PCI-7250/7251, cPCI-7252

NuIPC / NuDAQ

Relay Actuator & Isolated D/I Cards

User's Manual

Manual Rev. 2.00

Revision Date: January 10, 2005

Part No: 50-11105-103

Recycled Paper

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Advance Technologies; Automate the World.

Copyright 2005 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

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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: Chipset:	 CPU: Bios:

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Table of Contents

Table of Contents i

List of Tables iv

List of Figures v

1 Introduction 1
- 1.1 Features 2
- 1.2 Applications 2
- 1.3 Specifications 3
  - Digital input 3
  - Relay Output 3
  - General Specifications 4
  - Power Consumption 4
- 1.4 Software Support 5
  - Programming Library 5
  - PCIS-LVIEW: LabVIEW® Driver 6
  - PCIS-VEE: HP-VEE Driver 6
  - DAQBenchTM: ActiveX Controls 6
  - PCIS-DDE: DDE Server and InTouchTM 6
  - PCIS-ISG: ISaGRAFTM driver 6
  - PCIS-ICL: InControlTM Driver 7
  - PCIS-OPC: OPC Server 7

2 Installation 9
- 2.1 Unpacking Checklist 9
- 2.2 PCB Layout 10
  - PCI-7250 PCB Layout 10
  - cPCI-7252 PCB Layout 11
- 2.3 Input Signal Jumper Setting 12
- 2.4 Hardware Installation Outline 13
  - PCI Configuration 13
  - PCI Slot Selection 13
  - Installation Procedures 13
- 2.5 Device Installation for Windows Systems 14
- 2.6 Connector Pin Assignments 14
  - PCI-7250/51 Pin Assignment 14
  - cPCI-7252 Pin Assignment 16

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.7 PCI-7250 and PCI-7251 Connection 17

3 Registers 19
3.1 PCI PnP Registers 19
3.2 I/O Address Map 20
3.3 Relay Output and Readback Registers 20
3.4 Isolation Input Registers 21

4 Operation Theory 23
4.1 Using Relay Output 23
4.2 Using Isolated Input 25

5 C/C++ Libraries 27
5.1 Libraries Installation 27
5.2 Programming Guide 27
Naming Convention 27
Data Types 28
5.3 Running Testing Utility (7250UTIL.EXE) 28
5.4 725X Initialization 30
@ Description 30
@ Syntax 30
@ Arguments 30
@ Return Code 31
5.5 _7250_DI, _7252_DI 32
@ Description 32
@ Syntax 32
@ Arguments 32
@ Return Code 33
5.6 _7250_DO, _7252_DO 34
@ Description 34
@ Syntax 34
@ Arguments 34
@ Return Code 35
5.7 _7250_DO_Read_Back, _7252_DO_ReadRelay 35
@ Description 35
@ Syntax 35
@ Arguments 35
@ Return Code 36
5.8 _7251_Check_Exist 37
@ Description 37

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@ Syntax 37
@ Argument 37
@ Return Code 37

Appendix..... 39
Relay Contact Protection Circuits 39
RC Circuit 39
Diode Circuit 40
Diode & Zener diode Circuit 41
Varistor Circuit 41

Warranty Policy..... 43

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

List of Tables

Table 1-1: Digital Input Specifications 3
Table 1-2: Relay Output Specifications 3
Table 1-3: General Specifications 4
Table 1-4: Power Consumption Specifications 4
Table 2-1: Jumpers and DI Channels 12
Table 2-2: Input Signal Selection Jumper Settings 12
Table 2-3: CN1 - PCI-7250/51 Pin Assignment 15
Table 2-4: CN1 - cPCI-7252 Pin Assignment 16
Table 3-1: PCI-7250 Address Map with PCI-7251 Installed 20
Table 3-2: cPCI-7252 Address Map 20
Table 3-3: Data Format of Relay Output and Readback Status Registers 21
Table 3-4: Relay Output 21
Table 5-1: Data Types 28

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

List of Figures

Figure 2-1: PCI-7250 Layout 10
Figure 2-2: cPCI-7252 Layout 11
Figure 2-3: CN1 - D Type Connector 14
Figure 2-4: Connection between PCI-7250 and PCI-7251 17
Figure 4-1: Form C Relay 23
Figure 4-2: Form A Relay 24
Figure 4-3: PCI-7250 Differential Input Circuit 25
Figure 4-4: cPCI-7252 Isolated Input Circuit 25

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1 Introduction

The PCI-7250/7251 and cPCI-7252 Relay Actuator and Isolated D/I cards are basic Digital I/O cards for PCI bus compliant computers used in industrial applications.

