



ADLINK
TECHNOLOGY INC.

NuDAQ® 723X Series

32 Channels Isolated

Digital I/O Card

User's Manual

Manual Rev. 4.00
Revision Date: November 18, 2004
Part No: 50-11103-203



Recycled Paper

Advance Technologies; Automate the World.



Copyright 2004 ADLINK TECHNOLOGY INC.

All Rights Reserved.

The information in this document is subject to change without prior notice in order to improve reliability, design, and function and does not represent a commitment on the part of the manufacturer.

In no event will the manufacturer be liable for direct, indirect, special, incidental, or consequential damages arising out of the use or inability to use the product or documentation, even if advised of the possibility of such damages.

This document contains proprietary information protected by copyright. All rights are reserved. No part of this manual may be reproduced by any mechanical, electronic, or other means in any form without prior written permission of the manufacturer.

Trademarks

NuDAQ, NuIPC, DAQBench are registered trademarks of ADLINK TECHNOLOGY INC.

Product names mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective companies.

Getting Service from ADLINK

Customer Satisfaction is top priority for ADLINK Technology Inc. Please contact us should you require any service or assistance.

ADLINK TECHNOLOGY INC.

Web Site: <http://www.adlinktech.com>
 Sales & Service: Service@adlinktech.com
 TEL: +886-2-82265877
 FAX: +886-2-82265717
 Address: 9F, No. 166, Jian Yi Road, Chungho City,
 Taipei, 235 Taiwan

Please email or FAX this completed service form for prompt and satisfactory service.

Company Information	
Company/Organization	
Contact Person	
E-mail Address	
Address	
Country	
TEL	FAX:
Web Site	
Product Information	
Product Model	
Environment	OS: M/B: CPU: Chipset: BIOS:

Please give a detailed description of the problem(s):

Table of Contents

Table of Contents	i
List of Tables	iii
List of Figures	iv
1 Introduction	1
1.1 Features.....	2
PCI-7230 and cPCI-7230 Features	2
PCI-7233/H and Features	2
PCI-7234/7234P Features	2
1.2 Specifications of PCI-7230/cPCI-7230	3
Isolated Digital I/O (DIO)	3
General Specifications	4
1.3 Specifications of PCI-7233/PCI-7233H.....	4
Isolated Digital Input	4
General Specifications	5
1.4 Specifications of PCI-7234/7234P	6
Isolated Digital Output	6
General Specifications	6
1.5 Software Supporting	7
Programming Library	7
PCIS-LVIEW: LabVIEW® Driver	8
PCIS-VEE: HP-VEE Driver	8
DAQBench™: ActiveX Controls	8
DASYLab™ PRO	9
PCIS-DDE: DDE Server and InTouch™	9
PCIS-ISG: ISaGRAF™ driver	9
PCIS-ICL: InControl™ Driver	9
PCIS-OPC: OPC Server	9
2 Installation	11
2.1 What You Have.....	11
2.2 Unpacking.....	11
2.3 Hardware Installation Outline.....	12
PCI configuration	12
PCI slot selection	12
2.4 Device Installation for Windows Systems	13

2.5	Connector Pin Assignment	14
	PCI-7230 Pin Assignment	14
	cPCI-7230 Pin Assignment	16
	PCI-7233 Pin Assignment	18
	PCI-7234 Pin Assignment	20
	PCI-7234P Pin Assignment	22
2.6	Termination Board Connection	23
3	Registers Format	25
3.1	PCI PnP Registers	25
3.2	I/O Registers Format.....	26
3.3	Digital Input Register.....	27
3.4	Digital Output Register.....	27
4	Operation Theorem.....	29
4.1	Isolated Digital Input Circuits	29
4.2	Isolated Digital Output Circuits.....	30
4.3	Change of State Detection.....	31
	What is COS?	31
	Structure of COS detection and Dual Interrupt System	32
	COS Detection	33
	Warranty Policy	35

List of Tables

Table 3-1 I/O Address Map of PCI-7230/cPCI-7230.....	26
Table 3-2 I/O Address Map of PCI-7233/PCI-7233H.....	26
Table 3-3 I/O Address Map of PCI-7234/7234P	26
Table 3-4 Digital Input Register.....	27
Table 3-5 Digital Output Register.....	28

List of Figures

Figure 2-1: PCI-7230 Pin Assignment	14
Figure 2-2: PCI-7230 Onboard Power and Ground terminal	15
Figure 2-3: cPCI-7230 Pin Assignment.....	16
Figure 2-4: PCI-7233 Pin Assignment	18
Figure 2-5: PCI-7233 Onboard Power and Ground terminal	19
Figure 2-6: PCI-7234 Pin Assignment	20
Figure 2-7: PCI-7234 Onboard Power and Ground terminal	21
Figure 2-8: PCI-7234P Pin Assignment	22
Figure 2-9: PCI-7234P Onboard Power and Ground terminal ...	23
Figure 4-1: Input circuits of PCI-7230, PCI-7233, and PCI-7233H.....	29
Figure 4-2: Differential Input circuits of cPCI-7230	30
Figure 4-3: Isolate output circuits of PCI-7234 (sink current).....	31
Figure 4-4: Isolate output circuits of PCI-7234P (source current)	31
Figure 4-5: Dual Interrupt System of PCI-7233.....	32
Figure 4-6: Example of COS detection	33

