DAIDISIKE®
戴迪斯科

E4J0101

Easy Multifunctional Delay Module

TRM

Ver. R1T1

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E4J0101(Topaz) R1T1

Easy Multifunctional Trigger Delay Module Rev.1 Typ. 1

Technical Reference Manual

Product Highlights

1.High Flexibility

- Single high-voltage optocoupler isolated digital trigger input
- Single arc-suppressed relay or transistor digital output
- More than 100 mutually independent delay modes

2.High Usability

- Functionality may be field-configured with digit display and buttons
- Configurable via USB connection to PC

3.High Expandability

- May be controlled via USB interface
- TTL serial port trigger extension possible
- Remote control trigger extension possible
- Upgradable firmware for gaining new functionality

4.High Reliability

- Real optocoupler input isolation measured with 1500V DC
- Real industry-class tolerance measured with 2000V EFT and 4000V ESD
- Protection against supply polarity inversion, overcurrent, and voltage surge
- The creepage slots on the PCB isolating the high voltage sides strictly follow the safety standards

Contents

List of Tables

List of Figures

Revision History

Version	Date (YYYY-MM-DD)	Notes
R1T1	2020-08-18	Initial Release

Chapter 1 Product Introduction

1.1 Preface

This product is an multifunctional digital delay module implemented with ASIC technology. It features a single trigger signal input and a single output, and has a digit display and buttons for field configuration. Depending on the model, its output may be a relay or a transistor. Some models also have wireless functionality and may be triggered by remote control.

All models are equipped with USB connectivity and serial port capability to connect to a PC for configuration or firmware upgrade. By upgrading the module to the latest firmware, the module may gain new functionality. The factory default delay accuracy is 1.5% over the full temperature range; when calibrated with the PC software, the delay accuracy may be adjusted to within 0,1%.

1.2 Structural Description

The standard designation of this product is E4J0101. There are seven screw terminals, four buttons, one digit display, three LED indicators, one USB interface and one TTL interface on the product. The description of each terminal and component are shown in the figure and table below.

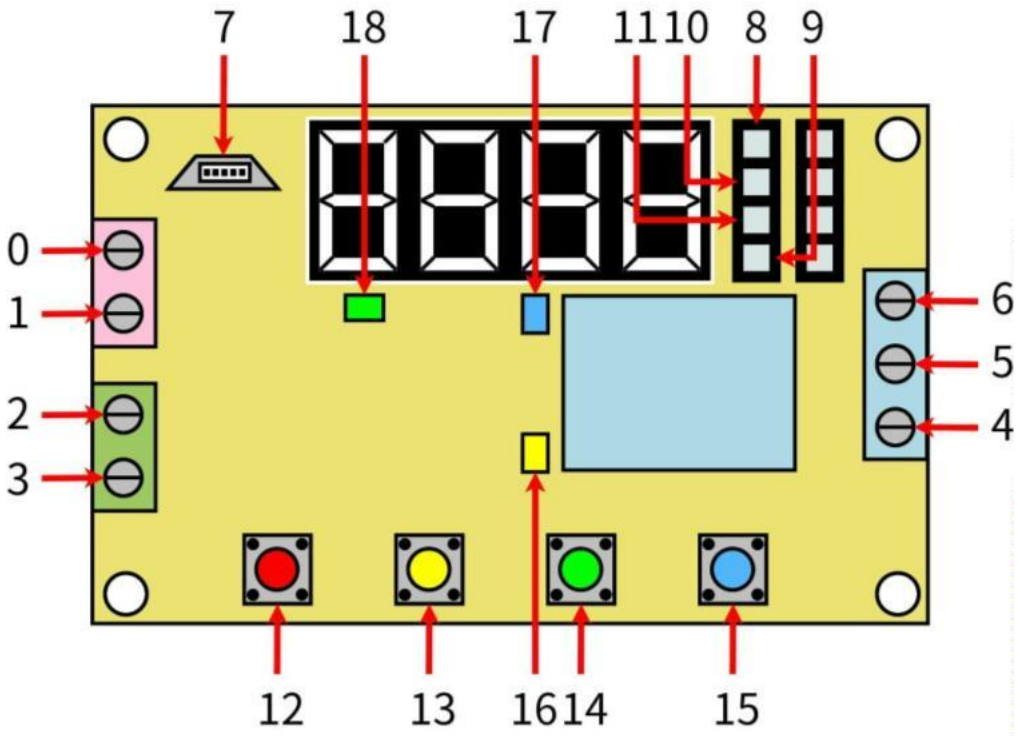

Figure 1-1 Product Front-side Marking Drawing

Table 1-1 Product Front-side Marking

Name	No.	Meaning
Positive supply	0	Positive power supply. The typical current consumption when the relay makes is 40 mA. Red.
Negative supply	1	Negative power supply. The typical current consumption when the relay makes is 40 mA. Red.
Positive digital input	2	Positive digital input. Green.
Negative digital input	3	Negative digital input. Green.
Normally open contact	4	The Normally Open (NO) contact of the relay. When the relay makes, this is connected to the common contact. Blue. For transistor output type products, this serves as the load ground.
Common contact	5	The COMmon (COM) contact of the relay. Blue. For transistor output type products, this serves as the load-side power supply ground.
Normally closed contact	6	The Normally Closed (NC) contact of the relay, when the relay breaks, this is connected to the common contact. Blue. For transistor output type products, this serves as the common terminal of load and load-side supply.
USB Port	7	USB communication port. Enumerated as a serial port when plugged into a computer.
VCC5V	8	5V positive power supply output, provides 50mA.
GND	9	5V negative power supply output, provides 50mA.
TXD	10	TTL serial port transmit pin, 5V level, baud rate 1500, no parity, 1 stop bit.
RXD	11	TTL serial port receive pin, 5V level, baud rate 1500, no parity, 1 stop bit.
"M" button	12	"Menu", for unlocking and saving configurations as well as entering and exiting menus. Red.
"S" button	13	"Select", for selecting the item being adjusted or entering the remote control pairing code. Yellow.
"+" button	14	"Increase", for increasing the value or selecting the next menu. Green.
"-" button	15	"Decrease", for decreasing the value or selecting the previous menu. Blue.

Name	No.	Meaning
Input indicator	16	The input level indicator. Yellow.
Action indicator	17	The relay output status indicator. Blue.
Power indicator	18	The power status indicator. Green.

1.3 Wiring Methods

The power supply terminals are directly connected to the DC power input. Output terminals are connected in series with the load and load power supply. A typical wiring diagram of the product is shown below.

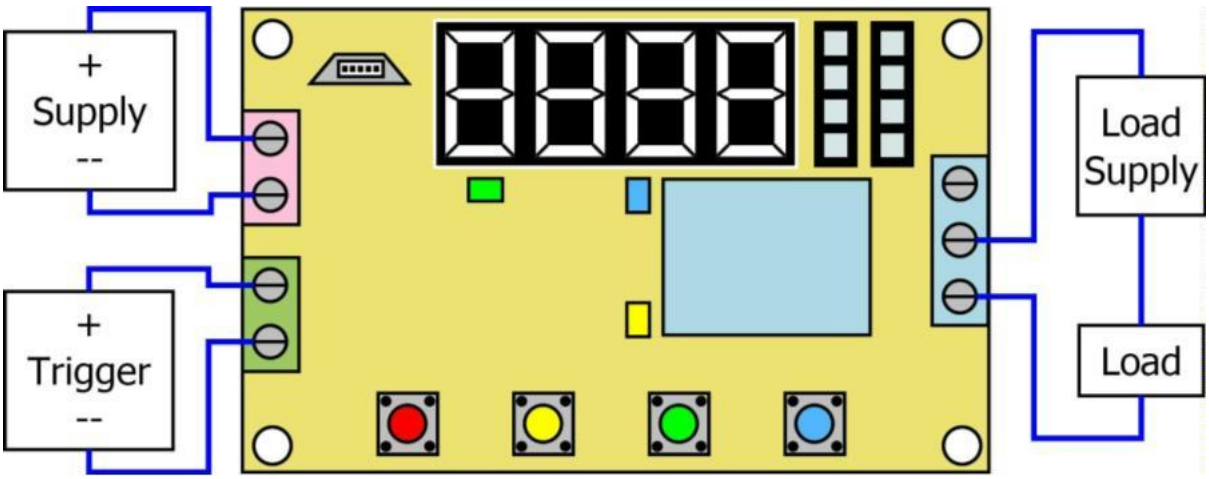

Figure 1-2 Typical Wiring Diagram of the Product

1.4 Mechanical Dimensions

The mechanical dimensions of the product are shown in the table below. The tolerance of all mechanical dimensions is 5%. All dimensions are in millimeters.

Table 1-2 Product Mechanical Dimensions

Dimension	Value
Module length	66
Module width	41
Module height	20
Terminal spacing	5.08

Chapter 2 Detailed Function Description

2.1 Menu Function Description

After powering on the product, long press the "M" button to unlock the settings. Then the product enters the configuration mode, and the digit display of the product turns on to show the menu. Press the "-" or "+" button to select the previous or next menu. Each menu may be entered or exited by a short press of the "M" button. After finishing the adjustments, long press the "M" button to exit the configuration mode and save the product settings. In configuration mode, any delay sequence being performed by the product will stop immediately and no new trigger events will be accepted.

After entering the menu, the item being adjusted will blink slowly. Press the "S" button to select the item being adjusted, press the "+" key to increase this item, and press the "-" button to decrease this item. The range of each item in different menus may be different, depending on the menu itself.

There are five possible menus for this product, as listed in the table below.

Table 2-1 Product Menu List

Name	Display	Meaning
F--0		Input and output mode
F--1		Delay function selection
P--A		Delay time parameter A
P--C		Delay time parameter C
P--L		Cycle count parameter L

2.2 Delay Mode Description

There are about 100 basic delay templates built into this module, which together with the input and output polarity make up about 1000 different specific delay modes. The basic templates may be divided into five groups: "Switching function ", "Delay then break", "Delay make then break", "Cyclic delay " and "Counting delay".

The input and output polarity of each delay group may be inverted. If the input is inverted, the trigger signal will be treated as invalid when it is valid, and the trigger signal will be treated as valid when it is invalid; if the output is inverted, it will break when it should make, and make when it should break. Therefore, each specific delay mode may be expanded to four submodes,

which are "both input and output are normal", "input inverted, output normal", "input normal, output inverted " and "both input and input are inverted".

In addition, all delay modes accepting trigger signal input may optionally be triggered once at power-up, and the state of the output at power-on and before the first trigger event may also be specified.

Table 2-2 Delay Groups List

Group	Group No.	Group Content
Switching function	0---	Simple switching functions. "Jog" "Self-locking toggle"
Delay then break	1---	Make the output upon power-up or triggering, and break after the delay ends. "On triggering, make; delay, then break" "On triggering, make; after the trigger signal is withdrawn, delay, then break"
Delay make then break	2---	Break the output upon power-up or triggering, then the first delay begins. After the first delay ends, make the output and the second delay begins. After the second delay ends, break the output. "Delay on after signal triggering" "Delay on after signal triggering and then delay off"
Cyclic delay	3---	Upon power-up or triggering, make and break the output repeatedly according to a certain rule for a certain number of times. "Repeatedly turn on for a certain time and turn off for a certain time after the signal triggering, and so on for a certain number of times"
Counting delay	4---	Make the output after a certain number of triggers. "Make after a certain number of triggers, delay, then break"

2.2.1 Delay Mode Selection Guide

A suitable delay mode may be selected according to the strategy in the following table. When a step in the table asks for input or output status, it refers to the status after all the polarity inversions above that step have been applied. This consolidates the various delay functions into easily identifiable standard delay modes by unifying the input and output polarities.

For example, in step 1, if the original delay function is "falling edge triggered", the input should be inverted to "rising edge triggered"; when searching the delay group in step 6, consider the "rising edge triggered" group obtained after the inverse.

For example, in step 3, if the original delay function is "break, delay and finally permanently make", the output should be inverted, which is "make, delay, and finally permanently break"; when searching the delay group in step 6, consider the delay function with the inverted output.

Table 2-3 Delay Mode Selection Guide

Steps	Questions	Answers	
0	Is the output function merely a simple switching one?	Yes	Search the "Switching Functions" group and go to step 8.
		No	Go to step 1.
1	Is it high-level or rising-edge triggered?	Yes	Go to step 2.
		No	Inverse the input, and go to step 2.
2	Is the output made upon power-up?	Yes	Set the output to make upon power up, and go to step 3.
		No	Go to step 3.
3	Is the output finally break after the delay?	Yes	Go to step 4.
		No	Inverse the output, and go to step 4.
4	Is there an on/off repeated cycle in the delay?	Yes	Search the "Cyclic Delay" group, and go to step 7.
		No	Go to step 5.
5	Is there a counter for the trigger input signal?	Yes	Find the "Counting Delay" group, and go to step 7.
		No	Go to step 6.
6	Does the output turn on immediately after triggering?	Yes	Search the "Delay-then-break" group, and go to step 7.
		No	Search the "Delay-make-then-break" group, and go to step 7.
7	Have you found the required delay template?	Yes	Go to step 8.
		No	Apply for delay mode customization service.
8	Is an additional triggering necessary when power up?	Yes	Set the input to trigger once upon power up, and go to step 9.
		No	Go to step 9。
9	Is there a limit to the total number of actions since power up, or is the "Cyclic Delay" group selected?	Yes	Set the cycle number L to the maximum number of actions or cycles.
		No	Set the cycle number L to 0.

2.2.2 Input and Output Mode

Select "F--0" to enter this menu to configure the basic inputs and outputs of the module. The meaning of the menu contents is as follows.

Table 2-4 Input and Output Mode Settings

Digit	Meaning	Option	Meaning
Third from the left （--0-）	Input polarity	3	Input is inverted, trigger once upon power up
		2	Input is normal, trigger once upon power up
		1	Input is inverted, no extra trigger upon power up
		0	Input is normal, no extra trigger upon power up
Fourth from the left （---0）	Output polarity	3	Output is inverted, break upon power up
		2	Output is normal, make upon power up
		1	Output is inverted, make upon power up
		0	Output is normal, break upon power up

2.2.3 Delay Template Configuration

All the delay templates are described below. "High-level" means the signal is valid and "low-level" means the signal is invalid. "Rising edge" means that the signal changes from low-level to high-level and "falling edge" means that the signal changes from high-level to low-level.

2.2.3.1 Switching Function (5)

The modes included in the switching function group are described below.

Table 2-5 List of Switching Function Mode

Group	No.	Description
00--	0000	Jog. The output makes when the signal is high-level and breaks when the signal is low-level.
	0001	The output makes upon power-up and stays made forever.
01--	0100	Self-locking toggle on rising edge. The output makes when rising edge comes, and breaks when rising edge comes again.
	0101	Self-locking toggle on any edge. The output makes on when any edge comes, and breaks when any edge comes again.
02--	0200	Function as a serial- or USB controlled relay. The serial port and USB may directly read and write the input and output.

2.2.3.2 Delay-Then-Break (40)

The delay-then-break group includes the following modes. Among them, "ignore" means that the delay action is not affected, "time extend" means that the delay timer is extended by a set value[1], "time reset" means that the delay timer is reset to the set value, "pause" means that the delay timer is paused and no longer counting, and "stop" means that the timer returns to the state before triggering.

In these modes, the cycle count L may also be configured; if L is set to any number other than 0, then it means that a maximum of L complete delay operations are allowed since power up. If the module has completed L delay operations, the module may not be triggered anymore.

Table 2-6 List of Modes in Delay-Then-Break Group

Group	No.	Description
10--	1000	Trigger on rising edge , and make; delay for A, then break; repeating rising edges are ignored.
	1001	Trigger on rising edge, and make; delay for a random period between A-C, then break; repeating rising edges are ignored.
	1002	Trigger on rising edge , and make; delay for A, then break; repeating rising edges within A+C are ignored.
	1003	Trigger on rising edge, and make; delay for A, then break; on repeating rising edges, extends the delay time.
	1004	Trigger on rising edge, and make; delay for A, then break; on repeating rising edges, extends the delay time with an upper limit of C.
	1005	Trigger on rising edge, and make; delay for A, then break; on repeating rising edges, reset the delay time.
	1006	Trigger on rising edge, and make; delay for A, then break; on repeating rising edges, stop the delay and break.
	1007	Trigger on rising edge, and make; delay for A, then break; on repeating rising edges, stop the delay and make.
	1008	Trigger on rising edge, and make; delay for A, then break; on repeating rising edges, toggle between pause and continue.
	1009	Trigger on rising edge, and make; delay for A, then break; on sustained high-level, pause until the high-level is removed.

[1] If the original setting value is 10 minutes, and the current delay has been carried out for 5 minutes, the remaining delay time will become 5 + 10 = 15 minutes after being superimposed once.

Group	No.	Description
	1010	Trigger on rising edge, and make; delay for A, then break; on sustained high-level, reset the delay time.
	1011	Trigger on rising edge, and make; delay for A, then break; on removal of the high-level during the delay, stop the delay and break.
	1012	Trigger on rising edge, and make; delay for A, then break; on removal of the high-level at any time, stop the delay and make.
11--	1100	Trigger on rising edge, and make; after falling edge, delay for A, then break; repeating rising edges are ignored.
	1101	Trigger on rising edge, and make; after falling edge, delay for A-C at random time, then break; repeating rising edges are ignored.
	1102	Trigger on rising edge, and make; after falling edge, delay for A, then break; repeating rising edges within A+C are ignored.
	1103	Trigger on rising edge, and make; after falling edge, delay for A, then break; on repeating rising edges, extends the delay time.
	1104	Trigger on rising edge, and make; after falling edge, delay for A, then break; on repeating rising edges, extends the delay time with an upper limit of C.
	1105	Trigger on rising edge, and make; after falling edge, delay for A, then break; on repeating rising edges, reset the delay time.
	1106	Trigger on rising edge, and make; after falling edge, delay for A, then break; on repeating rising edges, stop the delay and break.
	1107	Trigger on rising edge, and make; after falling edge, delay for A, then break; on repeating rising edges, stop the delay and make.
	1108	Trigger on rising edge, and make; after falling edge, delay for A, then break; on repeating rising edges, toggle between pause and continue.
12--	1200	Trigger on any edge , and make; delay for A, then break; repeating any edges are ignored.
	1201	Trigger on any edge, and make; delay for a random period between A-C, then break; repeating any edges are ignored.
	1202	Trigger on any edge , and make; delay for A, then break; repeating any edges within A+C are ignored.
	1203	Trigger on any edge, and make; delay for A, then break; on repeating any edges, extends the delay time.
	1204	Trigger on any edge, and make; delay for A, then break; on repeating any edges, extends the delay time with an upper limit of C.

Group	No.	Description
	1205	Trigger on any edge, and make; delay for A, then break; on repeating any edges, reset the delay time.
	1206	Trigger on any edge, and make; delay for A, then break; on repeating any edges, stop the delay and break.
	1207	Trigger on any edge, and make; delay for A, then break; on repeating any edges, stop the delay and make.
	1208	Trigger on any edge, and make; delay for A, then break; on repeating any edges, toggle between pause and continue.
13--	1300	Trigger on any edge, and make; after any edge, delay for A, then break; repeating any edges are ignored.
	1301	Trigger on any edge, and make; after any edge, delay for A-C at random time, then break; repeating any edges are ignored.
	1302	Trigger on any edge, and make; after any edge, delay for A, then break; repeating any edges within A+C are ignored.
	1303	Trigger on any edge, and make; after any edge, delay for A, then break; on repeating any edges, extends the delay time.
	1304	Trigger on any edge, and make; after any edge, delay for A, then break; on repeating any edges, extends the delay time with an upper limit of C.
	1305	Trigger on any edge, and make; after any edge, delay for A, then break; on repeating any edges, reset the delay time.
	1306	Trigger on any edge, and make; after any edge, delay for A, then break; on repeating any edges, stop the delay and break.
	1307	Trigger on any edge, and make; after any edge, delay for A, then break; on repeating any edges, stop the delay and make.
	1308	Trigger on any edge, and make; after any edge, delay for A, then break; on repeating any edges, toggle between pause and continue.

2.2.3.3 Delay-Make-Then-Break (34)

The delay-make-then-break group includes the following modes. Among them, "ignore" means that the delay action is not affected, and "stop" means that the timer returns to the state before triggering.

In these modes, the cycle count L may also be configured; if L is set to any number other than 0, then it means that a maximum of L complete delay operations are allowed since power up. If the module has completed L delay operations, the module may not be triggered anymore.

Table 2-7 List of Modes in Delay-Make-Then-Break Group

Group	No.	Description
20--	2000	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; repeating rising edges are ignored.
	2001	Trigger on rising edge, and break; delay for a random period between A-C, then make; delay for a random period between A-C, then break; repeating rising edges are ignored.
	2002	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; on repeating rising edges, reset the delay sequence.
	2003	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; on repeating rising edges, stop the delay and break.
	2004	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; on repeating rising edges, stop the delay and make.
	2005	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; on repeating rising edges, toggle between pause and continue.
	2006	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; on sustaining high-level, pause until it is removed.
	2007	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; on sustaining high-level, reset the delay time.
	2008	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; remove the high-level before makes, stop the delay and break.
	2009	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; remove the high-level during the delay, stop the delay and break.
	2010	Trigger on rising edge, and break; delay for A, then make; delay for C, then break; remove the high-level at any time, stop the delay and make.
21--	2100	Trigger on rising edge, and break; after falling edge, delay for A, then make; delay for C, then break; repeating rising edges are ignored.
	2101	Trigger on rising edge, and break; after falling edge, delay for a random period between A-C, then make; delay for a random period between A-C, then break; repeating rising edges are ignored.
	2102	Trigger on rising edge, and break; after falling edge, delay for A, then make; delay for C, then break; on repeating rising edges, reset the delay sequence.
	2103	Trigger on rising edge, and break; after falling edge, delay for A, then make; delay for C, then break; on repeating rising edges, stop the delay and break.

Group	No.	Description
	2104	Trigger on rising edge, and break; after falling edge, delay for A, then make; delay for C, then break; on repeating rising edges, stop the delay and make.
	2105	Trigger on rising edge, and break; after falling edge, delay for A, then make; delay for C, then break; on repeating rising edges, toggle between pause and continue.
22--	2200	Trigger on any edge, and break; delay for A, then make; delay for C, then break; repeating any edges are ignored.
	2201	Trigger on any edge, and break; delay for a random period between A-C, then make; delay for a random period between A-C, then break; repeating any edges are ignored.
	2202	Trigger on any edge, and break; delay for A, then make; delay for C, then break; on repeating any edges, reset the delay sequence.
	2203	Trigger on any edge, and break; delay for A, then make; delay for C, then break; on repeating any edges, stop the delay and break.
	2204	Trigger on any edge, and break; delay for A, then make; delay for C, then break; on repeating any edges, stop the delay and make.
	2205	Trigger on any edge, and break; delay for A, then make; delay for C, then break; on repeating any edges, toggle between pause and continue.
23--	2300	Trigger on any edge, and break; after any edge, delay for A, then make; delay for C, then break; repeating any edges are ignored.
	2301	Trigger on any edge, and break; after any edge, delay for a random period between A-C, then make; delay for a random period between A-C, then break; repeating any edges are ignored.
	2302	Trigger on any edge, and break; after any edge, delay for A, then make; delay for C, then break; reset the delay sequence.
	2303	Trigger on any edge, and break; after any edge, delay for A, then make; delay for C, then break; on repeating any edges, stop the delay and break.
	2304	Trigger on any edge, and break; after any edge, delay for A, then make; delay for C, then break; on repeating any edges, stop the delay and make.
	2305	Trigger on any edge, and break; after any edge, delay for A, then make; delay for C, then break; on repeating any edges, toggle between pause and continue.
24--	2400	Trigger on rising edge, delay for A, then make; if it is low-level, delay for C, then break; otherwise it keeps on.
	2401	Trigger on rising edge, delay for A, then make; if it is high-level, delay for C, then

Group	No.	Description
		break; otherwise break.
25--	2500	Before make, trigger on rising edge, and break; delay for A, then make; remove the high-level, reset the delay time and break. After make, trigger on falling edge, and make; delay for C, then break; remove the low-level, reset the delay time and break.
	2501	Before make, trigger on rising edge, and break; delay for A, then make; remove the high-level, reset the delay time and break. After make, trigger on rising edge, and make; delay for C, then break; remove the high-level, reset the delay time and make.
	2502	Before make, trigger on rising edge, and break; delay for A, then make; remove the high-level, reset the delay time and remain broken. After make, delay for C, then break; repeating any edges are ignored.

2.2.3.4 Cyclic Delay (17)

The cyclic delay group includes the following modes. Under the circumstance that the number of cycles is limited, the last cycle includes the delay C. In these modes, if the cycle count L is set to 0, it means that the cycle continues indefinitely.

Table 2-8 List of Cyclic Delay Group

Group	No.	Description
30--	3000	Trigger on rising edge, delay for A, then make; break and delay for C, with cycle of L times, repeating rising edges are ignored.
	3001	Trigger on rising edge, delays for A-C for a random period, break and delay for A-C for a random period, for a total of L times, repeating rising edges are ignored.
	3002	Trigger on rising edge, make and delay for A, break and delay for C, for a total of L times. Repeating the rising edges will superimpose the number of times.
	3003	Trigger on rising edge, make and delay for A, break and delay for C, for a total of L times. Repeating the rising edges will reset the number of times.
	3004	Trigger on rising edge, make and delay for A, break and delay for C, for a total of L times. Repeating the rising edges will stop the delay and break the output.
	3005	Trigger on rising edge, make and delay for A, break and delay for C, for a total of L times. Repeating the rising edges will stop the delay and make the output.
	3006	Trigger on rising edge, make and delay for A, break and delay for C, for a total

Group	No.	Description
		of L times. Repeating the rising edges will toggle between pause and continue to delay.
	3007	Trigger on rising edge, make and delay for A, break and delay for C, for a total of L times. Sustaining high-level will pause the delay.
	3008	Trigger on rising edge, make and delay for A, break and delay for C, for a total of L times. If the high-level is removed during the delay, the delay will stop the output will be broke.
	3009	Trigger on rising edge, make and delay for A, break and delay for C, for a total of L times. Remove the high-level at any time to stop the delay and the make the output.
31--	3100	Trigger on any edge, make and delay for A, break and delay for C, for a total of L times. Repeating any edges are ignored.
	3101	Trigger on any edge, make and delay for A-C for a random period, break and delay for A-C for a random period, for a total of L times. Repeating any edges are ignored.
	3102	Trigger on any edge, make and delay for A, break and delay for C, for a total of L times. Repeating any edges will superimpose the number of times.
	3103	Trigger on any edge, make and delay for A, break and delay for C, for a total of L times. Repeating any edges will superimpose the number of times.
	3104	Trigger on any edge, make and delay for A, break and delay for C, for a total of L times. Repeating any edges will stop the delay and break the output.
	3105	Trigger on any edge, make and delay for A, break and delay for C, for a total of L times. Repeating any edges will stop the delay and make the output.
	3106	Trigger on any edge, make and delay for A, break and delay for C, for a total of L times. Repeating any edges will toggle between pause and continue to delay.