This PCI-7250 and PCI-7251 provides 8 relay actuators and 8 opto-isolated digital inputs. Of the eight relays, four are Form C (R0~R3) and four are Form A (R4~R7). The cPCI-7252 provides 8 relay actuators and 16 opto-isolated digital inputs; all relays are Form C. They are very suited for constant ON/OFF control devices. For convenience the above models will be referred to as PCI-725X in this manual.

All channels are isolated and suitable for collecting digital input signals in a noisy environment. For identical non-polarized opto-isolated digital input channels, switching can be carried out using AC-filtered or non-AC-filtered channels.

A LED reflects the status of each relay output. When a 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 addresses. When a bit is read or written, its output status will be controlled, or its input status will be monitored. The I/O signals are routed through to a 37-pin D-type connector that protrudes through the computer case at the rear.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.1 Features

The PCI-725X Relay Actuator and D/I card provides the following advanced features:

- 32-bit PCI-Bus, Plug and Play (PCI-7250)
- 32-bit CompactPCI® Bus, Plug and Play (cPCI-7252)
- 8 relay actuator outputs
- 8 opto-isolated digital inputs (PCI-7250)
- 16 opto-isolated digital inputs (cPCI-7252)
- LED indicators to show energized 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 attaches to a PCI-7250 card. Each PCI-7251 card provides an additional 8 relay output and 8 photo isolated input signals. Up to three PCI-7251 cards can be attached to one PCI-7250 card to 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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.3 Specifications

Digital input

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

Table 1-1: Digital Input Specifications

Relay Output

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

Table 1-2: Relay Output Specifications

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

General Specifications

Dimensions	▶ 162mm x 107mm for PCI-7250 ▶ 141mm x 102mm for PCI-7251 ▶ 160mm x 100mm for cPCI-7252
Bus	32-bit PCI bus
Operating temperature	0 - 60ºC (Operating)
Storage temperature	-20ºC - 80ºC (Operating)
Humidity	5 to 90% non-condensing

Table 1-3: General Specifications

Power Consumption

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

Table 1-4: Power Consumption Specifications

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.4 Software Support

ADLINK provides versatile software drivers and packages to address different approaches to building a system. We not only provide programming libraries such as DLLs for many Windows systems, but also provide drivers for many software packages such as LabVIEW®, HP VEETM, DASYLabTM, InTouchTM, InControlTM, ISaGRAFTM, etc.

All software options are included in the ADLINK CD. Non-free software drivers are protected with licensing codes. Without the software code, you can install and run the demo version for two hours for trial/demonstration purposes. Please contact ADLINK dealers to purchase a formal license.

Programming Library

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

- DOS Library: For 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: Included device drivers and DLL for Windows 98, Windows NT and Windows 2000. A DLL is a 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" for installation procedures.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

PCIS-LVIEW: LabVIEW® Driver

PCIS-LVIEW contains VIs that are used to interface with the LabVIEW® software package. PCIS-LVIEW supports Windows 95/98/NT/2000. The LabVIEW® drivers are shipped free with the board. You can install and use them without a license. For more information about PCIS-LVIEW, please refer to the user's guide in the CD (\\Manual_PDF\Software\PCIS-LVIEW).

PCIS-VEE: HP-VEE Driver

PCIS-VEE includes user objects, which are used to interface with the HP VEE software package. PCIS-VEE supports Windows 95/98/NT. The HP-VEE drivers are shipped free with the board. For more information about PCIS-VEE, please refer to the user's guide in the CD (\\Manual_PDF\Software\PCIS-VEE).

DAQBenchTM: ActiveX Controls

Customers familiar with ActiveX controls and VB/VC++ programming can use the DAQBenchTM ActiveX Control component library for developing applications. DAQBenchTM is designed for Windows NT/98. For more information about DAQBench, please refer to the user's guide in the CD (\\Manual_PDF\Software\DAQBench\DAQBench Manual.PDF).

PCIS-DDE: DDE Server and InTouchTM

DDE stands for Dynamic Data Exchange. 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: ISaGRAFTM driver

ISaGRAF WorkBench is an IEC1131-3 SoftPLC control program development environment. PCIS-ISG includes ADLINK product drivers for ISaGRAF under the Windows NT environment. PCIS-ISG is included in the ADLINK CD and license is required to use the drivers.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

PCIS-ICL: InControlTM Driver

PCIS-ICL is the InControl driver which supports Windows NT. PCIS-ICL is included in the ADLINK CD and license is required to use the drivers.

