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# **PCX-4064**

## **Isolated**

### **64 channel D/O**

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Printed Aug. 2002 Rev 1.0

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# Chapter 1

## Introduction

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### 1.1 Introduction

The PCX-4064 is 64-CH high-density isolated digital output product. This digital output card is isolated up-to 5000 Vdc (excluding cables) for channel-to-computer isolation. It protects your computer against damage caused by accidental contact with high external voltage and eliminates troublesome ground loops.

The PCX-4064 fully implements the PCI local bus specification Rev 2.1. All bus relative configurations, such as base memory and interrupt assignment, are automatically controlled by BIOS software.

### 1.2 Features

The PCX-4064 Isolated digital I/O card provide the following advanced features:

- ◆ 64 Isolated digital output channels
- ◆ High output driving capability, 500mA sink current on isolated output
- ◆ 5000 Vrms high voltage isolation
- ◆ External interrupt signal on DI channels
- ◆ 68-pin SCSI-II connector (Pin compatible to PDB-8068)(see page 26)

### 1.3 Applications

- ◆ Laboratory and Industrial automation
- ◆ Relay driving
- ◆ On-Off control
- ◆ Low level pulse generator
- ◆ LED control

## 1.4 Specifications

### ♦ Optical Isolated Output Channel

Numbers of Channel: 64 digital outputs

Output type: Darlington transistors with common ground

Output voltage: 5<sub>VDC</sub> min, 90<sub>VDC</sub> maximum

Output Device: ULN2803 (common ground)

Sink Current: Max. 500mA/ch for only one of the ULN2803 transistor is ON

Power Dissipation: 1.47W per ULN2803 device (8 channels)

Isolated voltage: 5000 <sub>VDC</sub>

### ♦ General Specifications

Connector: 37-pin D-type connector

Operating temperature: 0°C ~ 60°C

Storage temperature: -20°C ~ 80°C

Humidity: 5 ~ 95%, non-condensing

Power Consumption: +5V @ 530 mA typical

Dimension: 170mm(W) x102mm (H)

## 1.5 Software Supporting

**Inlog** provides versatile software drivers and packages for users' different approach to built-up a system. We not only provide programming library such as DLL for many Windows systems, but also provide drivers for many software package such as LabVIEW™, InTouch™ and so on. All the software options are included in the provided CD.

## 1.6 Programming Library

The provided CD includes the function libraries for many different operating systems, including:

- ♦ **DOS Library:** BorlandC/C++ and Microsoft C++, the functions descriptions are included in this user's guide.
- ♦ **Windows 98/2000/NT/Me/XP DLL:** For VB, VC++, BC5, the functions descriptions are included in this user's guide.
- ♦ **Windows 98/2000/NT/Me/XP ActiveX:** For Windows's applications
- ♦ **LabVIEW ® Driver:** Contains the VIs, which are used to interface with NI's LabVIEW ® software package. Supporting Windows 95/98/NT/2000. The LabVIEW ® drivers are free shipped with the board.
- ♦ **InTouch Driver:** Contains the InTouch driver which support the Windows 98/2000/NT/XP. The The InTouch ® drivers are free shipped with the board.

# Chapter 2

## Installation

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This chapter describes how to install the PCX-4064 card. Please follow the following steps to install the PCX-4064 card.

### 2.1 What You Have

In addition to this *User's Manual*, the package includes the following items:

- ◆ PCX-4064 board
- ◆ Driver/utilities CD
- ◆ This user's manual

If any of these items is missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

### 2.2 Unpacking

Your PCX-4064 card contains sensitive electronic components that can be easily damaged by static electricity. The operator should be wearing an anti-static wristband, grounded at the same point as the anti-static mat. Inspect the card module carton for obvious damage. Shipping and handling may cause damage to your module. Be sure there are no shipping and handling damages on the module before processing.

After opening the card module carton, extract the system module and place it only on a grounded anti-static surface component side up. Again inspect the module for damage. Press down on all the socketed IC's to make sure that they are properly seated. Do this only with the module placed on a firm flat surface.