2.2.3.5 Counting Delay (8)

The counting delay template includes the following modes. The modes listed here are not implementable with other modes and a non-zero cycle number L, so they become a separate category. In these modes, if the cycle count L is set to 0, it means that no matter how many rising edges there are, they will never be triggered, or there is no limit to the number of triggers.

Table 2-9 List of Counting Delay Mode

Group	No.	Description

Group	No.	Description
40--	4000	Every L triggering on rising edges are detected, delay for A, then break, the rising edge is ignored during the delay.
	4001	Every L triggering on rising edges are detected in period C, delay for A, then break, the rising edge is ignored during the delay; the next time period C is counted from the first rising edge that is not within the previous time period C.
41--	4100	Every L triggering on any edges are detected, delay for A, then break, any edge is ignored during the delay.
	4101	Every time L any edges are detected in time period C to trigger on, delay A to break, and any edge is ignored during the delay; the next time period C is counted from the first any edge that is not within the previous time period C.
42--	4200	Trigger on rising edge, delay for A, then break. Repeating rising edges are ignored, and it can be triggered L times in each period C. The next time period C is counted from the first trigger that is not within the previous time period C.
	4201	Trigger on rising edge, after the falling edge comes, delay for A, then break. Repeating rising edges are ignored and it can be triggered L times in each period C. The next time period C is counted from the first trigger that is not within the previous time period C.
43--	4300	Trigger on any edge, delay for A, then break. Repeating any edges are ignored and it can be triggered L times in each period C. The next time period C is counted from the first trigger that is not within the previous time period C.
	4301	Trigger on any edge, after there is any edge, delay for A, then break. Repeating any edges are ignored and it may be triggered L times in each period C. The next time period C is counted from the first trigger that is not within the previous time period C.

2.2.4 Delay Time A &C Configuration

To set the delay time A and C, you need to enter the "P--A" and "P--C" menus respectively. The structures of these two menus are similar, as shown in the table below. If the delay time is set to 0, it is regarded as 10 milliseconds.

Table 2-10 Delay Time A and C Settings

Position	Meaning	Option	Meaning
First from the left （0---）	Time unit	9	Retain, do not use, the same effect as 10 hours
		8	Retain, do not use, the same effect as 10 hours

Position	Meaning	Option	Meaning
		7	10 hours
		6	1 hour
		5	10 minutes
		4	1 minute
		3	10 seconds
		2	1 second
		1	100 milliseconds
		0	10 milliseconds
Second from the left （-0--）	Hundreds ’ digit of time	0-9	The hundreds ’ digit of time value
Third from the left （--0-）	Tens’ digit of time	0-9	The tens’ digit of time value
Fourth from the left （---0）	Single digit of time	0-9	The single digit of time value

2.2.5 Cycle Number L Configuration

To set the cycle number L, you need to enter the "P--L" menu, the structure of which is shown in the table below. If the cycle number is set to 0, it means that the number of times is infinite.

Table 2-11 Cycle Number L Setting

Position	Meaning	Option	Meaning
First from the left （0---）	Thousands ’ digit of cycles	0-9	The thousands ’ digit of cycles
Second from the left （-0--）	Hundreds ‘digit of cycles	0-9	The hundreds’ digit of cycles
Third from the left （--0-）	Tens’ digit of cycles	0-9	The tens’ digit of cycles
Fourth from the left （---0）	Single digit of cycles	0-9	The single digit of cycles

2.3 Remote Control Function Description

The remote control function is only available on the remote control version. After the product is powered up, long press the "S" key, the digit display will display a flashing ripple, indicating that it enters the code matching state. At this time, keep pressing the remote control that is delivered with the machine until the digit display goes out, indicating that the code matching is completed. Now, the product will remember the remote control and automatically exit the code matching. For those remote controls with multiple buttons, the code matching is only for one of the buttons, and the rest of the buttons are invalid; use this to make different buttons of the remote control correspond to different products. If you want to turn off the remote control function, long press the "S" key again after entering the code matching state to exit directly.

When the button is clicked, it is regarded as a single effective trigger level lasting about 500 milliseconds, which consists of three phases: rising edge - high level - falling edge. The remote control buttons are automatically de-jittered; pressing and holding the button will be regarded as a continuous high-level until the button is released for more than 500 milliseconds. The input polarity setting has no effect on the remote control.

2.4 TTL Serial Port and AT Protocol Description

The AT protocol is an ASCII character-based control command set. It contains a series of short character commands to perform simple operations on the input and output of the product. In general, all AT commands start with "AT" and end with "\r\n" (<CR><LF>, 0x0D 0x0A). For this product, the "\r\n" at the end is optional.

AT command is available when the product leaves the factory; the parameters of TTL serial communication are fixed, 1500 baud rate, no parity, 1 stop bit. You may send "AT" itself to determine whether the serial port communication is normal; if it is normal, the module will return "OK". The AT of this product does not have an echo, nor does it support the echo control of the ATE0 command. An AT command must be sent completely at once. Only one AT command is allowed in one transmission.

2.4.1 Serial Interface Triggering

To use the serial port to trigger the delay sequence, use the AT+TRG command. This command will simulate a single effective trigger level lasting about 500 milliseconds, which consists of three phases: rising edge - high-level - falling edge. The input polarity setting does not work for this.

Example: Generate a trigger level once to trigger a delay sequence.

Send: AT+TRG

Receive: OK

2.4.2 Digital Input Reading

To read a digital input, use the AT+PIN? command. This command will return the status of the digital input, with 0 for low-level and 1 for high-level. This function is not affected by the input polarity setting.

Example: The digital input terminal is low-level.

Send: AT+PIN?

Receive: +PIN:0

OK

2.4.3 Digital Output Setting

To set the digital output, use the AT+OUT=command. This command will set the output to the desired state, 0 means off, 1 means on. This function is affected by the output polarity setting; if the output is set to reverse, 1 means off, and 0 means on. This command is only available under the delay time template (F--1) "0200", at that time the product becomes a serial port/USB relay module; the function of this command is unpredictable under other delay time templates. If the output polarity is set to reverse, break will happen while it is supposed to make, and make will happen while it is supposed to break.

Example: Set the output to turn on.

Send: AT+OUT=1

Receive: OK

The variant AT+OUT? of this command may be used to query the output status. This function is available regardless of whether the delay template is "0200" or not.

Example: Query the output status, when the output breaks.

Send: AT+OUT?

Receive: +OUT:0

OK

2.5 USB Interface and Firmware Upgrade Description

This product provides a USB interface, which is a quite common computer interface that is very reliable, flexible and easy to use, and it is also quite convenient to connect peripherals to the computer. The USB interface of this product may be used to configure the parameters of the product, and may also be used to manipulate various inputs and outputs of the product.

2.5.1 USB Interface and Virtual Serial Port

When the USB interface is connected, the product will be enumerated as a special virtual serial port, which may interact with the host computer through the serial port protocol. Now, you may use AT commands to interact with the product on this virtual serial port, and its operation is no different from that of a real serial port.

2.5.2 The Calibration of Delay Accuracy via USB Interface

The factory-default delay accuracy of this product is 1.5%, which is sufficient for most applications. In cases where high delay accuracy is required, the USB interface may be connected to the host computer software for delay calibration. The range of "calibration value" is 0-100, and its default value is 50. Each time the "calibration value" decreases by 1 to shorten the delay time by 0.05%, and increases by 1 to increase it by 0.05%, with the maximum adjustment range of plus or minus 2%. If the module goes too fast, the value may be increased appropriately, and if the module goes slower, the value may be reduced appropriately. After the adjustment is completed, click "Write Configuration" to package the delay configuration and calibration value to write.

2.5.3 Firmware Upgrade via USB Interface

The firmware of the product may be upgraded with a specialized software. The new firmware may include functional updates, software bug fixes, and reliability enhancements. Firmware updates will not change the validity of existing functionality. It is recommended to always update to the latest version of the firmware if possible. Firmware is always distributed in a package with special software, and each software version corresponds to a new firmware.

To enter the firmware update mode, you need to connect the product to your computer via USB, then click "Firmware Update" and wait for a while to complete the update. Do not power off the product or unplug the USB cable during the firmware upgrade. Although the module will not be damaged by power-off and unplugging the USB cable, because the firmware upgrade has not been completed, the product will stay in firmware upgrade mode the next time it is powered on until a complete firmware is written in.

2.5.4 Upgrade to Quick Configuration Firmware

Apart from normal firmware, upgrading to Quick Configuration Firmware (QCF) through the USB port is also possible. QCF is designed for cases where the delay parameters must be adjusted frequently. Under QCF, I/O polarities and delay mode cannot be adjusted through display and keys anymore, but delay time A & C and cycle number L may be adjusted easily. Reverting to normal firmware is also possible through firmware upgrade when desired.

Under QCF, long press "S" to adjust delay time A, long press "+" to adjust delay time C, long press “-” to adjust cycle number L. When delay time is being adjusted, only numeric adjustments are possible, and the position where time unit was shown now indicates the delay time being adjusted (A or C).

In each menu, short press "+" to increase by one, short press "-" to decrease by one. For delay time A & C, long press "+" will increase by 50, long press "-" will decrease by 50; for cycle number L, long press "+" will increase by 100, long press "-" will decrease by 100.

When adjustments are finished, press "M" to exit & save settings.

2.5.5 Upgrade to Customized Firmware

Apart from normal firmware, upgrading to Customized Firmware (CF) through the USB port is also possible. CFs are designed for cases where the delay sequence is complicated and thus full customization is required.

Each fully customized delay sequence corresponds to a CF, and also corresponds to a customization ID starting from 10000. When "F--1" menu is entered, the last four digits of this customization ID is shown, and the number cannot be changed. For each CF, the delay time A, C and cycle number L may have different meanings than that of the standard firmware.

Please consult us to get the exact functionality description of each CF. If your delay sequence cannot be implemented with neither normal firmware nor an existing CF, you may apply full customization: we will allocate a new customization ID and add a new CF.

Chapter 3 Host Computer Software Description

3.1 Software Installation and Configuration

The software only has a single executable file and needs no installation process. If you use Windows, please run the Windows version; if you use Linux, run the Linux version instead. This software gains access to the module via the USB port, so it needs to be run with administrator privileges. Additional USB-to-serial driver installations may be required.

3.2 Software Usage

The software interface is shown in the figure below, which is divided into four areas: "Configuration Modification", "Input and Output Reading and Writing", "System Firmware" and "Delay Mode Options". When operating the software, please make sure the connection between the host computer and the module is stable, and select the serial port number which is connected to the module to realize the communication.

