

PIO-32/32L(CPCI)
For CompactPCI Bus System
User's Guide



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Product Configuration

PIO-32/32L(CPCI) Board ... 1
PIO (CPCI) SERIES SETUP Diskette (3.5" / 1.44MB) ... 1
User's Guide (this booklet) ... 1

Unpacking:

This board is specially packed in an anti-static bag to prevent damage in shipping.

Note!

Do not remove the board from its protective packaging until the computer case is open and ready for installation. Electrical static can cause damage to electronic components.

Note!

Check the contents to make sure that you have everything listed above. If you do not have all the items, please contact CONTEC.

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Introduction

About the PIO-32/32L(CPCI) Board

PIO-32/32L(CPCI) is a CompactPCI bus-compatible add-on interface board designed for isolated digital input/output. Plugged in a CompactPCI bus expansion slot on the motherboard of a system, the board can input and output up to 32 channels.

Note!

This User's Guide assumes your PC uses the MS-DOS operation system; all explanations are based on this assumption.

Features

CompactPCI Bus Ver.2.0 compliant target/slave Interface board. It works in any peripheral slot of CompactPCI system.

- Opto-isolated input / output providing improved noise resistance
- Up to 32 (8 signals x 4 groups) current source type input signals
- Up to 32 (8 signals x 4 groups) current sink type output signals
- Four input signals can also generate interrupt requests
- Among the 32 input signals, 4 input signals can also be used as interrupt input signals. An onboard circuit will combine these interrupt signals to one interrupt request signal and send this interrupt request signal. INTA, into the system.
- Up to 35 VDC, 100mA per signal, max. (2A per common, max.) output
- In addition to its general-purpose input/output function, this board also supports:
 - Digital filter for input signals
 - Output data monitor
 - The STB/ACK signals can be used to handshake the data transmission.
 - Bit input/output function

Limited Three-Year Warranty

CONTEC Interface boards are warranted by CONTEC to be free from defects in material and workmanship for up to three years from the date of purchase by the original purchaser.

Replacement or repair will be free of charge only when this device is returned to CONTEC freight prepaid with the original invoice.

This warranty is not applicable for scratches or normal wear, but only for the electronic circuitry and original boards. The warranty is not applicable if the device has been tampered with or damaged through abuse, mistreatment, neglect, or unreasonable use, or if the original invoice is not included, in which case repairs will be considered beyond the warranty policy. If replacement with a new device is needed, regular factory prices will be charged, the product will be returned to you COD, and no other written warranty will apply.

The obligation of the warrantor is solely to repair or replace the product. In no event will the warrantor be liable for any incidental or consequential damages due to such defect or consequences that arise from inexperienced usage, misuse, or malfunction of this device.

How to Obtain Service

For replacement or repair, return the device freight prepaid, with a copy of the original invoice. Please obtain a Return Merchandise Authorization Number (RMA) from our Sales Administration Department before returning any product. No product will be accepted without an RMA number.

About the Manual

This manual consists of the following chapters:

Chapter 1 Setup

This chapter describes the procedures for setting up the PIO-32/32L(CPCI) board and setting its switches.

Chapter 2 External Connection

This chapter explains how to connect external devices to the board.

Chapter 3 I/O Ports and Registers

This chapter provides the assignment and definition of each I/O port bit used for the board.

Chapter 4 System Reference

This chapter summarizes hardware specifications of the board and provides circuit block diagrams.

Chapter 5 Troubleshooting

This chapter asks the set of questions you need to answer to trouble the board.

Chapter 1. Setup

Component Locations

Figure 1. shows the names of major parts on the PIO-32/32L(CPCI) board.

Note that the switch setting shown below is the factory default.

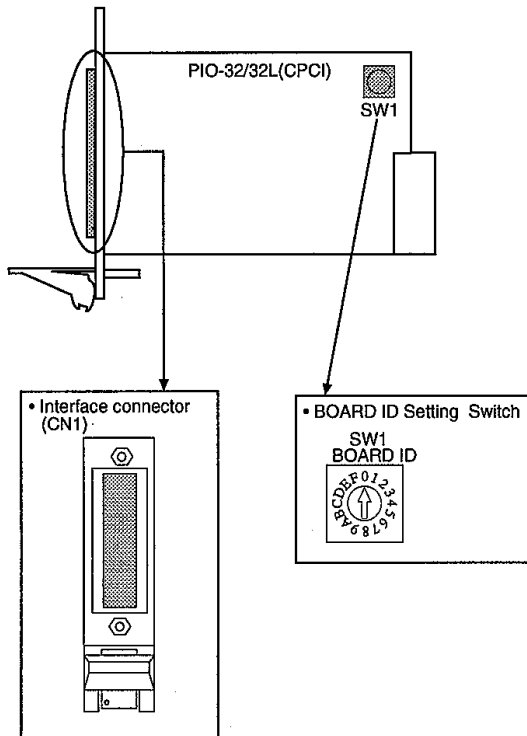


Figure 1. Component Locations

Setting the Board ID

If you install two or more PIO-32/32L(CPCI) boards on one system, assign a different ID value to each of the boards to distinguish them.

The board IDs from 0 to F can be set to identify up to sixteen boards.

If only one board is used, the original factory setting (Board ID = 0) should be used.

Setting Procedure

To set the board ID, use the rotary switch on the board. Turn the SW1 knob to set the board ID as shown below.

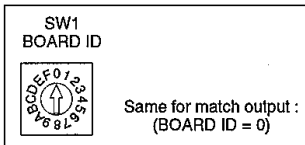


Figure 2. Board ID Settings (SW1)

Setting up the Board

The board setup method for the PIO-32/32L(CPCI) board depends on the operating system being used. Set up the board using the method appropriate for the OS that you are using.

Installing for Windows98

Installing the PIO-32/32L(CPCI) board hardware

Before the PIO-32/32L(CPCI) board can be used under Windows98, the OS must recognize the I/O addresses and interrupt level (IRQ) to be used for the PIO-32/32L(CPCI) board. Use the appropriate procedure to install the PIO-32/32L(CPCI) board.

- (1) Set the board ID.
- (2) Be sure to check that the system is off; then plug the board into an expansion bus slot in the system.
- (3) Turn the system ON to start up Windows98.
- (4) Windows98 will come up with the [New Hardware] detection dialog box. In the [Add New Hardware Wizard] that appears next, check that "Multimedia Device" has been listed, then select [Next>].
- (5) In the next dialog box, select a radio button of [Search for the best driver for your device. (Recommended).], then select [Next>].
- (6) In the next dialog box, select both of the [Floppy disk drives(F)] and [Specify Location(L)] check boxes, then enter the drive name and the directory name, WIN95, into the [Location] field.
(In the next dialog box, select two check box both of [Floppy disk drives] and [Specify Location:], then enter the drive name in the [Location] field.)
Insert PIO-32/32L(CPCI) Driver Install Disk 1 into the disk drive, then select [Next>].
- (7) In the [Windows driver file search for the device] dialog box, check that "CONTEC Co., Ltd. - PIO-32/32L(CPCI)" and "DIO_CPIO.INF" in the [Location of driver] has been listed, then select [Next>].
- (8) In the next dialog box, check the "Windows has finished installing the software that your new hardware device requires." message, then select [Finish]. After completed the board installation, be sure to check the assigned resources. The "Checking resources" part of this section explains you how to check the OS assigned resources of this board. (When board setup has been completed, be sure to check the assigned resources.)

Method of installing two or more PIO-32/32L(CPCI) boards :

Follow the procedure below to install two PIO-32/32L(CPCI) boards for use under Windows98.

