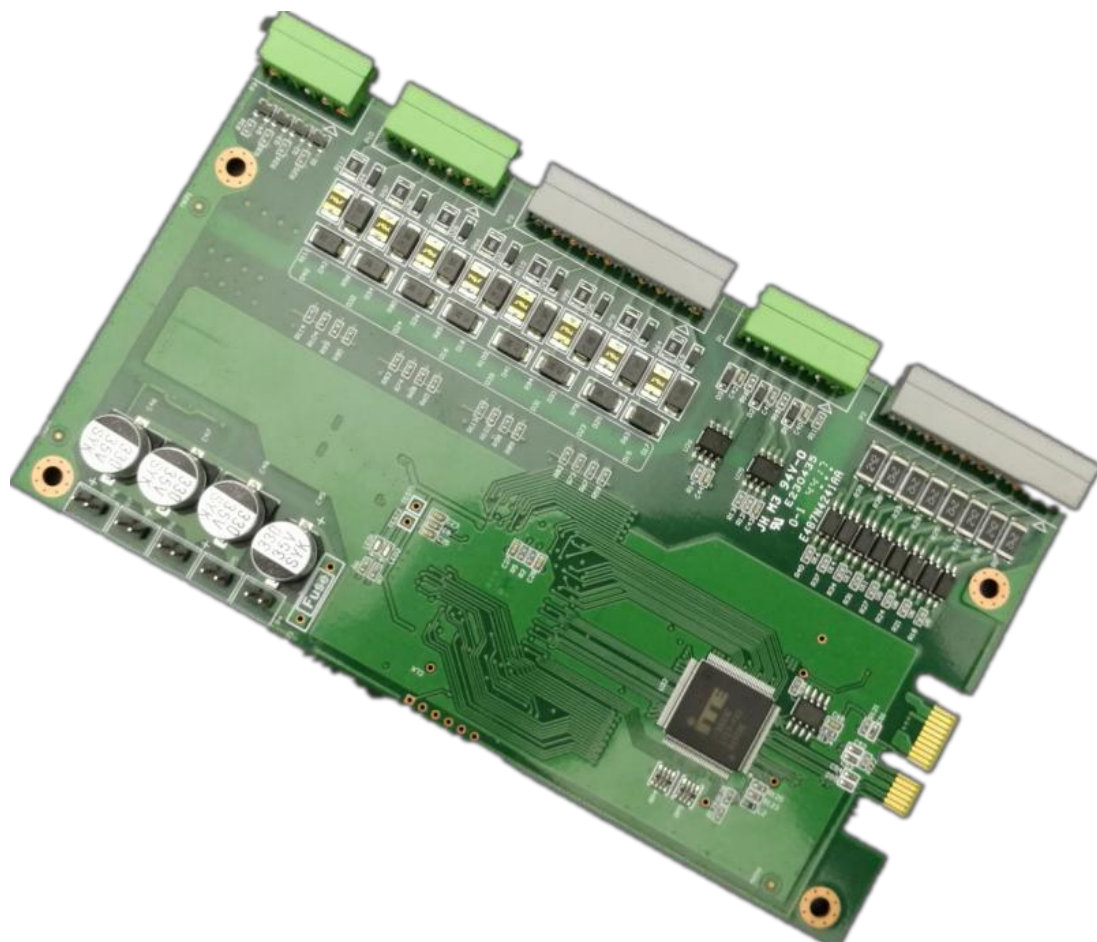


# IO Control Card

## User's Manual





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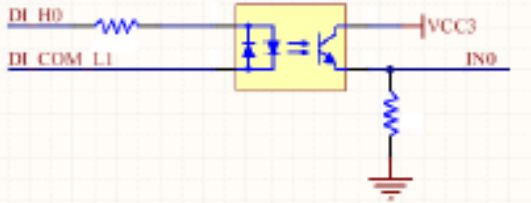
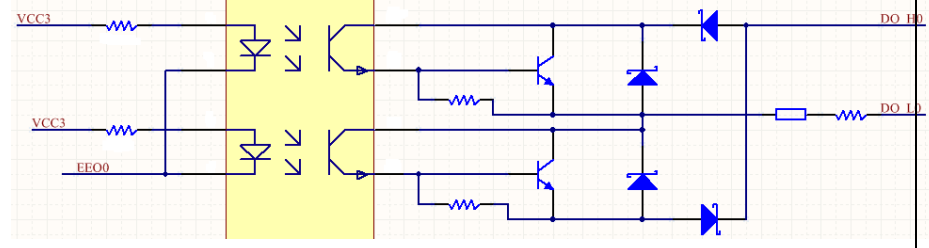
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# 1. Introduction

