USB I/O Unit X Series
Digital I/O Unit with Opto-Isolation for USB
DIO-3232LX-USB

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 can input and output digital signals at 12 - 24VDC.
This product features 32 channels of Optocoupler isolated inputs (compatible with current sink output) and 32 channels of Optocoupler isolated open-collector outputs (current sink type). You can use all of signals as interrupt inputs. Equipped with the 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-32/32L(PCI)H and PCI Express bus-compatible board DIO-3232L-PE in terms of connector shape and pin assignments, it is easy to migrate from the existing system.
Windows/Linux driver is supported with this product.

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

*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.

Features

- **32 channels of Optocoupler isolated inputs (compatible with current sink output) and 32 channels of Optocoupler isolated open-collector outputs (current sink type)**
This product has the 32 channels of Optocoupler isolated inputs (compatible with current sink output) and the 32 channels of Optocoupler isolated open-collector outputs (current sink type) whose response speed is 200μsec. Supporting driver voltages of 12 - 24 VDC for I/O. (12 - 24VDC external circuit power supply is required separately.)

- **Compatible to USB2.0/USB1.1**
Compatible to USB2.0/USB1.1 and capable to achieve high speed transfer at HighSpeed (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 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
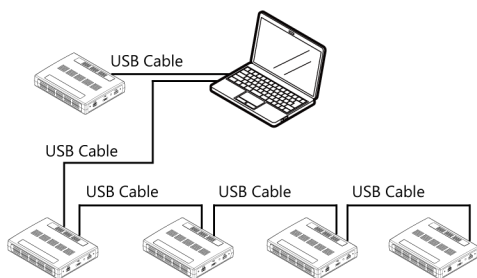
- **Common terminal provided per 16 channels**
Common terminal provided per 16 channels, capable of supporting a different external power supply.

- **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.

- **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-32/32L(PCI)H and DIO-3232L-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   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.

Included Items

Unit [DIO-3232LX-USB] … 1
Please read the following … 1
USB cable (1.8m) …1
USB cable attachment on the main unit's 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

Hardware specifications

Function Specifications

Item		Specifications
Input	Type	Opto-coupler isolated input (Compatible with current sink output) (Negative logic *1)
	Number of Channels	32 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	32 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	Type	Opto-coupler isolated open collector output (current sink type) (Negative logic *1)
	Number of Channels	32 channels
	Output rated voltage	35VDC (Max.)
	Output rated current	100mA (per point) (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(NEC) 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	Bus power / Self-power *4
Common	Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
	Number of terminals used at the same time	127 terminals (Max.) *5
	Dielectric strength	1000Vrms
	External circuit power supply *6	12 - 24VDC (±10%)
	Current consumption	5VDC 400mA (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
	Compatible wires	AWG28 - 16

*1   Data "0" and "1" correspond to the High and Low levels, respectively.
*2   The Optocoupler's response time comes.
*3   This depends on the PC environment used (OS and USB host controller).
*4   Use 5VDC power supply for self-power when you use the USB hub function.
*5   As a USB hub is also counted as one device, you cannot just connect 127 USB unit.
*6   External circuit power supply is required separately

Installation Environment Requirements

Item	Specifications
Operating ambient temperature *7*8	0 - 50℃
Operating ambient humidity *7	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

*7   To suppress the heating, ensure that there are spaces for ventilation (about 5cm) around this product.
*8   When using the attached AC adaptor POA200-20-2, it is 0 - 40℃

Block Diagram

Isolated line
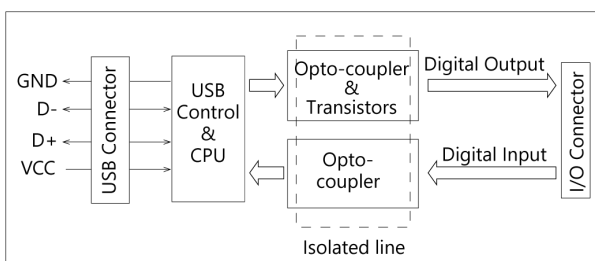
Support Software

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 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/

