

Digital pH Sensor

Operating Manual

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Chapter 1 Specification

Specification	
Power supply	9-36VDC
Size	Diameter: 30mm* Length: 160mm
Weight	0.55KG
Material	Main: PP
	Cable: PVC
Waterproof Grade	IP68/NEMA6P
Scope of Measurement	0-14pH
	Temperature: 0-80°C
Display Accuracy	Measurement value: $\pm 0.05\text{PH}$
	Temperature: $\pm 0.5^\circ\text{C}$
Output	MODBUS RS485
Storage Temperature	From 0 to 45°C
Pressure Range	$\leq 0.6\text{Mpa}$
Calibration	Calibration of standard fluids and Alignment
Length of Cable	10m cable, can extended to 100m
Warranty	Vulnerable parts

Table 1: pH Sensor technical specifications

Description: Product specifications are subject to change without prior notice.

Chapter 2 Product Description

The core theory of pH electrode measurement is Nounst equation. The electrodes used in the potentiometric analysis are called galvanic cells. A galvanic cell is a system that converts the energy of a chemical reaction into electricity. The voltage of the battery is called electromotive force (EMF). This electromotive force (EMF) consists of two and a half cells. One half of the cells is called the measuring electrode and its potential is related to the specific ion activity. The other half cell is the reference half cell, usually referred to as the reference electrode, which is generally connected with the measuring solution and the measuring instrument.

This product is widely used in dissolved oxygen monitoring in sewage plant, waterworks, water station, surface water, aquaculture, industry and other fields. the sensor appearance is shown in Figure 1. Sensor size shown in Figure 2.



