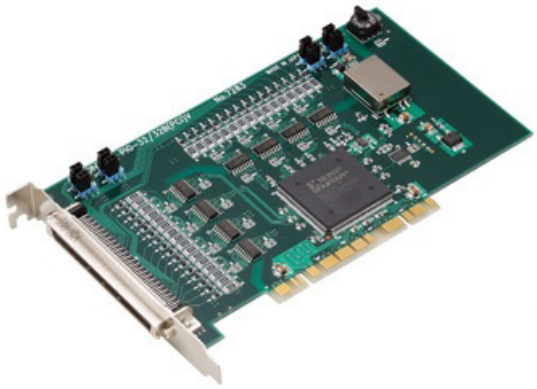
Digital I/O Board with Opto-Isolation for PCI

PIO-32/32B(PCI)V



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

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

This product features 32 opto-coupler isolated inputs and 32 opto-coupler isolated open-collector outputs. You can use all of input signals as interrupt inputs. In addition, this product is equipped with a power supply for driving opto-couplers (12 VDC), digital filtering, and output transistor protection circuits (surge voltage and overcurrent protection). This product is also upward compatible with our PIO-32/32B(PCI)H.

Windows/Linux device 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 August, 2023.

Features

Opto-coupler isolated input (supporting current sink output) and opto-coupler isolated open-collector output (current sink type)
This product has the 32ch of opto-coupler isolated input (supporting current sink output) and 32ch of opto-coupler isolated open-collector output (current sink type) whose response time is 200µsec.

Common terminal provided per 16channels, capable of supporting a different external power supply.

Opto-coupler bus isolation
As the PCI bus (PC) is isolated from the input and output interfaces by opto-couplers, this product has excellent noise performance.

Power for opto-coupler operation (12VDC 240mA) supplied internally
As the power to run the opto-couplers is supplied internally, no external power supply is required. The use of jumpers allows you to decide whether you want to use the internal or external power supply for every 16 points.

All input signals can be used as interrupt request signals
You can use all 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.

Windows/Linux support device driver
Using the device driver API-TOOL 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.

Equipped with 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.

Zener diode for surge voltage protection and the circuit for overcurrent protection.
Zener diodes are connected to the output circuits to protect against surge voltages. In addition, the output circuit, it attaches the overcurrent protection circuit at the output 8-channel unit. The output rating is max. 35VDC, 100mA per channel.

Specifications

Function specification

Item		Specifications
Input	Type	Opto-Isolated Input (for current sinking output) (Negative logic *1)
	Number of Channels	32ch (All available for interrupts) (One common power supply per 16 channels)
	Input resistance	4.7kΩ
	Current required to turn ON	2.0mA or more
	Current required to turn OFF	0.16mA or less
	Interrupts	Combine 32 interrupt signals to one interrupt request signal as the INTA. Either rising edge or falling edge of input signal can generate interrupt.
	Response time	200µsec within
Output	Type	Opto-Isolated Open Collector Output (current sinking type) (Negative logic *1)
	Number of Channels	32ch (One common power supply per 16 channels)
	Output rated voltage	35VDC (Max.)
	Output rated current	100mA/channel (Max.)
	Residual voltage with output on	0.5V or less (Output current ≤ 50mA), 1.0V or less (Output current ≤ 100mA)
	Surge protector	Zener diode RD47FM(Renesas) or equivalent
	Response time	200µsec within
Common	Connecting distance	50m(Typ.) (depending on wiring environment)
	I/O address	Any 32-byte boundary
	Interruption level	1 level use
	Boards in one system	Maximum of 16 boards can be install in a same system.
	Isolated voltage	500Vrms
	External circuit power supply	12 - 24VDC (±10%)
	Internal power	5VDC 240mA (Max.) *2
	Power consumption	5VDC 300mA (Max.) (Using the External power) 5VDC 1050mA (Max.) (Using the internal power)
	PCI bus specification	32bit, 33MHz, Universal key shapes supported *3
	Dimension (mm)	176.41(L) x 106.68(H) *4*5
	Weight	215g

*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 80 mA and the output channel switching section consumes a maximum of 60 mA. In this case, therefore, the output current to be supplied from the board is 100 mA.

