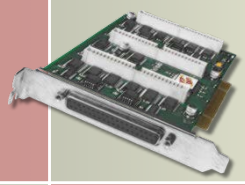

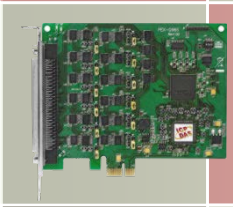

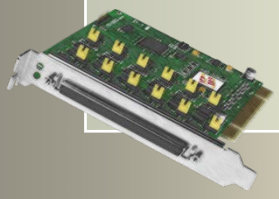

PIO-D96 Series Card User Manual

96-channel DIO board

Version 2.3, Jun. 2018

SUPPORTS

Board includes PIO-D96, PIO-D96U, PIO-D96SU and PEX-D96S.

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

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If you have any question, please feel to contact us. We will give you quick response within 2 workdays.

Email: service@icpdas.com, service.icpdas@gmail.com

TABLE OF CONTENTS

Packing List

The shipping package includes the following items:

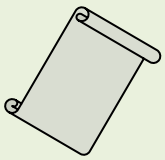
One PIO-D96 Series card as follows:

PIO-D96/D96U

PEX-D96S

PIO-D96SU

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 need to ship or store the product in the future.

1. Introduction

The PEX-D96S and PIO-D96U/D96SU cards are the new generation product that ICP DAS provides to meet RoHS compliance requirement, and is designed as an easy replacement for the PIO-D96, without requiring any modification to the software or the driver.

The PIO-D96U/D96SU universal PCI card supports 3.3 V/5 V PCI bus while the PEX-D96S supports PCI Express bus. These cards provide 96 TTL Digital I/O lines that consist of twelve 8-bit bi-directional ports. Each group of three 8-bit ports is arranged on the connector as Port A (PA), Port B (PB) and Port C (PC), respectively, and all ports are configured as inputs ports on power-up or after a reset.

The PIO-D96U provides four connectors for I/O wiring, while the PIO-D96SU and PEX-D96S provides a single high-density connector that reduces the amount of installation space required for the card in the computer.

The PIO-D96U/D96SU and PEX-D96S cards include an onboard Card ID switch that enables the board to be recognized via software if two or more boards are installed in the same computer. The pull-high/low jumpers allow the DI status to be predefined instead of remaining floating if the DI channels are disconnected or interrupted.

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.

Comparison Table

Model	Interface	DI Pull-High/Low	Card ID	Compatibility	Advantage
PEX-D96S	PCI Express	Yes	Yes	5 V/CMOS	Low power consumption Low temperature
PIO-D96SU	Universal PCI	Yes	Yes	5 V/CMOS	Low power consumption Low temperature
PIO-D96U	Universal PCI	Yes	Yes	5 V/TTL	High DO Driving (Output Capability)
PIO-D96 (Phased-out)	PCI Bus	No	No	5 V/TTL	High DO Driving (Output Capability)

1.1 Features

- Support the +5V PCI bus for PIO-D96
- Support the +3.3/+5 V PCI bus for PIO-D96U/D96SU
- Support the PCI Express x 1 for PEX-D96S
- 96 channels of digital I/O
- Bi-direction programmable I/O ports under software control
- All I/O lines buffered on the board
- Twelve 8-bit bi-direction I/O ports
- 4 Interrupt source: P2C0, P5C0, P8C0, P11C0
- Card ID function for PIO-D96U/D96SU and PEX-D96S
- Pull-high/low jumpers for DI channels for PIO-D96U/D96SU and PEX-D96S
- PIO-D96/D96U: one DB37 connector and three 50-pin box headers
- PIO-D96SU/PEX-D96S: one SCSI II 100-pin connector
- Buffer output for higher driving capability
- Connects directly to DB-24PR, DB-24PD, DB-24RD, DB-24PRD, DB-16P8R, DB-24POR, DB-24SSR, DB-24C or any OPTO-22 Compatible daughter boards
- PIO-D96/D96U/D96SU: DIO response time is about 1 µs (1MHz)
- PEX-D96S: DIO response time is about 500 kHz
- SMD, short card, power saving

1.2 Specifications

Model Name	PEX-D96S	PIO-D96SU	PIO-D96U	PIO-D96 (Phased-out)
Programmable Digital I/O				
Channels	96			
Digital Input				
Compatibility	5 V/COMS		5 V/TTL	
Input Voltage	Logic 0: 0.8 V max. Logic 1: 2.0 V min.			
Response Speed	500 kHz	1 MHz		
Digital Output				
Compatibility	5 V/COMS		5 V/TTL	
Output Voltage	Logic 0: 0.1 V max. Logic 1: 4.4 V min.		Logic 0: 0.4 V max. Logic 1: 2.4 V min.	
Output Capability	Sink: 6 mA @ 0.33 V Source: 6 mA @ 4.77 V		Sink: 64mA @ 0.8 V Source: 32 mA @ 2.0 V	
Response Speed	500 kHz	1 MHz		
General				
Bus Type	PCI Express x 1	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 SCSI II 100 pin x 1		Female DB37 x 1 50-pin box header x 3	
Dimensions (L x W x D)	124 mm x 97 mm x 22 mm		180 mm x 105 mm x 22mm	
Power Consumption	650 mA @ +3.3 V 0 mA @ +12 V	600 mA @ +5 V		
Operating Temperature	0 ~ 60 °C			
Storage Temperature	-20 ~ 70 °C			
Humidity	5 ~ 85% RH, non-condensing			

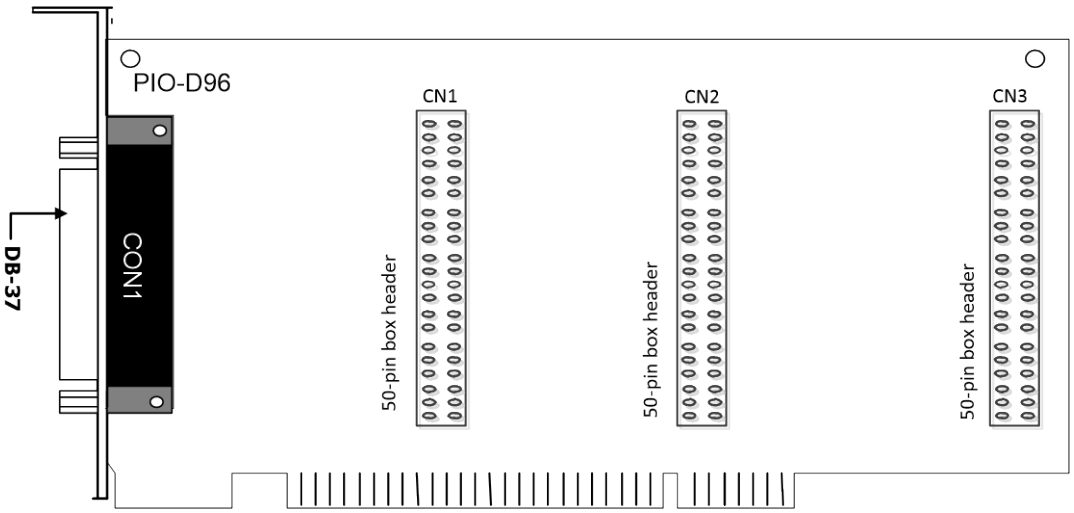
Note:

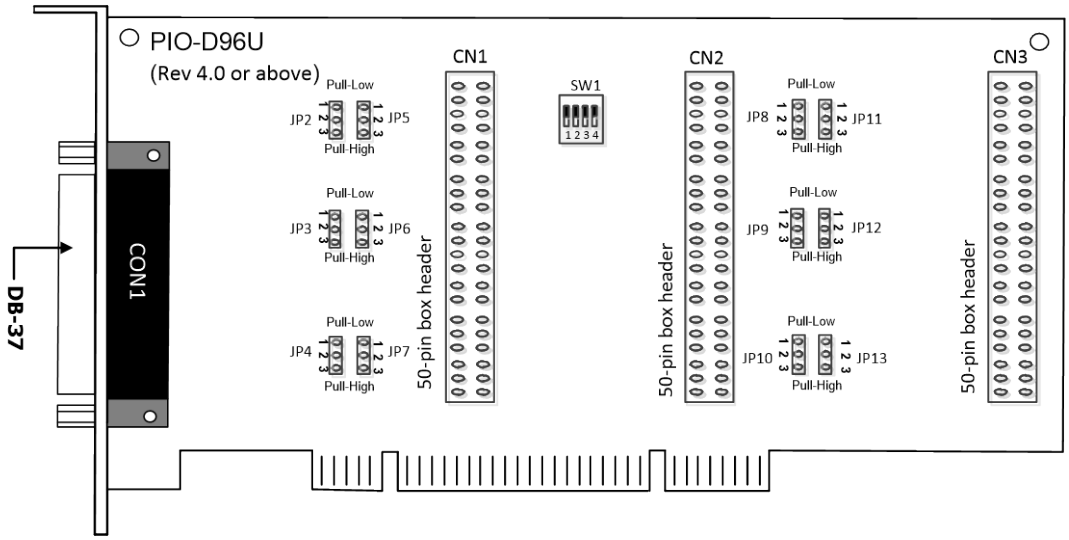
The I/O speed is depending on I/O card, bus speed, CPU speed and system loading. Any condition changes may cause the I/O speed different.

2. Hardware Configuration

2.1 Board Layout

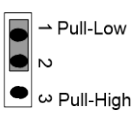
➢ **PIO-D96/PIO-D96U:**





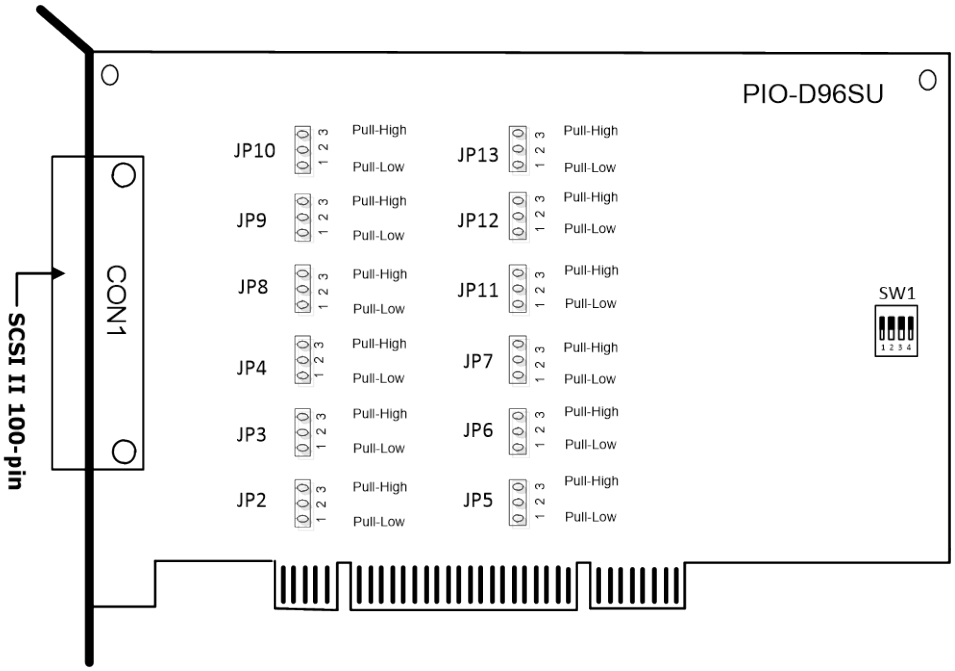
Note:

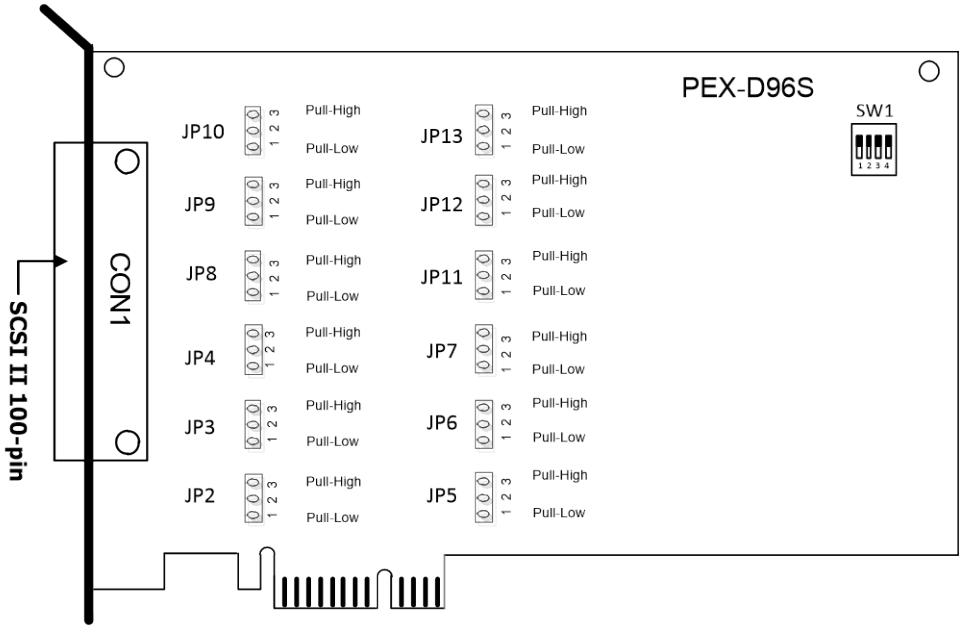
The JPx default settings: JP2/3/4/5/6/7/9/10/11/12/13 = 1-2 short = Pull-Low

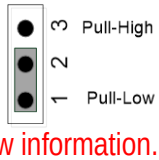


refer to Section 2.2 "I/O Port Location" for more detailed about DI pull-high/low information.

