Universal Digital Light Source Controller
MD01C (HK) Built-in Power Supply Series
User Manual

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

Revised in May 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	MD01C (HK) Series (See 1.2 Product Selection for specific model)		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

1.1 Product Features

- Supports RS232 communication
- Low trigger response time
- Supports external trigger mode
- Supports millisecond-level stroboscopic and microsecond-level stroboscopic functions
- Manual adjustment of brightness and mode
- 5~24V unidirectional trigger, compatible with high/low level trigger modes
- Equipped with overheating protection and output short-circuit protection functions
- Compact size, easy to install (screw mounting or C45 DIN rail mounting)

1.2 Product Selection

Model	Built-in Power Capacity	Maximum Current per Channel
DBS-65-MD01C-24025-4HK	65W	2.5A(GX12-2)
DBS-120-MD01C-24050-4HK	120W	5A(GX12-2)
DBS-200-MD01C-24050-4HK	200W	5A(GX12-2)
DBS-65-MD01C-24025-4HK	65W	2.5A(GX12-2)
DBS-200-MD01C-24025-2HK	200W	5A(GX12-2)
DBS-120-MD01C-24025-2HK	120W	5A(GX12-2)

1.3 Main Parameters

Table 1 Main Parameters

Item	Parameter	Description
Input Voltage	AC220V	For built-in switching power supply
Output Voltage	24V	Voltage of the built-in switching power supply
Output Current	2.5A/5A per channel	Maximum total current: 2.5A/5A/8A
Overheating Protection	Yes	Triggered when temperature exceeds 90° C
Output Short-Circuit Protection	Yes	
Operating Mode	4 types	0: Constant Off; 1: Constant On; 2: Millisecond-level Stroboscopic; 3: Microsecond-level Stroboscopic
Dimming Method	PWM	100kHz
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	1~999	Unit: ms (millisecond)

Microsecond-level Stroboscopic Time	1~999	Unit: μs (microsecond)
Communication Baud Rate	9600bps (default)	9600/19200/57600/115200(optional)
Built-in Power Supply	60W/65W/115W/120W/200W	
Number of Channels	4	
Connected Light Source Type	24V light source	10mA~2.5A/5A 24V light source
Operating Ambient Temperature	-5~50℃	
Dimensions	See Appendix for details	

1.4 Function Modes

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

Function	Nixie Tube Display Mode		Description
Brightness Setting	1. X	0≦X≦255	Adjust brightness
Operating Mode	H1. X	X=0 Constant Off Mode	Light turns on when the trigger signal is valid
		X=1 Constant On Mode	Light turns off when the trigger signal is valid
		X=2 Millisecond-level Stroboscopic Mode	Light flashes once (in milliseconds) when the trigger signal is valid (P. X, 1≦X≦999, Unit: ms)
		X=3 Microsecond-level Stroboscopic Mode	Light flashes once (in microseconds) when the trigger signal is valid (P. X, 1≦X≦999, Unit: μs)
Long press the MENU button at H1.X to enter the following parameter editing modes			
Level Trigger Mode	LL. X	X=0 Low Level Valid	Trigger signal is valid at low level
		X=1 High Level Valid	Trigger signal is valid at high level
Trigger Mode	Lo. X	X=0	Edge Trigger
		X=1	Level Trigger
Debounce Time Parameter	dt. X	0≦X≦99	X = debounce time, Unit: μs
Long press the MENU button at dt.X to enter the controller's short-circuit protection parameter setting			
Short-Circuit Protection Parameter Setting	PE.X	X=0	Disable short-circuit protection
		X=1	Enable short-circuit protection
Controller Internal Temperature Display	tp.X		Unit: ° C (Celsius)
Long press the MENU button at tp.X to enter the controller's cooling fan activation temperature setting			
Controller Cooling Fan Activation Temperature Setting	FS.X	20≦X≦60 Unit: ° C (Celsius)	Displays the controller's internal temperature via a temperature sensor and sets the cooling fan activation temperature (default: 55° C)
Linkage Mode	LH. X	X=0	No Linkage
		X=1	IO Linkage
		X=2	Sequence Linkage

Long press the MENU button at H2.X to enter the following parameter editing mode			
Initial Brightness Setting	C1.X	0≦X≦99	Adjust the initial brightness of the light source

2. User Instructions

2.1 Panel Description

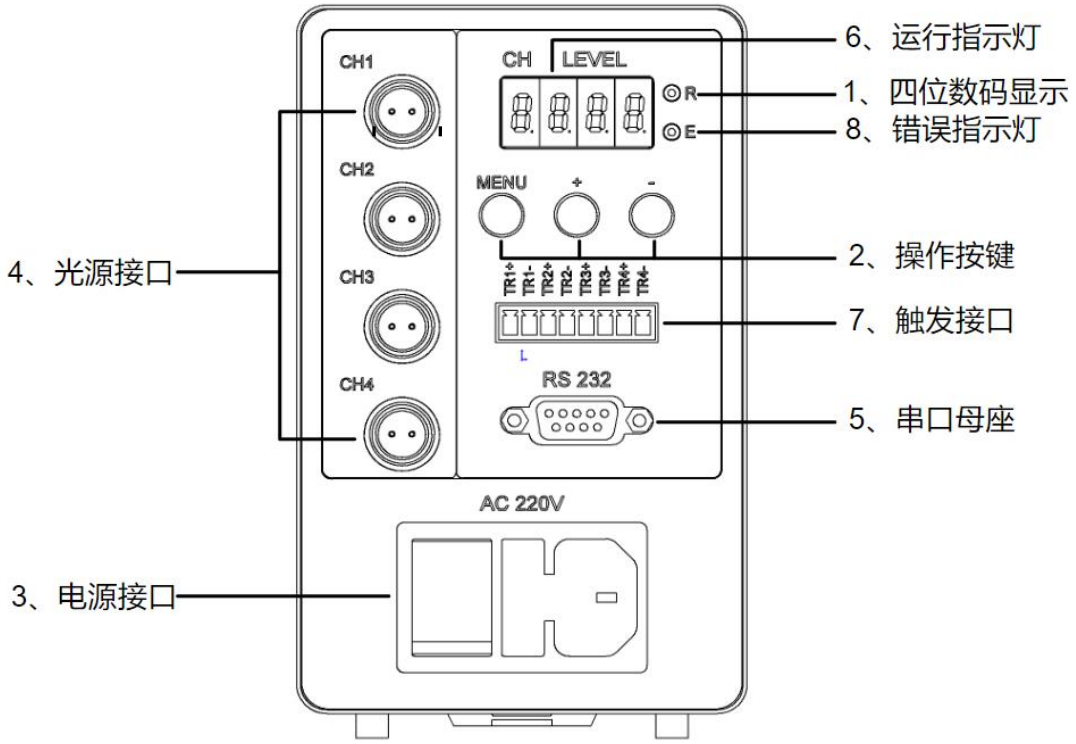


Figure 1 Front Panel

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	MENU: Function switching button; “+”: Increase value; “-”: Decrease value
3	Power Interface	DC24V input interface
4	Light Source Interface	Connect to 10mA~2.5A/3A 24V light source
5	Serial Female Port	Connect to devices with RS232 interface
6	Operation Indicator Light	Flashes when the controller is running

7	Trigger Interface	Connect to external signals for trigger switching
8	Error Indicator Light	Lights up when the controller malfunctions

2.2 Light Source Interface Definition

Table 4 Light Source Interface Definition

	Position	Definition	Description
	1	Light+	Positive pole of light source output
	2	Light-	Negative pole of light source output

2.3 Serial Female Port Interface Definition

The definition of the serial female port is shown in Figure 2; it is connected to the 9-pin serial port of the computer host using a parallel cable.