*3 This product 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.7283, No.7283A, and No.7238B is 176.41 (L) x 105.68 (H) mm.

Installation Environment Requirements

Item	Specifications
Operating ambient temperature	0 - +50°C
Operating ambient humidity	10 - 90%RH (No condensation)
Floating dust particles	Not to be excessive
Corrosive gases	None
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA

Support Software

Name	Contents	How to get
Windows Version Digital I/O Driver software API-DIO(WDM)	The Windows device driver is provided as a form of Windows API functions. Various sample programs such as C# and Visual Basic .NET, Visual C++, Python etc. and diagnostic program useful for checking operation is provided.	Download from the CONTEC website *1
Linux Version Digital I/O Driver software API-DIO(LNX)	The Linux device driver is provided as a shared library. The software includes various sample programs such as gcc (C, C++) and Python programs, as well as a configuration tool to configure the device settings.	Download from the CONTEC website *1
Software Development Tool Kits (SDK) and Support Software	In addition to the device drivers, we offer many software programs for using CONTEC devices in an easier manner.	Download from the CONTEC website *2

*1 Download the files from the following URL.
https://www.contec.com/download/

*2 For supported software, search the CONTEC website for this product and view the product page.
https://www.contec.com/

Optional Products

Product Name	Model type	Description
Shield Cable with 96-Pin Half-Pitch Connector at Both Ends (Mold Type)	PCB96PS-0.5P	0.5m
	PCB96PS-1.5P	1.5m
	PCB96PS-3P	3m
	PCB96PS-5P	5m
Flat Cable with 96-Pin Half-Pitch Connectors at Both Ends	PCB96P-1.5	1.5m
	PCB96P-3	3m
Shield Cable with 96-Pin Half-Pitch Connector at One End (Mold Type)	PCA96PS-0.5P	0.5m
	PCA96PS-1.5P	1.5m
	PCA96PS-3P	3m
	PCA96PS-5P	5m
Flat Cable with 96-Pin Half-Pitch Connector at One End	PCA96P-1.5	1.5m
	PCA96P-3	3m
Distribution Shield Cable with 96-Pin Half-Pitch Connector (96Pin→37Pin x 2)	PCB96WS-1.5P	1.5m
	PCB96WS-3P	3m
	PCB96WS-5P	5m
Screw Terminal Unit (M3 x 96P)	EPD-96A	*1 *2
Screw Terminal Unit (M3.5 x 96P)	EPD-96	*2
Screw Terminal Unit (M3 x 37P)	EPD-37A	*1 *3
Screw Terminal Unit (M3.5 x 37P)	EPD-37	*3
Digital I/O 64CH Series Terminal Panel (M3 x 96P)	DTP-64A	*2
Connection Conversion Board (96P→37P x 2)	CCB-96	*4
Signal Monitor for Digital I/O (64bit)	CM-64L	*2
Signal Monitor for Digital I/O (32bit)	CM-32L	*3

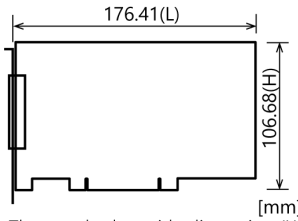
*1 "Spring-up" type terminal is used to prevent terminal screws from falling off.
*2 PCB96P or PCB96PS optional cable is required separately.
*3 PCB96WS optional cable is required separately.
*4 Option cable PCB96P or PCB96PS, and the cable for 37-pin D-SUB are required separately.

Visit the CONTEC website for the latest optional products.

