NuIPC® / NuDAQ®
cPCI-7252, PCI-7250/7251
Relay Actuator &
Isolated D/I Cards
User's Guide

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Web Site	http://www.adlink.com.tw http://www.adlinktechnology.com.		
Sales & Service	service@adlink.com.tw		
Technical Support	NuDAQ	nudaq@adlink.com.tw	
	NuDAM	nudam@adlink.com.tw	
	NuIPC	nuipc@adlink.com.tw	
	NuPRO	nupro@adlink.com.tw	
	Software	sw@adlink.com.tw	
	AMB	amb@adlink.com.tw	
TEL	+886-2-82265877	FAX	+886-2-82265717
Address	9F, No. 166, Jian Yi Road, Chungho City, Taipei, 235 Taiwan, R.O.C.		

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Questions	
Product Model	
Environment to Use	OS _____ Computer Brand _____ M/B : ☐ CPU : Chipset : ☐ BIOS : Video Card : Network Interface Card : Other :
Challenge Description	
Suggestions for ADLINK	

Table of Contents

How to Use This Guide

In the following contents, we use PCI-725X as a convenient for PCI-7250, PCI-7251 and cPCI-7252 if no specifed. The manual describes how to modify various settings on the PCI-725X cards to meet your requirements. It is divided into five chapters:

- **Chapter 1,** "Introduction", gives an overview of the product features, applications, and specifications.
- **Chapter 2,** "Installation", describes how to install the PCI-725X. The layout is shown, the jumpers setting for input configuration are specified.
- **Chapter 3,** "Programming", describes how to program the digital input and output channels on the PCI-725X.
- **Chapter 4,** "Relay Outputs & Isolation Inputs", gives an overview of PCI-725X's relay outputs and isolation inputs.
- **Chapter 5,** "C/C++ Libraries", describes the DOS and Windows 95 C/C++ Library for operating the PCI-725X.
- **Chapter 6,** "Troubleshooting", describes how to use DOS DEBUG utility to vertify the functionality of PCI-725X.

1

Introduction

The PCI-7250/7251 and cPCI-7252 Relay Actuator and Isolated D/I card is a basic Digital I/O card for PCI bus computer in industrial applications.

This PCI-7250 and PCI-7251 provide 8 relay actuators and 8 opto-isolated digital inputs. From the eight relays, four relays are Form C (R0~R3) and four relays are Form A (R4~R7). The cPCI-7252 provides 8 relay actuators and 16 opto-isolated digital inputs, all relays are Form C type. They are very suitable for ON/OFF control devices.

For the identical non-polarity opto-isolated digital input channels, each of them can be switchable by using RC filter or non-RC filter. All channels are isolated and suitable for collecting digital inputs in noisy environments.

The status of each relay output is reflected by a LED. When the relay is energized, its corresponding LED will turn ON, otherwise it is OFF.

The relay outputs and digital inputs are controlled by two bytes of I/O address. When the corresponding bit is read or written, its output status will be controlled, or its input status be monitored. The I/O signals are via a 37 pin D-type connector that projects through the computer case at the rear of the board.

1.1 Features

The PCI-7250 Relay Actuator and D/I Card provides the following advanced features:

- 32-bit PCI-Bus, Plug and Play for PCI-7250
- 32-bit ComapctPCI® Bus, Plug and Play for cPCI-7252
- 8 relay actuator outputs
- 8 opto-isolated digital inputs for PCI-7250
- 16 opto-isolated digital inputs for cPCI-7252
- LED indicators to show activated relays
- Jumper selectable AC-filter/non-AC-filter input signals
- On-board relay driving circuits
- On-board digital input signal conditioning circuits

Note: The PCI-7251 can attach to the PCI-7250 card. Each PCI-7251 card provides another 8 relay output and 8 photo isolated input signals. There are at most three PCI-7251 cards can be attached on one PCI-7250 card so that the system can provide 32 relay output signals and 32 photo isolated inputs signals.

1.2 Applications

- Industrial ON/OFF control
- External high power relay driving, Signal switching
- Laboratory automation
- Industrial automation
- Switch contact status sensing, limit switch monitoring,
- Useful with A/D and D/A cards to implement a data acquisition & control system

1.3 Specifications

Digital input

Input channels	8 for PCI-7250 and PCI-7251 16 for cPCI-7252
Photo-coupler	PC-814
Input current	10 mA rated 60 mA max. for isolated input
Input Voltage	Up-to 24 V_{DC} or 24V_{AC} 50-1,000Hz) Logic Low: 0~2.4V Logic High 3~24V
Threshold Voltage	2.4 VDC
Input impedance	1.2 KΩ
Input mode	Isolation AC-filter/ Non-AC-filter
Isolated voltage	5,000 Vrms channel-to-system

Relay Output

Output channels	8
Relay type	4 SPDT (Form C) 4 SPST (Form A)
Contact rating	120$V_{AC/DC}$, 0.5 A 24V_{DC}, 1A
Breakdown voltage	1000 V AC/DC min..
Release time	8 msec typical
Operate time	8 msec typical
Contact resistance	Bifurcated
Insulation resistance	100M Ω min.
Lifee expectancy	> 10 million operations at full load
LED indicators	Monitor ON/OFF status of each relay
Coil Voltage	+5V , 33 mA for each relay , total 0.264 A
Power supply of Relay	+ 5V from the PCI-Bus

