

Isolated Digital I/O Board  
for PCI (Internal power supply)  
**PIO-16/16B(PCI)H**



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

**Features**

- A different external power supply can be used for each common pin as it is shared by 16 channels.
- The PCI bus (personal computer) and the I/O interface are isolated from each other by an Optocoupler, offering good noise immunity.
- You can use all of the input signals as interrupt request signals.
- You can also select the interrupt trigger edge of the input signal.
- The board has a digital filter feature to prevent noise or chatter from causing erroneous inputs.
- Up to 35VDC, 100mA per signal, max. output.
- Zener diode connected to output transistors for protection from surge voltage. Overcurrent protection circuit provided for every eight channels of output transistors.
- The board carries an opto-coupler driving power supply. You can select whether to use the internal power supply or an external power supply.

**Included Items**

Product [PIO-16/16B(PCI)H] ... 1  
Please read the following ... 1

This board is a PCI-compliant interface board for input/output of digital signals.

The PC can be used to input the on/off state of a switch and to control a relay. This product can input and output up to 16 channels.

Windows/Linux driver is supported with this product.

Possible to be used as a data recording device for LabVIEW, with dedicated libraries.

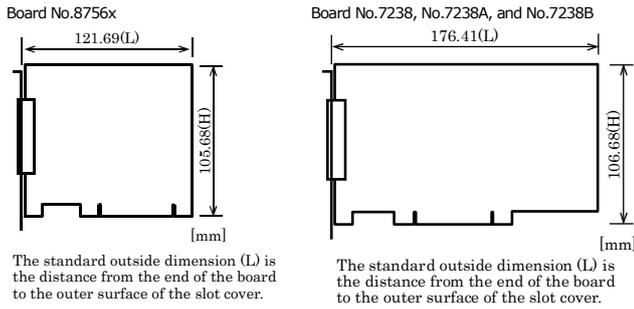
- \*The contents in this document are subject to change without notice.
- \*Visit the CONTEC website to check the latest details in the document.
- \*The information in the data sheets is as of October, 2022.

**Hardware specifications**

Item	Specification
<b>Input</b>	
Input format	Optocoupler isolated input (Compatible with current sink output)(Negative logic *1)
Number of input signal channels	16 channels (all available for interrupts) (1 common)
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 signal INTA. An interrupt is generated at the rising edge (HIGH-to-LOW transition) or falling edge (LOW-to-HIGH transition).
Response time	200μsec within
<b>Output</b>	
Output format	Optocoupler isolated open collector output (current sink type) (Negative logic*1)
Number of output signal channels	16 channels (1 common)
Output rating	Output voltage: 35VDC (Max.) Output current: 100mA (par channel) (Max.)
Residual voltage with output on	0.5V or less (Output currents≤50mA), 1.0V or less (Output currents≤100mA)
Surge protector	Zener diode RD47FM(NEC) or equivalent
Response time	200μsec within
<b>Common</b>	
I/O address	Any 32-byte boundary
Interruption level	1 level use
Max. board count for connection	16 boards including the master board
External circuit power supply	12 - 24VDC(±10%)
Internal power	12VDC 240mA *2
Power consumption	5VDC 1200mA (Max.) (Using the internal power) 5VDC 300mA (Max.) (Using the External power)
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
PCI bus specification	32bit, 33MHz, Universal key shapes supported *3
Dimension (mm)	121.69(L) x 105.68(H) *4*5
Weight	150g
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 When the internal power supply is used, the input section consumes a maximum of 42 mA and the output channel switching section consumes a maximum of 20 mA. In this case, therefore, the output current to be supplied from the board is 178 mA.  
 \*3 This board requires power supply at +5 V from an expansion slot (it does not work on a machine with a +3.3-V power supply alone).  
 \*4 The size of board No.7238, No.7238A, and No.7238B is 176.41 (L) x 105.68 (H) mm.  
 \*5 The size of board No.8756x is 121.69 (L) x 105.68 (H) mm

