

Universal Digital Light Source Controller DBS-DVXX-N01C-24012-4 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	DBS-DVXXX-N01C-24012-X		1
Serial Cable	1.5M Male-to-Female		1
Terminal Block	3.81-8P		1
Power Cable	1.5M		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	2
1.1 Product Features	2
1.2 Product Selection	2
1.3 Main Parameters	2
1.4 Function Modes	3
2. User Instructions	4
2.1 Panel Description	4
2.2 Light Source Interface Definition	5
2.3 Serial Interface Definition	5
2.4 Trigger Description	6
2.4.1 Trigger Interface	6
2.4.2 Trigger Interface Wiring Example	6
2.4.3 Trigger Timing Diagram	7
2.5 Manual Settings	9
2.5.1 Brightness Setting	9
2.5.3 Operating Mode Setting	9
2.5.4 Constant Off Mode Setting	10
2.5.5 Constant On Mode Setting	10
2.5.6 Millisecond-Level Stroboscopic Mode Setting	11
2.5.7 Microsecond-Level Stroboscopic Mode Setting	11
3. Communication Protocol	12
3.1 Programming Flow	12
3.2 Communication Settings	12
3.3 Frame Format Description	12
3.4 Communication Examples	13
4. Prompt Command Index	15
5. Accessories	16

1. Product Introduction

1.1 Product Features

- Supports RS232 communication
- Built-in 24V switching power supply
- Low trigger response time
- Supports external trigger mode
- Supports millisecond-level stroboscopic and microsecond-level stroboscopic
- Manual adjustment of brightness and mode
- 5~24V bidirectional trigger, adaptable to high/low level trigger modes
- Easy installation (screw mounting or C45 DIN rail mounting)

1.2 Product Selection

Model	Built-in Power Supply Power	Maximum Current per Channel
DBS-DV65-N01C-24012-4	65W	1.2A
DBS-DV120-N01C-24012-4	120W	1.2A

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	1.2A	Maximum current per channel
Overcurrent Protection	None	
Overvoltage Protection	None	
Operating Mode	4 types	0: Constant Off; 1: Constant On; 2: Millisecond-level Stroboscopic; 3: Microsecond-level Stroboscopic
Light Emitting Mode	Constant On/Constant Off/Stroboscopic	External trigger available in Constant Off and Stroboscopic modes
Trigger Method	Edge + Level Trigger	Edge trigger for stroboscopic mode; Level trigger for Constant On/Off modes
Constant On Brightness Level	255	255-level brightness adjustment
Millisecond-level Stroboscopic Time	0~99	Unit: ms (millisecond)
Microsecond-level Stroboscopic Time	0~99	Unit: μ s (microsecond)
Communication Baud Rate	9600bps	
Built-in Power Supply	Optional	Optional capacity: 65W, 120W
Number of Channels	4	
Connected Light Source Type	24V light source	10mA~1.2A 24V light source
Operating Ambient Temperature	-5~50°C	
Dimensions	See Appendix for details	

1.4 Function Modes

Table 2 Function Modes Table (Taking Channel 1 Display as an Example)

Mode	Nixie Tube Display Mode		Description
Brightness Setting	1. X	$0 \leq X \leq 255$	Adjust brightness
Operating Mode	H. 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 Stroboscopic Mode	Light flashes once (in milliseconds) when trigger signal is valid E1. X ($1 \leq X \leq 99$, Unit: ms)
		X=3 Microsecond-level Stroboscopic Mode	Light flashes once (in microseconds) when trigger signal is valid E1. X ($1 \leq X \leq 99$, Unit: μ s)