General Specifications

Dimension	• 162 mm x 107 mm for PCI-7250 • 141 mm x 102 mm for PCI-7251 • 160 mm x 100 mm for cPCI-7252
Bus	32-bit PCI bus
Operating temperature	0 ~ 60 °C (Operating);
Storage temperature	-20 °C ~ 80 °C (Operating);
Humidity	5 to 90% non-condensing

Power Consumption

Power Consumption	Note: No relay is energized
PCI-7250	+5V @ 140 mA
PCI-7251	+5V @ 125 mA
cPCI-7252	+5V @ 120 mA

1.4 Software Supporting

ADLINK 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®, HP VEE™, DASYLab™, InTouch™, InControl™, ISaGRAF™, and so on.

All the software options are included in the ADLINK CD. The non-free software drivers are protected with serial licensed code. Without the software serial number, you can still install them and run the demo version for two hours for demonstration purpose. Please contact with your dealer to purchase the formal license serial code.

1.4.1 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: Include 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 the PDF manual files under \\Manual_PDF\Software\PCIS-DASK.

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

1.4.2 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 free shipped with the board. You can install and use them without license. For detail information about PCIS-LVIEW, please refer to the user's guide in the CD.

(\\Manual_PDF\Software\PCIS-LVIEW)

1.4.3 PCIS-VEE: HP-VEE Driver

The PCIS-VEE includes the 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. You can install and use them without license. For detail information about PCIS-VEE, please refer to the user's guide in the CD.

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1.4.4 DAQBench™: ActiveX Controls

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

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1.4.5 PCIS-DDE: DDE Server and InTouch™

DDE stands for Dynamic Data Exchange specifications. The PCIS-DDE includes the PCI cards' DDE server. The PCIS-DDE server is included in the ADLINK CD. It needs license. The DDE server can be used conjunction with any DDE client under Windows NT.

1.4.6 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. It needs license.

1.4.7 PCIS-ICL: InControl™ Driver

PCIS-ICL is the InControl driver which support the Windows NT. The PCIS-ICL is included in the ADLINK CD. It needs license.

1.4.8 PCIS-OPC: OPC Server

PCIS-OPC is an OPC Server, which can link with the OPC clients. There are many software packages on the market can provide the OPC clients now. The PCIS-OPC supports the Windows NT. It needs license.

2

Installation

This chapter describes how to install the 725X series products. At first, the contains in the package and unpacking information that you should be careful are described. The jumpers setting for digital input channel configuration (AC-filter or Non-AC-filter) and the signals definitions of the 37-pins connectors are also specified in this chapter.

2.1 What You Have

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

- PCI-7250 (or PCI-7251, cPCI-7252) Relay Actuator & Isolated D/I Card
- ADLINK CD (for PCI-7250 and cPCI-7252 only)
- Software Installation Guide

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-7250 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 handing 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 7250 series products.

2.3 PCB Layout

2.3.1 PCI-7250' PCB Layout

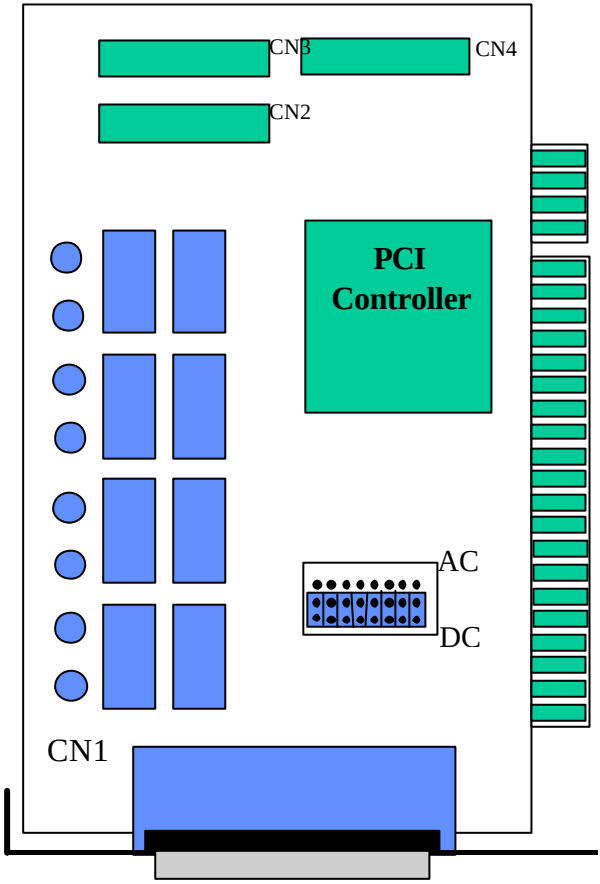
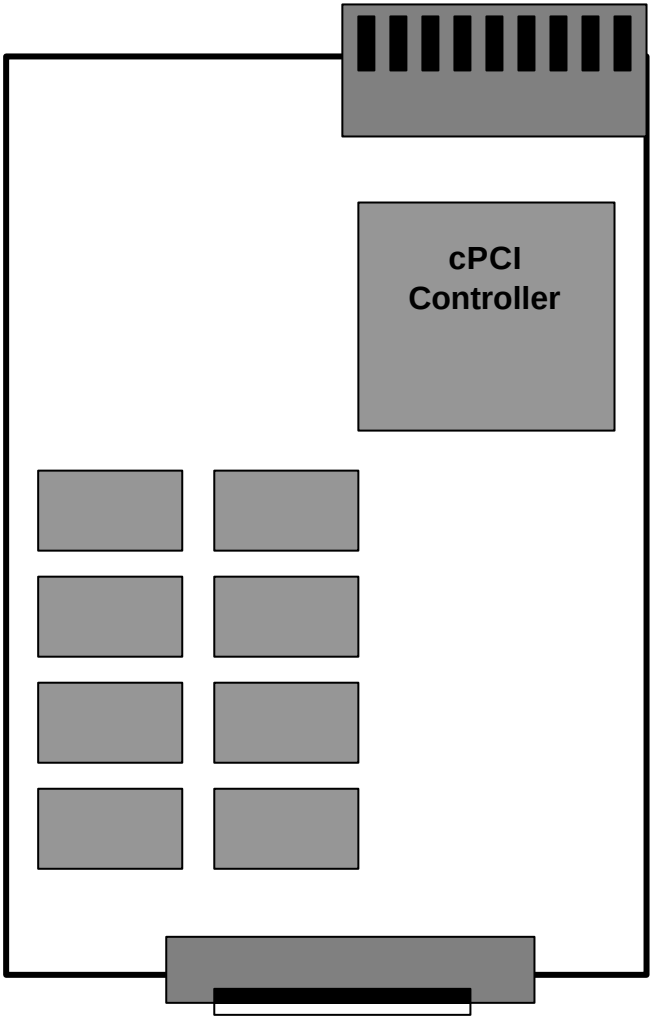


