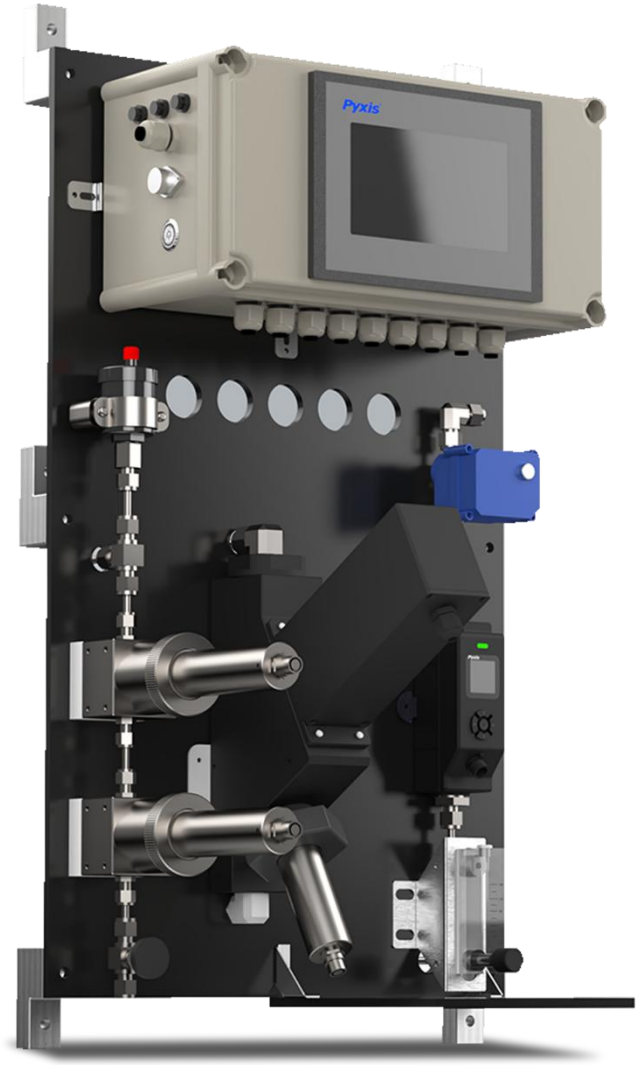
Pyxis®

WQMS-2000 Series

Quality Management Analyzer for Bottled & Beverage Water



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USER MANUAL

Pyxis

Related Statements

The manufacturer shall not be liable for direct, indirect, special, incidental or consequential damages resulting from any deficiency or omission in this manual. The manufacturer reserves the right to make changes to this manual and the products described in it at any time without notice or liability. Revised versions can be found on the manufacturer's website.

Safety Information

Please read this manual completely before unpacking, installing and operating this equipment. In particular, pay attention to all dangers, warnings and precautions, otherwise, it may cause serious personal injury to the operator or damage to the equipment.

Use of Danger Information

Danger
Indicates a potentially or urgent dangerous situation that, if not avoided, will cause death or serious injury.

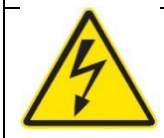
Warning
Indicates a potentially or very dangerous situation that, if not avoided, may cause serious personal injury or death.

Warning
Indicates a potentially dangerous situation that may cause a certain degree of personal injury.

Attention
Indicates conditions that if not avoided, will cause damage to the instrument. This is information that needs special emphasis.

Warning Label

Please read all labels and marks attached to the instrument. Failure to follow the instructions on these safety labels may result in personal injury or damage to the instrument.

	If this symbol appears in the instrument, it means refer to the operation and/or safety information in the instruction manual.
	If there is this mark on the instrument housing or insulator, it means there is a risk of electric shock or death from electric shock.
	Static electricity can damage the delicate internal electronic components, resulting in reduced performance or eventual failure of the instrument.
	Electrical equipment marked with this symbol cannot be disposed of through the European public waste system after August 12, 2005. In order to comply with European regional and national regulations (EU Directive 2002 / 98 / EC), European electrical equipment users must now return abandoned or expired equipment to the manufacturer for disposal without any cost.

Pyxis

Catalog

Pyxis

1. Specifications

Item	WQMS-2000	WQMS-2100
P/N	41396	46817
Turbidity Source / Wavelength	LED / Warm White	
Turbidity Dual Range	0.000 – 10.000 / 10.00 - 40.00 NTU	
Turbidity Flow Cell With Brushing	Included	NA
Oxidizer Method	Bare Gold - Electrochemical Method	
O3 Range	0.01 –2.00 ppm as O3	
Selectivity	Non-Selective / Cross-Sensitive to other Oxidizing Species	
pH Method	Electrochemical Method	
pH Range	0.01 – 14.00 pH	
TDS / Conductivity Method	2-Hastelloy Electrode	
TDS / Conductivity Range	0.02 – 1,000 uS/cm	
Measurement Accuracy	0.001NTU or ± 1% Full Scale ±0.01 ppm O3 or 1% Full Scale w/pH compensation to 9.0 ±0.01 pH ±1.5% µS/cm Conductivity	
Minimum Resolution	0.002 NTU 0.01 ppm O3 0.01 pH 1.0 µS/cm Conductivity	
Response Time	4s after immersion - Turbidity T95≤60s – Ozone T95≤5s – pH T95≤5s – Conductivity	
Compliance	EPA-180.1/334.0	
Measurement Interval	Continuous Measurement	
Display	7-inch LCD Color Industrial Capacitive Touch Screen	
Storage Capacity	Built-In 4GB of Ram for Storing up to 1-Million Data/Event Records	
Power Requirement	96-260VAC / 50-60 Hz; 10A Fuse; 200 W	
Output	5 x 4-20 mA / RS-485 Modbus - RTU / Modbus TCP	
Input	1 x 4-20 mA / RS-485 Modbus - RTU	
USB	1 x USB host, for data downloading and screen upgrade	
Internet	RJ-45 socket, Modbus-TCP	
Panel Operational Temperature	40 – 113°F (4-45 °C)	
Storage Temperature	Instrument: -4 – 131°F (-20 – 55°C) / Sensors 32 – 122°F (0 – 50°C)	
Sample Water Temperature	40 – 120°F (4-49°C)	
Sample Water Pressure	7.25 – 30 psi (0.05 – 0.2Mpa)	
Sample Water Flow Rate	100 - 300mL / Minute	
Sample Line Size	¼-inch OD Inlet / ¼-inch OD Outlet	
Rating	IP-65 Panel-Display / IP-67 Sensors	
Regulation	CE / RoHS	
Relative Humidity	20% - 90% (No Condensation)	
Altitude	<6,561 feet (<2,000 Meter)	
Dimensions (HxWxD)	Panel (WQMS-2000) 750H x 450W x 280D mm	
Approximate Product Weight	WQMS-2000 Series ~ 25 kg	

2. Unpackaging

The package includes the following items:

One WQMS-2000 Series Water Analyzer Panel Assembled and Complete with Power Supply Cord

- UC-100A Touch Screen Display/Data Logger with Pyxis Sensors Prewired in RS-485 (RTU)
- Inline Rotameter
- FS-100 Ultrasonic Flow Sensor
- Motorized Ball Valve – Flow Regulating
- ST-765SS-O3 (O3 + pH + Temperature) Sensor Mounted in ST-007 Tee Assembly
- ST-724 (Low Range Conductivity +Temperature) Sensor Mounted in ST-007 Tee Assembly
- LT-739 (Warm White Light) Ultra-Low Turbidity Sensor Mounted in 2 format options
  - FT-100-PLUS : Auto-Brushing Flow Reservoir (WQMS-2000)
  - FT-100 : Non-Brushing Flow Reservoir (WQMS-2100)

3. System Layout and Features

The WQMS-2000 series are multi-parameter inline water analyzers specifically designed as a 'Turn-Key' water quality monitoring solution for bottled water and beverage production applications. The WQMS-2000 series offers highly accurate, real-time measurement, display and data-logging of sample flow, Ultra-Low Turbidity, Ozone, Conductivity/TDS, pH and Temperature utilizing proprietary Pyxis Lab smart sensor technology, coupled with a Pyxis touch screen display and data logging terminal. The WQMS-2000 series is offered in a convenient and easy to integrate panel mounted format for rapid installation and simple maintenance.

Figure 1 - WQMS-2000
(Auto-Brushing Turbidity)

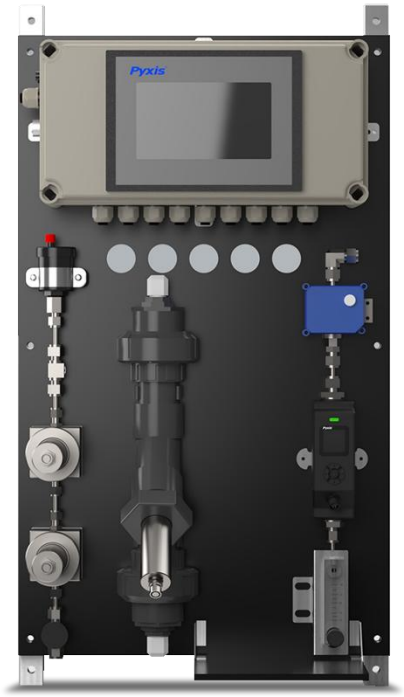


Figure 2 - WQMS-2100
(Non-Brushing Turbidity)

WQMS-2000 Series Features

- Pyxis Lab's advanced research and development sensor technologies to achieve highly accurate and stable measurement of Turbidity, Ozone, Conductivity/TDS, pH and Temperature.

- Pyxis LT-739 ultra-low resolution turbidity sensors offer a detection light source using warm white LED in 90-degree surface scatter format in accordance with USEPA 180.1 wavelength standards. The turbidity sensor is mounted in the unique Pyxis FT-100/FT-100-PLUS dual sensor flow reservoir enabling the highest resolution possible of 0.002NTU with unmatched stability. This sensor is housed in the FT-100-PLUS auto-brushing flow reservoir on the WQMS-2000, and FT-100 non-brushing flow reservoir on the WQMS-2100. The LT-739 offers simple calibration via the Pyxis L-CAL Portable Turbidity Calibration Kit as outlined in this manual.

- Pyxis ST-765SS-O3 is a three-parameter composite sensor used for the measurement residual ozone, pH, and temperature in compliance with USEPA 334.0 and ISO-7393 guidelines. The sensors advanced PCB offers built-in temperature and pH parameter compensation (up to pH 9.0+) algorithms eliminating the need for a supplemental pH sensor and controller. Unique Bare-Gold electrode technology for ozone measurement eliminates membranes and electrode solution replenishment commonly associated with conventional sensors. The ST-765SS-O3 has a uniquely designed flat bubble pH electrode design for reduced fouling potential. Reduce your maintenance and cost versus conventional electrochemical sensors by utilizing Pyxis replaceable Electrode Head (EH-765-O3) for this sensor allowing for years of reliable service. The ST-765SS-O3 may be calibrated in-situ after cleaning via DPD or similar Ozone wet chemistry test measurement of active sample.

- Pyxis ST-007 Single-Sensor inline stainless steel flow cell provides an ozone demand-free environment for the safe installation and accurate operation of the ST-765SS-O3 sensor. The inlet and outlet to the ST-007 are 316L stainless steel with SwageLok fittings in ¼-inch OD. The WQMS panel is also equipped with Rotameter and the FS-100 ultrasonic flow meter with motorized ball valve for user set flow rate and precise control with recording of the recommended flow range of 100-300 mL/minute. The outlet flow should be diverted to drain or the inlet of the pretreatment system for those desiring NSF compliance.

- Pyxis ST-724 is an industrial grade in-line ultra-low conductivity + temperature sensor specially designed for pure and ultra-pure water applications with a cell constant of 0.3. This 'smart sensor' provides a built-in transmitter supporting digital and analog signal outputs and is designed to simplify field installation, calibration and operation. The sensors offer simple ¾-inch MNPT threaded installation or installation in the Pyxis inline ST-007 Tee assembly and is constructed with a dual Hastelloy electrode tip and stainless-steel body.

