

PCI-1737U/1739U

**24/48 Channel Digital
I/O Output Card**

User Manual

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Product Warranty (2 years)

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.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
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.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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 A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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.

FM

The PCI-1737U/PCI-1739U has passed the FM certification. According to the National Fire Protection Association, work sites are classified into different classes, divisions and groups, based on hazard considerations. PCI-1737U/PCI-1739U is compliant with the specifications of Class I, Division 2, Groups A, B, C and D indoor hazards.

Technical Support and Assistance

- Step 1. Visit the Advantech web site at www.advantech.com/support where you can find the latest information about the product.
- Step 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

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

- PCI-1737U/PCI-1739U card
- Companion CD-ROM (Device Drivers included)
- This User Manual

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User's 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:
 - a. The power cord or plug is damaged.

- b. Liquid has penetrated into the equipment.
- c. The equipment has been exposed to moisture.
- d. The equipment does not work well, or you cannot get it to work according to the user's manual.
- e. The equipment has been dropped and damaged.
- f. The equipment has obvious signs of breakage.

NOTE: *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.*

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.*

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.

Safety Precaution - Static Electricity

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

1. 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.
2. 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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General Information

Sections include:

- Features
- Applications
- Installation Guide
- Software Overview
- Device Driver Programming Roadmap
- Accessories

Chapter 1 General Information

The PCI-1737U/PCI-1739U is a 24/48-bit DI/O card with PCI bus. It provides you with 24/48 bits of parallel digital input/output. It emulates mode 0 of the 8255 PPI chip, but the buffered circuits offer a higher driving capability than the 8255. The I/O bits are divided into three 8-bit I/O ports: A0, B0, and C0. (Six for PCI-1739U, A0, A1, B0, B1, C0, C1) You can configure each port as either input or output via software.

The interrupt handling capability provides users the flexibility to generate interrupt to a PC. One pin in the connector can output a digital signal simultaneously with the card's generating an interrupt. (Two pin for PCI-1739U)

The other features give the PCI-1737U/PCI-1739U practical advantages in an industrial setting. When the system is hot reset or power on, the I/O port settings and output values of PCI-1737U/PCI-1739U will be determined by switch.

1.1 Features

- Function Compatible with PCL-724/731 (24/48 TTL digital I/O lines)
- Emulates mode 0 of 8255 PPI
- Buffered circuits provide higher driving capability
- Output status readback
- Programmable interrupt handling
- Pin compatible with Opto-22 I/O module racks
- PCI universal card (both 3.3V and 5V signaling)

1.2 Applications

- Industrial AC/DC I/O module monitoring and control
- Relay and switch monitoring and control
- Parallel data transfer
- Sensing the signals of TTL, DTL, CMOS logic
- Driving indicator LED's

1.3 Installation Guide

Before you install your PCI-1737U/PCI-1739U card, please make sure you have the following necessary components:

- PCI-1737U/PCI-1739U DA&C card
- PCI-1737U/PCI-1739U User Manual
- Driver software Advantech DLL drivers (included in the companion CD-ROM)
- Personal computer or workstation with a PCI-bus slot (running Windows 2000/XP)

Please refer to Section 1.6 for the relevant wiring boards and cables.

Some other optional components are also available for enhanced operation: ActiveDAQ, ActiveDAQ Pro, LabView or other 3rd-party software packages

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 procedure. Figure 1.1 on the next page provides a concise flow chart to give users a broad picture of the software and hardware installation procedures:

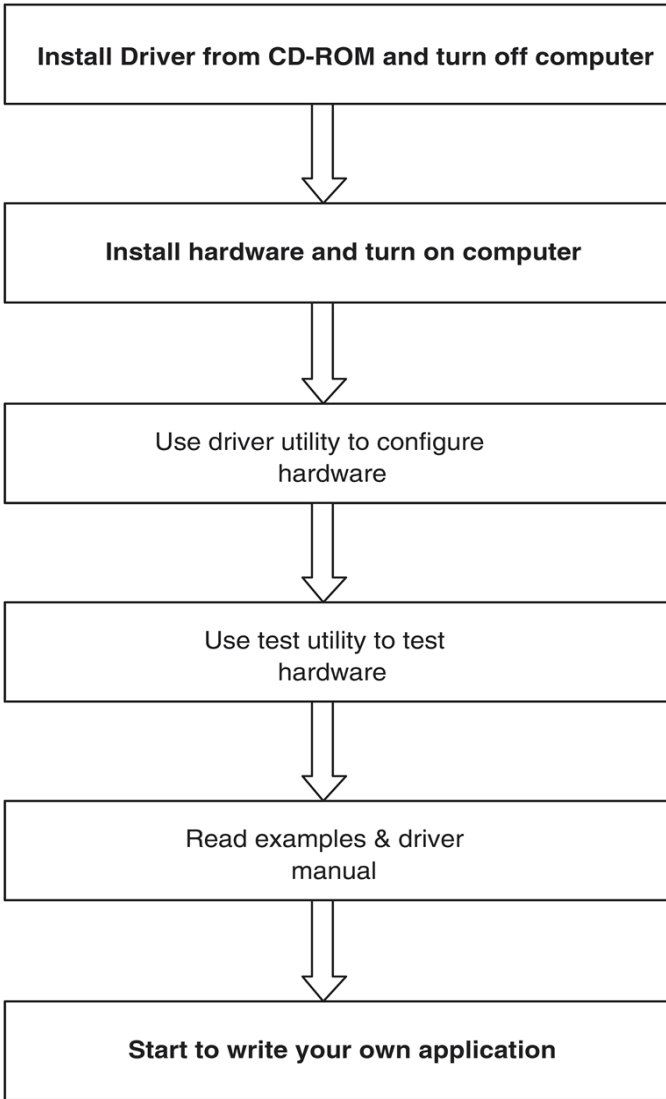


Figure 1.1: Installation Flow Chart

1.4 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-1737U/PCI-1739U card:

- Device Drivers (on the companion CD-ROM)
- LabVIEW driver
- Advantech ActiveDAQ
- Advantech ADAQView

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.

Device Drivers

Advantech Device Driver software is included on the companion CDROM at no extra charge. It also comes with all Advantech DA&C cards. Advantech's Device Drivers features a complete I/O function library to help boost your application performance. Advantech Device Drivers for Windows 2000/XP works seamlessly with development tools such as Visual C++, Visual Basic, Borland C++ Builder and Borland Delphi.

Register-level Programming

Register-level programming is available for experienced programmers who find it necessary to write code directly at the level of the device register. Since register-level programming requires much effort and time, we recommend that you use the Advantech Device Drivers instead. However, if register-level programming is indispensable, you should refer to the relevant information in *Chapter 4, Register Structure and Format*, or to the example codes included on the companion CD-ROM.

1.5 Device Driver Programming Roadmap

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

1.5.1 Programming Tools

Programmers can develop application programs with the following development tools:

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

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

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

Start/Programs/Advantech Automation/Advantech Device Manager /Device Driver's Manual

The example source code can 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 *Creating Windows 2000/XP Applications with Device Drivers* chapter and the *Function Overview* chapter in the Device Drivers Manual.

1.5.2 Programming with Device Drivers Function Library

Advantech Device Drivers offer a rich function library that can 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.

1.5.3 Troubleshooting Device Drivers Error

Driver functions will return a status code when they are called to perform a certain task for the application. When a function returns a code that is not zero, it means the function has failed to perform its designated function. To troubleshoot the Device Drivers error, you can pass the error code to `DRV_GetErrorMessage` function to return the error message.

Alternatively, you can refer to the Device Drivers Error Codes Appendix in the Device Drivers Manual for a detailed listing of Error Codes, Error IDs and the Error Messages.

1.6 Accessories

Cable

PCL-10150-1.2 IDC-50 pin socket connector with flat cable, 1.2M

Wiring Board

PCLD-782B 24-channel Opto-isolated Digital Input Boards

The PCLD-782B digital input daughterboards feature high-voltage (1500 V DC) optical isolation on all inputs. The PCLD-782B provides either 16 or 24 channels, depending on the connector you use. The PCLD-782B's 20-pin connector lets you access 16 channels, similar to the PCLD-782.

The PCLD-782B also provides a 50-pin Opto-22 connector with access to 24 channels. Both cards have on-board screw terminals for easy input wiring. Optically isolated signal conditioning provides isolation between separate channels, as well as between each input channel and the PC. This isolation prevents floating potential and ground loop problems while protecting the input lines from potentially damaging fault conditions. A red LED on each input channel indicates its status. If the input signal is high, the LED is on. You can configure each channel to work in either isolated or non-isolated mode. A variable resistor adjusts the threshold level for all 24 isolated input channels simultaneously.

PCLD-785B 16-channel Relay Output Boards

The PCLD-785B carry 16/24 SPDT electromechanical relays with a 20-pin flat cable connector and an additional 50-pin Opto-22 connector (for PCLD-785B only) compatible with the digital outputs of most I/O Cards. The number of output channels available on the PCLD-785B depends on the connector you use. The I/O card's 50-pin connector accesses all 24 channels, while its 20-pin connector has access to 16 channels. The PCLD-785B automatically selects the correct control logic for the connector in use.

PCLD-885 16-channel Power Relay Output Board

The PCLD-885 provides 16 SPST power relay channels with a maximum contact rating of 250 VAC @ 5 A or 30 VDC @ 5 A. The PCLD-885 can be driven directly by the digital output from PC-LabCards through its 20-pin box header or its 50-pin Opto-22 compatible connector.

