GI Instruments
Québec Inc.

GDC Multi-parameter Monitoring System

User Manual

CONTENTS

I General Information

1 Overview

This handbook includes the following sections:
Part I General information,
Part II Controller
Part III Contact

2 Safety guidelines

Installation, electrical connection, initial start-up, operation, and maintenance of the monitoring systems must only be performed by qualified personnel. The qualified personnel has to be trained and authorized by the manufacturer for these operations. The qualified personnel must be able to read and understand this manual and have to follow the instructions contained within.

The operator has to obtain the local operating permits and has to comply with the joint constraints associated with them. Additionally, the local legal requirements have to be observed (eg. regarding the safety of personnel and means of labor, disposal of products and materials, cleaning, environmental constraints). Before putting the measuring device into operation, the operator has to ensure that during mounting and initial startup – in case they are executed by the operator himself/herself – the local legislation and requirements (eg. regarding electrical connection) are observed.

All products left our factory in immaculate technical and safety conditions. Inappropriate or non-intended use of the product, however, can cause danger!

The manufacturer is not responsible for the damage caused by incorrect or unauthorized use. Any kind of manipulation of the instrument, except for the activities described in this document, is strictly prohibited. Conversions and changes to the device must not be made, otherwise, all certifications and guarantee/warranty become invalid.

For details regarding guarantee and warranty, please refer to our general terms and conditions.

2.1 Declaration of conformity

The research and development of the spectrometer, as well as the controller testing and manufacturing process, satisfy the requirements of electromagnetic compatibility (EMC).

2.2 Special hazard warning

Because the measuring systems are frequently installed in industrial and communal wastewater applications, one has to take extra care during mounting and demounting of the system, as parts of

the device can be contaminated with dangerous chemicals or pathogenic germs. All necessary precautions should be taken to prevent endangering one's health during working with the measuring device.

2.3 Storage and transportation

The temperature and humidity limits for device storage and transport are described in the technical specifications. They must be observed at all times. The device shall not be exposed to severe impacts, mechanical loads, or vibrations. The device should be kept free of corrosive or organic solvent vapors, nuclear radiation as well as strong electromagnetic radiation. Transport should be done in the original packaging if possible.

2.4 Arrival inspection

After receiving goods, please check for items conforming to the contents on the invoice, and check for damage in shipping. If there is an issue, please let transporters and the manufacturer know immediately.

2.5 Product upgrades and others

The manufacturer reserves the right to implement technological developments and modifications in the light of continuous product care without prior notice.

II Controller

1 Brief description

1.1 Uses

The GDC monitoring system is equipped with an intelligent and multi-channel controller. It can connect with a number of identical or different sensors including smart sensors to simultaneously display different measuring parameters including pH, ORP, conductivity, dissolved oxygen, turbidity, ammonium, free chlorine, etc. It can also communicate with the SA-9 continuous spectrum sensor to measure CODcr, CODmn, BOD, TOC, and other organic parameters as well as O_3, chroma, and nitrate. Additionally, it can measure SDT toxic and flammable gases (H_2S, NH_3, CH_4, Cl_2, and so on) when it is connected to the relevant gas sensors.
The sensors connected to the GDC must be the ones that are permitted to use for the applications described in the manual. Applications not mentioned in the manual and the equipment modifications that are not approved in writing are not permitted. Otherwise, the user must assume full responsibility for the damage caused, and manufacturer is not liable for compensation.

The corresponding range of various types of applications is described in the technical specifications.

manufacturer is not responsible for applications exceeding the listed measurement range of the specifications. Applications that are beyond the listed scope do not belong to the manufacturer's responsibility.

The instrument can only be used for the application mentioned above. If you do not follow the instructions in the operating manual, or if you have not been authorized to modify the equipment, manufacturer does not undertake the relevant risks arising from the unauthorized application. In this case, the corresponding risks and damages generated shall be the responsibility of the operator.

1.2 Specification

Parameters:

pH, ORP, Conductivity, DO, Turbidity, Ammonium, Chlorine, CODcr, CODmn , BODeq, TOCeq,

DOCeq, O_3, NO_3-N, NO_2-N, SAC254, Chroma, Flow, Level, and Toxic gas, etc.
Accuracy: ±0.1%F.S.
Repeatability: ±0.1%F.S.
Linearity: ±0.05%F.S.
Response time: T90<1s
Power: 24VDC (13.5~50VDC), 110/220VAC@50Hz/60Hz
Display: LCD touch screen
Displayable contents: measured parameters, measured values, units, and sensor type
The operating environment:

Temperature：-20~70 °C (-4~158 °F),

Humidity： 0~95%RH without condensation

Input: 1, Analog input 4~20mA (option)
        2 ,Digital input: RS485 MODBUS RTU
Output:
1, Analog output: 4~20mA linear, up to 8 channels (Depend on the purchased model of the transmitter), HART (option).
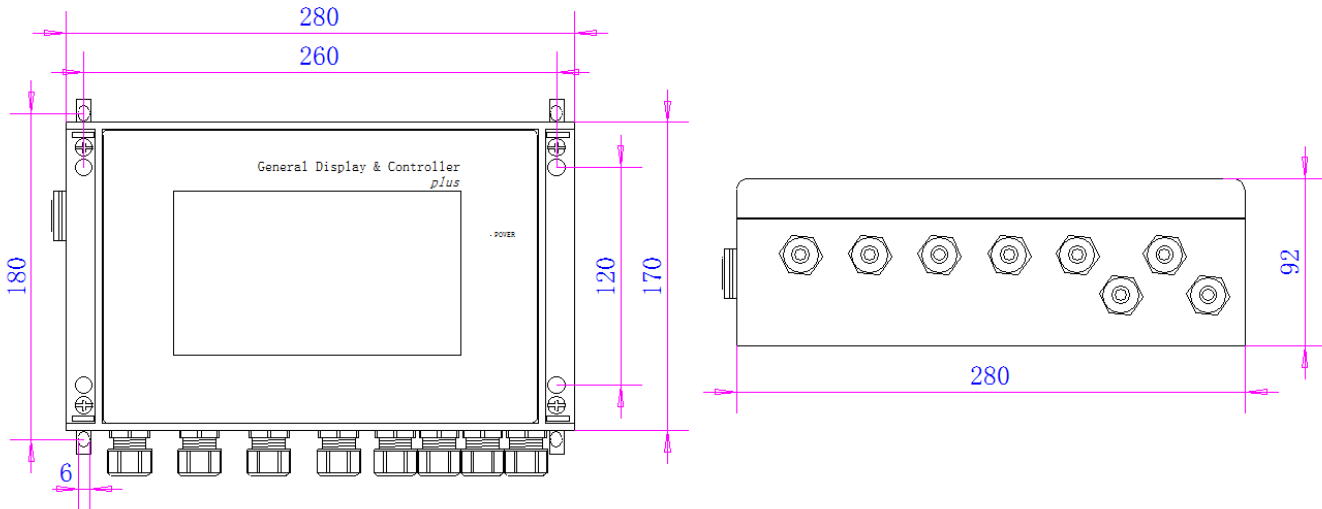2, Digital output: RS485 MODBUS, TCP/IP, and PROFIBUS-DP protocol (option)
Relay: SPDT, 5A@250VAC/5A@30VDC (option)
Compensation: Atmospheric compensation for dissolved oxygen and pressure measurement (option)
Protection: IP66
Weights: 1.5kg

2Dimensions:

Unit: mm

3 Installation

3.1 Location and environment

The controller should be mounted at a location for easy operation and is preferably close to the sensor. The location should be away from vibration, electromagnetic, and radio frequency interference. The protection grade of the controller is IP65, it can be installed outdoors. However, please do not expose it to direct sunlight or high-temperature area, it is better to place the controller into the instrument box or in the shield to avoid color fade and overheat.

The controller is designed for IP65 protection and its performance should not be affected by the change of the weather when the housing cover is securely closed. Nevertheless, please avoid extreme conditions (eg. excessive heat, strong electromagnetic fields, corrosive chemicals, mechanical loads, vibrations).

Additional protection against extreme weather conditions is provided by the optional weather shield.

To ensure the IP65 protection to the instrument, the gaskets and the case edges should be undamaged and must remain away from contact with foreign bodies. The clear plastic case cover must be tightly closed. Furthermore, the cover of the wiring compartment must be tightly screwed closed, and the cable bushings that are filled with cables or fitting plugs must also fit tightly. The connector for the SA-9 spectrometer probe and the plugs not in use must be covered with corresponding caps. Damage to the system caused by the intrusion of water will not be covered by the warranty.

3.2 Fixed installation

The controller can be mounted on a wall, a panel, or a flat board through four screws.

3.3 Cleaning equipment connection

In many cases, sensors are equipped with a mechanical brush or an automatic cleaning assembly. The mechanical brush can work automatically as a user's setting, and the automatic cleaning assembly consists of compressed air connections supplied with the system and contains components necessary to connect the sensor to the cleaning valve. It can also be programmed through the transmitter for automatic operation.

3.4 Wiring

The terminals for wiring can be reached by opening the cover after loosening the four screws. The operation must be performed by an authorized operator after the power supply is disconnected.

⚠ Pay attention to the relay's power supply and the controller, they may be of 230VAC. The improper operation may cause a fatal electric shock to the operator.

The following are GDC wiring diagram：
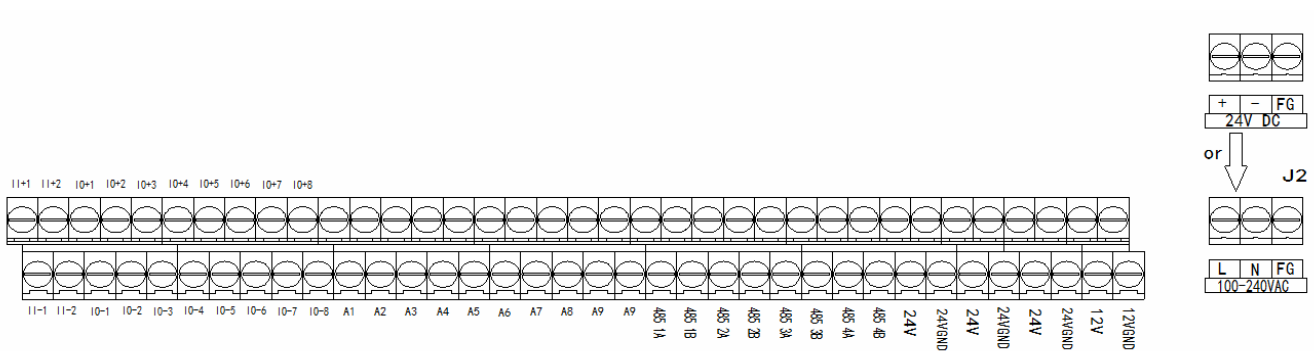
The controller is equipped with the following output/input terminals:

4 channels standard RS485 digital communication ports(485 1A, 485 1B85 2A, 485 2B485 3A, 485

3B, 4854A, 4854B)

2 channels input terminals (II+1, II-1II+2, II-2)
6 channels DC24V outputs
2 channels DC12V outputs
8 channels 4-20mA outputs

9 channels programmable relay outputs (I01output –I09 output)   ,

The following table shows you the detailed connection :

Terminal	Function		
Terminal for inputting 4-20mA current			
I I+1	4-20mA signal 1 input+		
I I-1	4-20mA signal 1 input-		
I I+2	4-20mA signal 2 input+		
I I-2	4-20mA signal 2 input-		
Terminals for outputting 4-20mA current			
IO+1	mA output 1+		
IO-1	mA output 1-		
IO+2	mA output 2+		
IO-2	mA output 2-		
IO+3	mA output 3+		
IO-3	mA output 3-		
IO+4	mA output 4+		
IO-4	mA output 4-		
IO+5	mA output 5+		
IO-5	mA output 5-		
IO+6	mA output 6+		
IO-6	mA output 6-		
IO+7	mA output 7+		
IO-7	mA output 7-		
IO+8	mA output 8+		
IO-8	mA output 8-		
Terminals for alarm relays			
A1	Alarm relay 1		
A2	Alarm relay2		
A3	Alarm relay3		
A4	Alarm relay4		
A5	Alarm relay 5		
A6	Alarm relay6		
A7	Alarm relay7		
A8	Alarm relay8		
A9	Alarm relay9		
A9	Alarm relay9		
Terminals for digital communication			
485 1A	RS485 A for channel 1		
485 1B	RS485 B for channel 1		
485 2A	RS485 A for channel 2		
485 2B	RS485 B for channel 2		
485 3A	RS485 A for channel 3		
485 3B	RS485 B for channel 3		
485 4A	RS485 A for channel 4		
485 4B	RS485 B for channel 4		

Terminals for DC power supply output			
24V	DC24V output +		
24VGND	DC24V output -		
24V	DC24V output +		
24VGND	DC24V output -		
24V	DC24V output +		
24VGND	DC24V output -		
12V	DC12V output +		
12VGND	DC12V output -		
Terminal for AC power supply input			
L	220VAC LINE		
N	220VAC Neutral		
FG	Grounding		

3.5 Spectrometer and ISE sensor connection

The Spectrometer probe and the ISE （Ion Selective Electrode） sensors can be connected to the controller through an aviation connector. If an extension cable is required, the total cable length of the probe should not be longer than 30m.

4 Operation

4.1 Initial start-up

After installing and inspecting the GDC controller and the sensor, the user can start the water quality analytical system. The operator must follow the following outlined steps to initialize the system:

1 Connect the sensor to the GDC controller through its built-in aviation plug

2 If the mechanical brush or cleaning assembly is necessary, connect their assembly cable to its corresponding terminals on the GDC controller

3 Unscrew the four screws fixing the front panel and open it, check if there is a lithium battery on the main board, if there isn't, please buy and install it. The model of the battery is CR2032, which is the same as the one on the main board of the desktop computer, it is easy to buy the battery in a local department store.

Please check or install a lithium battery, and reconfigure the time and date in the system as the instruction in Appendix 2.

If the battery is present, please perform the next operation.

4 Connect the power supply to the GDC controller and turn it on.

5 Start the initialization of the sensor

6 Configure the measuring parameters and self-cleaning intervals/durations

7Check if the self-cleaning system is working normally

8Configure all analog and digital output ports for the measurement parameters

Notice :

Use the initial password (2016), to access the menu pages for configuration.

Warning :

(1) It is prohibited that installing or moving the SD card when power is present

(2) The transmitter must work with the original SD card supplied by the manufacturer.

4.2 Menu operation

4.2.1 Buttons

The GDC is equipped with a touch-screen to enable all the buttons' operation on the screen.

4.2.2 User interface

After completing the connection between the controller and the sensor, double-check the wiring and then turn the power on. The GDC will show the measurement screen after starting up.
The measurement screen has two modes, one is termed full-screen mode, and the other is called measurement screen mode with some shortcuts along the left side.

COD	mg/L	DO	mg/L
————		————	
		Temp = ---- ℃	

FLOW VEL	m/s	Flow Velo	m/s
————		————	

Rate Flow	m³/s	Rate Flow V	m³/s
0.00		0.00	
h=---- m v=---- m/s		h=---- m θ=120°	

Total Flow V	m³	Level	m
174702.70		————	

The above full-screen interface window shows the contents below depending on the configuration

of sensors ordered：

Name of the measuring parameter, Unit, and measured value

Under the full-screen mode，click anywhere on the display will appear the following:

COD	mg/L	DO	mg/L
————		————	
		Temp = ---- ℃	

FLOW VEL	m/s	Flow Velo	m/s
————		————	

Menu

Rate Flow	m³/s	Rate Flow V	m³/s
0.00		0.00	
h=---- m v=---- m/s		h=---- m θ=120°	

Total Flow V	m³	Level	m
174702.70		————	

Clicking the "Menu" button will open the password input window.
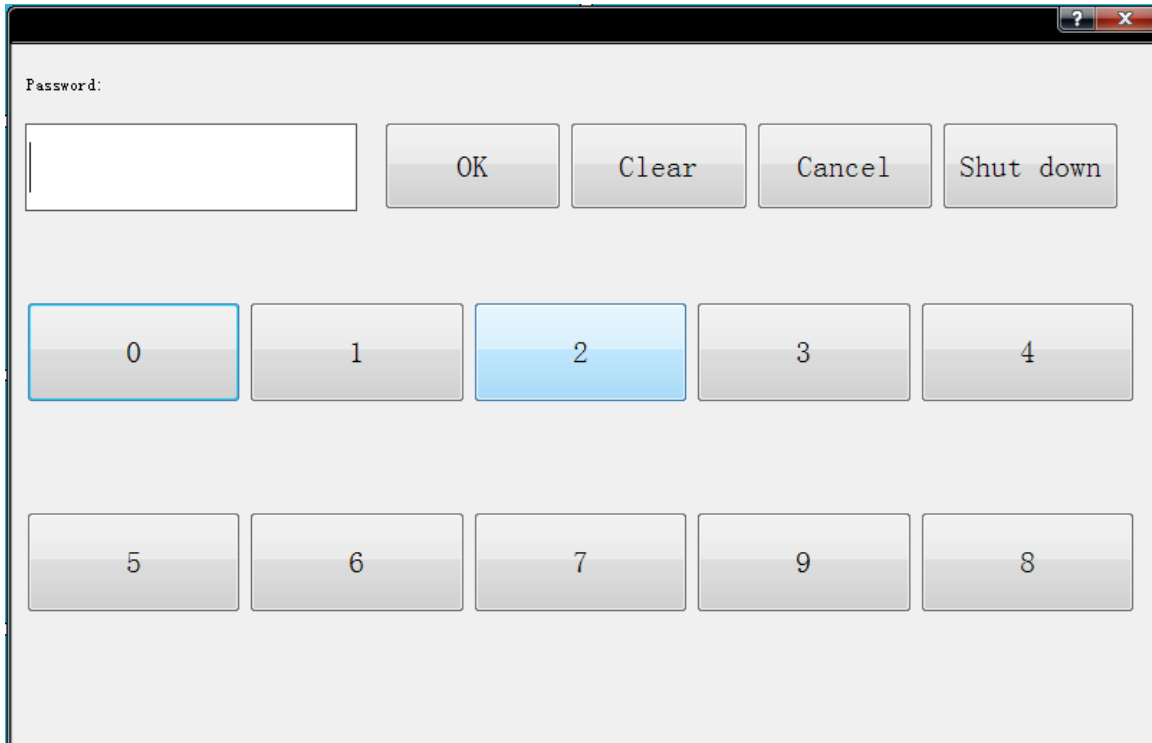
When the correct password (default is 2016) is entered, The following shortcut configuration screen is opened.

If the inputted password is incorrect, you can reenter it after clicking the "Clear" button

Clicking the "Cancel" button to return to the full-screen interface.

Click the "Shut down" button to stop running the transmitter, if you want to run it again, please turn it off and repower which will reboot the system.

Notice:

If you want to turn off the transmitter, it is recommended to first press the "Shutdown" button to turn off the transmitter and then disconnect the power supply. If the power is suddenly turned off, the system file may be damaged.

On the above screen , press and hold the button "Data" for about 5 seconds, it returns to the full-screen mode.

