

NuDAQ
723X Series
32 Channels Isolated
Digital I/O Card
User's Manual

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Introduction

This manual describes the contents of PCI-723X family products. Include:

- PCI-7230: Isolated 16-CH DI and 16-CH DI Card
- PCI-7233: Isolated 32-CH DI Card with COS detection
- PCI-7233H: Isolated High-speed 32-CH DI Card with COS
- PCI-7234: Isolated 32-CH DO Card
- cPCI-7230: Isolated 16-CH DI and 16-CH DI Module for 3U CompactPCI

These products are with high isolation voltage and 32 DI or DO channels. The high isolation voltage protects your computer against damage caused by accidental contact with high external voltage and eliminates troublesome ground loops.

The PCI-7230/cPCI-7230 provides 32 isolated digital I/O, 16 Isolated inputs and 16 isolated outputs. The isolated I/O channels are isolated to 5,000 Vrms (excluding cables).

The PCI-7233 provides 32 isolated digital input channels with COS (change-of-state detection). The high speed version PCI-7233H provides 32-CH isolated digital input .The isolation voltage of PCI-7233H is high up to 2,500 Vrms (excluding cables).

The PCI-7234 provides 32 isolated digital output (Darlington transistor) channels. The isolation voltage is high up to 5,000 Vrms (excluding cables), both channel-to-channel and channel-to-computer.

The PCI-7230/7233/7234 use ASIC PCI controller to interface the board to the PCI bus. The ASIC fully implement the PCI local bus specification Rev 2.1. All bus relative configurations, such as base memory address and interrupt assignment, are automatically controlled by BIOS software. It does not need any user interaction and pre-study for the configurations. This removes the burden of searching for a conflict-free configuration, which can be very time-consuming and difficult with some other bus standards.

1.1 Features

1.1.1 PCI-7230 and cPCI-7230 Features

- 16 Isolated Digital Input Channels
- 16 Isolated Digital Output Channels
- High output driving capability
- 2,500 Vrms high voltage isolation
- Interrupt is controlled from external signal
- Dual interrupt trigger
- 200mA sink current on isolated output channels
- Up to 24V voltage protection for isolated input
- 37-pin D-type connector

1.1.2 PCI-7233/H and Features

- 32 Isolated Digital Input Channels
- 5000 Vrms high voltage isolation
- Up to 24V voltage protection for isolated input
- Interrupt is generated by COS (change-of-state) detection
- Dual interrupt trigger
- High-speed isolator (1ms) version PCI-7233H available with 2500 Vrms isolation voltage
- 37-pin D-type connector

1.1.4 PCI-7234 Features

- 32 Isolated Digital Output Channels
- High output driving capability
- 200mA sink current on isolated output channels
- 5,000 Vrms high voltage isolation
- 37-pin D-type connector

1.2 Specifications of PCI-7230/cPCI-7230

◆ Isolated Digital I/O (DIO)

- **Optical Isolated Input Channel**

Numbers of Channel: 16 digital inputs

Input Voltage: up to 24Vdc

▸ Logic "L": 0~2.4V

▸ Logic "H": 3~24V

Input resistance: 1.2K Ω @ 0.5W

Isolated voltage: 5000 Vrms

Throughput: 10K Hz

- **Optical Isolated Output channel**

Numbers of Channel: 16 digital outputs

Output Voltage: open collector minimum 5V, maximum 35V DC

Sink Current:

▸ 200 mA max @ 100 % duty, for one of the 8 transistor device ON

▸ 370mA @ duty 10% for all transistors devices ON

▸ 140mA @ duty 50% for all transistors devices ON

(Note: the pulse width is 25ms for one duty cycle.)

Isolated voltage: 5000 Vrms

Throughput: 10K Hz

- **Interrupt sources**

Channel 0 and channel 1 of digital input channels

◆ General Specifications

- **Connector:** 37-pin D-type connector for PCI-7230

50-pin SCSI-II type connector for cPCI-7230

- **Operating Temperature:** 0° C ~ 60° C

- **Storage Temperature:** -20° C ~ 80° C

- **Humidity:** 5 ~ 95%, non-condensing

- **Power Consumption:**

PCI-7230: +5 V @ 150 mA (typical)

cPCI-7230: +5 V @ 270 mA (typical)

- **Dimension:** Compact size

PCI-7230 107mm(H) X 153mm(L)

cPCI-7230 Standard 3U CompactPCI form factor

1.3 Specifications of PCI-7233/PCI-7233H

◆ Isolated Digital Input

- **Optical Isolated Input Channel (PCI-7233)**

Numbers of Channel: 32 digital inputs

Input Voltage: up to 24Vdc

‣ Logic "L": 0~2.4V

‣ Logic "H": 3~24V

Input resistance: 1.2 K Ω @ 0.5W

Isolated voltage: 5000 V rms

Throughput: 10K Hz

- **Optical Isolated Input Channel (PCI-7233H)**

Numbers of Channel: 32 digital inputs

Input Voltage: up to 24Vdc

‣ Logic "L": 0~3.2V

‣ Logic "H": 3.5~24V

Input resistance: 1.2K Ω @ 0.5W

Isolated voltage: 2500 V rms

Throughput: High speed 500 KHz

- **Dual-interrupt sources:**

Change-of-state (COS) on any 16 DI lines of LSB

Change-of-state (COS) on any 16 DI lines of MSB

◆ 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 @ 300 mA for PCI-7233
+5V @ 550 mA for PCI-7233H
- **Dimension:** Compact size only 158 mm x 107 mm