2. User Instructions

2.1 Panel Description

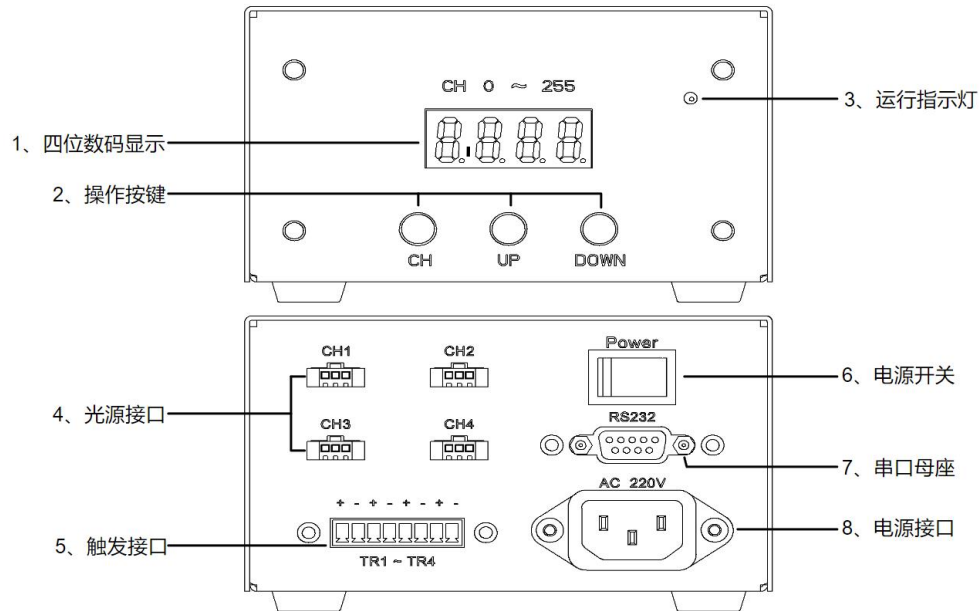


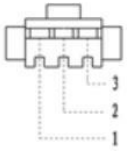
Figure 1 Front and Rear Panels

Table 3 Panel Interface Definition

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 value of the current operating channel
2	Operation Buttons	"CH" = function switch button; "+" = increase value; "-" = decrease value
3	Power Indicator Light	Turns on when power is input
4	Light Source Interface	For connecting 10mA~1.2A 24V light sources
5	Trigger Interface	For connecting external signals to control the switch operation
6	Power Switch	Turns on the controller power
7	Serial Female Socket	For connecting devices with RS232 interface
8	Power Interface	AC220V interface

2.2 Light Source Interface Definition

Table 4 Light Source Interface Definition

	Position	Definition	Description
	1	Light+	Positive pole of light source output
	2	NC	Not connected
	3	Light-	Negative pole of light source output

2.3 Serial Interface Definition

The interface definition of the serial female socket is shown in Figure 3. It is connected to the 9-pin serial port of the computer host using a straight cable.

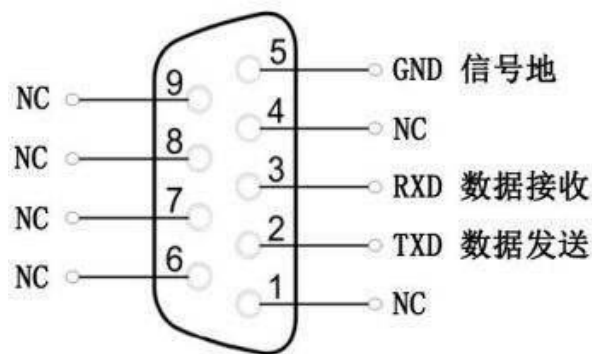


Figure 3 Serial Female Socket Interface Definition

Table 5 Serial Female Socket Interface Definition

Pin No.	Name	Description
1	NC	Not connected
2	TXD	Controller RS232 data transmission (RS232 level)
3	RXD	Controller RS232 data reception (RS232 level)
4	NC	Not connected
5	GND	RS232 signal ground
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	NC	Not connected

2.4 Trigger Description

2.4.1 Trigger Interface

The external trigger input interface is shown in Figure 4:

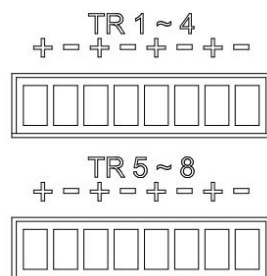


Figure 4 External Trigger Input Interface

There are 4 channels of external trigger input interfaces; each channel has one trigger port TR_x (where "x" represents the channel number), and COM is the common port (can be connected to either the positive or negative pole of the power supply). A bidirectional optocoupler is built inside, and its electrical diagram is shown in Figure 5:

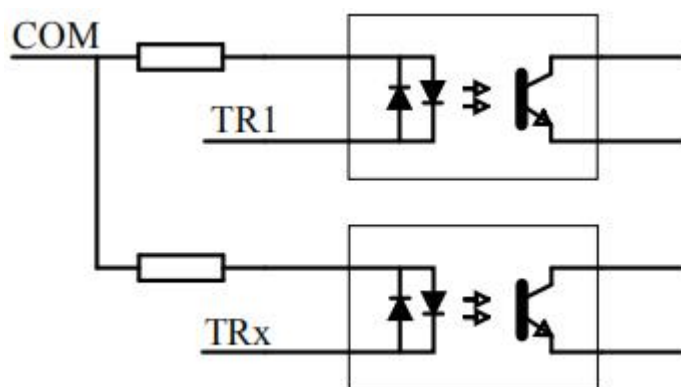


Figure 5 Internal Electrical Diagram of External Trigger

2.4.2 Trigger Interface Wiring Example

When the valid trigger signal is a rising edge or high level, the wiring is shown in Figure 6:

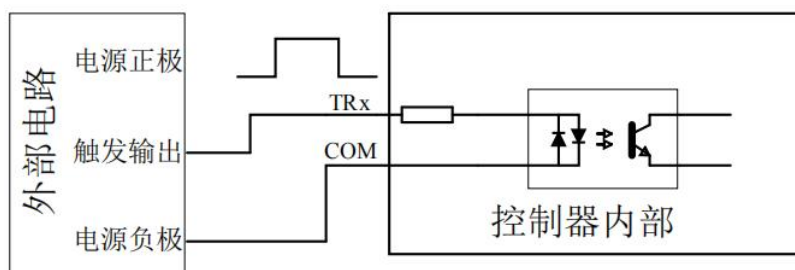


Figure 6 Wiring Example for Rising Edge or High-Level Validity

Connect the trigger output of the external control circuit to TR_x, 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 a falling edge or low level, the wiring is shown in Figure 7:

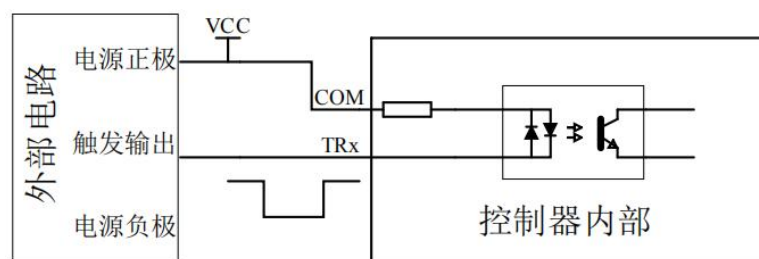


Figure 7 Wiring Example for Falling Edge or Low-Level Validity

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's trigger input signal is valid, the light source turns on. The timing relationship is illustrated with high-level validity as an example, as shown in Figure 8:

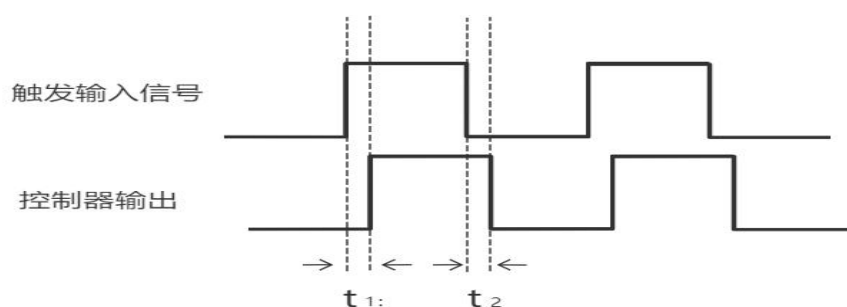


图 8 常灭模式时序图

Parameter	Time
t_1	$\leq 25\mu s$
t_2	$\leq 150\mu s$

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

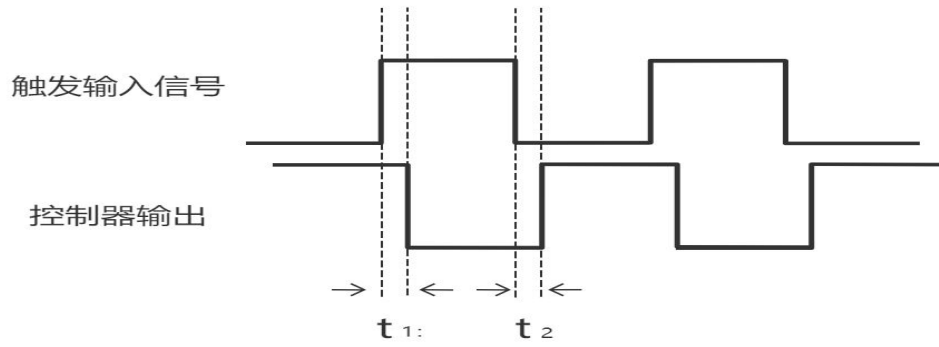


图 9 常亮模式时序图

Parameter	Time
t_1	$\leq 25\mu s$
t_2	$\leq 150\mu s$

Stroboscopic Mode: When the controller is set to millisecond-level or microsecond-level stroboscopic mode, the light source turns on when the trigger input signal is valid. The timing relationship is illustrated with high-level validity as an example, as shown in Figure 10:

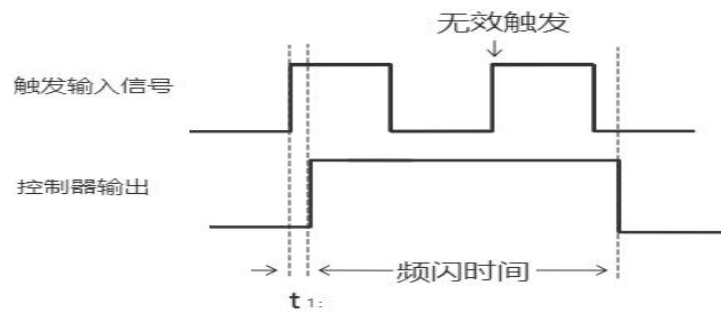


Figure 10 Stroboscopic Mode Timing Diagram

Parameter	Time
t_1	$\leq 25\mu s$

2.5 Manual Settings

2.5.1 Brightness Setting

When the controller is turned on, the 4-digit nixie tube displays "Channel Number + Brightness Value". Initially, it shows Channel 1 and its brightness value. For example, if the previous brightness setting of Channel 1 was 10, the display will be "1.010".

The following takes "setting the brightness of Channel 2 to 125" as an example, and its flow chart is shown in Figure 11.

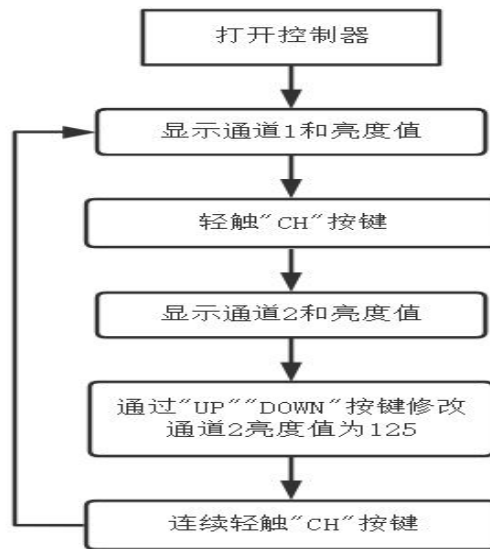


Figure 11 Brightness Setting Flow Chart

2.5.3 Operating Mode Setting

This model of controller has 4 operating modes, which can be set via manual buttons or communication. For 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 Constant Off Mode of Channel 2 is shown in Figure 12.