Figure 2.1 PCI-7250 Layout

2.3.2 cPCI-7252' PCB Layout



2.4 Input Signal Jumper Setting

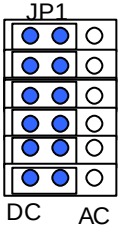
Note: This section is for PCI-7250 and PCI-7251 only.

For PCI7250 and PCI-7251, there are 8 jumpers (JP1 to JP8) associated with each digital input channel for configuring the channel as *AC-Filter* or *Non-AC-Filter* input. Each digital input channel and their corresponding jumper are shown in the following Table 2.1. Note

JUMPER	INPUT SIGNAL
JP1	DI0
JP2	DI1
JP3	DI2
JP4	DI3
JP5	DI4
JP6	DI5
JP7	DI6
JP8	DI7

Table 2.1 The jumper and DI channels

The default setting of the input signal selection is **Non-AC-Filter** (DC signal input), which is shown as below :



Input Signal Selection	Non-AC-Filter (DC Signal)	AC-Filter (AC Signal)
Jumper JP1 ~ JP8	2-3	1-2

Table 2.2 Input Signal Selection Jumper Setting

2.5 Hardware Installation Outline

PCI configuration

The PCI cards (or CompactPCI 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. Please note that the PCI system board and slot must provide bus-mastering capability to operate this board well.

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 PCI or CompactPCI card.
5. Select a 32-bit PCI slot. PCI slot are short than ISA or EISA slots, and are usually white or ivory.
6. 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.
7. Position the board into the PCI slot you selected.
8. 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 NuDAQ/NuIPC cards. If this is the first time to install NuDAQ/NuIPC cards in your Windows system, you will be informed to input the device information source. Please refer to the "***Software Installation Guide***" for the steps of installing the device.

2.7 Connector Pin Assignments

2.7.1 PCI-7250/51 Pin assignments

The PCI-7250 card comes equipped with a 37-pin D type connector (CN1) accessible from the rear of the card (Ref. Fig 2.1). The pin assignment of the D type connector is described by Figure 2.2.

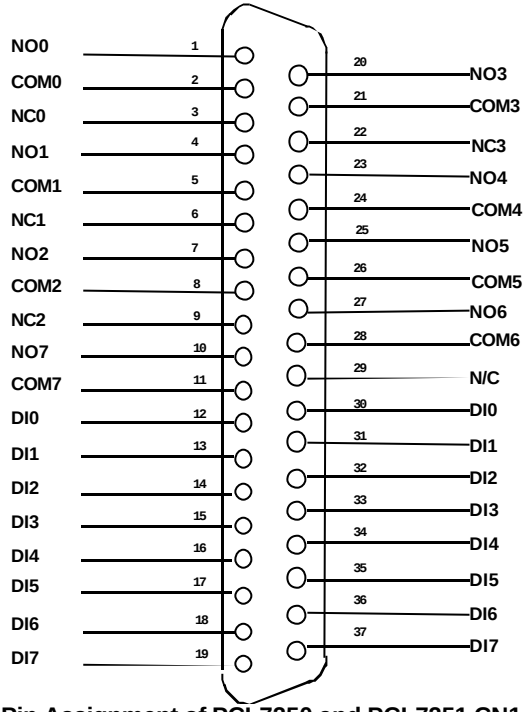


Figure 2.2 Pin Assignment of PCI-7250 and PCI-7251 CN1

Legend :

