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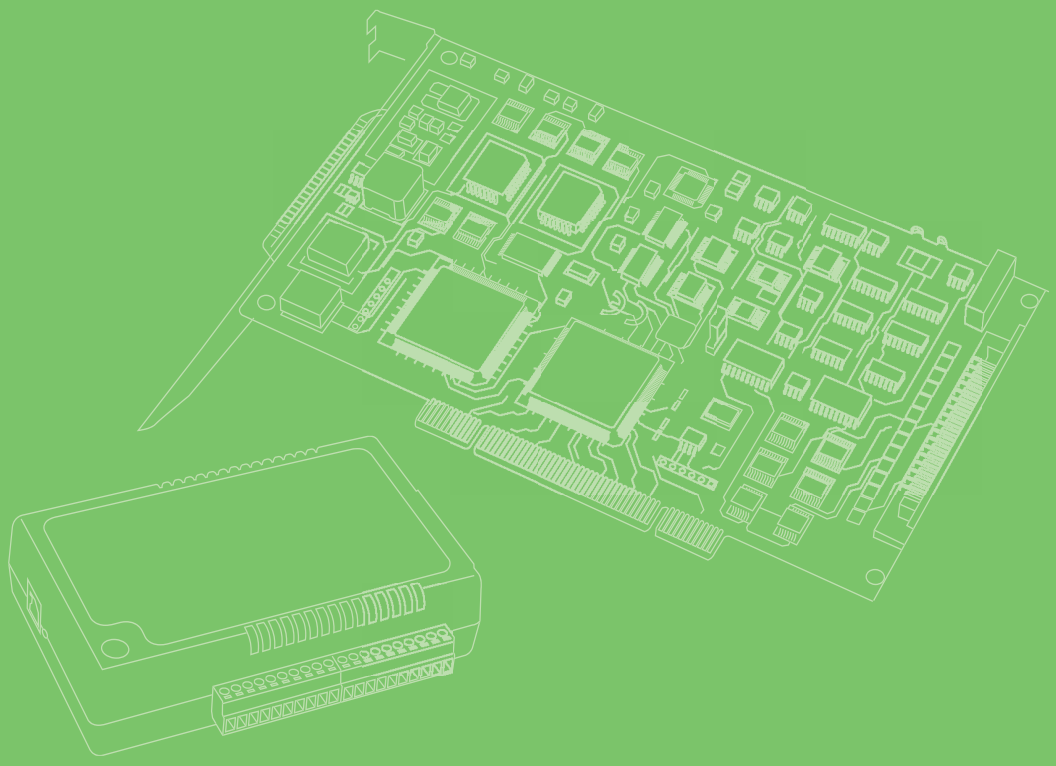
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User Manual

PCL-730

32-ch Isolated Digital I/O ISA Cards

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eAutomation

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Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

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3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.
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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

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.

FCC Class B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Technical Support and Assistance

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

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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.

Document Feedback

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to: support@advantech.com

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.

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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).

Safety Precaution - Static Electricity

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

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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Chapter 1

Overview

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1.1 Introduction

The PCL-730 offers 32 isolated digital I/O channels (16 DI and 16 DO) and 32 TTL digital I/O channels (16 DI and 16 DO) on a PC add-on card. Providing 2500 V_{DC} isolation, each I/O channel corresponds to a bit in a PC I/O port, making the PCL-730 very easy to program. The PCL-730 offers one PC interrupt with jumper-selectable IRQ.

1.2 Features

- 32 isolated DIO channels (16 inputs and 16 outputs)
- 32 TTL-level DIO channels (16 inputs and 16 outputs)
- High output driving capacity
- High-voltage isolation on isolated I/O channels (2500 V_{DC})
- Interrupt capacity
- Two separate 20-pin connectors for isolated input channels and output channels
- D-type connectors for isolated input channels and output channels
- High sink current on isolated output channels (200 mA/channel)

1.3 Applications

- Industrial ON/OFF control
- Contact closure monitoring
- Switch status sensing
- BCD interfacing
- Digital I/O control
- Industrial and lab automation

