High Speed Bi-Directional Digital I/O Board for PCI

PIO-32DM(PCI)

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

The PIO-32DM(PCI) is an interface board in compliance with the PCI bus specification and performs high-speed digital input and output application using bus mastering. This should be installed in a PCI bus slot.
The board can input and output a total of 32 TTL-level digital signals. Select input or output for each 16 signals.
With the Digital Driver [API-DIO(WDM)], you can create Windows application software for this board in your favorite programming language supporting Win32 API functions, such as Visual Basic or Visual C/C++.

* 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 July, 2022.

Features

Since the board supports bus master, it is suited for fast-processing and controlling applications to control external devices with output of any digital pattern or to quickly sample digital input. The board is also equipped with synchronization control connectors to solve timing lag problems during channel expansion.
However, since the board is susceptible to electrical disturbances, it should be used for applications with a short wiring distance and in quiet environment.

- With bus master, the board transfers data between the PC and board at a speed of 80MB/sec. (133 MB/sec. at maximum) without any burden on the CPU.
- The board stores digital signals at a sampling rate of 20 MHz and can detect patterns (pattern input).
- The board can be used as a 20 MHz digital pattern generator (pattern output).
- A 1K-Word on-board FIFO memory is installed each for input and output.
- The 32-bit I/O lines can configure as either input or output, and 16-bit or 32-bit. The board can be set to 32-bit input lines, or 16-bit lines each for input and output, or 32-bit output lines.
- In addition to the digital I/O lines, control signals are available to start or stop pattern I/O. To achieve high-speed access to peripherals, the board also supports the REQ and ACK handshaking signals.
- The board is equipped with an SC connector to allow easy inter-board synchronization between the same or different boards.
- The board can be used not only for pattern I/O using bus mastering but also as a general-purpose digital I/O board. In general-purpose input mode, four input lines are available to interrupts (rising edge).
- Interrupts are set by the software, not by the hardware.
- The board is installed with a timer available to applications to accurately monitor time even when the board is used in Windows environment.

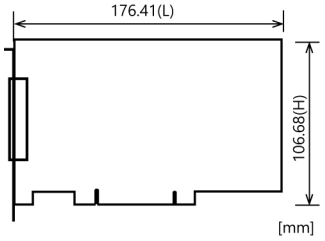
Specification

Specification <1/2>

Item		Specification
Digital section		
Number of I/O Channels		32-bit input lines, 16-bit input/output lines, 32-bit output lines (programmable)
I/O signal level		TTL level (Equivalent to ALS245A)
Data access method		General-purpose digital I/O or pattern I/O with bus mastering DMA
Echo-back function		Available (at general-purpose output)
Connector		Equivalent to PCR-96LMD (HONDA)
Signal extension distance		1.5m (dependent on wiring environment)
Pattern input	Sampling start trigger	Software start/External start/Pattern detection
	Sampling stop trigger	Software stop/External stop/End of transfer/Transfer error
	Sampling clock	Sampling timer/External clock input/handshake/SC connector
	Sampling timer	50ns - 107s 25ns unit
Pattern output	Generating start trigger	Software start/External start/SC connector
	Generating stop trigger	Software stop/External stop/End of transfer/Transfer error/Specified number of items/SC connector
	Generating clock	Output timer/External clock input/Handshake/SC connector
	Generating timer	50ns - 107s 25ns unit
Control signal	I/O signal level	TTL level (Input: equivalent to ALS541; Output: equivalent to LS125A)
	REQ signal (handshake)	Negative logic tL=50ns (Min.)
	ACK signal (handshake)	Negative logic tL=50ns (Min.)
	External start signal	Selection of rising/falling edge with the software
	External stop signal	Selection of rising/falling edge with the software
	External clock input	f=10 MHz (Max.)
Bus master section		
DMA channels		2 channels (one each for input and output)
Transfer bus width		32-/16-bit width
Transfer data length		8 PCI Words length (Max.)
Transfer rate		80 MB/sec.
FIFO		1K Word/ch.
Scatter/Gather function		64 MB/ch.
Synchronization section		
Control output signal		Selection of output signal with the software when specifying a sync master board.
Control input signal		Selection of sync factor with the software when specifying sync slave boards.
Max board count for connection		16 boards including the master board
Connector		PS-10PE-D4T1-B1 (JAE) or equivalent x 2
Common section		
I/O addresses		Occupies 2 locations, any 32-ports and 64-ports boundary
Interrupt		Errors and various factors, One interrupt request line as INTA
Current consumption		5 VDC, 700 mA (Max.)
Operating conditions		0 - 50°C, 10 - 90%RH (No condensation)
PCI bus specification		32bit, 33MHz, Universal key shapes supported *1*2
External dimensions (mm)		176.41(L) x 106.68(H)
Weight		130g
Standard		VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA

*1 This board requires power supply at +5V from an expansion slot (it does not work on a machine with a +3.3V power supply alone).
*2 When the board No. is 7166, PCI bus specification is 32bit, 33MHz, 5V.

