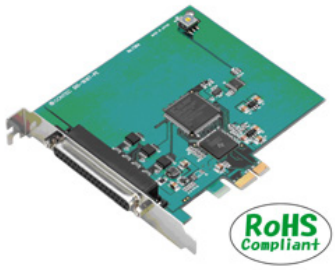
PCI Express-compliant
Digital I/O board

DIO-1616T-PE



This product is a PCI Express bus-compliant unisolated digital I/O board for input/output of digital signals (TTL level). Unisolated TTL level input 16ch and unisolated open collector output 16ch are provided, and all input signals can be used as interrupts. In addition, digital filter function to prevent wrong recognition of input signals is provided.
With the driver libraries for Windows/Linux supplied as standard, applications with CONTEC hardware features fully utilized can be created.
LabVIEW is supported with a plug-in of dedicated libraries.

Features

- **Unisolated TTL level input, un-isolated open-collector output**
  On one board, 16ch of un-isolated TTL level input and 16ch of un-isolated open-collector output with a response time of 200nsec are amounted. Output rating: max 30VDC, 40mA per pin.

- **You can use all of the input signals as interrupt inputs.**
  All input signals can be used as interrupt request signals, and it is available to enable/disable interrupt by bit unit and to select interrupt edge.

- **This product has a digital filter to prevent input signals from carrying noise or a chattering.**
  A digital filter which can prevent the misrecognition by the noise and chattering of input signal is equipped. All input terminals can be added a digital filter, and the setting can be performed by software.

- **Windows/Linux compatible driver libraries are attached.**
  Using the attached driver library API-PAC(W32) makes it possible to create applications of Window/Linux. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

- **Functions and connectors are compatible with PCI compatible board PIO-16/16T(PCI)H.**
  The functions same with PCI compatible board PIO-16/16T(PCI)H are provided. In addition, as there is compatibility in terms of connector shape and pin assignments, it is easy to migrate from the existing system.

- **LabVIEW is supported by a plug-in of dedicated library VI-DAQ.**
  Using the dedicated library VI-DAQ makes it possible to make a LabVIEW application.

Optional Cable & Connector

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)

Flat Cable with One 37-pin D-SUB Connector
:PCA37P-1.5 (1.5m)

Shielded Cable with One 37-pin D-SUB Connector
:PCA37PS-0.5P (0.5m)
:PCA37PS-1.5P (1.5m)

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

Accessories

Screw Terminal Unit (M3 terminal block, 37 points)
:EPD-37A *1

Screw Terminal Unit (M3.5 terminal block, 37 points)
: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

*1PCB37P-1.5 or PCB37PS-0.5P, 1.5P optional cable is required separately.

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

Packing List

- Board [DIO-1616T-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

Support Software

You are recommended to use CONTEC support software according to your purpose and development environment.

Driver Library API-PAC(W32) (Bundled)
API-PAC(W32) is the library software that provides the commands for CONTEC hardware products in the form of Windows standard Win32 API functions (DLL). It makes it easy to create high-speed application software taking advantage of the CONTEC hardware using various programming languages that support Win32 API functions, such as Visual Basic and Visual C++.
It can also be used by the installed diagnosis program to check hardware operations.
CONTEC provides download services (at http://www.contec.com/apipac/) to supply the updated drivers and differential files. For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.

< Operating environment >
OS: Windows XP, Server 2003, 2000
Adaptation language: Visual C++ .NET, Visual C# .NET, Visual Basic .NET, Visual C++, Visual Basic, Delphi, C++Builder, etc..

Linux version of digital I/O driver API-DIO(LNX) (Supplied: Stored on the API-PAC(W32) (CD-ROM)
This driver is used to control CONTEC digital I/O boards (cards) from within Linux.
You can control CONTEC I/O boards easily using the shared library called from the user application, the device driver (module) for kernel version, and the board (card) configuration program (config).
CONTEC provides download services (at http://www.contec.com/apipac/) to supply the updated drivers and differential files. For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.

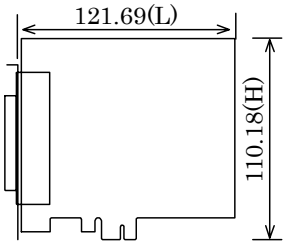
< Operating environment >
OS: RedHatLinux, TurboLinux, etc..(For details on supported distributions, refer to Help available after installation.)
Adaptation language: gcc, etc..

Data acquisition VI library for LabVIEW VI-DAQ (Available for free download from the CONTEC web site.)
This is a VI library to use in National Instruments LabVIEW.
VI-DAQ is created with a function form similar to that of LabVIEW's Data Acquisition VI, allowing you to use various devices without complicated settings.
See http://www.contec.com/vidaq/ for details and download of VI-DAQ.