Figure 1: pH Sensor appearance diagram

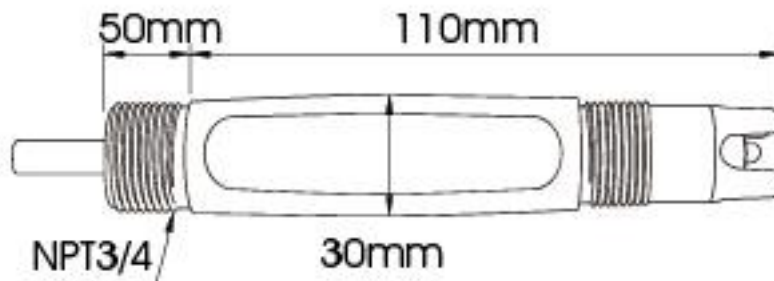


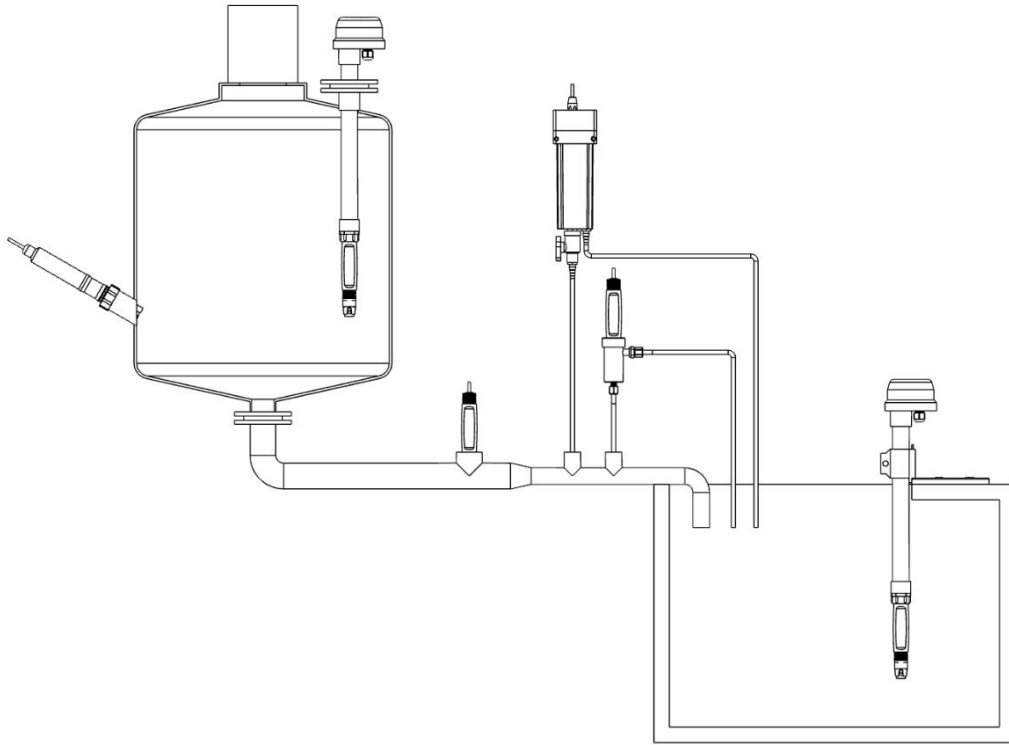
Figure 2: pH Sensor dimensions

Chapter 3 Installation

3.1 Sensor installation

The specific installation steps are as follows:

Note: The plexiglass protection cap needs to be unscrewed before use to be able to measure.



Schematic diagram of the PH sensor installation

3.2 Connection of the sensor

The sensor is connected correctly according to the following wire core definition:

Core	1	2	3	4
Sensor color	Red	Black	Green	White
Signal	+9-36VDC	AGND	RS485 A	RS485 B

Chapter 4 Communication Protocol

The sensor is equipped with MODBUS RS485 communication function. Please refer to this manual 3.2 for communication wiring. The specific MODBUS-RTU table is shown below.

Communication configuration: 9600 N 8 1

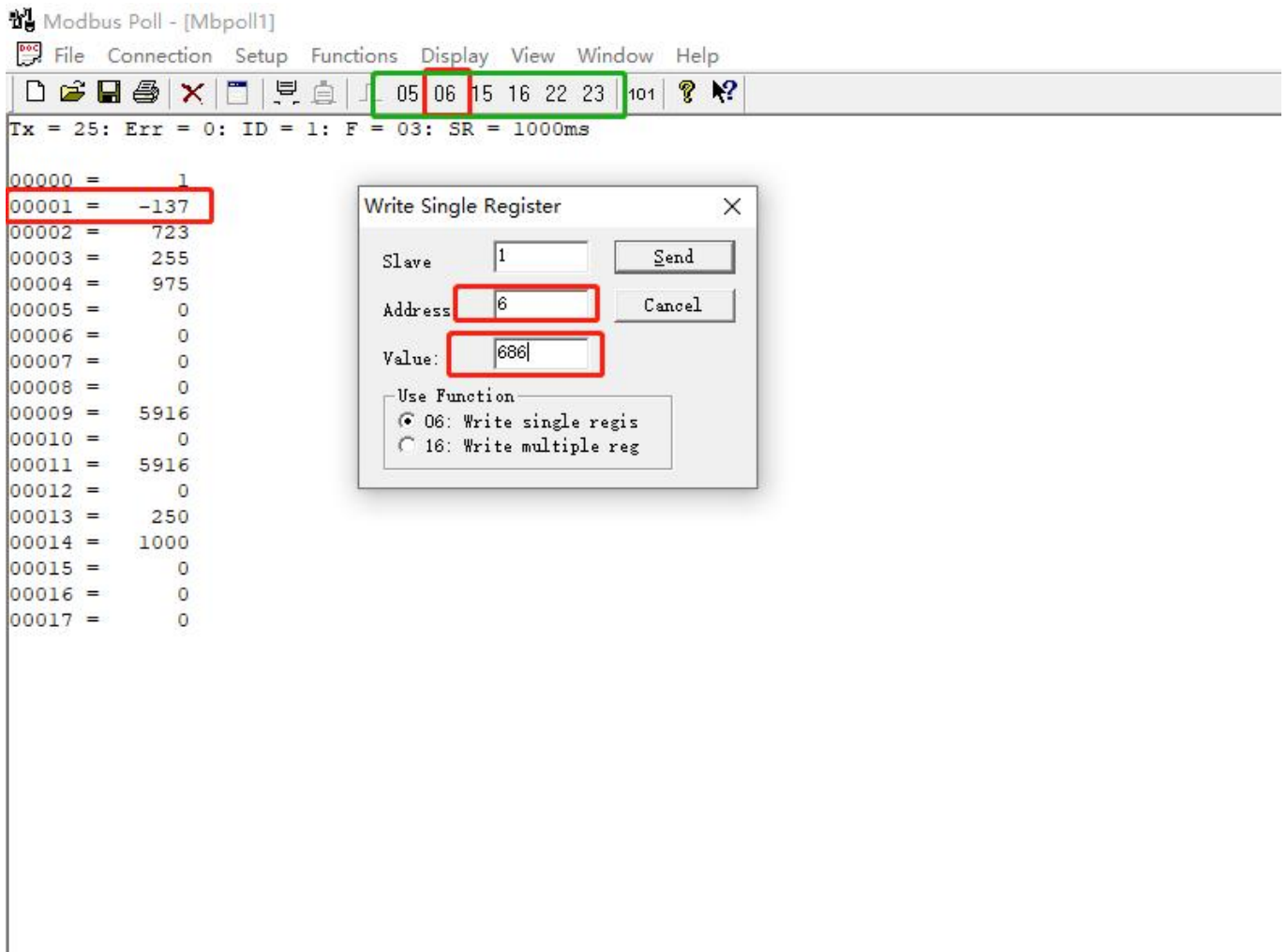
Address: 1 can be modified by broadcast address 255 communication protocol:

MODBUS RTU 03 read 06 write

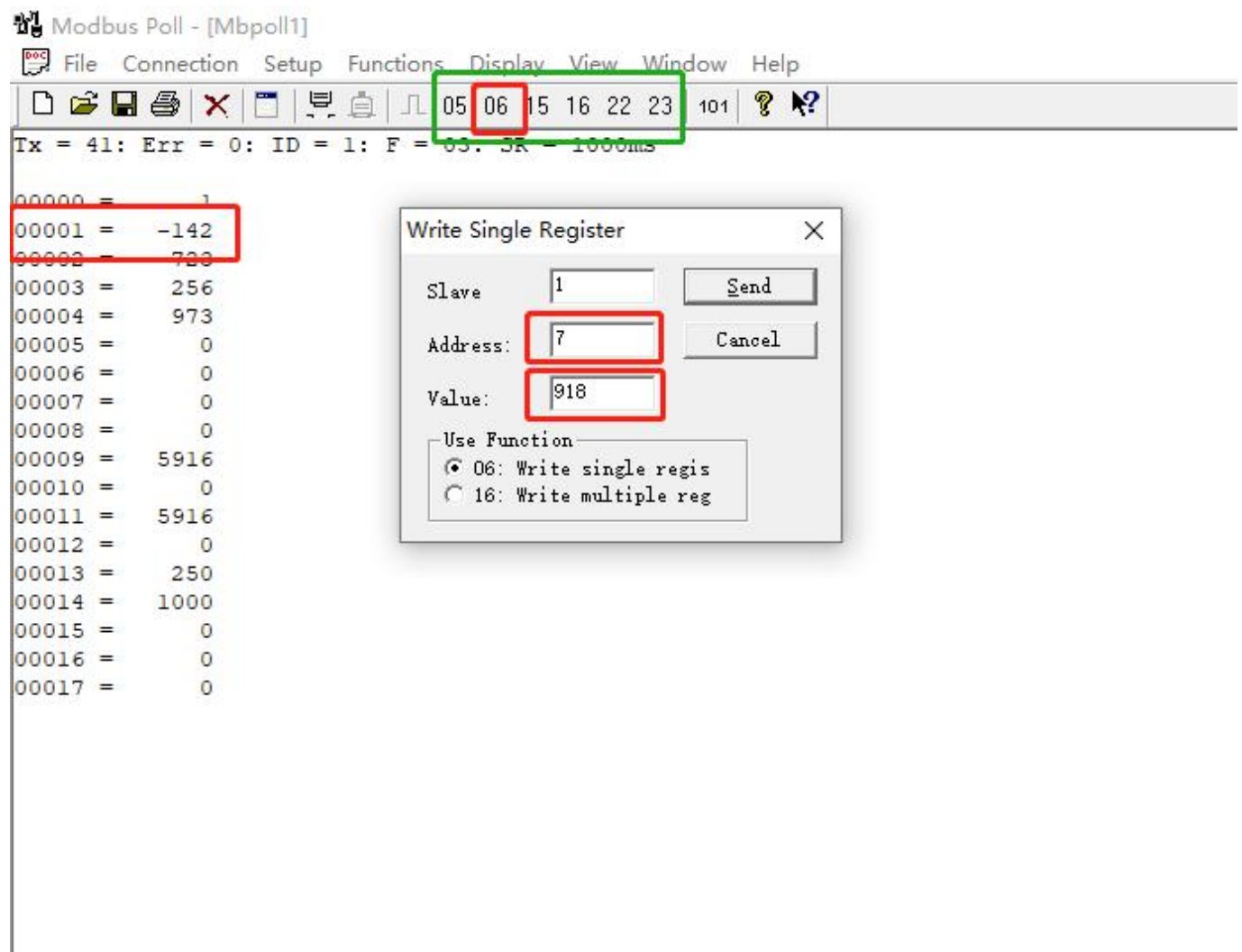
Items	Add	Definition	Default	Decimal	Range	Limitation	Explanation
	0	Type	1	0	1: PH 2: ORP	Read-only	
Measure value	1	mV value	-	1	-10000~10000	Read-only	
	2	PH value	-	2	0-1400	Read-only	
	3	Temp. scale	-	1	0-600	Read-only	
	4	Resistance	-	0		Read-only	
Calibration	5	Field calibration	0	-	Communication sends field values, such as 700 generations	Read-write	Support 2 or 3 point calibration, calibration address 6,7,8 default value is 0, after the first
	6	Calibration 1	0	2	Put it into the Solution 1 and wait for the voltage to stabilize then input solution 1 value: 686 or 700	Read-write	step, numerical update must calibration point (6.86 or 7.00), the second step: calibration
	7	Calibration 2	0	2	Put it into the Solution 2 and wait for the voltage to stabilize then input solution 2 value: 918 or 1000	Read-write	point and calibration points three belong to select the mark, the sensor into the second
	8	Calibration 3	0	2	Put it into the Solution 2 and wait for the voltage to stabilize then input solution 2 value: 400 or 401	Read-write	label after the corresponding address value, such as in 4.00 standard liquid after send 400
	9	PH Slope 1	5916	2			in address 8, such as in 9.18 after address 7
	10	PH Zero 1	0	2			send 918, complete two point calibration step
	11	PH Slope 2	5916	2			3: if continue to put the third label
	12	PH Zero 2	0	2			corresponding address input value to
	13	Temp.	250	1			
	14	Linear comp.	1000	3			complete the three-point calibration
	15	Dynamic fix	0	1			
	16	Temp. state	0	0	0: Auto 1: Manual		
	17	Temp. fix	0	1			
	50	Module	1	0	1: PH 2: ORP		
	51	Buffer coefficient	10	0	0-50		
	52	Add. range	1	0	1-254		Broadcast address: 255
	53	Baud rate	0		0:9600 1:19200 2:38400		
	54	Parity bit	0		0: None 1: Odd 2: Even		
Recovery	200	Restore factory	0	0	1: Factory recovery	Write-only	

Chapter 5 Calibration of the sensors

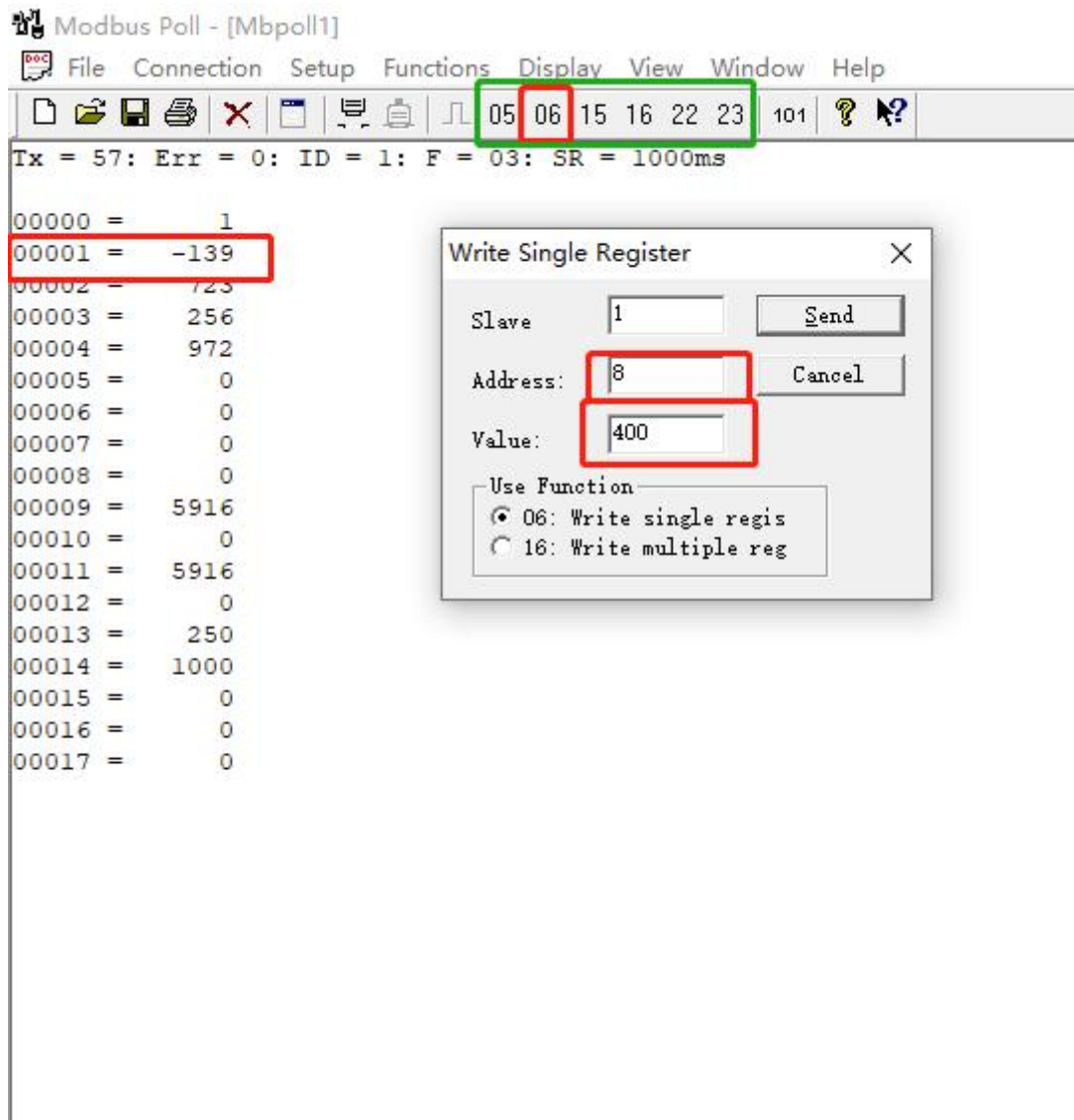
In the first step, put the digital PH sensor into the "6.86" standard solution. After the voltage value displayed in the "01" position stabilizes, select the "06" function code, enter "6" in the "Address" line, enter "686" in the "Value" line, click "Send", there will be a popup display "Response OK", then the first point calibration is completed!