1. DIn-digital input low, channel n (input signal Is not polarity sensitive)
2. NC n-normal close pin of relay n
3. NO n-normal open pin of relay n
4. COM n-common pin of relay n
5. N/C-No Connection

2.7.2 cPCI-7252 Pin assignments

IGND	1	26	IGND
DI8	2	27	DI12
DI9	3	28	DI13
DI10	4	29	DI14
DI11	5	30	DI15
DI0L	6	31	DI4H
DI0H	7	32	DI4L
DI1L	8	33	DI5H
DI1H	9	34	DI5L
DI2L	10	35	DI6H
DI2H	11	36	DI6L
DI3L	12	37	DI7H
DI3H	13	38	DI7L
NO0	14	39	NO5
NO1	15	40	NO4
COM0	16	41	COM5
COM1	17	42	COM4
NC0	18	43	NC5
NC1	19	44	NC4
NO2	20	45	NO7
NO3	21	46	NO6
COM2	22	47	COM7
COM3	23	48	COM6
NC2	24	49	NC7
NC3	25	50	NC6

Figure 2.3 Pin Assignment of cPCI-7252 CN1

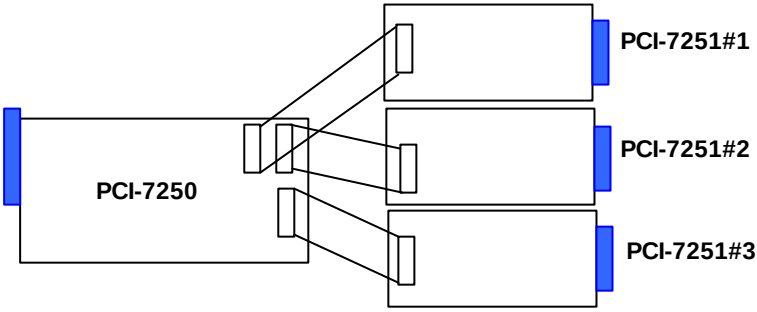
Legend :

1. DIn-digital input channel n
2. IGND-ground of DIn signals
3. DInH-digital input channel n with positive polarity
4. DInL-digital input channel n with negative polarity
5. NC n-normal close pin of relay n
6. NO n-normal open pin of relay n
7. COM n-common pin of relay n

2.8 PCI-7250 and PCI-7251 Connection

There are 8 relay output and 8 isolation input on both PCI-7250 and PCI-7251. The PCI-7251 is used as expansion of the PCI-7250. The operations of PCI-7251 are the same as which in PCI-7250. There are at most 3 PCI-7251 expansion boards to attach on the PCI-7250. Therefore, the PCI-7250 can control up to 32 relays and sense 32 isolation signals. Figure 2.3 shows the block diagram of connecting PCI-7250 and PCI-7251.

In addition, the existance of the PCI-7251 expansion boards can be detected. Refer to the section 4.x. for using the function library.



3

Registers Format

The detailed descriptions of the registers format are specified in this chapter. 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

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 725X registers.

The PCR, which is compliant to the PCI-bus specifications, is initialized and controlled by the plug & play (PnP) PCI BIOS. User's can study the PCI BIOS specification to understand the operation of the PCR. Please contact with PCISIG to acquire the specifications of the PCI interface.

The PCI bus controller PCI-9050 is provided by PLX technology Inc. (www.plxtech.com). For more detailed information of LCR, please visit PLX technology's web site to download relative information. It is not necessary for users to understand the details of the LCR if you use the software library. The PCI PnP BIOS assigns the base address of the LCR. The assigned address is located at offset 14h of PCR.

The PCI-6308 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 know the base address by using the BIOS function call.

Please do not try to modify the base address and interrupt which assigned by the PCI PnP BIOS, it may cause resource confliction in your system.

3.2 I/O Address Map

The 725X registers are all 8 bits. The users can access these registers only by 8 bits I/O instructions. The control of the relays and status of the isolation input is by means of registers. The following table shows the registers map, including descriptions and their offset addresses relative to the base address.. If the expansion PCI-7251 boards is not installed, the corresponding registers are not used and meanningless.

Offset	Write	Read	Board
0	Relay Output	Output readback	PCI-7250
1	not used	Isolation Input	
2	Relay Output	Output readback	PCI-7251 #1
3	not used	Isolation Input	
4	Relay Output	Output readback	PCI-7251 #2
5	not used	Isolation Input	
6	Relay Output	Output readback	PCI-7251 #3
7	not used	Isolation Input	

Table 3.2.1 The address map of PCI-7250 with PCI-7251

Offset	Write	Read	Board
0	Relay Output	Isolation Input	cPCI-7252
1	not used	not used	
2	not used	Output readback	

Table 3.2.2 The address map of cPCI-7252

3.3 Relay Output and Readback Registers

There are 8 relays on each PCI-7250 / 7251 and cPCI-7252 board. Each relay are controlled by one bits of the control register. The bit value '0' means the relay is not excited. The normal open signal line is 'open' with the common line and the normal closed signal line is connected with the common line. The bit value '1' means the relay is excited and the normal open signal line is now closed, and vise versa.

The initial bits values of the control register are all '0'. And the status of the relay can be readback from the readback register. If the relay is open, the corresponding bit value is '0'. If the relay is closed, the bit value is '1'.

Refer to section 4.x and 4.x for the relative function library.

