Digital I/O Unit
with Opto-Isolation for USB

DIO-3232LX-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 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 32 input 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.

*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 November, 2022.

Features

- 32 channels of Optocoupler isolated inputs (compatible with current sink output) and 32 channels of Optocoupler isolated open-collector outputs (current sink type)

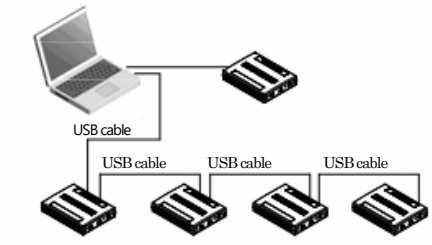
This product has the 32 channels of Optocoupler isolated inputs (compatible with current sink output) and the 32 channels of Optocoupler isolated open-collector outputs (current sink type) whose response speed is 200µsec. Supporting driver voltages of 12 - 24 VDC for I/O. (12 - 24VDC external circuit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

- Compatible to USB1.1/USB2.0

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

- USB HUB function

This product has the USB hub function. Max. 4 DIO-3232LX-USB can be used in 1 USB port of PC. When you use 4 or more DIO-3232LX-USB, you can do by connecting DIO-3232LX-USB to the another USB port of PC side. *1
Also, you can connect the CONTEC's USB device other than DIO-3232LX-USB to the USB port of DIO-3232LX-USB. *2*3



- Common terminal provided per 16 channels

Common terminal provided per 16 channels, capable of supporting a different external power supply.

- Optocoupler bus isolation

As the USB (PC) is isolated from the input and output interfaces by Optocouplers, this product has excellent noise performance.

- You can use 32 input signals as interrupt request signals.

You can use 32 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 has a 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.

- Output circuits include zener diodes for surge voltage protection and poly-switches for overcurrent protection.

Zener diodes are connected to the output circuits to protect against surge voltages. Similarly, polyswitches are fitted to each group of 8channels outputs for over-current protection.
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. 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).

- Windows/Linux compatible driver libraries are supported.

Using the digital I/O driver 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 When you use the USB port included on the DIO-1616LX-USB, use 5VDC power supply for self-power.
*2 Do not connect the device other than that of CONTEC's USB to the USB port included on the DIO-1616LX-USB. 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

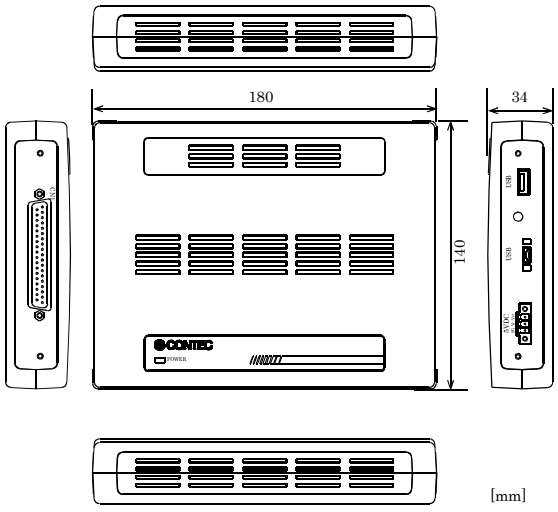
Unit [DIO-3232LX-USB] ... 1
Please read the following ... 1
USB cable (1.8m) ...1
USB cable attachment on the main unit's side (For Mini B connector side) ...1
Clamps for prevention of cable on the main unit's side...1
Power connector MC1,5/3-ST-3,5 ...1
Ferrite core ...1