## 1.1 Brief Introduction

IO control card is an industrial control IO board that communicates with PC using PCIe X1 interface bus. The IO control card has 8 isolated inputs and 8 isolated outputs. The input can select level input and edge trigger, it can connect to various sensors and other switching signals, and count the input pulses, provide programmable anti-shake filtering, real-time dynamic triggering. The output design supports the irrigation/source current DO through external wiring. It can set level output or pulse output, adjustable pulse width, and can drive solenoid valve, relay, cylinder and other switching devices. At the same time, the IO control card also has 4 light source controls, which can drive up to max 1A light source, which is convenient for users to connect external light source equipment according to actual conditions. The IO control card features advanced encoder functionality, support for positional comparison of equally spaced and discrete numbers, and with the other features of the IO control card, users can build their ideal vision solution system.

## 1.2 Specifications

Power Specifications	
Voltage	PCIe X1 slot 3.3V
Input characteristics	
Input channel	8 isolated input
Input Voltage	5-36V DC
Input Current	2mA - 15mA
Isolation voltage	2500 RMS
Circuit schematic	
Output characteristics	
Output channel	8 isolated output
Load voltage	9-36V DC
Output Current	Single maximum output 200mA
Isolation voltage	2500 RMS
Circuit schematic	

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Encoder	
Number of channels	1 channel, isolated
Interface	EA+, EA-; EB+, EB-; EZ+, EZ-
Power supply	5V ±5%
Signal frequency	MAX 1MHz
Isolation voltage	1.5KV
Light source controller	
Number of channels	4 channel, Constant current, 1A/channel
Dimming method	PWM, MAX 500KHz
Support external triggering	Support 4 channel light source external trigger input, Trigger voltage: DC 3.3-24V, Trigger current: 2.5-20mA
Trigger delay	≤10us
Switch control	Support 4 channel LED light source separate switch
Development and debugging	
Software API	Provide API interface functions for the user to invoke
Debugging DEMO	Provide debugging software that supports simple debugging of DIO, light source controller and encoder
Operating environment	
Operating temperature	0 to 55°C
Operating humidity	5%-95%, no condensation
Atmospheric pressure	1080 to 795 hPa (Equivalent to altitude -1000 to 2000m)
Transportation/storage environment	
Transportation/storage temperature	-20 to 70°C
Atmospheric pressure	1080 to 660 hPa (Equivalent to altitude -1000 to 3500m)
Free fall	0.3m, 5times, product packaging
Relative humidity	Maximum humidity 95%

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1.3 IO control card outline structure (unit: mm)

