

PCM-3725

**PC/104 8-ch Relay Actuator and
Isolated Digital Input Module**

User's manual

Contents

CHAPTER 1: General Information	1
1.1 Introduction	2
1.2 Features	2
1.3 Applications	3
1.4 Specifications	3
1.5 Software Support	5
1.6 DLL Driver Programming Roadmap	6
1.7 Block Diagram	8
CHAPTER 2: Installation	7
2.1 Initial Inspection	8
2.2 Switch and Jumper Settings	9
2.3 Connector pin assignments	13
2.4 Hardware Installation Installing the module	15
CHAPTER 3: Digital I/O	17
3.1 Digital I/O Programming	18
3.2 Isolated Digital Input Connections	19
3.3 Relay Output	20
CHAPTER 4: Register Format	21
4.1 Overview	22
4.2 I/O Port Address Map	22
4.3 Register Format	23

Figures

Fig. 2-1 Card connector, jumper and switch locations	9
Fig. 2-2 PCM-3725 interrupt circuitry	11
Fig. 3-1 Isolated digital input connection	19
Fig. 3-2 Relay output connection	20

Table

Table 2-1	PCM-3725 connectors, jumpers, and switches	9
Table 2-2	PCM-3725 I/O address	10
Table 2-3	Abbreviations of pin assignment	13

CHAPTER **1**

General Information

1.1 Introduction

The PCM-3725 is a 8-ch relay actuator and 8-ch isolated digital input module that attaches to the PC/104 connector on your CPU card or PC/104 module. It offers eight relay actuators and 8-bit isolated digital input channels.

Its eight on-board SPDT relays are ideal for applications such as device On/Off control or low power switching. A red LED next to each relay shows its On/Off status for easy monitoring.

The PCM-3725's eight optically-isolated digital input channels are ideal for digital input in noisy environments or with floating potentials.

1.2 Features

- 8 Relay actuators outputs
- 8 Opto-isolated digital inputs
- LED indicators to show activated relays
- On-board relay driver circuits
- On-board input signal conditioning circuits
- Easy to use and program

1.3 Applications

- Digital signal sensing
- Switch contact status sensing
- Limit switch monitoring
- BCD interface
- Industrial on/off control
- Signal switching
- Valve/solenoid control
- External high power relay driving
- Alarm activating
- Annunciator control
- Industrial automation
- Laboratory automation
- Useful with A/D's and D/A's

1.4 Specifications

Isolated Digital Input:

Number of Input Channel	8	
Optical Isolation	2500 V _{DC}	
Opto-isolator response time	25μs	
Over-voltage Protect	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	10 V _{DC}	1.7 mA (typical)
	12 V _{DC}	2.1 mA (typical)
	24 V _{DC}	4.4 mA (typical)
	48 V _{DC}	9.0 mA (typical)
	50 V _{DC}	9.4 mA (typical)

Relay Output:

Number of Output Channel	8
Relay Type	SPDT (Form C)
Nominal Switching Capacity	1.5A 30 V _{DC}
Max. Switching Power	45 W
Max. Switching Voltage	220 V _{DC}
Max. Switching Current	1.5 A
Min. Switching Capacity	10 μA 10m V _{DC}
Breakdown Voltage	2,000 V _{rms} for 1 min. (Between contact and coil)
Operate time	4 ms max.
Release time	4 ms max.
Insulation Resistance	1,000 MΩ min. (at 500 V _{DC})
Life Expectancy	10 ⁵ min. (at 2A 30V _{DC} resistive)

For detailed information, please refer to CD-ROM:\Document\PCM-3725_Relay Spec.pdf

General:

Power Consumption	+5V @100 mA (typical) +5V @280 mA (max.)	
Digital Input Connector	20-pin post header	
Relay Output Connector	50-pin post header	
Dimensions	96 mm x 90 mm (3.7" x 3.5")	
Temperature	Operation	0 ~ +60° C (32 ~ 14° F) (refer to IEC 68-2-1,2)
	Storage	-20 ~ +70° C (-4 ~ 158° F)
Relative Humidity	5 - 95 % RH non-condensing(refer to IEC 68-2-3)	
Certification	CE Class A certified	

1.5 Software Support

The PCM-3725 comes with a powerful and easy-to-use software driver. This driver makes application programming much easier, especially when you use sophisticated features like interrupt data transfer.

