Gas Alarm Controller

ACR4000

User Manual

QINGDAO ALLRED ELECTRONICS CO.,LTD

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1. System Description

1.1 Introduction

This manual introduces the main purpose, working principle, technical parameters, installation, operation, fault analysis and troubleshooting, and other precautions of ACR4000 gas detection controller (hereinafter referred to as the controller).

The controller is used in conjunction with combustible gas detectors to form a gas detection control system. Before installing and using the controller, please make sure that you have read and understood the content of this manual in detail to prevent damage to personnel safety and products.

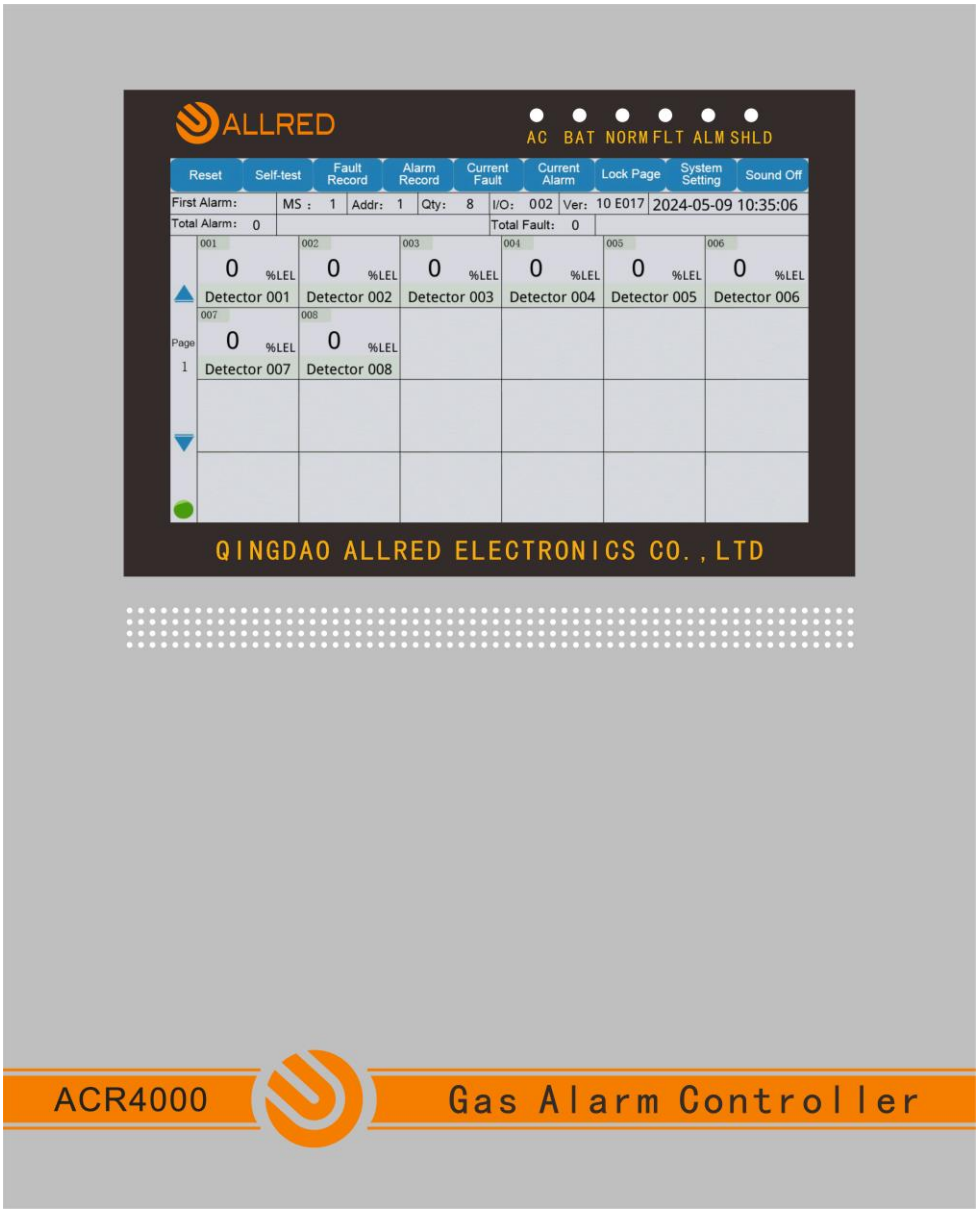


Figure 1.1 ACR4000 Gas Alarm Controller

1.2 Features

1. The core of the controller adopts advanced ARM processor. Ensure the real-time and accuracy of data processing, the system is more stable and reliable.
2. Display intuitive and easy to understand, easy to operate. The controller adopts 10-inch color touch screen, users can easily carry out relevant inquiries and parameter settings.
3. Intelligent protection system. Automatically detect the voltage fluctuation of the power grid, and automatically realize the power supply overcurrent protection. Automatic switching of main and backup power to maximize the normal operation of the system.
4. Password protection. There are corresponding passwords for all levels of operation, effectively avoiding mis-operation.

1.3 Product Standards

ACR4000 gas alarm controller is designed, manufactured and tested in accordance with GB16808-2008 *Combustible gas alarm control units*.

2. System Principle

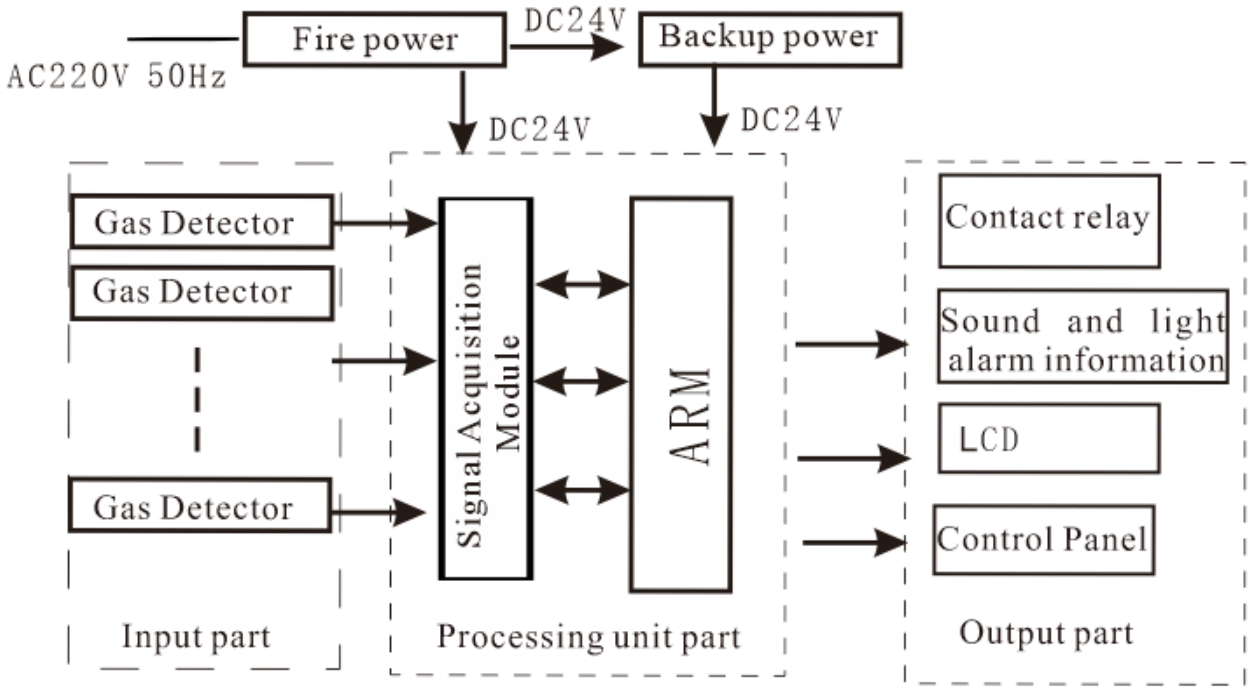


Figure 2.1 System working diagram

2.1 Operating Principle

The core of the controller is an advanced ARM processor. The external input signals are collected and processed by the signal acquisition circuit, and then the data are sent to the ARM processor, which compares the data and sends the results to the LCD screen and controls the alarm indicators, relays and buzzers. The 24V fire power supply inside the controller not only supplies the internal circuit, but also provides 24V power to the on-site detector and charges the backup battery.

2.2 Function

1. Alarm function.

When one of the following situations occurs, the controller will issue sound and light alarm signals:

① The controller monitors the concentration value of the gas detector, when the concentration value reaches the low alarm value, the buzzer will emit a slightly slower alarm sound while the alarm light flashes slowly; when the concentration value exceeds the high alarm value, the buzzer will emit a sharp alarm sound while the alarm light flashes rapidly.

② When the gas detector on the spot is faulty or the line is short-circuited or disconnected, the buzzer will emit a slightly slower alarm sound while the fault light flashes slowly.

③ When the main power supply is disconnected or lower than the normal working range, the controller generates the main power failure alarm, the failure indicator light is on, and the screen displays “AC Power Fault”.

④ When the standby power supply is broken or short-circuited, the controller's fault indicator light up and the screen displays “Battery Fault”.

⑤ When the backup power charging circuit is broken or short-circuited, the controller fault indicator will light up and the screen will display “Charger Fault”.

⑥ When the backup power supply is under-voltage, the controller fault indicator will light up, the buzzer will emit a slow alarm sound, and the screen will display “Low Battery”.

2. Display function: the controller real-time display of the first alarm, the total number of alarms, the total number of faults, the concentration information, the total number of shielding, the alarm part, the shielding part, the fault part, and other information cycle display.

3. Self-test: manually self-test the indicator lights, LCD screen and buzzer on the controller panel.

4. Reset: the controller is set with manual reset button.

5. Sound Off: after the controller sends out the alarm signal, press the “Sound Off” key to eliminate the alarm sound. When there is a new alarm message or fault message, the alarm will start again. If the gas detector shows that the concentration exceeds the alarm setting value and sends out an alarm signal, even if the concentration on the scene is reduced to below the alarm setting value, it is still necessary to eliminate the alarm sound of the controller manually. If it is a fault alarm, when the fault state disappears, the alarm sound will be eliminated automatically.

6. Alarm record: when the gas concentration in a certain area exceeds the set alarm value, the alarm circuit number, alarm status and alarm start time will be recorded automatically, and up to 1024 alarm messages can be recorded.

7. Fault record: when a fault occurs in a certain part, the fault location and fault time are automatically recorded, and up to 1024 pieces of fault information can be recorded.

8. Controller parameter query and setting: can query including fault information, alarm information, shielding information, concentration information, alarm records and so on. It can set the address, time, high report, low report concentration value and channel shielding.

9. Switching output: the controller has switching nodes (normally open or normally closed is optional) for controlling automatic fire-fighting equipment, alarm equipment or other purposes.

10. Standby power switching. When the main power supply power failure, the controller can automatically switch to the backup power supply, at the same time, the panel “AC” indicator light off, “BAT” indicator light on. When the main power supply is restored, it automatically switches to the main power supply and the “AC” indicator light on the panel is on. 220V power supply is connected, the fire power supply is automatically charged for the standby power.

11. It has the function of communicating with the upper computer. It can be connected with PC. With the monitoring software, it can display the real-time data of each monitoring point on the computer screen.