- (1) Check the board ID of the first PIO-32/32L(CPCI) board, plug it into an expansion bus slot, then start up Windows98 to install the first board correctly.
- (2) Check that the first PIO-32/32L(CPCI) board has been set up correctly, as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.
- (3) Exit Windows98 and turn the system off.
- (4) Check the board ID of the second PIO-32/32L(CPCI) board, then plug it into an expansion bus slot. Assign ID to the second board a board ID that is different from the ID assigned to the first board.
- (5) Turn the system on again to start up Windows98.
- (6) Windows98 will come up with the [New Hardware] detection dialog box. In the [Add New Hardware Wizard] that appears next, check that "CONTEC Co., Ltd.- PIO-32/32L(CPCI)" has been listed, then select [Next>].
- (7) In the next dialog box, select a radio button of [Display a list of all the drivers in a specific location, so you can select the driver you want.], then select [Next>].
- (8) In the next dialog box, select "CONTEC Co., Ltd. PIO-32/32L(CPCI) " from [Models], then select [Next>].
- (9) In the [Windows driver file search for the device] dialog box, check that "CONTEC Co., Ltd. - PIO-32/32L(CPCI)" and "CONTEC~*.INF" in the [Location of driver] has been listed, then select [Next>]. (* is a number which the OS assigned.)
- (10) In the next dialog box, check the "Windows has finished installing the software that your new hardware device requires." message, then select [Finish]. This completes installation of the PIO-32/32L(CPCI) board. After finishing installing the board, be sure to check the assigned resources again.

For installing the third board and any additional boards, follow the same steps as those for installing a second board. Before you can install a third board or additional boards, all PIO-32/32L(CPCI) boards that are already installed must be in an expansion bus slots.

Chapter 1. Setup

Notes!

- *The second PIO-32/32L(CPCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) for the board can be allocated. Before attempting to install the second board, first determine what PC resources are free.*
- *The resources used for each PIO-32/32L(CPCI) board do not depend on the location of an expansion bus slot or the board itself. The resources used for each PIO-32/32L(CPCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more PIO-32/32L(CPCI) boards that have already been installed and then remount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the remounted board. In this case, re-check the resource settings.*

Checking resources

Follow the steps below to check the assigned resources managed by the OS.

- (1) Double-click on the [System] option in [Control Panel] to open the [System Properties] property sheet. Select the [Device Manager] tab.
- (2) Click on the [Multi-function adapters] folder.
- (3) Click on the [CONTEC Co., Ltd. - PIO-32/32L(CPCI)] folder to display its properties.
- (4) Select the [Resources] tab to check the device type, resource settings, and the conflicting device list.
- (5) If you want to change a resource setting, uncheck the [Use automatic settings] option in advance. To change the I/O address range (Input/Output Range), change the configuration name in the [Setting based on:] field. Since the interrupt level (Interrupt Request) cannot be changed, use the assigned IRQ.

Support software

CONTEC provides the following driver software for Windows98.

API-PAC(W32) Ver. Jun. 1998 or later

This driver software supports up to four PIO-32/32L(CPCI) boards.

Note that when API-PAC(W32) is used, only 32-bit versions of development languages can be used. Neither driver can be supported by any language dedicated to 16-bit applications.

Installing for Windows95

Installing the PIO-32/32L(CPCI) board hardware

Before the PIO-32/32L(CPCI) board can be used under the Windows95 operation system (OS), the OS must recognize the assigned I/O address range and the interrupt level (IRQ) of this board and register these information into OS itself. Refer the following procedure to register the board information for Windows95.

Checking the OS version

Note that the procedure for installing the PIO-32/32L(CPCI) board depends on which version of Windows95 you are using. Check the version of Windows95 on your system as follows before installing the PIO-32/32L(CPCI) board.

- (1) Open [Control Panel] from [My Computer].
- (2) Double-click on the [System] option to open the [System Properties] property sheet.
- (3) Check the "System:" number displayed on the [General] page.
System : Microsoft Windows 95
4.00.950

The version numbers of Windows95 include 4.00.950, 4.00.950a, 4.00.950B and 4.00.950C. The PIO-32/32L(CPCI) board setup depends on the version number of Windows95 that is being used.

Procedure for use under Windows95 version 4.00.950 or 4.00.950a :

- (1) Set the board ID.
- (2) Be sure to check that the system is off; then plug the board into an expansion bus slot in the system.
- (3) Turn the system ON to start up Windows95.
- (4) Windows95 will come up with the [New Hardware] detection dialog box. Select [Multimedia Device: Select which driver you want to install for your new hardware.] and then [Driver from disk provided by hardware manufacturer].
- (5) In the [Install From Disk] dialog box, insert PIO-32/32L(CPCI) Driver Install Disk 1 into the disk drive, enter the drive name and directory name in the [Copy Distributed File From] field, then click on [OK].
This completes installation of the PIO-32/32L(CPCI) board.
- (6) Follow the instructions on the screen to complete installation of the PIO-32/32L(CPCI) board.
After completed the board installation, be sure to check the assigned resources. The "Checking resources" part of this section explains you how to check the OS assigned resources of this board.

Procedure for use under Windows95 version 4.00.950B or 4.00.950C :

- (1) Set the board ID.
- (2) Be sure to check that the system is off; then plug the board into an expansion bus slot in the system.
- (3) Turn the system on to start up Windows95.
- (4) Windows95 will come up with the [New Hardware] detection dialog box. In the [Device Driver Wizard] that appears next, check that "CONTEC Co., Ltd. - Multimedia Device" has been listed, then select [Next>].
- (5) In the next dialog box, select [Specify Location...]. Insert the supplied FD in a drive, enter the drive name and directory name (WIN95) in the [Location] field, then click on [OK].

In the next dialog box, check the "Updated driver found for this device" message, then select [End]. This completes installation of the PIO-32/32L(CPCI) board. After completed the board installation, be sure to check the assigned resources. The "Checking resources" part of this section explains you how to check the OS assigned resources of this board.

Method of installing two or more PIO-32/32L(CPCI) boards (For use under Windows95 version 4.00.950 or 4.00.950a) :

Follow the procedure below to install two PIO-32/32L(CPCI) boards for use under Windows95 version 4.00.950 or 4.00.950a.

- (1) Check the board ID of the first PIO-32/32L(CPCI) board, plug it into an expansion bus slot, then start up Windows95 to install the first board correctly.
- (2) Check that the first PIO-32/32L(CPCI) board has been set up correctly, as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.
- (3) Exit Windows95 and turn the system off.
- (4) Check the board ID of the second PIO-32/32L(CPCI) board, then plug it into an expansion bus slot. Assign ID to the second board a board ID that is different from the ID assigned to the first board.
- (5) Turn the system on again to start up Windows95.
- (6) Windows95 will come up with the [New Hardware] detection dialog box. In [Multimedia Device: Select which driver you want to install for your new hardware.], select [Select from List].
- (7) The [Select Hardware Type] dialog box will then appear. In [Select Hardware Type to Install], select [Other Devices].

- (8) In the [Select Device] dialog box that appears, select [CONTEC] from [Manufacturers] and select [CONTEC Co., Ltd. - PIO-32/32L(CPCI)] from [Models].
- (9) The [Change System Settings] dialog box appears. Follow the messages to restart the computer.
- (10) When Windows95 is restarted, installation of the second PIO-32/32L(CPCI) board is completed. Check the assigned resources again.

For installing the third board and any additional boards, follow the same steps as those for installing a second board. Before you can install a third board or additional boards, all PIO-32/32L(CPCI) boards that are already installed must be in an expansion bus slots.

Notes!

- *The second PIO-32/32L(CPCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) for the board can be allocated. Before attempting to install the second board, first determine what PC resources are free.*
- *The resources used for each PIO-32/32L(CPCI) board do not depend on the location of an expansion bus slot or the board itself. The resources used for each PIO-32/32L(CPCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more PIO-32/32L(CPCI) boards that have already been installed and then re-mount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the re-mounted board. In this case, re-check the resource settings.*

**Method of installing two or more PIO-32/32L(CPCI) Boards
(For use under Windows95 version 4.00.950B or
4.00.950C) :**

Follow the procedure below to install two PIO-32/32L(CPCI) boards for use under Windows95 version 4.00.950B or 4.00.950C.

- (1) Check the board ID of the first PIO-32/32L(CPCI) board. Then plug it into an expansion bus slot. Finally, start up Windows95 to install the first board correctly.
- (2) Check that the first PIO-32/32L(CPCI) board has been set up correctly, as described in "Checking resources". Be sure to complete installation of the first board before attempting to install the second one.
- (3) Exit Windows95 and turn the system OFF.
- (4) Check the board ID of the second PIO-32/32L(CPCI) board. Then plug it into a Compact PCI bus slot. Assign to the second board a board ID different from that assigned to the first board.
- (5) Turn the system ON again to start up Windows95.
- (6) The OS will then automatically install the second board. When the installation has been completed, re-check the assigned resources.