### 2.3 Hardware Installation Outline

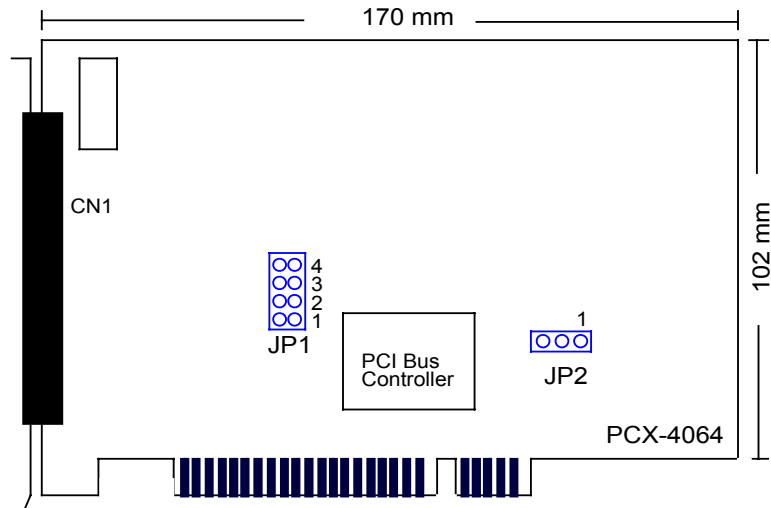
#### ◆ PCI configuration

The PCI cards are equipped with plug and play PCI controller, it can request base addresses and interrupt according to PCI standard. The system BIOS will install the system resource based on the PCI cards' configuration registers and system parameters (which are set by system BIOS). Interrupt assignment and memory usage (I/O port locations) of the PCI cards can be assigned by system BIOS only. These system resource assignments are done on a board-by-board basis. It is not suggested to assign the system resource by any other methods.

#### ◆ PCI slot selection

The PCI card can be inserted to any PCI slot without any configuration for system resource.

## 2.4 PCB Layout



Where

CN1: Digital output connector

JP1: Card number jumper

JP2: Restore output value jumper

## 2.5 Installation Procedures

1. Turn off your computer.
2. Turn off all accessories (printer, modem, monitor, etc.) connected to your computer.
3. Remove the cover from your computer.
4. Setup jumpers on the card.
5. Before handling the PCI cards, discharge any static buildup on your body by touching the metal case of the computer. Hold the edge and do not touch the components.
6. Position the board into the PCI slot you selected.
7. Secure the card in place at the rear panel of the system.

## 2.6 Device Installation for Windows Systems

Once Windows 95/98/2000 has started, the Plug and Play function of Windows system will find the new PCX cards. If this is the first time to install PCX cards in your Windows system, you will be informed to input the device information source.

## 2.7 Connector Pin Assignment of PCX-4064

The pin assignment of the 68 pins SCSI-II connector is an isolated signal connector, 4064's pin assignment is as shown in Figure 2.7

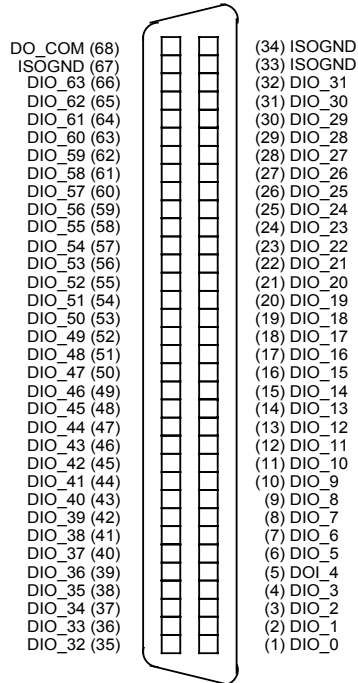


Figure 2.7 Pin Assignment of PCX-4064 connector CN1

**Legend:**

- ◆ **DO\_n**: Isolated digital output channel #n
- ◆ **DO\_COM**: Power input signal for fly-wheel diode of DO channels
- ◆ **ISOGND**: Ground return path of isolated input and output channels

## 2.8 Card number setting

Maximum four PCX-4064 cards can be installed in system simultaneously with each has a unique card number.

A jumper called "JP1" (see page 7) on the card is used to set the card number starts from 1 to 4

JP1	Card number
	1 (default setting)
	2
	3
	4

## 2.9 Latch output value setting

Jumper JP2 gives the PCX-4064 a new and valuable capability. With JP2 enabled, the PCX-4064 "memorizes" all output values, and, in the event of a "hot" reset or "push button" reset, the output values present at the port just prior to reset are held to each port following reset.

Complete loss of power to the chip clears chip memory. Thus, even if JP2 is enabled, if the power to the card is disconnected, the card's initial power-on state of all output ports are with "Open state" (output transistor OFF)

JP2	
Enable	Disable

# Chapter 3

## Registers Format

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This information is quite useful for the programmers who wish to handle the card by low-level programming. However, we suggest user have to understand more about the PCI interface then start any low-level programming. In addition, the contents of this chapter can help users understand how to use software driver to manipulate this card.