2.3 Technical Parameters

Operating Voltage	220VAC 50Hz
Operating Current	1.5A
Display	10.1-inch color LCD touch screen
Sound Alarm	When the alarm setting value is reached, the buzzer will sound; the sound pressure level at 1m directly in front (A-weighted) is greater than 65dB, less than 115dB
Indicator Light	There are corresponding indicator lights for main power supply, standby power supply, normal, alarm, fault and shielding
Control Function	8-way switch output, 5-way freely configurable switch output and total switch output of fault, low alarm, high alarm, node capacity 5A 220VAC/30VDC
Input Signal	4-20mA (optional RS485/LoRa/4G/NB-IOT, etc.)
Standby Power	Lead-acid battery (24V, 7Ah). Under the condition of non-limit discharge, it can be fully charged in 24 hours.
Dimension	Wall-mounted (length 420mm, width 340mm, height 153mm)
Operating Temperature	-10℃～45℃
Operating Humidity	≤95%RH Non-condensing
Weight	12.4KG

3. Installation Method

3.1 Wall-mounted Installation

See Appendix I, Installation Dimensional Drawings

3.2 Electrical Installation

3.2.1 Circuit Board Terminal Labeling Diagram

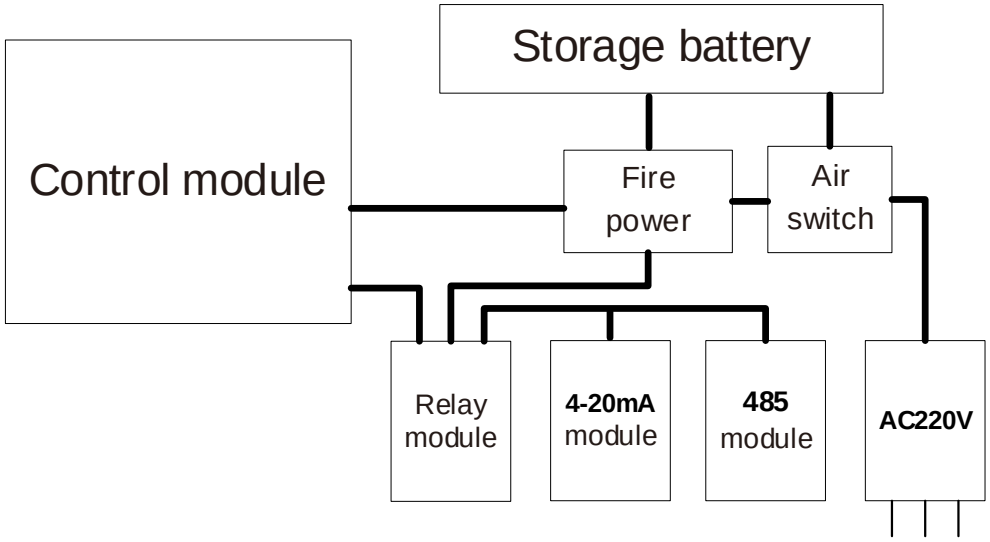


Figure 3.1 Connection diagram of each module of the controller

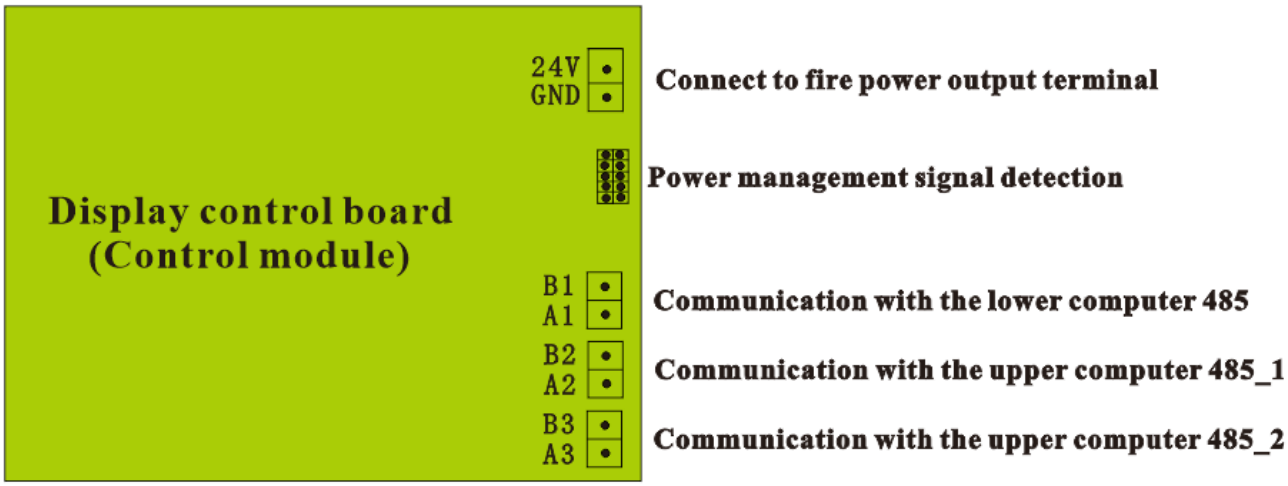


Figure 3.2 Control module terminal description

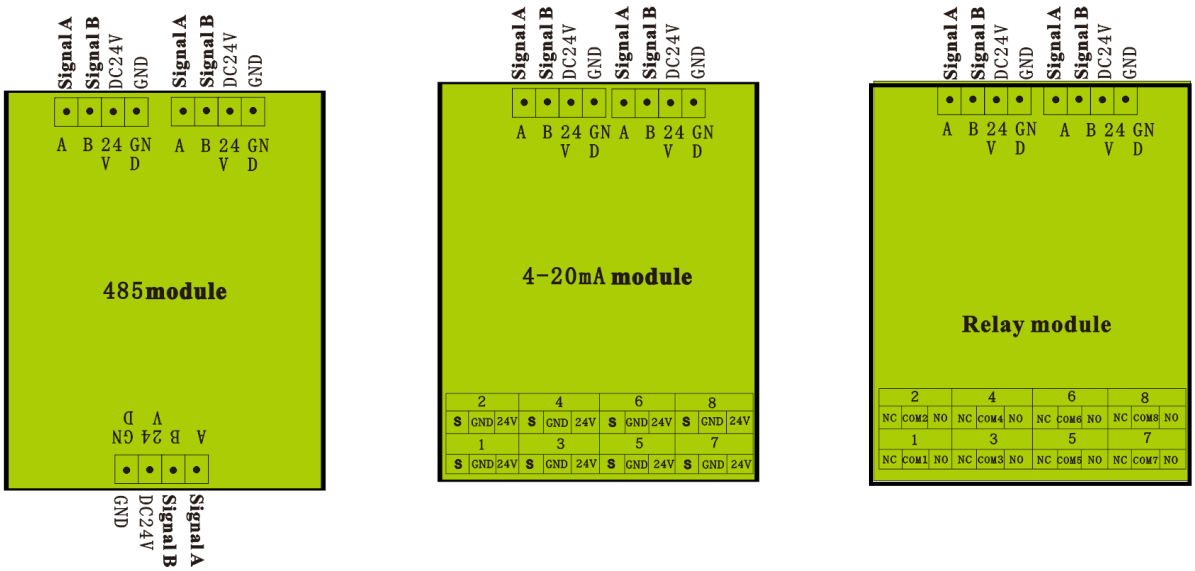


Figure 3.3 485 module and 4-20mA module and Relay module

Description:

Relay module: the maximum capacity of each circuit is 1100 watts, the identification of the relay output port, “NC” bit normally closed, “COM” for the common terminal, “NO” is normally open.

4-20mA module and 485 module wiring order can refer to the controller module in front of the acrylic plate silkscreen.

3.2.2 Wiring Instructions

See Appendix II and Appendix III: Electrical Wiring Diagrams

The controller adopts independent power supply and provides DC 24V power supply for the gas detector on site.

3.2.3 Field wiring

See Appendix IV and Appendix V : Schematic diagram of field wiring.

4. Operation Instructions

The front panel of the controller is shown below

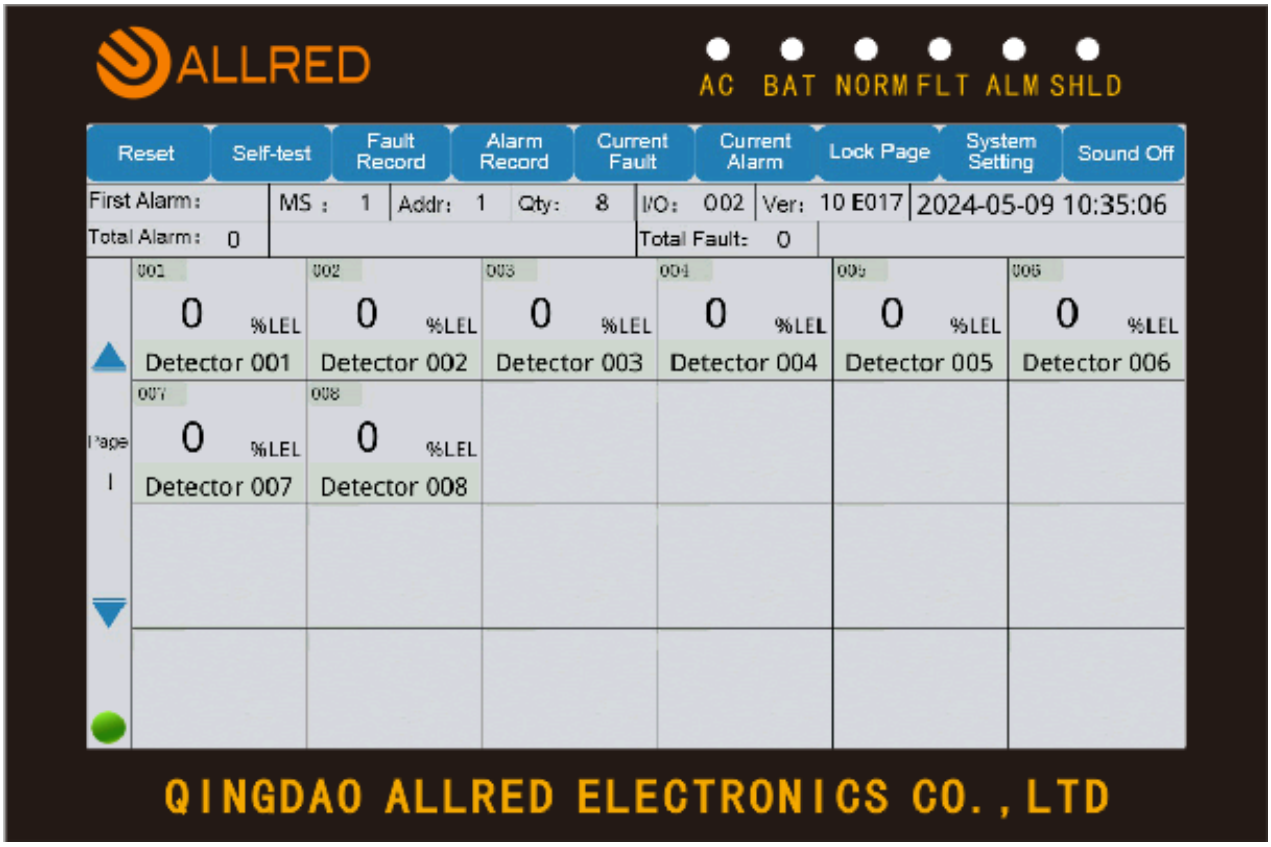


Figure 4.1 Controller panel

4.1 Indicator Light

1. “AC” indicator: when the controller is powered on and working normally, “AC” indicator green light is always on, when the main power supply is disconnected or fault, “AC” indicator light off.
2. “BAT” indicator：when the backup power supply is normal, “BAT” green light is always on, when the backup power supply is disconnected or fault, “BAT” indicator light off.
3. “NORM” indicator: when the controller detects all parts are in normal working condition, and the concentration value is less than the set alarm value, “NORM” indicator green light is always on; When an alarm, fault, or shielding state occurs in any part, the "NORM" state indicator light goes out and the corresponding indicator light turns on.
4. "ALM" indicator: when the concentration value of any part is greater than the low alarm value, the "ALM" indicator light flashes red slowly; when the concentration value is greater than the high alarm value, the "ALM" indicator light flashes red quickly.
5. "FLT" indicator: when any part is in a fault state (detector sensor failure, connecting wire

short circuit, open circuit, etc.), the "FLT" indicator light flashes.

6. "SHLD" indicator: when any part of the channel is set to the shielding state, the "SHLD" indicator light flashes.

4.2 Buzzer

The buzzer sounds a slightly slower alarm when a low alarm, fault, or shield condition occurs in any part of the controller, and a sharp alarm when a high alarm occurs. The audible alarm can be cleared by using the mute button.

