

PCI Express-compliant  
High-Speed TTL level Opto-isolated Digital I/O

## DIO-1616TB-PE



Includes API-PAC Driver Library

This PCI Express compliant interface board was designed to extend digital signal I/O functions using a standard PC.

DIO-1616TB-PE is a 12 - 24VDC digital I/O board with TTL level 16ch opto-coupler isolated inputs and TTL level 16ch opto-coupler isolated open-collector outputs with a 5VDC on-board power. All input signals can be used as interrupts. It is equipped with a digital filter function and output transistor protection circuit (voltage surge and overcurrent protection).

Both Windows and Linux drivers are included with this board.

CONTEC provides drivers that enable these boards to be used with LabVIEW.

## Packing List

- Board [DIO-1616TB-PE] ...1
  - First step guide ... 1
  - CD-ROM \*1 [API-PAC(W32)] ...1
- \*1 The CD-ROM contains the driver software and User's Guide.

## Features

### TTL level Opto-coupler isolated input (support current sink output) and TTL level opto-coupler isolated open-collector output (current sink)

This board has TTL level 16ch of opto-coupler isolated input (supporting current sink output) with a 1 $\mu$ sec response speed and TTL level 16ch of opto-coupler isolated open-collector output (current sink).

### Opto-coupler bus isolation

The PCI Express bus (PC) is isolated from both the input and output interfaces by the use of opto-couplers, providing superior noise immunity.

### 5VDC 600mA on-board power supply

This board has a 5VDC 600mA on-board power supply. 16 ch shares common terminal, allowing the power to disable or enable by jumper setting

### All input signals can be used as interrupts

All input signals can be used as interrupts. Disable or enable interrupts in bit units and select the interrupt edge via software.

### Windows and Linux driver libraries are included

The included driver library [API-PAC(W32)] makes it possible to create applications in both Windows and Linux environments. A diagnostic program to check the hardware operation is also provided.

### Digital filter prevents input signal errors from noise or chattering.

A digital filter is provided to prevent input signal errors from noise or chattering. This filter can be added to each input terminal, with settings performed via software.

### Zener diodes on output circuits provide voltage surge protection with poly-switches for overcurrent protection.

Zener diodes are connected to the output circuits for protection against voltage surges. Similarly, poly-switches are provided for each group of 8ch outputs for over-current protection. The output rating is 35 VDC (max), 100mA per channel.

### Functions and connectors are compatible with PIO-16/16TB(PCI)H series PCI-bus boards

Compatible connector shapes and pin assignments provide easy transition from PCI based to PCI-Express based systems.

### LabVIEW support

LabVIEW is supported by using CONTEC's dedicated library VI-DAQ.

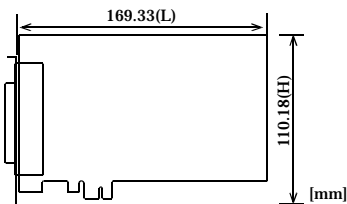
## Specifications

Item	Specification	
<b>Input</b>		
Input format	Opto-isolated TTL level input (Negative logic *1)	
Number of input signal channels	16ch (all available for interrupts) (1 common)	
Input resistance	1.1kΩ	
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	Within 1μsec	
<b>Output</b>		
Output format	Opto-isolated TTL level output (Negative logic *1)	
Number of output signal channels	16ch (1 common)	
Output rating	Output voltage	5VDC (Max.)
	Output current	Average 6.4mA (par channel) (4 TTL loads )
Response time	Within 1μsec	
<b>Common</b>		
Built-in power	5VDC 600mA *2	
Allowable distance of signal extension	Approx. 5m (depending on wiring environment)	
I/O address	Any 32-byte boundary	
Interruption level	1 level use	
Max. board count for connection	16 boards including the master board	
Isolated Power	500Vrms	
External circuit power supply	5VDC (±10%)	
Power consumption (Max.)	When using the internal power supply : 3.3VDC 550mA, 12VDC 350mA When using the external power supply : 3.3VDC 550mA	
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)	
Bus specification	PCI Express Base Specification Rev. 1.0a x1	
Dimension (mm)	169.33(L) x 110.18(H)	
Connector	37 pin D-SUB connector [F (female) type] DCLC-J37SAF-20L9E [mfd by JAE] or equivalent to it	
Weight	140g	

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

\*2:When using the internal power supply, the input section consumes a maximum of 51mA and the output channel switching section consumes a maximum of 105.6mA. In this case, therefore, the output current to be supplied from the board is 443.4mA.