Hardware specifications

Item			Specification
Input section			
	Number of input signal channels		32 channels (all available for interrupts) (1 common in 16 channels)
	Input format		Optocoupler isolated input (Compatible with current sink output) (Negative logic *1)
	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. 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 section			
	Number of output signal channels		32 channels (1 common)
	Output format		Optocoupler isolated open collector output (current sink type) (Negative logic*1)
	Output rating	Output voltage	35VDC (Max.)
		Output 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(NEC) or equivalent
	Response time		200µsec within *2
USB section			
	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 section			
	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 (Max.)		5VDC 400mA
	Operating conditions		0 - 50°C, 10 - 90%RH (No condensation)
	Allowable distance of signal extension		Approx. 50m (depending on wiring environment)
	Physical dimensions (mm)		180(W) x 140(D) x 34(H) (No protrusions)
	Weight		300g (Not including the USB cable, attachment)
	Connector		96pin half-pitch connector [M(male)type] PCR-E96LMD+ [mfd. by HONDA TSUSHIN KOGYO CO., LTD.] or equivalence to it
	Attached cable		USB cable 1.8m
	Applicable wire		AWG28 - 16
	Standard		VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA

*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 This depends on the PC environment used (OS and USB host controller).
*6 External circuit power supply is required separately.

Physical Dimensions



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.

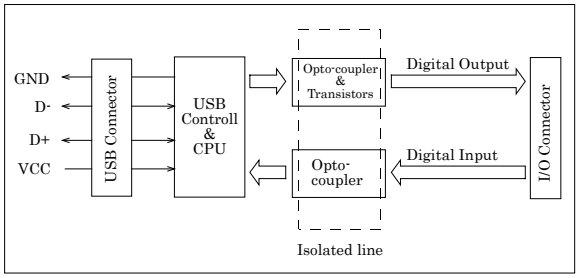
Name	Contents	How to get
Windows Version Digital I/O Driver software API-DIO(WDM)	The API-DIO(WDM) is the Windows version driver software that provides products in the form of Win32 API functions (DLL). Various sample programs such as Visual Basic and Visual C++, etc and diagnostic program useful for checking operation is provided.	Download from the CONTEC website
Linux Version Digital I/O Driver software API-DIO(LNX)	The API-DIO(LNX) is the Linux version driver software which provides device drivers (modules) by shared library and kernel version. Various sample programs of gcc are provided.	Download from the CONTEC website
LabVIEW-support data acquisition library DAQfast for LabVIEW	This is a data collection library to use in the LabVIEW by National Instruments. With Polymorphic VI, our design enables a LabVIEW user to operate seamlessly. Our aim is that the customers to perform easily, promptly what they wish to do.	Download from the CONTEC website

Option

Product Name	Model type	Description
Flat Cable with 96-Pin Half-Pitch Connectors at Both Ends	PCB96P-1.5	1.5m
	PCB96P-3	3m
Shield Cable with 96-Pin Half-Pitch Connectors at Both Ends	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 One End	PCA96P-1.5	1.5m
	PCA96P-3	3m
Shield Cable with 96-Pin Half-Pitch Connectors at One End	PCA96PS-0.5P	0.5m
	PCA96PS-1.5P	1.5m
	PCA96PS-3P	3m
	PCA96PS-5P	5m
Distribution shield cable with 96-Pin Half-Pitch Connectors (96P→37P x 2)	PCB96WS-1.5P	1.5m
	PCB96WS-3P	3m
	PCB96WS-5P	5m
Screw Terminal Unit (M3 x 96P)	EPD-96A	*1*4
Screw Terminal Unit (M3.5 x 96P)	EPD-96	*1
Terminal Unit for Cables (M3 x 96P)	DTP-64A	*1
Signal Monitor / Output Accessory for Digital I/O (64P)	CM-64L	*1
Screw Terminal (M3 x 37P)	EPD-37A	*2*4
Screw Terminal (M3.5 x 37P)	EPD-37	*2
General Purpose Terminal (M3 x 37P)	DTP-3C	*2
Screw Terminal (M2.5 x 37P)	DTP-4C	*2
Signal Monitor for Digital I/O (32Bits)	CM-32L	*2
Connection Conversion Board (96-Pin□37-Pin x 2)	CCB-96	*3
USB I/O Unit Bracket for X Series	BRK-USB-X	
AC adaptor (input : 90 - 264VAC, output : 5VDC 2.0A)	POA200-20-2	*4

*1 A PCB96P or PCB96PS optional cable is required.
*2 A PCB96WS optional cable is required separately.
*3 Optional PCB96P, PCB96PS or cable for 37Pin D-SUB is required separately.
*4 "Spring-up" type terminal is used to prevent terminal screws from falling off.
* Check the CONTEC's Web site for more information on these options.