Data Format of Relay Output and Readback Status Registers:

Bit	7	6	5	4	3	2	1	0
Relay Output	DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0
Output Readback	RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0

3.4 Isolation Input Registers

There are 8 isolation input channels on each PCI-7250 / 7251 board. The status of the 8 channels can be read from the isolation input register. Each bit is corresponding to each channel. As the DI status are controlled by one bits of the control register. The bit value "1" means input voltage is high and "0" menas input voltage is low.

Data Format :

Relay Output :

Bit	7	6	5	4	3	2	1	0
Iso. Input	DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0
Bit	15	14	13	12	11	10	9	8
Iso. Input	DI15	DI14	DI13	DI12	DI11	DI10	DI9	DI8

Note: bit#8~15 is for cPCI-7252 only

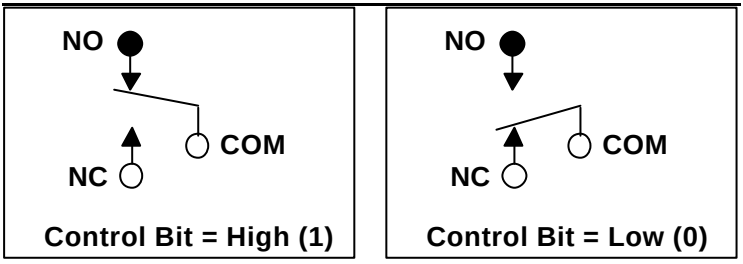
4

Operation Theorem

4.1 Using Relay Output

The PCI-7250 contains two types of relay : Form C and Form A. The relay R0 ~ R3 are form C relays, and R4 ~ R7 are plain form A type. Note that the cPCI-7252 contains Form C relay only. The difference between these two types of relay are :

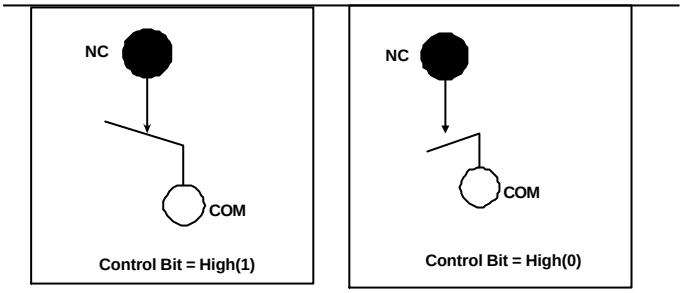
1. Form C Relay : (R0 ~ R3)



Form C relay has three contacts : NC (Normal Close), NO (Normal Open), and COM (Common). The COM post, located at the middle, can make contact either NO post or NC post. When the control bit is high (1), the COM post and NO post are contacted. If the control bit is low (0), the COM post and NC post make contact.

In normal power-up and reset, the relay is in ***low*** status.

2. Form A Relay : (R4 ~ R7)



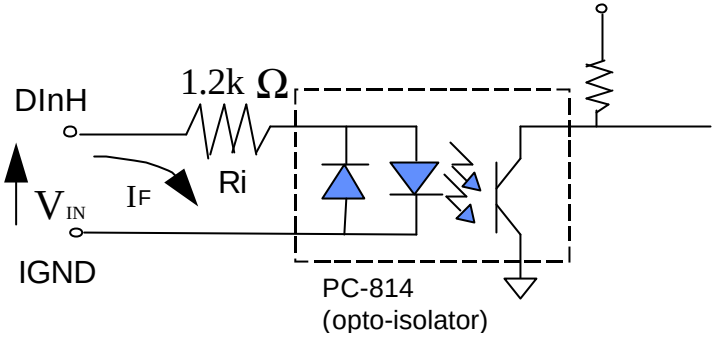
Form A relay only has two contacts : NC (Normal Close) and COM (Common). The COM post can m`ake contact either NO post or not contact NO post. When the control bit is high (1), the COM post and NO post are contacted. If the control bit is low (0), the COM post and NO post does not make contact.

In normal power-up and reset, the relay is in ***low*** status.

The relay output contacts are rated for a maximum of 0.5A at 120VAC (resistive), 1A 24VDC, or 0.3A 60VDC. You should reduce these ratings for inductive loads. For more detailed information of relay contact, please refer Appendix B.

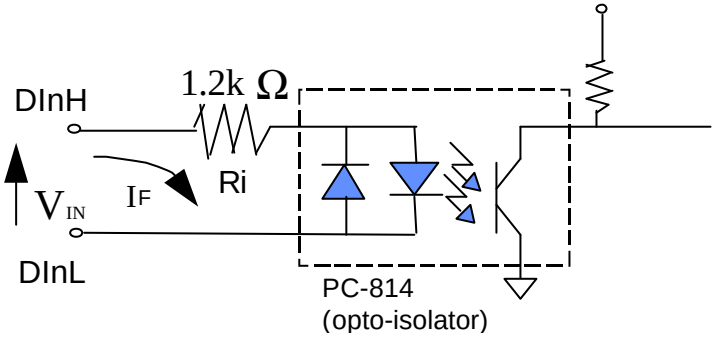
4.2 Using Isolated Input

The PCI-7250 (or PCI-7251) contains 8 identical opto-isolated control input channels. The circuit diagram of the isolated input channel is shown.



