Digital I/O Unit with High Voltage Isolation for USB

DIO-1616RYX2-USB

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

This product is an USB2.0-compliant digital I/O unit used to provide a digital signal I/O function on a PC.

This product features 16 channels of Opto-coupler isolated inputs (compatible with current sink output/current source output) and 16 channels of semiconductor-relay outputs. You can use all of signals as interrupt inputs. Equipped with the digital filter function to prevent wrong recognition of input signals. As there is compatible with PCI bus-compatible board PIO-16/16RY(PCI) and PCI Express bus-compatible board DIO-1616RY-PE in terms of connector shape and pin assignments, it is easy to migrate from the existing system. The input specification is fixation from 12 - 24VDC for this product.

Windows/Linux device driver is supported with this product.

* 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 March, 2025.

Features

16 channels of Optocoupler isolated inputs (compatible with current sink output/current source output) and 16 channels of semiconductor-relay output

This product has 16 channels of Optocoupler isolated inputs (compatible with current sink output/current source output) whose response speed is 200µsec and 16 channels of semiconductor-relay whose response speed is 1.0msec. Supporting driver voltages of 12 - 24 VDC for input and 120VAC/DC for output with high voltage. (12 - 24VDC external circuit power supply is required separately.)

Opto-coupler and semiconductor-relay bus isolation

As the USB (PC) is isolated from the input and output interfaces by opto-couplers and semiconductor-relay, this product has excellent noise performance.

All input signals can be used as interrupt request signals

You can use all input signals as interrupt request signals and also disable or enable the interrupt in bit units and select the edge of the input signals, at which to generate an interrupt.

Equipped with digital filter to prevent wrong recognition of input signals from carrying noise or a chattering

This product has a digital filter to prevent wrong recognition of input signals from carrying noise or a chattering. All input terminals can be added a digital filter, and the setting can be performed by software.

Connectors are compatible with PCI/PCI Express bus-compatible board and digital I/O unit

As there is compatible with PIO-16/16RY(PCI), DIO-1616RY-PE and DIO-1616RYX-USB in terms of connector shape and pin assignments, it is easy to migrate from the existing system. The specification of the input part is from 12 - 24VDC fixation however.

If the system of this product is created by the digital I/O driver API-DIO(98/PC), it is required to replace it with API-DIO(WDM).

Compatible to USB2.0/USB1.1

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

Windows/Linux support device driver

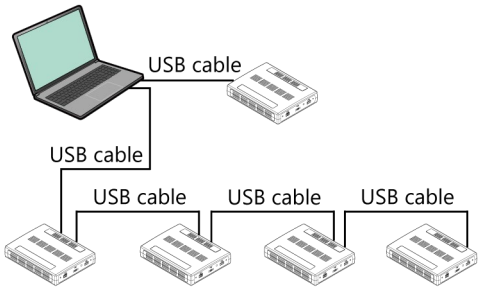
Using the device driver API-TOOL makes it possible to create applications of Windows/Linux. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

USB HUB function

This product has the USB HUB function. Max. 4 products can be used in 1 USB port of PC. *1

When you use 4 or more products, you can do by connecting products to the another USB port of PC side. *2

Also, you can connect the CONTEC's USB device other than products to the USB port of products. *3*4



*1 This product cannot be stacked up for installation.

*2 When you use the USB port included on the product, use 5VDC power supply for self-power. For more details on the connection with 5VDC power supply, refer to "+5VDC input terminal".

*3 Do not connect the device other than that of CONTEC's USB to the USB port included on the product. Otherwise, this may cause a failure or malfunction.

*4 When connecting multiple units with USB HUB function and set up them, do one at a time and complete setup for the previous unit before starting to do the next unit.

