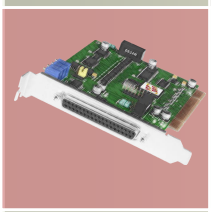
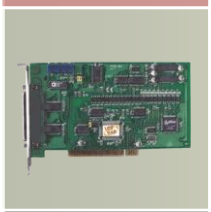



PISO-813 Series Card User Manual

32-channel Single-Ended Isolated A/D board Version 1.5, Feb. 2014

Supports

Board includes PISO-813 and PISO-813U.

Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

ICP DAS assumes no liability for damages consequent to the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, nor for any infringements of patents or other rights of third parties resulting from its use.

Copyright

Copyright © 2014 by ICP DAS. All rights are reserved.

Trademark

Names are used for identification only and may be registered trademarks of their respective companies.

Contact US

If you have any question, please feel to contact us at:
service@icpdas.com; service.icpdas@gmail.com
We will give you quick response within 2 workdays.

TABLE OF CONTENTS

1. INTRODUCTION 3

1.1 PACKING LIST 4
1.2 FEATURES 4
1.3 SPECIFICATIONS 5

2. HARDWARE CONFIGURATION 6

2.1 BOARD LAYOUT 6
2.2 CARD ID SWITCH 8
2.3 A/D CONVERTER OPERATION 9
2.3.1 A/D Conversion Block Diagram 9
2.3.2 JP1: Analog Input Range Selection 9
2.3.3 JP2: Analog Input Polarity Selection 10
2.3.4 Setting Reference 10
2.3.5 A/D Operation Flow 11
2.4 PIN ASSIGNMENTS 12

3. HARDWARE INSTALLATION 13

4. SOFTWARE INSTALLATION 17

4.1 OBTAINING/INSTALLING THE DRIVER INSTALLER PACKAGE 17
4.2 PNP DRIVER INSTALLATION 18
4.3 VERIFYING THE INSTALLATION 19
4.3.1 How do I get into Windows Device Manager? 19
4.3.2 Check that the Installation 21

5. TESTING PISO-813 SERIES CARD 22

5.1 SELF-TEST WIRING 22
5.2 EXECUTE THE TEST PROGRAM 23

6. I/O CONTROL REGISTER 25

6.1 HOW TO FIND THE I/O ADDRESS 25
6.1.1 PIO_DriverInit 26
6.1.2 PIO_GetConfigAddressSpace 28
6.1.3 Show_PIO_PISO 29

6.2 The Assignment of I/O Address 30
6.3 The I/O Address Map 32
6.3.1 RESET\ Control Register 32
6.3.2 A/D Data Register 33
6.3.3 Multiplexer Channel Select Register 34
6.3.4 PGA Gain Code Register 34
6.3.5 A/D Trigger Control Register 35
6.3.6 Card ID Register 35

7. DEMO PROGRAMS 36

7.1 Demo Program for Windows 36
7.2 Demo Program for DOS 38
7.3 PIO_PISO Utility 39

APPENDIX: DAUGHTER BOARD 41

A1. DB-37 and DN-37 41
A2. DB-8325 41

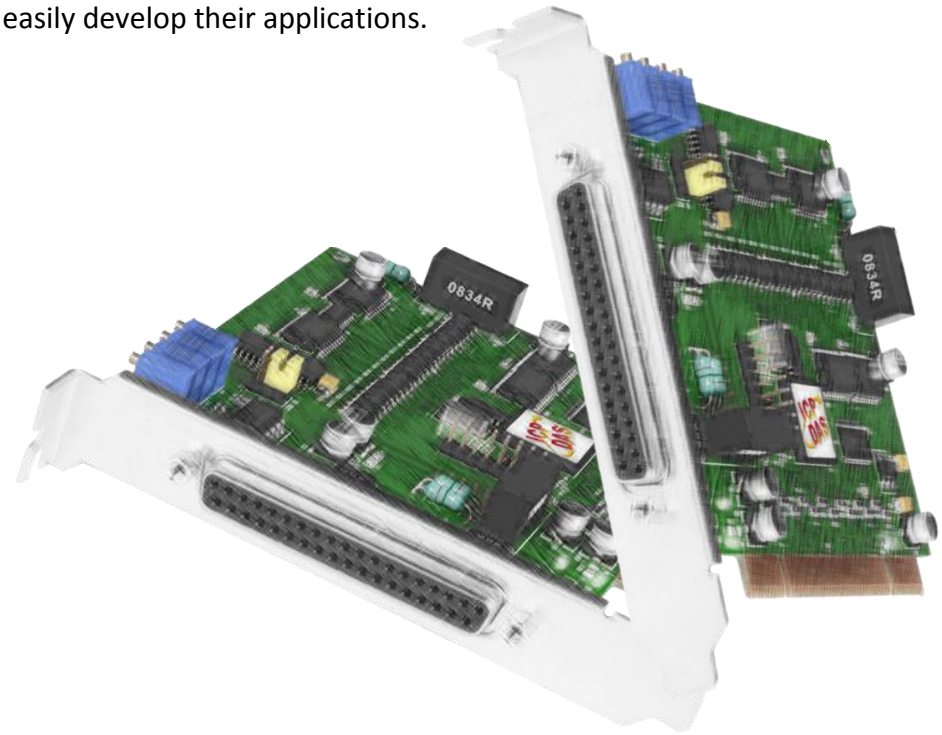
1. Introduction

The PISO-813U card is the new generation product that ICP DAS provides to meet RoHS compliance requirement. The new PISO-813U card is designed as a drop-in replacement for the PISO-813, and users can replace the PISO-813 by the PISO-813U directly without software/driver modification.

The PISO-813 series card is bus-typed isolated A/D board for IBM or compatible PC. The PISO-813U universal PCI card supports 3.3 V/5 V PCI bus while the PISO-813 supports 5 V PCI bus. They feature 12-bit 32 single-ended analog inputs, 3750 V_{rms} bus-typed isolation protection and 10 kS/s data acquisition under DOS and Windows. It is the most cost effective isolated A/D board for the universal PCI/PCI Bus in the world.

The PISO-813U also adds a Card ID switch on-board. Users can set Card ID and then recognize the board by the ID via software when using two or more PISO-813U cards in one computer.

These cards support various OS such as Linux, DOS, Windows 98, Windows NT, Windows 2000, 32-/64-bit Windows XP/2003/2008/Vista/7 and Windows 8. It also provides the DLL and Active X control, and various language sample programs in Turbo C++, Borland c++, Microsoft C++, Visual C++, Borland Delphi, Borland C++ Builder, Visual Basic, C#.NET, Visual Basic.NET and LabVIEW to help users to quickly and easily develop their applications.



1.1 Packing List

The shipping package includes the following items:

- One PISO-813 series card hardware
- One printed Quick Start Guide
- One software utility CD

Note:
If any of these items is missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

1.2 Features

- Support the +5V PCI bus for PISO-813
- Support the +3.3/+5 V PCI bus for PISO-813U
- 12-bit 10 kS/s A/D converter
- 32 single-ended analog input channels
- 3750 V_{rms} bus-type isolation protection
- Built-in DC/DC converter with 3000 V_{DC} protection
- Analog input range:
  - Bipolar: ±10 V, ±5 V, ±2.5 V, ±1.25 V, ±0.625 V
  - Unipolar: 0~10 V, 0~5 V, 0~2.5 V, 0~1.25 V, 0~0.625 V
- Supports Card ID (SMD Switch) for PISO-813U
- Programmable gain control: 1, 2, 4, 8, 16
- A/D trigger mode: Software Trigger
- A/D data transfer mode: polling
- SMD, Sort card

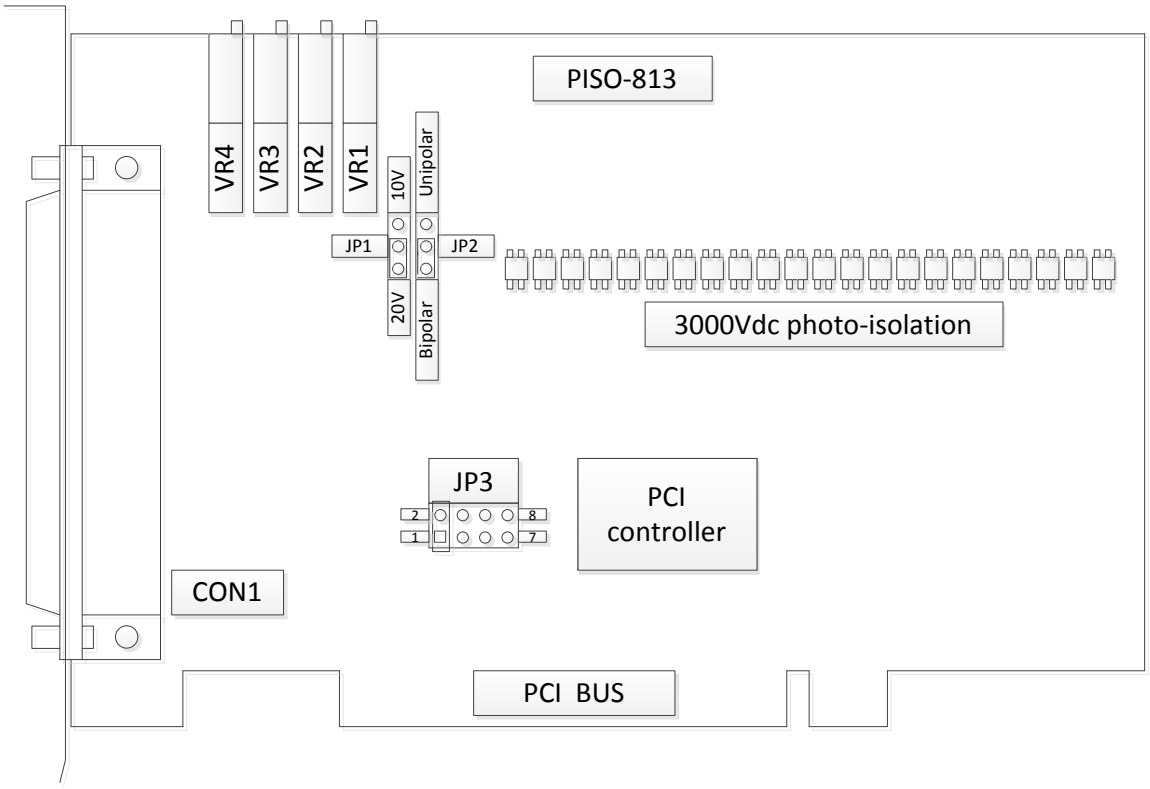
1.3 Specifications

Model Name	PISO-813U		PISO-813		
Analog Input					
Isolation Voltage	3750 V_{rms} (Bus Type)				
Channels	32 single-ended				
A/D Converter	12-bit, 8 µs Conversion time				
Sampling Rate	10 kS/s. max.				
FIFO Size	N/A				
Over voltage Protection	Continuous +/-35 Vp-p				
Input Impedance	10 MΩ/6 pF				
Trigger Modes	Software				
Data Transfer	Polling				
Accuracy	0.01 % of FSR ±1 LSB @ 25 °C, ± 10 V				
Zero Drift	+/- 25 ppm/°C of FSR				
General					
Bus Type	3.3 V/5 V Universal PCI, 32-bit, 33 MHz		5 V PCI, 32-bit, 33 MHz		
Data Bus	8-bit				
Card ID	Yes(4-bit)		No		
I/O Connector	Female DB37 x 1				
Dimensions (L x W x D)	128 mm x 92 mm x 22mm		180 mm x 105 mm x 22 mm		
Power Consumption	850 mA @ +5 V				
Operating Temperature	0 ~ 60 °C				
Storage Temperature	-20 ~ 70 °C				
Humidity	5 ~ 85% RH, non-condensing				
Analog Input Range					
Gain	1	2	4	8	16
Bipolar	±10 V ±5 V	±5 V ±2.5 V	±2.5 V ±1.25 V	±1.25 V ±0.625 V	±0.625 V
Unipolar	0~10 V	0~5 V	0~2.5 V	0~1.25 V	0~0.625 V
Sampling Rate Max.	10 kS/s. max.				