Included Items

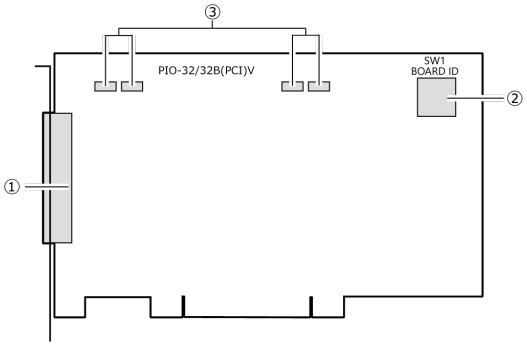
Product [PIO-32/32B(PCI)V] ...1
Please read the following ... 1

External Dimensions



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

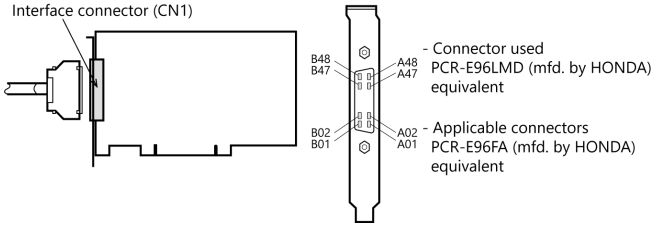
Component Name



No.	Name	No.	Name
1	Interface Connector	3	Supply power setting jumper
2	Board ID Setting Switch		

Connecting an Interface Connector

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



Layout on the Interface Connector(CN1)

Common plus pin for +6/+7 output ports	OP-6/7	B48		A48	IP-2/3	Common plus pin for +2/+3 input ports
	OP-6/7	B47		A47	IP-2/3	
+7 port (output)	O-77	B46		A46	I-37	+3 port (input)
	O-76	B45		A45	I-36	
	O-75	B44		A44	I-35	
	O-74	B43		A43	I-34	
	O-73	B42		A42	I-33	
	O-72	B41		A41	I-32	
	O-71	B40		A40	I-31	
	O-70	B39		A39	I-30	
+6 port (output)	O-67	B38		A38	I-27	+2 port (input)
	O-66	B37		A37	I-26	
	O-65	B36		A36	I-25	
	O-64	B35		A35	I-24	
	O-63	B34		A34	I-23	
	O-62	B33		A33	I-22	
	O-61	B32		A32	I-21	
	O-60	B31		A31	I-20	
Common minus pin for +6/+7 output ports	ON-6/7	B30		A30	IN-2/3	Common minus pin for +2/+3 input ports
	ON-6/7	B29		A29	IN-2/3	
N.C.	N.C.	B28		A28	N.C.	N.C.
	N.C.	B27		A27	N.C.	

	N.C.	B26	[49] B48	A26	N.C.	
	N.C.	B25		A25	N.C.	
	N.C.	B24		A24	N.C.	
	N.C.	B23		A23	N.C.	
	N.C.	B22		A22	N.C.	
	N.C.	B21		A21	N.C.	
Common plus pin for +4/+5 output ports	OP-4/5	B20		A20	IP-0/1	Common plus pin for +0/+1 input ports.
	OP-4/5	B19		A19	IP-0/1	
+5 port (output)	O-57	B18		A18	I-17	+1 port (input)
	O-56	B17		A17	I-16	
	O-55	B16		A16	I-15	
	O-54	B15		A15	I-14	
	O-53	B14		A14	I-13	
	O-52	B13		A13	I-12	
	O-51	B12		A12	I-11	
	O-50	B11		A11	I-10	
+4 port (output)	O-47	B10		A10	I-07	+0 port (input)
	O-46	B09		A09	I-06	
	O-45	B08		A08	I-05	
	O-44	B07		A07	I-04	
	O-43	B06		A06	I-03	
	O-42	B05		A05	I-02	
	O-41	B04		A04	I-01	
	O-40	B03	B01 [96] A01 [48]	A03	I-00	
Common minus pin for +4/+5 output ports	ON-4/5	B02		A02	IN-0/1	Common minus pin for +0/+1 input ports
	ON-4/5	B01		A01	IN-0/1	

* I-00 - I-37 can be used as all of interrupt signal.

