PCI-1232 Digital Output Control Device

User Manual

Rev. C

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Safety Requirements

Warning

Only the voltage within the specified range can be connected. Voltage exceeding the specified range may cause damage to the device, and even present a negative impact on personal safety. Check the product specification for detailed reference to the range of voltages that can be connected by each port.

Warning

Do not attempt to operate the device in other ways that are not mentioned in this document. Incorrect use of the device may be dangerous. In the event of device damage, the internal security protection mechanism will also be affected.

Warning

Do not attempt to replace device components or change devices in other ways that are not mentioned in this document. Do not repair the device yourself in the event of a product failure.

Warning

Do not use the device in an environment where an explosion may occur or where flammable flue or gas is present. If you must use the device in this kind of environment, please fit it into a proper case.

Warning

While the device is running, all chassis covers and fill panels need to be closed.

Warning

For equipment with exhaust vents, do not insert foreign objects into the vents or block air circulation in the vents.

Measurement Categories

Warning For use in measurement category I (CAT I) only. Do not use in measurement category II/III/IV. Use this device to connect signals or make measurements.

Measurement categories Note

Measurement categories I (CAT I) means that measurements are made on a circuit that is not directly connected to the main power supply. For example, a circuit that is not exported from the main power supply, especially a circuit that is exported from a protected (internal) primary power supply, is measured. In the latter case, the instantaneous stress will change. Therefore, the user should be aware of the instantaneous affordability of the device.

Measurement categories II (CAT II) means that measurements are made on a circuit that is directly connected to a low-voltage device. For example, a measurement on household appliances, portable tools and similar equipment.

Measurement categories III (CAT III) means that measurements are made in construction equipment. For example, a measurement on the distribution boards, circuit breakers, wiring (including cables, Busbars, junction boxes, switches, sockets) in fixed equipment and equipment for industrial use and certain other equipment (for example, fixed motors that are permanently connected to fixtures).

Measurement categories IV (CAT IV) means that measurements are made on the source of low-voltage equipment. For example, a measurement on a meter, a major overcurrent protection device, and a pulse control unit.

Environment

Temperature	
Operating	0℃ ~ 55℃
Storage	-40℃ ~ 85℃
Humidity	
Operating	5%RH ~ 95%RH，no condensation
Storage	5%RH ~ 95%RH，no condensation
Pollution degree	2
Highest elevation	2000 m

Pollution degree description

Pollution degree 1: No pollution, or only dry non-conductive pollution. This pollution degree has no effect. For example: a clean room or an air-conditioned office environment.

Pollution degree 2: Generally only dry non-conductive pollution occurs. Temporary conduction can sometimes occur due to condensation. For example: General indoor environment.

Pollution degree 3: Conductive pollution occurs, or dry non-conductive pollution becomes conductive due to condensation. For example, an outdoor sheltered environment.

Pollution degree 4: Permanent conductive pollution caused by conductive dust, rain, or snow. For example: Outdoor places.

Recycle precautions

Warning Some of the substances contained in this product may be harmful to the environment or human health. In order to avoid releasing harmful substances into the environment or endangering human health, it is recommended that appropriate methods be used to recover this product to ensure that most materials can be properly reused or recycled. For information about processing or recycling, please contact your local professional organizations.

CONTENT

1. Getting Started

This chapter describes the basic functions of PCI-1232 Data Acquisition Decice, as well as product specifications and precautions in the process of product unpacking.

1.1. Product introduction

PCI-1232 digital output control card is a digital I/O acquisition device based on PCI bus, which can be used to control the output of digital switch signals when it is loaded into a computer.All digital inputs of are isolated from the computer system by optocouplers.

PCI-1232 digital output control card can be used in WinDows operating system environment, provides standard dynamic link library, and supports mainstream development languages such as VC++, VB, C#, LabVIEW and Matlab.

Key Features

- 32 photoelectric isolated digital input interfaces
- Digital output supports custom waveform output, with a maximum of 2048 points and a maximum sampling rate of 500ks/s.
- Digital output supports infinite length waveform output, and the highest sampling rate is 10ks/s.
- Digital output supports power-on default state customization.
- The isolated power supply voltage is 5~50VDC, and the maximum load current is 500mA.
- Compatible with 32-bit 3.3V/5VPCI bus

1.2. Function Diagram

Figure 1.1 shows the schematic diagram of PCI-1232 data acquisition device.