2. Hardware Configuration

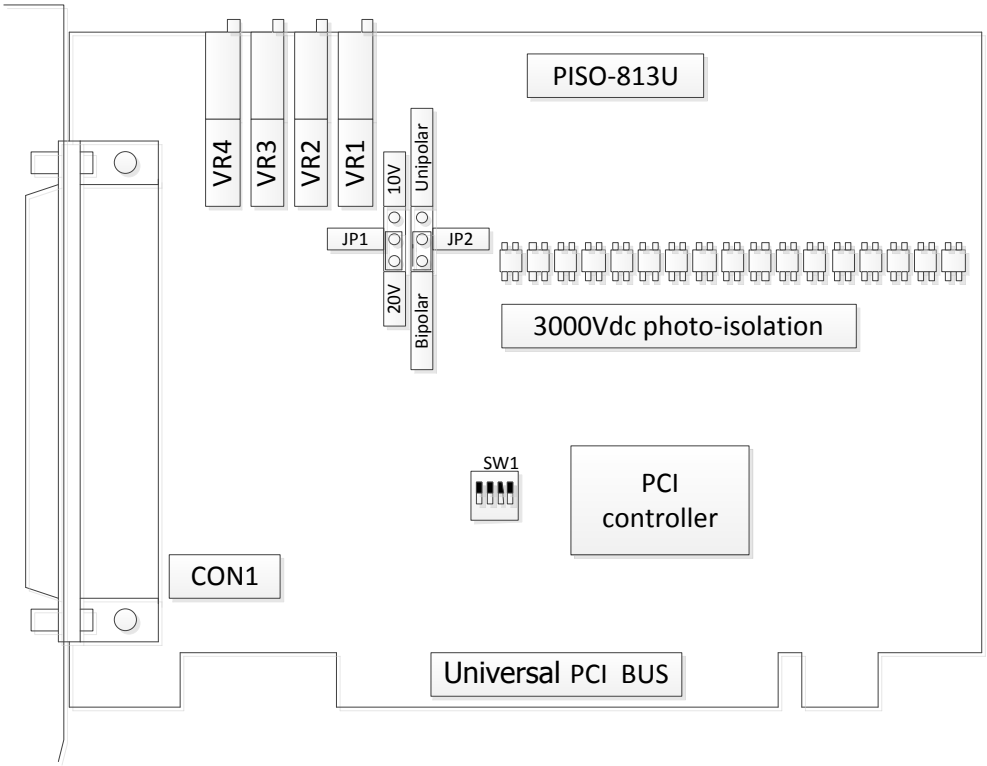
2.1 Board Layout

- Board Layout of the PISO-813.



CON1	32-channel analog input, refer to Sec.2.4 **for more detailed information.**
JP1	Input range setting, refer to Sec. 2.3.1 for more detailed information.
JP2	Unipolar/Bipolar setting, refer to Sec. 2.3.2 for more detailed information.
JP3	Reserved
VR1~VR4	For manufacture calibration

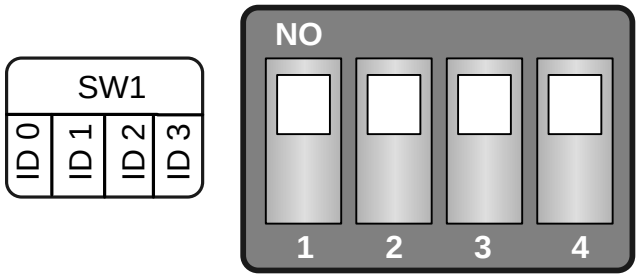
- Board Layout of the PISO-813U.



CON1	32-channel analog input Sec.2.4 for more detailed information.
JP1	Input range setting, refer to Sec. 2.3.1 for more detailed information.
JP2	Unipolar/Bipolar setting, refer to Sec. 2.3.2 for more detailed information.
SW1	Card ID function, refer to Sec. 2.2 for more detailed information.
VR1~VR4	For manufacture calibration

2.2 Card ID Switch

The PISO-813U has a Card ID switch (SW1) with which users can recognize the board by the ID via software when using two or more PISO-813U cards in one computer. The default Card ID is 0x0. For detail SW1 Card ID settings, please refer to Table 2.1. Note that the Card ID function is only supported by the PISO-813U.



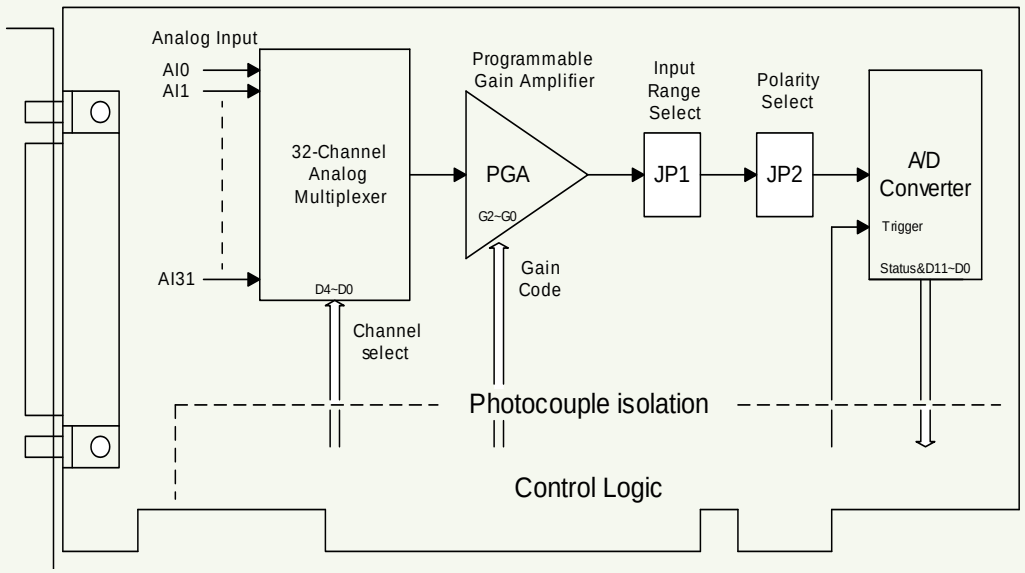
(Default Settings)

Table 2.1 (*) Default Settings; OFF → 1; ON → 0

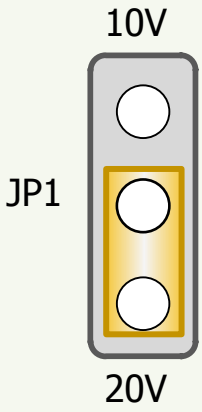
Card ID (Hex)	1 ID0	2 ID1	3 ID2	4 ID3
(*) 0x0	ON	ON	ON	ON
0x1	**OFF**	ON	ON	ON
0x2	ON	**OFF**	ON	ON
0x3	**OFF**	**OFF**	ON	ON
0x4	ON	ON	**OFF**	ON
0x5	**OFF**	ON	**OFF**	ON
0x6	ON	**OFF**	**OFF**	ON
0x7	**OFF**	**OFF**	**OFF**	ON
0x8	ON	ON	ON	**OFF**
0x9	**OFF**	ON	ON	**OFF**
0xA	ON	**OFF**	ON	**OFF**
0xB	**OFF**	**OFF**	ON	**OFF**
0xC	ON	ON	**OFF**	**OFF**
0xD	**OFF**	ON	**OFF**	**OFF**
0xE	ON	**OFF**	**OFF**	**OFF**
0xF	**OFF**	**OFF**	**OFF**	**OFF**

2.3 A/D Converter Operation

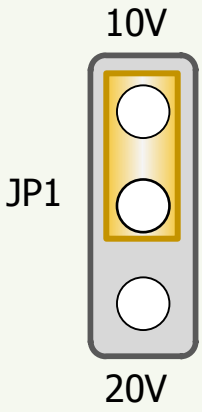
2.3.1 A/D Conversion Block Diagram



2.3.2 JP1: Analog Input Range Selection

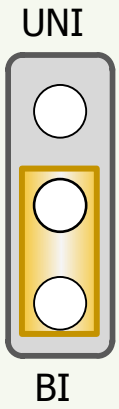


Input Range = 20 V
(Default Settings)

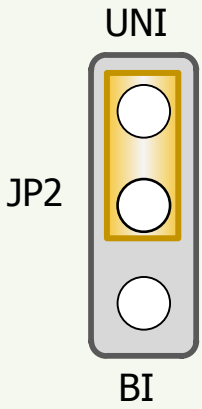


Input Range = 10 V

2.3.3 JP2: Analog Input Polarity Selection



Bipolar Mode
(Default Settings)



Unipolar Mode

2.3.4 Setting Reference

Analog Input	JP2 Polarity Select	JP1 Range Select	Gain
-10 V ~ +10 V	Bipolar	20 V	1
-5 V ~ + 5 V	Bipolar	20 V	2
		10 V	1
-2.5 V ~ +2.5 V	Bipolar	20 V	4
		10 V	2
-1.25 V ~ +1.25 V	Bipolar	20 V	8
		10 V	4
-0.625 V~ +0.625 V	Bipolar	20 V	16
		10 V	8
0 ~10 V	Unipolar	10 V	1
0 ~ 5 V	Unipolar	10 V	2
0 ~ 2.5 V	Unipolar	10 V	4
0 ~ 1.25 V	Unipolar	10 V	8
0 ~ 0.625 V	Unipolar	10 V	16