PCIS-OPC: OPC Server

PCIS-OPC is an OPC Server that can link with OPC clients. There are several software packages on the market which can provide OPC clients. PCIS-OPC supports Windows NT and requires a license to operate.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2 Installation

This chapter describes how to install and setup the 725X cards. Jumper settings for the digital input channel configurations (AC-filter or Non-AC-filter) and the signal definitions of the 37-pins connectors are also specified.

2.1 Unpacking Checklist

Check the shipping carton for any damage. If the shipping carton and contents are damaged, notify the dealer for a replacement. Retain the shipping carton and packing materials for inspection by the dealer. Obtain authorization before returning any product to ADLINK.

Check the following items are included in the package, if there are any items missing, please contact your dealer:

Included 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
- This User's Manual

Note: The packaging of OEM versions with non-standard configuration, functionality, or package may vary according to different configuration requests.

CAUTION: The boards must be protected from static discharge and physical shock. Never remove any of the socketed parts except at a static-free workstation. Use the anti-static bag shipped with the product to handle the board. Wear a grounded wrist strap when servicing

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.2 PCB Layout

PCI-7250 PCB Layout

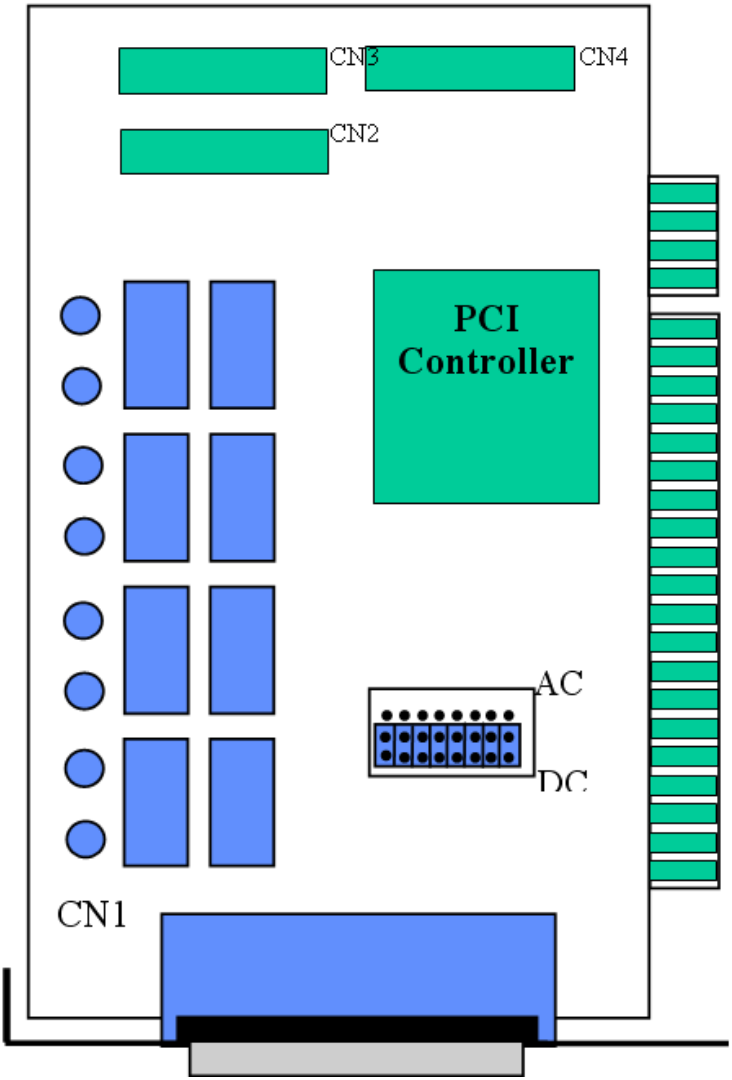


Figure 2-1: PCI-7250 Layout

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

cPCI-7252 PCB Layout

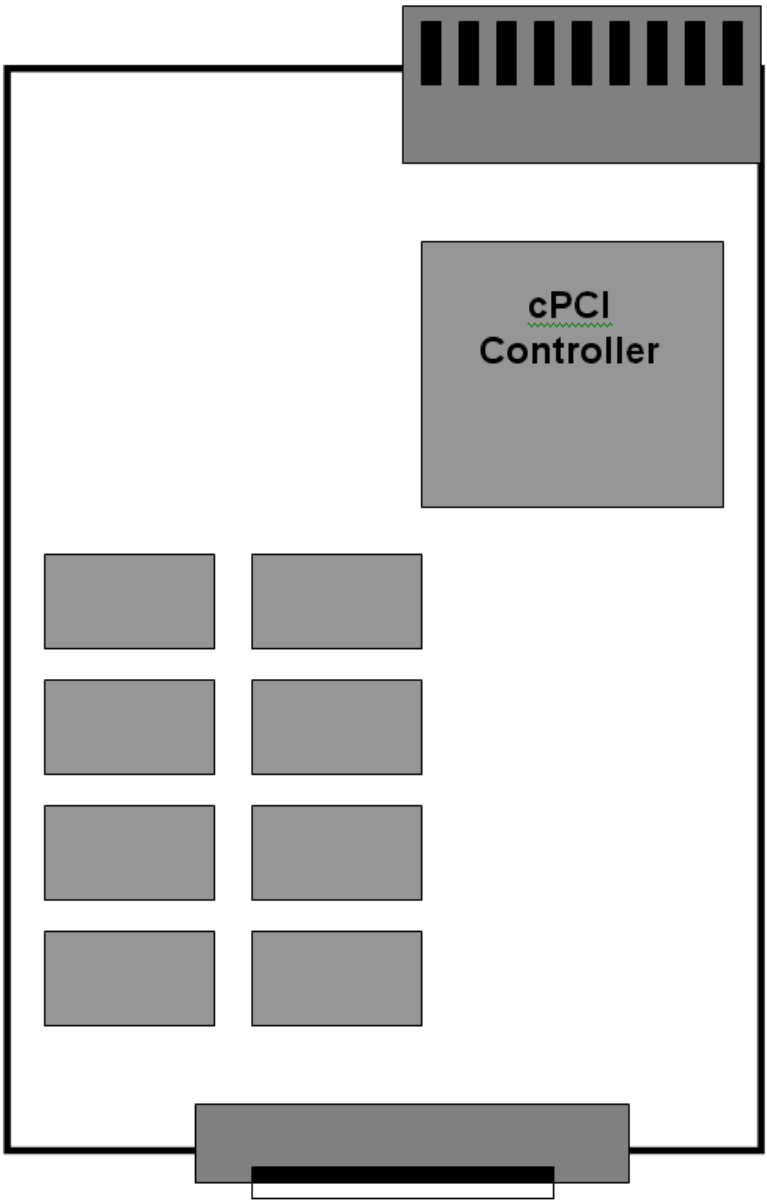


Figure 2-2: cPCI-7252 Layout

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3 Input Signal Jumper Setting

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

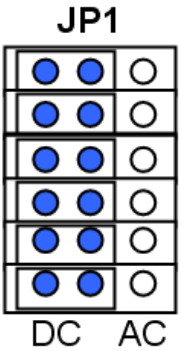