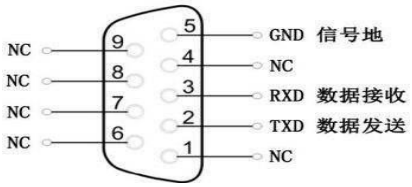


Figure 2 Serial Female Port Interface Definition

Table 5 Serial Female Port Interface Definition

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 3:

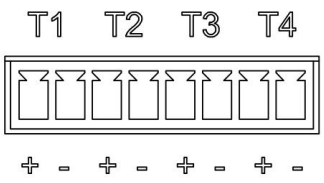


Figure 3 External Trigger Input Interface

There are 4 channels for the external trigger input interface; each channel has two input terminals: “+” and “-” (x represents the channel number). A unidirectional optocoupler is built inside, and its electrical diagram is shown in Figure 4:

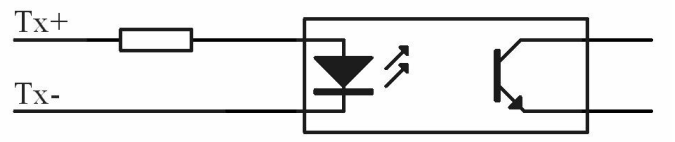


Figure 4 Internal Electrical Diagram of External Trigger

2.4.2 Trigger Interface Wiring Example

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

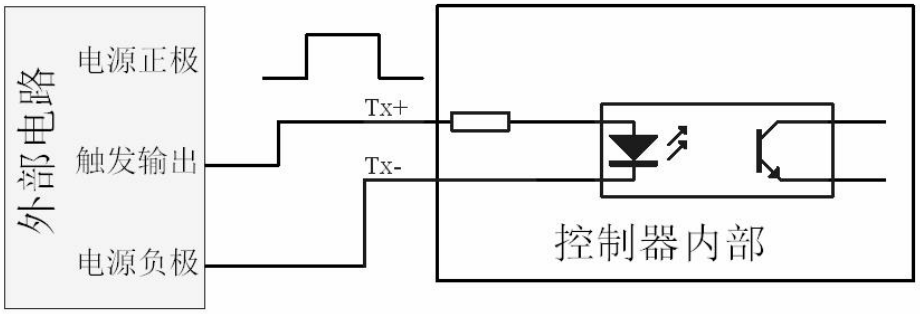


Figure 5 Wiring Example for Rising Edge or High Level Validity

Connect the trigger output of the external control circuit to Tx+, and the negative pole of the power supply to Tx-. 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 6:

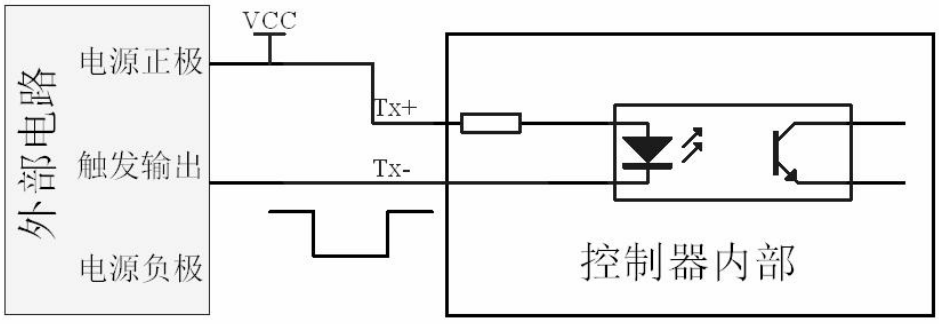


Figure 6 Wiring Example for Falling Edge or Low Level Validity

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

2.4.3 Trigger Timing Diagrams

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:

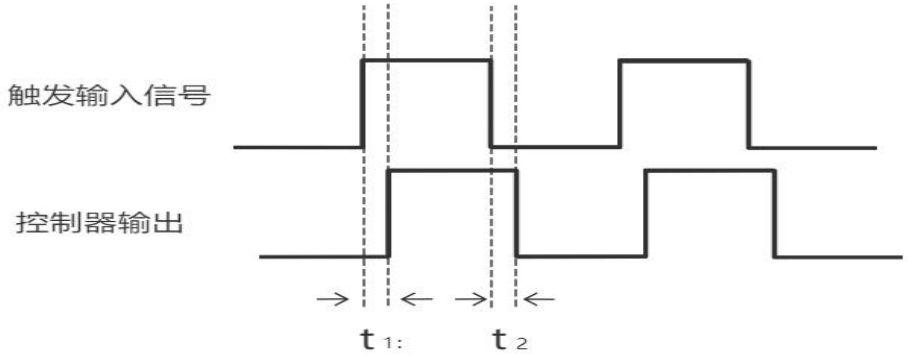


Figure 7 Constant Off Mode Timing Diagram

Parameter	Time
t_1	≦25us
t_2	≦150us

Constant On Mode: When the controller'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:

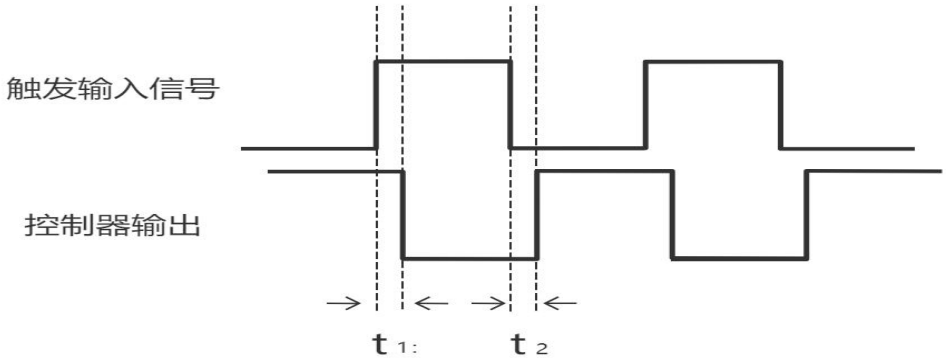


Figure 8 Constant On Mode Timing Diagram

Parameter	Time
t_1	≦25us
t_2	≦150us

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 9:

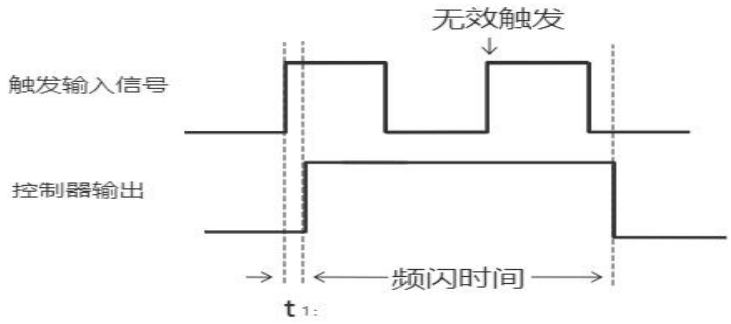


Figure 9 Stroboscopic Mode Timing Diagram

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 previous brightness setting of Channel 1 was 10, the display will show “1.010”.The following takes setting the brightness of Channel 2 to 125 as an example; the flow chart is shown in Figure 10.

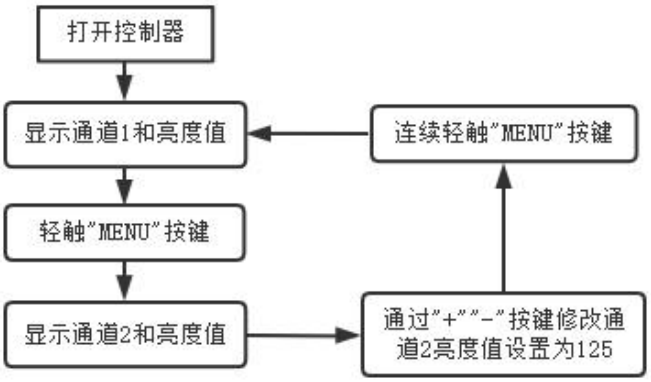


Figure 10 Brightness Setting Flow Chart

2.5.2 Operating Mode Setting

This controller model 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.

2.5.3 Constant Off Mode Setting

The flow chart for setting Constant Off Mode of Channel 2 is shown in Figure 11.

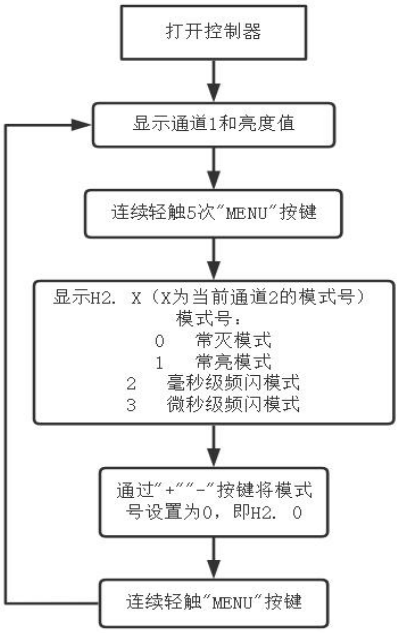


Figure 11 Constant Off Mode Setting Flow Chart

2.5.4 Constant On Mode Setting

The flow chart for setting Constant On Mode of Channel 2 is shown in Figure 12.

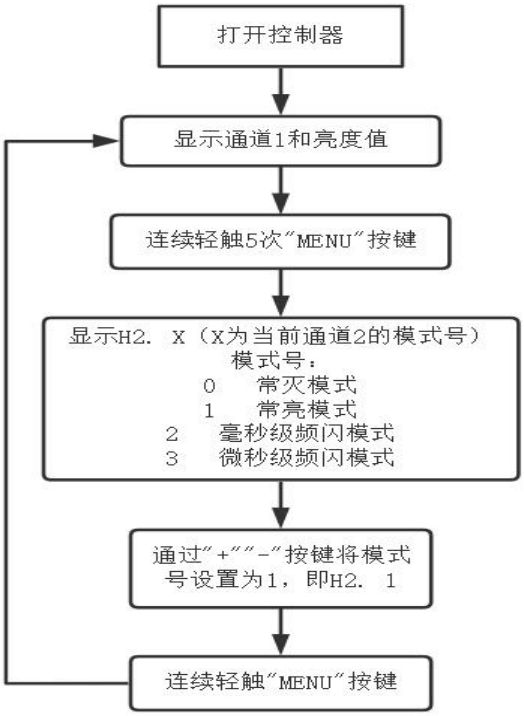


Figure 12 Constant On Mode Setting Flow Chart

2.5.5 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 13.

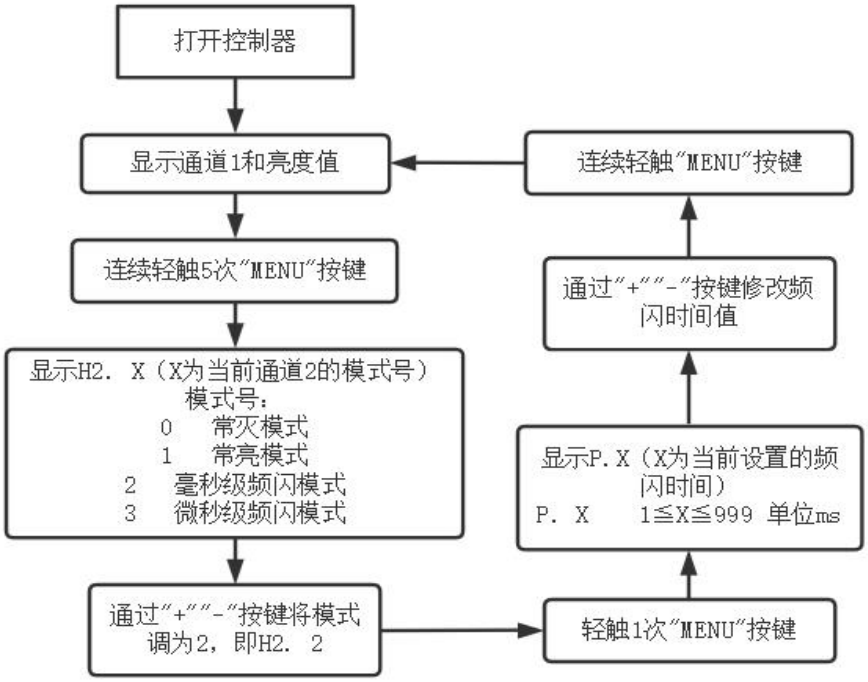


Figure 13 Millisecond-level Stroboscopic Mode and Time Setting Flow Chart

2.5.6 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 14.