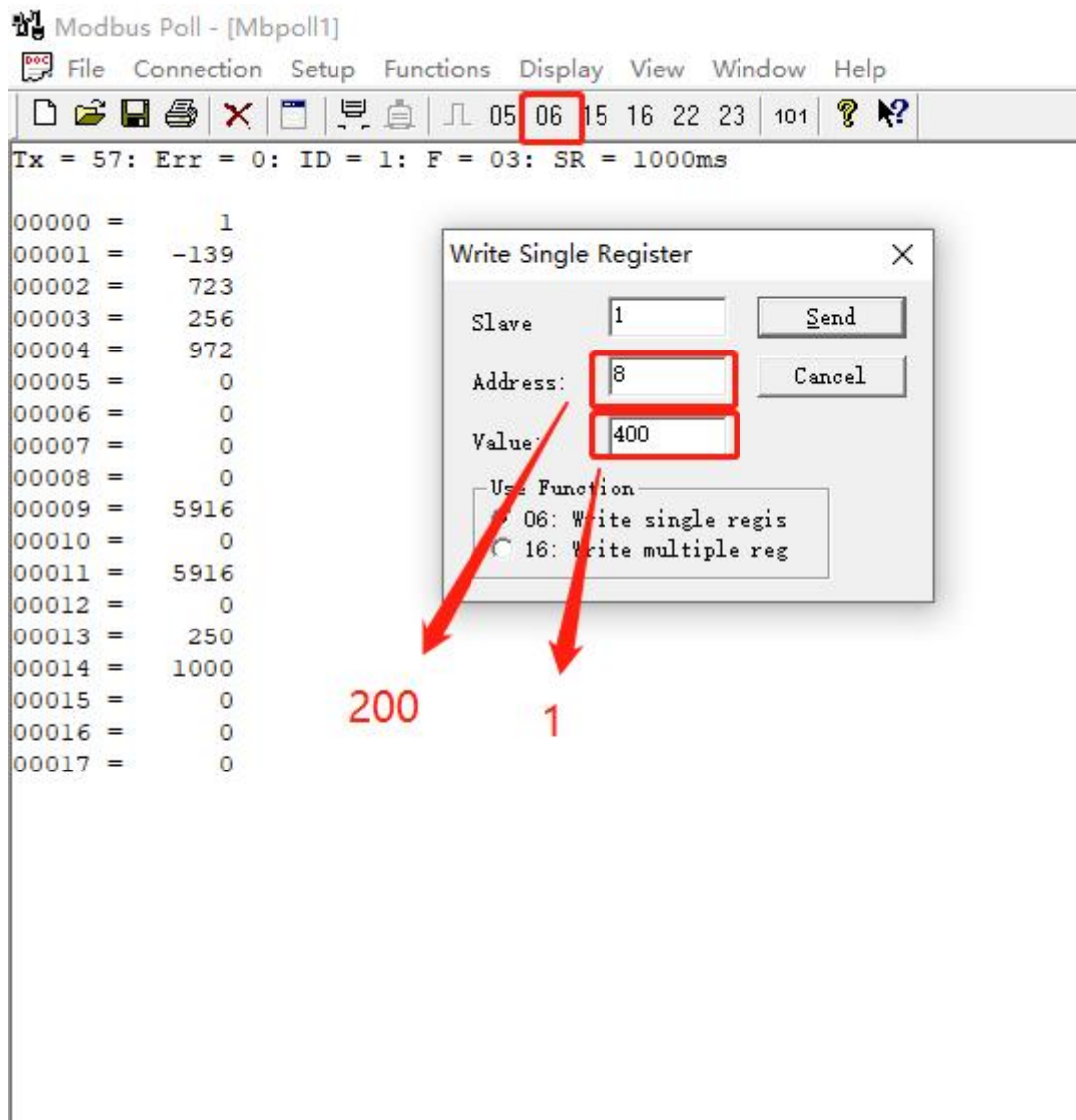
The second step, put the digital PH sensor into the "9.18" standard solution, after the voltage value displayed in the "01" position is stable, select "06" function code, enter "7" in the "Address" line, "Value" line input "918", click "Send", there will be a popup display "Response OK", the second point calibration is completed!



The third step, put the digital PH sensor into the "4.00" standard solution, after the voltage value displayed in the "01" position stabilizes, select "06" function code, enter "8" in "Address", "Value" "400", click "Send", a popup display "Response OK", the third point calibration is completed!