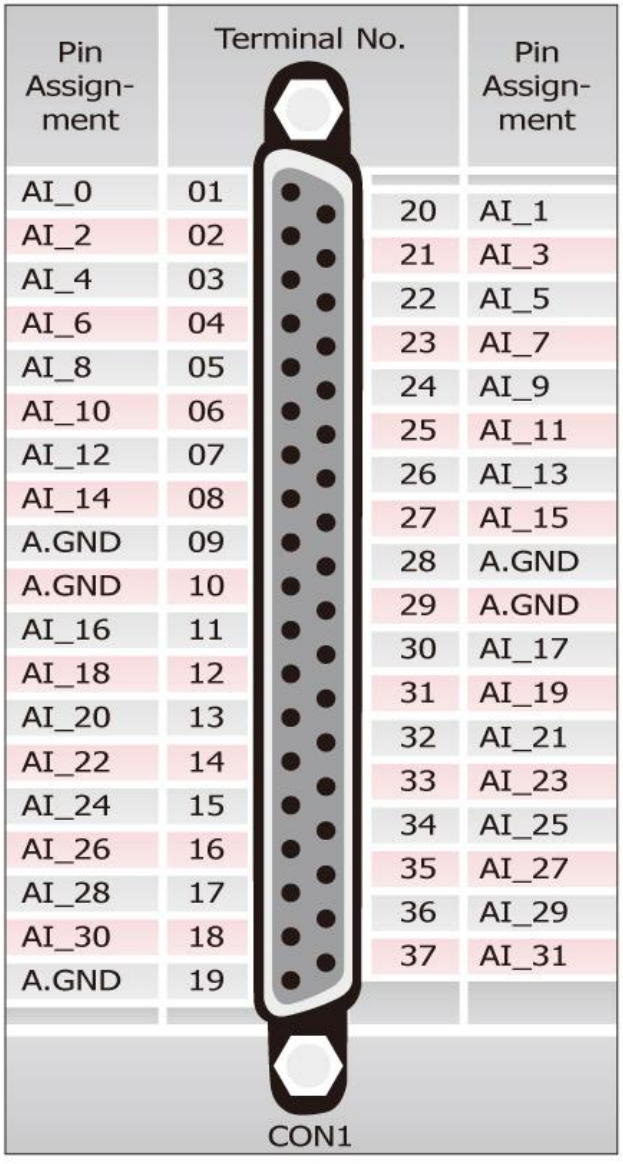
Note: Refer to Sec.6.3.4 for more information about gain setting.

2.3.5 A/D Operation Flow

Step 1: Find address-mapping of PISO-813(U). (Refer to Sec.6.1)
Step 2: Enable operation of PISO-813(U). (Refer to Sec.6.3.1)
Step 3: Make sure the range and polarity of the analog input signal. Select suitable Setting as show in Sec.2.3.4.
Step 4: Select input channel. (Refer to Sec.6.3.3)
Step 5: delay 10 μs. (for photocouple propagation delay and analog multiplexer settling time)
Step 6: Trigger A/D converter. (Refer to Sec.6.3.5)
Step 7: Delay 70 μs. (for photocouple propagation delay and A/D conversion time)
Step 8: Read high byte of A/D conversion data. Check the status of A/D converter until conversion ready. (Refer to Sec.6.3.2)
Step 9: Read low byte of A/D conversion data. (Refer to Sec.6.3.2)
Step10: A/D conversion complete.
Refer to the DEMO1.C of DOS Demo.

2.4 Pin Assignments

The Pin assignments of CON1 for 37-pin D-type female connector on the PISO-813 and PISO-813U are represented in the figure below.



3. Hardware Installation

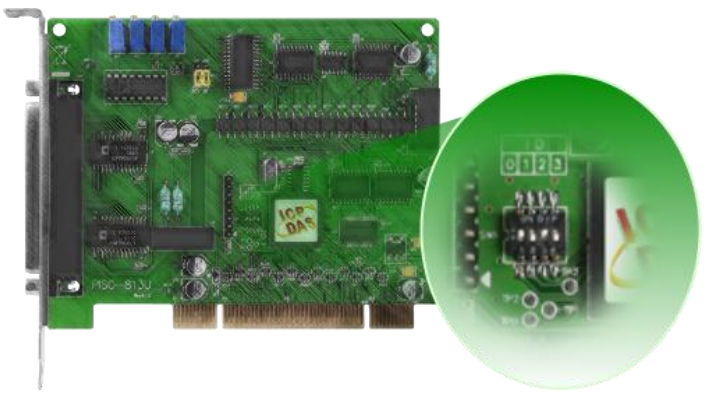
Note:
It's recommended to install driver first, since some operating system (such as Windows 2000) may ask you to restart the computer again after driver installation. This reduces the times to restart the computer.

To install the PISO-813 series card, follow the procedure described below:

Step 1: Installing PISO-813 series card driver on your computer first.

For detailed information about the driver installation, please refer to Chapter 4 Software Installation.

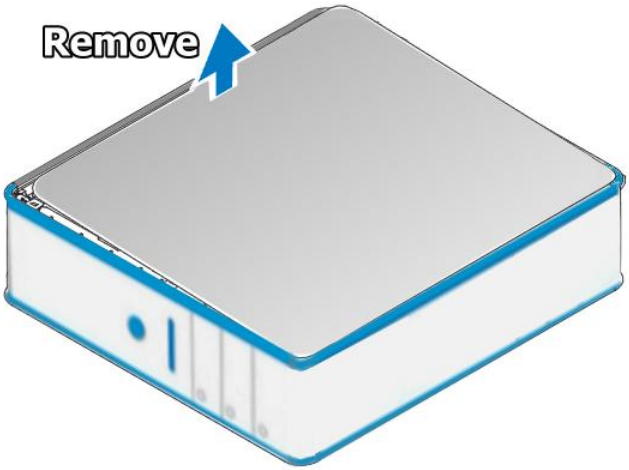
Step 2: Configuring Card ID by the SW1 DIP-Switch for PISO-813U only.



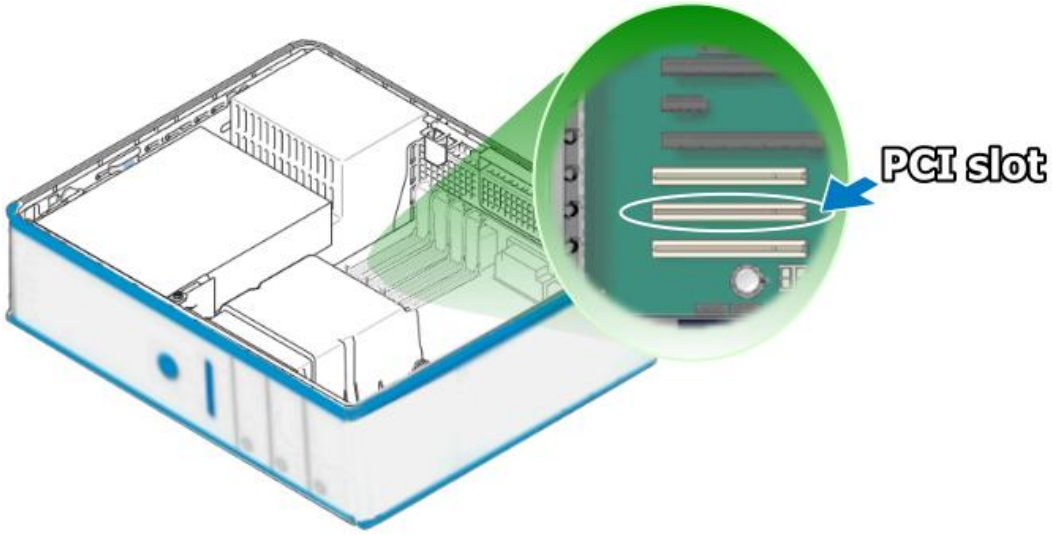
For detailed information about the card ID (SW1), please refer to Sec. 2.2 Car ID Switch.

Step 3: Shut down and power off your computer.

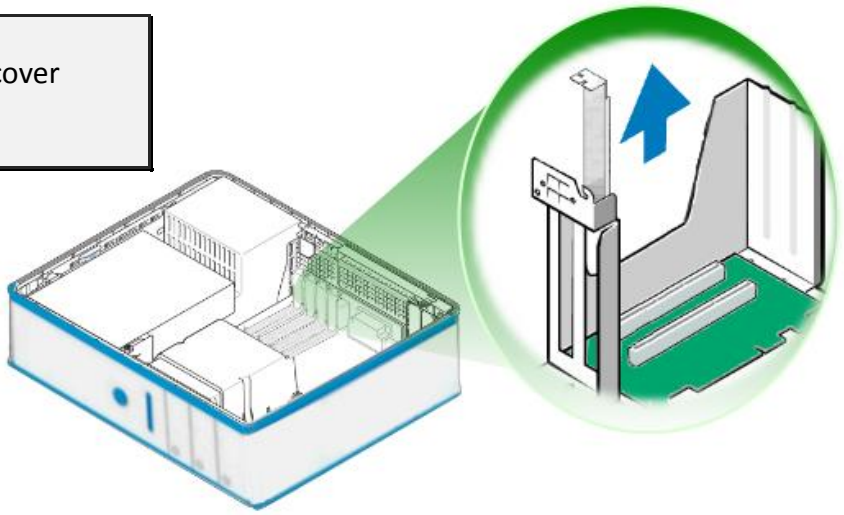
Step 4: Remove all covers from the computer.

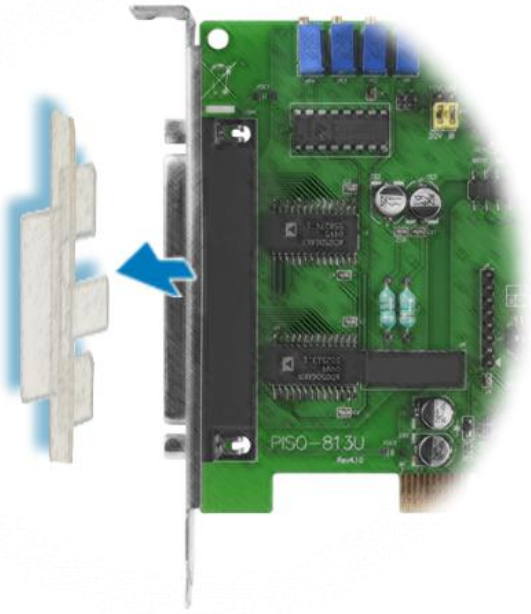


Step 5: Select an empty PCI slot.