- All Pyxis sensors are connected to the UC-100A display/data logger via RS-485 modbus (RTU) allowing for integrated sensor calibration interface and diagnostics within the display touch screen. Display/data logger offers 5 x 4-20mA output,1 x 4-20mA input as well as RS-485 and TCP-IP with remote diagnosis and parameter adjustment.

- Convenient and simple to install Back-Panel (WQMS-2000 Series) for rapid and easy installation. Truly a plumb and power to go platform with intense factory setup, testing and sensor calibration prior to shipment.

4. Dimension and Mounting

WQMS-2000 Series Panel Dimensions (mm)

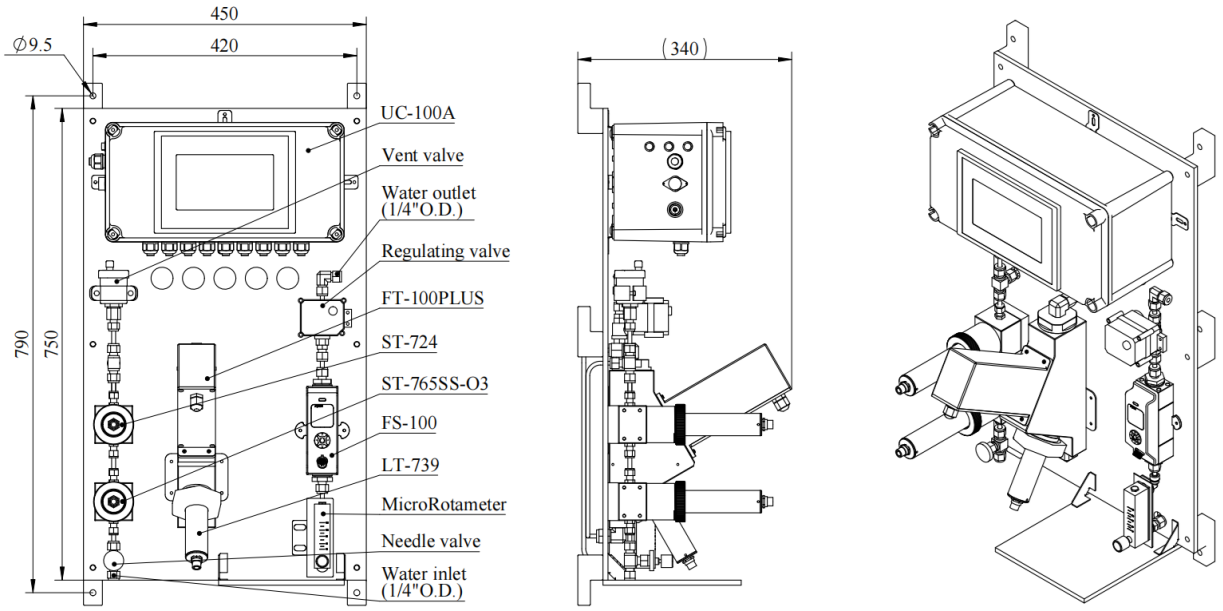


Figure 3 - WQMS-2000 *(Auto-Brushing Turbidity)*

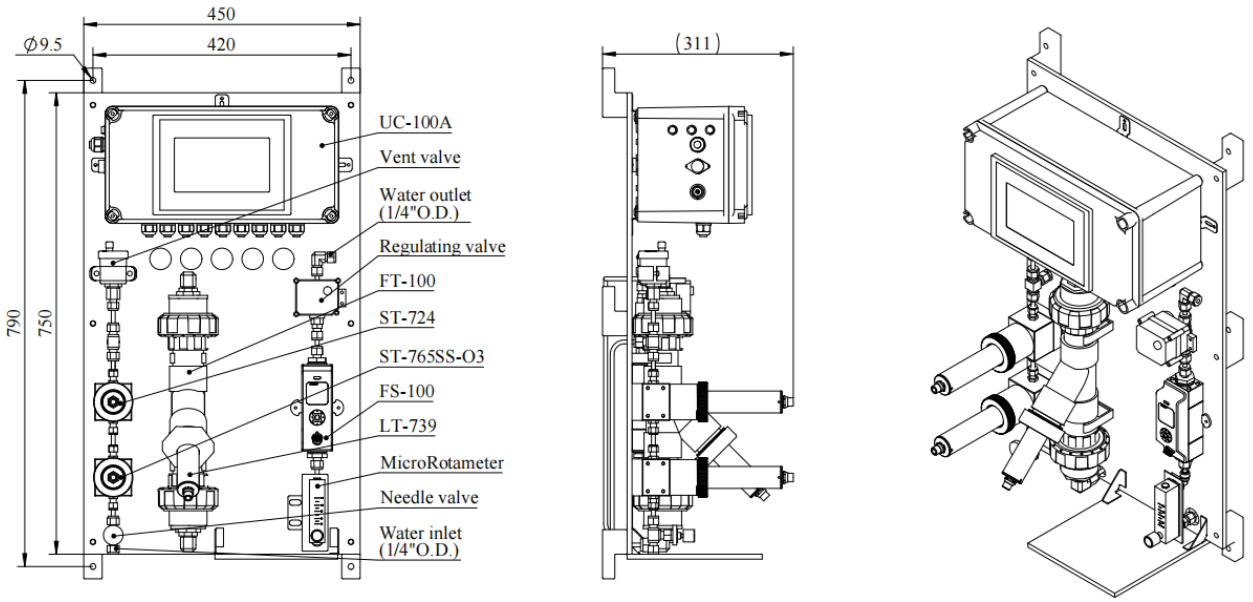
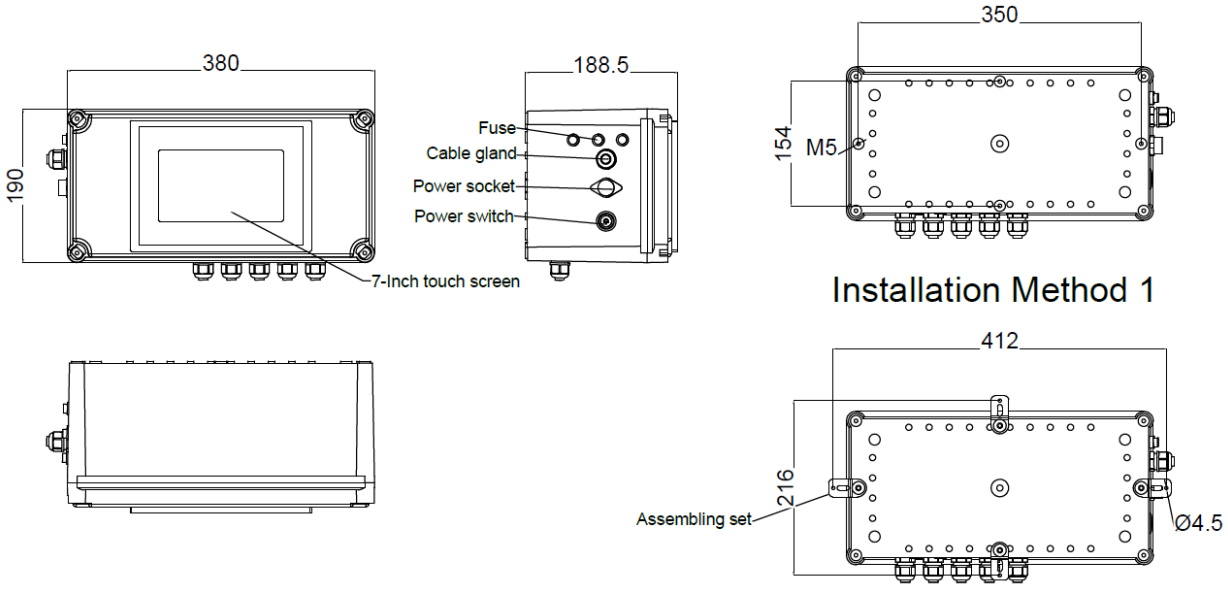
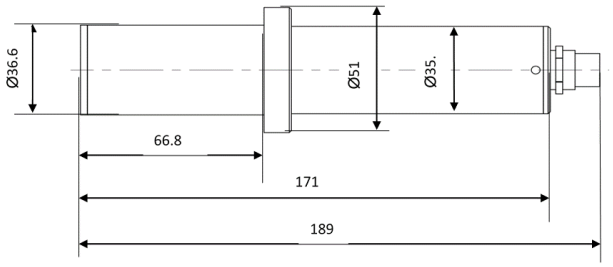


Figure 4 - WQMS-2100 *(Non-Brushing Turbidity)*

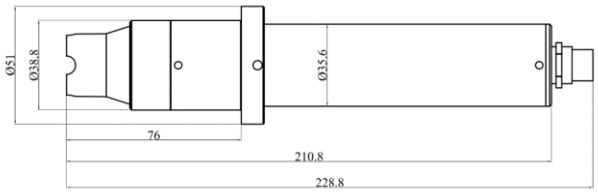
UC-100A Display/Data Logger Dimensions (mm)



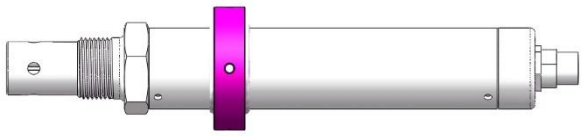
WQMS Series Sensor Diagrams (mm)



LT-739 Turbidity Sensor



ST-765SS-O3 Ozone + pH Sensor



ST-724 Conductivity/ TDS Sensor

5. Installation

5.1. Installation Requirements

Power Supply: 100~240V AC 50/60Hz

Water Supply: Inlet water pressure should be from 7.25 – 30 psi (0.05-0.2MPa) with an inlet feedwater line diameter of ¼-inch O.D. Tubing. Water supply should be set and regulated at 100mL/minute of sample flow with a maximum of 300mL/minute through the FS-100 flow meter setpoint control.

Drainage: Outlet pipe diameter is ¼-inch OD and should both be connected to a discharge drain via gravity flow.

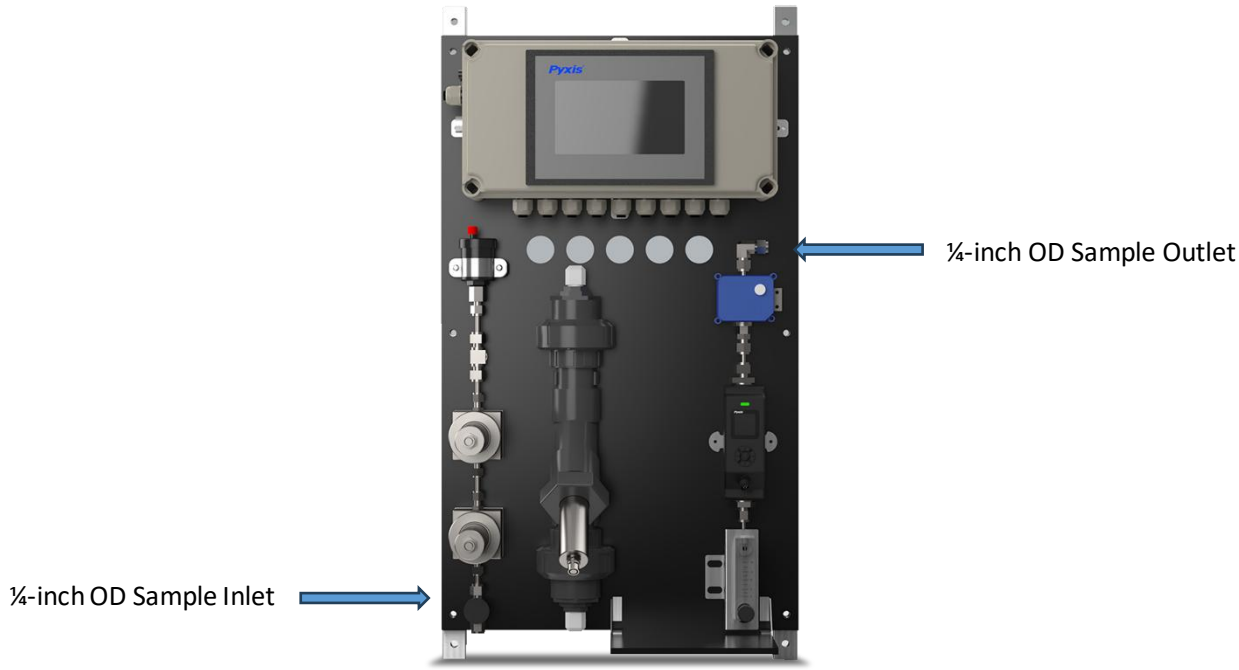
Wall Mount Space: The WQMS-2000 series analyzer panel size is roughly 750H x 450W x 239D (mm) in dimension. Please accommodate sufficient space for mounting.