1.4 Specifications of PCI-7234

◆ Isolated Digital Output

- **Optical isolated Output channel**

Numbers of Channel:	32 digital output
Output Voltage:	open collector 5V (min) to 35V (max)
Output type:	Darlington transistors
Sink Current:	<ul style="list-style-type: none">▸ 200 mA max @ 100 % duty, for one of the 8 transistors ON▸ 370mA @ duty 10% for all transistors devices ON▸ 140mA @ duty 50% for all transistors devices ON (pulse width 25ms)
Isolated voltage:	5000 Vrms
Throughput:	10K Hz

◆ 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:** +5 V @ 190 mA (typical)
- **Dimension:** Compact size only 95mm(H) X 143mm(L)

1.5 Software Supporting

1.5.1 Programming Library

For the customers who are writing their own programs, we provide MS-DOS Borland C/C++ programming library and Windows-95 DLL for PCI-7230 series products. Both DOS and Windows-95 libraries are shipped with the board. Windows-95 library can also be used under Windows-98.

PCIS-DASK is the Data Acquisition Software Kit including the native device driver and the DLL for Windows-98/NT, which can be used for many programming environments, such as VC++, VB, and Delphi. Please contact your dealer to purchase PCIS-DASK.

The cPCI-7230 is shipped with the PCIS-DASK for Windows NT programming. For the others hardware, the PCIS-DASK is optional.

1.5.2 ActiveX Controls

For the customers who familiar ActiveX controls and VB programming, we suggest to use the **DAQBench™** ActiveX Control components for your application. The **DAQBench™** components for PCI-7230 family can only work under Windows NT. Windows 98 version of PCI-7230 family ActiveX control is coming soon.

1.5.3 LabView Driver

The PCIS-LVIEW includes the PCI-7230's VIs which is used to interface with NI's LabView software package. The PCIS-LVIEW supports Windows-95/98/NT.

1.5.4 DDE Server and InTouch

DDE is stand for Dynamic Data Exchange specifications. The PCIS-DDE includes the PCI-7230's DDE server. The **PCIS-DDE** server is included in the "ADLink-Wonderware InTouch 7.0". The DDE server can be used conjunction with any DDE client under Windows-NT environment.

1.5.5 ISaGRAF Driver

The ISaGRAF is an IEC1131-3 SoftPLC control program developing environment. The **PCIS-ISG** includes ADLink products' target drivers for ISaGRAF under windows NT environment.

1.5.6 InControl Driver

The InControl is an IEC 1131-3 SoftPLC control program developing environment. The **PCIS-ICL** includes ADLink products' driver for InControl under Windows NT environment.

1.5.7 Full Software Package

Full software package is provided here, PCIS-FULL, for all ADLink's software drivers on PCI series data acquisition cards.

PCIS-FULL: PCIS-DASK, PCIS-LVIEW, PCIS-VEE, PCIS-DDE, PCIS-ISG and PCIS-ICL included.

With this full package, you can apply the PCI-723X family products to any development environment.

2

Installation

This chapter describes the configurations of the PCI-7230/7233/7234. At first, the contents in the package and unpacking information that you should care about are described. The PCI-7230, 7233 or 7234 is plug-and-play and very easy to install into any PC system with PCI slots.

Please follow the follow steps to install the PCI-7230 family products.

- ◆ Check what you have (section 2.1)
- ◆ Unpacking (section 2.2)
- ◆ Check the PCB (section 2.3)
- ◆ Install the hardware (section 2.4)
- ◆ Install the software drivers and run utility to test (section 2.5)
- ◆ Cabling with external devices (section 2.6, 2.7)

2.1 What You Have

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

- PCI-723X family Isolated Digital I/O Card
- ADLink All-in-one CD-ROM

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 PCI-7230, cPCI-7230, PCI-7233, PCI-7233H or PCI-7234 card contains sensitive electronic components that can be easily damaged by static electricity.

The card should be done on a grounded anti-static mat. 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 place on a firm flat surface.

Note: DO NOT APPLY POWER TO THE CARD IF IT HAS BEEN DAMAGED.

You are now ready to install your PCI Card.

2.3 PCB Layout

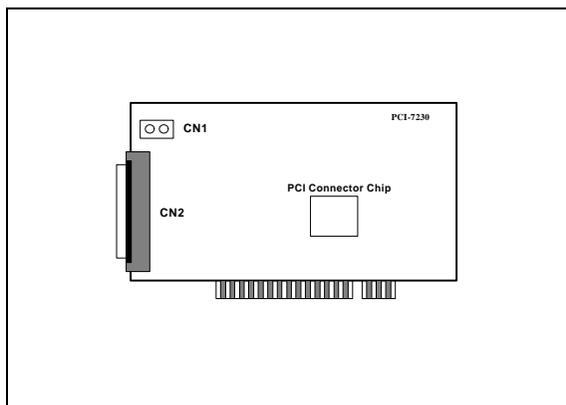


Figure 2.1 PCI-7230 PCB Layout

2.4 PCI card Installation Outline

2.4.1 Hardware configuration

PCI card has plug and play PCI controller on board. The memory usage (I/O port locations) of the PCI card is assigned by system BIOS. The address assignment is done on a board-by-board basis for all PCI cards in the system.

2.4.2 PCI slot selection

Your computer will probably have both PCI and ISA slots. Do not force the PCI card into a PC/AT slot. The NuDAQ PCI card can be used in any PCI slot.

Installation Procedures

1. Read through this manual, and setup the jumper according to your application
2. Turn off your computer, Turn off all accessories (printer, modem, monitor, etc.) connected to computer.
3. Remove the cover from your computer.
4. Select a 32-bit PCI expansion slot. PCI slots are short than ISA or EISA slots and are usually white or ivory.
5. Before handling the PCI-7230/7233/7234, 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 unit using screw removed from the slot.

2.5 Device Installation in Windows 95/98

While you first plug PCI-723x card and enter Windows 95/98, the system will detect this device automatically. Please follow the steps to install the device.

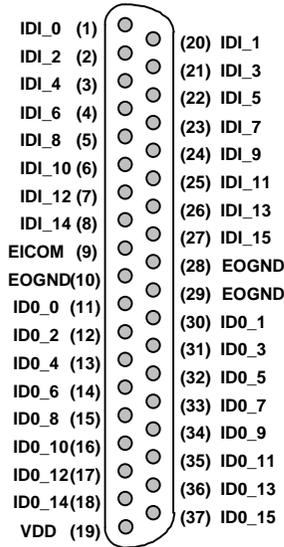
1. Click the Next button in the Update Device Driver Wizard window, Win95 will start to search floppy drive A for the PCI-723x driver information, After fail to find the information in drive A, it will display the message "Windows was unable to locate a driver for this device."
2. Insert ADLink's All-in-one CD-ROM drive.
3. Click the "Other Location..." button in the Update Device Driver Wizard Window, then the Select Other Location windows will appear.
4. Click Browse button to invoke the Browser for Folder window, then select the location

X:\Win95Inf\723x (X indicates the CD-ROM drive).

2.6 Connector Pin Assignment

2.6.1 PCI-7230 Pin Assignment

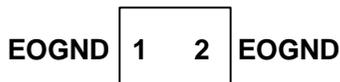
The pin assignment of the 37 pins D-type connector CN2, which is an isolated DIO signal connector, is shown below.



Legend:

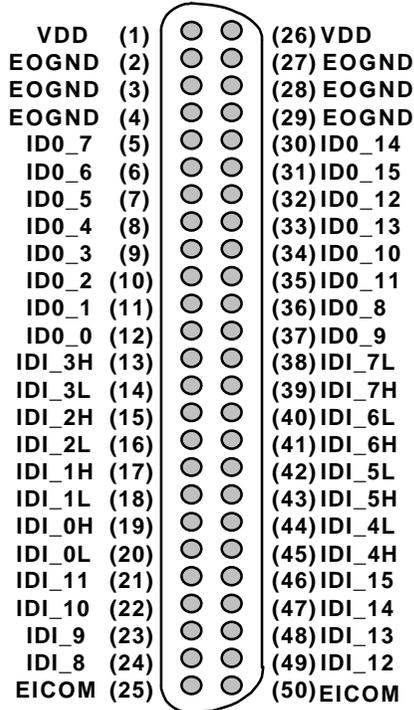
- IDI_n** : Isolated digital input channel #n
- IDO_n** : Isolated digital output channel #n
- EICOM** : Common Ground or Common power of isolated input channels
- EOGND** : Ground return path of isolated output channels
- VDD** : Power supply of isolated output channels

Note: The VDD must provided by external power supply 10~30 VDC.



2.6.2 cPCI-7230 Pin Assignment

The pin assignment of the cPCI-7230's 50 pins SCSI-II type connector CN1 is shown in the following diagram.

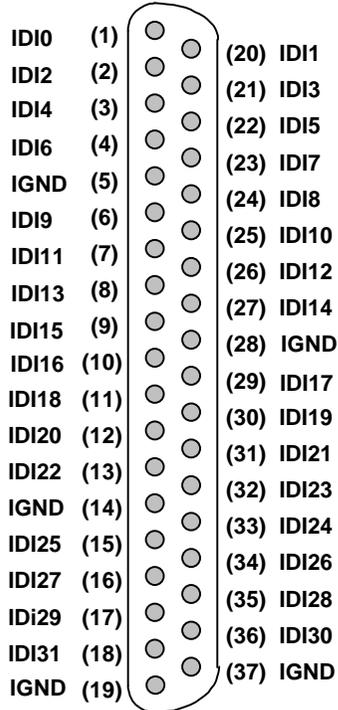


Legend:

- IDI_n** : Isolated digital input channel #n
- IDO_n** : Isolated digital output channel #n
- EICOM** : Common ground or common power of isolated input channels #8~15
- IDI_{nH}** : High input of isolated differential DI channel #n
- IDI_{nL}** : Low input of isolated differential DI channel #n
- EOGND** : Ground return path of isolated output channels
- VDD** : Power input signal for fly-wheel diode of DO channels

2.6.3 PCI-7233 Pin Assignment

The pin assignment of the 37 pins D-type connector CN1 is illustrated in the following.