Support Software

Name	Contents	How to get
Windows Version Digital I/O Driver software API-DIO(WDM)	The Windows device driver is provided as a form of Windows API functions. Various sample programs such as C# and Visual Basic .NET , Visual C++, Python etc. and diagnostic program useful for checking operation is provided.	Download from the CONTEC website *1
Linux Version Digital I/O Driver software API-DIO(LNX)	The Linux device driver is provided as a shared library. The software includes various sample programs such as gcc (C, C++) and Python programs, as well as a configuration tool to configure the device settings.	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/

Specifications

Function specification

Item	Specification
Input section	
Input format	Optocoupler isolated input (Both of current sink and source outputs supported)
Number of input signal channels	16 channels (all available for interrupts) (1 common pin)
Input resistance	3kΩ
Input ON current	3.1mA or more
Input OFF current	1.0mA or less
Interrupt	16 input signals are arranged into a single output of interrupt request signal INTA. An interrupt is generated at the rising edge (HIGH-to-LOW transition) or falling edge (LOW-to-HIGH transition) (set by software).
Response time	200µsec within *1
Output section	
Output format	Semiconductor relay output
Number of output signal channels	16ch
Output rated voltage	120VAC/DC (Max.)
Output rated current	100mA (par channel) (Max.)
ON resistance	10.0Ω or less
OFF leakage current	1.0µA or less
Response time	1.0msec within
USB section	
Bus specification	USB Specification 2.0/1.1 standard
USB transfer rate	12Mbps (Full-speed), 480Mbps (High-speed) *2
Power supply	Bus power / Self-power *3
Common section	
Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
Number of terminals used at the same time	16 terminals (Max.)
Dielectric strength	1000Vrms
External circuit power supply*4	12 - 24VDC (±10%)
Current consumption	5VDC 500mA (Max.)
Physical dimensions (mm)	180(W) x 140(D) x 34(H) (No protrusions)
Weight	300g (Not including the USB cable, attachment)
Attached cable	USB cable 1.8m

*1 The Optocoupler's response time comes.

*2 This depends on the PC environment used (OS and USB host controller).

*3 Use 5VDC power supply for sefl-power when you use the USB hub function.

*4 External circuit power supply is required separately.

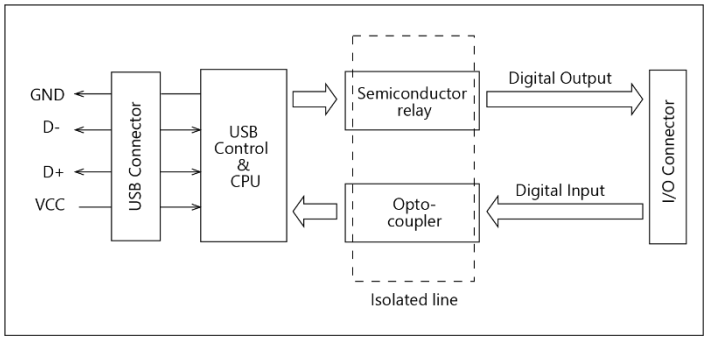
Installation Environment Requirements

Item	Specifications
Operating ambient temperature *1*2	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

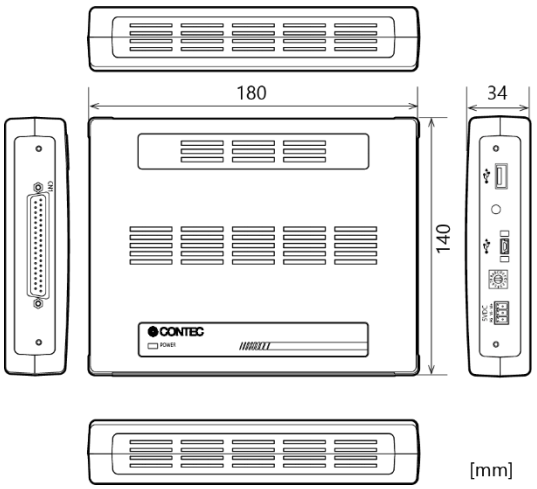
*1 To suppress the heating, ensure that there are spaces for ventilation (about 5cm) around this product.

*2 When using the attached AC adaptor POA200-20-2, it is 0 - 40°C.

