485 Type Light Source Controller
DBS-DVXXX-N04C-24XXX-4
User Manual

Thank you for choosing our company's product. Please read this user manual carefully before use.

Revised in April 2025, V1.3

Precautions：

⚠Warnings	
	This product requires an external power supply for power. Ensure the power switch of the controller is in the OFF position when plugging in or unplugging the power supply to prevent electric shock.
	Before using this product, please read this manual in detail; when using this product, follow the operations specified in this manual.
	In case of abnormal conditions, please contact our company. Do not disassemble or assemble the product by yourself.
	Ensure the product is properly grounded to prevent electric shock.
	When using the matching light source, do not look directly at the light emitted by the light source to avoid eye damage.

Document Version Description:

Version No.	Revision Date	Revision Description
V1.1	2024.Jun	New version release
V1.2	2024.Nov	1. Added precautions and document version description 2. Fixed known issues
V1.3	2025.Mar	Updated content and version format

Standard Shipping List

Product Name	Model	Type	Quantity
Light Source Controller	N04C 4-channel series See 1.2 for model selection		1
Serial Cable	1.5M Male-to-Female		1
Terminal Block	3.81-5P		1
Power Cable	1.5M National Standard IEC 60320 C13 Plug		1
Terminal Block	3.81-2P		1

Note: If you have other requirements for the shipping configuration, please contact the salesperson or distributor in a timely manner.

Contents

1. Product Introduction

1.1 Product Features

- Supports RS232 communication;
- Supports RS485 communication;
- Built-in 24V switching power supply;
- Low trigger response time (≤10μs);
- Supports external trigger mode;
- Supports millisecond-level stroboscope and microsecond-level stroboscope;
- Manual adjustment of brightness and mode;
- 5~24V bidirectional trigger, adaptable to high and low-level trigger modes;
- Compact size, easy installation, available for screw mounting or C45 DIN rail mounting;

1.2 Product Model Selection

Model	Built-in Power Supply Power	Maximum Current per Channel
DBS-DV65-N04C-24025-4	65W	2.5A
DBS-DV120-N04C-24040-4	120W	4A
DBS-DV200-N04C-24040-4	200W	4A

1.3 Main Parameters

Table 1 Main Parameters Table

Item	Parameter	Description
Input Voltage	AC220V	For built-in switching power supply
Output Voltage	24V	Voltage of built-in switching power supply
Output Current	2.5A/4A	Maximum current per channel
Overcurrent Protection	None	
Overvoltage Protection	None	
Operating Mode	4 types	0: Constant OFF; 1: Constant ON; 2: Millisecond-level stroboscope; 3: Microsecond-level stroboscope
Lighting Mode	Constant on/Constant off/Strobe	External trigger available in Constant OFF and Stroboscope modes
Trigger Mode	Edge + Level Trigger	Edge trigger in stroboscope mode; Level trigger in Constant ON and Constant OFF modes
Constant ON Brightness Level	255	255-level brightness adjustment
Millisecond-level Stroboscope Time	1~99	Unit: ms
Microsecond-level Stroboscope Time	10~990	Unit: μs
Communication Baud Rate	9600bps	
Built-in Power Supply	Optional	Optional power: 65W, 120W, 200W
Number of Channels	4	

Connected Light Source Type	24V Light Source	10mA~2.5A 24V light source / 10mA~4A 24V light source
Operating Ambient Temperature	-5~50℃	
Dimensions	See Appendix for details	

1.4 Function Modes

Table 2 Function Modes Table

Mode	Digital Tube Display	Description
Constant OFF Mode	H1. 0	The light source turns on when the trigger signal is valid
Constant ON Mode	H1. 1	The light source turns off when the trigger signal is valid
Millisecond-level Stroboscope Mode	H1. 2	The light source flashes once for a millisecond-level duration when the trigger signal is valid
Microsecond-level Stroboscope Mode	H1. 3	The light source flashes once for a microsecond-level duration when the trigger signal is valid

