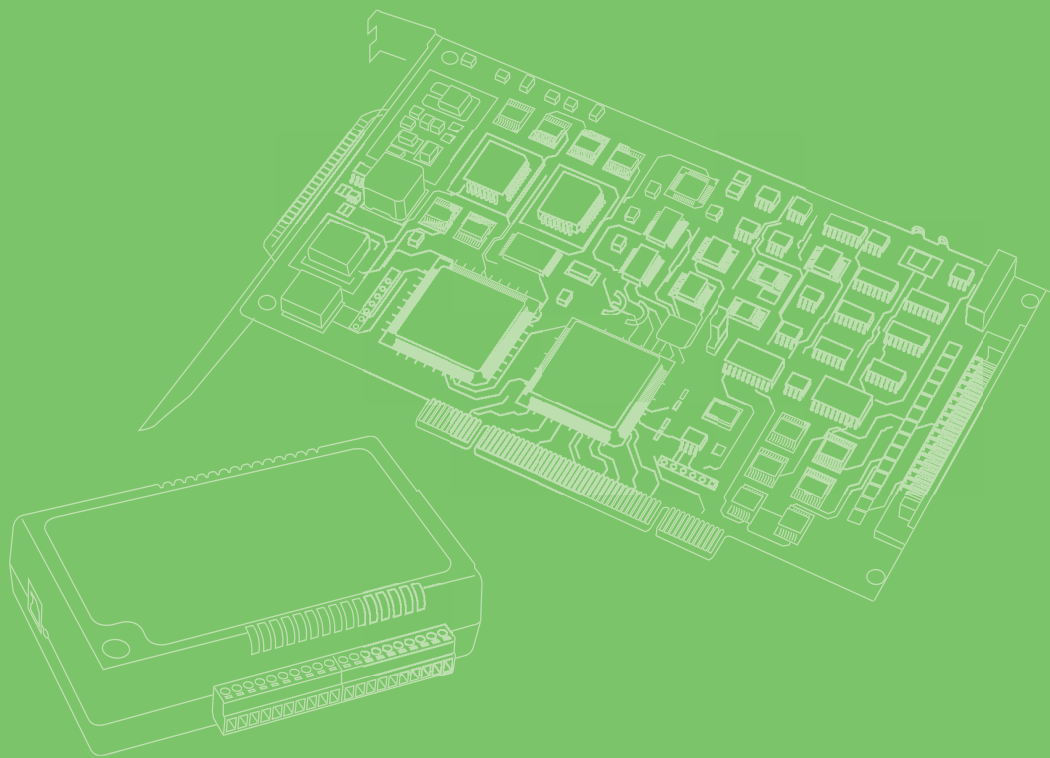


User Manual



PCI-1762

16-ch Relay & 16-ch Isolated
Digital Input PCI Card

ADVANTECH

Enabling an Intelligent Planet

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2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
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CE

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

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1. Visit the Advantech web site at www.advantech.com/support where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions, which if not observed, can cause personal injury!*



Caution! *Cautions are included to help you avoid damaging hardware or losing data. e.g.*



There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Note! *Notes provide optional additional information.*



Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
 15. The power cord or plug is damaged.
 16. Liquid has penetrated into the equipment.
 17. The equipment has been exposed to moisture.
 18. The equipment does not work well, or you cannot get it to work according to the user's manual.
 19. The equipment has been dropped and damaged.
 20. The equipment has obvious signs of breakage.
21. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
22. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**
23. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

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Chapter 1

Overview

1.1 Introduction

Thank you for buying the Advantech PCI-1762 DAS card. The Advantech PCI-1762 DAS card is a 16-ch relay actuator and 16-ch isolated digital input card for the PCI bus.

Its sixteen on-board SPDT relays are ideal for applications such as device ON/OFF control or small power switched. For easy monitoring, each relay is equipped with one red LED to show its ON/OFF status.

The PCI-1762's sixteen optically-isolated digital input channels are ideal for digital input in noisy environments or with floating potentials.

1.1.1 PCI-1762 16-ch Isolated Digital Input and 16-ch Relay Output Card

The following sections of this chapter will provide further information about features of the DAS cards, a Quick Start for installation, together with some brief information on software and accessories for the PCI-1762 card.

1.2 Features

- 16 relay output channels and 16 isolated digital input channels
- LED indicators to show activated relays
- Jumper selectable Form A/Form B-type relay output channel
- Output status read-back
- Keep relay output values when hot system reset
- High-voltage isolation on input channels (2,500 V_{DC})
- High ESD protection (2,000 V_{DC})
- High over-voltage protection (70 V_{DC})
- Wide input range (10 ~ 50 V_{DC})
- Interrupt handling capability
- High-density DB-62 connector
- Board ID

The Advantech PCI-1762 offers the following main features:

Robust Protection

The PCI-1762 digital input channels feature a robust isolation protection for industrial, lab and machinery automation applications. It durably withstands voltage up to 2,500 V_{DC}, preventing your host system from any incidental harms. If connected to an external input source with surge-protection, the PCI-1762 can offer up to a maximum of 2,000 V_{DC} ESD (Electrostatic Discharge) protection. Even with an input voltage rising up to 70 V_{DC}, the PCI-1762 can still manage to work properly albeit only for short period of time.