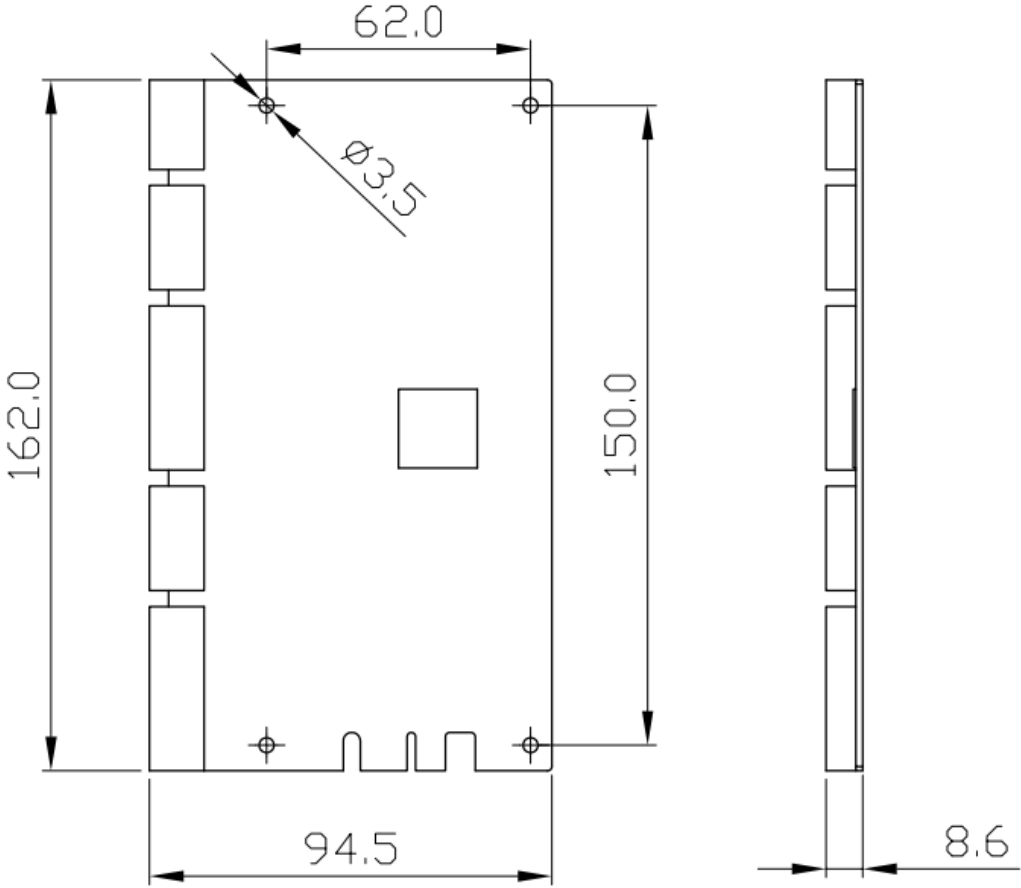


Figure 1-1 IO control card outline structure schematic diagram

# 2. Hardware

## 2.1 Unpacking checklist

Before opening the package, please check whether the product model indicated on the outer packaging is consistent with the ordered product. After unpacking, first check the surface of the IO control card for mechanical damage, then carefully check the accessories according to the packing list or ordering contract. If the surface of the IO control card is damaged, or the product content does not match, do not use it, contact the dealer immediately.

IO control card product list:

- a. IO control card, 1piece
- b. Companion CD, 1piece
- c. Warranty Card, 1piece
- d. Certificate, 1piece