For installing the third board and any additional boards, follow the same steps as those for installing a second board. Before you can install a third board or additional boards, all PIO-32/32L(CPCI) boards that are already installed must be in an expansion bus slots.

Notes!

- A second PIO-32/32L(CPCI) board cannot be properly installed unless the resources (I/O addresses and interrupt level) to be used for the board can be allocated. Before attempting to install a second board, first determine which PC resources are free.
- The resources used for each PIO-32/32L(CPCI) board do not depend on the location of an expansion bus slot or the board itself. The resources used for each PIO-32/32L(CPCI) board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more PIO-32/32L(CPCI) boards that have already been installed and then re-mount one of them on the computer, it is unknown which one of the sets of resources previously assigned to the two boards is assigned to the re-mounted board. In this case, check the resource settings again.

Checking resources

Follow the steps below to check the assigned resources managed by the OS.

- (1) Double-click on the [System] option in [Control Panel] to open the [System Properties] property sheet. Select the [Device Manager] tab.
- (2) Click on the [Multi-function adapters] folder.
- (3) Click on the [CONTEC Co., Ltd. - PIO-32/32L(CPCI)] folder to display its properties.
- (4) Select the [Resources] tab to check the device type, resource settings, and the conflicting device list.
- (5) If you want to change a resource setting, uncheck the [Use automatic settings] option in advance. To change the I/O address range (Input/Output Range), change the configuration name in the [Setting based on:] field. Since the interrupt level (Interrupt Request) cannot be changed, use the assigned IRQ.

Support software

CONTEC provides the following driver software for Windows95:

API-PAC(W32) Ver. Jun. 1998 or later

This driver software supports up to four PIO-32/32L(CPCI) boards.

Note that when API-PAC(W32) is used, only 32-bit versions of development languages can be used. Neither driver can be supported by any language dedicated to 16-bit applications.

Installing for WindowsNT

Installing the PIO-32/32L(CPCI) board requires separately priced CONTEC driver software. Follow the procedure below to install the board.

Verifying PC settings

Be sure that [PnP OS] is either [disabled] or set to [not to use] in the PC's BIOS setup. If this is set to [Windows95], for example, the PIO-32/32L(CPCI) might not be recognized properly.

Installing the PIO-32/32L(CPCI) driver software

To use the PIO-32/32L(CPCI) board under WindowsNT operation system, you need an optional CONTEC installation driver program. Refer the following procedure to install this board to the WindowsNT OS.

- (1) Set the board ID.
- (2) Be sure that the system power is off. Then plug the board into an expansion bus slot in the system.
- (3) Start WindowsNT with Administrator.
- (4) Execute the optional driver program to install the board. Refer the driver program's manual or the driver program's help file for details.

After completed the board installation, be sure to check the assigned resources. The "Checking resources" part of this section explains you how to check the OS assigned resources of this board.

Checking resources

Follow the steps below to check the assigned resources managed by the OS.

- (1) Open [WindowsNT Diagnostic Program] from [Management Tools].
- (2) Select [Resources] (IRQ/port settings). Check the types and settings of resources assigned to the relevant driver and the corresponding device list.

Support software

CONTEC provides the following driver software for WindowsNT.

API-PAC(W32) Ver. Jun. 1998 or later

This driver software supports up to four PIO-32/32L(CPCI) boards.

Note that when API-PAC(W32) is used, only 32-bit versions of development languages can be used.

Installing for other OS System

For all the other operation systems, in addition of the Windows OS, we use MS-DOS as an example to show how to use the PIO-32/32L(CPCI) board under the OS.

For all the other operation systems, refer the MS-DOS programs of the attached floppy as an example.

For a CompactPCI bus board, the system will automatically assign a usable resource / usable resources to the board. Refer the following procedure to copy the attached programs and to confirm the assigned resource/resources.

Procedure

- (1) Set the board ID.
- (2) Be sure that the system power is off; then plug the board into a CompactPCI bus slot in the system.
- (3) Turn the system ON to start up MS-DOS.
- (4) Copy the programs that are under the DOS directory of the attached floppy to a directory of your HDD.
- (5) Execute the PIOPCI.EXE resource confirmation program.
- (6) Check the I/O addresses and interrupt level (IRQ) displayed on the screen.

Sample programs for MS-DOS

The sample programs for using the PIO-32/32L(CPCI) board under MS-DOS are written in Microsoft C.

The attached floppy contains following sample programs.

DOS --- Samples ---	(1) PIOPCI.C PIOPCI.EXE	Resource check program
	(2) PIO3232.C PIO3232.EXE	Input/Output data (PIO-32/32(CPCI) series)
	(3) PI64.C PI64.EXE	Input data (PI-64(CPCI) series)
	(4) PO64.C PO64.EXE	Output data (PO-64(CPCI) series)
	(5) INTPC.C INTPC.EXE	Input data by interrupt for PC (PIO-32/32(CPCI) series)

Figure 3. Sample Programs on FD

For details on I/O addresses, see Chapter 3 "I/O Ports and Registers."

Chapter 2. External Connection

Interface Connector

Connecting the Interface Connector

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

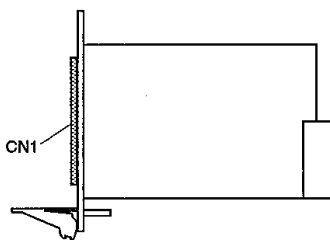
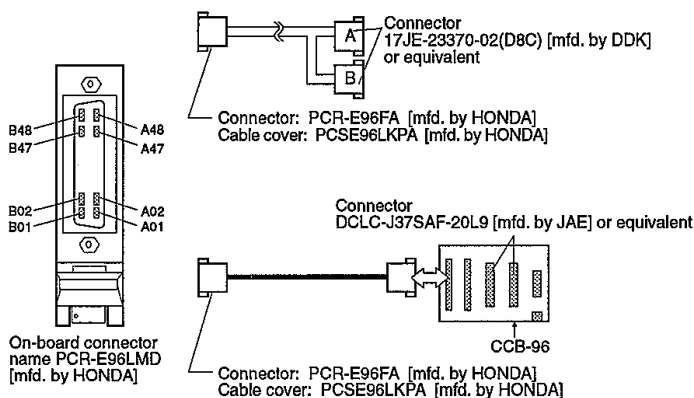


Figure 4. Connecting the Interface Connector

- Connector used
PCR-E96LMD [mfd. by HONDA]
- Applicable connector
PCR-E96FA [mfd. by HONDA]

* Optional cable PCB96WS-**



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

Figure 5. Connector Used

Interface Connector Pin Assignment

To connect an external device to this interface board, plug the device into the on-board 96-pin connector shown below in Figure 6.

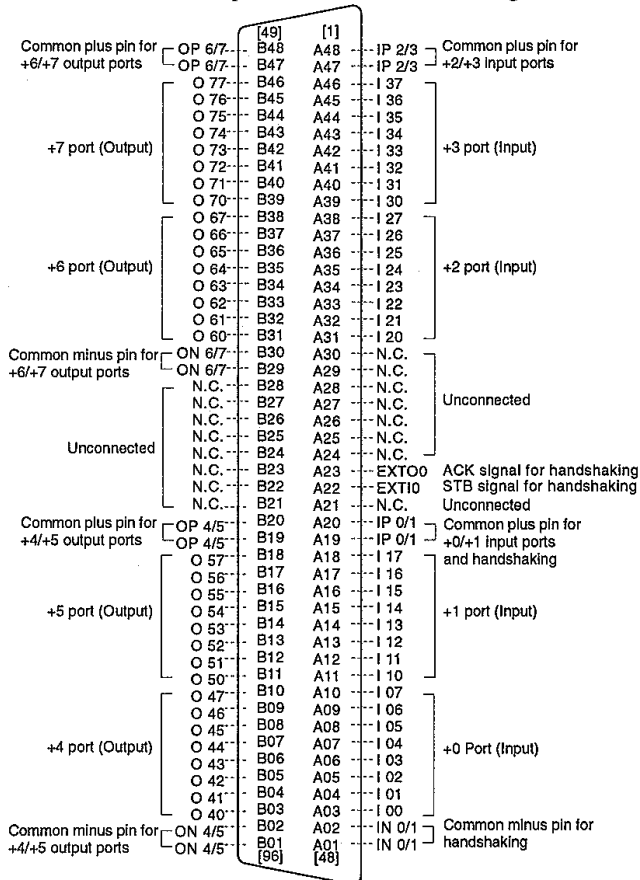


Figure 6. Interface Connector Pin Assignment

Note!