➢ PIO-D96SU/PEX-D96S:







Note:

The JPx default settings: JP2/3/4/5/6/7/9/10/11/12/13 = 1-2 short = Pull-Low

refer to Section 2.2 "I/O Port Location" for more detailed about DI pull-high/low information.

2.2 I/O Port Location

There are twelve 8-bit I/O ports in the PIO-D96 series card. Each I/O port can be programmed as a DI or DO port. When the PC is first powered-on or reset all the ports are configured as DI ports. These DI ports can be selected to either pull-high or pull-low via placement of the JP2 to JP13 jumpers. These I/O port locations are given as follows:

Connector of PIO-D96U (Rev 4.0 or above)		CON1	CN1	CN2	CN3
PA0 ~ PA7	Port	Port0	Port3	Port6	Port9
	Pull-high/Low	JP2	JP5	JP8	PJ11
PB0 ~ PB7	Port	Port1	Port4	Port7	Port10
	Pull-high/Low	JP3	JP6	JP9	JP12
PC0 ~ PC7	Port	Port2	Port5	Port8	Port11
	Pull-high/Low	JP4	JP7	JP10	JP13

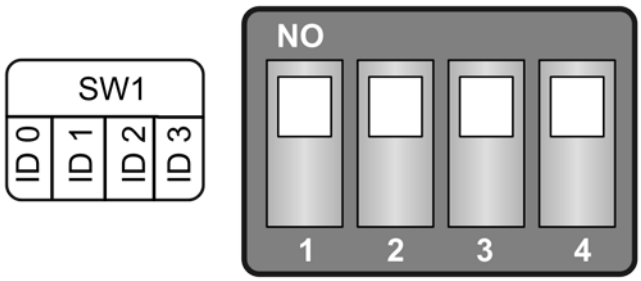
Connector of PIO-D96SU/PEX-D96S	CON1
PA0 ~ PA7	Port0 (pull-high/low by JP2)
PB0 ~ PB7	Port1 (pull-high/low by JP3)
PC0 ~ PC7	Port2 (pull-high/low by JP4)
PA10 ~ PA17	Port3 (pull-high/low by JP5)
PB10 ~ PB17	Port4 (pull-high/low by JP6)
PC10 ~ PC17	Port5 (pull-high/low by JP7)
PA20 ~ PA27	Port6 (pull-high/low by JP8)
PB20 ~ PB27	Port7 (pull-high/low by JP9)
PC20 ~ PC27	Port8 (pull-high/low by JP10)
PA30 ~ PA37	Port9 (pull-high/low by JP11)
PB30 ~ PB37	Port10 (pull-high/low by JP12)
PC30 ~ PC37	Port11 (pull-high/low by JP13)

Note:

1. This board is a bi-directional I/O design with default DI mode when power on.
Before switching to DO mode, the DI pull-high jumper setting may activate active-high DO devices (e.g., DB-24R / 24PR / 24C), or the pull-low setting may activate active-low DO devices.
Please have a appropriate jumper setting depending on the characteristics of your external device.
2. Each PC0 can be used as an interrupt signal source. Refer to Section 2.7 “Interrupt Operation” for more information.

2.3 Card ID Switch

The PIO-D96U/D96SU and PEX-D96S has a Card ID switch (SW1) with which users can recognize the board by the ID via software when using two or more PIO-D96U/D96SU and PEX-D96S cards in one computer. The default Card ID is 0x0. For detailed information about the SW1 Card ID settings, refer to Table 2.4.



(Default Settings)

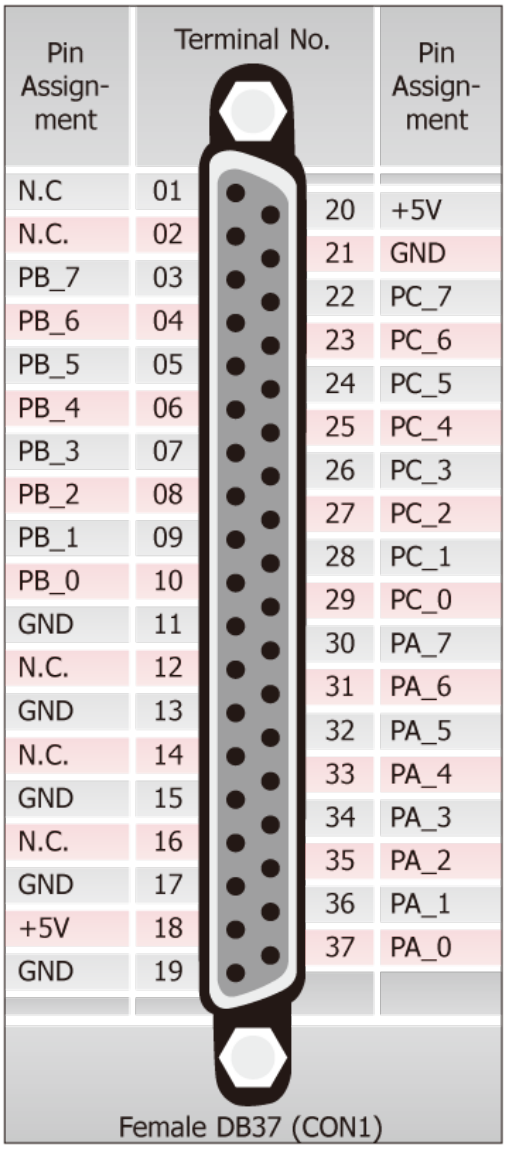
Table 2.1 (*) Default Settings; OFF → 1; ON → 0

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**

2.4 Pin Assignments

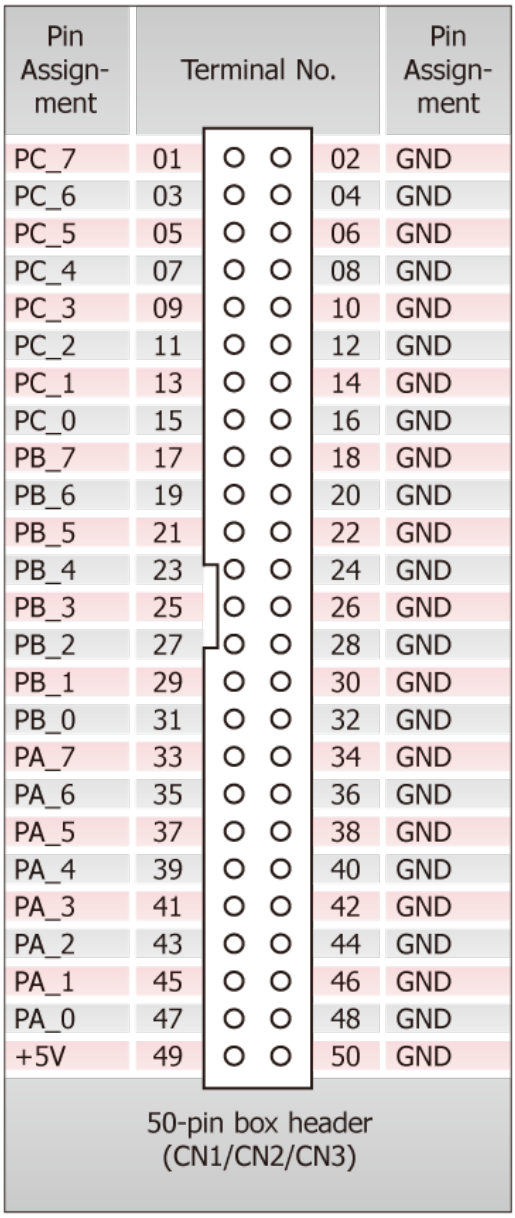
2.4.1 PIO-D96 and PIO-D96U

- **CON1:** 37-pin D-type female connector (for Port0, Port1, Port2).
- **CN1/CN2/CN3:** 50-pin flat-cable connector (for Port3 to Port11).



Pin Assign-ment	Terminal No.		Pin Assign-ment
N.C	01	20	+5V
N.C.	02	21	GND
PB_7	03	22	PC_7
PB_6	04	23	PC_6
PB_5	05	24	PC_5
PB_4	06	25	PC_4
PB_3	07	26	PC_3
PB_2	08	27	PC_2
PB_1	09	28	PC_1
PB_0	10	29	PC_0
GND	11	30	PA_7
N.C.	12	31	PA_6
GND	13	32	PA_5
N.C.	14	33	PA_4
GND	15	34	PA_3
N.C.	16	35	PA_2
GND	17	36	PA_1
+5V	18	37	PA_0
GND	19		

Female DB37 (CON1)



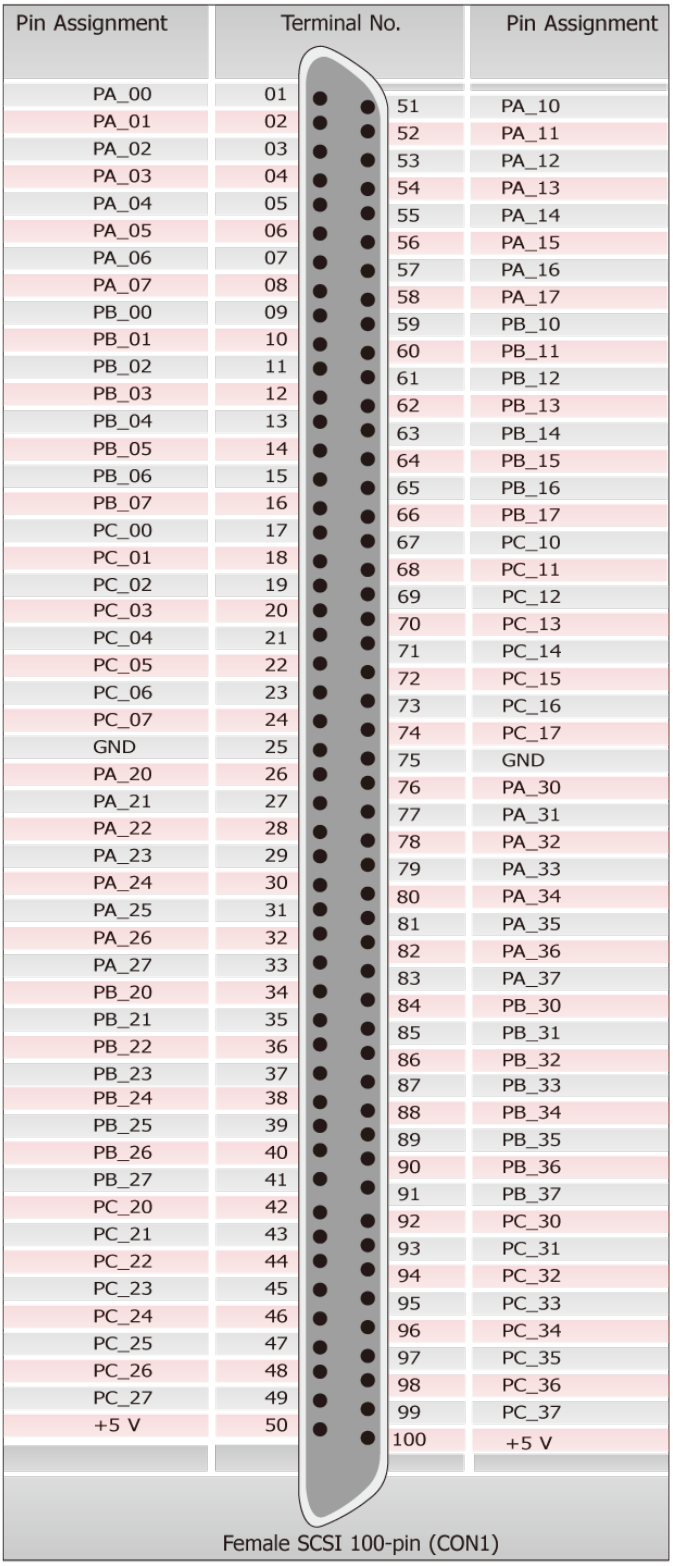
Pin Assign-ment	Terminal No.		Pin Assign-ment
PC_7	01	02	GND
PC_6	03	04	GND
PC_5	05	06	GND
PC_4	07	08	GND
PC_3	09	10	GND
PC_2	11	12	GND
PC_1	13	14	GND
PC_0	15	16	GND
PB_7	17	18	GND
PB_6	19	20	GND
PB_5	21	22	GND
PB_4	23	24	GND
PB_3	25	26	GND
PB_2	27	28	GND
PB_1	29	30	GND
PB_0	31	32	GND
PA_7	33	34	GND
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

50-pin box header
(CN1/CN2/CN3)

Figure 2-1

2.4.2 PIO-D96SU and PEX-D96S

➢ **CON1:** 100-pin SCSI II connector (for Port0 to Port11).



Pin Assignment	Terminal No.		Terminal No.	Pin Assignment
PA_00	01		51	PA_10
PA_01	02		52	PA_11
PA_02	03		53	PA_12
PA_03	04		54	PA_13
PA_04	05		55	PA_14
PA_05	06		56	PA_15
PA_06	07		57	PA_16
PA_07	08		58	PA_17
PB_00	09		59	PB_10
PB_01	10		60	PB_11
PB_02	11		61	PB_12
PB_03	12		62	PB_13
PB_04	13		63	PB_14
PB_05	14		64	PB_15
PB_06	15		65	PB_16
PB_07	16		66	PB_17
PC_00	17		67	PC_10
PC_01	18		68	PC_11
PC_02	19		69	PC_12
PC_03	20		70	PC_13
PC_04	21		71	PC_14
PC_05	22		72	PC_15
PC_06	23		73	PC_16
PC_07	24		74	PC_17
GND	25		75	GND
PA_20	26		76	PA_30
PA_21	27		77	PA_31
PA_22	28		78	PA_32
PA_23	29		79	PA_33
PA_24	30		80	PA_34
PA_25	31		81	PA_35
PA_26	32		82	PA_36
PA_27	33		83	PA_37
PB_20	34		84	PB_30
PB_21	35		85	PB_31
PB_22	36		86	PB_32
PB_23	37		87	PB_33
PB_24	38		88	PB_34
PB_25	39		89	PB_35
PB_26	40		90	PB_36
PB_27	41		91	PB_37
PC_20	42		92	PC_30
PC_21	43		93	PC_31
PC_22	44		94	PC_32
PC_23	45		95	PC_33
PC_24	46		96	PC_34
PC_25	47		97	PC_35
PC_26	48		98	PC_36
PC_27	49		99	PC_37
+5 V	50		100	+5 V

Female SCSI 100-pin (CON1)

Figure 2-2

2.5 Enable I/O Operation

When the PC is first turned on, all operations involved with Digital I/O channels are disabled. Note that the Digital I/O channel of each port is enabled or disabled by the RESET\ signal, refer to Section 6.3.1 "REST\ Control Register" for more information related to this. The power-on states for all DI/DO ports are given as follows:

- DI/DO operations for each port are disabled.
- DI/DO ports are all configured as Digital Input ports.
- DO latch register outputs are all high impedance. (Refer to Section 2.6 "DI/DO Architecture")

The user has to perform some initialization before using these Digital I/O ports. The recommended steps are given below:

Step 1: Find the address-mapping for PIO/PISO cards. (Refer to Section 6.1 "How to Find the I/O Address")

Step 2: Enable all Digital I/O operations. (Refer to Section 6.3.1 "RESET\ Control Register").