In the full-screen interface, click on the real-time value of a parameter to access the real-time curve interface
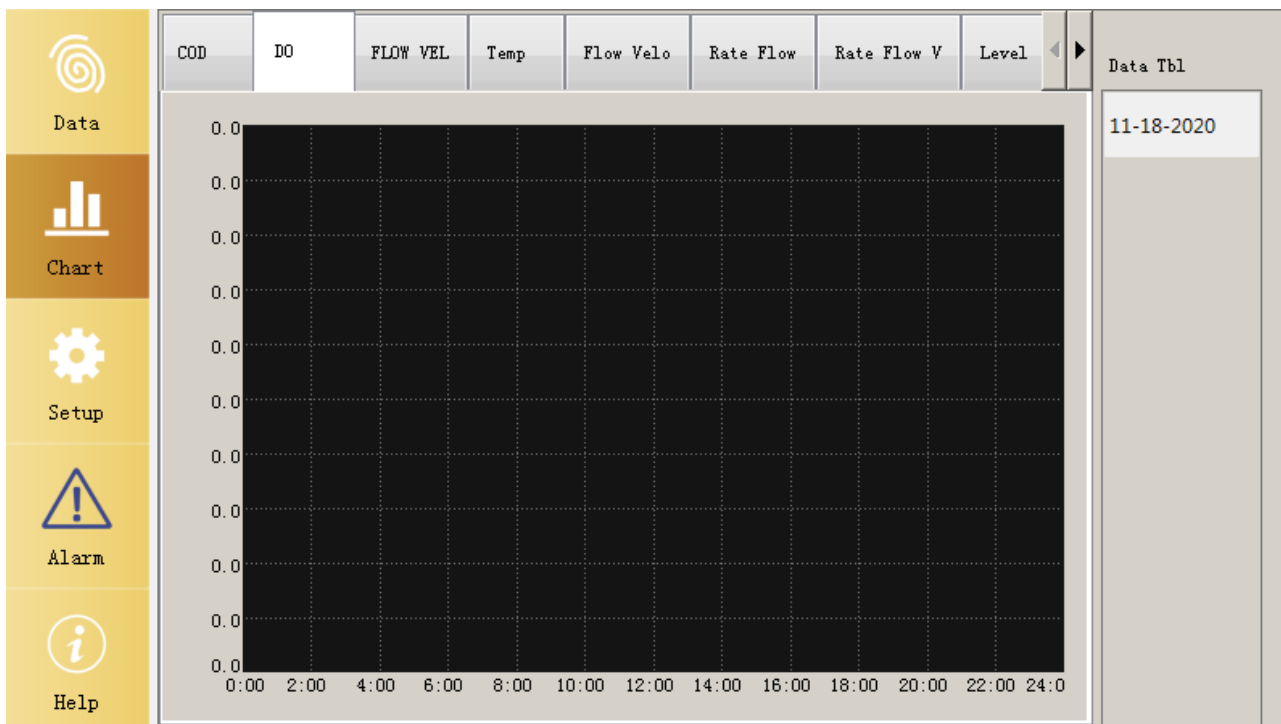
After selecting the parameter and time on the right side, the 24-hour data graph of the corresponding parameter will appear.

If the user wants to view the detailed data curve of a certain period, the user can tap and hold on t he screen near the data, then draw a box on the screen enclosing the area of interest, the data of t hat period will be displayed enlarged.

To go back, click the button "Return" appearing at the upper right corner of the current window.

4.2.3 Parameters setup

Click the "setup" button to get to the screen for the settings of the controller under the main menu

There are three items: serial port setting, environment setting, and Param1~24 setting.
Here are their details.
(1) Serial port setting

This item is used to set up four RS 485 ports. Please refer to the following figure. These ports can be configured as inputs or outputs depending on which sensors they are connected to. Generally, we recommend that the RS485port 1-3 are used for input and RS485 port 4 for output. Click the button "open" to enable the port to be used. To disable one port, clicking the button "Close".
If the operator is going to change settings of the using RS485 port, click the button "Change"
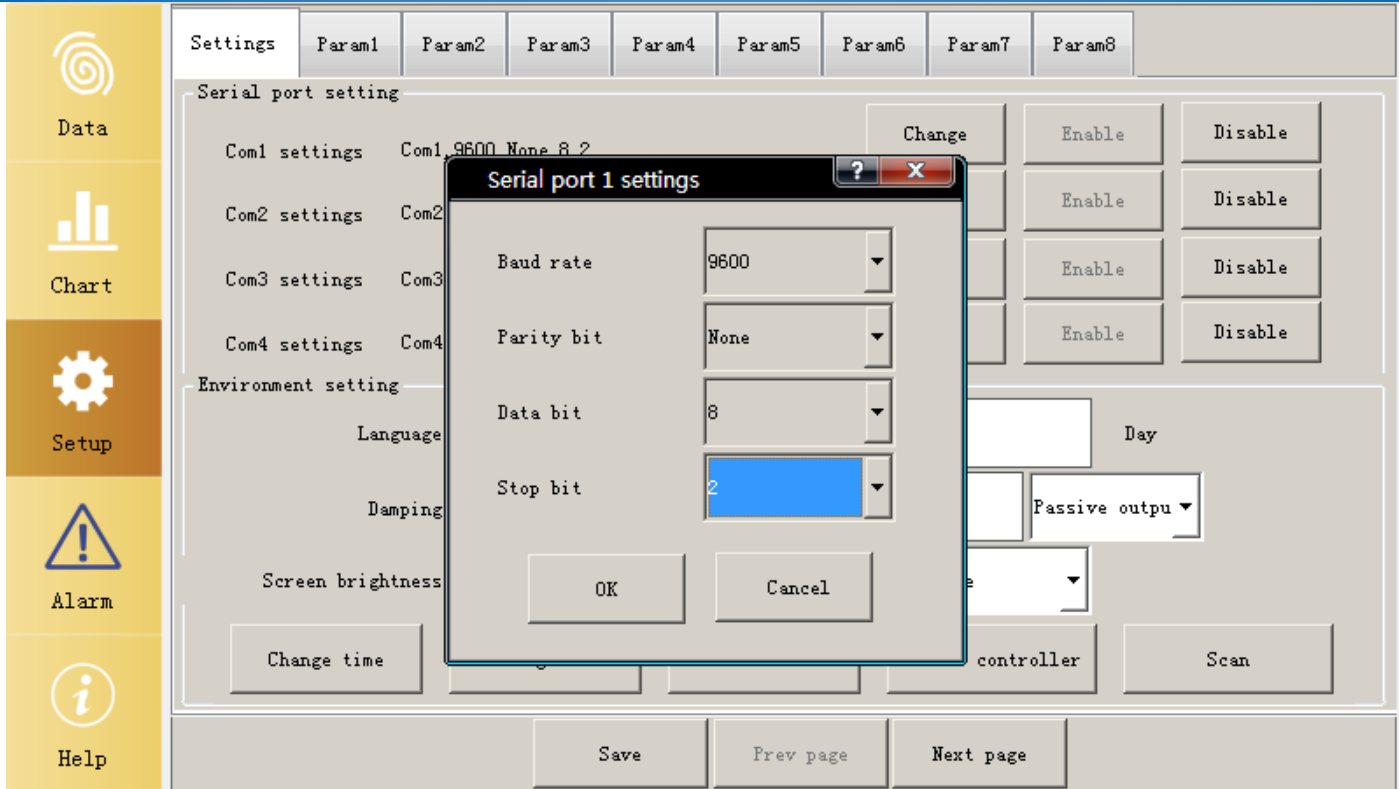
After setting the parameters, press Save.

Notice: It is important to close the unused port to prevent interference.

(2) Environment setting
The environment settings include language selection, data storage time setting, controller Modbus ID setting, damping coefficient, read spectral data, screen brightness setting, system time setting, user password change, screen correction, controller restart, and scanning sensor.
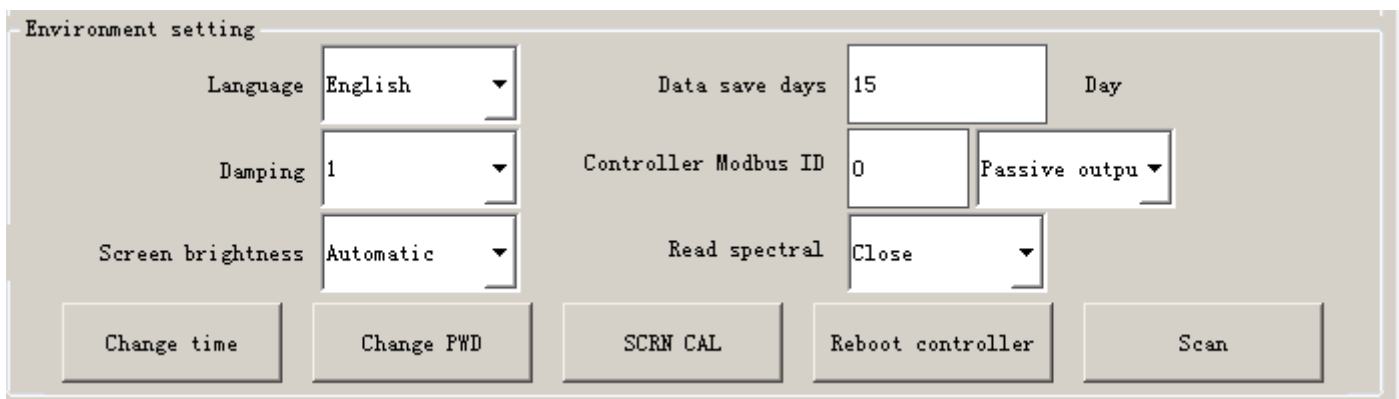
On the **"language selection"**, there are two options: English or Chinese. After selecting the corresponding language, you need to restart the controller. When you do not need the "language selection" function, double-click the Logo icon in the service interface to confirm using the current language as the default option, and the controller will no longer provide this "language selection" function. If you need to reactivate this "language selection" function, you have to double-click the Logo icon again. Remember, each operation requires restarting the controller to activate the function.
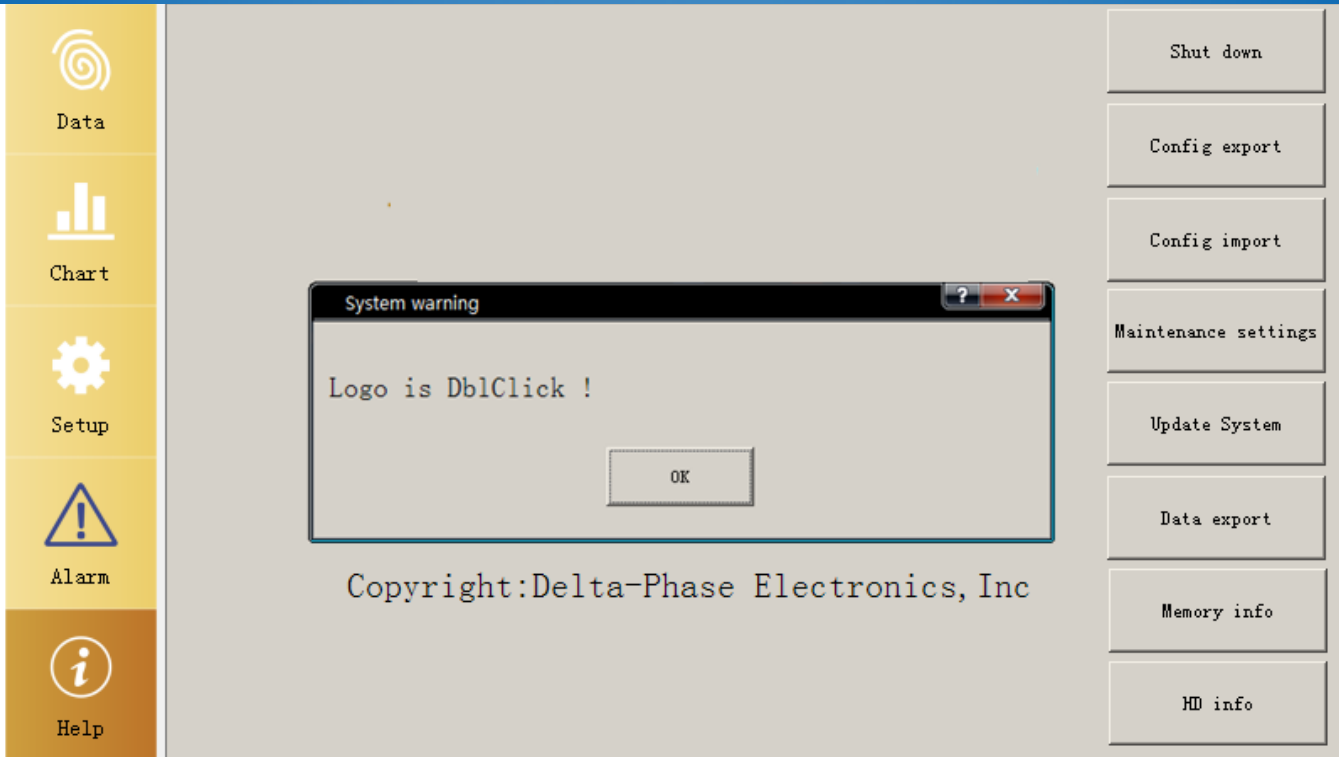
On the option "**Data save days**", the user can choose different options for saving measured data, depending on the connecting sensors and showing parameters on the display, the period of storing data can be set up to 3 years.

On the option "**Controller Modbus ID** ", the operator can set an actual address ID number for Modbus output, its range is 1-255.

The **damping** coefficient is used for the smooth display and output of the parameters. If this value is 1, the transmitter does not conduct smoothing to the data received from the sensor. If the damping confidence is 3, the transmitter will display and output by a moving average of 3 consecutive measured values.

The option **"Read spectral"**: It is used for choosing if the controller reading spectral data from SA9 or SA9L sensors. If this function is enabled, the spectral data will be saved on the SD card according to the measuring interval, it will be used for database or operating state analysis of the SA9 sensor.

If the connecting sensor is not a spectrophotometer sensor (e.g., SA-9) , this item will disappear automatically.

The option **"screen brightness"** is used for the setting of screen brightness, there are three options in total :

Automatic: is After 3 minutes of inactivity, the screen will automatically turn black until any operation is performed on the display.

Close: Screen will turn off automatically after 3 minutes until there is any operation on the display.

Keep bright: Screen will remain bright

The default setting is Automatic"

There are also five functional buttons at the bottom of the display, "Change time", "Change PWD", "SCRN CAL", "Reboot controller" and "Scan"

"Change time" item: press the button to appear in the diagram below :
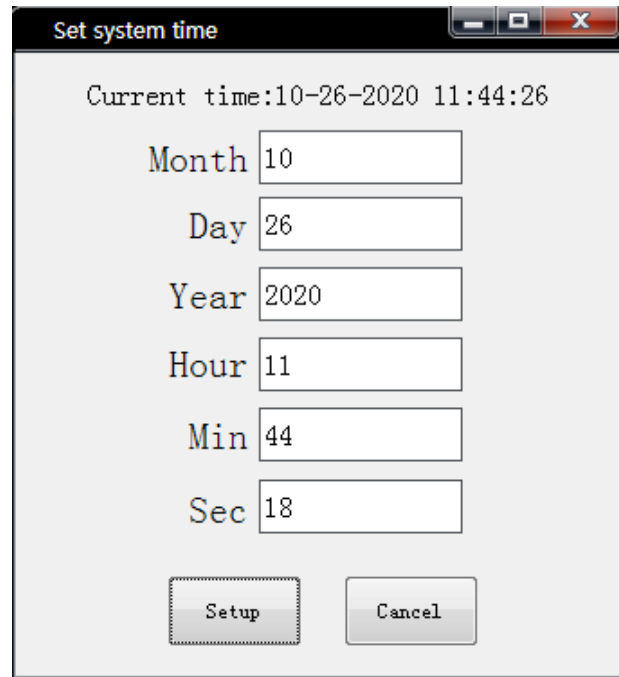
Enter the correct setting and click "Set up" to save.

The "Change PWD": press the button to show the screen below
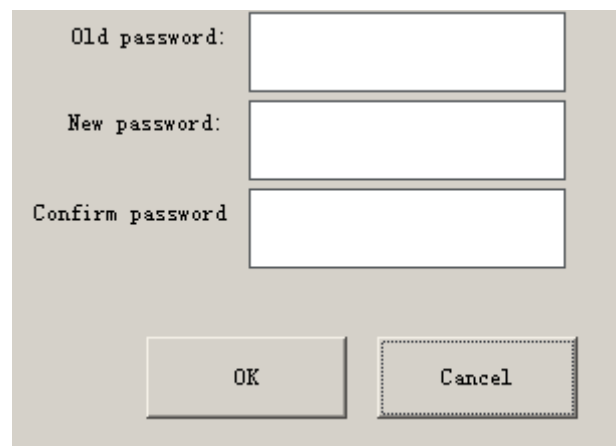
Enter the old password, new password, and confirm it again, press the "OK" to save.

The "SCRN CAL" item: It is used to calibrate the touch screen. Press the button, the system will give a prompt window as below
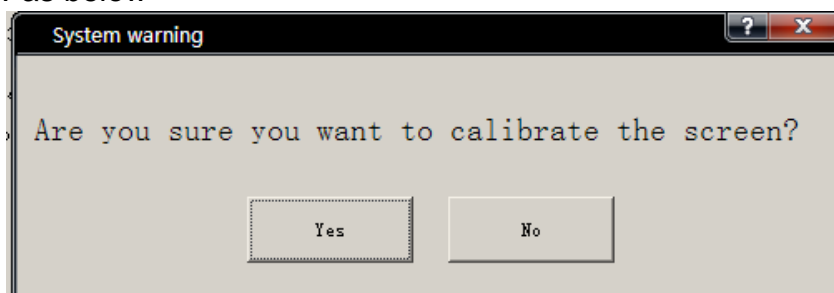
Press "Yes" to restart the GDC transmitter, wait for initialization to complete, then navigate to the interface for calibration of the touch screen.