2. User Instructions

2.1 Panel Description

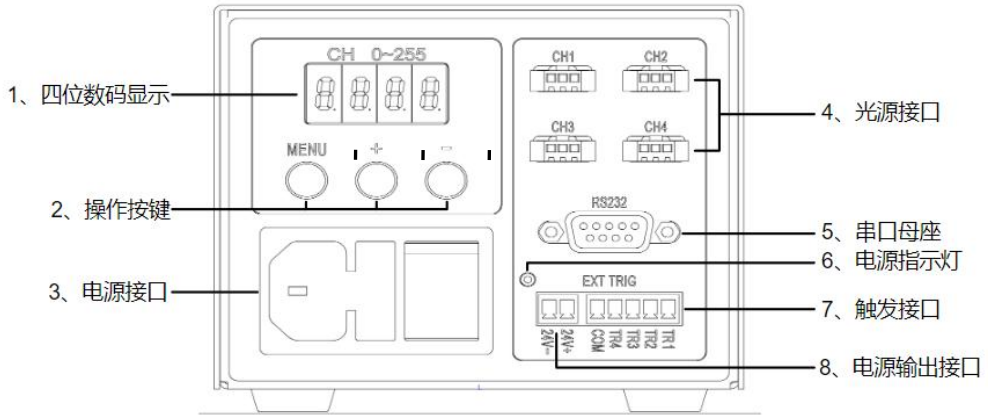


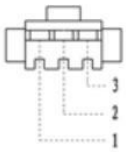
Figure 1: Front Panel

Table 3: Panel Interface Definition Table

No.	Name	Description
1	4-Digit Nixie Tube Display	The first digit from the left is the current operating channel, and the last three digits are the corresponding value of the current operating channel
2	Operation Buttons	"MENU" is the function switching button; "+" for increasing the value; "-" for decreasing the value
3	Power Interface	AC220V interface
4	Light Source Interface	For connecting 10mA~2.5A 24V light source
5	Serial Female Socket	For connecting devices with RS232/RS485 interface
6	Power Indicator Light	The indicator light is on when there is power input
7	Trigger Interface	For connecting external signals to trigger the switch operation
8	Power Output Interface	Outputs 24V voltage with a maximum current of 1A, which can be used for external devices

2.2 Light Source Interface Definition

Table 4 Light Source Interface Definition Table



Position	Definition	Description
1	Light+	Positive pole of light source output
2	Empty	No function
3	Light-	Negative pole of light source output

2.3 Communication Interface Definition

The communication interface definition is shown in Figure 2.

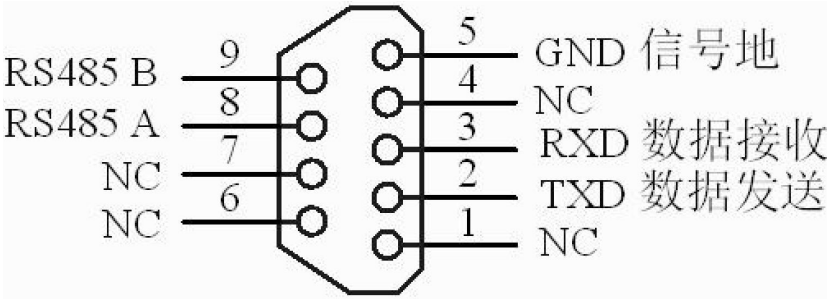


Figure 2 Communication Interface Female Socket Definition

Table 5 Serial Female Socket Interface Definition Table

No.	Name	Description
1	NC	No function
2	TXD	Controller RS232 data transmission (RS232 level)
3	RXD	Controller RS232 data reception (RS232 level)
4	NC	No function
5	GND	RS232 signal ground
6	NC	No function
7	NC	No function
8	RS485 A	RS485 A terminal
9	RS485 B	RS485 B terminal

2.4 Trigger Description

2.4.1 Trigger Interface

The external trigger input interface is shown in Figure 3:

Figure 3 External Trigger Input Interface

There are 4 channels of external trigger input interfaces, each with a trigger port TRx (x represents the channel number). COM is the common port, which can be connected to the positive pole or negative pole of the power supply. The internal part is a bidirectional optocoupler, and its electrical diagram is shown in Figure 4:

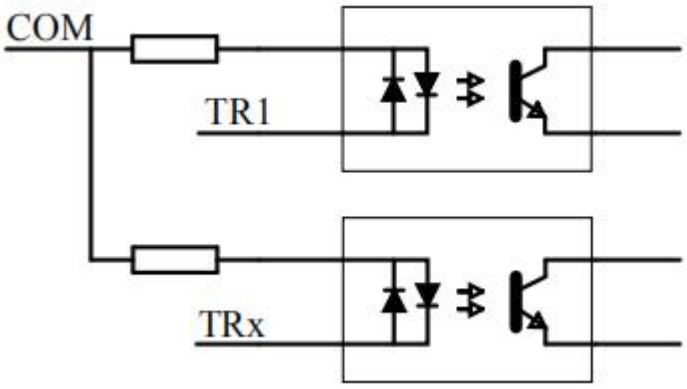


Figure 4 Internal Electrical Diagram of External Trigger

2.4.2 Trigger Interface Wiring Example

When the trigger valid signal is rising edge or high-level valid, the wiring is shown in Figure 5:

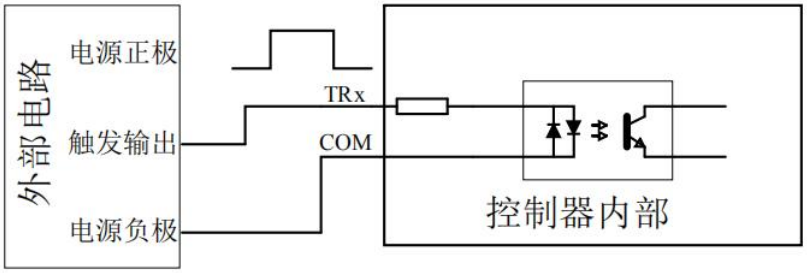


Figure 5 Wiring Example for Rising Edge or High-Level Valid

Connect the trigger output of the external control circuit to TRx and the negative pole of the power supply to COM. The controller controls the output when there is a rising edge or high level at the trigger output terminal.

When the trigger valid signal is falling edge or low-level valid, the wiring is shown in Figure 6:

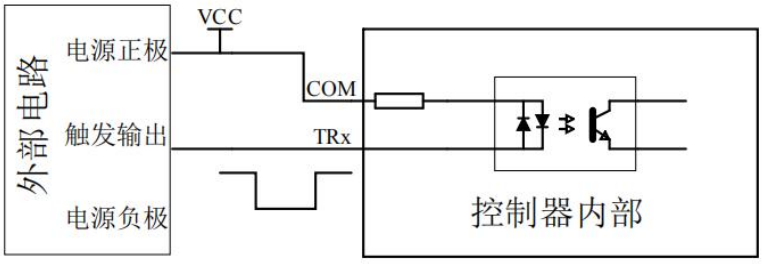


Figure 6 Wiring Example for Falling Edge or Low-Level Valid

Connect the trigger output of the external control circuit to TRx and the positive pole of the power supply to COM. The controller controls the output when there is a falling edge or low level at the trigger output terminal.

2.4.3 Trigger Timing Diagram

Constant OFF Mode: The light source turns on when the controller's trigger input signal is valid. Taking high-level validity as an example, the timing relationship is shown in Figure 7:

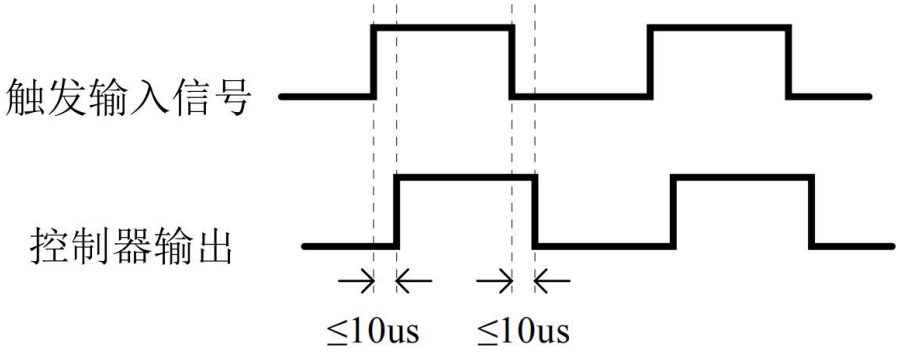


Figure 7 Constant OFF Mode Timing Diagram

Constant ON Mode: The light source turns off when the controller's trigger input signal is valid. Taking high-level validity as an example, the timing relationship is shown in Figure 8:

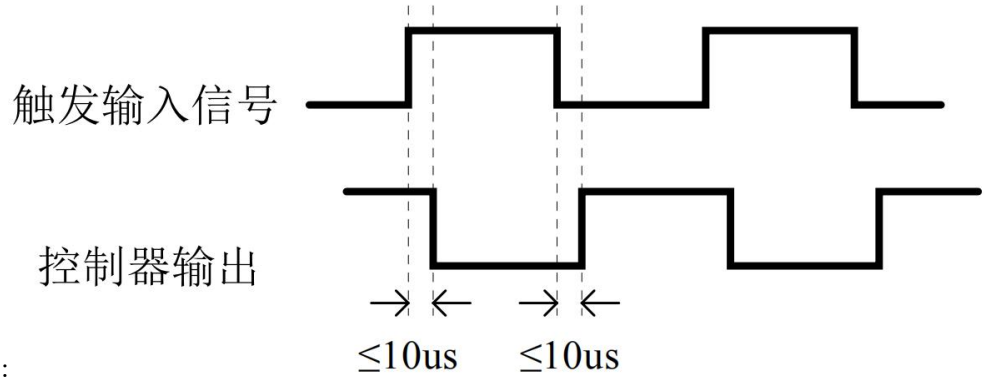


Figure 8 Constant ON Mode Timing Diagram

Strobe Mode: When the controller is set to millisecond-level stroboscope or microsecond-level stroboscope, the light source turns on when the controller's trigger input signal is valid. Taking high-level validity as an example, the timing relationship is shown in Figure 9:

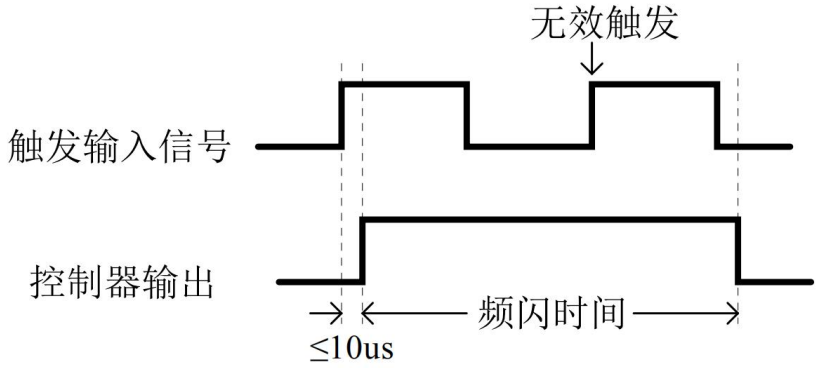


Figure 9 Strobe Mode Timing Diagram

2.5 Manual Settings

2.5.1 Brightness Setting

After turning on the controller, the 4-digit digital tube displays the channel number + brightness value. Initially, it displays Channel 1 and its brightness value. For example, if the brightness value of Channel 1 was set to 10 last time, it will display "1.010".The following takes setting the brightness of Channel 2 to 125 as an example, and its flow chart is shown in Figure 10.