The numbers in brackets are pin numbers defined by the connector manufacturer.

Chapter 2. External Connection

PCB96WS and CCB-96 Signal Assignments

Optional cable connectors and their corresponding signals are shown in Figure 7 below.

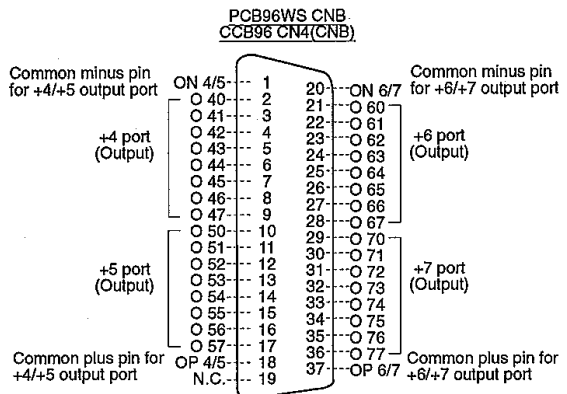
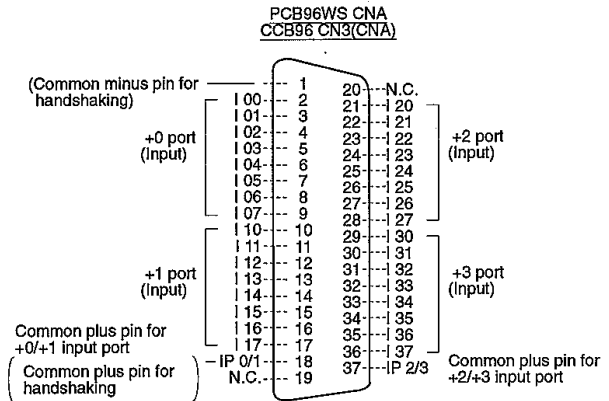


Figure 7. PCB96WS and CCB-96 Signal Assignments

Note!

Not support signals for handshaking.

Input Circuit and Output Circuit

Input circuit

The input circuit of this board is illustrated in Figure 8. The on-board photocouplers isolate internal input circuits from outside devices. The input channels are current source type signals. Driving these opto-isolated circuits require an additional power supply isolated from the PC system. When a 12 VDC external power is used each input channel will consume about 4 mA current; when a 24 VDC external power supply is selected, each input channel will consume about 8 mA current.

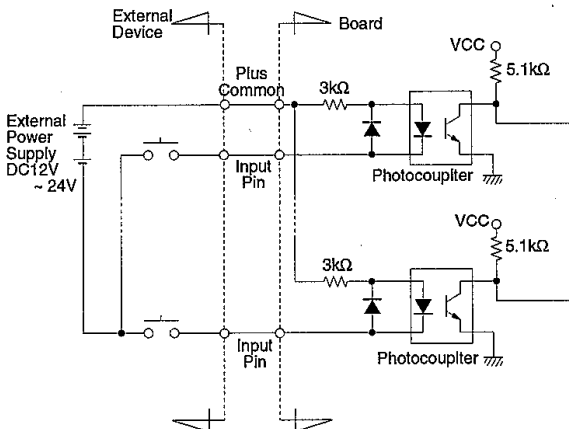


Figure 8. Input Circuit

Chapter 2. External Connection

Output circuit

The output circuit of this illustrated in Figure 9. The output channel is a photocoupler-insulated open-collector type (sink type). Driving these opto-isolated circuits require an additional power supply isolated from the PC system. The maximum output current rating is 100 mA per channel or 2 A per common ; (16 output channels share a common power supply).

Note!

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

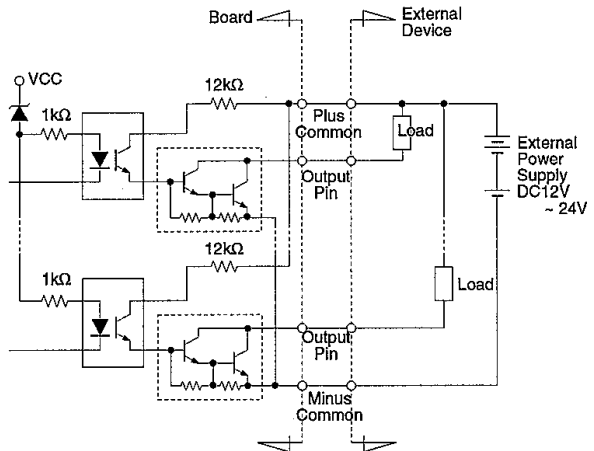


Figure 9. Output Circuit

STB and ACK input and output circuits

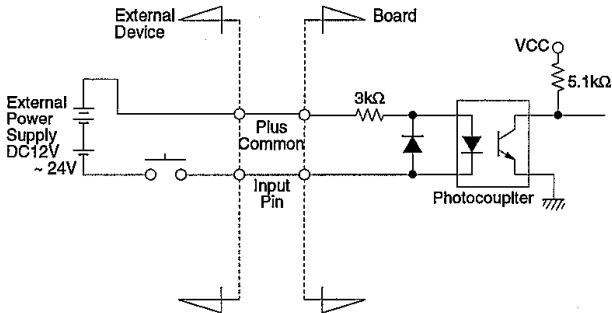


Figure 10. STB Input Circuit

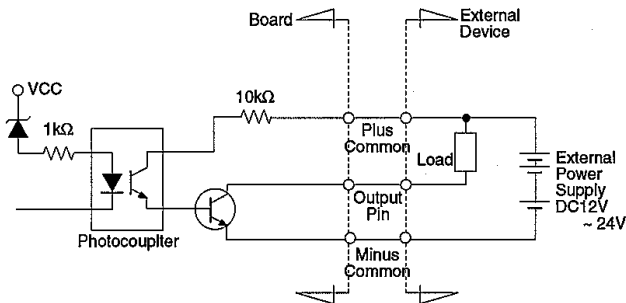
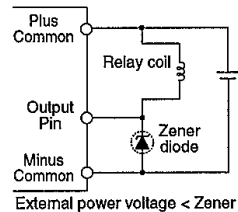
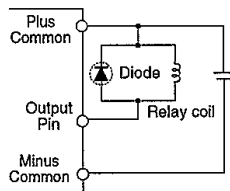


Figure 11. ACK Output Circuit

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. Example of measures against voltage surge are shown in Figure 12 below.

■ Examples of use of relay coil



■ Examples of use of lamp

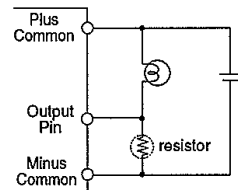
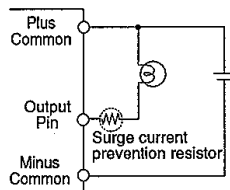


Figure 12. Samples of Voltage Surge Protection

Note!

The protection circuit must be installed less than 50 cm from the load and contact to provide effective protection.