For building up a high performance Human Machine Interface (HMI), you may need other supporting software beside our included driver to the PCM-3725. Please consult your Advantech representative for appropriate software packages.

GeniDAQ

GeniDAQ is a Windows-based data acquisition, control, analysis and presentation development software package. In addition to typical Human Machine Interface (HMI) functions, GeniDAQ features a Visual Basic programming environment, and it provides numerous graphical control and display icons to assist you in developing user's HMI.

ActiveDAQ

ActiveDAQ is a collection of add-on ActiveX Control which provides an easy-to-use property sheet interface for configuring analog/digital input/output, counter/frequency, high-speed data acquisition and controls. You can use ActiveX control in Visual Basic, Delphi, Visual C++ development environments for Windows 95/98/NT.

LabVIEW Driver

Advantech LabVIEW Driver supports National Instruments LabVIEW 4.1/5.0 and runs in Microsoft Windows 95/98 and Windows NT 4.0 environments.

1.6 DLL Driver Programming Roadmap

This section will provide you a roadmap to demonstrate how to build an application from scratch using Advantech DLL driver with your favorite development tools such as Visual C++, Visual Basic, Delphi and C++ Builder. The step-by-step instructions on how to build your own applications using each development tool will be given in the *DLL Drivers Manual*. Moreover, a rich set of example source codes are also given for your reference.

Programming Tools

Programmers can develop application programs with their favorite development tools:

- Visual C++
- Visual Basic
- Delphi
- C++ Builder

For instructions on how to begin programming works in each development tool, Advantech offers a *Tutorial* Chapter in the *DLL Drivers Manual* for your reference. Please refer to the corresponding sections in this chapter on the *DLL Drivers Manual* to begin your programming efforts. You can also take a look at the example source codes provided for each programming tool, since they can get you very well-oriented.

The *DLL Drivers Manual* can be found on the companion CD-ROM. Or if you have already installed the DLL Drivers on your system, The *DLL Drivers Manual* can be readily accessed through the **Start** button:

Start/Programs/Advantech Driver for 95 and 98 (or for NT)/Driver Manual

The example source codes could be found under the corresponding installation folder such as the default installation path:

\Program Files\Advantech\ADSAPI\Examples

For information about using other function groups or other development tools, please refer to the *Creating Windows 95/NT Application with DLL Driver* chapter and the *Function Overview* chapter on the *DLL Drivers Manual*.

Programming with DLL Driver Function Library

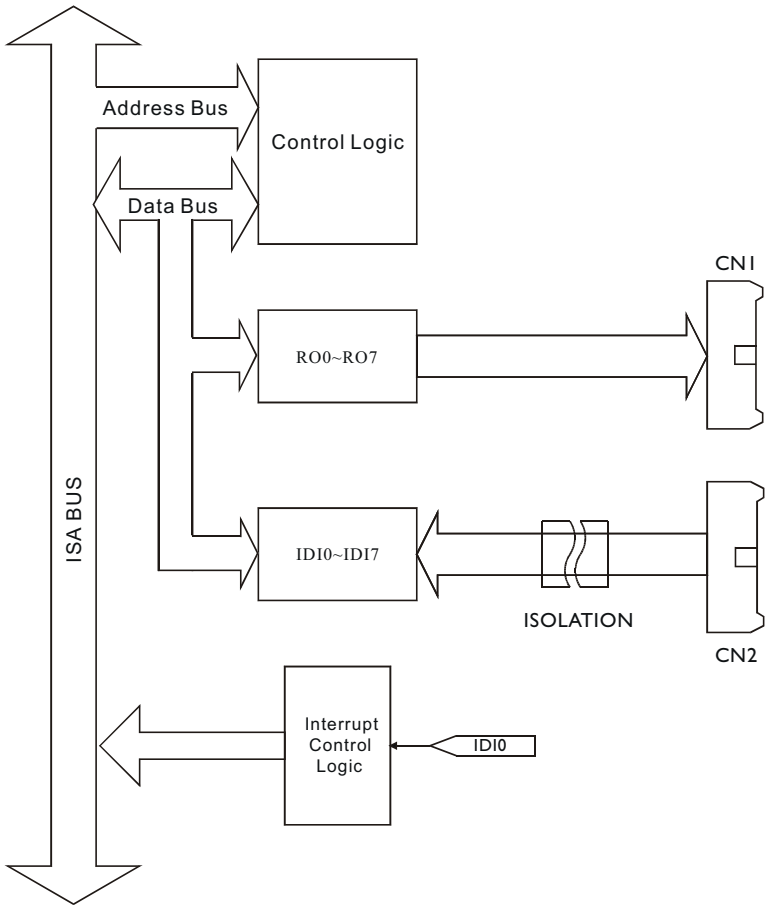
Advantech DLL driver offers a rich function library to be utilized in various application programs. This function library consists of numerous APIs that support many development tools, such as Visual C++, Visual Basic, Delphi and C++ Builder.

