RS485 Light Source Controller
DBS-DVXXX-N04C-24XXX-2
User Manual

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

Revised in April 2025, Version 1.3

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 2-Channel Series See 1.2 for model selection details		1
Serial Cable	1.5M Male-to-Female		1
Terminal Block	3.81-5P		1
Power Cable	1.5M National Standard IEC 320 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
- Supports external trigger mode
- Supports millisecond-level and microsecond-level strobe
- Manual adjustment of brightness and mode
- 5~24V bidirectional trigger, adaptable to high/low level trigger modes
- Compact size, easy to install (screw installation or C45 DIN rail installation)

1.2 Product Selection

Model	Built-in Power Supply Power	Maximum Current per Channel
DBS-DV65-N04C-24025-2	65W	2.5A
DBS-DV120-N04C-24040-2	120W	4A
DBS-DV200-N04C-24040-2	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 strobe; 3: Microsecond-level strobe
Light Emitting Mode	Constant on/Constant off/Strobe	External trigger available in constant off and strobe modes
Trigger Mode	Edge + Level Trigger	Edge trigger for strobe mode; Level trigger for constant on/off modes
Constant On Brightness Level	255	255-level brightness adjustment
Millisecond-level Strobe Time	1~99	Unit: Milliseconds (ms)
Microsecond-level Strobe Time	10~990	Unit: Microseconds (μs)
Communication Baud Rate	9600bps	
Built-in Power Supply	可选	Optional power: 65W, 120W, 200WW
Number of Channels	2	
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

Taking Channel 1 as an example:

Function	Nixie Tube Display Format		Description
Brightness Setting	1. X	0≦X≦255	Adjust brightness
Operating Mode	H1. X	X=0 Constant off mode	Light turns on when trigger signal is valid
		X=1 Constant on mode	Light turns off when trigger signal is valid
		X=2 Millisecond-level strobe mode	Light flashes once for millisecond duration when trigger signal is valid, E1. X, 1≦X≦99, Unit: ms
		X=3 Microsecond-level strobe mode	Light flashes once for microsecond duration when trigger signal is valid, E1. X, 1≦X≦99, Unit: μs
Station Number	A. X	1≦X≦255	X is the address value

2. User Instructions

2.1 Panel Description

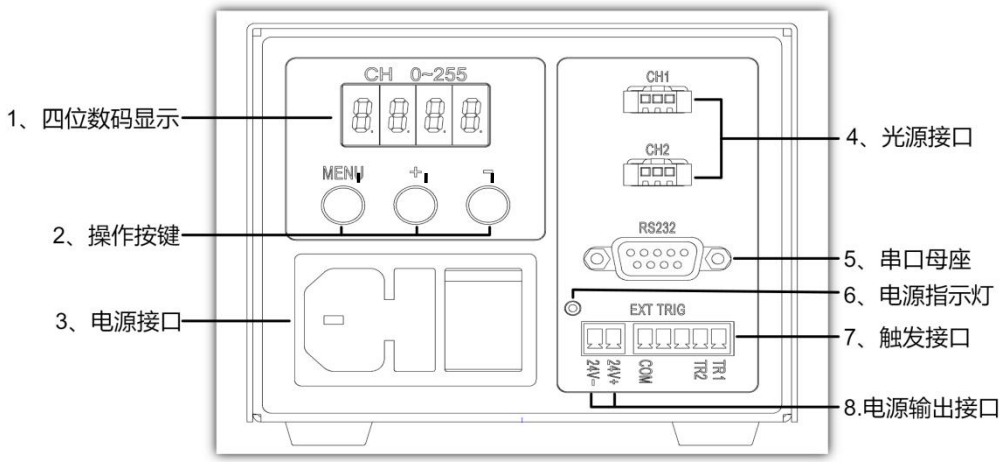


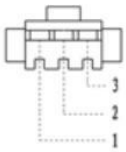
Figure 1: Front Panel

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; the last three digits are the corresponding values of the current operating channel.
2	Operation Keys	MENU: Function switching key; "+": Value increase; "-": Value decrease
3	Power Interface	AC220V interface
4	Light Source Interface	For connecting devices with RS232/RS485 interface
5	Serial Female Connector	Lights up when power is input
6	Power Indicator Light	The indicator light turns on when there is a power input.
7	Trigger Interface	For connecting external signals to trigger switching operations
8	Power Output Interface	Outputs 24V voltage, maximum current 1A (for powering 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.

