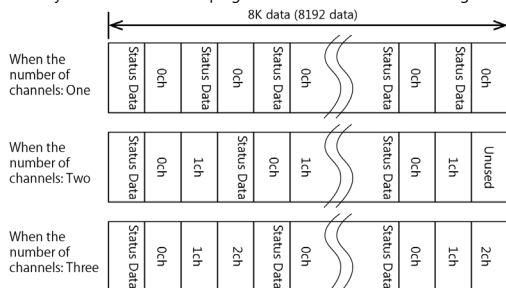
Item	AI-1608VIN-USB		AI-1608AIN-USB
Analog input			
Isolated specification	Bus-Isolated		
Input type	Differential Input		
Input channel	8ch		
Input range	Voltage: Bipolar $\pm 10V$	Current: 0 - 20mA	
Maximum input voltage/current	Voltage: $\pm 15V$	Current: 30mA	
Input impedance	1M Ω or more	250 Ω (Typ.)	
Resolution	16bit		
Non-linear error *1*2	$\pm 8LSB$	$\pm 20LSB$	
Conversion speed	10 μ sec/ch *3 (Max.)	20 μ sec/ch *3 (Max.)	
Buffer memory	8K data *4		
Conversion start trigger	Software / external trigger		
Conversion stop trigger	Number of sampling times / external trigger / soft-ware		
External start signal	TTL level (Rising or falling edge can be selected to the DI00-pin by software)		
External stop signal	TTL level (Rising or falling edge can be selected to the DI01-pin by software)		
External clock signal	TTL level (Rising or falling edge can be selected to the DI02-pin by software)		
Digital input			
Number of input channels	4ch		
Input type	Bus-isolated TTL level input (Negative logic) *5*6		
Digital output			
Number of output channels	4ch		
Output format	Bus-isolated open collector output (Negative logic) *5		
Output rating	Output voltage	30VDC (Max.)	
	Output current	40mA (par channel) (Max.)	
USB			
Bus specification	USB Specification 2.0/1.1-compliant		
USB transfer rate	12Mbps (Full-speed), 480Mbps (High-speed) *7		
Power supply	Self-power		
Power supply			
Input voltage range	12 - 24VDC $\pm 10\%$		
Power consumption	12VDC 250mA (Max.), 24VDC 150mA (Max.)		
Common section			
Number of terminals used at the same time	127 terminals (Max.) *8		
Dielectric strength	500Vrms		
Physical dimensions (mm)	188.0(W) \times 78.0(D) \times 30.5(H) (No projection included)		
Weight	250g (Not including the USB cable or attachment)		
Attached cable	USB cable 1.8m		

*1 The non-linearity error means an error of approximately $\pm 0.1\%$ occurs over the maximum range at $-20^\circ C$ and $60^\circ C$ ambient temperature. The error can be reduced by calibrating under the actual temperature conditions.

*2 At the time of the source use of a signal which built in the high-speed operational amplifier.

*3 This numerical displays the conversion speed for A/D converter. The minimum executable sampling cycle depends on the operating condition of the terminal.

*4 Not only sampling data but also status data are stored in buffer memory. This product employs 8K (8192 data) data buffer memory. When the number of channels x the number of sampling are up to 8192 data (see below), sampling can be done at 10 $\mu sec/ch$ of the conversion speed of A/D converter. The number of channels x The number of sampling ≤ 8192 data. However, the amount of data that can actually be stored in buffer memory will be decreased since the memory for one data at one sampling is used as internal status. See the images of buffer memory below.



*5 Data "0" and "1" correspond to the High and Low levels, respectively.

*6 The DI00 / DI01 / DI02-pin of digital input cannot be used simultaneously with External start signal/ External stop signal/ External clock signal.

*7 The USB transfer rate depends on the host PC environment used (OS and USB host controller).

*8 As a USB hub is also counted as one device, you cannot just connect 127 USB terminals.