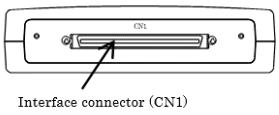
Block Diagram



Using the Connectors

Connecting to a Connector

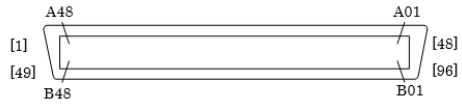
To connect an external device to this product, plug the cable from the device into the interface connector (CN1) of unit shown below.



Interface connector (CN1)

- Connector used
  PCR-E96LMD+ equivalence to it
  [mfd. by HONDA TSUSHIN KOGYO CO., LTD.]
- Compatible connectors
  PCR-E96FA+ equivalence to it
  [mfd. by HONDA TSUSHIN KOGYO CO., LTD.]

CN1



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	+7 port (output)	A46	I-37	+3 port (input)
B45	O-76		A45	I-36	
B44	O-75		A44	I-35	
B43	O-74		A43	I-34	
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	+6 port (output)	A38	I-27	+2 port (input)
B37	O-66		A37	I-26	
B36	O-65		A36	I-25	
B35	O-64		A35	I-24	
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.	N.C.
B29	ON 6/7		A29	N.C.	
B28	N.C.	N.C.	A28	N.C.	
B27	N.C.		A27	N.C.	
B26	N.C.		A26	N.C.	
B25	N.C.		A25	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	+5 port (output)	A18	I-17	+1 port (input)
B17	O-56		A17	I-16	
B16	O-55		A16	I-15	
B15	O-54		A15	I-14	
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	+4 port (output)	A10	I-07	+0 port (input)
B09	O-46		A09	I-06	
B08	O-45		A08	I-05	
B07	O-44		A07	I-04	
B06	O-43		A06	I-03	
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.	

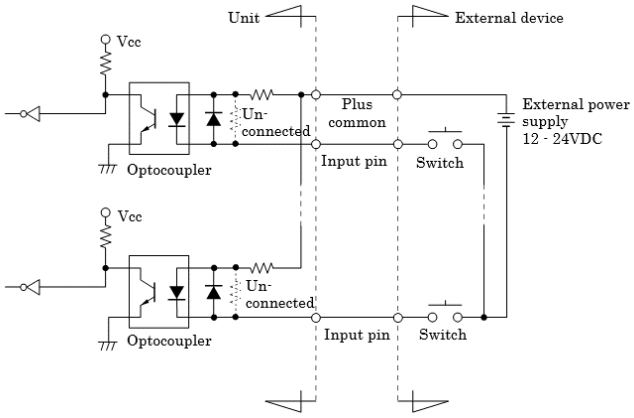
* I-00 - I-37 can be used as interrupt input signal.
* [ ] shows pin numbers specified by HONDA TSUSHIN KOGYO CO., LTD.

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

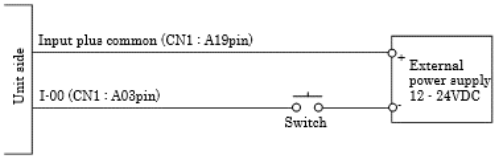
Input Circuit



* I-xx represents the input pin.

The input circuits of interface blocks of this product is illustrated in the image above.
The signal inputs are isolated by Optocouplers (compatible with current sink output). This product therefore requires an external power supply to drive the inputs. The power requirement for each input pin is about 5.1mA at 24VDC (about 2.6mA at 12VDC).

