

Digital Intelligent Constant Current Controller

DBS-XXX-MI02C-240XX-X

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	MI02C Series (See 1.2 Product Selection for details)		1
Terminal Block	3.81-8P		2
Power Cable	1.5m National Standard IEC 320 C13 Plug		1
Serial Cable	1.5M		1

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

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1. Product Introduction

1.1 Product Features

- Digital constant current controller with constant current output and no brightness flicker
- Supports RS232 communication
- Output current adjustable per channel, maximum current of 3A
- Supports external trigger mode
- Supports millisecond-level and microsecond-level strobe
- Manual brightness and mode setting
- 5~24V unidirectional trigger, adaptable to high/low level trigger modes
- Equipped with over-temperature protection and output short-circuit protection
- 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-65-MI02C-24020-2	65W	2A
DBS-120-MI02C-24030-4	120W	3A
DBS-200-MI02C-24030-4	200W	3A

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	2A/3A per channel (adjustable)	Maximum total current of 8A
Over-Temperature Protection	Yes	Over-temperature protection is triggered when the temperature exceeds 90°C
Output Short-Circuit Protection	Yes	
Operating Modes	4 Types	0: Constant off; 1: Constant on; 2: Millisecond-level stroboscope; 3: Microsecond-level stroboscope
Light Emitting Mode	Constant on/constant off/stroboscope	External triggering is available in constant off and stroboscope modes
Trigger Mode	Edge + Level Trigger	Edge trigger is used in stroboscope mode; level trigger is used in constant on and constant off modes
Constant On Brightness Level	255	255-level brightness adjustment
Millisecond-Level Stroboscope Time	1~999	Unit: ms (millisecond)
Microsecond-Level Stroboscope Time	1~999	Unit: us (microsecond)

Communication Baud Rate	9600bps (default)	9600/19200/57600/115200 (optional)
Built-in Power Supply	120W/200W	
Number of Channels	4	-
Connected Light Source Type	24V light source	10mA~2/3 24V light source
Operating Ambient Temperature	-5~50°C	
Dimension	See Appendix for details	

1.4 Functional Modes

Table 2 Functional Modes Table
(Take Channel 1 as an example)

Function	Digital Tube Display Mode		Description
Brightness Setting	1. X	$0 \leq X \leq 255$	Adjust brightness
Operating Mode	H1. X	X=0 Constant off mode	The light source turns on when the trigger signal is valid
		X=1 Constant on mode	The light source turns off when the trigger signal is valid
		X=2 Millisecond-level stroboscope mode	The light source flashes once for a millisecond-level duration when the trigger signal is valid (P. X, $1 \leq X \leq 999$, Unit: ms)
		X=3 Trigger Delay Off mode	The light source turns on when the trigger signal is valid, and turns off with a delay after the trigger signal becomes invalid (P. X, $1 \leq X \leq 999$, Unit: ms)
Debounce Time Parameter	dt. X	$0 \leq X \leq 99$	X represents debounce time, Unit: us
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
Controller Cooling Fan Activation Temperature Setting	FS.X	$20 \leq X \leq 60$ Unit: Celsius (°C)	The internal temperature of the controller is displayed via a temperature sensor, and the activation temperature of the cooling fan is set (default: 55°C).
Press and hold the MENU button at tp.X to enter the cooling fan activation temperature setting interface of the controller			
Controller Internal Temperature Display	tp.X		Unit: Celsius (°C)
Press and hold the MENU button at H1. X to enter the following parameter editing mode			
时间系数	LF.X	$1 \leq X \leq 99$	Stroboscope time or delay off time = Time coefficient $\times$ P. X
At brightness level 1.XXX, long press the menu button to enter Controller 1 channel maximum current limit settings			
Maximum Current Limit Setting	A. X.X	$1 \leq X \leq Y$ (= maximum current of the selected model)	Setting of maximum current output limit

