Liquid Level Sensor Instructions

1、Overview

- Feedback type liquid level detection module can output ‘in liquid’ or ‘out liquid’ signal, increase the capacitance value reading confirmation, to determine whether the detection trigger is the real liquid level;

- This module has rich IO and bus communication interfaces. It is recommended to trigger the Z-axis stop signal by using the pulse output from OUT1, and verify the real liquid level by using 485 or CAN feedback data；

- Examples of application scenarios and validation logic:

1. Conventional applications require that the conductive needle or tip of the sampling suction should be below the liquid level before and after suction, otherwise it will result in suction emptying phenomenon, which requires the liquid level sensor module to have and only have two very clear triggers for in-liquid and out-liquid;

2. When the main control sends out the detecting command and the needle touches the liquid level, OUT1 sends out the pulse signal in time, and at the same time uploads the status value of the current module through the bus, when and only when the status value is 01 for the real liquid level;

3. After the needle or tip has been aspirated through the pump, it is recommended to reset the module status to 00 in preparation for the next step of obtaining a clear status;

4. The Z-axis rises, the needle leaves the liquid level, OUT2 outputs a pulse, and the bus module's updates the status value, and this detection is true when and only when the status value is 02;

In summary, it can be seen that: a complete detection process is that, when the needle or the tip enters the liquid surface, OUT1 triggers the output pulse, and the status value of the module on the bus is 01, and when the needle leaves the liquid surface, OUT2 triggers the trigger, and the status value of the module on the bus is 02;

• Multi-needle parallel detection mode:

1. Firmware must be in cls2.xxxxx.cfw format or higher. For 8-channel configurations, IDs should be sequentially set as 01, 02...08. Set ID 01 as the master via the 485 port using the command [01#cls_master=1] (query with [1#cls_master]). All other IDs default as slave stations.

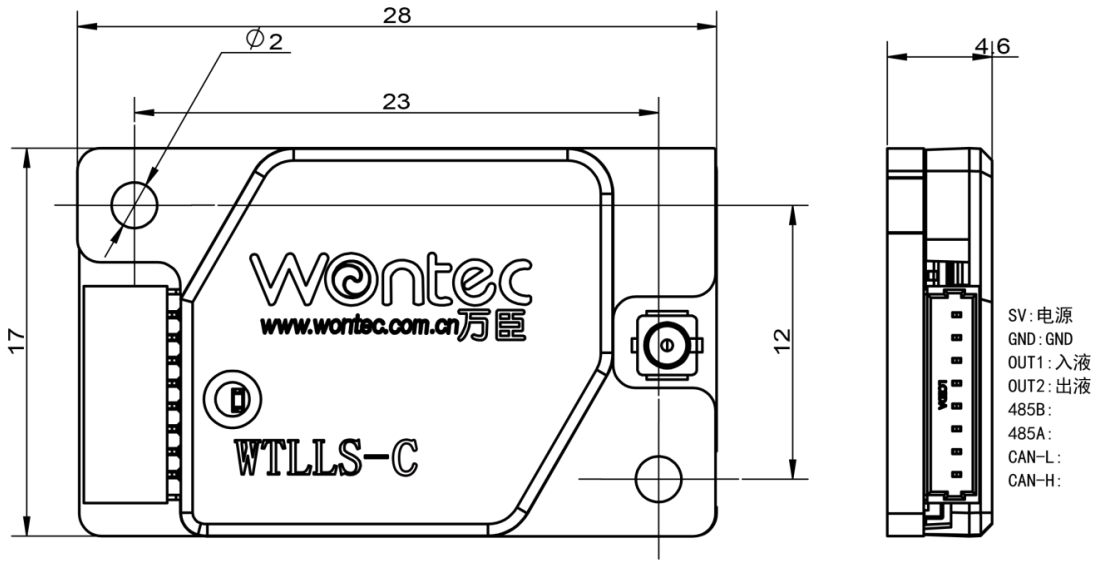
2. CAN ports connecting the master station to each slave station;