### 3.1 PCI PnP Registers

There are two types of registers: PCI Configuration Registers (PCR) and Peripheral Interface Bus (PIB). The PCR, which is compliant to the PCI-bus specifications, is initialized and controlled by the plug & play (PnP) PCI BIOS..

The PCI bus controller Tiger 100/320 is provided by Tigerjet Network Inc. ([www.tjnet.com](http://www.tjnet.com)). For more detailed information of PIB, please visit Tigerjet technology's web site to download relative information. It is not necessary for users to understand the details of the PIB if you use the software library. The PCI PnP BIOS assigns the base address of the PIB. The assigned address is located at offset 14h of PIB .

The 4064 board registers are in 32-bit width. But only lowest byte (bit0~bit7) is used. The users can access these registers by only 32-bit I/O or 8-bit I/O instructions. The following sections show the address map, including descriptions and their offset addresses relative to the base address.

### 3.2 Reset control registers

The PCX-4064 is in inactive state when the system power on, and should be activated by set bit 0 of this register to "1" state

**Address:** Base + 0x00

**Attribute:** Write only

**Value:**

Bit	7	6	5	4	3	2	1	0	State
Base+0x00	0	0	0	0	0	0	0	0	Inactive (reset) state (Default)
Base+0x00	0	0	0	0	0	0	0	1	Active state

♦ Bit 0 of this register should be set to "1" before using PCX-4064

### 3.3 Digital Output Register

There are total 64 digital output channels on the PCX-4064. each bit of based address is corresponding to a signal on the digital output channel.

**Address:** BASE + 0C0H ~ BASE +0DCH (port 0 ~ port 7)

**Attribute:** write only

**Value:**

Bit	Port	7	6	5	4	3	2	1	0
Base+0C0H	0	DO_7	DO_6	DO_5	DO_5	DO_3	DO_2	DO_1	DO_0
Base+0C4H	1	DO_15	DO_14	DO_13	DO_12	DO_11	DO_10	DO_9	DO_8
Base+0C8H	2	DO_23	DO_22	DO_21	DO_20	DO_19	DO_18	DO_17	DO_16
Base+0CCH	3	DO_31	DO_30	DO_29	DO_28	DO_27	DO_26	DO_25	DO_24
Base+0D0H	4	DO_39	DO_38	DO_37	DO_36	DO_35	DO_34	DO_33	DO_32
Base+0D4H	5	DO_47	DO_46	DO_45	DO_44	DO_43	DO_42	DO_41	DO_40
Base+0D8H	6	DO_55	DO_54	DO_53	DO_52	DO_51	DO_50	DO_49	DO_48
Base+0DCH	7	DO_63	DO_62	DO_61	DO_60	DO_59	DO_58	DO_57	DO_56

# Chapter 4 Operation Theorem

## 4.1 Isolated Digital Output Channels

On PCX-4064, the DO\_COM pin is used as “fly-wheel” diode, which can protect the driver if the loading is inductance loading such as relay, motor or solenoid. If the loading is resistance loading such as resistor or LED, the connection to fly-wheel diode is not necessary.

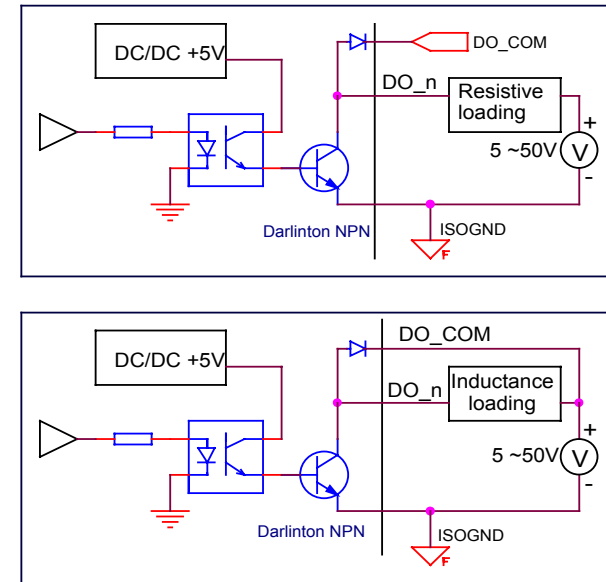


Figure 4-1 isolated digital outputs

Please note that when the loading is as “inductance type loading” such as relay, coil or motor, the DO\_COM pin must be connected to the external power source. The extra connection is to utilize the ‘fly-wheel diode’ to form a current-release closed loop, so that the transistor won’t be destroyed by the reverse high voltage which is generated by the inductance load when the output switches from “ON” to “OFF”.