Wall Mount Weight: Approximately 25kg. Please use appropriate mounting hardware.

5.2. Tube Connection

Inlet Water: Connect the ¼-inch inlet water tubing to the quick adapter provided.

Outlet Water: Connect the ¼-inch overflow tubing to the quick adapter provided.



5.3. Terminal Wiring

The WQMS-2000 analyzer has universal AC power supply equipment allowing users simply to plug the power supply into a 100~240V AC 50/60Hz power outlet for normal operation. **WARNING** The process of electrical connection to contact the 220V single-phase power supply, should be operated by personnel with an electrician's license. Failure to operate according to the electrical code of practice may result in electric shock injury or even death.

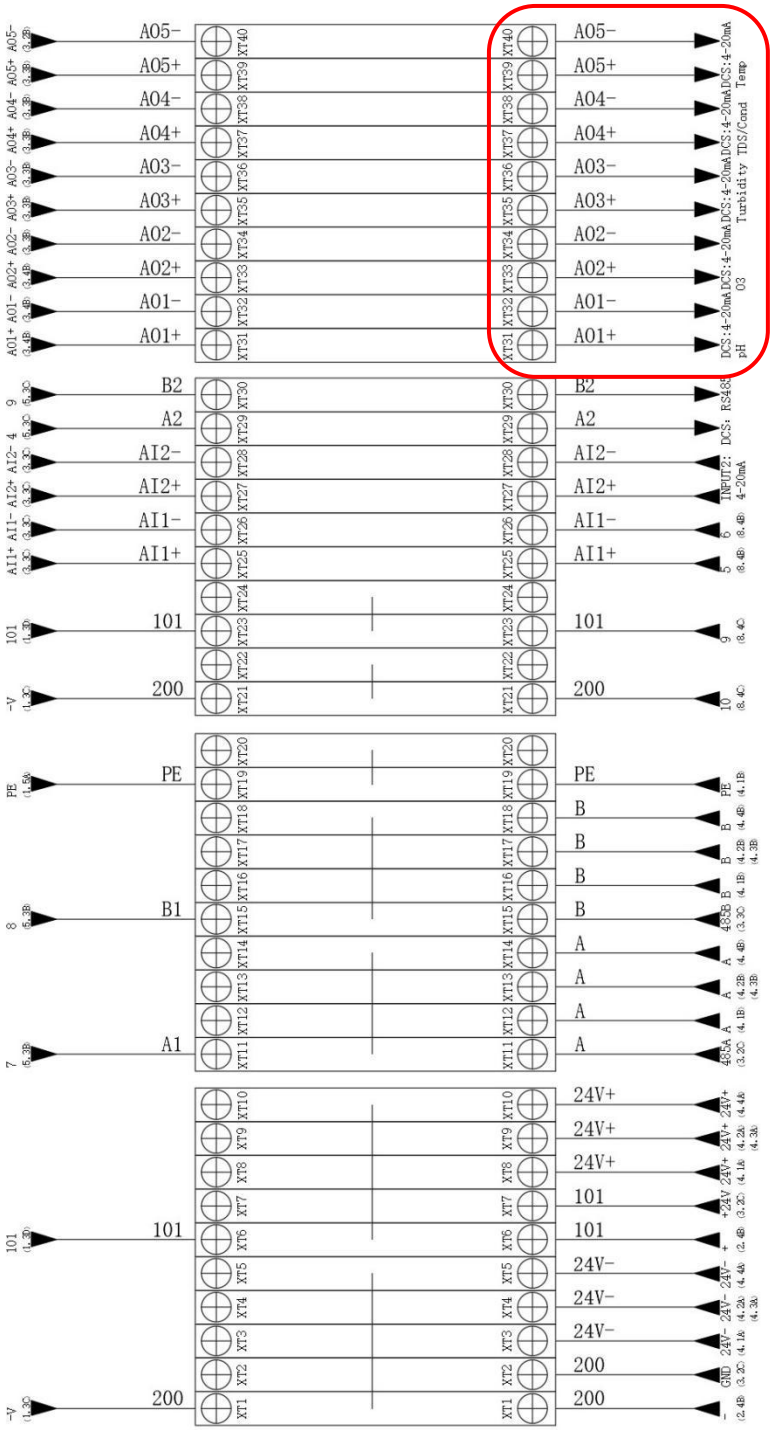


Figure 5 - Terminal Wiring Diagram

6. FS-100 Flow Control Module Overview & Use

The Flow Control Module is a stand-alone water flow measurement and control solution, a unique platform that provides accurate flow measurement and regulation. The Flow Control Module is equipped with the Pyxis FS-100 ultrasonic flow meter with display, which allows direct control of pre-installed regulating valves through a simple user programmable interface and a measurement range of 0 – 3,000mL/min and control as low as 10mL/min.

6.1. FS-100 Key Function

Enter Key

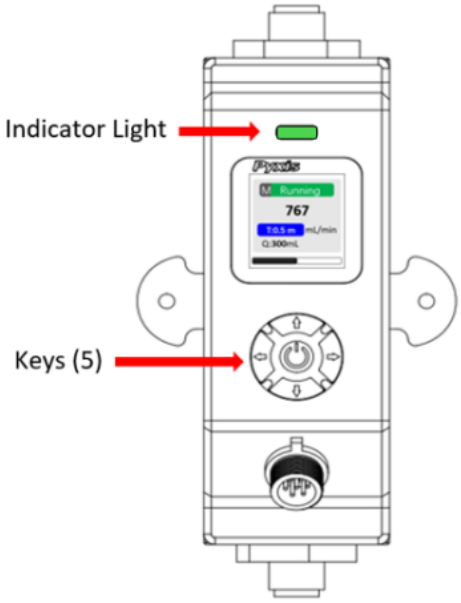
- Main screen → Setting Menu.
- Confirms and saves the input values.

◀ ▶ Left / Right Key

- Main screen → Trend Chart.
- Move the cursor to the left or right.
- Turn pages on the screen.

▲▼ Up / Down Key

- To increase or decrease a displayed number value.
- Jump up and down in the operating menu.



LED Status Indicator

The status LED is used for a quick visualization of the flowmeter status.

LED Behavior	Status
Green	Normal Running
Red	Alarm Information

6.2. FS-100 Main Screen

Main Screen Description

NO.	Description
1	Flow Detection Mode (1)
2	Working Status (same color as LED status indicator)
3	Flow Rate Value
4	Timer (2) (unit: auto range)
5	Unit of measured flow value
6	Accumulated Flow Value (unit: auto range)

(1) **R** = Average Flow Rate Mode

M = Instantaneous Flow Rate Mode

C = Flow Rate Control Mode ***NOTE*** *For C-Mode refer to Section 6.4 for programming details.*

(2) The **Timer** feature is enabled when the FS-100 is powered on and can be set by pressing the▼ key.

- **Pause or Restart the Timer:** Press ▼ key momentarily and release.
- **Reset the Timer:** Press and hold ▼ key for about two seconds

6.3. FS-100 Flow Trend Chart

From the main screen, Press ◀ or ▶ to the trend chart display. Flow values will be displayed as a line graph to show the real-time trend. Press ◀ or ▶ to return to the main screen.

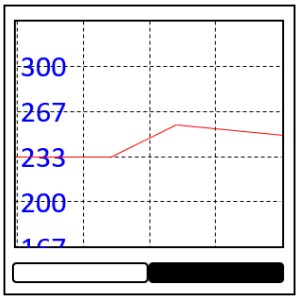


Figure. 6A - FS-100 Flow Trend Chart

6.4. FS-100 - Setting the C-Mode for the Sample Flow Control

The QMS series are programmed to use the Flow Rate Control (C) mode by default, which can be changed by the user. If a change to measure only is desired (with no control) users may follow the steps below to adjust the FS-100 functional settings.

Press ◀ or ▶ in the setting menu and select ***[Pattern]***. The following operating modes are available:

- **Flow Rate (R) =** Display the average flow rate
- **Flow Meter (M) =** Display the instantaneous flow rate
- **Flow Control (C) =** Set a desired constant flow rate

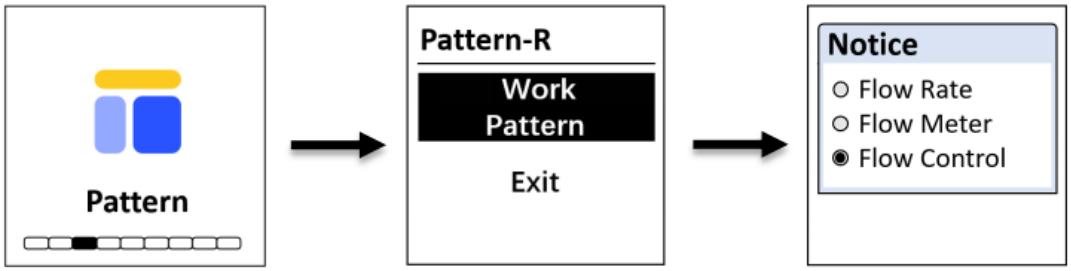


Figure. 5B - Operating Mode

When Flow Control Mode (C) is selected, a user defined flow rate setpoint must be entered (Figures 5B & 5C). The FS-100 will automically control the regulating valve according to the preset flow rate with an internally calculated PID algorithm.

NOTE *The WQMS Series should be operated within the recommended flow rates of 100-300 mL/min. See Specifications Section 1.0*

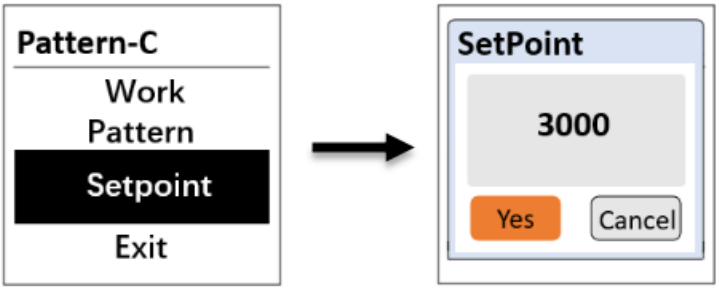


Figure. 5C - Flow Control (C) Operating Mode with User Defined Setpoint

NOTE *If the actual flow rate does not reach the preset flow rate for a duration time of longer than two minutes, the main screen and LED indicator will display* **RED** *alarm status .*

6.5. FS-100 Modbus Communication Settings

Press ◀ or ▶ in the setting menu and select ***[Com]*** to modify communication parameters (Figure 5D).
The following communication settings are pre-programmed into the FS-100 for direct communication with the WQMS display interface. ***IMPORTANT NOTE*** *These values should NOT BE ALTERED, otherwise flow control failure will occur.*

- **Modbus Address** *= 95*
- **Baud Rate** *= 9600*
- **Parity** *= Even*

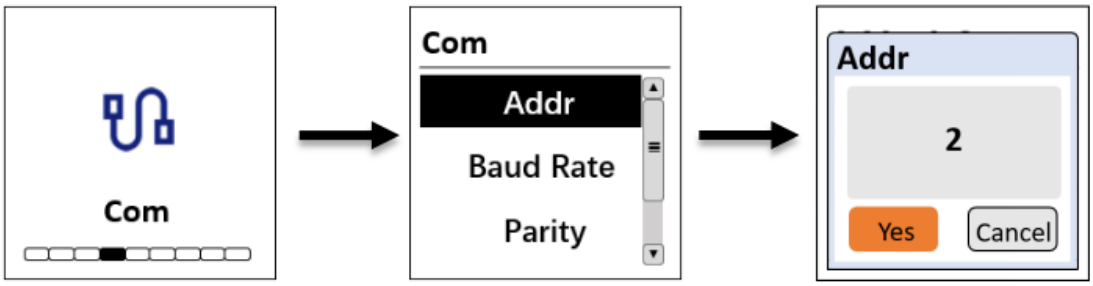


Figure. 5D - Communication Settings

6.6. FS-100 Factory Reset

If the user wants to restore all device settings to factory default parameters, Navigate to ***[Info]*** screen (Figure 10), press and hold ⏻ key for about two seconds, the FS-100 will reboot itself (Figure 5E).