Specifications

Item			Specification
Input			
	Input format		Unisolated TTL level input (Negative logic *1)
	Number of input signal channels		16ch (all available for interrupts) (1 common)
	Input resistance		10kΩ (1 TTL level load)
	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 200nsec
Output			
	Output format		Unisolated open-collector output (Negative logic *1)
	Number of output signal channels		16ch (1 common)
	Output rating	Output voltage	30VDC (Max.)
		Output current	40mA (par channel) (Max.)
	Response time		Within 200nsec (Variable with pull-up resistance)
Common			
	External supply capable current (Max.)		5VDC 350mA
	Allowable distance of signal extension		Approx. 1.5m (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
	Power consumption (Max.)		3.3VDC 400mA
	Operating condition		0 - 50°C, 10 - 90%RH (No condensation)
	Bus specification		PCI Express Base Specification Rev. 1.0a x1
	Dimension (mm)		121.69(L) x 110.18(H)
	Connector		37-Pin D-SUB connector [F(female)type] DCLC-J37SAF-20L9 [mfd by JAE] or equivalent to it
	Weight		80g

Board Dimensions



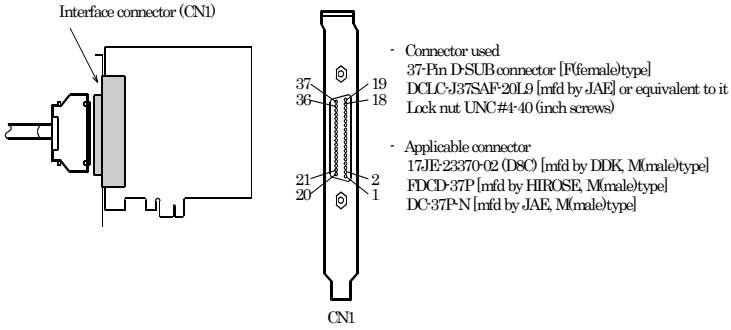
The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

[mm]

Connector Wiring

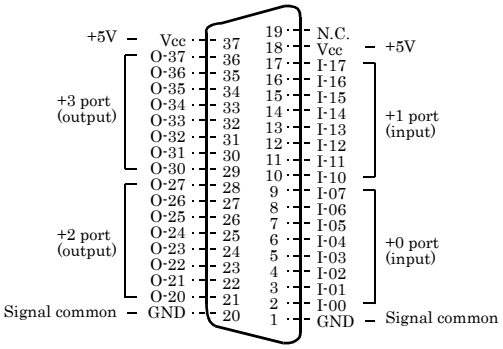
Connector shape

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)

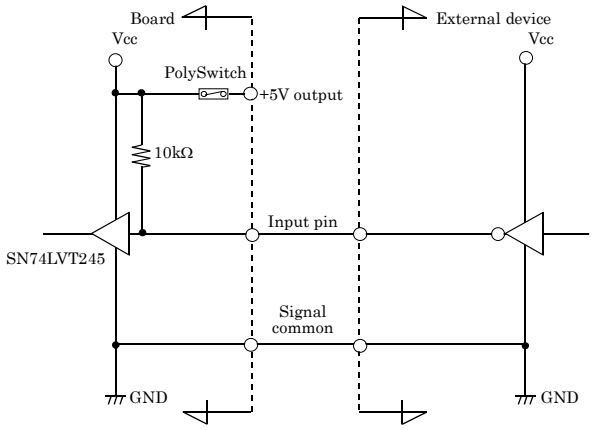


I-00 - I-17	16 input signal pins. Connect output signals from the external device to these pins.
O-20 - O-37	16 output signal pins. Connect these pins to the input signal pins of the external device.
Vcc	This pin outputs power at +5V. Max. electrical current is 350mA.
GND	This pin is connected to the slot's GND.
N.C.	This pin is left unconnected.

How to Connect Input Signals

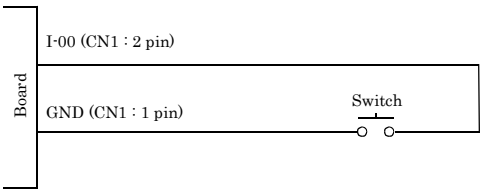
The input circuit of interface is illustrated as follows.
External digital signals given to signal inputs are TTL levels. The individual input signals are passed to the personal computer as active low signals. As each of the signal inputs is pulled up internally, the output of a relay contact or semiconductor switch can be connected directly between the signal input and the signal common pin.

Input Circuit



I-xx represents input pin.
One polyswitch is connected for Vcc (+5V output) terminal.