Chapter 3. I/O Ports and Registers

I/O Address Map

Board I/O Address	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0
+0H	Input Group 0							
	I07 [7]	I06 [6]	I05 [5]	I04 [4]	I03 [3]	I02 [2]	I01 [1]	I00 [0]
+1H	Input Group 1							
	I17 [15]	I16 [14]	I15 [13]	I14 [12]	I13 [11]	I12 [10]	I11 [9]	I10 [8]
+2H	Input Group 2							
	I27 [23]	I26 [22]	I25 [21]	I24 [20]	I23 [19]	I22 [18]	I21 [17]	I20 [16]
+3H	Input Group 3							
	I37 [31]	I36 [30]	I35 [29]	I34 [28]	I33 [27]	I32 [26]	I31 [25]	I30 [24]
+4H	Input Group 4							
	O47 [39]	O46 [38]	O45 [37]	O44 [36]	O43 [35]	O42 [34]	O41 [33]	O40 [32]
+5H	Input Group 5							
	O57 [47]	O56 [46]	O55 [45]	O54 [44]	O53 [43]	O52 [42]	O51 [41]	O50 [40]
+6H	Input Group 6							
	O67 [59]	O66 [58]	O65 [57]	O64 [56]	O63 [55]	O62 [54]	O61 [53]	O60 [52]
+7H	Input Group 7							
	O77 [63]	O76 [62]	O75 [61]	O74 [60]	O73 [59]	O72 [58]	O71 [57]	O70 [56]
+8H	Handshake Status Input							
	X	X	X	X	INT	IBF	STB	ACK
+9H	Not Allowed							
+AH	Bit Data Input							
	0	0	0	0	0	0	0	BDT
+BH	Not Allowed							
+CH	Group Data Input							
	PD7	PD6	PD5	PD4	PD3	PD2	PD1	PD0
+DH	Not Allowed							
+EH	Interrupt Setting							
	X	X	IN1	IN0	X	IR	IS1	IS0
+FH	Digital Filter Setting							
	X	X	X	ST4	ST3	ST2	ST1	ST0
+10H	Not Allowed							
+11H	Interrupt Status							
	0	0	0	0	INTS3	INTS2	INTS1	INTS0
+12H +1FH	Not Allowed							

Ixx represents an input signal;
Oxx represents an output signal
that will be read back here;
Numbers in brackets [] represent
input bit numbers.

Note

- All access except to input group 0 to 7 (port +0 to +7) should be byte access.
- Input by word access to input group 0 to 7 should be to I/O addresses that are multiples of 2 (+0, +2, +4, +6).
- Input by double word access to input group 0 to 7 should be to I/O addresses that are multiples of 4 (+0, +4).

Figure 13. Input Port Assignments

Chapter 3. I/O Ports and Registers

Board I/O Address	D7	D6	D5	D4	D3	D2	D1	D0
+0H	Output Group 0							
	Not Allowed							
+1H	Output Group 1							
	Not Allowed							
+2H	Output Group 2							
	Not Allowed							
+3H	Output Group 3							
	Not Allowed							
+4H	Output Group 4							
	O47 [39]	O46 [38]	O45 [37]	O44 [36]	O43 [35]	O42 [34]	O41 [33]	O40 [32]
+5H	Output Group 5							
	O57 [47]	O56 [46]	O55 [45]	O54 [44]	O53 [43]	O52 [42]	O51 [41]	O50 [40]
+6H	Output Group 6							
	O67 [55]	O66 [54]	O65 [53]	O64 [52]	O63 [51]	O62 [50]	O61 [49]	O60 [48]
+7H	Output Group 7							
	O77 [63]	O76 [62]	O75 [61]	O74 [60]	O73 [59]	O72 [58]	O71 [57]	O70 [56]
+8H	ACK Signal Setting							
	0	0	0	0	0	0	0	ACK
+9H	Not Allowed							
+AH	Bit Data							
	0	0	0	0	0	0	0	BDT
+BH	Bit Select							
	0	0	BS5	BS4	BS3	BS2	BS1	BS0
+CH	Group Data							
	PD7	PD6	PD5	PD4	PD3	PD2	PD1	PD0
+DH	Group Select							
	0	0	0	0	0	PS2	PS1	PS0
+EH	Interrupt Setting							
	0	0	INT1	INT0	0	IR	IS1	IS0
+FH	Digital Filter Setting Register							
	0	0	0	ST4	ST3	ST2	ST1	ST0
+10H	Interrupt Mask Register							
	0	0	0	0	INTM3	INTM2	INTM1	INTM0
+11H	Interrupt Clear Register							
	0	0	0	0	INTC3	INTC2	INTC1	INTC0
+12H +1FH	Not Allowed							

Oxx represents an output signal;
Numbers in brackets [] represent
output bit numbers.

- Note
- All access except to output group 0 to 7 (port +0 to +7) should be byte access.
 - Output by word access from output group 4-7 should be from I/O addresses that are multiples of 2 (+4, +6).
 - Output by double word access from output group 4-7 should be from I/O addresses that are multiples of 4 (+4).

Figure 14. Output Port Assignments

Input / Output Data by Direct Access to I/O Ports

Data Input

I/O address + 0H to + 3H input ports are used to read input channel data. The following table shows input channels and their corresponding input ports. If an input channel is "ON", a driving current is running through the photo diode and the corresponding bit of the input ports. For example, if channel I07 is ON, bit D7 of the I/O address + 0 port is read "1." If an input channel is "OFF", no driving current is running through the photo diode, and the corresponding bit of the input port is read "0".

		D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0
Input Ports	I/O Address	Input Group 0							
		I07 [7]	I06 [6]	I05 [5]	I04 [4]	I03 [3]	I02 [2]	I01 [1]	I00 [0]
	+1H	Input Group 1							
		I17 [15]	I16 [14]	I15 [13]	I14 [12]	I13 [11]	I12 [10]	I11 [9]	I10 [8]
		Input Group 2							
		I27 [23]	I26 [22]	I25 [21]	I24 [20]	I23 [19]	I22 [18]	I21 [17]	I20 [16]
	+3H	Input Group 3							
		I37 [31]	I36 [30]	I35 [29]	I34 [28]	I33 [27]	I32 [26]	I31 [25]	I30 [24]

Ixx represents an input signal of CN1 connector.

Figure 15. Input Port " I/O Address +0H ~ 3H "

Programming examples

The following programming examples check the input channel I07. If this channel is "ON" then program will continue. The "PORT%" and "port" are sample I/O addresses.

BASIC (MS-DOS version)

```

DAT% = INPUT(PORT%)
IF (DAT% AND &H80) = &H80 THEN

```

⋮

Microsoft C or C++ (MS-DOS version)

```

data_in = inp(port);
while(data_in & 0x80)

```

⋮

Data Output

I/O address +4H to +7H output ports are used to output data. The following table shows the relationship of output channels and output ports. Setting an output bit of output ports to "1" will switch the corresponding output transistor to "ON". Resetting an output bit of output ports to "0" will switch the corresponding output transistor to "OFF".

		D7	D6	D5	D4	D3	D2	D1	D0
Output Ports I/O Address	+4H	Output Group 4							
		O47 [39]	O46 [38]	O45 [37]	O44 [36]	O43 [35]	O42 [34]	O41 [33]	O40 [32]
	+5H	Output Group 5							
		O57 [47]	O56 [46]	O55 [45]	O54 [44]	O53 [43]	O52 [42]	O51 [41]	O50 [40]
	+6H	Output Group 6							
		O67 [55]	O66 [54]	O65 [53]	O64 [52]	O63 [51]	O62 [50]	O61 [49]	O60 [48]
	+7H	Output Group 7							
		O77 [63]	O76 [62]	O75 [61]	O74 [60]	O73 [59]	O72 [58]	O71 [57]	O70 [56]

Oxx represents an output signal of CN1 connector.

Figure 16. Output Port " I/O Address +4H ~ 7H "

Programming examples

The following programming examples turn the O47 output transistor to "ON". The "PORT%" and "port" are sample I/O addresses.

BASIC (MS-DOS version)

```
OUT PORT% + &H04, &H80
```

Microsoft C or C++ (MS-DOS version)

```
outp(port + 0x04, 0x80) ;
```

Note!

When the PC is turned ON, all output ports are reset to "0."

Input / Output Data by Bit Number

PIO-32/32L(CPCI) supports bit input / output function. Under this function, you can specify a bit number and then input this bit status or output to this bit. The following figure shows the relations of bit numbers and their corresponding input ports.