3. The command to enable multi-probe parallel detection is >01ga; to disable multi-probe parallel detection, use >01g1.

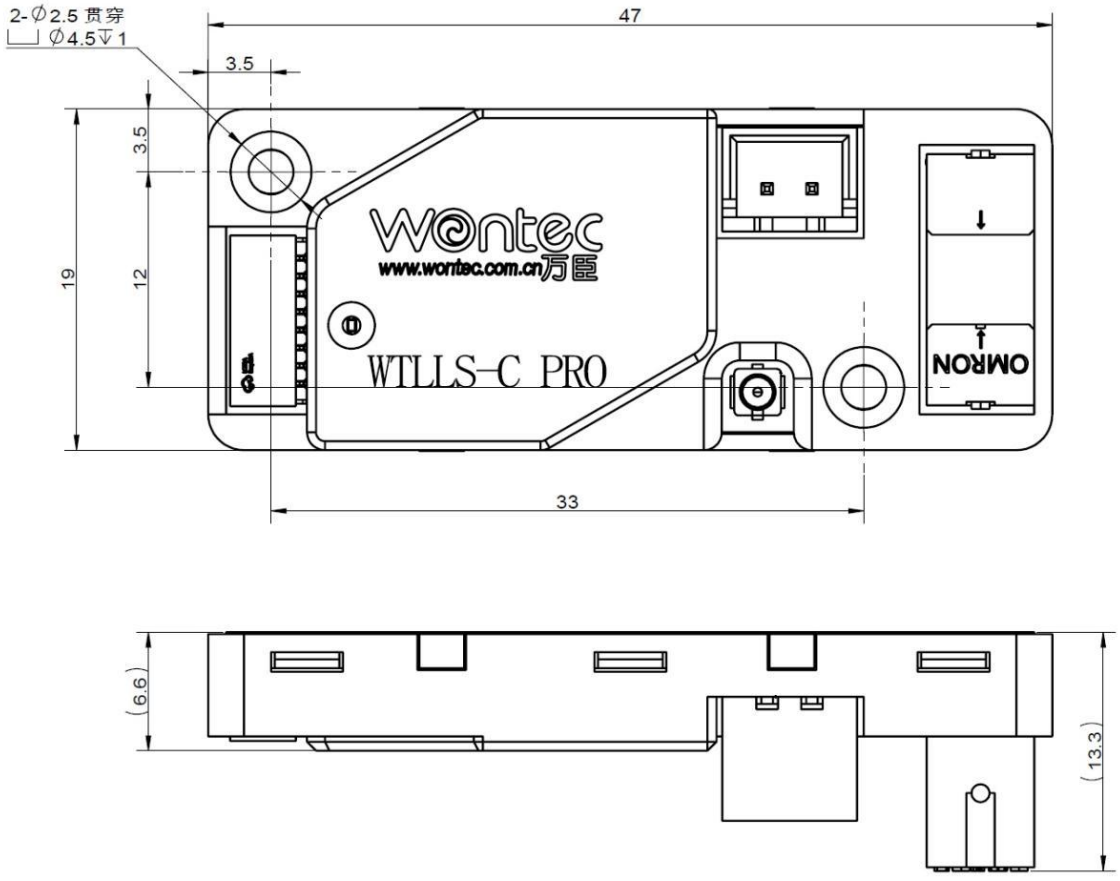
2、Installation size

Click to download module 3D documentation

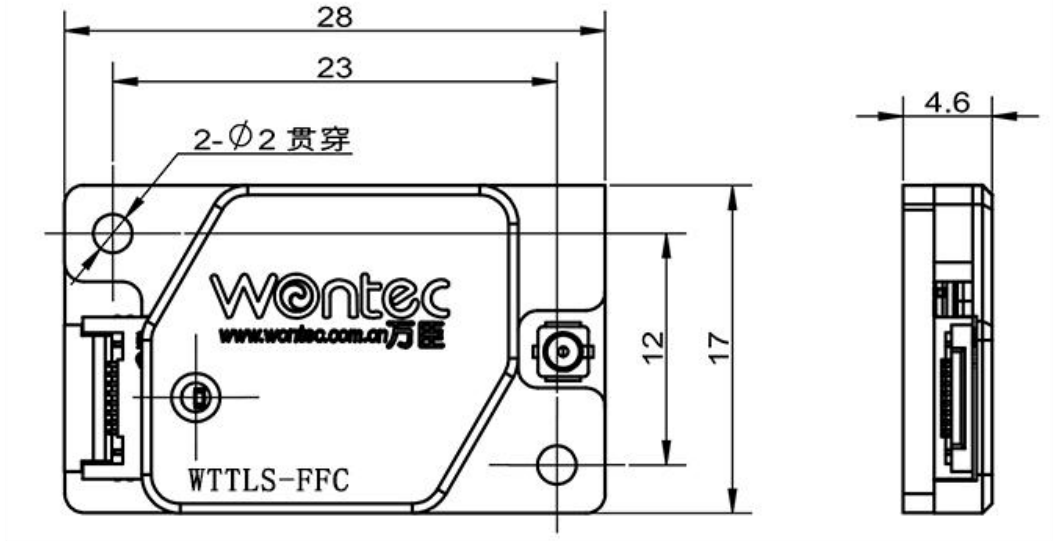
WTLLS-C Dimension Drawing:



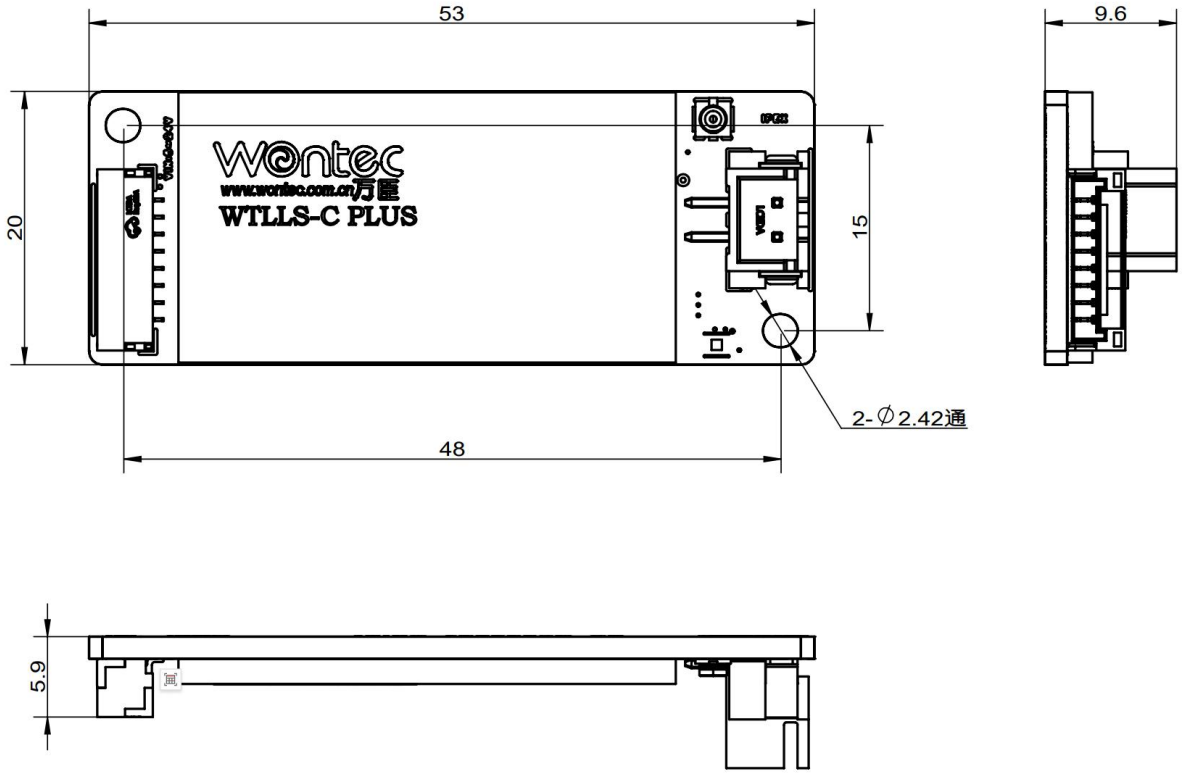
WTLLS-C P Dimension Drawing:



WTLLS-FFC Dimension Drawing:



WTLLS-C PLUS Dimension Drawing:



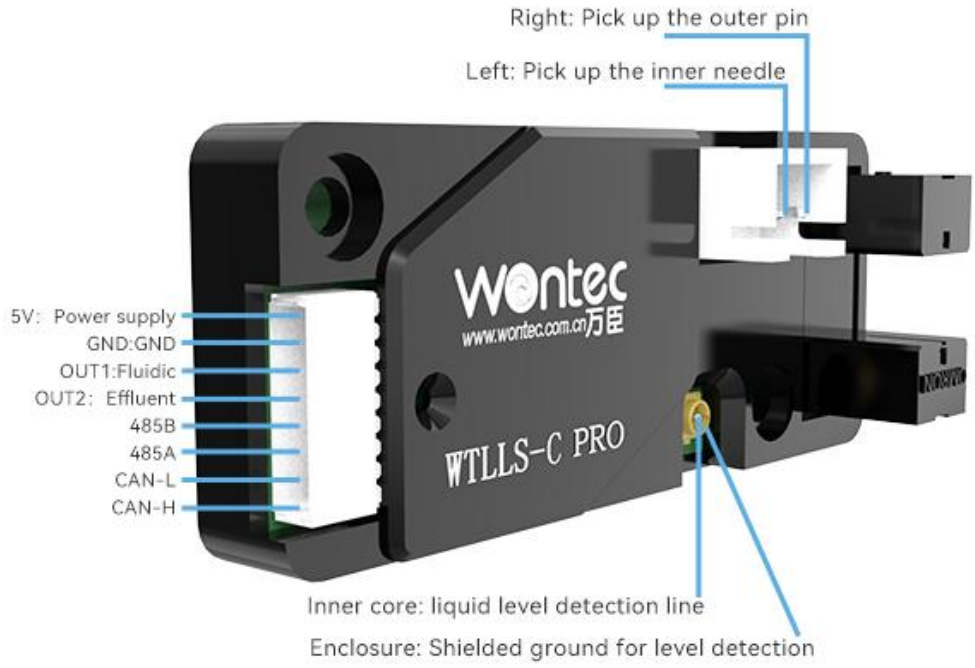
3、Interface description

3.1 Liquid Level Detection Sensor 8P

The Liquid Level Sensor 8P interface includes inlet and outlet signals, 485 and CAN functions.

Liquid Level Detection Sensor WTLLS-C		
No.	**meaning**	**descriptions**
①	5V	Power supply, max. 6V
②	GND	GND
③	OUT1	Contact with water surface signal With signal output low NPN signal
④	OUT2	Leaving the water surface signal has a signal output low NPN signal
⑤	485_B	485 B signal
⑥	485_A	485 A signal
⑦	CAN_L	CAN L
⑧	CAN_H	CAN H

Liquid level sensor 8P PRO: Two detection signal inputs are connected in parallel, only one of which can be selected;



Liquid Level Detection Sensor C **PRO**		
No.	**meaning**	**descriptions**
①	5V	Power supply, max. 6V
②	GND	GND
③	OUT1	Inlet Output
④	OUT2	Optocoupler output
⑤	485_B	485 B signal
⑥	485_A	485 A signal
⑦	CAN_L	CAN L
⑧	CAN_H	CAN H
⑨	left	internal needle
⑩	right	external needle
⑪	inner core	Liquid Level Detection Line
⑫	Probe shield or GND	Probe shield or GND

WTLLS-FFC:

Liquid Level Detection Sensor WTLLS-FFC		
No.	**meaning**	**descriptions**
①	5V	Power supply, maximum not exceeding 6V
②	GND	GND
③	OUT1	OUT1:Liquid entry
④	OUT2	OUT2:discharge
⑤	485_B	485 B Signal
⑥	485_A	485 A Signal
⑦	CAN_L	CAN L
⑧	CAN_H	CAN H
⑨	inner	Liquid Level Detection Cable
⑩	Outer casing	Detect shielded cable or GND

WTLLS-C PLUS:

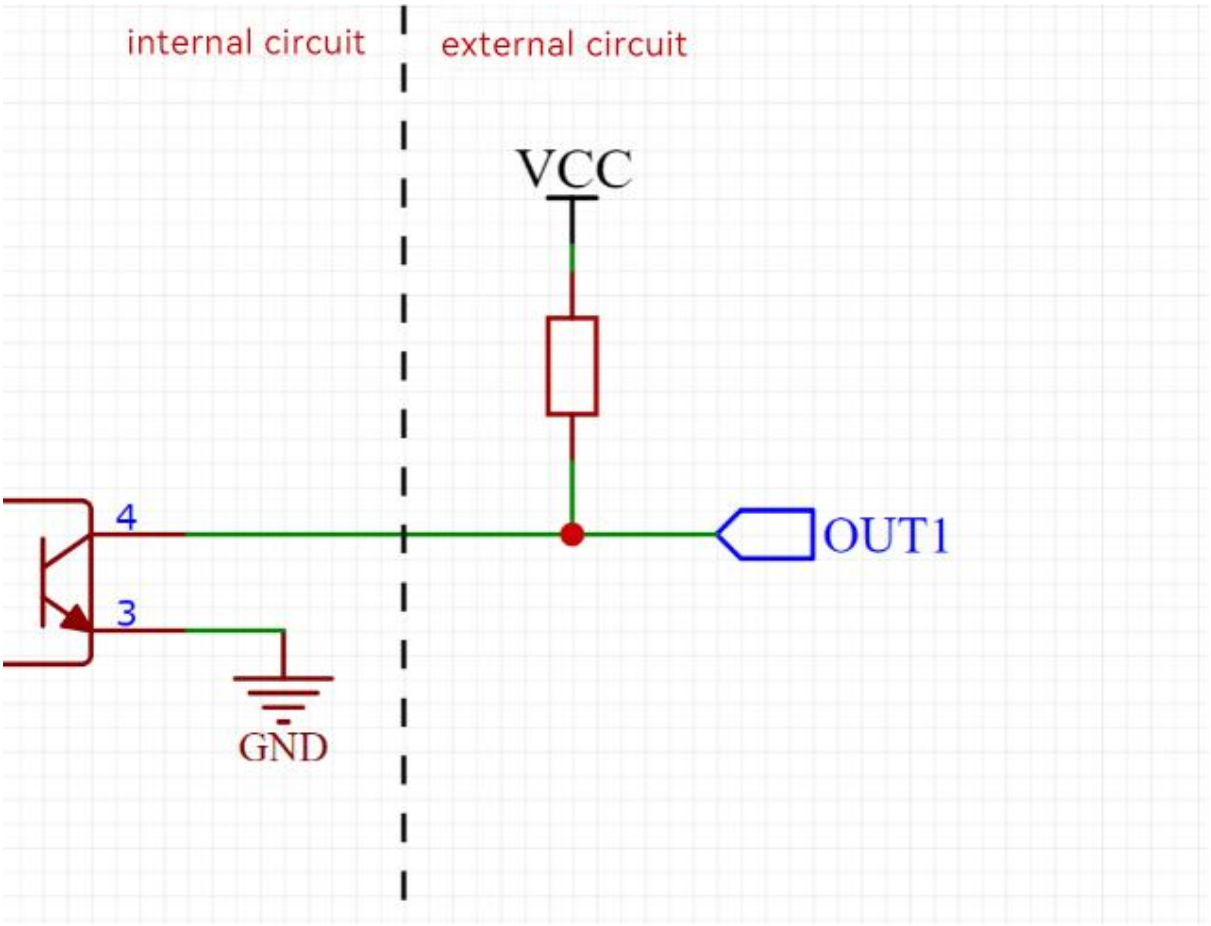
Liquid Level Detection Sensor WTLLS-C PLUS		
No.	**meaning**	**descriptions**
①	Power Supply	Power Supply, 5V-24V
②	GND	GND
③	OUT1	OUT1:Liquid entry
④	OUT2	OUT2: discharge
⑤	485_B	485 B Signal
⑥	485_A	485 A Signal
⑦	CAN_L	CAN L
⑧	CAN_H	CAN H
⑨	UP	External needle/Suspended
⑩	Down	Internal needle
⑪	inner	Liquid Level Detection Cable
⑫	Outer casing	Detect shielded cable or GND