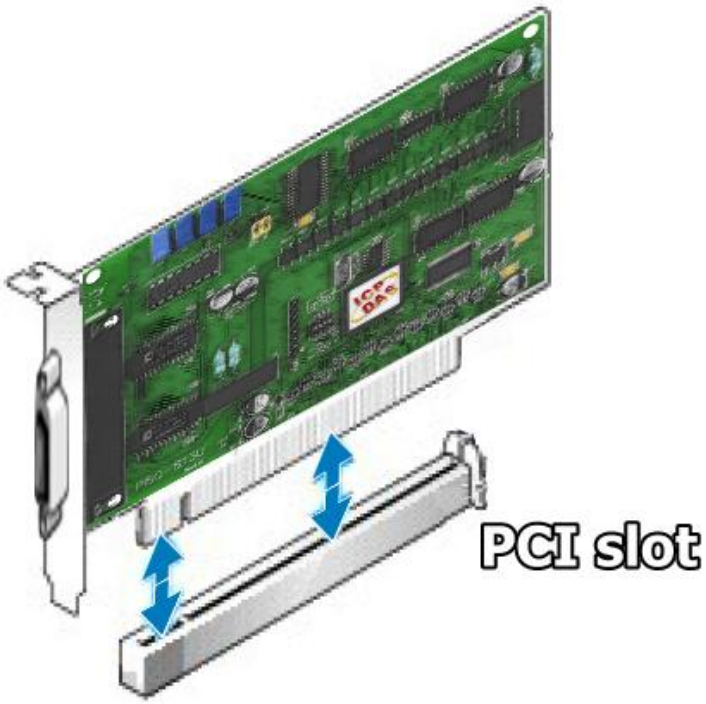
Step 6: Remove the PCI slot cover form the PC.

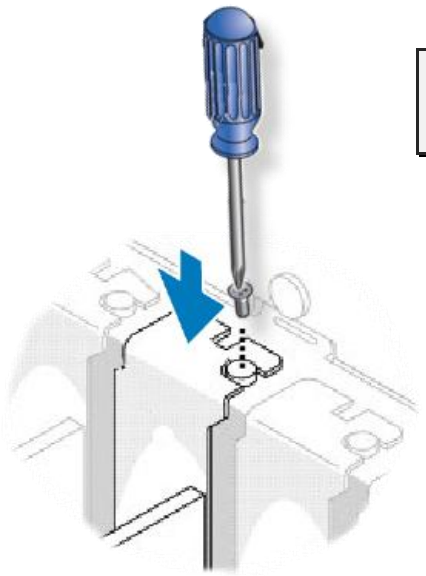




Step 7: Remove the connector cover form the PISO-813 series card.

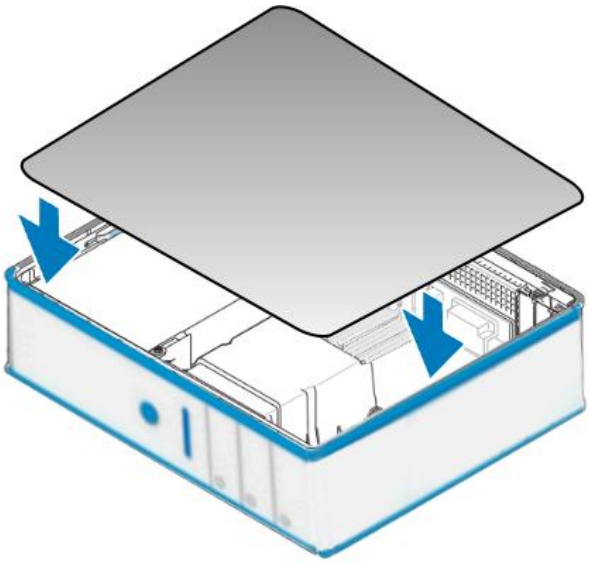
Step 8: Carefully insert your PISO-813 series card into the PCI slot.





Step 9: Tighten the screw.

Confirm the PISO-813 series card is mounted on the motherboard.



Step 10: Replace the computer cover.

Step 11: Power on the computer.

Follow the prompt message to finish the Plug&Play steps, please refer to Chapter 4 Software Installation.

4. Software Installation

This chapter provides a detailed description of the process for installing the PISO-813 series driver and how to verify whether the PISO-813 was properly installed. PISO-813 series card can be used on DOS, Linux and Windows 98/ME/2000 and 32-/64-bit XP/2003/Vista/7/8 based systems, and the drivers are fully Plug and Play (PnP) compliant for easy installation.

4.1 Obtaining/Installing the Driver Installer Package

The driver installer package for the PISO-813 series card can be found on the supplied CD-ROM, or can be obtained from the ICP DAS FTP web site. Install the appropriate driver for your operating system. The location and addresses are indicated in the Table4-1 and Table 4-2 below.

Table 4-1: UniDAQ Driver/SDK

OS	**Windows 2000、32/64-bit Windows XP、32/64-bit Windows 2003、32/64-bit Windows Vista、32/64-bit Windows 7、32/64-bit Windows 2008、32/64-bit Windows 8**
CD-ROM	CD:\\ NAPDOS\PCI\UniDAQ\DLL\Driver\
Web Site	http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/unidaq/dll/driver/
Driver Name	**UniDAQ Driver/SDK (unidaq_win_setup_xxxx.exe)**
Installing Procedure	For detailed information about the UniDAQ driver installation, please refer to UniDAQ DLL Software Manual. The user manual is contained in: CD:\NAPDOS\PCI\UniDAQ\Manual\ http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/unidaq/manual/

Table 4-2: PISO-813 Series Classic Driver

OS	Windows 95/98/ME、Windows NT、Windows 2000、32-bit Windows XP、32-bit Windows 2003、 32-bit Windows Vista、32-bit Windows 7	
CD-ROM	CD:\\ NAPDOS\PCI\PISO-813\DLL_OCX\	
Web Site	http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/piso-813/dll_ocx/	
Driver Name	**PISO-813 Series Classic Driver**	
Win2K_XP_7 Folder	piso_813_win2K_xxx.exe	For Windows 2000, 32-bit Windows XP/2003/Vista/7
Win98 Folder	piso_813_win98_xxx.exe	For Windows 95/98/ME
WinNT Folder	Piso_813_winnt_xxx.exe	For Windows NT 4.0
Installing Procedure	For detailed information about the PISO-813 series classic driver installation, please refer to PISO-813 series classic DLL Software Manual. The user manual is contained in: CD:\NAPDOS\PCI\PISO-813\Manual\ http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/piso-813/manual/	

4.2 PnP Driver Installation

Power off the computer and install the PISO-813 series cards. Turn on the computer and Windows 95/98/ME/NT/2000 and 32-/64-bit Windows XP/2003/Vista/7/8 should automatically defect the new PCI device(s) and then ask for the location of the driver files for the hardware. If a problem is encountered during installation, refer to the PnPinstall.pdf file for more information.

4.3 Verifying the Installation

Please open the **Device Manager** to verify the installation. Below are the steps for entering the Device Manager in each of the major versions of windows. Refer to appropriate for your OS, continue to complete the following steps:

4.3.1 How do I get into Windows Device Manager?

■ Microsoft Windows 95/98/ME users

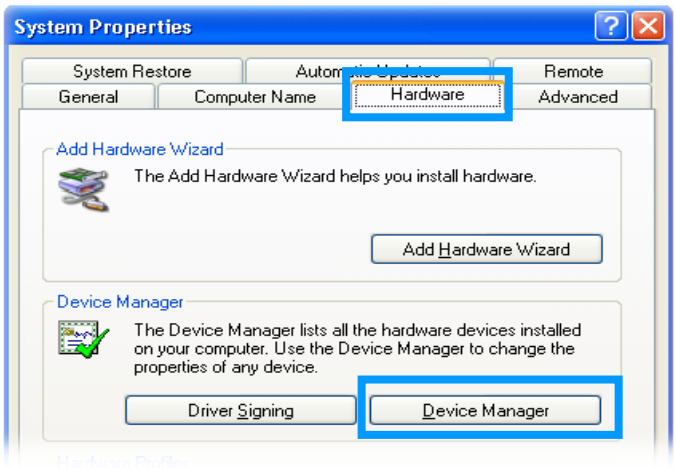
Step 1: On the desktop right-click on **"My Computer"** and click **"Properties"** or open the **"Control Panel"** and double-click the **"System"** icon.

Step 2: Click the "Device Manager" tab.

■ Microsoft Windows 2000/XP users

Step 1: Select **"Start→ Settings→ Control Panel"** and double-click the **"System"** icon.

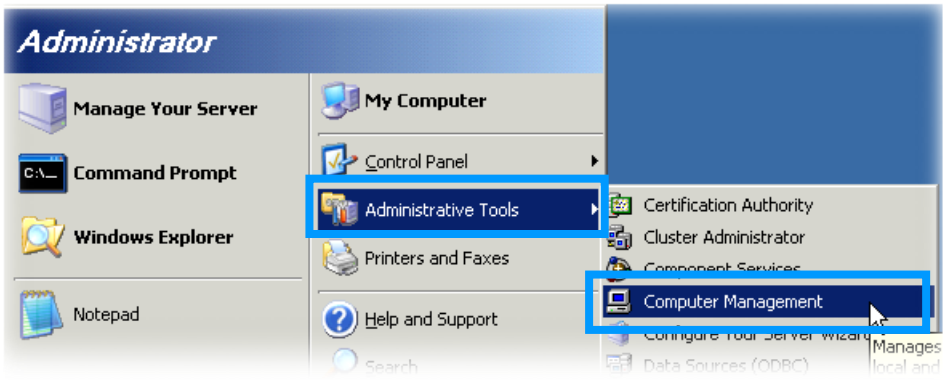
Step 2: Click the **"Hardware"** tab and then click the **"Device Manager"** button.



■ Microsoft Windows 2003 users

Step 1: Open the **"Administrative Tools"** in Control Panel.