2. User Instructions

2.1 Panel Description

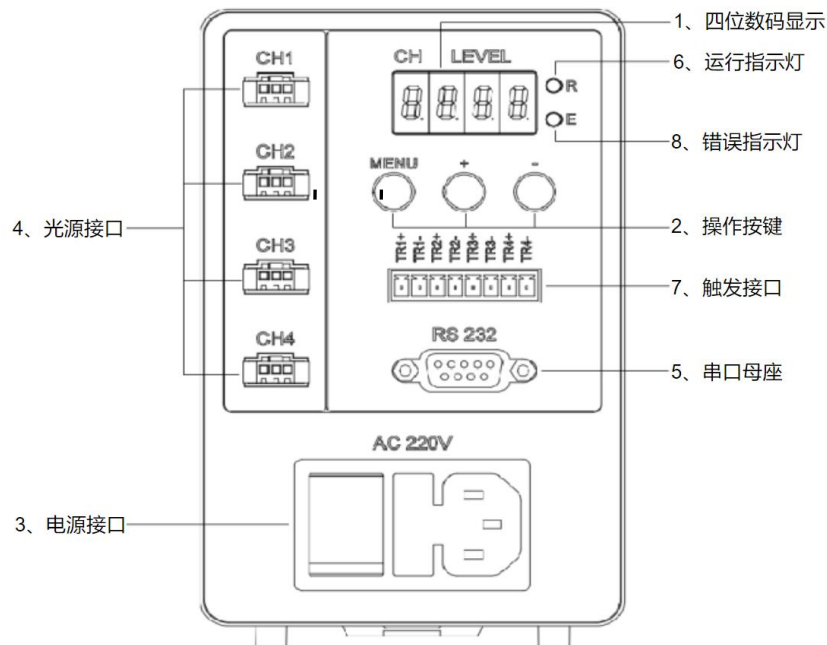


Figure 1 Front Panels

Table 3 Panel Interface Definition Table

No.	Name	Description
1	4-digit digital 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: Function switching button; "+": Increase value; "-": Decrease value
3	Power Interface	Power input interface
4	Light Source Interface	Connect to 10mA~2/3 24V light source
5	Serial Female Socket	Connect to devices with RS232 interface
6	Running Indicator Light	The indicator light flashes when the controller is running
7	Trigger Interface	Connect to external signals for trigger switching operation
8	Error Indicator Light	Lights up when the controller malfunctions

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	Not Connected
	3	Light-	Negative pole of light source output

2.3 Serial Female Socket Interface Definition

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

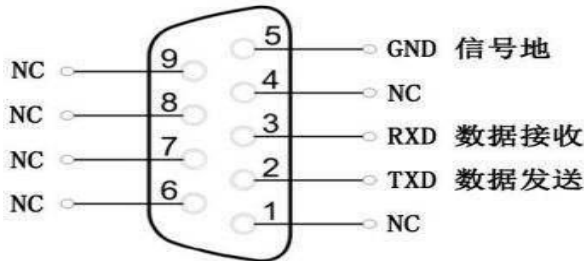


Figure 2 Serial Female Socket Interface Definition

Table 5 Serial Female Socket Interface Definition Table

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

2.4 Trigger Description

2.4.1 Trigger Interface

The external trigger input interface is shown in Figure 3:

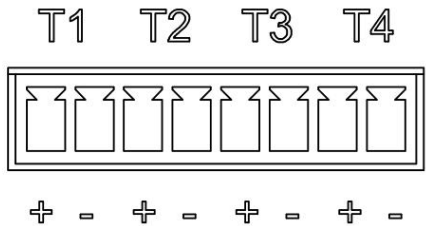


Figure 2 External Trigger Input Interface

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

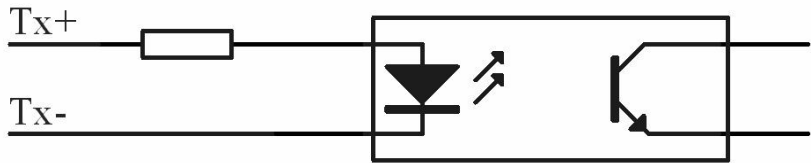


Figure 4 Internal Electrical Diagram of External Trigger

2.4.2 Trigger Interface Wiring Example

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

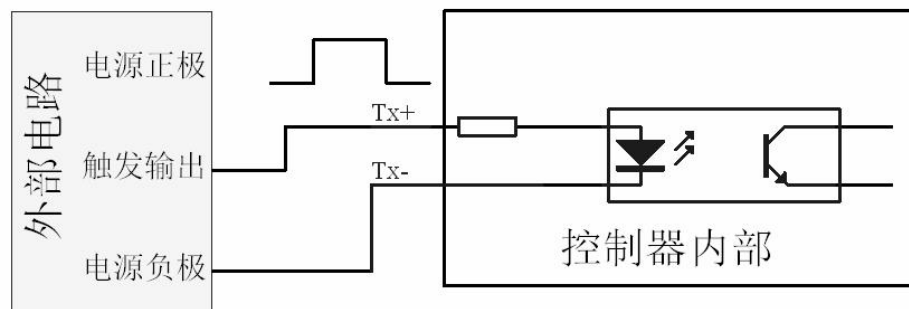


Figure 5 Wiring Example for Rising Edge or High-Level Valid

The trigger output of the external control circuit is connected to Tx+, and the negative pole of the power supply is connected 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 valid, the wiring is shown in Figure 6:

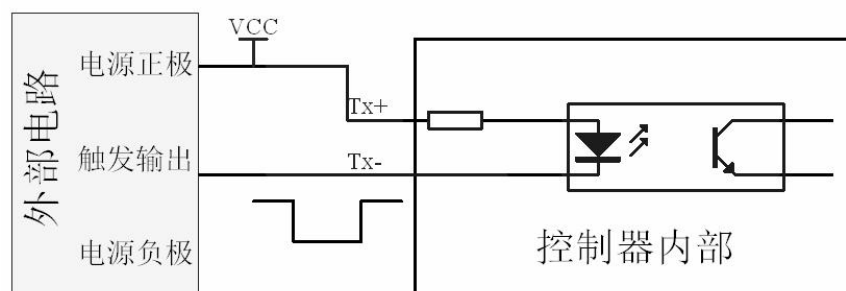


Figure 6 Wiring Example for Falling Edge or Low-Level Valid

The trigger output of the external control circuit is connected to Tx-, and the positive pole of the power supply is connected 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 Diagram

Constant off mode: When the trigger input signal of the controller is a valid signal, the light source turns on. Taking high-level valid as an example to illustrate the timing relationship, as shown in Figure 7:

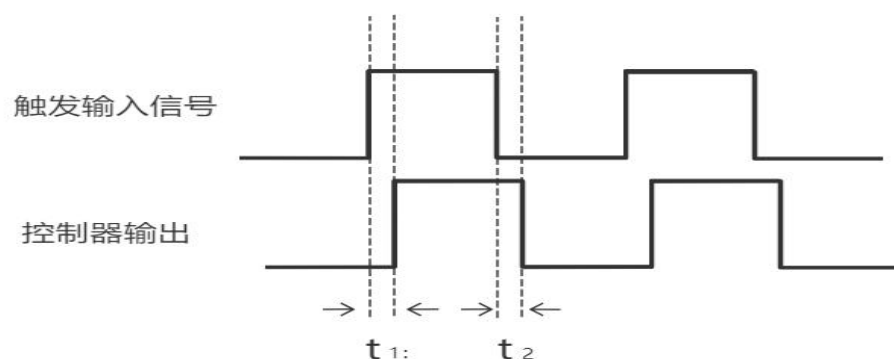


Figure 7 Constant Off Mode Timing Diagram

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

Constant on mode: When the trigger input signal of the controller is a valid signal, the light source turns off. Taking high-level valid as an example to illustrate the timing relationship, as shown in Figure 8:

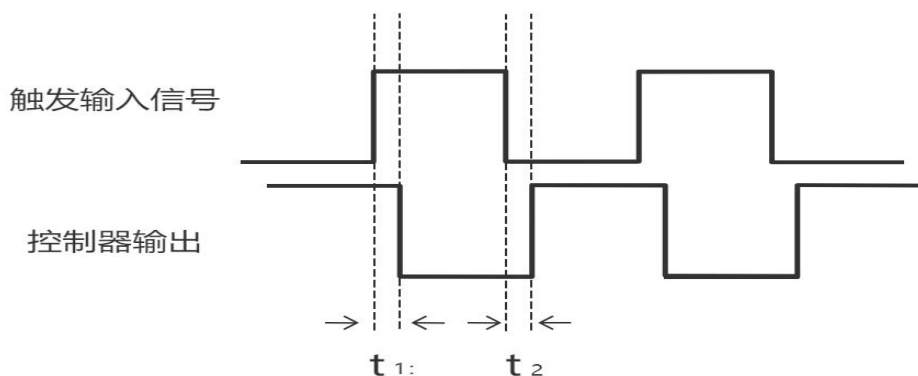


Figure 8 Constant On Mode Timing Diagram

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

Stroboscope mode: When the controller is set to millisecond-level stroboscope or microsecond-level stroboscope, the light source turns on when the trigger input signal of the controller is a valid signal. Taking high-level valid as an example to illustrate the timing relationship, as shown in Figure 9:

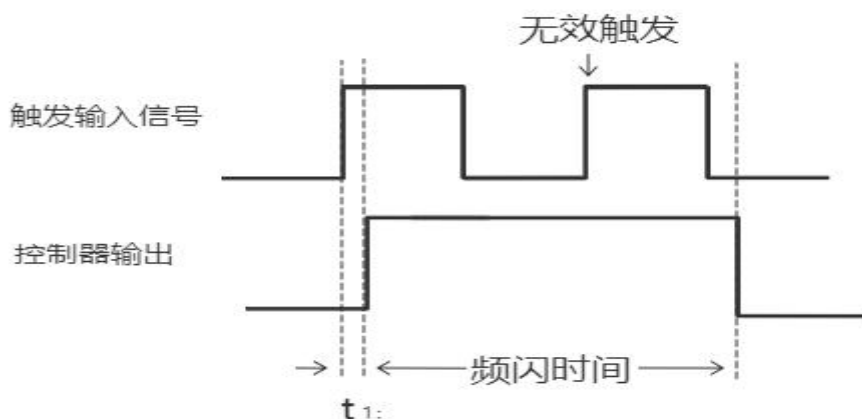


Figure 9 Stroboscope Mode Timing Diagram

Parameter	Time
t_1	$\leq 25\mu s$

2.5 Manual Setting

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 1 to 125 as an example, and its flow chart is shown in Figure 11.