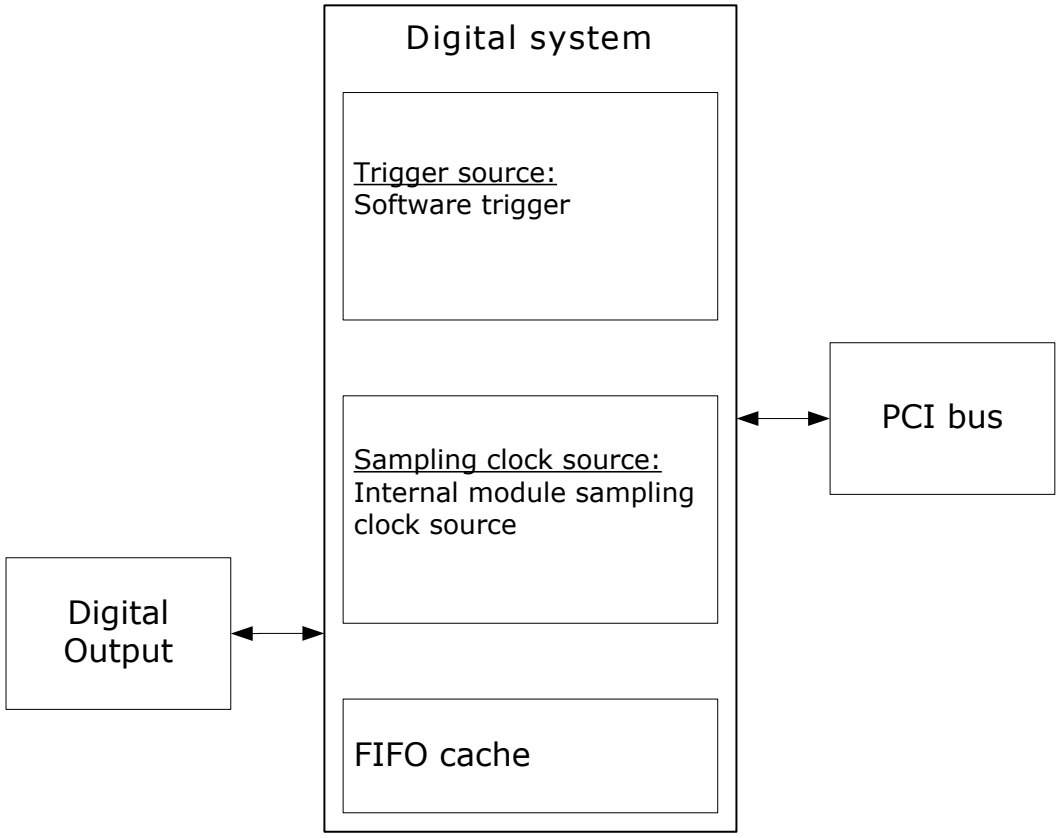

Figure 1.1 PCI-1232 data acquisition device functions

1.3. Product specifications

The following product specification parameters, unless otherwise stated, are acquired at the temperature of 25°C and the humidity of 40%, while the device is turned on for 20 minutes.

Digital Output

Number of channels	32
Ground reference	ISOGND，Isolate from computer
Output type	Darlington transistor
Output voltage	5 ~ 50 V_{DC}
Output current	single channel conduction: 500mA max All channels conduction: 150mA max.
Output power-on status	Support customization
Output mode	Direct output / finite length waveform output / infinite non-cyclic waveform output

Highest sampling rate	50kS/s
Timing resolution	20 ns

Bus power requirements

PCI bus	compatible with 5V and 3.3V
Power supply	PCI bus power supply
Typical current without load	160mA@+5V, typical
Maximum Load	400mA@+5V

1.4. Product unpacking

Precautions

To prevent electrostatic discharge (ESD) from damaging the device, please note the following:

- Please wear a grounding wristband or touch a grounded object first to ensure being grounded.
- Before removing the equipment from the packaging, please first connect the anti-static packaging to the grounded object.
- Do not touch the exposed pins of the connector.
- Place your device in anti-static packaging when you are not using the device.

Check the packing list

After unpacking the product, follow the packing list in the box, check the host and each attachment individually to ensure that the items in the box are consistent with the packing list.

If you find that any item is missing, please get in touch with us for help as soon as possible.

If you find that the product comes in damaged after unpacking, please get in touch with us as soon as possible. Do not install damaged equipment on your devices.

2. Installation

This chapter describes signal connection and drive installation of PCI-1232 data acquisition device.