Step 3: Configure the first three ports to their expected DI/DO state and send their initial values to every DO port (Refer to Section 6.3.7 "I/O Selection Control Register")

Step 4: Configure the other three ports to their expected DI/DO states and send their initial values to every DO port (Refer to Section 6.3.7 "I/O Selection Control Register")

Note:

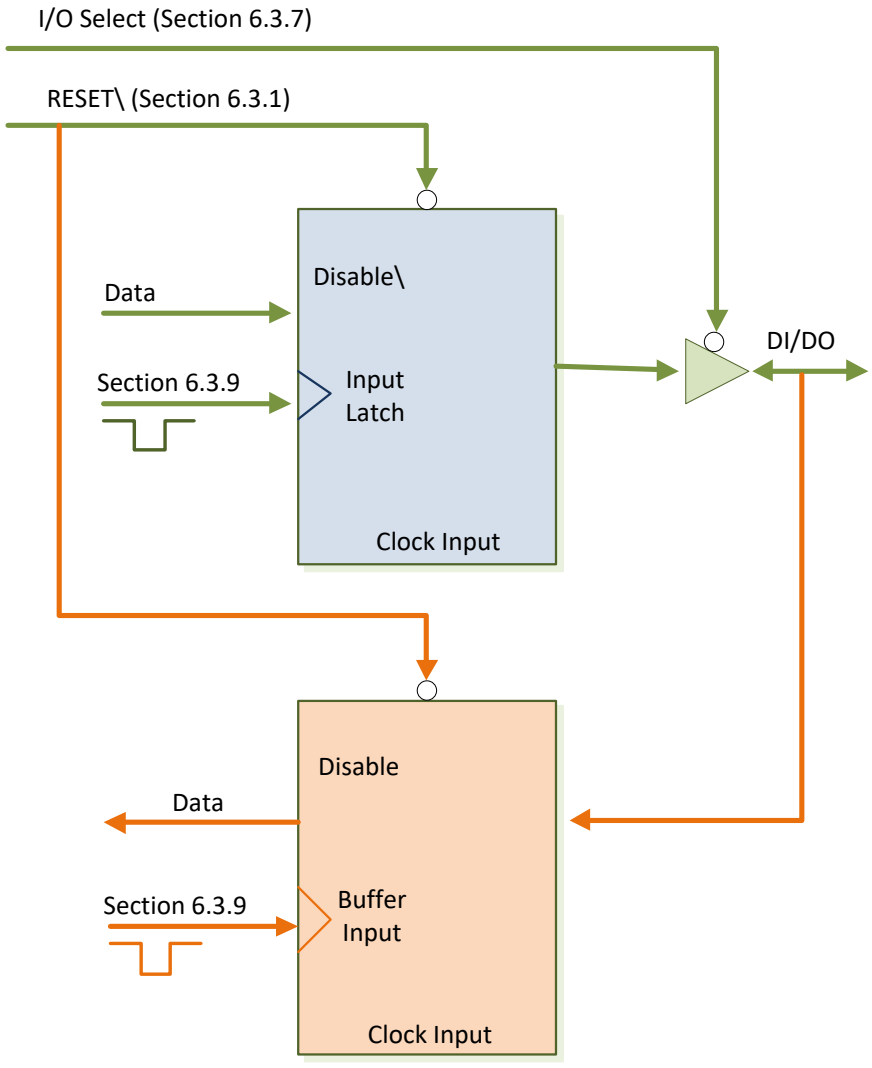
For more information on the initial procedure for Digital I/O ports, refer to the DIO demo program.

2.6 DI/DO Architecture

The Digital I/O control architecture for the PIO-D96 series card is demonstrated in the figure below. The operation method used for the control signal is presented below.

- RESET\ is in the Low-state → all DI/DO operation is disabled
- RESET\ is in the High-state → all DI/DO operation is enabled.
- If DI/DO is configured as a DI port → DI= external input signal
- If DI/DO is configured as a DO port → DI = read back DO

If the DI/DO is configured as a DI port → sending data to a Digital input port will only change the DO latch register. The latched data will be output when the port is configured as digital output and is activated right away.



2.7 Interrupt Operation

The P2C0, P5C0, P8C0 and P11C0 can be used as interrupt signal source. Refer to Section 2.1 "Board Layout" and Section 2.4 "Pin Assignments" for P2C0/P5C0/P8C0/P11C0 location. The interrupt of PIO-D96 series card is **level-trigger and Active_High**. The interrupt signal can be programmable as **inverted or non-inverted**. The procedures for how to configure the interrupt signal source are given as follows:

1. Make sure **the initial level is high or Low from the signal source**.
2. If the initial state is High, please select the **inverted** setting for interrupt signal source (Section 6.3.6 "Interrupt Polarity Register"). If the initial state is Low, please select the **non-inverted** setting for interrupt signal source (Section 6.3.6 "Interrupt Polarity Register")
3. Enable the interrupt function (Section 6.3.4 "INT Mask Control Register")
4. If the interrupt signal is active, the interrupt service routine will be started up.

Note that DEMO3.C and DEMO4.C are demo programs for a single interrupt source and DEMO5.C is the demo program for four interrupt sources in the DOS operating system. If only one interrupt signal source is used, the interrupt service routine does not need to identify the interrupt source. (Refer to DEMO3.C and DEMO4.C). However, if there are more than one interrupt source, the interrupt service routine has to identify the active signals in the following manner: (refer to DEMO5.C)

1. Read the new status of the interrupt signal sources.
2. Compare the new status with the old status to identify the active signals.
3. If P2C0 is active, service P2C0 and non-inverter/inverted the P2C0 signal.
4. If P5C0 is active, service P5C0 and non-inverted/inverted the P5C0 signal.
5. If P8C0 is active, service P8C0 and non-inverted/inverted the P8C0 signal.
6. If P11C0 is active, service P11C0 and non-inverted/inverted the P11C0 signal.
7. Update the interrupt status.

Note

If the interrupt signal is too short, the new status may be the same as the old status. So the interrupt signal must be held active until the interrupt service routine has been executed. This hold time is different for differing operating systems. The hold time can be as short as a micro-second or as long as 1 second. In general, 20 ms is enough for all O.S.

3. Hardware Installation

Note:

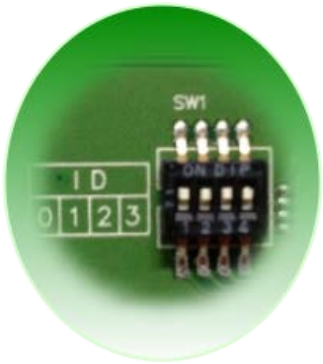
It is recommended that the driver is installed before installing the hardware as the computer may need to be restarted once the driver is installed in certain operating systems, such as Windows 2000 or Windows XP, etc. Installing the driver first helps reduce the time required for installation and restarting the computer.

To install your PIO-D96 series card, follow the procedure described below:

Step 1: Install the driver for your board on Host computer.

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

Step 2: Configure the Card ID using the DIP Switch (SW1).

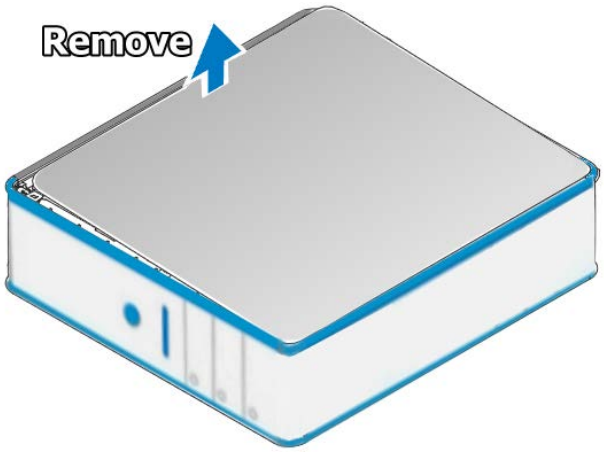


For detailed information about the card ID (SW1), please refer to Section 2.3 "Card ID Switch".

Note

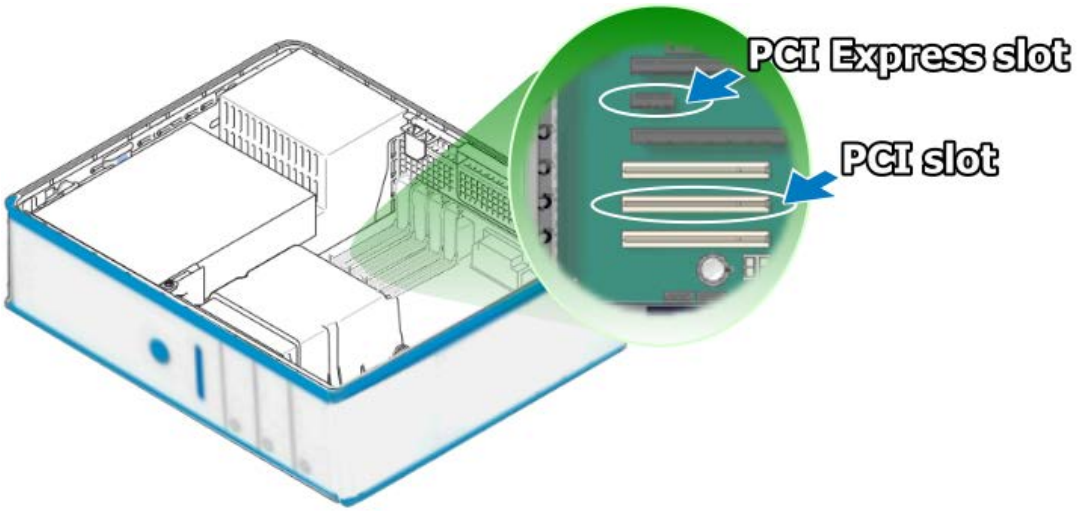
The Card ID function is only supported by the PIO-D96U/D96SU and PEX-D96S.

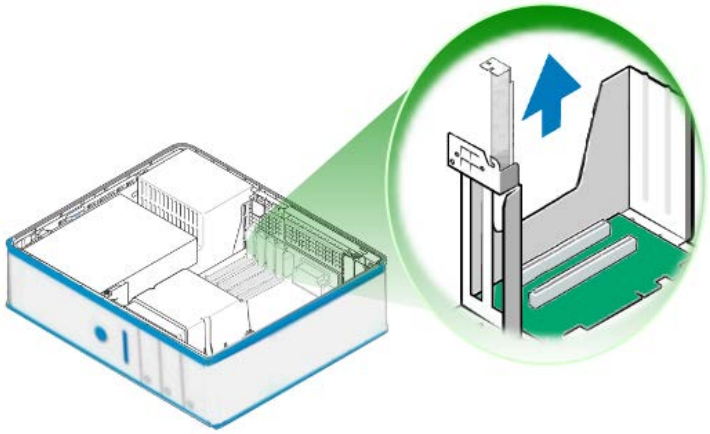
Step 3: Shut down and switch off the power to the computer, and then disconnect the power supply.



Step 4: Remove the cover from the computer.

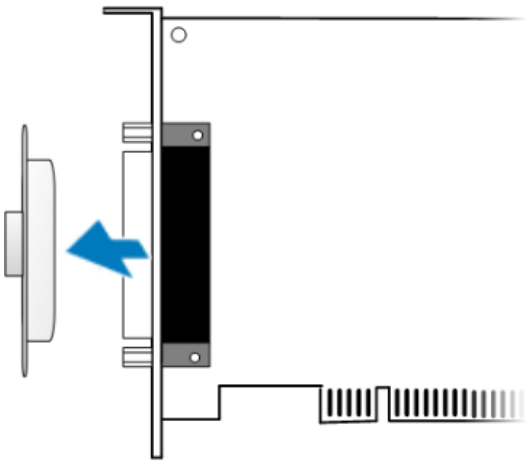
Step 5: Select a vacant PCI/PCI Express slot.