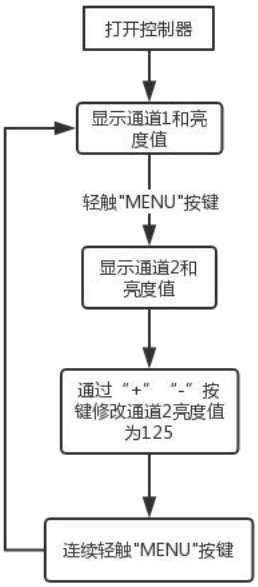


Figure 10 Brightness Setting Flow Chart

2.5.2 RS485 Interface Protocol Address Setting

When multiple controllers are connected to the RS485 bus, each controller's address needs to be set separately for differentiation. The address can be set manually (as shown in Figure 11) or via communication (refer to the Communication Protocol chapter).

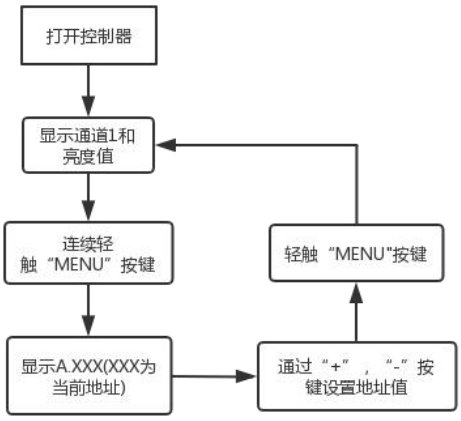


Figure 11 Address Setting Flow Chart

2.5.3 Mode Setting

This model of controller has 4 operating modes, which can be set via manual buttons or communication. For the 4 modes, please refer to Table 2.

The mode of each channel can be set separately. The following takes setting the mode of Channel 2 as an example; the setting methods for other channels are similar.

The flow chart for setting Channel 2 to Constant OFF Mode is shown in Figure 12.

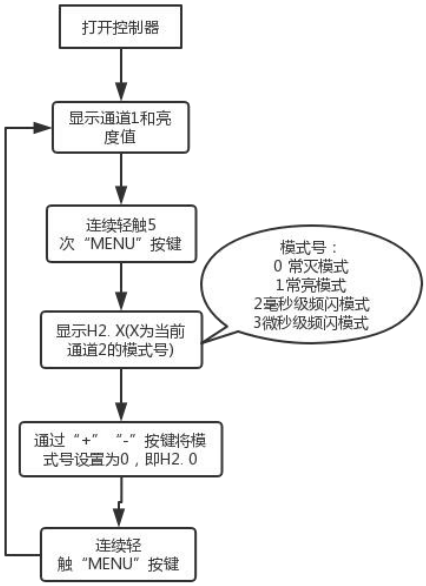


Figure 12 Constant OFF Mode Setting Flow Chart

The flow chart for setting Channel 2 to Constant ON Mode is shown in Figure 13.

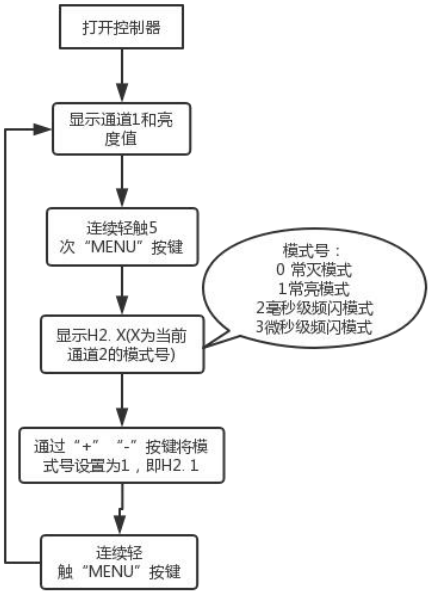


Figure 13 Constant ON Mode Setting Flow Chart

The flow chart for setting Channel 2 to Millisecond-level Strobe Mode and its strobe time is shown in Figure 14.