		D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0
Input Ports I/O Address	+0H	Input Group 0							
		I07 [7]	I06 [6]	I05 [5]	I04 [4]	I03 [3]	I02 [2]	I01 [1]	I00 [0]
+1H		Input Group 1							
		I17 [15]	I16 [14]	I15 [13]	I14 [12]	I13 [11]	I12 [10]	I11 [9]	I10 [8]
+2H		Input Group 2							
		I27 [23]	I26 [22]	I25 [21]	I24 [20]	I23 [19]	I22 [18]	I21 [17]	I20 [16]
+3H		Input Group 3							
		I37 [31]	I36 [30]	I35 [29]	I34 [28]	I33 [27]	I32 [26]	I31 [25]	I30 [24]
+4H		Input Group 4							
		O47 [39]	O46 [38]	O45 [37]	O44 [36]	O43 [35]	O42 [34]	O41 [33]	O40 [32]
+5H		Input Group 5							
		O57 [47]	O56 [46]	O55 [45]	O54 [44]	O53 [43]	O52 [42]	O51 [41]	O50 [40]
+6H		Input Group 6							
		O67 [55]	O66 [54]	O65 [53]	O64 [52]	O63 [51]	O62 [50]	O61 [49]	O60 [48]
+7H		Input Group 7							
		O77 [63]	O76 [62]	O75 [61]	O74 [60]	O73 [59]	O72 [58]	O71 [57]	O70 [56]
+AH		Bit Data							
		0	0	0	0	0	0	0	BDT

Ixx represents an input signal; Oxx represents an output signal that will be read back here; Numbers in brackets [] represent input bit numbers; BDT is input data.

Figure 17. Input Port " I/O Address +0H ~ 7H "
and " I/O Address +AH "

Chapter 3. I/O Ports and Registers

The following figure shows bit numbers and their corresponding output ports.

		D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0
Output Ports I/O Address	+0H	Output Group 0							
		Not Used							
+1H		Output Group 1							
		Not Used							
+2H		Output Group 2							
		Not Used							
+3H		Output Group 3							
		Not Used							
+4H		Output Group 4							
		O47 [39]	O46 [38]	O45 [37]	O44 [36]	O43 [35]	O42 [34]	O41 [33]	O40 [32]
+5H		Output Group 5							
		O57 [47]	O56 [46]	O55 [45]	O54 [44]	O53 [43]	O52 [42]	O51 [41]	O50 [40]
+6H		Output Group 6							
		O67 [55]	O66 [54]	O65 [53]	O64 [52]	O63 [51]	O62 [50]	O61 [49]	O60 [48]
+7H		Output Group 7							
		O77 [63]	O76 [62]	O75 [61]	O74 [60]	O73 [59]	O72 [58]	O71 [57]	O70 [56]
+AH		Bit Data							
		0	0	0	0	0	0	0	BDT
+BH		Bit Select							
		0	0	BS5	BS4	BS3	BS2	BS1	BS0

Oxx represents an output signal; Numbers in brackets [] represent output bit numbers; BDT is output data; BS0 to BS5 specify an input or output bit number.

Figure 18. Output Port " I/O Address +0H ~ 7H "
and " I/O Address +AH ~ BH "

Input a Bit Data

- (1) Select the bit number that you are going to input by outputting this bit number to an I/O address + BH output port, the Bit Select port. The bit numbers are from 0 to 63 (3FH).
- (2) Input this bit data from I/O address + AH input port, the Bit Data port. The BDT indicates the status of the specified bit signal.

Programming examples

The following programming examples input the bit [31] (1FH). The "PORT%" and "port" are sample I/O addresses.

BASIC (MS-DOS version)

```
OUT PORT% + &H0B, &H1F
BDT% = INP(PORT% + &H0A)
```

Microsoft C or C++ (MS-DOS version)

```
outp(port + 0x0b, 0x1f) ;
bit_data = inp(port + 0x0a) ;
```

Output a Bit Data

- (1) Select the bit number that you are going to output by outputting this bit number to an I/O address + BH output port, the Bit Select port. The bit numbers are from 32 (20H) to 63 (3FH).
- (2) Output this bit data to an I/O address + AH output port, the Bit Data port. The BDT is the output data of the specified bit signal.

Programming examples

The following programming examples output "1" to bit [63] (3FH). The "PORT%" and "port" are sample I/O addresses.

BASIC (MS-DOS version)

```
OUT PORT% + &H0B, &H3F
OUT PORT% + &H0A, &H01
```

Microsoft C or C++ (MS-DOS version)

```
outp(port + 0x0b, 0x3f) ;
outp(port + 0x0a, 0x01) ;
```

Note!

After the PC is turned ON, all output bits are reset to "0."

Input / Output Data by Group Number

PIO-32/32L(CPCI) supports group input / output function. Under this function, you can specify a group number instead of the I/O port and then input from this port or output to this port. The following figure shows group numbers and their corresponding input ports.

		D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0
Input Ports I/O Address	+0H	Input Group 0							
		I07 [7]	I06 [6]	I05 [5]	I04 [4]	I03 [3]	I02 [2]	I01 [1]	I00 [0]
+1H		Input Group 1							
		I17 [15]	I16 [14]	I15 [13]	I14 [12]	I13 [11]	I12 [10]	I11 [9]	I10 [8]
+2H		Input Group 2							
		I27 [23]	I26 [22]	I25 [21]	I24 [20]	I23 [19]	I22 [18]	I21 [17]	I20 [16]
+3H		Input Group 3							
		I37 [31]	I36 [30]	I35 [29]	I34 [28]	I33 [27]	I32 [26]	I31 [25]	I30 [24]
+4H		Input Group 4							
		O47 [39]	O46 [38]	O45 [37]	O44 [36]	O43 [35]	O42 [34]	O41 [33]	O40 [32]
+5H		Input Group 5							
		O57 [47]	O56 [46]	O55 [45]	O54 [44]	O53 [43]	O52 [42]	O51 [41]	O50 [40]
+6H		Input Group 6							
		O67 [55]	O66 [54]	O65 [53]	O64 [52]	O63 [51]	O62 [50]	O61 [49]	O60 [48]
+7H		Input Group 7							
		O77 [63]	O76 [62]	O75 [61]	O74 [60]	O73 [59]	O72 [58]	O71 [57]	O70 [56]
+CH		Group Data							
		PD7	PD6	PD5	PD4	PD3	PD2	PD1	PD0

Ixx represents an input signal; Oxx represents an output signal that will be read back here.

Figure 19. Input Port " I/O Address +0H ~ 7H "
and " I/O Address + CH "

Chapter 3. I/O Ports and Registers

The following figure shows group numbers and their corresponding output ports.

	D7	D6	D5	D4	D3	D2	D1	D0
Output Ports I/O Address	Output Group 0							
	Not Used							
+0H	Output Group 1							
	Not Used							
+1H	Output Group 2							
	Not Used							
+2H	Output Group 3							
	Not Used							
+3H	Output Group 4							
	O47 [39]	O46 [38]	O45 [37]	O44 [36]	O43 [35]	O42 [34]	O41 [33]	O40 [32]
+4H	Output Group 5							
	O57 [47]	O56 [46]	O55 [45]	O54 [44]	O53 [43]	O52 [42]	O51 [41]	O50 [40]
+5H	Output Group 6							
	O67 [55]	O66 [54]	O65 [53]	O64 [52]	O63 [51]	O62 [50]	O61 [49]	O60 [48]
+6H	Output Group 7							
	O77 [63]	O76 [62]	O75 [61]	O74 [60]	O73 [59]	O72 [58]	O71 [57]	O70 [56]
+7H	Group Data							
	PD7	PD6	PD5	PD4	PD3	PD2	PD1	PD0
+CH	Group Select							
	0	0	0	0	0	PS2	PS1	PS0
+DH								

Oxx represents an output signal; PS0 to PS2 specify an input or output group number.

Figure 20. Output Port " I/O Address +0H ~ 7H "
and " I/O Address +CH ~ DH "

Input a Group Data

- (1) Select the group number that you are going to input by outputting this group number to an I/O address + DH output port, the Group Select port. The group numbers are from 0 to 7.
- (2) Input this group data from an I/O address + CH input port, the Group Data port. The PD0 to PD7 represent the status of the specified group signals.

Programming examples

The following programming examples input data from input group 0. The "PORT%" and "port" are variables of I/O addresses.

BASIC (MS-DOS version)

```
OUT PORT% + &H0D, &H00
GDT% = INP(PORT% + &H0C)
```

Microsoft C or C++ (MS-DOS version)

```
outp(port + 0x0d, 0x00) ;
group_data = inp(port + 0x0c) ;
```

Output a Group Data

- (1) Select the group number that you are going to output by outputting this group number to an I/O address + DH output port, the Group Select port. The group numbers are from 4 to 7.
- (2) Output this group data to an I/O address + CH output port, the Group Data port. The PD0 to PD7 are output data of the specified group, which represent the related output channels.