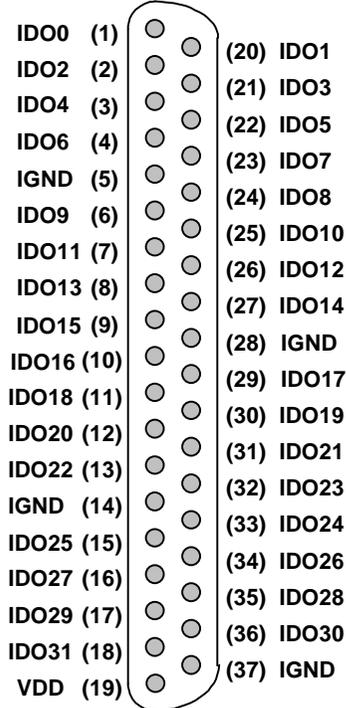


Legend:

IDI n : Isolated digital input channel *n*
IGND : Isolated common ground

2.6.4 PCI-7234 Pin Assignment

The pin assignment of the 37 pins D-type connector CN2, which is an isolated DIO signal connector, is shown below.



Legend:

IDO n: Isolated digital output signal channel *n*

I.GND: Isolated Ground for all isolated output channels

VDD : Power input signal for fly-wheel diode of DO channels

Register & Operation Theorem

In this chapter, the register format and primitive digital I/O operations of 723X series products will be specified. The operation theorem of the digital I/O, interrupt are introduced. Before programming or applying the 723X cards to your applications, please go through this chapter to understand the features of the functions.

3.1 I/O Port Base Address

The PCI-723X products function as a 32-bit PCI target device to any master on the PCI bus. There are three types of registers on the PCI-723X: PCI Configuration Registers (PCR), Local Configuration Registers (LCR) and PCI-723X registers.

The PCR, which conform the PCI-bus specifications R2.1, is initialized and controlled by the system plug & play PCI BIOS. Please refer to the PCI BIOS specification to understand how to get information from the PCR.

The LCR is specified by the PCI bus controller (PCI-9050). It is not necessary for users to understand the details of the LCR if you use the software library. The base address of the LCR is assigned by the PCI PnP BIOS. The assigned address is located at offset 14h of PCR. Please refer to the PCI-9050's data sheet for the detail operation of the LCR and also the register format of the PCR. For detail information about PCI-9050, you can download its datasheet from <http://www.plxtech.com>.

The registers of 723X series are shown in the Section 3.2. The base address of the 723X registers are also assigned by the PCI PnP BIOS. The assigned base address is stored at offset 18h of PCR. Therefore, users can read the PCR to get the base address by using the BIOS function call. Note that the PCI-723X registers are all 32 bits. The users can access these registers by 8 bits or 16-bit I/O instructions.

3.2 I/O Registers Format

The PCI-7230/cPCI-7230 requires one 32-bit address in the PC I/O address space. Table 3.1 shows the I/O address of each register with respect to the base address.

Address	Write	Read
Base (0 - 1)	Isolated DO	Isolated DI

Table 3.1. I/O Address Map of PCI-7230 and cPCI-7230

The PCI-7233 requires one 32-bit address in the PC I/O address space. Table 3.2 shows the address.

Address	Write	Read
Base (0 - 3)	--	Isolated DI

Table 3.2. I/O Address Map of PCI-7233/PCI-7233HS

The PCI-7234 requires one 32-bit address in the PC I/O address space. Table 3.3 shows the address.

Address	Write	Read
Base (0 - 3)	Isolated DO	--

Table 3.3. I/O Address Map of PCI-7234

Cautions:

1. All the above I/O ports are 32-bit width
2. 8-bit or 16-bit I/O access is NOT allowed.

3.3 Digital Input Register

There are total 16 and 32 digital input channels on the PCI-7230 (cPCI-7230) and PCI-7233 respectively. Each bit is corresponding to a signal on the digital input channel. The IDI_16~IDI_31 are only available on PCI-7233/PCI-7233H.

Address: BASE + 0 ~ BASE + 3

Attribute: read only

Data Format:

Bit	7	6	5	4	3	2	1	0
Base + 0	IDI_7	IDI_6	IDI_5	IDI_4	IDI_3	IDI_2	IDI_1	IDI_0
Base + 1	IDI_15	IDI_14	IDI_13	IDI_12	IDI_11	IDI_10	IDI_9	IDI_8
Base + 2	IDI_23	IDI_22	IDI_21	IDI_20	IDI_19	IDI_18	IDI_17	IDI_16
Base + 3	IDI_31	IDI_30	IDI_29	IDI_28	IDI_27	IDI_26	IDI_25	IDI_24

IDI_N: Isolated Digital Input CH *N*

3.4 Digital Output Register

There are total 16 and 32 digital output channels on the PCI-7230 (cPCI-7230) and PCI-7234 respectively. Each bit is corresponding to a signal on the digital output channel. The IDO_16~IDO_31 are only available on PCI-7234.