Installation Environment Requirements

Item	AI-1608VIN-USB	AI-1608AIN-USB
Operating ambient temperature	$-20 - +60^\circ C$ *1	
Operating ambient humidity	10 - 90%RH (No condensation)	
Floating dust particles	Not to be excessive	
Corrosive gases	None	
Line-noise resistance *2	Line noise	AC Line/ $\pm 2kV$ (IEC61000-4-4 Level 3, EN61000-4-4 Level 3) Signal Line/ $\pm 1kV$ (IEC61000-4-4 Level 3, EN61000-4-4 Level 3)
	Static electricity resistance	Touch/ $\pm 4kV$ (IEC61000-4-2 Level 2, EN61000-4-2 Level 2) Air/ $\pm 8kV$ (IEC61000-4-2 Level 3, EN61000-4-2 Level 3)
Vibration resistance	Sweep resistance	10 - 57Hz/semi-amplitude vibration 0.15mm, 57 - 150Hz/2.0G 40minutes each in X, Y, and Z directions (JIS C60068-2-6-compliant, IEC60068-2-6-compliant)
	Shock resistance	147m/s ² (15G)/11ms/half-sine shock (JIS C 60068-2-27 -compliant, IEC 60068-2-27 -compliant)
Standard	VCCI Class A, FCC Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA	

*1 When using the supplied AC adaptor POA 201-10-2, it is 0 - 40 $^\circ C$.

*2 When using the supplied AC adaptor POA 201-10-2.

AC adapter environmental condition (environmental specification)

Item	Specifications
Input voltage range	90 - 264VAC
Rated input current	300mA
Number of frequency	50 - 60Hz
Rated output voltage	12.0VDC
Rated output current	1.0A (Max.)
Physical dimensions (mm)	47.5(W) \times 75(D) \times 27.3(H) (No protrusions)
Weight	175g
Operating temperature	0 - 40 $^\circ C$
Operating humidity	20 - 80%RH (No condensation)
Life expectancy *1	1.5 years (at the ambient temperature 40 $^\circ C$ when 100VAC is input and 1.0A is output) 4 years (at the ambient temperature 40 $^\circ C$ when 100VAC is input and 0.5A is output)
Allowable time of short interruption	20ms (Max.) (When 100VAC is input and 0.55A is output) *2
Floating dust particles	Not to be excessive
Corrosive gases	None
Voltage compatible to the supplied AC cable	125VAC 7A

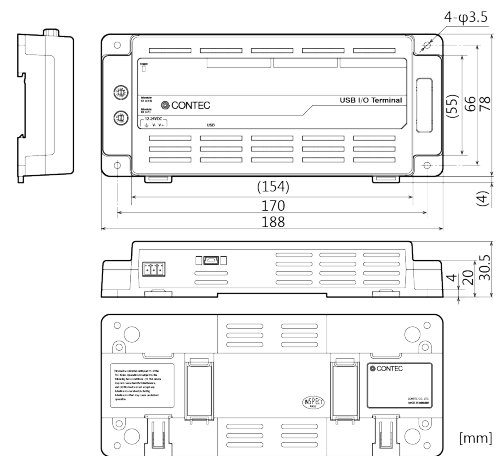
*1 Life expectancy is four years when using this product.

*2 When short interruption occurs and the product causes an error, unplug and plug the AC adapter.

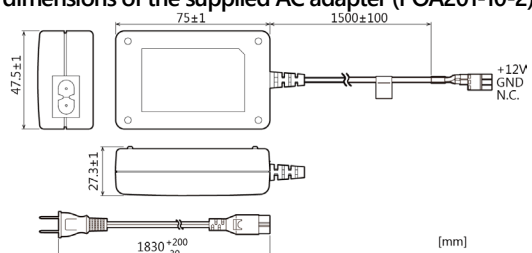
*3 This board requires +5V power supply from expansion slots (it does not operate in the environment of only +3.3V power supply).

Physical Dimensions

Product



Physical dimensions of the supplied AC adapter (POA201-10-2)



Support Software

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.