Optional Products

Product Name	Model type	Description
Shielded Cable with Two 96-Pin Half-Pitch Connectors	PCB96PS-0.5P	0.5m
	PCB96PS-1.5P	1.5m
	PCB96PS-3P	3m
	PCB96PS-5P	5m
Flat Cable with 96-pin Half-Pitch Connectors at Both Ends	PCB96P-1.5	1.5m
	PCB96P-3	3m
Shielded Cable with One 96-pin Half-Pitch Connector	PCA96PS-0.5P	0.5m
	PCA96PS-1.5P	1.5m
	PCA96PS-3P	3m
	PCA96PS-5P	5m
Flat Cable with One 96-pin Half-Pitch Connector	PCA96P-1.5	1.5m
	PCA96P-3	3m
Connection Conversion Shield Cable (96P→37P x 2)	PCB96WS-1.5P	1.5m
	PCB96WS-3P	3m
	PCB96WS-5P	5m
Screw Terminal (M3 * 96)	EPD-96A	*1 *2
Terminal Unit for Relay Terminal Banks	EPD-96	*2
Screw Terminal (M3 * 37P)	EPD-37A	*1 *3
Screw Terminal (M3.5 * 37)	EPD-37	*3
Screw Terminal	DTP-64A	*2
General Purpose Terminal	DTP-3C	*3
Screw Terminal	DTP-4C	*3
Signal monitor Accessory for Digital I/O (64bits)	CM-64L	*2
Signal monitor Accessory for Digital I/O (32bits)	CM-32L	*3
Connector Conversion Board (96pin→37pinx2)	CCB-96	*4
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	

*1   "Spring-up" type terminal is used to prevent terminal screws from falling off.
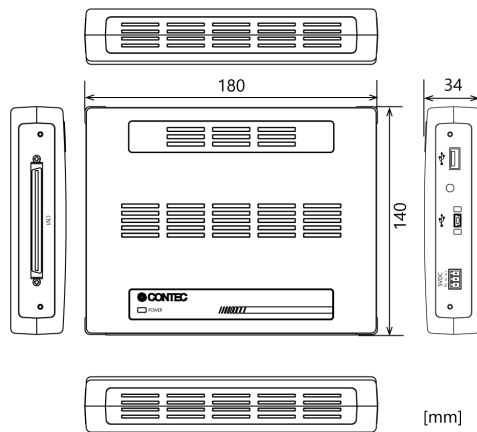*2   PCB96P or PCB96PS optional cable is required separately.
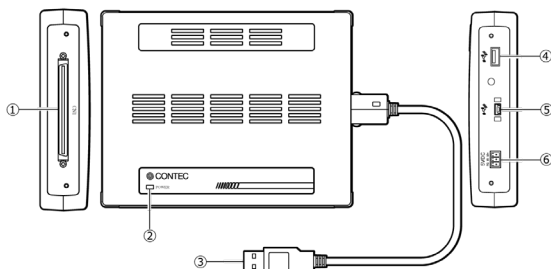*3   PCB96WS optional cable is required separately.
*4   Optional PCB96P, PCB96PS or cable for 37Pin D-SUB is required separately.

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

Physical Dimensions

180   34

140

[mm]

Nomenclature of Product Components

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

Using the Connectors

Connecting to a Connector

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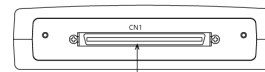
Interface connector (CN1)

- Connector used
  PCR-E96LMD+ or equivalence
  [mfd. by HONDA TSUSHIN KOGYO CO., LTD.]

- Compatible connectors
  PCR-E96FA+ or equivalence
  [mfd. by HONDA TSUSHIN KOGYO CO., LTD.]