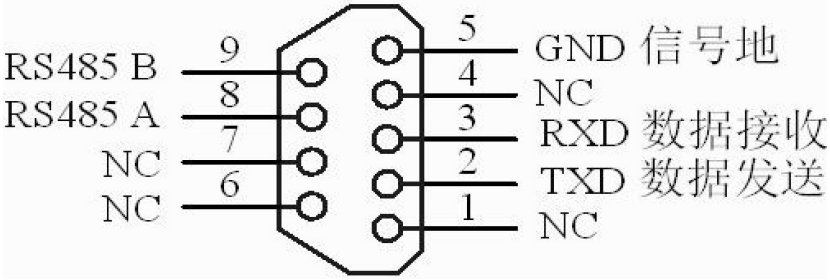


Figure 2 Communication Interface Female Connector Definition

Table 5 Serial Female Connector 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:

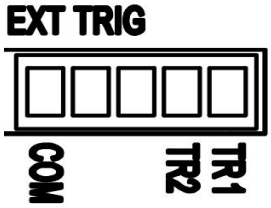


Figure 3 External Trigger Input Interface

There are 2 channels for the external trigger input interface. Each channel has one trigger port TRx (x represents the channel number), and COM is the common port (can be connected to the positive or negative pole of the power supply). A bidirectional optocoupler is built inside, and its electrical diagram is shown in Figure 4:

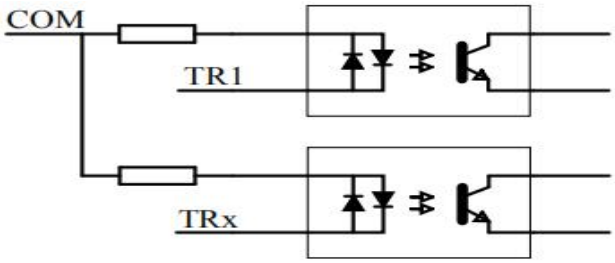


Figure 4 Internal Electrical Diagram of External Trigger

2.4.2 Trigger Interface Wiring Example

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

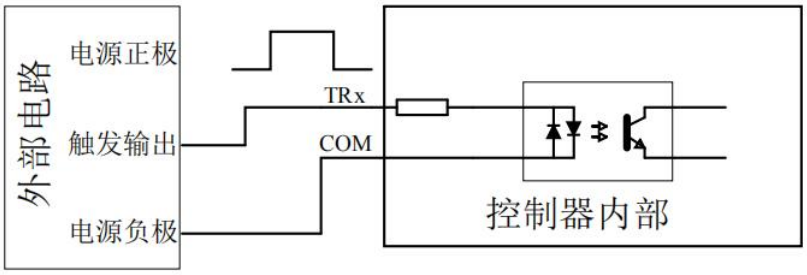


Figure 5 Wiring Example for Rising Edge or High Level Validity

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

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

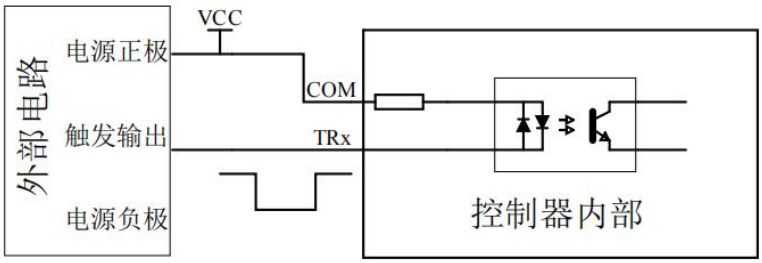


Figure 6 Wiring Example for Falling Edge or Low Level Validity

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

2.4.3 Trigger Timing Diagram

Constant Off Mode: When the controller receives a valid trigger input signal, the light source turns on. Taking high-level validity as an example, the timing relationship is shown in Figure 7:

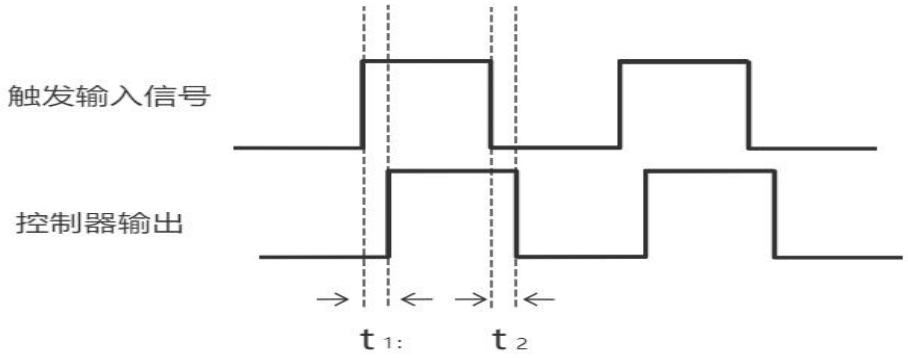


Figure 7 Constant Off Mode Timing Diagram

Parameter	Time
t_1	≦25us
t_2	≦150us

Constant On Mode: When the controller receives a valid trigger input signal, the light source turns off. Taking high-level validity as an example, the timing relationship is shown in Figure 8:

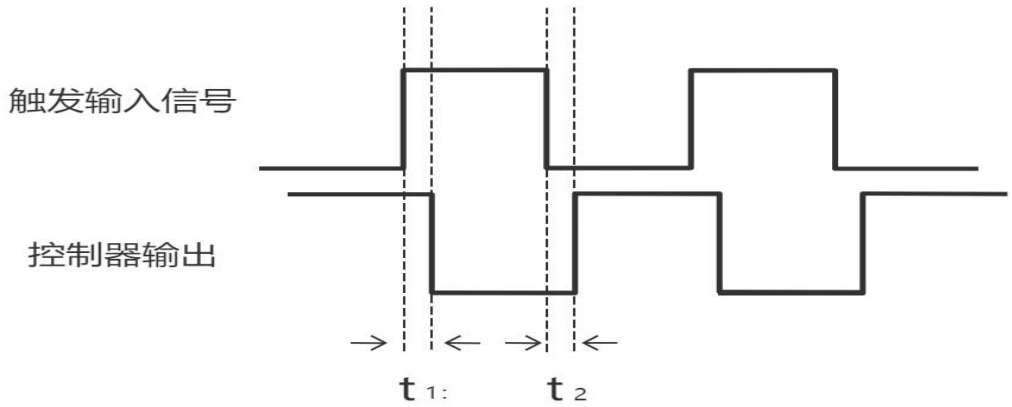


Figure 8 Constant On Mode Timing Diagram

Parameter	Time
t_1	≦25us
t_2	≦150us

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

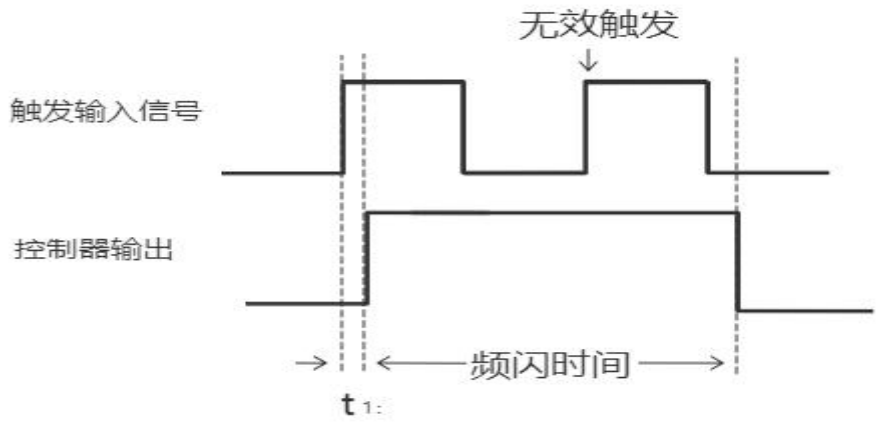


Figure 9 Strobe Mode Timing Diagram

Parameter	Time
t_1	≤25us

2.5 Manual Settings

2.5.1 Brightness Setting

When the controller is turned on, the 4-digit nixie tube displays the "channel number + brightness value". Initially, it shows Channel 1 and its brightness value. For example, if the previously set brightness of Channel 1 is 10, the display will be "1.010".

The following takes setting the brightness of Channel 2 to 125 as an example; the flow chart is shown in Figure 10.

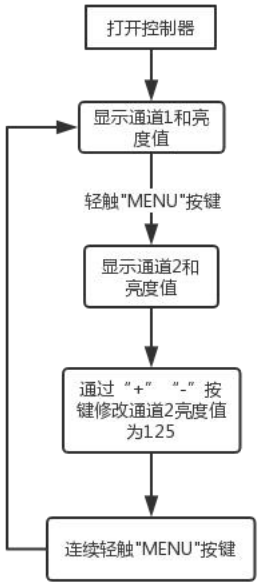


Figure 10 Brightness Setting Flow Chart

2.5.2 RS485 Interface Protocol Address Setting

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

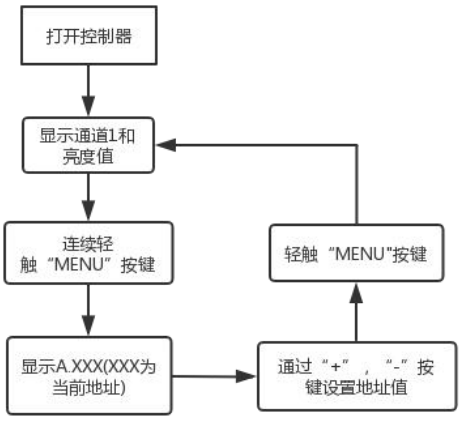


Figure 11 Address Setting Flow Chart

2.5.3 Operating Mode Setting

This controller supports 4 operating modes, which can be set via manual keys or communication. For details of the 4 modes, refer to Table 2.

The mode of each channel can be set independently. The following takes setting the mode of Channel 2 as an example; the setting method for other channels is similar.。

2.5.4 Constant Off Mode Setting

The flow chart for setting Channel 2 to constant off mode is shown in Figure 12.