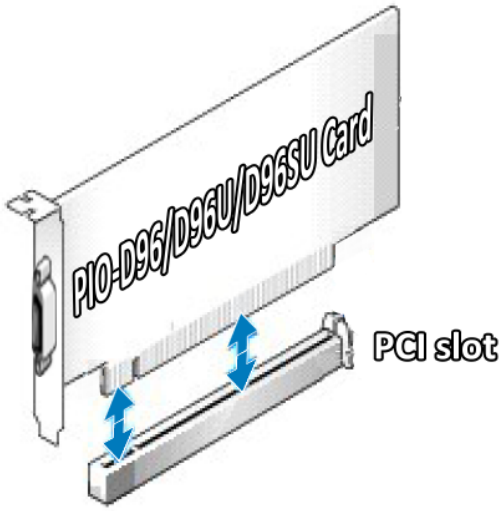


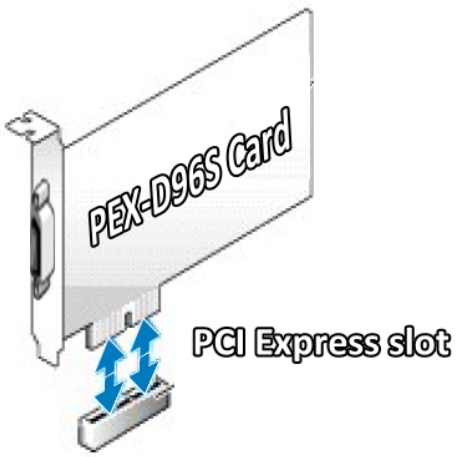
Step 6: Unscrew and remove the PCI slot cover from the computer case.

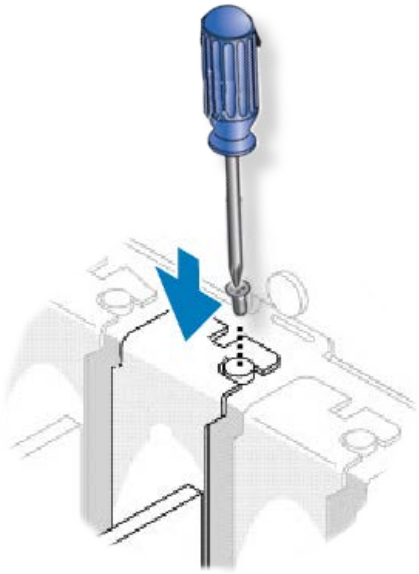
Step 7: Remove the connector cover from your board.



Step 8: Carefully insert your board into the PCI/PCI Express slot by gently pushing down on both sides of the board until it slides into the PCI connector.

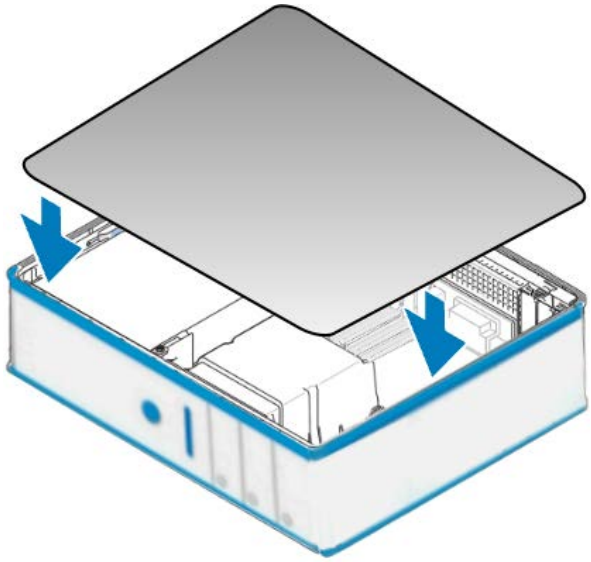






Step 9: Confirm that the board is correctly inserted in the motherboard, and then secure your board in place using the retaining screw that was removed in **Step 6.**

Step 10: Replace the covers on the computer.



Step 11: Re-attach any cables, insert the power cord and then switch on the power to the computer.

Once the computer reboots, follow any message prompts that may be displayed to complete the Plug and Play installation procedure. Refer to Chapter 4 "Software Installation" for more information.

4. Software Installation

This chapter provides a detailed description of the process for installing the PIO-D96 series driver and how to verify whether the PIO-D96 was properly installed. PIO-D96 series card can be used on DOS, Linux and 32/64-bit XP/2003/2008/7/8/10 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 installation package for PIO-D96 series board can be found on the companion CD-ROM, or can be obtained from the ICP DAS FTP web site. Install the appropriate driver for your operating system. The location and website addresses for the installation package are indicated below.

- **UniDAQ Driver/SDK** (It is recommended to install this driver for new user.)

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, 32/64-bit Windows 10
Driver Name	UniDAQ Driver/SDK (unidaq_win_setup_xxxx.exe)
CD-ROM	CD:\\ NAPDOS\PCI\UniDAQ\DLL\Driver\
Web Site	http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/unidaq/dll/driver/
Installing Procedure	To install the UniDAQ driver, follow the procedure described below. Step 1: Double-click the UniDAQ_Win_Setupxxx.exe icon to begin the installation process.

Installation Procedure	Step 2: When the "Welcome to the ICP DAS UniDAQ Driver Setup Wizard" screen is displayed, click the "Next>" button to start the installation. Step 3: On the "Information" screen, verify that the DAQ board is included in the list of supported devices, then click the "Next>" button. Step 4: On the "Select Destination Location" screen, click the "Next>" button to install the software in the default folder, C:\ICPDAS\UniDAQ. Step 5: On the "Select Components" screen, verify that the DAQ board is in the list of device, and then click the "Next>" button to continue. Step 6: On the "Select Additional Tasks" screen, click the "Next>" button to continue. Step 7: On the "Download Information" screen, click the "Next>" button to continue. Step 8: Once the installation has completed, click "No, I will restart my computer later", and then click the "Finish" button. For more detailed information about how to install the UniDAQ driver, refer to Section 2.2 "Install UniDAQ Driver DLL" of the UniDAQ Software Manual, which can be found in the \NAPDOS\PCI\UniDAQ\Manual\ folder on the companion CD, or can be downloaded from: http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/unidaq/manual/

➢ **PIO-DIO Series Classic Driver** (Recommended to install this driver for have been used PIO-DIO series boards of regular user)

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, 32-bit Windows 8, , 32-bit Windows 10
Driver Name	PIO-DIO Series Classic Driver(PIO_DIO_Win__vxxx.exe)
CD-ROM	CD:\\ NAPDOS\PCI\PIO-DIO\DLL_OCX\Driver\
Web Site	http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/pio-dio/dll_ocx/driver/
Installing Procedure	Please follow the following steps to setup software: Step 1: Double click the PIO-DIO Series Classic Driver to setup it. Step 2: When the Setup Wizard screen is displayed, click the Next> button. Step 3: Select the folder where the drivers are to install. The default path is C:\DAQPro\PIO-DIO. But if you wish to install the drivers to a different location , click the "Browse..." button and select the relevant folder and then click the Next> button. Step 4: Click the Install button to continue. Step 5: Select the item "No, I will restart my computer later", press the Finish button. For detailed information about how to install the PIO-DIO Classic Driver, refer to the PIO-DIO Series Classic Driver DLL Software, which can be found in the \NAPDOS\PCI\PIO-DIO\Manual\ folder on the companion CD, or can be downloaded from: http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/pio-dio/manual/

4.2 PnP Driver Installation

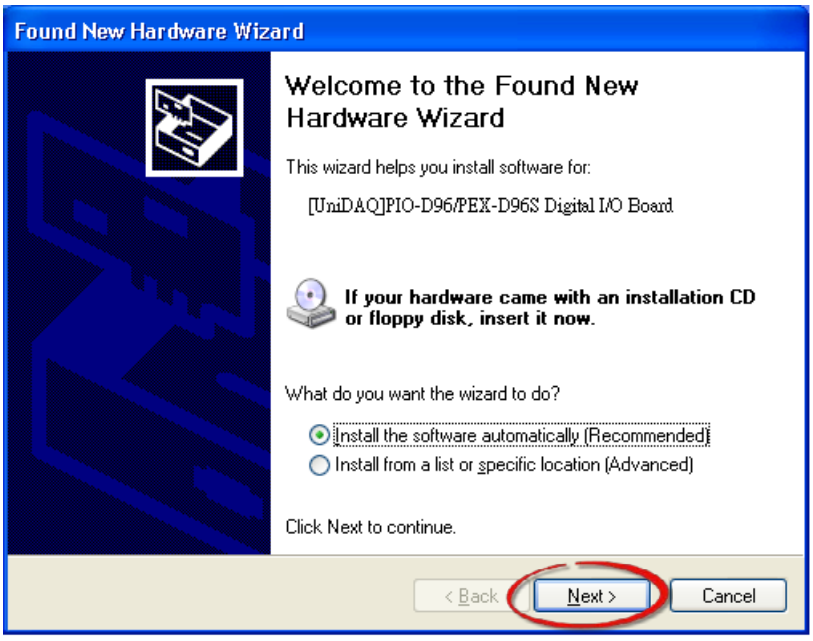
Step 1: Correctly shut down and power off your computer and disconnect the power supply, and then install your board into the computer. For detailed information about the hardware installation of PIO-D96 series board, refer to Chapter 3 "Hardware Installation".

Step 2: Power on the computer and complete the Plug and Play installation**.**

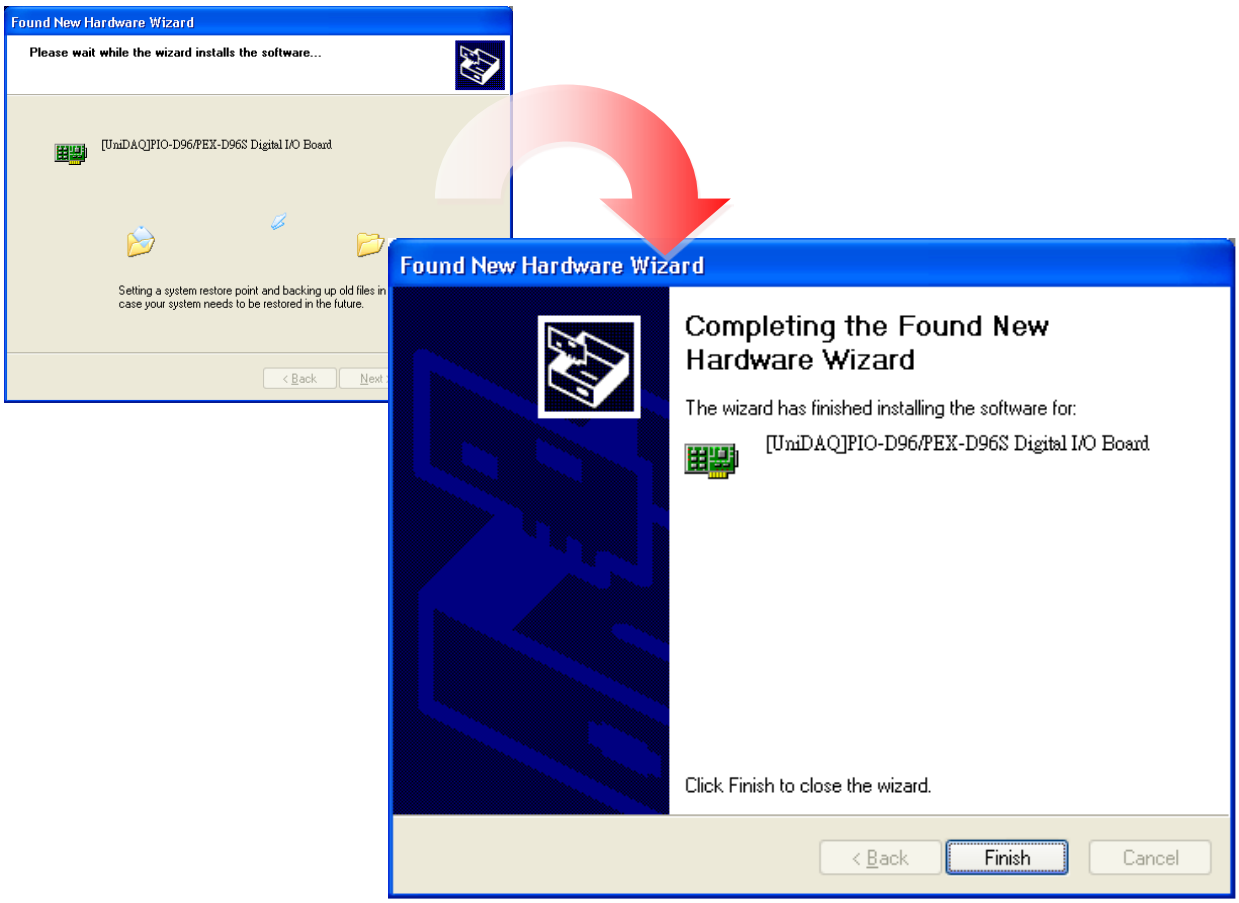
Note:

recent operating systems, such as Windows 7/8/10 will automatically detect the new hardware and install the necessary drivers etc., so Steps 3 to 5 can be skipped.

Step 3: Select **"Install the software automatically [Recommended]"** and click the **"Next>"** button.



Step 4: Click the **"Finish"** button.



Step 5: Windows pops up **"Found New Hardware"** dialog box again.