Block Diagram



Physical Dimensions



Packing List

Product [DIO-1616RYX2-USB] ...1
Please read the following...1
USB cable (1.8m) ...1
USB cable attachment on the main unit's side (For Mini B connector side) ...1
Clamps for prevention of cable on the main unit's side...1
Power connector MC1,5/3-ST-3,5 ...1
Ferrite core ...1

Optional Products

Product Name	Model type	Description
Shield Cable with two 37-pin D-type connectors	PCB37PS-0.5P	0.5m
	PCB37PS-1.5P	1.5m
	PCB37PS-3P	3m
	PCB37PS-5P	5m
Flat Cable with 37-Pin D-type Connectors on 2Ends	PCB37P-1.5	1.5m
Shield Cable with One 37pin D-type Connector	PCA37PS-0.5P	0.5m
	PCA37PS-1.5P	1.5m
	PCA37PS-3P	3m
	PCA37PS-5P	5m
Flat Cable with a 37Pin D-type Connectors	PCA37P-1.5	1.5m
	PCA37P-3	3m
Screw Terminal (M3 * 37P)	EPD-37A	*1 *2
Screw Terminal (M3.5 * 37)	EPD-37	*1
General Purpose Terminal	DTP-3C	*1
Screw Terminal	DTP-4C	*1
Signal monitor Accessory for Digital I/O (32bits)	CM-32L	*1*3
USB I/O Unit Bracket for X Series	POA200-20-2	
AC-DC Power Adaptor(5VDC, 2A)	POA200-20-2	

*1 PCB37P or PCB37PS optional cable is required separately.

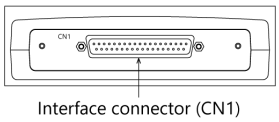
*2 "Spring-up" type terminal is used to prevent terminal screws from falling off.

*3 Not available for sink input/source output.

Visit the CONTEC website for the latest optional products.

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.



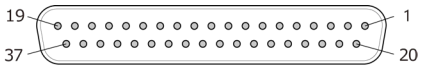
Interface connector (CN1)

- Connector used
  37-pin D-SUB connector [F(female)type]
  DCLC-J37SAF-20L9E [mfd by JAE] or equivalence
  Lock nut UNC #4-40 (inch screw threads)

- Compatible connector
  17JE-23370-02(D8C) [mfd by DDK, M(male)type]
  FDCD-37P [mfd by HIROSE, M(male)type]
  DC-37P-N [mfd by JAE, M(male)type]

Signal Layout of Interface Connector

Layout on the Interface Connector (CN1)



Pin No.	Signal Name	Description	Pin No.	Signal Name	Description
			19	N.C.	
37	N.C.		18	ICOM 0/1	Common for +0/+1 input port
36	O-37	+3 port (Output)	17	I-17	+1 port (Input)
35	O-36		16	I-16	
34	O-35		15	I-15	
33	O-34		14	I-14	
32	O-33		13	I-13	
31	O-32		12	I-12	
30	O-31		11	I-11	
29	O-30		10	I-10	
28	O-27	+2 port (Output)	9	I-07	+0 port (Input)
27	O-26		8	I-06	
26	O-25		7	I-05	
25	O-24		6	I-04	
24	O-23		5	I-03	
23	O-22		4	I-02	
22	O-21		3	I-01	
21	O-20		2	I-00	
20	OCOM 2/3	Common pin for +2/+3 output port	1	N.C.	

* I-00 - I-17 can be used as all of interrupt signal.

Signal name	Description
I-00 - I-17	16 input signal pins. Connect output signals from the external device to these pins.
O-20 - O-37	16 output signal pins. Connect these pins to the input signal pins of the external device.
ICOM 0/1	Common pin for input signals. These pins are common to 16 input signal pins.
OCOM 2/3	Common pin for output signals. These pins are common to 16 output signal pins.
N.C.	This pin is left unconnected.

Connecting Input Signals

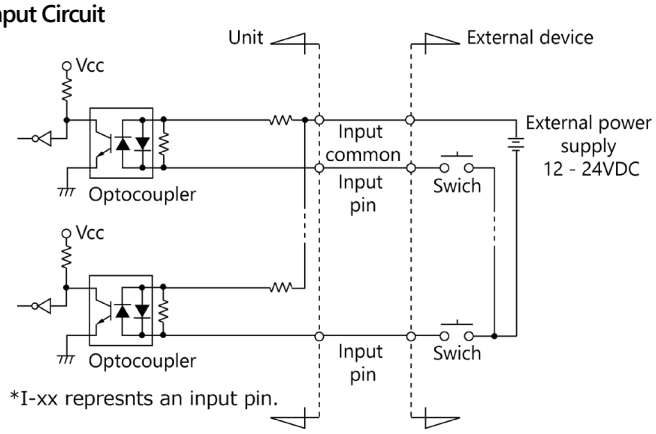
Connect the input signals to a device which can be current-driven, such as a switch or transistor

output device.