There are 8 jumpers (JP1 to JP8) on the PCI-7250 and PCI-7251; each associated with one digital input to configure that channel as either AC-Filtered or Non-AC-Filtered. Digital input channels and corresponding jumpers are listed in the table below

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

Table 2-1: Jumpers and DI Channels

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

JP1



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 Settings

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.4 Hardware Installation Outline

PCI Configuration

PCI cards (or CompactPCI cards) are equipped with plug and play PCI controllers which can request base addresses and interrupts according to the PCI standard. The system BIOS will assign the system resources based on the PCI card configuration registers and system parameters (which are set by the system BIOS). Interrupt assignment and memory usage (I/O port locations) can only be assigned by the system BIOS. 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 into any PCI slot without any configuration of the system resources. The CompactPCI card can also be inserted into any CompactPCI I/O slot.

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 shorter 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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.5 Device Installation for Windows Systems

Once Windows 95/98/2000 has started, the Plug and Play functions of the Windows system will find and locate the new NuDAQ/NuIPC card. If this is the first time a NuDAQ/NuIPC card is installed in your Windows system, you will be prompted to input the device information source. Please refer to the “Software Installation Guide” for installation procedures for the device drivers.

2.6 Connector Pin Assignments

PCI-7250/51 Pin Assignment

The PCI-7250 card comes equipped with a 37-pin D type connector (CN1) accessible from the rear of the card. The pin assignment of the D type connector is shown in below.