4.3 Verifying the Installation

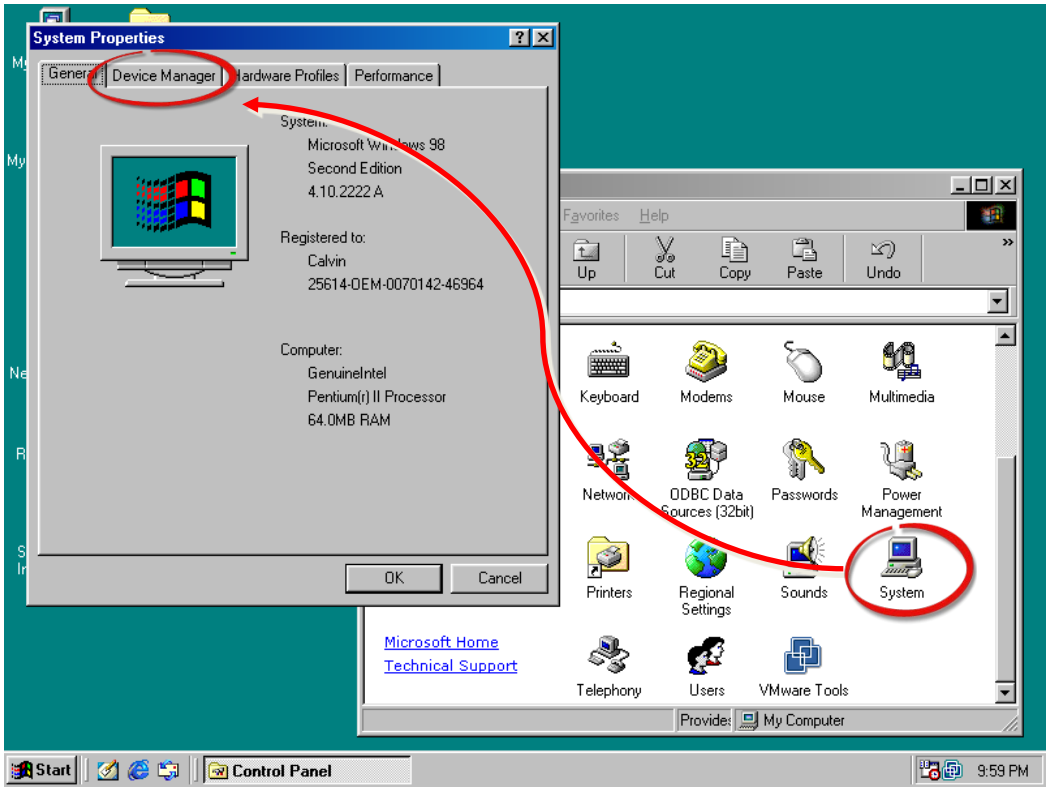
To verify that the driver was correctly installed, use the Windows **Device Manager** to view and update the device drivers installed on the computer, and to ensure that the hardware is operating correctly. The following is a description of how access the Device Manager in each of the major versions of Windows. Refer to the appropriate description for the specific operating system to verify the installation.

4.3.1 Accessing Windows Device Manager

- **Windows 95/98/ME**

Step 1: Either right-click the **"My Computer"** icon on the desktop and then click **"Properties"**, or open the **"Control Panel"** and double-click the **"System"** icon to open the System Properties dialog box.

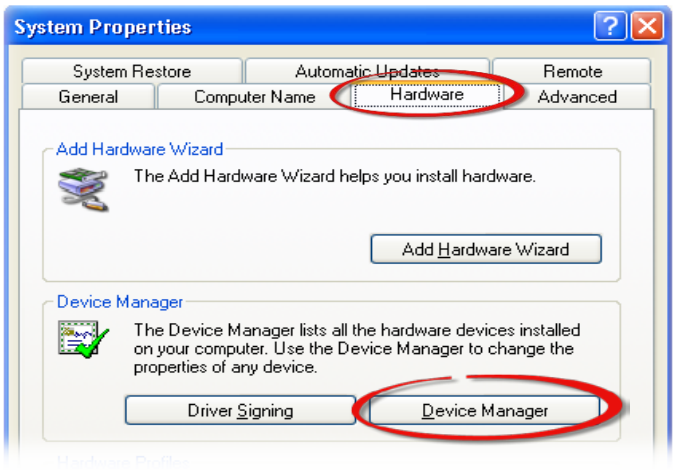
Step 2: In the **System Properties** dialog box, click the "**Device Manager**" tab.



➢ Windows 2000/XP

Step 1: Click the "**Start**" button and then point to "**Settings**" **and click** "**Control Panel**". Double-click the "**System**" icon to open the **"System Properties"** dialog box.

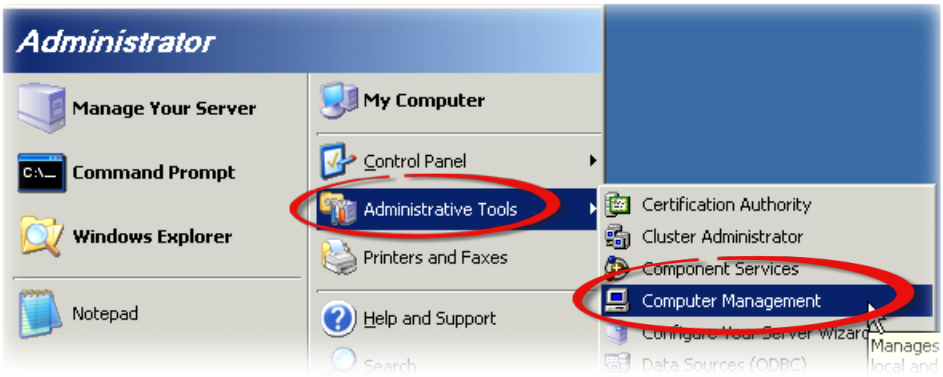
Step 2: Click the "**Hardware**" tab and then click the "**Device Manager**" button.



➢ Windows Server 2003

Step 1: Click the **"Start"** button and point to **"Administrative Tools"**, and then click the **"Computer Management"** option.

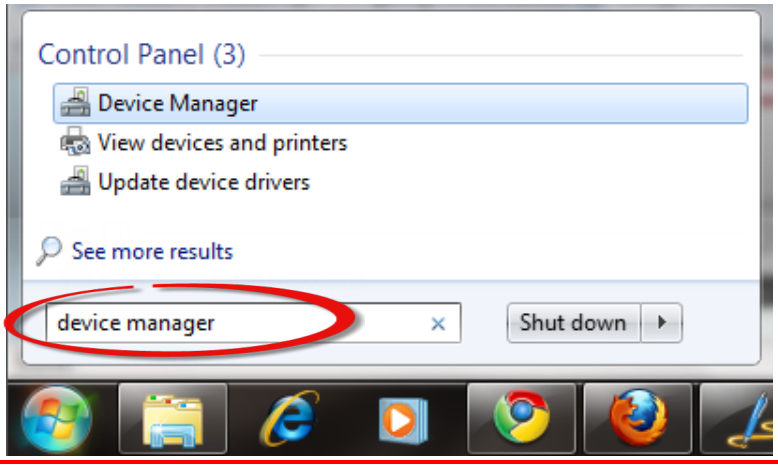
Step 2: Expand the **"System Tools"** item in the console tree, and then click **"Device Manager"**.



➢ Windows 7/10

Step 1: Click the **"Start"** button, and then click **"Control Panel"**.
Step 2: Click **"System and Maintenance"**, and then click **"Device Manager"**.

Alternatively,
Step 1: Click the **"Start"** button.
Step 2: In the **Search field,** type **Device Manager** and then press Enter.



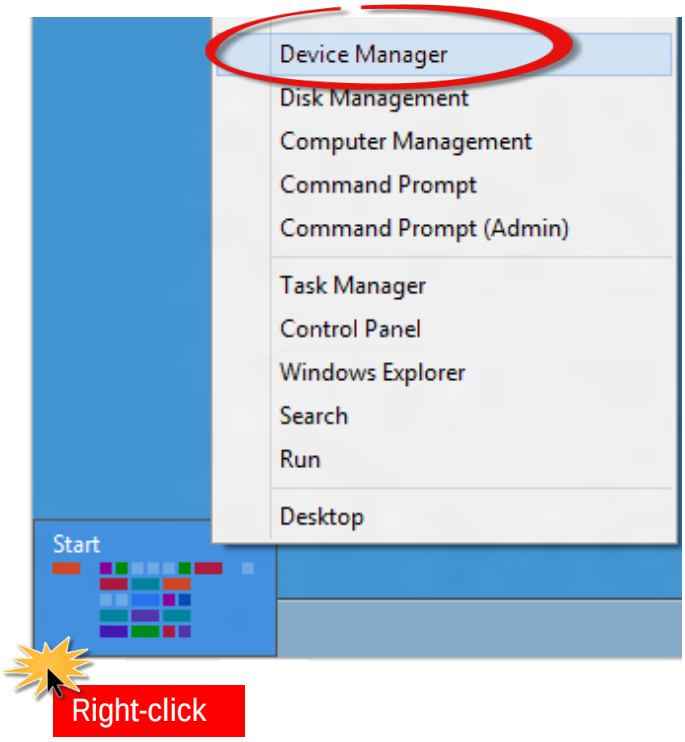
Note:

Administrator privileges are required for this operation. If you are prompted for an administrator password or confirmation, enter the password or provide confirmation by clicking the "Yes" button in the User Account Control message.

➢ Windows 8

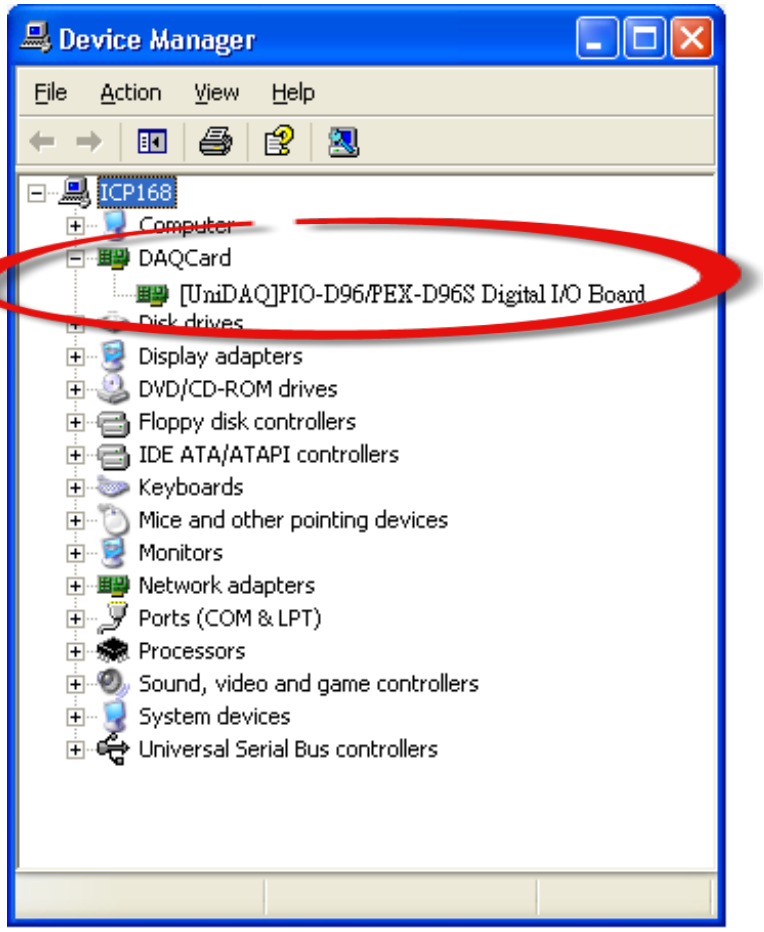
Step 1: To display the **Start screen icon** from the desktop view, hover the mouse cursor over the **bottom-left corner** of screen.
Step 2: **Right-click** the Start screen icon and then click "**Device Manager**".

Alternatively, press **[Windows Key] +[X]** to open the Start Menu, and then select Device Manager from the options list.



4.3.2 Check that the Installation

Check that the PIO-D96 series board is correctly listed in the **Device Manager** window, as illustrated below.



5. Board Testing

This chapter provides detailed information about the **"Self-Test"** process, which is used to confirm that the PIO-D96 series board is operating correctly. Before beginning the **"Self-Test"** process, ensure that both the hardware and driver installation procedures are fully completed. For detailed information about the hardware and driver installation, refer to Chapter 3 "Hardware Installation" and Chapter 4 "Software Installation".

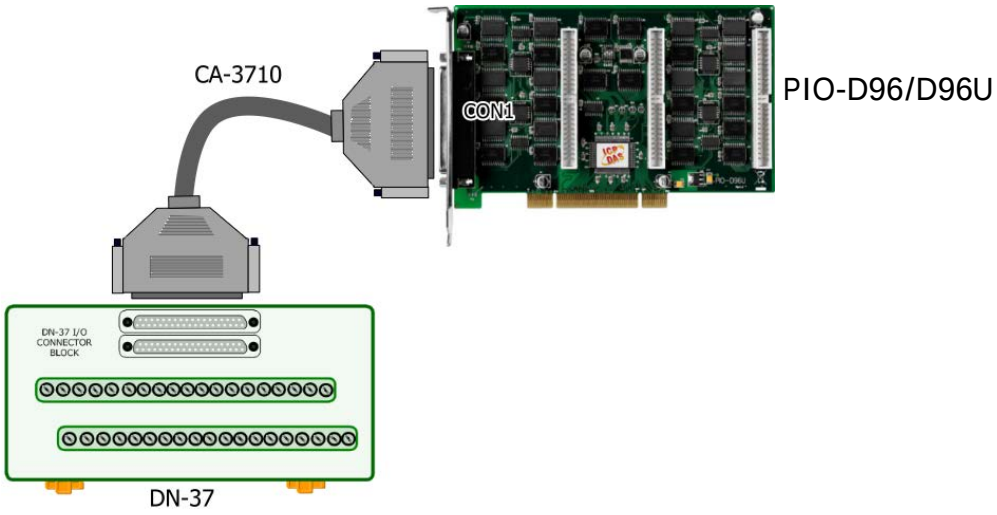
5.1 Self-Test Wiring

5.1.1 PIO-D96/D96U

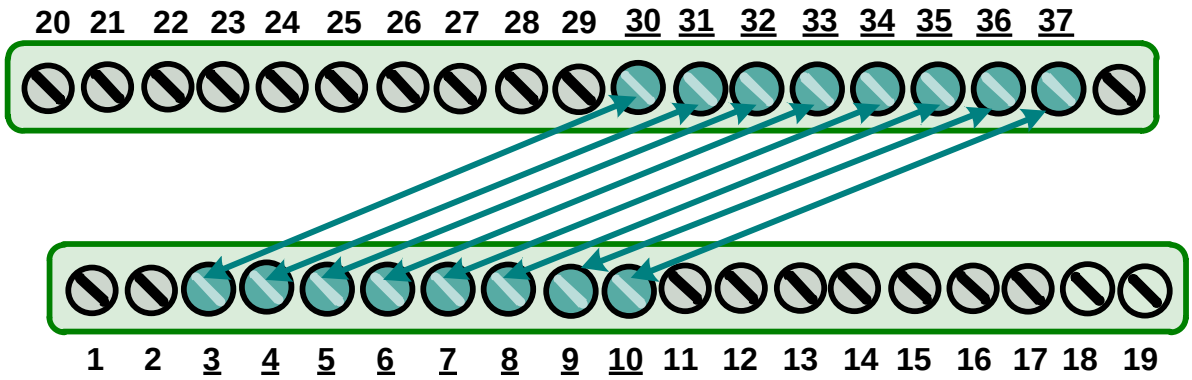
Before beginning the **"Self-Test"** procedure, ensure that the following items are available:
☑ A CA-3710 Cable
(Optional, Website: http://www.icpdas.com/products/Accessories/cable/cable_selection.htm)

☑ A DN-37 Terminal Board
(Optional, Website:
http://www.icpdas.com/root/product/solutions/pc_based_io_board/daughter_boards/dn-37.html)

Step 1: Connect the DN-37 to the CN1 connector on your board using the CA-3710 cable.