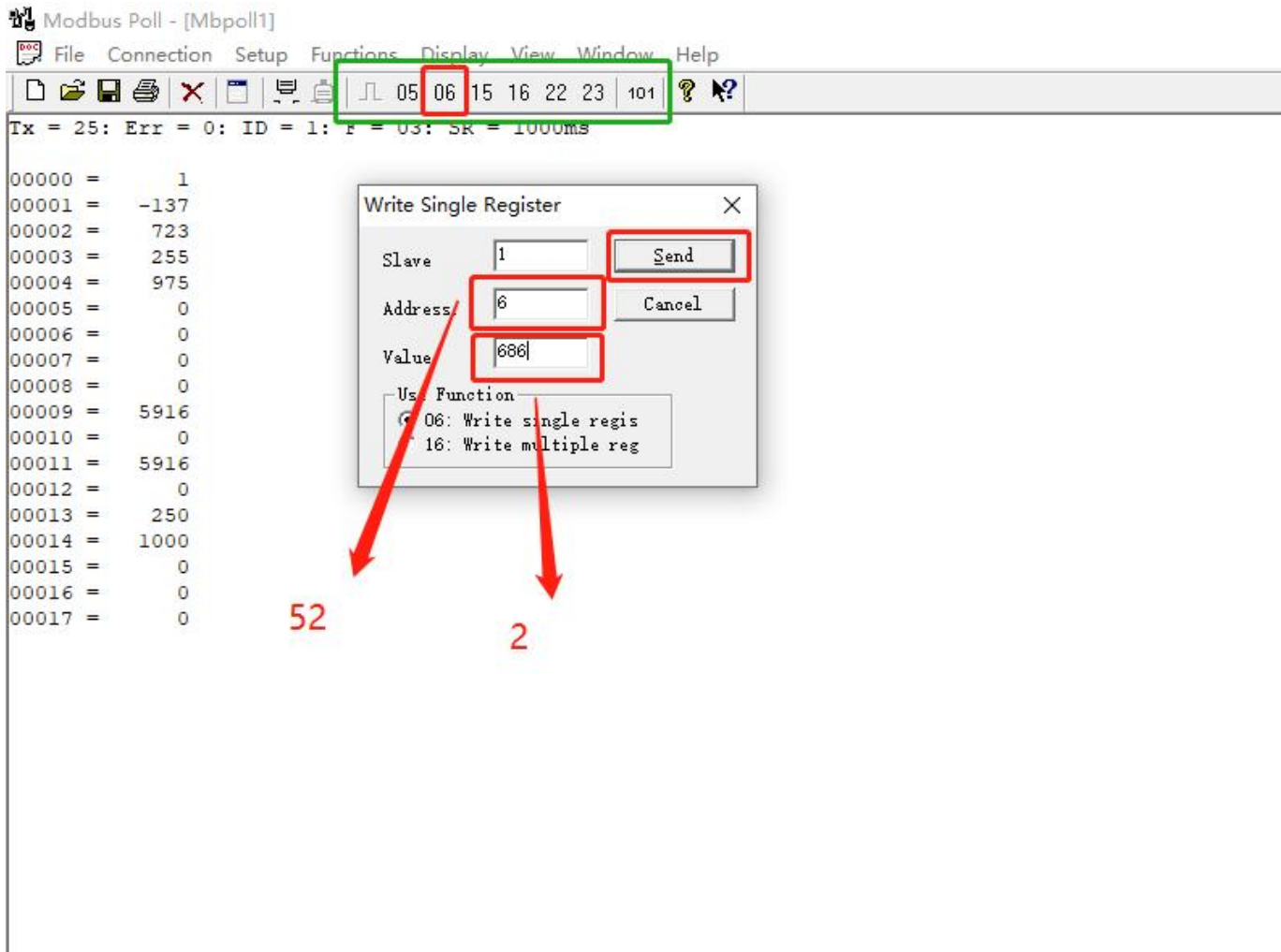


If the digital PH sensor calibration error, select "06" function code, enter "200" in the "Address" line, "Value" line "1", click "Send", will have a pop-up display "Response OK", then the digital PH sensor to restore the factory setting, please recalibrate!



Modify the sensor address

After connecting the digital PH sensor and MODBUS software, select "06" function code, enter "52" in "Address", "Value" enter "2" or the address to be modified, click "Send", a popup will display "Response OK", then the digital pH sensor address will be modified!



PH Communication Explanation

The communication protocol adopts MODBUS (RTU) protocol, and the communication content and address can be changed according to the customer's needs.

The default configuration is network address 01, port rate 9600, no check, a stop bit, users can set the change;

Function code 03 instruction for example:

pH value =7.27, Temperature value =28.5

Host sent: 01 03 00 00 00 0A C5 CD

Slave reply: 01 03 14 00 01 FF 59 02 D7 01 1D 03 5A 00 00 00 00 00 00 00 00 17 1C 65 3B

Explanation: **【01】** Represents the sensor address address;

【03】 Representative function code 03;