ADAM-3950 50-pin Flat Cable Wiring Terminal for DIN-rail Mounting

The ADAM-3900 series consists of universal screw terminal modules designed for field signal wiring in industrial applications. They can be connected to the analog and digital ports of Advantech products such as the PCL series.

Installation

.Sections include:

- Unpacking
- Driver Installation
- Hardware Installation
- Device Configuration

Chapter 2 Installation

2.1 Unpacking

After receiving your PCI-1737U/PCI-1739U package, please inspect its contents first. The package should contain the following items:

- PCI-1737U/PCI-1739U card
- Companion CD-ROM (Device Drivers included)
- User Manual

The PCI-1737U/PCI-1739U cards harbor certain electronic components vulnerable to electrostatic discharge (ESD). ESD can easily damage the integrated circuits and certain components if preventive measures are ignored.

Before removing the card from the antistatic plastic bag, you should take the following precautions to ward off possible ESD damage:

Touch the metal part of your computer chassis with your hand to discharge the static electricity accumulated on your body. Alternatively, one can also use a grounding strap.

Touch the anti-static bag to a metal part of your computer chassis before opening the bag.

Take hold of the card only by the metal bracket when removing it out of the bag.

After taking out the card, you should first:

Inspect the card for any possible signs of external damage (loose or damaged components, etc.). If the card is visibly damaged, please notify our service department or our local sales representative immediately. Do not install a damaged card into your system.

Also, pay extra caution to the following aspects during installation:

Avoid physical contact with materials that could hold static electricity such as plastic, vinyl and Styrofoam.

Whenever you handle the card, grasp it only by its edges. DO NOT TOUCH the exposed metal pins of the connector or the electronic components.

Note: Keep the anti-static bag for future use. You might need the original bag to store the card if you have to remove the card from a PC or transport it elsewhere.

2.2 Driver Installation

We recommend you install the driver before you install the PCI-1737U/PCI-1739U card into your system, since this will guarantee a smooth installation process.

The Advantech Device Drivers Setup program for the PCI-1737U/PCI-1739U card is included in the companion CD-ROM that is shipped with your DA&C card package. Please follow the steps below to install the driver software:

1. Insert the companion CD-ROM into your CD-ROM drive.
2. The Setup program will be launched automatically if you have the autoplay function enabled on your system. When the Setup Program

Note: If the autoplay function is not enabled on your computer, use Windows Explorer or Windows Run command to execute AUTORUN.EXE on the companion CD-ROM.



Figure 2.1: Advantech Automation Software Setup

3. Select the Device Drivers option.
4. Select the specific device then just follow the installation instructions step by step to complete your device driver installation and setup.

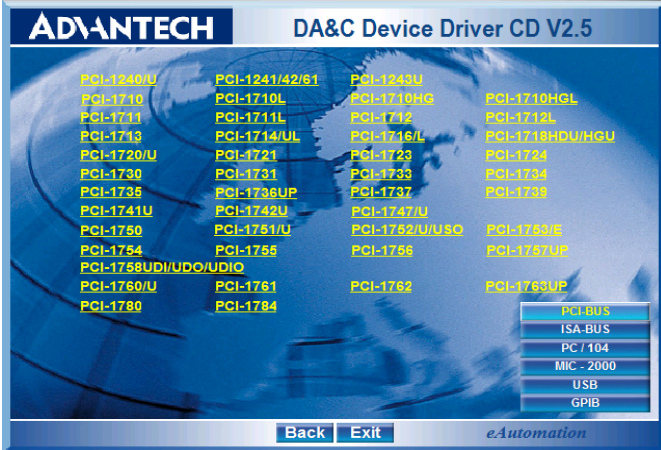


Figure 2.2: Different Options for Driver Setup

For further information on driver-related issues, an online version of the Device Drivers Manual is available by accessing the following path:

Start/Advantech Automation/Device Manager/Device Driver's Manual

2.3 Hardware Installation

Note: Make sure you have installed the driver before you install the card (please refer to chapter 2.2 Driver Installation)

After the Device Drivers installation is completed you can install the PCI-1737U/PCI-1739U card into any PCI slot on your computer. 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. However, it is suggested that you refer to the computer's user manual or related documentation if you have any doubts. Please follow the steps below to install the card.

1. Turn off your computer and unplug the power cord and cables.
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 PCI-1737U/PCI-1739U 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.
6. Fasten the bracket of the PCI card on the back panel rail of the computer with screws.
7. Connect appropriate accessories (50-pin flat 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 **Advantech Device Manager Program** that has itself already been installed on your system during driver setup.

2.4 Device Configuration

The *Advantech Device Manager 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 configure the I/O device for your card, you must first run the setup program by accessing *Start/Advantech Automation/Device Manager/ Advantech Device Manager* .
2. You can then view the device(s) already installed on your system.