1. When a low report alarm or a high report alarm occurs, the alarm sound will continue until manually cleared. After the alarm sound is manually cleared, the audible alarm automatically resumes when there is a new concentration alarm signal.

2. When the alarm is triggered by a fault condition, the alarm sound can be cleared manually, and after the fault is removed, the alarm sound can be eliminated automatically. When there is a new fault signal, the audible alarm can be automatically re-established.

4.3 Button

1. Reset：after pressing the key, enter the password to enter the reset operation.
2. Self-test：after pressing the key, enter the password to enter the self-test operation.
3. Fault Record: after pressing the key, the fault record is displayed.
4. Alarm Record: after pressing the key, the alarm record will be displayed.
5. Current Fault: after pressing the key, it displays all the current fault information.
6. Current Alarm: after pressing the key, display all the alarm information occurred at present.
7. Lock Page: When the number of detectors is greater than 24, automatic page turning will be displayed. After pressing this key, automatic page turning will be stopped, and automatic page turning will be resumed when pressed again.
8. System Setting: after pressing the key, input the password to set the system operation.
9. Sound Off：after pressing the key, the alarm tone that is currently occurring will be turned off, and when there is a new alarm, the alarm sound will be restored.
10. Return: press this key to return to the previous page.
11. OK：press the key to confirm the operation.
12. Save：press the key to save.
13. ▲: press the key to turn the previous page.
14. ▼：press the key to turn the next page.

4.4 Warming Up

Figure 4.2 Preheating self-test

1. There is a 30s countdown after power-on, and in conjunction with the detector, it needs to be preheated to work properly;

2. It has a self-test function. The main light, backup light, normal light, fault light, alarm light, and shielding light light up at the same time. Check whether these indicator lights are normal.

4.5 Normal Status

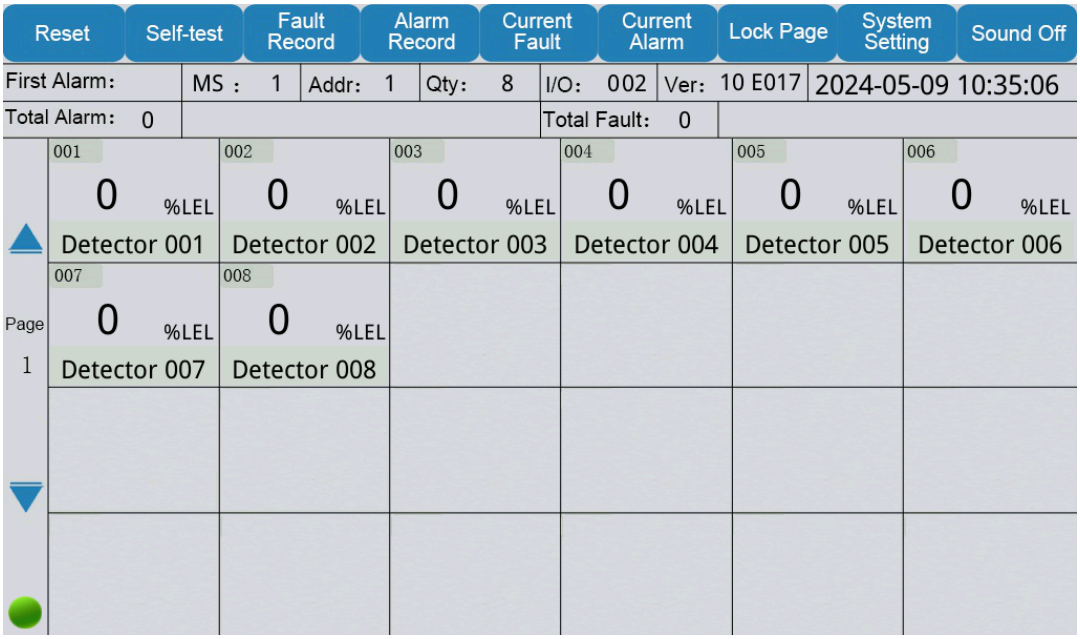


Figure 4.3 Normal status display

4.6 Alarm Status

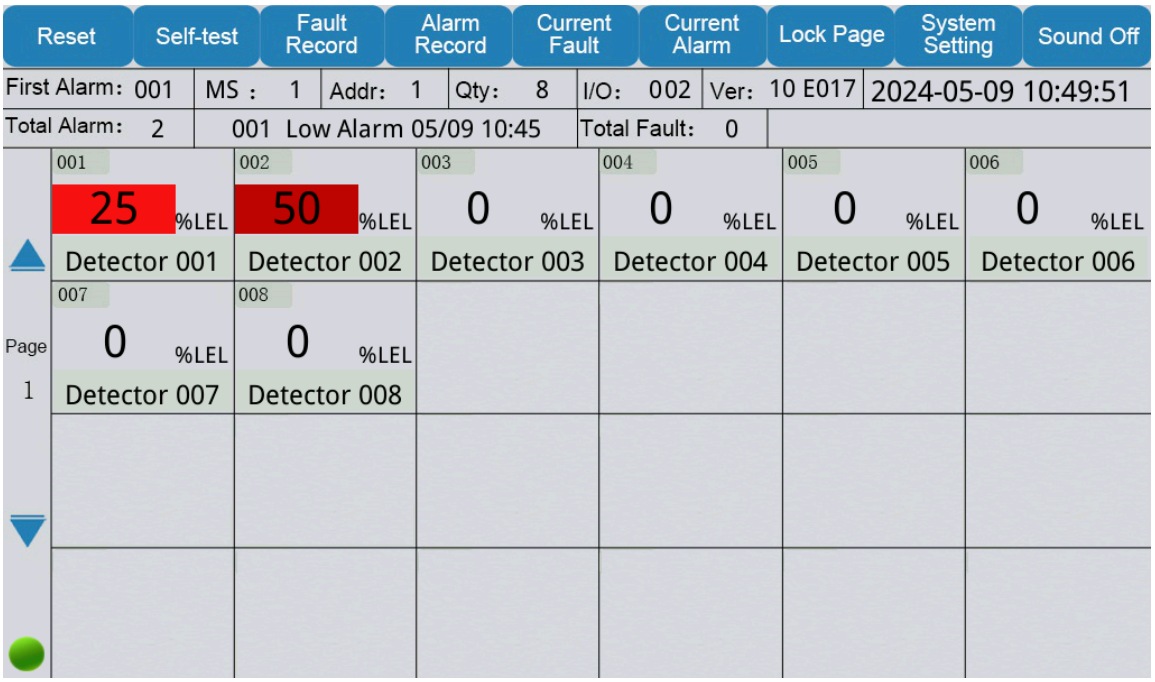


Figure 4.4 No. 001 detector Low Alarm, 002 detector High Alarm

4.7 Fault Status

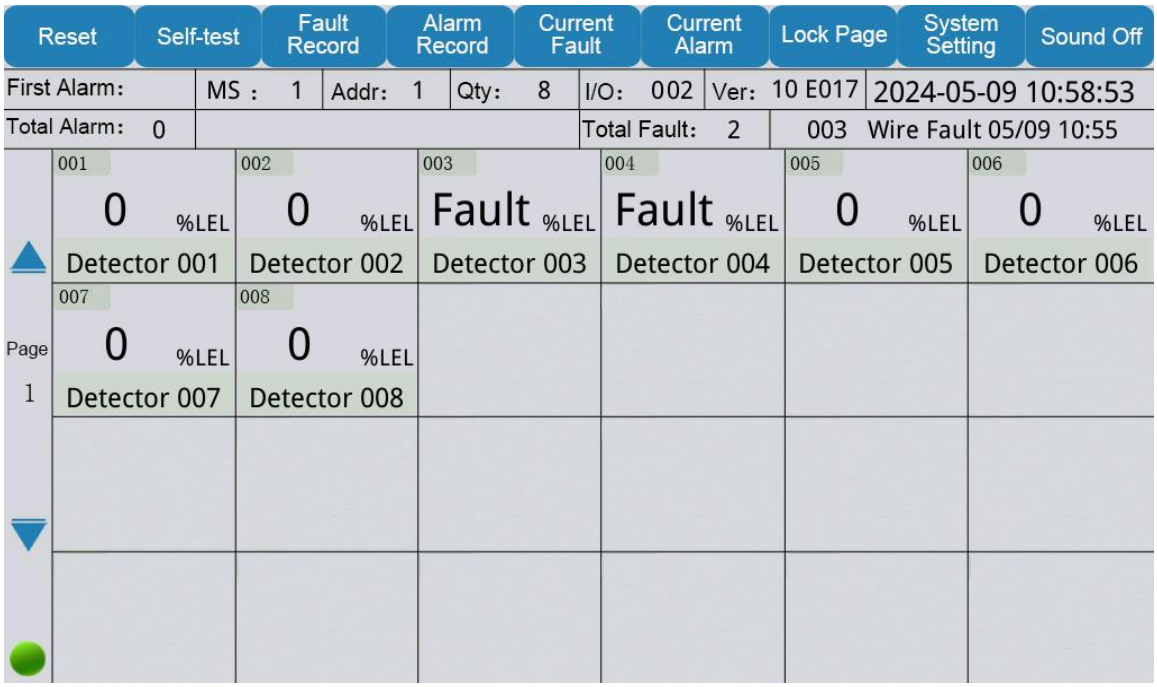


Figure 4.5 No. 003 detector Wire Fault, 004 detector Sensor Fault

4.8 Reset

The “Reset” function is used to reset the system. Click the “Reset” button, click to enter the secondary password “1234”, and finally click “Enter” to start the reset.

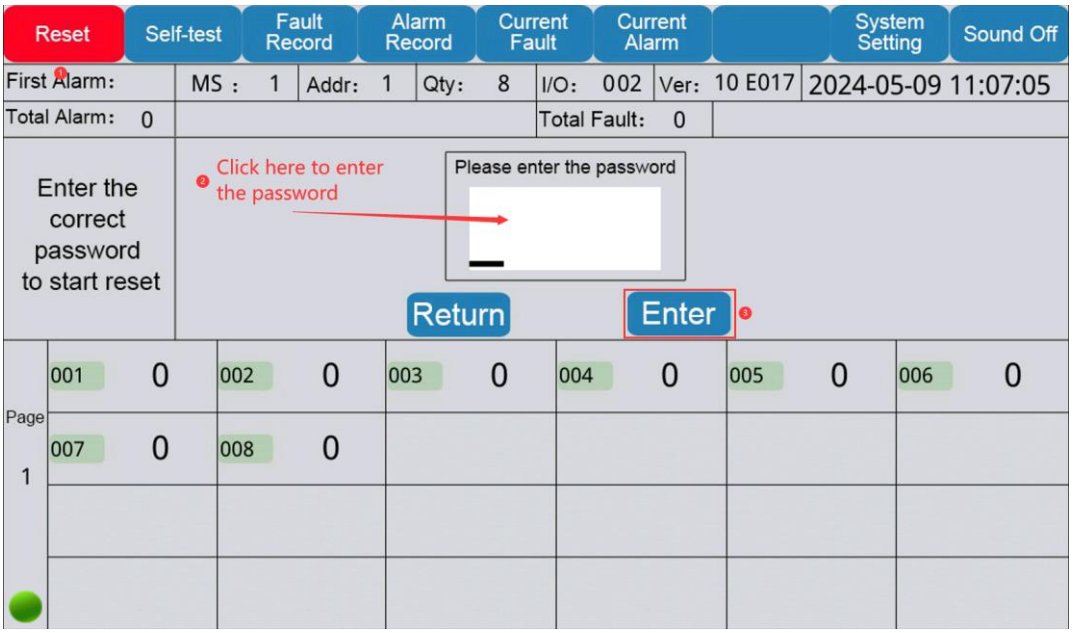


Figure 4.6 Reset

4.9 Self-test

The “Self-test” function is used to carry out the system self-test operation, detecting whether the indicator lights, LCD screen and buzzer are normal. Click the “Self-test” button, click to enter the secondary password “1234”, and finally click “Enter” to start the self-test.

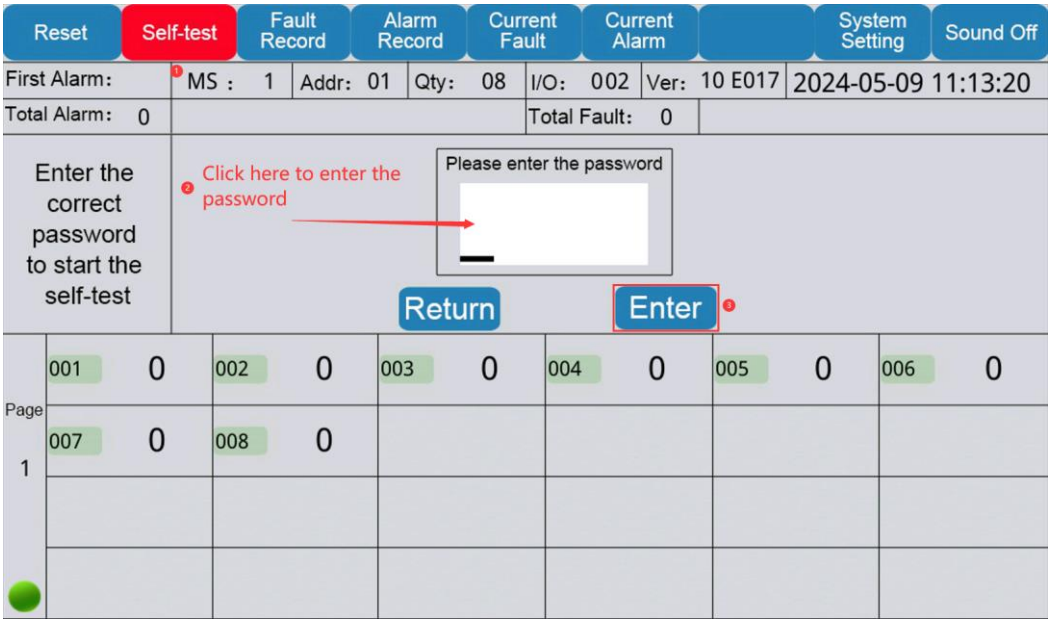


Figure 4.7 Self-test

4.10 Fault Record Query

“Fault Record” can query the time and type of fault record. Click on the “Fault Records” button to display the fault records, and click on “▲” and “▼” to turn the page. The specific operations are as follows:

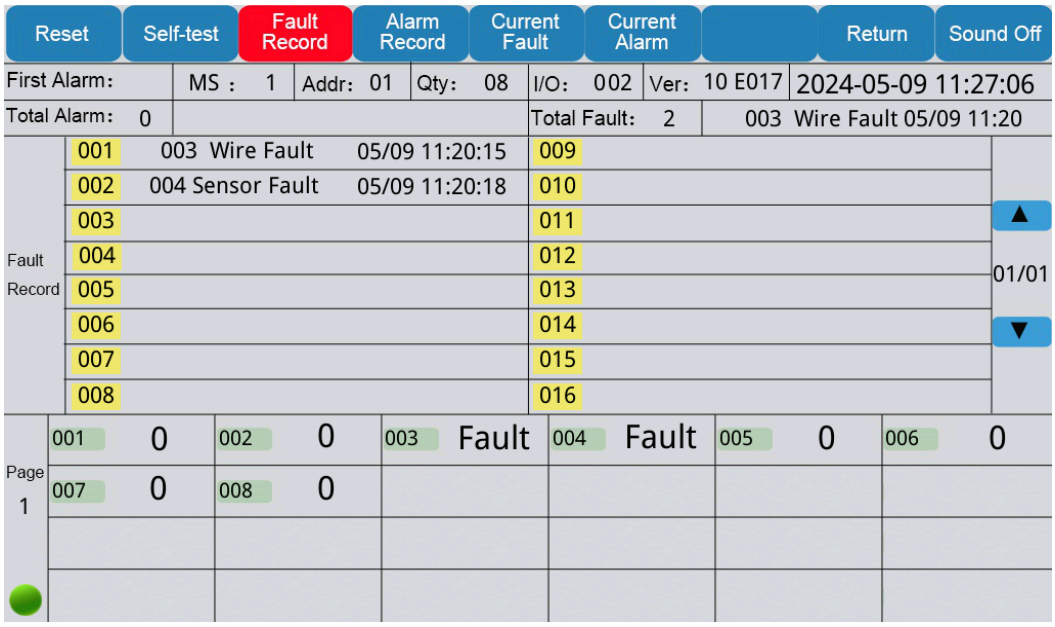


Figure 4.8 Fault Record

4.11 Alarm Record Query

"Alarm record" can query the time and type of alarm record. Click the "Alarm Record" button to display the alarm record. Click "▲" and "▼" to turn pages. The specific operations are as follows:

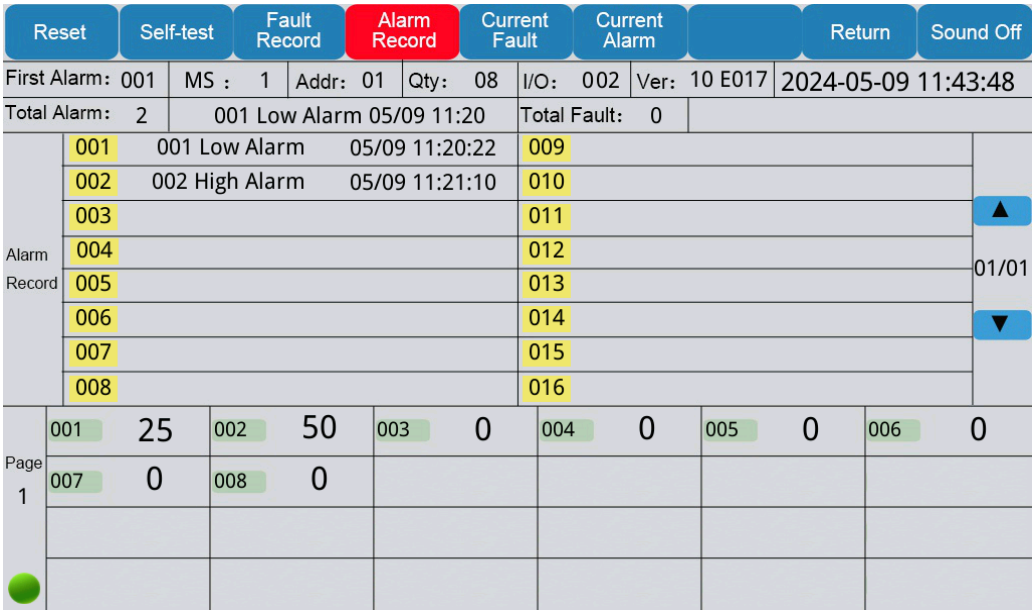


Figure 4.9 Alarm Record

4.12 Current Fault Query

"Current Fault" can query the type and time of all fault information currently occurring. Click the "Current Fault" button to display the fault information. Click "▲" and "▼" to turn pages. The specific operations are as follows:

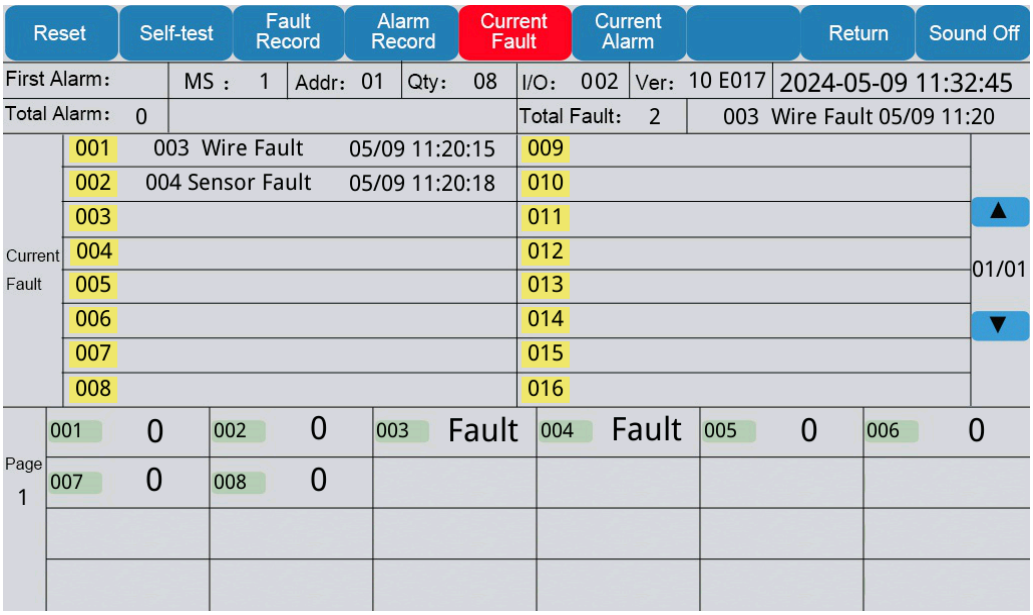


Figure 4.9 Current Fault

4.13 Current Alarm Query

"Current Alarm" can query the type and time of all alarm information that has occurred currently. Click the "Current Alarm" button to display the alarm information. Click "▲" and "▼" to turn pages. The specific operations are as follows:

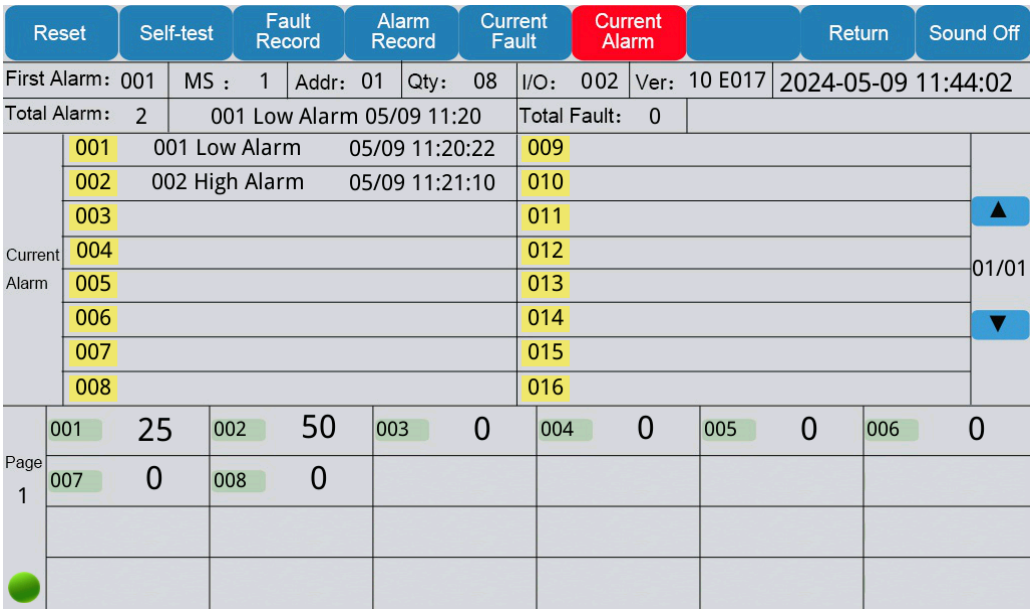


Figure 4.10 Current Alarm

5. System Setting

Click the "System Setting" button, click to enter the third-level password "8888", and click "Enter" to set all information, including Basic Setting, Alarm Setting, Data Type Setting, Relay Setting, Coefficient Setting, Shielding Setting, and Time Setting.