Wide Input Range

The PCI-1762 has a wide range of input voltage from 10 to 50 V_{DC}, and it is suitable for most industrial applications with 12 V_{DC}, 24 V_{DC} and 48 V_{DC} input voltage.

Board ID

The PCI-1762 has a built-in DIP switch that helps define each card's ID when multiple PCI-1762 cards have been installed on the same PC chassis. The board ID setting function is very useful when users build their system with multiple PCI-1762

cards. With the correct Board ID settings, the user can easily identify and access each card during hardware configuration and software programming.

Reset Protection Fulfills Requirement for Industrial Applications

When the system has undergone a hot reset (i.e. without turning off the system power), the PCI-1762 can either retain outputs values of each channel, or return to its default configuration as open status, depending on its on-board jumper setting. This function protects the system from wrong operations during unexpected system resets.

Plug-and-Play Function

The PCI-1762 is a Plug-and-Play device, which fully complies with PCI Specification Rev 2.2. During card installation, there is no need to set jumpers or DIP switches. Instead, all bus-related configurations such as base I/O address and interrupt are automatically done by the Plug-and-Play function.

1.3 Applications

- Industrial On/Off control
- Switch status sensing
- Digital I/O control
- Industrial and lab automation
- SMT/PCB machinery
- Semi-conductor machinery
- PC-based Industrial Machinery
- Testing & Measurement
- Laboratory & Education
- External relay driving

1.4 Installation Guide

Before you install your PCI-1762 card, please make sure you have the following necessary components:

- PCI-1762 card
- PCI-1762 User's Manual
- Driver software - Advantech DLL drivers (included in the companion CD-ROM)
- Wiring cable - PCL-10162 (optional)
- Wiring board - ADAM-3962 (optional)
- Personal computer or workstation with a PCI interface (running Windows 8 (desktop mode), 7 and XP)
- Application software - DAQ Navi, LabView or other 3rd-party software

After you get the necessary components and maybe some of the accessories for enhanced operation of your Multifunction card, you can then begin the Installation procedures.

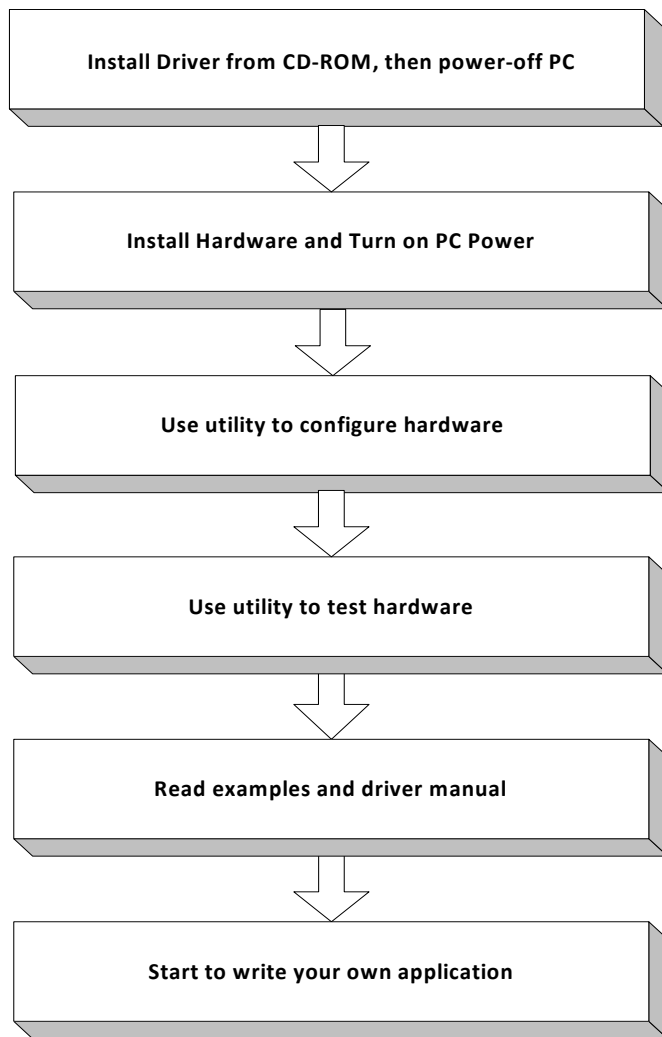


Figure 1.1 Installation Flow Chart

1.5 Software Overview

Advantech offers a rich set of DLL drivers, third-party driver support and application software to help fully exploit the functions of your PCI-1762 card:

- Personal computer or workstation with a PCI interface (running Windows 8 (desktop mode), 7 and XP)
- Application software - DAQ Navi, LabView or other 3rd-party software

Programming choices for DA&C cards

You may use Advantech application software such as Advantech Device Drivers. On the other hand, advanced users can use register-level programming, although this is not recommended due to its laborious and time-consuming nature.