2.1. Connector signal pins distribution

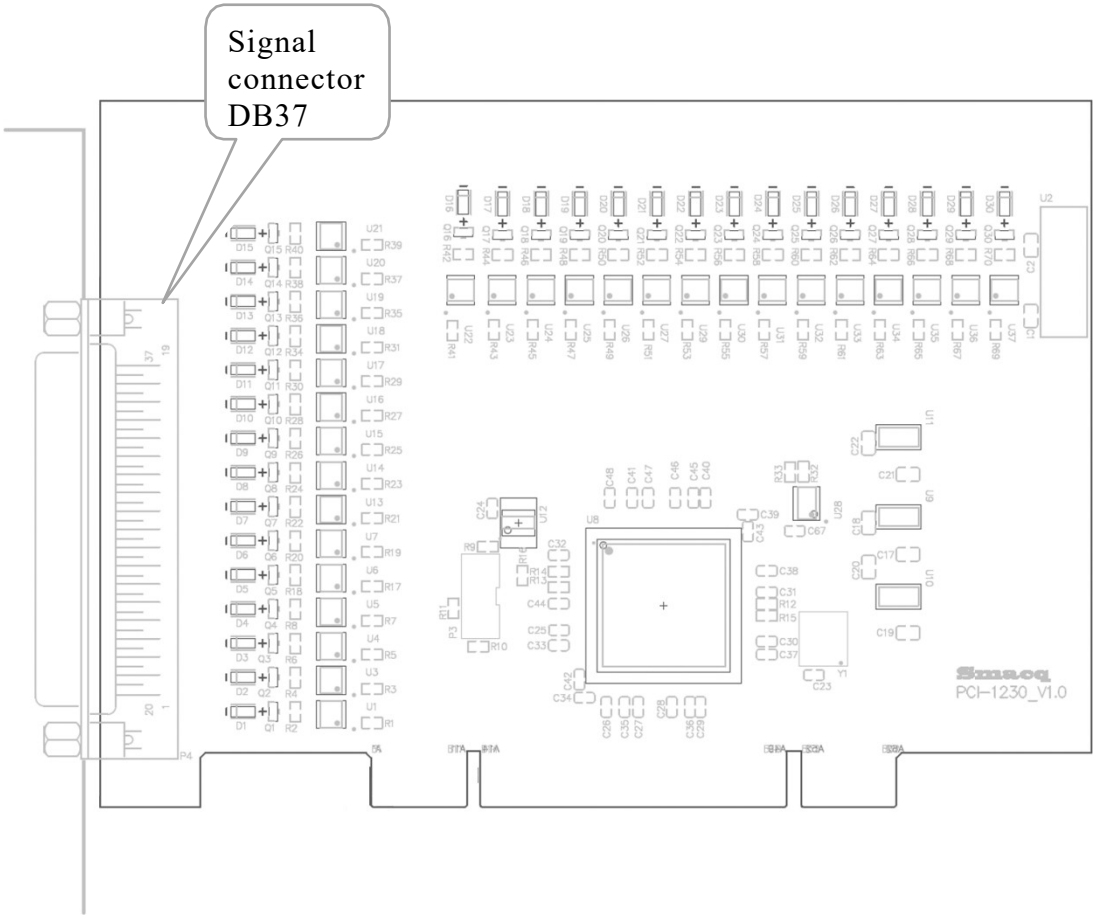

Figure 2.1 Schematic diagram of PCI-1232 digital output control card

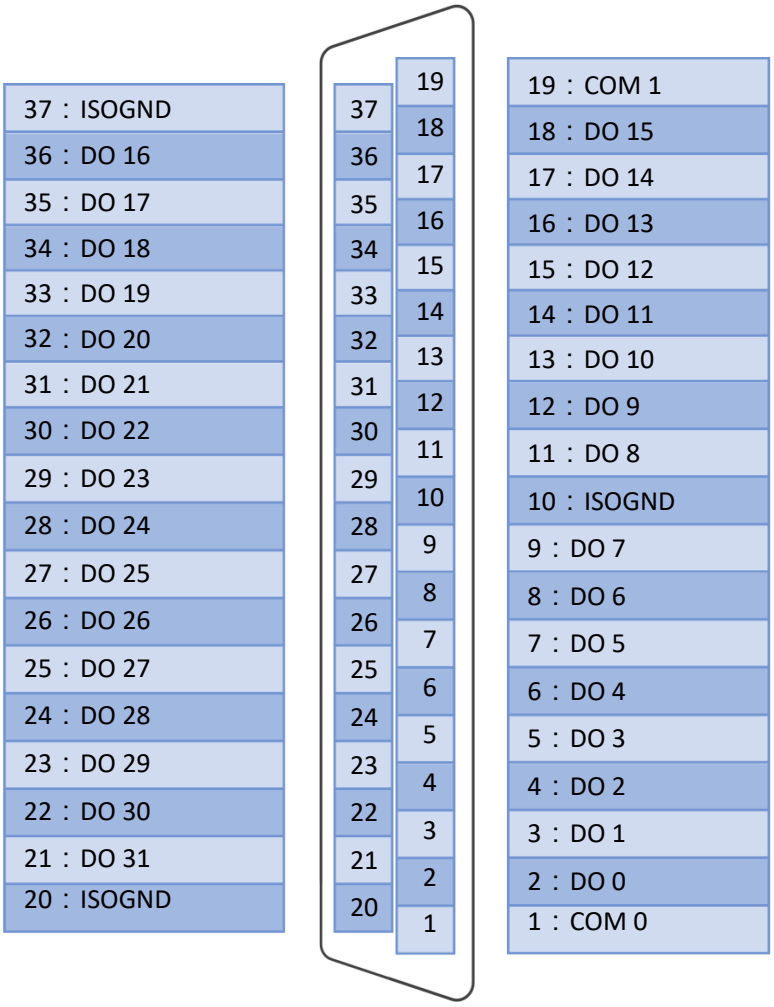

Figure 2.1 Signal connector distribution diagram

Table 2.1, Signal pin allocation

Signal name	Notes
DO x	Number input x
ISOGND	The reference ground of digital I/O is isolated from the computer.
COM 0	Common end of DO 0 ~ DO 15
COM 1	Common end of DO 16 ~ DO 31

2.2. Drive installation

PCI-1232 data acquisition device can be used in Windows 7 and Windows 10, including 32-bit and 64-bit. Here, taking the driver installation in Windows 10 environment as an example, we will introduce how to install the driver of PCI-1232 data acquisition device step by step. The steps of installing drivers in Windows 7 environment are the same as those in Windows 10 environment.