### Board Dimensions



The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

## Support Software

### API-DIO(WDM)/API-DIO(98/PC) Digital I/O driver for Windows

[Found on the included CD-ROM driver library API-PAC(W32)]  
For use in Windows environments, API-DIO(98/PC) is driver library software that provides basic Win32 API functions (DLL). Various sample programs using Visual Basic and Visual C++ and a diagnostic program used to check the hardware operation are also provided.

< Operating Environments >

Operating Systems: Windows Vista, Windows XP, Server 2003, 2000

Programming languages: Visual Basic, Visual C++, Visual C#, Delphi, C++ Builder

Upgraded software versions can be downloaded from CONTEC's document site (<http://www.contec.com/apipac/>).

For more details on supported OS, programming languages and for updated information, please visit CONTEC's Web site.

### API-DIO(LNX) Digital I/O driver for Linux

[Found on the included CD-ROM driver library API-PAC(W32)]  
API-DIO(LNX) is driver software for Linux which provides device drivers (modules) by shared library and kernel versions. Various sample gcc programs are provided.

< Operating Environments >

Operating Systems: RedHatLinux, TurboLinux  
(For details on supported distributions, refer to Help files that are available after installation.)

Programming language: gcc

Upgraded software versions can be downloaded from CONTEC's document site (<http://www.contec.com/apipac/>).

For more details on supported OS, programming languages and for updated information, please visit CONTEC's Web site.

### VI-DAQ Data acquisition VI library for LabVIEW

[Available for free download from CONTEC's web site]

CONTEC's VI library is for use with National Instruments' LabVIEW.

VI-DAQ is designed with functions similar to that of LabVIEW's Data Acquisition VI, allowing various devices to be used without complicated settings.

For more details and to download VI-DAQ go to <http://www.contec.com/vidaq/>.

### Optional Cables and Connectors

Flat Cable with Two 37-pin D- SUB Connectors  
 :PCB37P-1.5 (1.5m)  
 : PCB37P-3 (3m)  
 : PCB37P-5 (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)  
 : PCA37P-5 (5m)

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)

37-pin D-SUB Male Connector Set (5 Pieces)  
 : CN5-D37M

### Accessories

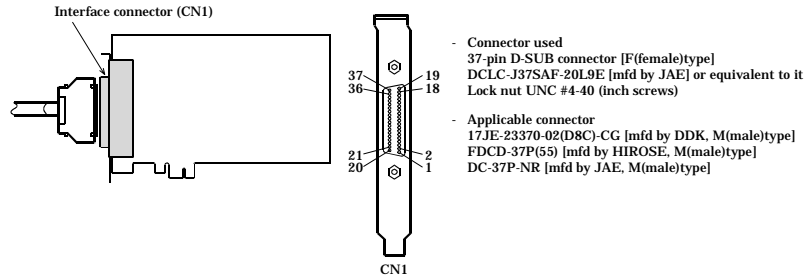
Screw Terminal (M3 x 37P) : EPD-37A \*1  
 Screw Terminal (M3.5 x 37P) : EPD-37 \*1  
 General Purpose Terminal : DTP-3A \*1  
 Screw Terminal : DTP-4A \*1  
 Signal Monitor for Digital I/O : CM-32(PC)E \*1

\*1 A PCB37P or PCB37PS optional cable is required separately.

### On-board connector wiring

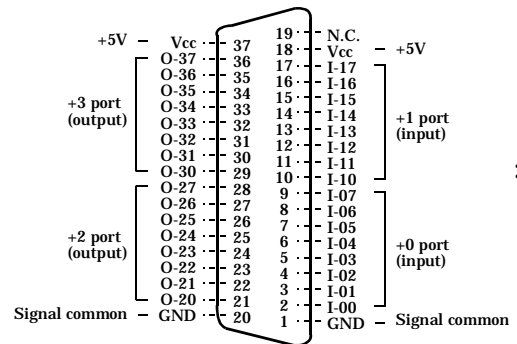
#### Connector shape

The on-board interface connector (CN1) is used when connecting this product and the external devices.



#### Connector Pin Assignment

Pin Assignments of Interface Connector (CN1)



I-00 - I-17 can be used as interrupt signal.