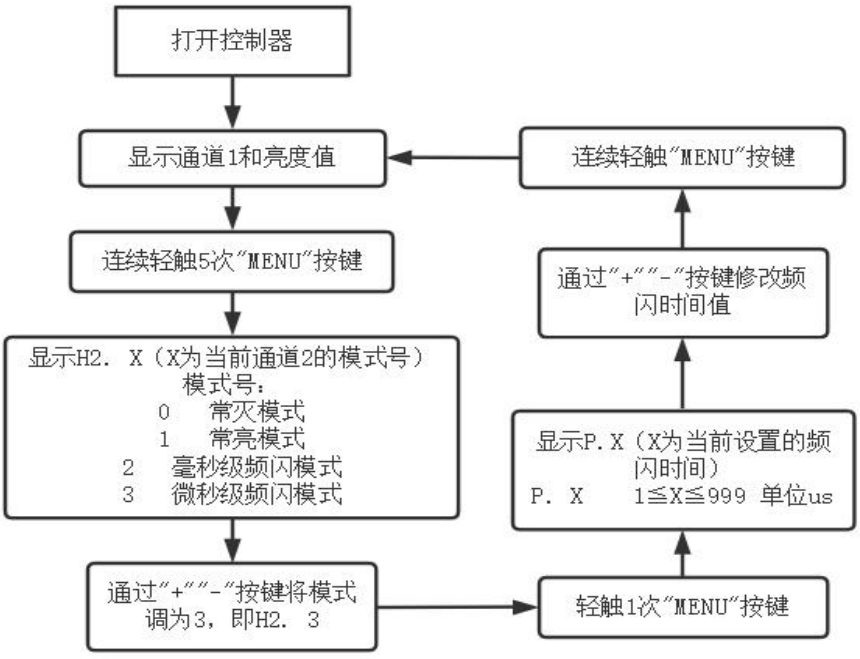


Figure 14 Microsecond-level Stroboscopic Mode and Time Setting Flow Chart

2.5.7 High-level Trigger Mode Setting

The flow chart for setting the high-level trigger mode for all channels is shown in Figure 15.

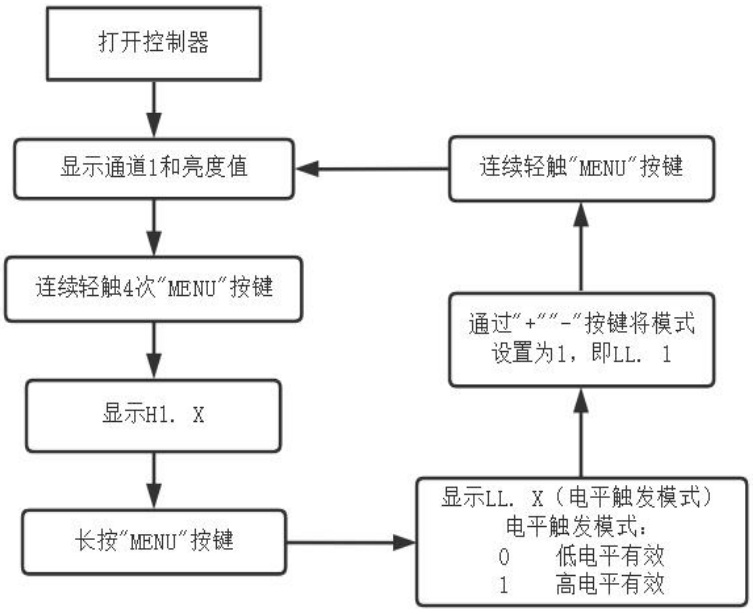


Figure 15 High-level Trigger Mode Setting Flow Chart for All Channels

2.5.8 Edge Trigger Mode Setting

The flow chart for setting the edge trigger mode for all channels is shown in Figure 16.

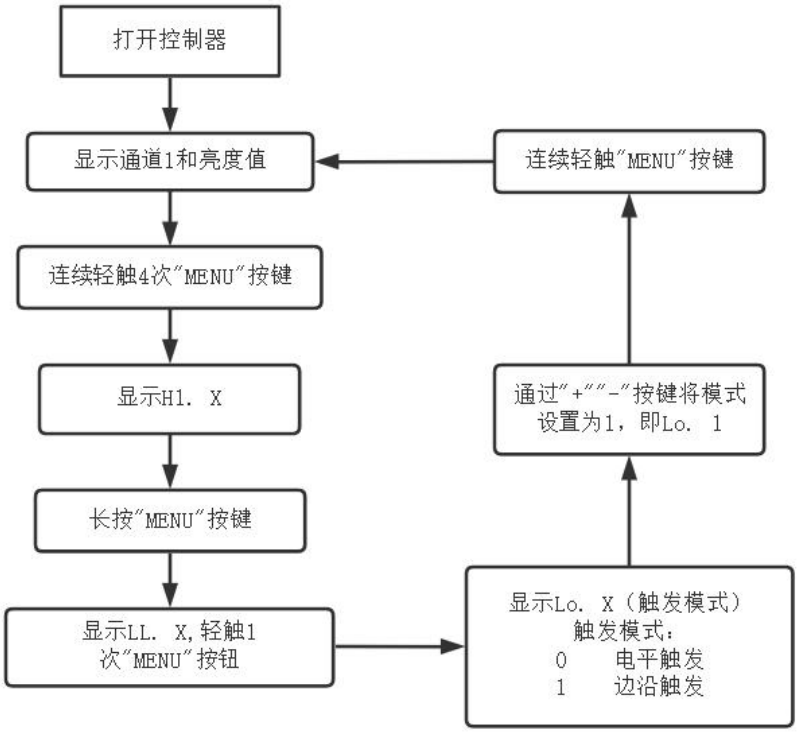


Figure 16 Edge Trigger Mode Setting Flow Chart for All Channels

2.5.9 Debounce Time Parameter Setting

The flow chart for setting the debounce time parameter for all channels is shown in Figure 17.

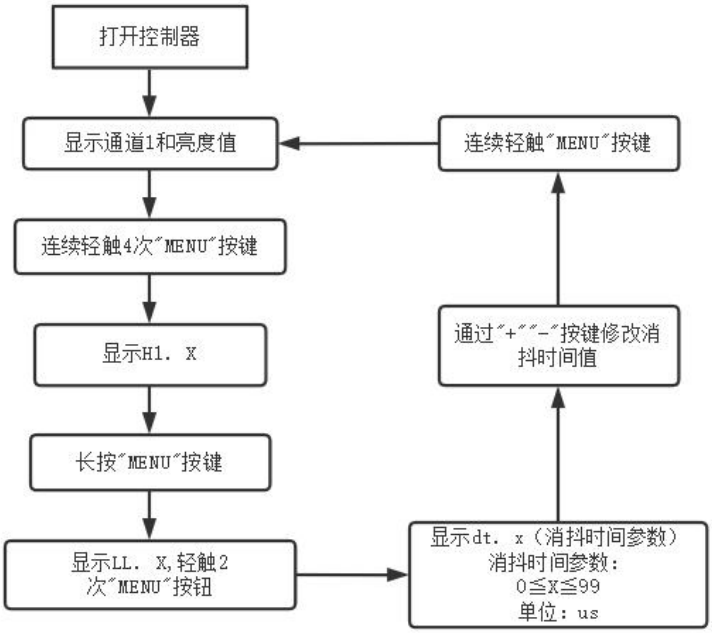


Figure 17 Debounce Time Parameter Setting Flow Chart for All Channels

2.5.10 Short-Circuit Protection Setting

The flow chart for short-circuit protection setting is shown in Figure 18.