3.2 Liquid level sensor 5P

The level sensor 5P interface contains the inlet signal, 485 function.

Liquid Level Detection Sensor **5P**		
No.	**meaning**	**descriptions**
①	5V	Power supply, max. 6
②	GND	GND
③	OUT1	Contact with water surface signal With signal output low NPN signal
④	485_B	485 B signal
⑤	485_A	485 A signal
⑥	inner core	Liquid Level Detection Cable
⑦	Outer casing	Liquid Level Detection Shielded Cable

3.3 OUT1/OUT2 Description: Output Equivalent Circuit


internal circuit
external circuit
VCC
4
3
OUT1
GND

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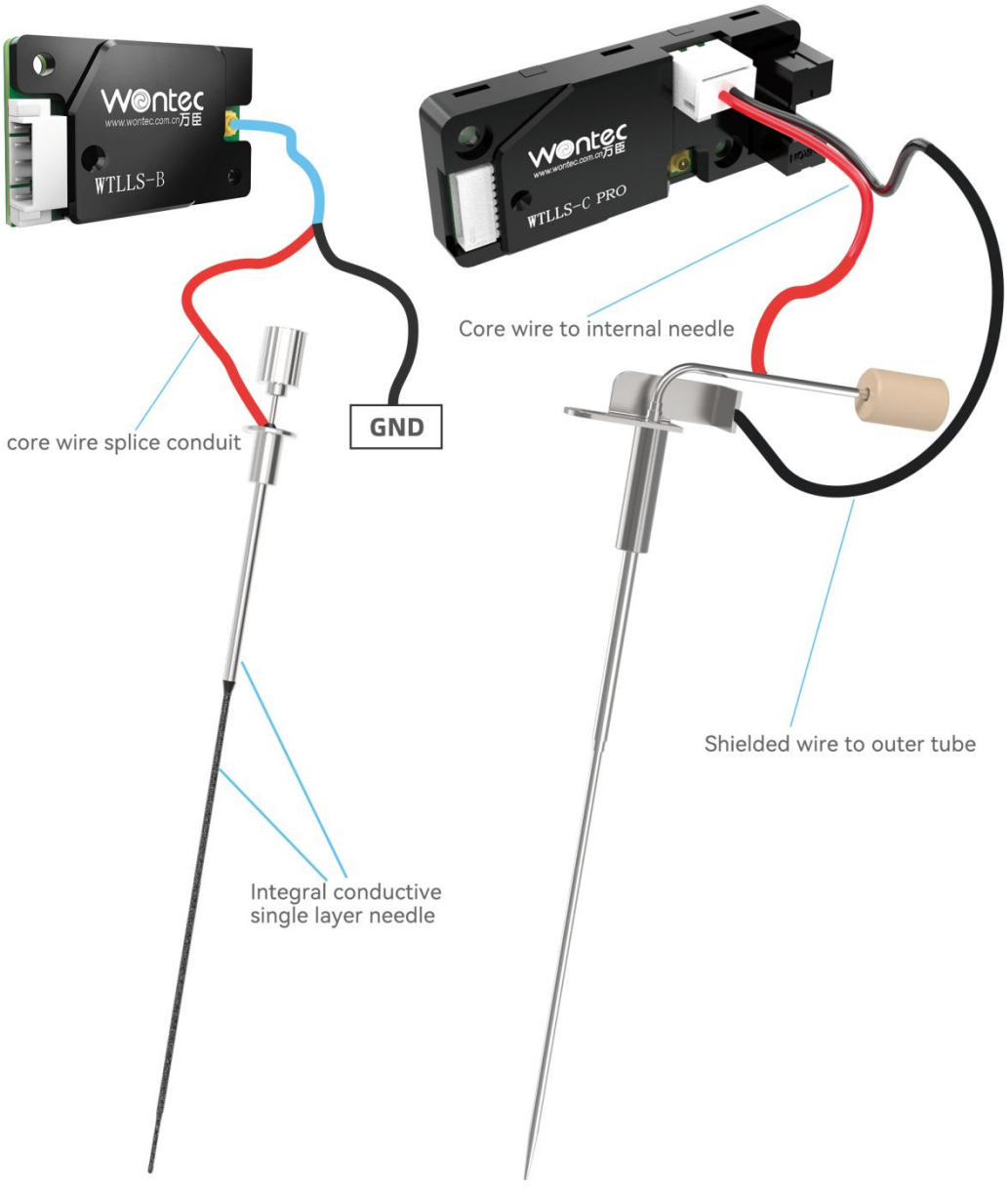
TYPICAL WIRING FOR LIQUID LEVEL DETECTION



Single layer pin wiring diagram

Dual-channel wiring diagram

4、Description of the agreement

4.1 CAN Protocol Description

Default baud rate: 1M;

extended frame

ID assignments are as follows: (data is in big-end mode)

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
unusable			Equipment type					Function code high 4 bits					reservation		Dir
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Function Code Lower 8 Bits								Motor station number							

Dir：

A value of 0 indicates a command from the controller, and a value of 1 indicates the returned data.