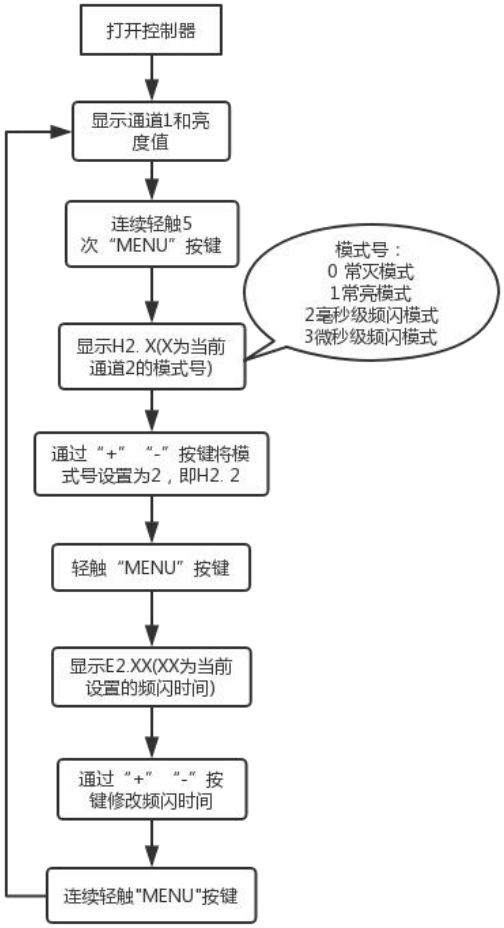


Figure 14 Millisecond-level Strobe Mode and Its Time Setting Flow Chart

Figure 14 Millisecond-level Strobe Mode and Its Time Setting Flow Chart

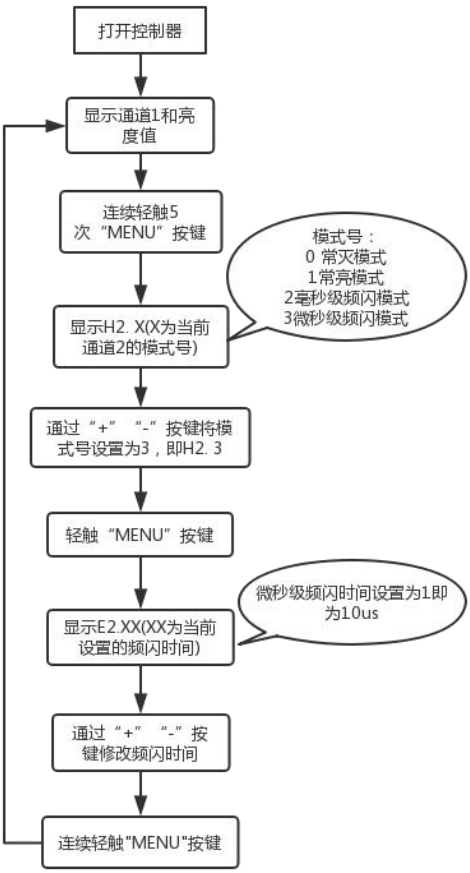


Figure 15 Microsecond-level Strobe Mode and Its Time Setting Flow Chart

3. RS232 Communication Protocol

3.1 Programming Flow

When controlling the light source controller via the serial port, the communication programming flow is shown in Figure 16:

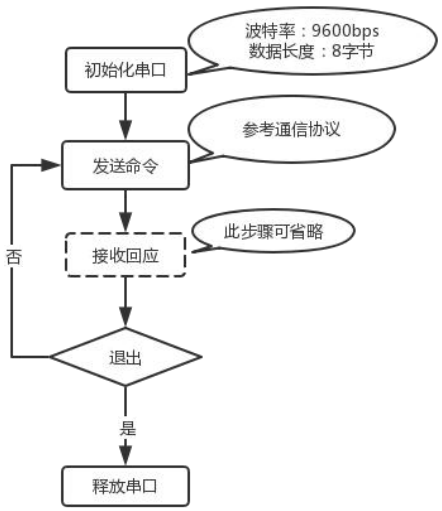


Figure 16 Communication Programming Flow Chart

3.2 Communication Settings

The serial port communication format settings are shown in Table 6.