DAQNavi Software

Advantech DAQNavi software includes device drivers and SDK which features a complete I/O function library to help boost your application performance. This software is included in the companion DVD-ROM at no extra charge and comes with all Advantech DA&C cards. The Advantech DAQNavi software for Windows XP/7/8 (desktop mode) works seamlessly with development tools such as Visual Studio .Net, Visual C++, Visual Basic and Borland Delphi.

1.6 Accessories

Advantech offers a complete set of accessory products to support the PCI-1762 cards. These accessories include:

Wiring Cable

The PCL-10162 shielded cable is specially designed for PCI-1762 cards to provide high resistance to noise. To achieve a better signal quality, the signal wires are twisted in such a way as to form a “twisted-pair cable”, reducing cross-talk and noise from other signal sources. Furthermore, its analog and digital lines are separately sheathed and shielded to neutralize EMI/EMC problems. Advantech provides 1 m, 3m and 5m cables for different user requirements.

Wiring Board

The ADAM-3962 is a D-Sub 62-pin wiring terminal module for DIN-rail mounting. This terminal module can be readily connected to the Advantech PC-Lab cards and allow easy yet reliable access to individual pin connections for the PCI-1762 card.

Chapter 2

Installation

2.1 Unpacking

After receiving your PCI-1762 package, please inspect its contents first. The package should contain the following items:

- PCI-1762 card
- Companion CD-ROM (DLL driver included)
- Startup Manual

2.2 Switch and Jumper Settings

The PCI-1762 card has one function switch and two jumper settings. The following sections tell how to configure the card. You may want to refer to the figure below for help in identifying card components.

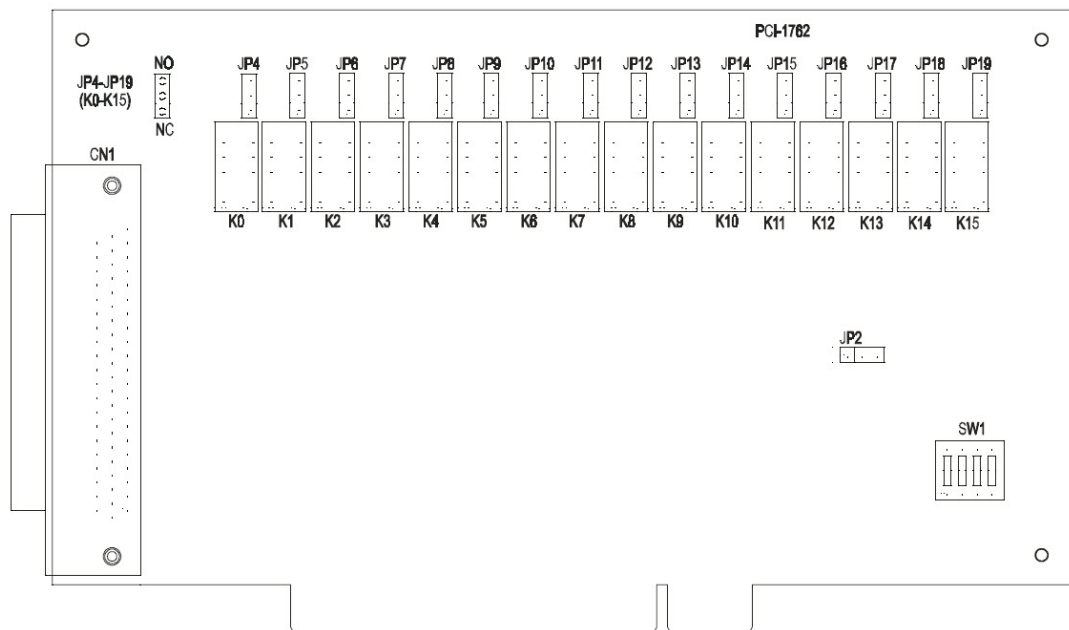
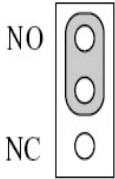
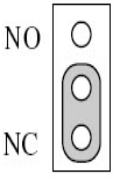

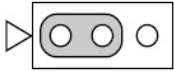


Figure 2.1 Card Connector, Jumper and Switch Locations

Table 2.1: Summary of Jumper Settings

Names of Jumpers	Function Description
JP4 ~ 19	Sets relay output to be normally open
	
JP4 ~ 19	Sets relay output to be normally closed
	
JP2	Keep last status after hot reset
	
JP2	Default configuration
	

Board ID (SW1)

The PCI-1762 has a built-in DIP switch (SW1), which is used to define each card's board ID. When there are multiple cards on the same chassis, this board ID switch is useful for identifying each card's device number.