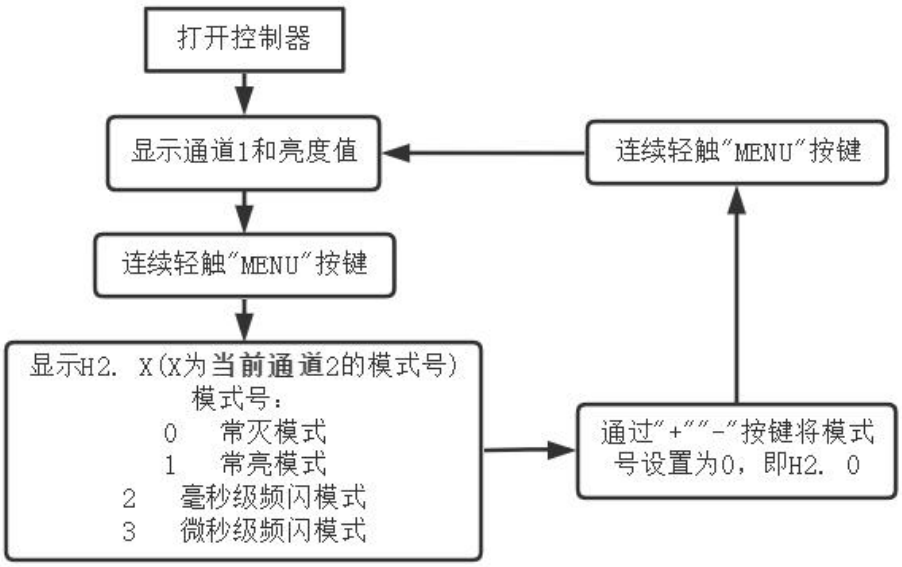


Figure 12 Constant Off Mode Setting Flow Chart

2.5.5 Constant On Mode Setting

The flow chart for setting Channel 2 to constant on mode is shown in Figure 13.

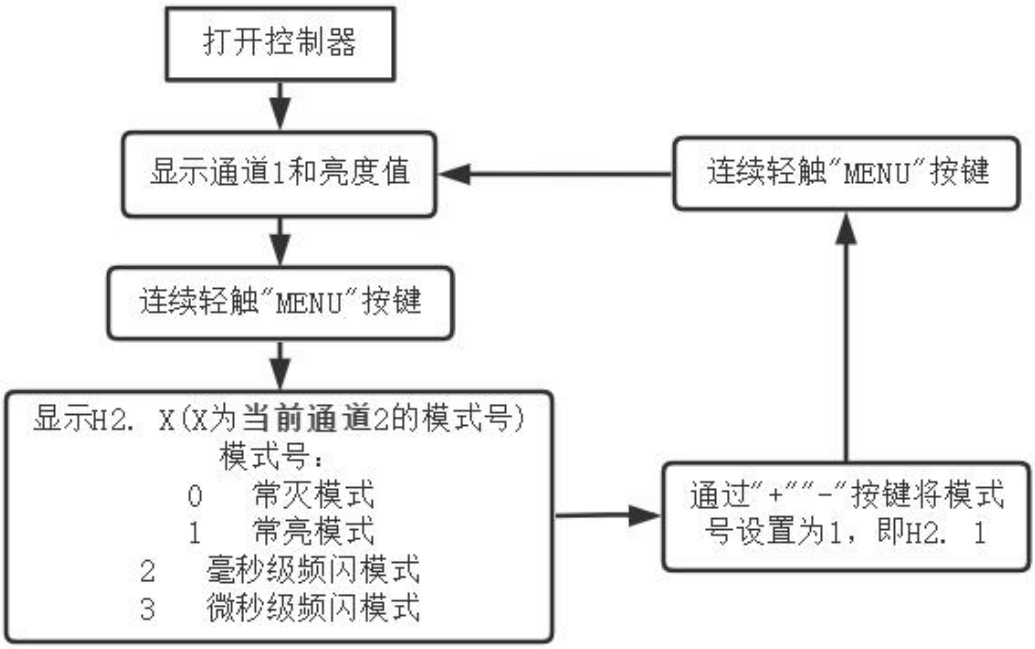


Figure 13 Constant On Mode Setting Flow Chart

2.5.6 Millisecond-level Strobe Mode Setting

The flow chart for setting Channel 2 to millisecond-level strobe mode and adjusting its strobe time is shown in Figure 14.

