USB I/O Unit X Series Digital I/O Unit with Opto-Isolation for USB (On-board Power Supply) **DIO-1616BX-USB**



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

Features

- 16 channels of Optocoupler isolated inputs (compatible with current sink output) and 16 channels of Optocoupler isolated open-collector outputs (current sink type)

This product has the 16 channels of Optocoupler isolated inputs (compatible with current sink output) and the 16 channels of Optocoupler isolated open-collector outputs (current sink type) whose response time is 200µsec. Supporting driver voltages of 12 - 24 VDC for I/O. (12 - 24VDC external circuit power supply is required separately.)

- Power for opto-coupler operation (12VDC 240mA) supplied internally As the power to run the opto-couplers is supplied internally, no external power supply is required.

- Compatible to USB 2.0/USB 1.1

Compatible to USB 2.0/USB 1.1 and capable to achieve high speed transfer at High Speed (480 Mbps).

- 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 another USB port of PC side.

Also, you can connect the CONTEC's USB device other than products to the USB port of products. *2*3



- Opto-coupler bus isolation

As the USB (PC) is isolated from the input and output interfaces by optocouplers, 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. This product is an USB 2.0-compliant digital I/O unit used to provide a digital signal I/O function on a PC. This product can input and output digital signals at 12VDC.

This product features 16 channels of Optocoupler isolated inputs (compatible with current sink output) and 16 channels of Optocoupler isolated open-collector outputs (current sink type). You can use all of signals as interrupt inputs. Equipped with a power supply for driving opto-couplers (12VDC), digital filter function to prevent wrong recognition of input signals and output transistor protection circuit (surge voltage protection and over current protection). As there is compatible with PCI bus-compatible board PIO-16/16B(PCI)H and PCI Express bus-compatible board DIO-1616B-PE in terms of connector shape and pin assignments, it is easy to migrate from the existing system.

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 September, 2024.

- 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.

- Zener diode for surge voltage protection and the circuit for overcurrent protection

Zener diodes are connected to the output circuits to protect against surge voltages. In addition, the output circuit, it attaches the overcurrent protection circuit at the output 8-channel unit. The output rating is max. 35VDC, 100mA per channel.

- Connectors are compatible with PCI/PCI Express bus-compatible board

As there is compatible with PIO-16/16B(PCI)H and DIO-1616B-PE in terms of connector shape and pin assignments, it is easy to migrate from the existing system.

- 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.

- *1 This product cannot be stacked up for installation.
- *2 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.
- *3 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.

Included Items

Product...1 AC adapter...1 AC Cable (for 125VAC)...1 USB Cable (1.8m)...1 Ferrite Core (small size)...1 Ferrite core (large size)...2 Clamps for prevention of cable on the main unit's side...1 USB Cable Attachment on the main unit's side...1 Power Connector(MC1,5/3-ST-3,5)...1 Please read the following...1

Hardware specifications

Function Specifications

	ltem	Specifications
Input	Туре	Opto-coupler isolated input (Compatible with current sink output) (Negative logic *1)
	Number of Channels	16 channels (all available for interrupts) (1 common in 16 channels)
	Input resistance	4.7kΩ
	Input ON current	2.0mA or more
	Input OFF current	0.16mA or less
	Interrupt	16 interrupt 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 *2
Output	Туре	Opto-coupler isolated open collector output (current sink type) (Negative logic *1)
	Number of Channels	16 channels (1 common in 16 channels unit)
	Output rated voltage	35VDC (Max.)
	Output rated current	100mA (per channel) (Max.)
	Residual voltage with output on	0.5V or less (Output current≤50mA), 1.0V or less (Output current≤100mA)
	Surge protector	Zener diode RD47FM(Renesas) or equivalent
	Response time	200µsec within *2
USB	Bus specification	USB Specification 2.0/1.1 standard
	USB transfer rate	12Mbps (Full-speed), 480Mbps (High-speed) *3
	Power supply	Self power
Common	Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
	Number of terminals used at the same time	127 terminals (Max.) *4
	Dielectric strength	500Vrms
	Internal power supply	12VDC 240mA *5
	Current consumption	5VDC 830mA (Max.)
	Physical dimensions (mm)	180(W) x 140(D) x 34(H) (exclusive of protrusions)
	Weight	300g (Not including the USB cable, attachment)
	Attached cable	USB cable 1.8m

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

*2 The Opto-coupler's response time comes.

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

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

*5 The input section consumes up to 40mA and the SW section of output channel consumes up to 30mA, so the output current that can be supplied to the external device is 170mA.

Installation Environment Requirements

Item	Specifications
Operating ambient temperature *1*2	0 - 50°C
Operating ambient humidity *1	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

AC adapter environmental condition (environmental specification)

ltem	Specifications
Input voltage range	90 - 264VAC
Rated input current	300mA
Number of frequency	50 - 60Hz
Rated output voltage	5.0VDC
Rated output current	2.0A (Max.)
Dimension (mm)	47.5(W) x 75(D) x 27.3(H) (No protrusions)
Weight	175g
Operating temperature	0 - 40°C
Operating humidity	20 - 80%RH(No condensation)
Life expectancy	4 years at the ambient temperature 40°C (When 100VAC is input and 1.3A is output)
Allowable time of short interruption	15ms (Max.) (When 100VAC is input and 1.3A is output) *1
Floating dust particles	Not to be excessive
Corrosive gases	None
Voltage corresponding to the attached AC cable	125VAC 7A

*1 When the short interruption occurs and the defective operation of the equipment is generated, please insert the power supply of the equipment after pulling out it.

Physical Dimensions

Physical dimensions





Physical dimensions of attached AC adapter (POA200-20-2)



Support Software

Name	Contents	How to get
Windows Version Digital I/O Driver software API-DIO(WDM)	T 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/

For supported software, search the CONTEC website for this product and view the product page. *2 https://www.contec.com/

Option

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	*2
General Purpose Terminal	DTP-3C	*2
Screw Terminal	DTP-4C	*2
Signal monitor Accessory for Digital I/O (32bits)	CM-32L	*2
USB I/O Unit Bracket for X Series	BRK-USB-X	
AC-DC Power Adaptor(5VDC, 2A)	POA200-20-2	
F&eIT Series DC-DC Power Supply Unit	POW-DD10GY	
F&eIT Series 5VDC AC-DC Converter	PWD-25AWD5	

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

PCB37P or PCB37PS optional cable is required separately. Visit the CONTEC website for the latest optional products.

Block Diagram



Connecting an Interface Connector

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	Interface connector (CNI1)

- 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]

Layout on the Interface Connector(CN1)



Pin No.	Signal name	Meaning	Pin No.	Signal name	Meaning
· · · · ·			19	N.C.	
37	P1	Common plus pin for +2/+3 output port	18	PO	Common plus pin for +0/+1 input port
36	O-37		17	I-17	
35	O-36		16	I-16	
34	O-35		15	I-15	
33	O-34	+3 port	14	I-14	+1 port
32	O-33	(output)	13	I-13	(input)
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	
27	O-26		8	I-06	
26	O-25		7	I-05	
25	0-24		6	I-04	+0 port
24	O-23		5	I-03	(input)
23	0-22		4	I-02	
22	O-21		3	I-01	
21	O-20		2	I-00	
20	N1	Common minus pin for +2/+3 output port	1	N0	Common minus pin for +0/+1 input port

* 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.		
P0	The output of this pin is +12V. These pins are common to 16 input signal pins.		
P1	The output of this pin is +12V. These pins are common to 16 output signal pins.		
N0	This pin is GND. These pins are common to 16 input signal pins.		
N1	This pin is GND. These pins are common to 16 output signal pins.		
N.C.	These pins are left unconnected.		

To perform input/output using this product with the CONTEC device driver, specify logical ports and logical bits when calling each function. For details, refer to the "Relationships between API-TOOL Logical Ports/Bits and Connector Signal Pins".

Connecting Input and Output Signals

Input Circuit

Connect the input signals to a device which can be current-driven, such as a switch or transistor output device. The product inputs the ON/OFF state of the current-driven device as a digital value.



The signal inputs are isolated by opto-couplers (compatible with current sink output).

Connecting a Switch



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

Output Circuit

Connect the output signals to a current-driven controlled device such as a relay or LED. The product controls turning on/off the current-driven controlled device using a digital value.



* O-xx represents the output pin.

The signal output section is an opto-coupler isolated, open-collector output (current sink type). This product therefore requires the on-board internal power supply to drive the output section of this product. The rated output current per channel is 100mA at maximum. The output section can also be connected to a TTL level input as it uses a low-saturated transistor for output. The residual voltage (low-level voltage) between the collector and emitter with the output on is 0.5V or less at an output current within 50mA or at most 1.0V at an output current within 100mA.

A zener diode is connected to the output transistor for protection from surge voltages. An overcurrent protection component is provided for every 8 output transistors. When the over-current protector works, the output section of the product is temporarily disabled. If this is the case, turn of the power to the PC and the external power supply and wait for a few minutes, then turn them on back.

CAUTION

When the PC is turned on, all outputs 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.

Example of Connection to TTL Level Input

(Connection Example of Output and TTL level Input Signal)



Connecting the Sink Type Output and Sink Output Support Input

The following example shows a connection between a sink type output (output side) and a sink output support input (input side). Refer to this connection example when you connect such products to each other.



+5VDC input terminal

This product must be connected with 5VDC power supply (in a self-powered state).

Connect with 5VDC power supply by using +5VDC input pin.



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

When the accompanying power connector (MC1,5/3-ST-3,5, suitable cable: AWG28 - 16) is used to supply power to this unit, strip the end of the suitable cable and insert it to the power connector before firmly securing it using a screw.

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

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installation on a DIN rail is used, connect the unit using the accompanying power connector MC1,5/-ST-3,5.

- 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.
- 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.
- Do not remove the power connector [MC1,5/3-ST-3,5] attached to the AC adapter.

Difference from DIO-1616B-PE and PIO-16/16B(PCI)H

Item	DIO-1616BX-USB	DIO-1616B-PE	PIO-16/16B(PCI)H
Selecting Power Supply	It is impossible. (Only using the internal power supply)	It selects it with the jumper.	
Current consumption (Max)	5VDC 830mA	When using the internal power supply: 3.3VDC 350mA 12VDC 350mA When using the external power supply: 3.3VDC 350mA	When using the internal power supply: 5VDC 1200mA When using the external power supply: 5VDC 300mA
Bus specification	USB Specification 2.0/1.1 standard	PCI Express Base Specification Rev. 1.0a x1	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)	140g	150g