Board Dimensions



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

Support Software

The name of the documents	Contents	How to get
Digital I/O Driver software API-DIO(WDM)	Driver software of digital input and output for Windows.	Download (ZIP)
Digital I/O Driver software API-DIO(LNX)	Driver software of digital input and output for Linux.	Download (tgz)
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 (ZIP)
Windows version pattern generator / logic analyzer C-LogicDesigner	C-LogicDesigner is software that uses a Contec high-speed bidirectional digital I/O device (32DM series) to generate digital signals and provide logic analyzer functions based on sampling. It is capable of automatically generating digital signal patterns and directly editing data in graphs, as well as generating signals based on a wide range of output conditions, checking signals that were sampled under specified conditions, saving data in files, searching data patterns, frequency calculation, and other functions.	Download (exe)

* Download the software from the CONTEC website.

Option

Item	Model	Description
Cable	PCB96PS-0.5P (0.5m) PCB96PS-1.5P (1.5m)	Shielded cable with double-ended connector for 96-pin half-pitch connector
	PCB96P-1.5 (1.5m)	Flat cable with double-ended connector for 96-pin half-pitch connector
	PCA96PS-0.5P (0.5m) PCA96PS-1.5P (1.5m)	Shielded cable with single-ended connector for 96-pin half-pitch connector
	PCA96P-1.5 (1.5m)	Flat cable with single-ended connector for 96-pin half-pitch connector
Accessories	EPD-96A *1*2	Screw Terminal (M3 x 96)
	EPD-96 *1	Screw Terminal (M3.5 x 96)
	DTP-64A *1	Terminal Unit for Cables (M3 x 96P)

*1 PCB96P or PCB96PS optional cable is required separately.
*2 "Spring-up" type terminal is used to prevent terminal screws from falling off.
* Check the CONTEC's Web site for more information on these options.

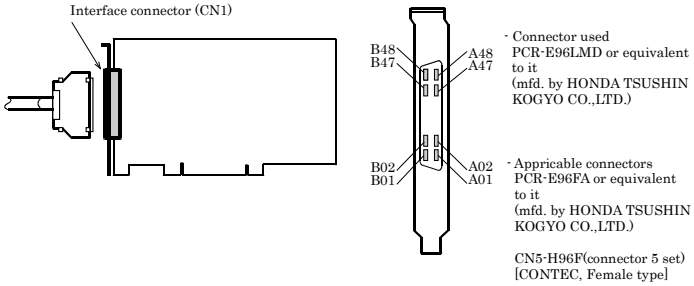
Packing List

Board [PIO-32DM(PCI)]...1
SC Cable (10cm) ...1
Setup Guide ... 1
Warranty Certificate ...1
Serial Number Lable...1

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 (CN1) shown below.



- Connector used
PCR-E96LMD or equivalent to it
(mfd. by HONDA TSUSHIN KOGYO CO.,LTD.)

- Appricable connectors
PCR-E96FA or equivalent to it
(mfd. by HONDA TSUSHIN KOGYO CO.,LTD.)

CN5-H96F(connector 5 set)
[CONTEC, Female type]