1) Open the device manager of Windows operating system, and when the driver is not installed, it is displayed as "PCI Data Capture and Signal Processing Controller", as shown in Figure 2.3 below.

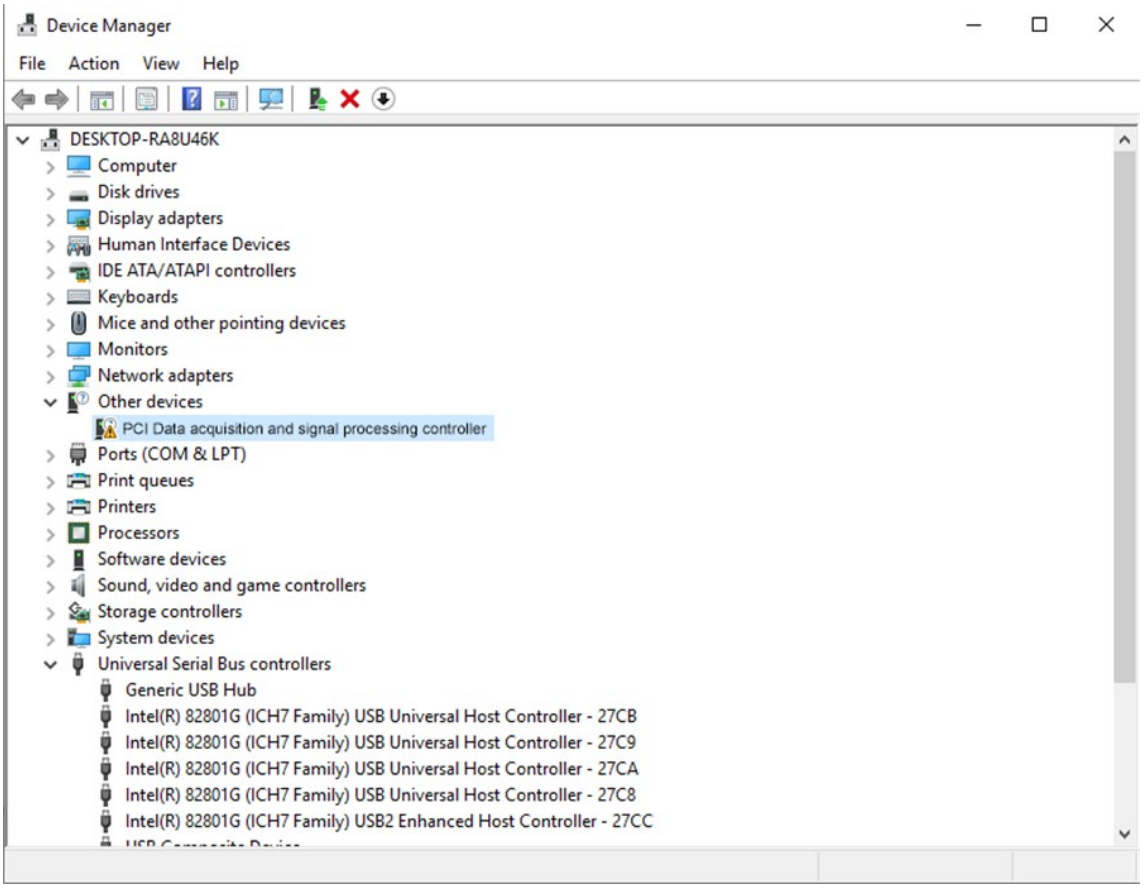

Figure 2.3 Before the driver is installed

2) Select "PCI Data Capture and Signal Processing Controller", right-click and select "Update Driver". Select "Browse my computer to find driver software" in the pop-up dialog box, as shown in Figure 2.4 below.