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

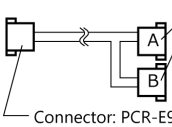
Signal name	Description
I-00 - I-37	32 input signal pins. Connect output signals from the external device to these pins.
O-40 - O-77	32 output signal pins. Connect these pins to the input signal pins of the external device.
IP-0/1	When the external power supply is selected, its positive side is connected to these pins. When the internal power supply is used, these pins output power at +12 V. these pins are common to 16 input signal pins.
IP-2/3	When the external power supply is selected, its positive side is connected to these pins. When the internal power supply is used, these pins output power at +12 V. these pins are common to 16 input signal pins.
OP-4/5	When the external power supply is selected, its positive side is connected to these pins. When the internal power supply is used, these pins output power at +12 V. These pins are common to 16 output signal pins.
OP-6/7	When the external power supply is selected, its positive side is connected to these pins. When the internal power supply is used, these pins output power at +12 V. These pins are common to 16 output signal pins.
IN-0/1	When the external power supply is selected, its negative side is connected to these pins. When the internal power supply is selected, these pins serve as the ground. These pins are common to 16 input signal pins.
IN-2/3	When the external power supply is selected, its negative side is connected to these pins. When the internal power supply is selected, these pins serve as the ground. These pins are common to 16 input signal pins.
ON-4/5	When the external power supply is selected, its negative side is connected to these pins. When the internal power supply is selected, these pins serve as the ground. These pins are common to 16 output signal pins.
ON-6/7	When the external power supply is selected, its negative side is connected to these pins. When the internal power supply is selected, these pins serve as the ground. These pins are common to 16 output signal pins.
N.C.	This pin is left unconnected.

⚠ CAUTION

To perform input/output using this product with the CONTEC device driver, specify logical ports and logical bits when calling each function. For details, refer to the "Relationships between API-TOOL Logical Ports/Bits and Connector Signal Pins" of Reference Manual.

Pin Assignments of Optional Connector PCB96WS

* Optional cable PCB96WS-**



Connector: PCR-E96FA [mfd. by HONDA]
Connector cover: PCS-E96LKPA [mfd. by HONDA]

** represents the cable length (1.5, 3, or 5m).

CNA for PCB96WS

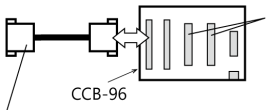
	N.C.	19	19 37	37	IP-2/3	Common plus pin for +2/+3 input ports
Common plus pin for +0/+1 input ports	IP-0/1	18		36	I-37	
+1 port (Input)	I-17	17		35	I-36	+3 port (Input)
	I-16	16		34	I-35	
	I-15	15		33	I-34	
	I-14	14		32	I-33	
	I-13	13		31	I-32	
	I-12	12		30	I-31	
	I-11	11		29	I-30	
	I-10	10		28	I-27	
+0 port (Input)	I-07	9		27	I-26	+2 port (Input)
	I-06	8		26	I-25	
	I-05	7		25	I-24	
	I-04	6		24	I-23	
	I-03	5		23	I-22	
	I-02	4		22	I-21	
	I-01	3		21	I-20	
	I-00	2	1 20	20	IN-2/3	Common minus pin for +2/+3 input ports
Common minus pin for +0/+1 input ports	IN-0/1	1				

CNB for PCB96WS

	N.C.	19	19 37	37	OP-6/7	Common plus pin for +6/+7 output ports
Common plus pin for +4/+5 output ports	OP-4/5	18		36	O-77	
+5 port (Output)	O-57	17		35	O-76	+7 port (Output)
	O-56	16		34	O-75	
	O-55	15		33	O-74	
	O-54	14		32	O-73	
	O-53	13		31	O-72	
	O-52	12		30	O-71	
	O-51	11		29	O-70	
	O-50	10		28	O-67	
+4 port (Output)	O-47	9		27	O-66	+6 port (Output)
	O-46	8		26	O-65	
	O-45	7		25	O-64	
	O-44	6		24	O-63	
	O-43	5		23	O-62	
	O-42	4		22	O-61	
	O-41	3		21	O-60	
	O-40	2	1 20	20	ON-6/7	Common minus pin for +6/+7 output ports
Common minus pin for +4/+5 output ports	ON-4/5	1				