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

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

<https://www.contec.com/>

Optional Products

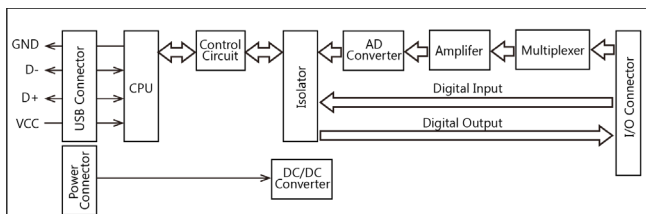
Product Name	Model type	Description
AC-DC Power Adaptor (12VDC, 1A)	POA201-10-2	*1
CONPROSYS Series 12VDC AC-DC Converter	CPS-PWD-15AW12-01	*2
CONPROSYS Series 24VDC AC-DC Converter	CPS-PWD-30AW24-01	*2
	CPS-PWD-90AW24-01	*2
CONPROSYS Series Magnet	CPS-MAG01-4	Four Piece Set

*1 The operating ambient temperature is 0 to 40 °C. It is the same adapter included in this package.

*2 The operating ambient temperature is -20 to 70 °C.

Visit the CONTEC website for the latest optional products.

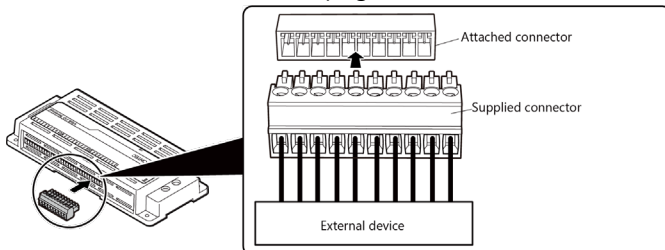
Circuit Block Diagram



Connecting an Interface Connector

Use the supplied interface connector (plug connector) to connect the product to an external device.

The following example describes how to make the connecting cable with the interface connector (connector plug).



[Attached connector]: European type terminal 3.5 pitch 10-pin jack connector

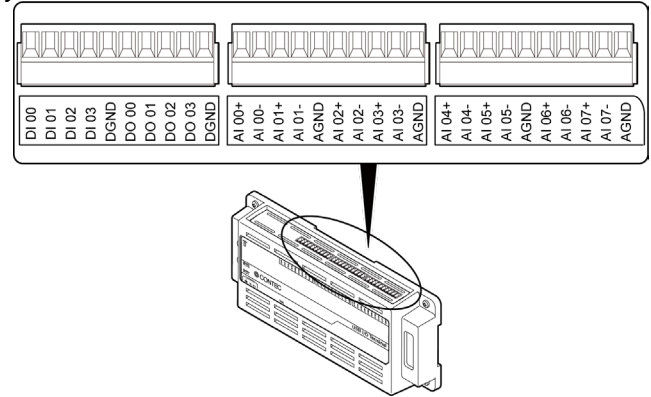
[Supplied connector]: European type terminal 3.5 pitch 10-pin plug connector

[Compatible cable]: AWG28 - 16

CAUTION

- Removing the connector plug by grasping the cable can break the wire. Always grasp the interface connector to remove it.
- Do not set or remove the interface connector when the power is on or during the communication.

Layout on the Interface Connector



DI 00 - DI 03	Digital input pins. The numbers correspond to input bits.
DO 00 - DO 03	Digital output pins. The numbers correspond to output bits.
DGND	This is a digital ground and shares channels of I/O signals.
AI 00+ - AI 07+	Analog input pins(+). The numbers correspond to channel numbers.
AI 00- - AI 07-	Analog input pins(-). The numbers correspond to channel numbers.
AGND	This is an analog ground and shares channels of analog input signals.

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.

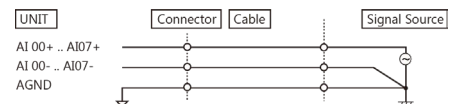
Connecting Analog Input Signal (AI-1608VIN-USB)

Here are examples on how to connect analog input signals of interface connector with flat cable or shield cable.

Differential Input Connection

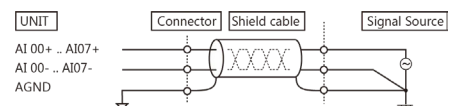
Connection example with flat cable

The following figure shows an example of flat cable connection. For each analog input channel on interface connector, connect the "+" input to the signal and connect the "-" input to the signal source ground. Also connect the analog ground on the product to the signal source ground.