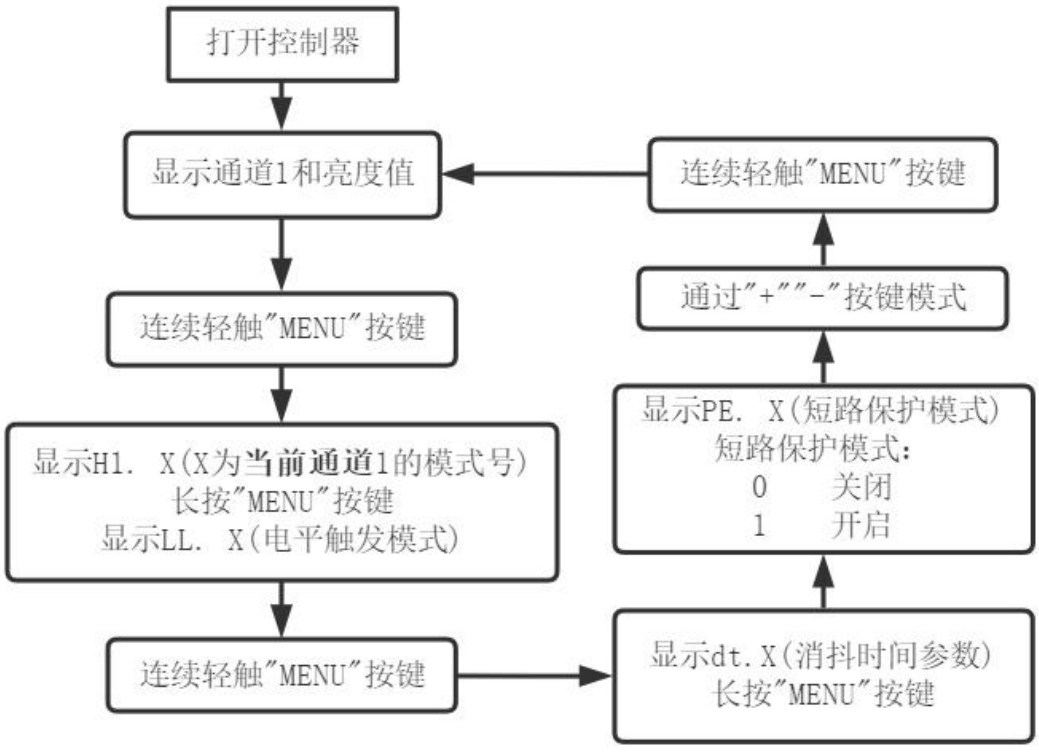


Figure 18 Short-Circuit Protection Setting Flow Chart

2.5.11 Fan Temperature Display and Setting

The flow chart for setting the fan activation temperature is shown in Figure 19.

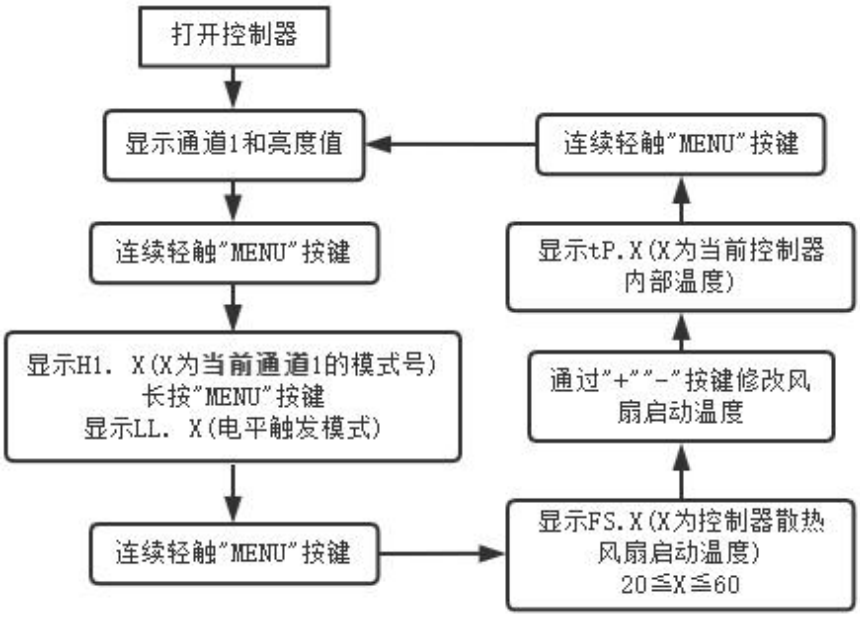


Figure 19 Flow Chart for Fan Activation Temperature Setting

2.5.12 Initial Brightness Setting

The initial brightness setting for Channel 2 is shown in Figure 20.

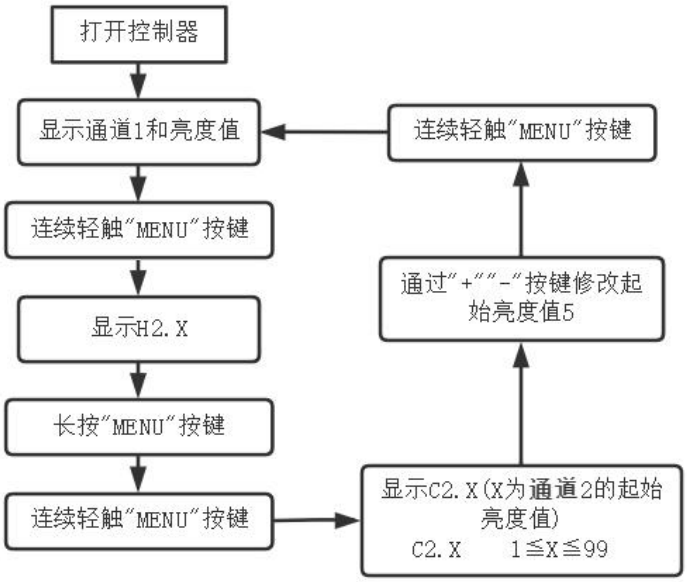


Figure 20 Flow Chart for Initial Brightness Setting of Channel 2

2.5.13 Key Lock Setting

Press and hold the MENU key when the channel and brightness values are displayed to lock the keys. After locking, you can switch between the data of each channel but cannot modify the data.

