

**Opto-Isolated Digital I/O Board
with On-Board 12V Power Supply
PIO-16/16B(PC)H**



The PIO-16/16B(PC)H is a 16-channel digital input and output interface board for the IBM PC/AT and compatible computers. It can also be installed into a CONTEC I/O expansion unit. Plugged in a ISA bus expansion slot on the motherboard of a personal computer, can input and output up to 16 channels.

Features

Photo-Insulated input/outputs providing improved noise resistance

Up to 16 (8 signals x 2 groups) input signals

Up to 16 (8 signals x 2 groups) output signals

Two input signals can also generate interrupt requests

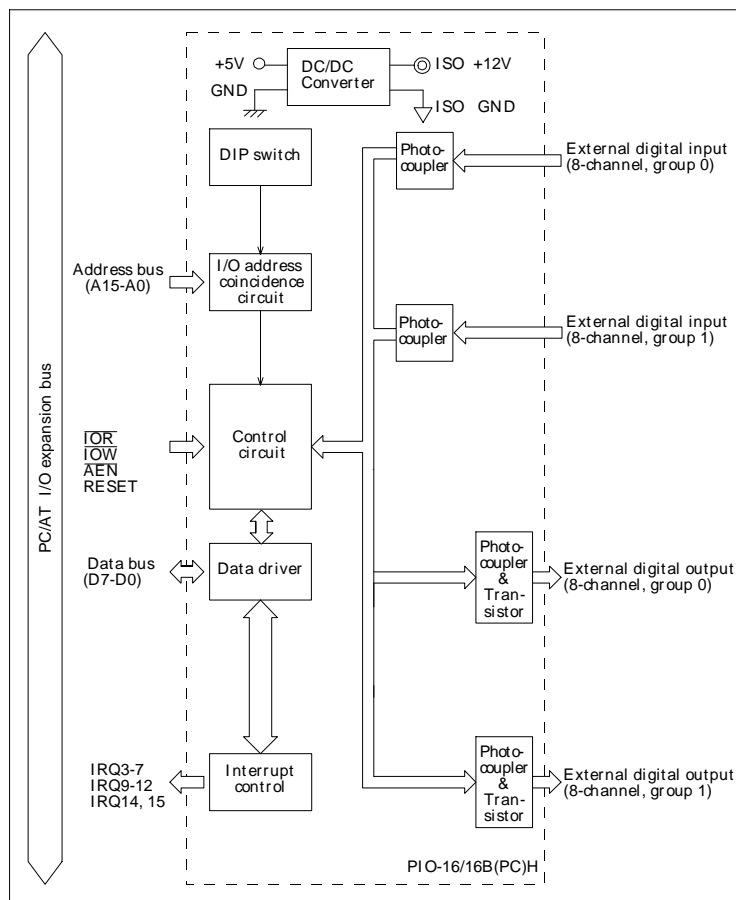
Up to 35VDC, 100mA per signal, max. output ability

On board has an isolated 12VDC power supply for driving the photo-isolation devices. Therefore you can select to use either the on board 12VDC for your application or an external power supply to drive the photo-isolation devices.

Specification

Item		Specification
Input		
Type	Opto-Isolated Input (for current sinking output) (Negative logic)	
Resister	3kΩ	
Current required to turn ON	3.4mA (Min.)	
Current required to turn OFF	0.16mA (Max.)	
Number of Channels	16 channels (2 of these 32 can be used as interrupt signal) (16 channels with the common)	
Response time	1ms (Max.)	
Output		
Type	Opto-Isolated Open Collector Output (current sinking type) (Negative logic)	
Rating	Voltage	35VDC (Max.)
	Current	100mA Max. per channel
Number of Channels	16 channels (16 channels with the common)	
Response time	1ms (Max.)	
Common		
I/O address	8bits x 2ports occupied	
Interrupts	Some of IRQ 3~7, 9~12, 14, and 15 (up to 2 IRQs at a time) Interrupt generated at High to Low edge	
External power supply	12 to 24VDC (±15%) Note: 4mA/12V to 8mA/24V per input channel	
Internal power supply	12VDC 250mA (Max.) *2	
Power consumption	5VDC 800mA (Max.) (using internal isolated power supply)	
	5VDC 50mA (Max.) (using external power supply)	
Operating condition	0 to 50°C, 20% to 90% (not condensing)	
Connecting distance	30m (Typ.) (depending on wiring environment)	
Dimension (mm)	160.0 (L) x 122.0 (H)	
Weight	150g	