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1.4 Specifications

Digital input

16 optically-isolated inputs

- Input voltage: 5 to 24 V_{DC}
- Input resistance: 3 KΩ @ 0.2 W
- Isolation voltage: 2,500 V_{DC}
- Maximum speed: 10 KHz

16 TTL-level inputs

- Input voltage:
  - Low: 0.8 V max.
  - High: 2.0 V min.
- Input load:
  - Low: 0.4 mA max at 0.5 V
  - High: 0.05 mA max at 2.7 V

Digital output

16 optically-isolated outputs

- Output voltage: Open collector 5 to 40 V_{DC}
- Sink current: 200 mA max.
- Isolation voltage: 2500 V_{DC}

16 TTL-level outputs

- Output voltage:
  - Low: Sink 8 mA at 0.5 V max.
  - High: Source -0.4 mA at 2.4 V min.

Interrupt source

Jumper selectable:

Channels 0 and 1 of Isolated DI port or
Channels 0 and 1 of TTL DI port

Register format

BASE+0 and BASE+1	Isolated DI/O
BASE+2 and BASE+3	TTL DI/O

Dimensions

185 mm x 100 mm

Connectors

DB-37 connector for isolated DIO
Two 20-pin flat-cable connectors for isolated DIO
Two 20-pin flat-cable connectors for TTL DIO

Power consumption

+5 V: 330 mA typical, 500 mA maximum
+12V: 80 mA typical, 105 mA maximum

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1.5 Daughterboards

The PCL-730 interfaces with a wide variety of Advantech daughterboards, such as the following:

PCLD-786 AC/DC power SSR and relay driver board

This board holds eight optically-isolated solid state relay modules and provides an additional eight outputs to drive external relays.

PCLD-785B and PCLD-885 relay output boards

These boards let you control relays through the PCL-730's 16-bit TTL digital output channels. PCLD-785B provides 24 SPDT relays, while the PCLD-885 provides 16 SPST power relays.

PCLD-782B Isolated D/I Board

This board provides 24 optically-isolated digital input channels and a cable to connect to the PCL-730's digital input ports.

PCLD-885

The PCLD-885 provides 16 SPST power relay channels with a maximum contact rating of AC: 250V, 5A or DC: 20V, 5A. The PCLD-885 can be driven directly by the digital outputs of PCLabCards through 20-pin flat-cable connectors or 50-pin OPTO-22 compatible connectors.

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Chapter 2

Hardware Installation

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2.1 Installation

This chapter gives users a package item checklist, proper instructions about unpacking and step-by-step procedures for both driver and card installation.

2.2 Initial Inspection

We carefully inspected the PCL-730 both mechanically and electrically before shipment. It should be free of marks and in perfect order on receipt.

As you unpack the PCL-730, check it for signs of shipping damage (damaged box, scratches, dents, etc.). If it is damaged or fails to meet specifications, notify our service department or your local sales representative immediately. Also, call the carrier immediately and retain the shipping carton and packing material for inspection by the carrier. We will then make arrangements to repair or replace the unit.

Discharge any static electricity on your body before you touch the board by touching the back of the system unit (grounded metal).

Remove the PCL-730 card from its protective packaging by grasping the rear metal panel. Handle the card only by its edges to avoid static electric discharge which could damage its integrated circuits. Keep the antistatic package. Whenever you remove the card from the PC, please store the card in this package for protection.