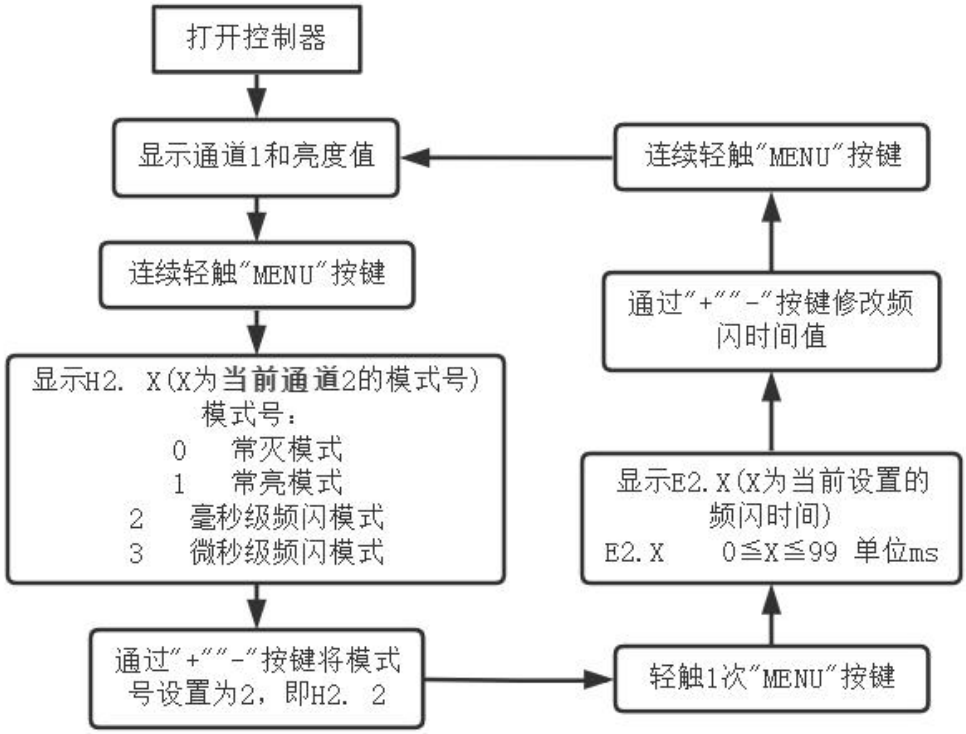


Figure 14 Millisecond-level Strobe Mode and Time Setting Flow Chart

2.5.7 Microsecond-level Strobe Mode Setting

The flow chart for setting Channel 2 to microsecond-level strobe mode and adjusting its strobe time is shown in Figure 15.