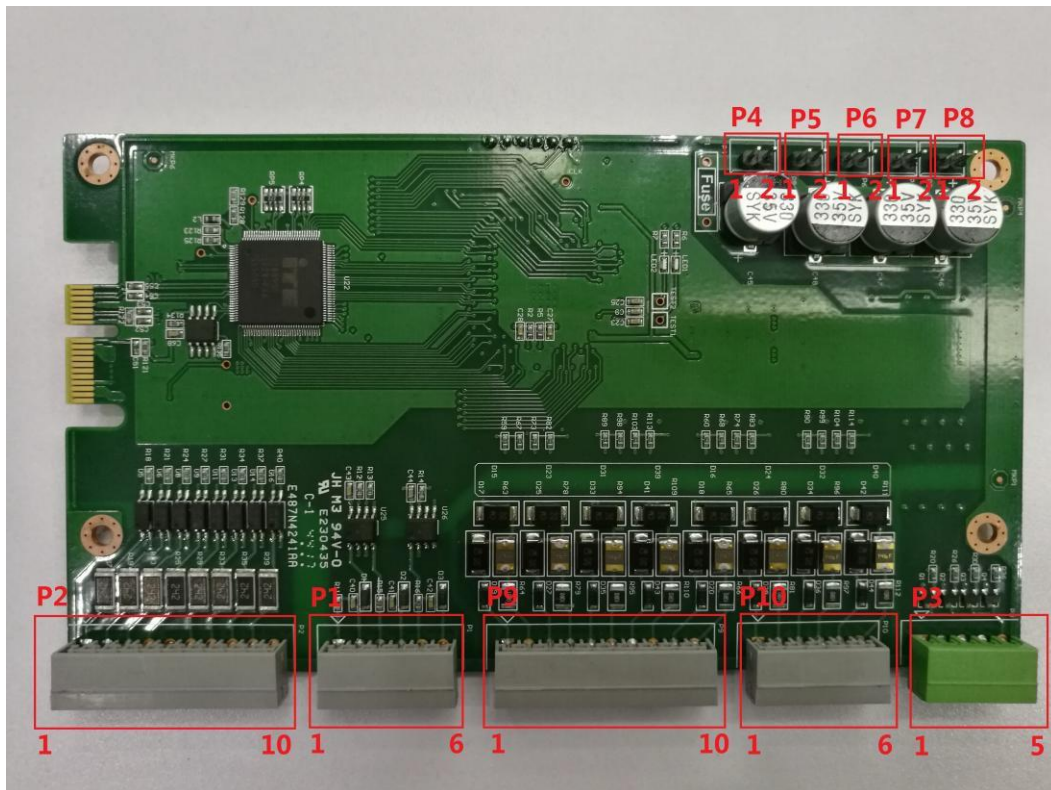
注意

To prevent static damage to the IO control card, touch an effective grounded metal object before touching the control card circuit to release the static charge carried by your body and wear anti-static gloves.

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## 2.2 Interface definition

### 2.2.1 IO control card interface



Interface	Function
P1	Encoder input interface
P2	Universal input
P3	PWM External trigger input
P4	PWM Power interface
P5	PWM1 output
P6	PWM2 output
P7	PWM3 output
P8	PWM4 output
P9	Universal output 1-5
P10	Universal output 6-8



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### 2.2.2 Interface definition

#### 1、 P2(IO input)

PIN	Definition	Des	PIN	Definition	Des
1	DI1	input 1	6	DI5	input 5
2	DI2	input 2	7	DI6	input 6
3	DI3	input 3	8	DI7	input 7
4	DI4	input 4	9	DI8	input 8
5	DI_L1	Input common 1	10	DI_L2	Input common 2

Note: Input 1-4 shared input common 1, input 5-8 shared input common 2

#### 2、 P1(Encoder input)

PIN	Definition	Des	PIN	Definition	Des
1	EA+	Encoder A positive	2	EA-	Encoder A negative
3	EB+	Encoder B positive	4	EB-	Encoder B negative
5	EZ+	Encoder Z positive	6	EZ-	Encoder Z negative

#### 3、 P9(IO output)

PIN	Definition	Des	PIN	Definition	Des
1	DO_H1	output 1	2	DO_L1	output 1
3	DO_H2	output 2	4	DO_L2	output 2
5	DO_H3	output 3	6	DO_L3	output 3
7	DO_H4	output 4	8	DO_L4	output 4
9	DO_H5	output 5	10	DO_L5	output 5

#### 4、 P10 ( IO output )

PIN	Definition	Des	PIN	Definition	Des
1	DO_H6	output 6	2	DO_L6	output 6
3	DO_H7	output 7	4	DO_L7	output 7
5	DO_H8	output 8	6	DO_L8	output 8

Note: Each output port has two interfaces, DO\_Hn and DO\_Ln (n is the channel port number), and can connect any port to VCC, another port is connected to GND.

#### 5、 P3(PWM external trigger input)

PIN	Definition	Des	PIN	Definition	Des
1	TR1	PWM1 trigger	2	TR2	PWM2 trigger
3	TR3	PWM3 trigger	4	TR4	PWM4 trigger
5	TR_COM	PWM trigger common			

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### 6、 P4(PWM power interface)

PIN	Definition	Des	PIN	Definition	Des
1	VCC	Power positive	2	OGND	Power ground

### 7、 P5(PWM1 output)

PIN	Definition	Des	PIN	Definition	Des
1	LED+	PWM1 output positive	2	LED1-	PWM1 output negative

### 8、 P6(PWM2 output)

PIN	Definition	Des	PIN	Definition	Des
1	LED+	PWM2 output positive	2	LED2-	PWM2 output negative

### 9、 P7(PWM3 output)

PIN	Definition	Des	PIN	Definition	Des
1	LED+	PWM3 output positive	2	LED3-	PWM3 output negative

### 10、 P8(PWM4 output)

PIN	Definition	Des	PIN	Definition	Des
1	LED+	PWM4 output positive	2	LED4-	PWM4 output negative

### 3. Software

#### 3.1 DEMO Introduction

The IO control card provides a C++ language function library and a dynamic link library under Windows. Users can implement various functions by simply calling the instructions in the library.