2.6 Linkage Mode Setting

This product provides two linkage modes: 1. IO Linkage; 2. Sequence Linkage. Users can select and set the mode according to actual needs.

2.6.1 IO Linkage Mode Setting

In IO linkage mode, when one of the trigger channels receives a trigger signal, the light sources of all four channels turn on simultaneously. The brightness of the light sources is determined by the group parameter settings (the brightness value is displayed on the screen). The setting method for other trigger channels is similar.

Description of IO Linkage Mode:

When the interface displays "n. 0", if a corresponding channel responds, the number "0" will change to the number of the responding channel.

Example: When a trigger signal is sent to Channel 1, the light sources of all four channels turn on simultaneously. The brightness of Channel 1 is 100, Channel 2 is 50, Channel 3 is 150, and Channel 4 is 100.

The flow chart for IO linkage mode setting is shown in Figure 21.

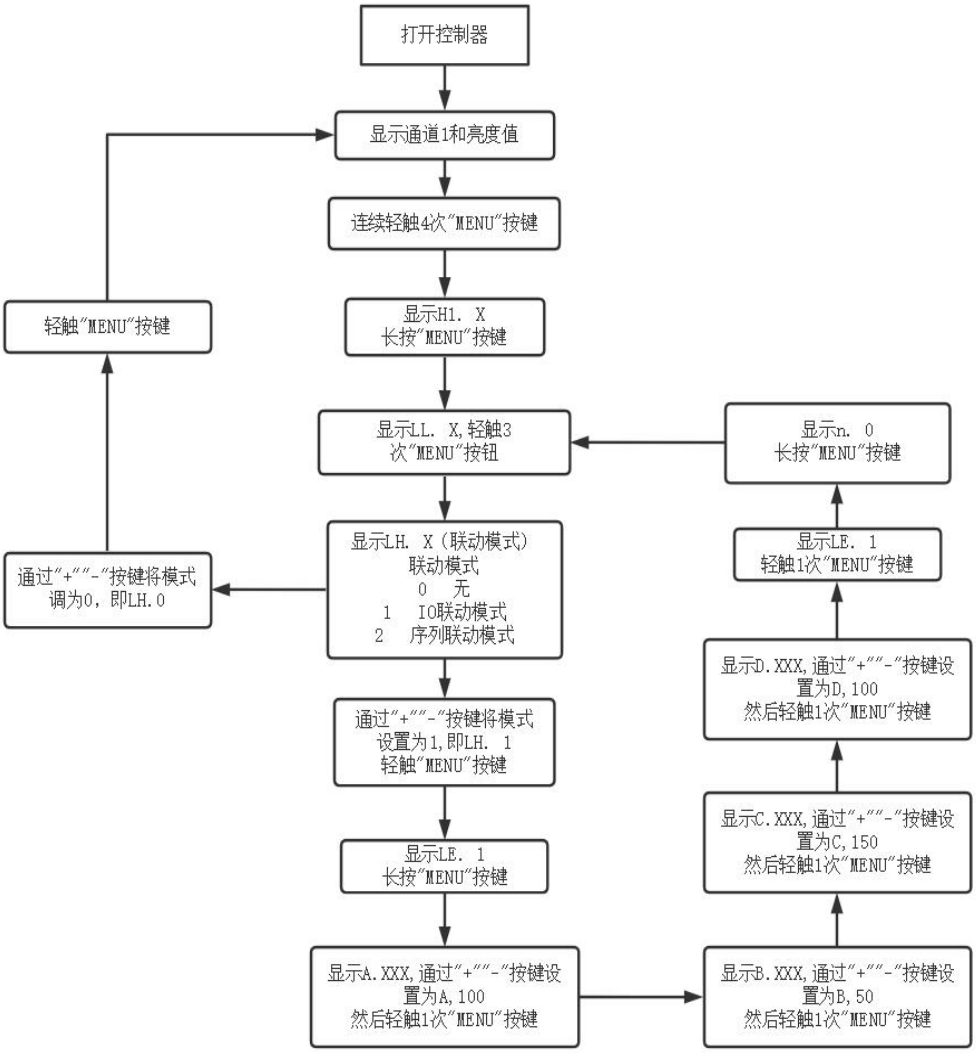


Figure 21 Flow Chart for IO Linkage Mode Setting

2.6.2 Sequence Linkage Mode Setting

In sequence linkage mode, take Channel 1 as the trigger channel. Each time a trigger signal is sent, Channel 1 turns on, and the sequence increments by 1. After incrementing to the last sequence, it automatically returns to the first sequence to cycle. The brightness of the light source during each activation is determined by the group parameters of the current sequence (a maximum of 8 groups of parameters can be preset). The setting method for other trigger channels is similar.

Example: When a trigger signal is sent to Channel 1, the brightness of Channel 1’s light source follows the sequence: 100, 125, 150, 175, 50, 75.Each trigger causes an increment; after reaching the last sequence, it automatically returns to the first sequence to cycle.The flow chart for sequence linkage mode setting is shown in Figure 22.