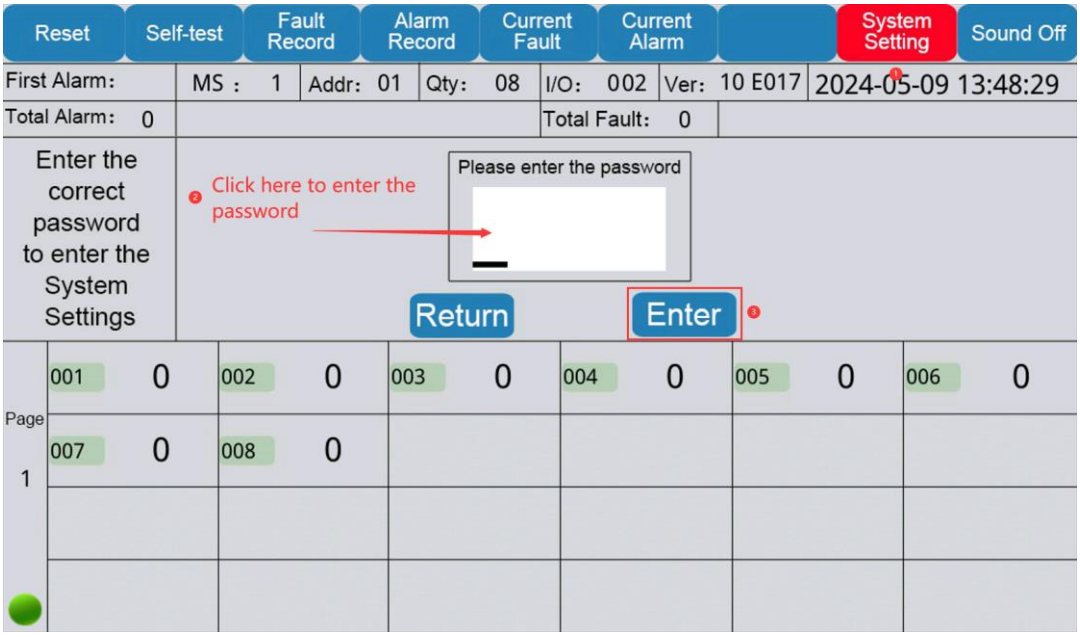


Figure 5.1 System Setting

5.1 Time Setting

"Time Setting" can set the date and time. According to the current time, after clicking Save, the time setting will take effect. The specific operations are as follows:

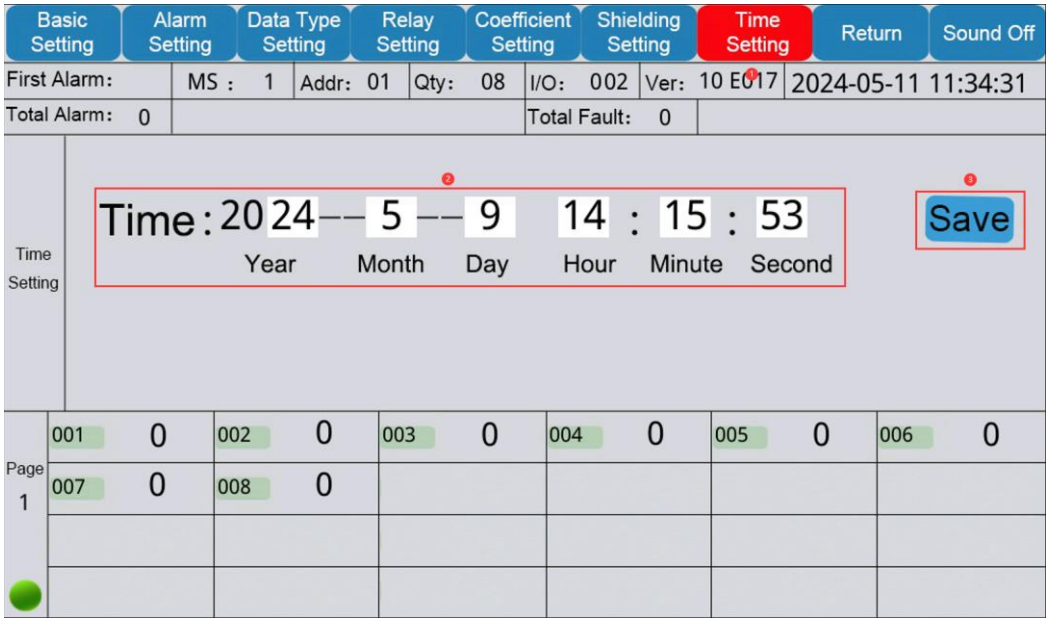


Figure 5.2 Time Setting

5.2 Basic Setting

"Basic Setting" allows you to set the slave station address and the number of detectors as well as the detector address and unit. The specific operation is as follows:

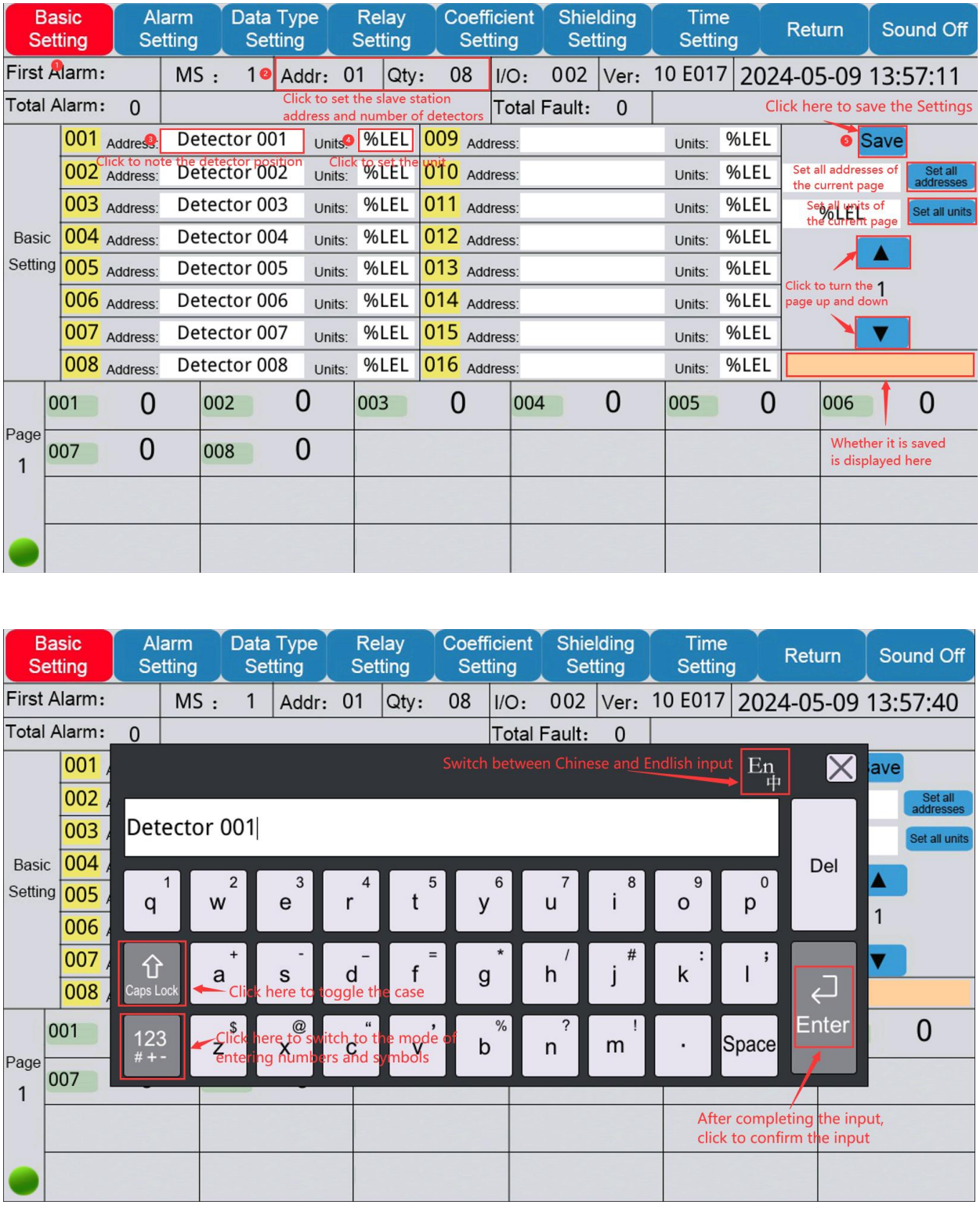


Figure 5.3 Basic Setting

Addr: set the upload communication slave station address.

Qty: set the number of detectors.

Address: set the detector installation location address.

Unit: set the corresponding unit of the detector.

Save: all settings need to be clicked to save to take effect.

Set all address: Set the address information of the current page. After clicking " Set all address ", the set information will be written to all addresses on the left. Note that you need to click "Save" again to take effect.

Set all units: Set the unit information of the current page. After clicking " Set all units ", the set information will be written to all units on the left. Note that you need to click "Save" again to take effect.

▲: click to turn to the previous page.

▼: click to turn to the next page.

Yellow area: after clicking Save, if the setting is successful, "Saved" will be displayed.

5.3 Alarm Setting

The “Alarm Setting” function is used to set the alarm action value of the detector, including low and high alarms. The factory default alarm value is: low alarm limit 25% LEL, high alarm limit 50% LEL, you can also reset the alarm value according to the specific requirements of the site, the specific operation is as follows:

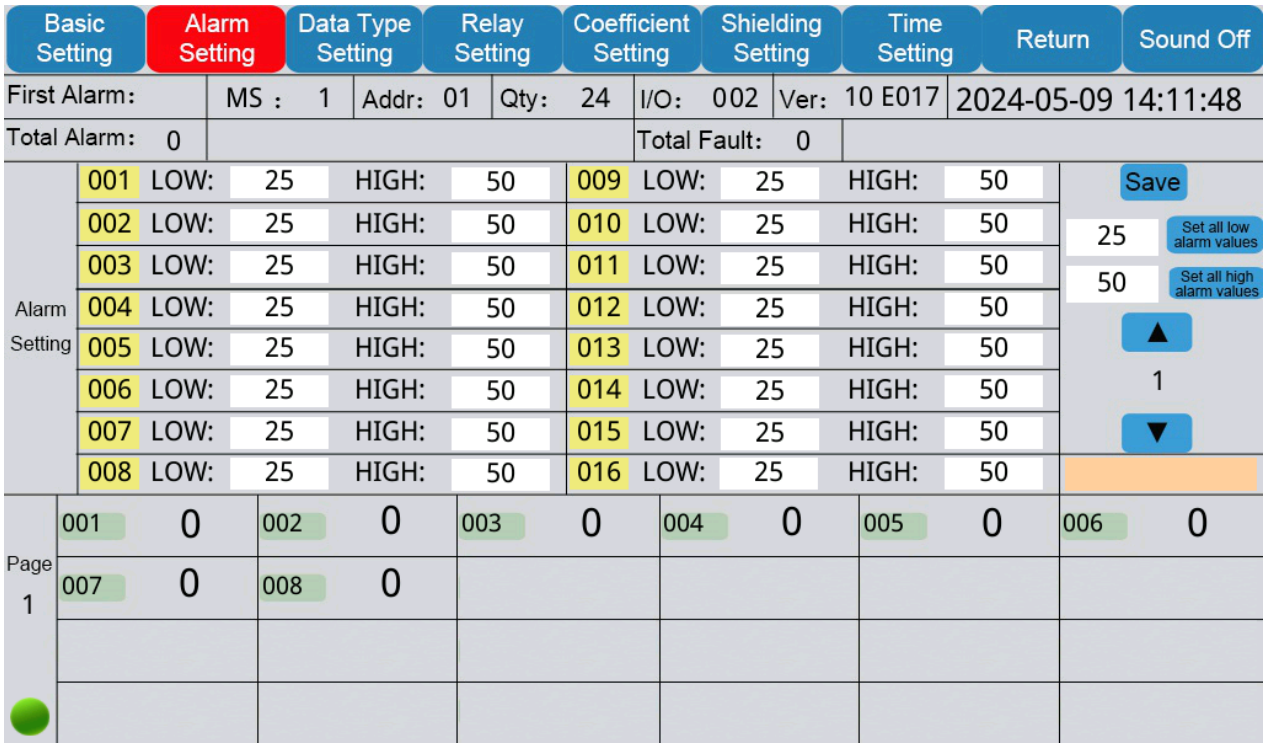


Figure 5.4 Alarm Setting

5.4 Data Type Setting

"Data Type Setting" can set the detector display mode, green is the current selection. The specific operations are as follows:

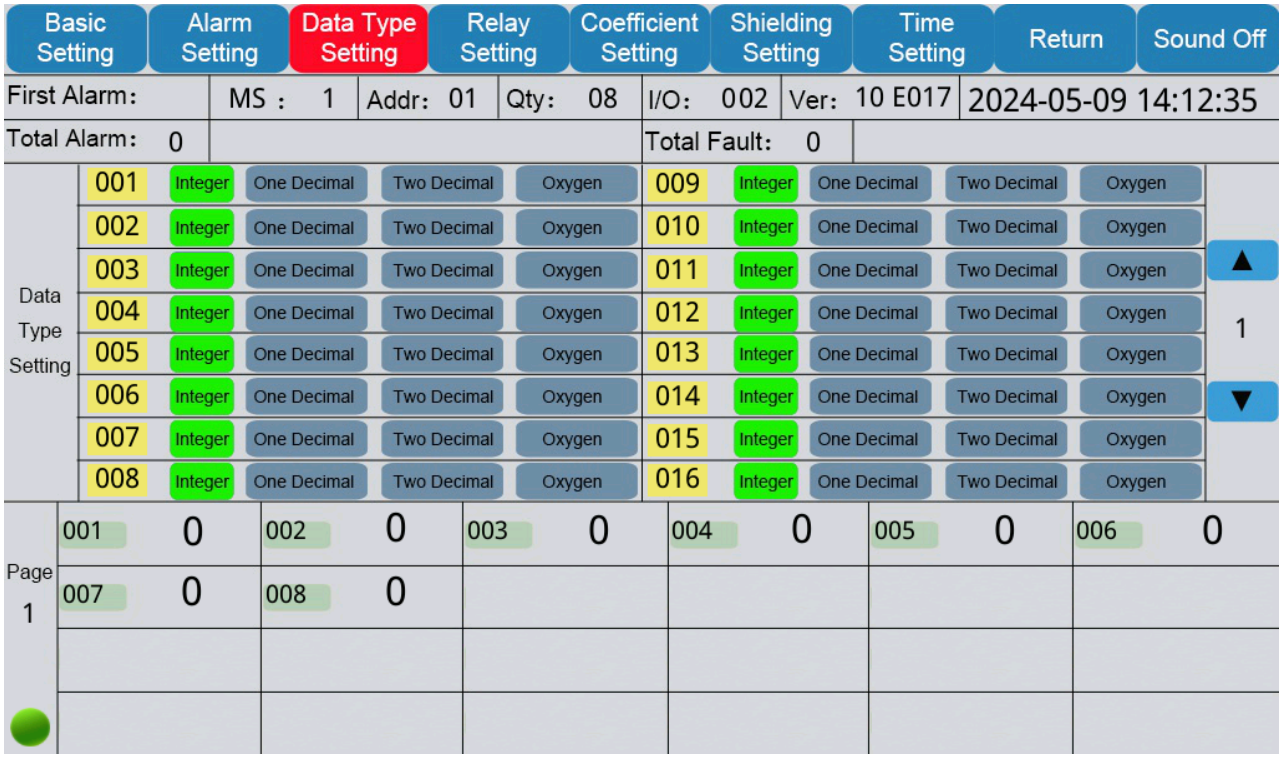


Figure 5.5 Data Type Setting

Integer: the display content is a whole number, such as 15, combustible gases can choose integer.

One Decimal: display content is 1 decimal, such as 1.0, toxic gases can be selected as required.

Two Decimal: display content is 2-digit decimal, such as 1.00, toxic gases can be selected according to the need.

Oxygen display: display content for 1 decimal, such as 20.9, specifically for oxygen settings to select.

▲: after clicking, turn to the previous page.

▼: click and turn to the next page.

5.5 Relay Setting

“Relay Setting” is used to set the relay switching output, green color is the current selection. Each detector can freely bind five relay outputs, and after setting, you have to set the trigger conditions at the same time, and set the low report or high report output. The specific operation is as follows:

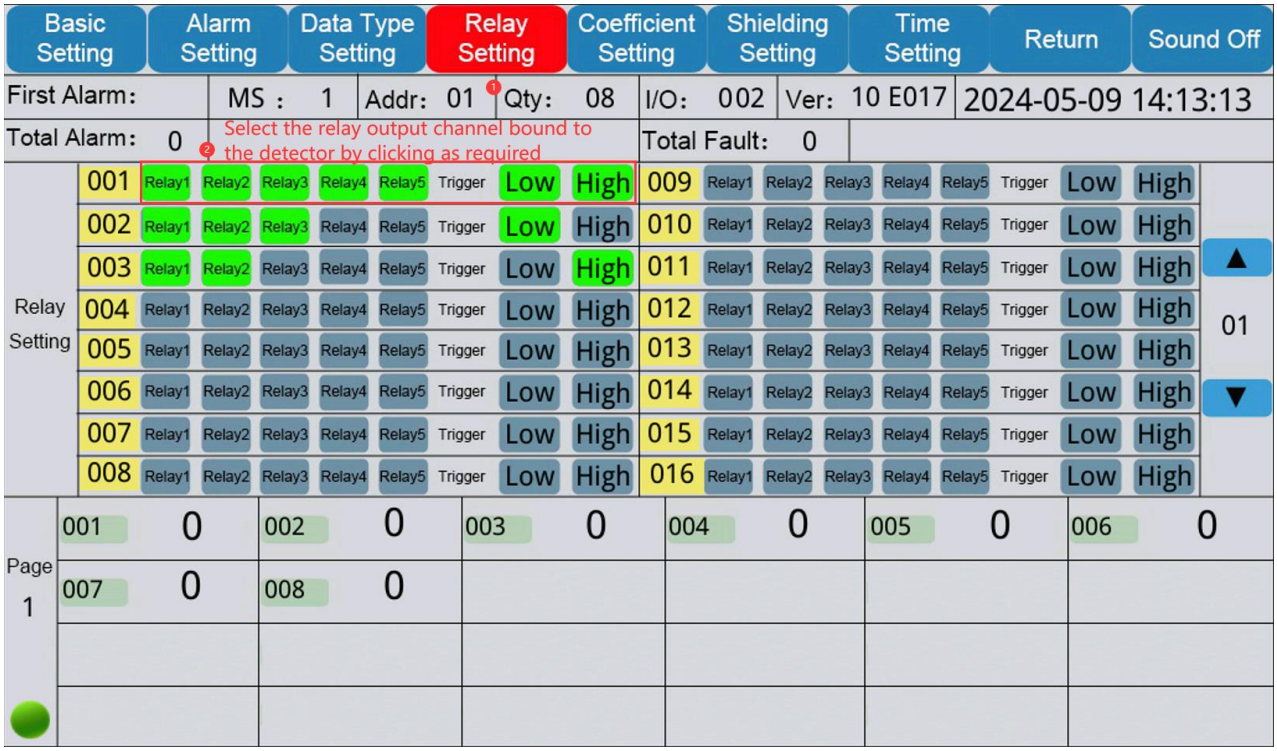


Figure 5.6 Relay Setting

Relay 1~Relay 5: five relay outputs.

Trigger: trigger condition.

Low: low alarm trigger, after the current detector low alarm, the relay selected before will be activated.

High: high alarm trigger, after the current detector high alarm, the relay selected before will actuate the output.

▲: click and turn to the previous page.

▼: click and turn to the next page.

5.6 Coefficient Setting

"Coefficient Setting" is used to set the detector value conversion, the default is 100, the specific operation is as follows:

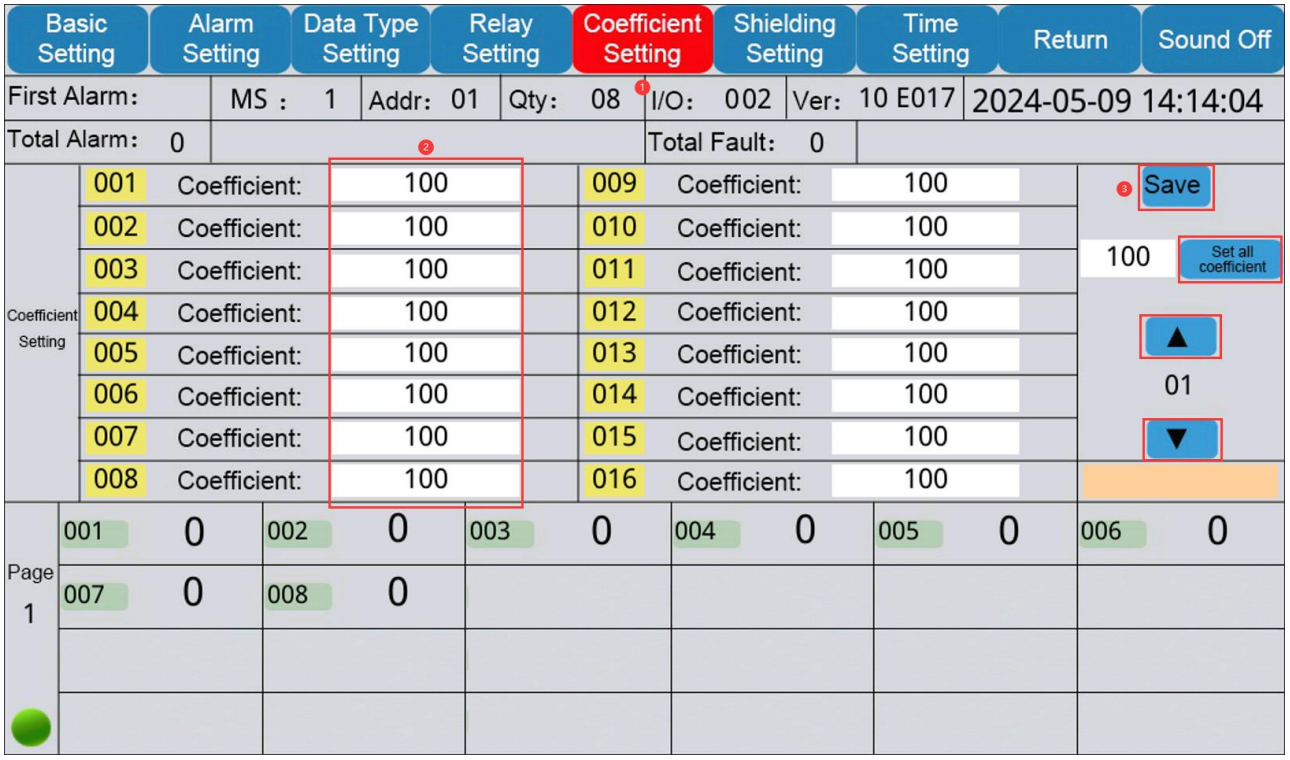


Figure 5.7 Coefficient Setting

Coefficient: coefficients converted according to the collected signals and actual display values, default 100.

Save: after setting the coefficients, you need to click save for the setting to take effect.

Set all coefficients All: set coefficients information in the front area, after clicking "Set all coefficients", the set information will be written to all the coefficients on the left side, note that you need to click "Save" again to take effect.

▲: click and turn to the previous page.

▼: click and turn to the next page.