Device Type:

17: Liquid level sensor device (fixed number), 01 for motorised jaws, 06 for plunger pump, 18 for pipetting control board;

Motor station number:

Range 1~255; 0 is broadcast

Function Code:

No.	CAN function code (12bit)	Corresponding 485 function code	functionalities
1	0x000	$	Upload station number /Support broadcast
2	0x001	A	Upload programme version
3	0x005	U	Save all parameters and restore factory
4	0x006	i	Setting ID
5	0x011	Q	reboot
6	0x088	d	State value acquisition
7	0x087	D	Status value setting

8	0x082	C	Sensitivity setting
9	0x083	B	Sensitivity Acquisition
10	0x086	v	Get Capacitance Value
11	0x08A	J	Output inversion, status active upload setting
12	0x08B	j	Output inversion, status active upload acquisition
13	0x080	g	Active/passive mode setting
14	0x081		Active/passive mode reading
15	0x08E	L	Limit Optocoupler and Polarity Parameter Setting
16	0x08F	l	Limit Optocoupler and Polarity Parameter Reading

1、0x000 Upload station number（$）

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x00000000								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x00001000	**A**	**B**						
Description: byte1 motor station number, byte2 device type **Device Type: 17 Liquid Level Sensor Device**								

2、0x001 Read program version（A）

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11000101								
Description: device type 17; station 1, read message command								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11010101	**'D'**	**'1'**	**'.'**	**'0'**	**'0'**	**'b'**	**'1'**	
Description： Return the ascii of the string D1.00b1, corresponding to the version number.								

3、0x005 save all parameters (U)

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

0x11000501	A							
Description：A: 0xff all parameters restore default value；0x01 save all parameters								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11010501								
Description:								

4、0x006 Set ID (i)

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11000601	A							
Description: A: ID number to be set								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11010601								
Description:								

5、0x011 Reboot device (Q)

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11001101								
Description:								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11011101								
说明：重启设备								

6、0x088 State Value Acquisition

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008801								
Description:								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11018801	A							
Explanation: A: 1 in liquid 2 out liquid 3 probe wire shorted to GND 4 active shorted (turn off interference in case of multi-needle probing);								

7、0x087 Status value setting

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008701	A							
Explanation: A: 00 idle 01 contact 02 leave, this instruction is used to clear the state before the needle leaves the liquid, it is recommended to take only 00;								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11018701	A							
Description:								

8、0x082 Setting Sensitivity

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008201	A	A						
Description： A: Sensitivity, suggested threshold between 0x9~0x14, the smaller the value the more sensitive, the larger the value, the stronger the anti-interference;								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11018201								
Description:								

9、0x083 Read Sensitivity

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008301								
Description: A: Sensitivity								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11018301	A	A						
Description:								

10、0x086 Read instantaneous capacitance relative value

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008601								
Description:								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11018601	A	A						
Note: A Relative value of capacitance, which can be used as an aid to judgement; the characteristics of hovering and bubbling are clearly distinguishable from the true liquid level;								

11、0x08A output reversed, status active upload set (J)

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008A01	A							
Explanation: **A: 11 output inversion (triggered as high resistance state), status change active upload;** **00 Normal output (normally high resistance state), state change is not actively uploaded;**								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11018A01								
Description:								

12、0x08B output inverted, state active upload acquired (j)

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008B01								
Description:								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11018B01	A							

Explanation:
A is 11 output inversion (triggered for high resistance state), status change active upload;
00 normal output (normally high resistance state), state changes are not actively uploaded;

13、0x080 Setting the detection active and passive modes

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008001	A							

Note: A 00 disables the detection signal to prevent interference, causing the LED to flash continuously; 01 enables the detection signal. This command is primarily used during multi-pin detection to prevent mutual interference, allowing only one pin to detect at a time while disabling detection on others.
10 For multi-needle parallel scenarios, the master station automatically assigns detection tasks;
1. During initialization, actively short the inner pin to the shield (or GND) for several tens of milliseconds to discharge static electricity from the inner pin surface.
2. When performing sequential multi-probe detection, actively short-circuit to minimize interference with adjacent probes.
3.When multiple probes are connected in parallel, the master station automatically assigns detection tasks with an A value of 10; this command is only effective for the PLUS version.

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11018001								

Description:

14、0x081 Read active/passive mode

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008101								

Description:

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

0x11018101	**A**							
Description: A 01 is active mode 00 is passive mode Active mode is to switch on the detection signal automatically								

15、0x08E Limit Optocoupler Enable and Polarity Parameter Setting

(C_PRO version of the command)

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008E01	**A**							
Explanation: A 00 indicates that the limit optocoupler of the anti-flammable pin is not enabled, and out2 is the liquid output; 11 indicates that the limit optocoupler is enabled, and out2 is the optocoupler output, and the shading is constant high; 10 indicates that the shading is constant low; 11 indicates that the limit optocoupler is enabled and OUT2 is the optocoupler output.								

Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte8
0x11018E01								
Description:								

16、0x08F Limit Optocoupler Enable and Polarity Parameter Read

(C_PRO version of the instruction)

Master → Equipment

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x11008F01								
Description:								

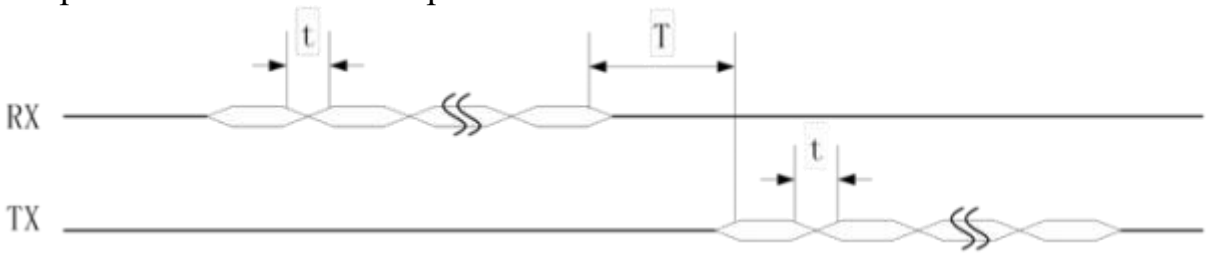
Equipment → Master

Extended Frame ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte8
0x11018F01	**A**							
Explanation: A 00 indicates that the limit optocoupler of the anti-flammable pin is not enabled, and out2 is the liquid output; 11 indicates that the limit optocoupler is enabled, and out2 is the optocoupler output, and the shading is constant high; 10 indicates that the shading is constant low;								

4.2 485 Protocol Description

name	clarification
Interface Type	RS485
working method	Asynchronous Serial, Half-Duplex
transmission method	ASCII code
Default Baud Rate	115200 bit/s
data bit	8
stop bit	1
parity check	none
flow control	none
Start of frame (HEX)	＞(0x3E)
Frame terminator (HEX)	CR(0x0D)LF(0x0A)
Maximum frame length (including start and end characters)	50
Intercharacter timeout	5ms
inter-frame timeout	50ms

Explanation of the timeout period



t Intercharacter time　　T Interframe timeout

As shown in the above figure, RX is the character received by the slave and TX is the character sent by the slave. When the lower computer receives a frame of data from the upper computer, it should respond immediately, and the interval should be less than the inter-frame timeout T. When sending a frame, the interval between characters should be less than the inter-character timeout T. The lower

computer can also send a frame to the upper computer, and the interval between characters should be less than the inter-frame timeout T.