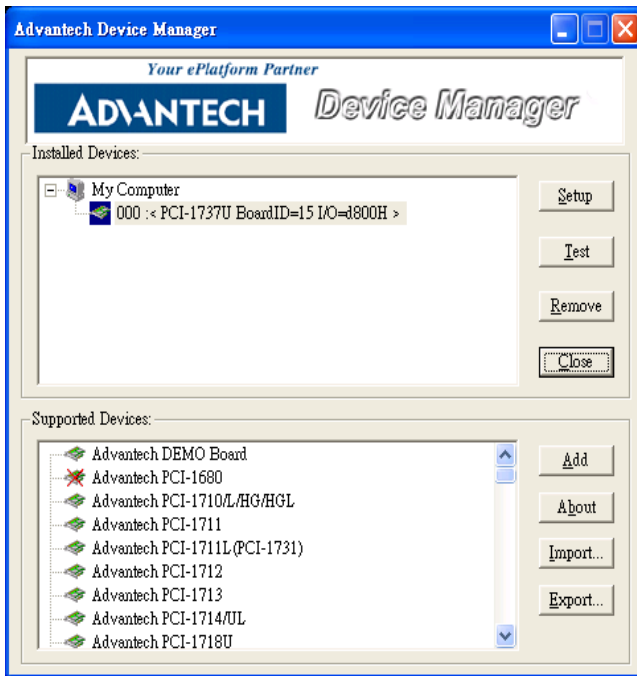


Figure 2.3: The Device Manager Dialog Box

3. On the Device Setting dialog box (Fig. 2-4), you can configure I/O port and interrupt source setting.

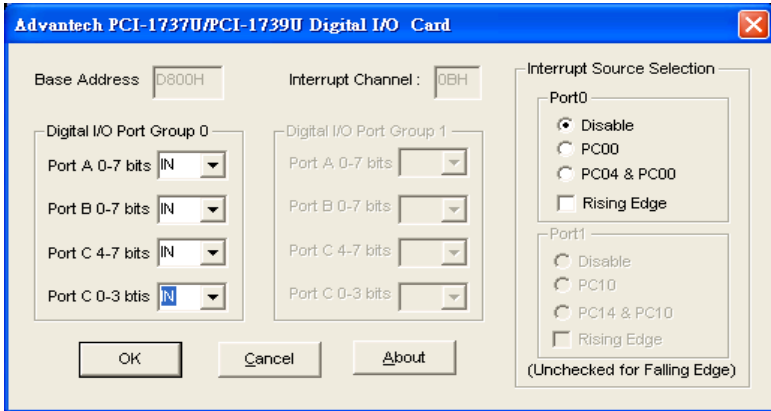


Figure 2.4: The Device Setting Dialog Box

After your card is properly installed and configured, you can click the ‘Test’ button to test your hardware by using the testing utility supplied.

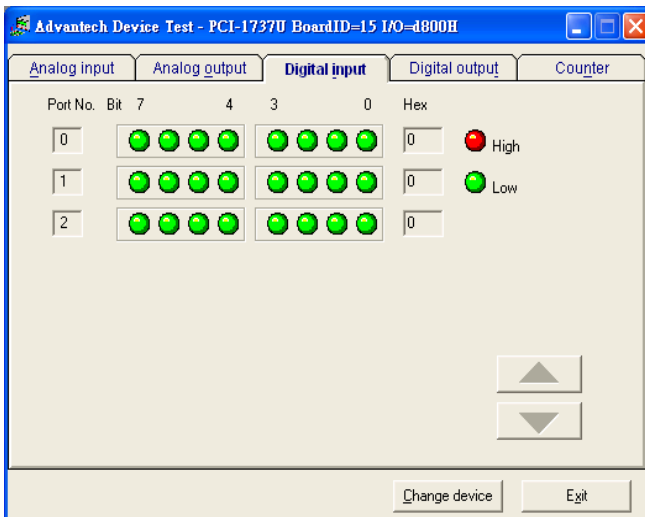


Figure 2.5: Digital Input Test Utility

For more detailed information, please refer to Chapter 2 of the Device Drivers Manual. You can also find rich examples on the CD-ROM to speed up your programming.

CHAPTER 3

Signal Connections

.Sections include:

- Switch and Jumper Settings
- Signal Connections

Chapter 3 Signal Connections

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-1737U/PCI-1739U via the I/O connector.