According to their specific functions or services, those APIs can be categorized into several function groups:

- Analog Input Function Group
- Analog Output Function Group
- Digital Input/Output Function Group
- Counter Function Group
- Temperature Measurement Function Group
- Alarm Function Group
- Port Function Group
- Communication Function Group
- Event Function Group

For the usage and parameters of each function, please refer to the *Function Overview* chapter in the *DLL Drivers Manual*.

1.7 Block Diagram



CHAPTER
2

Installation

2.1 Initial Inspection

We carefully inspected the PCM-3725 both mechanically and electrically before shipment. It should be free of marks and in perfect order on receipt.

As you unpack the PCM-3725, 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 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 PCM-3725 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.

2.2 Switch and Jumper Settings

The PCM-3725 card has one function switch and three 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.

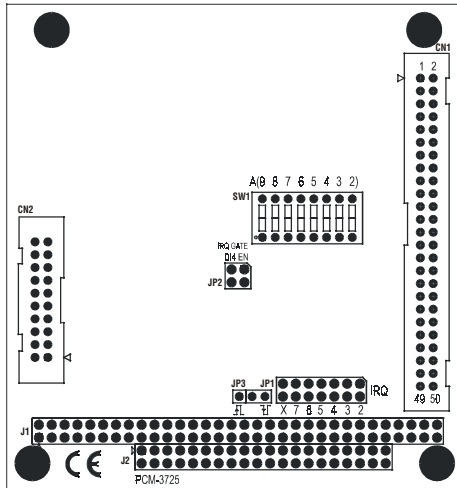


Fig. 2-1 Card connector, jumper and switch locations

Connectors, Jumpers, and Switches	
Label	Function
CN1	Relay output
CN2	Isolated digital input
JP1	Interrupt level
JP2	Interrupt gate
JP3	Interrupt trigger
J1	PC-bus Connector
SW1	Card base address

Table 2-1 PCM-3725 connectors, jumpers, and switches

Base address selection (SW1)

You control PCM-3725 operation by reading or writing data to the PC's I/O (input/output) port addresses. The PCM-3725 requires four consecutive address locations. Switch SW1 sets the card's base (beginning) address. Valid base addresses range from Hex 000 to Hex 3FC. Other devices in your system may, however, be using some of these addresses.

We set the PCM-3725 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)								
Base address (hex)	Switch position							
	1	2	3	4	5	6	7	8
000	●	●	●	●	●	●	●	●
004	●	●	●	●	●	●	●	○
⋮								
*300	○	○	●	●	●	●	●	●
⋮								
3FC	○	○	○	○	○	○	○	○

○ = Off ● = On *=default

Table 2-2 PCM-3725 I/O address

Note: Switches 1-6 control the PC bus address lines as follows:

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

Interrupt function

The isolated digital input channel IDI0 in PCM-3725 is connected to the interrupt circuitry that can be used to generate hardware interrupt.