Connecting a Switch

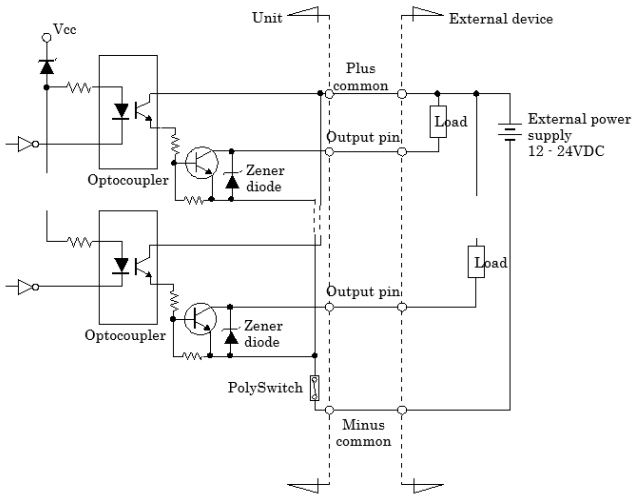


When the switch is ON, the corresponding bit contains 1.
When the switch is OFF, by contrast, the bit contains 0.

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 the output pin.

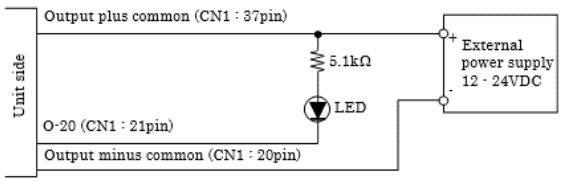
The output circuits of interface blocks of this product is illustrated in the image above.

The signal output section is an Optocoupler isolated, open-collector output (current sink type). Driving the output section requires an external power supply.
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. A PolySwitch-based overcurrent protector is provided for every 8 output transistors. When the overcurrent protector works, the output section of this 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

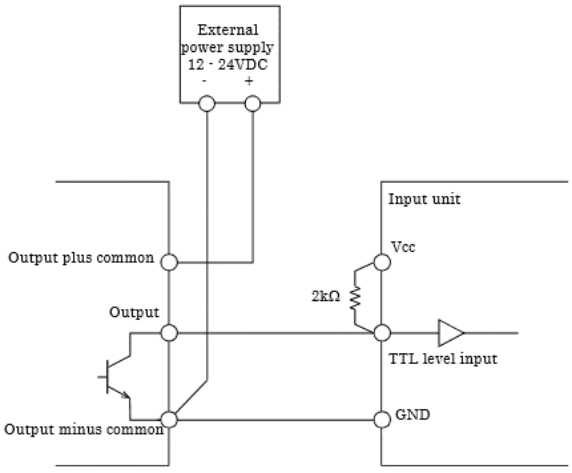
- When the PC is turned on, all output are reset to OFF.

Connection to the LED



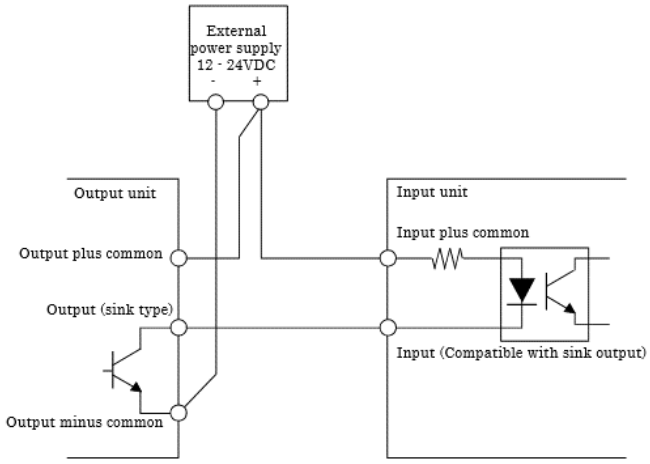
When "1" is output to a relevant bit, the corresponding LED comes on.
When "0" is output to the bit, in contrast, the LED goes out.

Example of Connection to TTL Level Input



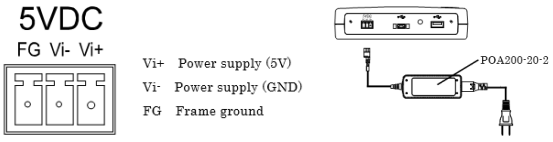
Connecting the Sink Type Output and Sink Output Support Input

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 DIO-3232LX-USB, this product must be connected with 5VDC power supply (in a self-powered state). Connect with 5VDC power supply by using +5VDC input pin.



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.

⚠ 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.