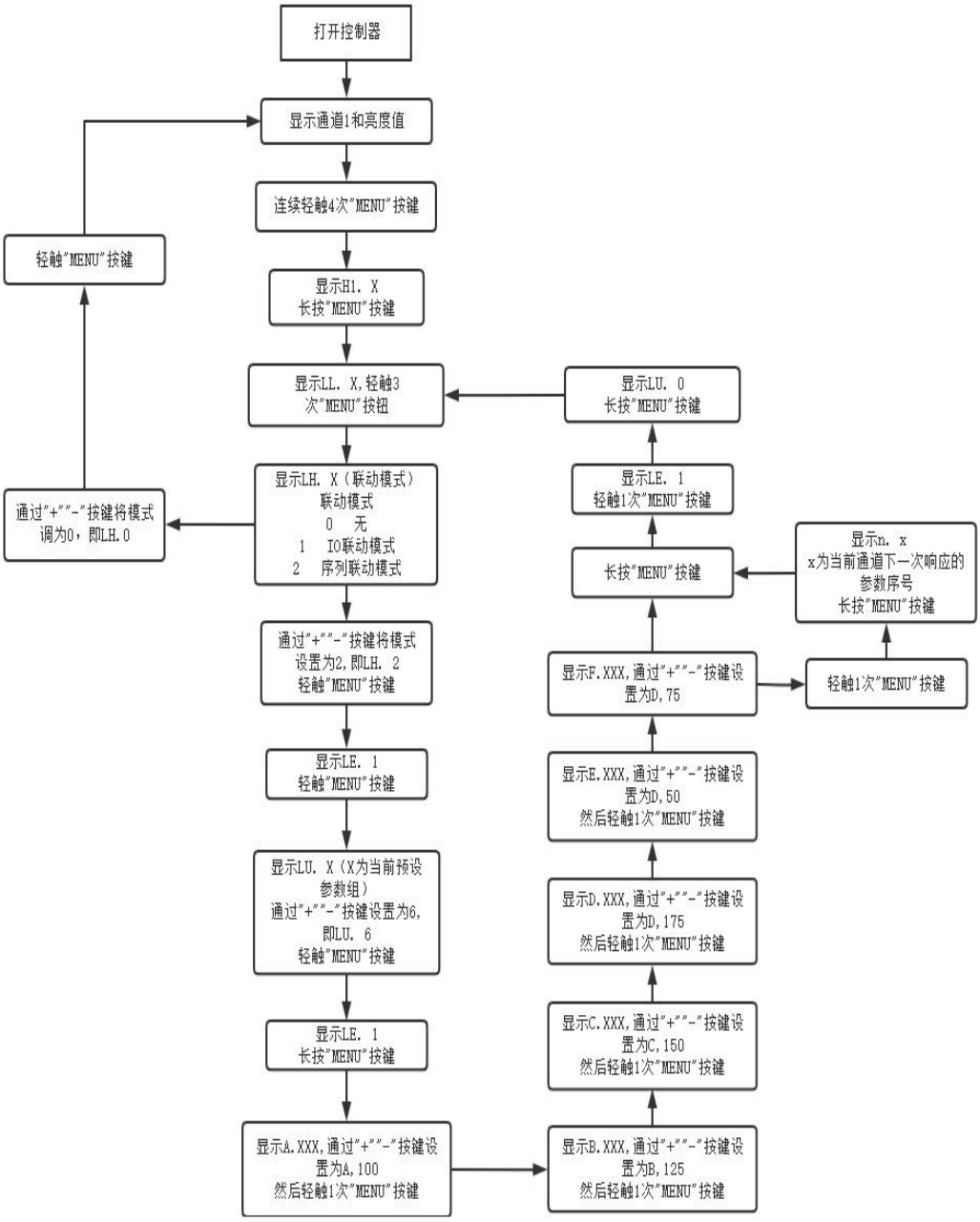


Figure 22 Flow Chart for Sequence Linkage Mode Setting

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 23:

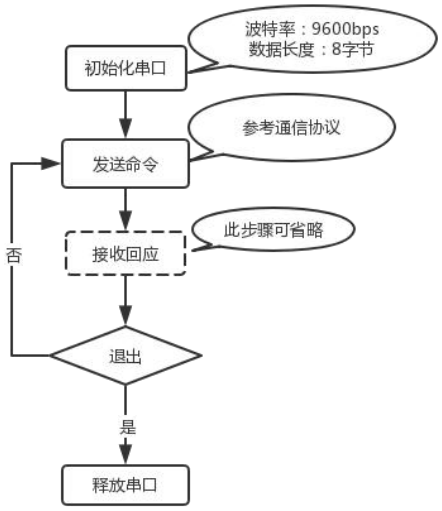


Figure 23 Communication Programming Flow

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、The flag is: $.

3、The command is as shown in Table 8 (Command Function Table).

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

6、The channel is "1", "2", "3", or "4", representing Channels 1 to 4 respectively.

7、Data = 0XX (XX is any value from 00 to FF), which is the setting parameter of the corresponding channel. The high byte comes first, and the low byte comes next.

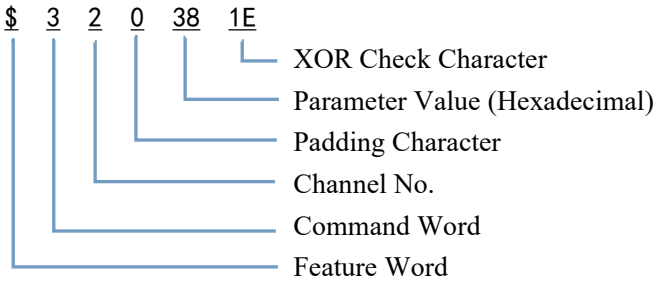
8、XOR Checksum = XOR checksum of all bytes except the checksum bytes (including the flag, command, channel, and data). The high 4-bit ASCII code of the checksum comes first, and the low 4-bit ASCII code comes next.

Table 8 Command Function Table

Character	Function	Description
“1”	Turn on the corresponding channel	The corresponding channel is determined by the channel byte.
“2”	Turn off the corresponding channel	The corresponding channel is determined by the channel byte.
“3”	Set brightness parameters of the corresponding channel	The corresponding channel is determined by the channel byte; brightness parameters are Data 1~Data 3.
“4”	Read brightness parameters of the corresponding channel	The corresponding channel is determined by the channel byte; the return format is the same as the send format.
“7”	Trigger stroboscopic function of the corresponding channel	The corresponding channel is determined by the channel byte; this function is invalid in non-stroboscopic modes.
“8”	Set mode of the corresponding channel	The corresponding channel is determined by the channel byte.
“9”	Set stroboscopic time of the corresponding channel	The corresponding channel is determined by the channel byte; this function is invalid in non-stroboscopic modes.

3.4 Communication Examples

To set the brightness of Channel 2 to 56, write the ASCII code "$320381E" (as shown below):



	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 of 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 result during the calculation of the XOR checksum. It is only necessary to ensure the format is 0XX (XX is any value from 00 to 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 of 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