After setting each PCI-1762, you can identify each card in system with different device numbers. The default value of board ID is 0 and if you need to adjust it to other value, please set the SW1 by referring to Table 2.2.

Table 2.2: Board ID Setting (SW1)

SW1	Position 1	Position 2	Position 3	Position 4
Board ID	ID3	ID2	ID1	ID0
0	ON	ON	ON	ON
1	ON	ON	ON	OFF
2	ON	ON	OFF	ON
3	ON	ON	OFF	OFF
4	ON	OFF	ON	ON
5	ON	OFF	ON	OFF
6	ON	OFF	OFF	ON
7	ON	OFF	OFF	OFF
8	OFF	ON	ON	ON
9	OFF	ON	ON	OFF
10	OFF	ON	OFF	ON
11	OFF	ON	OFF	OFF
12	OFF	OFF	ON	ON
13	OFF	OFF	ON	OFF
14	OFF	OFF	OFF	ON
15	OFF	OFF	OFF	OFF

Default Setting 0

Setting relay outputs to be NC/NO

Sixteen relay outputs, K0 ~ K15, are single-pole single-throw (SPST), which can be jumper set as either normally open (NO) or normally close (NC) (see Table 2.3). The default settings for K0 ~ K15 are normally open.

Table 2.3: Summary of jumper settings for relay

Relay Output channel	Corresponding Jumper
K0	JP4
K1	JP5
K2	JP6
K3	JP7
K4	JP8
K5	JP9
K6	JP10
K7	JP11
K8	JP12
K9	JP13
K10	JP14
K11	JP15
K12	JP16
K13	JP17
K14	JP18
K15	JP19

Setting the time to reset the relay outputs

Some users will want the capability of clearing each relay output when the system (or PC) issues a reset signal on the PCI bus. Some users will want to clear their relays only as part of system power-on.

The PCI-1762 satisfies both these needs by providing jumper JP2.

Depending on the application, this capability may allow relay outputs to be "OFF" without requiring a complete shutdown of processes controlled by the card.

Complete loss of power to the chip clears the chip memory. Thus, no matter how JP2 is set, if the power to the PCI-1762 is disconnected, the relay initial power-on state will be "OFF" (NC or NO, depending on the user's settings).

2.3 I/O Connectors

IDI0 ~ IDI3 :
Isolated digital input of Group 0

IDI4 ~ IDI7 :
Isolated digital input of Group 1

IDI8 ~ IDI11 :
Isolated digital input of Group 2

IDI12 ~ IDI15 :
Isolated digital input of Group 3

ECOM0 :
External common input of Group 0

ECOM1 :
External common input of Group 1

ECOM2 :
External common input of Group 2

ECOM3 :
External common input of Group 3

NC : No connection

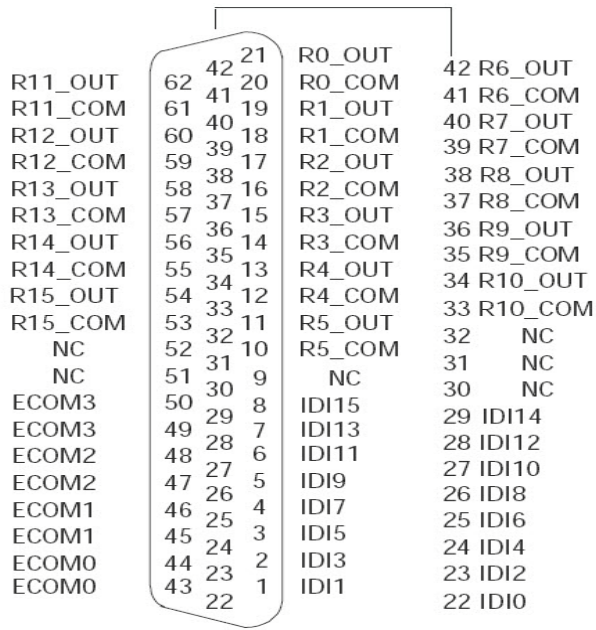


Figure 2.2 I/O connector pin assignments for the PCI-1762

2.4 Hardware Installation

After the device driver installation is completed, you can now go on to install the PCI-1762 card in any PCI slot on your computer. But it is suggested that you should refer to the computer user manual or related documentation if you have any doubt. Please follow the steps below to install the card on your system.

1. Turn off your computer and unplug the power cord and cables. **TURN OFF** your computer before installing or removing any components on the computer.
2. Remove the cover of your computer.
3. Remove the slot cover on the back panel of your computer.
4. Touch the metal part on the surface of your computer to neutralize the static electricity that might be on your body.
5. Insert the 1762 card into a PCI slot. Hold the card only by its edges and carefully align it with the slot. Insert the card firmly into place. Use of excessive force must be avoided, otherwise the card might be damaged.
6. Fasten the bracket of the PCI card on the back panel rail of the computer with screws.
7. Connect appropriate accessories (62-pin cable, wiring terminals, etc. if necessary) to the PCI card.
8. Replace the cover of your computer chassis. Re-connect the cables you removed in step 2.
9. Plug in the power cord and turn on the computer.