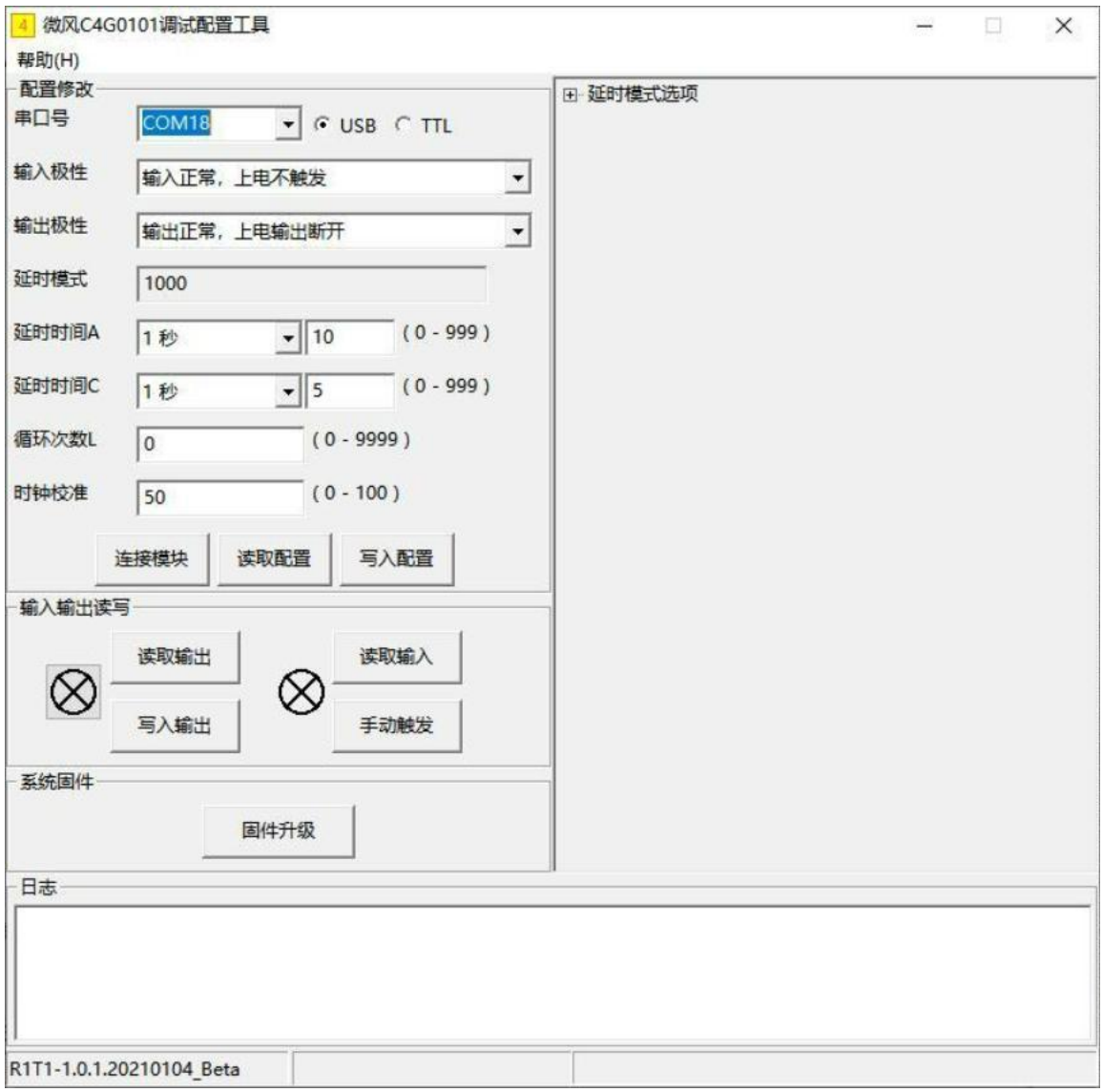

Figure 3-1 Case Diagram of Software Main Interface

3.2.1 Configuration Modification

The "Configuration Modification" area is responsible for using the parameters shown in this area, which may be connected to the module to test its operation, and the configuration of the module may be written and read. Since the USB virtual serial port is used, communication may be performed directly by selecting the serial port number, without setting parameters such as baud rate. When multiple serial ports are available on the PC at the same time, the serial port number automatically detected may be incorrect and needs to be corrected manually.

When reading and writing the configuration, the module needs to be continuously powered and the communication cable may not break. If it suddenly breaks, you need to stand still for about half a minute and wait for the module to re-enumerate the serial port before proceeding to the next step. Whether the serial port enumeration has been completed may be checked through the serial port number list box on the software. Click the drop-down list box of the serial port

number. If the enumeration is not completed, the display will be blank; if the enumeration is completed, the serial number information will be displayed.

3.2.1.1 Connect to Module

The "Connect to Module" is responsible for the communication status with the module. Connect the module with the USB cable, select the correct serial number, click the "Connect to Module" button, and the software will automatically send a verification command and pop up the corresponding prompt box, which is accorded to the communication status between the module and the host computer.

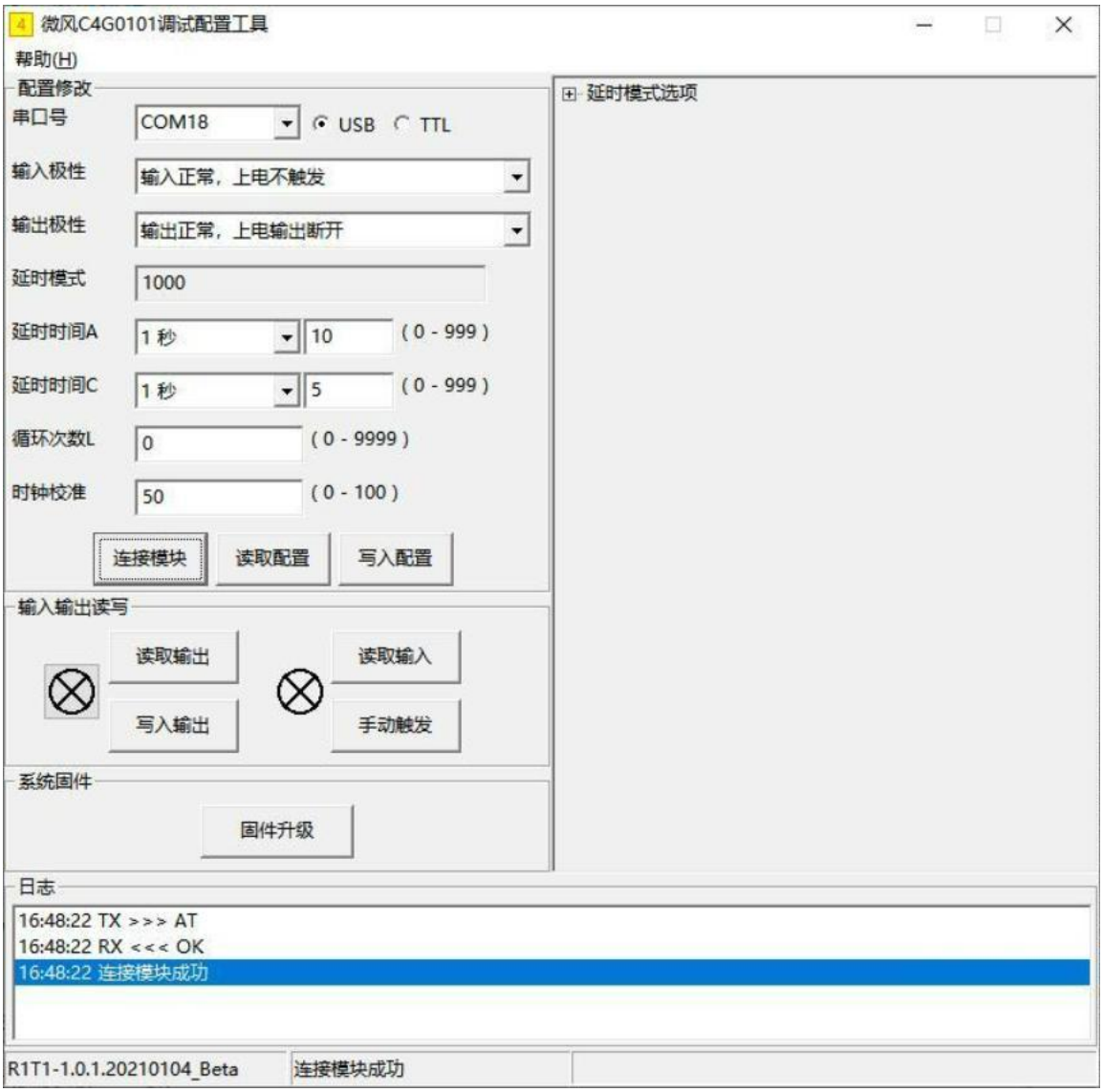

Figure 3-2 Connect to Module Example

3.2.1.2 Read Configuration

The "Read Configuration" is responsible for reading the delay mode configuration of the module. The configuration of the delay module is copied into the software as the original set.

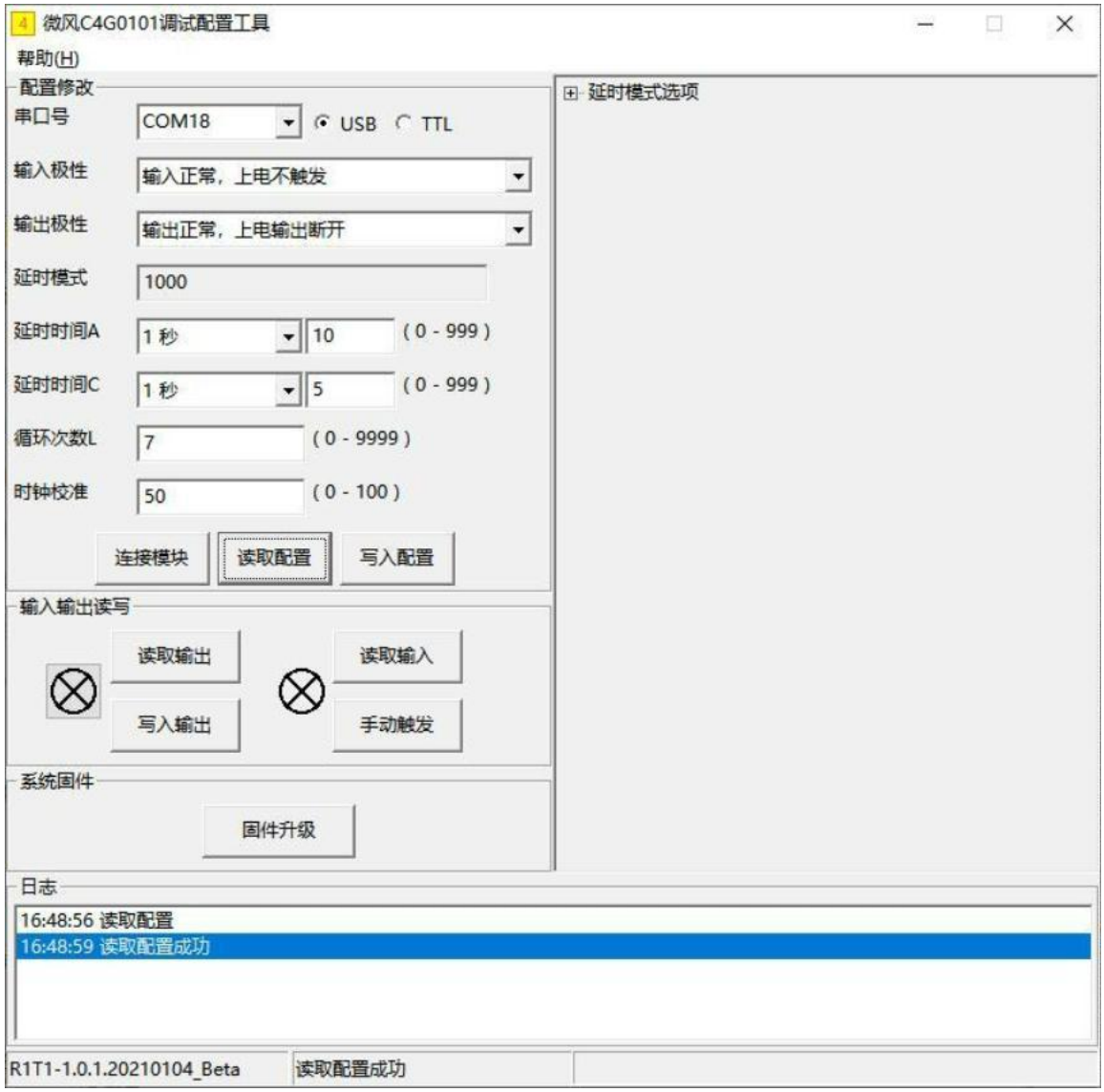

Figure 3-3 Read Module Configuration Example

3.2.1.3 Write Configuration

"Write configuration" is responsible for writing the delay configuration into the module. When writing the configuration, you need to select a specific delay mode, and there are specific delay mode options on the right side of the software for selection. After selecting, the delay mode just selected will appear in the text box of the delay mode on the left side of the software. Please select the corresponding delay mode for configuration based on your own needs. The software uses the default configuration every time it is started. It is recommended to read the configuration of the module before modifying it.