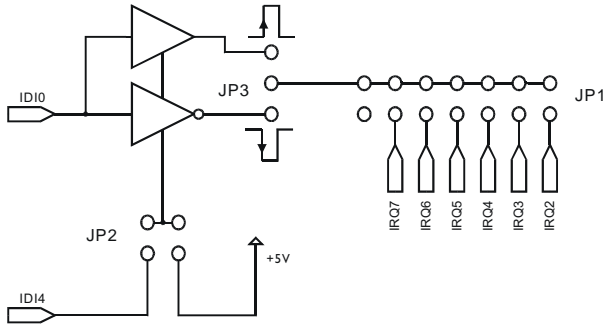
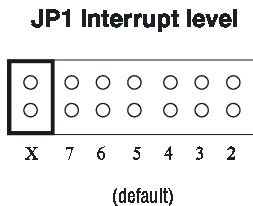


Fig. 2-2 PCM-3725 interrupt circuitry

Interrupt level (JP1)

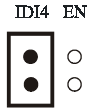
Jumper JP1 controls the card's IRQ level, as shown below. Position X disables the interrupt.



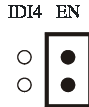
Interrupt gate (JP2)

Jumper JP2 selects the gate mode of the card's interrupt. Jumper settings appear below:

JP2 Gate mode



Interrupt function is enabled by IDI4



Always enabled (default)

Interrupt trigger (JP3)

Jumper JP3 selects the trigger edge (rising or falling) on which the card will trigger an interrupt. Jumper settings appear below:

JP3 Trigger method



Rising edge interrupt triggering (default)



Falling edge interrupt triggering

2.3 Connector Pin Assignments

The PCM-3725 has one on-board 20-pin flat-cable connector for isolated DI and one 50-pin connector for relay output.

Refer to the table below for abbreviations of the pin assignment.

Abbreviations	Description
NCn	Normally closed pin of relay n
NO n	Normally open pin of relay n
COMn	Common pin of relay n
IDInH	Isolated digital input high, channel n
IDInL	Isolated digital input low, channel n
NC	No connection

Table 2-3 Abbreviations of pin assignment

Connector CN1 - Relay output

COM0	1	2	COM0
NCO	3	4	NCO
NO0	5	6	NO0
COM1	7	8	COM1
NC1	9	10	NC1
NO1	11	12	NO1
COM2	13	14	COM2
NC2	15	16	NC2
NO2	17	18	NO2
COM3	19	20	COM3
NC3	21	22	NC3
NO3	23	24	NO3
COM4	25	26	COM4
NC4	27	28	NC4
NO4	29	30	NO4
COM5	31	32	COM5
NC5	33	34	NC5
NO5	35	36	NO5
COM6	37	38	COM6
NC6	39	40	NC6
NO6	41	42	NO6
COM7	43	44	COM7
NC7	45	46	NC7
NO7	47	48	NO7
NC	49	50	NC

Connector CN2 - Isolated digital input

IDI0H	20	19	IDI0L
IDI1H	18	17	IDI1L
IDI2H	16	15	IDI2L
IDI3H	14	13	IDI3L
NC	12	11	NC
IDI4H	10	9	IDI4L
IDI5H	8	7	IDI5L
IDI6H	6	5	IDI6L
IDI7H	4	3	IDI7L
NC	2	1	NC

2.4 Hardware Installation

Warning! *TURN OFF your PC power supply whenever you install or remove the PCM-3725 or connect and disconnect Cables.*



Installing the module

1. Turn off the PC's power off. Turn off the power of 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. Remove the CPU card from the chassis (if necessary) to gain access to the card's PC/104 connector.
5. Connect the connector J1 of the PCM-3725 to the PC/104 connector. Carefully align the pins to the PC/104 connector. Slide the module into the connector. The module pins may not slide all the way into the connector; do not force the pins into place, or the module may be damaged.
6. Fasten the module to the CPU card by using the included brass screw. Screw the brass spacer into the threaded hole on the CPU card. Do not tighten too much, or the threads may be damaged.
7. Attach any accessories to the PCM-3725 using 20/50 pin cables.
8. Reinstall the CPU card and replace the system unit cover. Reconnect the cables you removed in step 2. Plug in and turn on the power.

This completes the hardware installation. Install the software driver as described in the following section.

CHAPTER
3

Digital I/O

3.1 Digital I/O Programming

On the PCM-3725 card, 8 isolated digital input channels and 8 relay output channels are provided. Two I/O port addresses (started from BASE +0) are reserved for accessing these channels.