"Reboot controller": Press the button to restart the transmitter

"Scan": This item is used to scan the sensor with an unknown Modbus ID number, press the button to appear in the diagram below:
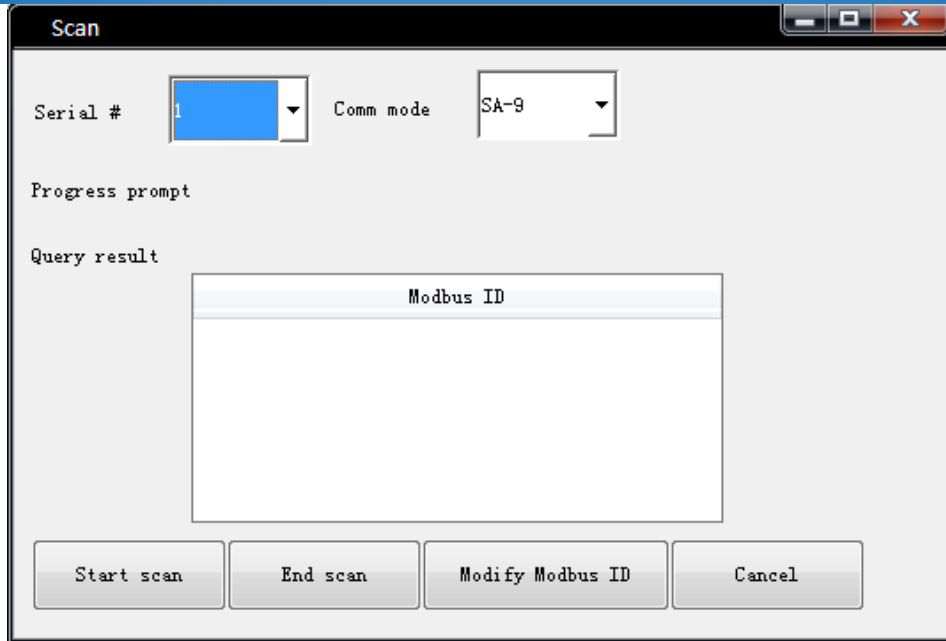
Firstly choose the proper option for the "Serial #" and "Comm mode"

"Serial #": It is the port number of the RS485 terminal which is connecting the sensor

"Comm mode": It is a type for the connecting sensor.

After the above settings are chosen, press the button "start scan" to start scanning the sensor in the available range, after finishing the scanning, the ID number will appear in the data area.

If the Modbus ID number of the sensor to scan has shown in the data area and the scanning process is still going on, the operator can click the button "End scan" to stop the scanning.

The operator can also change the known ID number to another one, press the button "Modify Modbus ID " :
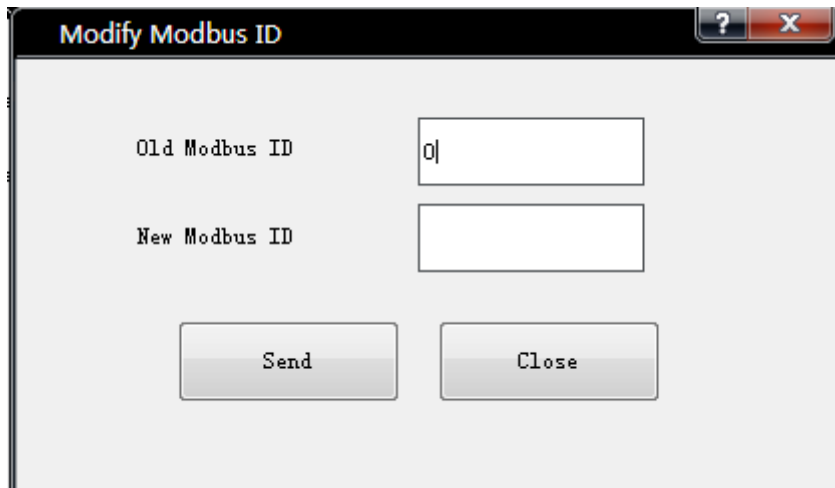
Enter the old ID and the new one, then press the button "Send", then press the "Close" to return to the previous screen after finishing the modification.

(2) Param1~Param20 setting (as shown below)

1) **Parameter basic information setting:** It includes the parameter name, unit, communication mode, RS485 port serial number, measurement interval, and the setting of display parameters.

Tips:
   It is better to first choose the item "Comm mode" before configuring other items.
Click the pull-down key on the right of the "Display " item to show the following:

0-The "Don't display" item: After selecting the item, this parameter will neither be displayed in the main measurement screen nor output and recorded in the historical trend data.

1-Display: the parameter is to be displayed in the main measurement screen, and also is to be output and recorded in the historical trends.

2-Merge display: After choosing the item, the primary parameters and any secondary (e.g., temperature) parameters will be shown on the main measurement screen, taking an example, the PH is displayed as the primary parameter and the temperature is displayed as the second parameter.

3-More display: After choosing the item, the parameter like temperature can be displayed as a secondary parameter, and it may be displayed simultaneously with the primary parameter.

2) Parameter input setting: It sets the Modbus ID of the sensor with RS 485 communication, the starting address of the register, the number of registers to read, data format, lower limit, upper limit, calibration, and sensor settings.

Note: If you set the lower and upper limits, the transmitter can only display and output the values within the limits, even if the measured value is beyond the limits.

Notice：

 Some parameters include secondary parameters , like some sensors having communication modes "PAR" and "AM7". when configuring settings about "serial #" and "Module ID" , must set them as same as the primary parameter. if possible, it is best to retain the default. the following is a diagram of the main parameter and secondary parameters.
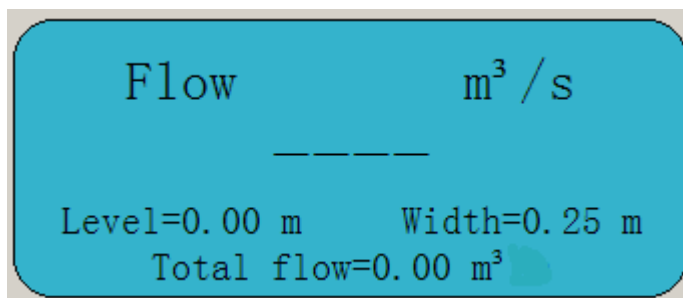
For some parameters, there are some functional buttons for special settings , in addition to calibration and sensor setting:

For velocity measured by RV7 sensor, there are "low-velocity cut- off" item

 Click the button, shows the following .
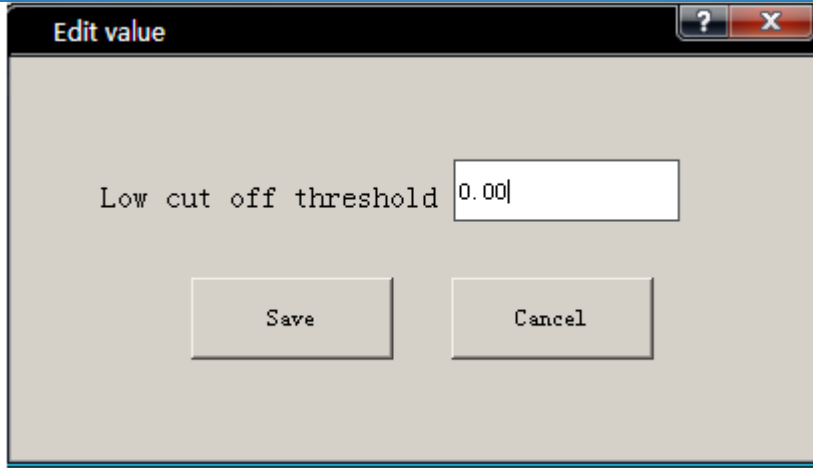
Click the data entering area, the interface for entering digit will appear:
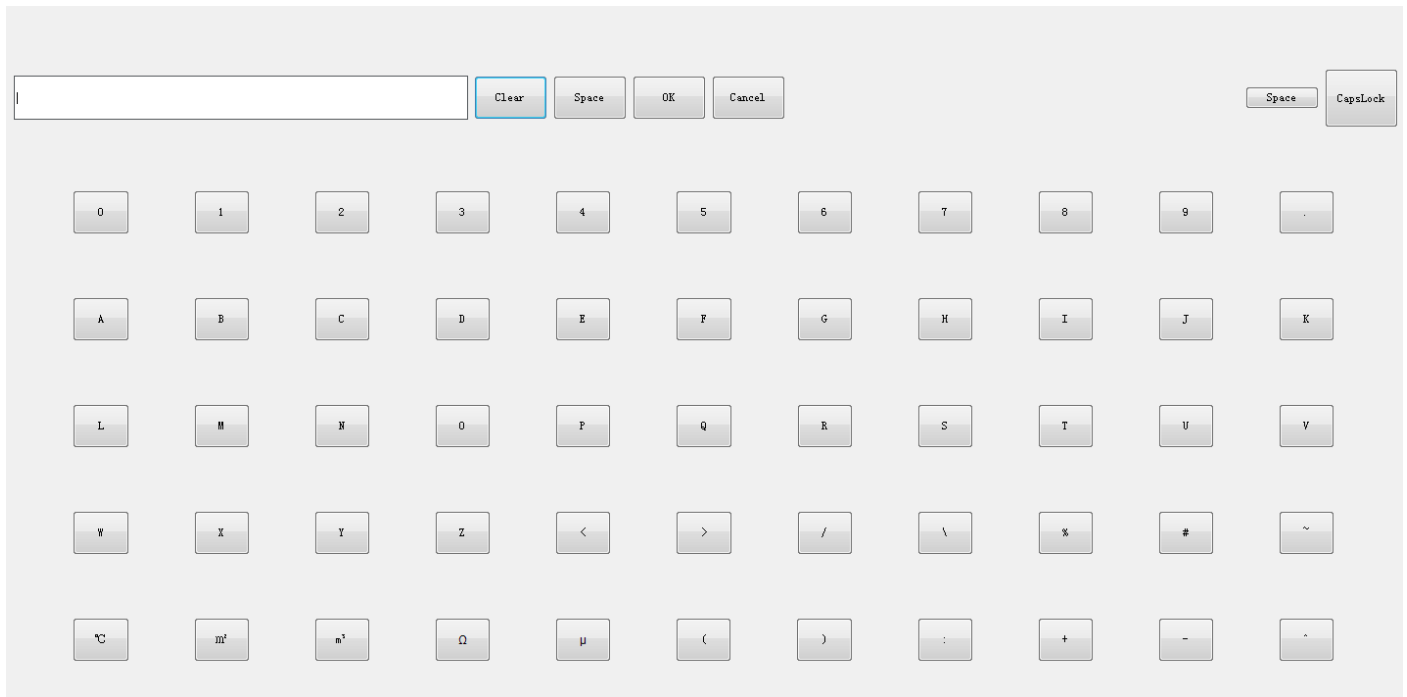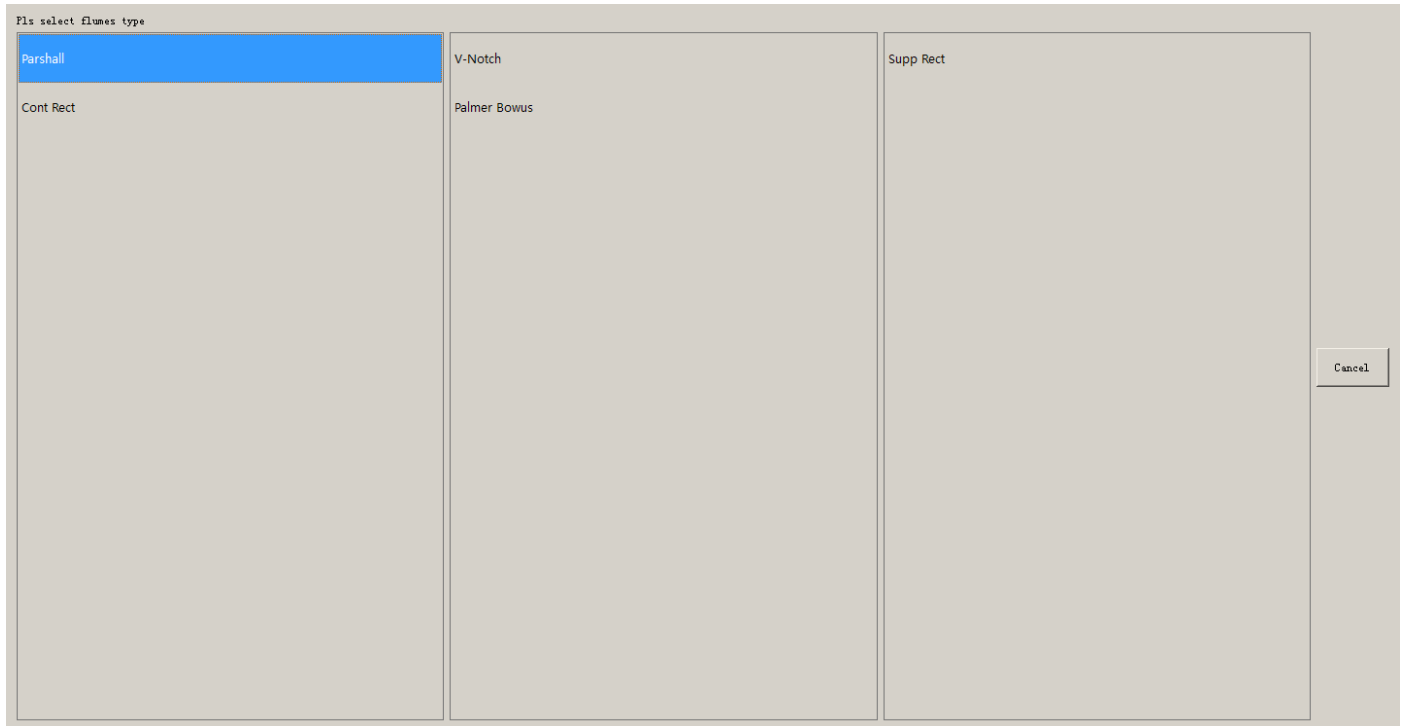

Press the "OK' button after entering the value you want to cut off, this value is shown on the previous screen. After pressing "Save", the system shows the message "the data is saved successfully", press "OK" and "Cancel" for returning.

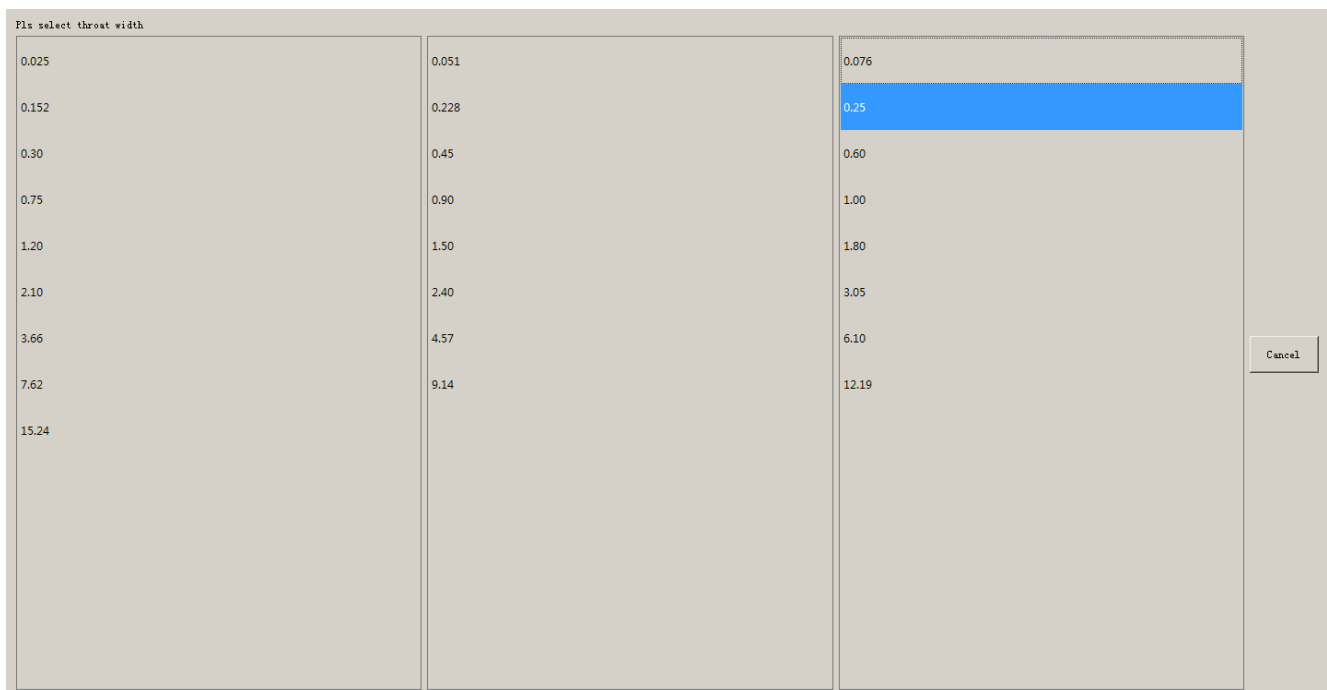For flow measurement of the medium in an open channel, there some settings to be configured on the interface below
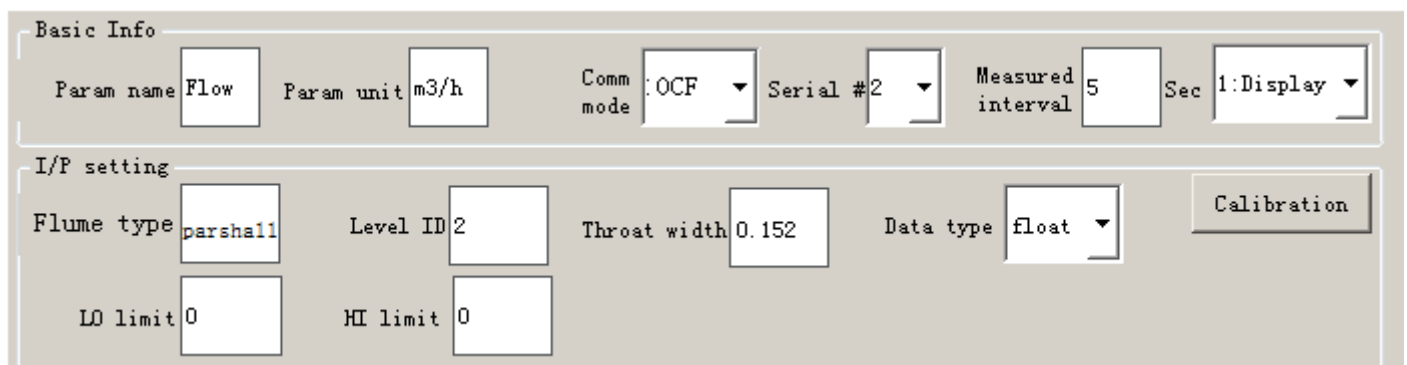
Comm mode: This item should be chosen as the "OCF" when the actual application is open channel flow measurement.

Flume type : This item is used for choosing shape of your flume, click the blank area and appear the page below

```
Pls select flumes type

Parshall                          V-Notch                          Supp Rect

Cont Rect                         Palmer Bowus


                                                                                     Cancel
```

There are five options for flume shape can be chosen, system will return the previous page once operator click one item.

For the option" **Parshall"**, the parameter "Throat width" needs to be configured . click the choice area ,appear screen below

```
Pls select throat width

0.025          0.051          0.076

0.152          0.228          0.25

0.30           0.45           0.60

0.75           0.90           1.00

1.20           1.50           1.80

2.10           2.40           3.05

3.66           4.57           6.10              Cancel

7.62           9.14           12.19

15.24
```

On the above page , there are 25 options can be chosen, system will return to the previous page

once operator click one item.

For the option" **V-Notch"** , the parameter "Angle" needs to be chosen,

Click the choice area on back of the parameter , will appear the following screen

Choose the one of all options ,system will return to the previous page.

For the item **"Supp Rect",** there are two parameters to be configured, "Throat width and "Flume height"

Click the data inputting area on back of the parameter, then enter the value as the actual application.