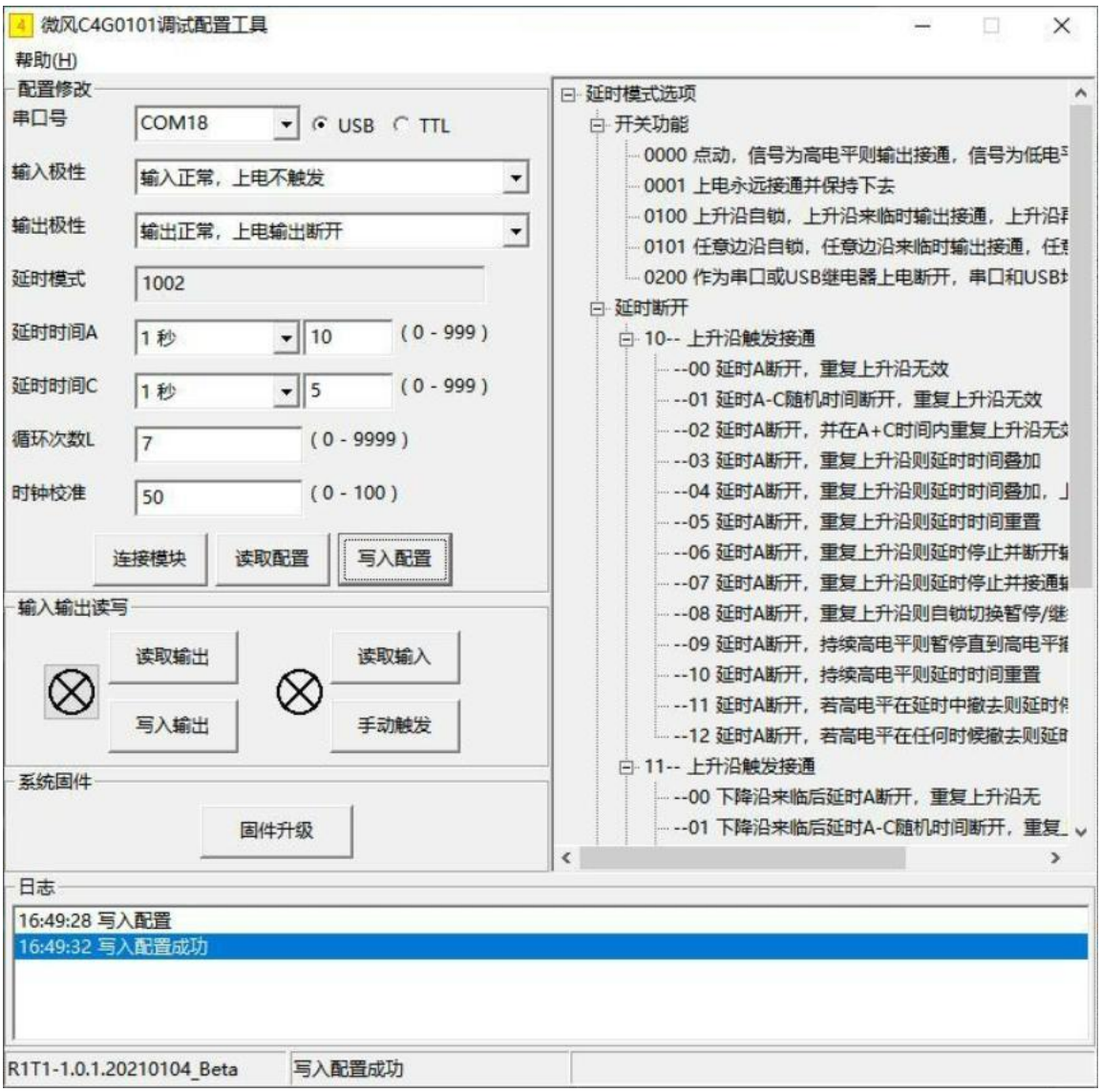

Figure 3-4 Write Module Configuration Example

3.2.1.4 Delay Calibration

The module is shipped with a typical delay time accuracy of about 1% up to 2%. For more demanding applications, it is necessary to calibrate the delay time of the module. This calibration is performed by filling in the corresponding calibration value in the "Clock Calibration" column. The calibration value may be adjusted between 0-100, the default value is 50; the delay time corresponding to each unit is about 0.05%. That is, increasing one unit of calibration value will increase the delay time of the module by 0.05%; decreasing one unit of calibration value will decrease the delay time of the module by 0.05%.

Specifically, calibration may be performed by performing a long delay of 1000 seconds[1]. Set the module to a long delay of 1000 seconds, then trigger and confirm whether the actual delay

[1] Actually more than 100 seconds is enough.

time is too short or too long; if the delay time is too short, increase the calibration value, and if it is too long, decrease the calibration value. Finally, the delay accuracy of the module may be calibrated to within 0.05%.

The calibration value will be written into the module together with other function configurations of the module when you click "Write Configuration" to complete the calibration.

3.2.2 Input and Output Reading and Writing

The "Input and Output Reading and Writing" area is responsible for manual control of the relay on and off, input level detection and manually triggering the delay. The communication parameters of this software when controlling the module are all determined by the serial port number. In some specific delay modes of the module, the priority of the selected delay mode is greater than that of the manual control relay output. At this time, the writing output may not work, such as 0000-inching mode, which is a normal phenomenon.

3.2.2.1 Write Output

The "Write Output" is responsible for controlling the module relay on and off. If the relay makes, the button picture on the left side of the "Write Output" needs to be clicked and switched to the on state (yellow). Now, click "Write Output" again and the software will communicate. When the communication is complete, the relay will toggle to make. Conversely, if the relay breaks, the picture button needs to be switched to the off state (gray), and then click "Write Output".

Figure 3-5 Write Output Example

3.2.2.2 Read Output

"Read Output" is responsible for reading the output status of the module relay. Click the "Read Output" button, the software will change the picture button according to the output status of the relay on the module, if it is on, the picture button on the left side of the "Read Output" button will turn yellow; if it is off, the picture button will turn gray.

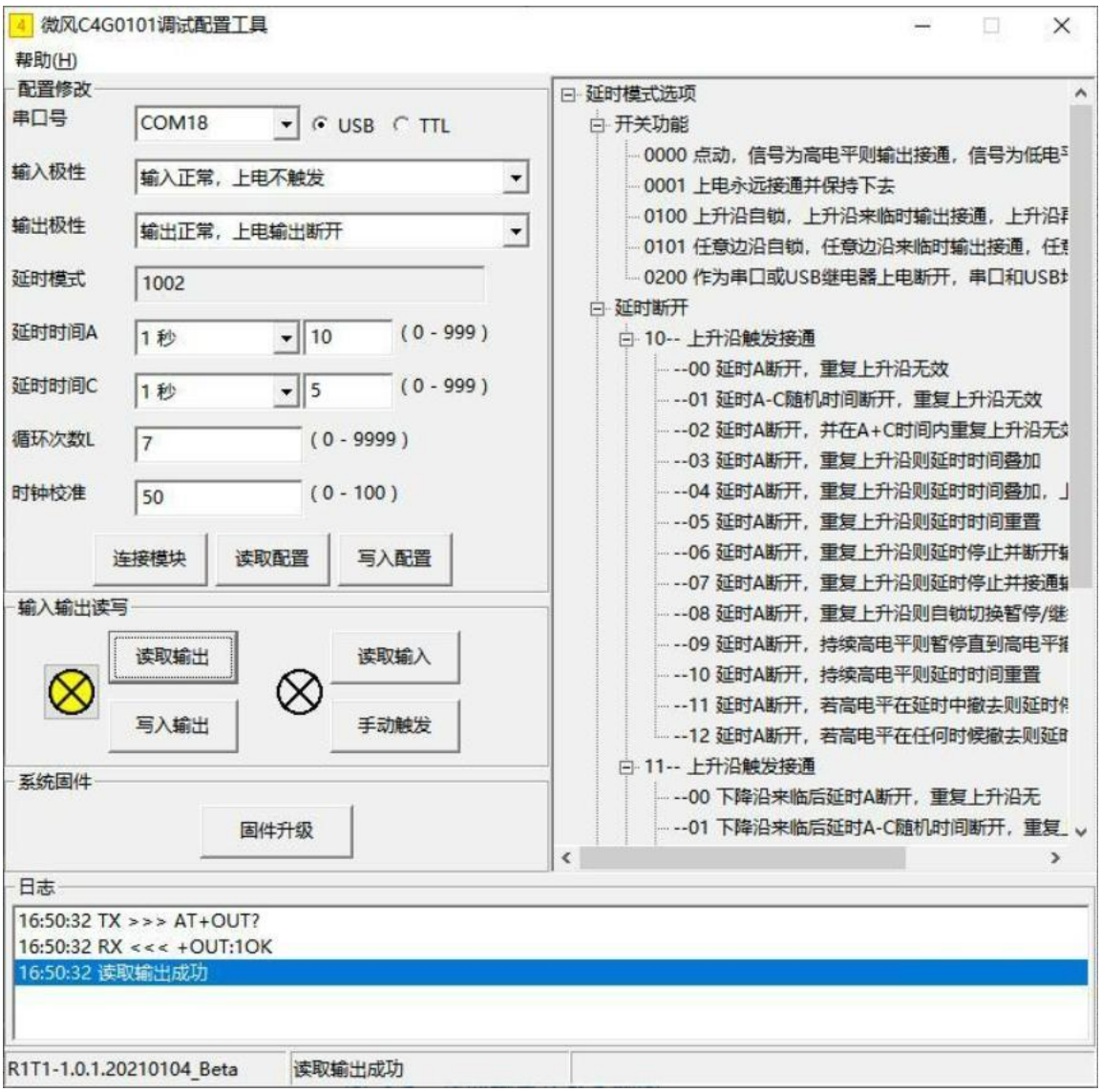

Figure 3-6 Read Output Example

3.2.2.3 Read Input

The "Read Input" is responsible for the detection of the input level of the module. Click the "Read Input" button, if the input is high-level, the picture on the left side of "Read Input" will turn yellow; if the input is low-level, the picture will turn gray.

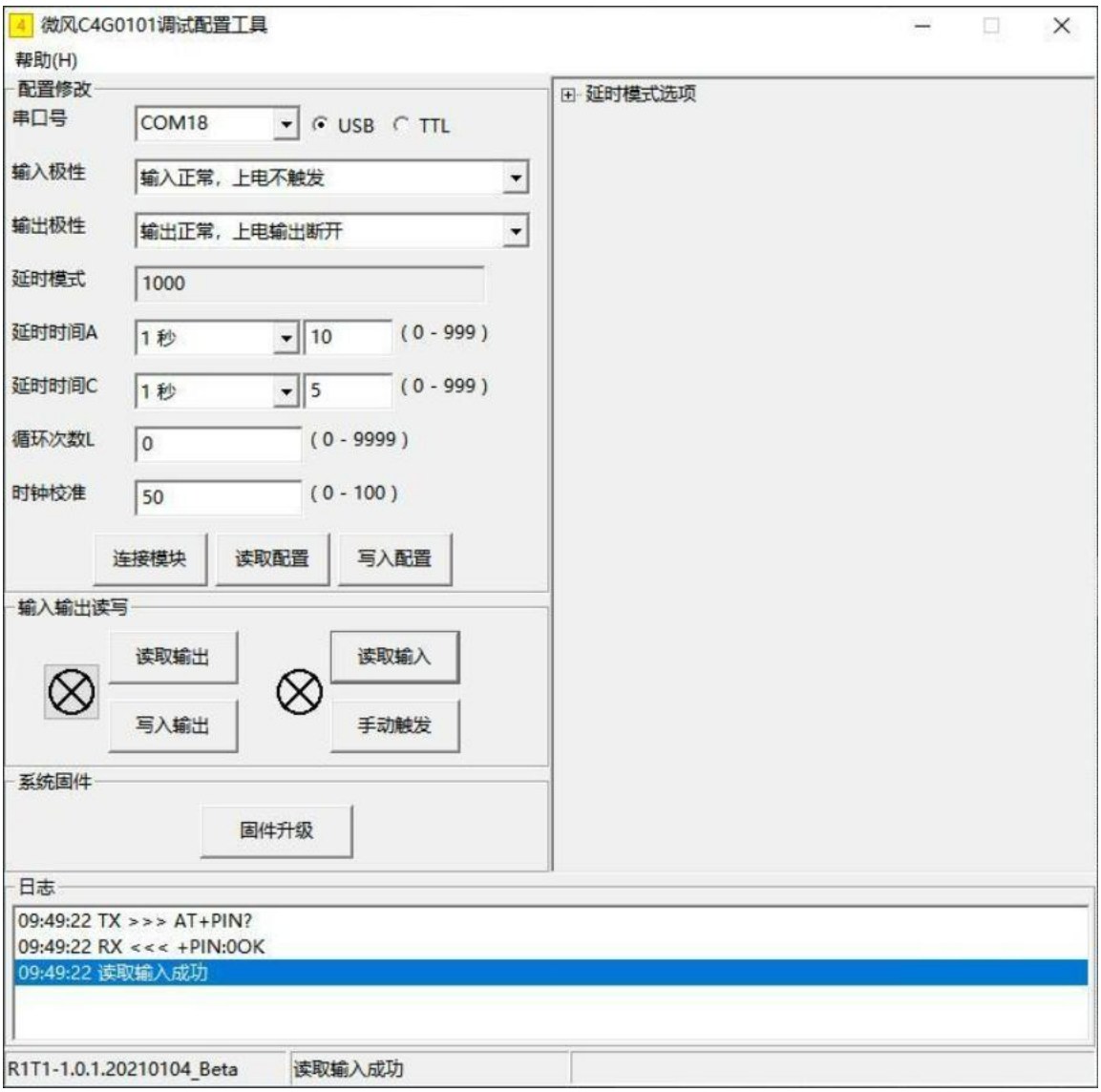

Figure 3-7 Read Digital Input Example

3.2.2.4 Manual Trigger

The "Manual Trigger" is responsible for manually triggering the delay, the specific delay action depends on the configuration. By clicking the "Manual Trigger" button, the software will send a command to the module to simulate a single effective trigger level lasting about 500 milliseconds, which consists of three phases: rising edge - high-level - falling edge.