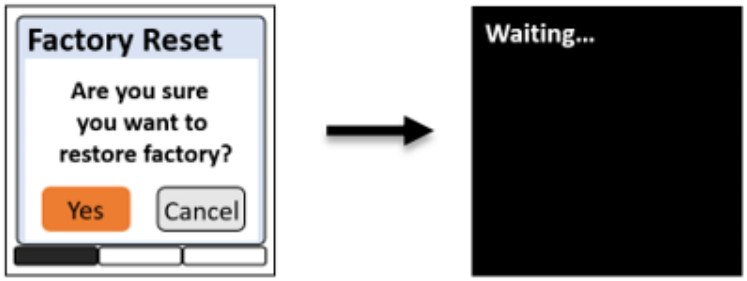


Figure. 5E - Factory Reset

6.7. FS-100 Device Information & Diagnosis

Press ◀ or ▶ in the setting menu and select ***[Info].*** This screen contains the device name, serial number, software version, and hardware version. Provide an image of both the **DEVICE INFORMATION** screen and the **DIAGNOSIS** screen when you contact Pyxis (service@pyxis-lab.com) for troubleshooting your device or call +1 (866) 203-8397 ext 2.

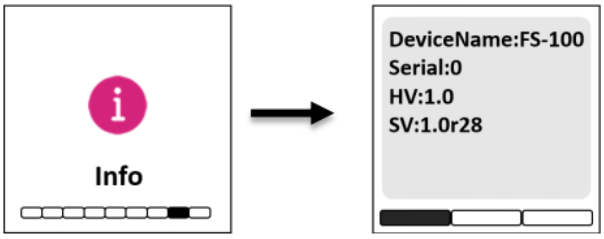


Figure. 5F- Device Information

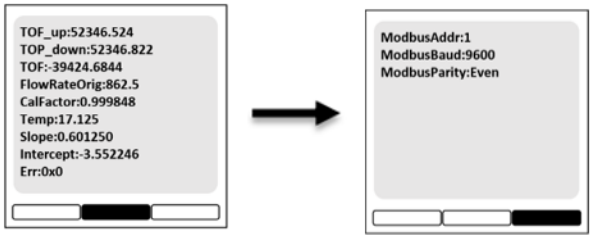


Figure. 5G - Diagnosis

Press ◀ or ▶ to turn the page. This screen information has no use for normal operation, but instead is used for device troubleshooting. Provide an image of both the **DEVICE INFORMATION** screen and the **DIAGNOSIS** screen when you contact Pyxis (service@pyxis-lab.com) for troubleshooting your device or call +1 (866) 203-8397 ext 2.

7. Touch Screen Operation

7.1. Main Screen

After the system is powered on an initial screen allows the user to log into the system.

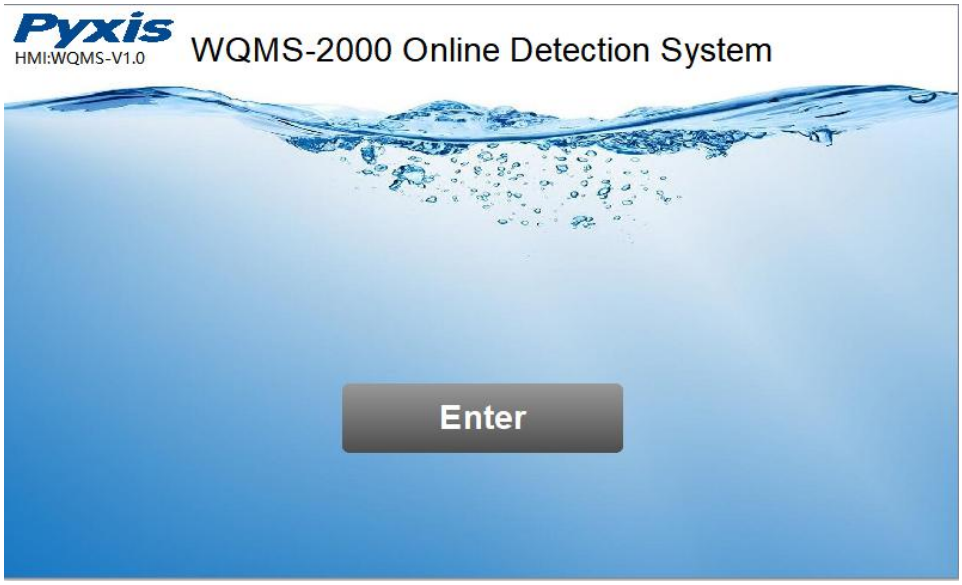


Figure 7 - Main Screen

7.2. User Login

After powering on the system, log in with the user name and password to be able to change system settings. Click the "User Login" button, select the user "**pyxis**", enter the password: "**888888**" in the user password field. A new user can be added via "User Management" in interface of the menu.

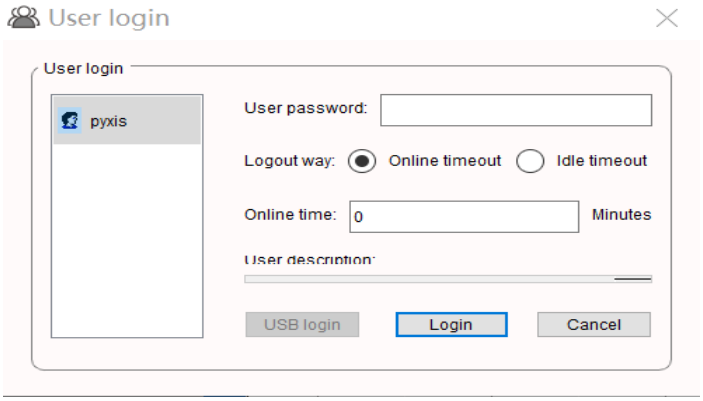


Figure 8 - User Login Screen

If you do not need a password, or want to change the user, you can enter the system and "Manage" in the "User Management" screen of the menu.

7.3. Real-Time Monitoring

Click the "Enter System" button on the main interface to enter the real-time monitoring screen of the system. The data detected by the Pyxis sensors will be displayed in real-time. See a functional overview of each section of this screen highlighted below. (numbers 1-4)

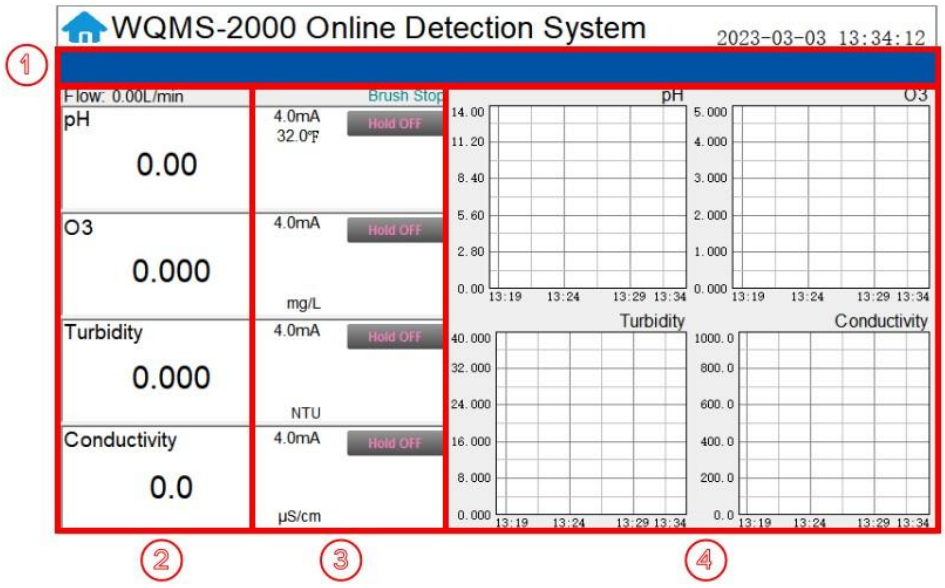


Figure 9 - Real-time Monitoring Screen

Section Number	Functional Overview
1	The blue area will scroll any alarm information in real time until the alarm is cleared.
2	Real-time display of current sensor measurement value.
3	Real-time display of the current sensor's 4-20mA signal value.
4	Historical data is recorded as a live curve, with the horizontal coordinate being the time and the vertical coordinate being the measured value.

Table 1 - Main interface functional overview

Press and hold the curve area for 2 seconds and then let go, the Y-axis curve range setting dialog box will appear. Users may change the display value range of Y-axis for each measurement index curve. Click the outter area of the screen to save and exit the setting screen after modifications are made.

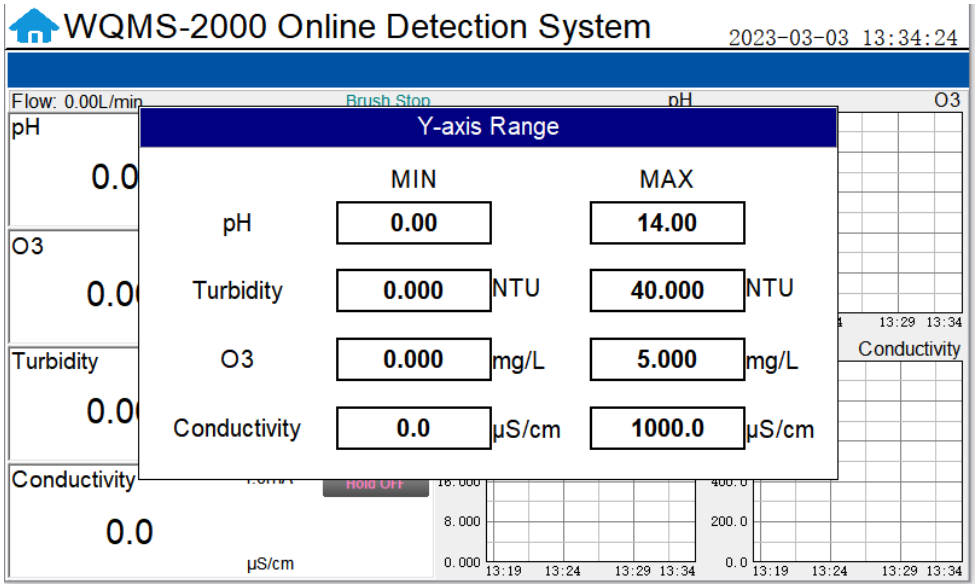


Figure 10 – Display Curve Range Setting

7.4. Explanation and use of the HOLD Feature

The UC-100A has an integrated HOLD feature for all Modbus TCP output parameters from the sensor that would be connected to an onsite DCS network. The purpose for this feature is to allow the user to enter a signal value HOLD on the designated parameter during periods of sensor maintenance or removal. This feature prevents network system alarms from operational shutdown during sensor maintenance or replacement.

Click the "**Hold OFF**" button on the main interface to enter the HOLD setting interface.

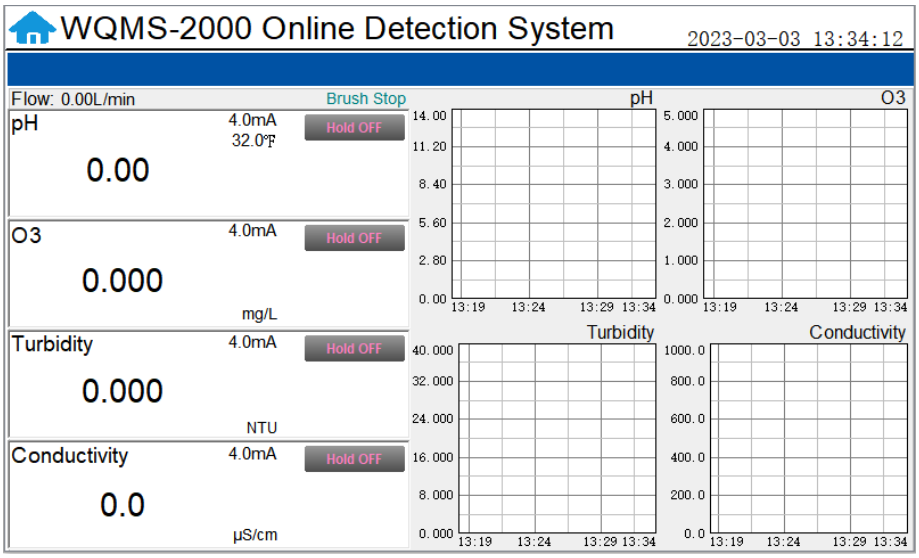


Figure 11 - Main Interface

In the pop-up box, enter the parameter value and click "**Confirm**" to open the "**Hold ON**" function. The main interface will display the entered value for 15 minutes, after which it will resume displaying the real-time value read by the sensor.

When the "Hold ON" function is activated by the user, the sensor may be maintenanced, calibrated or removed and the Modbus TCP output will continue to retain the user entered value for a period of 15 minutes, ensuring network alarm and process will not be interupped due to the sudden disappearance of the 'normal' value. The 'actual' live sensor reading along with the user entered hold value reading will both be displayed during this period.

Clicking "**Cancel**" will turn off this function, the main interface will immediately display the real-time value read by the sensor, and the main interface button will be displayed as "**Hold OFF**".

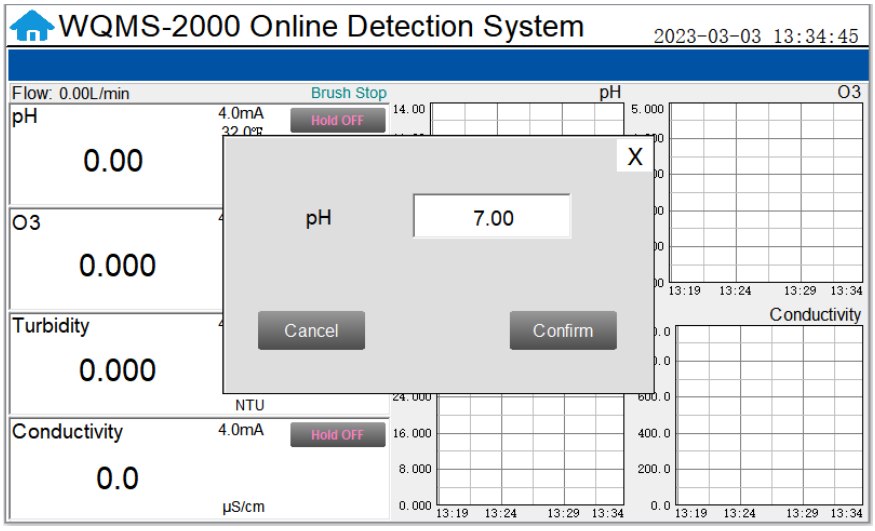


Figure 12 - Hold Feature - pH Value Entry by User

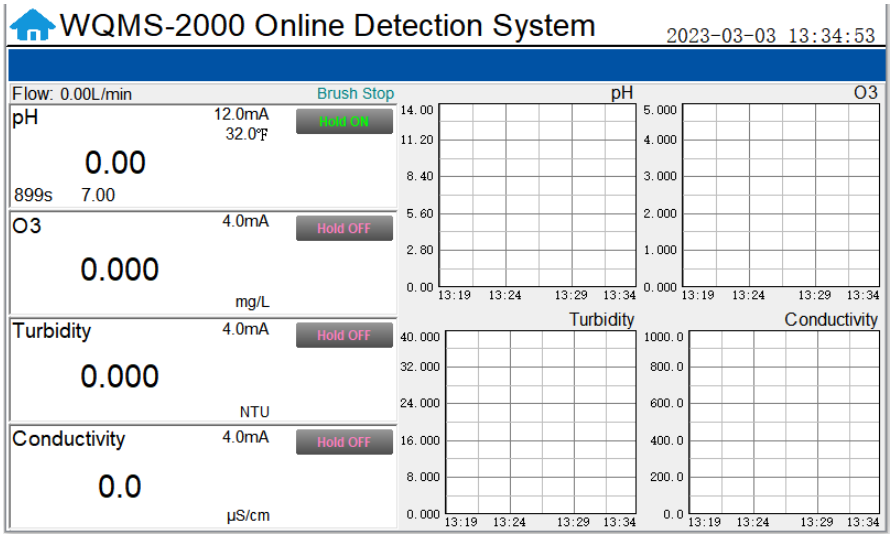


Figure 13 - Hold ON Interface

7.5. Menu Bar

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

7.6. Configurable Parameters

Click the "Parameter" button in the menu bar. Here you can select to enter "Alarm Parameters" and "4-20mA Output" setting interface etc.

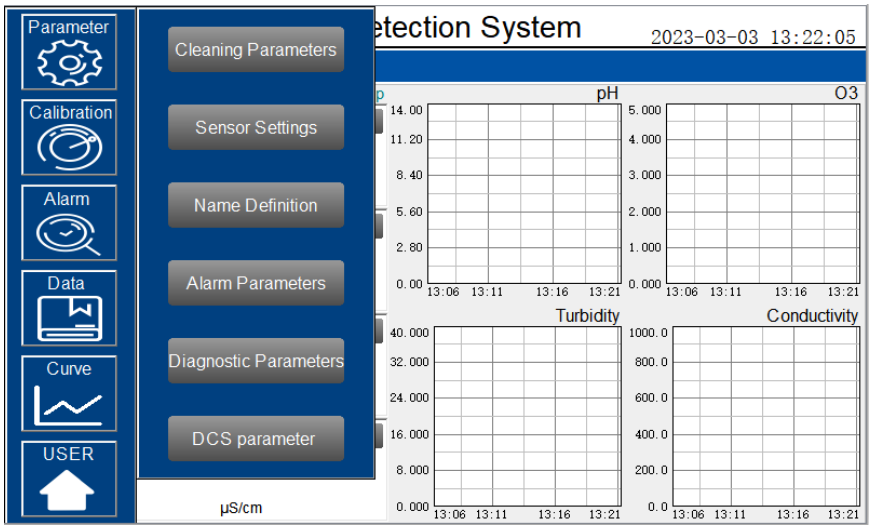


Figure 14 - Parameter Settings

7.6.1. Cleaning Parameters Setting *(For WQMS-2000 Only)*

The WQMS-2000 offers an auto-brushing flow reservoir for the LT-739 turbidity sensor. When entering the cleaning control parameter setting interface for the first time, a notice screen will appear to ensure the panel has the auto-brushing assembly in place (FR-100-PLUS). After confirming that the cleaning control module is installed, click Enable to enter the parameter setting interface.

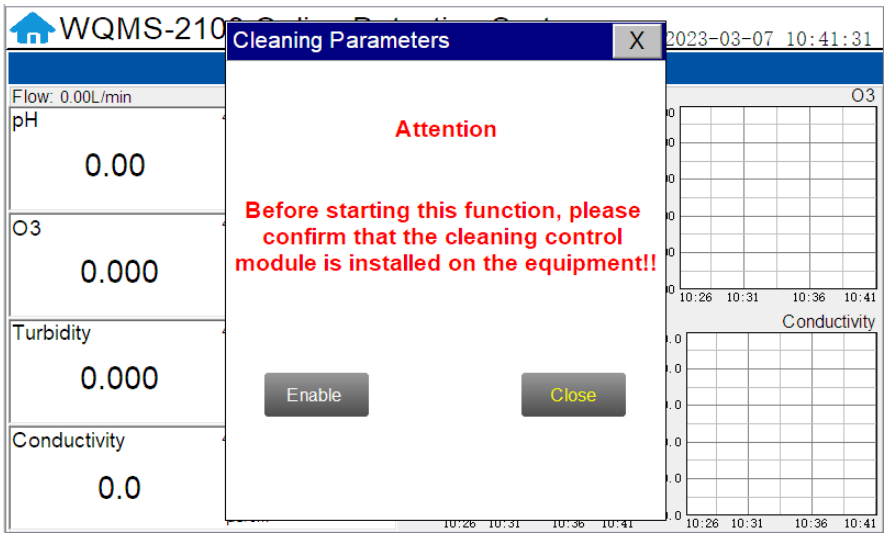


Figure 15 - Cleaning Module Confirmation Interface

On the parameter setting interface, users can program the automatic cleaning cycle frequency (minutes) and brush rotation cycles per cleaning. ***IMPORTANT NOTE*** *- A setting of 1 for Time will result in 30 brush rotations* (Example. If you desire the clean the sensor with 30 brush rotations you would set the Brush Rotations Per Cleaning to 1) Brush operation in either AUTO or MANUAL mode can be set.

Figure 16 - Cleaning Parameters setting

7.6.2. Sensor Setting

Click "Conductivity" to enter the setup interface, where TDS or conductivity can be selected according to the sensor, and the conversion factor can be set below. ***NOTE*** TDS to Conductivity conversion ratio default will be 0.67. This is user adjustable based on geographic location of installation.

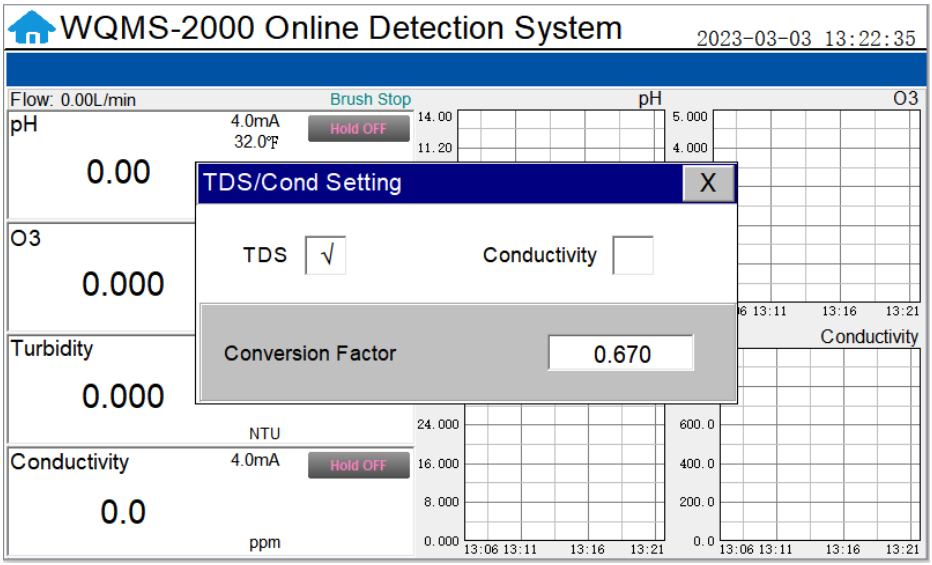


Figure 17 – TDS / Conductivity Setup

Click ON in "Sensor Parameters" to activate the Ozone electrode properties. Activation ON will result in the ST-765SS-O3 electrode conducting internal cleaning voltometry protocol for a duration of 12 seconds every 5 minutes of operation. During this time, sensor data will be suspended at previous reading value prior to activation then reinitate after the 12 second cleaning is complete. To stop this feature, turn activation OFF.