		[49]	[1]		
Ground	GND	B48	A48	GND	Ground
Ground	GND	B47	A47	GND	Ground
Ground	GND	B46	A46	GND	Ground
External clock input	EXTCLK1	B45	A45	EXTCLK0	External clock input
Ground	GND	B44	A44	GND	Ground
External start signal	EXTSTART1	B43	A43	EXTSTART0	External start signal
Ground	GND	B42	A42	GND	Ground
External stop signal	EXTSTOP1	B41	A41	EXTSTOP0	External stop signal
Ground	GND	B40	A40	GND	Ground
REQ signal	EXTREQ1	B39	A39	EXTREQ0	REQ signal
Ground	GND	B38	A38	GND	Ground
ACK signal	EXTACK1	B37	A37	EXTACK0	ACK signal
Ground	GND	B36	A36	GND	Ground
Ground	GND	B35	A35	GND	Ground
Ground	GND	B34	A34	GND	Ground
I/O signal D07	DIOD07	B33	A33	DIOB07	I/O signal B07
Ground	GND	B32	A32	GND	Ground
I/O signal D06	DIOD06	B31	A31	DIOB06	I/O signal B06
Ground	GND	B30	A30	GND	Ground
I/O signal D05	DIOD05	B29	A29	DIOB05	I/O signal B05
Ground	GND	B28	A28	GND	Ground
I/O signal D04	DIOD04	B27	A27	DIOB04	I/O signal B04
Ground	GND	B26	A26	GND	Ground
I/O signal D03	DIOD03	B25	A25	DIOB03	I/O signal B03
Ground	GND	B24	A24	GND	Ground
I/O signal D02	DIOD02	B23	A23	DIOB02	I/O signal B02
Ground	GND	B22	A22	GND	Ground
I/O signal D01	DIOD01	B21	A21	DIOB01	I/O signal B01
Ground	GND	B20	A20	GND	Ground
I/O signal D00	DIOD00	B19	A19	DIOB00	I/O signal B00
Ground	GND	B18	A18	GND	Ground
I/O signal C07	DIOC07	B17	A17	DIOA07	I/O signal A07
Ground	GND	B16	A16	GND	Ground
I/O signal C06	DIOC06	B15	A15	DIOA06	I/O signal A06
Ground	GND	B14	A14	GND	Ground
I/O signal C05	DIOC05	B13	A13	DIOA05	I/O signal A05
Ground	GND	B12	A12	GND	Ground
I/O signal C04	DIOC04	B11	A11	DIOA04	I/O signal A04
Ground	GND	B10	A10	GND	Ground
I/O signal C03	DIOC03	B09	A09	DIOA03	I/O signal A03 / interrupt signal In03*
Ground	GND	B08	A08	GND	Ground
I/O signal C02	DIOC02	B07	A07	DIOA02	I/O signal A02 / interrupt signal In02*
Ground	GND	B06	A06	GND	Ground
I/O signal C01	DIOC01	B05	A05	DIOA01	I/O signal A01 / interrupt signal In01*
Ground	GND	B04	A04	GND	Ground
I/O singal C00	DIOC00	B03	A03	DIOA00	I/O singal A00 / interrupt signal In00*
Unconnection	N.C.	B02	A02	N.C.	Unconnection
Unconnection	N.C.	B01	A01	N.C.	Unconnection
		[96]	[48]		

- [ ]shows the pin No. of HONDA TSUSHIN KOGYO CO., LTD. specification.
* Can be used as an interrupt signal when used as general-purpose I/O.

Connection method to the external device -Data I/O-

Connecting the data I/O signal(DIOA0* - DIOD0*)

These lines input from and output to external devices and can be configured in 16-bit with the software.

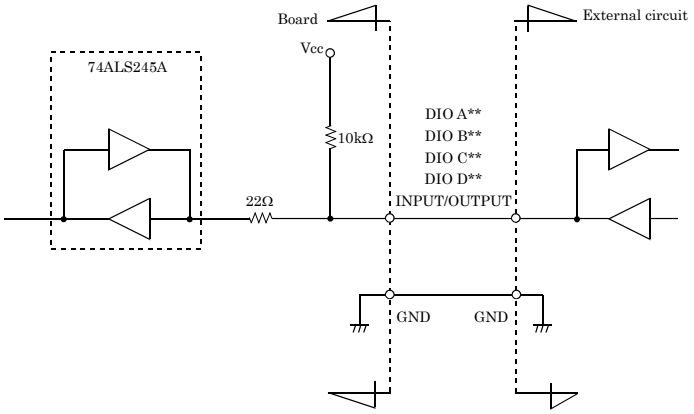
Input and output and setting procedures are the same whether these lines are used for general-purpose digital I/O or bus master transferring and they can be configured in three different settings as shown below:

I/O signal

Signal name	Setup1	Setup2	Setup3
DIOA00 - DIOA07	Digital input	Digital input	Digital output
DIOB00 - DIOB07	Digital input	Digital input	Digital output
DIOC00 - DIOC07	Digital input	Digital output	Digital output
DIOD00 - DIOD07	Digital input	Digital output	Digital output

When settings 1 and 2 are used for general-purpose digital I/O, DIOA00 through DIOA03 can be used as interrupts (rising edge).

Detailed Data I/O Signal Circuit



Connection method to the external device -Control I/O-

Connection to the control signal (EXT**)

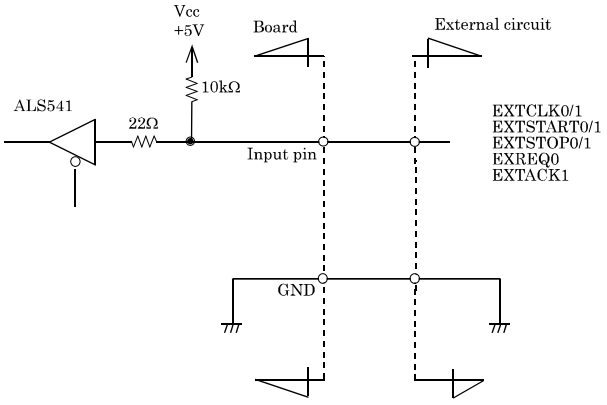
In order to control bus mastering from outside, five signals are provided each for pattern I/O. Before using the signals to be input as control signals please verify their pulse widths.