Connection example with shield cable

The following figure shows an example of shielded cable connection. Use shielded cable if the distance between the signal source and product is long or if you want to provide better protection from noise. For each analog input channel on interface connector, connect the "+" input to the signal and connect the "-" input to the signal source ground. Also connect the analog ground on the product and the signal source ground to the shielding.



CAUTION

- If the signal source contains over 1 MHz signals, the signal may affect the cross-talk noise between channels.
- When the analog ground is not connected, the conversion data is not determined.
- 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 that inputs to the [+] input or the [-] input should not exceed the maximum input voltage and current listed in the "Function Specifications". The product may be damaged if the maximum voltage or current is exceeded.
- When the [+] input or the [-] input is not connected, the conversion data is not determined. Connect all the unused [+] input pins and the [-] input pins of channels to analog ground.
- This product measures multiple channels with the multiplexer. 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.

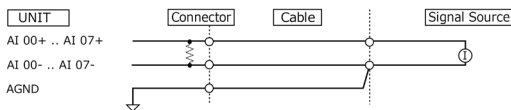
- An input pin may fail to obtain input data properly when the signal source connected to the pin has high impedance. If this is the case, change the signal source to one with lower output impedance or insert a high-speed amplifier as a buffer between the signal source and the analog input pin to reduce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

Connecting Analog Input Signal (AI-1608AIN-USB)

Connection Example of Current Input

Connecting with two-terminal current output (Flat Cable)

The following shows an example of flat cable connection with two-terminal current output. Connect the [+] input of analog input channel of the interface connector to the positive side of signal source, and the [-] to the negative side of the signal source respectively. Also, connect the analog ground of the interface connector to the [-] input of the signal source.

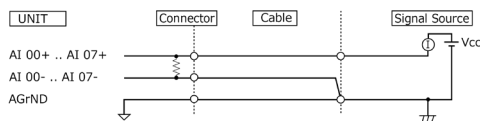


Connecting with current source output (Flat Cable)

The following shows an example of flat cable connection with current source output. Connect the [+] input of analog input channel of the interface connector to the output terminal of the signal source, and the [-] input to negative side of the signal source respectively.

Also, connect the analog ground of the interface connector to the ground of the signal source.

- * When connecting the [-] input of the product and the analog ground on the external device side, make sure the potential difference between the [-] input of the product and the analog ground is 0.5V or less.



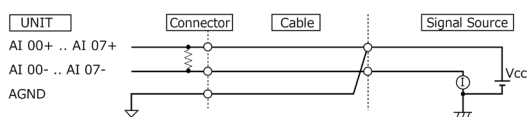
Connecting with current sink output (Flat Cable)

The following shows an example of flat cable connection with current sink output.

Connect the [+] input of analog input channel of the interface connector to the positive side of the current source, and the [-] input to the output terminal of the current source respectively.

Also, connect the analog ground to the [+] input of signal source.

- * When connecting the [+] input of the product and the analog ground on the external device side, make sure the potential difference between the [+] input of the product and the analog ground is 0.5 V or less.

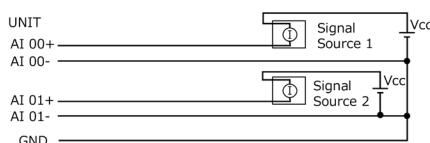


Connecting with several current source output (Flat Cable)

The following shows an example of flat cable connection with current source output.

Connect the [+] input of analog input channel of the interface connector to the output terminal of the current source, and the [-] input to the negative side of the current source respectively.

Also, connect the analog ground to the ground of signal source.



CAUTION

- If the signal source contains over 1 MHz signals, the signal may affect the cross-talk noise between channels.
- When the analog ground is not connected, the conversion data is not determined.
- If the connecting cable is affected by noise, accurate analog input may not be made. To secure the accuracy, place the connecting cable far from the source of the noise and put a laminated ceramic capacitor on the interface connector of the product (when using a ceramic capacitor, make the lead as short as possible).
- The analog ground is shared since analog input channels are not isolated among all. If inter-channels suffer from potential differences, isolate them with such as an isolated converter.
- An input analog signal that inputs to the [+] input or the [-] input should not exceed the maximum input voltage and current listed in the "Function Specifications(Page68)". The product may be damaged if the maximum voltage or current is exceeded.
- Converted data is undefined when either of the [+] and [-] input terminals is left unconnected.
- Connect both of the [+] and [-] input terminals of the channel that are not connected to the signal source to the analog ground.

