

## Digital I/O Unit with Opto-Isolation for USB DIO-1616LX-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 speed is 200μsec. Supporting driver voltages of 12 - 24 VDC for I/O. (12 - 24VDC external circuit power supply is required separately.)

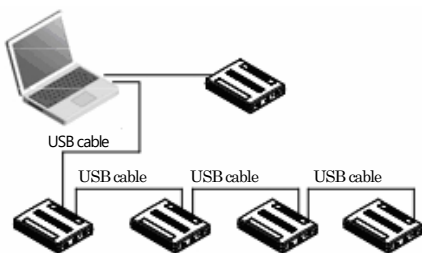
- **Compatible to USB1.1/USB2.0**

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-1616LX-USB can be used in 1 USB port of PC. When you use 4 or more DIO-1616LX-USB, you can do by connecting DIO-1616LX-USB to the another USB port of PC side. \*1

Also, you can connect the CONTEC's USB device other than DIO-1616LX-USB to the USB port of DIO-1616LX-USB. \*2\*3



- **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 16 input signals as interrupt request signals.**

You can use 16 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.

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 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 16 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-16/16L(PCI)H and PCI Express bus-compatible board DIO-1616L-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.

- **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-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. 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-1616LX-USB] ... 1

Please read the following ... 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

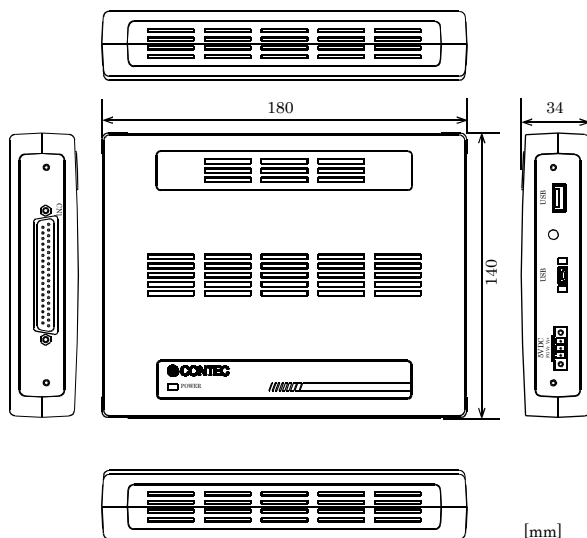
Ferrite core ...1

## Hardware specifications

Item	Specification	
<b>Input section</b>		
Number of input signal channels	16 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	4.7k $\Omega$	
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	200 $\mu$ sec within*2	
<b>Output section</b>		
Number of output signal channels	16 channels	
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 $\leq$ 50mA), 1.0V or less (Output current $\leq$ 100mA)	
Surge protector	Zener diode RD47FM(NEC) or equivalent	
Response time	200 $\mu$ sec within*2	
<b>USB section</b>		
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	
<b>Common section</b>		
Number of terminals used at the same time	127 terminals (Max.) *5	
Dielectric strength	1000Vrms	
External circuit power supply*6	12 - 24VDC ( $\pm$ 10%)	
Current consumption (Max)	5VDC 300mA	
Operating conditions*7*8	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	37-pin D-SUB connector [F(female)type] DCLC-J37SAF-20L9E [mfd.by JAE] or equivalence to it	
Attached cable	USB cable 1.8m	

- \*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.
- \*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°C

## Physical Dimensions



[mm]

## 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 Two 37-pin D- SUB Connectors	PCB37P-1.5	1.5m
Shielded Cable with Two 37-pin D- SUB Connectors	PCB37PS-0.5P	0.5m
	PCB37PS-1.5P	1.5m
	PCB37PS-3P	3m
	PCB37PS-5P	5m
Flat Cable with One 37-pin D- SUB Connector	PCA37P-1.5	1.5m
	PCA37P-3	3m
Shielded Cable with One 37-pin D- SUB Connector	PCA37PS-0.5P	0.5m
	PCA37PS-1.5P	1.5m
	PCA37PS-3P	3m
	PCA37PS-5P	5m
Screw Terminal (M3 x 37P)	EPD-37A	*1*2
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
USB I/O Unit Bracket for X Series	BRK-USB-X	
AC adaptor (input : 90 - 264VAC, output : 5VDC 2.0A)	POA200-20-2	*3