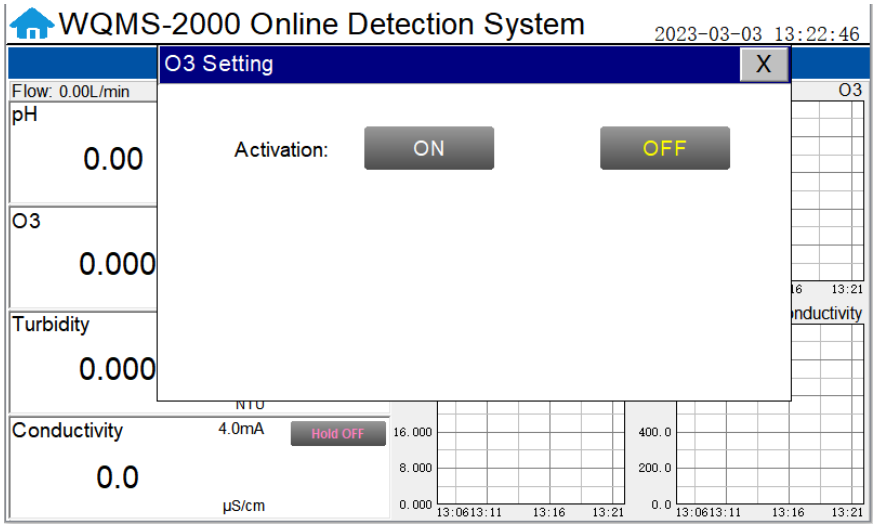


Figure 18 - ST-765SS-O3 Setting

7.6.3. Name Definition

Click the orange dialog box to customize the sensor name. Here users can also change the unit of measure for temperature display.

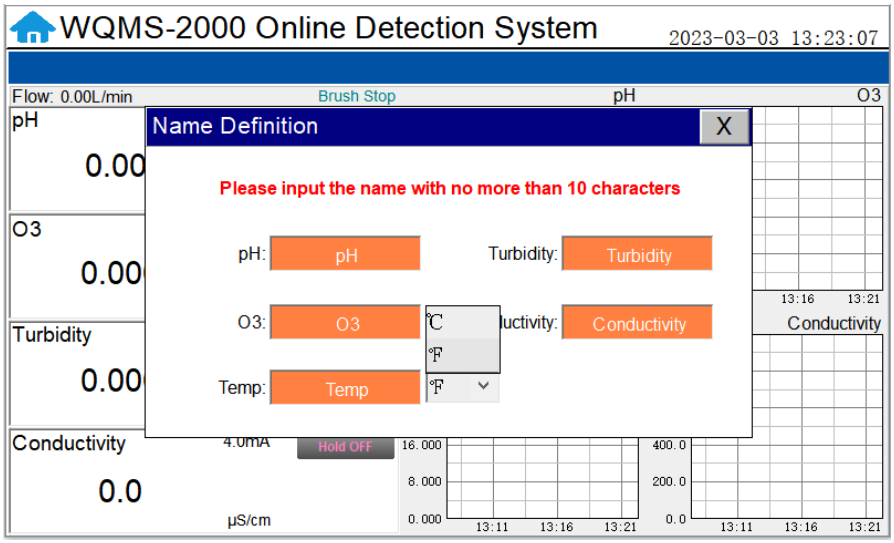


Figure 19 - Name Definition

7.6.4. Alarm Parameters Setting

Users can set the upper and lower alarm limits. Click "Alarm Parameters" to enter the alarm parameter settings. When the measured sensor value is lower than the set lower limit (the XX lower limit alarm) or when the measured value is higher than the set upper limit (the XX upper limit alarm), the corresponding sensor alarm will be displayed on the real-time monitoring screen. The user can also choose to turn the alarm display on or off at the top left of the corresponding parameter list.

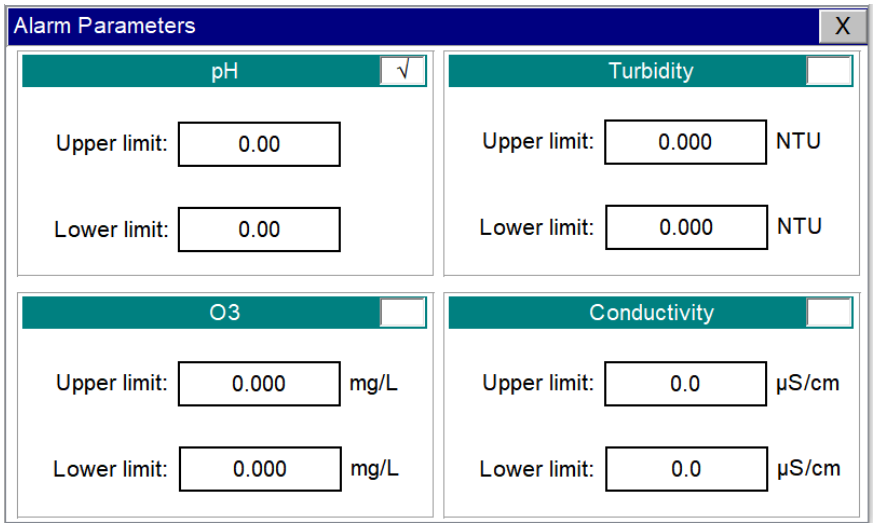


Figure 20 - Alarm Parameter Setting

7.6.5. 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.

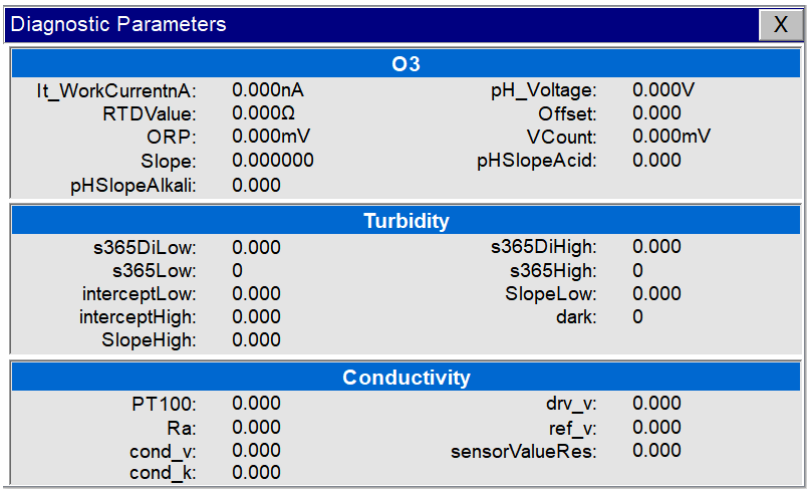


Figure 21 - Diagnostic Parameters

7.6.6. 4-20mA Output Parameters Setting

Click "4-20mA Output " to enter the 4-20mA output parameter setting interface. The 4mA and 20mA output values should corresponds to the lower and upper limits of the sensor range or range of application use. Default 4-20mA output values are provided in Figure 21. ***NOTE*** The closer the value is set to the measurement value the more precise the data. It is recommended to set according to the range of the sensor.

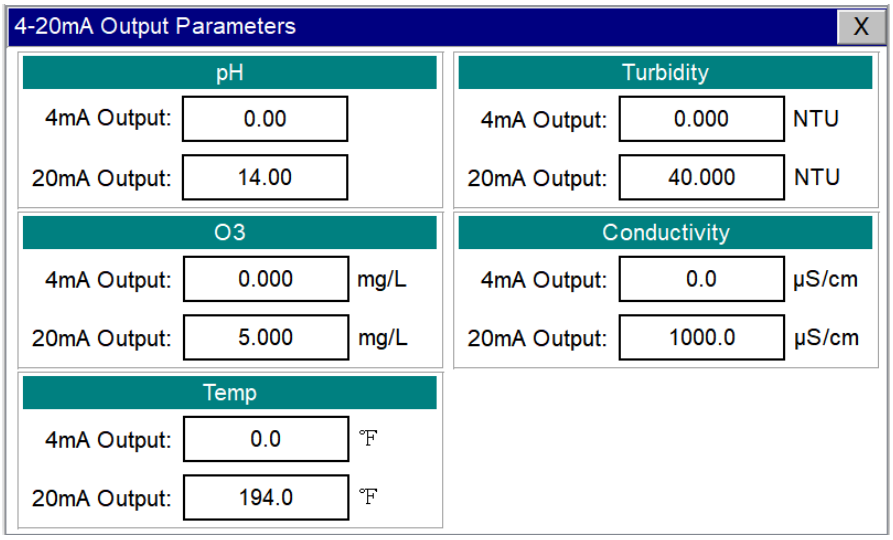


Figure 22 - 4-20mA Output Setting

7.6.7. Communication Setting

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.

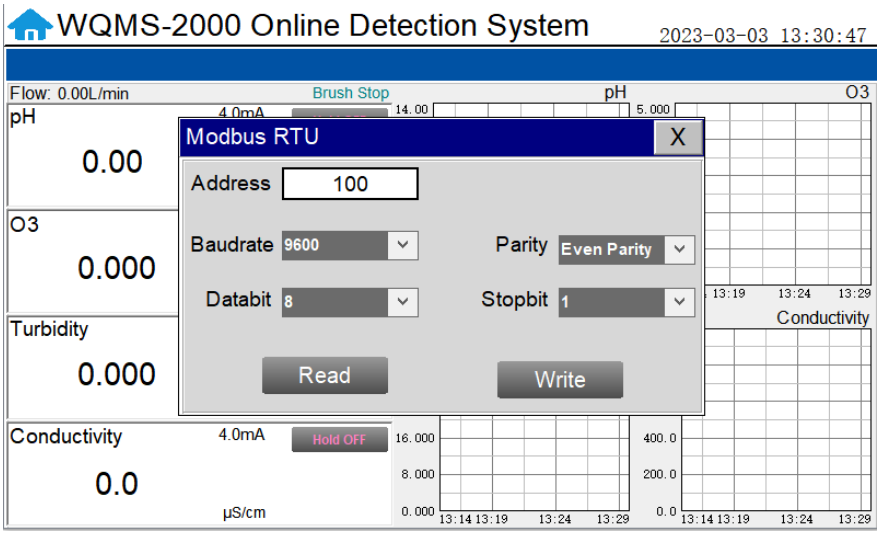


Figure 23 - Modbus RTU

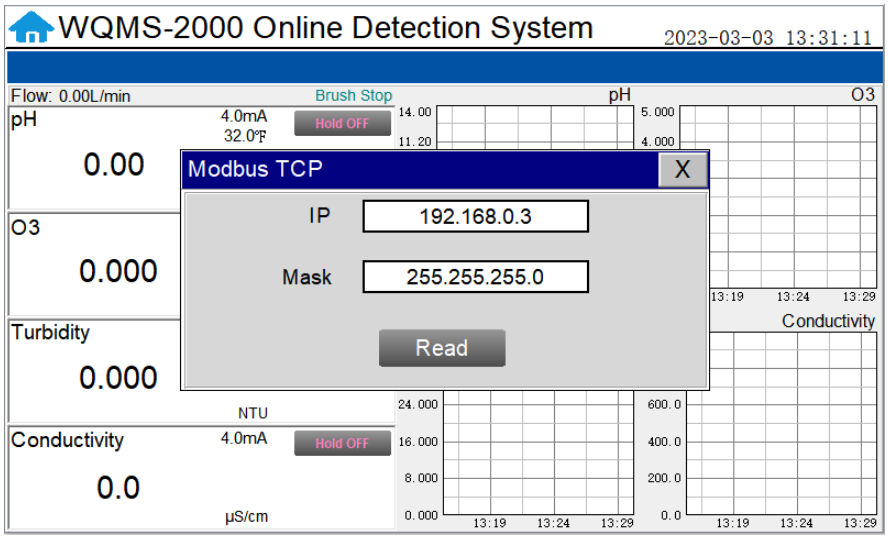


Figure 24 - Modbus TCP

7.7. Calibration

Click on the "Calibration" button in the menu bar and select the sensor to be calibrated.