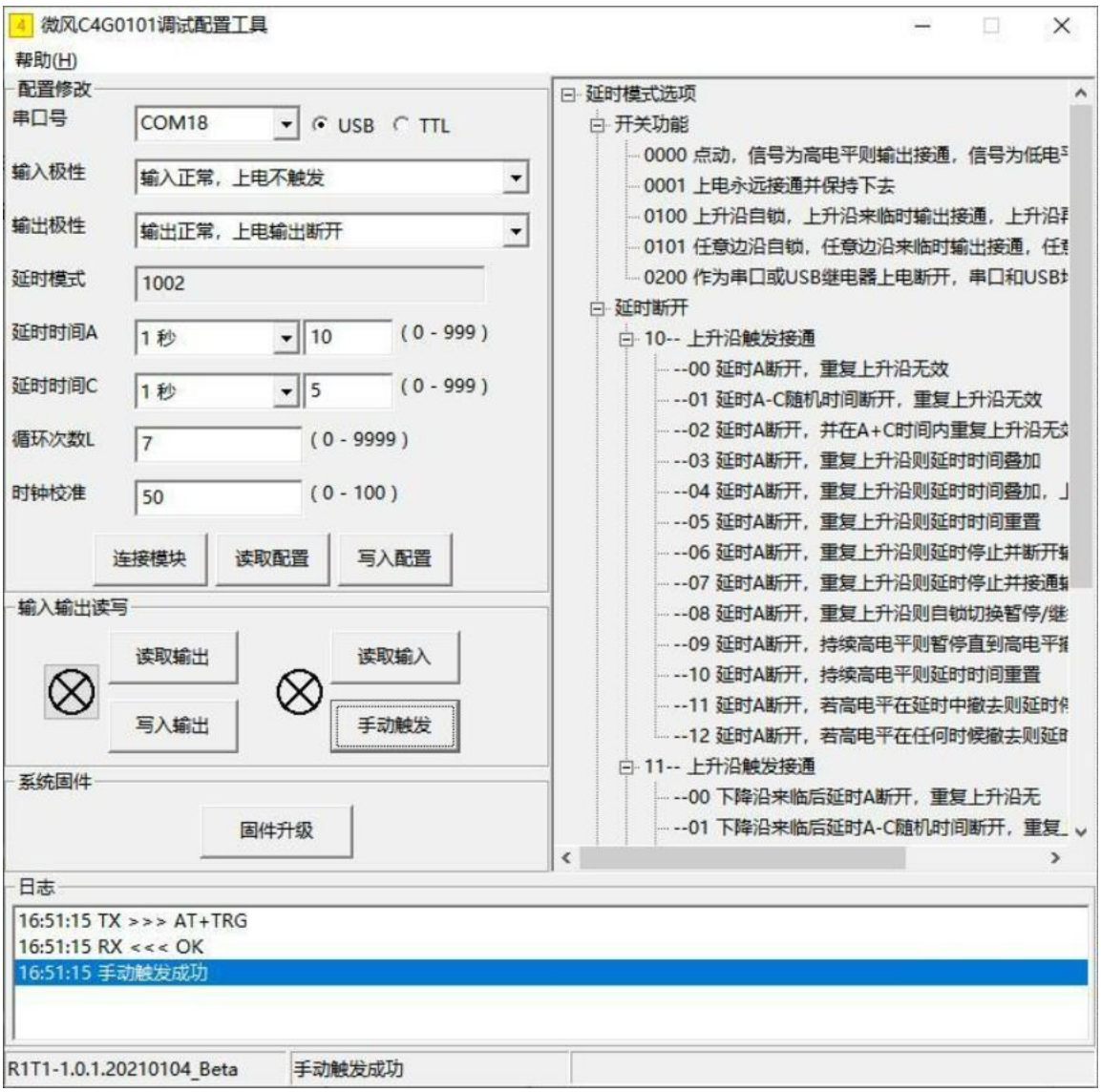

Figure 3-8 Manual Trigger Example

3.2.3 System Firmware

The "Firmware Update" area is responsible for firmware upgrade. This module have three firmwares available: "Normal Firmware", "Quick Configuration Firmware" and "Customized Firmware".

Normal Firmware (NF) are designed for maximum flexibility, where adjustment of all parameters are possible through the digital display and keys.

Quick Configuration Firmware (QCF) are designed for quick parameter adjustments. It does not allow changing I/O polarity and delay mode through the digital display and keys, but delay time A & C and cycle number L may be conveniently modifed.

Customized Firmware (CF) are designed for cases where the required functionality is missing in NF. All CFs are designed from scratch and only have a fixed delay mode that meets the customer's needs.

Firmware updates will not modify delay parameters. The old delay parameters will be inherited. If any parameter changes are necessary, they may be configured through the USB port or digital display & keys.

Before the firmware upgrade, please check the connection between the module, USB cable and the host computer to make sure the connection of the three is in good condition. If the connection is unstable, such as loose USB cable, poor contact, it is not recommended to upgrade the operation.

During the upgrade process, there is a progress bar at the bottom indicating the update progress. Please do not turn off the power and break the USB cable before the update is complete. Although the module will not be damaged by power-off and unplugging the USB cable, because the firmware upgrade has not been completed, the product will stay in the firmware upgrade mode when it is powered on the next time until a good firmware is written.

If the communication suddenly breaks during the upgrade process, or if there is a request timeout, the module needs to be let alone for about half a minute and then power cycled to connect for the upgrade.

3.2.3.1 Normal Firmware

In the "Firmware Update" area, click "Normal Firmware" button and follow the instructions to upgrade the firmware.

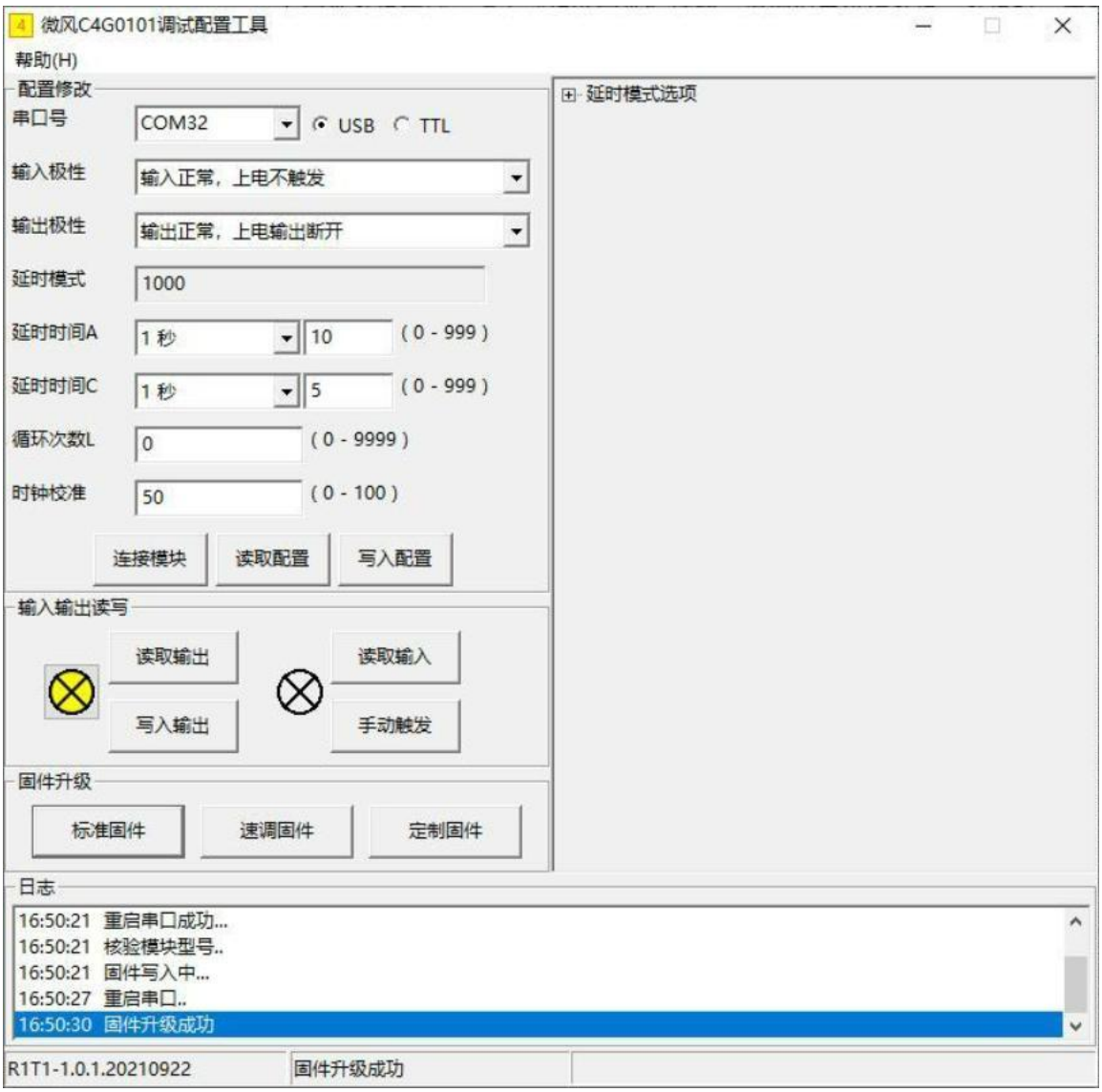

Figure 3-9 Normal Firmware Update Example

3.2.3.2 Quick Configuration Firmware

In the "Firmware Update" area, click "Quick Configuration Firmware" button and follow the instructions to upgrade the firmware.

Figure 3-10 Quick Configuration Firmware Update Example

3.2.3.3 Customized Firmware

In the "Firmware Update" area, click "Customized Firmware" button, then the firmware ID dialog will be popped up. Fill in the customization ID like "1xxxx" then the corresponding firmware will be loaded.

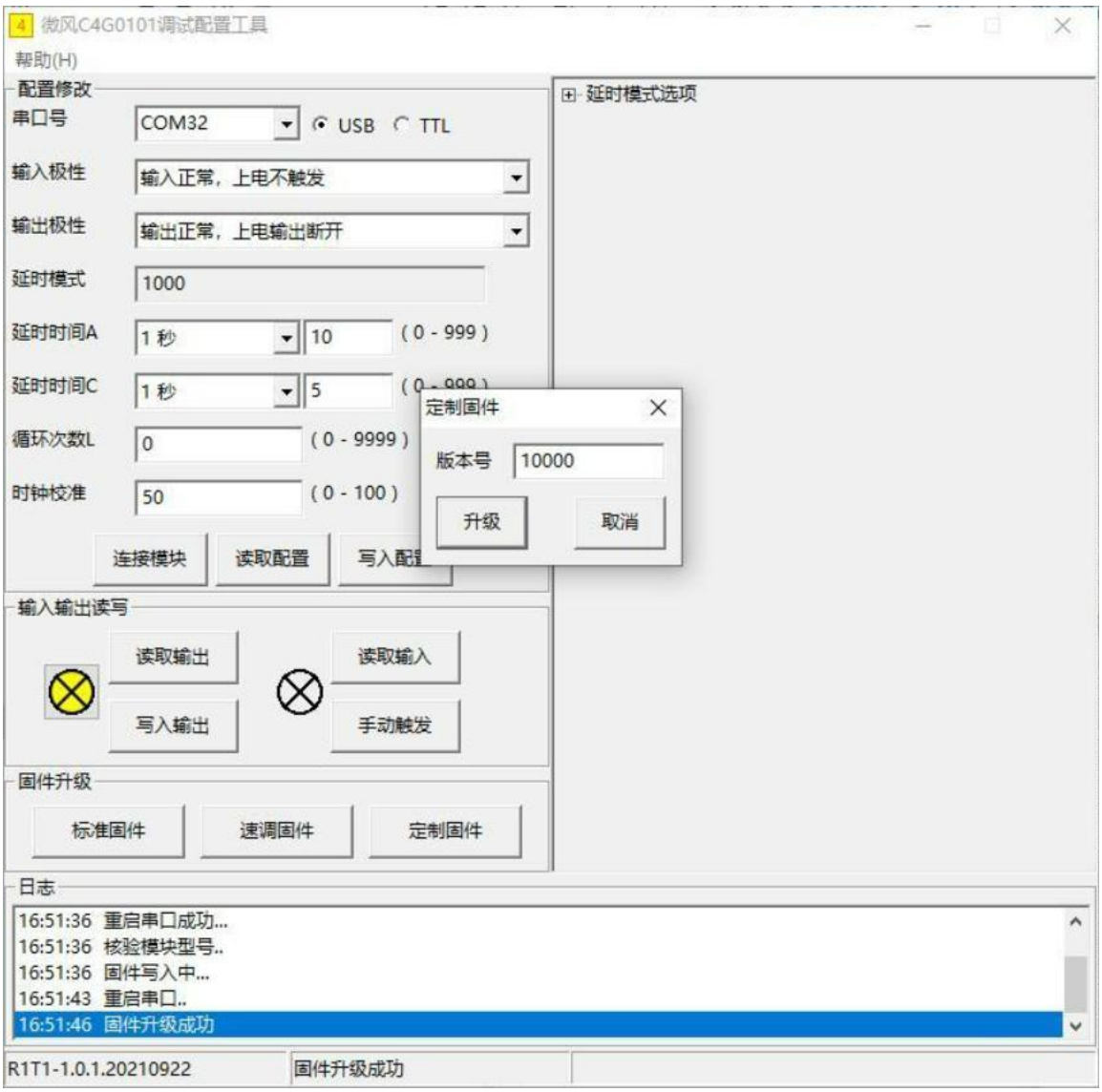

Figure 3-11 Customized Firmware Update Example

3.3 Guide For Secondary Development

The module supports AT commands, and standard Windows or Linux serial port programming practices may be applied to secondary development of the host computer. The module itself can update the firmware by downloading the official host computer software, but secondary development is not supported.