Table 6 Serial Port Setting Table

Baud Rate	Parity	Data Bits	Stop Bits
9600	None	8	1

3.3 Frame Format Description

The communication frame format is shown in Table 7.

Table 7 Frame Format

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Feature Character	Command Character	Channel Character	Data 1	Data 2	Data 3	XOR Check Character 1	XOR Check Character 2

1、All communication bytes adopt ASCII code.

2、Feature Character: $.

3、Command Characters are as shown in Table 7.

4、When the Command Character is "1", "2", "3", "7", "8", or "9": If the controller receives the command successfully, it returns the feature character "$"; if the controller fails to receive the command, it returns "&".

5、When the Command Character is "4": If the controller receives the command successfully, it returns the brightness setting parameter of the corresponding channel (the return format is the same as the sending format); if the controller fails to receive the command, it returns "&".

6、Channel Characters: "1", "2", "3", "4", representing the 4 channels respectively.

7、Data = 0XX (XX is any value between 00 and FF), which corresponds to the setting parameter of the channel, with the high byte first and the low byte last.

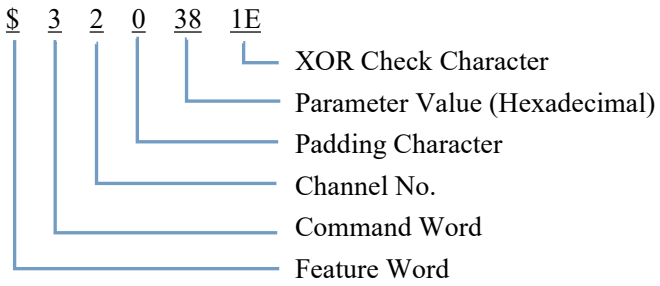
8、XOR Check Character = XOR checksum of all bytes except the check characters (including: Feature Character, Command Character, Channel Character, and Data). The high 4-bit ASCII code of the checksum comes first, and the low 4-bit ASCII code comes last.

Table 7 Command Word Function Table

Character	Function	Description
“1”	Turn on the corresponding channel	The corresponding channel is determined by the Channel Character
“2”	Turn off the corresponding channel	The corresponding channel is determined by the Channel Character
“3”	Set the brightness parameter of the corresponding channel	The corresponding channel is determined by the Channel Character; the brightness parameter is Data 1~Data 3
“4”	Read the brightness parameter of the corresponding channel	The corresponding channel is determined by the Channel Character; the return format is the same as the sending format
“7”	Trigger strobe for the corresponding channel	The corresponding channel is determined by the Channel Character; this function is invalid in non-stroboscope modes
“8”	Set the mode of the corresponding channel	The corresponding channel is determined by the Channel Character
“9”	Set the stroboscope time of the corresponding channel	The corresponding channel is determined by the Channel Character; this function is invalid in non-stroboscope modes

3.4 Communication Examples

Set the brightness of channel 2 to 56, then write "$320381E" in ASCII code downwards.



	String	ASCII Code	ASCII Code (Hexadecimal)	Represent High 4 Bits and Low 4 Bits with 8421 Code Respectively
Feature Word	$	36	24	0010 0100
Command Word	3	51	33	0011 0011
Channel Word	2	50	32	0011 0010
Data	0	48	30	0011 0000
	3	51	33	0011 0011
	8	56	38	0011 1000
XOR Sum				0001 1110
XOR Checksum Word				1 E

Note: For the three functions (turning on the corresponding channel, turning off the corresponding channel, and reading parameters of the corresponding channel), the values of the 3 data bytes have no impact on the XOR result during checksum calculation. It is only necessary to ensure the format is 0XX (where XX is any value within 00～FF).