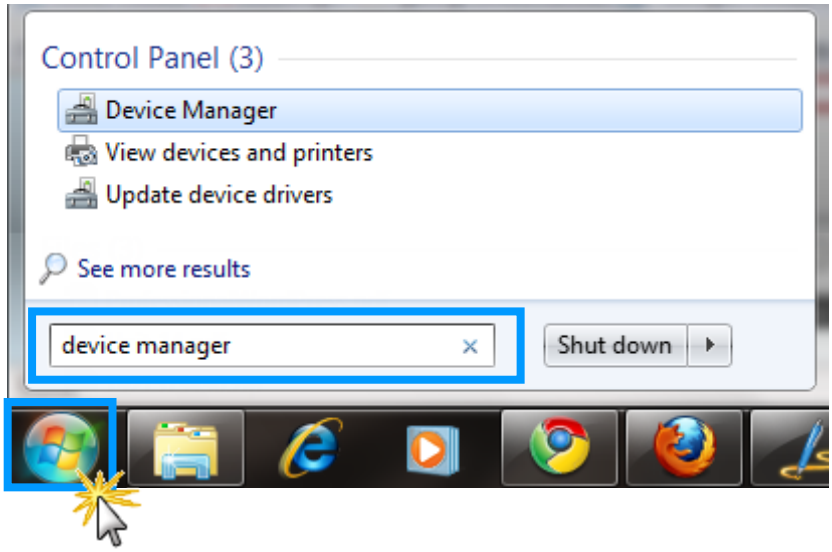
Step 2: Within the Administrative Tools click **"Computer Management"**.



■ Microsoft Windows Vista/7 users

Step 1: Click on the **"Start"** button.

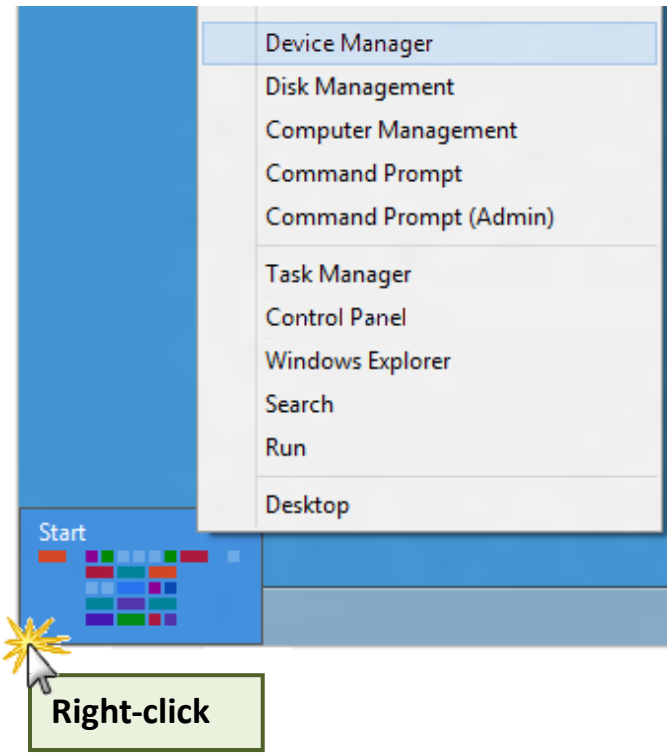
Step 2: In the **Start Search box type device manager** and then press enters.



■ Microsoft Windows 8 users

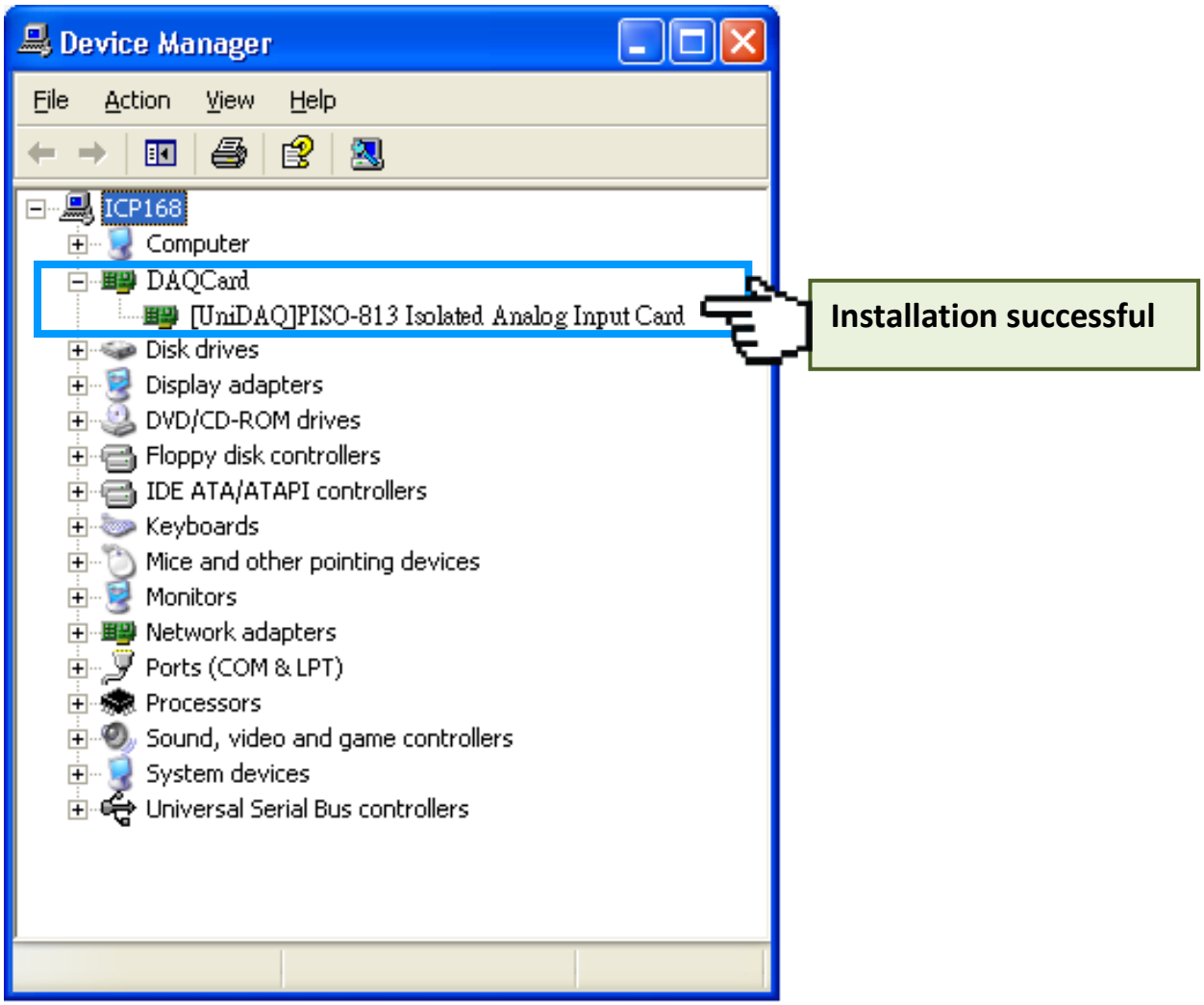
Step 1: To show the **Start screen icon** from the desktop view, simply hover your cursor over the **bottom-left corner** of your screen. (Or using keyboard shortcuts, click **[Windows Key] +[X]** to open the Start Menu.)

Step 2: **Right-click** on the Start screen icon then click on **"Device Manager"**.



4.3.2 Check that the Installation

Check the PISO-813 series card which listed correctly or not, as illustrated below.



5. Testing PISO-813 Series Card

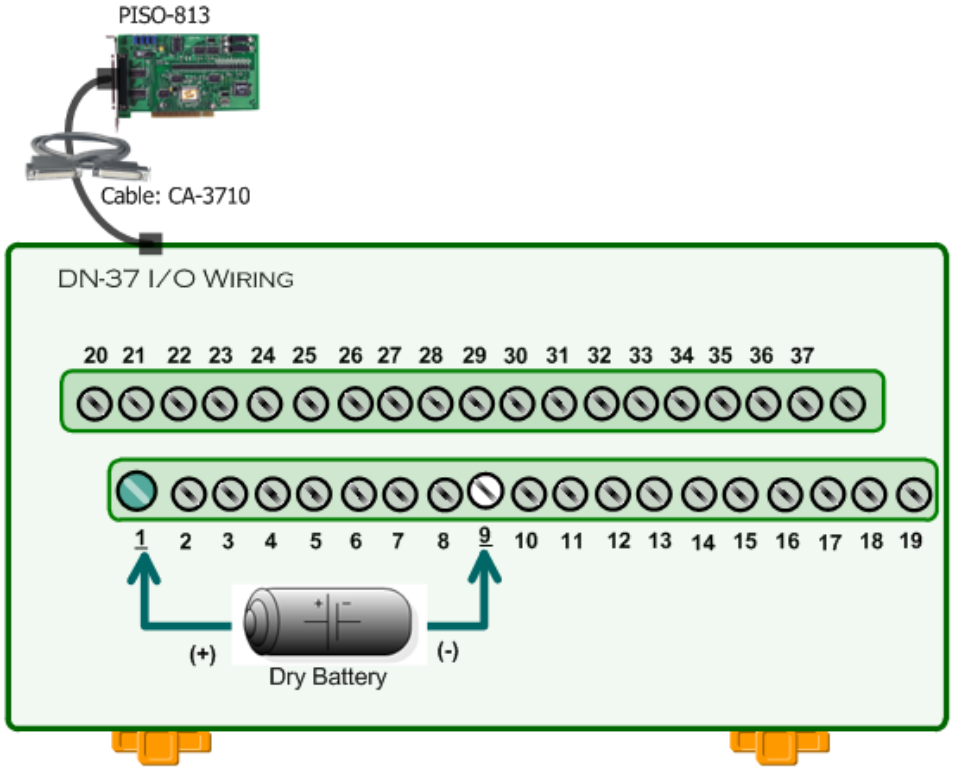
This chapter can give you the detail steps about self-test. In this way, user can confirm that PISO-813 series card well or not. Before the self-test, you must complete the hardware and driver installation. For detailed information about the hardware and driver installation, please refer to Chapter 3 Hardware Installation and Chapter 4 Software Installation.

5.1 Self-Test Wiring

- Prepare for device:
  - ☑ DN-37 (optional) wiring terminal board.
  - ☑ Provide a stable signal source. (For example, dry battery)

Step 1: Use the **DN-37 to connect the CON1** on the PISO-813 series card.