1 Introduction

This manual lists and describes the components of the PCI-723X family products, which includes:

- ▶ PCI-7230: Isolated 16-CH DI and 16-CH DO 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
- ▶ PCI-7234P: Isolated 32-CH DO Card (source current)
- ▶ cPCI-7230: Isolated 16-CH DI and 16-CH DI Module for 3U CompactPCI

These products have high isolation voltage with either 32 DI or 32 DO channels. The high isolation voltage protects the user's 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-7234/7234P 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. (PCI-7234 is sink current DO card, PCI-7234P is source current DO card).

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

PCI-7230 and cPCI-7230 Features

- ▶ 16 isolated Digital Input Channels
- ▶ 16 isolated Digital Output Channels
- ▶ High output driving capability
- ▶ 5,000 Vrms high voltage isolation
- ▶ Interrupt is controlled from external signal
- ▶ Dual interrupt trigger
- ▶ 500mA max@ 100% duty, for one of the eight transistor devices ON
- ▶ Up to 24V voltage protection for isolated input
- ▶ 37-pin D-type connector (for PCI-7230)
- ▶ 50-pin SCSI-II type connector (for cPCI-7230)

PCI-7233/H and Features

- ▶ 32 Isolated Digital Input Channels
- ▶ 5000Vrms high voltage isolation (PCI-7233)
- ▶ 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 2500Vrms isolation voltage
- ▶ 37-pin D-type connector

PCI-7234/7234P Features

- ▶ 32 Isolated Digital Output Channels
- ▶ High output driving capability
- ▶ 500mA max@ 100% duty, for one of the eight transistor devices ON (PCI-7234: sink current, PCI-7234P: source current)
- ▶ 5,000Vrms 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 to 1V
 - ▷ Logic “H”: 3 to 24V
- ▶ Input resistance: 1.2K Ω @ 0.5W
- ▶ Isolated voltage: 5000Vrms
- ▶ Throughput: 10KHz
- ▶ Optical Isolated Output channel:
 - ▷ Numbers of Channel: 16 digital outputs
 - ▷ Output type: Darlington transistors
 - ▷ Output Voltage: open collector 5V (min.), up to 35VDC (max.)
- ▶ Sink Current:
 - ▷ 500mA max @ 100% duty, for one of the eight transistor devices ON
 - ▷ 370 mA @ duty 10% for all transistors devices ON
 - ▷ 140 mA @ duty 50% for all transistors devices ON

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

- ▶ Isolated voltage: 5000Vrms
- ▶ Throughput: 10KHz
- ▶ 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 to 60°C
- ▶ Storage Temperature: -20 to 80°C
- ▶ Humidity: 5 to 95%, non-condensing
- ▶ Power Consumption:
 - ▷ PCI-7230: +5V @ 150mA (typical)

(Note: Requires external power)

- ▷ cPCI-7230: +5V @ 270mA (typical)
- ▶ Dimension: Compact size
 - ▷ PCI-7230 153mm(L) X 107mm(H)
 - ▷ 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 to 1.5V
 - ▷ Logic "H": 5 to 24V
- ▶ Input resistance: 1.2 K Ω @ 0.5W
- ▶ Isolated voltage: 5000Vrms
- ▶ Throughput: 10KHz

Optical Isolated Input Channel (PCI-7233H)

- ▶ Numbers of Channel: 32 digital inputs
- ▶ Input Voltage: up to 24Vdc
 - ▷ Logic “L”: 0 to 1.5V
 - ▷ Logic “H”: 5 to 24V
- ▶ Input resistance: 1.2K Ω @ 0.5W
- ▶ Isolated voltage: 2500Vrms
- ▶ Throughput: High speed 500KHz
- ▶ 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 to 60°C
- ▶ Storage Temperature: -20°C to 80°C
- ▶ Humidity: 5 to 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-7234/7234P

Isolated Digital Output

- ▶ Optical isolated Output channel
- ▶ Numbers of Channel: 32 digital output
 - ▷ Output type: Darlington transistors
 - ▷ Output Voltage: open collector 5V (min.), up to 35VDC (max.)
- ▶ Sink Current: (PCI-7234)
 - ▷ 500mA max @ 100% duty, for one of the eight transistors 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)

- ▶ Source Current:(PCI-7234P)
 - ▷ 500mA max @ 100% duty, for one of the eight transistors ON
 - ▷ 260mA @ duty 10% for all transistors devices ON
 - ▷ 59mA @ duty 50% for all transistors devices ON

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

- ▶ Isolated voltage:
 - ▷ 5000Vrms
- ▶ Throughput:
 - ▷ 10KHz

General Specifications

- ▶ Connector: 37-pin D-type connector
- ▶ Operating Temperature: 0 to 60°C
- ▶ Storage Temperature: -20 to 80°C
- ▶ Humidity: 5 to 95%, non-condensing
- ▶ Power Consumption: +5V @ 180mA (typical)
- ▶ Dimension: Compact size only 175mm(H) x 107mm(L)

1.5 Software Supporting

ADLINK provides versatile software drivers and packages for different users' approach to building up a system. We not only provide a programming library such as DLL for various Windows systems, but also provide drivers for many software packages such as LabVIEW®, HP VEETM, DASYLab™, InTouch™, InControl™, ISaGRAF™.

All software options are included on the ADLINK CD. Software drivers that require a fee are protected with a serial licensed code. Without the software serial number, the drivers can still be installed, with the demo version used for demonstration purposes for two hours. Please contact your dealer to purchase the formal license serial code.

Programming Library

For customers who are writing their own programs, we provide function libraries for many different operating systems, including:

DOS Library:

Borland C/C++ and Microsoft C++, the functions descriptions are included in this user's guide.

Windows 95 DLL:

For VB, VC++, Delphi, BC5, the functions descriptions are included in this user's guide.

PCIS-DASK:

Includes device drivers and DLL for Windows 98, Windows NT, and Windows 2000. DLL is binary compatible across Windows 98, Windows NT, and Windows 2000. That means all applications developed with PCIS-DASK are compatible across Windows 98, Windows NT, and Windows 2000. The developing environment can be VB, VC++, Delphi, BC5, or any Windows programming language that allows calls to a DLL. The user's guide and function reference manual of PCIS-DASK are in the CD. Please refer to the PDF manual files under the following directory: \\Manual_PDF\Software\PCIS-DASK.

PCIS-DASK/X:

Includes device drivers and shared library for Linux. The developing environment can be Gnu C/C++ or any programming language that allows linking to a shared library. The user's guide and function reference manual of PCIS-DASK/X are in the CD. (\\Manual_PDF\Software\PCIS-DASK-X.)

The above software drivers are shipped with the board. Please refer to the "Software Installation Guide" to install these drivers.

PCIS-LVIEW: LabVIEW® Driver

PCIS-LVIEW contains the VIs, which are used to interface with NI's LabVIEW® software package. The PCIS-LVIEW supports Windows 95/98/NT/2000. The LabVIEW® drivers are shipped free of charge with the board. These can be installed and used without license. For further detailed information about PCIS-LVIEW, please refer to the user's guide in the CD.

(\\Manual_PDF\Software\PCIS-LVIEW)

PCIS-VEE: HP-VEE Driver

The PCIS-VEE includes user objects, which are used to interface with HP VEE software package. PCIS-VEE supports Windows 95/98/NT. The HP-VEE drivers are free, shipped with the board. These can be installed and used without license. For further information about PCIS-VEE, please refer to the user's guide in the CD.

(\\Manual_PDF\Software\PCIS-VEE)

DAQBench™: ActiveX Controls

It is recommended that customers who are familiar with ActiveX controls and VB/VC++ programming to use the DAQBench™ ActiveX Control components library for developing applications. The DAQBench™ is designed under Windows NT/98. For further information on DAQBench, please refer to the user's guide in the CD.

(\\Manual_PDF\Software\DAQBench\DAQBench Manual.PDF)

DASYLab™ PRO

DASYLab is an easy-to-use software package, which provides easy-setup instrument functions such as FFT analysis. Please contact ADLINK for DASYLab PRO, which includes DASYLab and ADLINK hardware drivers.

PCIS-DDE: DDE Server and InTouch™

DDE is an acronym for Dynamic Data Exchange specifications. The PCIS-DDE includes the PCI cards' DDE server. The PCIS-DDE server is included in the ADLINK CD, and requires a license. The DDE server can be used in conjunction with any DDE client under Windows NT.

PCIS-ISG: ISaGRAF™ driver

The ISaGRAF WorkBench is an IEC1131-3 SoftPLC control program development environment. The PCIS-ISG includes ADLINK products' target drivers for ISaGRAF under Windows NT environment. The PCIS-ISG is included in the ADLINK CD and also requires a license.

PCIS-ICL: InControl™ Driver

PCIS-ICL is the InControl driver which supports the Windows NT. The PCIS-ICL is included in the ADLINK CD, requiring a license.

PCIS-OPC: OPC Server

PCIS-OPC is an OPC Server, which can be linked with OPC clients. Many software packages now provide OPC clients. The PCIS-OPC supports Windows NT and requires a license.

2 Installation

This chapter describes the configurations of PCI-7230/7233/7234. PCI-7230, 7233, and 7234 is Plug and Play and can easily be installed onto any PC system with PCI slots.