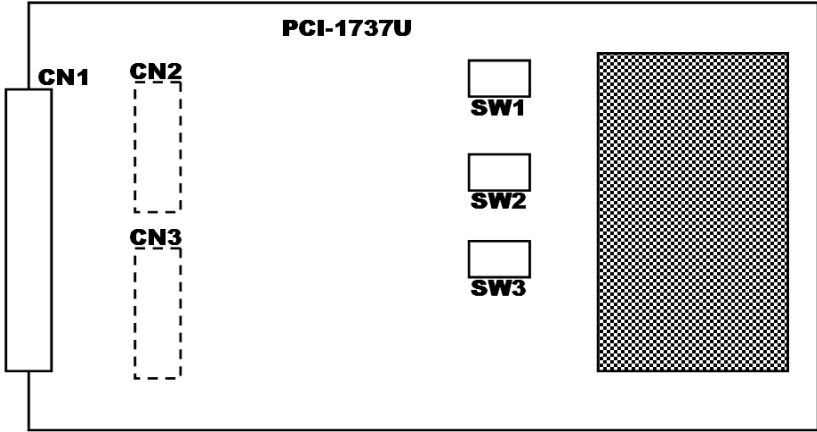


Figure 3.1: PCI-1737U Board Layout

- CN1:** IDC 50-pin header for digital input/output port A, B, and C
- CN2:** IDC 20-pin header digital input/output port A and B (optional)
- CN3:** IDC 20-pin header digital input/output port C (optional)
- SW1:** Port status setting (input/output) for PA0, PB0, PC0H and PC0L
- SW2:** Port output status setting (low/high)
- SW3:** BoardID switch (0~15)

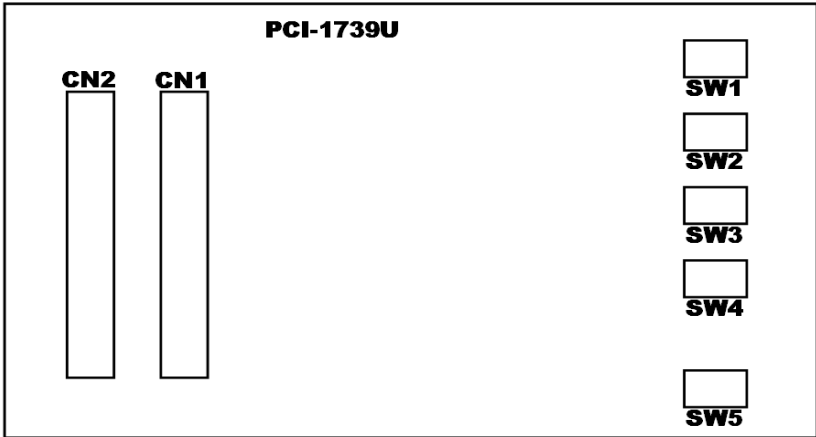


Figure 3.2: PCI-1739U Board Layout

CN1: IDC 50-pin header for digital input/output port A, B, and C

CN2: IDC 50-pin header for digital input/output port A, B, and C

SW1: Port status setting (input/output) for PA0, PB0, PC0H and PC0L

SW2: Port status setting (input/output) for PA1, PB1, PC1H and PC1L

SW3: Port output status setting (low/high) for PA0, PB0, PC0H and PC0L

SW4: Port output status setting (low/high) for PA1, PB1, PC1H and PC1L

SW5: BoardID switch (0~15)

3.1 Switch and Jumper Settings

We designed the PCI-1737U/PCI-1739U with ease-of-use in mind. It is a "plug and play" card, i.e. the system BIOS assigns the system resources such as base address and interrupt automatically. There are only some functions with 3 switches (5 for PCI-1739U) to be set by the user. The following section describes how to configure the card. You may want to refer to the figure below for help in identifying card components.

3.1.1 Port Status Setting

(SW1 for PCI-1737U, SW1/SW2 for PCI-1739U) Users can set the onboard I/O ports as input or output separately. Please be aware that once dials the switch to “ON” (Set port as output); the software setting will be ignored.

Table 3.1: Port Status Setting

ON	Set port as output
OFF	Set port I/O by software

3.1.2 Output Status Setting

Users can determine the output status of each port after the system powering up or resetting. The function will be effective only when the "Port Status Setting" switch is on.

Table 3.2: Output Status Setting

ON	Output HIGH after reset
OFF	Output LOW after reset

3.1.3 BoardID Setting

(SW3 for PCI-1737U, SW5 for PCI-17339U)

Table 3.3: BoardID Setting

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

3.2 Signal Connections

3.2.1 Pin Assignment For PCI-1737U

PCI-1737U is quipped with a standard IDC 50-pin header. However you can also access the signals on CN1 by attaching IDC 20-pin connectors to the holes in the PCB at CN2 and CN3 by yourself. The pin assignments are as follows.