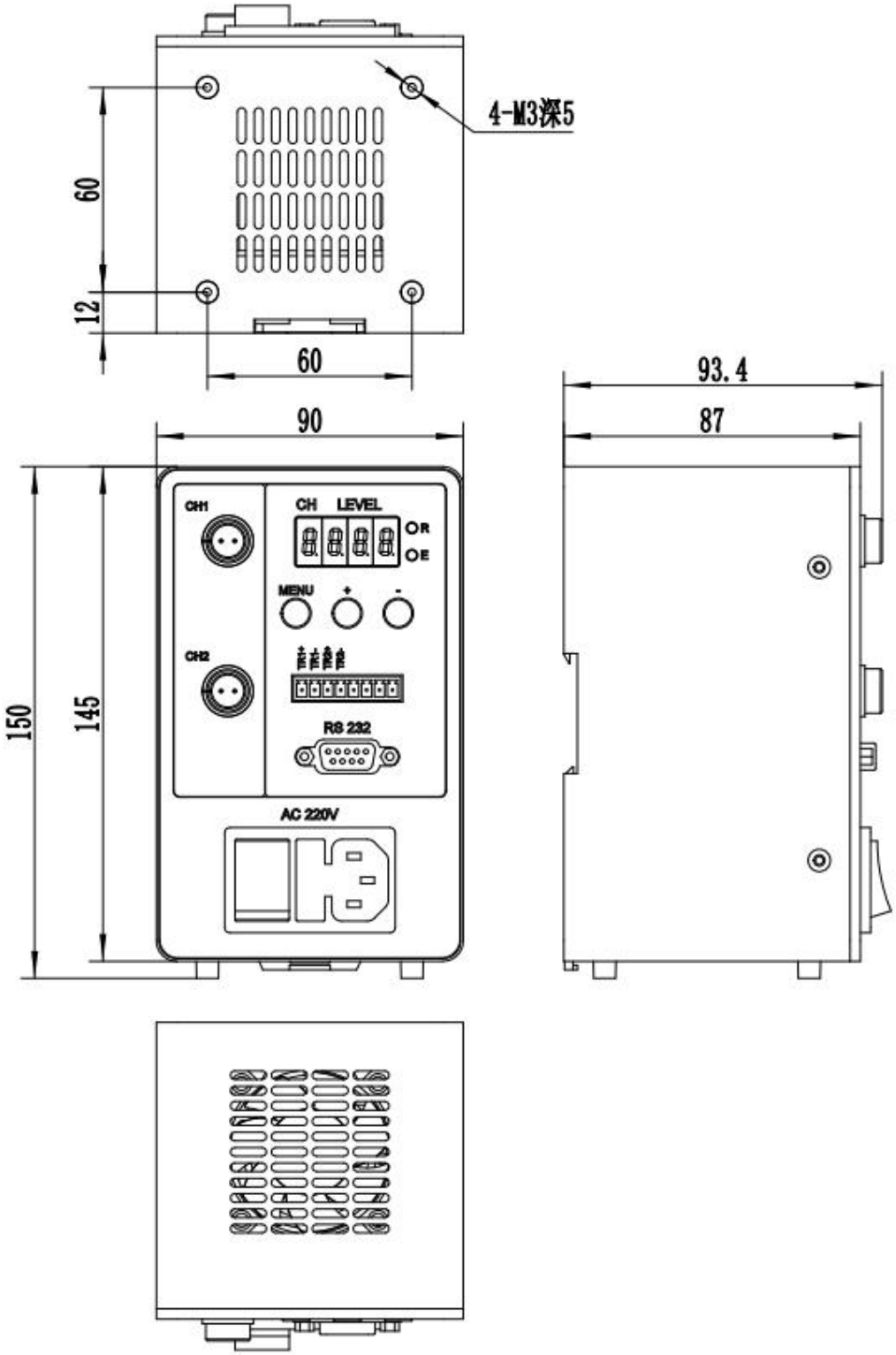
4. Prompt Command Index

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

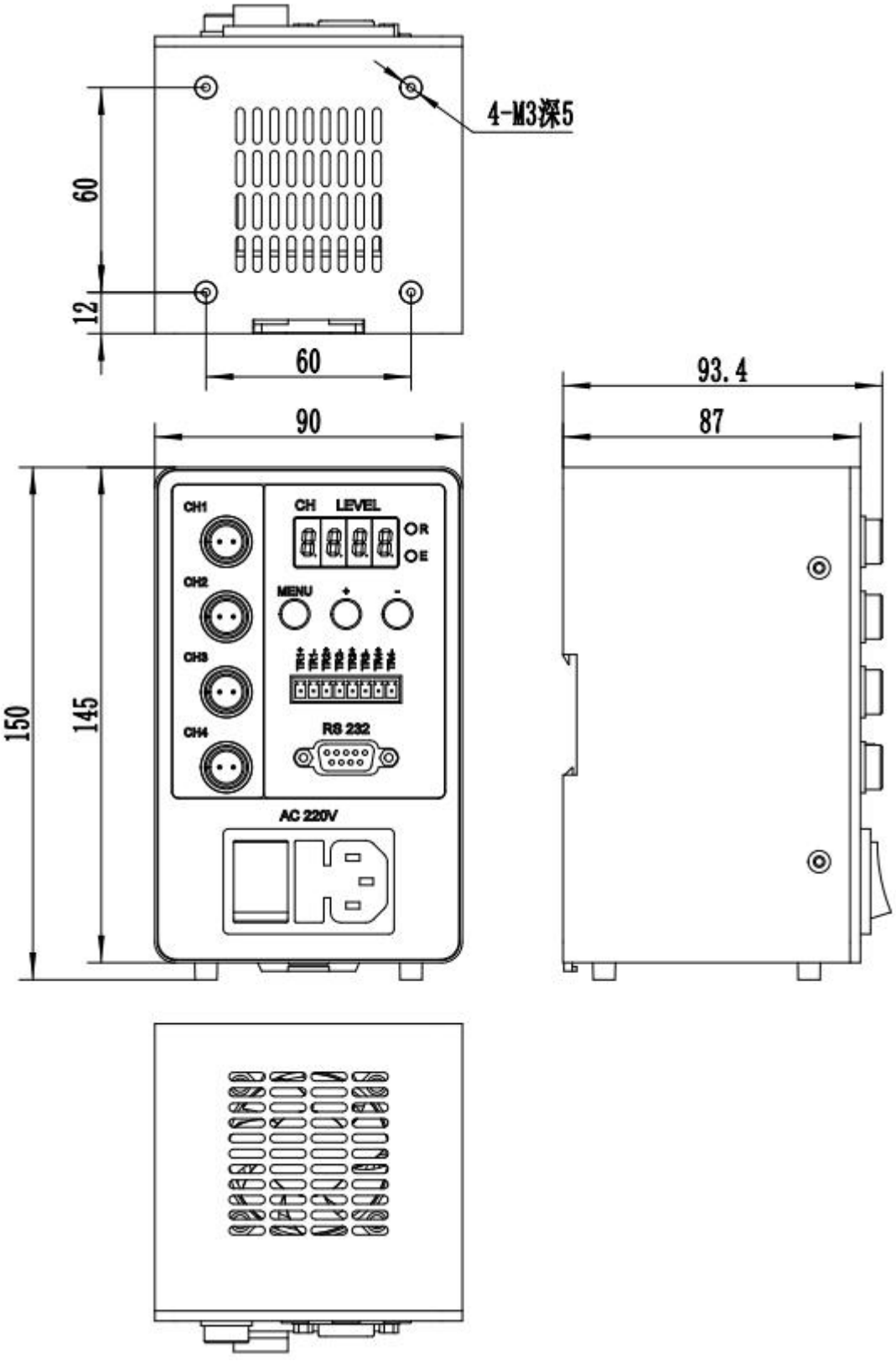
Command	Description	Troubleshooting Solution for Prompt Command
F.1	Unregistered	Re-register
F.2	Storage Chip Damaged	Need to return to the factory for repair
F.3	Exceeding Light Source Power, Short Circuit, Signal Interference	Check the light source power, whether the light source is short-circuited, 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

2CH



4CH


4-M3深5
60
12
60
90
93.4
87
150
145
CH1
CH2
CH3
CH4
CH
LEVEL
R
E
MENU
+
-
RS 232
AC 220V