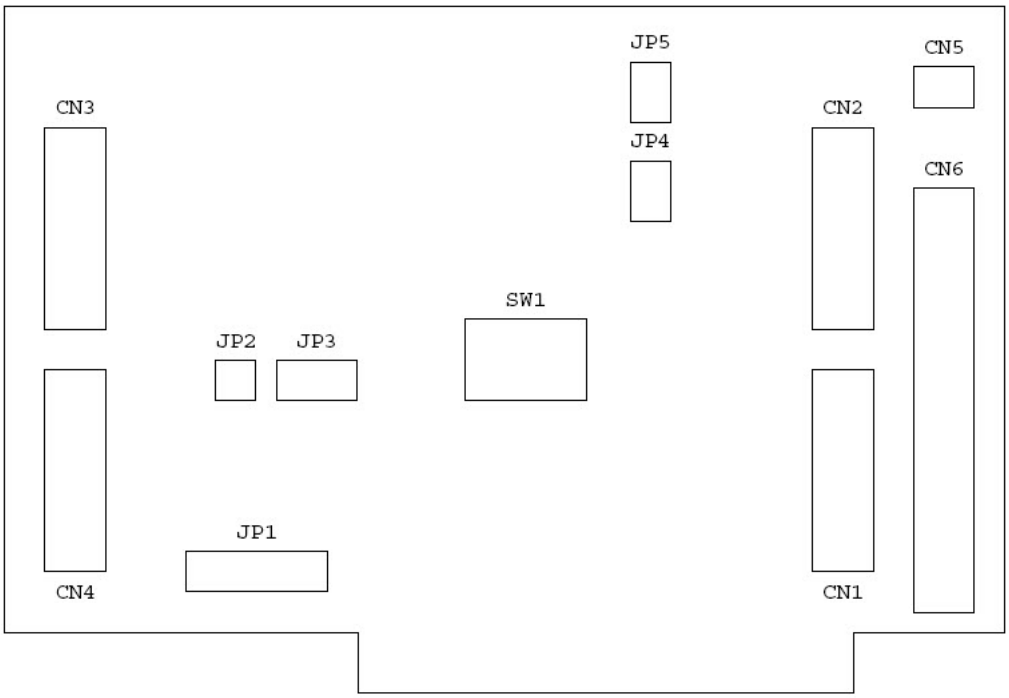
You should also avoid contact with materials that hold static electricity such as plastic, vinyl and styrofoam.

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2.3 Switch and Jumper Settings

The PCL-730 card has one function switch and four jumper settings.

The following sections tell how to configure the card. You may want to refer to the opposite page for help identifying card components.



Card connector, jumper and switch locations

Table 2.1: Connectors, Jumpers, and Switches

Label	Function
CN1	Isolated output
CN2	Isolated input
CN3	Digital output
CN4	Digital input
CN5	E.GND (external ground)
CN6	Isolated input/output
JP1	Interrupt level
JP2	Interrupt trigger
JP3	Interrupt source
JP4/5	Version control
SW1	Card base address

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2.4 Base Address selection (SW1)

You control the PCL-730's operation by reading or writing data to the PC's I/O (input/output) port addresses. The PCL-730 requires four consecutive address locations. Switch SW1 sets the card's base (beginning) address. Valid base addresses range from Hex 200 to Hex 3F0. Other devices in your system may, however, be using some of these addresses.

We set the PCL-730 for a base address of Hex 300 at the factory. If you need to adjust it to some other address range, set switch SW1 as shown in the following table:

Card I/O addresses (SW1)

Range (hex)	Switch position							
	1	2	3	4	5	6	7	8
200 - 203	○	●	●	●	●	●	●	●
204 - 207	○	●	●	●	●	●	●	○
▯								
* 300 - 303	○	○	●	●	●	●	●	●
▯								
3F0 - 3F7	○	○	○	○	○	○	●	●

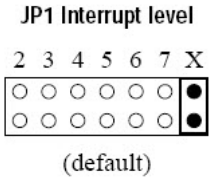
○ = Off ● = On * = default

Note: Switches 1-8 control the PC bus address lines as shown below:

Switch	1	2	3	4	5	6	7	8
Line	A9	A8	A7	A6	A5	A4	A3	A2

2.4.1 Interrupt level (JP1)

Jumper JP1 controls the card's IRQ level, as shown below. Position X disables the interrupt.

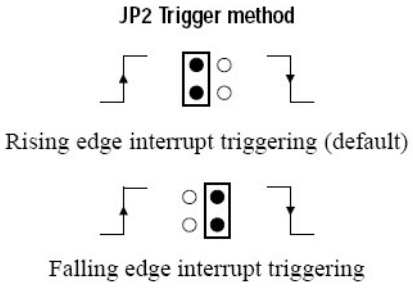


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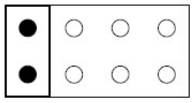
2.4.2 Interrupt triggering (JP2)

Jumper JP2 selects the trigger edge (rising or falling) on which the card will trigger an interrupt. Jumper settings appear below:



2.4.3 Interrupt source (JP3)

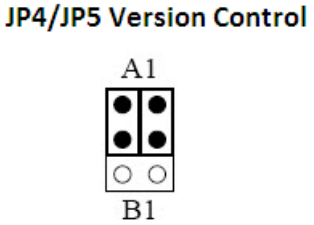
Jumper JP3 selects the source of the card's interrupt.