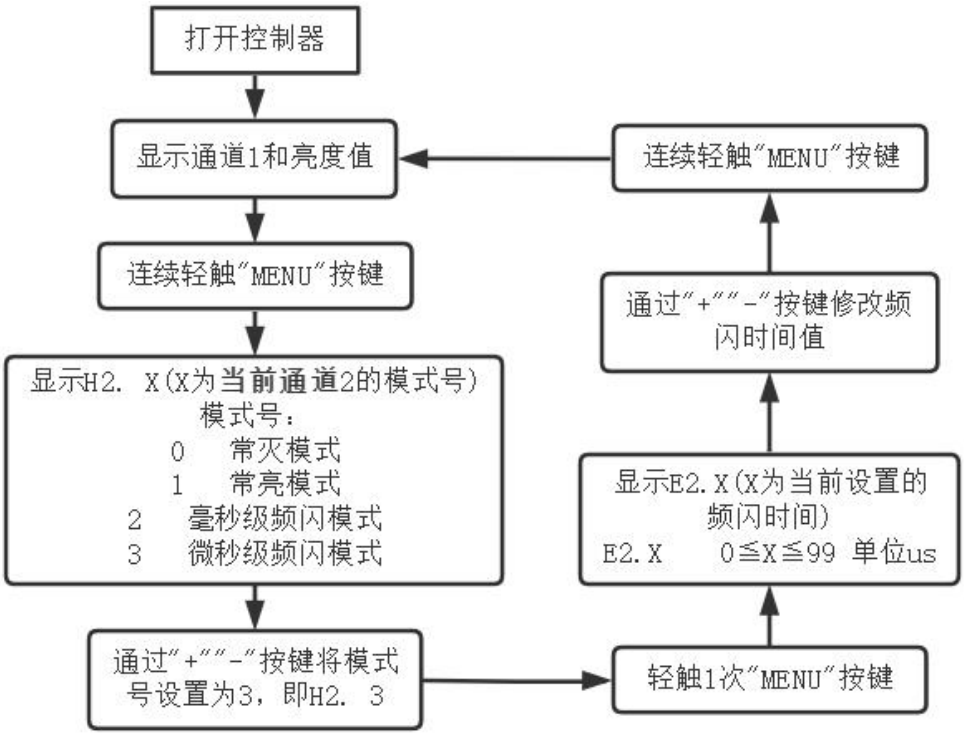


Figure 15 Microsecond-level Strobe Mode and Time Setting Flow Chart

3. RS232 Communication Protocol

3.1 Programming Flow

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

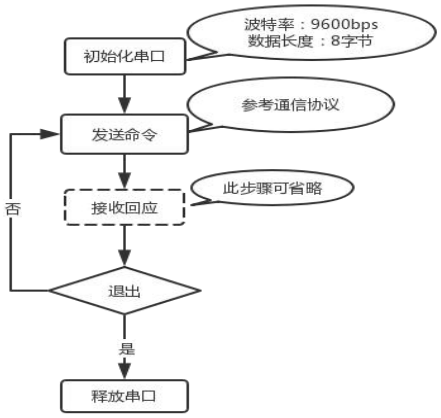


Figure 16 Communication Programming Flow Chart

3.2 Communication Settings

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

Table 6 Serial Port Settings

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 use ASCII codes.

2、The feature word is: $.

3、Command words are as shown in Table 7.

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

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

6、Channel words "1", "2", "3", "4" represent Channels 1 to 4 respectively.

7、Data = 0XX (XX is any value within 00～FF), corresponding to the set parameters of the channel, with the high bit first and the low bit last.

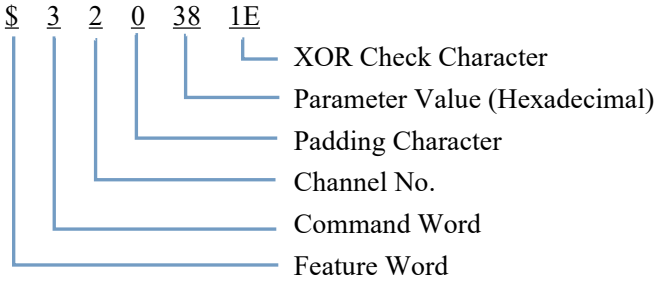
8、XOR checksum = XOR checksum of all bytes except the checksum (including: feature word, command word, channel word, and data). The high 4 bits of the checksum's ASCII code come first, followed by the low 4 bits.

Table 7 Command Word Function Table

Character	Function	Description
“1”	Turn on the corresponding channel	The corresponding channel is determined by the channel word
“2”	Turn off the corresponding channel	The corresponding channel is determined by the channel word
“3”	Set brightness parameter of the corresponding channel	The corresponding channel is determined by the channel word; brightness parameters are Data 1~Data 3
“4”	Read brightness parameter of the corresponding channel	The corresponding channel is determined by the channel word; the return format is the same as the send format
“7”	Trigger strobe for the corresponding channel	The corresponding channel is determined by the channel word; this function is invalid in non-strobe modes
“8”	Set mode for the corresponding channel	The corresponding channel is determined by the channel word
“9”	Set strobe time for the corresponding channel	The corresponding channel is determined by the channel word; this function is invalid in non-strobe 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 published 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 industrial fields and is now a common connection method between industrial electronic devices.

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

Coil Register Address Table

Register Name		Register Address	Description
Channel 1 Control			
Channel Brightness	Holding Register (0x03, 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 Trigger Mode		0x000B	Trigger mode data of Channel 2
Strobe Time		0x000C	Trigger mode 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

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