Address: BASE + 0 ~ BASE + 3

Attribute: write only

Data Format:

Bit	7	6	5	4	3	2	1	0
Base + 0	IDO_7	IDO_6	IDO_5	IDO_4	IDO_3	IDO_2	IDO_1	IDO_0
Base + 1	IDO_15	IDO_14	IDO_13	IDO_12	IDO_11	IDO_10	IDO_9	IDO_8
Base + 2	IDO_23	IDO_22	IDO_21	IDO_20	IDO_19	IDO_18	IDO_17	IDO_16
Base + 3	IDO_31	IDO_30	IDO_29	IDO_28	IDO_27	IDO_26	IDO_25	IDO_24

IDO_N: Isolated Digital Output CH *N*

3.5 Isolated Digital Input Circuits

The isolated digital output is an open collector transistor output. The input can accept voltage upto 24V. The input resisters on PCI-7230/7233 and cPCI-7230 are 1.2K Ω . The connection between outside signal and PCI-7230, cPCI-7230 and PCI-7233 is shown below.

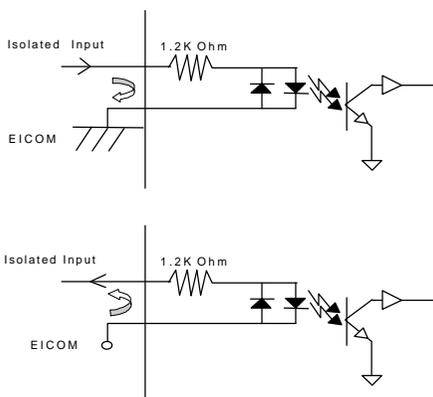


Figure 3.1 Input circuits of PCI-7230, cPCI-7230 and PCI-7233

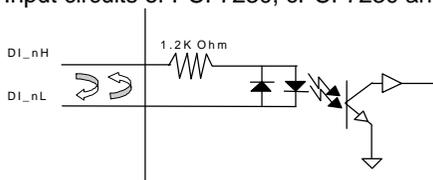


Figure 3.2 Differential Input circuits of cPCI-7233

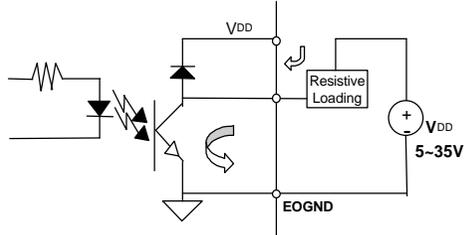
3.6 Isolated Digital Output Circuits

The connection of isolated digital output is shown as following diagram. The PCI-7230 need external 10~30V DC power from the VDD pin to provide the power source of the digital output circuit. The cPCI-7230 and PCI-7234 is equipped with internal DC-DC converter.

On PCI-7230, an external voltage source, minimum 10V, maximum 35 VDC, is necessary to power the internal isolated circuits. It is connected with pin-19 of CN2, When the isolated digital output goes to high, the sink current will be from VDD.

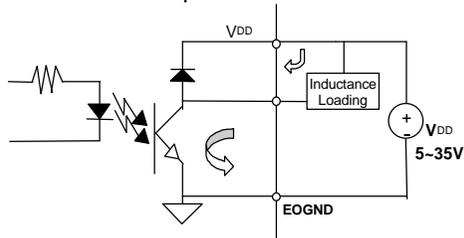
On PCI-7234 and cPCI-7230, the VDD pin is used as “fly-wheel” diode, which can protect the driver if the loading is inductance loading such as relay, motor or solenoid. If the loading is resistance loading such as resistor or LED, the connection to fly-wheel diode is not necessary.

Therefore, the first step for connecting the output with external device is to distinguish the type of loading. For example, if the loading is LED or resistor, you can use the following wiring diagram. The VDD is opened on PCI-7234 and cPCI-7230.



DO circuit of PCI-7230, PCI-7234, and cPCI-7230

If the loading is a inductance loading such as relay, you can use the following wiring diagram. The VDD must connect to the external power to form a fly-wheel current loop.



3.7 Change of State Detection

3.7.1 What is COS?

The COS (Change of State) means when the input state (logic level) is changed from low to high or from high to low. The COS detection circuit is used to detect the edge of level change. In the PCI-7233 card, the COS detection circuit is applied to all the 32 channels input channels. When anyone channel is changed, the COS detection circuit generate an interrupt request signal.

3.7.2 Structure of COS detection & Dual Interrupt System

The dual interrupt system is used in PCI-7233. Dual interrupt means the hardware can generate two interrupt request signals in the same time and the software can service these two request with ISR. Note that the dual interrupt do not mean the card occupy two IRQ levels. The two interrupt request signals (INT1 and INT2) are comes from COS detection output signal #1 and #2. The INT1 is inserted when any channel of 0 ~ 15 is changed. The INT2 is inserted when any channel of 16 ~ 31 is changed. Fig3.6.1 show the interrupt system.