### 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 for 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

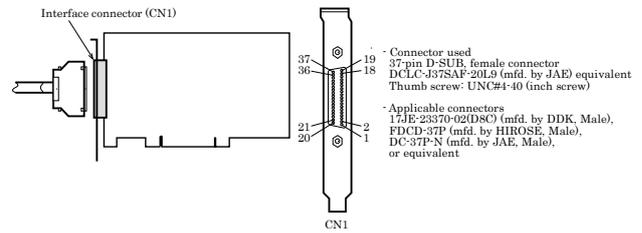
Product Name	Model type	Description
Flat Cable with Two 37-pin D-SUB Connectors	PCB37P-1.5	1.5m
Shielded Cable with Two 37-pin D-SUB Connectors	PCB37PS-0.5P	0.5m
	PCB37PS-1.5P	1.5m
	PCB37PS-3P	3m
	PCB37PS-5P	5m
Flat Cable with One 37-pin D-SUB Connector	PCA37P-1.5	1.5m
	PCA37P-3	3m
Shielded Cable with 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

\*1 "Spring-up" type terminal is used to prevent terminal screws from falling off.  
 \*2 A PCB37P or PCB37PS optional cable is required separately.  
 \* Check the CONTEC's Web site for more information on these options.

### How to connect the connectors

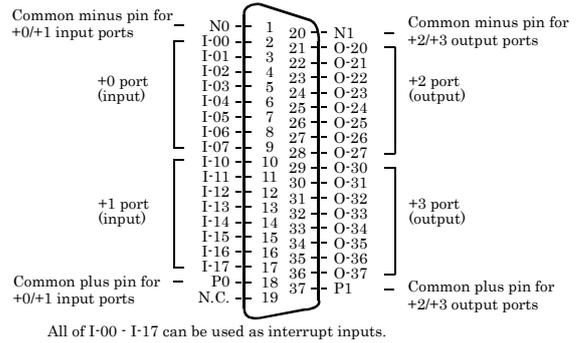
#### Connector shape

To connect an external device to this board, plug the cable from the device into the interface connector shown below.



#### Connector Pin Assignment

##### Pin Assignments of Interface Connector (CN1)



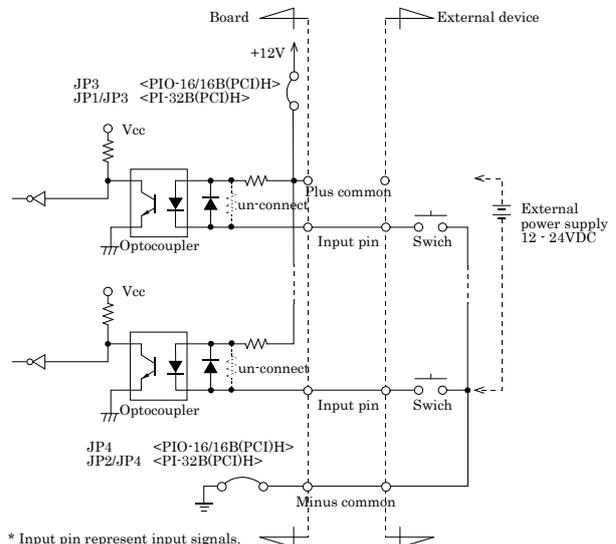
I-00 - I-17	16 input signal pins. Connect output signals from the external device to these pins.
O-20 - O-37	16 output signal pins. Connect these pins to the input signal pins of the external device.
P0	When the external power supply is selected, its positive side is connected to this pin. When the internal power supply is used, this pin outputs power at +12V. These pins are common to 16 input signal pins.
P1	When the external power supply is selected, its positive side is connected to this pin. When the internal power supply is used, this pin outputs power at +12V. These pins are common to 16 output signal pins.
N0	When the external power supply is selected, its negative side is connected to this pin. When the internal power supply is selected, this pin serves as the ground. These pins are common to 16 input signal pins.
N1	When the external power supply is selected, its negative side is connected to this pin. When the internal power supply is selected, this pin serves as the ground. 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 board inputs the ON/OFF state of the current-driven device as a digital value.