PC 7	1	2	GND
PC 6	3	4	GND
PC 5	5	6	GND
PC 4	7	8	GND
PC 3	9	10	GND
PC 2	11	12	GND
PC 1	13	14	GND
PC 0	15	16	GND
PB 7	17	18	GND
PB 6	19	20	GND
PB 5	21	22	GND
PB 4	23	24	GND
PB 3	25	26	GND
PB 2	27	28	GND
PB 1	29	30	GND
PB 0	31	32	GND
PA 7	33	34	GND
PA 6	35	36	GND
PA 5	37	38	GND
PA 4	39	40	GND
PA 3	41	42	GND
PA 2	43	44	GND
PA 1	45	46	GND
PA 0	47	48	GND
+5V	49	50	GND

Figure 3.3: Connector 1

PA0	1	11	PA1	PC0	1	11	PC1
PA2	2	12	PA3	PC2	2	12	PC3
PA4	3	13	PA5	PC4	3	13	PC5
PA6	4	14	PA7	PC6	4	14	PC7
PB0	5	15	PB1	PD0	5	15	PD1
PB2	6	16	PB3	PD2	6	16	PD3
PB4	7	17	PB5	PD4	7	17	PD5
PB6	8	18	PB7	PD6	8	18	PD7
GND	9	19	GND	GND	9	19	GND
+5V	10	20	+12V	+5V	10	20	+12V

Figure 3.4: Connector 2 & 3 (Optional)

3.2.2 I/O Connector Signal Description For PCI-1737U

Table 3.4: I/O Connection signal Description			
Signal	Ref.	Direction	Description
PA <0~7>	GND	Input/Output	Digital input/ output port A, channel 0~7.
PB <0~7>	GND	Input/Output	Digital input/ output port B, channel 0~7.
PC <0~7>	GND	Input/Output	Digital input/ output port C, channel 0~7.
+5V	GND	Output	+5V DC power
+12V	GND	Output	+12V DC power
GND	-	-	Digital ground.

3.2.3 Pin Assignment For PCI-1739U

PCI-1739U is equipped with 2 standard IDC 50-pin headers. The pin assignments are as follows.

CN1			CN2		
PC 07	1 2	GND	PC 17	1 2	GND
PC 06	3 4	GND	PC 16	3 4	GND
PC 05	5 6	GND	PC 15	5 6	GND
PC 04	7 8	GND	PC 14	7 8	GND
PC 03	9 10	GND	PC 13	9 10	GND
PC 02	11 12	GND	PC 12	11 12	GND
PC 01	13 14	GND	PC 11	13 14	GND
PC 00	15 16	GND	PC 10	15 16	GND
PB 07	17 18	GND	PB 17	17 18	GND
PB 06	19 20	GND	PB 16	19 20	GND
PB 05	21 22	GND	PB 15	21 22	GND
PB 04	23 24	GND	PB 14	23 24	GND
PB 03	25 26	GND	PB 13	25 26	GND
PB 02	27 28	GND	PB 12	27 28	GND
PB 01	29 30	GND	PB 11	29 30	GND
PB 00	31 32	GND	PB 10	31 32	GND
PA 07	33 34	GND	PA 17	33 34	GND
PA 06	35 36	GND	PA 16	35 36	GND
PA 05	37 38	GND	PA 15	37 38	GND
PA 04	39 40	GND	PA 14	39 40	GND
PA 03	41 42	GND	PA 13	41 42	GND
PA 02	43 44	GND	PA 12	43 44	GND
PA 01	45 46	GND	PA 11	45 46	GND
PA 00	47 48	GND	PA 10	47 48	GND
+5 V	49 50	GND	+5 V	49 50	GND

Figure 3.5: PCI-1739U Pin Assignments

3.2.4 I/O Connector Signal Description For PCI-1737U

Table 3.5: I/O Connection signal Description

Signal	Ref.	Direction	Description
PA <0~7, 10~17>	GND	Input/Output	Digital input/ output port A, channel 0~7 & channel 10~17.
PB <0~7, 10~17>	GND	Input/Output	Digital input/ output port B, channel 0~7 & channel 10~17.
PC <0~7, 10~17>	GND	Input/Output	Digital input/ output port C, channel 0~7 & channel 10~17.
+5V	GND	Output	+5V DC power
GND	-	-	Digital ground.

Operation

Sections include:

- Configuration
- 8255 Mode 0 Function Definitions
- Interrupt Handling

Chapter 4 Operation

This chapter describes the operating characteristics of the PCI-1737U/PCI-1739U. The DLL driver allows a user to access all of the card's functions without register level programming. Please see the User's Manual for the driver bundled with this card for more information. For users who prefer to implement their own bit-level programming to drive the card's functions, information useful for making such a program is included in this chapter.

4.1 Configuration

The PCI-1737U/PCI-1739U emulates 8255 programmable peripheral interface (PPI) chips in mode 0, but with higher driving capability than a standard 8255 chip. The 8255 chips has 24 programmable I/O pins that are divided into three 8-bit ports. The total 24 DI/O pins from both chips are divided into 3 ports, designated PA0, PB0, PC0. Each port can be programmed as an input or an output port. The I/O pins in port A0 are designated PA00, PA01... PA07; the pins in port B0 are designated PB00, PB01... PB07, etc. These port names are used both in this manual and in the software library. Refer to Chapter 1, connector.