In order to reduce the difficulty of use, a simple DEMO program is provided on the user CD for the customer to use and debug the module. Users need to install a driver to easily operate the IO control card.

After the program is installed, open the DEMO software. The main interface is shown in Figure 3-1:



Figure 3-1 IO control card DEMO main interface

DEMO software mainly has the following functional modules:

- Configuration bar: mainly to open the device and turn off the device.
- Input module: Provides level input (inverted input state), edge trigger, filter debounce time, and provide rising edge count function.
- Output module: Provides level output (output status can be reversed), pulse output, input trigger output pulse function, and can set the rising edge or falling edge trigger of any input channel; output can set the delay time, set the width of the output pulse.
- PWM output module: Provides 4-channel PWM output with adjustable frequency and adjustable duty cycle. It can be set to normally open or close on software, or can be set as hard trigger output of external TR signal.
- Encoder module: Provides functions such as encoder count, reset, and direction setting. It also provides powerful position comparison function. It supports position comparison between equal-space and discrete numbers. You can set any one or more output channels at the same time for comparison. Completed output, provides position capture to support capture of rising or falling edges of any input channel.

## 3.2 Use of DEMO

Step 1:

Driver installation:

1. Open the program installation file inside the folder and double-click to start the installation.
2. After the installation is complete, in the “Device Manager”, you can see the driver of the IO control card, as shown in Figure 3-2:

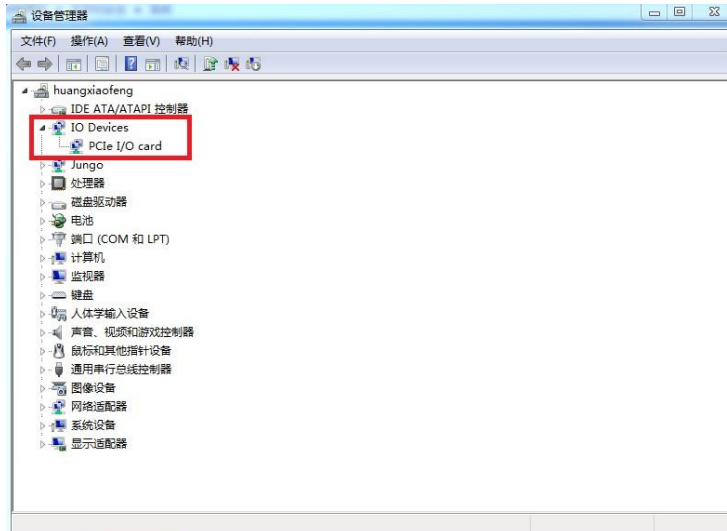


Figure 3-2 Driver successfully installed interface

At this point, the driver and program for the IO control card have been installed. After the hardware is properly connected, you can start to open DEMO for preliminary testing.

Step 2:

1. Double-click to start DEMO and enter the main interface of Figure 3-1. If the prompt "No devices found", please check:
  - a. If the IO control card driver is installed correctly;
  - b. If the PCIe interface of the IO control card and the PCIe slot in the PC are inserted correctly;
2. Click on "Search for devices" → "Open the device", the IO control card can be used normally, as shown in Figure 3-3:



Figure 3-3 IO control card DEMO device normal frame

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### Step 3:

Input test: Select the “Refresh” box. If there is input, “√” will be displayed in the “Input Status” box under the corresponding channel, indicating that the input is valid; if you select the “Status Inversion” box The "inversion", the interface display is reversed