After the host sends a frame of data to the slave, it is considered as timeout if no reply from the slave is received within the frame timeout time T. In the process of receiving the reply data from the slave, if the nth character data is not received within the inter-character timeout time t after the nth character is received, it is considered as timeout.

4.2.1 Host Command Frame Format

NO.	1	2	3	。	N+1	N+3	N+5	N+6
Name	Frame Header> (0x3E)	Slave Address	Function Code	command data	Checksum (H)	Checksum (H)	Frame Tail (0x0D)	Frame Tail (0x0A)
lengths	1 word	2 word	1 word	N word	4 word		2word	
clarification	Slave address	The master device passes the address of the slave device that will be contacted. Specify the ASCII code character '01' as the slave designator.						
	Function code	The function code is expressed in hexadecimal ASCII characters from 'A' to 'F'. For example, function code 0x0C is '0C'.						
	Command data	ASCII characters A'~'Z'						
	checksum	MODBUS CRC16, redundancy polynomial 0x1A001, first loaded register value 0xFFFF. The CRC calculation includes the frame header, slave address, function code and data section						

4.2.2 Slave Response Frame Format

（1）response frame

No.	1	2	3	。	N+1	N+3	N+5	N+6
Name	Frame Header> (0x3E)	Slave Address	Function Code	command data	Checksum (H)	Checksum (H)	Frame Tail (0x0D)	Frame Tail (0x0A)
lengths	1 word	2 word	1 word	N word	4 word		2word	

（2）Response frame parameter description

	Slave address	Returns the slave address specified in the command frame, indicating the slave for this response.
	Function code	Returns the received function code.

clarification	Response data	ASCII code characters ‘A’~‘Z’
	checksum	MODBUS CRC16, redundancy polynomial 0x1A001, first loaded register value 0xFFFF. The CRC calculation includes the frame header, slave address, function code and data section.

4.3 checksum calculation

MODBUS CRC16 Calculation Example

```
unsigned short cal_crc(unsigned char *byte, unsigned
char nbyte){
unsigned short itemp=0xFFFF;
unsigned char i;
while(nbyte--)
{
itemp ^= *byte;
byte++;
for (i=0; i<8; i++)
{
if (itemp& 0x1)
{
itemp>>= 1;
itemp ^= 0xA001;
}else
{
itemp>>= 1;
}
}
}
returnitemp;
}
```

4.4 Protocol Command List

function code	clarification	remark
“$”	Query upload station number	
“B”	Level reading sensitivity	
“C”	Setting the level sensitivity	
“D”	Reset Module Status Values	
“d”	Query module status values	
“Q”	Reboot the device	
“g”	active-passive mode	
“i”	Change of station number	
“v”	Query the relative value of capacitance	
“J”	Output inversion, status active upload	
“j”	Output inversion, status active upload	
“L”	Anti-friction pin limit optocoupler and polarity parameter setting	
“l”	Anti-friction pin limit optocoupler with polarity parameter reading	
“U”	Save parameters	

4.4.1 $ Read Address

functional definition	Read version			
hidden meaning	slave address	function code	command data	calibration
Host Commands	Level address	“$”	none	**CRC**
number of characters	2 word	1 word	1	4 word
slave response	onboard address	“$”	version number	CRC
number of characters	2 word	1 word	2 word	4 word
remark				
Sending Example	>00$			
Examples of responses	>01$01,>02$02…			
example resolution	Returns the addresses of all slaves on the bus			

4.4.2 B Read the liquid level sensing sensitivity value

functional definition	Read the liquid level sensing sensitivity value			
hidden meaning	**slave address**	**function code**	**command data**	**calibration**
Host Commands	onboard address	“B”	none	**CRC**
number of characters	2 word	1 word	0 word	4 word
slave response	onboard address	“B”	sensitivity value	CRC
number of characters	2 word	1 word	4 word	4 word
remark	Sensitivity value 4 word			
Sending Example	>01B			
Examples of responses	>01B0014			
example resolution	Read the level detection sensitivity value of the board, this time the value is 20			

4.4.3 C Setting the level sensing sensitivity value

functional definition	Setting the level sensing sensitivity value			
hidden meaning	**slave address**	**function code**	**command data**	**calibration**
Host Commands	onboard address	“C”	sensitivity value	**CRC**
number of characters	2 word	1 word	4 word	4 word
slave response	onboard address	“C”	none	CRC
number of characters	2 word	1 word	0 word	4 word
remark	Set sensitivity value 4 word			
Sending Example	>01C0014			
Examples of responses	>01C			
example resolution	Set the level detection sensitivity value of the board to 20			

4.4.4 d Query module status values

functional definition	Queries the current state value of the module			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	“d”	none	**CRC**
number of characters	2 word	1 word	0 word	4 word
slave response	onboard address	“d”	current state value	CRC
number of characters	2 word	1 word	2 word	4 word
remark	The return value 00 means unknown, 01 means in liquid, 02 means out liquid.03 Signal line passive shorting, may be coaxial cable core and shield short circuit, 04 active shorting signal, initialisation, used to release static electricity on the needle;			
Sending Example	>01d			
Examples of responses	>01d01			
example resolution	Read the current status value of the module as 01			

4.4.5 D Reset Module Status Values

functional definition	Reset the current state value of the module			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	“D”	current state value	**CRC**
number of characters	2 word	1 word	2 word	4 word
slave response	onboard address	“D”		CRC
number of characters	2 word	1 word	0 word	4 word
remark	Generally set 00 for the idle state to provide an explicit value for getting the next state change			
Sending Example	>01D00			
Examples of responses	>01D			

example resolution	Reset the current state value of the module to 00;

4.4.6 Q Reboot the device

functional definition	Signal line grounding control			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	“Q”	Reboot the device	**CRC**
number of characters	2 word	1 word	0 word	4 word
slave response	onboard address	“Q”		CRC
number of characters	2 word	1 word	0 word	4 word
remark				
Sending Example	>01Q			
Examples of responses	>01Q			
example resolution	Reboot the device			