Step 2: Wire the **signal source to channel0**, and then keep set the **JP1 and JP2 jumper to default** (refer to Sec. 2.3.1 and Sec. 2.3.2 for more detailed), and wire the signals as follows:

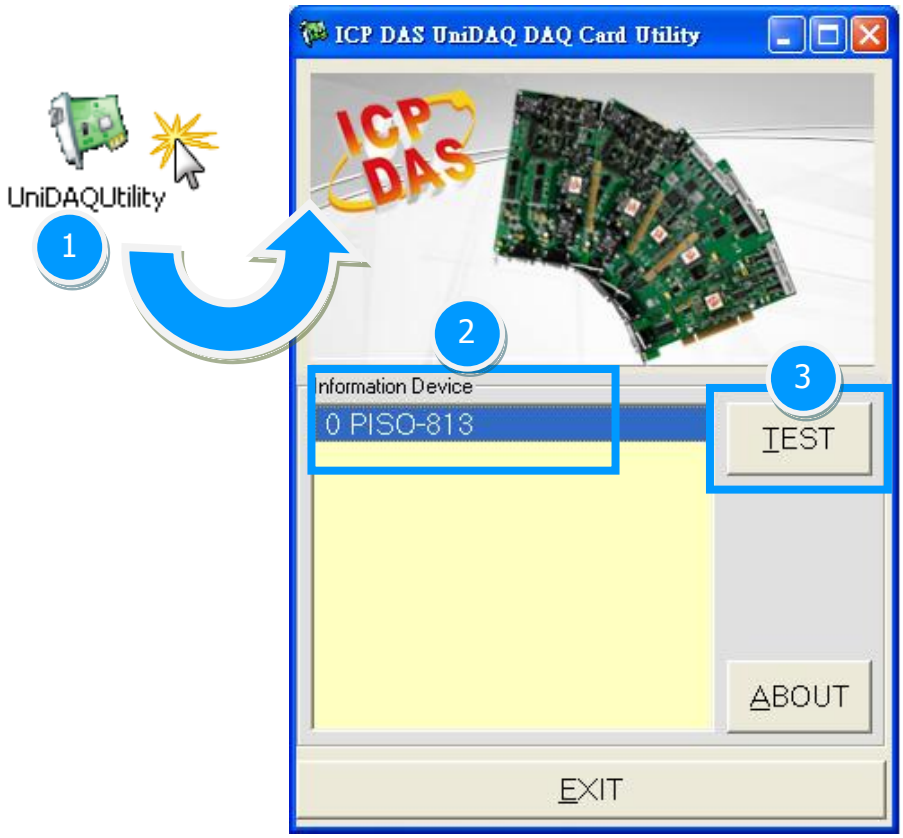


5.2 Execute the Test Program

The following example use UniDAQ driver to perform self-test. If you install the PISO-813 series classic driver, please refer to Quick Start Guide of the PISO-813 (http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/piso-813/manual/quickstart/classic/piso-813_quickstart_eng.pdf) to execute the self-test.

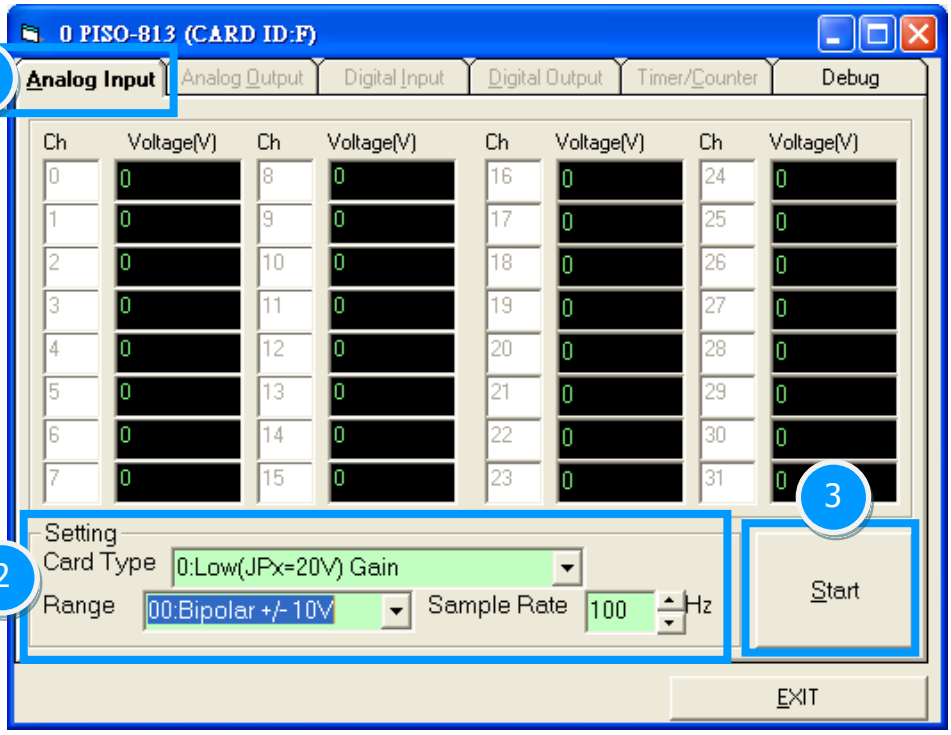
Step 1: Execute the UniDAQ Utility Program. The UniDAQ Utility.exe will be placed in the default path (C:\ICPDAS\UniDAQ\Driver\) after completing installation.

1. Double click the **"UniDAQUtility.exe"**
2. Confirm the PISO-813 series card had successfully installed to PC. It starts form 0.
3. Click the **"TEST"** button to start test.

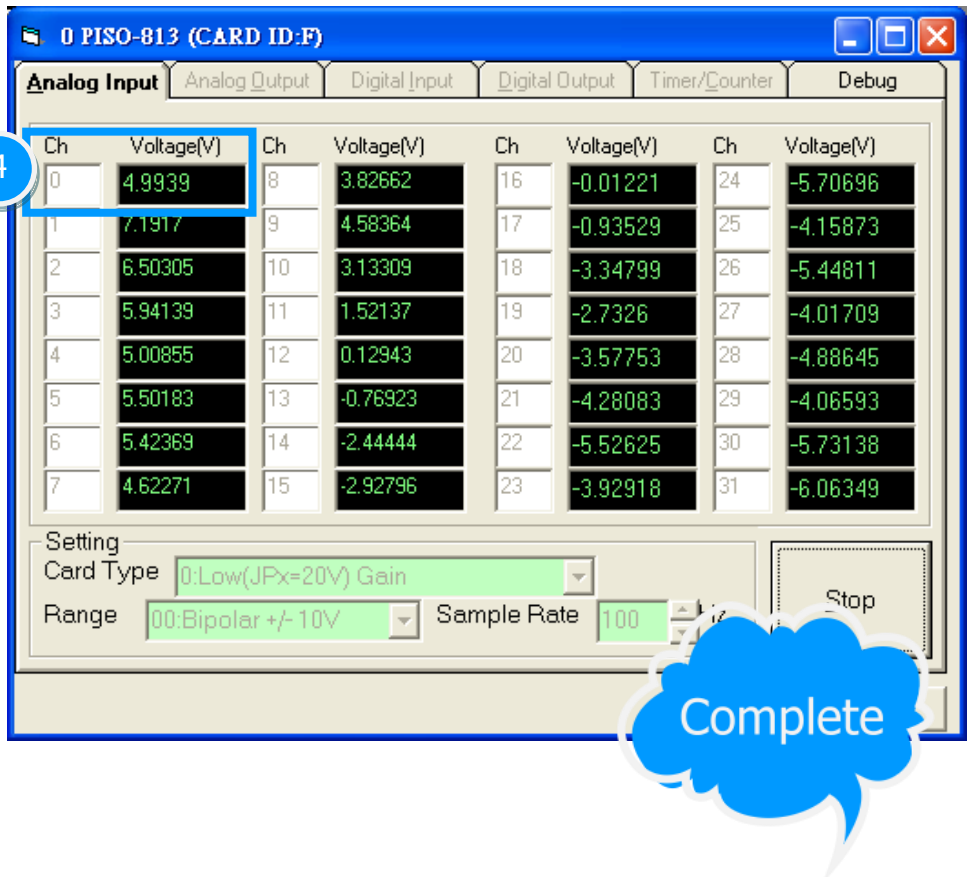


Step 2: Get A/D function test result.

1. Click the **"Analog Input"** Item.
2. Confirm the hardware setting (Depend on JP1 and JP2)
3. Click the **"Start"** button to start test.



4. Check analog input on **Channel 0** testbox.
   The other Channels value for floating number.



6. I/O Control Register

6.1 How to Find the I/O Address

The plug&play BIOS will assign a proper I/O address to every PIO/PISO series card in the power-on stage. The fixed IDs for the PISO-813 series cards are given as follows:

Table 6-1:

PISO-813 (Rev 1.0)		PISO-813 (Rev 2.0 or above) PISO-813U	
Vendor ID	0xE159	**Vendor ID**	0xE159
Device ID	0x02	**Device ID**	0x01
Sub-Vendor ID	0x80	**Sub-Vendor ID**	0x0280 0x4280
Sub-Device ID	0x0A	**Sub-Device ID**	0x02
Sub-Aux ID	0x00	**Sub-Aux ID**	0x00

We provide all necessary functions as follows:

1. **PIO_DriverInit(&wBoard, wSubVendor, wSubDevice, wSubAux)**
2. **PIO_GetConfigAddressSpace(wBoardNo,*wBase,*wIrq, *wSubVendor, *wSubDevice, *wSubAux, *wSlotBus, *wSlotDevice)**
3. **Show_PIO_PISO(wSubVendor, wSubDevice, wSubAux)**

All functions are defined in PIO.H. Refer to Chapter 7 for more information. The important driver information is given as follows:

1. Resource-allocated information:

- **wBase:** BASE address mapping in this PC
- **wIrq:** IRQ channel number allocated in this PC

2. PIO/PISO identification information:

- **wSubVendor:** subVendor ID of this board
- **wSubDevice:** subDevice ID of this board
- **wSubAux:** subAux ID of this board

3. PC's physical slot information:

- **wSlotBus:** hardware slot ID1 in this PC's slot position
- **wSlotDevice:** hardware slot ID2 in this PC's slot position

The PIO_PISO.EXE utility will detect and show all PIO/PISO cards installed in this PC. Refer to Sec. 7.3 for more information.

6.1.1 PIO_DriverInit

PIO_DriverInit(&wBoards, wSubVendor, wSubDevice, wSubAux)

Parameter	Description
wBoards=0 to N	number of boards found in this PC
wSubVendor	subVendor ID of board to find
wSubDevice	subDevice ID of board to find
wSubAux	subAux ID of board to find

This function can detect all PIO/PISO series card in the system. It is implemented based on the PCI plug&play mechanism-1. It will find all PIO/PISO series cards installed in this system and save all their resource in the library.