For the item **"Cont Rect",** there are three parameters to be configured ,"Throat width, "Flume height" and b/B.

Click the data inputting area on back of every parameter ,then enter the value as the actual application.

For the item **"Palmer Bowus",** there is only one parameter to be configured , it is "Model"

Click the choice area on back of it , appear the page below

There are 10 options can be chosen , click one of them , system will return the previous page .

Level ID :

This item is used to configurate a parameter number for level measurement when calculating flow rate.,it is a number of one parameter which is assigning to parameter"Level" on page ParaX.

For the parameter **"Total",** the following parameters will be configured .

Level ID : Entering a channel number on the item , the channel number is ParaX which is assigning to parameter "Level".

Flow ID: Entering a channel number on the item , the channel number is "ParaX"which is assigned to parameter "Flow rate" .

UL7 shape : the option "OCF" will be chosen when the actual application is open channel flow measurement .

The total value on LCD sometimes needs to be set. The operator can press the item **"Set flow "** to change it.

After entering the value you desire, press "Save".

(3) Calibration
When the measurement error is significant, the instrument needs an on-site calibration. Generally, the two-point approach is used to calibrate the instrument.
The Calibration page depends on the connecting sensor, generally, it comes in three styles:
A: MV signal sensor like PH 7, RX7, AM7and NO7

On the above page, click the button "Calibration" to get to the calibration page, the system will read and show the present calibration data.

Clean the sensor with pure water and soak it into the first standard solution (PH 6.86), click the button "Measure" next to the item "Calibration MV1" to display the measuring signal (its unit is volt) on the green data area, can click the button several times for stable measuring signal.

After then click the white data inputting area next to the item "Calibration concentration1", appear the following page :

| Clear | Space | OK | Cancel | | Space | CapsLock |

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | . |

| A | B | C | D | E | F | G | H | I | J | K |

| L | M | N | O | P | Q | R | S | T | U | V |

| W | X | Y | Z | < | > | / | \ | % | # | ~ |

| ℃ | m² | m³ | Ω | μ | (|) | : | + | - | ^ |
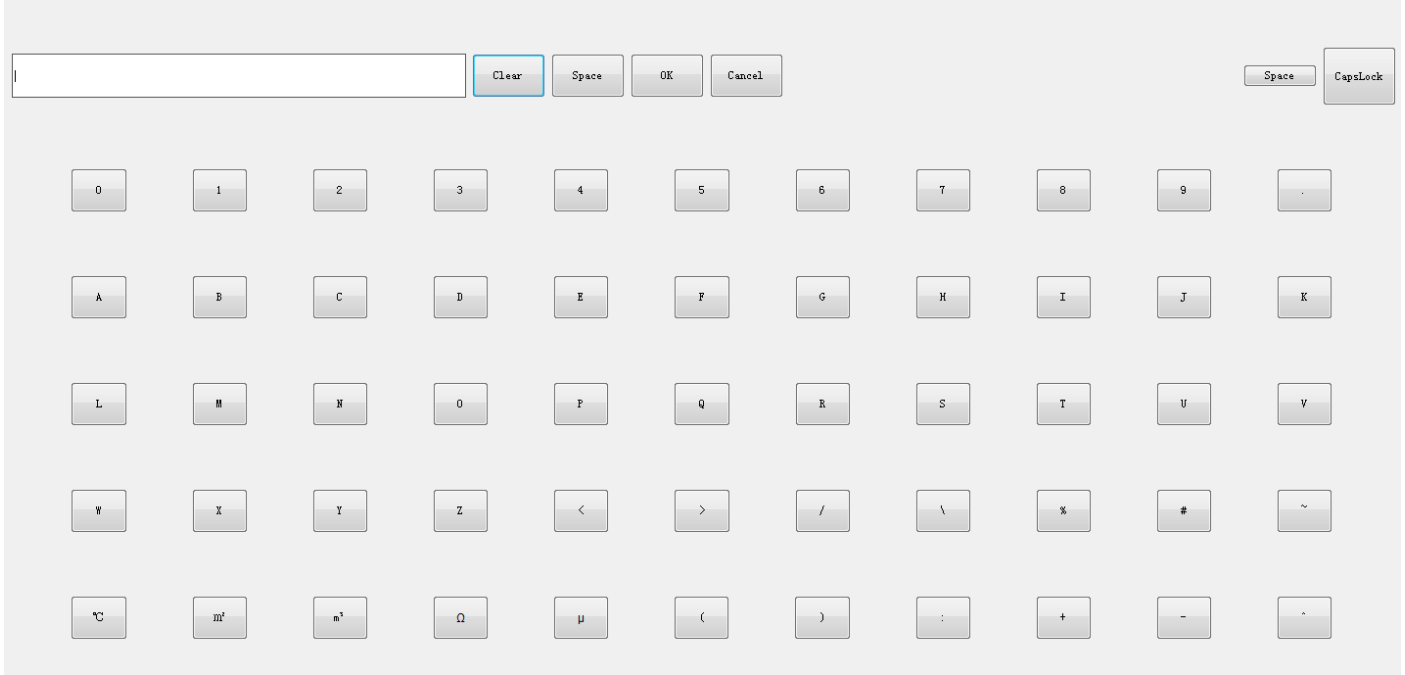
Enter the concentration value for the standard solution 1 and click "OK", the value will be shown on the white inputting area. An operator can ignore the step if the value does not need to be changed. Click the button "Calibration 1" to perform the first calibration.

Clean the sensor with pure water and soak it into the second standard solution (PH 4.00), click the button "Measure" next to the item "Calibration MV2" to display the measuring signal on the green data area until it is stable.
Click the white data inputting area next to the item "Calibration concentration2" and enter the concentration value for the standard solution 2, then click "OK", the value will be shown in the white input field.
Click the button "Calibration 2" to perform the second calibration.
Once complete, click the button "Cancel" to return the previous page, click shortcuts "Data" to the main screen.

B: CS7 and DO7 sensor

Click the button "Calibration" to appear on the following page

Clean the sensor and place it in an environment with zero analyte present, please refer to the following:
CS7 conductivity sensor, place it in the air after cleaning and drying it
DO7 dissolved oxygen sensor, soak it into a 0 ppm O2 solution

Click the button "Measure" next to the green measuring data area to display the current data, click several times until it is stable and close to 0.

Click the button "Zero calibration" to perform zero calibration

Soak the sensor into the solution with known concentration after cleaning it, click the button "Measure" several times for stable data.

Click the white data input field to enter the concentration value for the solution.

Click the button "Concentration calibration" to perform concentration calibration.

Notice：For CS7 sensor，the parameter conductivity comes in two measuring unit "ms" or" us". whatever any one of them will be chosen , there are same data on the measurement screen and the calibration screen, but the calibration concentration value must be entered in the measuring unit "ms".

Once complete, click the button "Cancel" to return the previous page, click shortcuts "Data" to the main screen.

C: Spectrophotometer sensors (e.g.,SA9 and SA9L)
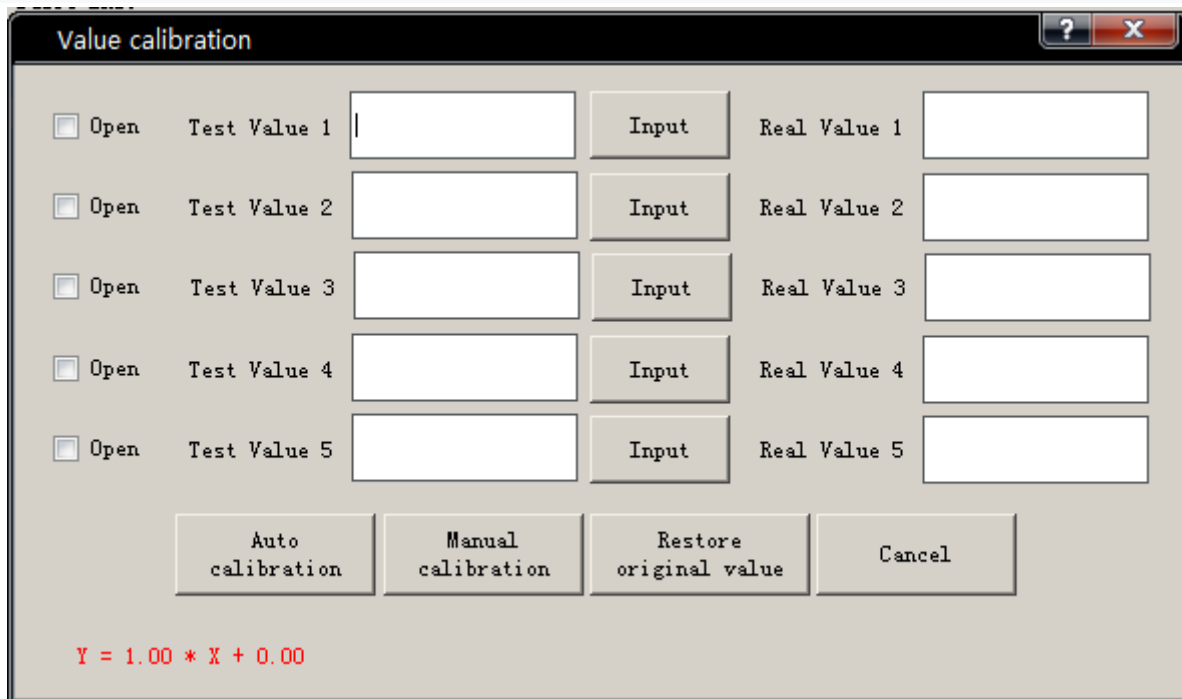
There are two methods to calibrate the meter: 'Auto calibration' and 'Manual calibration'.
For 'Auto calibration', the meter measures the different concentration values of the medium being measured, then, the operator manually enters the actual values of the medium. Alternatively, you may click "input" to manually enter the measured values, then click "Auto calibration" to complete the procedure. The instrument will automatically calculate the slope and the offset, and you can verify the generated linear expression shown at the lower-left corner of the window for its reasonableness.
In the above screen, the operator can choose up to 5 values. Click the blank box after the corresponding "Test Value x" to get the test value of the current measurement medium.
Prepare two different solutions before calibration. Their concentrations depend on the process condition and the range of the instrument. The operator must clean the sensor before each operation. Put the sensor into the first calibration solution, and then click on the blank area next to

"Test Value 1", the GDC will acquire the first test value.

When the progress bar reaches 100%, the data is automatically collected. Then, enter the concentration value of the first calibration solution into the blank area next to "Real Value 1".
Clean the sensor again, and then put the sensor into the second calibration solution. Click the blank area next to "Test Value 2", the GDC will get the second test value. Similarly, when the progress bar reaches 100%, the data is automatically collected. Enter the concentration of the second calibration solution into the blank area next to "Real Value 2" After the data is read, press the "Auto calibration" to get the calculated calibration formula as shown below:
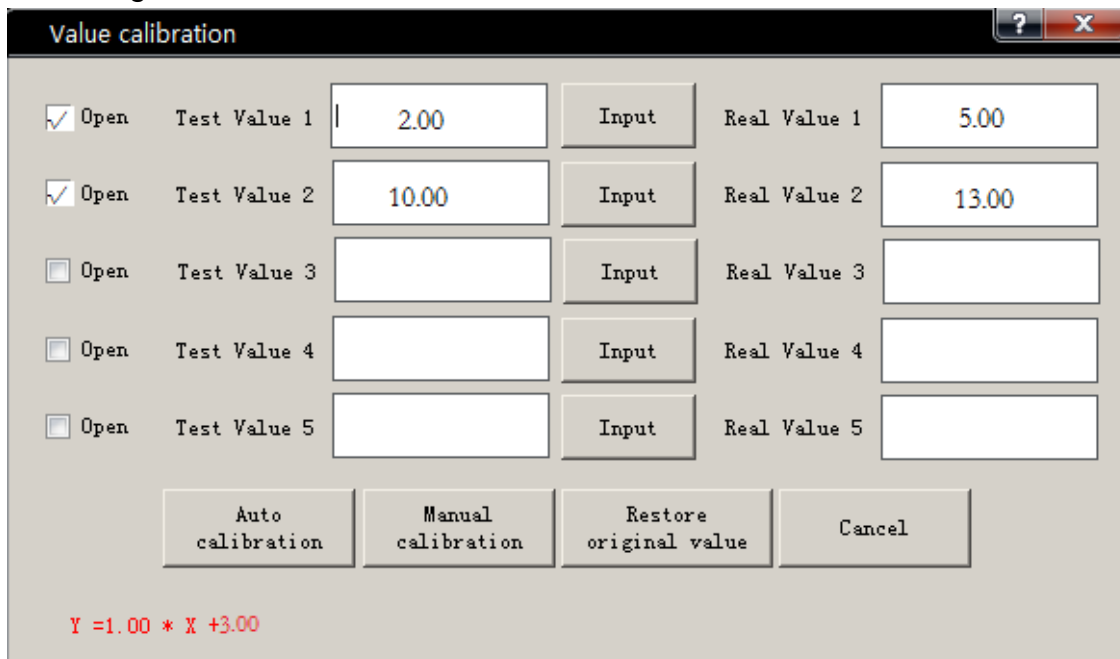
Manual calibration is a direct modification of the calibration formula. Click on the manual calibration, the following interface appears:
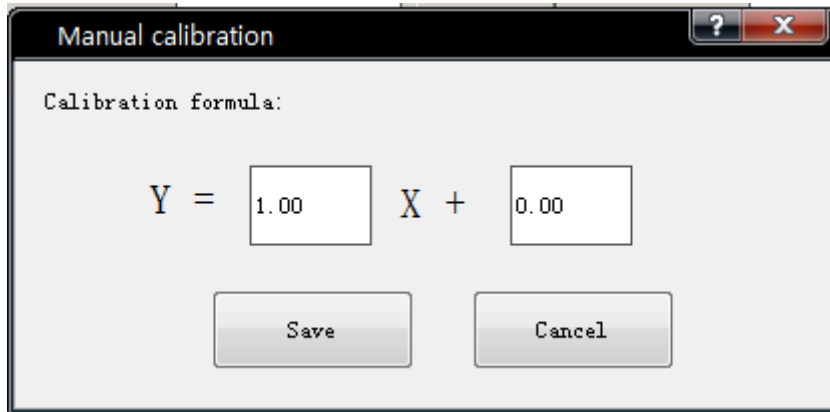
According to the data by manual calculation, enter the correct value in the above data box, and press the "Save" button.

Note:

When conducting the calibration function, the calibration collar is normally used. Please pay attention to the following when installing and removing the collar:

1) When the collar is not used for a long time, its internal seal may become dry, and it is best to lubricate with distilled water to ease installation.

2) Similarly, when the collar has been placed on the sensor for a long time, if you want to remove it from the sensor, it is better to have the sensor part that touches the seal of the collar immersed in water first to lubricate the seals and the sensor body.

(5) Sensor setting ("read" and "write" operation to the sensor)

Click on the "Sensor setting" button, the screen asking for a password appears. After entering the correct password, the following screen is shown.

A: Nonspectral sensor
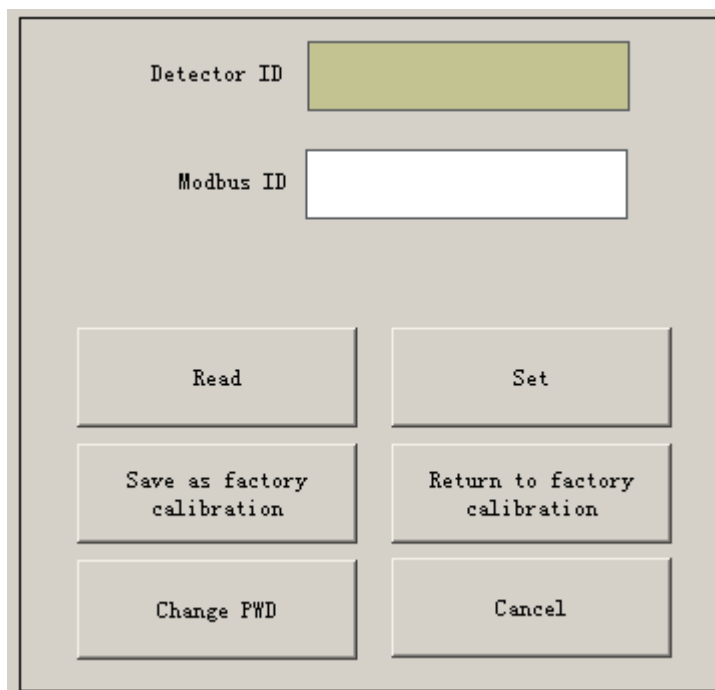
Click the button "Read" to read the ID number of the detector and Modbus ID number of the sensor, and show them on the corresponding area.

Click the button" Save as factory calibration " to store the current calibration data into the factory calibration.

Click the button" Return to factory calibration " to restore the current calibration data from the storing factory calibration.

Click the button "Cancel" to return the previous page.

Note:

(1) It is better to perform the "Read "function before operating others.

(2) Don't recommend operating the two items "Set" and "Change PWD" if not necessary.

B: Spectral sensor

It includes the settings of the sensor, spectral intensity, absorbance, and internal parameters 1~ 6 (can store database file for different parameters measurement or test environment).

The setting of the sensor includes:

Detector ID: Read-only.

Measurement interval: You can set the sensor's measurement interval.

Startup mode: Select the internal or external start mode.

Measurement mode: The measurement mode has the current spectrum (average), the zero-point spectrum (average), the current spectrum (single), and the zero-point spectrum (single). The current spectral method is useful for viewing the current water absorption of the spectrum. The zero-point spectral method compares the deviation between the measured spectrum and the real-time spectrum, allowing the engineer to compare the sensor's zero-point change. When an "average" is chosen, the sensor will run a moving average of 9 consecutive measured values to output smoother data, yet it will be less responsive to the actual testing. When a "single" is chosen, the averaging feature is disabled. The selection of "single" can test the performance of the sensor. When the sensor is used in conjunction with the transmitter's "damping coefficient", it provides a more flexible and convenient measurement method.

Compensate with turbidity: Select with or without turbidity compensation.