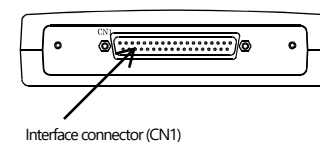
- \*1 "Spring-up" type terminal is used to prevent terminal screws from falling off.
- \*2 A PCB37P or PCB37PS optional cable is required separately.
- \*3 It is the same as the one appended to the product. Please buy it necessary for maintenance.

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

## Using the Connectors

### Connecting to a Connector

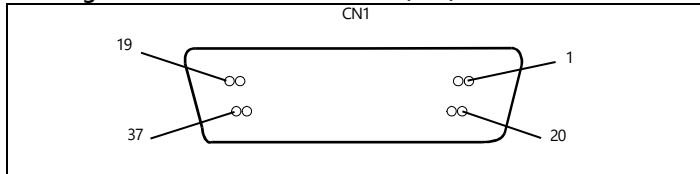
To connect an external device to this product, plug the cable from the device into the interface connector (CN1) of unit shown below.



- Connector used  
37-pin D-SUB connector [F(female)type]  
DCLC-J37SAF-20L9E [mfd by JAE] +  
equivalence to it 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]

Connector Pin Assignment

Pin Assignments of Interface Connector (CN1)



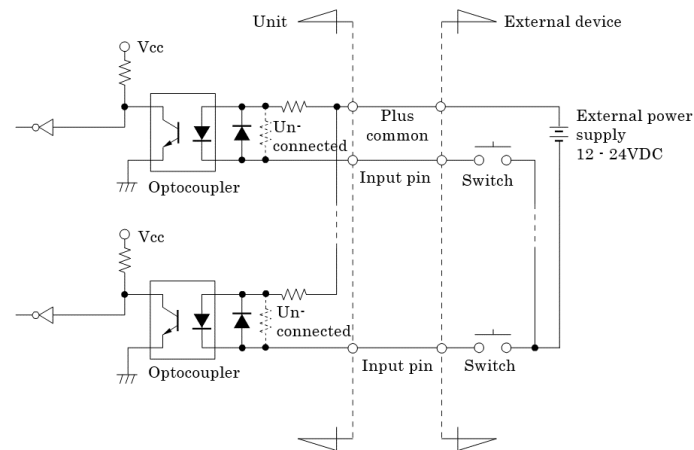
Pin No.	Signal name	Meaning	Pin No.	Signal name	Meaning
37	OP 2/3	Common plus pin for +2/+3 output port	19	N.C.	
36	O-37		18	IP 0/1	Common plus pin for +0/+1 input port
35	O-36		17	I-17	+1 port (input)
34	O-35	16	I-16		
33	O-34	15	I-15		
32	O-33	14	I-14		
31	O-32	13	I-13		
30	O-31	12	I-12		
29	O-30	11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

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.
IP 0/1	Connect the positive side of the external power supply. These pins are common to 16 input signal pins.
OP 2/3	Connect the positive side of the external power supply. These pins are common to 16 output signal pins.
ON 2/3	Connect the negative side of the external power supply. 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. This product inputs the ON/OFF state of the current-driven device as a digital value.

Input Circuit

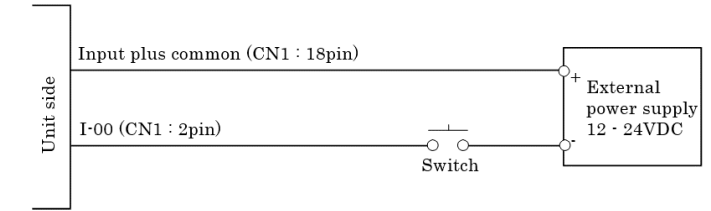


\* I-xx represents the input pin.

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.