Step 2: Connect the Port0 (PA0 ~ PA7) with Port1 (PB0 ~ PB7).

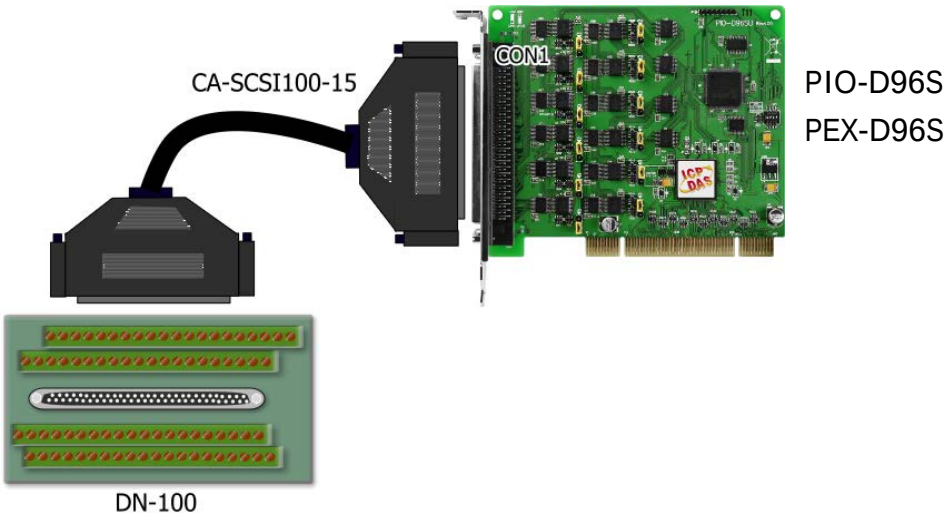


5.1.2 PIO-D96SU/PEX-D96S

Before beginning the **"Self-Test"** procedure, ensure that the following items are available:
☑ A CA-SCSI100-15 Cable
(Optional, Website: http://www.icpdas.com/products/Accessories/cable/cable_selection.htm)

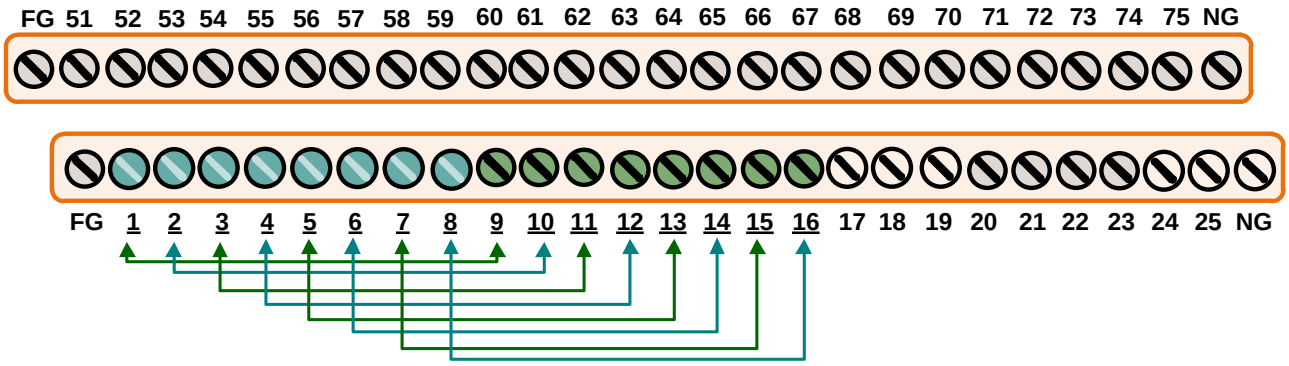
☑ A DN-100 Terminal Board
(Optional, Website:
http://www.icpdas.com/root/product/solutions/pc_based_io_board/daughter_boards/dn-100.html)

Step 1: Connect the DN-100 to the CON1 connector on your board using the CA-SCSI100-15 cable.



PIO-D96S
PEX-D96S

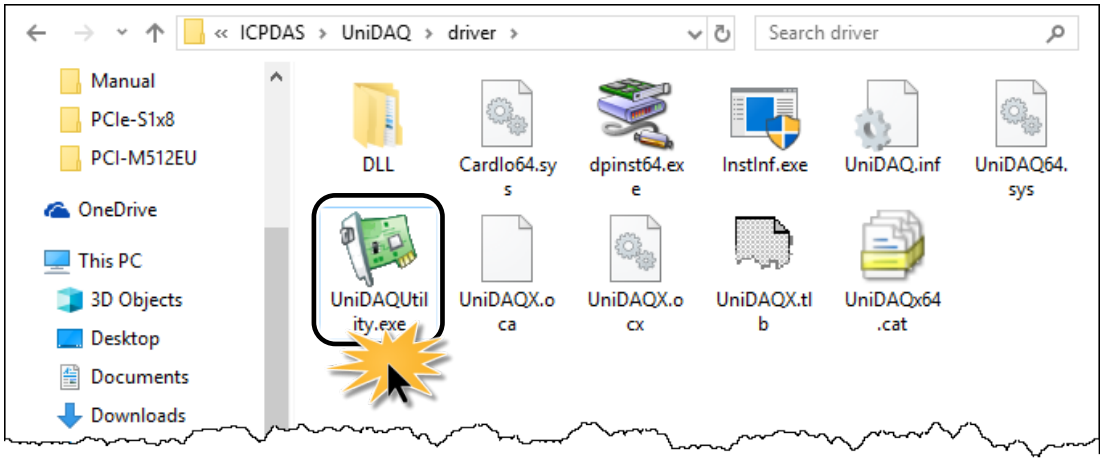
Step 2: Connect the Port0 (PA00 ~ PA07) with Port1 (PB00 ~ PB07).



5.2 Launch the Test Program

The following example use UniDAQ driver to perform self-test. If you install the PIO-DIO series classic driver, refer to Quick Start Guide of the PIO-D96 series (http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/pio-dio/manual/quickstart/classic/) to execute the self-test.

Step 1: Double-click the **UniDAQ Utility** software. The UniDAQ Utility will be placed in the **default path "C:\ICPDAS\UniDAQ\Driver"** after completing installation.



Step 2: Confirm that your board has been successfully installed in the Host system. **Note that the device number starts from 0**.

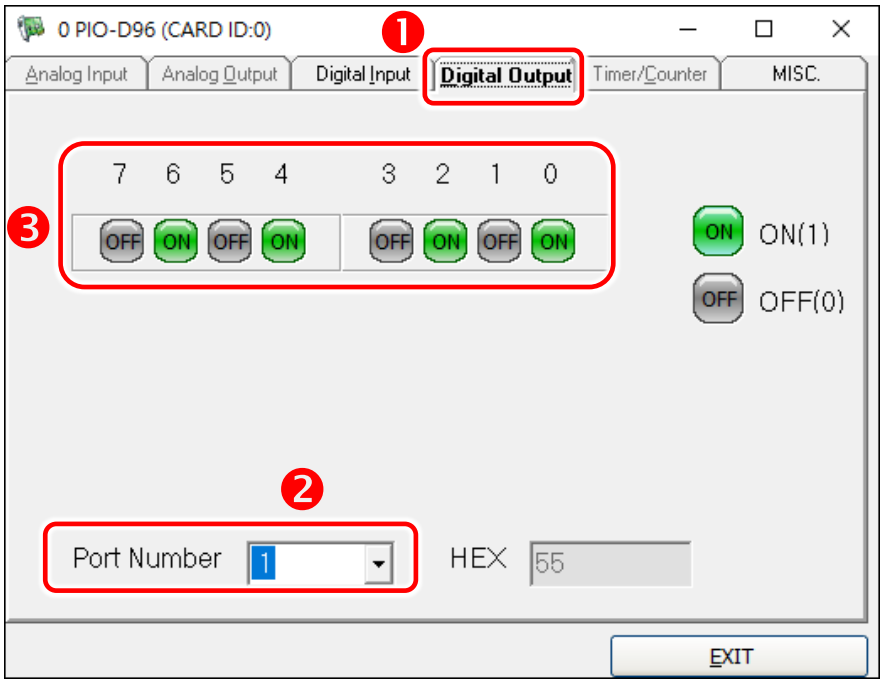
Step 3: Click the **"TEST"** button to start the test.

Note:

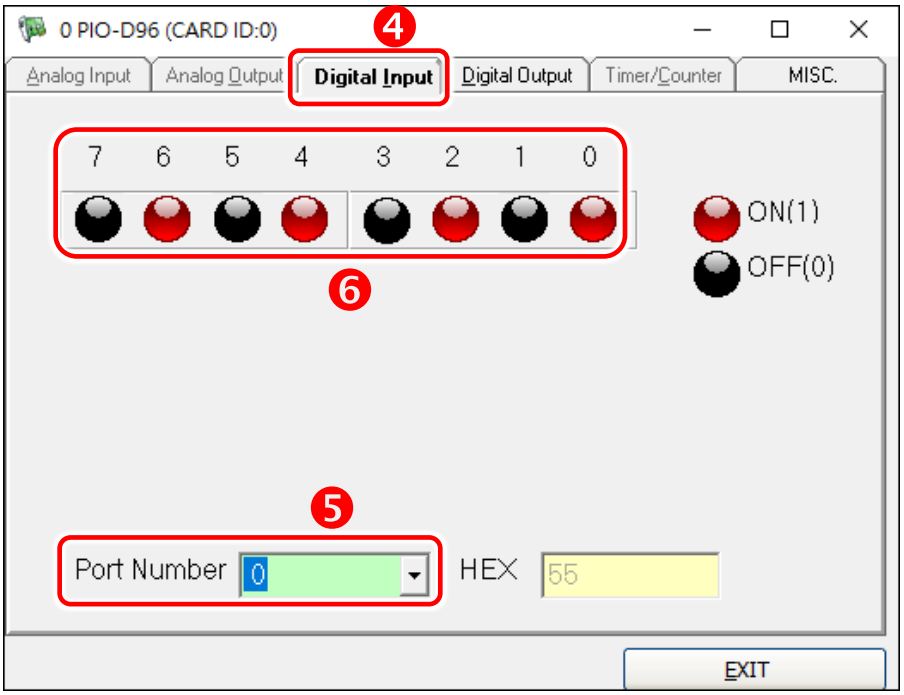
The PEX-D96S, PIO-D96SU and PIO-D96U software is fully compatible with the PIO-D96 series software.

Step 4: Check the results of the **Digital Input and Digital Output** functions test.

1. Click the **"Digital Output"** tab.
2. Select **"Port 1"** from the **"Port Number"** drop-down menu.
3. Check the checkboxes for **channels 0, 2, 4 and 6**.



4. Click the **“Digital Input”** tab.
5. Select **“Port 0”** from the **“Port Number”** drop-down menu.
6. The DI indicators will turn **red** when the corresponding DO channels 0, 2, 4 and 6 are **ON**.



6. I/O Control Register

6.1 How to Find the I/O Address

During the power-on stage, the Plug and Play BIOS will assign an appropriate I/O address to each PIO-D96 series card installed in the system. Each board includes four fixed ID numbers that are used to identify the board, and are indicated below:

Table 6-1:

	PIO-D96 (Rev 1.0 ~ 3.0)	PIO-D96 (Rev 4.0 or above)
Vendor ID	0xE159	0xE159
Device ID	0x0002	0x0001
Sub-Vendor ID	0x80	0x5880
Sub-Device ID	0x01	0x01
Sub-Aux ID	0x10	0x10

Table 6-2:

	PIO-D96U (Rev 1.0 or above)	PIO-D96SU (Rev 1.0 or above)	PEX-D96S (Rev 1.0 or above)
Vendor ID	0xE159	0xE159	0xE159
Device ID	0x0001	0x0001	0x0001
Sub-Vendor ID	0x5880	0x1880	0x1880
Sub-Device ID	0x01	0x01	0x01
Sub-Aux ID	0x10	0x10	0x10

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 PIODIO.H. Refer to Section 6.3 "The I/O Address Map" for more information. The important driver information is given as follows:

■ Allocated resource information:

- **wBase :** BASE address mapping in this PC
- **wIrq:** Allocated IRQ channel number of this board in this PC

■ PIO/PISO identification information:

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

■ PC's physical slot information:

- **wSlotBus:** The bus number of the slot used by this board.
- **wSlotDevice:** The device number of the slot used by this board.