Modbus ID: Sensor Modbus ID. Read-only

Instruction state:
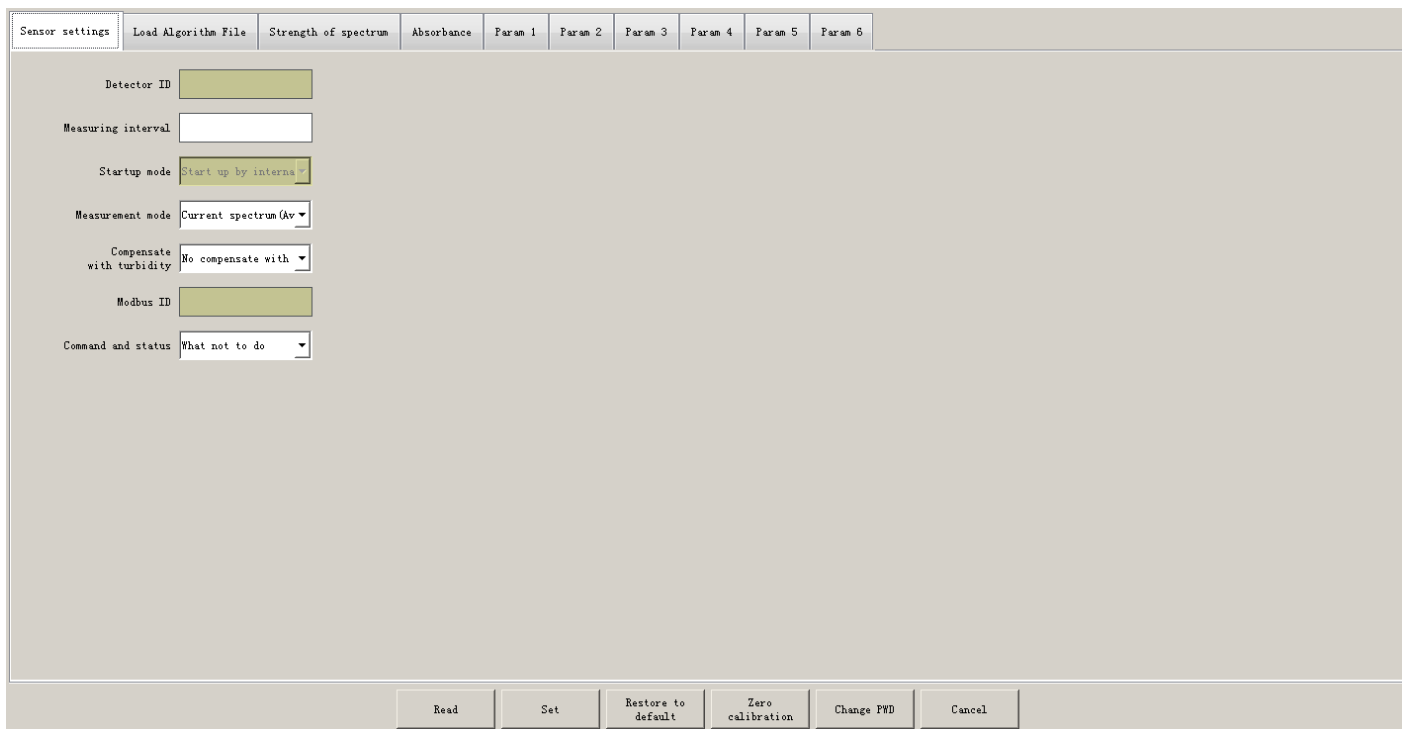
The toolbar at the bottom of the screen includes: Read (read the parameters from the sensor), Set (write the modified instruction to the sensor), Restore to default (Restore the current settings to the

default), Zero calibration(Perform the zero calibration), Password Change (modify service engineer password), Cancel (return to the previous menu)

Strength of spectrum

After choosing the "Strength of spectrum" tab, click on the "read" button, the controller will automatically read the real-time spectrogram. The service engineers can determine the status of the sensor according to the figure, as shown below.
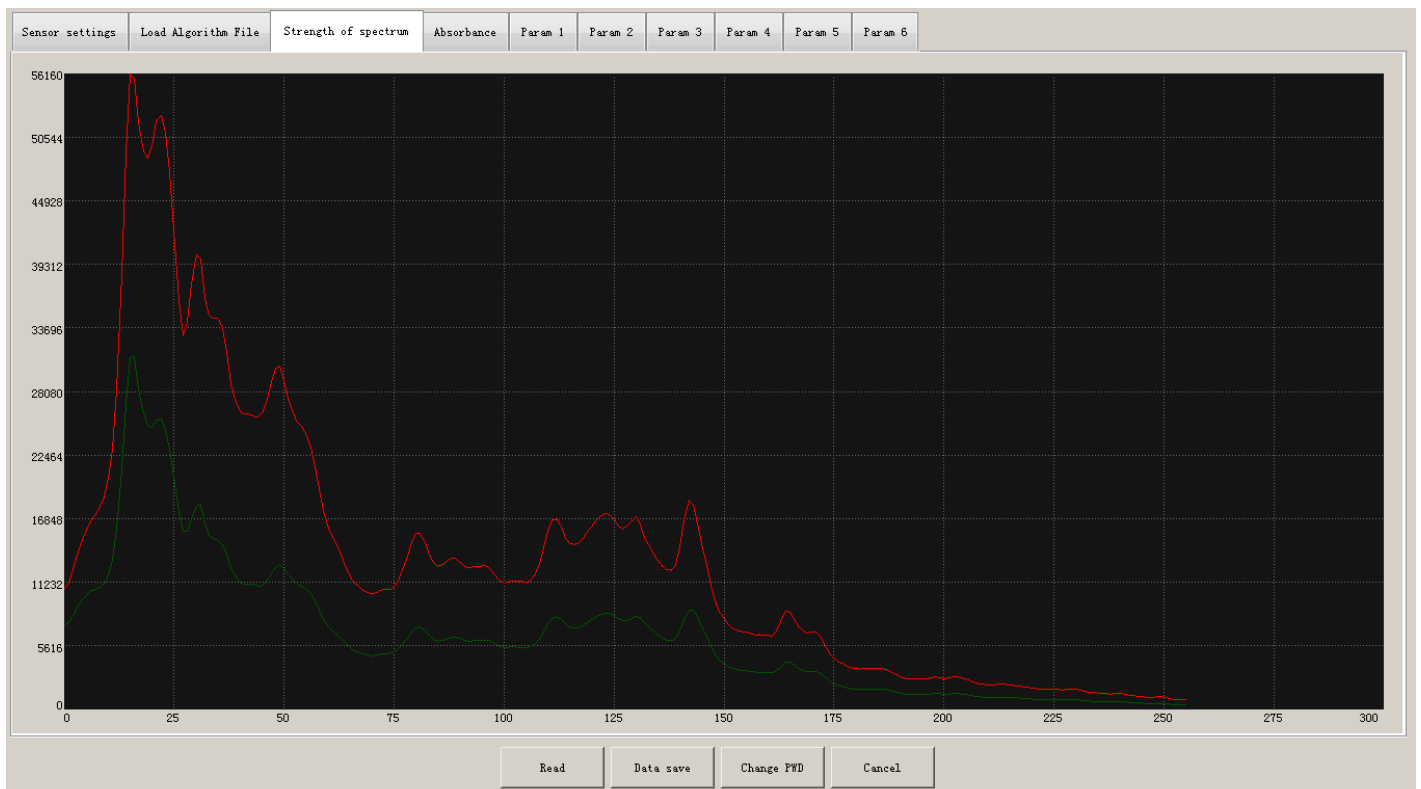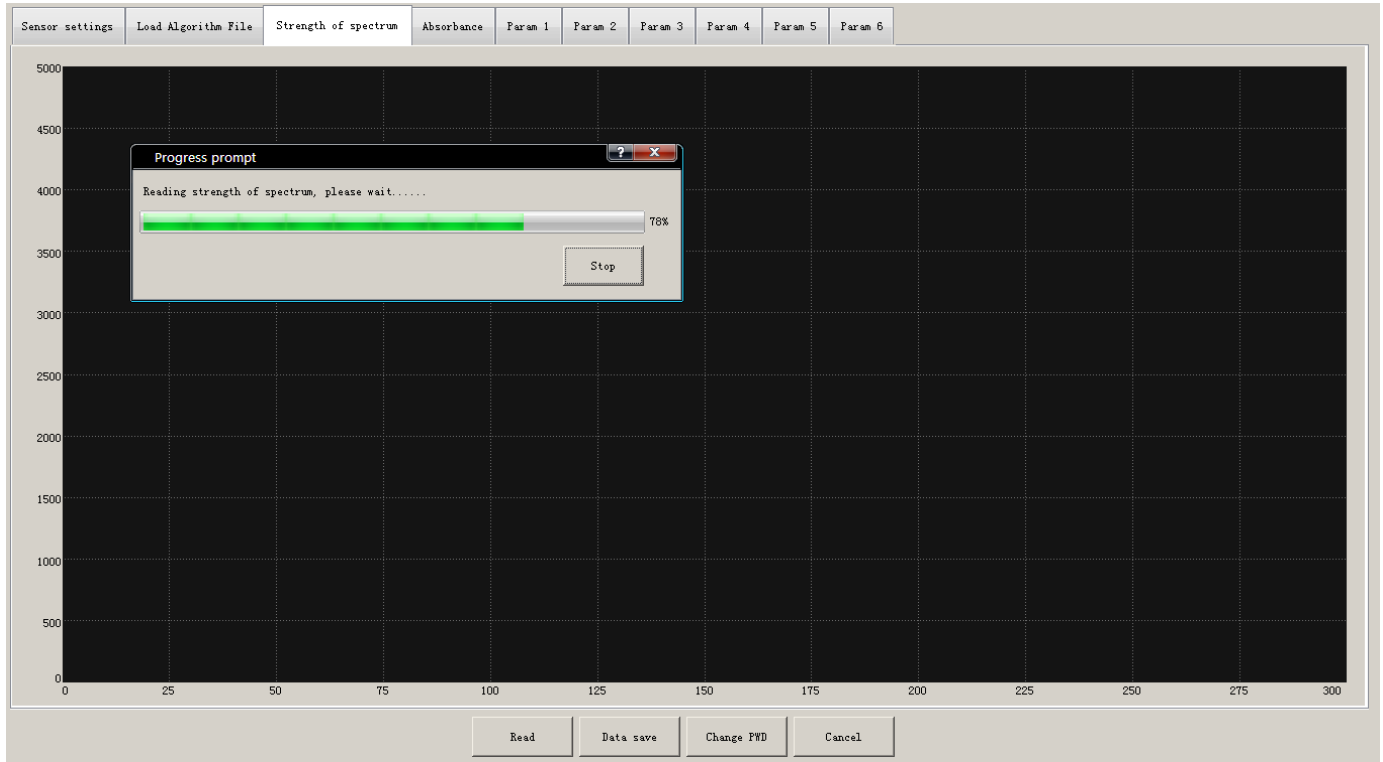
The green line depicts a real-time spectrogram, while the red line is a reference spectrogram.

Absorbance:

After choosing the **"Absorbance"** tab, click on the "read" button, the screen will show the curve of the present absorbance.
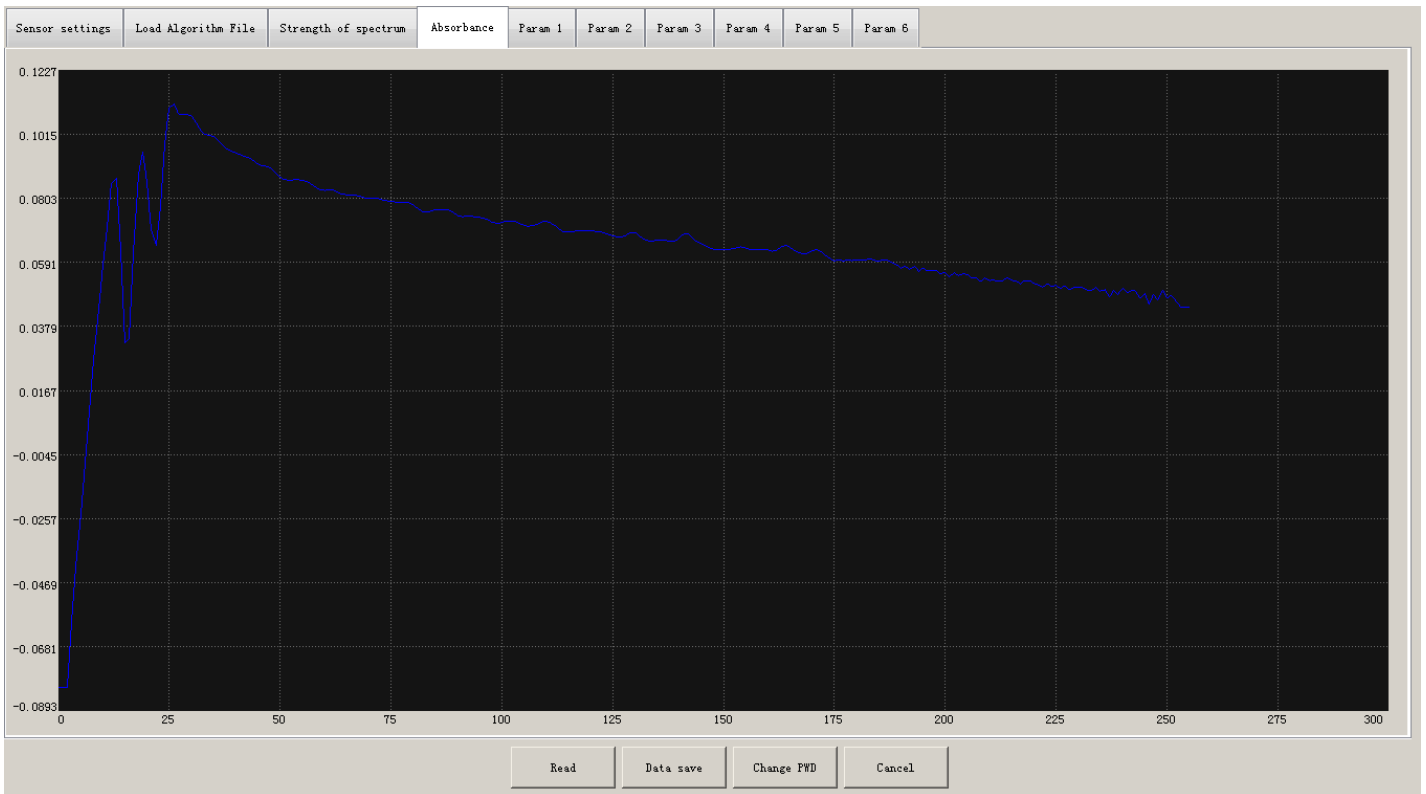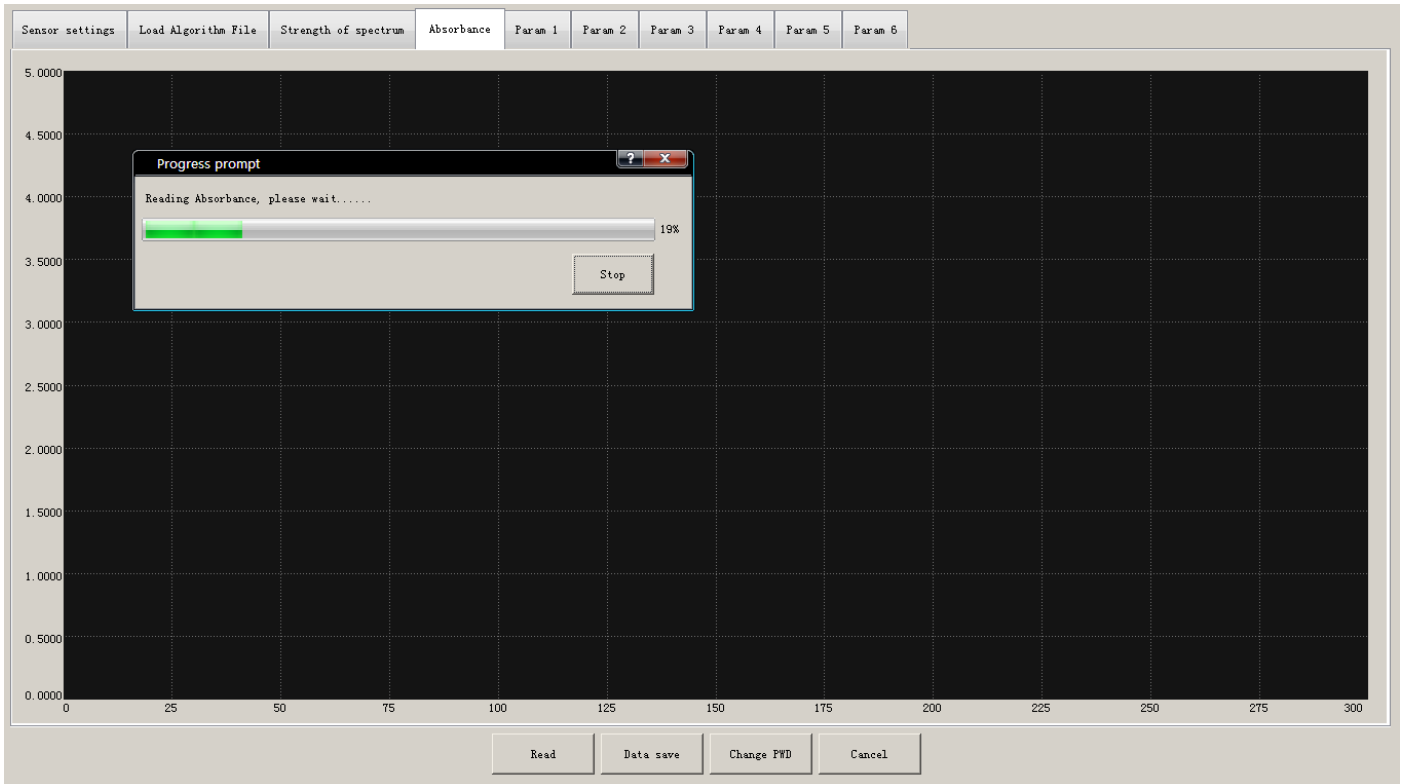

Storing data:

The data of the spectrum from the sensor can be stored in the SD card inside of the transmitter, the user can export the data to USB Disk, this function is convenient to form a database by engineer according to actual data of spectrum.
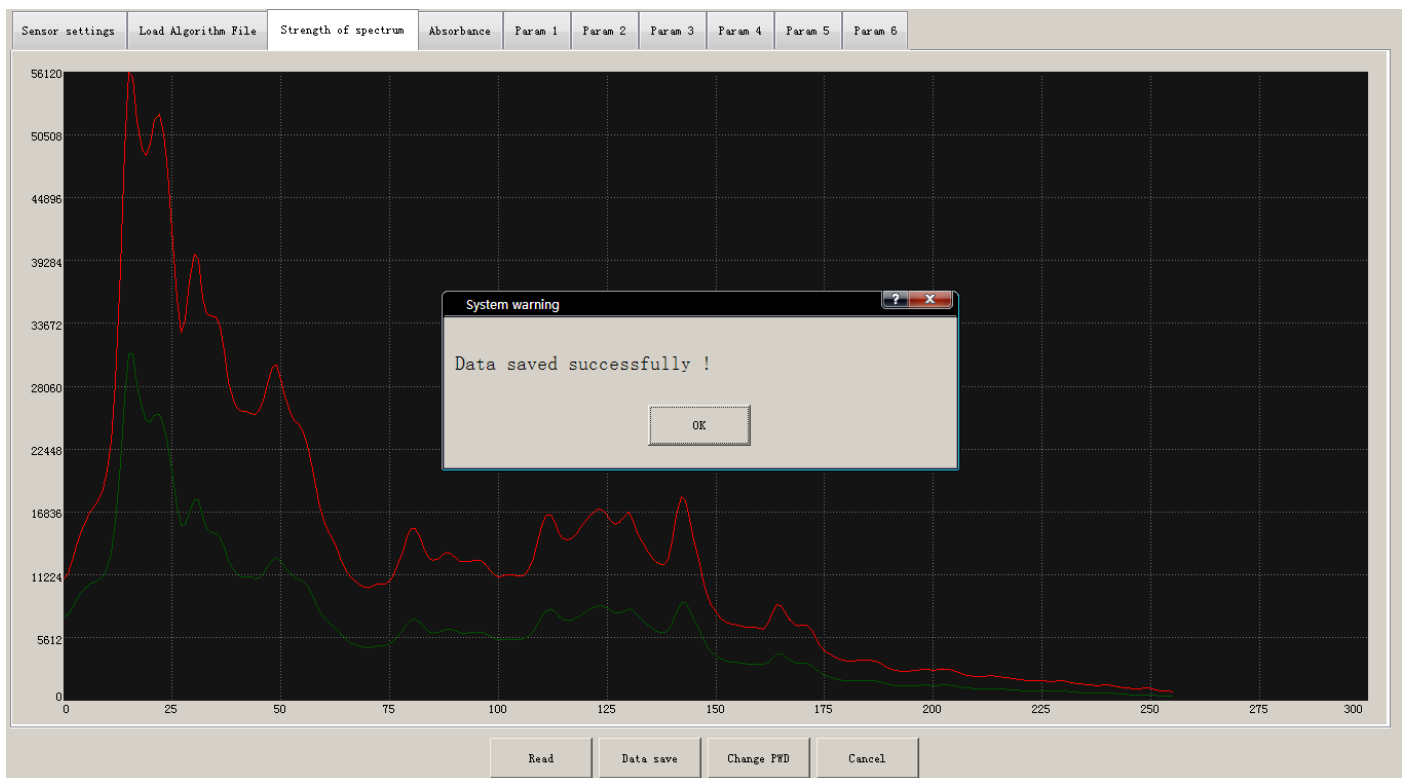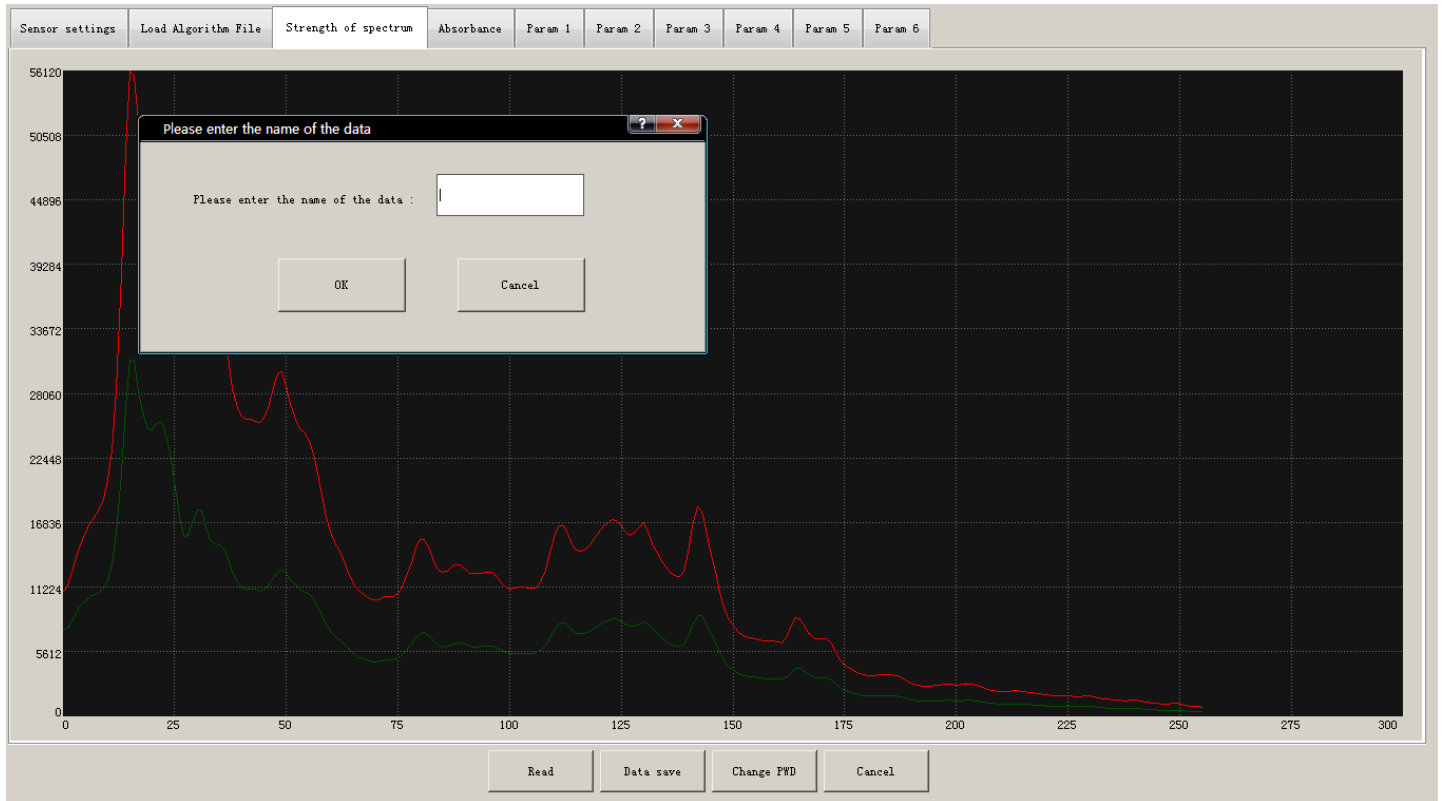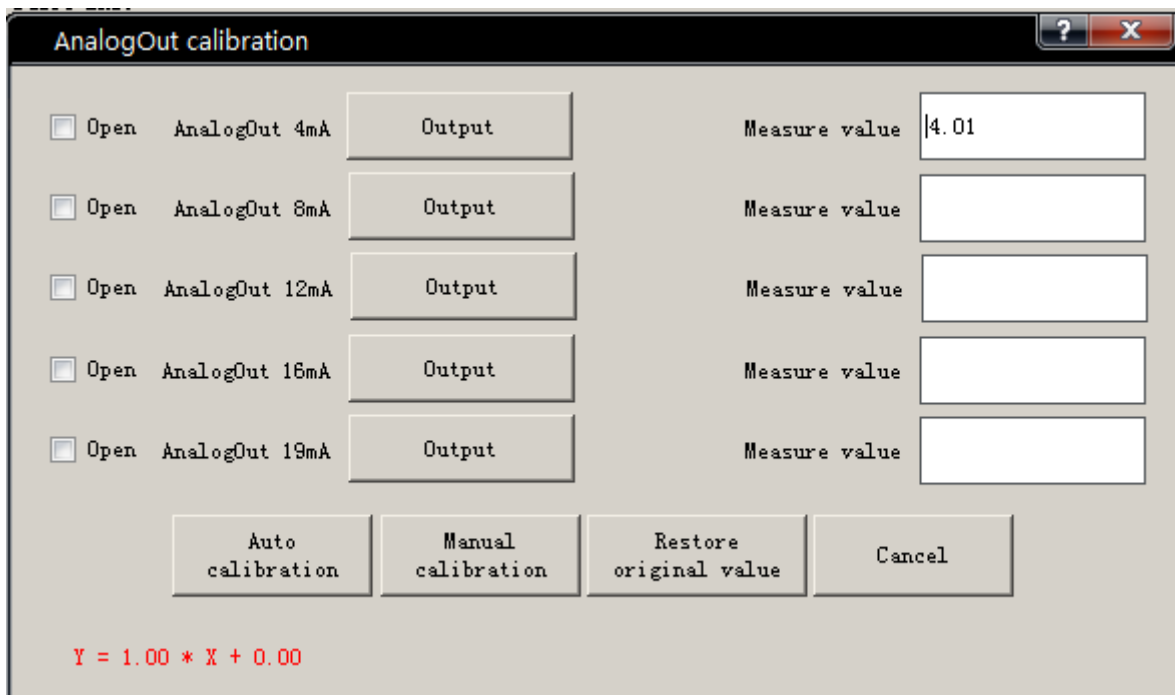
（6）Output setting: It includes output channel selection and on / off, current range upper and lower limits setting, analog output calibration.

O/P setting
Channel 5 ▼ ☑ Enable   4mA 0   20mA 100   AnalogOut calibration
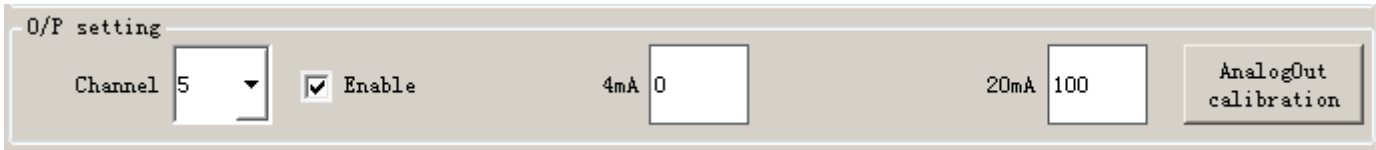
Output calibration: This is to calibrate the analog output of the transmitter
There are 1-8 eight-channel options in the output channel setting, corresponding to 1-8 analog output ports on the transmitter.
After setting the output channel to be calibrated, press the "Output calibration" icon to get the following interface.

AnalogOut calibration

☐ Open AnalogOut 4mA   Output   Measure value |4.01
☐ Open AnalogOut 8mA   Output   Measure value
☐ Open AnalogOut 12mA   Output   Measure value
☐ Open AnalogOut 16mA   Output   Measure value
☐ Open AnalogOut 19mA   Output   Measure value

Auto calibration   Manual calibration   Restore original value   Cancel

Y = 1.00 * X + 0.00

According to the actual calibration requirements, in the range of 4-20mA, you can choose up to five points for calibration. Here is an example that uses 2 points at 4MA and 19MA respectively to do the calibration.
1 Connect an ammeter into the output circuit. Clicking on the "Output" button next to '4mA', the controller will output a current of approximately 4mA
2 Enter the actual current in the data input area after "Measured value" (the reading on the ammeter should be about 4ma)
3 Click on the "Output" button next to '19mA' to output a current of about 19mA
4 Enter the actual current (approx. 19 mA) into the data input area after "Measured value"
5 Click on the 'Auto Calibration' button, the controller calculates the calibration coefficients and then stores them. If the result is not satisfactory, you may restore the formula without updating the coefficients by clicking on the 'Restore original values' button. After completing the above steps, click on the 'Cancel' button to return to the previous screen.

（7）**Setting of alarm/cleaning:** This window selects the alarm relay and sets its ON / OFF state, lower limit alarm, and upper limit alarm. The window also specifies the cleaning relay and its ON / OFF status, cleaning cycle, and cleaning time.

Notice :

After setting or modifying one parameter, you must press the "save" button at the bottom of the page for saving.

4.2.4 Alarms

This tab is for recording the condition when the alarm relay is energized, it includes the present alarm value and the history alarm values.

Click the button "Refresh" to get the newest record.
Click the button "Delete" to delete the selected alarm record.
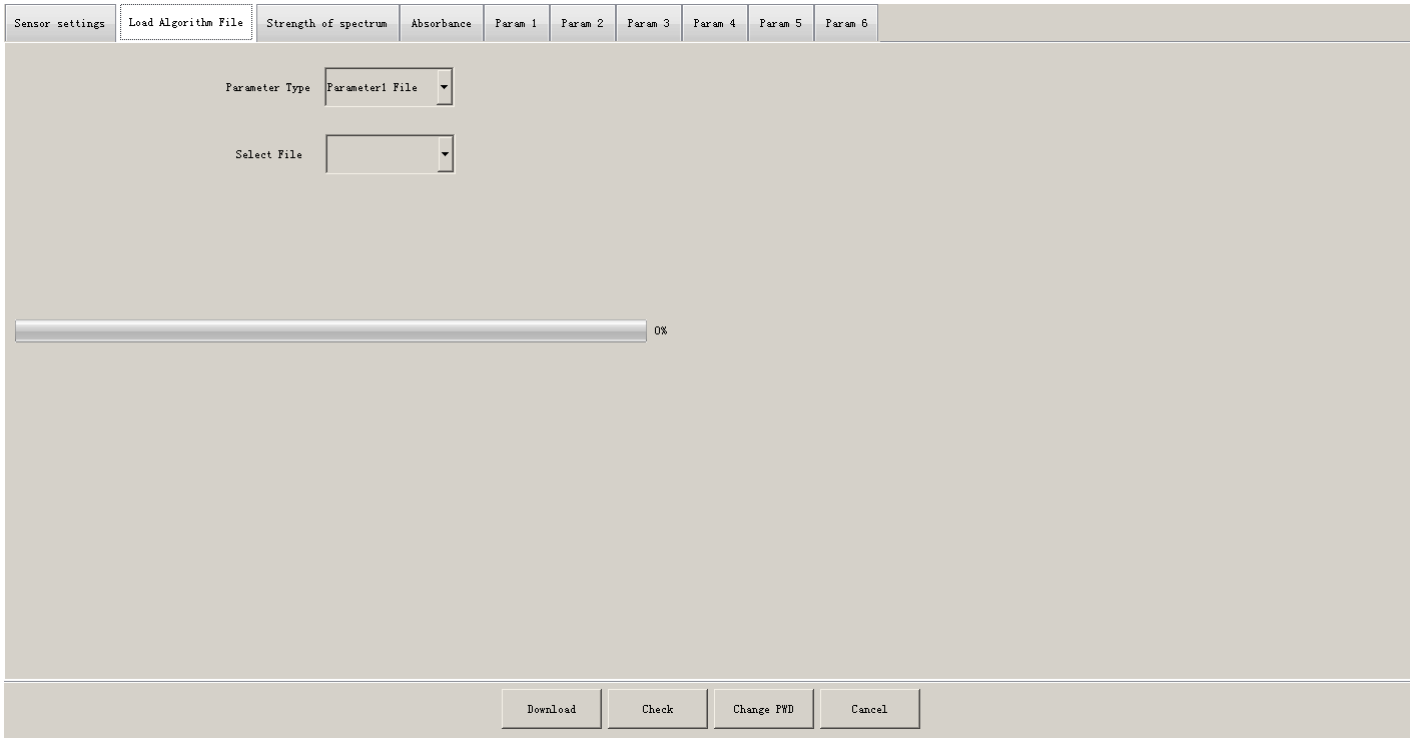Click the button "Close buzzer" to switch off the buzzer even if it is in an alarm state.

4.2.5 Algorithm database download

Under the screen "Para x", click the item "Sensor Settings" and enter the password 7601. appear the following screen

Select the "download algorithm database", and then select the "parameter type" (that is, to place the database at the register location of the sensor parameter, and then remember this location to help set the register starting address of the parameter), next, select "parameters file" (you need to know the optical path length, the parameters to be measured, and the application), and finally click "download", wait for the progress bar to complete.

| Sensor settings | Load Algorithm File | Strength of spectrum | Absorbance | Param 1 | Param 2 | Param 3 | Param 4 | Param 5 | Param 6 |

Parameter Type   Parameter1 File ▼

Select File   ▼

0%

Download   Check   Change PWD   Cancel

4.2.6 Service

Used to display the manufacturer information, transmitter data export, memory information, hard disk information, and restart the controller. When switching to different languages, you must "restart the controller" to make the settings effective.

Data

Chart

Setup

Alarm

Help

Shut down

Config export

Config import

Maintenance settings

Update System

Data export

Memory info

HD info
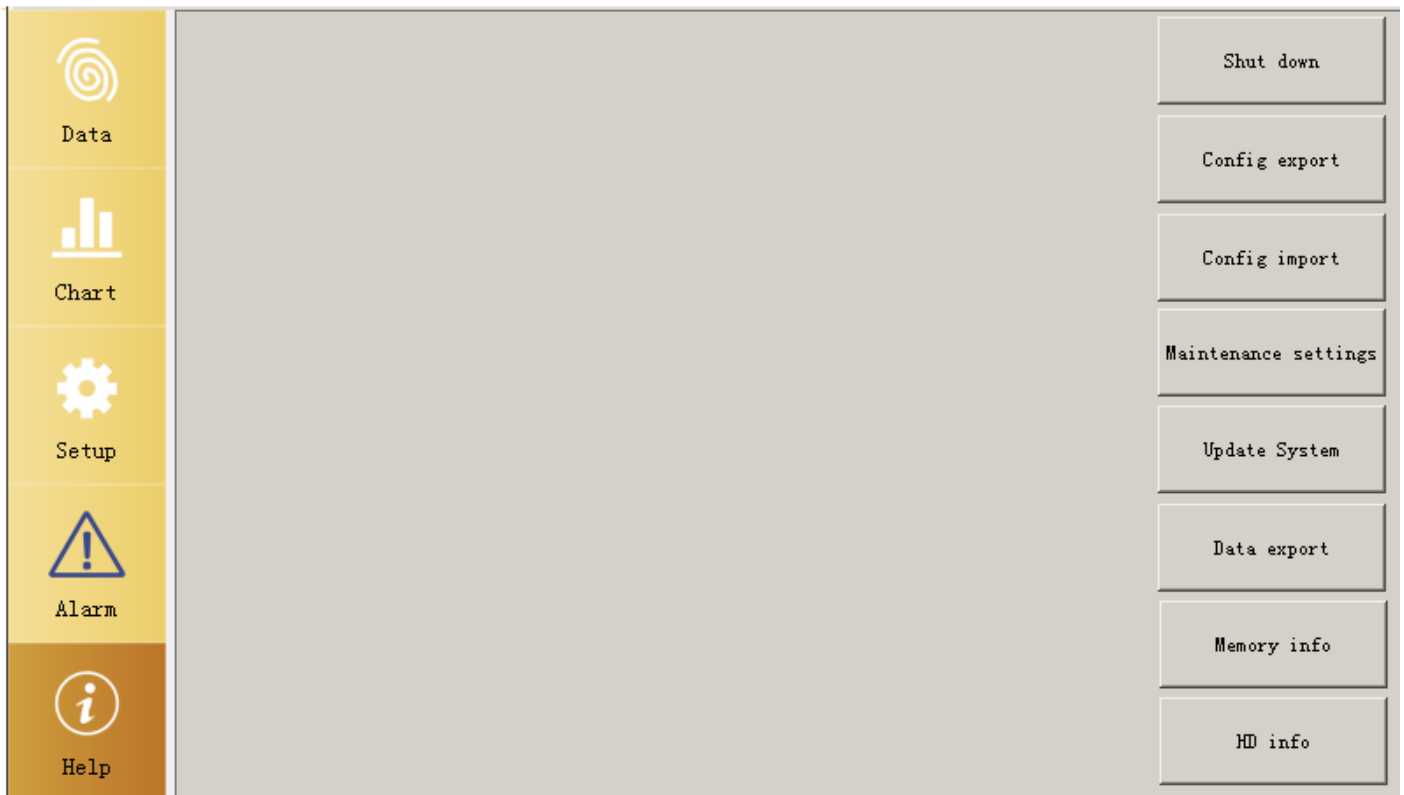
Shut down: It is used to stop running the transmitter, but it can not turn off the power supply. If the transmitter will not be used for a long time, it is recommended to stop running it first and then disconnect the power. If you want to run the transmitter again, reconnect the power.