Setting	Channel	Connector
IDI0	Isolated DI Channel 0	CN2 Pin 1
IDI1	Isolated DI Channel 1	CN2 Pin 2
DI0	TTL DI Channel 0	CN4 Pin 1
DI1	TTL DI Channel 1	CN4 Pin 2

2.4.4 Version control (JP4/JP5)

Jumper JP4 controls the pin assignments for CN1 and CN6 while JP5 controls it for CN2 and CN6. Setting this jumper to A1 makes the card's pin assignments the same as the A1 version.



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2.5 Hardware Installation

Warning! TURN OFF your PC power supply whenever you install or remove the PCL-730 or connect and disconnect cables.



1. Turn the computer off. Turn the power off to any peripheral devices such as printers and monitors.
2. Disconnect the power cord and any other cables from the back of the computer.
3. Remove the system unit cover (see the user's guide for your chassis if necessary).
4. Locate the expansion slots at the rear of the unit and choose any unused slot.
5. Remove the screw that secures the expansion slot cover to the system unit. Save the screw to secure the interface card retaining bracket.
6. Carefully grasp the upper edge of the PCL-730 card. Align the hole in the retaining bracket with the hole on top of the expansion slot and align the gold striped edge connector with the expansion slot socket. Press the board firmly into the socket.
7. Secure the PCL-730 using the screw you removed in Step 5.
8. Attach any accessories (using 20 pin flat cables, a DB-37 cable, etc.) to the PCL-730.
9. Replace the system unit cover. Connect the cables you removed in Step 2. Turn the computer power on.

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Chapter 3

Signal Connections

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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 PCL-730 via the I/O connector.

3.2 Connector Pin Assignments

The PCL-730 has four on-board 20-pin flat-cable connectors (insulation displacement, mass termination) and a DB-37 connector accessible from the card bracket. See the figure on page 7 for the location of each connector.

Pin assignments for each connector appear in the following sections.

Abbreviations	
DO	Digital output
DI	Digital input
IDO	Isolated digital output
IDI	Isolated digital input
E.GND	External ground for isolated output
EI.GND	External ground for isolated input
D.GND	Digital ground
VDD	External power for isolated outputs
PCOM	Free wheeling common diode

*NOTE: When JP4 is set to B1, Pin 19 on CN1 and Pin 10 on CN6 will both be assigned PCOM1. When JP4 is set to A1, both pins will be assigned E.GND. For JP5, Pin 17 & 19 and Pin 18 & 20 on CN2 will combine together (be the same GND) when JP5 is set to A1. But Pin 17 & 19 and Pin 18 & 20 on CN2 will be different GND (EI.GND1 and EI.GND2 separately) when JP5 is set to B1.

Connector CN1 – Isolated output

IDO 0	1	2	IDO 1
IDO 2	3	4	IDO 3
IDO 4	5	6	IDO 5
IDO 6	7	8	IDO 7
IDO 8	9	10	IDO 9
IDO 10	11	12	IDO 11
IDO 12	13	14	IDO 13
IDO 14	15	16	IDO 15
E.GND	17	18	E.GND
***PCOM1/E.GND**	**19**	20	PCOM2

Connector CN2 — Isolated input

IDI 0	1	2	IDI 1
IDI 2	3	4	IDI 3
IDI 4	5	6	IDI 5
IDI 6	7	8	IDI 7
IDI 8	9	10	IDI 9
IDI 10	11	12	IDI 11
IDI 12	13	14	IDI 13
IDI 14	15	16	IDI 15
EI.GND1	17	18	EI.GND2
EI.GND1	19	20	EI.GND2

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Connector CN3 – Digital output