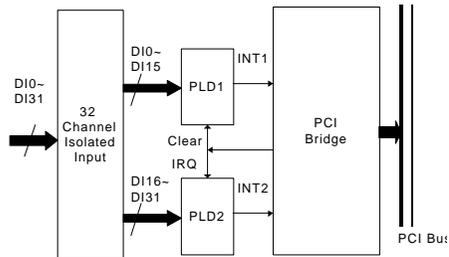
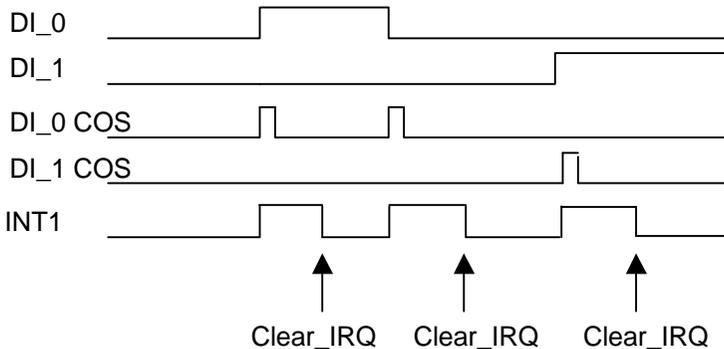


Fig.3.6.1 Dual Interrupt System of PCI-7233

3.7.3 COS Detection

The following timing is an example of the COS detection. Every DI signal's edge change can be detected. All the DI channels edge will be 'OR' together to generate the INT1 or INT2 IRQ signals.

If INT1 or INT2 irq Signals generate, the signal will be latch its state. The user can use the “_7233_CLR_IRQ” function to clear, INT1 or INT2 IRQ signal state.



C/C++ Libraries

In this chapter, the PCI-7230/7233/7234 and cPCI-7230 software library for DOS and Windows 95/98, C/C++ language library is described.

4.1 Installation

In the following sections, we use PCI-7230/cPCI-7230 as an example to show how to install the software utility and drivers. PCI-7230 and cPCI-7230 are fully compatible in software. To install PCI-7233 or PCI-7234, just change the all the name from 7230 to 7233 or from 7230 to 7234 in all procedures.

The PCI-7230/7233/7234's software includes an utility software, C-language library and some demonstration programs which can help you reduce programming work. The following procedures use the PCI-7230 as an example for installation. The install procedure for PCI-7233 and PCI-7234 is the same as PCI-7230.

4.1.1 MS-DOS Software Installation

1. Turn our PC's power switch on
2. Put the ADLink's All-in-one CD into the appropriate CD drive.
3. Type the commands(X indicates the CD ROM driver):

```
X:\>CD \NuDAQPCI\7230\DOS  
X:\ NuDAQPCI\7230\DOS> SETUP
```
4. An installation completed message will be shown on the screen.
After installation, all the files of *PCI-7230 Library & Utility for DOS* are stored in C:\ADLink\7230\DOS directory.

4.1.2 Windows 95 Software Installation

1. Turn your PC's power switch on and enter Windows 95
2. Put the ADLink's All-in-one CD into the appropriate CD drive.
3. If autorun setup program is not invoked automatically, please execute **X:\Setup.exe**. (X indicates the CD ROM drive)
4. Select NuDAQ PCI→Drivers→Win95/98→PCI-7230 to setup PCI-7230 DLL for Windows 95.

Setup first displays a Welcome dialog box. Please click Next button to go on installation.

After a welcome dialog box, Setup prompts the following dialog box for you to specify the destination directory. The default path is C:\ADLink\7230\w95. If you want to install *PCI-7230 DLL for Windows 95* in another directory, please click Browse button to change the destination directory.



Then you can click Next to begin installing *PCI-7230 DLL for Windows 95*.

After you complete the installation of PCI-7230 Software, PCI-7230's DLL (7230.DLL) is copied to Windows System directory (default is C:\WINDOWS\SYSTEM for Win-95) and the driver files (W95_7230.VXD and PCIW95.VXD) are also copied to the appropriate directory.

After finishing the installation, you can execute the utility by typing following command as an example:

```
C> CD \ADLink\7230\DOS\UTIL
C> 7230UTIL
```

4.2 Software Driver Naming Convention

We defined some data types in `acl_pci.h`. These data types are used by PCI-7230 library. We suggest you to use these data types in your application programs. The following table shows the data type names and their range.

Type Name	Description	Range
U8	8-bit ASCII character	0 to 255
I16	16-bit signed integer	-32768 to 32767
U16	16-bit unsigned integer	0 to 65535
I32	32-bit signed integer	-2147483648 to 2147483647
U32	32-bit single-precision floating-point	0 to 4294967295
F32	32-bit single-precision floating-point	-3.402823E38 to 3.402823E38
F64	64-bit double-precision floating-point	-1.797683134862315E308 to 1.797683134862315E309
Boolean	Boolean logic value	TRUE, FALSE

The functions of PCI-7230's software drivers are using full-names to represent the functions' real meaning. The naming convention rules are :

In DOS Environment :

`_{hardware_model}_{action_name}`. e.g. `_7230_Initial ()`.