2.1 What You Have

- ▶ This User's Manual
- ▶ 723X family Isolated Digital I/O Card
- ▶ ADLINK CD
- ▶ Software Installation Guide

If any of these items are missing or damaged, please contact the dealer from whom the product was purchased. Save the shipping materials and carton for future storage or shipping purposes.

2.2 Unpacking

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

The card should be placed on a grounded anti-static mat. The operator should wear 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 the module. Ensure that 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 socketed ICs to make sure they are properly seated. Do this only with the module placed on a firm flat surface.

Note: Do not apply power to the card if it has been damaged.

2.3 Hardware Installation Outline

PCI configuration

The PCI cards (or CompactPCI cards) are equipped with a Plug and Play PCI controller, it can request base addresses and interrupt in accordance with the 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 recommended that the system resource be assigned by any other method.

PCI slot selection

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

Installation Procedures

1. Turn off the computer.
2. Turn off all accessories (printer, modem, monitor, etc.) connected to your computer.
3. Remove the computer cover.
4. Select a 32-bit PCI slot. PCI slots are shorter than ISA or EISA slots, and usually white or ivory in color.
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 selected PCI slot.
7. Secure the card in place at the rear panel of the system.

2.4 Device Installation for Windows Systems

Once Windows 95/98/2000 has started, the Plug and Play function of Windows system will find the new NuDAQ/NuIPC cards. If this is the first time installing NuDAQ/NuIPC cards on your Windows system, you will be prompted to enter the device information source. Please refer to the “Software Installation Guide” for instructions on installing the device.

2.5 Connector Pin Assignment

PCI-7230 Pin Assignment

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

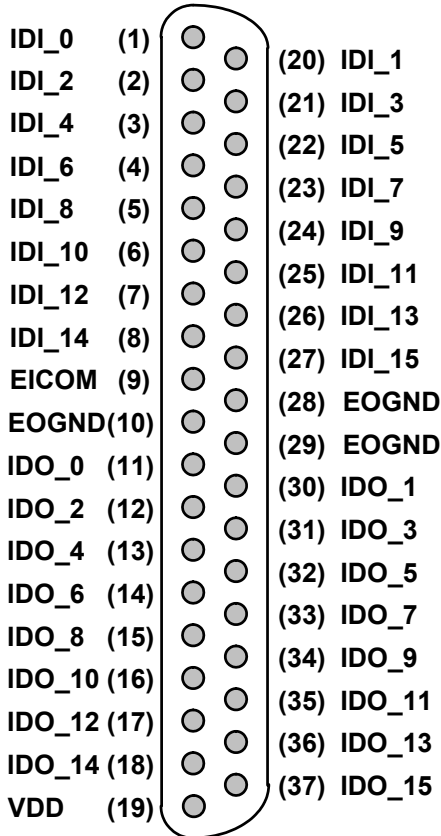


Figure 2-1: PCI-7230 Pin Assignment

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 be supplied by an external power supply of 5 to 35VDC.

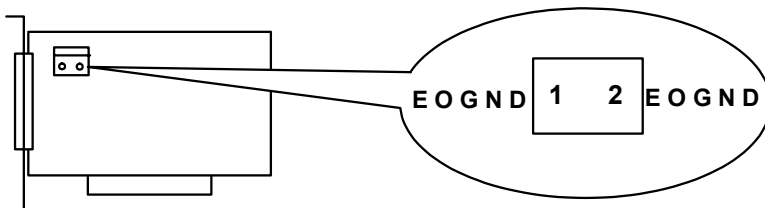


Figure 2-2: PCI-7230 Onboard Power and Ground terminal

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.

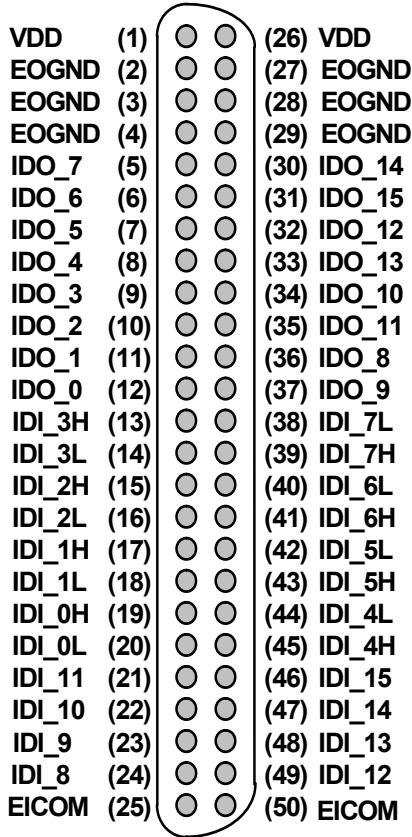


Figure 2-3: cPCI-7230 Pin Assignment

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 to 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.