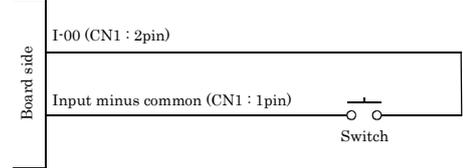
#### Input Circuit



The input circuit of this board is illustrated in the image above. The signal inputs are isolated by the Optocoupler (ready to accept current sinking output signals). To drive the input section of the board, therefore, the on-board internal power supply must be used or an external power supply is required. The power requirement for each input pin is about 5.1 mA at 24 VDC (about 2.6 mA at 12 VDC).

**CAUTION**  
- See the "Selecting the internal or external power supply" section to connect the jumpers depending on the power supply to be used.

**Connecting a Switch**

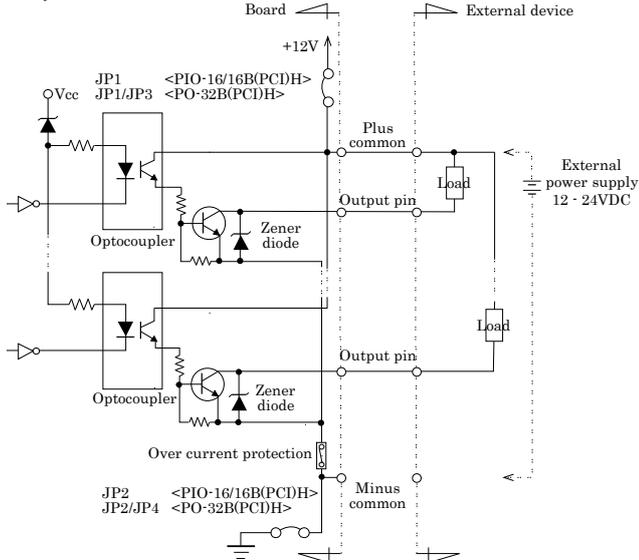


When the switch is ON, the corresponding bit contains 1.  
When the switch is OFF, by contrast, the bit contains 0.

**Connecting Output Signals**

Connect the output signals to a current-driven controlled device such as a relay or LED. The board 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 board and PO-32B(PCI)H are illustrated in the image above. The signal output section as an Optocoupler isolated open-collector output (current sink type). To drive the output section, the on-board internal power supply must be used or an external power supply is required.

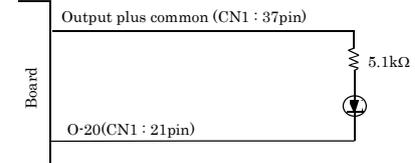
The rated output current per channel is 100 mA at maximum.

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 0.5 V or less at an output current within 50 mA or at most 1.0 V at an output current within 100 mA.

To protect against surge voltage, a Zener diode is connected to the output transistor. Also, an overcurrent protection circuit is attached to a unit of eight output channels.

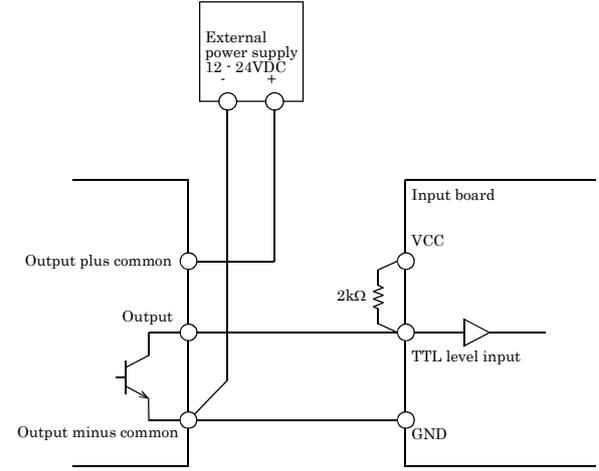
**CAUTION**  
- When the PC is turned on, all output are reset to OFF. See the "Selecting the internal or external power supply" section to connect the jumpers depending on the power supply to be used.