CN1

A48 [1]   [48] A01

B48 [49]   [96] B01

Pin No.	Signal name	Meaning	Pin No.	Signal name	Meaning
B48	OP 6/7	Common plus pin for +6/+7 output ports	A48	IP 2/3	Common plus pin for +2/+3 input ports
B47	OP 6/7		A47	IP 2/3	
B46	O-77		A46	I-37	
B45	O-76		A45	I-36	
B44	O-75		A44	I-35	
B43	O-74	+7 port (output)	A43	I-34	+3 port (input)
B42	O-73		A42	I-33	
B41	O-72		A41	I-32	
B40	O-71		A40	I-31	
B39	O-70		A39	I-30	
B38	O-67		A38	I-27	
B37	O-66		A37	I-26	
B36	O-65		A36	I-25	
B35	O-64	+6 port (output)	A35	I-24	+2 port (input)
B34	O-63		A34	I-23	
B33	O-62		A33	I-22	
B32	O-61		A32	I-21	
B31	O-60		A31	I-20	
B30	ON 6/7	Common minus pin for +6/+7 output ports	A30	N.C.	
B29	ON 6/7		A29	N.C.	
B28	N.C.		A28	N.C.	
B27	N.C.		A27	N.C.	
B26	N.C.		A26	N.C.	
B25	N.C.	N.C.	A25	N.C.	N.C.
B24	N.C.		A24	N.C.	
B23	N.C.		A23	N.C.	
B22	N.C.		A22	N.C.	
B21	N.C.		A21	N.C.	
B20	OP 4/5	Common plus pin for +4/+5 output ports	A20	IP 0/1	Common plus pin for +0/+1 input ports
B19	OP 4/5		A19	IP 0/1	
B18	O-57		A18	I-17	
B17	O-56		A17	I-16	
B16	O-55		A16	I-15	
B15	O-54	+5 port (output)	A15	I-14	+1 port (input)
B14	O-53		A14	I-13	
B13	O-52		A13	I-12	
B12	O-51		A12	I-11	
B11	O-50		A11	I-10	
B10	O-47		A10	I-07	
B09	O-46		A09	I-06	
B08	O-45		A08	I-05	
B07	O-44		A07	I-04	
B06	O-43	+4 port (output)	A06	I-03	+0 port (input)
B05	O-42		A05	I-02	
B04	O-41		A04	I-01	
B03	O-40		A03	I-00	
B02	ON 4/5	Common minus pin for +4/+5 output ports	A02	N.C.	N.C.
B01	ON 4/5		A01	N.C.	

* I-00 - I-37 can be used as interrupt input signal.

* [ ] shows pin numbers specified by HONDA TSUSHIN KOGYO CO., LTD.

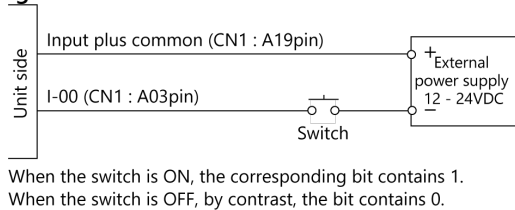| Signal name	Description
I-00 - I-37	32 input signal pins. Connect output signals from the external device to these pins.
O-40 - O-77	32 output signal pins. Connect these pins to the input signal pins of the external device.
IP-0/1	Connect the positive side of the external power supply. These pins are common to 16 pins of input sign I-00 - I-07, I-10 - I-17.
IP-2/3	Connect the positive side of the external power supply. These pins are common to 16 pins of input sign I-20 - I-27, I-30 - I-37.
OP-4/5	Connect the positive side of the external power supply. These pins are common to 16 pins of output sign O-40 - 0-47, O-50 - O-57.
OP-6/7	Connect the positive side of the external power supply. These pins are common to 16 pins of output sign O-60 - 0-67, O-70 - O-77.
ON-4/5	Connect the negative side of the external power supply. These pins are common to 16 pins of output sign O-40 - 0-47, O-50 - O-57.
ON-6/7	Connect the negative side of the external power supply. These pins are common to 16 pins of output sign O-60 - 0-67, O-70 - O-77.
N.C.	These pins are 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.
This product inputs the ON/OFF state of the current-driven device as a digital value.

Input Circuit

* I-xx represents an input pin.
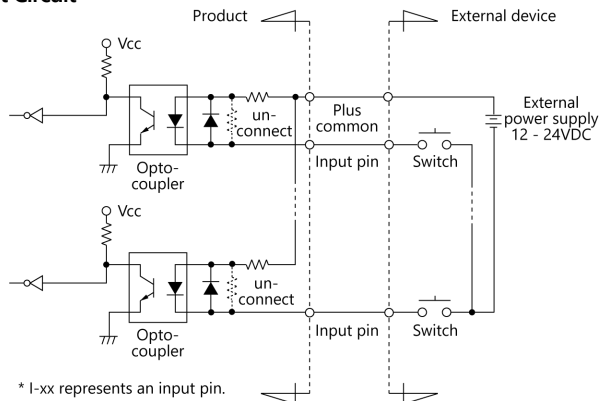
The signal inputs are isolated by opto-couplers (ready to accept current sinking output signals).
The product therefore requires an external power supply to drive the inputs. The power requirement for each input pin is about 5.1 mA at 24 VDC (about 2.6 mA at 12 VDC).