PCI-7233 Pin Assignment

The pin assignment of the 37 pins D-type connector CN1 is illustrated below:

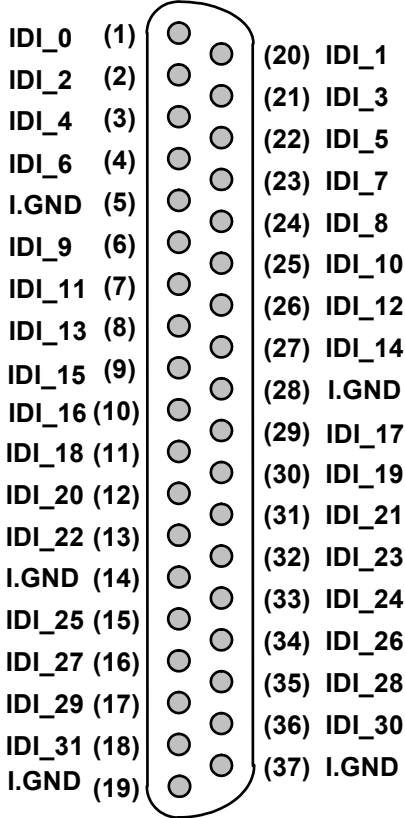


Figure 2-4: PCI-7233 Pin Assignment

Legend:

IDI_n: Isolated digital input channel n.

I.GND: Isolated common ground.

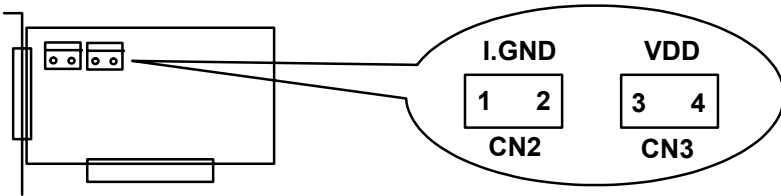


Figure 2-5: PCI-7233 Onboard Power and Ground terminal

PCI-7234 Pin Assignment

The pin assignment of the 37 pins D-type connector CN1, which is an isolated DIO signal connector, is shown below.

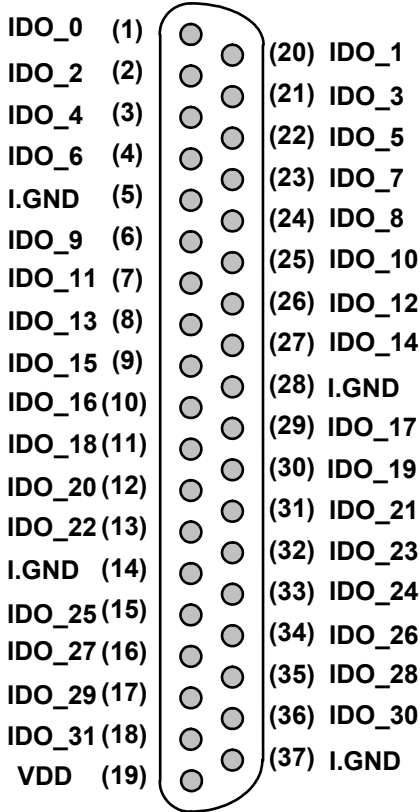


Figure 2-6: PCI-7234 Pin Assignment

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.

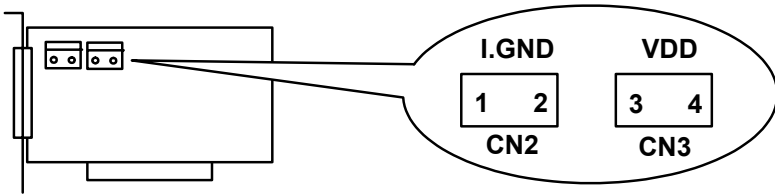


Figure 2-7: PCI-7234 Onboard Power and Ground terminal

PCI-7234P Pin Assignment

The pin assignment of the 37 pins D-type connector CN1, which is an isolated DIO signal connector, as shown below:

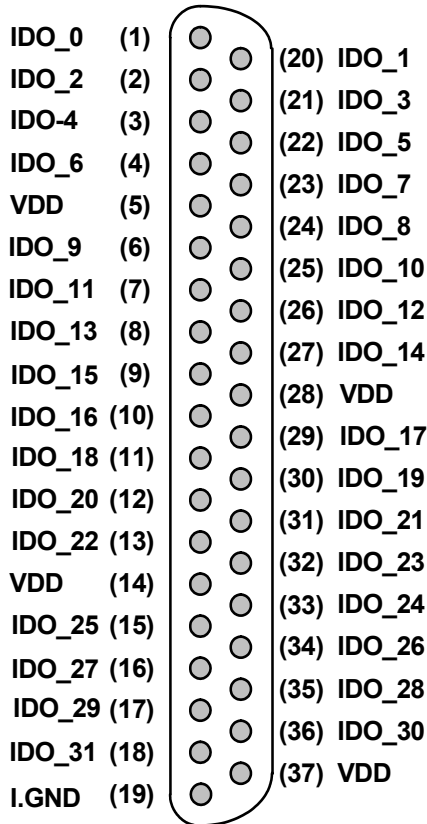


Figure 2-8: PCI-7234P Pin Assignment

Legend:

IDO_n: Isolated digital output signal channel n.