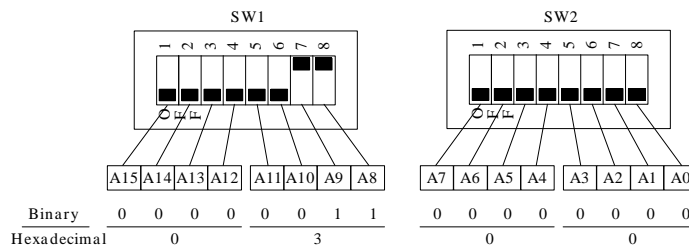
Block Diagram



I/O Address Setting

Use the on-board DIP switches (SW1 and SW2) to set the I/O base address of this board. Individual bits in the SW1 and SW2 correspond to the 15 high-order bits (A15 to A1) in the I/O base address. Set A0 always to "0" (OFF).

The ON and OFF states of bits in the SW1 and SW2 correspond to the binary values of "1" and "0" in the I/O base address, respectively.



The figure shows that the head I/O Address is set as 0300H by a diagram, and this board occupies the I/O Address of 0300H-0301H.

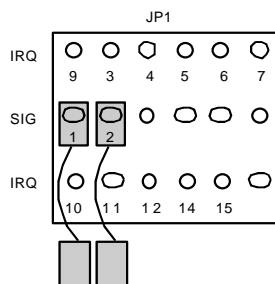
Setting Interrupt Levels

This board can use signals, such as two digital signals among 16 input signals, as interrupt request signals. The interrupt levels set for this board are IRQ 3~7, 9~12, 14, and 15. Set those not used for the PC and for any other board. Up to two levels of interrupt request signals can be assigned, corresponding to input signals on a one-to-one basis.

Notes!

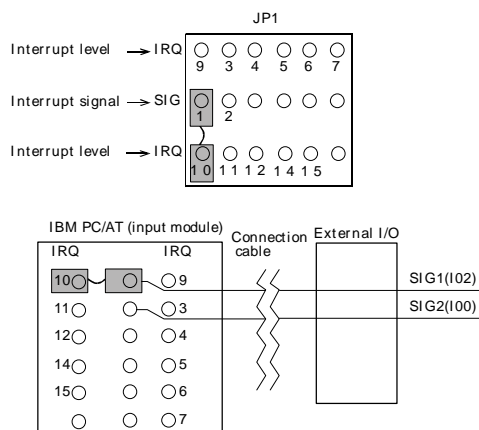
- (1) When using interrupts, set interrupt levels which are not used for any other resource.
- (2) Do not plug or unplug any strapping connector on the JP1 when power has been supplied to the PC (or I/O expansion unit) on which this board has been installed.

Disabling Interrupts



Enabling Interrupts

Use strapping connectors to connect input signals to the interrupt levels you want to assign. The assignable interrupt levels are IRQs 3 to 7, 9 to 12, 14, and 15. Note, however, that IRQs 10 to 15 cannot be used on PCs with XT (8-bit) buses.



To connect SIG1(I02) from the interface board to IRQ10 on the PC/AT as an interrupt request signal, set the JP1 as shown above.

Selecting power supply

The photo-insulation circuits need power supply that cannot be supplied directly from the PC system, for isolation purpose. This board equips an on board isolated power supply (12VDC, 250mA) for driving photo-insulation circuits. You can select to use this internal power supply or use an external power supply for driving the photo-insulation circuits in unit of two ports (16 channels) per common.

Notes!

When the internal power supply is used, the input section of this board consumes up to 64mA current maximum and the output channel switching section consumes up to 16mA current maximum. Note that the output current that can be supplied to the external device is therefore 170mA maximum in case you use internal power supply for all the input and output channels.

Never use the isolated on board 12VDC together with an external power supply. That may damage the isolated 12VDC supply.

Supply to	Use Internal Power (Factory defaults)	Use External Power
Output Port 0 Output Port 1	JP3 +12V JP4 GND	JP3 +12V JP4 GND
Input Port 0 Input Port 1	JP5 +12V JP6 GND	JP5 +12V JP6 GND

I/O Port Bit Assignment

Input Port Bit Assignment

When input data is "ON," the corresponding bit contains "1." If the data is "OFF," the bit contains "0."

I/O base address	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0
+0H	I07 [9]	I06 [8]	I05 [7]	I04 [6]	I03 [5]	I02 [4]	I01 [3]	I00 [2]
+1H	I17 [17]	I16 [16]	I15 [15]	I14 [14]	I13 [13]	I12 [12]	I11 [11]	I10 [10]

Ixx is an input signal name; numbers in brackets [] are connector pin numbers.
I00 and I02 can also serve as interrupt signals.