Pin Assignments of Optional Connector CCB-96

* Optional cable PCB96PS-** + connector conversion board CCB-96



Connector: PCR-E96FA [mfd. by HONDA]
Connector cover: PCS-E96LKPA [mfd. by HONDA]

** represents the cable length (1.5, 3, or 5m).

CN3(CAN) for CCB96

	N.C.	19	19 37	37	IP-2/3	Common plus pin for +2/+3 input ports
Common plus pin for +0/+1 input ports	IP-0/1	18		36	I-37	
+1 port (Input)	I-17	17		35	I-36	+3 port (Input)
	I-16	16		34	I-35	
	I-15	15		33	I-34	
	I-14	14		32	I-33	
	I-13	13		31	I-32	
	I-12	12		30	I-31	
	I-11	11		29	I-30	
	I-10	10		28	I-27	
+0 port (Input)	I-07	9		27	I-26	+2 port (Input)
	I-06	8		26	I-25	
	I-05	7		25	I-24	
	I-04	6		24	I-23	
	I-03	5		23	I-22	
	I-02	4		22	I-21	
	I-01	3		21	I-20	
	I-00	2	1 20	20	IN-2/3	Common minus pin for +2/+3 input ports
Common minus pin for +0/+1 input ports	IN-0/1	1				

CN4(CNB) for CCB-96

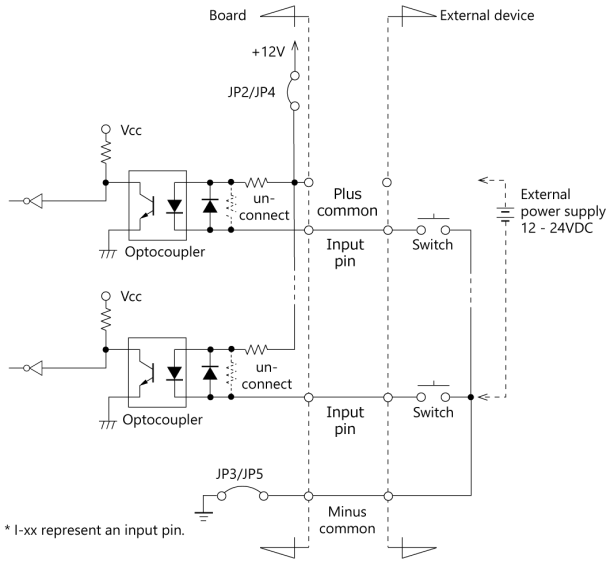
	N.C.	19	19 37	37	OP-6/7	Common plus pin for +6/+7 output ports
Common plus pin for +4/+5 output ports	OP-4/5	18		36	O-77	
+5 port (Output)	O-57	17		35	O-76	+7 port (Output)
	O-56	16		34	O-75	
	O-55	15		33	O-74	
	O-54	14		32	O-73	
	O-53	13		31	O-72	
	O-52	12		30	O-71	
	O-51	11		29	O-70	
	O-50	10		28	O-67	
+4 port (Output)	O-47	9		27	O-66	+6 port (Output)
	O-46	8		26	O-65	
	O-45	7		25	O-64	
	O-44	6		24	O-63	
	O-43	5		23	O-62	
	O-42	4		22	O-61	
	O-41	3		21	O-60	
	O-40	2	1 20	20	ON-6/7	Common minus pin for +6/+7 output ports
Common minus pin for +4/+5 output ports	ON-4/5	1				

Connecting Input and Output Signal

Input Circuit

Connect the input signals to a device which can be current-driven, such as a switch or transistor output device.

The product inputs the ON/OFF state of the current-driven device as a digital value.

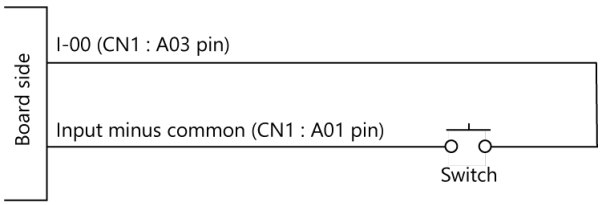


The signal inputs are isolated by opto-couplers (ready to accept current sinking output signals). This product therefore requires the on-board internal power supply or the external power supply to drive the input section of this product. The power requirement for each input pin is about 5.1 mA at 24 VDC (about 2.6 mA at 12 VDC).