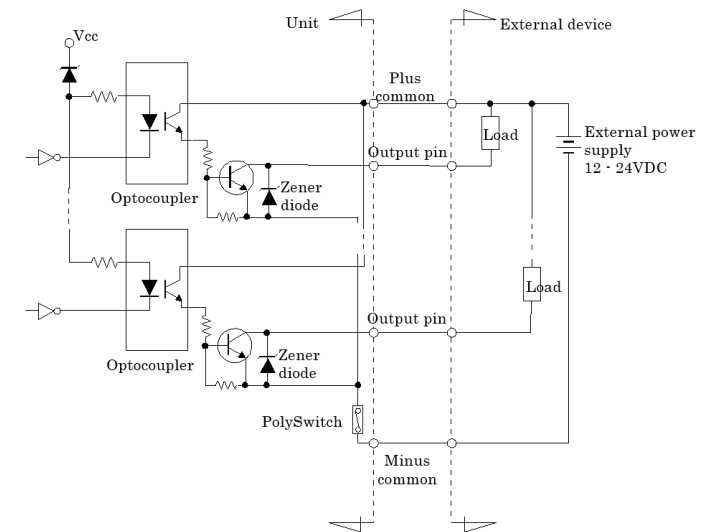
When the switch is OFF, by contrast, the bit contains 0.

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.

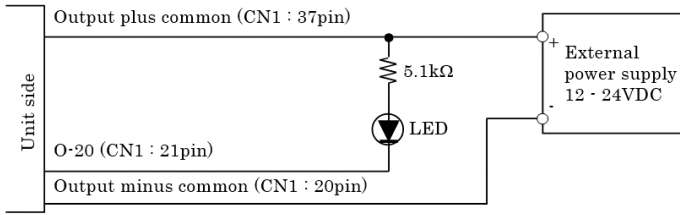
The output section can also be connected to a TTL level input as it uses a low-saturated transistor for output. The residual voltage (low-level voltage) between the collector and emitter with the output on is 0.5V or less at an output current within 50mA or at most 1.0V at an output current within 100mA.

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

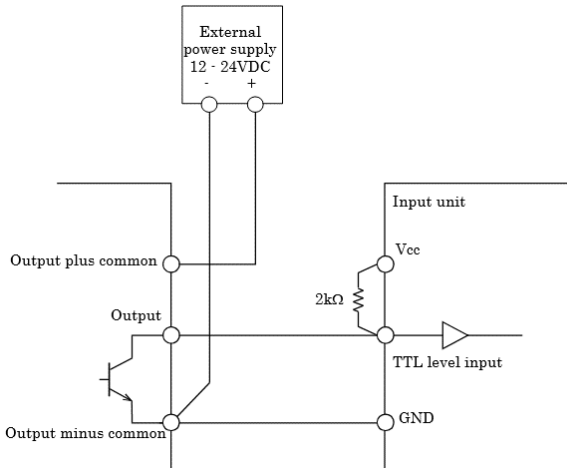
- When the PC is turned on, all output are reset to OFF.

**Connection to the LED**



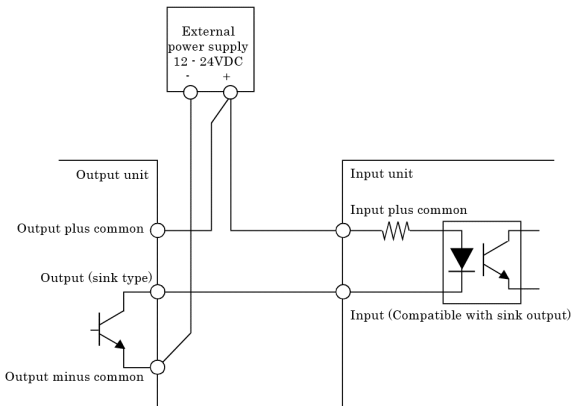
When "1" is output to a relevant bit, the corresponding LED comes on.  
 When "0" is output to the bit, in contrast, the LED goes out.

**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 board) and a sink output support input (input board). Refer to this connection example when you connect such boards to each other.



**Block Diagram**