# Chapter 5

## Libraries

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This chapter describes the software library for operating this card. Only the functions in DOS library and Windows DLL are described. Please refer to the PCIDAQ function reference manual, which included in Inlog CD, for the descriptions of the Windows 98/NT/2000 DLL functions.

### 5.1 Libraries Installation

This section will show you how to install the software libraries DOSDAQH.LIB for DOS, or Windows 98 DLL, or PCIDAQ for Windows 98/NT/2000.

The device drivers and DLL functions of Windows 98/NT/2000 are included in the PCIDAQ. The Inlog CD also includes the detail examples and readme files

#### 5.1.1 How to use the DOSDAQH.LIB in DOS

##### ◆ For BC compiler

1. Large mode: Add `..\LIB\BC\DOSDAQ.LIB` in your project
2. Huge mode: Add `..\LIB\BC\DOSDAQH.LIB` in your project
3. Include DOSDAQ.H in your source file

##### ◆ For MSC compiler

1. Large mode: Add `..\LIB\MSC\DOSDAQ.LIB` in your project
2. Huge mode: Add `..\LIB\MSC\DOSDAQH.LIB` in your project
3. Include DOSDAQ.H in your source file

##### ◆ For TC compiler

1. Large mode: Add `..\LIB\TC\DOSDAQ.LIB` in your project
2. Huge mode: Add `..\LIB\TC\DOSDAQH.LIB` in your project
3. Include DOSDAQ.H in your source file

### 5.1.2 How to use the PCIDAQ.DLL s in Windows

#### ♦ VC++6.0:

1. Add file '../Include/PCIDAQ.H' in your project
2. In link page of menu project| setting, add '../LIB/PCIDAQ.LIB' in the blank of Objects/Library Modules
3. Add this sentence "#include '../Include/PCIDAQ.H' " to the head of your main file.

#### ♦ Visual BASIC:

1. Add file '../Include/Declare.bas' in your project.

#### ♦ Delphi:

1. Add file '../Include/Declare.pas' in your project
2. Add this sentence "uses Declare;" in the head of your unit.pas

#### ♦ C++Builder:

1. Add file '../Include/PCIDAQ.H' and '../Lib/PCIDAQ\_CB.lib' to your project
2. Add this sentence "#include '../Include/PCIDAQ.H' " to head of your main file.

**Note:** For more information, please refer to program in directory '../Example/'

### 5.2 Summary of function calls

Function	Description	page
Open card	Initial PCX-4064 card before using	20
Get Card's ID	Get PCI ID code of PCX-4064	21
Get Driver Version	Get version number of PCIDAQ.DLL	22
Close card	Close PCX-4064 card before terminating program	23
Get PCI Bus and Slot number	Get PCI bus and slot number occupied by PCX-4064	24
Write data to digital output port	Write data (8-bit) to digital output port	25

### 5.3 Open card

#### Description:

Because the PCX-4064 is PCI bus architecture and meets the plug and play design, the IRQ and base address are assigned by system BIOS directly. PCX-4064 cards have to be initialized by this function before calling other functions.

#### Syntax:

##### C/C++(DOS)

```
WORD D_4064_Open (WORD cardNo);
```

##### C/C++ (Windows)

```
WORD W_4064_Open (WORD *ExistedCards);
```

##### Visual BASIC (Windows)

```
Function W_4064_Open (ByRef ExistedCards As Long) As Long
```

##### Delphi

```
Function W_4064_Open (var ExistedCards:Integer):Integer;
```

#### Argument:

cardNo: Card number set by jumper on card (DOS only)

existCards: This pointer return a value shows how many PCX-4064 cards installed in your system. (Windows only)

#### Return Code:

Error Code (Please refer to PCIDAQ.H or DOSDAQ.H)

### 5.4 Get Card's ID:

#### Description:

Get the cards number that is set by jumper on cards.