The two addresses are allocated as:

BASE +0 R/O channel 0-7

BASE +1 D/I channel 0-7

A read operation on BASE +1 will read in the value (8 bits) of the 8 corresponding isolated digital input channels.

To access these channels on BASIC, use the statement:

```
VALUE = INP (BASE +1)
```

A write operation on BASE +0 will set the desired status (1 = ON, 0 = OFF) on the 8 corresponding relay output channels. To program these channels in BASIC, use the following statement:

```
OUT BASE, XYZ
```

Where XYZ should be a number between 0 and 255. The status of the relay output can be monitored by reading back the BASE +0 byte as shown below:

```
STATUS = INP (BASE)
```

3.2 Isolated Digital Input Connections

The PCI-3725 has 8 isolated digital input channels designated IDI0~IDI7.

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

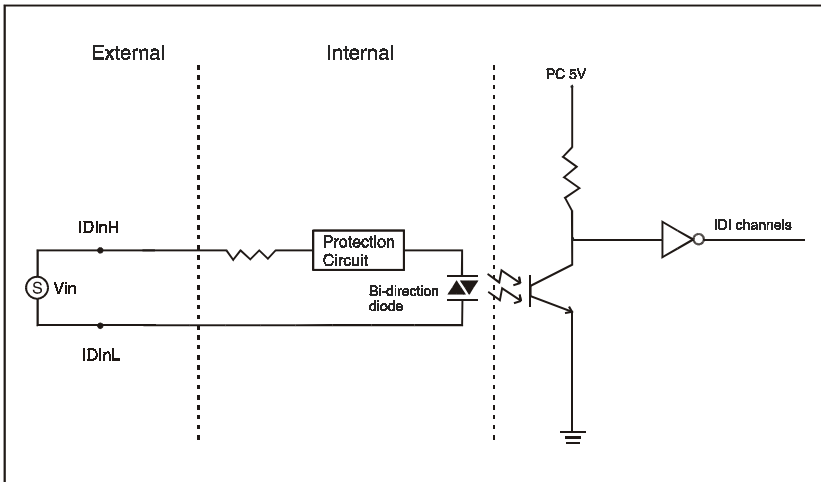


Fig. 3-1 Isolated digital input connection

3.3 Relay Output

After power on, the initial relay output status of PCM-3725 is shown as below:

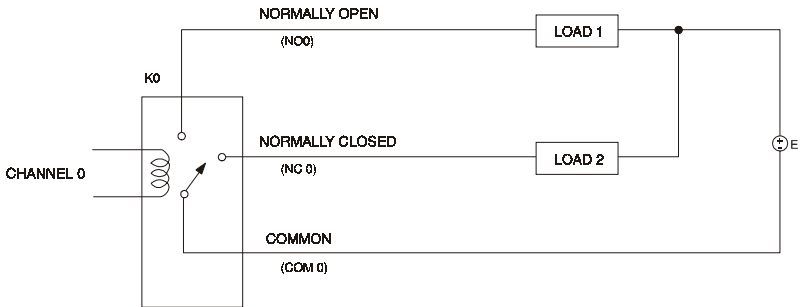


Fig. 3-2 Relay output connection

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.

CHAPTER **4**

Register Format

4.1 Overview

The PCM-3725 is delivered with an easy-to-use 32-bit DLL driver for user programming under the Windows 95/98/NT operating system. We advise users to program the PCM-3725 using the 32-bit DLL driver provided by Advantech to avoid the complexity of low-level programming by register.

The most important consideration in programming the PCM-3725 at 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.

4.2 I/O Port Address Map

The PCM-3725 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+1 is the base address plus one byte.

4.3 Register Format

PCM-3725 Register Format									
Base Add.		7	6	5	4	3	2	1	0
0	R	Relay Output Read Back							
		RS7	RS6	RS5	RS4	RS3	RS2	RS1	RS0
	W	Relay Output							
		RO7	RO6	RO5	RO4	RO3	RO2	RO1	RO0
1	R	Isolated Digital Input							
		IDI7	IDI6	IDI5	IDI4	IDI3	IDI2	IDI1	IDI0
	W	N/A							