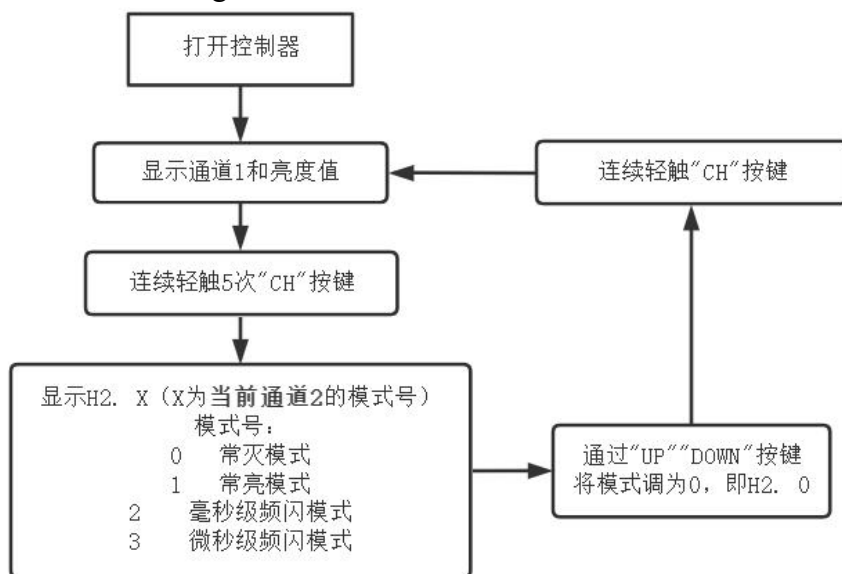


Figure 12 Constant Off Mode Setting Flow Chart

2.5.5 Constant On Mode Setting

The flow chart for setting Constant On Mode of Channel 2 is shown in Figure 13.

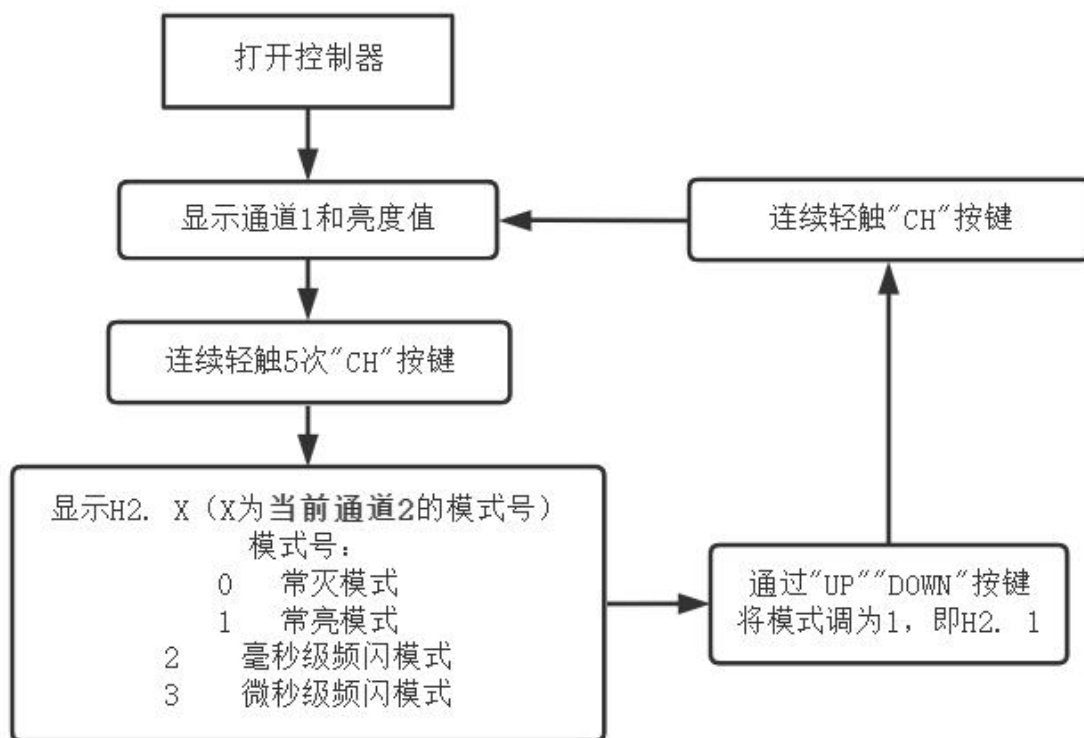


Figure 13 Constant On Mode Setting Flow Chart

2.5.6 Millisecond-Level Stroboscopic Mode Setting

The flow chart for setting Millisecond-Level Stroboscopic Mode and its stroboscopic time of Channel 2 is shown in Figure 14.