The digital input is first routed through a photo-coupler (PC-814), so that the connection are not polarity sensitive whether used on AC or DC voltage.

The cPCI-7252 contains 16 identical opto-isolated control input channels. The circuit diagram of the isolated input signales of channel number 8~15 are the same as which in PCI-7250. However, the input signals for channel number 0~7 is differential input which is shown in the following diagram.



In addition, a single-pole filter with a time constant about 5ms is used to filter when the AC inputs passed through.

The normal input voltage range for high state is 3 to 24VAC or DC. The normal input range can be extended by changing the resister (Ri) to limit the current (IF) through the PC-814 (opto-isolator to about 10mA . The exact

resister value to replace the original resister Ri (1.2K Ω) can be calculated by the following formula.

$$\mathbf{Vin = I_F \ X \ Ri}$$

$$\mathbf{Pw = Vin \ X \ I_F}$$

For example, if the input voltage is 110V, then the Ri should be replace by

Ri = 110 (V) / 0.01 (A) = 11 KΩ

Pw = 110 (V) X 0.01 (A) = 1.1 W

5

C/C++ Libraries

This chapter describes the software library for operating this card. Only the functions in DOS library and Windows 95 DLL are described. Please refer to the PCIS-DASK function reference manual, which included in ADLINK CD, for the descriptions of the Windows 98/NT/2000 DLL functions.

The function prototypes and some useful constants are defined in the header files LIB directory (DOS) and INCLUDE directory (Windows 95). For Windows 95 DLL, the developing environment can be Visual Basic 4.0 or above, Visual C/C++ 4.0 or above, Borland C++ 5.0 or above, Borland Delphi 2.x (32-bit) or above, or any Windows programming language that allows calls to a DLL. It provides the C/C++, VB, and Delphi include files.

5.1 Libraries Installation

Please refer to the "***Software Installation Guide***" for the detail information about how to install the software libraries for DOS, or Windows 95 DLL, or PCIS-DASK for Windows 98/NT/2000.

The device drivers and DLL functions of Windows 98/NT/2000 are included in the PCIS-DASK. Please refer the PCIS-DASK user's guide and function reference, which included in the ADLINK CD, for detailed programming information.

5.2 Programming Guide

5.2.1 Naming Convention

The functions of the NuDAQ PCI cards or NuIPC CompactPCI cards' software driver are using full-names to represent the functions' real meaning. The naming convention rules are:

In DOS Environment :

_{hardware_model}_{action_name}. **e.g. _6308_Initial().**

All functions in PCI-7250 driver are with 7250 as {hardware_model}. All functions in cPCI-7252 driver are with 7252 as {hardware_model}.

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_7252_Initial().**

5.2.2 Data Types

We defined some data type in Pci_7250.h (DOS) and Acl_pci.h (Windows 95). These data types are used by NuDAQ Cards' 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

5.3 Running Testing Utility (7250UTIL.EXE)

After finishing the DOS installation, you can execute the utility by typing as follows :

C> cd \ADLINK\7250\DOS\UTIL

(or “cd \ADLINK \7252\DOS\util” for cPCI-7252.)

C> 7250UTIL

the following diagram will be displayed on you screen. You can test the functionality of digital input and output.

The detailed description of each function are specified in the following sections.

5.4 725X Initial

@ Description

The PCI-7250 and cPCI-7252 cards are initialized according to the card number. Because the PCI-7250 is PCI bus architecture and meets the plug and play design, the ***IRQ*** and ***base_address*** (pass-through address) are assigned by system BIOS directly. Every PCI-7250 card has to be initialized by this function before calling other functions.

Note : Because configuration of PCI cards are handled by the system, there is no jumpers or IRQ selection on the PCI boards that need to be set up by the users.

@ Syntax

C/C++ (DOS)

```
U16   _7250_Initial   (U16   *existCards,   PCI_INFO
    *pciInfo)
U16   _7252_Initial   (U16   *existCards,   PCI_INFO
    *pciInfo)
```

C/C++ (Windows 95)

```
U16   W_7250_Initial   (U16   *existCards,   PCI_INFO
    *pciInfo)
U16   W_7252_Initial   (U16   *existCards,   PCI_INFO
    *pciInfo)
```

Visual Basic (Windows 95)

```
W_7250_Initial (existCards As Integer, pciInfo As
    PCI_INFO) As Integer
W_7252_Initial (existCards As Integer, pciInfo As
    PCI_INFO) As Integer
```

@ Argument

existCards : The number of installed PCI-7250 cards. The returned value shows how many PCI-7248 cards are installed in your system.

pciinfo: It is a structure to memorize the PCI bus plug and play initiallization 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_PCIBiosNotExist

5.5 _7250_DI, _7252_DI

@ Description

This function is used to read data from digital input port. There are 8-bit digital inputs on the PCI-7250 or PCI-7251 extended board. You can get all 32 input data from _7250_DI by using this function.