Chapter 4 Modification Description

4.1 Preface

This product has the following modifications whose ordering numbers are in the form of E4J0101R[a]T[b]M[ccc]. The [a] field and [b] field are the main version number and sub-version number of the product respectively; the [ccc] field determines the specific modification of the product. The product modification classes are mutually independent. If no specific requirement is designated when the product is shipped, the default option is the most basic full relay output type, that is, M31. The specific meanings of the [ccc] field are as follows.

Table 4-1 The Meanings of the [ccc] Field

Digit	Description	Meaning	
First	Supply voltage of the product	1	5V supply type
		2	9V supply type
		3	12V supply type
		4	18V supply type
		5	24V supply type
Second	Output modes of the product	1	Relay output type
		2	Transistor output type
Third	Remote control function availability	1	Remote control function is not available, TTL serial port is available
		2	Remote control function available, TTL serial port not available

4.2 Transistor Output Type Description

For the unidirectional transistor output version, the transistor product is connected to the circuit in open-drain mode. The transistor has a rated working voltage of 12-48V DC and a rated current of 10A. With a 10A freewheeling diode on the transistor, it can directly power an inductive load up to 10A[1]. The typical wiring diagram of a transistor output type is shown below.

Compared with relays, transistors are far more sensitive. When the module is powered on or off, the internal working state of the control chip may be abnormal; even if it is not triggered, the transistor may turn on for a moment[2] and then turn off. This problem does not exist in the relay

[1] Usually heavy-duty electromagnets and motors, etc.

[2] About 100 milliseconds.

version, but you must pay attention to the use of the transistor version, especially when the device connected to the output terminal may respond to short pulses. An effective solution is to use power sequence: to ensure that the product is powered on before the output is powered on, and to ensure that the output is powered off before the product is powered off.

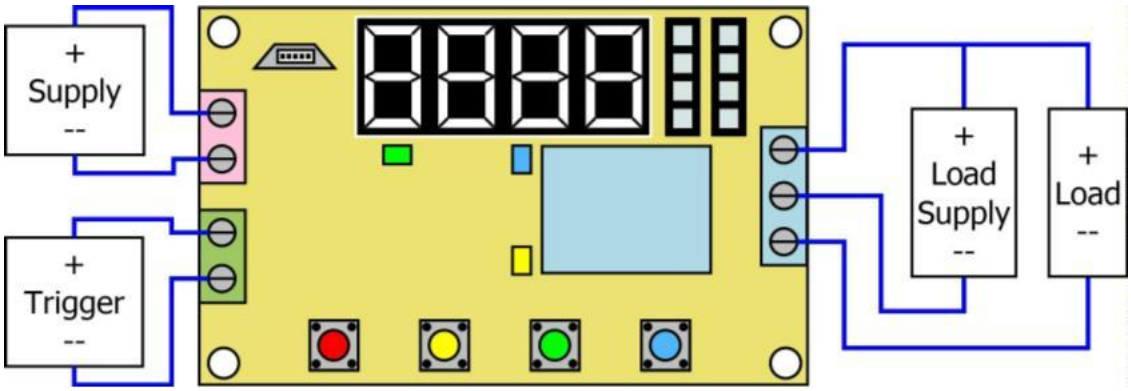

Figure 4-1 Typical Wiring Diagram of a Transistor Output Type Product

4.3 "Easylight" Customization Process Description

"Easylight" customization is a method of mass customization of delay modules introduced by our company. It allows for quick customization of inexpensive and functionally stable time delay modules. Since the E4J0101 delay module is relatively expensive and not quite economical in batch use, so this customized mode is specially introduced. The hardware used in the customization is B2J0601, which has a non-isolated digital input and a digital output. It is much superior to the delay module in terms of size and price, but slightly less stable, and is very suitable for commercial and light industrial situations with strict requirements on price and size. All of the delay modes of the E4J0101 may be implemented in the B2J0601, regardless of complexity.

The "Easylight" customization process is divided into four processes: "Function Trial", "Function Confirmation", "Second Confirmation" and "Batch Delivery", as listed below. For an example of mass customization, please refer to 6.1.2. At the million-shipment level, "Easylight" customization may reduce the total cost of ownership by up to 70%.

4.3.1 Function Trial

The customer first obtains E4J0101, and tries various combinations of delay parameters in the actual usage environment, trying to find a suitable setting. Once a suitable setting is found, the customer proceeds to the next stage.

4.3.2 Function Confirmation

The customer obtains a small number of E4J0101, configures them to the appropriate settings, and tries them out for a period of time in an actual usage environment. If the results of the trial are satisfactory and meet the needs, contact our company and report the detailed configuration of E4J0101.

4.3.3 Second Confirmation

Our company produces a small number of B2J0601 with the same function and solidified delay parameters according to the customer's E4J0101 configuration, and sends them to the customer's actual usage environment for testing. If this test still passes, we will proceed to the mass production phase.

4.3.4 Mass Production

Our company have negotiated the supply contract with our customer and mass-produced to preset the B2J0601 with the same delay mode, which will be supplied at a much lower price than the full-featured E4J0101, making it extremely economical.

Chapter 5 Electrical Specification Description

5.1 Normal Working Conditions

The normal working conditions of this module are shown in the table below. Only within this condition can the normal operation be guaranteed.

Table 5-1 Normal Working Conditions

Description	Range	
Supply voltage	5V	DC 4.8 - 5.2V
	9V	DC 8.5 - 11V
	12V	DC 11 - 14V
	18V	DC 16 - 20V
	24V	DC 20 - 28V
Power supply ripple	----	Less than 1Vp-p
Supply current	----	Less than 200mA
Output stress load driven power supply	Relay type	DC 30V or AC 0 - 220V, 8A
	Transistor type	DC 12 - 48V, 8A
Operating temperature	----	-20 - 60°C
Trigger input	----	DC 0-30V
TTL communication port	----	Less than 5Vp
Output isolating voltage	Relay type	Less than 250V
	Transistor type	Less than 130V

5.2 Absolute Maximum Ratings

The extreme conditions that this product can withstand are shown in the following table. Stresses at or above those listed here may permanently damage the product.

Table 5-2 Absolute Maximum Ratings

Description	Range	
Supply voltage	5V	DC 5.3V
	9V	DC 11.5V
	12V	DC 15V
	18V	DC 22V
	24V	DC 30V

Self-resettable fuse	----	DC 60V, 500mA
Output stress load driven power supply	Relay type	AC 250V, 10A
	Transistor type	DC 55V, 10A
Storage temperature	----	-40 - 85°C
Trigger input	----	DC 50V
TTL communication port	----	Less than 5.5Vp
Input isolating voltage	----	DC 1000V, 60s (Type test only)
Output isolating voltage	Relay type	DC 1000V, 60s (Type test only)
	Transistor type	DC 250V, 60s (Type test only)
Relay mechanical life	Relay type	More than 100,000 times (Actual life varies with load, > 10,000 times under heavy load)

5.3 Other Parameters and Certifications

The other parameters and certifications of this product are listed as follows. These parameters and certifications include electrostatic discharge, electrical fast transient and voltage surge tests that comply with the requirements of IEC61000-6-2-2016 (Edition 3.0, 2016-08) for basic industry purposes. During all of these tests, the modules are powered by a well-grounded 12V supply and in active operation.

Table 5-3 Other Parameters and Certifications

Item	Details	Passing Criterion
Electrostatic discharge resistance IEC61000-4-2	4kV, discharge on all terminals.	(A) product functions normally.
Electrical fast transient resistance IEC61000-4-4	2kV, 5kHz, 2min, applied to all terminals.	(A) product functions normally.
Electrical fast transient resistance IEC61000-4-4	4kV, 5kHz, 2min, applied to all terminals.	(C) product is not permanently damaged.
Surge resistance IEC61000-4-5	1kV voltage surge to ground, applied to power terminals.	(C) product is not permanently damaged.

Creepage distance IEC60950-2L/2N	Pollution degree 3, material category IIIa and IIIb, basic isolation from relay terminal[1] to logic side[2], creepage distance above 6mm.	The actual distance is above 6.05mm, which meets the requirements.
Electrical clearance IEC60950-2H	Pollution degree 3, basic isolation from optocoupler input terminal and relay terminal to logic side, electrical clearance above 2mm.	The actual distance is above 2.1mm, which meets the requirements.
CQC Voluntary Certification[3]	CQC-11-448321-2016: Electronic Timer	Certificate No.: CQC-21002320614

5.4 Notes on Reliability

This product has enhanced stability thus well resists interferences in general industrial environments[4], and may be used as a general product in industrial applications. If additional stability is still required, a switching power supply[5] with Electrical Fast Transient (EFT) resistance or a supply line filter is required to power the product and the power supply cord must be shorter than 3m.

During all tests, the negative supply of the product is directly connected to the earth by default. The same connection should be made to obtain the reliability performance in the table above. In addition, when EFT interference is continuously applied, the remote control function will be temporarily disabled, and the digital tube may flicker slightly, which is normal.

The EFT specification of the digital input port applies to situations where the capacitive coupling clamp is used for testing and the pulse group is sparse[6]. Frequent pulses may result in overloading of the input resistor and cause rapid input failure. For applications where the digital input port is directly connected to frequent EFT pulses[7], please contact us to order an enhanced product whose input resistor is reinforced. The ordering number of this enhanced product has an additional suffix "XS".

[1] Primary circuit.

[2] Extra low voltage(ELV). Take note that it is not designed according to Safety Extra Low Voltage circuit standards, that is, not SELV.

[3] Only applies to a specific version that has reinforced wiring terminals. If this version is needed, please contact us.

[4] It withstands 2kV EFT, which greatly exceeds the requirement to withstand 1kV EFT in IEC61000-6-2-2016.

[5] Preferably isolated.

[6] The interval between adjacent pulse groups is a few minutes or more.

[7] Such as inductive loads and some high frequency electrostatic sources.

Chapter 6 Appendix

6.1 Typical Applications

6.1.1 Switching Function Application

Now a certain warehouse needs a simple lighting. In order to be convenient to use, it not only needs a fixed switch button, but also needs to be able to switch the lights by remote control.

6.1.1.1 Requirement Analysis

The wireless function, one input and one relay output are used in this application, and the power supply voltage of the product and the lighting lamp is 12V and 220V AC civil voltage respectively. The application may be fulfilled with the E4J0101M312 product with wireless function. We use the delay mode of "Rising edge self-locking, the output is turned on when the rising edge comes, and the output is turned off when the rising edge comes again", that is, the mode "0100".

6.1.1.2 Circuit Design

According to the requirements above, connect the circuit as shown in the figure:

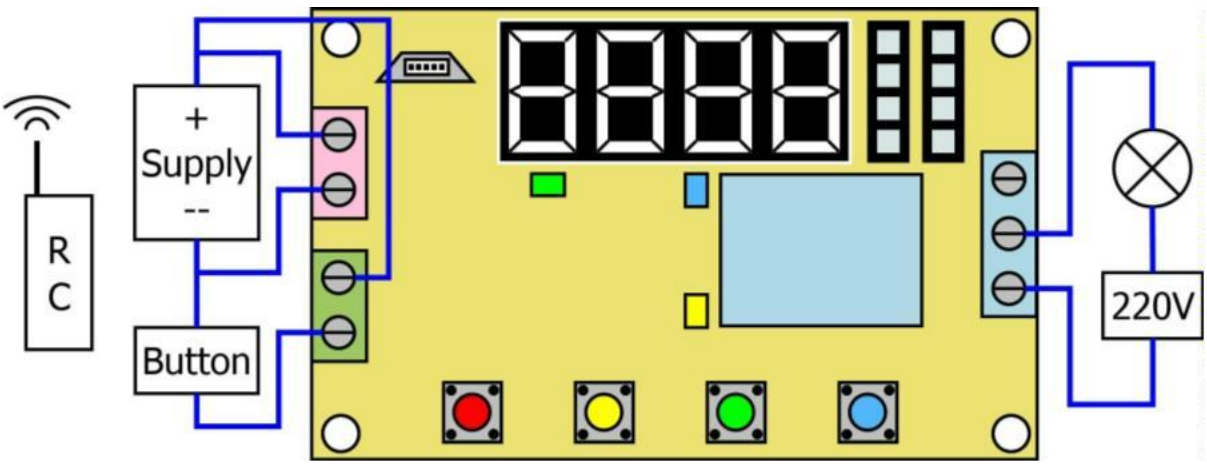

Figure 6-1 Wiring Diagram of Switch Function Application Case

Since the rising edge self-locking trigger method is used, a self-resetting button is selected for the button selection.