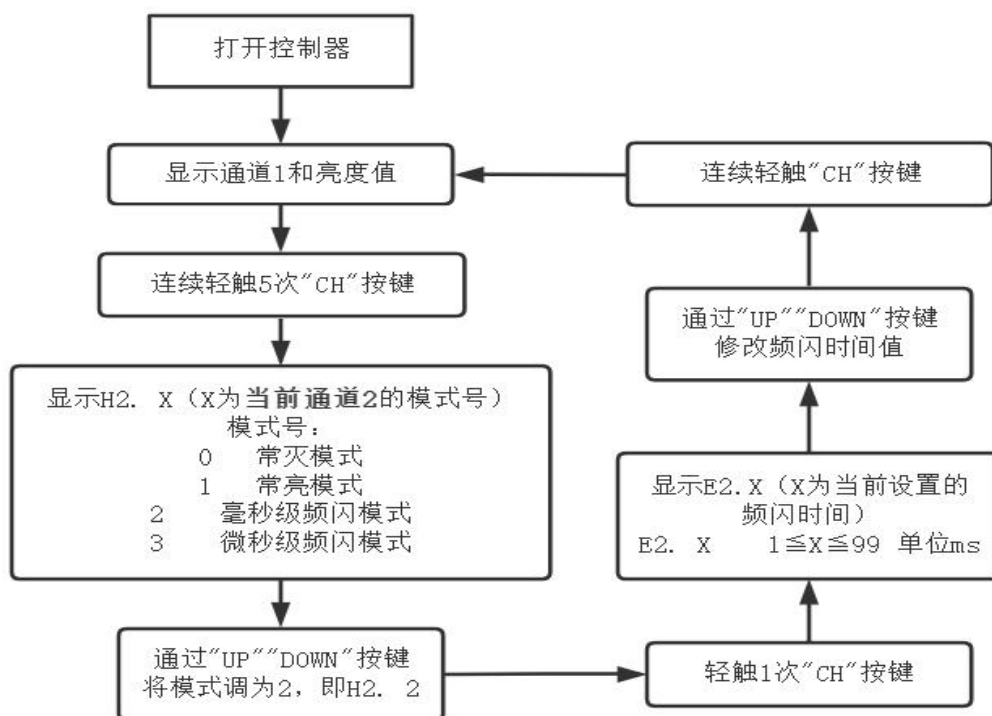


Figure 14 Millisecond-Level Stroboscopic Mode and Time Setting Flow Chart

2.5.7 Microsecond-Level Stroboscopic Mode Setting

The flow chart for setting Microsecond-Level Stroboscopic Mode and its stroboscopic time of Channel 2 is shown in Figure 15.