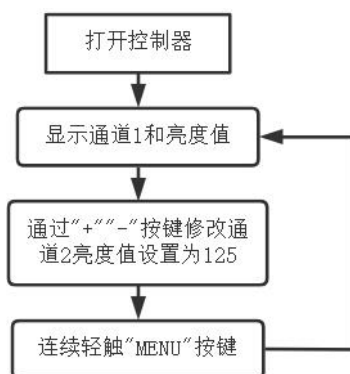


Figure 11 Brightness Setting Flow Chart

2.5.2 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 following takes setting the mode of Channel 1 as an example.

2.5.3 Constant Off Mode Setting

The flow chart for setting the constant off mode of Channel 1 is shown in Figure 12.

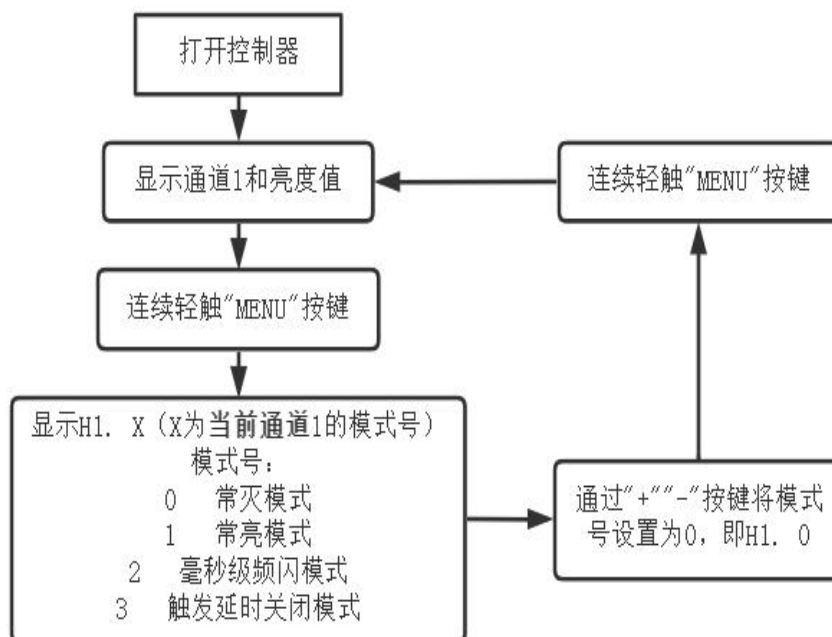


Figure 12 Constant Off Mode Setting Flow Chart

2.5.4 Constant On Mode Setting

The flow chart for setting the constant on mode of Channel 1 is shown in Figure 13.

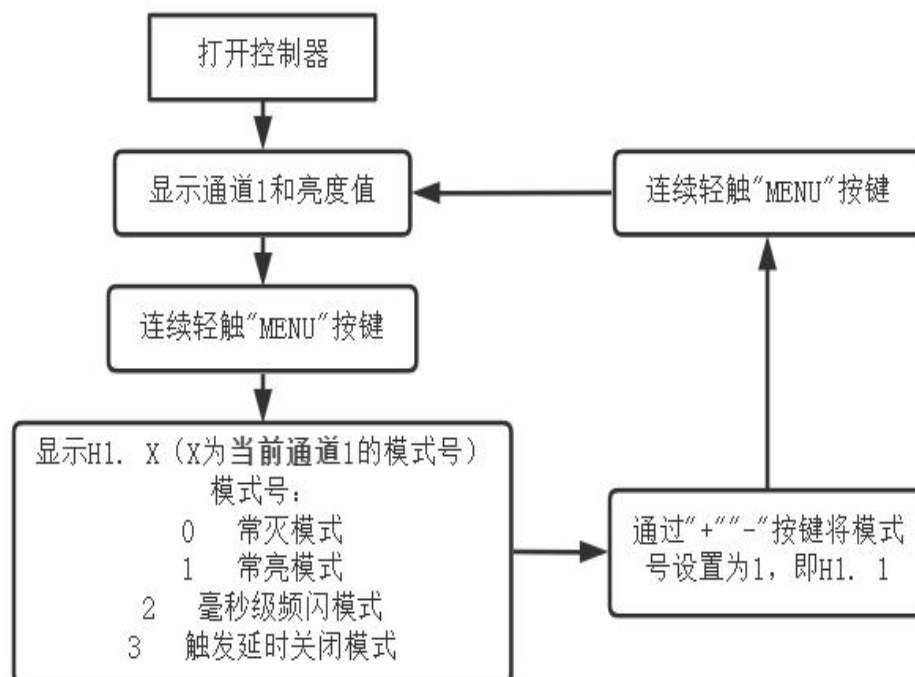


Figure 13 Constant On Mode Setting Flow Chart

2.5.5 Millisecond-Level Stroboscope Mode Setting

The flow chart for setting the millisecond-level stroboscope mode and stroboscope time of Channel 1 is shown in Figure 14.