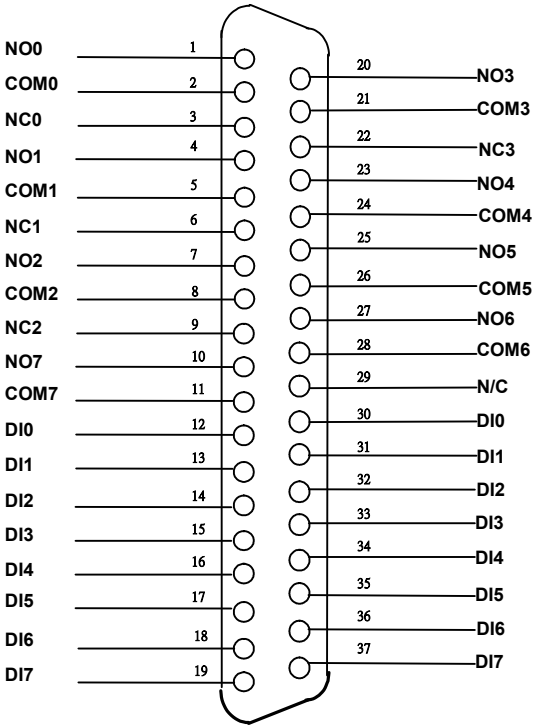


Figure 2-3: CN1 - D Type Connector

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Legend	
Din:	Digital input low, channel n (input signal Is not polarity sensitive)
NC n:	Normal close pin of relay n
NO n:	Normal open pin of relay n
COM n:	Common pin of relay n
N/C:	No connection

Table 2-3: CN1 - PCI-7250/51 Pin Assignment

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

cPCI-7252 Pin Assignment

Signal	Pin	Pin	Signal
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
D2IL	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

Table 2-4: CN1 - cPCI-7252 Pin Assignment

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Legend	
Din:	Digital input channel n
IGND:	Ground of DIn signals
DinH:	Digital input channel n with positive polarity
DinL:	Digital input channel n with negative polarity
NC n:	Normal close pin of relay n
NO n:	Normal open pin of relay n
COM n:	Common pin of relay n

2.7 PCI-7250 and PCI-7251 Connection

There are 8-relay outputs and 8-isolation inputs on both the PCI-7250 and PCI-7251. The PCI-7251 is used as an expansion for the PCI-7250. The operations of the PCI-7251 are the same as that of the PCI-7250. There can be at most 3 PCI-7251 expansion boards to one PCI-7250. Therefore, the PCI-7250 can control up to 32 relays and detect 32 input signals.

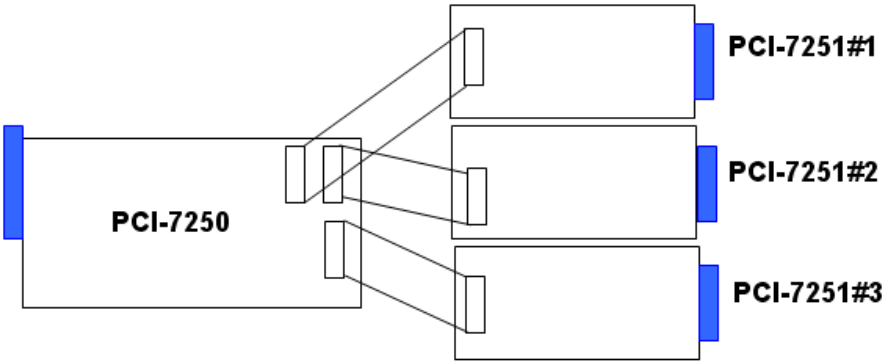


Figure 2-4: Connection between PCI-7250 and PCI-7251

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3 Registers

Detailed descriptions of the registers are specified in this chapter. This information is useful for programmers who wish to control the card with low-level programming. However, we suggest users fully understand the PCI interface before starting any low-level programming. In addition, the contents of this chapter will also help users understand how to use the software drivers to configure 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 PCI-bus specification compliant, is initialized and controlled by the Plug and Play (PnP) PCI BIOS. Users may obtain more information on the PCI BIOS specification to better understand the operation of the PCR. Please contact PCISIG to acquire PCI interface specifications.

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

The 725X registers are discussed in the next section. The base address, which is also assigned by the PCI PnP BIOS, is located at an offset of 18h from the PCR. Therefore, users can read the address 18h from the PCR to obtain its base address by using the BIOS function call. Do not attempt to modify the base address and interrupt that have been assigned by the PCI PnP BIOS, it may cause resource conflicts with your system.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.2 I/O Address Map

All 725X registers are 8 bits long. Users can access these registers using 8-bit I/O instructions. Using these registers will allow the relays and status of the inputs to be controlled. The following table shows the registers address map, including descriptions and their offset addresses relative to the base address. If the PCI-7251 expansion boards are not installed, corresponding registers have no significance.