4.4.7 g active-passive mode

functional definition	Signal line grounding control			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	“g”	active-passive mode	**CRC**
number of characters	2 word	1 word	1 word	4 word
slave response	onboard address	“g”		CRC
number of characters	2 word	1 word	0 word	4 word
remark	Data 1 is active mode, 0 is passive mode;			
Sending Example	>01g0			
Examples of responses	>01g			

example resolution	0 is passive mode, the detection core and shield are shorted internally and the LED flashes normally; this function is used in two main applications: 1. When the instrument is initialised, take the initiative to short the inner needle to the shield (or GND) for tens of ms to release the static electricity on the surface of the inner needle. 2. When multiple needles are probed in sequence, active shorting reduces the effect on neighbouring needles;A is the multi-needle parallel mode. In this case, the CAN ports of the sensors must be cascaded, with station 01 configured as the master mode. The command is [01#cls_master=1]. To retain this function after power loss, execute the save command.

4. 4. 8 i Setting the address

functional definition	Setting the address			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	“i”	Slave ID	**CRC**
number of characters	2 word	1 word	2 word	4 word
slave response	onboard address	“i”		CRC
number of characters	2 word	1 word		4 word
remark				
Sending Example	>01i02			
Examples of responses	>02i			
example resolution	For Station 01 read Station 02			

4. 4. 9 V Read the relative value of capacitance

functional definition	Relative value of capacitance read by sensor			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	“v”		**CRC**
number of characters	2 word	1 word		4 word

slave response	onboard address	“v”	Relative value of capacitance	CRC
number of characters	2 word	1 word	8 word	4 word
remark				
Sending Example	>01v			
Examples of responses	>01v00000F4B			
example resolution	Slave 01 returns the relative value of capacitance			

4.4.10 U Save parameters

functional definition	**Save parameters**			
hidden meaning	**slave address**	**function code**	**command data**	**calibration**
Host Commands	onboard address	“U	Save parameters	**CRC**
number of characters	2 word	1 word	2 word	4 word
slave response	onboard address	“U		CRC
number of characters	2 word	1 word		4 word
remark	Data 01,Save all changes; FF restores default values;			
Sending Example	>01U01			
Examples of responses	>01U			
example resolution	Save all parameters;			

4.4.11 J Output inversion, status active upload setting

functional definition	**Output inversion, status active upload setting**			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	“J”	Output inversion + status upload	**CRC**

number of characters	2 word	1 word	2 word	4 word
slave response	onboard address	“J”		CRC
number of characters	2 word	1 word	0 word	4 word
remark	Out default is normally high, output pull-down pulse, if it is taken inverse, it is normally low, output pull-up pulse; active upload state is when CAN communication, 485 does not have this function;			
Sending Example	>01J01			
Examples of responses	>01J			
example resolution	IO1 output is not inverted and is actively uploaded when the state value changes (when can communication);			

4. 4. 12 I Output inversion, status active upload reading

functional definition	**Output inversion, status active upload reading**			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	“I”		**CRC**
number of characters	2 word	1 word		4 word
slave response	onboard address	“I”	Output inversion + status upload	CRC
number of characters	2 word	1 word	2 word	4 word
remark	Out default is normally high, output pull-down pulse, if it is taken inverse, it is normally low, output pull-up pulse; active upload state is when CAN communication, 485 does not have this function;			
Sending Example	>01I			
Examples of responses	>01I01			
example resolution	IO1 output is not inverted and is actively uploaded when the state value changes (when can communication);			

4. 4. 12 L Pin Crash Limit Optocoupler and Polarity Parameter Setting (C_PRO version of the command)

functional definition	Pin Crash Limit Optocoupler and Polarity Parameter Setting			
hidden meaning	**slave address**	**function code**	**command data**	**calibration**
Host Commands	onboard address	"L"	Optocoupler Enable + Polarity Parameters	**CRC**
number of characters	2 word	1 word	2 word	4 word
slave response	onboard address	"L"		CRC
number of characters	2 word	1 word		4 word
remark	Default state of constant shade on the needle visor			
Sending Example	>01L11			
Examples of responses	>01L			
example resolution	00 indicates that the limit optocoupler is not enabled, and out2 is the outflow output; 11 indicates that the limit optocoupler is enabled, out2 is the optocoupler output, and the shading is constant high; 10 indicates that the shading is constant low;			

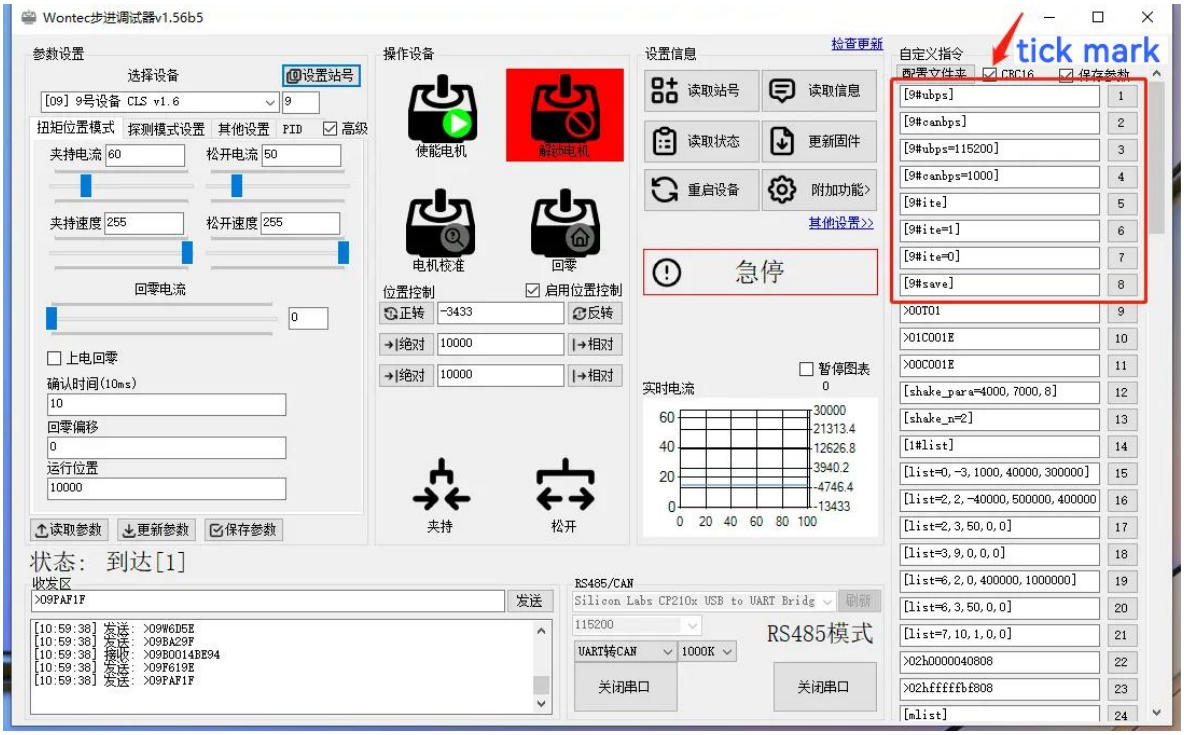
4. 4. 12 l Pin Crash Limit Optocoupler and Polarity Parameter Reading (C_PRO version of the command)