**Connection to the LED**



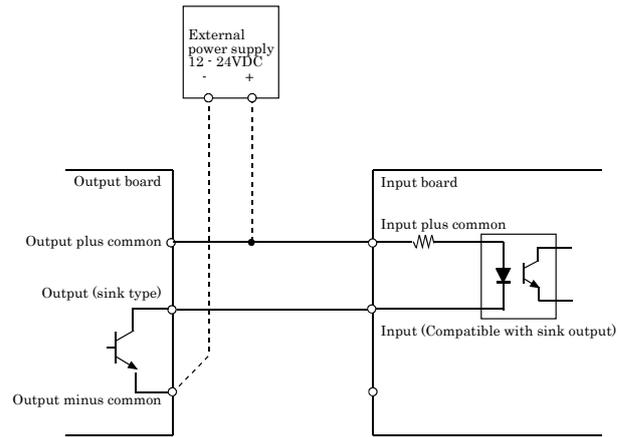
When "1" is output to a relevant bit, the corresponding LED comes on.  
When "0" is output to the bit, in contrast, the LED goes out.

**Example of Connection to TTL Level Input**



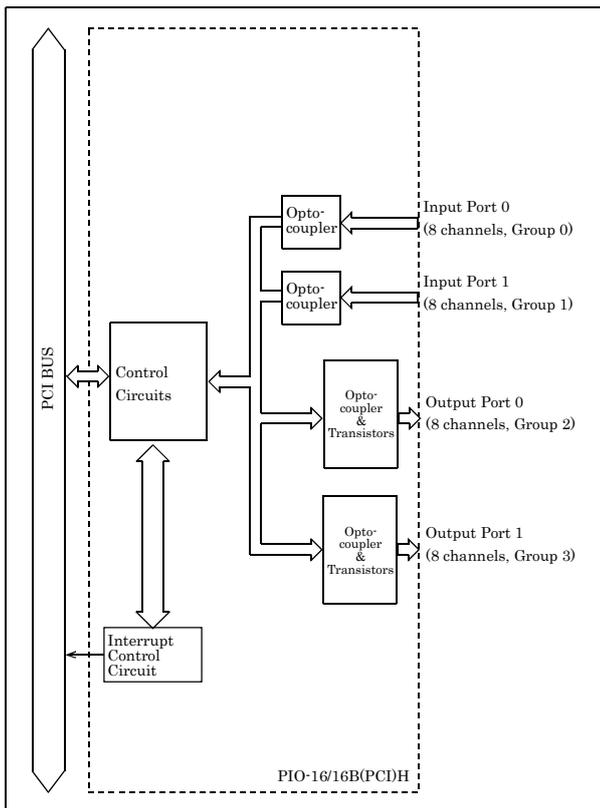
**Connecting the Sink Type Output and Sink Output Support Input**

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.



The board dimensions of PIO-16/16B(PCI)H differ depending on board number. There is no change in electrical specifications other than board dimensions.

## Block Diagram



## Differences in board dimensions of PIO-16/16B(PCI)H

- Different in board dimensions  
 No.7238x : 176.41(L) x 105.68(H) mm  
 No.8756x : 121.69(L) x 105.68(H) mm

## Differences between the PIO-16/16B(PCI)H No.7238x and PIO-16/16B(PCI)

This product is connector-pin compatible with the conventional PIO-16/16B(PCI) but has the following differences from it:

- Different in the number of input signals available to interrupt requests  
 PIO-16/16B(PCI)H : All of 16 channels  
 PIO-16/16B(PCI) : 4 channels
- Different in the expression to calculate the digital filter time (n: setting value)  
 PIO-16/16B(PCI)H :  $2^n / (8 \times 10^6)$   
 PIO-16/16B(PCI) :  $2^n / (16 \times 10^6)$
- Protective elements provided for outputs  
 PIO-16/16B(PCI)H : Surge protector: Zener diode  
 PIO-16/16B(PCI) : Nothing
- Different in interrupt level resource allocation  
 PIO-16/16B(PCI)H : Automatically allocates on interrupt level.  
 PIO-16/16B(PCI) : Uses a jumper switch to select whether to allocate interrupt levels.
- Different in board dimensions  
 PIO-16/16B(PCI)H : 176.41(L) x 105.68(H) mm  
 PIO-16/16B(PCI) : 176.41(L) x 106.68(H) mm