

PCL-730

32-channel Isolated
Digital I/O Card

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CE notification

The PCL-730, developed by ADVANTECH CO., LTD., 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.

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CHAPTER

1

General Information

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 1000 V 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.

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 (1000 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)

Applications

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

Specifications

Digital input

16 optically-isolated inputs

- **Input voltage:** 5 to 24 V_{DC}
- **Input resistance:** 1.2 K Ω @ 0.5 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:** 1000 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

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: 250 V, 5 A or DC: 20 V, 5 A. The PCLD-885 can be driven directly by the digital outputs of PC-LabCards through 20-pin flat-cable connectors or 50-pin OPTO-22 compatible connectors.

PCLD-780

This wiring terminal board makes analog or digital I/O connections easy.

PCLD-880

The PCLD-880 is a universal screw terminal board for industrial wiring. It can be used with the analog or digital ports of various PC-LabCards via 20-pin flat cables or shielded round cables with DB-37 connectors.

C H A P T E R

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Installation

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.

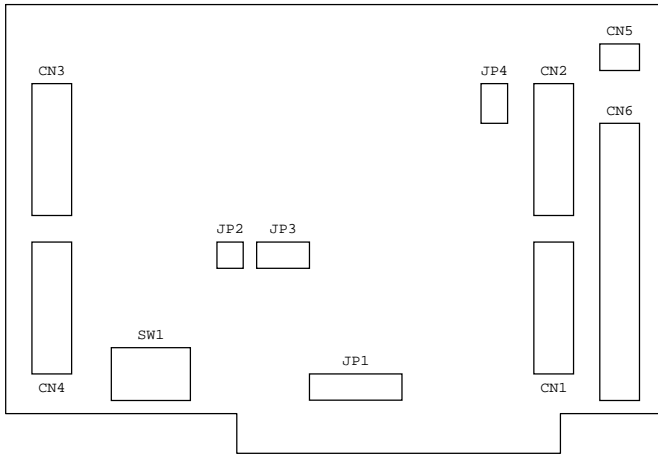
Discharge any static electricity on your body before you touch the board by touching the back of the system unit (grounded metal).

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.

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

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	Version control
SW1	Card base address

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

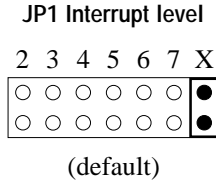
Note: Switches 1-8 control the PC bus address lines as shown below:

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

Appendix A provides a PC I/O port address map to help you avoid the I/O addresses for standard PC devices.

Interrupt level (JP1)

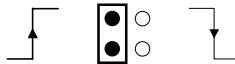
Jumper JP1 controls the card's IRQ level, as shown below. Position X disables the interrupt.



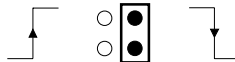
Interrupt triggering (JP2)

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

JP2 Trigger method



Rising edge interrupt triggering (default)



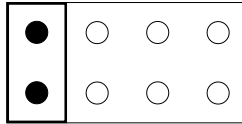
Falling edge interrupt triggering

Interrupt source (JP3)

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

JP3 Interrupt source

IDI0 IDI1 DIO DI1

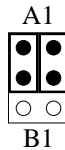


Setting	Channel	Connector
IDI0	Isolated DI channel 0	CN2 pin 1
IDI1	Isolated DI channel 1	CN2 pin 2
DIO	TTL DI channel 0	CN4 pin 1
DI1	TTL DI channel 1	CN4 pin 2

Version control (JP4)

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

JP4 Version control



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.

CHAPTER

3

Signal Connections

Good signal connections can avoid a lot of unnecessary damage to your valuable PC and other hardware. This chapter gives pin assignments for each of the card's connectors and signal connections for different applications.

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. See Chapter 2 for information on setting jumpers.*

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

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

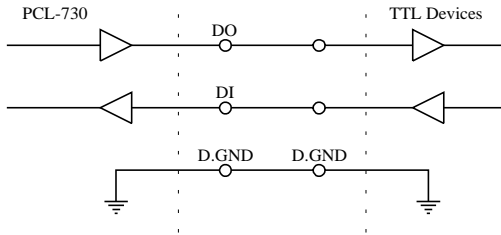
E.GND	1	2	E.GND
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Connector CN6 – Isolated input and output

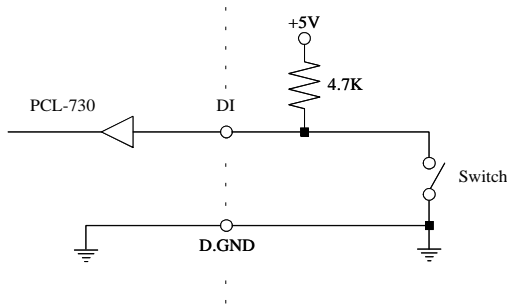
IDI 0	1	20	IDI 1
IDI 2	2	21	IDI 3
IDI 4	3	22	IDI 5
IDI 6	4	23	IDI 7
IDI 8	5	24	IDI 9
IDI 10	6	25	IDI 11
IDI 12	7	26	IDI 13
IDI 14	8	27	IDI 15
EI.GND1	9	28	EI.GND2
*PCOM1/E.GND	10	29	E.GND
IDO 0	11	30	IDO 1
IDO 2	12	31	IDO 3
IDO 4	13	32	IDO 5
IDO 6	14	33	IDO 7
IDO 8	15	34	IDO 9
IDO 10	16	35	IDO 11
IDO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

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:

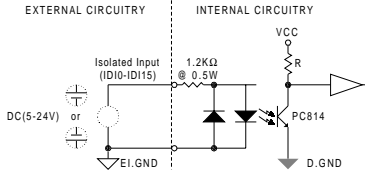


If you want to receive an OPEN/SHORT signal from a switch or relay, add a pull-up resistor to ensure that the input is held at a high level when the contacts are open. See the figure below:



Isolated Input

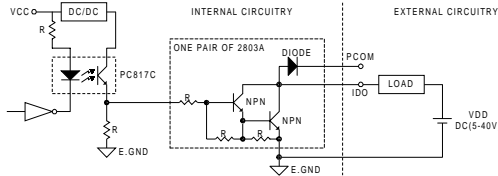
Each of the 16 isolated digital input channels accept voltages from 5 to 24 V and have a resistance of 1.2 kW . Every eight input channels share one external ground. (Channels 0~7 use EI.GND1. Channels 8~15 use EI.GND2.) The following figure shows how to connect an external input source to the card's isolated inputs:



Isolated Output

Each of the 16 isolated digital output channels comes equipped with a darlington transistor. Every eight ouput 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 (5~40 V) is connected to each isolated output channel (IDO) and its isolated digital output turns on (200 mA per channel maximum), the card's current will sink from the external voltage. The current through each E.GND should not exceed 50 mA. If the current for all channels combined exceeds 150 mA, return the current to the external voltage through CN5. The following figure shows how to connect an external output load to the card's isolated outputs.



APPENDIX

A

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.

Register Assignments

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

APPENDIX
B

**PC I/O Port
Address Map**

PC I/O port address map

Range (hex)	Function
000 - 1FF	Base system
200	Reserved
201	Game control
202 - 277	Reserved
278 - 27F	LPT2: (2nd printer port)
280 - 2F7	Reserved
2F8 - 2FF	COM2:
300 - 377	Reserved
378 - 37F	LPT1: (1st 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	COM1:
