Pyxis

UC-100AGS Display with LT-635 Submsersion Sensor User Manual

2023.11

General Information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Safety Information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger, warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To make sure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

Use of Hazard Information

 **DANGER**
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING**
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION**
Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE
Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Precautionary Labels

Read all labels and tags attached to the instrument. Physical injury or damage to the instrument could occur if not observed.

	This symbol, if noted on the instrument, refers to the instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists.
	Delicate internal electronic components can be damaged by static electricity, resulting in degraded performance or eventual failure.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/98/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user.

Pyxis

Catalog

1. Introduction

The LT-635 is a submersible, waterproof, self-cleaning sensor that determines the concentration of suspended solids by measuring the attenuation of an infrared light source through the sample media. The instrument is virtually maintenance-free, and the self-cleaning capability of the sensor prevents deviations caused by air bubbles and sludge particulate. The LT-635 can be powered by a 24 VDC/6W power supply and offers fully integrated 4-20 mA and RS-485 Modbus output signals for connection to any controller, PLC or DCS network. When clean, the unique Pyxis sensor design offers a stability of <0.1g/L for up to 1-year without calibration. The LT-635 is ideal for use in wastewater applications including clarifier/thickener sludge bed depth detection and activated aerobic or anoxic suspended solids detection. This manual covers direct RS-485 connection of the LT-635 sensor to the UC-100AGS display and data logging terminal for water and waste operational use.

- Resolution as low as 0.1g/L
- Built-in transmitter, without preamplifier or meter head
- Combination 4-20mA isolated signal and RS-485 Modbus (RTU) output
- Simple / Wireless calibration using uPyxis Mobile or Desktop APPs and MA-CR Bluetooth Adapter
- Supports self-cleaning of sensor
- Optional Ultrasonic Adapter for automatic cleaning (in development)
- Optional calibration with Pyxis secondary standards or field water samples

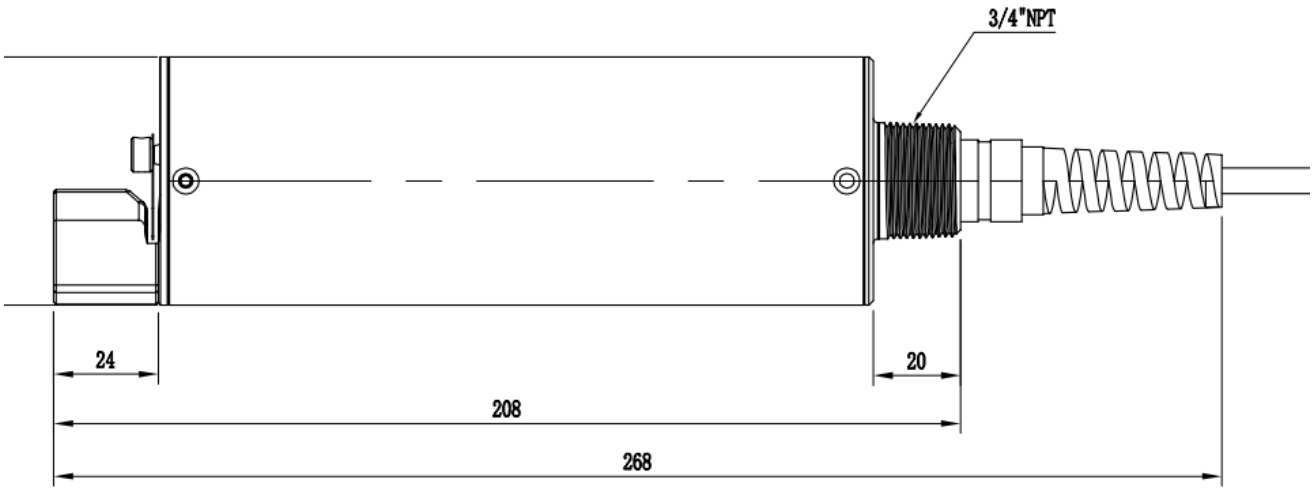
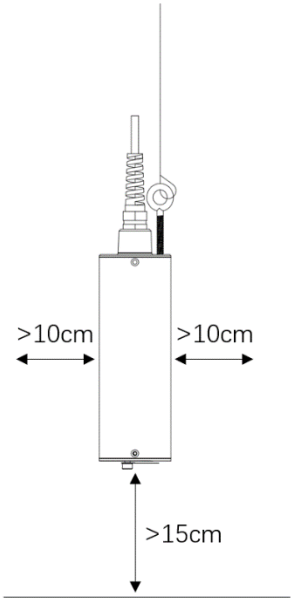


Figure A. – LT-635 Dimensions (mm)

2. LT-635 Specifications

Item	LT-635
P/N	53251
Parameter	Suspended Solids / Total Suspended Solids
Measurement Range	0.00-30g/L (0.00 – 30,000mg/L)
Unit	ppm (as SS or TSS)
Precision	± 0.1g/L or 5% of the value
Response Time	T95<10 Seconds
Calibration Method	Gravimetric Total Suspended Solids Analysis – Application Specific
Wavelength	850nm
Method	Absorbance
Power Supply	22 – 26VDC 6W
Operating Temperature	32 – 122 °F (0-50 °C)
Storage Temperature	-7 °C – 60 °C (20 – 140 °F)
Outputs	Isolated 4 – 20 mA Analog Output & Isolated RS-485 Digital Output
Installation	Submersed – Fixed Conduit ¾-inch MPNT Threaded Cable Fitting Submersed – Hoisting Chain or Cable
Material	316 Stainless Steel – Body & Wiper Arm PTFE – Wiper Blade
Weight	1,530 g (3.3 lbs.)
Operational Pressure	45 psi (3.1 Bar)
Rating	IP-68, Fully Dustproof & Waterproof
Typical Wiper Life Span	12-18 Months (Avg. 10x/hour)
Regulation	CE / RoHS
Dimension (L x W x H)	(288mm x 57mm x 57mm)
Cable Length	33 feet (10m) w/IP-67 8-Pin adapter 4.9 feet (1.5m) flying lead w/IP-67 8-Pin adapter

**As Pyxis technology is continuously updated, this technical parameter may change at any time without notice;*



IMPORTANT NOTE – The LT-635 submserion suspended solids sensor must be installed no less than 15 cm from vessel bottom and 10cm from vessel wall for proper operation.

3. UC-100AGS Display Specifications

Item	UC-100AGS Display & Data Logging Terminal w/Gateway
P/N	43056
Dimension	H190×W380×D188mm
Measurement Range	LT-635 (0.00 – 30,000mg/L as Suspended Solids)
Unit	mg/L
Precision	5% of the value
Response Time	T95<10 Seconds
Analog I/O	2 channels 4-20mA input & output
Communication	RS485 interface, 1 channel Ethernet MODBUS TCP master slave
Viewing Screen	7-inch LCD, 800 x 480 pixels, four-wire resistive touch screen, uv coated
Storage	Storage capacity built-in 4GB memory (1 million data/event records)
Power	100~240V AC 50/60Hz
Working temperature	40 – 113°F (4-45 °C)
Storage temperature	-4 – 131°F (-20 – 55°C)
Protection grade	IP65
Relative humidity	20 % - 90 %(No condensation)
Altitude	<6,561 feet (<2,000 Meter)
Security level	Password protection
Product weight	5kg

**As Pyxis technology is continuously updated, this technical parameter may change at any time without notice;*

4. Sensor Installation Methods

Submersed Fixed Installation with MA-120-B: The LT-635 may be installed in a submersed/fixed application using the MA-120-B Submersion Adapter Mounting Bracket (P/N: 50783). The LT-635 sensor should be installed as outlined in Figure 2 and 2A. For installation, the MA-120-B bracket should permanently mounted in a fixed position for easy access to the LT-635 sensor and piping. For sensor replacement and maintenance, users only need to lift (vertically/upwards) the sliding block and conduit with the mounted sensor from MA-120-B bracket. Please note the LT-635 outer diameter is ¾ - inch NPT. A ¾ to 1-inch NPT bushing is required for installation.

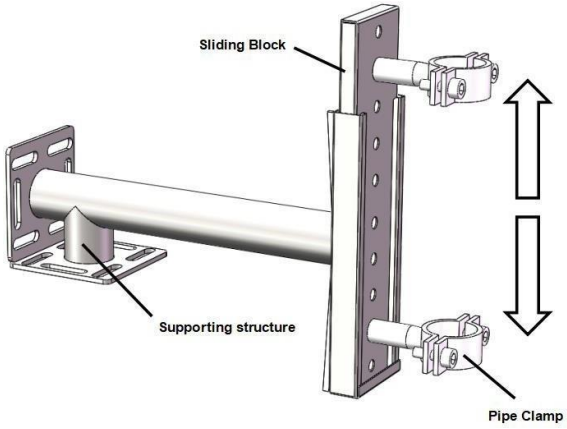


Figure B. – MA-120-B Submersion Adapter Mounting Bracket

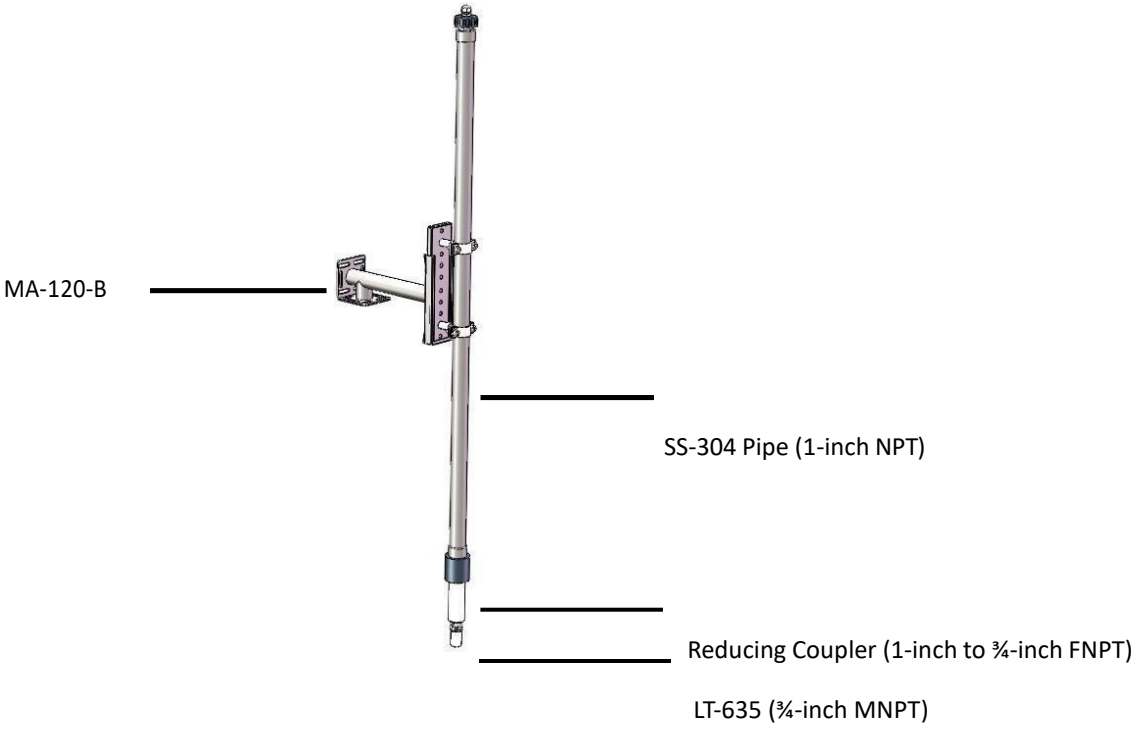


Figure C. - Installation Using MA-120-B Submersion Bracket with Piping

Submersed Installation with Lifting Ring: The LT-635 sensor comes equipped with a lifting ring which allows the sensor to be lifted and lowered using a user-provided chain or cable. This method of installation enables use of the LT-635 in clarifier or thickener sludge bed depth profiling. Users may mark measurement increments on the user provided lifting chain/cable and the LT-635 sensor may be slowly lowered into the clarifier/thickener. When a drastic increase in suspended solids measurement is observed, the sensor has been exposed to the clarifier/thickener sludge bed. The lowered distance of the sensor to this observed TSS measurement change as indicated on the marked chain/cable can be used as a reference of the clarifier/thickener supernatant (clean water). This value when subtracted from the total clarifier/thickener height may be used as a reference to the sludge bed depth. For this method of installation and use, please refer to Figure 3. For sensor replacement and maintenance, users only need to lift the chain or cable and LT-635 Sensor vertically (upwards).

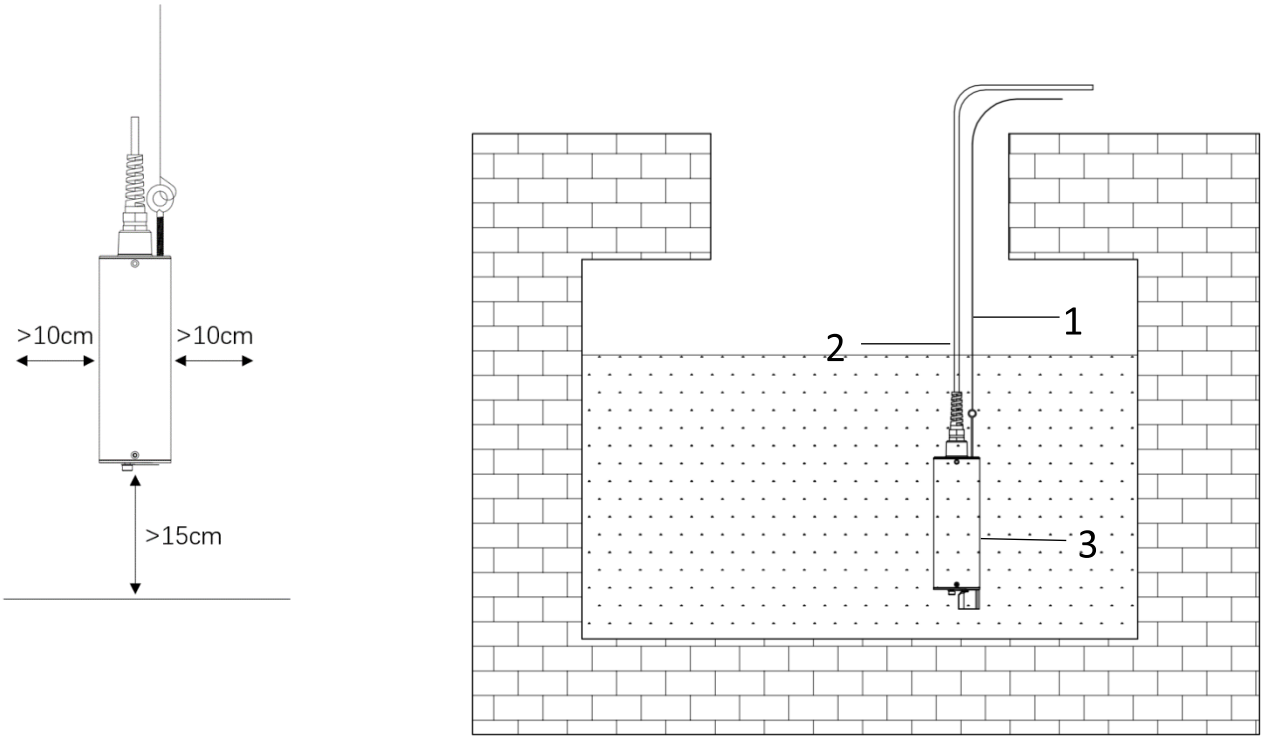


Figure D. – Submersed Installation with Lifting Ring - >15cm from vessel bottom and >10cm from vessel walls

Reference ID	Name
1	Retention Chain / Cable
2	Sensor Output Cable
3	LT-635 Suspended Solids Sensor

5. UC-100AGS Installation and Connection

5.1. UC-100AGS Installation Requirements

Power Supply: 100~240V AC 50/60Hz all the way;

Equipment Installation: on-site wall-mounted installation of monitoring device;flatness of wall surface is less than 0.5cm/m^2;

Equipment Weight: 5kg, fixed by expansion screws on the wall;

At least 0.5m operation space is reserved around the equipment installation;

3G/4G network signal: The 3G/4G network signal in the equipment installation area is normal, and the mobile phone on site can receive calls and surf the Internet normally.

5.2. UC-100AGS Installation

It is recommended that the equipment be installed on a solid wall for easy installation and maintenance.Punch holes and prepare expansion screws before installation. The dimensions given may vary slightly depending on the location of the installation.

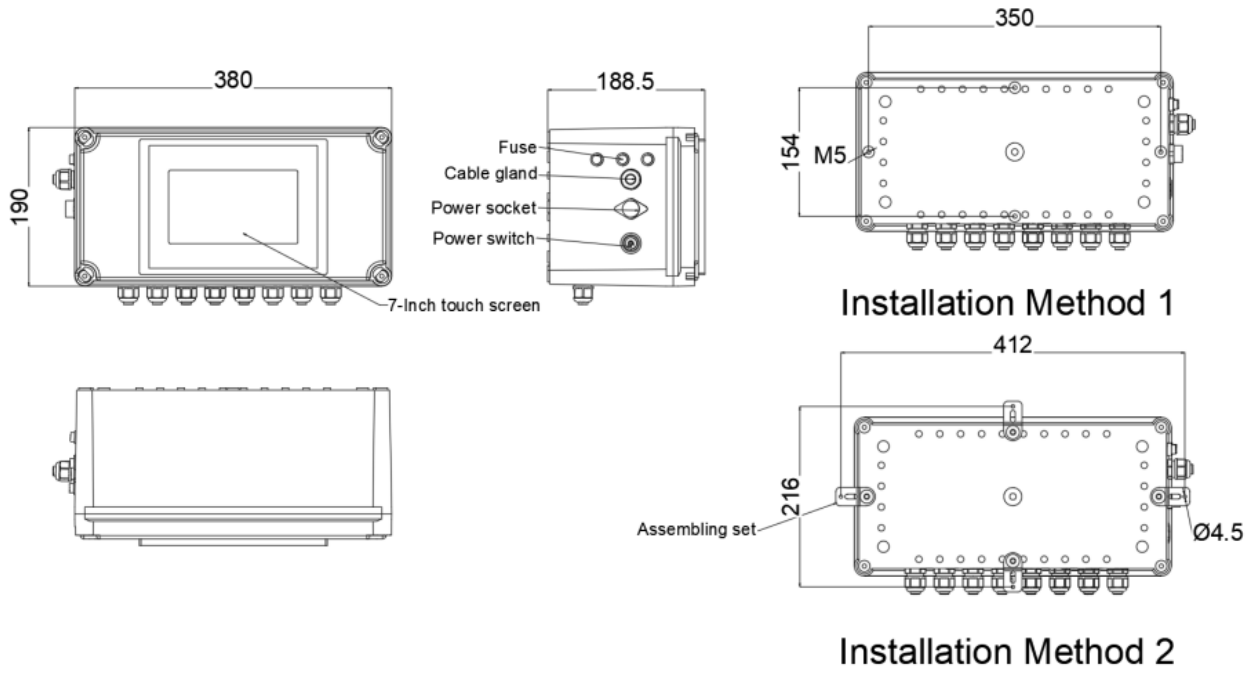


Figure. 1 UC-100AGS Installation dimensions

5.3. Electrical Connection

Users of online detection analyzer equipment only need to plug the power plug into a power socket of 100~240V AC 50/60Hz, and they can operate normally.The enlarged drawing can be seen in the attachment. In the process of electrical connection, if you want to contact the 220V single-phase power supply, it should be operated by a person with an electrician certificate. Failure to follow the electrical operation specifications may cause electric shock injury or even death.

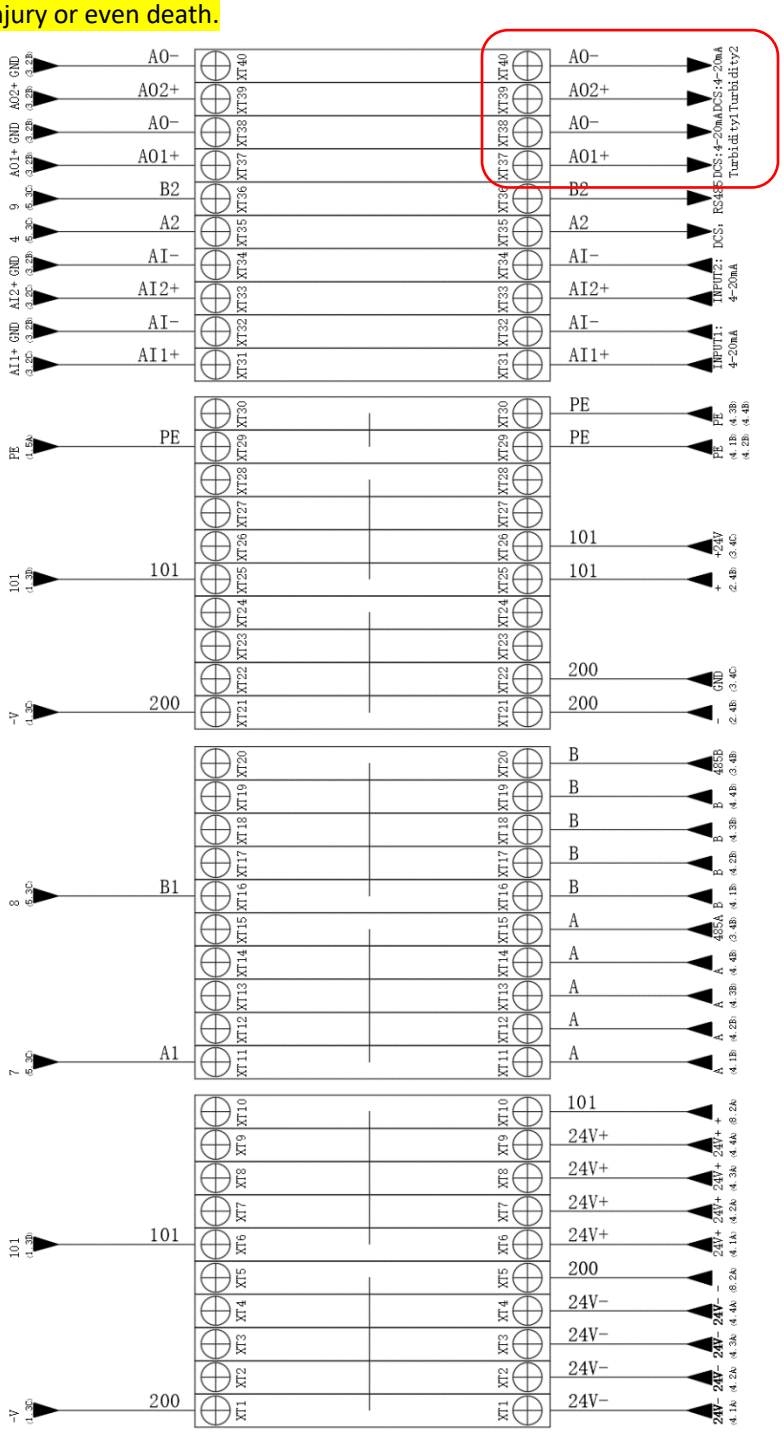


Figure. 2 UC-100AGS Terminal Connection Diagram

6. Touch Screen Operation

6.1. Initial Screen

After the system is powered on, the screen will open the initial screen, where the user can select the user to log in or enter the system.

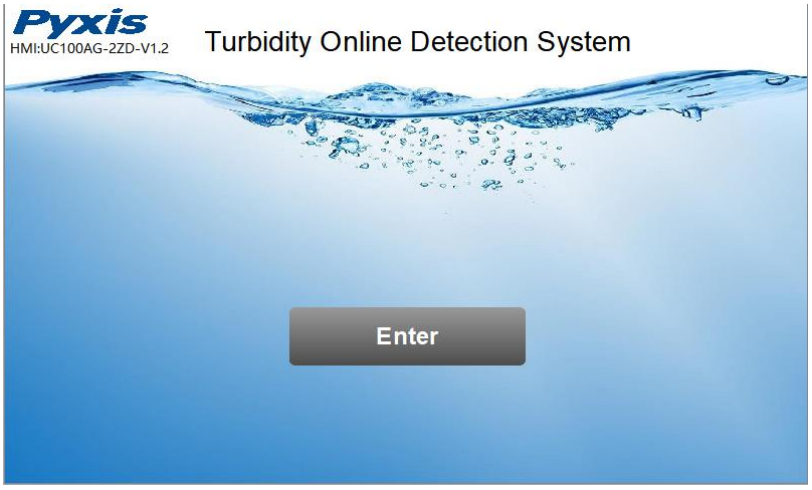


Figure. 3 Main Interface

6.2. User Login

After booting, the user needs to log in with the user name and password, otherwise they can only view the reading on the main interface, and cannot perform instrument parameter setting and calibration. Click the "User Login" button, a prompt box pops up: select the user "**pyxis**", enter the password: "**888888**" in the user password field. If you don't need a password or want to change the user, you can enter the system and perform "management" in the "user management" interface of the menu.

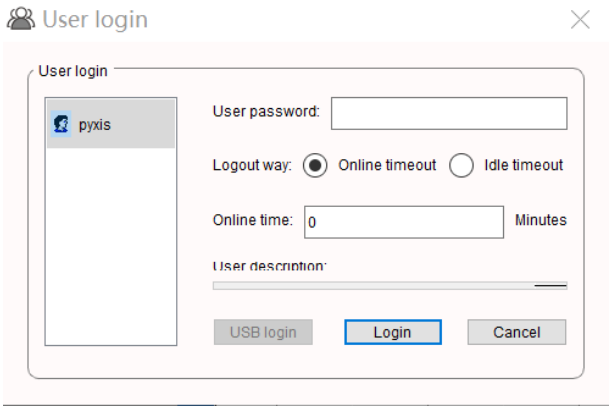


Figure. 4 User login interface

6.3. Real-time Monitoring

Click the "Enter System" button on the main interface to enter the real-time monitoring screen of the system, where the data detected by the sensor within 15 minutes will be displayed in real time.

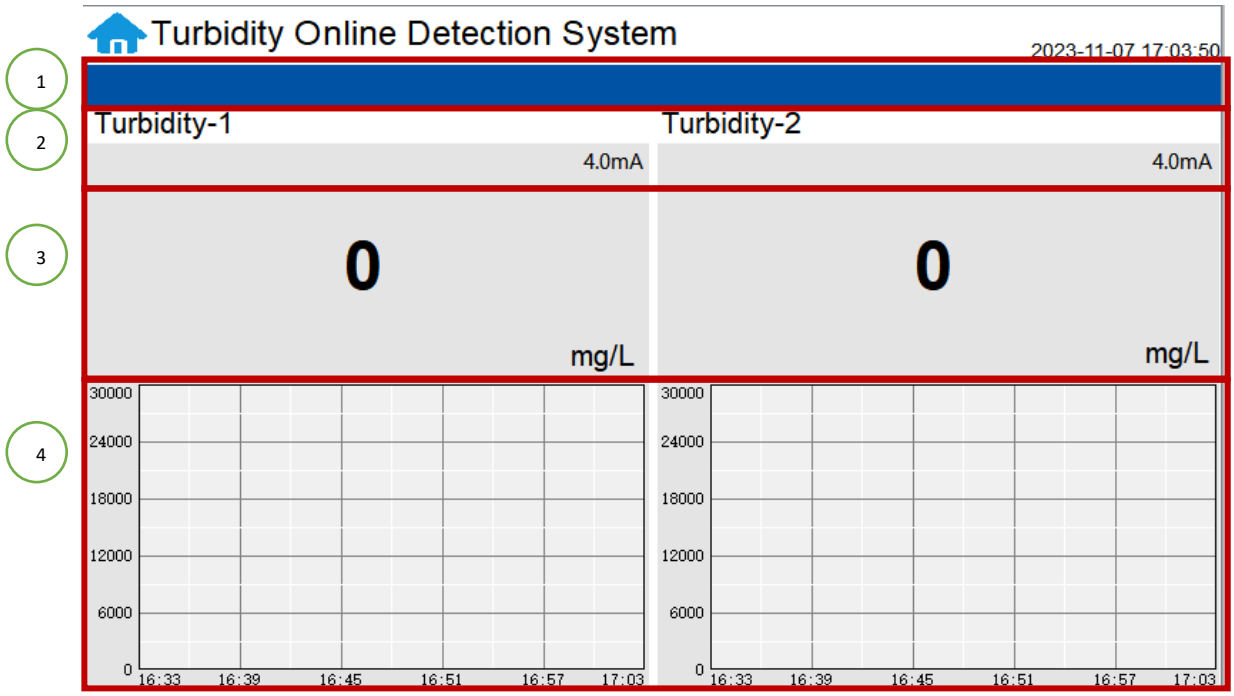


Figure. 5 Real-time Monitoring Screen

Table. 1 Main Interface Function Introduction

No.	Function Introduction
1	The blue area will scroll the alarm information in real time. Please deal with the alarm according to the content in time
2	Real-time display of the current sensor 4-20mA signal values
3	Real-time display of current sensor measurements, as well as flow
4	The historical data are recorded in a curvilinear manner. The abscissa is the time and the ordinate is the measured value

Hold on to the curve area for 2 seconds and let go. The Y-axis curve range setting dialog box will pop up. The Y-axis display value range of the measurement index curve can be changed. Click the other area of the screen again after modification to save the screen of exit Settings.

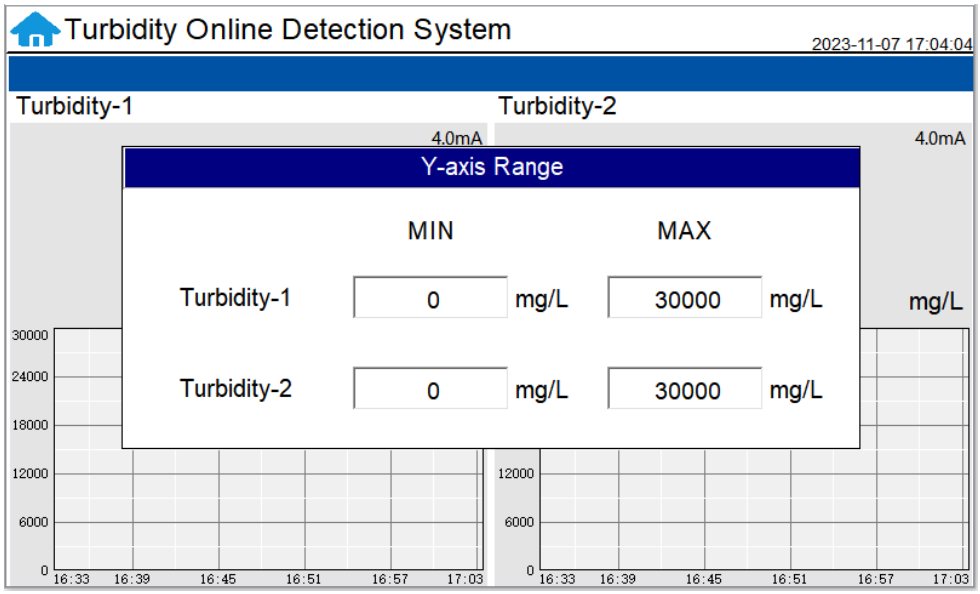


Figure. 6 Curve Range Setting

When "*******" appears on the interface, it means that the sensor is abnormal or the communication fails.

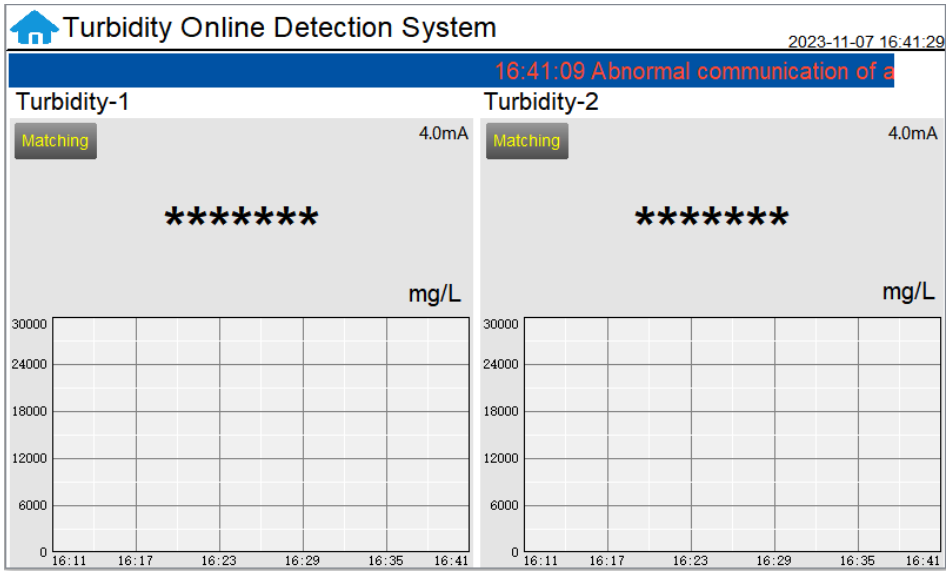


Figure. 7 Loss of Sensor Signal

After replacing the new sensor and confirming the connection, click "Matching" in the upper left corner of the corresponding interface, and you will be prompted to confirm the connection again.

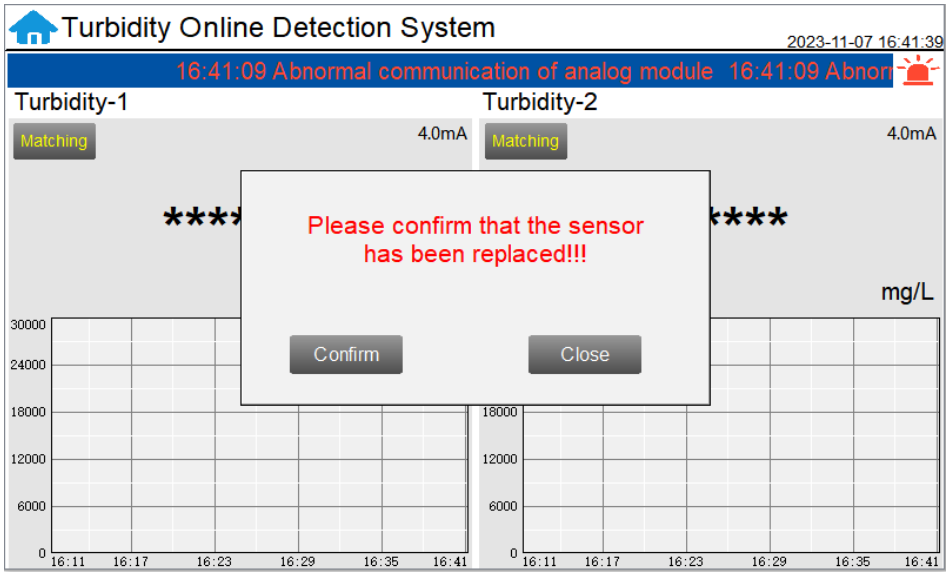


Figure. 8 Confirm Sensor Replacement

After clicking "Confirm", the system will start to match the sensors and wait for the matching to complete.

When the prompt "Match complete" indicates that the sensor is successfully matched, close the prompt box and it can be used normally.

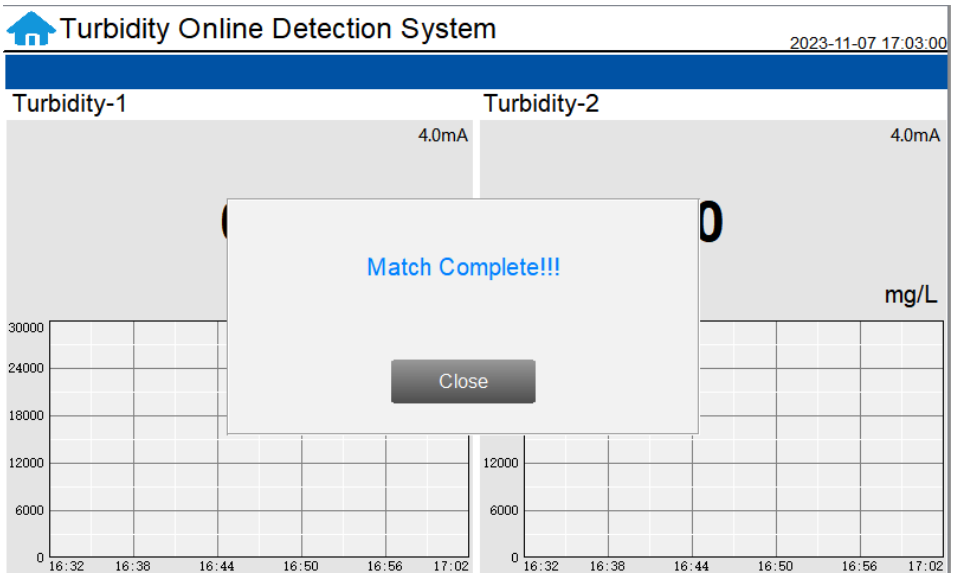


Figure. 9 Match Complete

When it prompts "Match timeout", it means that the matching fails. Please confirm that the cable is connected correctly and repeat the above operations. If it still fails, please contact Pyxis Lab.

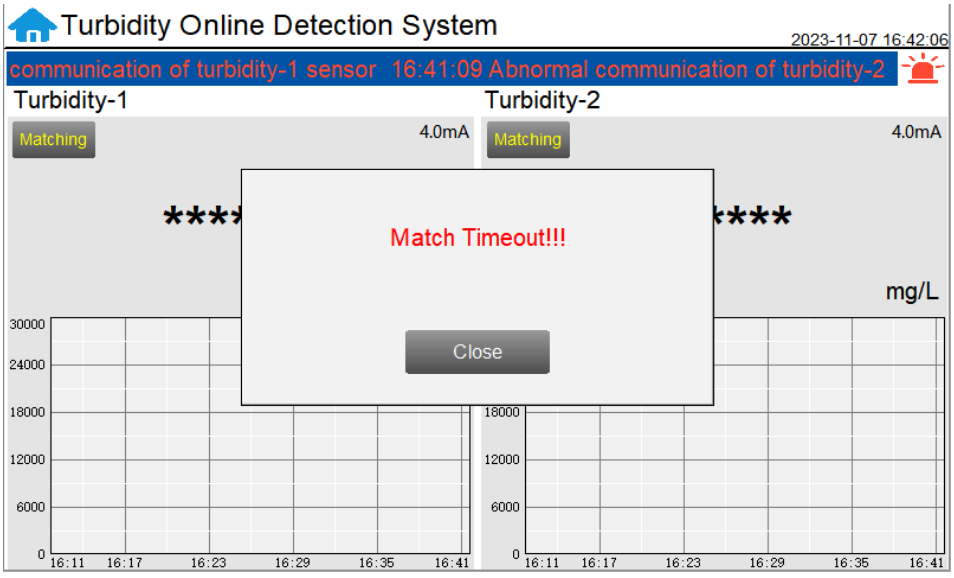


Figure. 10 Match Timeout

The above information applies only to replacement or damaged sensors. If the sensor is removed on site and the same sensor is reconnected, the controller will automatically connect without this operation.

6.4. Menu Bar

Click the " " button in the upper left corner of the screen to enter the system menu interface, where the user can choose to enter the desired operation interface.

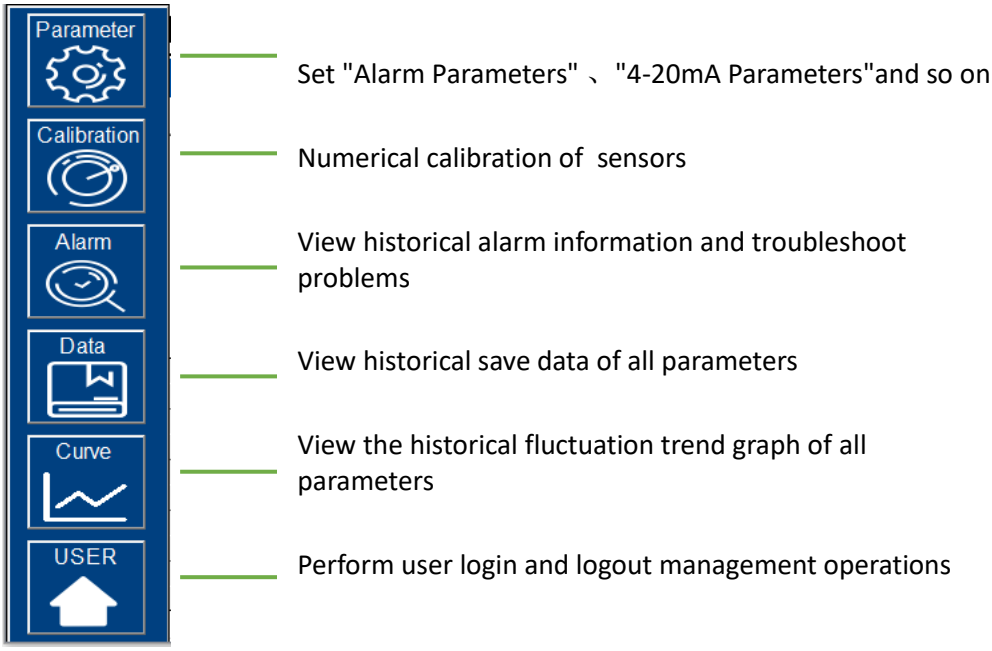


Figure. 11 Menu Bar

6.5. Parameter Setting

Click the "Parameter" button in the menu bar, you can choose to enter the "Alarm Parameters" 、 "4-20mA Output"setting interface:

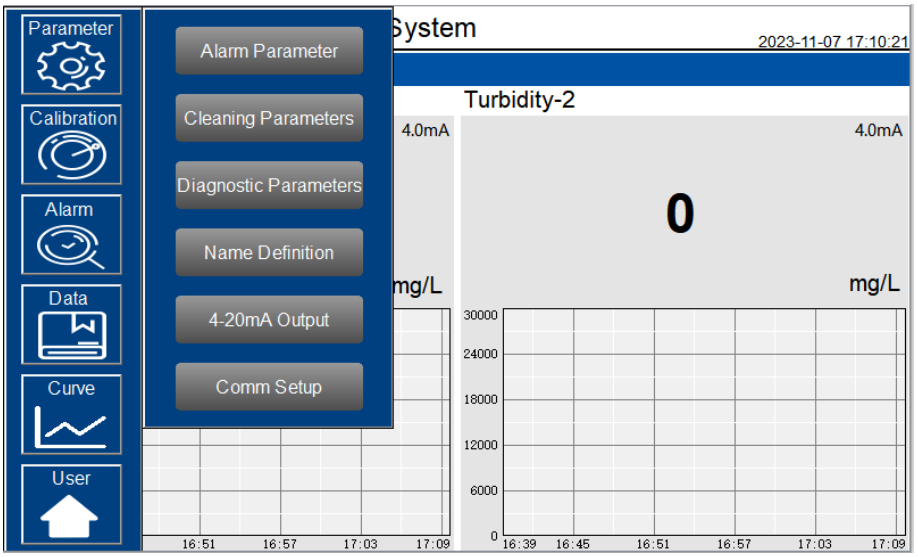


Figure. 12 Parameter Settings

6.5.1. Alarm Parameters

The upper and lower limits of alarm can be set. Click "Alarm Parameters" to enter the interface of setting alarm parameters. When the measured value is lower than the set lower limit, the "**** lower limit alarm" of the corresponding sensor will be displayed in the real-time monitoring screen; when the measured value is higher than the set upper limit, the "**** upper limit alarm" of the corresponding sensor will be displayed in the real-time monitoring screen. Users can also choose to turn on or off the alarm display function at the top right of the corresponding parameter.

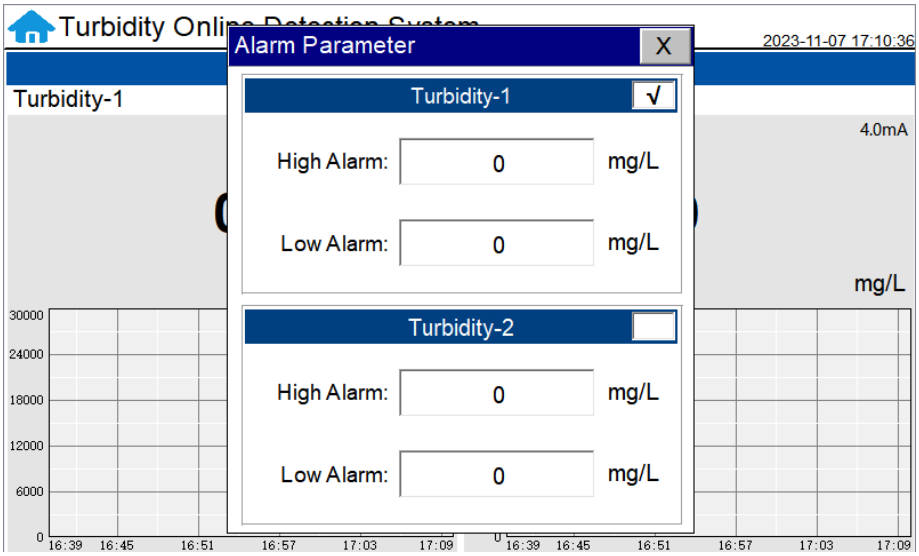


Figure. 13 Alarm Parameter Settings

6.5.2. Cleaning Parameters Setting

In "Cleaning Parameters" you can select the manual/automatic mode of the sensor cleaning brush. In manual mode, click on the "Start" button and the sensor will run for a set number of times according to the "Work Frequency" above. In Cycle Mode, turn on the "Cycle Controt" button and the sensor will run according to the set number of times.

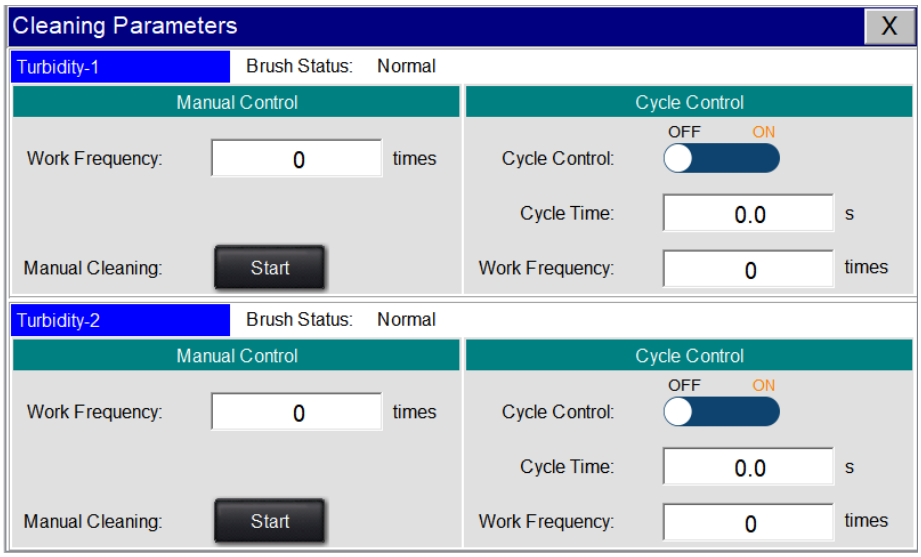


Figure. 14 Cleaning Parameters Setting

6.5.3. Diagnostic Parameters

Click “Diagnosis Parameters” to the diagnosis page. In the diagnosis page, the raw data measured by the probe is displayed. To help troubleshooting possible issues with the probe, please save an image of this data when the probe is placed in a clean water (tap water or deionized water), in a standard, and in the sample that the probe is intended for.

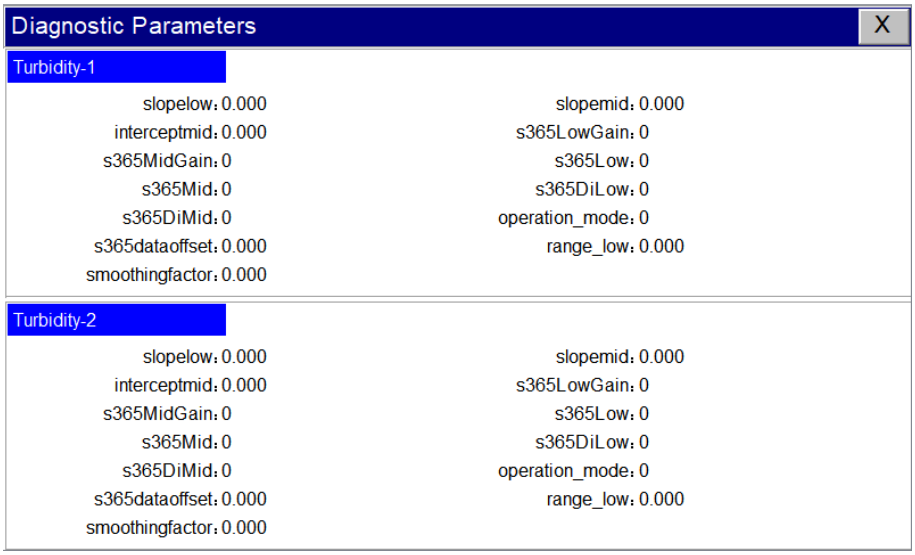


Figure. 15 Diagnostic Parameters

6.5.4. Name Definition

Click the orange dialog box to customize the sensor name. The default will be named Turbidity, however Suspended Solids is a more applicable for LT-635.

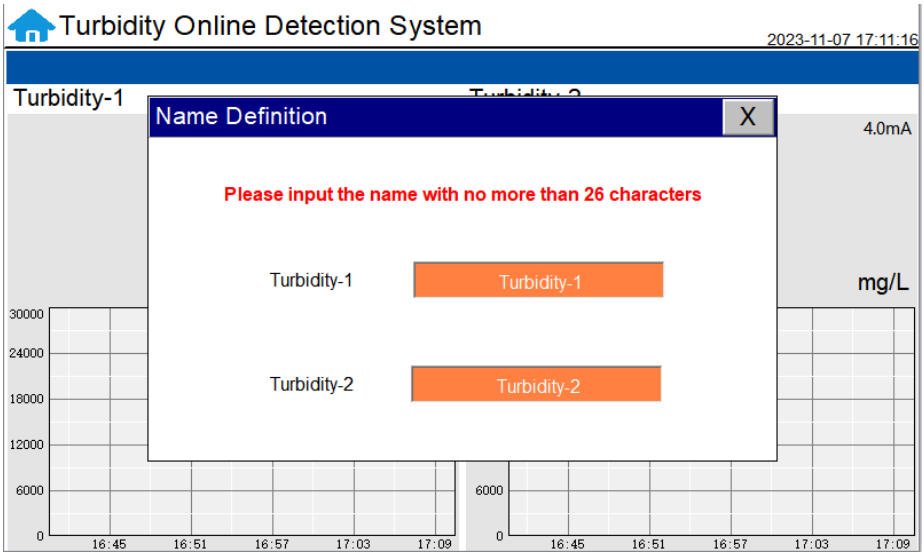


Figure. 16 Name Definition

6.5.5. 4-20mA Parameter

Click "4-20mA parameter" to enter the 4-20mA parameter setting interface. The 4mA output value corresponds to the lower limit of the sensor range value, and the 20mA output value corresponds to the upper limit of the range value. The closer the value setting is to the measured value, the more accurate it is recommended to set according to the sensor range.

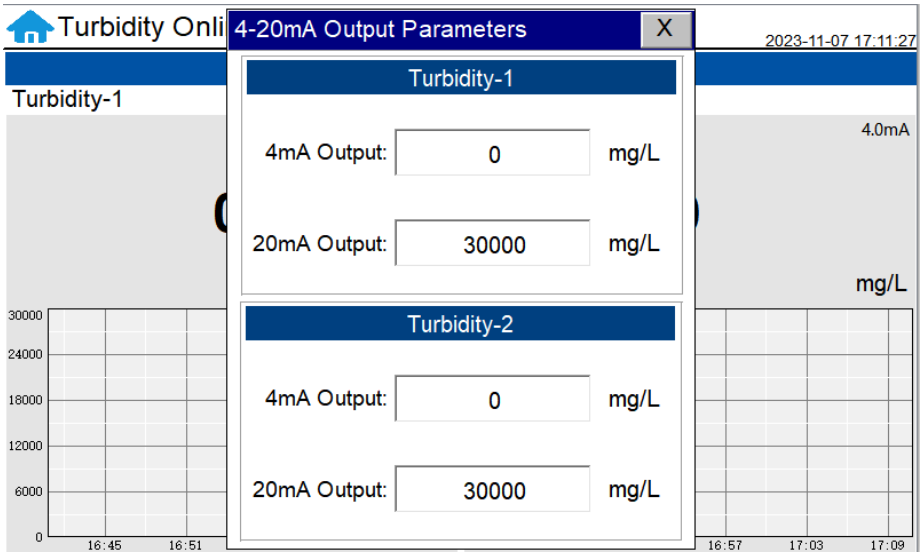


Figure. 17 4-20mA Setting

6.5.6. Communication Setup

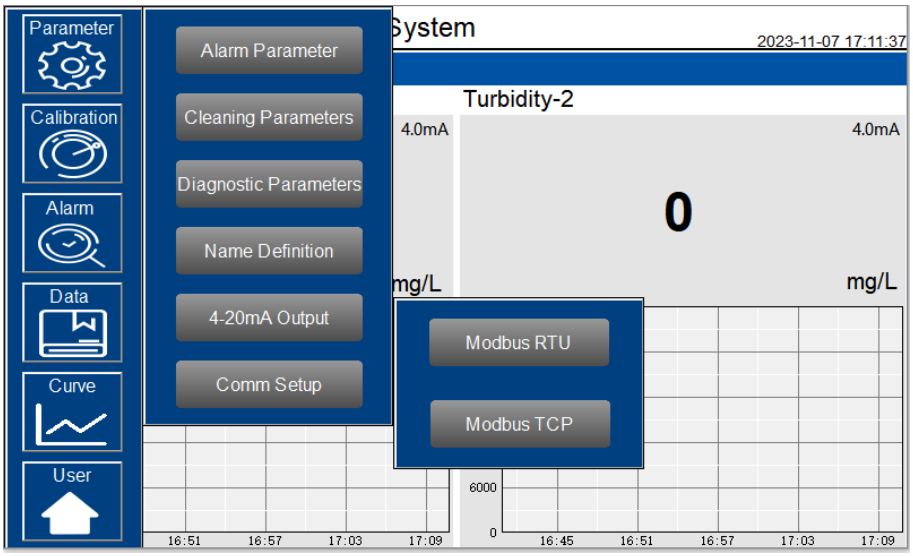


Figure. 18 Communication Setup

Communication parameters generally do not need to be changed. If the communication station number and other parameters need to be changed on site, they can be changed on this interface.

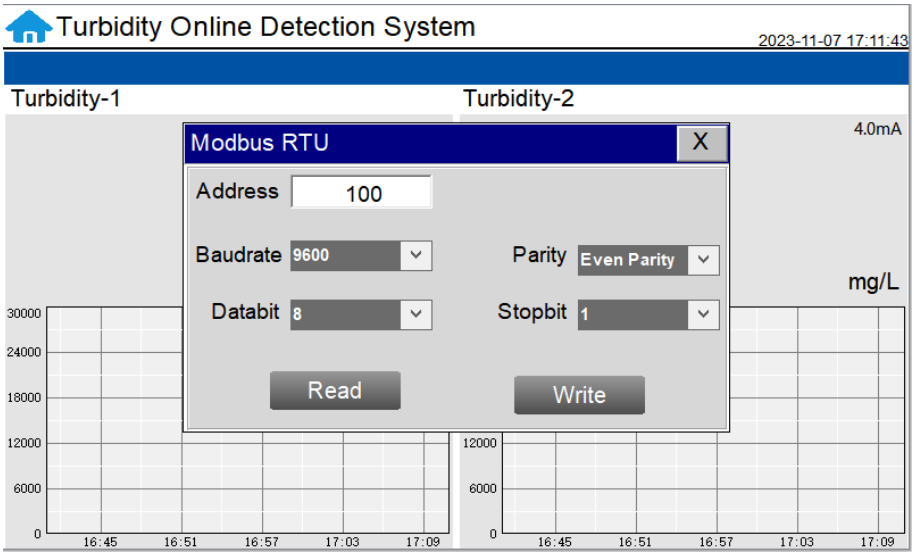


Figure. 19 Modbus RTU

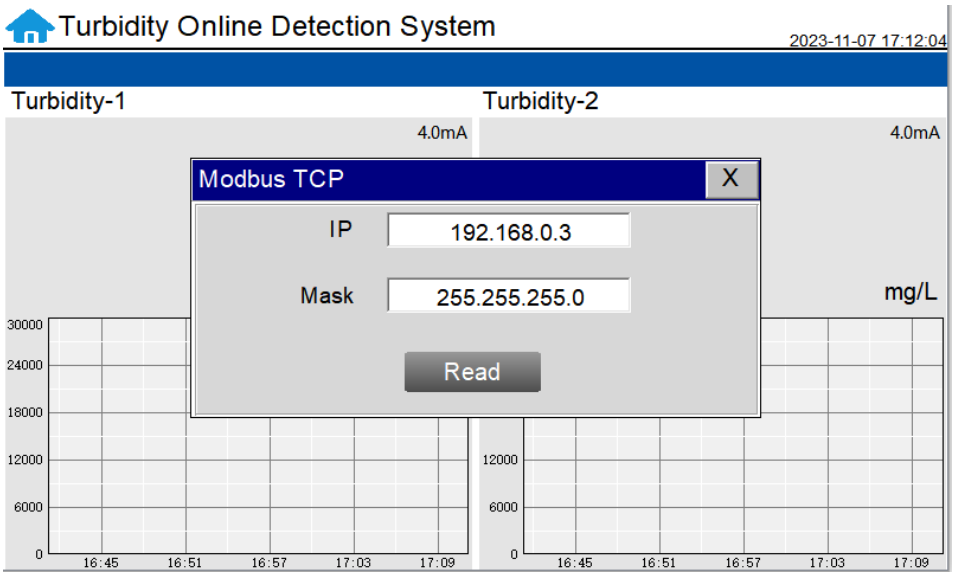


Figure. 20 Modbus TCP

6.6. Calibration

The LT-635 suspended solids sensor is rigorously calibrated at the Pyxis Lab factory. If the sensor is kept clean, the user will not need to calibrate the sensor for one year of operation. However, the user may calibrate the sensor as desired.

NOTE *Pyxis recommends the sensor be calibrated to the application range of its use only.*

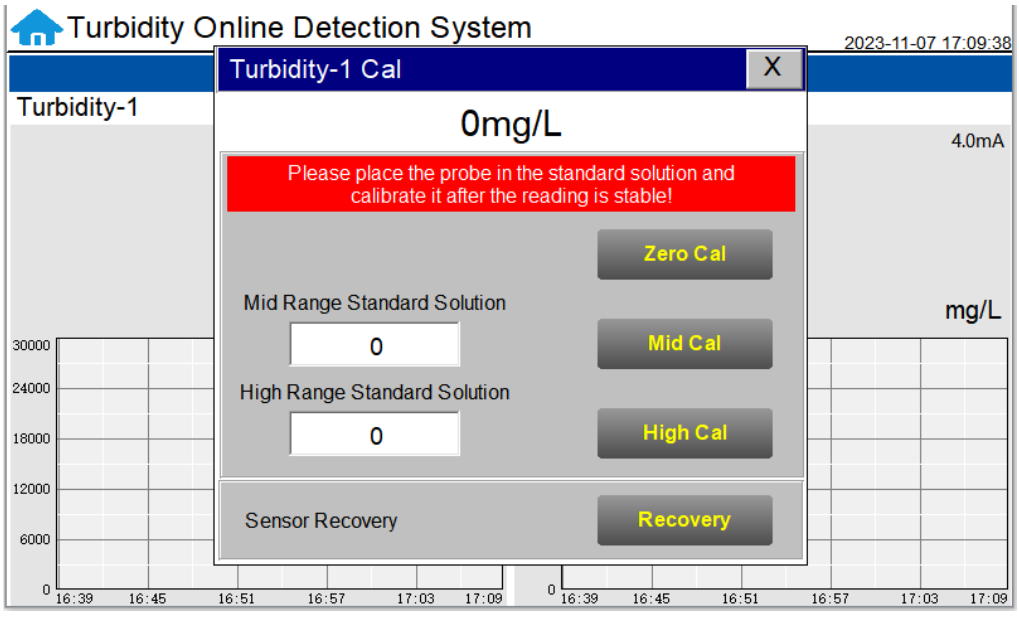


Figure. 21 Calibration Interface

Zero Calibration Process - Remove the LT-635 sensor and rinse it thoroughly with deionized water. Repeat this rinse process three times. Wipe the sensor with a dust-free cloth or paper-towel to confirm that the

sensor is free of obvious impurities. Insert the sensor into a bucket or large beaker. Add bubble-free deionized water into a bucket or large beaker and wait for the sensor reading to stabilize. Click the"Zero Calibration" button after the reading stabilizes. If the calibration is successful, the interface will return a message "Calibration Succeeded". If the calibration has failed, the interface will return a message "Calibration Failed", and the user must repeat the process until calibration success is achieved. ***NOTE*** *the LT-635 sensor must have a minimum distance of 15 cm from the containter bottom and 10cm from the container wall in order to function properly for operation and calibration.*

Mid-Range Calibration Process - After completing Deionized Water Calibration, remove and insert the LT-635 sensor into a clean and dry bucket or large beaker and add the midpoint calibration solution. ***NOTE*** *The midpoint calibration solution can be process water of the application itself, with a verified Total Suspended Solids (TSS) value in the range of 1,000 to 10,000 mg/L.* The recommended method of TSS verification for the calibration solution being used is Gravimetric Total Suspended Solids determination. Wait until the reading stabilizes and then click the Midpoint Calibration button to calibrate the midpoint. If the calibration is successful, the interface will return a message "Calibration Succeeded". If the calibration has failed, the interface will return a message "Calibration Failed" and the user must repeat the process until calibration success is achieved. ***NOTE*** *the LT-635 sensor must have a minimum distance of 15 cm from the containter bottom and 10cm from the container wall in order to function properly for operation and calibration.*

High-Range Calibration Process - If the high range calibration is not required (>10,000mg/L), the user does not need to calibrate the high range. To continue with the high range calibration after completing MidRange calibration, remove and insert the LT-635 sensor into a clean and dry bucket or large beaker and add the High Point calibration solution. ***NOTE*** *The high point calibration solution can be process water of the application itself, with a verified Total Suspended Solids (TSS) value in the range of 10,000 to 30,000 mg/L.* The recommended method of TSS verification for the calibration solution being used is Gravimetric Total Suspended Solids determination. Wait until the reading stabilizes and then click the High Point Calibration button to calibrate the high point. If the calibration is successful, the interface will return a message "Calibration Succeeded". If the calibration has failed, the interface will return a message "Calibration Failed" and the user must repeat the process until calibration success is achieved. ***NOTE*** *the LT-635 sensor must have a minimum distance of 15 cm from the containter bottom and 10cm from the container wall in order to function properly for operation and calibration.*

Restore To Factory - If user wants to restore the sensor calibration to factory default parameters, click the OK option to confirm. If the restoration is successful, the interface will return a message "Restore Succeed"

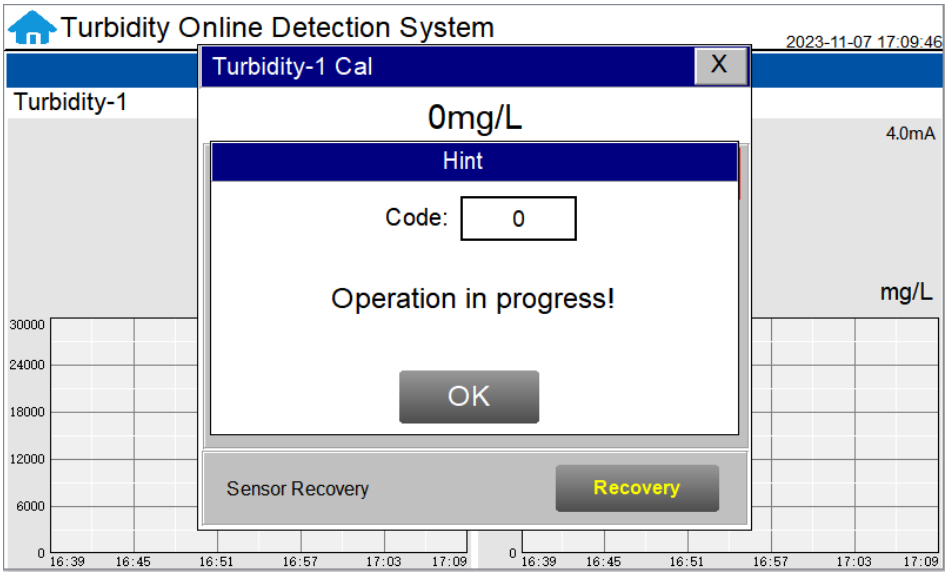


Figure. 22 Calibration Success

6.7. Alarm browsing

Click the "Alarm Browsing" button on the main interface to enter the alarm browsing interface.

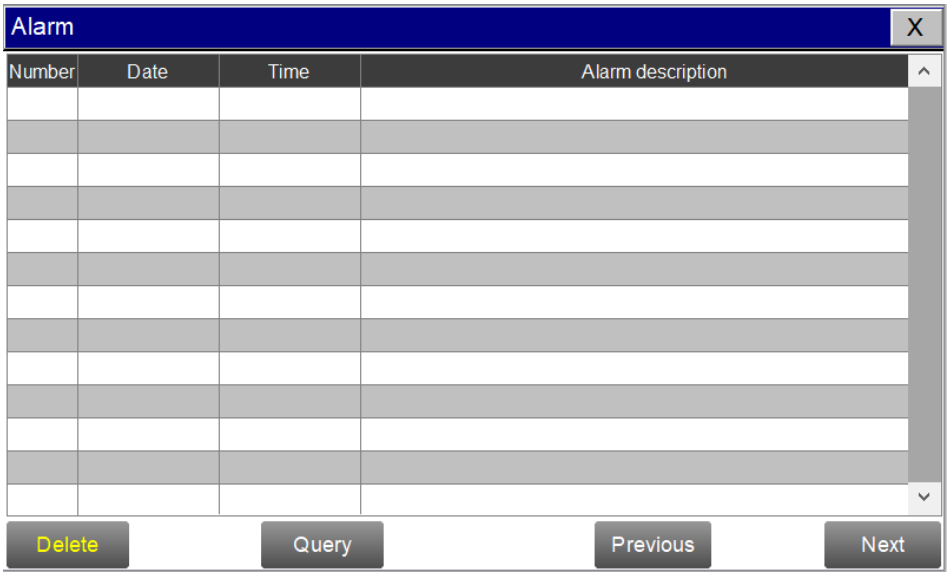


Figure. 23 Alarm Browsing

In this interface, the user can browse all alarm signals. Drag the right scroll bar to slide up and down to view historical alarm records. You can also click "Previous" and "Next" to turn pages quickly.

Click Query, enter the number in the pop-up box and query, you can quickly view the alarm problem of the corresponding number.

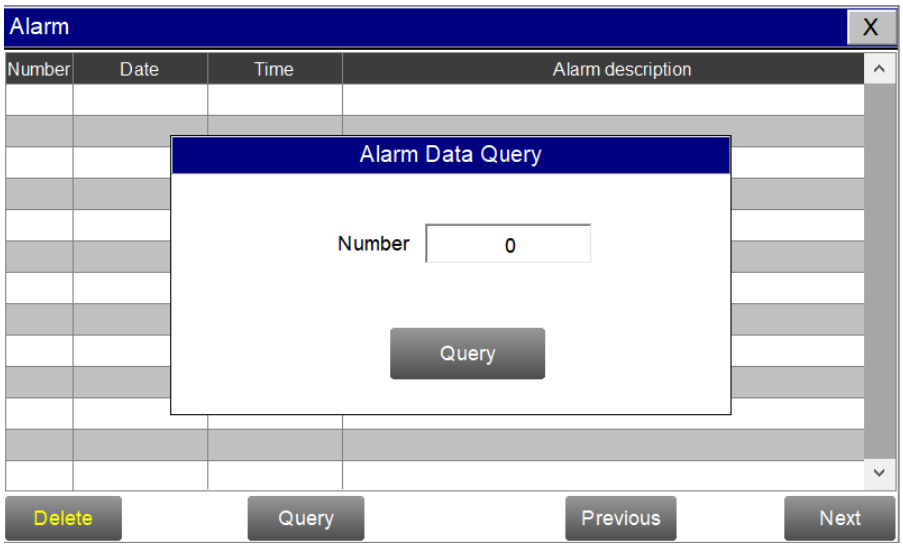


Figure. 24 Alarm Data Query Interface

After clicking the delete button in the lower left corner, all alarm records will be deleted. After clicking delete, you need to exit the current interface and enter again, the historical data in the data report will be cleared.

6.8. Historical data

Click the "Historical Data" button in the menu bar to enter the data report interface.

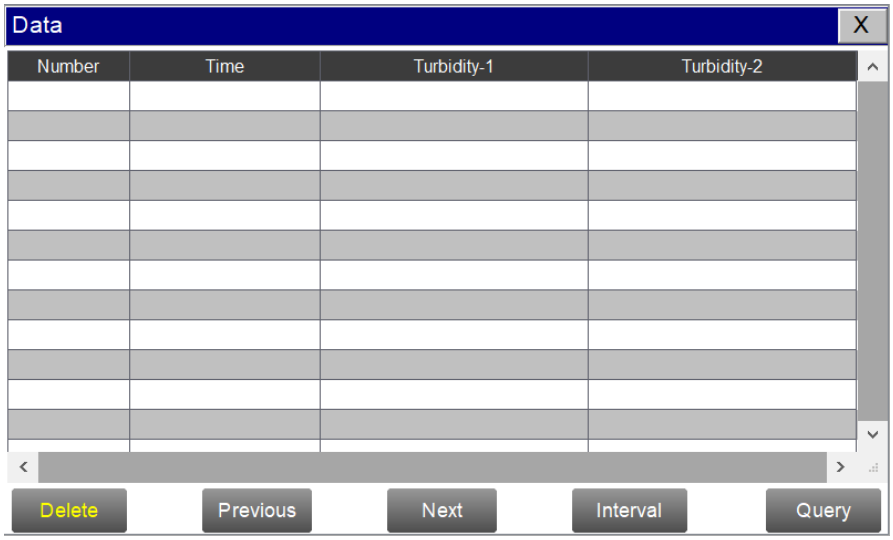


Figure. 25 Historical Data Interface

In the data report, the user can view the stored data of all parameters. The system records sensor readings every 4 seconds by default. Drag the scroll bar on the right to slide up or down, or click "Previous" and "Next" to view historical data records. The data record can save 100,000 pieces of data, and more than 100,000 will overwrite the previous data. The user can click the periodicity button to change th eperiod time of the system recording data.

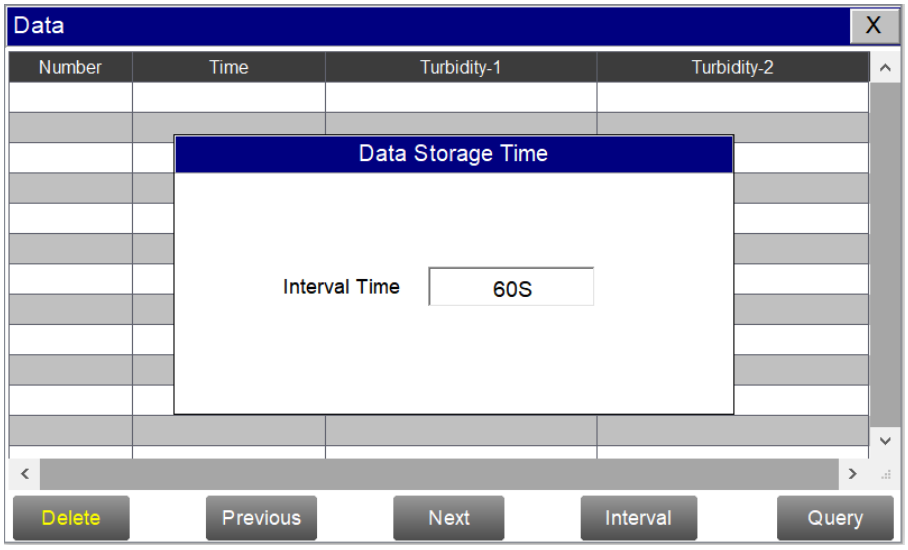


Figure. 26 Data storage cycle time Settings

Click Delete in the lower left corner. After entering the retention time, click the Delete button to clear all historical data except the retention time.

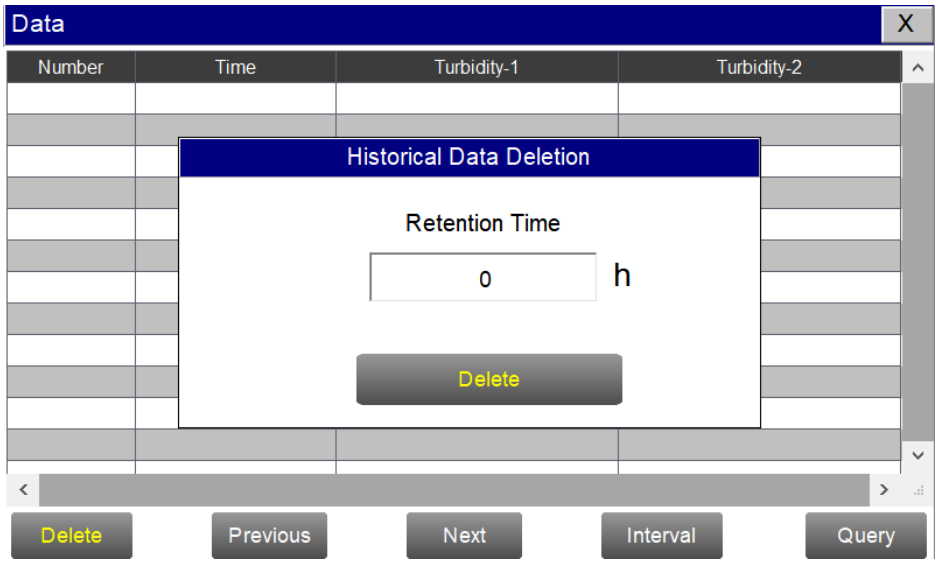


Figure. 27 Delete historical data interface

Click the query in the lower right corner, enter the start time and end time, and then click the query button, the data report will only display the historical data of the regional time. ***NOTE*** *The start time and end time need to be filled in completely according to the system time format (note the symbol format, which needs to be entered in the English input method state， you can refer to "Current Time"), otherwise it will not be recognized for query.*

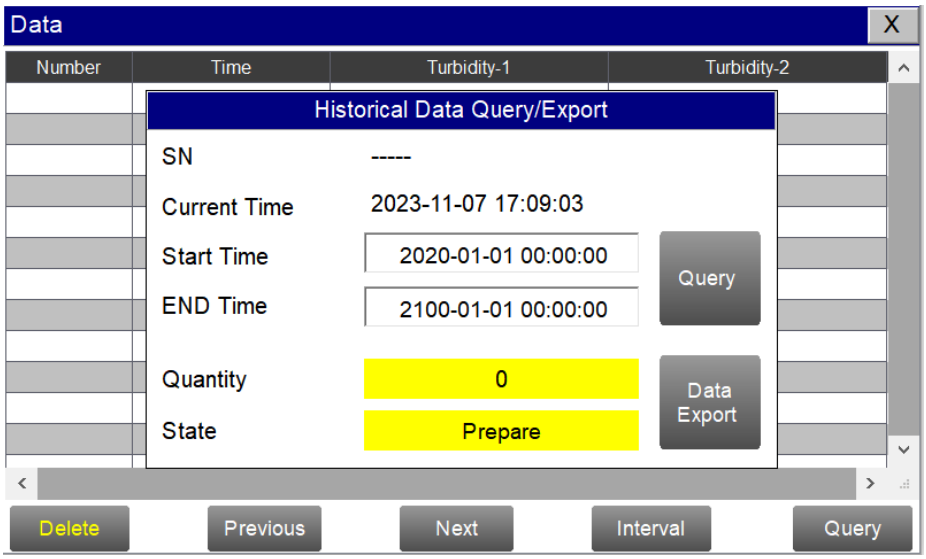


Figure. 28 Historical data query export interface

Insert the U disk behind the screen, and enter the time range of the data to be exported in the query area, click on the data export, when the status is displayed as success, and the quantity is positive, it means that the data export is successful; if the status is displayed successfully, the quantity is negative , Indicating that the data was not successfully exported, please check whether the time format is correct.

If the Quantity column shows a negative value, you can refer to the list to see the problem:

Table. 2 Code meaning

Code	Detailed question
-1001	Incorrect progress or control data object type
-1004	The group object name does not exist or the group object does not have the save attribute
-1020	The start time of the export is greater than the end time
-1021	U disk is not inserted
-1022	Only one export task is allowed at a time
-1023	The number of records read is 0
-1024	File operation failed
-1025	Export path is empty
-1026	Illegal export path
-1027	The time format is incorrect
-1028	Unsupported export mode

6.9. Historical Data Curve

Click the "historical curve" button in the menu bar to enter the trend curve interface. The ordinate is the monitoring value of the sensor, and the abscissa is the monitoring time. You can click the button below the abscissa to browse and view the values in different time periods. Clicking the Y-axis range will pop up the Y-axis range as shown in the figure. Enter the minimum and maximum values to change the displayed value of the Y-axis of the curve.

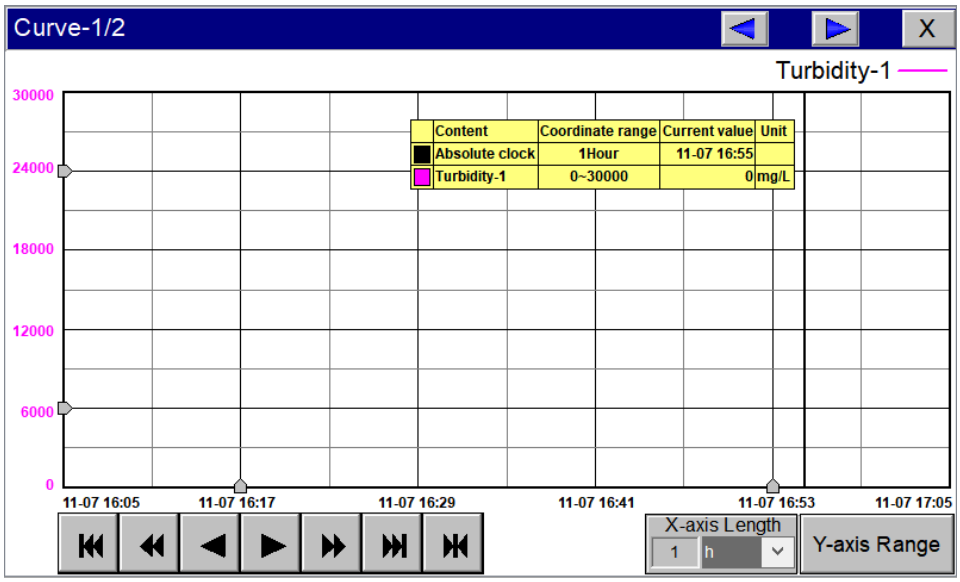


Figure. 29 Historical Curve Interface-1

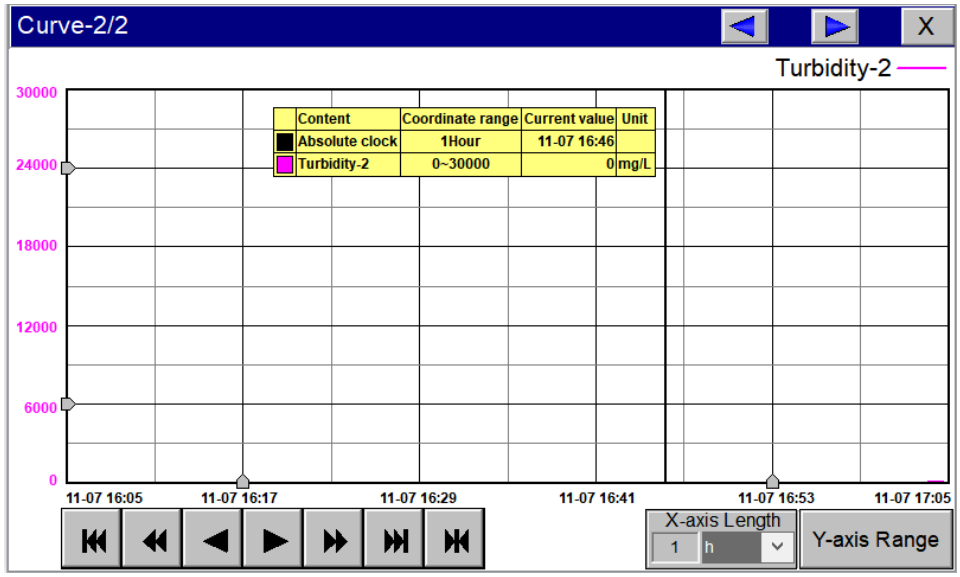


Figure. 30 Historical Curve Interface-2

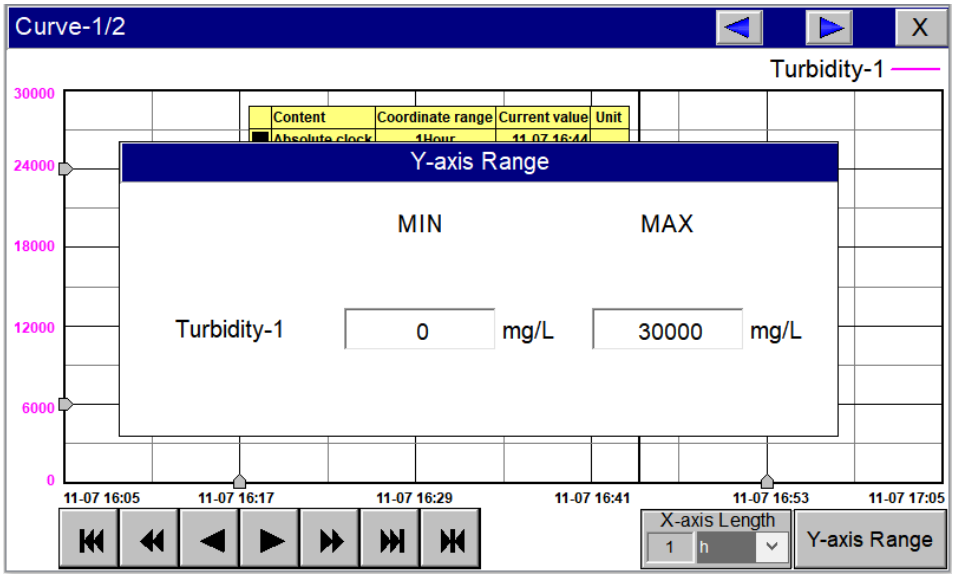


Figure. 31 Y Axis Range Setting-1

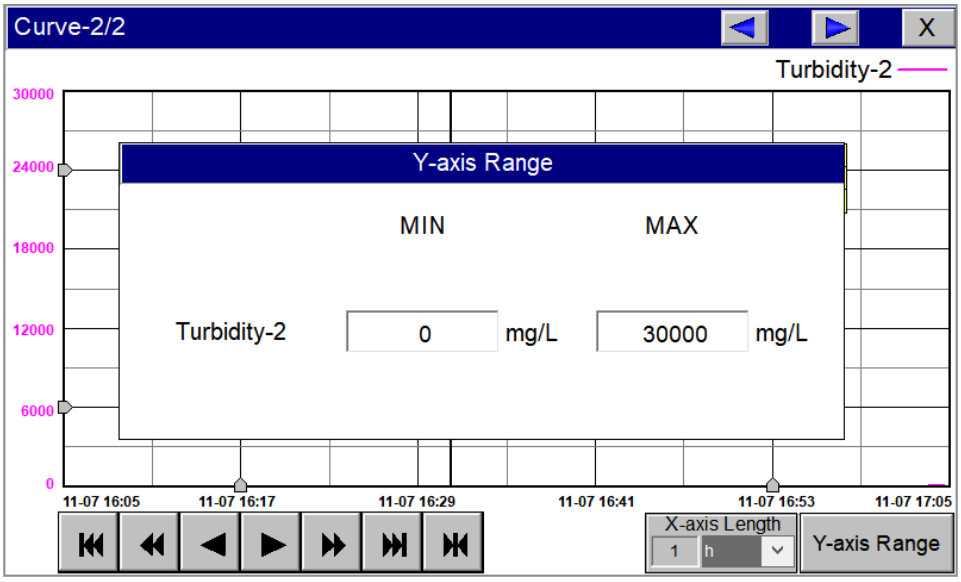


Figure. 32 Y Axis Range Setting-2

- The curve will scroll back (to the left of the X-axis) one page
- The curve will scroll back (to the left of the X-axis) half the page of the curve
- The curve will scroll backward (to the left of the X-axis) to a position where the main line is drawn
- The curve will scroll forward (to the right of the X-axis) to a position where the main line is drawn
- The curve will scroll forward (to the right of the X-axis) half the page of the curve
- The curve will scroll forward (to the right of the X-axis) one page
- A dialog box will pop up to reset the starting time of the curve

Figure. 33 Button Introduction

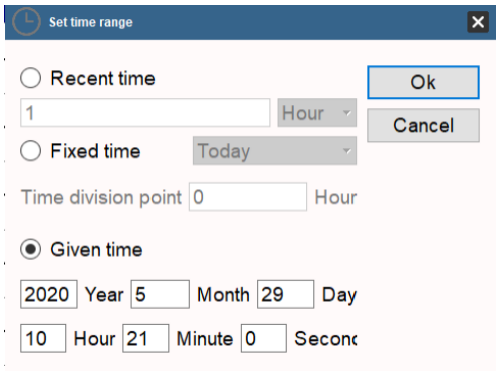


Figure. 34 Time Setting Interface

6.10. User Management

Click the "User Management" button on the menu bar, users can edit user information in this interface and switch between Chinese and English.

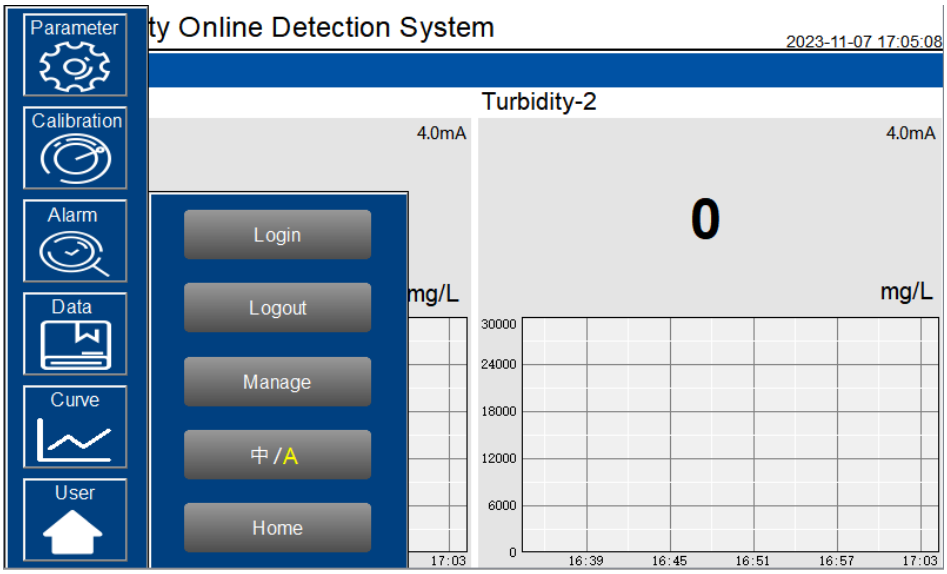


Figure. 35 User Management

Logout can make the user log out, and can only view the real-time reading, but cannot perform parameter setting and other operations.

Click Admin to enter the user management interface, where you can add users, modify passwords and other operations. Users can set their own user name and password, and select the user group to which they belong. Among them, only users in the administrator group can set parameters such as calibration.

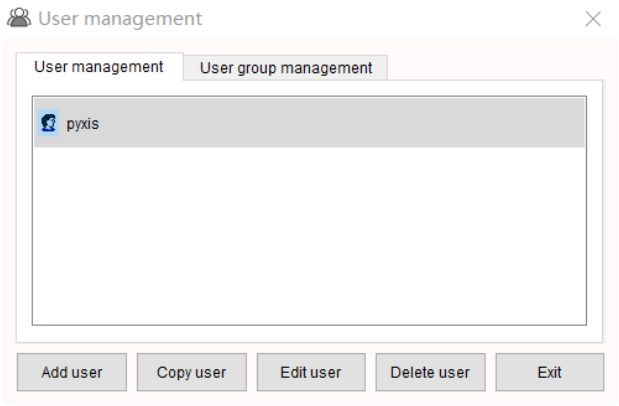


Figure. 36 User Management Interface

Change Password: Select the user to be changed, then click the Change User button, enter the user's own password in the User Password column and Confirm Password column, and click Confirm to modify successfully. Note: If the user does not want to set a password, the password can be deleted and saved.

7. Routine Maintenance

7.1. Modbus Communication Table

Table. 3 UC-100AGS Communication address

No.	Define	Address	Format	Model	Unit	Note
1	Turbidity_1	1	float	Read only	mg/L	Data format ABCD
2	Turbidity_2	3	float	Read only	mg/L	
3	Turbidity_1 lower limit alarm	5	uint	Read only		0: normal 1: alarm
4	Turbidity 1 Upper Limit Alarm	6	uint	Read only		
5	Turbidity_2_Lower_Limit_Alarm	7	uint	Read only		
6	Turbidity_2_high_limit_alarm	8	uint	Read only		
7	Turbidity 1 Sensor Communication Abnormal	9	uint	Read only		
8	Turbidity 2 sensor communication abnormality	10	uint	Read only		
9	Analog module communication abnormality	11	uint	Read only		
10	Brush 1 abnormal	12	uint	Read only		
11	Brush 2 abnormal	13	uint	Read only		
Communication protocol: standard Modbus-RTU						
Communication parameters: baud rate -9600, data bit-8, stop bit-1, parity bit-even						
Station number: 100						
Communication protocol: standard Modbus-TCP						
Communication parameters: IP: 192.168.0.3 (can be set); Port: 502						
Station number: 1						

7.2. Sensor Cleaning and Maintenance

The LT-635 sensor is designed to provide reliable and continuous Total Suspended Solids readings.

Although a self-cleaning feature has been added, heavy fouling can prevent light from reaching the sensor and may affect the accuracy of the sensor, depending on application conditions.

The LT-635 sensor is designed to be easily removed, inspected, and cleaned if required.

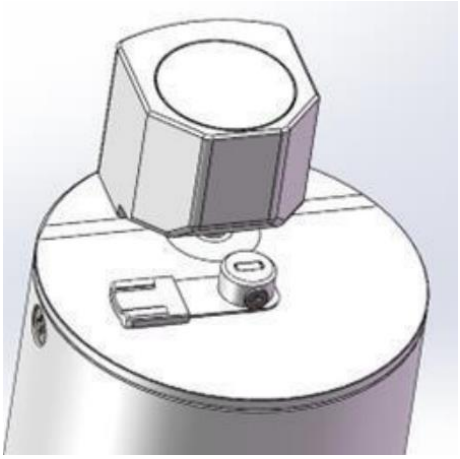
Aged heavy deposition, especially inorganic deposits such as iron oxide and calcium carbonate, can be removed by submersing and soaking (15 minutes) the LT-635 sensor into the Pyxis Sensor Cleaning Solution Kit available from Pyxis online Estore/Catalog https://www.pyxis-lab.com/product/inline sensorcleaning-kit/

Figure. 37 Pyxis Probe Cleaning Solution Kit (P/N: SER-01)

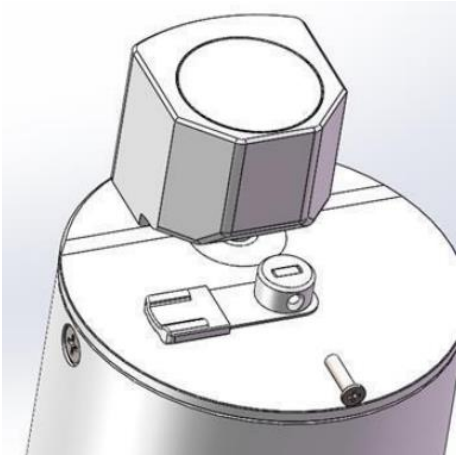
7.3. Sensor Wiper Replacement Procedure

The LT-635 will require wiper and arm replacement on a frequency of annualy or as needed based on water quality. The replacement **LT-635 Wiper/Arm Assembly Kit** (P/N 50700-A52) is provided with a quantity of 5 wipers/arms per kit and can be purchased by contacting order@pyxis-lab.com

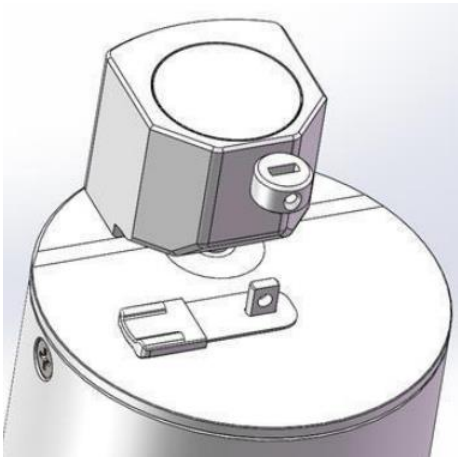
Replacement of wiper/arm kit assembly requires a total of 7 steps.



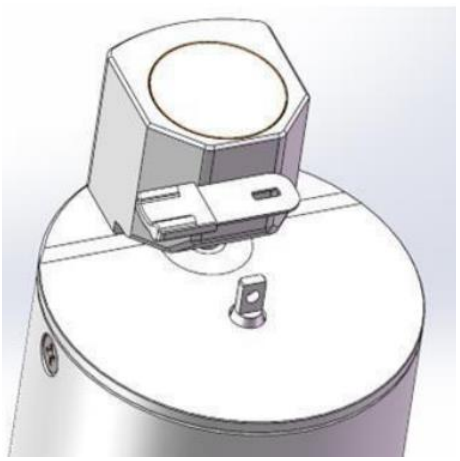
Step 1 Set the wiper arm assembly to a horizontal position after powering off the sensor



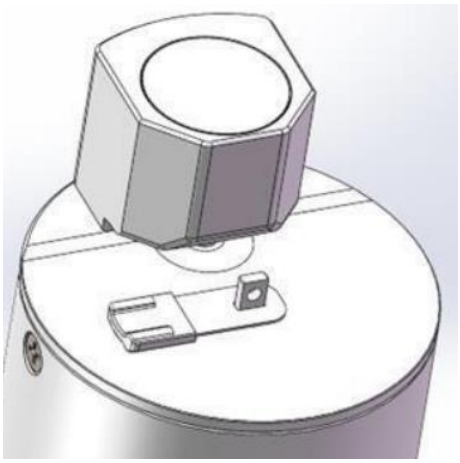
Step 2 Remove the M2 screw that holds the nut



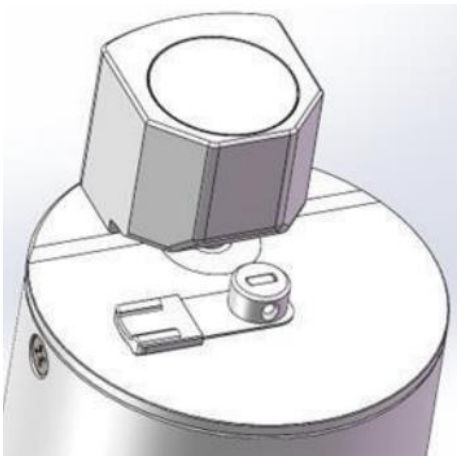
Step 3 Remove the nut that retainsthe wiper arm assembly



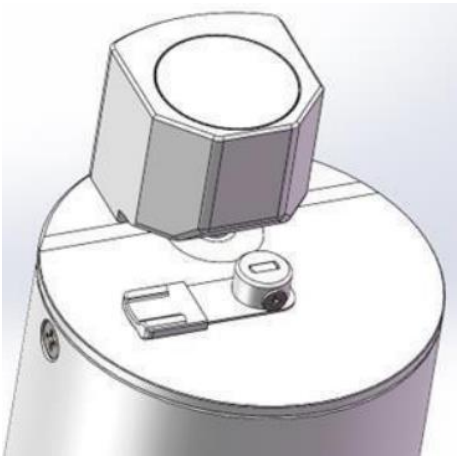
Step 4 Remove the old wiper arm assembly



Step 5 Install the wiper arm assembly to the sensor



Step 6 Install the new nut on the sensor



Step 7 Install the new M2 screw into the nut

8. Contact us

Contact us if you have questions about the use or maintenance of the analyzer:

Pyxis Lab, Inc
21242 Spell Circle Dr.
Tomball, TX 77375
service@pyxis-lab.com