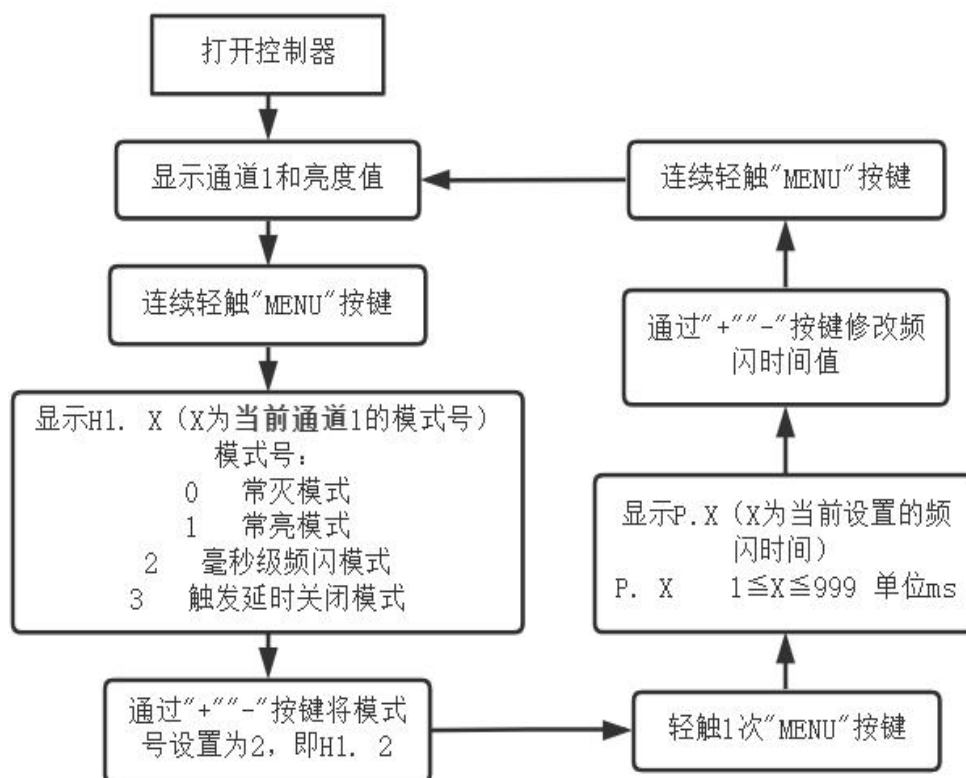


Figure 14 Millisecond-Level Stroboscope Mode and Time Setting Flow Chart

2.5.6 Trigger Delay Off Mode Setting

The flow chart for setting the trigger delay off mode of Channel 1 and setting the delay time to 500 is shown in Figure 15.

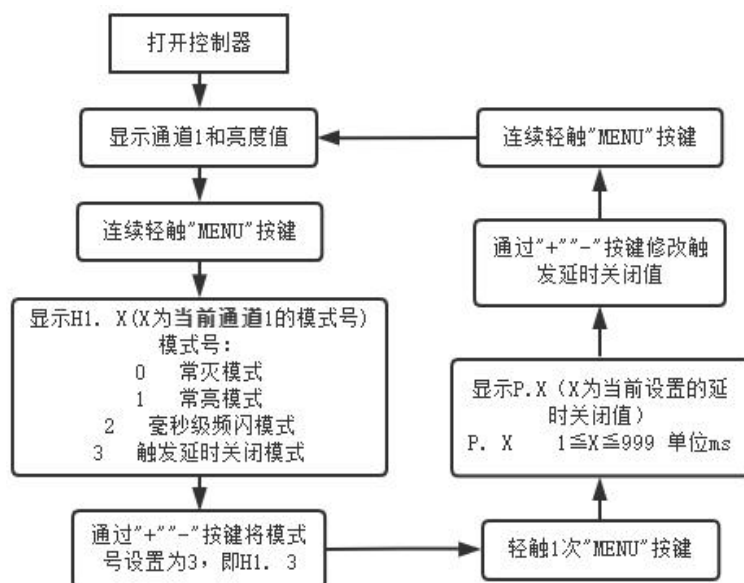


Figure 15 Trigger Delay Off Mode and Delay Time Setting Flow Chart

2.5.7 Debounce Time Setting

In occasions with strong interference signals, interference signals often cause false triggering of the controller. To eliminate the impact of interference signals, the debounce time can be set to filter out interference signals. The setting flow is shown in Figure 16.