I.GND: Isolated ground for isolated output channels.

VDD: External power supply for IDO source drivers.

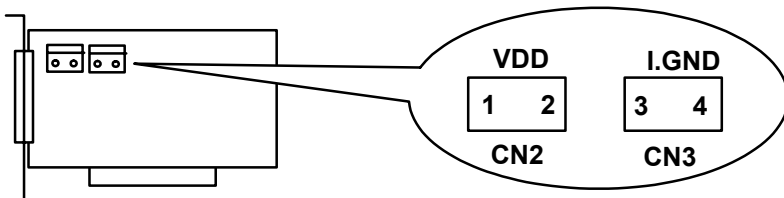


Figure 2-9: PCI-7234P Onboard Power and Ground terminal

2.6 Termination Board Connection

The 723X boards are equipped with a DB-37 connector. Available termination boards include:

ACLD-9137:

A general purpose 37-pin screw terminal. ACLD-9137 comes with a male DB-37 connector used to directly attach on the PCI-6308.

ACLD-9188:

A general purpose 37-pin screw terminal, which comes equipped with a heavy-duty screw terminal.

DIN-37D:

A general purpose 37-pin screw terminal with DIN-socket. DIN-37D is shipped with a 37-pin cable.

3 Registers Format

The registers format is described in this chapter. This information is quite useful for programmers who wish to handle the card by low-level programming. However, it is recommended that the user has a deeper understanding of the PCI interface before starting any low-level programming. This chapter can also assist users in using the software driver to manipulate this card.

3.1 PCI PnP Registers

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

The PCR, which is compliant with the PCI-bus specifications, is initialized and controlled by the Plug and Play PCI BIOS. Users can study the PCI BIOS specification to understand the operation of the PCR. Please contact the PCISIG for specifications of the PCI interface.

The PCI bus controller PCI 9050 is provided by PLX technology Inc. (www.plxtech.com). For further detail on the LCR, please visit PLX technology's website to download the relative information. Users are not required to understand the details of the LCR if using the software library. The PCI PnP BIOS assigns the base address of the LCR to offset 14h of PCR.

The PCI-723X registers are shown in the next section. The base address, which is also assigned by the PCI PnP BIOS, is located at offset 18h of PCR. Therefore, users can read the 18h of PCR to find the base address by using the BIOS function call.

Do not try to modify the base address and interrupt assigned by the PCI PnP BIOS as it may cause resource conflict within your system.

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/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-7233H

The PCI-7234/7234P 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-7234/7234P

CAUTION:



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

3.3 Digital Input Register

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

Address: BASE + 0 to 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

Table 3-4: Digital Input Register

Legend:

IDI_n: Isolated Digital Input CH n.

3.4 Digital Output Register

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

Address: BASE + 0 to 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_28	IDO_24

Table 3-5: Digital Output Register

Legend:

IDO_n: Isolated Digital Output CH n.

4 Operation Theorem

4.1 Isolated Digital Input Circuits

The isolated digital output is an open collector transistor output. The input can accept voltages of up to 24V. The input resistors on PCI-7230/7233/7233H and cPCI-7230 are 1.2K Ω . The connection between outside signal and PCI-7230, cPCI-7230, PCI-7233, PCI-7233H are shown below.