6.1.2 Delay-Then-Break Application

An existing corridor light is used to reduce power consumption. When someone arrives, the corridor light is turned on; when the person leaves, the corridor light is turned off after a delay period. A switchable body sensor is used to detect personnel activities.

6.1.2.1 Requirement Analysis

One input and one relay output are used in this application, and the power supply voltage of the product and the corridor LED lights is 12V. The application may be fulfilled with the E4J0101M311 product. We use the delay mode of "Rising edge triggers on, delay A then breaks, repeat rising edge to reset the delay time", that is, mode "1005". Once personnel activity is detected, the relay makes and the timing starts. This time will always be reset if there is personnel activity. The relay will break after a delay of a period of time until there is no personnel activity.

6.1.2.2 Circuit Design

According to the requirements above, connect the circuit as shown in the figure:

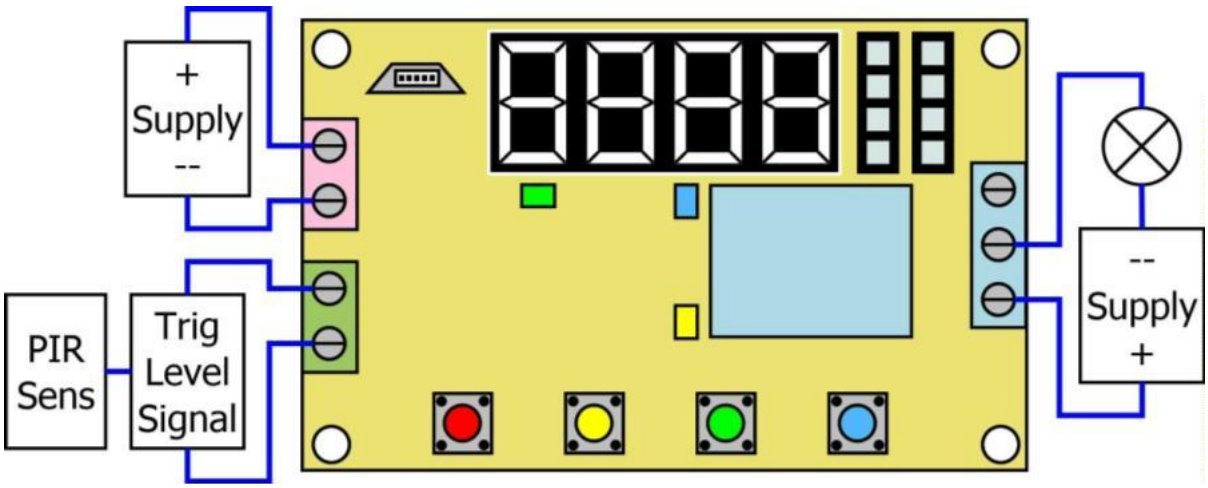

Figure 6-2 Wiring Diagram of Delay Off Application Case

The delay time A should be set according to the approximate length of sufficient light required after the person leaves the sensor.

6.1.2.3 "Easylight" Customization

Corridor lights are mass-produced products, so it is not economical to implement using E4J0101, and it needs to be customized to the more economical B2J0601.

First, the customer explores the delay parameters for setting E4J0101 and confirms that it may be used for the corridor light, and then purchases a few E4J0101 to produce a small number of corridor light samples.

Then, after confirming the normal behavior of these corridor lights, the customer will report the delay time (120 seconds) and delay mode (1005) to our company, and we will produce a small number of B2J0601 samples to the customer for testing.

Finally, when the customer confirms that these B2J0601 samples meet the requirements, the supply contract is signed, and the mass production of customized B2J0601 is started to complete the entire customization process.

6.1.3 Delay-Make-Then-Break Application

A factory robot arm grasps objects. The arrival of an object is detected on the conveyor belt, and it is picked up by the robot arm to the temporary storage point. Because the detection sensor is still some distance away from the robot arm, it needs to wait for a short period of time before powering on the operation, then stop and power off after a short period of operation.

6.1.3.1 Requirement Analysis

One input and one relay output are used in this application, and the power supply voltage of the product and the robot arm is 12V. The application may be fulfilled with the E4J0101M311 product. We use the delay mode of "Rising edge triggers off, delay A then makes, and delay C then breaks, repeat rising edge is invalid", that is, mode "2000".

6.1.3.2 Circuit Design

According to the requirements above, connect the circuit as shown in the figure:

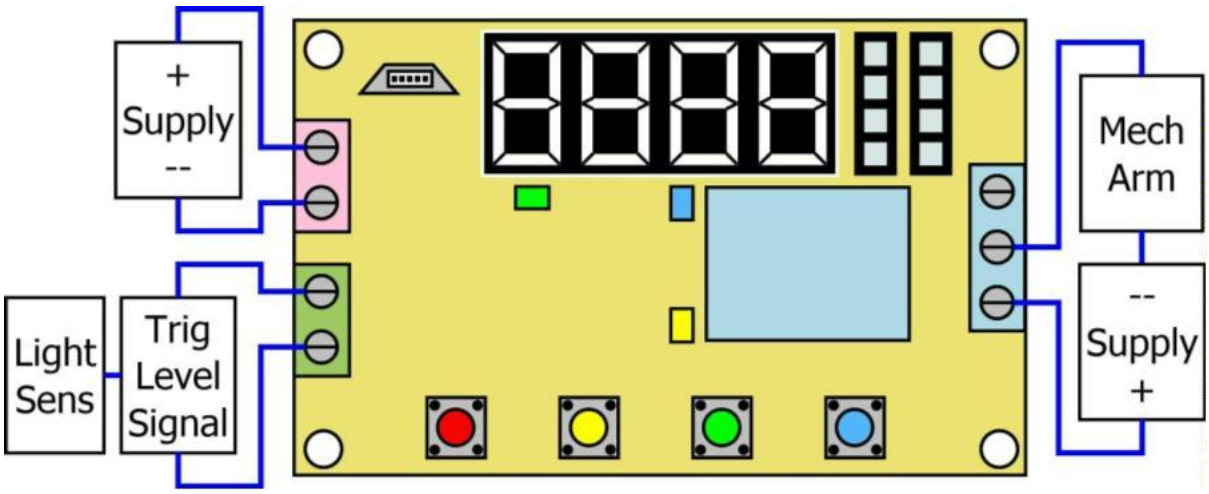

Figure 6-3 Wiring Diagram of Delay On/Off Application Case

The delay A is set according to the time when the object passes through the sensor to reach the robot arm, and the delay C is set according to the power-on operation time of the robot arm.

6.1.4 Cyclic Delay Application

A construction site drill rig will burn after working for extended periods, and hence needs some time to cool between uses. Frequent manual switching is not conducive to the convenience of operation. Usually, after 60 seconds of operation, a cooling time of 30 seconds is required. The drill rig runs for a maximum of 200 times before it stops operation.

6.1.4.1 Requirement Analysis

One input and one relay output are used in this application, and the power supply voltage of the product and the drill rig is 12V and 220V AC respectively. The application may be fulfilled with the E4J0101M311 product. We use the delay mode of "Rising edge triggers, makes and delays A, breaks and delays C, with a total of L times. Repeat the rising edge to stop the delay and break the output", that is, mode "3004". In addition, a button is added to control the drilling rig: when the button is pressed, the drilling rig will continue to cycle for 200 times in the manner of working for 60 seconds and stopping for 30 seconds; when the button is pressed again, the drilling rig will stop operating immediately.

6.1.4.2 Circuit Design

According to the requirements above, connect the circuit as shown in the figure:

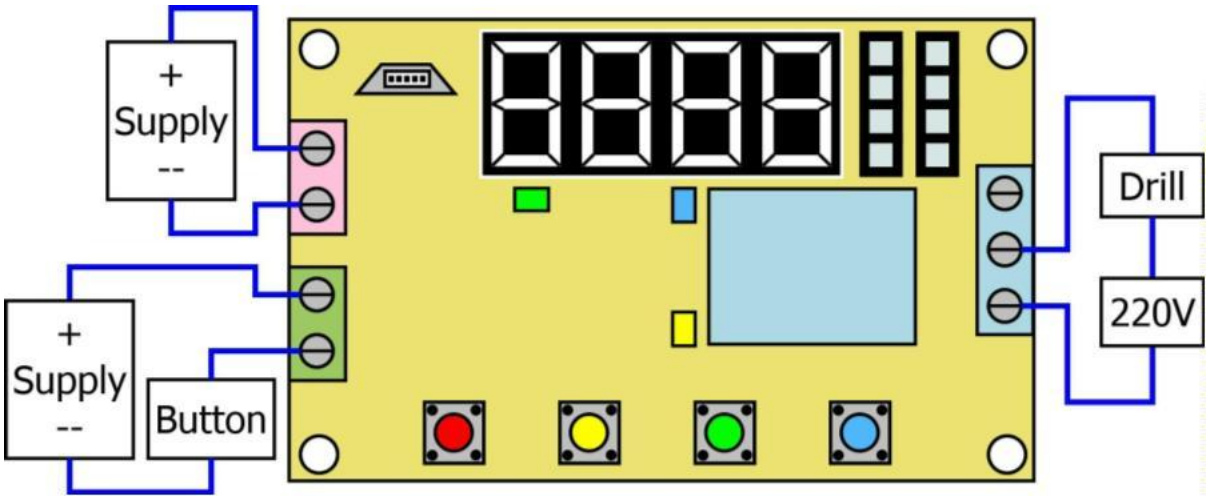

Figure 6-4 Wiring Diagram of Cyclic Delay Application Case

The delay time A is set to 60 seconds, the delay time C is set to 30 seconds, and the cycle number L is set to 200.

6.1.5 Counting Delay Application

In a factory production line, a high-level signal is required to drive a conveyor controller to detect the number of objects in a box. The manufacturing of the objects is done manually, the interval of the flow is variable, and it is not possible to confirm the number of objects by time, so photoelectric sensing is used to detect it. The number of objects per box is 100.

6.1.5.1 Requirement Analysis

One input and one relay output are used in this application, and the power supply voltage of the product and the high-level control signal is 12V. The application may be fulfilled with the E4J0101M311 product. We use the delay mode of "Every L rising edges detected trigger on, delay A then breaks, and the rising edge is invalid during the delay period", that is, mode "4000". Every 100 rising edges are detected, the relay makes and maintains for a short period of time.

6.1.5.2 Circuit Design

According to the requirements above, connect the circuit as shown in the figure:

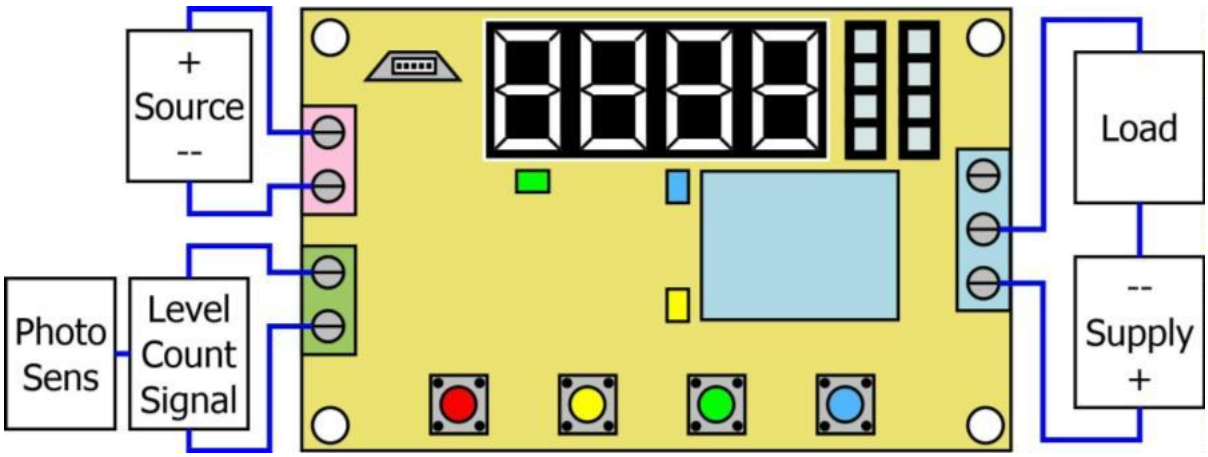

Figure 6-5 Wiring Diagram of Counting Delay Application Case

The delay time A is set to 1 second, and the cycle number L (used as the count number here) is set to 100.

6.2 Legal Statement

The company reserves the right to further modify, upgrade and amend the product and its manuals without notifications. The user should confirm that the information is complete and up-to-date before placing an order. The company is not responsible for the specific application of the customer and only guarantees that the module functions properly under normal working conditions. This product may be protected by one or more patents or other forms of intellectual properties and may contain third-party intellectual properties; the use of this product does not

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The company does not take responsibility for the user configurations of the product and only guarantees the correct operation of the product according to these configuration. Nor does the company guarantee that the specific configuration is suitable for a specific purpose. The company shall not be held liable for any losses in cases where the user configurations do not fit the specific purpose.