Sample program 1: Find all PISO-813 in this PC

```
wSubVendor=0x80; wSubDevice=0xa; wSubAux=0x00;    /* for PISO-813 */
wRetVal=PIO_DriverInit(&wBoards, wSubVendor,wSubDevice,wSubAux);
printf("Threr are %d PISO-813 Cards in this PC\n",wBoards);
/* step2: save resource of all PISO-813 cards installed in this PC */
for (i=0; i<wBoards; i++)
    {
     PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&wID1,&wID2,&wID3, &wID4,&wID5);
     printf("\nCard_%d: wBase=%x, wIrq=%x", i,wBase,wIrq);
     wConfigSpace[i][0]=wBaseAddress;     /*save all resource of this card */
     wConfigSpace[i][1]=wIrq;             /* save all resource of this card */
    }
```

Sample program 2: Find all PIO/PISO in this PC (refer to Sec. 7.3 for more information)

```
wRetVal=PIO_DriverInit(&wBoards,0xff,0xff,0xff);    /*find all PIO_PISO*/
printf("\nThrer are %d PIO_PISO Cards in this PC",wBoards);
if (wBoards==0 ) exit(0);

printf("\n-----------------------------------------------------");
for(i=0; i<wBoards; i++)
{
    PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&wSubVendor,
                    &wSubDevice,&wSubAux,&wSlotBus,&wSlotDevice);

    printf("\nCard_%d:wBase=%x,wIrq=%x,subID=[%x,%x,%x],
                    SlotID=[%x,%x]",i,wBase,wIrq,wSubVendor,wSubDevice,
                    wSubAux,wSlotBus,wSlotDevice);
    printf(" --> ");
    ShowPioPiso(wSubVendor,wSubDevice,wSubAux);
}
```

6.1.2 PIO_GetConfigAddressSpace

PIO_GetConfigAddressSpace(wBoardNo,*wBase,*wIrq, *wSubVendor, *wSubDevice, *wSubAux, *wSlotBus, *wSlotDevice)

Parameter	Description
wBoardNo=0 to N	totally N+1 boards found by PIO_DriveInit(….)
wBase	base address of the board control word
wIrq	allocated IRQ channel number of this board
wSubVendor	subVendor ID of this board
wSubDevice	subDevice ID of this board
wSubAux	subAux ID of this board
wSlotBus	hardware slot ID1 of this board
wSlotDevice	hardware slot ID2 of this board

The user can use this function to save resource of all PIO/PISO cards installed in this system. Then the application program can control all functions of PIO/PISO series card directly.

The sample program source is given as follows:

```
/* step1: detect all PISO-813 cards first */
wSubVendor=0x80; wSubDevice=0xa; wSubAux=0x0;      /* for PISO-813 */
wRetVal=PIO_DriverInit(&wBoards, wSubVendor,wSubDevice,wSubAux);
printf("Threr are %d PISO-813 Cards in this PC\n",wBoards);

/* step2: save resource of all PISO-813 cards installed in this PC */
for (i=0; i<wBoards; i++)
     {
     PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&t1,&t2,&t3,&t4,&t5);
     printf("\nCard_%d: wBase=%x, wIrq=%x", i,wBase,wIrq);
   wConfigSpace[i][0]=wBaseAddress;       /* save all resource of this card */
   wConfigSpace[i][1]=wIrq;               /* save all resource of this card */
   }
/* step3: control the PISO-813 directly */
wBase=wConfigSpace[0][0];          /* get base address the card_0    */
outport(wBase,1);                  /* enable all D/I/O operation of card_0 */

wBase=wConfigSpace[1][0];          /* get base address the card_1 */
outport(wBase,1);                  /* enable all D/I/O operation of card_1*/
```

6.1.3 Show_PIO_PISO

Show_PIO_PISO(wSubVendor,wSubDevice,wSubAux)

Parameter	Description
wSubVendor	subVendor ID of board to find
wSubDevice	subDevice ID of board to find
wSubAux	subAux ID of board to find

This function will show a text string for this special subIDs. This text string is the same as that defined in PIO.H

The demo program is given as follows:

```
wRetVal=PIO_DriverInit(&wBoards,0xff,0xff,0xff);    /*find all PIO_PISO*/
printf("\nThrer are %d PIO_PISO Cards in this PC",wBoards);
if (wBoards==0 ) exit(0);

printf("\n-----------------------------------------------------");
for(i=0; i<wBoards; i++)
      {
      PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&wSubVendor,
                        &wSubDevice,&wSubAux,&wSlotBus,&wSlotDevice);

      printf("\nCard_%d:wBase=%x,wIrq=%x,subID=[%x,%x,%x],
                        SlotID=[%x,%x]",i,wBase,wIrq,wSubVendor,wSubDevice,
                        wSubAux,wSlotBus,wSlotDevice);
      printf(" --> ");
      ShowPioPiso(wSubVendor,wSubDevice,wSubAux);
        }
```

6.2 The Assignment of I/O Address

The Plug&Play BIOS will assign the proper I/O address to a PIO/PISO series card. If there is only one PIO/PISO board, the user can identify the board as card_0. If there are two PIO/PISO boards in the system, it is very difficult to identify which board is card_0. The software driver can support a maximum of 16 boards. Therefore, the user can install 16 PIO/PSIO series cards onto one PC system. The methods used to find and identify card_0 and card_1 is demonstrated below.

The simplest way to identify which card is card_0 is to use wSlotBus and wSlotDevice in the following manner:

Step 1: Remove all PISO-813 series boards from the PC.

Step 2: Install one PISO-813 series into the PC's PCI_slot1, run PIO_PISO.EXE.
Then record the wSlotBus1 and wSlotDevice1 information.

Step 3: Remove all PISO-813 series boards from the PC.

Step 4: Install one PISO-813 series into the PC's PCI_slot2 and run PIO_PISO.EXE.
Then record the wSlotBus2 and wSlotDevice2 information.

Step 5: Repeat Steps(3) and (4) for every PCI_slot and record all information from wSlotBus and wSlotDevice.

The records may look similar to the table follows:

Table 6-2:

PC's PCI Slot	WslotBus	WslotDevice
Slot_1	0	0x07
Slot_2	0	0x08
Slot_3	0	0x09
Slot_4	0	0x0A
PCI-BRIDGE		
Slot_5	1	0x0A
Slot_6	1	0x08
Slot_7	1	0x09
Slot_8	1	0x07

The above procedure will record all the wSlotBus and wSlotDevice information on a PC. These values will be mapped to this PC's physical slot and this mapping will not be changed for any PIO/PISO cards. Therefore, this information can be used to identify the specified PIO/PISO card by following steps:

Step1: Using the wSlotBus and wSlotDevice information from Table 6-2.

Step2: Enter the board number into PIO_GetConfigAddressSpace(…) function to get the information for a specific card, especially the wSlotBus and wSlotDevice details.

Step3: Identify the specific PIO/PISO card by comparing the data of the wSlotBus and wSlotDevice from Step1 and Step2.

Note: that normally the card installed in slot 0 is card0 and the card installed in slot1 is card1 for PIO/PISO series cards.

6.3 The I/O Address Map

The I/O address for PISO-813 series cards are automatically assigned by the main board ROM BIOS. The I/O address can also be re-assigned by the user. It is strongly recommended that users do not change the I/O address. The Plug&Play BIOS will effectively perform the assignment of proper I/O addresses to each PISO-813 series card. The I/O address for the PISO-813 and PISO-813U are given in the table below, all of which are based on the base address of each card.

Table 6-3: Refer to Sec. 6.1 for more information about wBase.

Address	Read	Write
wBase+0	RESET\ Control Register	RESET\ Control Register
wBase+0xd0	Low byte of A/D Data	-
wBase+0xd4	High byte of A/D Data	-
wBase+0xe0	-	Multiplexer channel select register
wBase+0xe4	-	PGA gain code register
wBase+0xf0	-	A/D trigger control register
wBase+0xfc	Read Card ID	-

6.3.1 RESET\ Control Register

(Read/Write): wBase+0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	RESET\

When the PC's power is first turned on, RESET\ signal is in a Low-state. **This will disable all D/I/O operations.** The user has to set the RESET\ signal to a High-state before any D/I/O command applications are initiated.

For example:

```
outportb (wBase,1);        /* RESET\=High → all D/I/O are enable now */
outportb (wBase,0);        /* RESET\=Low → all D/I/O are disable now */
```

6.3.2 A/D Data Register

(Read): wBase+0xd0 → Low Byte of A/D Conversion Data

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
D7	D6	D5	D4	D3	D2	D1	D0

(Read): wBase+0xd4 → High Byte of A/D Conversion Data

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	Status	D11	D10	D9	D8

Status: The status bit is used as an indicator for A/D conversion. It is used for software polling. Setting values are as follows:
0 → A/D conversion is completed
1 → A/D conversion is not completed

D0 to D11: A/D Conversion Data

For example:

```
do
{
   HighByte=inportb(wBase+0xd4);
}while(HighByte&0x10);              /* check status until conversion complete */

LowByte=inportb(wBase+0xd0);
Data=(HighByte<<8)+LowByte;
```

6.3.3 Multiplexer Channel Select Register

(Write): wBase+0xe0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	D4	D3	D2	D1	D0

For example:

```
outportb(wBase+0xe0,0);          /* Select analog input channel   0 */
outportb(wBase+0xe0,1);          /* Select analog input channel   1 */
outportb(wBase+0xe0,31);         /* Select analog input channel  31 */
```

6.3.4 PGA Gain Code Register

(Write): wBase+0xe4

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	-	-	D2	D1	D0

For example:

```
outportb(wBase+0xe4,0);          /* Select PGM Gain = × 1   */
outportb(wBase+0xe4,1);          /* Select PGM Gain = × 2   */
outportb(wBase+0xe4,2);          /* Select PGM Gain = × 4   */
outportb(wBase+0xe4,3);          /* Select PGM Gain = × 8   */
```

6.3.5 A/D Trigger Control Register

(Read): wBase+0xf0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	-	-	-	-	-

The A/D data transfer mode is polling. Before read the conversion data, the A/D converter must be trigger by dummy write A/D Trigger Control Register. (Refer to Sec.2.3.5 for more information about A/D converter operation)

For example:

```
outportb(wBase+0xf0,0);                    /* Trigger A/D converter */
```

6.3.6 Card ID Register

(Read): wBase+0xfc

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	ID3	ID2	ID1	ID0

For example:

```
wCardID = inportb(wBase+0xfc);              /* read Card ID */
```

Note: The Card ID function is only supported by the PISO-813U (Ver. 1.0 or above)

7. Demo Programs

7.1 Demo Program for Windows

All demo programs will not work properly if the DLL driver has not been installed correctly. During the DLL driver installation process , the install-shields will register the correct kernel driver to the operation system and copy the DLL driver and demo programs to the correct position based on the driver software package you have selected (Win98/Me/NT/2K and 32-/64-bit winXP/2003/Vista/7/8). Once driver installation is complete, the related demo programs and development library and declaration header files for different development environments will be presented as follows.