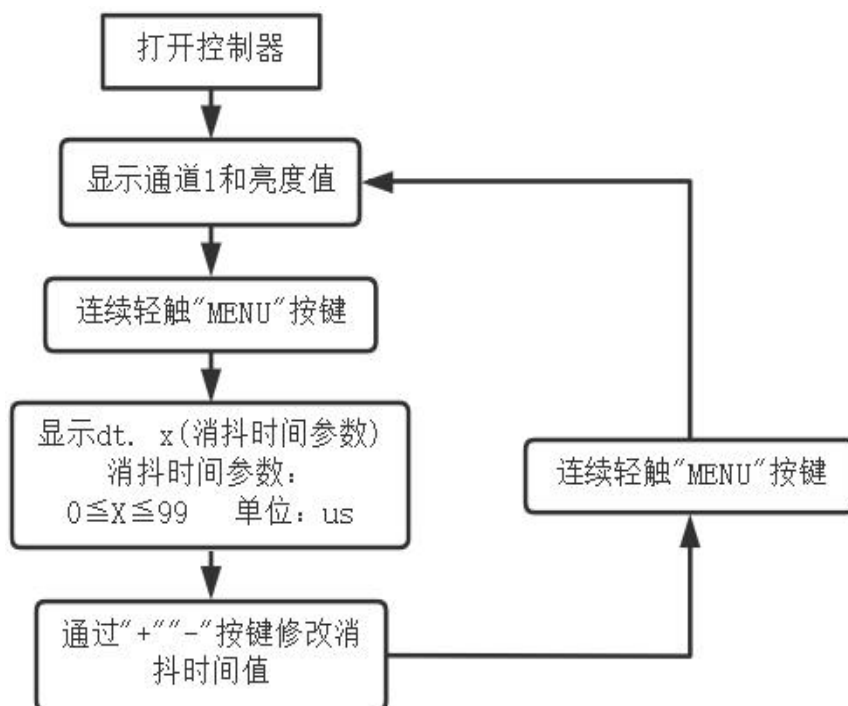


Figure 16 Debounce Time Setting Flow Chart

2.5.8 Trigger Level Setting

In different application scenarios, the valid signals of sensors or control devices are different. To adapt to different trigger signal sources, the trigger level of this model of controller can be set according to requirements. The setting flow is shown in Figure 17, taking setting high-level valid as an example.

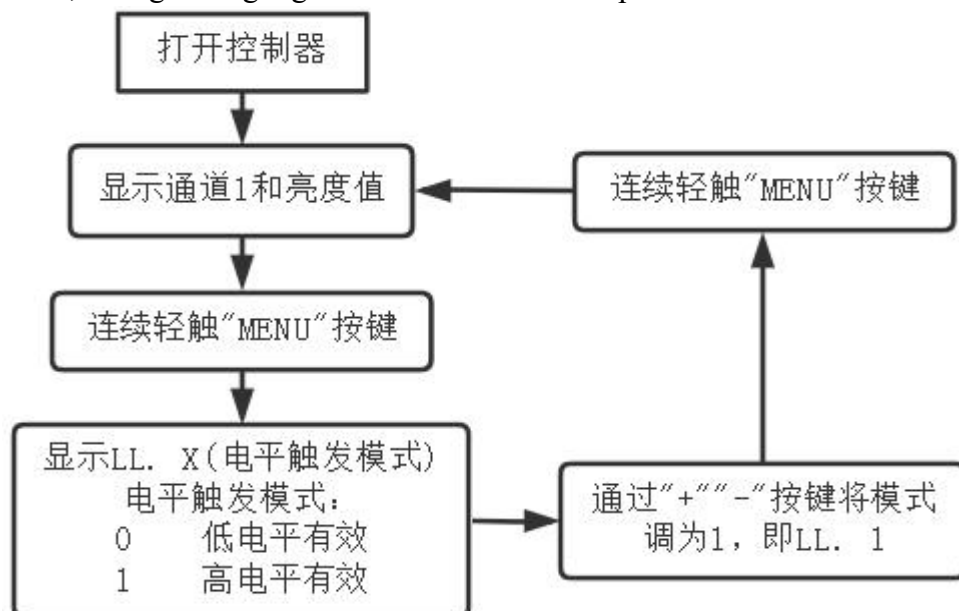


Figure 17 Trigger Level Setting Flow Chart

2.5.9 Edge Trigger Mode Setting

The flow chart for setting the edge trigger mode of all channels is shown in Figure 18.