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 3-1: PCI-7250 Address Map with PCI-7251 Installed

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

Table 3-2: cPCI-7252 Address Map

3.3 Relay Output and Readback Registers

There are 8 relays on each PCI-7250 / 7251 and cPCI-7252 board. Each relay is controlled by one bit in the control register. Bit value ‘0’ means the relay is not energized. The normal open signal line is ‘open’. Bit value ‘1’ means the relay is energized and the normal open signal line is now closed.

The initial bit values of the control register are all ‘0’ and the status of the relay can be readback from the readback register. If the

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

relay is open, the corresponding bit value read is ‘0’. If the relay is closed, the bit value read is ‘1’.

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

Table 3-3: Data Format of Relay Output and Readback Status Registers

3.4 Isolation Input Registers

There are 8 isolated input channels on the PCI-7250 / 7251 board. The status of the 8 channels can be read from the isolation input register. Each bit corresponds to each channel. Bit value “1” means input voltage is high and “0” means input voltage is low.

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

Table 3-4: Relay Output

Note: Bits 8-15 are for cPCI-7252 only

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4 Operation Theory

4.1 Using Relay Output

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

1. Form C Relay: (R0 - R3)

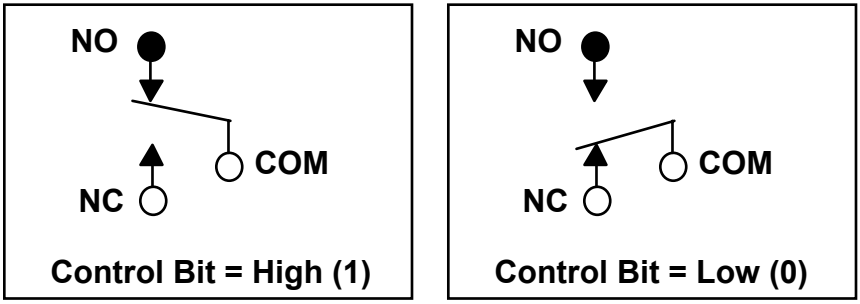


Figure 4-1: Form C Relay

Form C type relays have three contacts: NC (Normal Close), NO (Normal Open), and COM (Common). The COM post, located at the middle, must make contact with either the NO post or NC post. When the control bit is high (1), there is contact between the COM post and NO post. If the control bit is low (0), there is contact between the COM post and NC post.

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2. Form A Relay: (R4 - R7)

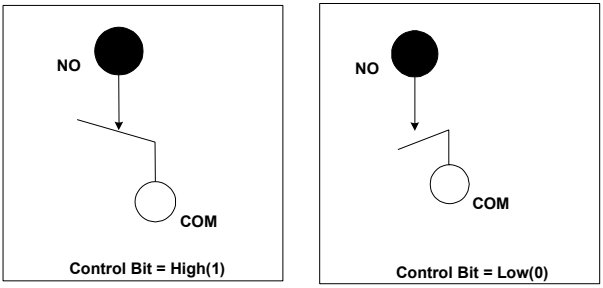


Figure 4-2: Form A Relay

Form A relay only has two contacts: NO (Normal Open) and COM (Common). The COM post can make contact either with the NO post or not. 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 at a maximum of 0.5A at 120VAC (resistive), 1A 24VDC, or 0.3A 60VDC. You should reduce these ratings for inductive loads. For more information on relay contact, please refer to the Appendix.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.2 Using Isolated Input

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

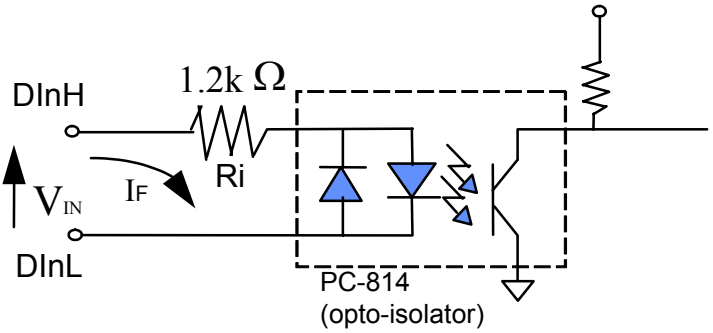


Figure 4-3: PCI-7250 Differential Input Circuit

The digital input is first routed through a photo-coupler (PC-814), which is shown in the following diagram.

The cPCI-7252 contains 16 identical opto-isolated control input channels. The circuit diagram of the differential input signals of channel number 0-7 are the same as of the PCI-7250. While the input signals for channel numbers 8-15 are isolated inputs, the connection is not polarity sensitive whether AC or DC voltage is used.