Mode 0 of 8255 provides simple input/output functions. No handshaking is required since data is written directly to or read from a specified port (see 8255 MODE 0 Function Definitions).

PCI-1737U/PCI-1739U's read-back function is another useful function that allows you to monitor each output port.

4.2 8255 Mode 0 Function Definitions

The basic functions of 8255 mode 0 include:

Two 8-bit I/O ports - port A (PA) and port B (PB)

Port C is divided into two nibble-wide (4-bit) I/O ports:- PC upper and PC lower

Any port can be used for either input or output.

Output status can be read back.

4.2.1 Interrupt Function of the DIO Signals

The I/O pin (PC00) can be used to generate hardware interrupt. A user can program the interrupt control register (Base + 8) to select the interrupt sources. Refer to "Interrupt Function" in this chapter for details about interrupt control.

4.2.2 Input/Output Control

A control word can be written to a port's configuration register (Base + 3) to set the port as an input or an output port, unless the ports are set as output ports via switches (refer to Section 3.1, Switch Settings). The following table shows the format of a control word.

Table 4.1: Bit map of port configuration register

D7	D6	D5	D4	D3	D2	D1	D0
--	--	--	PortA 0: output 1: input	Port C higher bits 0: output 1: input	--	PortB 0: output 1: input	Port C Lower bits 0: output 1: input

Note: A control word has no effect if the corresponding port is set as an output port by Switch.

Warning! Before setting any port as an output port via software, make sure that a safe output value has also been set. An output voltage will appear at the pins immediately following the control word taking effect. If no output value was specified, the value will be indeterminate (either 0 or 1), which may cause a dangerous condition.

4.2.3 Initial Configuration

The initial configuration of each port depends on the switch setting (SW1/SW2 for PCI-1737U and SW1/SW2/SW3/SW4 for PCI-1739U)

If SW1 is set to "OFF", all ports configured by software are automatically set as input ports during system start up or reset, with a default signal level of logic 1 (high). All ports are set as output ports during system start up or reset when SW1 is set to "ON", signal level depends on SW2. If SW2 is set to "OFF", the corresponding port will be set logic 1 (voltage high), otherwise, they will be set logic 0 (voltage low). Refer to "Switch Settings" in Chapter 2 for more information.

4.3 Interrupt Handling

Two lines in the I/O port (C0 and C4) are connected to the interrupt circuitry. The "Interrupt Control Register" of the PCI-1737U/PCI-1739U controls how the combination of the two signals generates an interrupt. When the interrupt request signal is generated, the software can service the request signal by ISR.

4.3.1 IRQ Level

The IRQ level is set automatically by the PCI plug-and-play BIOS and is saved in the PCI controller. There is no need for users to set the IRQ level.

4.3.2 Interrupt Control Register (Base + 8)

The "Interrupt Control Register" (Base + 8) controls the interrupt signal source, edge and flag. Table 4-2 shows the bit map of the interrupt control register. The register is a readable/writable register. When writing to it, it is used as a control register, and when reading from it, it is used as a status register

Table 4.2: Interrupt control register bit map

	D7	D6	D5	D4	D3	D2	D1	D0
Read	0	0	0	0	F0	E0	M01	M00
Write	N/A							

M00 and M01: mode bits of port0

E0: triggering edge control bits

F0: interrupt flag bit

4.3.3 Interrupt Source Control

The "mode bits" in the interrupt control register determine the allowable sources of signals generating an interrupt. Bit 0 and bit 1 determine the interrupt source for port. Table 3-3 shows the relationship between an interrupt source and the values in the mode bits.

<i>Table 4.3: Interrupt mode bit values</i>		
Port0		
M01	M00	Description
0	0	Disable interrupt
0	1	Source=PC00
1	0	Source=PC00 when PC04 =0 ; INT disable when PC04 = 1
1	1	N/A

4.3.4 Interrupt Triggering Edge Control

The interrupt can be triggered by a rising edge or a falling edge of the interrupt signal, selectable by the value written in the "triggering edge control" bit in the interrupt control register, as shown in Table 4-4.

<i>Table 4.4: Triggering edge control bit values</i>	
E0	Triggering edge of interrupt signal
1	Rising edge trigger
0	Falling edge trigger

4.3.5 Interrupt Flag Bit

The "interrupt flag" bit is a flag indicating the status of an interrupt. It is a readable and writable bit. Read the bit value to find the status of the interrupt, write "1" to this bit to clear the interrupt. This bit must be cleared in the ISR to service the next incoming interrupt.