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

➢ PIO_PISO.EXE Utility

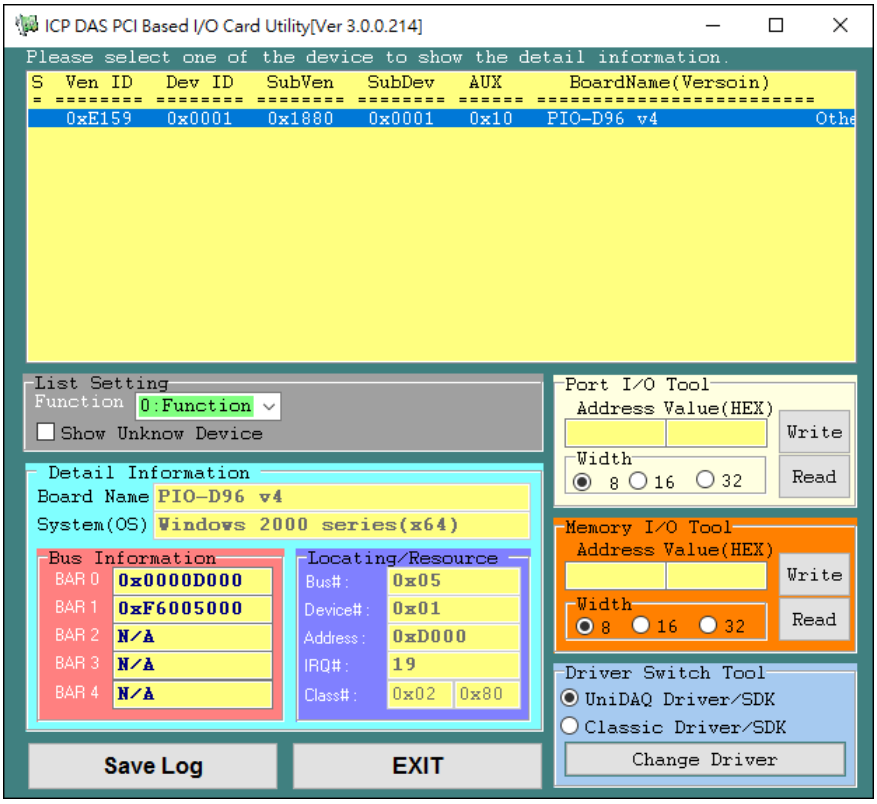
The **PIO_PISO.EXE** utility is valid for all PIO/PISO cards. This program shows all PCI hardware ID regarding the PIO and PISO series DAQ cards. It is useful to test if the card Plug & Play successfully when the computer bootup. If the PIO or PISO series card does not shown in the screen correctly, 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 Section 6.2 “The Assignment of I/O Address” for more information about the assignment of I/O Address)

➢ For Windows OS

The **PIO_PISO.EXE** utility is located on the CD as below and is useful for all PIO-DIO series boards. (CD:\NAPDOS\PCI\Utility\Win32\PIO_PISO\)
http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/utility/win32/pio_piso/



➢ 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();
}
```

6.2 The Assignment of I/O Address

The Plug and Play BIOS will assign the proper I/O address to a PIO/PISO series card. If there is only one PIO/PISO card, the user can identify the card as card_0. If there are two PIO/PISO card s in the system, it is very difficult to identify which board is card_0. The software driver can support a maximum of 16 cards. 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 PIO-D96 series boards from the PC.

Step 2: Install one PIO-D96 series onto the PC's PCI_slot1, run PIO_PISO.EXE.
Then record the "wSlotBus1" and "wSlotDevice1" information.

Step 3: Remove all PIO-D96 series boards from the PC.

Step 4: Install one PIO-D96 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 6-3

PC's PCI Slot	Locating/Resource	
	wSlotBus (Bus#)	wSlotBus (Device#)
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 “wSlotBus” 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 6-4.

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:

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 of the PIO/PISO series card is automatically assigned by the main board ROM BIOS. The I/O address can also be re-assigned by the user, but it is strongly recommended that the I/O address is not changed by user. The Plug and Play BIOS will assign an appropriate I/O address to each PIO/PISO series card. The I/O addresses of the PIO-D96 series card are as follows, and are based on the base address of each card.

Table 6-4:

Address	Read	Write
wBase+0	-	RESET\ Control Register
wBase+2	Aux control register	Same
wBase+3	Aux data register	Same
wBase+5	INT mask control register	Same
wBase+7	Aux pin status register	Same
wBase+0x2a	INT polarity control register	Same
wBase+0xc0	Read Port0	Write Port0
wBase+0xc4	Read Port1	Write Port1
wBase+0xc8	Read Port2	Write Port2
wBase+0xcc	-	Port0 ~ Port2 Configuration
wBase+0xd0	Read Port3	Write Port3
wBase+0xd4	Read Port4	Write Port4
wBase+0xd8	Read Port5	Write Port5
wBase+0xdc	-	Port3 ~ Port5 Configuration
wBase+0xe0	Read Port6	Write Port6
wBase+0xe4	Read Port7	Write Port7
wbase+0xe8	Read Port8	Write Port8
wBase+0xec	-	Port6 ~ Port8 Configuration
wBase+0xf0	Read Port9	Write Port9
wBase+0xf4	Read Port10	Write Port10
wBase+0xf8	Read Port11	Write Port11
wBase+0xfc	Read Card ID	Port9 ~ Port11 Configuration

Note:

Refer to Section 6.1 "How to Find the I/O Address" for more information about wBase.

6.3.1 RESET\ Control Register

(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 DI/O operations.** The user has to set the RESET\ signal to a High-state before any DI/O command applications are initiated.

For example:

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

6.3.2 AUX Control Register

(Read/Write): wBase+2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Aux7	Aux6	Aux5	Aux4	Aux3	Aux2	Aux1	Aux0

Aux?=0→ this Aux is used as a DI
Aux?=1→ this Aux is used as a DO

When the PC is first turned on, all Aux signals are in a Low-state. All Aux are designed as DI for all PIO/PISO series.

6.3.3 AUX Data Register

(Read/Write): wBase+3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Aux7	Aux6	Aux5	Aux4	Aux3	Aux2	Aux1	Aux0

When the Aux is used for DO, the output state is controlled by this register. This register is designed for feature extension. Therefore, do not use this register.

6.3.4 INT Mask Control Register

(Read/Write): wBase+5

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	EN3	EN2	EN1	EN0

EN0=0→ Disable P2C0 of CN1 as an interrupt signal (Default).
EN0=1→ Enable P2C0 of CN1 as an interrupt signal

For example:

```
outportb(wBase+5,0);        /*Disable interrupt */
outportb(wBase+5,1);        /* Enable interrupt P2C0 */
outportb(wBase+5,0x0f);     /* Enable interrupt P2C0, P5C0,P8C0,P11C0 */
```

6.3.5 Aux Status Register

(Read/Write): wBase+7

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Aux7	Aux6	Aux5	Aux4	Aux3	Aux2	Aux1	Aux0

Aux0=P2C0, Aux1=P5C0, Aux2=P8C0, Aux3=P11C0, Aux7~4=Aux-ID. Refer to DEMO5.C for more information. The Aux 0~3 are used as interrupt source. The interrupt service routine has to read this register to identify the interrupt source. Refer to Section 2.7 "Interrupt Operation" for more information.

6.3.6 Interrupt Polarity Register

(Read/Write): wBase+0x2A

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	INV3	INV2	INV1	INV0

This register provides a function to control invert or non-invert for the interrupt signal source. A detailed application example is given below.

INV0=1→ select the non-inverted signal from P2C0
INV0=0→ select the inverted signal from P2C0

```
For example:
outportb(wBase+0x2a,0x0f);  /* select the non-inverted input P2/5/8/11C0 */
outportb(wBase+0x2a,0x00); /* select the inverted input of P2/5/8/11C0 */
outportb(wBase+0x2a,0x0e); /* select the inverted input of P2C0 */
                           /* select the non-inverted input P5/8/11C0 */

outportb(wBase+0x2a,0x0c); /* select the inverted input of P2/5C0 */
                           /* select the non-inverted input P8/11C0 */
```

Refer to Section 2.7 "Interrupt Operation" and DEMO5.C (DOS) for more information.

6.3.7 I/O Selection Control Register

(Write): wBase+0xcc

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	Port2	Port1	Port0

(Write): wBase+0xdc

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	Port5	Port4	Port3

(Write): wBase+0xec

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	Port8	Port7	Port6

(Write): wBase+0xfc

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	Port11	Port10	Port9

These registers provide the function for configuration digital input/output port of the PIO-D96 series Card. Every I/O port can be programmed to be a DI or a DO port. Note that all ports are used as D/I ports when the PC is first turned on.

port?=1→ this port is used as a DO port
port?=0→ this port is used as a DI port

For example:

```
outportb(wBase+0xcc,0x03);          /* set port0 ~ port1 as DO ports */
                                    /* set port2 as DI ports */

outportb(wBase+0xdc,0x07);          /* set port3 ~ port5 as D/O ports */
outportb(wBase+0xec,0x00);          /* set port6 ~ port8 as DI ports */
```

6.3.8 Card ID Register

(Read): wBase+0xfc

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

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

Note: The Card ID function is only supported by the PIO-D96U/D96SU and PEX-D96S (Ver. 1.0 or above)

6.3.9 Read/Write 8-bit Data Register

(Read/Write): wBase+0xc0/0xc40xc8/0xd0/0xd4/0xd8
0xe0/0xe4/0xe8/0xf0/0xf4/0xf8

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

There are 12 8-bit I/O ports in the PIO-D96 series card. Every I/O port can be configured as DI or DO port. User can send/receive digital data to/from this register for digital input or output. Note that all ports are used as D/I port when the PC is first turned on.