@ Syntax

C/C++ (DOS)

```
U16 _7250_DI (U16 cardNo, U16 diPortNo, U16 *diData)
U16 _7252_DI (U16 cardNo, U16 *diData)
```

C/C++ (Windows 95)

```
U16 W_7250_DI (U16 cardNo, U16 diPortNo, U16 *diData)
U16 W_7252_DI (U16 cardNo, U16 *diData)
```

Visual Basic (Windows 95)

```
W_7250_DI (ByVal cardNo As Integer, ByVal diPortNo As Integer, diData As Integer) As Integer
W_7252_DI (ByVal cardNo As Integer, diData As Integer) As Integer
```

@ Argument

cardNo : card number to select borad

diPortNo : Digital Input Channel No, the constant is

Note: This argument is not necessary for cPCI-7252.

```
DI_PORT0    0x00    Access the 8 Digital Input of PCI-7250
DI_PORT1    0x01    Access the 8 Digital Input of
                    Expansion Board PCI-7251#1
DI_PORT2    0x02    Access the 8 Digital Input of
                    Expansion Board PCI-7251#2
DI_PORT3    0x03    Access the 8 Digital Input of
                    Expansion Board PCI-7251#3
```

diData : return 8-bit value from digital port.

@ Return Code

```
ERR_NoError
ERR_BoardNoInit
```

5.6 _7250_DO, _7252_DO

@ Description

This function is used to write data to digital output port which can energized RELAY ON/OFF. There are 8 digital outputs on the PCI-7250 or PCI-7251 extended board. You can control all 32 RELAYs through _7250_DO by using this function.

@ Syntax

C/C++ (DOS)

```
U16  _7250_DO  (U16  cardNo,  U16  doPortNo,  U16
    doData)
U16 _7252_DO (U16 cardNo, U16 doData)
```

C/C++ (Windows 95)

```
U16  W_7250_DO  (U16  cardNo,  U16  doPortNo,  U16
    doData)
U16 W_7252_DO (U16 cardNo, U16 doData)
```

Visual Basic (Windows 95)

```
W_7250_DO (ByVal cardNo As Integer, ByVal doPortNo
    As  Integer,  ByVal  doData  As  Integer)  As
    Integer
W_7252_DO (ByVal cardNo As Integer, ByVal doData
    As Integer) As Integer
```

@ Argument

cardNo : card number to select borad

doChannelNo : Digital Output Channel No, the constant is

Note: This argument is not necessary for cPCI-7252.

```
DI_PORT0    0x00    Access the 8 Digital Input of
    PCI-7250
DI_PORT1   0x01   Access the 8 Digital Input of
           Expansion Board PCI-7251#1
DI_PORT2   0x02   Access the 8 Digital Input of
           Expansion Board PCI-7251#2
DI_PORT3   0x03   Access the 8 Digital Input of
           Expansion Board PCI-7251#3
```

doData : value will be written to digital output port

@ Return Code

ERR_NoError, ERR_BoardNoInit

5.7 _7250_DO_Read_Back, _7250_DO_ReadRelay

@ Description

This function is used to read-back data from digital output port which is control by 725X_DO function. There are 8-bit digital outputs on the PCI-7250, cPCI-7252, or PCI-7251 extended board. You can get back all RELAYs status (ON or OFF) by using this function.

@ Syntax

C/C++ (DOS)

```
U16    _7250_DO_Read_Back    (U16    cardNo,    U16
    doChannelNo, U8 *doReadBackData)
U16    _7252_DO_ReadRelay    (U16    cardNo,    U16
    doReadBackData)
```

C/C++ (Windows 95)

```
U16    W_7250_DO_Read_Back    (U16    cardNo,    U16
    doChannelNo, U16 *doReadBackData)
U16    W_7252_DO_ReadRelay    (U16    cardNo,    U16
    *doReadBackData)
```

Visual Basic (Windows 95)

```
W_7250_DO_Read_Back  (ByVal  cardNo  As  Integer,
    ByVal doChannelNo As Integer, doReadBackData
    As Integer) As Integer
W_7252_DO_ReadRelay  (ByVal  cardNo  As  Integer,
    doReadBackData As Integer) As Integer
```

@ Argument

cardNo : card number to select borad

doChannelNo : Digital Output Channel No, the constant is

Note: This argument is not necessary for cPCI-7252.

```
DI_PORT0    0x00    Access the 8 Digital Input of
    PCI-7250
DI_PORT1   0x01   Access the 8 Digital Input of
           Expansion Board PCI-7251#1
DI_PORT2   0x02   Access the 8 Digital Input of
           Expansion Board PCI-7251#2
DI_PORT3   0x03   Access the 8 Digital Input of
           Expansion Board PCI-7251#3
```

diReadBackData : value read back from digital output port

@ Return Code

ERR_NoError, ERR_BoardNoInit

5.8 _7251_Check_Exist

@ Description

This function is used to check the exist of PCI-7251 expanded board. For normal configuration, each PCI-7250 can be connected with three expanded PCI-7251 boards. This function can be used to check if each of the PCI-7251 is existed or not.