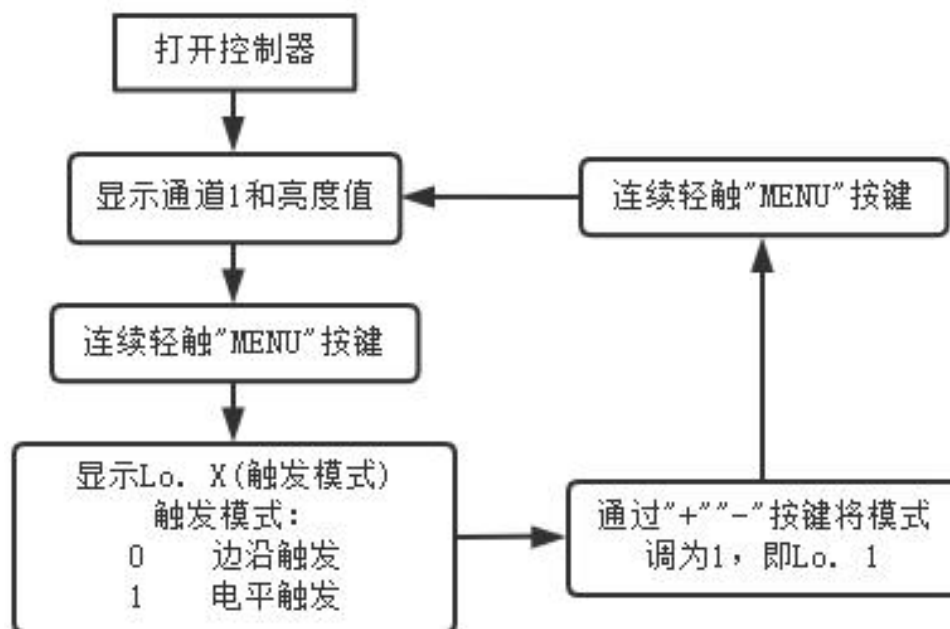


Figure 18 Edge Trigger Mode Setting Flow Chart for All Channels

2.5.10 Fan Temperature Display and Setting

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

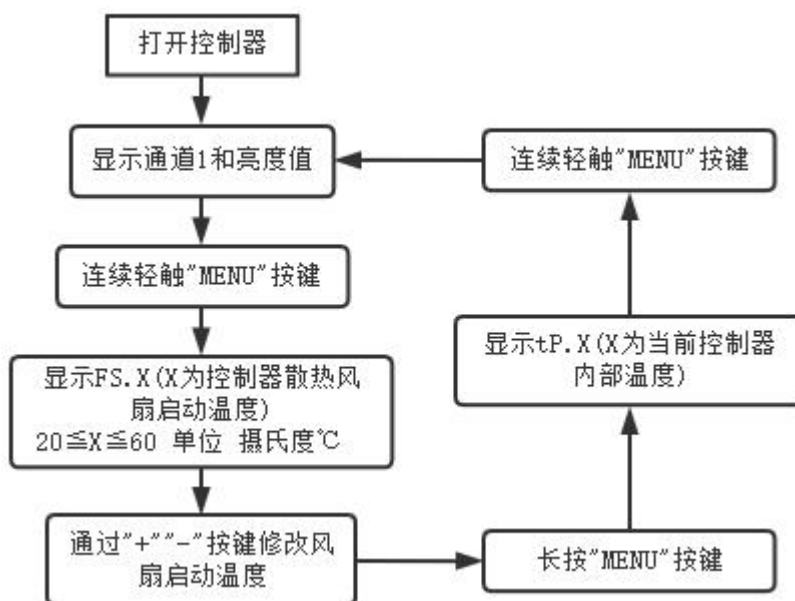


Figure 19 Fan Activation Temperature Setting Flow Chart

2.5.11 Time Coefficient Setting

The default value of the time coefficient is 1. If the required stroboscope time or delay time is greater than 999ms in practical applications, the time can be extended by modifying the time coefficient. The final time is calculated as: Time coefficient × Time setting value (i.e., P.xxx). The time coefficient setting flow is shown in Figure 20, taking setting the time coefficient to 10 as an example.