```
For example:
outportb(wBase+0xc0,Val);          /* write to Port0 */
Val=inportb(wBase+0xc0);           /* read from Port0 */
```

Note: Make sure the I/O port configuration (DI or DO) before read/write the data register, refer to Section 6.3.7 "I/O Selection Control Register" for more details.

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 (Win 98/Me/NT/2K and 32-/64-bit win XP/2003/2008/7/8/10). 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 PIO-DIO Series Classic Driver**

The demo program is contained in:


CD:\NAPDOS\PCI\PIO-DIO\DLL_OCX\Demo\


http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/pio-dio/dll_ocx/demo/

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

For detailed information about the DLL function of the PIO-D96 series, refer to PIO-DIO DLL Software Manual (CD:\NAPDOS\PCI\PIO-DIO\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, 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\PIO-DIO\DOS\d96\

http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/pci/pio-dio/dos/d96/

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

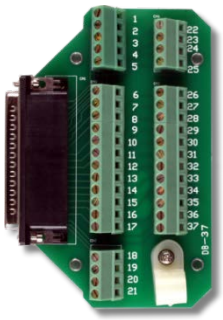
- \MSC\LIB\PIO.H → MSC Declaration File
- \MSC\LIB\MSCPIO_L.LIB → MSC Large Model Library File
- \MSC\LIB\MSCPIO_H.LIB → MSC Huge Model Library File

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

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

Appendix: Daughter Board

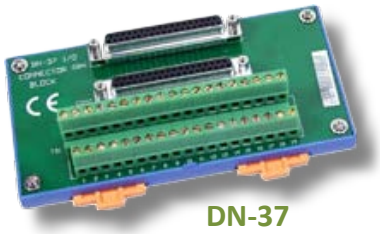
A1. DB-37, DN-37, DN-50 and DN-100



DB-37

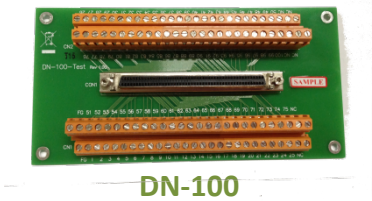
- **DB-37:** The DB-37 is a general purpose daughter board for D-sub 37 pins. It is designed for easy wire connection via pin-to-pin. Use a 37-pin cable (e.g. CA-3710, etc.) to connect DB-37 to CON1 of the PIO-D96/D96U.

DN-50



DN-37

- **DN-37 and DN-50:** The DN-37 is a general purpose daughter board for DB-37 pins with DIN-Rail Mountings. The DN-50 is designed for 50-pin flat-cable headers win 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 PIO-D96/D96U by DN-37, and then use a 50-pin cable (e.g. CA-5002, etc.) to connect to CN2/CN2/CN3 by DN-50.

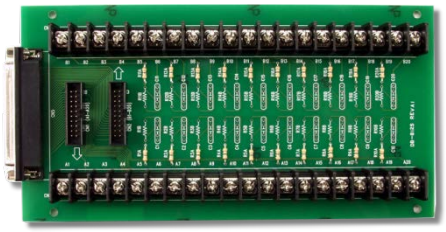


DN-100

- **DN-100:** The DN-100 is a general purpose daughter board for SCSI II 100 pins. It is designed for easy wire connection via pin-to-pin. Use a 100-pin SCSI II cable (e.g. CA-SCSI100-15 ,etc.) to connect DN-100 to CON1 of the PIO-D96SU/PEX-D96S.

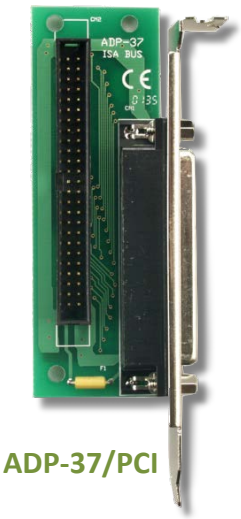
A2. DB-8125

The DB-8125 is a general purpose screw terminal board. It is designed for easy wire connection. The DB-8125 consists of one DB-37 and two 20-pin flat-cable headers. Use a 37-pin cable (e.g. CA-3710, etc.) to connect DB-8125 to CON1 of the PIO-D96(U).



DB-8125

A3. ADP-37/PCI and ADP-50/PCI

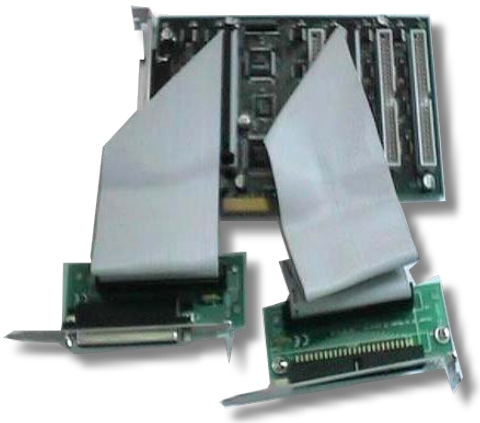


ADP-37/PCI

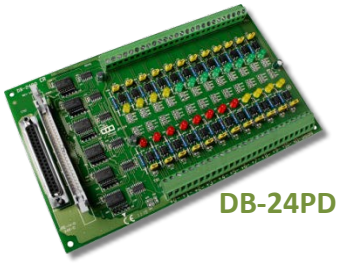
ADP-50/PCI

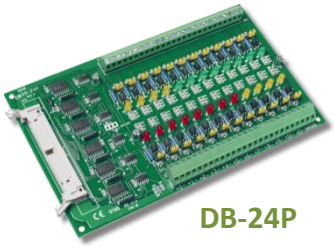
The ADP-37/PCI and ADP-50/PCI are extender for the 50-pin header. The one side of the ADP-37/PCI or the ADP-50/PCI can be connected to a 50-pin header. Note: that ADP-37/PCI is 50-pin header to DB-37 extender and ADP-50/PCI is 50-pin header to 50-pin header extender.

The other side can be mounted onto the PC chassis as is depicted by the following:



A4. DB-24P and DB-24PD Isolated Input Board





The DB-24P is a 24-channel isolated digital input daughter board. The optically isolated inputs of the DB-24P consist of a bi-directional optocoupler with a resistor for current sensing. You can use the DB-24P to sense DC signals from TTL levels up to 24 V or use the DB-24P to sense a wide range of AC signals. You can also use this board to isolate the computer from large common-mode voltage, ground loops and transient voltage spikes that often occur in industrial environments, as illustrated below. Table A4-1 is the comparison of DB-24P and DB-24PD.

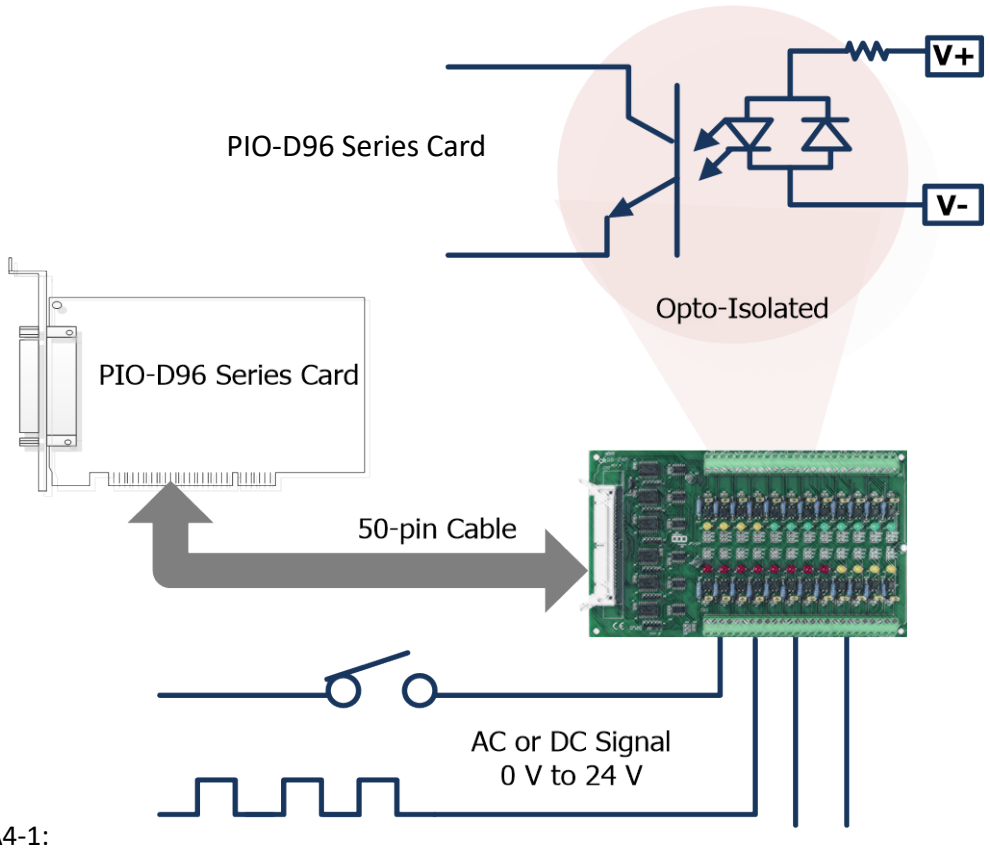
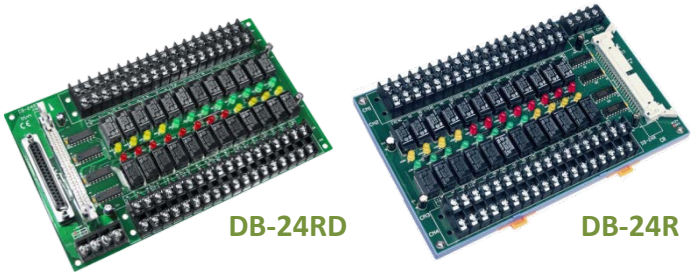


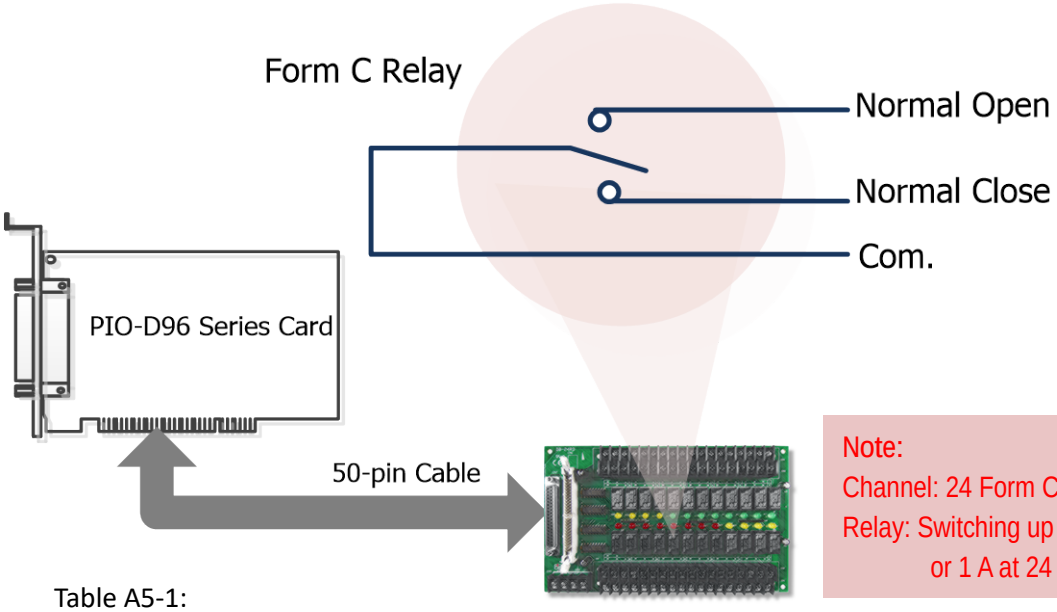
Table A4-1:

	DB-24P	DB-24PD
50-pin Flat-Cable Header	Yes	Yes
D-sub 37-pin Header	No	Yes
Other Specifications	Same	

A5. DB-24R and DB-24RD Relay Board

The DB-24R, 24-channel relay output board, consists of 24 form-C relays for efficiently controlling the switch with the use of an appropriately loaded program. The relays are energized by applying a 12 V/24 V voltage signal to the appropriate relay channel on the 50-pin flat-cable connector. There are 24 enunciator LEDs for each relay channel and the LED light will go on when their associated relay has been activated. The control scheme is illustrated below.





Note:
Channel: 24 Form C Relay
Relay: Switching up to 0.5 A at 110 V_{AC} or 1 A at 24 V_{DC}

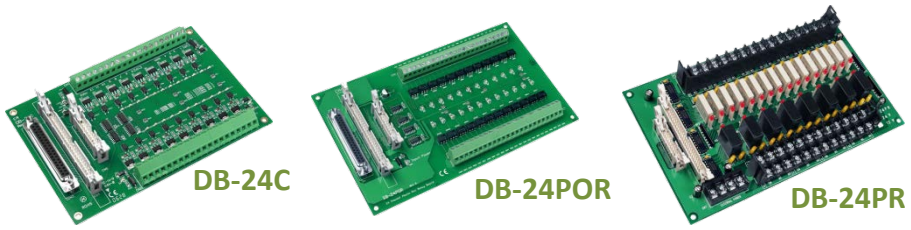
Table A5-1:

	DB-24R	DB24RD
50-pin Flat-Cable Header	Yes	Yes
D-sub 37-pin Header	No	Yes
Other Specifications	Same	

Table A5-2:

DB-24R, DB-24RD	24 * Relay (120 V, 0.5 A)
DB-24PR, DB-24PRD	24 * Power Relay (250 V, 5 A)
DB-24POR	24 * PhotoMOS Relay (350 V, 0.1 A)
DB-24SSR	24 * SSR (250 V_{AC}, 4 A)
DB-24C	24 * Open Collector (30 V, 100 mA)
DB-16P8R	16 * Relay (120 V, 0.5 A) + 8 * Isolated Input

A6. DB-24PR, DB-24POR and DB-24C



The DB-24PR, 24-channel power relay output board, consists of 8 Form-C and 16 form-A electromechanical relays for efficiently controlling the switch with the use of an appropriately loaded program. The contact of each relay can allow 5 A current load at 250 V_{AC}/30 V_{DC}. The relay is energized by applying a 5 voltage signal to the associate relay channel on the 20-pin flat-cable connector (just used 16 relays) or 50-pin flat-cable connector (OPTO-22 compatible, for DIO-24 series). 24 enunciator LEDs for indicating the status of for each relay and the corresponding LED light will go on when their associated relay has been activated. To avoid overloading your PC's power supply, this board needs a +12 V_{DC} or +24V_{DC} external power supply, as illustrated below.

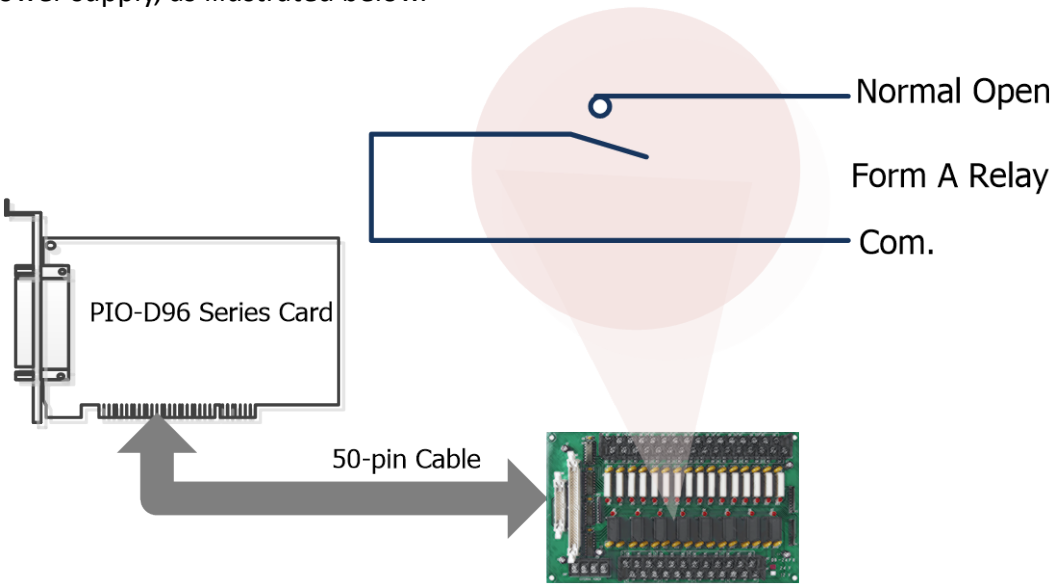


Table A6-1:

DB-24PR	24 * Power Relay, 5A/250 V
DB-24POR	24 * PhotoMOS Relay, 0.1 A/350 V_{AC}
DB-24C	24 * Open Collector, 100 mA per channel, 30 V max.

Notes:
1. 50-Pin connector (OPTO-22 compatible) for DIO-24/48/144, PIO-D144/D96/D56/D48/D24/D168.
2. 20-Pin connector for 16 channel digital output (A-82X, A-62X, DIO-64, ISO-DA16/DA8).
3. Channel: 16 Form A Relay, 8 Form C Relay.
4. Relay: switching up to 5 A at 110 V_{AC}/5 A at 30 V_{DC}.

A7. Daughter Boards Comparison Table

Table A7-1 is the comparison table for the daughter application of PIO/PISO series cards.

Table A7-1:

I/O Card	-	PIO-D96 PIO-D96U	PIO-D96 PIO-D96U	PIO-D96SU PEX-D96S
Cable/ Daughter Boards	20-Pin Flat-Cable	50-Pin Flat-Cable	37-Pin D-sub	100-Pin SCSI II
DB-37	NO	NO	Yes	NO
DN-37	NO	NO	Yes	NO
ADP-37/PCI	NO	Yes	Yes	NO
ADP-50/PCI	NO	Yes	NO	NO
DB-24P	NO	Yes	NO	NO
DB-24PD	NO	Yes	Yes	NO
DB-16P8R	NO	Yes	Yes	NO
DB-24R	NO	Yes	NO	NO
DB-24RD	NO	Yes	Yes	NO
DB-24C	Yes	Yes	Yes	NO
DB-24PR	Yes	Yes	NO	NO
DB-24PRD	NO	Yes	Yes	NO
DB-24POR	Yes	Yes	Yes	NO
DB-24SSR	NO	Yes	Yes	NO
DN-100	NO	NO	NO	Yes