Configuration export   :

It is used for exporting all configuration files via a USB port. After inserting the USB disk into the USB socket of the controller, click the menu item "Config export ", the following page appears:
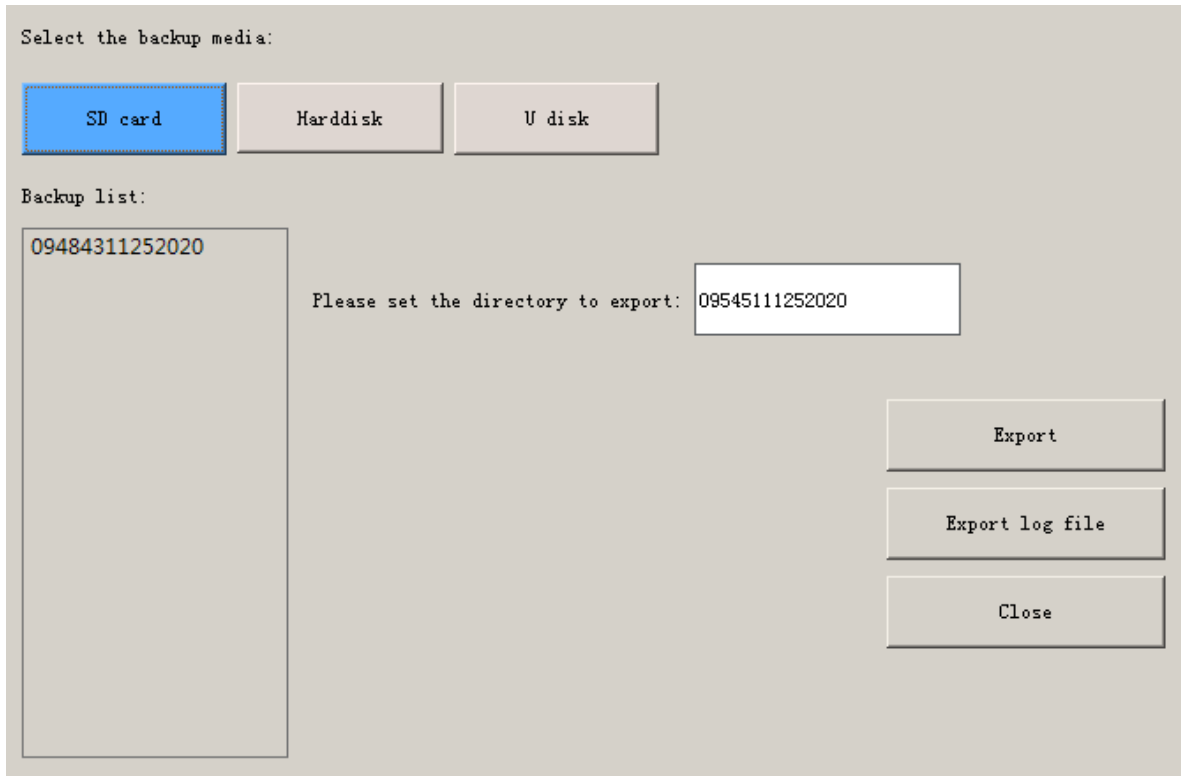
Choose the storing medium to back up. First, there are three options to choose from. Generally, a USB disk is often used.

SD Card- SD card inside of the transmitter; Hard disk- Mobile HDD and U disk

Then click the data entering the area to edit the name of the directory where the backup file will be stored. After that, press the button "Export", the system will automatically generate the file "IniTemp" in the USB disk and list the name of the directory in the table on the left side.

Configuration import :

It is used for importing all configuration files via USB port when the controller has a serious failure or its main board was upgraded. After inserting the USB disk into the USB socket of the controller, click the menu item "Config import":
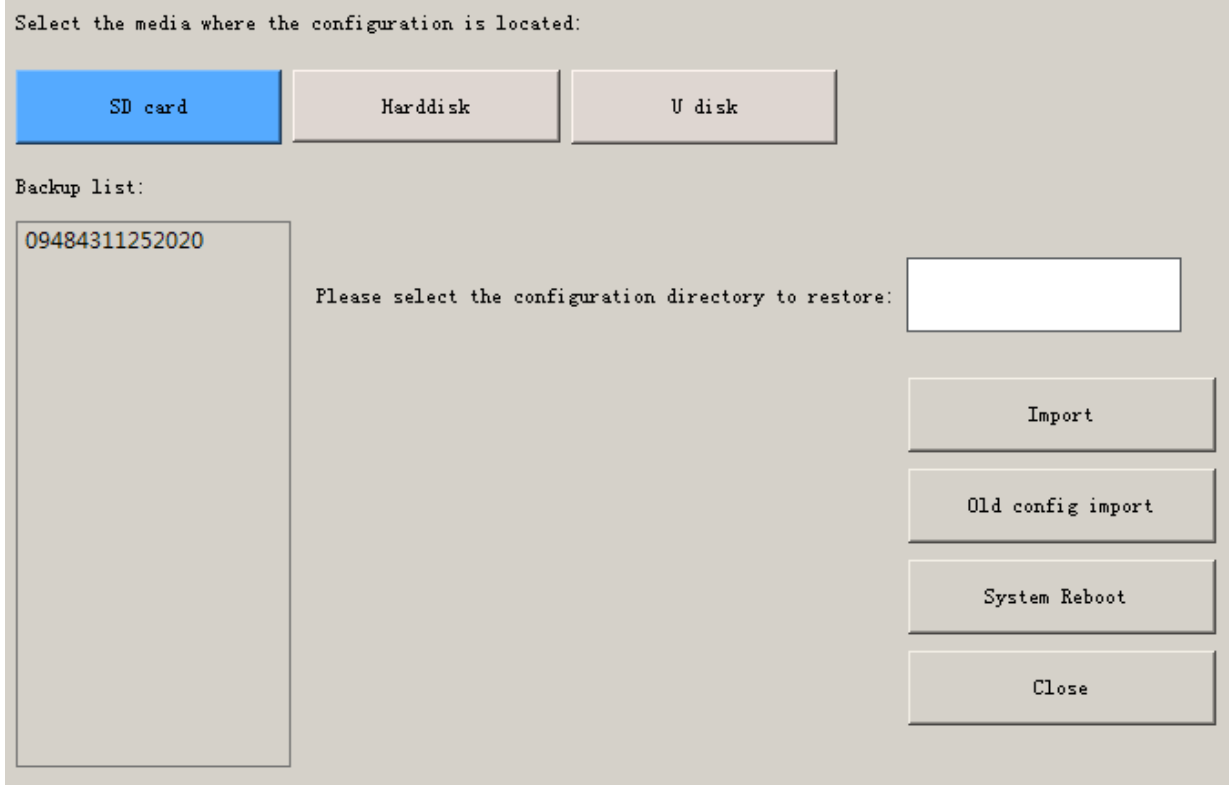
Choose the type of storing medium first, once complete, the system will automatically search all names of the directories storing configuration file and list them on the backup table. Click the directory name and make it appear in the data area. After that, press the button "Import", the system will automatically import the configuration file.

Notice :

After importing the new configuration, you need to restart the transmitter to activate the new configuration.

Maintenance settings:

It is used to remind the user to carry out regular maintenance for the sensor or the controller. When the maintenance time is set, the controller will prompt the status bar at the end of the operation cycle, and the system needs to be maintained. The prompt message will disappear automatically after 3 days.
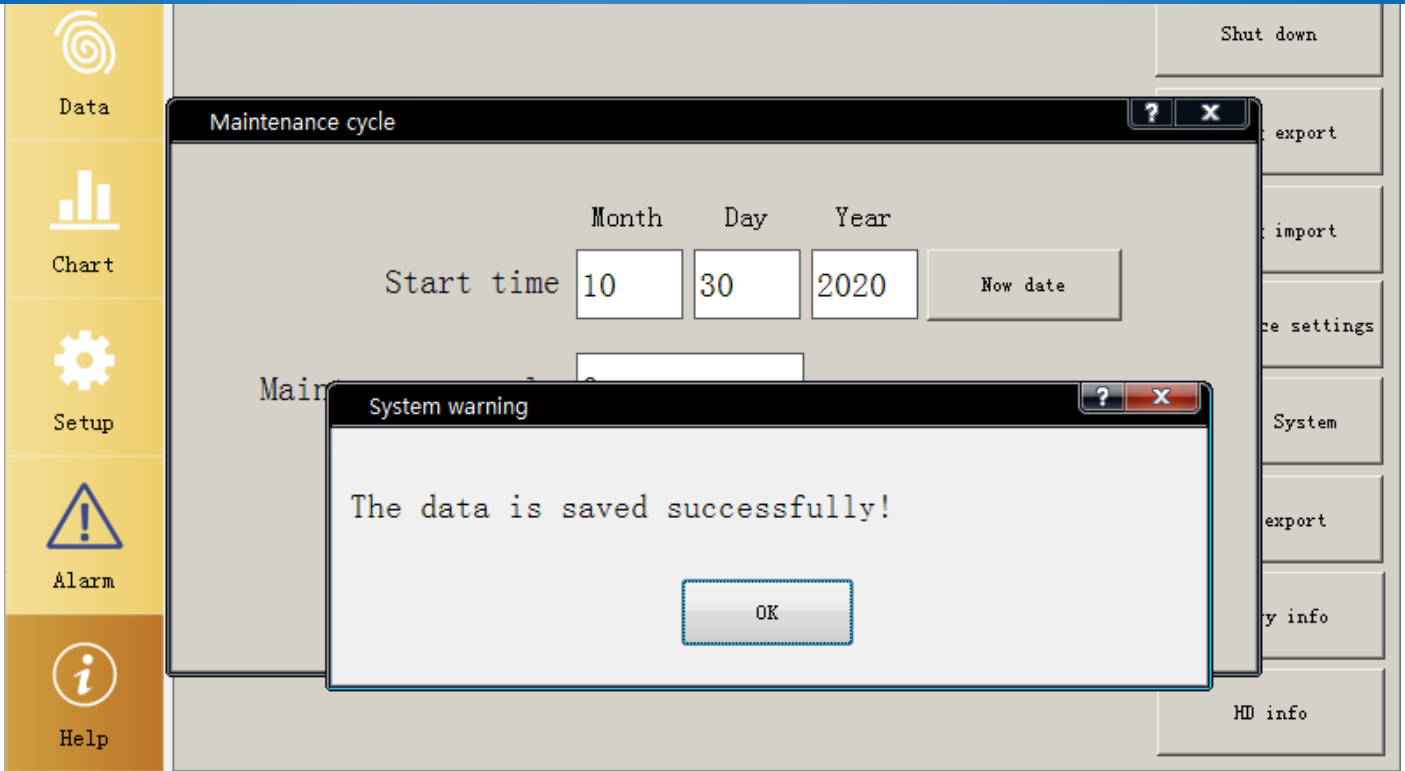
Updating software

Users can update the software of the transmitter via a USB interface, plug the USB disk, and select the item "update system" on the "service" page.
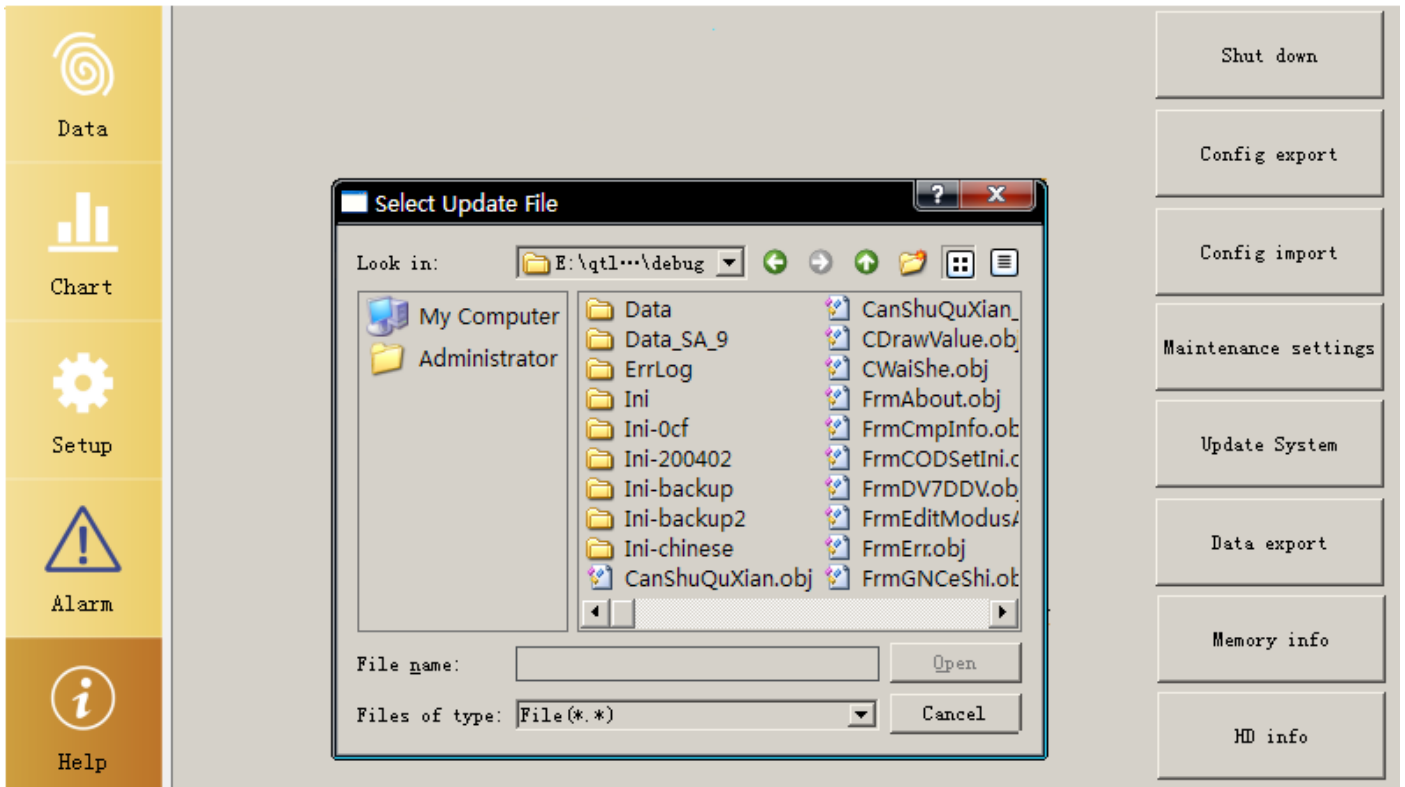
The system will list all files on the USB disk, choose the file to update, it will appear on the file name area at the bottom of the page, After pressing the button "Open", the system will be updated automatically.

Warning :

Pay very close attention to the file you chose, it must be matched to your transmitter, otherwise, an improper file will cause a serious malfunction.

Data export: Used to export the historical data of the parameters and the spectral curve data stored in the transmitter SD card. Detailed steps:

A: Export history data:

1) Select the parameter names of the historical data to be exported;

2) Select the period to be exported;

3) Click on "query"

4) Click "Export History". The exported data will be saved in the "Data" directory of the USB flash drive.

B: Export spectral data:

1) In the "Parameter Settings" -> "Parameter 1" -> "Sensor Settings" page, select "Spectral Intensity" or "Absorbance", click "Read" and then click "Data Save" button, the data is saved to the SD card in CSV data format;

2) Enter the "service" -> "data export" page, click the "export spectral data" button, the above spectral data in the internal SD card is exported to the external USB disk automatically;

3) When the item "Read spectral" is set to "open" on the page "setting", the data will be automatically stored in the file /Data/yyyy-MM-dd_Line.dat in the SD card, The data file generally is named after its storage date. The user

needs to copy it to a USB disk manually.
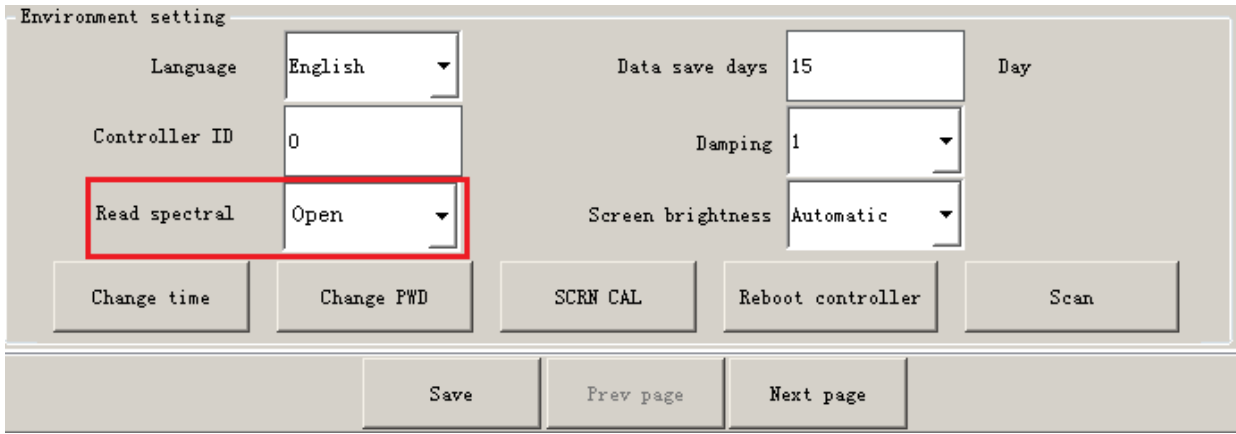
4) Users can view it using Delta-View software.