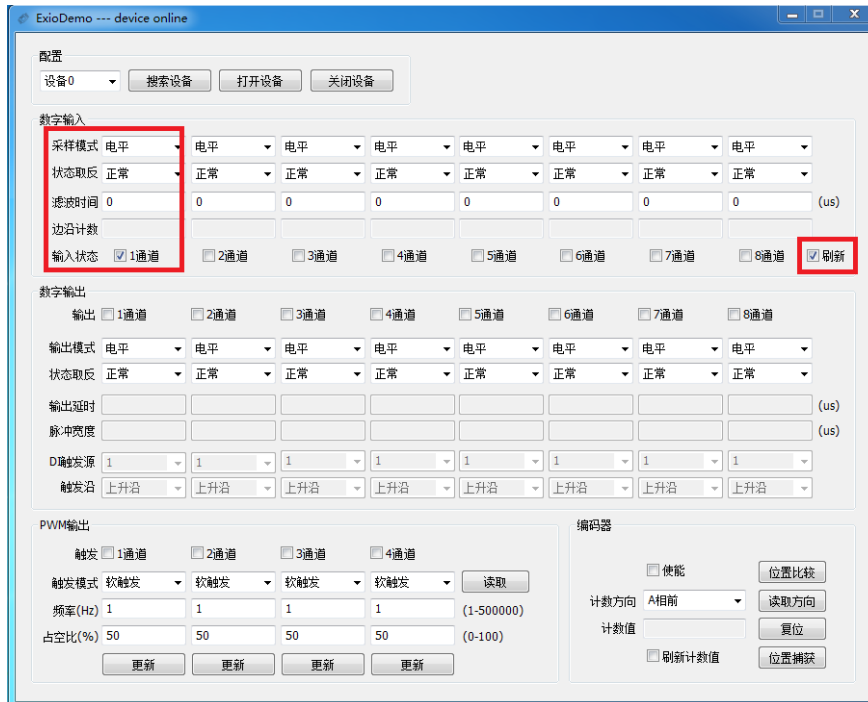


Figure 3-4 Input interface

### Step 4:

Output test: select the corresponding output channel in the dialog box, select the output mode, set whether to invert; if the output mode is selected as “direct pulse” or “input trigger”, the time and output of input and output delay can be selected at this time. Pulse width. Figure 3-5 shows the output level.

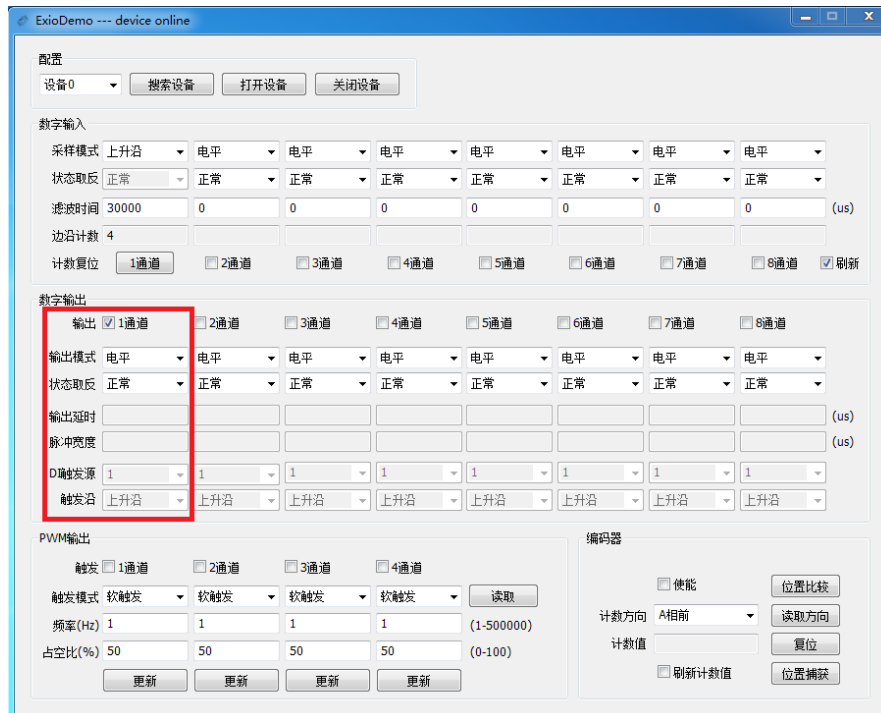


Figure 3-5 Output interface

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### Step 5:

PWM output test: first set the PWM output mode, then set the PWM frequency and duty cycle, click the “Update” button, and finally check the output channel to start the PWM output function of the channel.