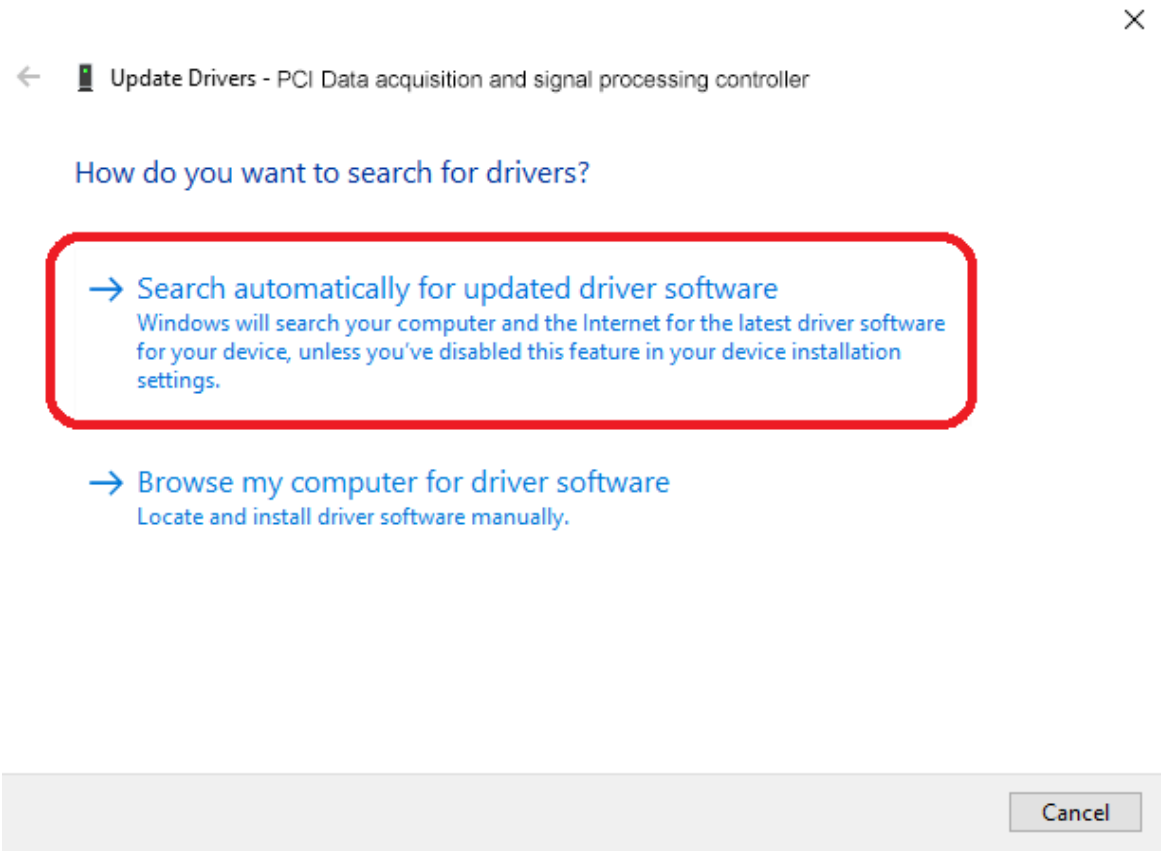

Figure 2.4 Browse my computer for driver software.

3) Then in the pop-up dialog box, click "Browse" button, locate the operating system version folder corresponding to the driver, and then click "Next", as shown in Figure 2.5.

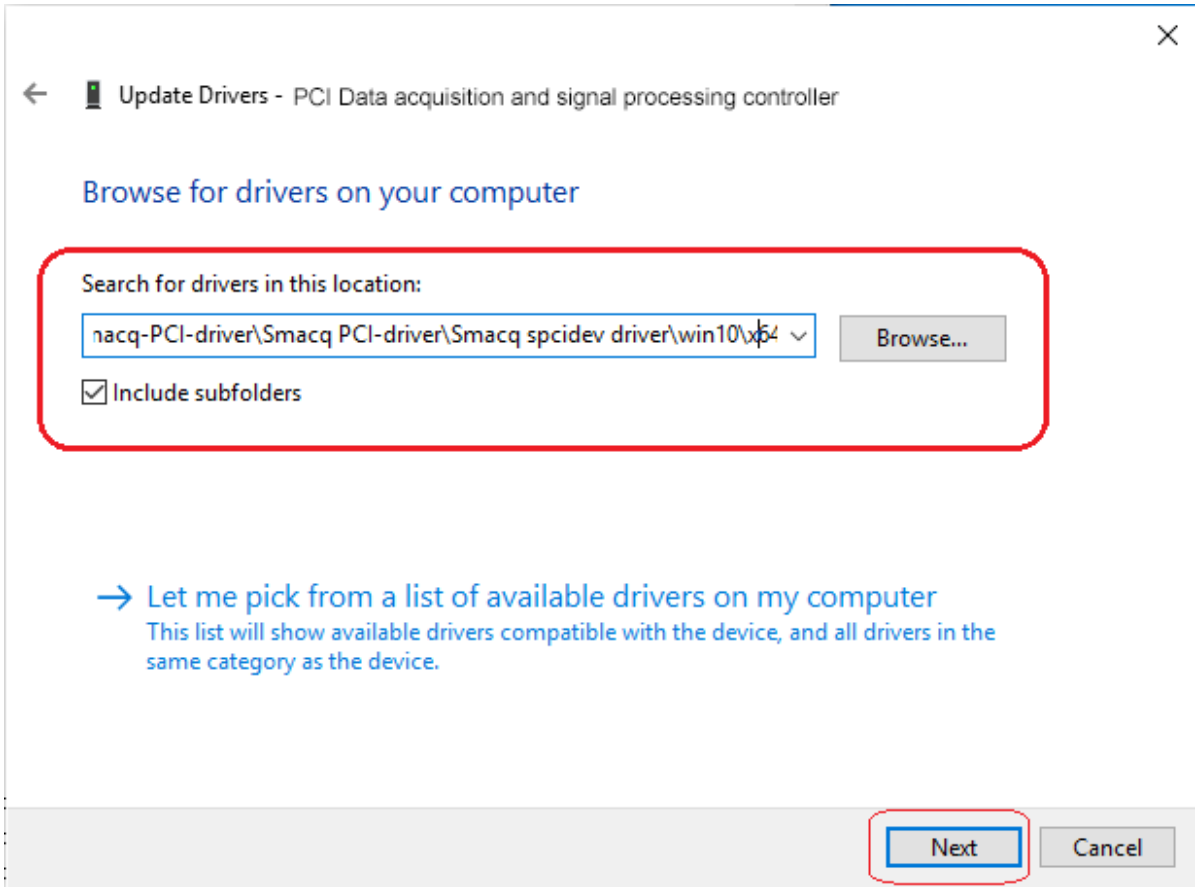

Figure 2.5 Locate the folder where the driver is located.