Table 4.5: Interrupt flag bit values

F0		Interrupt status
Read	1	Interrupt exists
	0	No interrupt
Write	1	Clear interrupt
	0	Don't care

APPENDIX
A

Specifications

Appendix A Specifications

A.1 PCI-1737U

Bus interface

PCI bus spec. 2.2 compliant and support both 3.3V and 5V signaling (PCI universal card)

Digital Input/Output

I/O lines: 24

Programming mode: 8255 PPI mode 0

Digital Output

Logic level 0: 0.4Vmax.@24mA(sink)

Logic level 1: 2.4 V min.@15mA(source)

Digital Input

Logic level 0: 0.4Vmax.

Logic level 1: 2.4 V min.

Interrupt: PC0 of each port can generate interrupt

Interrupt Triggering: Rising or falling edge triggering

General

Board dimension (L x H): 175 x 100 mm (6.9 " x 3.9 ")

Connector50-pin insulation displacement connectors

Power Consumption: +5V @ 300mA (MAX)

Operating Temperature: 0 ~ 60° C

Storage Temperature: -25 ~ 85° C

Operating Humidity: 5 ~ 95% Relative Humidity (non-condensing)

A.2 PCI-1739U

Bus interface

PCI bus spec. 2.2 compliant and support both 3.3V and 5V signaling (PCI universal card)

Digital Input/Output

I/O lines: 48

Programming mode: 8255 PPI mode 0

Digital Output

Logic level 0: 0.4Vmax.@24mA(sink)

Logic level 1: 2.4 V min.@15mA(source)

Digital Input

Logic level 0: 0.4Vmax.

Logic level 1: 2.4 V min.

Interrupt: PC0 of each port can generate interrupt

Interrupt Triggering: Rising or falling edge triggering

General

Board dimension (L x H) : 175 x 100 mm (6.9 " x 3.9 ")

Connector50-pin insulation displacement connectors

Power Consumption: +5V @ 720mA (MAX)

Operating Temperature: 0 ~ 60° C

Storage Temperature: -25 ~ 85° C

Operating Humidity: 5 ~ 95% Relative Humidity (non-condensing)

APPENDIX

B

Function Block

Appendix B Function Block

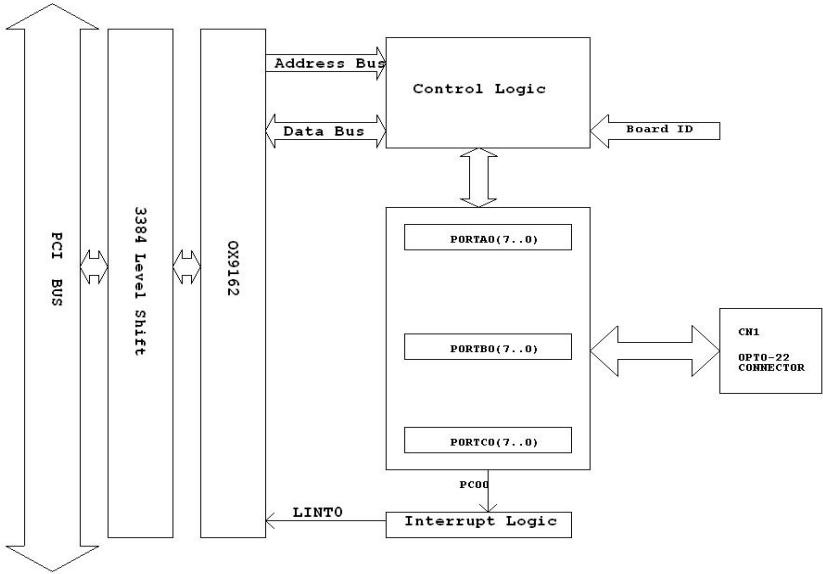


Figure B.1: PCI-1737U

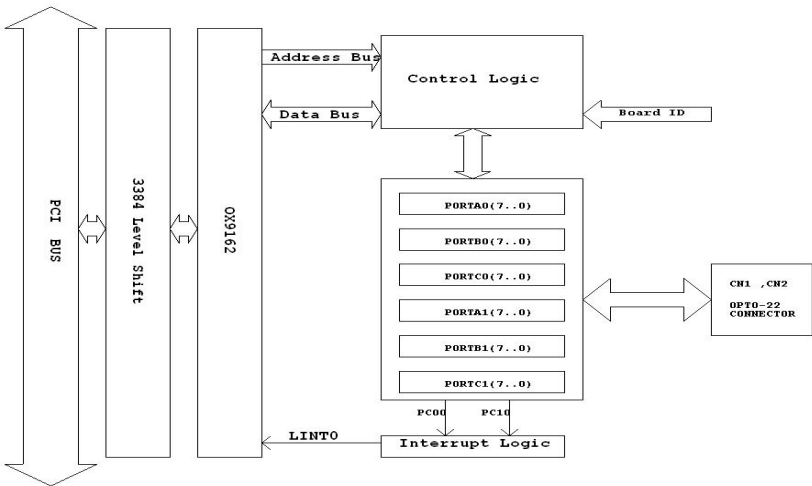


Figure B.2: PCI-1739U