Programming examples

The following programming examples output "OFFH" to group 4. The "PORT%" and "port" are sample I/O addresses.

BASIC (MS-DOS version)

```
OUT PORT% + &H0D, &H04
OUT PORT% + &H0C, &HFF
```

Microsoft C or C++ (MS-DOS version)

```
outp(port + 0x0d, 0x04) ;
outp(port + 0x0c, 0xff) ;
```

Note!

After the PC is turned ON, all output bits are reset to "0."

Digital Filter Function of Input Channels

PIO-32/32L(CPCI) is equipped with a digital filter function for input signals. This function provides all input channels with a means of cutting chattering and noise.

Digital Filter Function Principle

To use this function, you must set a filter time. The function circuits will then check all input signals synchronizing with the CompactPCI bus clock. A signal level, low or high, will be input only if the signal level remains stable during the filter set time.

Therefore, if a signal level changes faster than the filter set time, this level change will be ignored and the previous signal level will be input.

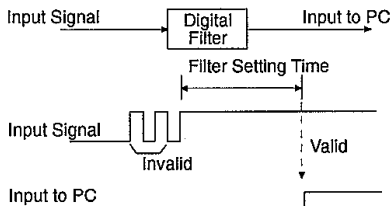


Figure 21. Digital Filter Operation Principle

	D7	D6	D5	D4	D3	D2	D1	D0
Input ports	Digital Filter Setting							
I/O Address +FH	x	x	x	ST4	ST3	ST2	ST1	ST0

	D7	D6	D5	D4	D3	D2	D1	D0
Output ports	Digital Filter Setting							
I/O Address +FH	0	0	0	ST4	ST3	ST2	ST1	ST0

Figure 22. I/O Ports of Digital Filter Function

Set Digital Filter Time

To set the digital filter time, write a five-digit setting data to the "I/O address + 0FH" output port, the Digital Filter Setting port. The setting data should be: 0 to 20(14H).

Writing a "0" to this port will disable the digital filter function.

Note!

- After power on, this port is reset to "0".
- Writing a setting data other than a "0" will apply this filter function to all input channels. This function cannot be applied to particular pins only but is applied to all input channels.
- Do not set a data more than 20(14H). Doing so may cause the board malfunctioning.

The following table shows digital filter times and their corresponding setting data.

Digital Filter Time[sec.] = $2^n / (16 \times 10^6)$

n: = setting data(0 to 20)

Digital filter time	n	Digital filter time	n
The filter function is not used.	0	64μsec	10
		128μsec	11
0.125μsec	1	256μsec	12
0.25μsec	2	512μsec	13
0.5μsec	3	1.024msec	14
1μsec	4	2.048msec	15
2μsec	5	4.096msec	16
4μsec	6	8.192msec	17
8μsec	7	16.384msec	18
16μsec	8	32.768msec	19
32μsec	9	65.536msec	20

Figure 23. Digital Filter Time and Setting Data

For example, to set a 1 msec filter time, the setting data should be 14(0EH) because $0.001 = (2^{14} / 16000000)$

Programming examples

The following programming examples set the filter time for 1 msec. The "PORT%" and "port" are sample I/O addresses.

BASIC (MS-DOS version)

```
OUT PORT% + &H0F, &H0E.
```

Microsoft C or C++ (MS-DOS version)

```
outp(port + 0x0f, 0x0e) ;
```

Confirm the Digital Filter Setting Data

Read the "I/O address + 0FH" input port, the Digital Filter Setting port, will get the filter setting data that you have set.

The following programming examples input the filter setting data. The "PORT%" and "port" are sample I/O addresses.

Programming examples

BASIC (MS-DOS version)

```
TIM% = INP(PORT% + &H0F)
```

Microsoft C or C++ (MS-DOS version)

```
set_time = inp(port + 0x0f) ;
```

Handshake of Input Channel 0 to 15

Under this function, an external STB signal will latch channel 0 to 15 input data into input registers. This STB signal can also issue an interrupt request signal if you set the interrupt event for it. An ACK signal can be issued through software commands. By using these STB and ACK signals, you can then handshake the input actions with external circuits.

Note!

Outputting a hexadecimal data 0F0H to I/O address + 8H port will reset (initial) the handshake function.

	D7	D6	D5	D4	D3	D2	D1	D0
Input ports	Handshake Status Input							
I/O Address +8H	x	x	x	x	INT	IBF	STB	ACK

	D7	D6	D5	D4	D3	D2	D1	D0
Output ports	ACK Signal Setting							
I/O Address +8H	0	0	0	0	0	0	0	ACK

Figure 25. I/O Port Assignment of Handshake Function

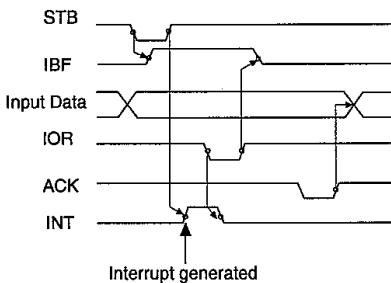


Figure 26. Timing of Handshake Function

Chapter 3. I/O Ports and Registers

Programming examples

The following programming examples input a latched data by checking the INT status of the handshake status register. The "PORT%" and "port" are sample I/O addresses.

BASIC (MS-DOS version)

```
OUT PORT% + &H08, &HF0
                                'INITIALIZE HANDSHAKEFUNCTION
WHILE((INP(PORT% + &H08) AND &H08) = 0)
                                'INPUT STATUSREGISTER
WEND                            'CHECK INT STATUS
DAT% = INP(PORT%)              'INPUT DATA
OUT PORT% + &H08, 0            'OUTPUT ACK SIGNAL
OUT PORT% + &H08, 1
```

Microsoft C or C++ (MS-DOS version)

```
#include<stdio.h >
void main (void)
{
    int dat;

    outp(port + 0x08, 0xf0) ;
        /* initialize handshake function */
    while(!(inp(port + 0x08) & 0x08)) ;
        /* Checking INT status */
    data = inp(port + 0x00) ;        /* input data */
    outp(port + 0x08, 0);           /* output ACK signal */
    outp(port + 0x08, 1);
}
```

Interrupt Control Function

If the No.1-2 pins of JP1 is jumped as "Using Interrupt", up to 4 interrupt events, either I00 to I03 input signals or three of the four input signals and the handshake signal (STB signal), can generate an interrupt request signal.

	D7	D6	D5	D4	D3	D2	D1	D0
Input ports	Interrupt Setting							
I/O Address +EH	x	x	IN1	IN0	x	IR	IS1	IS0

	D7	D6	D5	D4	D3	D2	D1	D0
I/O Address +11H	Interrupt Status							
	0	0	0	0	INTS3	INTS2	INTS1	INTS0

Figure 27. Input Port Assignment of Interrupt Function

	D7	D6	D5	D4	D3	D2	D1	D0
Output ports	Interrupt Setting							
I/O Address +EH	0	0	IN1	IN0	0	IR	IS1	IS0

	D7	D6	D5	D4	D3	D2	D1	D0
I/O Address +10H	Interrupt Mask Register							
	0	0	0	0	INTM3	INTM2	INTM1	INTM0

	D7	D6	D5	D4	D3	D2	D1	D0
I/O Address +11H	Interrupt Clear Register							
	0	0	0	0	INTC3	INTC2	INTC1	INTC0

Figure 28. Output Port Assignment of Interrupt Function

Set Interrupt Events

You use the Interrupt Setting output port to set interrupt events and the active logic of these events.

When you set the interrupt events, I00 input signal can be connected only to internal signal INTa; I01 input signal can be connected only to internal signal INTb; I02 input signal can be connected only to internal signal INTc; I03 input signal can be connected to internal signal INTd only. The handshake event, however, can be connected to any of the internal signals INTa to INTd.