4) The computer starts to enter the driver installation process. After the installation is successful, the dialog box shown in Figure 2.6 below pops up, and the driver installation is completed.

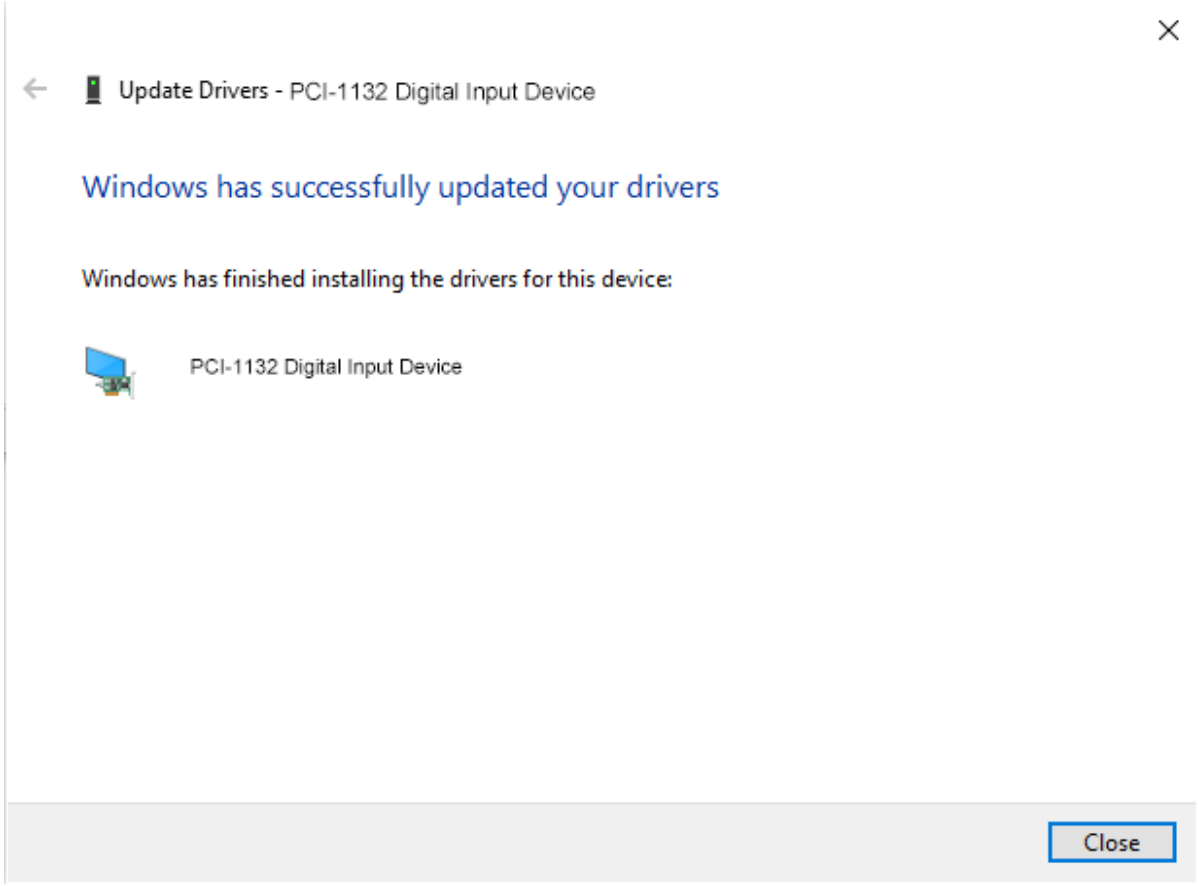

Figure 2.6 Driver installation is complete.