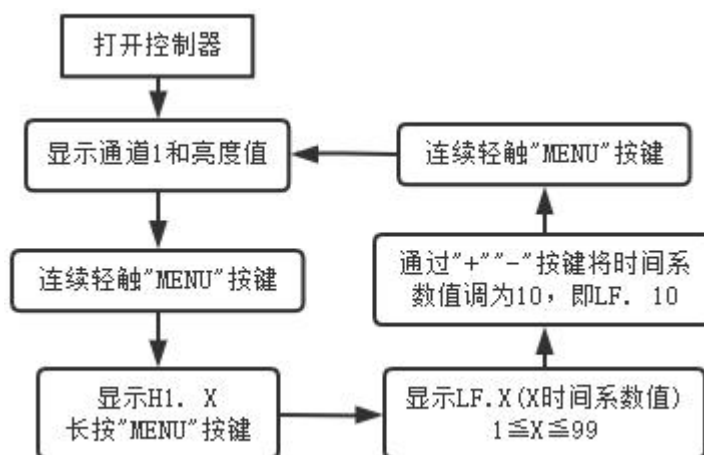


Figure 20 Time Coefficient Setting Flow Chart

3. Communication Protocol

3.1 Programming Flow

When controlling the light source controller via serial port, the communication programming flow is shown in Figure 21:

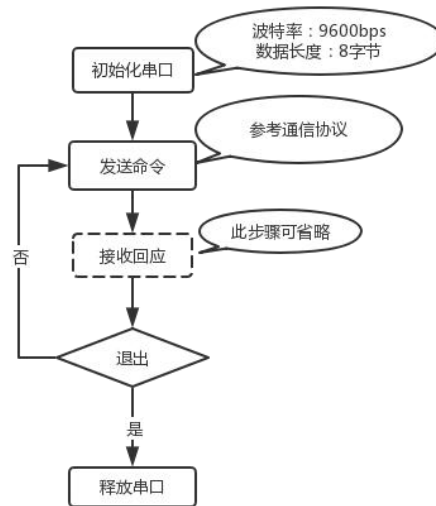


Figure 21 Communication Programming Flow Chart

3.2 Communication Setting

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

Table 6 Serial Port Setting Table

Baud Rate	Parity Bit	Data Bit	Stop Bit
9600	None	8	1

3.3 Frame Format Description

The frame format of communication 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、Feature word: \$.
- 3、Command words are shown in Table 7.
- 4、When the command word is "1", "2", "3", "7", "8", or "9": If the controller receives the command successfully, 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 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 word: "1", "2", "3", "4", representing 4 channels respectively.

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

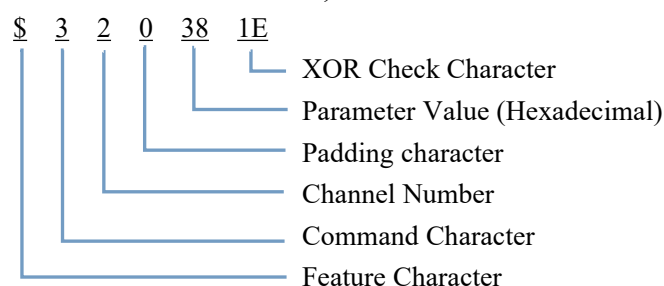
8、XOR checksum word = XOR checksum of bytes except the checksum word (including: feature word, command word, channel word, and data). The high 4-bit ASCII code of the checksum comes first, and the low 4-bit ASCII code comes after.

Table 8 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 the brightness parameter of the corresponding channel	The corresponding channel is determined by the channel word; 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 word; the return format is the same as the sending format
"7"	Trigger the stroboscope of the corresponding channel	The corresponding channel is determined by the channel word; this function is invalid in non-stroboscope mode
"8"	Set the mode of the corresponding channel	The corresponding channel is determined by the channel word
"9"	Set the stroboscope time of the corresponding channel	The corresponding channel is determined by the channel word; this function is invalid in non-stroboscope mode

3.4 Communication Example

To set the brightness of Channel 2 to 56, write "\$320381E" in ASCII code.



	String	ASCII Code	ASCII Code (Hexadecimal)	Represent High 4 Bits and Low 4 Bits with 8421 Code Respectively
Feature Character	\$	36	24	0010 0100
Command Character	3	51	33	0011 0011
Channel Character	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 Check Character				1 E

Note: In the XOR check byte calculation process for the three functions of opening the corresponding channel, closing the corresponding channel, and reading the corresponding channel parameters, the values of the three bytes of data do not affect the XOR result, as long as the format is 0XX (XX can be 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 Character	\$	36	24	0010 0100
Command Character	2	50	32	0011 0010
Channel Character	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 Check Character				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 Character	\$	36	24	0010 0100
Command Character	1	49	31	0011 0001
Channel Character	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 Check Character				1 C

Read 2-channel data: \$4200012

	String	ASCII Code	ASCII Code (Hexadecimal)	Represent High 4 Bits and Low 4 Bits with 8421 Code Respectively
Feature Character	\$	36	24	0010 0100
Command Character	4	52	34	0011 0100
Channel Character	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 Check Character				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