DO 0	1	2	DO 1
DO 2	3	4	DO 3
DO 4	5	6	DO 5
DO 6	7	8	DO 7
DO 8	9	10	DO 9
DO 10	11	12	DO 11
DO 12	13	14	DO 13
DO 14	15	16	DO 15
D.GND	17	18	D.GND
+5 V	19	20	+12 V

Connector CN4 — Digital input

DI 0	1	2	DI 1
DI 2	3	4	DI 3
DI 4	5	6	DI 5
DI 6	7	8	DI 7
DI 8	9	10	DI 9
DI 10	11	12	DI 11
DI 12	13	14	DI 13
DI 14	15	16	DI 15
D.GND	17	18	D.GND
+5 V	19	20	+12 V

Connector CN5 — Isolated output ground terminal

E.GND	1	2	E.GND

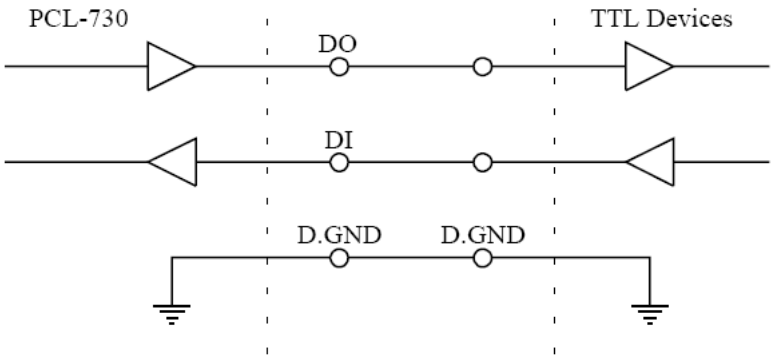
Connector CN6 – Isolated input and output

IDI 0	1	20	IDI 1
IDI 2	2	21	IDI 3
IDI 4	3	22	IDI 5
IDI 6	4	23	IDI 7
IDI 8	5	24	IDI 9
IDI 10	6	25	IDI 11
IDI 12	7	26	IDI 13
IDI 14	8	27	IDI 15
EI.GND1	9	28	EI.GND2
***PCOM1/E.GND**	**10**	29	E.GND
IDO 0	11	30	IDO 1
IDO 2	12	31	IDO 3
IDO 4	13	32	IDO 5
IDO 6	14	33	IDO 7
IDO 8	15	34	IDO 9
IDO 10	16	35	IDO 11
IDO 12	17	36	IDO 13
IDO 14	18	37	IDO 15
PCOM2	19		

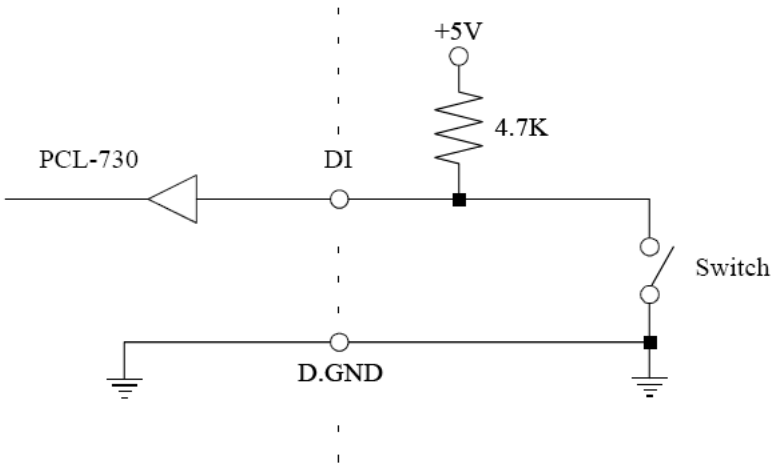
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3.3 TTL-level I/O

The PCL-730 has 16 TTL-level digital inputs and 16 TTL-level digital outputs. The following figure shows connections to exchange digital signals with other TTL devices:

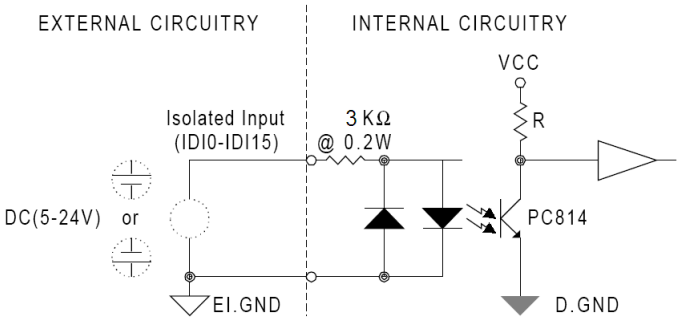


If you want to receive an OPEN/SHORT signal from a switch or relay, add a pull-up resistor to ensure that the input is held at a high level when the contacts are open. See the figure below:



3.3.1 Isolated Input

Each of the 16 isolated digital input channels accept voltages from 5 to 24V and have a resistance of 3 kΩ. Every eight input channels share one external ground. (Channels 0~7 use EI.GND1. Channels 8~15 use EI.GND2.) The following figure shows how to connect an external input source to the card's isolated inputs:

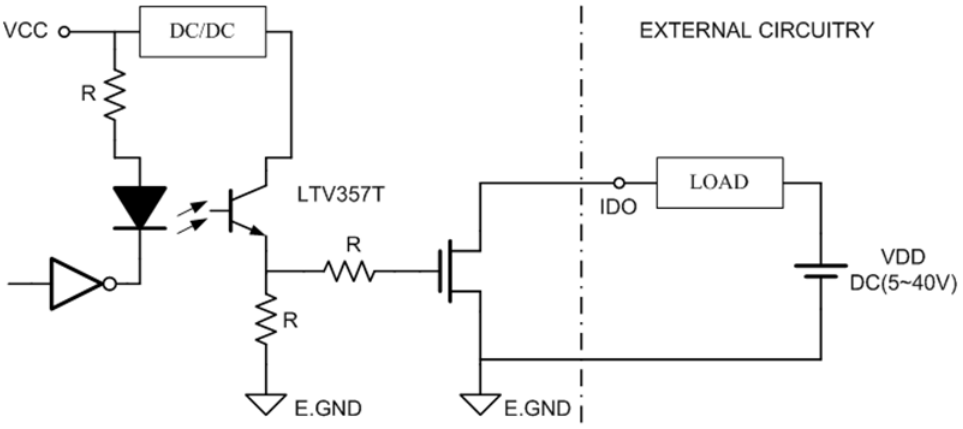


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3.3.2 Isolated Output

Each of the 16 isolated digital output channels comes equipped with a MOSFET. Every eight output channels share common emitters and integral suppression diodes for inductive load, activated by connecting PCOM to VDD. (Channels 0~7 use PCOM1. Channels 8~15 use PCOM2.)

If the external voltage (5~40V) is connected to each isolated output channel (IDO) and its isolated digital output turns on (200mA per channel maximum), the card's current will sink from the external voltage.



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Appendix A

Register Format

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A.1 Register Format

Programming the PCL-730 is extremely simple. Each I/O channel corresponds to a bit in the card's registers. To turn on an output channel you write a ‘‘1” to the corresponding bit. To read an input port, you simply read from the register.

The card requires four I/O register addresses. 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+2 is the base address + two bytes. If the card's base address is 300h, the register's address is 302h. See Chapter 2 for information on setting the card's base address.

Table A.1: Register Assignment

Address	Write	Read
BASE + 0	IDO bits 0-7	IDI bits 0-7
BASE + 1	IDO bits 8-15	IDI bits 8-15
BASE + 2	DO bits 0-7	DI bits 0-7
BASE + 3	DO bits 8-15	DI bits 8-15

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Appendix B

PC I/O Port Address Map

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B.1 PC I/O Port Address Map

Range (hex)	Function
000-1FF	Base System
200	Reserved
201	Came Control
202-277	Reserved
278-27F	Second Printer Port
280-2F7	Reserved
2F8-2FF	COM 2
300-377	Reserved
3713-37F	First Printer Port
380-3AF	Reserved
3B0-3BF	Mono Display/Print Adapter
3C0-3CF	Reserved
3D0-3DF	Color/Graphics
3E0-3EF	Reserved
3F0-3F7	Floppy Disk Drive
3F8-3FF	COM 1

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