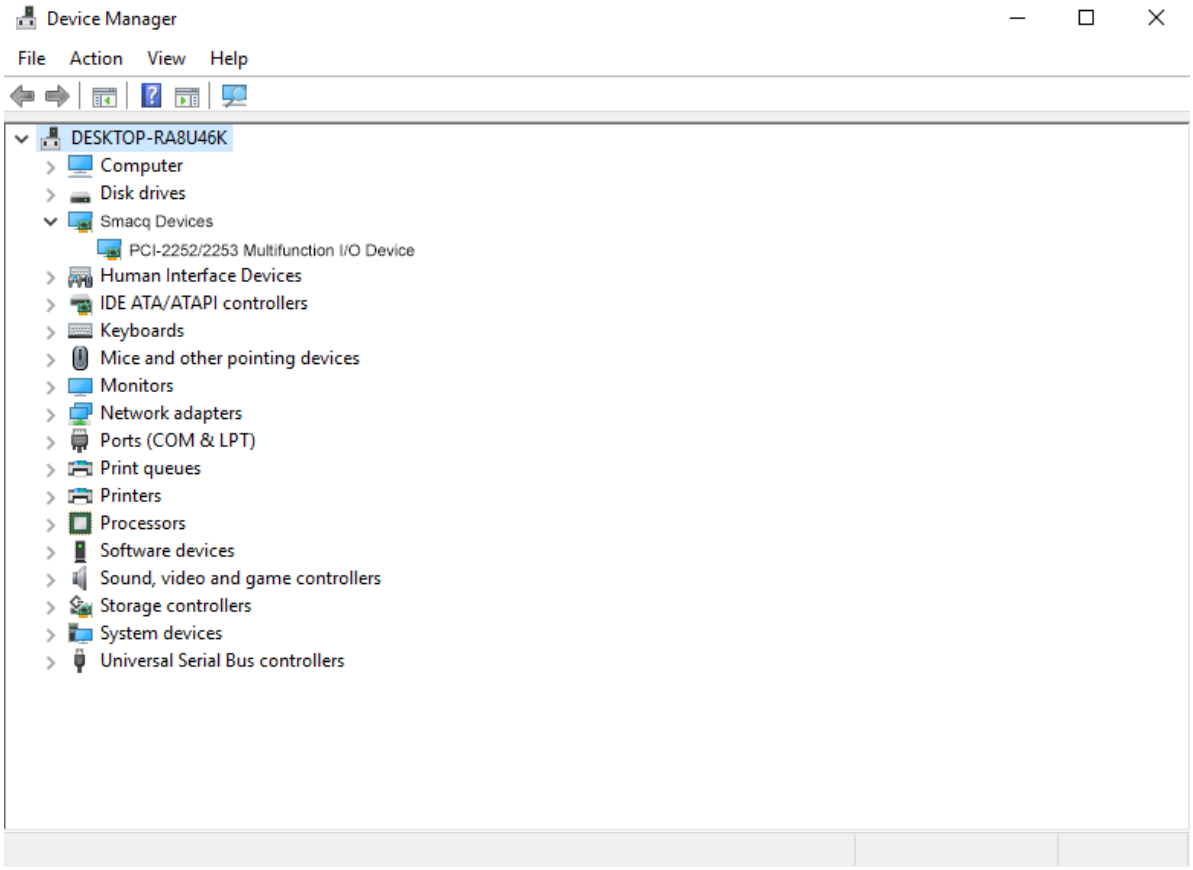

Figure 2.7 Device Manager after successful driver installation

3. Digital Output（DO）

This chapter introduces the digital signal output for the PCI-1232 data acquisition device. The digital input is referred to as DO here, the abbreviation of Digital Output.

3.1 Schematic diagram of digital output circuit

The circuit diagram of digital output is shown in Figure 3.1.

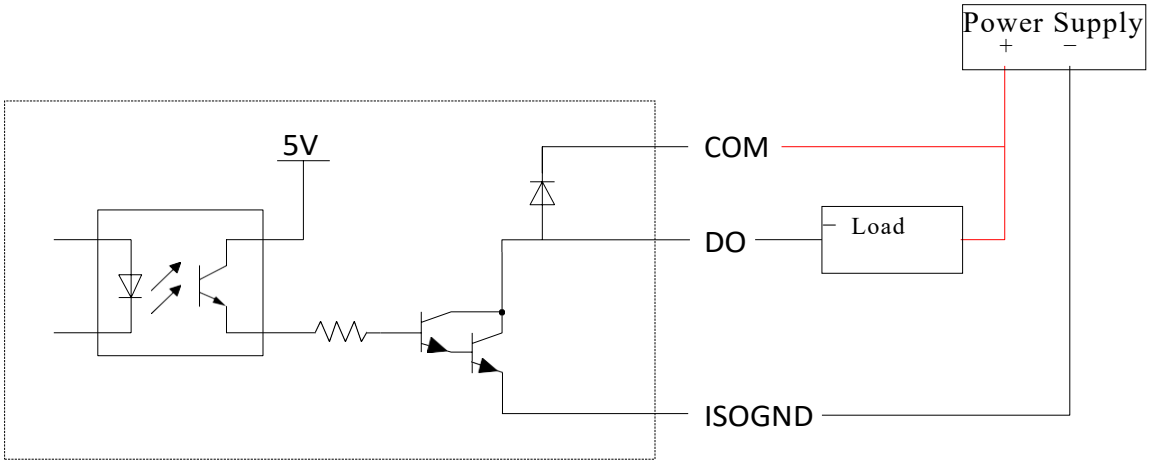

Figure 3.1 Schematic diagram of digital output circuit

3.2 Signal output mode

PCI-1232 data acquisition device supports the following three output modes for digital output:

- Immediate output
- Finite length waveform output
- Infinite loop waveform output

The sampling rate of the latter two modes adopts hardware timing.