#### Syntax:

##### C/C++(DOS)

```
void D_4064_GetCardsID (WORD *CardsIDArray);
```

##### C/C++(Windows)

```
WORD W_4064_GetCardsID (WORD *CardsIDArray);
```

##### Visual BASIC (Windows)

```
Function W_4064_GetCardsID (ByRef CardsIDArray As Long)
    As Integer
```

##### Delphi

```
Function W_4064_GetCardsID (var CardsIDArray:Word):Word;
```

#### Argument:

CardsIDArray: This array return card number (1,2,3,4), which is set by jumper on card. You should define a 4 elements array, and then pass the array's pointer to this function.

#### Return Code:

Error Code (Please refer to PCIDAQ.H or DOSDAQ.H)

## 5.5 Get Driver Version

### Description:

The PCX-4064 card is driven by PCIDAQ.DLL driver. This function returns the version of PCIDAQ.DLL driver

### Syntax:

#### C/C++(DOS):

```
void D_4064_Version (char *version);
```

#### C/C++ (Windows)

```
Int W_4064_Version (void);
```

#### Visual BASIC (Windows)

```
Function W_4064_Version () As Long
```

#### Delphi

```
Function W_4064_Version ():Integer;
```

### Argument:

Version: This string return the version of DOSDAQ.DLL (DOS only)

### Return Code:

Return the version number (Windows only)

## 5.6 Close card

### Description:

The IRQ and base address of PCX-4064 (pass-through address) are assigned by system BIOS directly. This function should be called to release all system resource before terminate application program

### Syntax:

#### C/C++(DOS)

```
WORD D_4064_Close (WORD cardNo);
```

#### C/C++ (Windows)

```
Void W_4064_Close (void);
```

#### Visual BASIC (Windows)

```
Function W_4064_Close ()
```

#### Delphi

```
Function W_4064_Close ();
```

### Argument:

cardNo: Card number (1,2,3,4),It's set by jumper on card

### Return Code:

Error Code (Please refer to PCIDAQ.H or DOSDAQ.H)

## 5.7 Get PCI Bus and Slot number

### Description:

Get the PCI bus and slot number occupied by PCX-4064 card

### Syntax:

#### C/C++(DOS)

```
WORD D_4064_GetBusSlot (WORD cardNo, WORD *bus,WORD *slot);
```

#### C/C++ (Windows)

```
WORD W_4064_GetBusSlot (WORD cardNo, WORD *bus,WORD *slot);
```

#### Visual BASIC(Windows)

```
Function W_4064_GetBusSlot (ByVal cardNo As Long,  
    ByRef bus As Long, ByRef slot As Long) As Long
```

#### Delphi

```
Function W_4064_GetBusSlot (cardNo:Integer;  
    var bus:Integer;var slot:Integer):Integer;
```

### Argument:

cardNo: Card number (1,2,3,4),It's set by jumper on card

bus: Return PCI bus Number

slot: Return PCI slot Number of the bus

### Return Code:

Error Code (Please refer to PCIDAQ.H or DOSDAQ.H)

## 5.8 Write data to digital output port

### Description:

This function is used to write data (byte) to output port. You can send 8-bit output data to PCX-4064 by calling this function.

### Syntax:

#### C/C++(DOS)

```
WORD D_4064_Write_Do (WORD cardNo,WORD portNo,WORD Data);
```

#### C/C++ (Windows)

```
WORD W_4064_Write_Do (WORD cardNo,WORD portNo,WORD Data);
```

#### Visual BASIC (Windows)

```
Function W_4064_Write_Do (ByVal cardNo As Long,  
    ByVal portNo As Long, ByVal Data As Long) As Long
```

#### Delphi

```
Function W_4064_Write_Do (cardNo:Integer;portNo:Integer;  
    Data:Integer):Integer;
```

### Argument:

cardNo: Card number (1,2,3,4),It's set by jumper on card

portNo: Digital port number (0 ~ 7)

Port #0: DO\_0~DO\_7,      Port #4: DO\_32~DO\_39

Port #1: DO\_8~DO\_15      Port #5: DO\_40~DO\_47

Port #2: DO\_16~DO\_23      Port #6: DO\_48~DO\_55

Port #3: DO\_24~DO\_31      Port #7: DO\_56~DO\_63

Data: Data be written to output port

### Return Code:

Error Code (Please refer to PCIDAQ.H or DOSDAQ.H)

# Chapter 6

## PDB-8068 Terminal board

PDB-8068 digital input/output termination board features one DIN socket for easy maintenance, wiring, and installation. It provides 68 channels that are accessed through a SCSI-68 connector.

Each terminal pin is in serial with 0 ohms resistor to relative pin on the DIN connector. These resistors can be changed to the desired value to meet the requirement of your applications