@ Syntax

C/C++ (DOS)

```
U16 _7251_Check_Exist
    (U16 cardNo, U16 extnesionBoardNo)
```

C/C++ (Windows 95)

```
U16 _7251_Check_Exist
    (U16 cardNo, U16 extnesionBoardNo)
```

Visual Basic (Windows 95)

```
W_7251_Check_Exist (ByVal cardNo As Integer, ByVal
    extensionBoardNo As Integer) As Integer
```

@ Argument

cardNo : card number to select borad

existBoardNo : Extension PCI-7251 No.

```
PCI_7251_EX1   0x01  PCI-7251 Board #1
PCI_7251_EX2   0x02  PCI-7251 Board #2
PCI_7251_EX3   0x03  PCI-7251 Board #3
```

@ Return Code

```
PCI_7251_EXIST        1
PCI_7251_NOT_EXIST    0
```

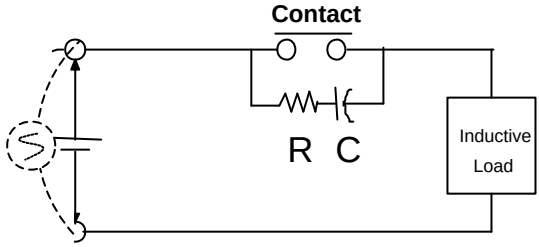
Appendix A.Relay Contact Protection Circuits

The contacts are the most important elements of relay constructions, Contact performance conspicuously influenced by contact material, and voltage and current values applied to the contacts.

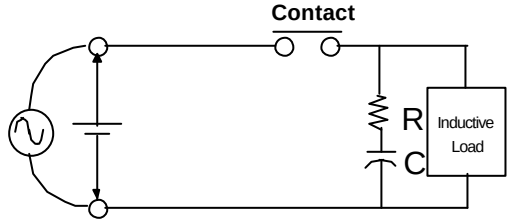
Another important issue is contact protection, a right contact protection circuit can suppress the counter emf to a low level. However, note that incorrect use will result in an adverse effect. Typical contact protection circuits are given below :

1. RC Circuit

This circuit is suitable for DC application. If the load is a timer, leakage current flows through the RC circuit causing faulting operation.



The below circuit is suitable for both AC and DC applications. If the load is a relay or solenoid, the release time lengthens. Effective when connected to both contacts if the power supply voltage is 24V or 48V and the voltage cross the load is 100 to 200V.



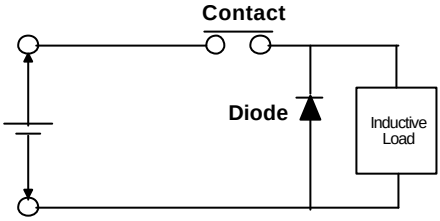
Device Selection:

As a guide in selecting R and C,
R : 0.5 to 1 Ω per 1V contact voltage
C : 0.5 to 1 μF per 1A contact current

Value vary depending on the properties of the capacity C acts to suppress the discharge the moment the contacts open. Resistor R acts to limit the current when the power is turned on the next time. Test to confirm. Use a capacitor with a breakdown voltage of 200 to 300V. Use AC type capacitors (non-polarized) for AC circuits.

2. Diode Circuit

This circuit is suitable for DC application. The diode connected in parallel causes the energy stored in the coil to flow to the coil in the form of current and dissipates it as joule heat at the resistance component of the inductive load. This circuit further delays the release time compared to the RC circuit.

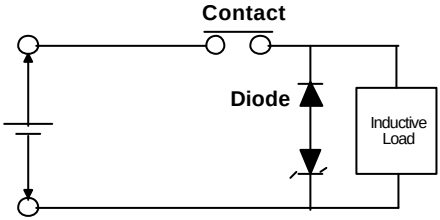


Device Selection:

Use a diode with a reverse breakdown voltage at least 10 times the circuit voltage and a forward current at least as large as the load current. In electronic circuits where the circuit voltages reverse breakdown voltage of above 2 to 3 times the power supply voltage.

3. Diode & Zener diode Circuit

This circuit is also suitable for DC application. Effective when the release time i the diode circuit is too long.

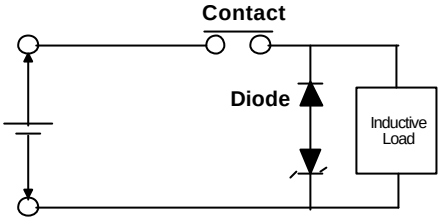


Device Selection:

Use a zener diode with a zener voltage about the same as the power supply voltage.

4. Varistor Circuit

This circuit is also suitable for both AC & DC applications. Using the stable voltage characteristics of the varistor, this circuit prevents excessively high voltages from being applied across the contacts. This circuit also slightly delays the release time. Effective when connected to both contacts of the power supply voltage is 24 or 48V and the voltage across the load is 100 to 200 V.



Product Warranty/Service

ADLINK warrants that equipment furnished will be free from defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, we shall, at our option, either repair or replace any product that proves to be defective under normal operation.

This warranty shall not apply to equipment that has been previously repaired or altered outside our plant in any way as to, in the judgment of the manufacturer, affect its reliability. Nor will it apply if the equipment has been used in a manner exceeding its specifications or if the serial number has been removed.

ADLINK does not assume any liability for consequential damages as a result from our product uses, and in any event our liability shall not exceed the original selling price of the equipment. The remedies provided herein are the customer's sole and exclusive remedies. In no event shall ADLINK be liable for direct, indirect, special or consequential damages whether based on contract of any other legal theory.

The equipment must be returned postage-prepaid. Package it securely and insure it. You will be charged for parts and labor if the warranty period is expired or the product is proves to be misuse, abuse or unauthorized repair or modification.