After your card is properly installed on your system, you can now configure your device using the Device Installation Program that has itself already been installed on your system during driver setup. A complete device installation procedure should include device setup, configuration and testing. The following sections will guide you through the Setup, Configuration and Testing of your device.

2.5 Device Setup & Configuration

The Advantech Navigator program is a utility that allows you to set up, configure and test your device, and later stores your settings on the system registry. These settings will be used when you call the APIs of Advantech Device Drivers.

Setting Up the Device

1. To install the I/O device for your card, you must first run the Advantech Navigator program (by accessing Start/Programs/Advantech Automation/DAQNavi/ Advantech Navigator).
2. You can then view the device(s) already installed on your system (if any) on the Installed Devices list box. If the software and hardware installation are completed, you will see PCI-1762 card in the Installed Devices list.

Configuring the Device

3. Please go to the Device Setting to configure your device. you can configure the ID0/ID8 Interrupt trigger mode either as Rising Edge or Falling Edge, and Enable of Disable the ID0/ID8.
4. After your card is properly installed and configured, you can go to the Device Test page to test your hardware by using the testing utility supplied.

Chapter 3

Signal Connections

3.1 Overview

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly. A good signal connection can avoid unnecessary and costly damage to your PC and other hardware devices. This chapter provides useful information about how to connect input and output signals to the PCI-1762 via the I/O connector.

3.2 Isolated Digital Input Connections

The PCI-1762 has 16 isolated digital input channels designated IDI0~IDI15.

Each of isolated digital input channel accepts 10~50 V_{DC} voltage inputs, and accept bi-directional input. It means that you can apply positive or negative voltage to an isolated input pin (V_{in}). The figure below shows how to connect an external input source to one of the card's isolated input channels.

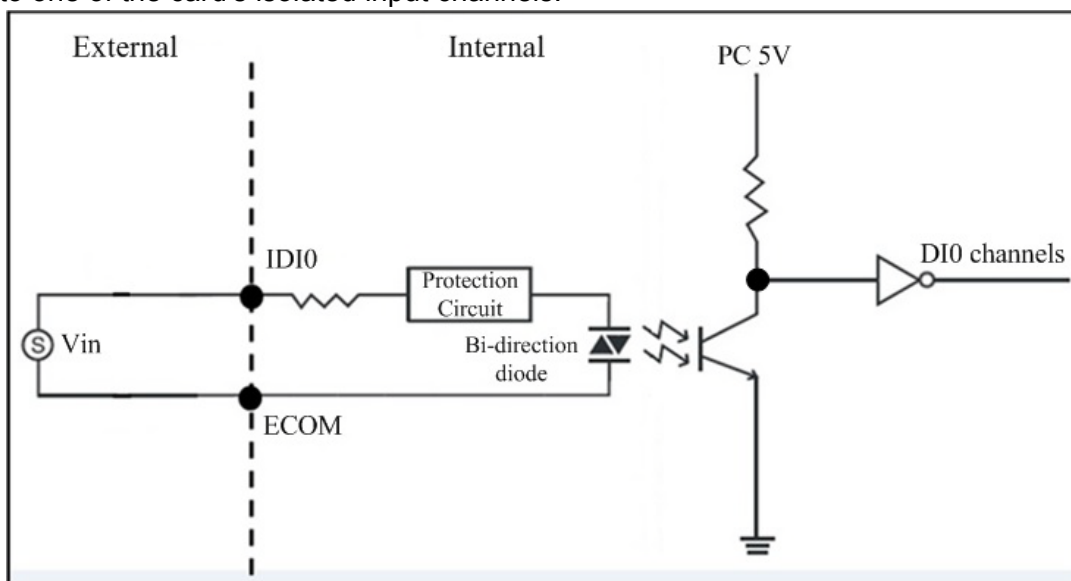


Figure 3.1 Isolated Digital Input Connections

3.3 Relay Connections

After power on, the initial relay output status of PCI-1762 is shown as below:

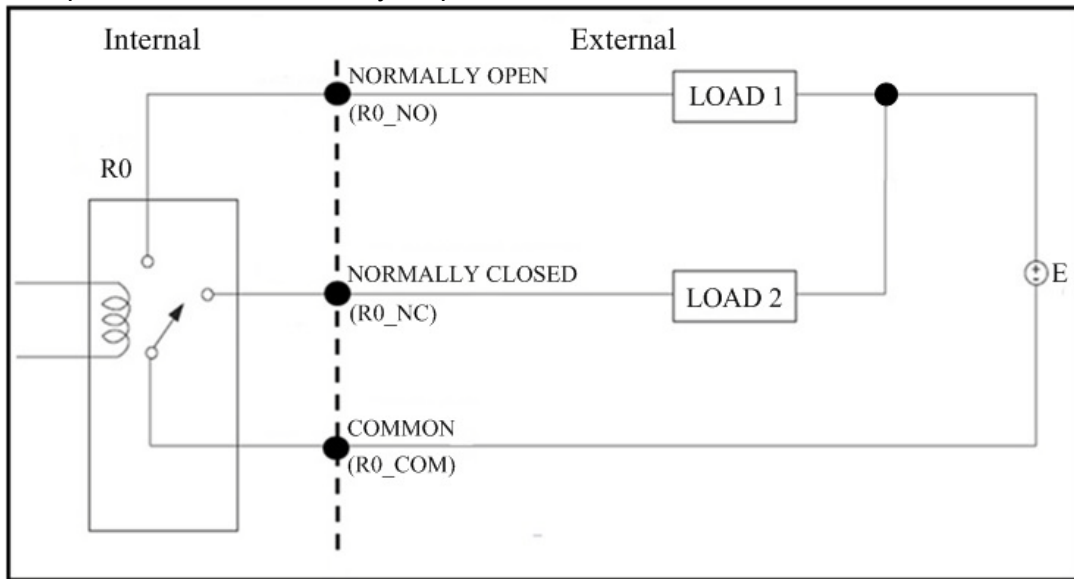


Figure 3.2 Relay Output Connection

A write operation to I/O address, BASE +0, will change the output status of each relay. For example, if Bit 0 of BASE +0 is set "1" (logic high), relay 0, K0, will switch from position "NORMALLY CLOSED", NC0, to position "NORMALLY OPEN", NO0. This means that LOAD2 will be de-energized, while LOAD1 is energized.

To summarize, the "COMMON" line connect to the "NORMALLY CLOSED" line, if the corresponding bit is set as 0 (power-on initial status). Otherwise, if the corresponding bit is set as 1, then the "COMMON" line will connect to the "NORMALLY OPEN" line.

Appendix **A**

Specifications

A.1 Specifications

Table A.1: Isolated Digital Input

Number of Input Channels	16
Interrupt Inputs	2 (IDI0,IDI8)
Optical Isolation	2500V _{DC}
Optical isolator response time	100μs
Input Resistance	5.7KΩ @1W
Over Voltage Protection	70 V _{DC}
Input Voltage	V _{IH} (max.) = 50 V _{DC}
	V _{IH} (min.) = 10 V _{DC}
	V _{IL} (max.) = 3 V _{DC}
Input Current	1.6 mA @10 V _{DC} (typical)
	1.9 mA @12 V _{DC} (typical)
	4.1 mA @24 V _{DC} (typical)
	8.5 mA @48 V _{DC} (typical)
	8.9 mA @50 V _{DC} (typical)

Table A.2: Relay Output

Number of Output Channels	16	
Relay Type	SPDT (Form A or Form B, Jumper selectable)	
Contact Rating (resistive)	0.5 A @ 250 V _{AC} , 0.5 A@30 V _{DC}	
Max. Switching Power	125 VA, 15 W	
Max. Switching Voltage	250V _{AC} , 220V _{DC}	
Resistance	50mΩ max.	
Breakdown Voltage	Between Coil and Contacts	1500V _{AC}
	Between Open Contacts	1000V _{AC}
	Between Adjacent Contacts	1000V _{AC}
Operating Time	Typical: 3 ms, Max.: 5 ms	
Release Time	Typical: 2 ms, Max.: 4 ms	
Life Expectancy	2 x 10 ⁵ cycles min. @ 0.5A/250 V _{AC}	