The connection requires an external power supply to feed currents.

The product inputs the ON/OFF state of the current-driven device as a digital value.

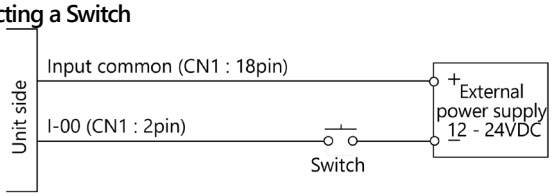
Input Circuit



The signal inputs are isolated by opto-couplers (both of current sink and source outputs supported).

The product therefore requires an external power supply to drive the inputs. The power requirement for each input pin is about 4 mA at 12 VDC.

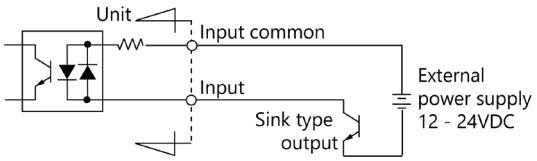
Connecting a Switch



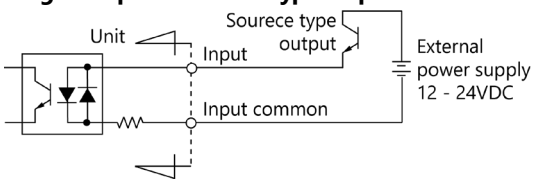
When the switch is ON, the corresponding bit contains 1.
When the switch is OFF, by contrast, the bit contains 0.

Examples of Connecting the Board to an External Device

- Connecting the input to the sink type output



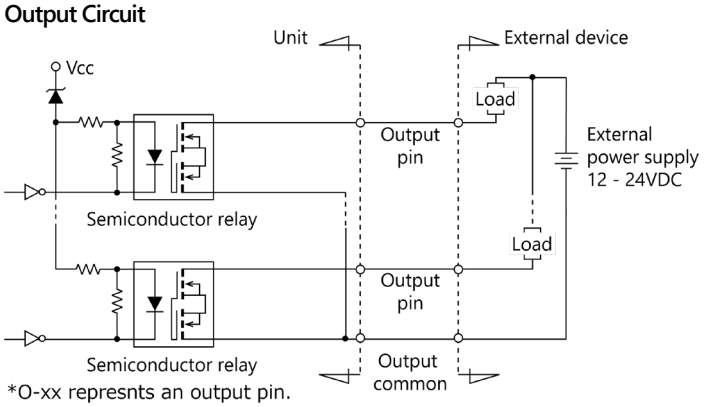
- Connecting the input to the sink type output



Connecting Output Signals

Connect the output signals to a current-driven controlled device such as a relay or LED. The connection requires an external power supply to feed currents. This product controls turning on/off the current-driven controlled device using a digital value.

Output Circuit

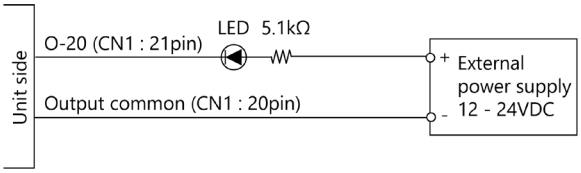


The signal outputs are semiconductor relay outputs using a rated output current of up to 100 mA per channel.

⚠ CAUTION

- When the PC is turned on, all output are reset to OFF.

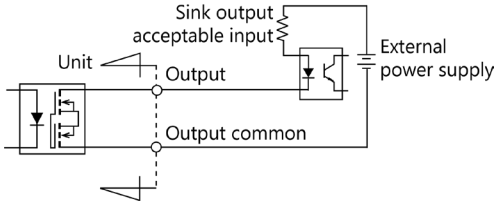
Connection to the LED



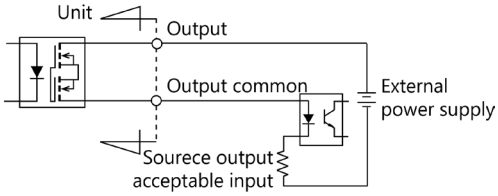
When "1" is output to a relevant bit, the corresponding LED comes on.
When "0" is output to the bit, in contrast, the LED goes out.