In Windows 95 Environment :

In order to recognize the difference between DOS library and Windows 95 library, A capital "W" is put on the head of each function name of the Windows 95 DLL driver. e.g.

W_7230_Initial ()

There are 3 functions provided by PCI-7230 software drivers. The detail descriptions of each function are specified in the following sections.

4.3 Initialization

@ *Description*

The PCI-7230 or PCI-7233 or PCI-7234 cards must be initialized before using. The software library can control multiple PCI-7230/7233/7234 cards. Because in PCI bus architecture, the cards meet the plug and play specifications, the **IRQ** and **I/O address** are assigned by system BIOS directly.

@ *Syntax*

C/C++ (DOS)

```
U16 _7230_Initial(U16 *existCards, PCI_INFO *pciInfo )
U16 _7233_Initial(U16 *existCards, PCI_INFO *pciInfo )
U16 _7234_Initial(U16 *existCards, PCI_INFO *pciInfo )
```

C/C++ (Windows 95/98)

```
U16 W_7230_Initial (U16 *existCards, PCI_INFO *pciInfo)
U16 W_7233_Initial (U16 *existCards, PCI_INFO *pciInfo)
U16 W_7234_Initial (U16 *existCards, PCI_INFO *pciInfo)
```

Visual Basic (Windows 95/98)

```
W_7230_Initial (existCards As Integer, pciInfo As
PCI_INFO) As Integer
W_7233_Initial (existCards As Integer, pciInfo As
PCI_INFO) As Integer
W_7234_Initial (existCards As Integer, pciInfo As
PCI_INFO) As Integer
```

@ *Arguments:*

existCards: The total number of installed PCI-7230 /7233/7234 cards. The returned value shows how many PCI-7230/7233/7234 cards are installed in your system.

pciinfo: It is a structure to memorize the PCI bus plug and play initialization information which is decided by p&p BIOS. The PCI_INFO structure is defined in `acl_pci.h`. The base I/O address and the interrupt channel number is stored in `pciinfo` which is for reference.

@ *Return Code:*

```
ERR_NoError
ERR_BoardNoInit
ERR_PCIBiosNotExist
```

4.4 Digital Input

@ *Description*

This function is used to read 16-bit digital inputs data from digital input port. You can get the 16 bits data from `_7230_DI` by using this function. You can get the 32 bits data from `_7233_DI` by using this function.

@ *Syntax*

C/C++ (DOS)

```
U16 _7230_DI( U16 cardNo, U16 *di_data )
U16 _7233_DI( U16 cardNo, U32 *di_data )
```

C/C++ (Windows 95/98)

```
U16 W_7230_DI ( U16 cardNo, U16 *diData)
U16 W_7233_DI ( U16 cardNo, U32 *diData)
```

Visual Basic (Windows 95/98)

```
W_7230_DI (ByVal cardNo As Integer, DIData As Integer)
As Integer
W_7233_DI (ByVal cardNo As Integer, DIData As Integer)
As Integer
```

@ *Argument* :

cardNo: card number to select board
di_data: return 16-bit value from digital port.

@ *Return Code* :

ERR_NoError

4.5 Digital Output

@ Description

This function is used to write data to digital output ports. There are 16 and 32 isolated digital outputs on the PCI-7230 and PCI-7234 respectively,

@ Syntax

C/C++ (DOS)

```
U16 _7230_DO(U16 cardNo, U16 do_data )  
U16 _7234_DO(U16 cardNo, U32 do_data )
```

C/C++ (Windows 95/98)

```
U16 W_7230_DO ( U16 cardNo, U16 doData)  
U16 W_7234_DO ( U16 cardNo, U32 doData)
```

Visual Basic (Windows 95/98)

```
W_7230_DO (ByVal cardNo As Integer, ByVal DOData As  
Integer) As Integer  
W_7234_DO (ByVal cardNo As Integer, ByVal DOData As  
Integer) As Integer
```

@ Arguments:

cardNo : card number to select board

do_data : value will be written to digital output port

@ Return Code:

ERR_NoError

4.6 Interrupt Relative Functions

4.6.1 `_723X_Set_INT_Control`

@ *Description*

The PCI-7230/PCI-7233 is equipped with dual interrupts system, two interrupt sources can be generated and be checked by the software. This function is used to select and control PCI-7230/PCI-7233 interrupt sources by writing data to interrupt control register. For PCI-7230, the interrupt sources can be set as from channel 0 (INT1) or channel 1 (INT2) of digital input channel. For PCI-7233, the interrupt source can be set as from Channel 0 ~15 changing (INT1) or channel 16 ~ 31 changing (INT2) of digital input channels. Only one of interrupt sources can be set as enable.