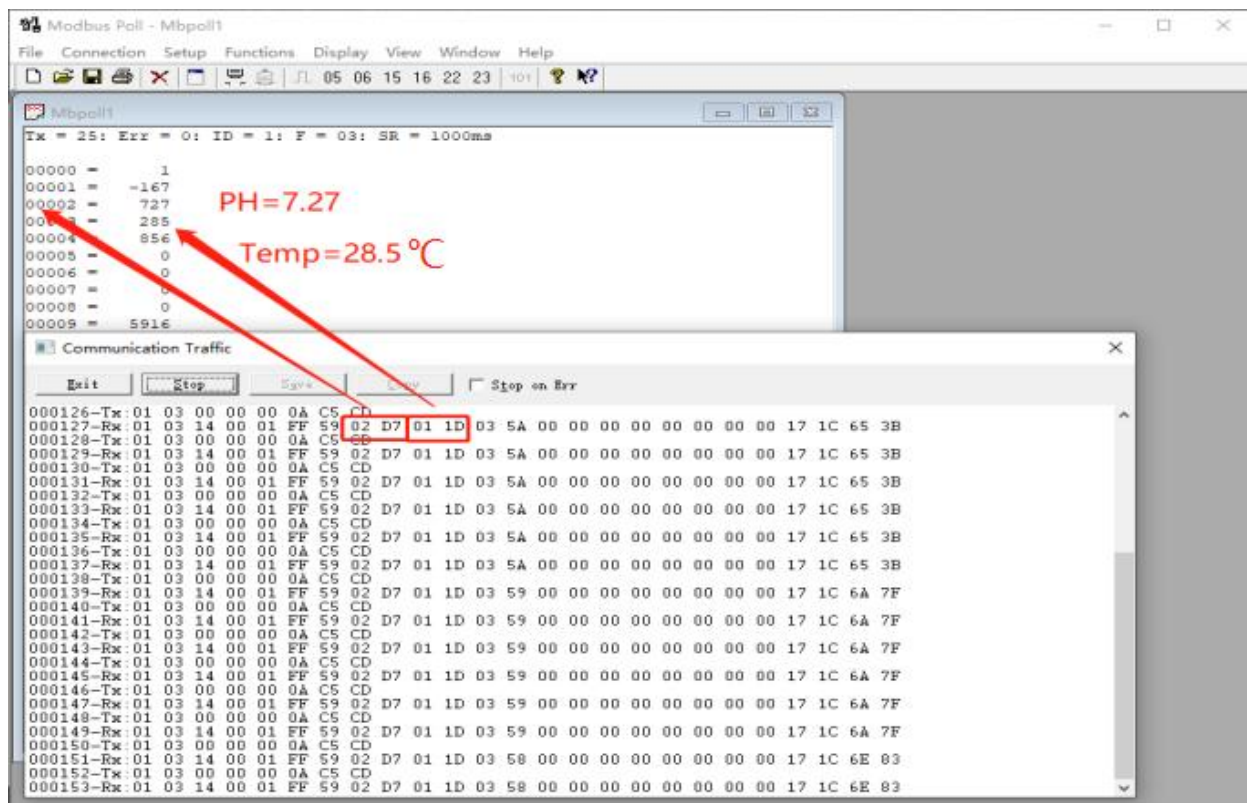
【14】 Representative with 20 bytes of data;

【00 01】 =1; //Represents the sensor type

【02 D7】 =727; //PH value=7.27 (2 decimal)

【01 1D】 =285; //Temperature Value=28.5°C (1 decimal)

【65 3B】 Represents the CRC 16 check code



Chapter 6 Maintenance and Maintenance

For the best measurement results, the sensors are regularly maintained and maintained. Maintenance and maintenance mainly include sensor cleaning, inspection for sensor damage, and regular calibration.

When measuring, it should be washed in distilled water (or deionized water), and drained water with filter paper to prevent impurities into the tested liquid. The sensor bubble and fluid collaterals should be completely immersed in the measured liquid.

When not in use, the sensor should be washed and inserted into a protective sleeve equipped with 3.3M potassium chloride solution, or insert the sensor into a container equipped with 3.3M potassium chloride solution.

The glass ball on the top of the sensor has dirt, which can be cleaned with 0.1N hydrochloric acid, and then invade into the 3.3M KCL solution of internal activation, do not touch by hand. To ensure the long-term correct measurement, the sensor must be cleaned, maintained and calibration regularly. After a period of use, the metal sensor will produce oxidation, and the sensor head is black. Fine sandpaper can be used to brighten the sensor head, and the oxidation part will be removed to ensure the sensitivity of the sensor measurement.

Check whether the terminal is dry. If it is dirty, wipe with absolute alcohol and use after drying.

Chronic immersion in distilled water or protein solution should be avoided and contact with silicone grease should be prevented.

Using a longer sensor, its glass film may become translucent or attached with sediment, which can be washed with hydrochloric acid and washed with water.

It is recommended that the user clean the sensor once and correct with the instrument.

When you use the above method to maintain and maintain the sensor, you still cannot carry out the correction procedure and normal measurement, indicating that the sensor can not restore the response, please replace the sensor.