The following are several sets of command data:

Turn off Channel 2: $220381F

	String	ASCII Code	ASCII Code (Hexadecimal)	Represent High 4 Bits and Low 4 Bits with 8421 Code Respectively
Feature Word	$	36	24	0010 0100
Command Word	2	50	32	0011 0010
Channel Word	2	50	32	0011 0010
Data	0	48	30	0011 0000
	3	51	33	0011 0011
	8	56	38	0011 1000
XOR Sum				0001 1111
XOR Checksum Word				1 F

Turn on Channel 2: $120381C

	String	ASCII Code	ASCII Code (Hexadecimal)	Represent High 4 Bits and Low 4 Bits with 8421 Code Respectively
Feature Word	$	36	24	0010 0100
Command Word	1	49	31	0011 0001
Channel Word	2	50	32	0011 0010
Data	0	48	30	0011 0000
	3	51	33	0011 0011
	8	56	38	0011 1000
XOR Sum				0001 1100
XOR Checksum Word				1 C

Read data from Channel 2: $4200012

	String	ASCII Code	ASCII Code (Hexadecimal)	Represent High 4 Bits and Low 4 Bits with 8421 Code Respectively
Feature Word	$	36	24	0010 0100
Command Word	4	52	34	0011 0100
Channel Word	2	50	32	0011 0010
Data	0	48	30	0011 0000
	0	48	30	0011 0000
	0	48	30	0011 0000
XOR Sum				0001 0010
XOR Checksum Word				1 0

4.RS485 Interface Communication Protocol

This controller supports the Modbus RTU communication protocol.

4.1 Modbus Communication Protocol

Modbus is a serial communication protocol, which was released by Modicon (now Schneider Electric) in 1979 for communication with Programmable Logic Controllers (PLCs). Modbus has become a de facto industry standard for communication protocols in the industrial field and is now a commonly used connection method between industrial electronic devices.

This product supports the Modbus RTU format. For detailed instruction generation and parsing methods, please refer to the register table in this document combined with the Chinese Version of the MODBUS Protocol.

Coil Register Address Table

Register Name	Register Address		Description
Channel 1 Control			
Channel Brightness	Holding Register0x03、0x06、0x10	0x0000	Brightness data of Channel 1
Channel Trigger Mode		0x0001	Trigger mode data of Channel 1
Strobe Time		0x0002	Millisecond-level/microsecond-level strobe data of Channel 1
Channel 2 Control			
Channel Brightness	Holding Register:0x03、0x06、0x10	0x000A	Brightness data of Channel 2
Channel Brightness		0x000B	Trigger mode data of Channel 2
Strobe Time		0x000C	Millisecond-level/microsecond-level strobe data of Channel 2
Channel 3 Control			
Channel Brightness	Holding Register:0x03、0x06、0x10	0x0014	Brightness data of Channel 3
Channel Trigger Mode		0x0015	Trigger mode data of Channel 3
Strobe Time		0x0016	Millisecond-level/microsecond-level strobe data of Channel 3
Channel 4 Control			
Channel Brightness	Holding Register:0x03、0x06、0x10	0x001E	Brightness data of Channel 4
Channel Trigger Mode		0x001F	Trigger mode data of Channel 4
Strobe Time		0x0020	Millisecond-level/microsecond-level strobe data of Channel 4
User Configuration			

RS485 Communication Baud Rate	Holding Register:0x03 、 0x06 、 0x10	0x0069	See the Baud Rate Value Correspondence Table below. The default value is 0, supporting values 0-3. This register determines the RS485 communication baud rate
Station Number		0x006D	Range: 1-255

Baud Rate Value Correspondence Table

Value	Baud Rate
0	9600bps
1	19200bps
2	57600bps
3	115200bps

5. Prompt Command Index

If the controller's nixie tube displays a non-functional prompt command, troubleshoot according to the following command table:

Command	Description	Troubleshooting Solution for Prompt Command
F.1	Unregistered	Re-register
F.2	Storage Chip Damaged	Need to return to the factory for repair
F.3	Exceeding Light Source Power, Short Circuit, Signal Interference	Check the light source power, whether the light source is short-circuited, and whether there is signal interference
F.6	Over-Temperature Alarm (Available for Some Models)	Excessively high temperature; check the controller's operating environment
Loc	Key Lock	Unlock via DIP switch or long-press the "MENU" button

6. Accessories