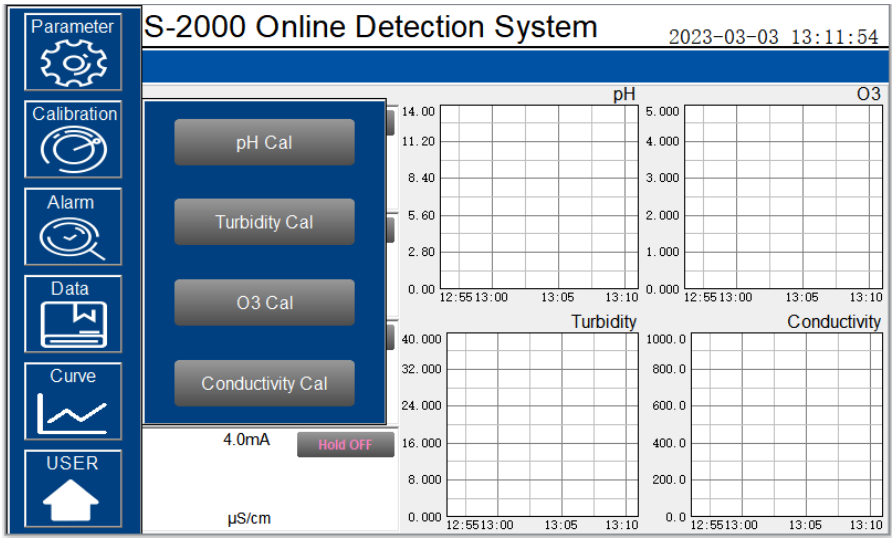


Figure 25 - Sensor Calibration

7.7.1. pH Calibration

The pH function is thoroughly calibrated at the Pyxis Lab factory. After checking with a pH standard buffer solution, if the sensor value has shifted, then the user may choose from single-point, two-point or three-point calibration to re-calibrate the pH portion of the ST-765SS-O3 sensor as desired.

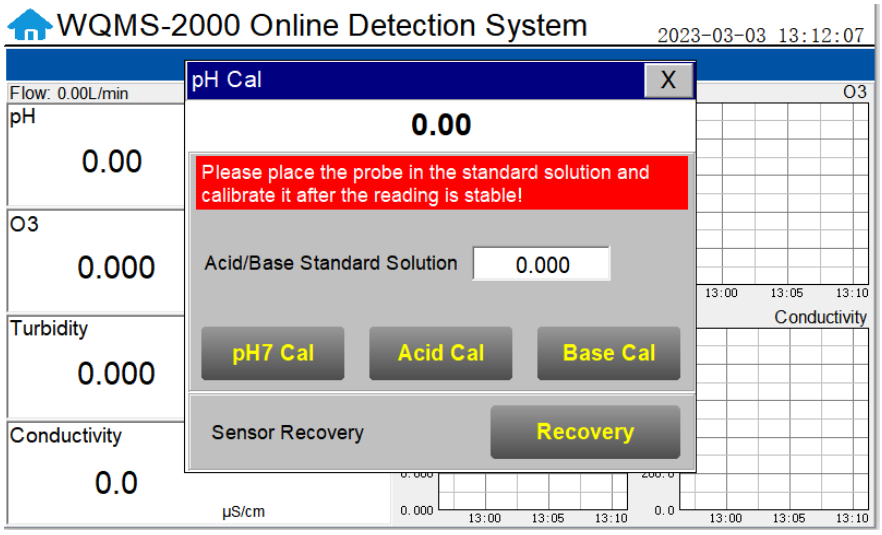


Figure 26 - pH Calibration

Single Point pH Calibration

Remove the ST-765SS-O3 sensor and rinse 3x with DI water. Submerge the sensor into a beaker with pH=7 buffer solution. Click "pH7 calibration". A dialog box will pop up to confirm whether to perform this operation, click "OK" if the calibration operation is confirmed, if the calibration is successful the dialog box will show "calibration success".

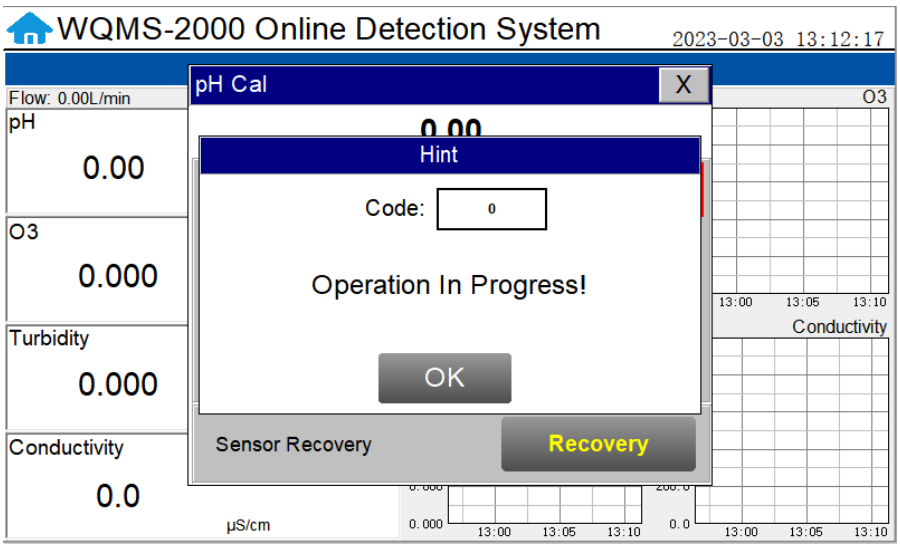


Figure 27 - pH Calibration Success Prompt

Two Point pH Calibration

Remove the ST-765SS-O3 sensor and rinse 3x with DI water. Submerge the sensor into a beaker with pH=7 buffer solution. Click "pH7 calibration". A dialog box will pop up to confirm whether to perform this operation, click "OK" if the calibration operation is confirmed, if the calibration is successful the dialog box will show "calibration success".

After pH7 is successfully calibrated, you can choose acid calibration or alkali calibration for the second calibration point. If you choose acid calibration, clean beaker 3x with deionized water. Fill the beaker with pH=4 buffer solution. Enter the value 4 in the calibration value dialog box, and click "Acid Calibration", then a dialog box will pop up to confirm whether to perform this operation. Click "OK" if the calibration operation is confirmed and the dialog box will show "Calibration Successful" if the calibration is successful. Similarly a pH=10 buffer solution can be selected for the second point calibration if desired.

Figure 28A - pH Entry

Three Point pH Calibration

Remove the ST-765SS-O3 sensor and rinse 3x with DI water. Submerge the sensor into a beaker with pH=7 buffer solution. Click "pH7 calibration". A dialog box will pop up to confirm whether to perform this operation, click "OK" if the calibration operation is confirmed, if the calibration is successful the dialog box will show "calibration success".

After pH7 is successfully calibrated, you can choose acid calibration or alkali calibration for the second calibration point. If you choose acid calibration, clean the beaker 3x with deionized water. Fill the beaker with pH=4 buffer solution. Enter the value 4 in the calibration value dialog box, and click "Acid Calibration", then a dialog box will pop up to confirm whether to perform this operation. Click "OK" if the calibration operation is confirmed and the dialog box will show "Calibration Successful" if the calibration is successful.

After successful acid calibration, select pH=10 for alkali calibration. Clean the beaker 3x with deionized water. Fill the beaker with pH=10 buffer solution. Enter the value 10 in the calibration value dialog box, and click "Alkali Calibration", then a dialog box will pop up to confirm whether to perform this operation. Click "OK" if the calibration operation is confirmed and the dialog box will show "Calibration Successful" if the calibration is successful. The three-point calibration is completed.

7.7.2. Turbidity Calibration

The LT-739 Ultra Low Turbidity 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. Example – for ultralow turbidity applications, the user ONLY needs to calibrate the sensor for Low-Range and Mid and High range calibration is not necessary

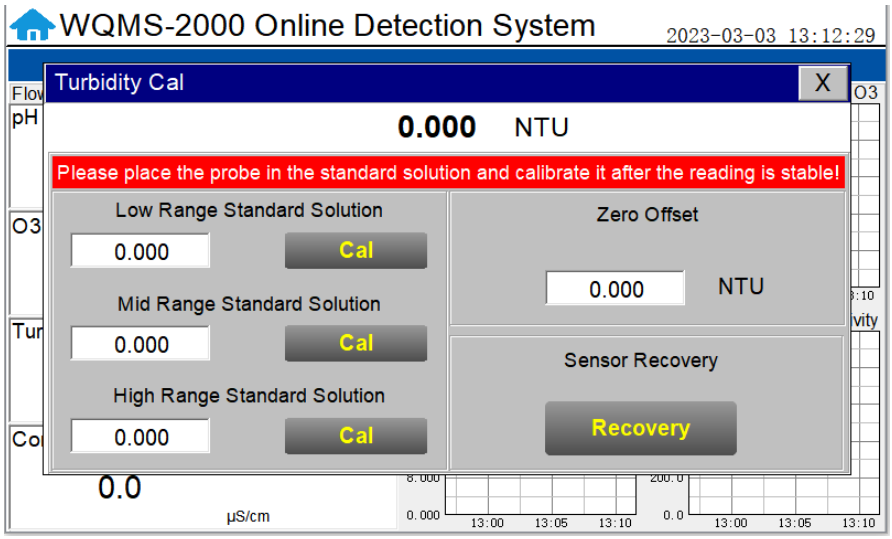


Figure 29 - Turbidity Calibration Screen

Low-Range Calibration Procedure DI Water in the Pyxis L-CAL Portable Turbidity Calibration Kit:

Isolate the panel and drain the piping and inline Tee assemblies. Remove the LT-739 sensor from the FT-100 flow tee. Triple rinse the LT-739 sensor surface, the FT-100 flow tee internals and the L-CAL Portable Turbidity Calibration Kit (P/N 53247) vessel with Deionized water. Insert the cleaned LT-739 turbidity sensor into the L-CAL calibration vessel and positon the L-CAL vessel vertically (with the sensor inserted in a horizontal position to the ground as shown in the step-by-step images provided on page 24 of this manual). Remove the top cap and fill the L-CAL vessel with 500mL of bubble free deionized water. After the displayed turbidity data is stable, enter "0.05" for the low-range calibration value and click on "Low Range Calibration", a dialog box will pop up to confirm whether to perform this operation. Click "OK", if the calibration is successful, the dialog box will show "Calibration successful". ***NOTE*** Because there is no global standard for zero turbidity in the industry, Pyxis recommends 0.05 NTU as a target for Low-Point Calibration while using Bubble-Free DI Water.

Mid-Range Calibration using the L-CAL Portable Turbidity Calibration Kit:

If a mid-range calibration is not required, the user does not need to perform a mid-range calibration of the LT-739 series sensor. If a mid calibration is required, proceed by rinsing the L-CAL vessel with Deionized water and refill with 500mL of known turbidity standard solution between 5NTU and 10NTU for mid-range calibration (see page 24). After the displayed data is stable, enter the medium turbidity standard solution value and click on "Mid Range Calibration", a dialog box will pop up to confirm whether to perform this operation. Click "OK", if the calibration is successful, the dialog box will show "Calibration successful".