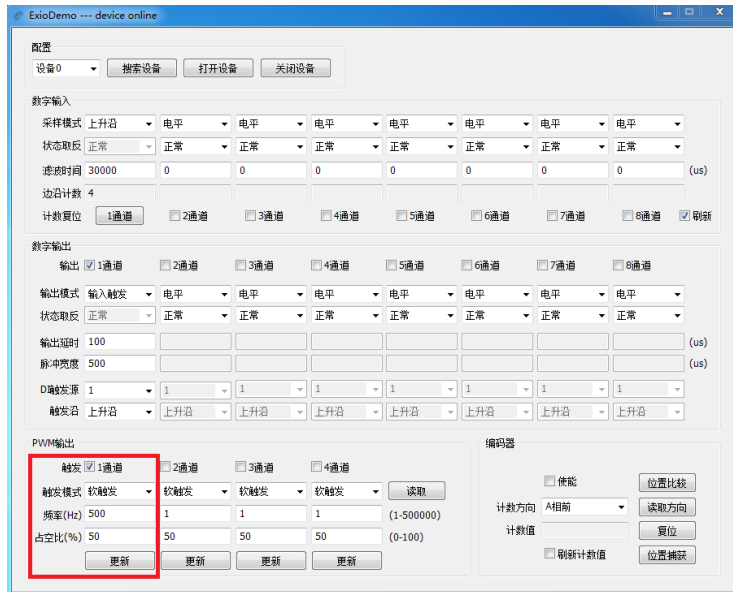


Figure 3-6 PWM output

### Step 6:

Encoder Test: Click on the "Location Comparison" or "Location Capture" button and the status bar in the red box above will pop up. In this interface, you can set the position comparison mode to “equal spacing” or “discrete number”, then set the channel to be output after the comparison is completed, set the pulse width of the channel and some parameters of the position comparison, and finally click “Start comparison”. The button activates this function. To test the function of “position capture”, first set the capture condition, which can be the rising edge or falling edge of any input channel. Click the “Start Capture” button to start the function.

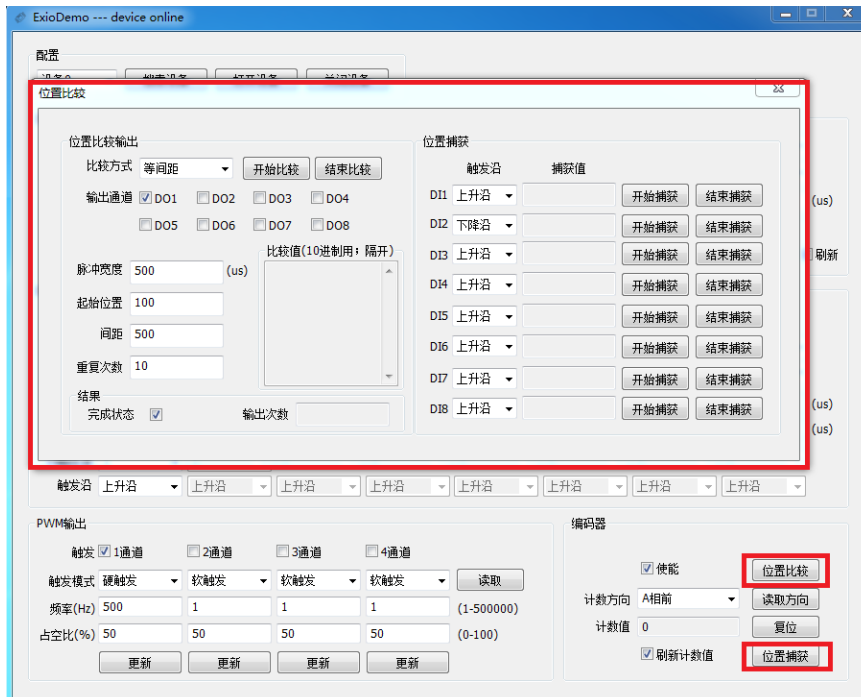


Figure 3-7 Location comparison function