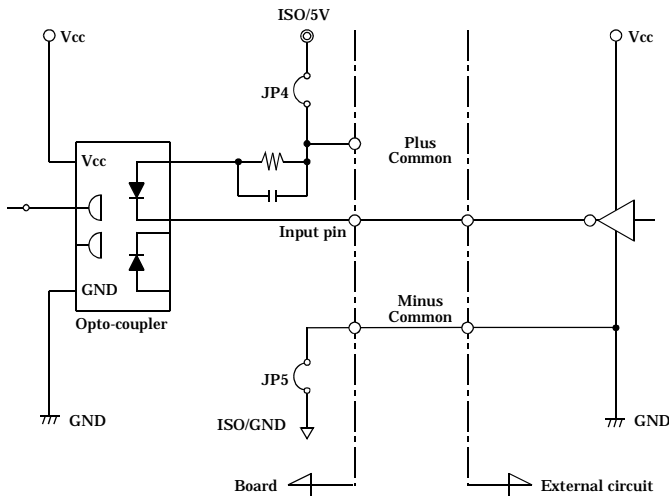
\* The numbers in square brackets [ ] are pin numbers designated by HONDA TSUSHIN KOGYO CO., LTD.

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.
Vcc	When using the internal power supply, output +5V. When using the external power supply, connect these pins to the positive side.
GND	When using the internal power supply, output GND. When using the external power supply, connect these pins to the negative side.
N.C.	This pin is left unconnected.

## Connection of Input Signals

The external digital signal given to the signal input section is TTL level and each input signal is taken into the PC side by negative logic.

### Input Circuit



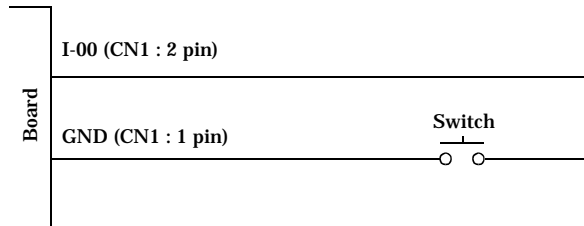
\* Input pin represents I-xx.

The input circuits of interface blocks of this product are illustrated above. The signal inputs are isolated by opto-couplers. This product therefore requires the on-board internal power supply or the external 5VDC power supply to drive the input section of this product. When you are using the external power supply, 4.5mA current is requested each channel.

### CAUTION

Please refer to Selecting Power Supply, and choose the proper supply by jumps.

### Connecting a Switch

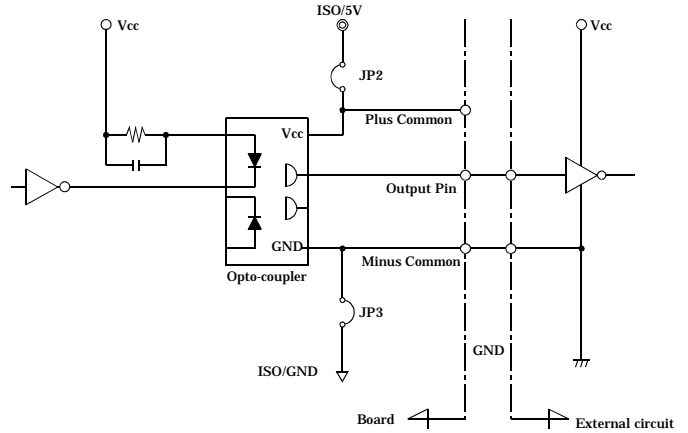


When the switch is ON, the corresponding bit contains 1.  
When the switch is OFF, by contrast, the bit contains 0.

## Connection of Output Signals

The signal output section is TTL driver output and each output signal is sent to an external device as negative logic.

### Output Circuit



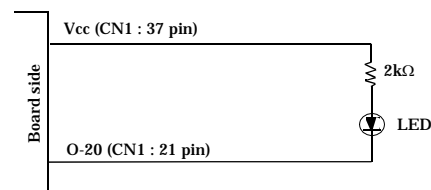
\* Output pin represents O-xx.

The output circuits of interface blocks of this product are illustrated above. The signal outputs are TTL level signals isolated by opto-couplers. This product therefore requires the on-board internal power supply or the external 5VDC power supply to drive the output section of this product.

### CAUTION

- The Opto-coupler used on this board, with power turned, feeds low-level output when the primary circuit is not driven.
- Using the external power supply:  
The Opto-coupler keeps on outputting low-level while the external power supply is turned on and the PC is off.
- Using the internal power supply:  
Since the internal power supply ISO/5V is enabled earlier than the PC's Vcc, the opto-coupler outputs the low level for several ms while the PC is off or before the PC is turned on.
- Please refer to "Selecting Power Supply" and then connect the jumper in accordance with 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.

## Block Diagrams