5 Digital communication

1) The 485 output from this transmitter conforms to the standard Modbus-485 protocol.
2) The supported baud rate: 9600bps; data bits: 8; parity check: N; stop bit: 1 or 2 (1 for the MV7 sensor, 2 for the SA-9 sensor, and other sensors can use either 1 or 2 as specified).
3) Controller Modbus ID: The user may specify the address as required. The interface is shown as below:
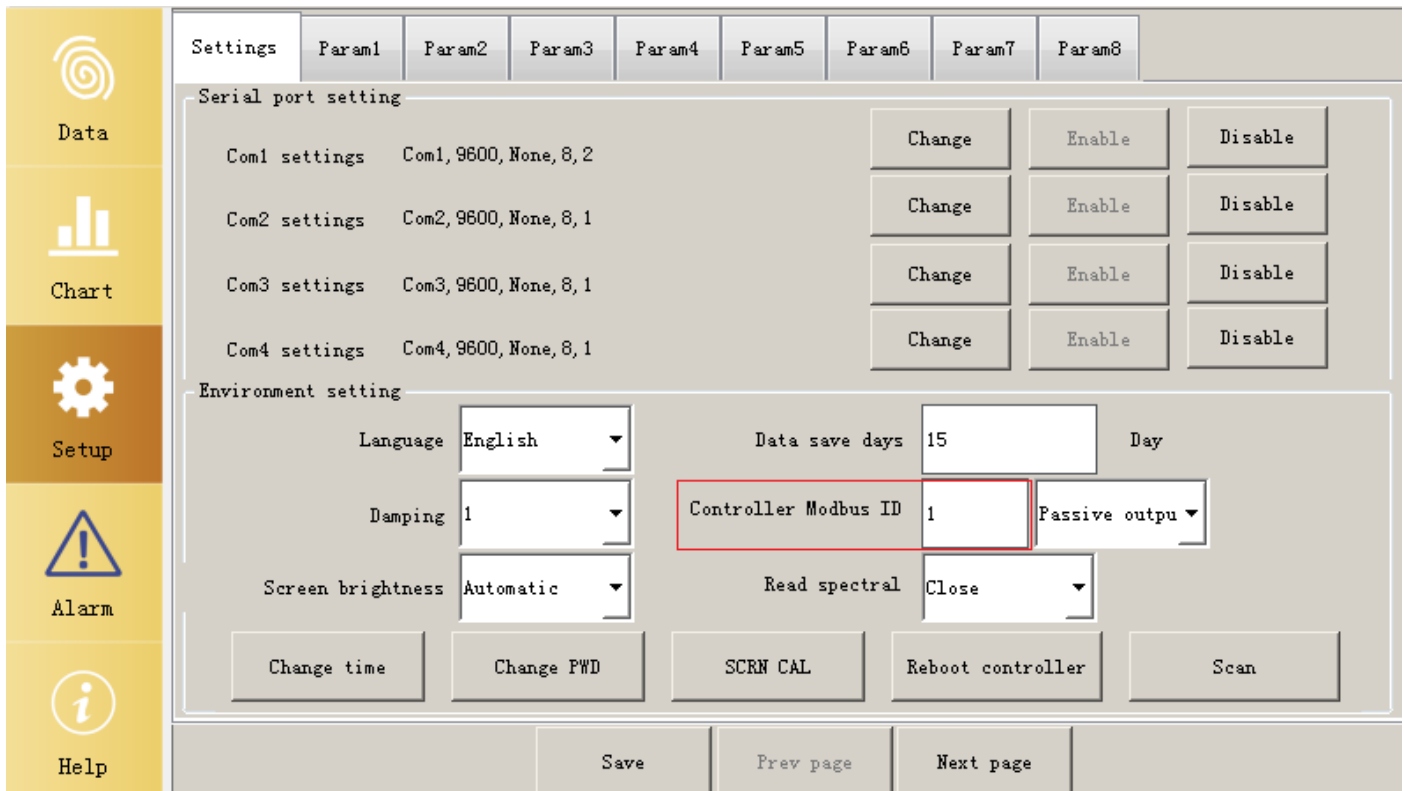
4) The output rules of the data

In the order in which they are displayed;

The first display data is the value stored in register 0 and register 1; data type: floating-point

number

The second display data is the value stored in register 2 and register 3; data type: floating-point

number

…

And so on…

5) Example

To read 3 measured data saved in the controller with the controller's Modbus ID address 12
Send: 0C 03 00 00 00 06 C4 D5
    0C: The Slave Address (0CH = 12)
    03: The Function Code 3 (read Analog Output Holding Registers)
    0000: The Data Address of the first 16-bit register requested
    0006: The total number of the 16-bit registers requested
    C4 D5: The CRC (cyclic redundancy check) for error checking.

Return: 0C 03 0C 99 9A 40 59 45 1F 43 96 F7 AE 44 7A 44 E3
    0C: The Slave Address (0CH = 12)
    03: The Function Code 3 (read Analog Output Holding Registers)
    0C: The number of data bytes to follow (6 registers x 2 bytes each = 12 bytes)
    99 9A 40 59: The first measured value. It is 3.4 in IEEE754 data format
    45 1F 43 96: The second measured value. It is 300.54 in IEEE754 data format
    F7 AE 44 7A: The third measured value. It is 1003.87 in IEEE754 data format
    44 E3: The CRC (cyclic redundancy check) for error checking.

6) Hardware connection

The transmitter is equipped with 4 RS-485 ports. Any unused port can be assigned as an RS485 digital output port. The system will automatically detect the setting, no need to manually set it.

7) CRC Function
```
long CRC (unsigned char data[],int intLength)
{
    int     i,flag;
    long lng ;
    unsigned char CL , CH   ;                //Polynomial Code &HA001
    unsigned char SaveHi    , SaveLo ;
    unsigned char CRC16Lo    , CRC16Hi;       //CRC Register
    CRC16Lo = 0xFF;
    CRC16Hi =0xFF;
    CL = 0x1;
```

```
        CH = 0xA0;

        for (i=0;i< intLength +1;i++)

        {

                CRC16Lo = CRC16Lo ^ data[i];

                for (flag = 0;flag<=7;flag++)

                {

                        SaveHi = CRC16Hi;

                        SaveLo = CRC16Lo;

                        CRC16Hi=CRC16Hi >>1;

                        CRC16Lo=CRC16Lo>>1 ;

                        if ((SaveHi & 0x1) == 0x1)

                            CRC16Lo = CRC16Lo | 0x80;

                        if ((SaveLo & 0x1) == 0x1)

                        {

                                CRC16Hi = CRC16Hi ^ CH;

                                CRC16Lo = CRC16Lo ^ CL;

                        }

                }

        }

        lng = CRC16Hi*256+CRC16Lo;

        return lng;

}
```

6 Maintenance

Except for keeping the front panel clean for better operation, the controller does not require regular maintenance. If the window gets dirty, you can use a soft cloth to clean it. For stubborn stains, you can use some neutral detergent or spray cleaner to clean them. Do not use strong chemicals or solvents.

7 Troubleshooting

Description of failure	Possible Causes	Solution
No content is displayed on the LCD.	No power supply	Check if the power supply voltage is correct. Check if the polarity of the voltage (DC-powered model) to the controller is correct.
	Low contrast	Increase the display contrast value.
No menu displayed	Check the LCD screen cable Malfunctions of the software	Remove and re-plug the cable to ensure a reliable connection Restart. If it does not work, return it to the manufacturer for evaluation.
The reading on the meter is either zero or constant	The sensor has a poor cable connection or there is no medium	Check the connection of the sensor, and check the measuring medium.
	Malfunction of the controller or the sensor	Return to the manufacturer for evaluation.
The readings are unstable	There are a lot of bubbles in the measuring medium	Change the sensor installation position or apply a defoaming device
Incorrect readings	There is dirt on the sensor light window	Clean the sensor light window
	Poor linear calibration	Recalibrate

III Contact

The warranty period of our company's products is one year after shipment or in accordance with the contract agreed period. If there is any question or technical service is required, please contact us.

Appendix 1 GDC-04 Functional diagram
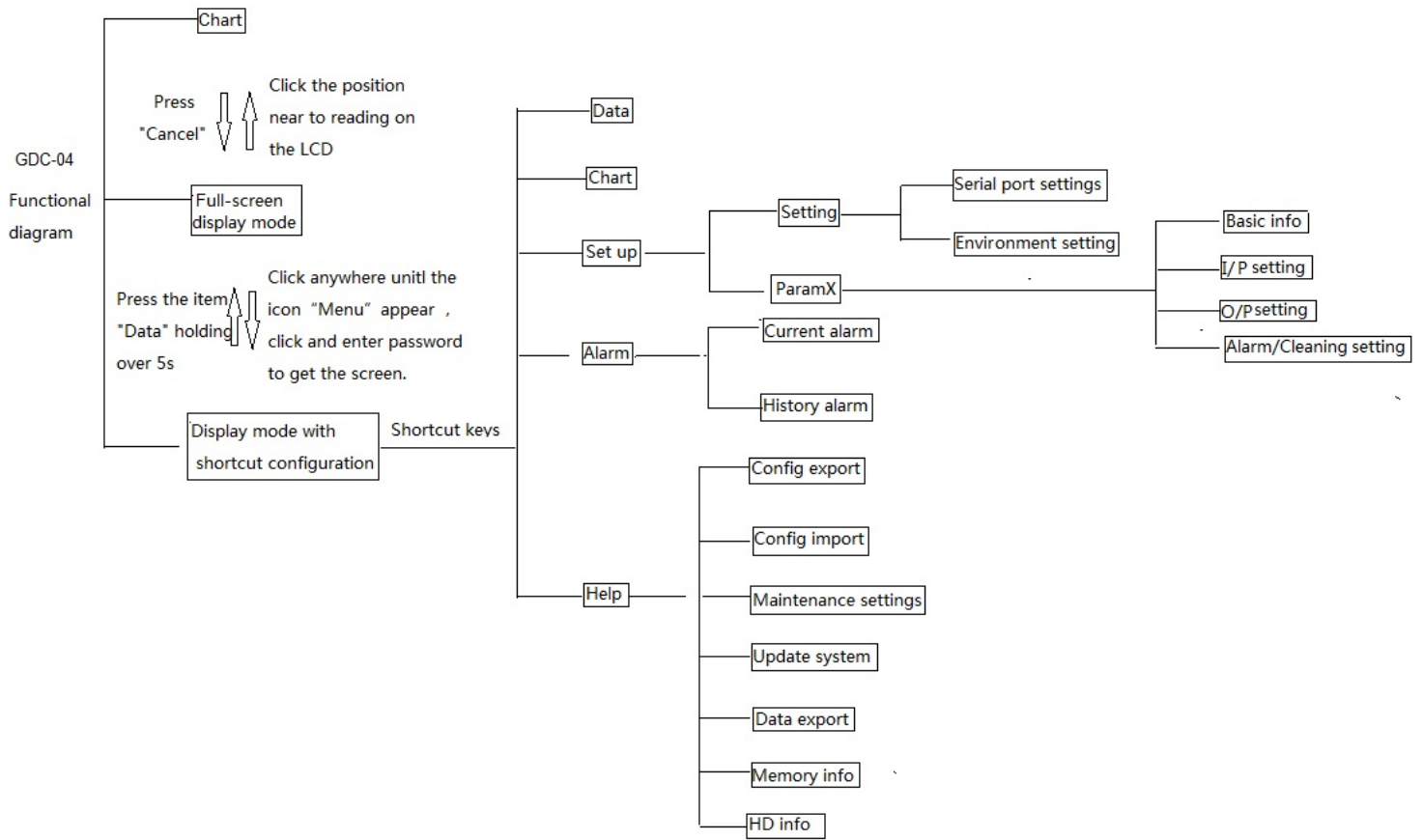
Appendix 2: Install lithium battery and reconfigure date and time in system

2.1 Check or install the lithium battery

（1）Unscrew and remove the four screw, open the front panel to access the PCB boards as the show below

（2）If there isn't a lithium battery on the mainboard, please buy and install it.

2.2 Configure date and time in system

2.2.1 Get to the page "Setting"

After completing the connection between the controller and the sensor, double-check the wiring and then turn the power on. The GDC will show the measurement screen after starting up.
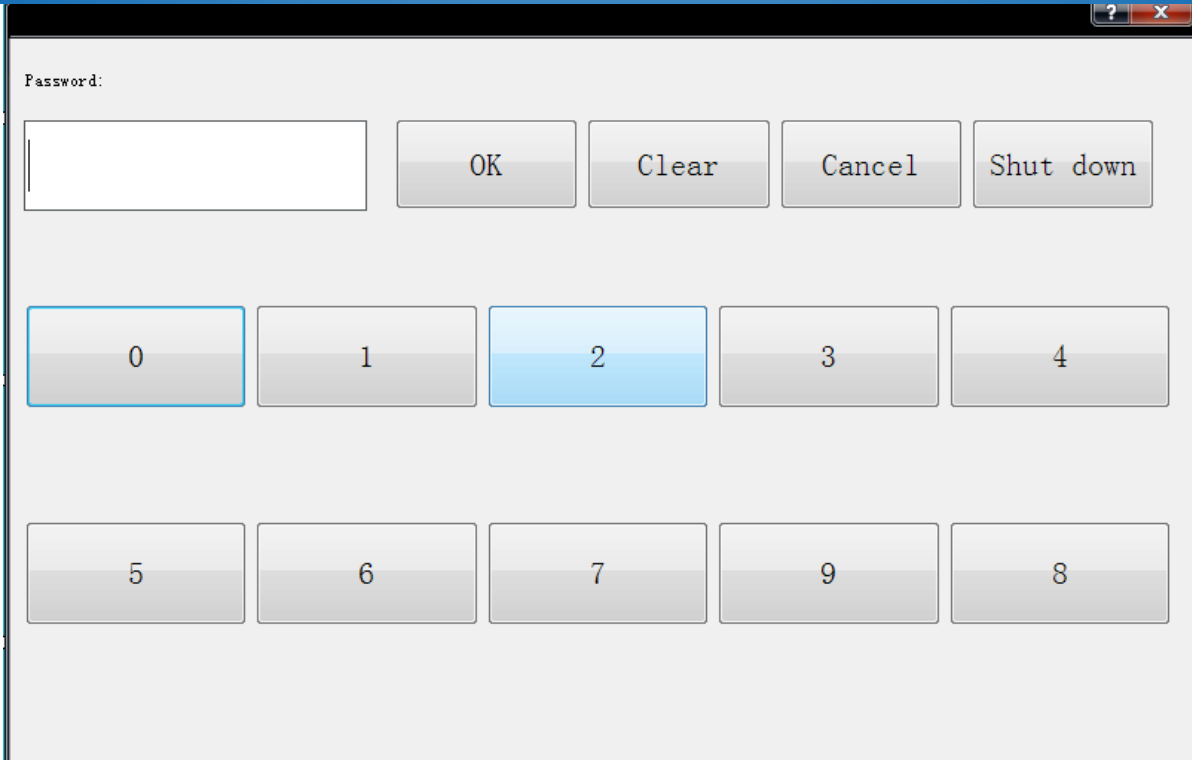
The measurement screen has two modes, one is termed as full-screen mode, and the other is called measurement screen mode with some shortcuts indications.

Under the full-screen mode，click anywhere on the display will appear the following:

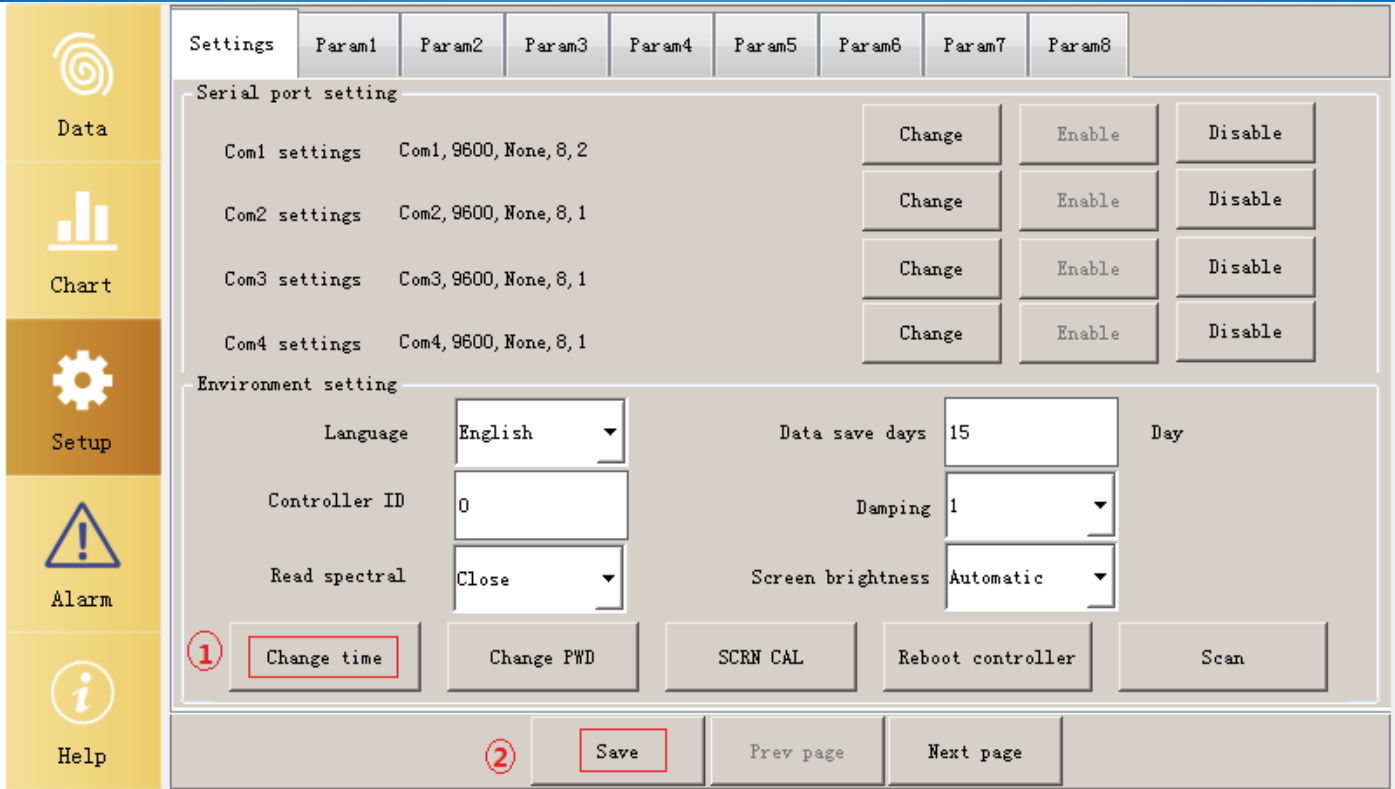Click the "Menu" button，it goes to the following password input window.

When the correct password (default is 2016) is entered, It enters the following shortcut configuration screen.

If the inputted password is incorrect, can reenter it after clicking the "Clear" button
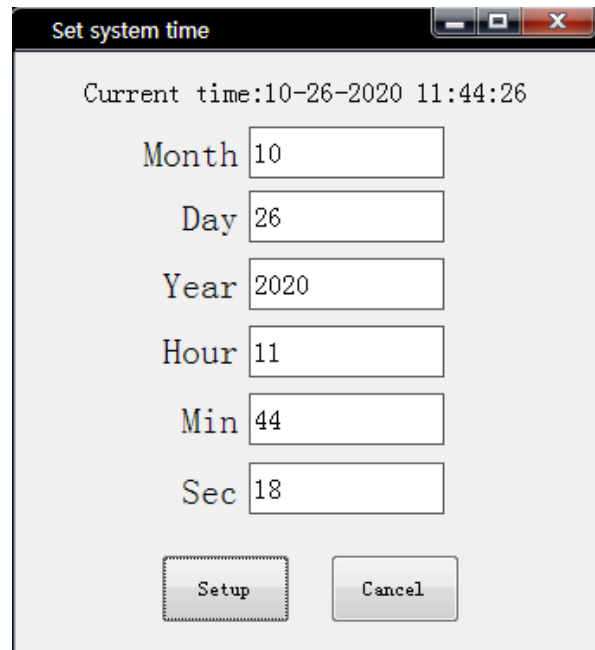

Click the "setup" button to get to the screen for the settings of the controller under the main menu

2.2.2 Change time and date in system

Click the button" Change time" to appear in the diagram below :

Enter the correct setting and click "Set up" to save, then return to the previous page by clicking the

button"Cancel".

Click button "Save " to save the changed settings under the page "setting".