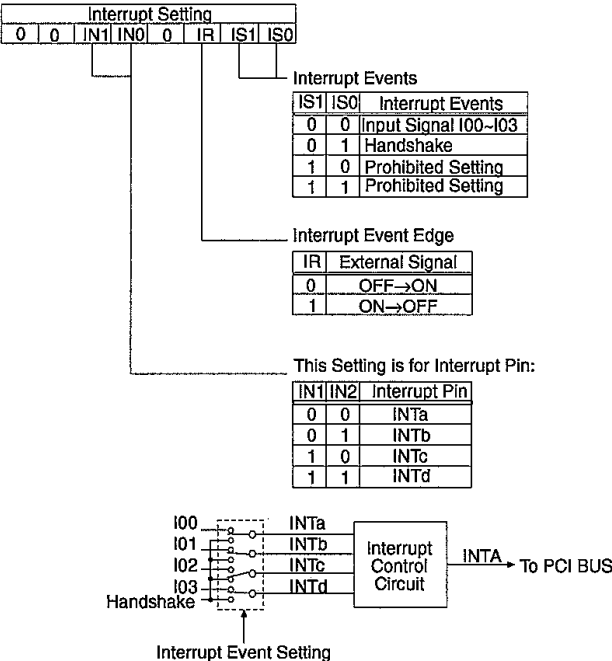


Figure 29. Explanation of Interrupt Setting Register

Interrupt Event Masking

PIO-32/32L (CPCI) uses I/O address + 10H output port for masking. Setting a bit to "1" will mask the related event from generating an unwanted interrupt request. For example, if you set the I01 input signal as an interrupt event and you set INTM1 to "1" from I/O address + 11H, then I01 input signal will not generate an interrupt request but set the INTS1 of interrupt status register. The relationship of interrupt events "INTa to INTd" and interrupt masking bits is as following:

INTa : INTM0
INTb : INTM1
INTc : INTM2
INTd : INTM3

Note!

After power on, these two ports are reset as all "1".

Interrupt Status Register

PIO-32/32L(CPCI) connects only one interrupt request signal to the CompactPCI bus, the INTA bus signal. The board combines these four interrupt requests into one signal. Before setting more than two interrupt events for generating interrupt requests in your interrupt handler program, you must first determine which event has requested this interrupt service. The Interrupt Status input port is designed for this purpose.

For example, if you have set the I00 to I03 as interrupt events and the active logic is from low to high, a change of I00 from low to high will set the interrupt status INTS0 to "1" and generate an interrupt request. Interrupt events and their corresponding interrupt status are shown below:

INTa : INTS0
INTb : INTS1
INTc : INTS2
INTd : INTS3

Check Interrupt Setting

You can check what you have set for the interrupt setting register by reading the I/O address + 0EH input port.

Clear Interrupt Request Signal

The interrupt of the CompactPCI bus uses a level trigger instead an edge trigger, which is used by the ISA bus. Therefore, the arrival of an interrupt request means that the INTA has been assigned to low. If you do not clear this request signal, the CPU will respond to this interrupt request repeatedly. To avoid this kind of malfunctioning in your interrupt handler program, you must clear the interrupt request signal before you enable the interrupt. For PIO-32/32L(CPCI), you can use the Interrupt Clear output port for this purpose. For example, if the INTS2 is "1" in the Interrupt Status register of your interrupt handler program, INTC will generate an interrupt request. Setting the INTC2 to "1" by output to the Interrupt Clear port will clear this INTS2 interrupt request to enable the next interrupt.

INTa : INTC0

INTb : INTC1

INTc : INTC2

INTd : INTC3

Programming example

The following sample program is part of a sample interrupt handler program. The "port" is sample I/O address.

Microsoft C or C++ (MS-DOS version)

```
_disable() ;
n = inp(port + 0x11) & 0x0f ;
/*Find out which event(s) has/have requested interrupt.*/
out(port + 0x11, n) ;
/*Clear interrupt request signal.*/
.
.
/* Service the interrupt request.*/
_enable() ;
```


Chapter 4. System Reference

Block Diagram

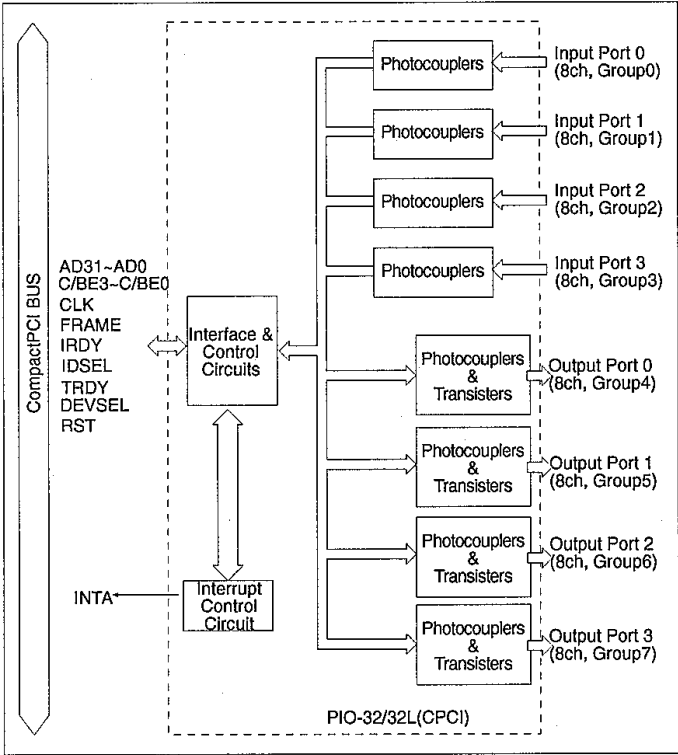


Figure 30. Block Diagram

Specifications

Table 1. lists the chief specifications of this board.

Table 1. Specifications

Item		Specification
Input	Type	Opto - Isolated current - source (Negative logic) 16 channels share a positive common
	Resistor	3k Ω
	Current required to turn ON	3.4mA (Min.)
	Current required to turn OFF	0.16mA (Max.)
	Number of channels	32 channels (4 of these 32 can be used as interrupt signal)
	Interrupts	Combine four interrupt signals to one interrupt request signal as the INTA. Both rising edge or falling edge of input signal can generate interrupt.
Output	Throughput	1 ms (Max.)
	Type	Opto - Isolated open collector current - sink (Negative logic) 16 channels share a positive common and a negative common
	Voltage	35VDC (Max.)
	Current	100mA max. per channel 2A max. per common
	Number of channels	32 channels
	Throughput	1 ms (Max.)
I/O address		Any 32-byte boundary
Isolated voltage		1000Vrms
Boards in one system		Maximum of 16 boards can be install in a same system.
External power supply		12 to 24 VDC (+/- 15%) Note: 4mA/12V to 8mA/24V per input channel
Power consumption		5 VDC 300mA (Max.)
Operating condition		0 to 50°C, 20% to 90% (not condensing)
Connecting distance		50m (Typical) (depending on wiring environment)
Dimension		3U / 4HP
Weight		160g

Chapter 5. Troubleshooting

If you are having trouble with your board or program, first answer the following questions to see if you can find the problem.

QUESTIONS:

STEPS TO TAKE:

Is the pilot light on?

The system must be turned on and the power supply must be working. Check the main power switch and the power supply.

Did the system boot up?

If the board is installed and the system did not boot up, check the following:

- Make sure that the board is plugged in firmly.
- Can you boot up if you chose not to use the interrupt?

Does your program work?

If the system booted and your program does not work, check the following:

- Try one of the programs provided on disk and see if it works.
- Check the board address of your program.
- Check your interrupt handler program.

Does the sample program work?

Check the following:

- Try it with only the PIO-32/32L(CPCI) board installed.
- Make sure that input signals are connected to the right pins.
- Make sure that output signals are recalled back correctly.
- Pin connections on the I/O cables are secure.

Chapter 5. Troubleshooting

Note!

Before you call, please make a list of the following information. Our technical representatives will need the following information to help you.

1. Your name, company, and phone number.
2. The brand and type of computer you are using
3. OS and Version (e.g. DOS Ver.6.2)
4. Name of the CONTEC board that you are using.
5. Names of other boards in the computer.
6. The programming language that you are using (and the version number).
7. Are you using your own program or a CONTEC sample program?
8. List AUTOEXEC.BAT.
9. List CONFIG.SYS.

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