Output Port Bit Assignment

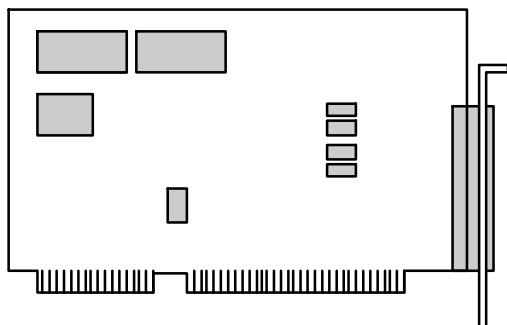
When "1" is output to a bit, the corresponding output data is set to "ON." If "0" is output to the bit, the data is set to "OFF."

I/O base address	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0
+0H	O07 [28]	O06 [27]	O05 [26]	O04 [25]	O03 [24]	O02 [23]	O01 [22]	O00 [21]
+1H	O17 [36]	O16 [35]	O15 [34]	O14 [33]	O13 [32]	O12 [31]	O11 [30]	O10 [29]

Oxx is an output signal name; number in brackets [] are connector pin numbers.

External Connection

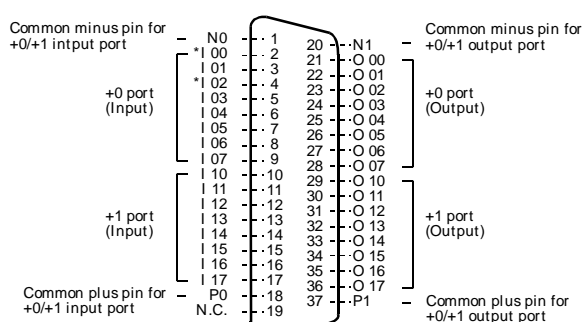
To connect an external device to this board, plug the cable from the device into the interface connector (CN1).



connector used



Connector Pin Assignment



*I00 and *I02 are also used as interrupt signals

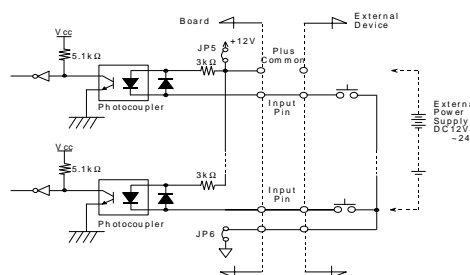
Input Circuit and Output Circuit

Input Circuit

The input circuit of this board is illustrated in following Figure. The on-board photocouplers isolate internal input circuits from outside devices. The input channels are to be connected with current sinking output signals. You need an additional power supply that is isolated from the PC system to drive these insulation circuits. When you use a 12VDC power (internal or external), each input channel will consumes about 4mA current; when 24VDC external power supply is selected, each input channel will consumes about 8mA current.

Note!

You cannot connect an external power supply and in the mean time select to use internal isolated power. To use an external power supply, set the power supply select jumpers for External Power in pair and then connect the external power supply as shown with dotted lines in the following illustration.



Output Circuit

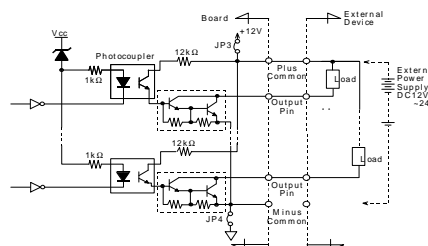
The output circuit of these boards is illustrated in the following figure. Signal output is open collector system by Opto-isolated.

You need an additional power supply that is isolated from the PC to drive these insulation circuits.

There are no surge voltage protection circuits on board for protecting output transistors. To drive inductive loads such as relays and lamps by this board, therefore, a measure against surge voltage must be taken on the load side.

Notes!

You cannot connect an external power supply and in the mean time select to use internal isolated power. To use an external power supply, set the power supply select jumpers for External Power in pair and then connect the external power supply as shown with dotted lines in the following illustration.



Example

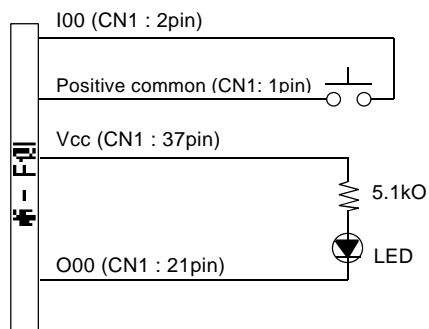
Program that makes LED connected to O00 output terminal as an example of use of this board. According to ON/OFF of the external switch connected to I00 input terminal turn on switch off is shown below. Description language is Microsoft C. In the state of switch-on, 1 is displayed on screen, LED lights up, 0 is displayed on screen in the state of switch-off, and LED puts out the light.