⚠ CAUTION

Please refer to "Supply power setting jumper" and choose the proper supply by jumpers.

Connecting a Switch (An Example to use Input I-00)

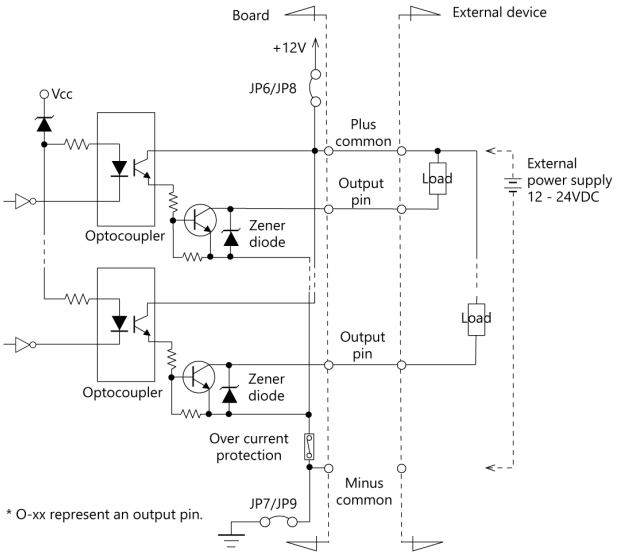


When the switch is ON, the corresponding bit contains 1.
When the switch is OFF, by contrast, the bit contains 0.

Output Circuit

Connect the output signals to a current-driven controlled device such as a relay or LED.

The product controls turning on/off the current-driven controlled device using a digital value.



The signal output section is an opto-coupler isolated, open-collector output (current sink type).

This product therefore requires the on-board internal power supply or the external power supply to drive the output section of this product.

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.

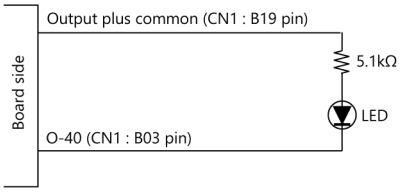
An overcurrent protection component is provided for every 8 output transistors.

⚠ CAUTION

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

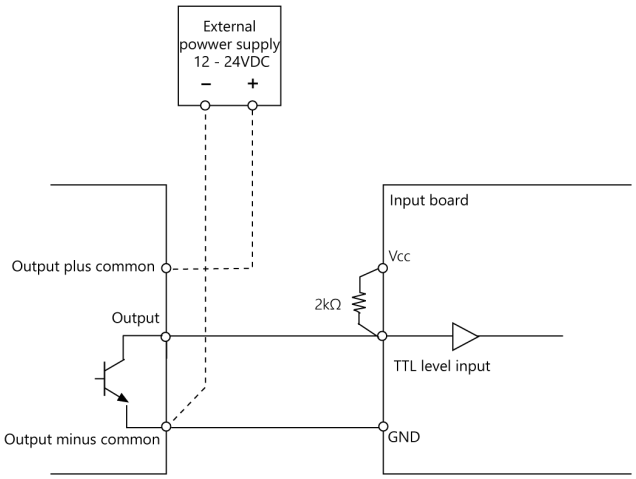
Please refer to "Supply power setting jumper" and choose the proper supply by jumpers.

Connection to the LED (An Example to use Output O-40)



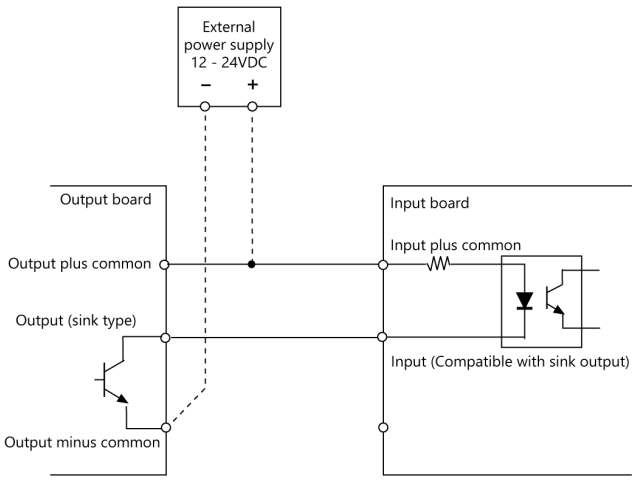
When "1" is output to a relevant bit, the corresponding LED comes on.
When "0" is output to the bit, in contrast, the LED goes out.