Connecting to the Switch

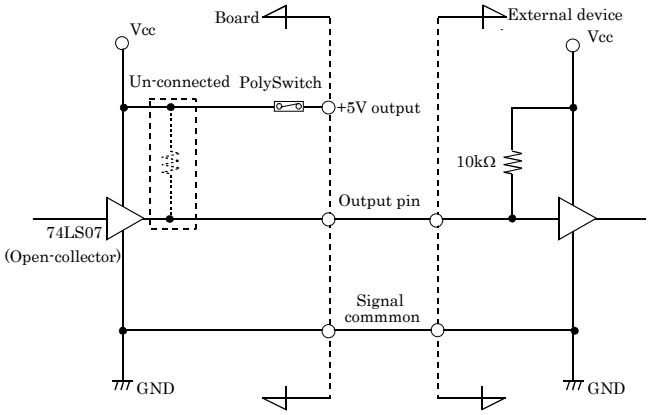


When the switch is ON, the corresponding bit contains 1.
When the switch is OFF, by contrast, the bit contains 0.

How to Connect Output Signals

The output circuit of interface is illustrated in Figure 3.5. Signal outputs are open-collector outputs; individual output signals are sent to the external device as active low signals. Note that each signal output must be pulled up at the external device as it is not pulled up internally.

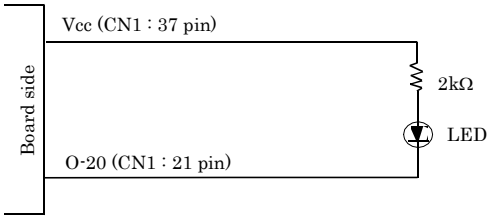
Output Circuit



* O-xx represents output pin.
One polyswitch is connected for Vcc (+5V output) terminal.

⚠ CAUTION
When the PC is turned on, all outputs are reset to OFF.

Connecting to the LED

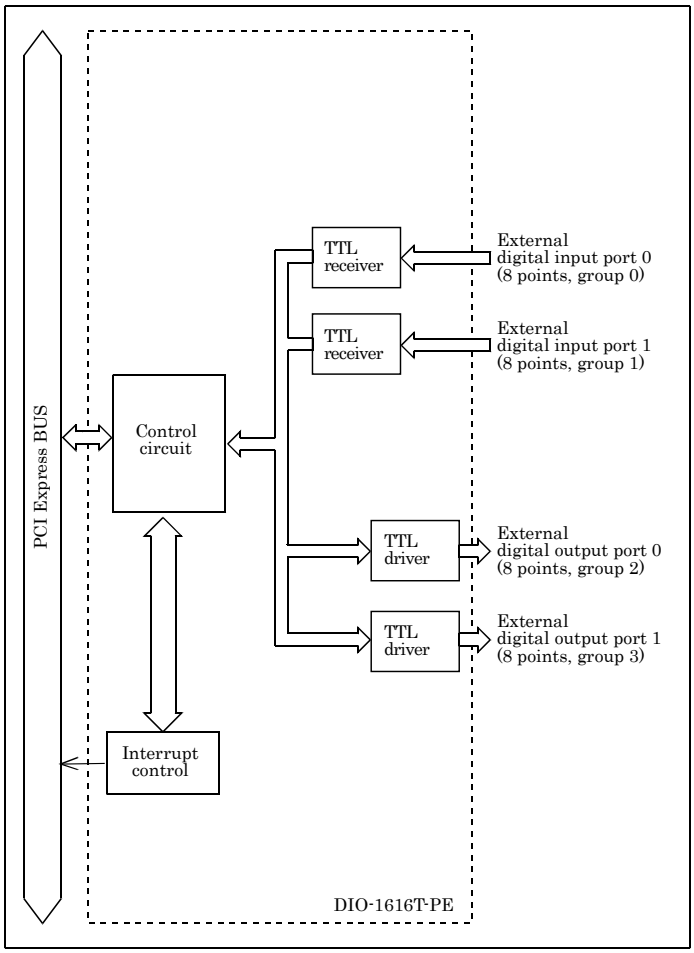


When "1" is output to a relevant bit, the corresponding LED comes on.
When "0" is output to the bit, in contrast, the LED goes out.

Surge Protection

When connecting to digital outputs a load that may generate a voltage surge or current, for example an inductive load such as a relay coil or incandescent lamp, suitable protection measures are required to prevent damage to the output stage or malfunction owing to noise. The instantaneous interruption of current flowing through a coil, including a relay, results in the sudden generation of a high-voltage pulse. If the voltage exceeds the withstand voltage of the transistor, the transistor performance may be degraded or the transistor may be damaged. To prevent this, be sure to connect a surge absorption element when driving an inductive load including a relay coil.

Block Diagram



*Price, specification, color and design of the products may be changed without notice.