Connecting a Switch

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

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

* O-xx represents an output pin.
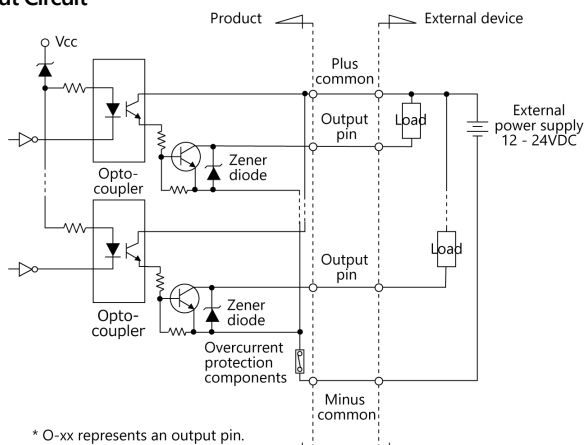
The signal output section is an opto-coupler isolated, open-collector output (current sink type). This product therefore requires the external power supply to drive the output section of this product.
The rated output current per channel is 100mA at maximum. The output section can also be connected to 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.
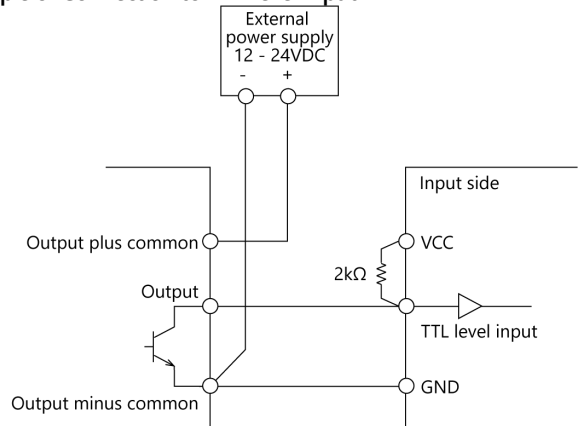
⚠ CAUTION
- When the PC is turned on, all output are reset to OFF.

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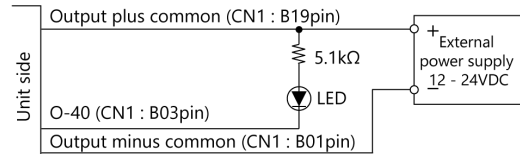
When "1" is output to a relevant bit, the corresponding LED comes on.
When "0" is output to the bit, in contrast, the LED goes out.

### Example of Connection to TTL Level Input

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 this product to each other.
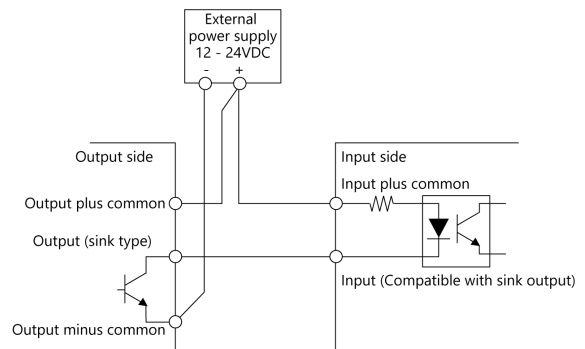
Connection with 5VDC Power Supply for Self-power

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
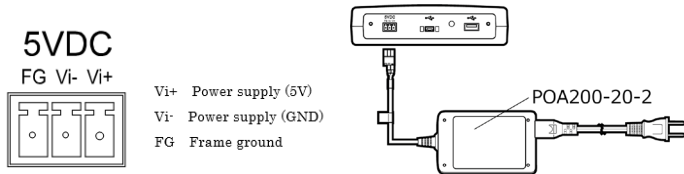
POA200-20-2

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 adaptor [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.