Immediate output

Immediate output refers to the output state without buffer and no waveform. The computer sends a command to the acquisition device, and it immediately outputs the specified level state.

Hardware timing

Hardware timing means that the sampling rate of DO output is controlled by hardware digital signal (DO sampling clock), which is generated internally by the acquisition device.

Finite length waveform output

Limited-length waveform output means that the computer first sends the specified length of waveform points to the acquisition device. When DO acquisition is triggered, the acquisition device starts to output waveforms according to the set sampling speed. When the output waveform cycle number reaches the set cycle number, the acquisition device automatically stops outputting.

Attention

- The length of the number of waveform points cannot exceed 2048 points.
- When the number of waveform cycles is set to bit 0, the acquisition device will always output the waveform cyclically.

Infinite loop waveform output

Unlimited waveform output refers to the output of waveforms of infinite length. At this time, the computer is required to send the latest waveform points to the acquisition device at the set speed, and the acquisition device will output the latest waveform points at the set sampling speed. Please refer to the response routine for details.

3.3. Trigger

PCI-1232 data acquisition device provides two trigger options, and the schematic diagram of DO acquisition trigger options is shown in figure 4.2.

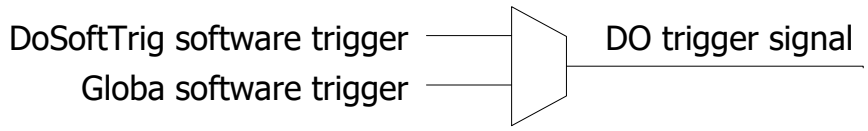

Figure 4.2 DO trigger options

DoSoftTrig software trigger is used as trigger source for DO acquisition by default, and other trigger sources can be used for DO acquisition through software settings to achieve the function of synchronization of various functions.

DoSoftTrig software trigger and global software trigger are both software triggers, which can be triggered by sending a command from the computer to the acquisition device.

Clear trigger

Trigger status can be reset to an untriggered state via software settings.

4. Register address mapping

Address mapping should be applied to lower-level programming development. Before that, developers should be familiar with the principles of computer system and PCI interface. Therefore, in the Windows system environment, we recommend developers to use the drivers and dll provided by us to develop the devices.

All registers in the device are 32-bit wide, some registers use all 32-bits, and some registers only use a part of them. The register addresses given in this paper are all offset addresses.

Later, by default, developers are already familiar with the principle of computer system and PCI interface, so the related terms and reading and writing methods will not be described in detail.

4.1. PCI register

Offset Address	Name	R/W	Explain
0x0000	Interrupt state	R/W	Bit-0: DMA completes the interrupt, 1 means an interrupt is generated, and 0 means no interrupt is generated. Bit-1:An interrupt is generated about the DI electrical level, 1 means an interrupt is generated, and 0 means no interrupt is generated.
0x0004	Interrupt enable	R/W	Bit-0: DMA completes the interrupt enable, 1 means an interrupt is generated, and 0 means no interrupt is generated. Bit-1:An interrupt enable is generated about the DI electrical level, 1 means an interrupt is generated, and 0 means no interrupt is generated.
0x0008	DMA transfer destination header address	R/W	When the device performs DMA transfer, it corresponds to the first address of the computer memory target.
0x000C	DMA transfer length	R/W	Actual DMA transfer length, in DWORD.
0x0010	DMA transfer counter	R/W	Actual DMA transfer length, in DWORD.

4.2. DO digital output register

Offset Address	Name	R/W	Explain
0x1300	DoReady	R/W	D0 function configuration completion flag, 1 means to start waiting for triggering, and 0 means that the configuration has not been completed.
0x1304	Do output mode	R/W	0: Direct output. 1: waveform output ncycle. 2: Infinite non-cyclic waveform output.
0x1308	DO sampling period	R/W	Di acquisition period, in 20ns. Di acquisition actual period = this register value * 20ns
0x130C	Do limited number of collection points	R/W	Ai collects points for a limited number of times
0x1310	Do acquisition clock source	R/W	0: external clock. 1: internal clock.
0x1314	Do trigger source	R/W	See the trigger source chapter later.
0x1318	Do direct output value	R/W	Do direct output value The output is the uncalibrated binary value directly.
0x131C	Do wave table FIFO	W	writes a point into the Do wave table.
0x1320	Empty Do wave table	W	Empty Do wave table

5. Service and Warranty

Beijing Smacq Technology Co., Ltd. is committed to its products during the warranty period, if the product fails under normal use in warranty, we will repair or replace defected parts for free. Please refer to the warranty explanation in the box for detailed instructions.

In addition to the warranties mentioned in this manual and the warranty note, we do not provide any other warranties, express or implied, including, but not limited to, any implied warranties as to the tradable nature of the product and the suitability of the special purpose.

To get more technical support and service details, or if you have any questions about using this product and this document, you are welcome to contact us:

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E-mail: service@smacq.com
Website: http://www.smacq.com
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6. Ordering Information

Host

Model	Notes
PCI-1232	32-Do

Optional accessories

Model	Notes
DB37CB-1.5M	DB37 connecting line, double male, 1.5m.
DB37TB	End board, DiN guide rail installation