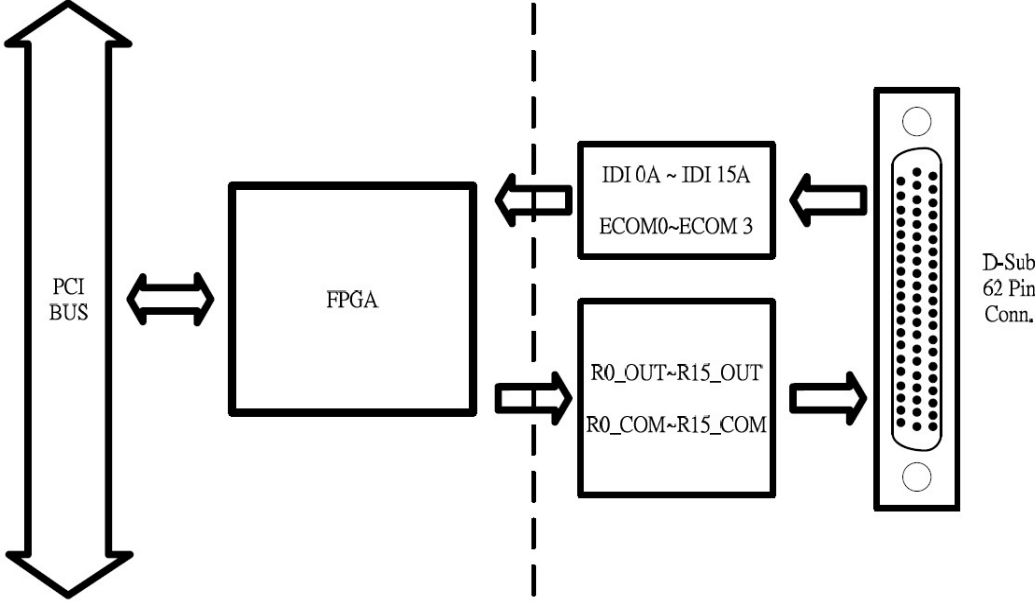
Table A.3: General Specifications

I/O Connector Type	62-pin D-type female	
Dimensions	175 mm x 100 mm (6.9" x 3.9")	
Power Consumption	+5V @ 250 mA (typical) +5V @ 620 mA (max.)	
Temperature	Operating	0 ~ +60°C (32 ~ 140°F)
	Storage	-20 ~ +70°C (-4 ~ 158°F)
Relative Humidity	5 - 95 % RH non-condensing	
Certifications	CE/FCC	

Appendix **B**

Block Diagram

B.1 Block Diagram



Appendix **C**

Register Structure and
Format

C.1 Overview

The PCI-1762 is delivered with an easy-to-use driver for user programming under the Windows and Linux operating systems. We advise users to program the PCI-1762 using the driver provided by Advantech to avoid the complexity of low-level programming by register. The most important consideration in programming the PCI-1762 the register level is to understand the function of the card's registers. The information in the following sections is provided only for users who would like to do their own low-level programming.

C.2 I/O Port Address Map

The PCI-1762 requires 32 consecutive addresses in the PC's I/O space. The address of each register is specified as an offset from the card's base address. For example, BASE+0 is the card's base address and BASE+7 is the base address plus seven bytes.

Table C-1 shows the function of each register of the PCI-1762 or driver and its address relative to the card's base address.

Table C.1: Register Functions																
Base Addr, + Decimal	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	R	Relay Output Status														
		RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS
	W	Relay Output														
		RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
2	R	Isolated Digital Input														
		IDI	IDI	IDI	IDI	IDI	IDI	IDI	IDI	IDI	IDI	IDI	IDI	IDI	IDI	IDI
	W	N/A														
4	R	Board ID Register														
													ID3	ID2	ID1	ID0
	W	N/A														
6	R	Interrupt Status Register														
							ID8	ID8	ID8						ID0	ID0
	W	Interrupt Control Register														
							ID8	ID8	ID8						ID0	ID0

C.3 C.3 Relay I/O Registers - BASE+0H and BASE+1H


The PCI-1762 offers 16-ch relay Actuators. These I/O channels use the input and output ports at addresses **BASE+0** and **BASE+1**.

Table C.2: Register for Relay Output Status

Read	Relay Output Status							
Bit #	7	6	5	4	3	2	1	0
BASE +1	RS15	RS14	RS13	RS12	RS11	RS10	RS9	RS8
BASE +0	RS7	RS6	RS5	RS4	RS3	RS2	RS1	RS0

Table C.3: Register for Relay Output

Write	Relay Output							
Bit #	7	6	5	4	3	2	1	0
BASE +1	RO15	RO14	RO13	RO12	RO11	RO10	RO9	RO8
BASE +0	RO7	RO6	RO5	RO4	RO3	RO2	RO1	RO0

Note!  The default configuration of the digital output channels is a logic 0. This avoids damaging external devices during system start-up or reset since the power on status is set to the default value.

C.4 Isolated Digital Input Registers - BASE+2H and BASE+3H

The PCI-1762 offers 16-ch isolated digital input channels. These channels use the input ports at addresses **BASE+2** and **BASE+3**.

Register for Isolated Digital Input

Read	Isolated Digital Input							
Bit #	7	6	5	4	3	2	1	0
BASE +3	IDI15	IDI14	IDI13	IDI12	IDI11	IDI10	IDI9	IDI8
BASE +2	IDI7	IDI6	IDI5	IDI4	IDI3	IDI2	IDI1	IDI0

C.5 Board ID - BASE+4H

The PCI-1762 offers Board ID register **BASE+4**. With correct Board ID settings, user can easily identify and access each card during hardware configuration and software programming.

Table C.4: Register for Board ID

Read	Board ID							
Bit #	7	6	5	4	3	2	1	0
BASE +4					BD3	BD2	BD1	BD0

BD3 ~ DB0

Board ID

BD0 LSB of the Board ID

BD3 MSB of the Board ID

C.6 Interrupt Status Register - BASE+6H and BASE+7H

The **Interrupt Status Register** control the status of two interrupt signal sources (ID10 and ID18).