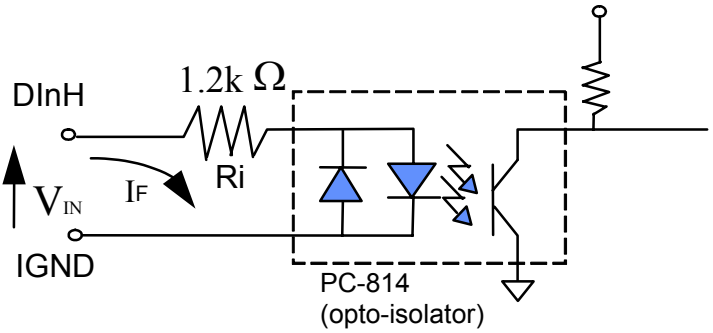


Figure 4-4: cPCI-7252 Isolated Input Circuit

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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

The normal input voltage range for an active 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 (1.2KΩ) can be calculated by the following formula.

```
Vin = IF x Ri
Pw = Vin x IF
```

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
```

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5 C/C++ Libraries

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

The function prototypes and useful constants are defined in the header files located in the LIB directory (DOS) and INCLUDE directory (Windows 95). For the 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.

5.1 Libraries Installation

Refer to the “Software Installation Guide” for information regarding software installation of libraries for DOS, Windows 95 DLL, or PCIS-DASK for Windows 98/NT/2000.

The device drivers and DLL functions for Windows 98/NT/2000 are included in the PCIS-DASK. Refer to the PCIS-DASK user’s guide and function reference, which is included in the ADLINK CD, for programming information.

5.2 Programming Guide

Naming Convention

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

In a DOS Environment:

`_{hardware_model}_{action_name}.`
e.g. `_7250_Initial().`

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

In order to recognize the difference between the DOS library and Windows 95 library, a capital "W" is placed at the start of each function name for Windows 95 DLL drivers. e.g. **`W_7252_Initial()`**.

Data Types

We have defined some data types in the Pci_7250.h (DOS) and Acl_pci.h (Windows 95) header files. These data types are used by the NuDAQ card library. We recommend you 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 long integer	-2147483648 to 2147483647
U32	32-bit unsigned long integer	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

Table 5-1: Data Types

5.3 Running Testing Utility (7250UTIL.EXE)

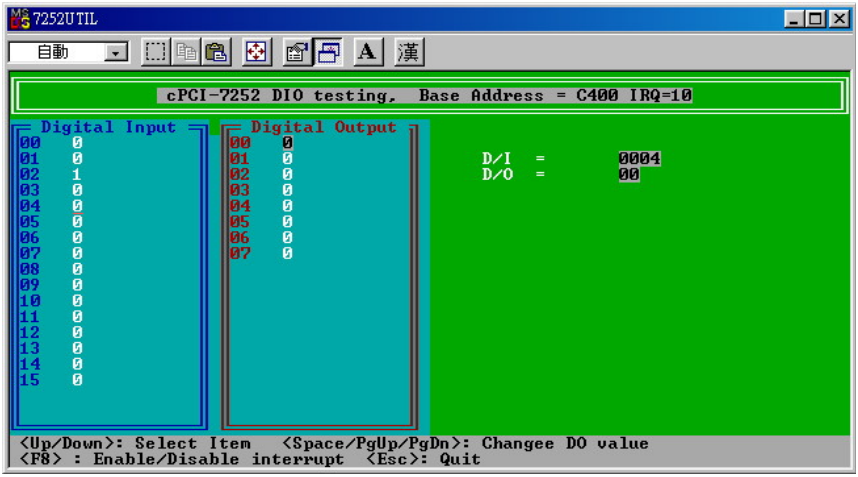
After finishing the DOS installation, you can execute the utility by typing the following command:

The following:

```
C> cd\ADLINK\7252\DOS\UTIL
("cd\ADLINK\7250\DOS\util" for PCI-7250)
C> 7252UTIL
```

The following interface will be displayed on the screen.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



You can use this program to test the functionality of the digital inputs and outputs.

A detailed description of each function is specified in the proceeding sections.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.4 725X Initialization

@ Description

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

Note: Because the configuration of PCI card is handled by the system, there are no jumpers or IRQ selection on the PCI board that needs 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
```

@ Arguments

`existCards`: The number of installed PCI-7250 cards. The returned value shows how many PCI-7250 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 the P&P BIOS. The PCI_INFO structure is defined in ACL_PCI.H. The base I/O

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

addresses and the interrupt channel number are stored in pciinfo, which is for reference.