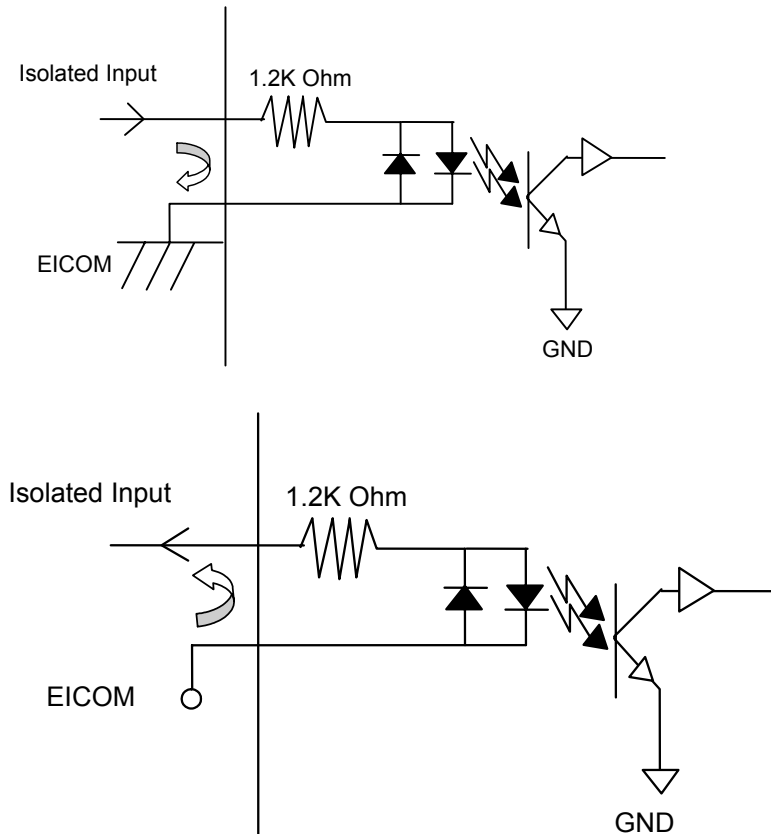


Figure 4-1: Input circuits of PCI-7230, PCI-7233, and PCI-7233H

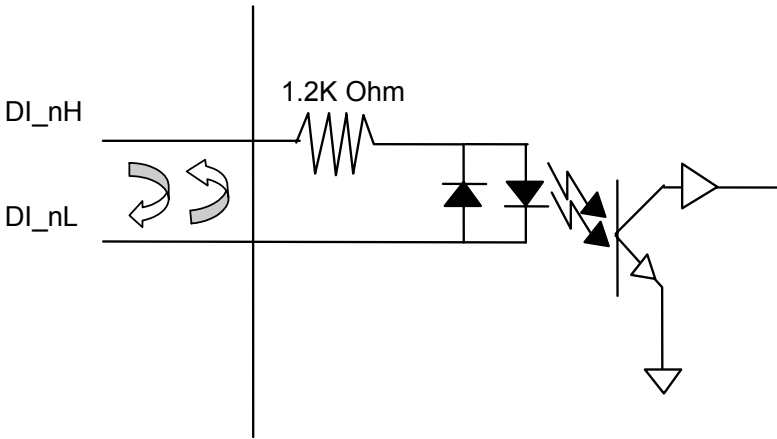


Figure 4-2: Differential Input circuits of cPCI-7230

4.2 Isolated Digital Output Circuits

The connection of isolated digital output is illustrated below. The PCI-7230 requires an external power of between 5 to 35VDC from the VDD pin for the digital output circuit. cPCI-7230 and PCI-7234/7234P are both equipped with an internal DC-DC converter.

On the PCI-7230, an external voltage source, minimum 5V, 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 a “fly-wheel” diode, which can protect the driver if the loading is inductance loading such as relay, motor, or solenoid.

The VDD must connect to the external power to form a fly-wheel current loop.

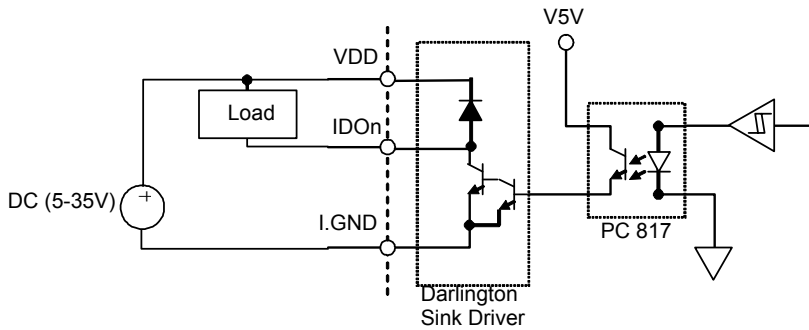


Figure 4-3: Isolate output circuits of PCI-7234 (sink current)

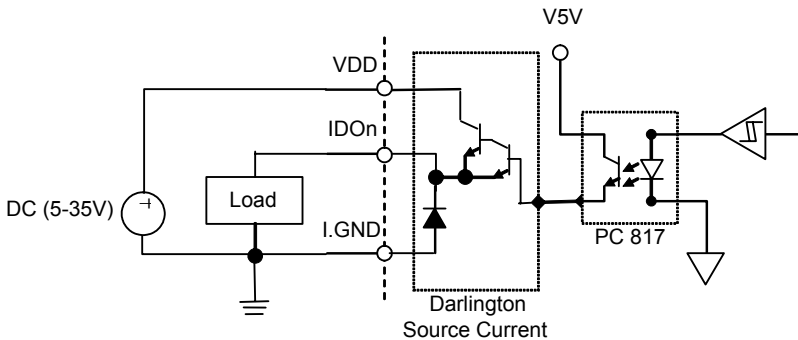


Figure 4-4: Isolate output circuits of PCI-7234P (source current)

4.3 Change of State Detection

What is COS?

The COS (Change of State) occurs 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 32 chan-

nels input channels. If any channel is changed, the COS detection circuit generates an interrupt request signal.