Examples of Connecting the Board to an External Device

- Connecting the Output to the Sink Output Acceptable Input



- Connecting the Output to the Source Output Acceptable Input

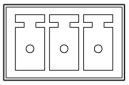


+5VDC input terminal

When you use the HUB function (USB Type-A connector) included on the product, this product must be connected with 5VDC power supply (in a self-powered state). Connect with 5VDC power supply by using +5VDC input pin.

5VDC

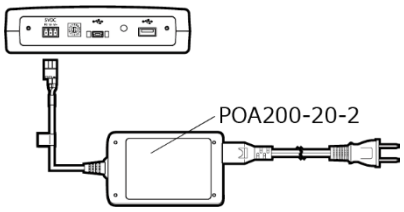
FG Vi- Vi+



Vi+ Power supply (5V)
Vi- Power supply (GND)
FG Frame ground

To supply power using the bundled power connector (MC1,5/3-ST-3,5, compatible cable : AWG28 - 16), strip the end of the compatible cable, insert it into the power connector, then securely screw it.

When using the optional AC adapter [POA200-20-2], please connect directly to the input terminals.



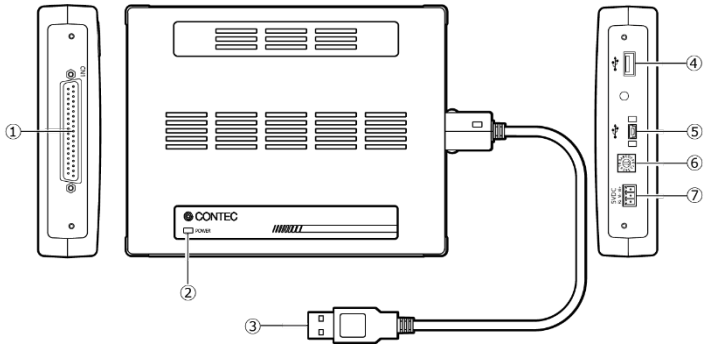
Beside the AC adaptor, a power supply for installation on a DIN rail is also available (as an option).

Use the appropriate power supply depending on the operating environment and application. When a power supply for installation on a DIN rail is used, connect the unit using the accompanying power connector MC1,5/-ST-3,5.

⚠ CAUTION

- Connect 5VDC power supply to the main unit. Next, connect the USB cable to the PC.
  Do not turn it on or off when using. If you remove, USB cable is first and then 5VDC power supply.

Component Name



No.	Name	No.	Name
1	Interface Connector	5	USB port (mini B connector)
2	POWER Status	6	Rotary Switch
3	USB Type-A connector	7	+5VDC input terminal
4	USB port (USB Type-A connector)		

Difference from DIO-1616RY-PE, PIO-1616RY(PCI) and DIO-1616RYX-USB

Item	DIO-1616RYX2-USB	DIO-1616RYX-USB	DIO-1616RY-PE	PIO-16/16RY(PCI)
Input section				
Input resistance	3kΩ		3 kΩ (with 12 - 24 V selected) or 6 kΩ (with 24 - 48 V selected)	
External circuit power supply	12 - 24VDC (±10%)		12 - 24 VDC (±10%) or 24 - 48 VDC (±10%) (selected by jumper switch)	12 - 24VDC (±10%)
Current consumption (Max.)	5VDC 500mA		3.3VDC 550mA	5VDC 400mA
Number of terminals used at the same time	16	127	16	
Individual recognition method	Set with the rotary switch	Built-in ID	Set with the rotary switch	
Bus specification	USB Specification 2.0/1.1 standard		PCI Express Base Specification Rev. 1.0a x 1	PCI(32bit, 33MHz, Universal key shapes supported)
Physical dimensions (mm)	180(L) x 140(D) x 34(H) (No protrusions)		169.33(L) x 110.18(H)	176.41(L) x 105.68(H)
Weight	300g (Not including the USB cable, attachment)		120g	130g