@ Return Code

```
ERR_NoError, ERR_PCIBiosNotExist
```

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.5 _7250_DI, _7252_DI

@ Description

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

@ Arguments

cardNo: card number selected

diPortNo: Digital Input Channel No, the constant is:.

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

Note: This argument is not necessary for cPCI-7252

diData: return 8-bit value from digital port.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@ Return Code

ERR_NoError
ERR_BoardNoInit

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5.6 _7250_DO, _7252_DO

@ Description

This function is used to write data to the digital output port. This energizes or de-energizes the RELAY. There are 8 digital outputs on the PCI-7250 or PCI-7251 extended board. You can control all 32 RELAY's through using the _7250_DO 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
```

@ Arguments

cardNo: card number selected

doChannelNo: Digital Output Channel No, the constant is:.

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

Note: This argument is not necessary for cPCI-7252

doData: value will be written to digital output port

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

@ Return Code

ERR_NoError, ERR_BoardNoInit

5.7 _7250_DO_Read_Back, _7252_DO_ReadRelay

@ Description

This function is used to read-back data from the digital output port which is control by the 725X_DO function. There are 8-bit digital outputs on the PCI-7250, cPCI-7252, or PCI-7251 extended board. You can readback all RELAY status (High or Low) 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
```

@ Arguments

cardNo: card number selected

doChannelNo: Digital Output Channel No, the constant is:

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

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

DI_PORT3	0x03	Access the 8 Digital Input of Expansion Board PCI-7251#3

Note: This argument is not necessary for cPCI-7252

`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 existence of the PCI-7251 expanded board. For normal configuration, each PCI-7250 can be connected with up to three PCI-7251 boards. This function is used to detect the presence of the PCI-7251.

@ 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
```

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Appendix

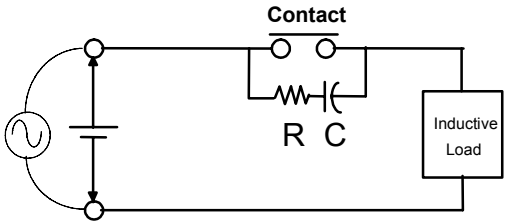
Relay Contact Protection Circuits

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

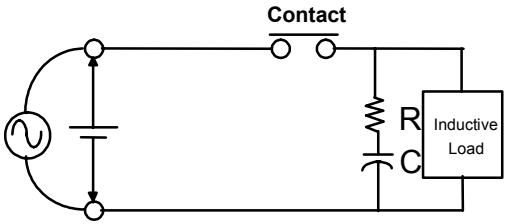
Another important issue is contact protection; the right contact protection circuit can suppress the counter EMF to a low level. However, note that incorrect use will result in an adverse effect. Typical contact protection circuits are given below:

RC Circuit

This circuit is suitable for DC applications. If the load is a timer, leakage current flow through the RC circuit may cause faulty operation.



The circuit below is suitable for both DC and AC applications. If the load is a relay or solenoid, the release time is lengthened. 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.



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Device Selection:

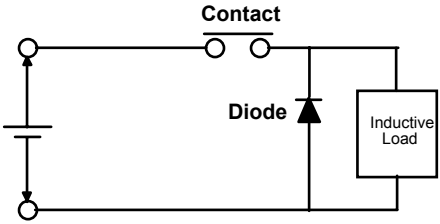
As a guide in selecting R and C,

- R: 0.5 to 1Ω per 1V contact voltage
- C: 0.5 to 1μF per 1A contact current

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

Diode Circuit

This circuit is suitable for DC applications. 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 resistive component of the inductive load. This circuit further delays the release time compared to the RC circuit.



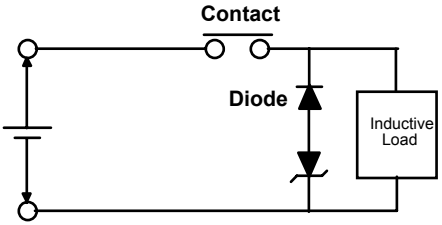
Device Selection:

Use a diode with a reverse breakdown voltage of at least 10 times the circuit voltage and a forward current at least as large as the load current.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Diode & Zener diode Circuit

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

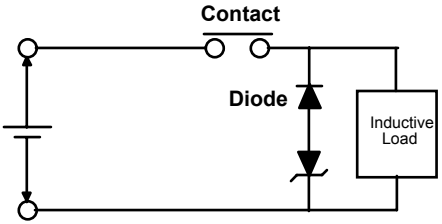


Device Selection:

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

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 if the power supply voltage is 24V or 48V and the voltage cross the load is 100 to 200V.



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

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.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000