Example of Connection to TTL Level Input (Connection Example of Output and TTL level Input Signal)

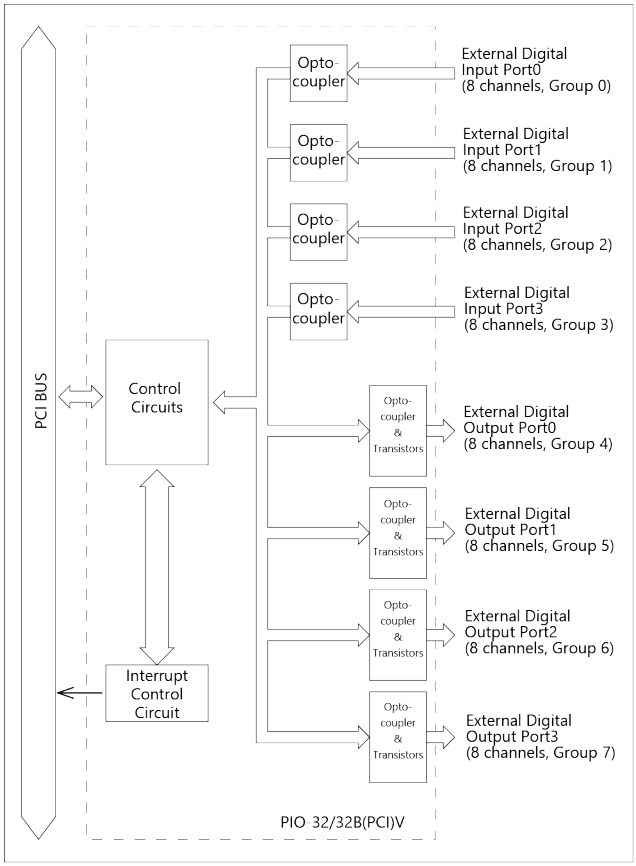


Connecting the Sink Type Output and Sink Output Support Input

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



Differences from Conventional Products

Differences between the PIO-32/32B(PCI)V and PIO-32/32B(PCI)H

The PIO-32/32B(PCI)V is connector-pin compatible with the conventional PIO-32/32B(PCI)H but has the following differences from it:

(1) Different in the number of input signals available to interrupt requests
- PIO-32/32B(PCI)V : All of 32 channels
- PIO-32/32B(PCI)H : 4 channels

(2) Different in the expression to calculate the digital filter time (n: setting value)
- PIO-32/32B(PCI)V : $2^n / (8 \times 10^6)$
- PIO-32/32B(PCI)H : $2^n / (16 \times 10^6)$

(3) Protective elements provided for outputs
- PIO-32/32B(PCI)V : Surge protector: Zener diode
- PIO-32/32B(PCI)H : Nothing

(4) Different in interrupt level resource allocation
- PIO-32/32B(PCI)V : Automatically allocates on interrupt level.
- PIO-32/32B(PCI)H : Uses a jumper switch to select whether to allocate interrupt levels.

(5) Different in whether ASIC or not.
- PIO-32/32B(PCI)V : Nothing
- PIO-32/32B(PCI)H : ASIC

(6) Different in Power Consumption
- PIO-32/32B(PCI)V : 5VDC 300mA (Max.) (Using the external power) 5VDC 1050mA (Max.) (Using the internal power)
- PIO-32/32B(PCI)H : 5VDC 300mA (Max.) (Using the external power) 5VDC 1300mA (Max.) (Using the internal power)