5.7 Shielding Setting

"Shielding Setting" is used to set whether the detector is shielded. The specific operations are as follows:

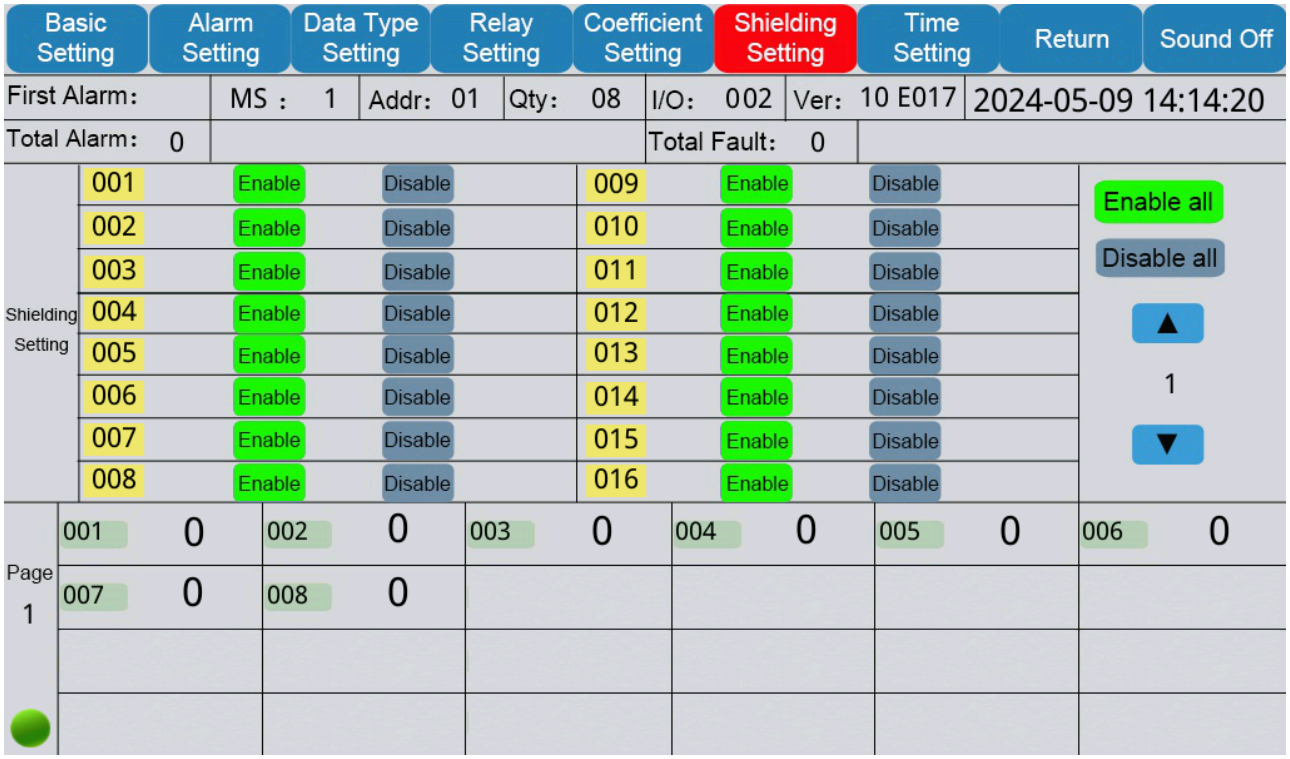


Figure 5.8 Shielding Setting

Enable: when clicked, the current detector is enabled.

Disable: click it to block the current detector.

Enable All: click it to enable all detectors on the current page.

Disable All: click it to block all detectors on the current page.

6. Common Problem and Solution

Problem Phenomenon	Possible Reasons	Solution
Unable to turn on	a. The power supply is not connected properly; b. Controller switch is not turned on; c. Device is damaged.	a. Check power supply; b. Turn on the controller switch; c. Contact manufacturer.
The controller and the on-site detector display are inconsistent	a. Poor contact in detector wiring; b. Problems with detector output.	a. Check connecting wires; b. Contact manufacturer.
Display shows “Sensor Fault”	Detector failure.	Check detector status.
The display shows “Wire Fault”	Communication with the detector fails.	a. Check if the detector is installed; b. Check if the detector has power; c. Check the detector wiring.
Display shows “AC Power Fault”	The 220V power supply is not plugged in.	a. Check whether the power cord is disconnected; b. Check whether the power socket has power.
The display shows "Battery Fault" or "Low Battery "	The battery voltage is too low.	a. Check the main power supply; b. Contact the manufacturer to replace the battery.

7. Package Content

a. ACR4000 gas alarm controller 1 set
b. Back mounting bracket 1 pcs
c. Installation parts kit 1 copy

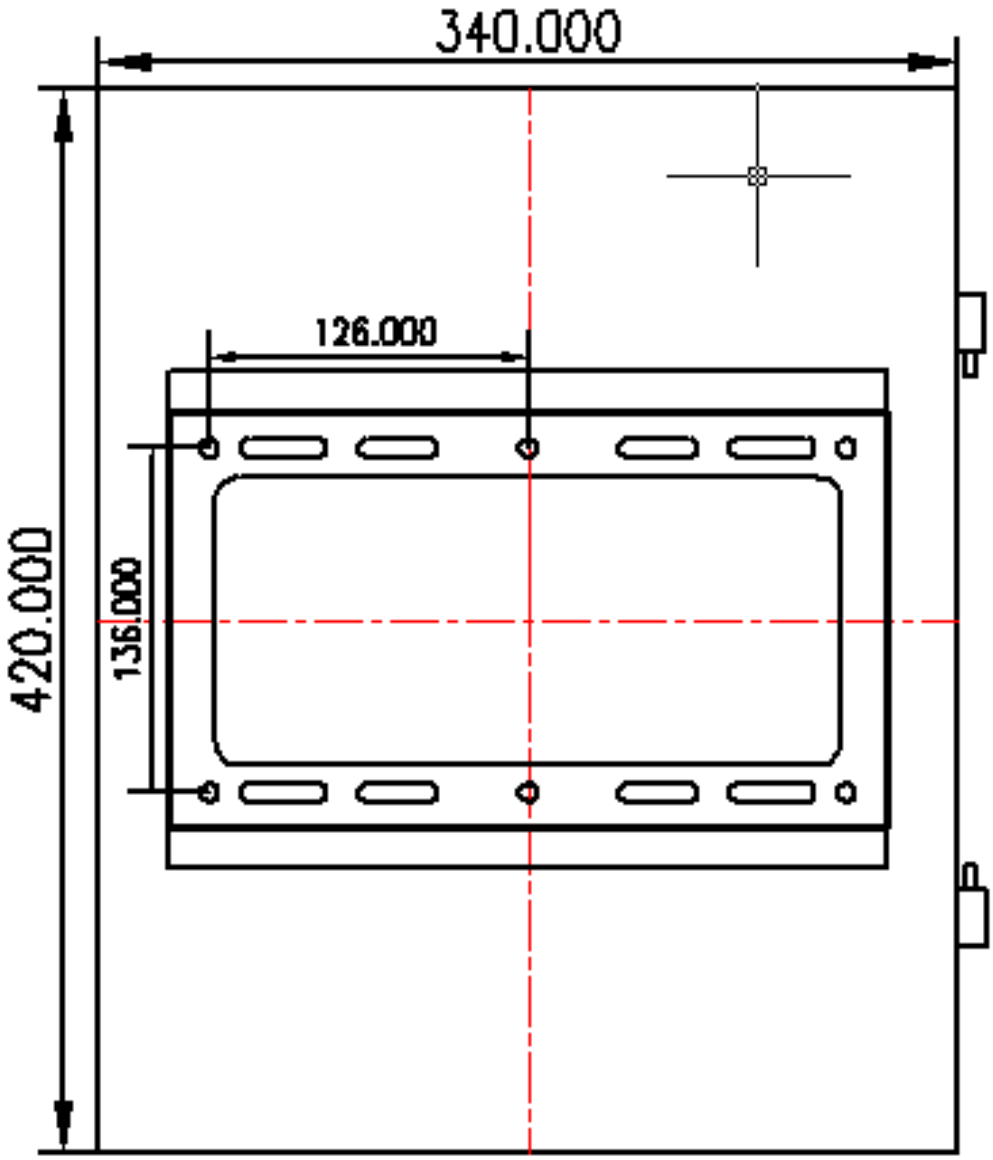
8. Transportation and Storage

a. ACR4000 gas alarm controller is packed in carton box.
b. ACR4000 gas alarm controller with battery can be transported by road, air and ship, pay attention to waterproof and moisture-proof during transportation, avoid impact on the upper surface of the packing box to avoid damage.
c. Under the condition of good sealing, the storage temperature is -10℃～45℃ and the ambient humidity is ≤95%RH.

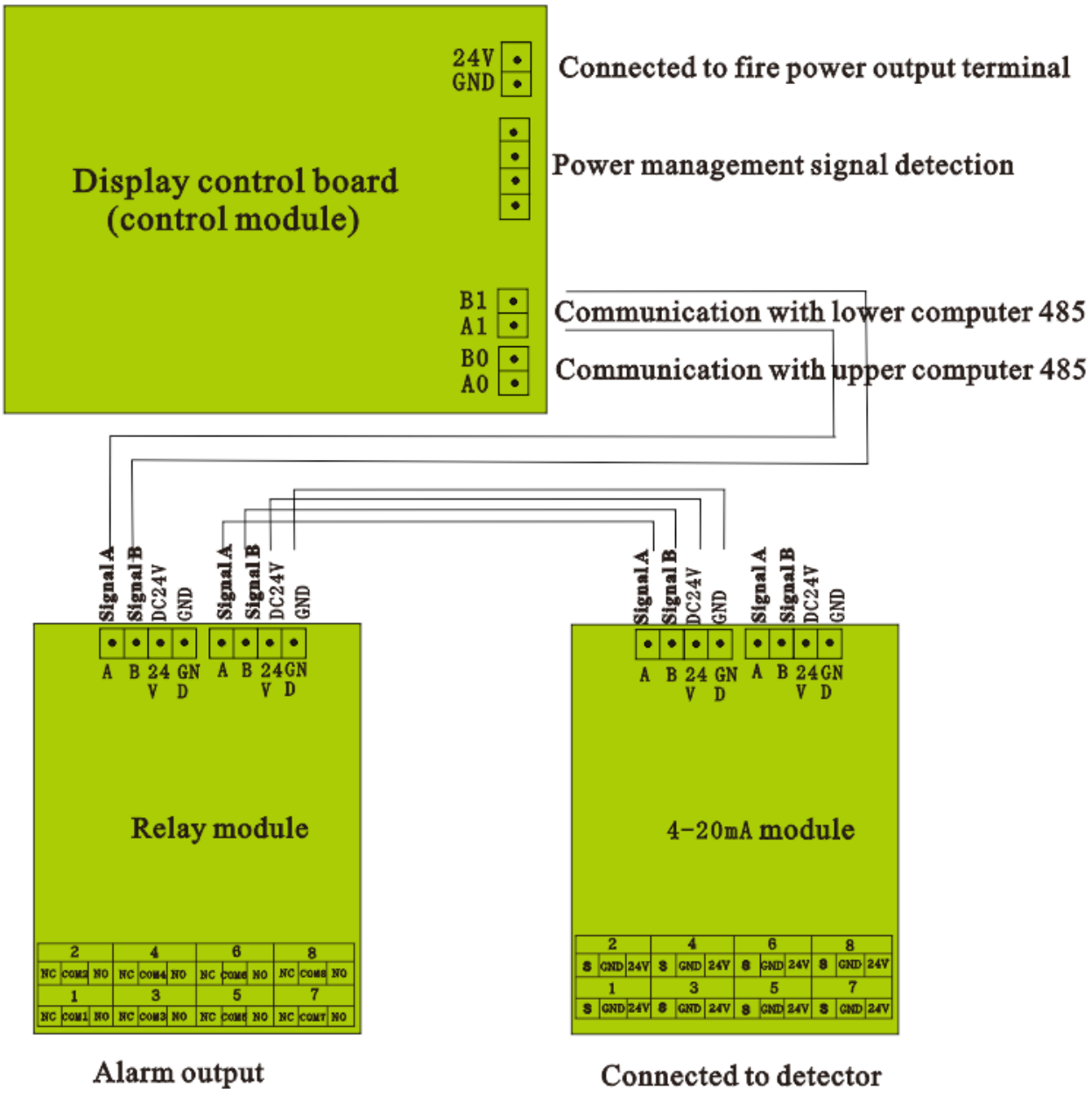
9. Warranty

Within two years from the date of sale of this product, if the user uses it correctly and does not make any unauthorized changes to the internal components of the chassis, if quality problems occur, our company will be responsible for free repairs. Afterwards, be responsible for long-term maintenance and collect costs.