"0" at the end of a signal name indicates a pattern input signal and "1" a pattern output signal.

Signal name	Direction	Usage	Signal name	Direction	Usage
EXTCLK0	In	Pattern input clock	EXTCLK1	In	Pattern output clock
EXTSTART0	In	Pattern input start signal	EXTSTART1	In	Pattern output start signal
EXTSTOP0	In	Pattern input stop signal	EXTSTOP1	In	Pattern output stop signal
EXTREQ0	In	Pattern input REQ signal	EXTREQ1	Out	Pattern output REQ signal
EXTACK0	Out	Pattern input ACK signal	EXTACK1	In	Pattern output ACK signal

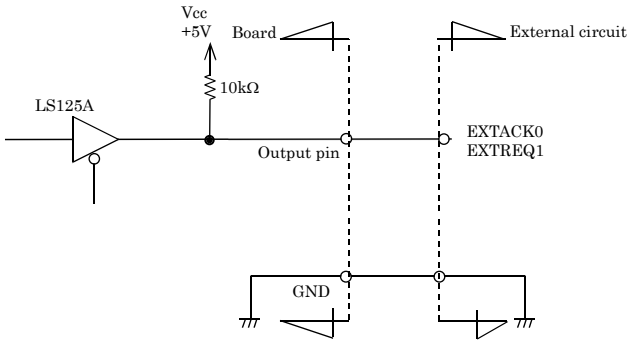
Detailed Control Input Signal Circuit

Control signals to be input include clock, start, stop, and handshake input signals.



Detailed Control Output Signal Circuit

Control signals to be output include handshake output signals.

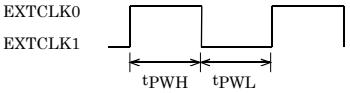


What is the Control Signal ?

External clock signal (EXTCLK0/EXTCLK1)

These signals input external pacer clocks. The maximum frequency is 10MHz.

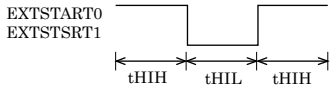
When the external clock input is set as the clock source, pattern input or output occurs at the falling edge of this signal.



t_{PWH} : Clock pulse high width 50ns (Min.)
t_{PWL} : Clock pulse low width 50ns (Min.)

Eternal start signal (EXTSTART0/EXTSTART1)

These input signals start bus mastering with an external signal. The signal level is LVTTL and you can select and enable the rising or falling edge with the software. In order to detect the signal edge, a high- and low-level hold time of 50ns is needed at minimum.



tHIH : High level hold time 50ns (Min.)
tHIL : Low level hold time 50ns (Min.)

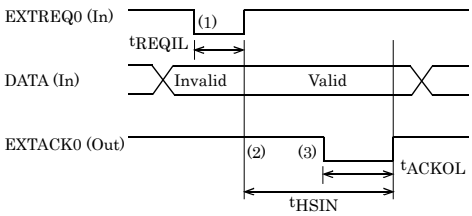
External stop signal (EXTSTOP0/EXTSTOP1)

These input signals start bus mastering with an external signal. The signal level is TTL and you can select and enable the rising or falling edge with the software. In order to detect the signal edge, a high- and low-level hold time of 50ns is needed at minimum.

Handshake Signal (EXTREQ0/EXTACK0/ EXTREQ1/EXTACK1)

These signals handshake with external devices. The signal is TTL level and controlled with negative logic.

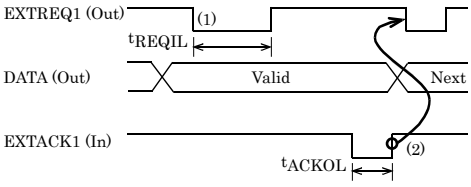
Input



t_{REQIL} : EXTREQ0 low width 50ns (Min.)
t_{ACKOL} : EXTACK0 low width 100ns (Min.)
t_{HSIN} : Handshaking time 100ns (Min.)

(1) After setting the handshaking operation, the PIO-32DM(PCI) samples the EXTREQ0 signal and starts pattern input when it recognizes a low pulse of more than 50ns. Pattern data prior to that time is disabled.
(2) The board generates a cycle to write data input from an external device to the PC memory by bus mastering.
(3) At the end of writing data, the board outputs acknowledge signal EXTRACK0 to notify the external device.

Output



t_{REQOL} :	EXTREQ1 low width	100ns (Min.)
t_{ACKOL} :	EXTACK1 low width	50ns (Min.)

(1) After setting the handshaking operation, the PIO-32DM(PCI) outputs the EXTREQ1 signal.
(2) The board begins sampling acknowledge signals from external devices. The board recognizes the end with a low pulse of more than 100ns and, at the leading edge, starts preparing to output the next data.