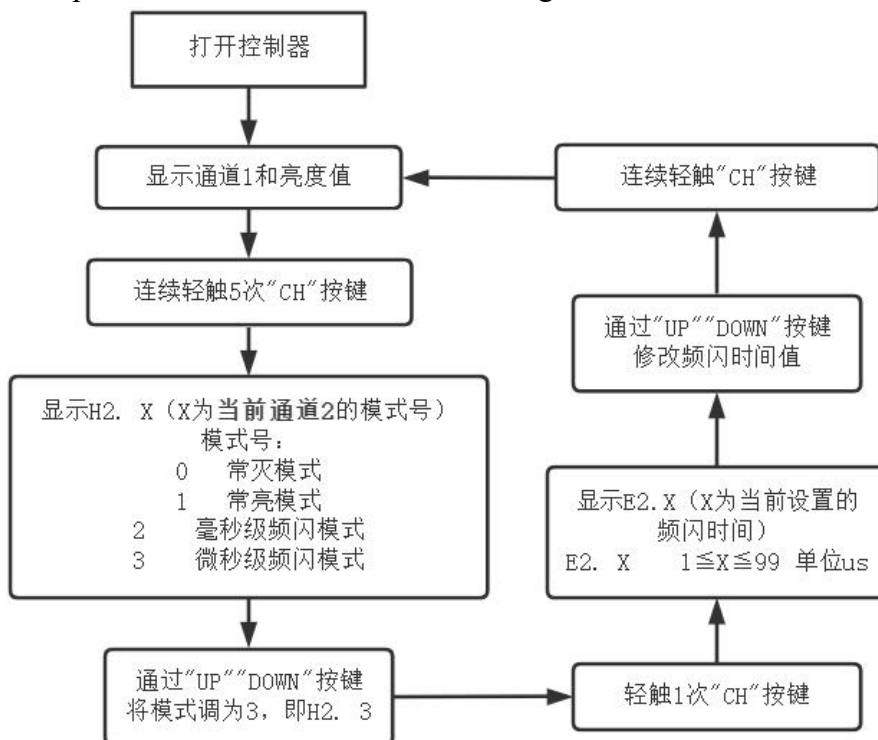


Figure 15 Microsecond-Level Stroboscopic Mode and Time Setting Flow Chart

3. 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:

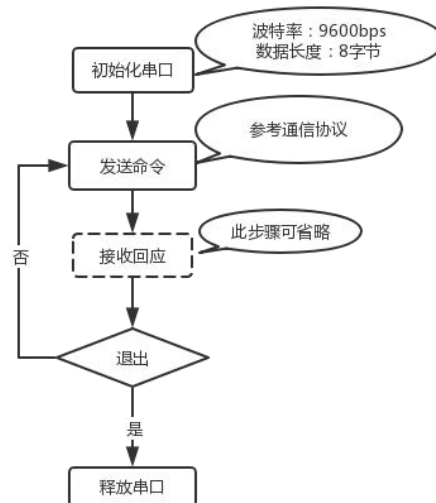


Figure 16 Communication Programming Flow

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

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
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 code.
- 2、Marker: \$
- 3、Command: See Table 7 (Command Function Table).
- 4、When the command is "3", "7", "8", or "9": If the controller receives the command successfully, it returns the marker \$; If the controller fails to receive the command, it returns &.

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

6、Channel: "1", "2", "3", "4" (representing 4 channels respectively).

7、Data = 0XX (XX is any value between 00 and FF in hexadecimal), corresponding to the setting parameters of the channel. The high byte comes first, followed by the low byte.

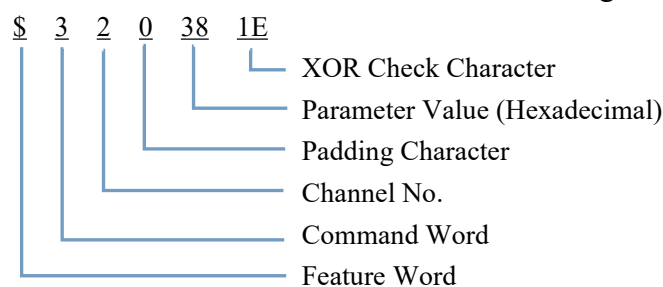
8、XOR Checksum: Calculated by XORing all bytes except the checksum itself (including Marker, Command, Channel, and Data). The ASCII code of the high 4 bits of the checksum comes first, followed by the ASCII code of the low 4 bits.

Table 7 Command Function Table

Character	Function	Description
"3"	Set brightness parameters of the corresponding channel	The target channel is determined by the Channel byte; brightness parameters are Data 1~Data 3
"4"	Read brightness parameters of the corresponding channel	The target channel is determined by the Channel byte; return format is the same as the transmission format
"7"	Trigger stroboscopic of the corresponding channel	The target channel is determined by the Channel byte; invalid in non-stroboscopic modes
"8"	Set mode of the corresponding channel	The target channel is determined by the Channel byte
"9"	Set stroboscopic time of the corresponding channel	The target channel is determined by the Channel byte; invalid in non-stroboscopic modes

3.4 Communication Examples

To set the brightness of Channel 2 to 56, write the ASCII string: "\$320381E"



	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 the parameters of the corresponding channel), the values of the 3 data bytes have no impact on the XOR checksum calculation. It is only necessary to ensure the format is 0XX (where XX is any value ranging from 00 to FF in hexadecimal).

Example:

Reading 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. 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

5. Accessories