Table C.5: Register for Interrupt Status

Read	Interrupt Status Register							
Bit #	7	6	5	4	3	2	1	0
BASE +7						ID8RF	ID8EN	ID8F
BASE +6						ID0RF	ID0EN	ID0F

ID_nF

Interrupt flag bits (n = 0 or 8)

This bit is a flag indicating the status of an interrupt. User can read this bit to get the status of the interrupt

0 No interrupt

1 Interrupt occurred

ID_nEN

Interrupt enable control bits (n = 0 or 8)

Read this bit to Enable/Disable the interrupt.

0 Disable

1 Enable

ID_nRF

Interrupt triggering control bits (n = 0 or 8)

The interrupt can be triggered by a rising edge or falling edge of the interrupt signal, as determined by the value in this bit.

0 Rising edge trigger

1 Falling edge trigger

C.7 Interrupt Control Register - BASE+6H and BASE+7H

The Interrupt Control Register control the status of two interrupt signal sources (IDI0 and IDI8). The user can clear the interrupt by writing its corresponding value to the Interrupt Control Register, as shown in below table.

Table C.6: Register for Interrupt Control

Write	Interrupt Control Register							
Bit #	7	6	5	4	3	2	1	0
BASE +7						ID8RF	ID8EN	ID8CLR
BASE +6						ID0RF	ID0EN	ID0CLR

IDnCLR

Interrupt clear control bits (n = 0 or 8)

This bit must first be cleared to service the next interrupt.

0	Don't care
1	Clear the interrupt

IDnEN

Interrupt enable control bits (n = 0 or 8)

Set this bit to Enable/Disable the interrupt.

0	Disable
1	Enable

IDnRF

Interrupt triggering control bits (n = 0 or 8)

The interrupt can be triggered by a rising edge or falling edge of the interrupt signal, as determined by the value in this bit.

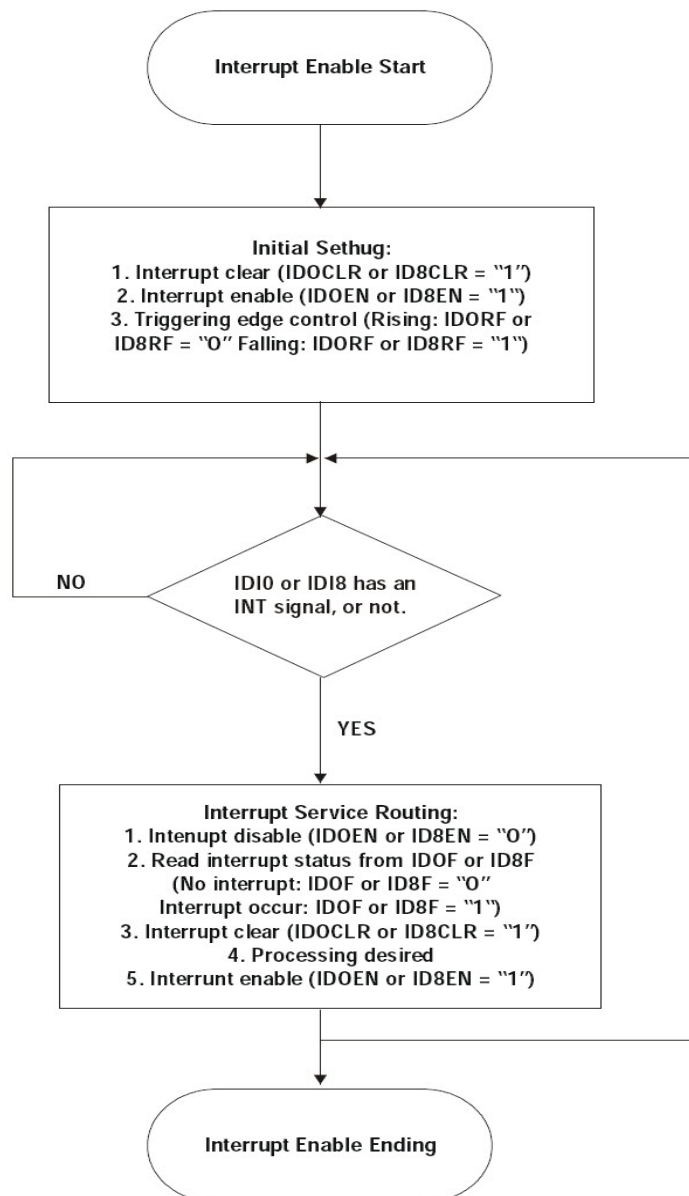
0	Rising edge trigger
1	Falling edge trigger

Appendix **D**

Flow Chart

D.1 Flow Chart

To write a command or confirm the command status, please follow the follow chart below.



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