Setting Conditions

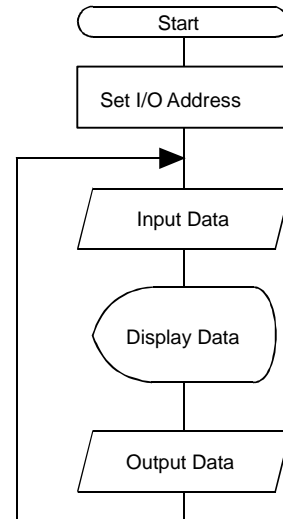
I/O Address: 0300H

Interrupt: unused (Please remove all the short connectors of JP1.)

Connection Example



Flow Chat



Program List

```

#include<stdio.h>

void main (void)
{
    int port ;
    int pidata ;

    port = 0x300 ;    /*Set I/O Address*/

    do {

        pidata = inp ( port ) ; /*Input data*/

        printf("%x\n", pidata ); /*Display data*/

        outp( port, pidata ) /*Output data*/

    }while( !kbhit() ) ;
}
  
```

Product Configuration List

Product Configuration List

- Board[PIO-16/16B(PC)H] ... 1
- This User's Manual ... 1

Support Software

API Function Library

The bundled CD-ROM "API Function Library Package API-PAC(W32)"

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/C++.

Use the installed diagnosis program to check whether the board and driver software work normally, thereby you can confirm that they have been set up correctly.

For details, refer to the help file. The help file provides various items of information such as "Function Reference", "Sample Programs", and "FAQs". Use them for program development and troubleshooting.

< Operating environment >

Support OS

Windows XP, Windows 2000 Professional, Windows NT, Windows Me/98/95

Support Language

Visual C++ Version 6.0, 5.0, 4.x, 2.0

Visual Basic Version 6.0, 5.0, 4.0

Visual C++ .NET

Visual Basic .NET

Borland C Version 5.0, 4.5x

Borland C++ Builder 6.0, 5.0

Borland Delphi 6.0, 4.0 3.0

The newest driver and download service (<http://www.contec.com/apipac/>) of difference file are also offered.

Library for digital I/O boards API-DIO(LNX)

It is free download service of the driver for Linux.

The API-DIO(LNX) is a library for controlling our digital I/O board in Linux.

Feature

API-DIO (LNX) offers the function group for controlling our digital I/O board by shared library and the driver of module form.

Fundamental functions, such as input and output, interrupt, trigger function and timer function are offered.

It configure the device to be used by the setting program (config) and the setting file.

A configuration program outputs the setting file that makes easy to execution environment, a driver starting script and a stop script.

The source code for user interrupt processing is included and used with a driver.

You can download updated driver software and differential files as well as sample programs available in several languages.

Sample Software (These sample software is printed by the manual.)

Sample Output Program in Q-BASIC

The program inputs hexadecimal data from the keyboard, outputs the data to individual ports, then display the values in hexadecimal.

When data for the 0300H, 0301H, 0302H, and 0303H ports is entered in byte units from the keyboard, the program outputs the data to each port.

This board only occupies the first two ports.

The data output to 0302H and 0303H are not utilized.

Sample Input Program in Microsoft C

This is the Microsoft C version of the sample program.

The C version is the same as the Q-BASIC version in specifications.

Sample Interrupt Program in Q-BASIC

This program registers and uses a machine language program (Microsoft Macro Assembler) from Q-BASIC as an interrupt processing program.

Specifications The program causes the machine language program to count the number of interrupts, and causes BASIC to display the count each time an interrupt signal (IRQ5) is generated.

Accessories (Option)

Accessories (Option)

Screw Terminal: EPD-37 *1

Termination Panel: DTP-3(PC)

Termination Panel: DTP-4(PC)

Signal Monitor for Digital I/O: CM-32(PC)

Signal Monitor for Digital I/O: CM-32(PC)E *1

Flat cable with 37-pin D-SUB connectors at either end:

PCB37P-*(1.5m, 3m, 5m)

Shielded cable with 37-pin D-SUB connectors at either end:

PCB37PS-*(0.5m, 1.5m, 3m, 5m)

Flat cable with a 37-pin D-SUB connector at one end:

PCA37P-*(1.5m, 3m, 5m)

Shielded cable with a 37-pin D-SUB connector at one end:

PCA37PS-*(0.5m, 1.5m, 3m, 5m)

*1 : The option cable PCB37P or PCB37PS is needed.