@ *Syntax*

C/C++ (DOS)

```
void _7230_Set_INT_Control (U16 cardNo, U16 int1Flag,  
U16 int2Flag)  
void _7233_Set_INT_Control (U16 cardNo, U16 int1Flag,  
U16 int2Flag)
```

C/C++ (Windows 95/98)

```
void W_7230_Set_INT_Control (U16 cardNo, U16 int1Flag,  
U16 int2Flag)  
void W_7233_Set_INT_Control (U16 cardNo, U16 int1Flag,  
U16 int2Flag)
```

Visual Basic (Windows 95/98)

```
W_7230_Set_INT_Control (ByVal cardNo As Integer, ByVal  
int1Flag As Integer, ByVal int2Flag As Integer)  
W_7233_Set_INT_Control (ByVal cardNo As Integer, ByVal  
int1Flag As Integer, ByVal int2Flag As Integer)
```

@ *Argument*

cardNo : card number to select board
int1Flag : INT1 setting; 0: disable, 1: enable
int2Flag : INT2 setting; 0: disable, 1: enable

@ *Return Code:*

None

4.6.2 `_723X_Get_IRQ_Status`

@ *Description*

The PCI-7230/PCI-7233 has dual interrupts system. Two interrupt sources can be generated and be checked by the software. This function is used to distinguish which interrupt is inserted if both INT1 and INT2 interrupts are used.

@ *Syntax*

C/C++ (DOS)

```
void _7230_Get_IRQ_Status (U16 cardNo, U16
*int1Status, U16 *int2Status)
void _7233_Get_IRQ_Status (U16 cardNo, U16
*int1Status, U16 *int2Status)
```

C/C++ (Windows 95/98)

```
void W_7230_Get_IRQ_Status (U16 cardNo, U16
*int1Status, U16 *int2Status)
void W_7233_Get_IRQ_Status (U16 cardNo, U16
*int1Status, U16 *int2Status)
```

Visual Basic (Windows 95/98)

```
W_7230_Get_IRQ_Status (ByVal cardNo As Integer,
int1Status As Integer, int2Status As Integer)
W_7233_Get_IRQ_Status (ByVal cardNo As Integer,
int1Status As Integer, int2Status As Integer)
```

@ *Argument*

cardNo : card number to select board
int1Status :INT1 status; 0: interrupt is not from INT1, 1: interrupt is from INT1
int2Status :INT2 status; 0: interrupt is not from INT2, 1: interrupt is from INT2

@ *Return Code*:

None

4.6.3 _723X_CLR_IRQ

@ Description

This function is used to clear interrupt request. This function is only available in DOS library.

@ Syntax

C/C++ (DOS)

```
void _7230_CLR_IRQ (U16 cardNo)
void _7233_CLR_IRQ (U16 cardNo)
```

@ Argument

None

@ Return Code

None

4.6.4 Interrupt Enable

@ Description

This function is only available in Windows 95 driver. This function is used to start up the interrupt control. After calling this function, every time an IRQ generated, a software event is signaled. So that in your program, you can use wait operation to wait for the event. When the event is signaled, it means an interrupt is generated. Please refer to the sample program 7230int.c. Please note that the PCI-7234 do not have any interrupt.

@ Syntax

C/C++ (Windows 95/98)

```
U16 W_7230_INT_Enable (U16 cardNo, HANDLE *hEvent)
U16 W_7233_INT_Enable (U16 cardNo, HANDLE *hEvent)
```

Visual Basic (Windows 95/98)

```
W_7230_INT_Enable (ByVal cardNo As Integer, hEvent As Long) As Integer
W_7233_INT_Enable (ByVal cardNo As Integer, hEvent As Long) As Integer
```

@ Arguments

cardNo : card number to select board

hEvent : the address of an array of two handles. hEvent[0] and hEvent[1] are the events for interrupt signals INT1 and INT2 respectively.

@ Return Code:

```
ERR_NoError
ERR_BoardNoInit
```

4.6.5 Interrupt Disable

@ *Description*

This function is only available in Windows 95 driver. This function is used to disable the interrupt signal generation. Please refer to the sample program 7230int.c.

@ *Syntax*

C/C++ (Windows 95/98)

```
U16 W_7230_INT_Disable (U16 cardNo)
```

```
U16 W_7233_INT_Disable (U16 cardNo)
```

Visual Basic (Windows 95/98)

```
W_7230_INT_Disable (ByVal cardNo As Integer) As  
Integer
```

```
W_7233_INT_Disable (ByVal cardNo As Integer) As  
Integer
```

@ *Arguments*

cardNo : card number to select board

@ *Return Code:*

ERR_NoError

ERR_BoardNoInit

Product Warranty/Service

Seller warrants that equipment furnished will be free from defects in material and workmanship for a period of one year from the confirmed date of purchase of the original buyer and that upon written notice of any such defect, Seller will, at its option, repair or replace the defective item under the terms of this warranty, subject to the provisions and specific exclusions listed herein.

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The equipment warranty shall constitute the sole and exclusive remedy of any Buyer of Seller equipment and the sole and exclusive liability of the Seller, its successors or assigns, in connection with equipment purchased and in lieu of all other warranties expressed implied or statutory, including, but not limited to, any implied warranty of merchant ability or fitness and all other obligations or liabilities of seller, its successors or assigns.

The equipment must be returned postage-prepaid. Package it securely and insure it. You will be charged for parts and labor if you lack proof of date of purchase, or if the warranty period is expired.