Appendix I, Installation Dimensional Drawings



Appendix II Electrical Wiring Diagram for 4-20mA Module

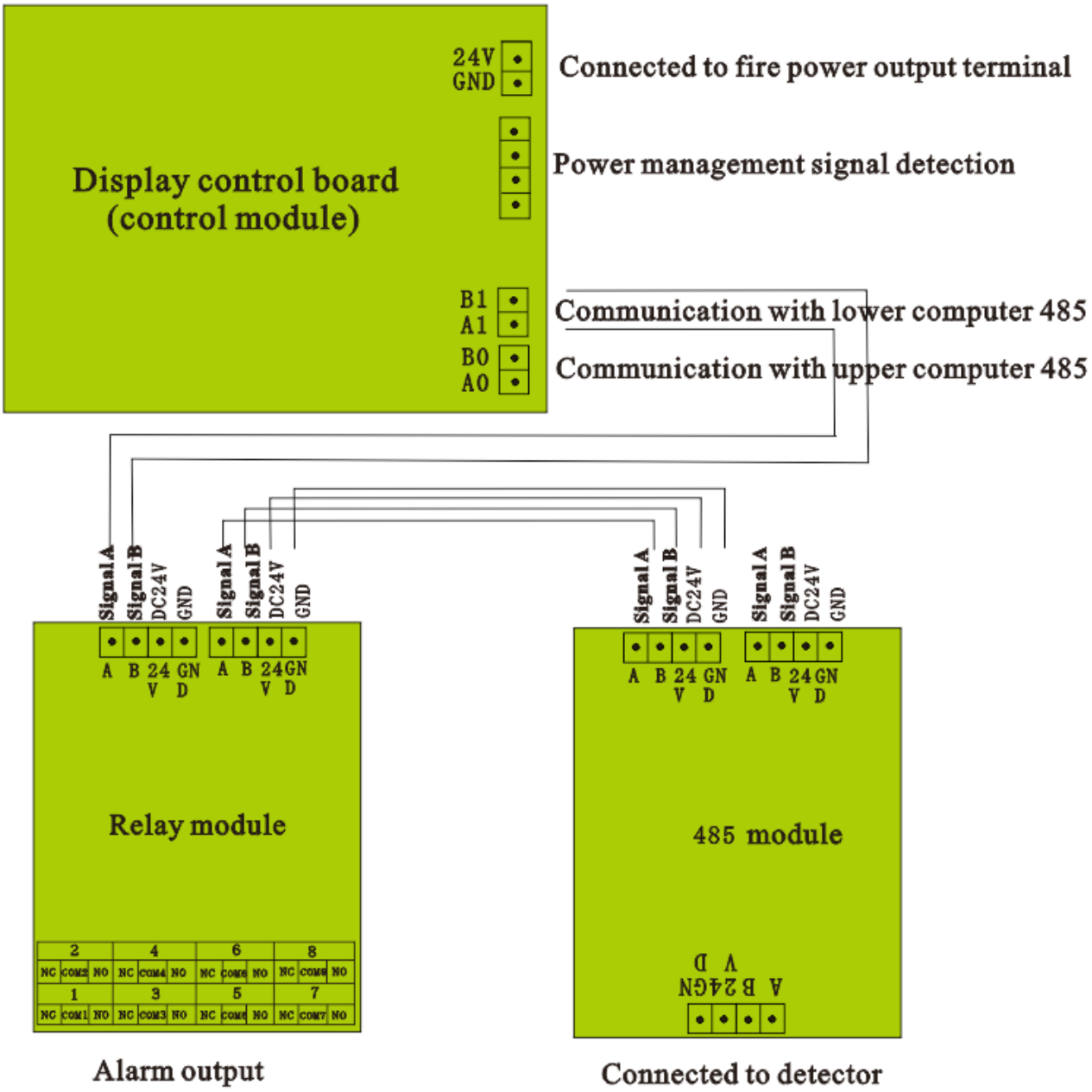


4-20mA Electrical Wiring Diagram

Remarks:

When the number of on-site detectors does not exceed 8 sets, only one set of signal conversion circuit board and one relay module can be used. When the number of detectors exceeds 8, the module should be configured according to the actual number of detectors.

Appendix III Electrical Wiring Diagram for RS485 Module

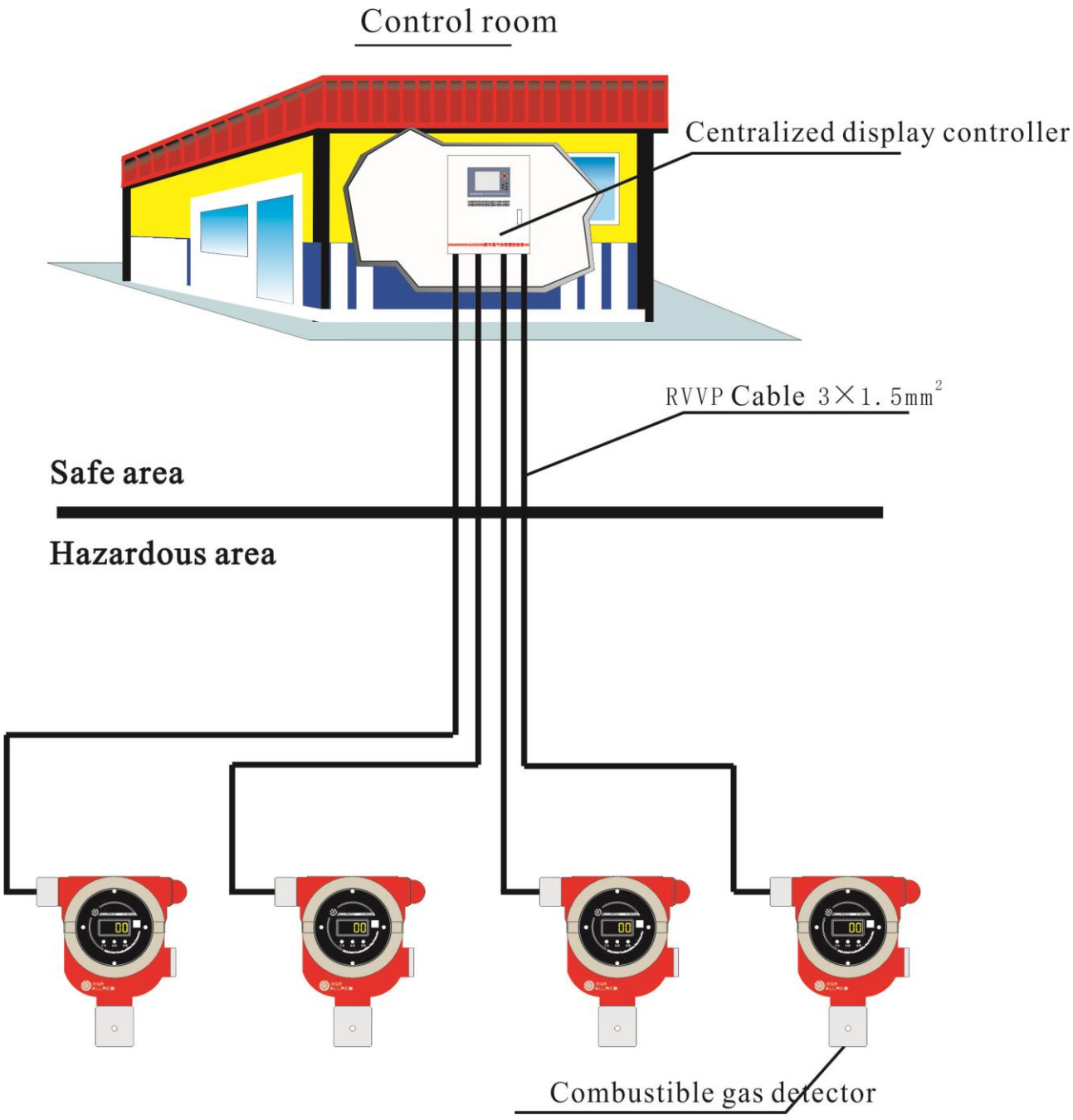


RS485 Electrical Wiring Diagram

Remarks:

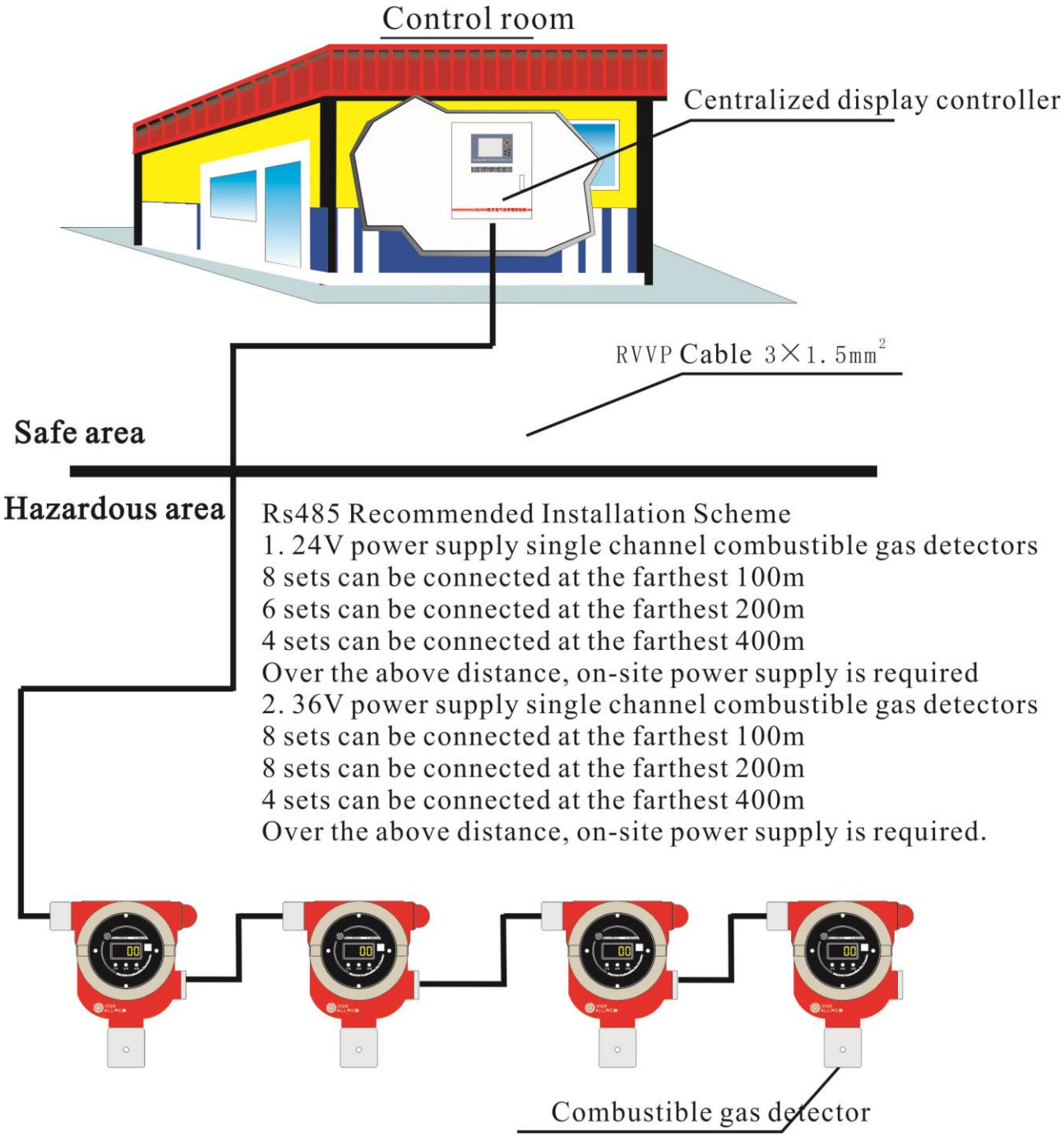
Each 485 module sets the number of detectors connected by the loop through the dial switch, up to 16. The address of the 485 module starts from 1 and goes back in order. When the number of detectors is greater than 8, it takes up two address bits.

Appendix IV Field Wiring Diagram for 4-20mA Gas Detector



4-20mA Wiring Diagram

Appendix V Field Wiring Diagram for RS485 Gas Detector



RS485 Wiring Diagram

Version 1.0.1

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