■ Demo Program for PISO-813 Series Classic Driver

The demo program is contained in:

CD:\NAPDOS\PCI\PISO-813\DLL_OCX\Demo

http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/piso-813/dll_ocx/demo/

- BCB4 → for Borland C++ Builder 4
  PISO813.H → Header files
  PISO813.LIB → Linkage library for BCB only
- Delphi4 → for Delphi 4
  PISO813.PAS → Declaration files
- VC6 → for Visual C++ 6
  PISO813.H → Header files
  PISO813.LIB → Linkage library for VC only
- VB6 → for Visual Basic 6
  PISO813.BAS → Declaration files
- VB.NET2005 → for VB.NET2005
  PISO813.vb → Visual Basic Source files
- CSharp2005 → for C#.NET2005
  PISO813.cs → Visual C# Source files

For detailed information about the DLL function of the PISO-813 series card, please refer to PISO-813 DLL Software Manual (CD:\NAPDOS\PCI\PISO-813\Manual\)

■ Demo Program for UniDAQ SDK Driver

The demo program is contained in:

CD:\NAPDOS\PCI\UniDAQ\DLL\Demo

http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/unidaq/dll/demo/

- BCB6 → for Borland C++ Builder 6
  UniDAQ.H → Header files
  UniDAQ.LIB → Linkage library for BCB only
- Delphi6 → for Delphi 6
  UniDAQ.PAS → Declaration files
- VB6 → for Visual Basic 6
  UniDAQ.BAS → Declaration files
- CSharp2005 → for C#.NET2005
  UniDAQ.cs → Visual C# Source files
- VC6 → for Visual C++ 6
  UniDAQ.H → Header files
  UniDAQ.LIB → Linkage library for VC only
- VB.NET2005 → for VB.NET2005
  UniDAQ.vb → Visual Basic Source files
- VC.NET2005 → for VC.NET2005 (32-bit)
  UniDAQ.H → Header files
  UniDAQ.LIB → Linkage library for VC only
- VC.NET2005 → for VC.NET2005 (64-bit)
  UniDAQ.H → Header files
  UniDAQ.LIB → Linkage library for VC only

For detailed information about the DLL function and demo program of the UniDAQ, please refer to UniDAQ DLL Software Manual (CD:\NAPDOS\PCI\UniDAQ\Manual\)

7.2 Demo Program for DOS

The demo program is contained in:

CD:\NAPDOS\PCI\PISO-813\DOS\PISO813

http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/piso-813/dos/piso-813/

- \TC*.* → for Turbo C 2.xx or above
- \MSC*.* → for MSC 5.xx or above
- \BC*.* → for BC 3.xx or above

- \TC\LIB*.* → for TC Library
- \TC\DEMO*.* → for TC demo program
- \TC\DIAG*.* → for TC diagnostic program

- \TC\LIB\Large*.* → TC Large Model Library
- \TC\LIB\Huge*.* → TC Huge Model Library File
- \TC\LIB\Large\PIO.H → TC Declaration File
- \TC\LIB\Large\TCPIO_L.LIB → TC Large Model Library File
- \TC\LIB\Huge\PIO.H → TC Declaration File
- \TC\LIB\Huge\TCPIO_H.LIB → TC Huge Model Library File

- \MSC\LIB\Large\PIO.H → MSC Declaration File
- \MSC\LIB\Large\MSCPIO_L.LIB → MSC Large Model Library File
- \MSC\LIB\Huge\PIO.H → MSC Declaration File
- \MSC\LIB\Huge\MSCPIO_H.LIB → MSC Huge Model Library File

- \BC\LIB\Large\PIO.H → BC Declaration File
- \BC\LIB\Large\BCPIO_L.LIB → BC Large Model Library File
- \BC\LIB\Huge\PIO.H → BC Declaration File
- \BC\LIB\Huge\BCPIO_H.LIB → BC Huge Model Library File

For detailed information about the DLL function of the DOS, please refer to PISO-813 DLL Software Manual (CD:\NAPDOS\PCI\PISO-813\Manual\)

7.3 PIO_PISO Utility

The PIO_PISO.EXE is valid for all PIO/PISO cards. This program shows all PCI hardware ID regarding the PIO and PISO series DAQ cards. It is useful to test if the card Plug & Play successfully when the computer bootup. If the PIO or PISO series card does not shown in the screen correctly, please try to use another PCI slot and try again.

The user can execute the PIO_PISO.EXE to get the following information:

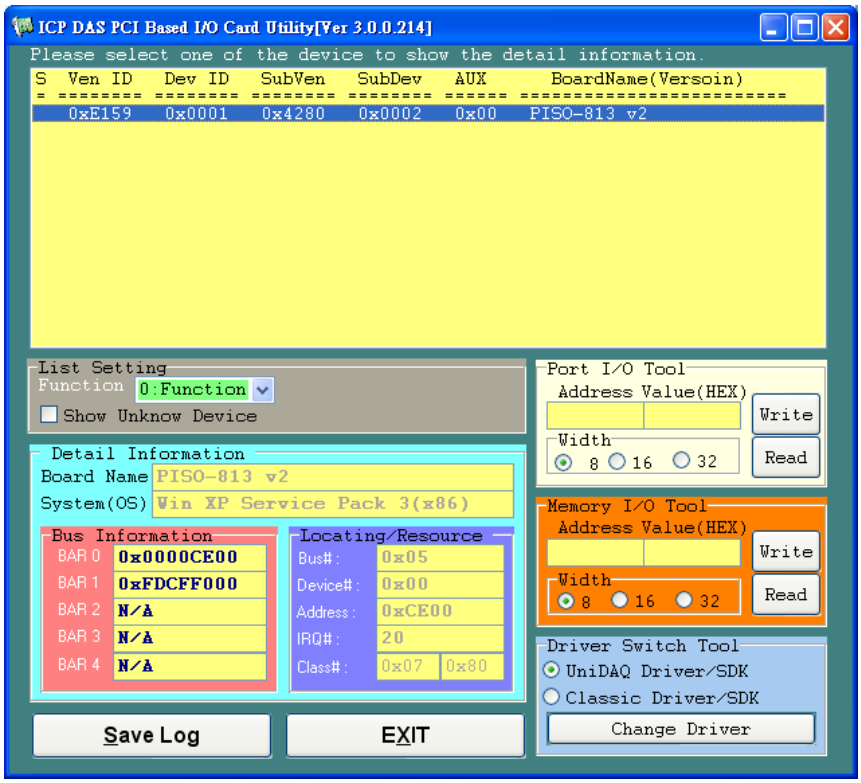
- List all PIO/PISO cards installed in this PC
- List all resources allocated to every PIO/PISO cards
- List the wSlotBus and wSlotDevice for specified PIO/PISO card identification. (refer to Sec. 6.2 for more information about the assignment of I/O Address)

■ For Windows OS

The PIO_PISO.EXE for Windows is contained in:

	CD:\NAPDOS\PCI\Utility\Win32\PIO_PISO
	http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/utility/win32/pio_piso/

After executing the utility, the detail information for all PIO/PISO cards that installed in the PC will be shown as follows:



For DOS

The PIO_PISO.EXE for DOS is contained in:

CD:\NAPDOS\PCI\Utility\DOS

http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/utility/dos/

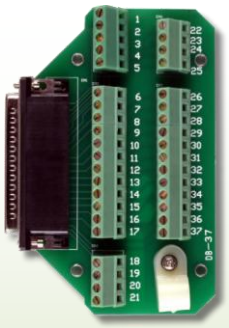
The PIO_PISO program source is given as follows:

```
/* ------------------------------------------------------------ */
/* Find all PIO_PISO series cards in this PC system */
/* step 1 : plug all PIO_PISO cards into PC */
/* step 2 : run PIO_PISO.EXE */
/* ------------------------------------------------------------ */

#include "PIO.H"

WORD wBase,wIrq;
WORD wBase2,wIrq2;

int main()
{
int    i,j,j1,j2,j3,j4,k,jj,dd,j11,j22,j33,j44;
WORD wBoards,wRetVal;
WORD wSubVendor,wSubDevice,wSubAux,wSlotBus,wSlotDevice;
char c;
float ok,err;

clrscr();
wRetVal=PIO_DriverInit(&wBoards,0xff,0xff,0xff); /*for PIO-PISO */
printf("\nThrer are %d PIO_PISO Cards in this PC",wBoards);
if (wBoards==0 ) exit(0);

printf("\n-----------------------------------------------------");
for(i=0; i<wBoards; i++)
    {
    PIO_GetConfigAddressSpace(i,&wBase,&wIrq,&wSubVendor,
                    &wSubDevice,&wSubAux,&wSlotBus,&wSlotDevice);

    printf("\nCard_%d:wBase=%x,wIrq=%x,subID=[%x,%x,%x],
                    SlotID=[%x,%x]",i,wBase,wIrq,wSubVendor,wSubDevice,
                    wSubAux,wSlotBus,wSlotDevice);
    printf(" --> ");
    ShowPioPiso(wSubVendor,wSubDevice,wSubAux);
    }

PIO_DriverClose();
}
```

Appendix: Daughter Board

A1. DB-37 and DN-37

- **DB-37:** The DB-37 is a general purpose daughter board for D-sub 37 pins. It is designed for easy wire connection via pin-to-pin. Use a 37-pin cable (e.g. CA-3710, etc.) to connect DB-37 to CON1 of the PISO-813 series card.



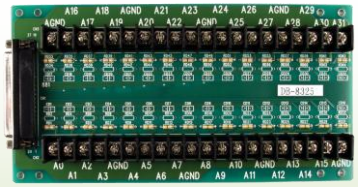
DB-37

- **DN-37:** The DN-37 is a general purpose daughter board for DB-37 pins with DIN-Rail Mountings. They are also designed for easy wire connection via pin-to-pin.
  Use a 37-pin cable (e.g. CA-3710, etc.) to connect to CON1 of the PISO-813 series card by DN-37.

DN-37

A2. DB-8325

The DB-8325 is a general purpose screw terminal board. It is designed for easy wire connection. The DB-8325 consists of one DB-37. Use a 37-pin cable (e.g. CA-3710, etc.) to connect DB-8325 to CON1 of the PISO-813 series card.



DB-8325