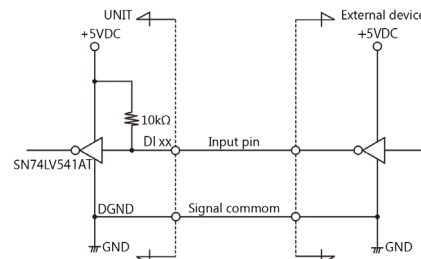
Connecting Digital I/O Signals

Digital I/O signals can be used as control I/O signals (external trigger input signals, sampling clock input signals, etc.). The following section shows examples of how to connect signals.

Input Circuit

The following is a digital I/O circuit of the interface (connector) part.

External digital signals given to signal input section are TTL level, and each signal is taken to a PC using negative logic. Each signal input section is pulled-up in this product, therefore, outputs of relay contacts or semiconductor switch can be connected directly between this signal input and signal common.

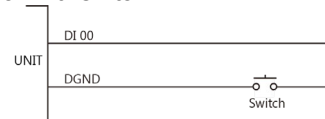


*Input pins are indicated as DI xx. xx corresponds to input bits.

DI00 - DI02 can be used as control signals listed below. However, when using them as control signals, they cannot be used as general-purpose digital inputs.

- DI00: External Start Signal Input
- DI01: External Stop Signal Input
- DI02: External Clock Signal Input

Example Connection with switch



When switch is "ON", the corresponding bit is "1".

When switch is "OFF" in contrast, the corresponding bit is "0".

Output Circuit

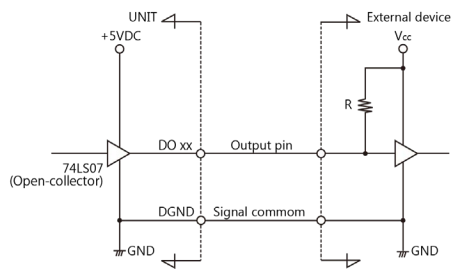
The following is an output circuit of the interface (connector) part.

Signal output section is an open-collector, and each signal is sent to external devices using negative logic.

Outputting by open-collector makes outputting in accordance with the power of the external devices. Note that each signal output section is not pulled-up in this product, therefore, pull up at the external device side.

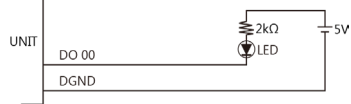
CAUTION

- Do not short the output signals to analog ground, and/or digital ground. Doing so may damage the product.
- When supplying power of 12 - 24VDC power (such as the AC adapter), all output will be OFF.



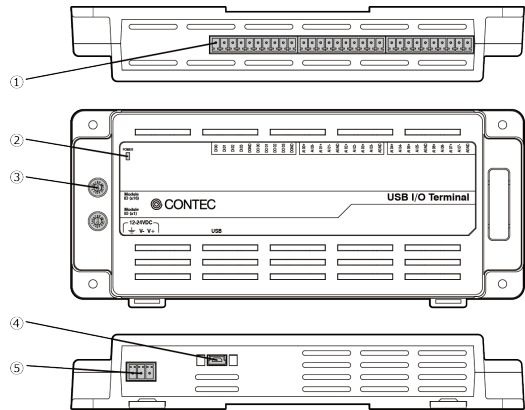
*Output pins are indicated as DO xx. xx corresponds to output bits.

Example Connection with LED



When "1" is output to a relevant bit, the corresponding LED comes on.
When "0" is output to the bit, in contrast, the LED goes out

Component Name



No.	Name	No.	Name
1	Interface Connector	4	USB port (mini B Connector)
2	LED Indicator	5	Power Supply Connector
3	Setting Switches		