Structure of COS detection and Dual Interrupt System

The dual interrupt system is used in PCI-7233. Dual interrupt occurs when the hardware can generate two interrupt request signals at the same time and the software can service these two requests with ISR. Note that dual interrupt does not mean the card occupies two IRQ levels. The two interrupt request signals (INT1 and INT2) come from COS detection output signal #1 and #2. The INT1 is inserted when any channel from 0 to 15 is changed. The INT2 is inserted when any channel between 16 to 31 is changed. The interrupt system is illustrated below.

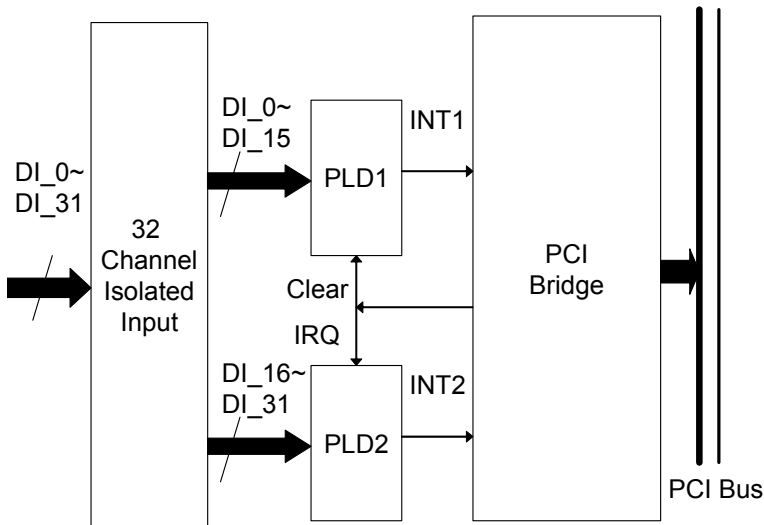


Figure 4-5: Dual Interrupt System of PCI-7233

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.

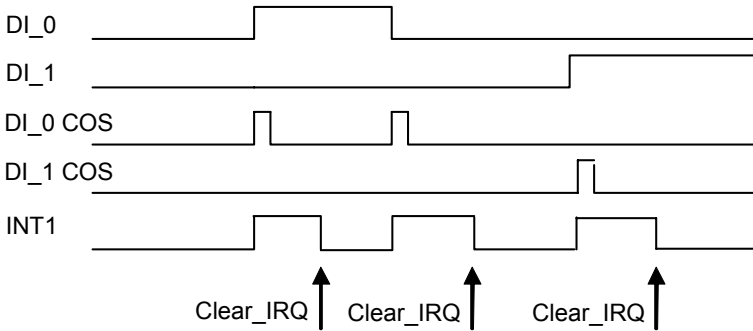


Figure 4-6: Example of COS detection

Warranty Policy

Thank you for choosing ADLINK. To understand your rights and enjoy all the after-sales services we offer, please read the following carefully.

1. Before using ADLINK's products please read the user manual and follow the instructions exactly. When sending in damaged products for repair, please attach an RMA application form which can be downloaded from: <http://rma.adlinktech.com/policy/>.
2. All ADLINK products come with a two-year guarantee:
 - ▶The warranty period starts from the product's shipment date from ADLINK's factory.
 - ▶Peripherals and third-party products not manufactured by ADLINK will be covered by the original manufacturers' warranty.
 - ▶For products containing storage devices (hard drives, flash cards, etc.), please back up your data before sending them for repair. ADLINK is not responsible for loss of data.
 - ▶Please ensure the use of properly licensed software with our systems. ADLINK does not condone the use of pirated software and will not service systems using such software. ADLINK will not be held legally responsible for products shipped with unlicensed software installed by the user.
 - ▶For general repairs, please do not include peripheral accessories. If peripherals need to be included, be certain to specify which items you sent on the RMA Request & Confirmation Form. ADLINK is not responsible for items not listed on the RMA Request & Confirmation Form.

3. Our repair service is not covered by ADLINK's two-year guarantee in the following situations:
 - ▶ Damage caused by not following instructions in the user's manual.
 - ▶ Damage caused by carelessness on the user's part during product transportation.
 - ▶ Damage caused by fire, earthquakes, floods, lightening, pollution, other acts of God, and/or incorrect usage of voltage transformers.
 - ▶ Damage caused by unsuitable storage environments (i.e. high temperatures, high humidity, or volatile chemicals).
 - ▶ Damage caused by leakage of battery fluid during or after change of batteries by customer/user.
 - ▶ Damage from improper repair by unauthorized technicians.
 - ▶ Products with altered and/or damaged serial numbers are not entitled to our service.
 - ▶ Other categories not protected under our warranty.
4. Customers are responsible for shipping costs to transport damaged products to our company or sales office.
5. To ensure the speed and quality of product repair, please download an RMA application form from our company website: <http://rma.adlinktech.com/policy>. Damaged products with attached RMA forms receive priority.

If you have any further questions, please email our FAE staff:
service@adlinktech.com.