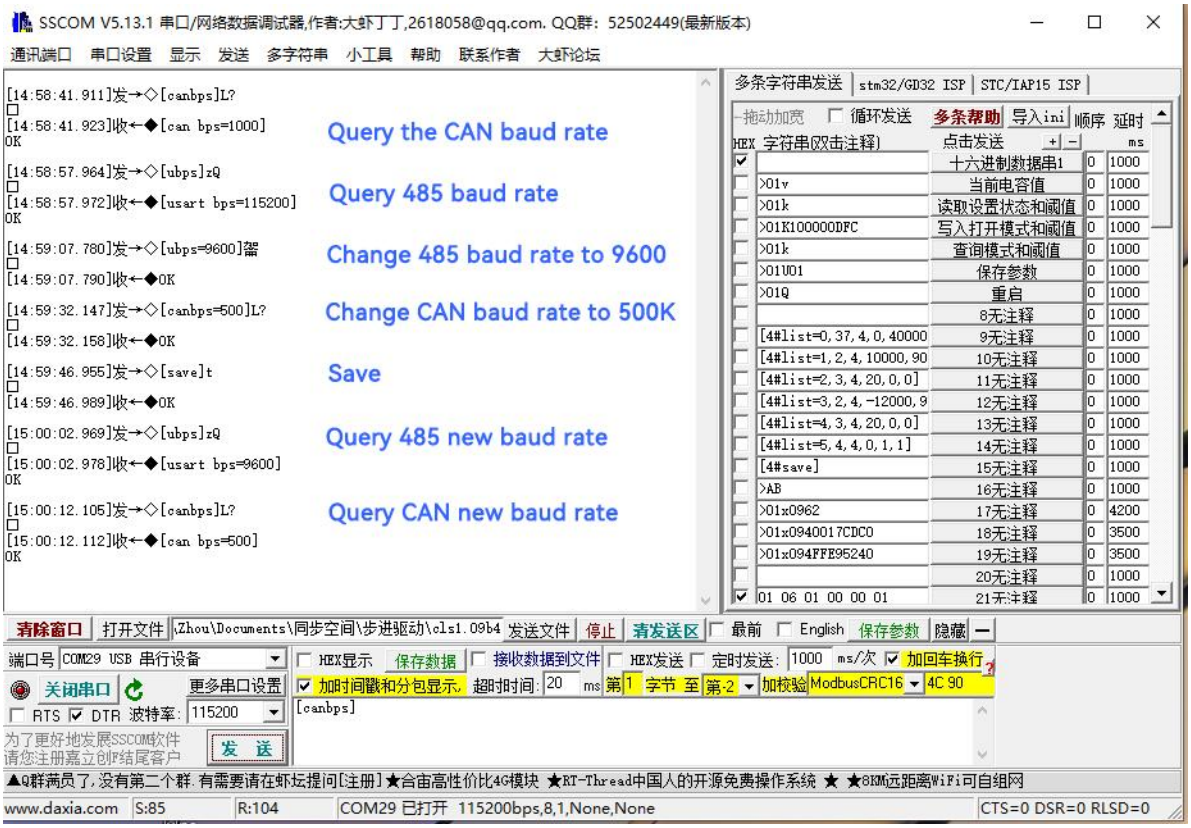
functional definition	Limit Optocoupler and Polarity Parameter Reading			
hidden meaning	slave address	function code	command data	calibration
Host Commands	onboard address	"l"		**CRC**
number of characters	2 word	1 word		4 word
slave response	onboard address	"l"	Optocoupler Enable + Polarity Parameters	CRC
number of characters	2 word	1 word	2 word	4 word
remark	l (for the small letter L)			
Sending Example	>01 l			

Examples of responses	>01 1 11
example resolution	00 indicates that the limit optocoupler is not enabled, and out2 is the outflow output; 11 indicates that the limit optocoupler is enabled, out2 is the optocoupler output, and the shading is constant high; 10 indicates that the shading is constant low;

5、 Other parameter modifications

Important: All of the following commands require CRC16 checksums, as do other commands in the protocol; they should be ticked in the host computer;





- commands related to changing the communication baud rate:
  - Commands related to changing the communication baud rate:

Change 485 communication baud rate command: [station number #ubps=new baud rate]

Query current baud rate command: [station number #ubps]

Change CAN communication baud rate command: [station number #canbps = new baud rate]

Query current baud rate command: [station number #canbps]

Save change instruction: [station #save]

Example:

[9#ubps] // Query the current 485 communication baud rate of slave 9;

[9#canbps] // Query the current can communication baud rate of slave 9;

[9#ubps=115200] // Set the current 485 communication baud rate of slave 9 to 115200;

[9#canbps=1000] // Set the current can communication baud rate of slave 9 to 1000K (supports 1M, 500K, 100K, 50K, 10K);

[9#save]//Save all current updates;

6、precautionary note

（1）The power-on LED will blink for 100ms, but will not output a signal.

（2）Short the signal line to ground, the signal will continue to output, the LED is always on, and the status will read 03. This is an abnormal state, probably the coaxial cable of the probe is shorted to the shield, and needs to be serviced.

(3) After receiving out1 into the liquid signal, you can read the status through 485 or CAN to confirm, if the status is 02, then it is an interference signal.

(4) active and passive mode default active mode, set to passive mode, the detection core wire and GND in the sensor internal shorting, in order to prevent the two adjacent needles interfere with each other, but also in the initialisation of the device, set to active mode dozens of ms, to eliminate the static electricity of the needle;