High-Range Calibration using the L-CAL Portable Turbidity Calibration Kit:

If a high-range calibration is not required, the user does not need to perform a high-range calibration of the LT-739 series sensor. If a high calibration is required, proceed by rinsing the L-CAL vessel with deionized water and refill with known turbidity standard solution between 20NTU and 40NTU for high-range calibration (see page 24). After the displayed data is stable, enter the high turbidity standard solution value and click on "High Range Calibration", a dialog box will pop up to confirm whether to perform this operation. Click "OK", if the calibration is successful, the dialog box will show "Calibration successful".

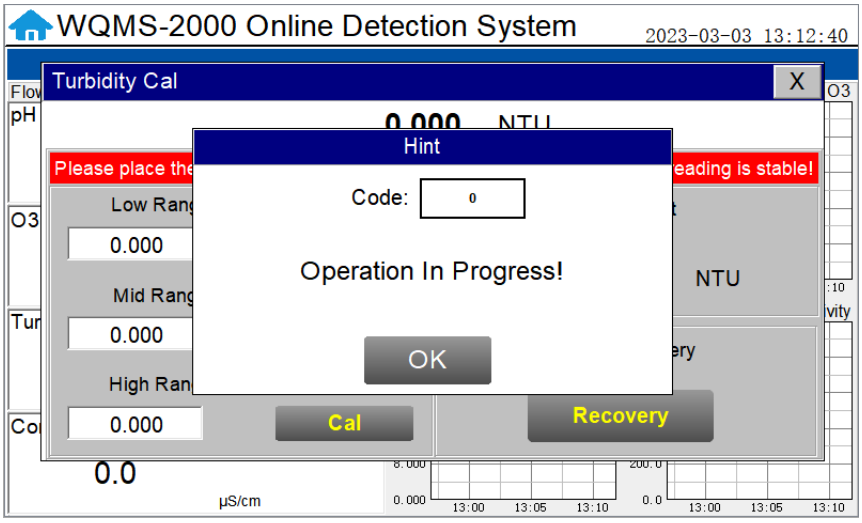


Figure 30 - Awaiting execution Screen of Turbidity Calibration

Troubleshooting Calibration Failed Messages

If you receive a "Calibration Fails" message during the calibration steps above, the following items should be checked:

1) Ensure your source of Deionized water is not contaminated with turbidity
2) Ensure your turbidity calibration standard solutions have not been contaminated
3) Ensure the LT-739 sensor distillate end is not contaminated with debris or other substances

LT-739 Calibration using L-CAL Portable Turbidity Calibration Kit

Pyxis Lab has developed L-CAL as a portable and reusable liquid-state turbidity calibration kit for rapid calibration of the all LT-73X Series inline ultra-low turbidity sensors. The L-CAL calibration kit allows users to calibrate all LT-73X Series ultra-low turbidity sensors using smaller volumes of Formazin turbidity calibration standards providing an affordable and reusable solution for long term sensor reliability. The unique design of the L-CAL liquid calibration kit allows the LT-73X sensor to be easily inserted and calibrated with the sensor in a horizontal position, allowing air bubbles to be evacuated through the integrated air-vent line ensuring superior accuracy of the sensor calibration. The L-CAL has an easy to remove lid allowing users to fill and empty the calibration kit with DI water for vessel/sensor cleaning and Formazin calibration standards for sensor calibration.

L-CAL Liquid Turbidity Calibration Kit (P/N

Turbidity Calibration Principals & Considerations

The precision, resolution and the low detection limit of the LT-73X Series sensors are not affected by the calibration method, regardless of using certified Formazin standards and the L-CAL kit. The calibration only affects the turbidity sensor accuracy. The nature of turbidity measurement makes an absolute turbidity value not easily obtainable for any sensor manufacturer although proper standards and methods are followed. For example, turbidity values greater than 1.0 NTU measured on real-world samples with different sensors, even from the single manufacturer, could differ significantly. For ultra-low turbidity (less than 0.3 NTU) measurement using the same methods (ISO-7027 or EPA-180.1), it is likely that the values from different sensors can agree within 0.05 NTU. As such, the user should choose a calibration method and remain with the same calibration method for consistency.

L-CAL Specifications

Item	**L-CAL Portable Liquid Formazin Calibration Kit**
P/N	53247
Sensor Name	LT-739
Calibration	**Recommended Calibration Standard Solution Range**
Low-Range (0.05NTU Recommended for Calibration)	Bubble Free DI Water or Standard <2.0 NTU
Mid-Range	5 – 10 NTU
High-Range	20 – 40 NTU

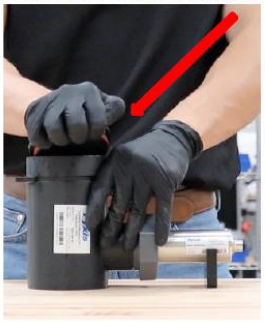
L-CAL Portable Liquid Formazin Calibration Kit Use Method

After removing the LT-73X sensor, gently wipe off the flat distal end with a soft cloth to ensure it is clean. The LT-73X Sensor should then be calibrated using the L-CAL portable liquid calibration kit using the following steps, and wirelessly calibrated via the uPyxis Mobile or Desktop APP. Please refer to LT-73X Series Operation Manual for details.

Insert LT-73X Sensor

Tighten Sensor Nut

Position Vertically and Remove Lid



Preclean by adding DI-Water (200mL)

Insert Lid

Gently Shake Then Empty Contents

Add Calibration Standard (500mL)

Insert Lid and Remove Air Bubble Vent Line Cap

FOLLOW CALIBRATION STEPS

NOTE *Sensor Brace Included with L-CAL Kit for Stability*

WATCH PROCEDURE VIDEO https://www.youtube.com/watch?v=1MuJM5Q5VB4

7.7.3. Ozone (O3) Calibration

The measurement module of the ST-765SS-O3 sensor is thoroughly calibrated at the Pyxis Lab factory. To calibrate, the user can perform a single-point according to the requirements of the application (USEPA-334.0 / ISO-7393 compliant methodology). Calibration of the ST-765SS-O3 sensor for ozone should be done with the sensor inline exposed to active flowing sample water. Use a portable or laboratory colorimeter (i.e.. Pyxis SP-200 / SP-800 / SP-910 or similar) to test the active (flowing) water sample in the flow tee assembly. Once you have tested and confirmed the concentration value in the active (flowing) sample, enter the test result value of the portable or laboratory colorimeter into Calibration Screen in High Standard Solution box, then click "High Cal". A dialog box will pop up to confirm whether to perform this operation. If the calibration operation is confirmed, click "OK", and if the calibration is successful, the dialog box will show "Calibration Success".

NOTE Click the restore button in the calibration interface of each sensor to restore the data of pH/residual O3 sensor. If a user error is made during calibration and other operations, you may restore the factory settings of the sensor through the restore function.

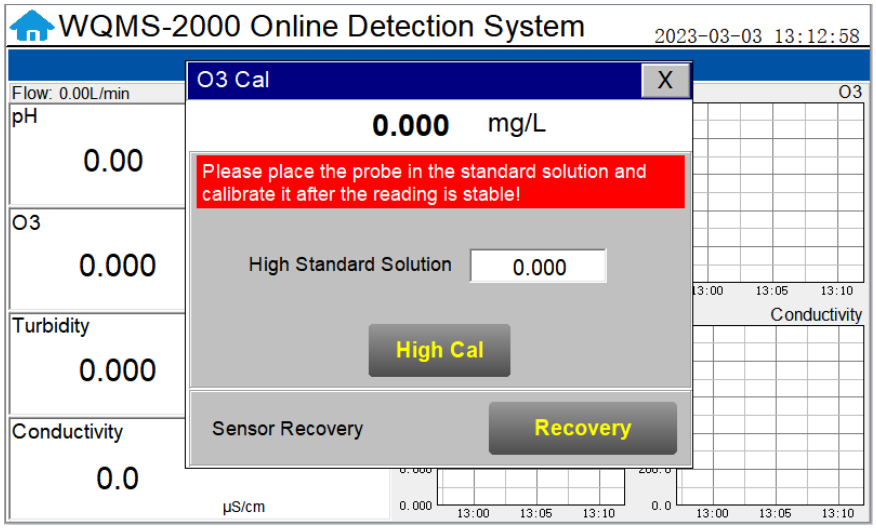


Figure 31 – Ozone (O3) Calibration

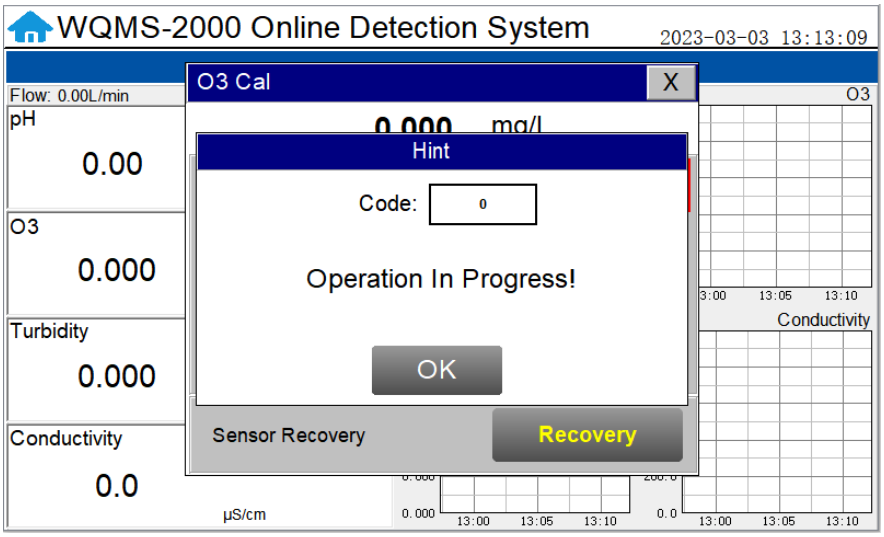


Figure 32 - Awaiting Execution Screen of Ozone (O3) Calibration

7.7.4. TDS/Conductivity Calibration

The TDS/conductivity sensor only needs to be calibrated once, put the sensor into the standard solution with known standard solution value, enter the standard solution value in the interface, then click calibration, wait for the calibration completion prompt to pop up confirming the calibration is successful.

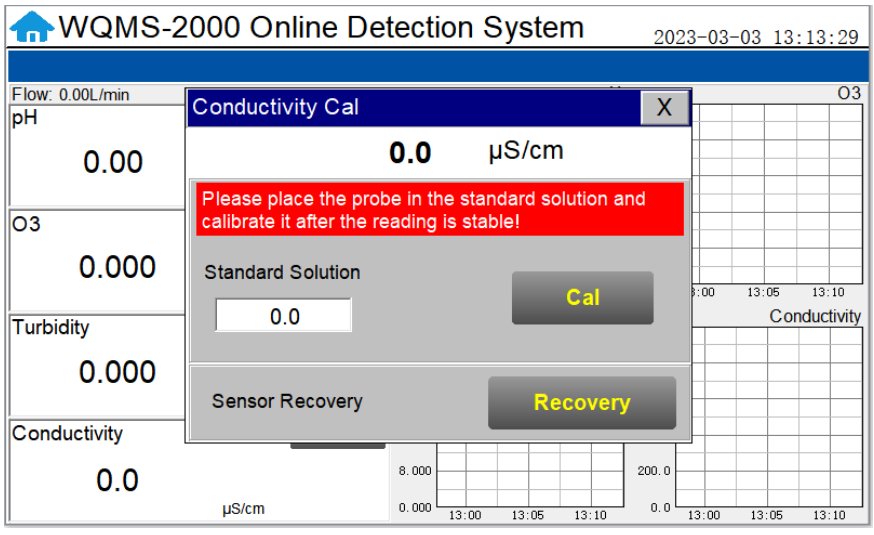


Figure 33 - Conductivity Calibration

7.8. Recovering Data

Click the restore button in the calibration interface of each sensor to restore the data of pH/chlorine sensor and turbidity sensor. If a user error is made during calibration and other operations, you may restore the factory settings of the sensor through the restore function.

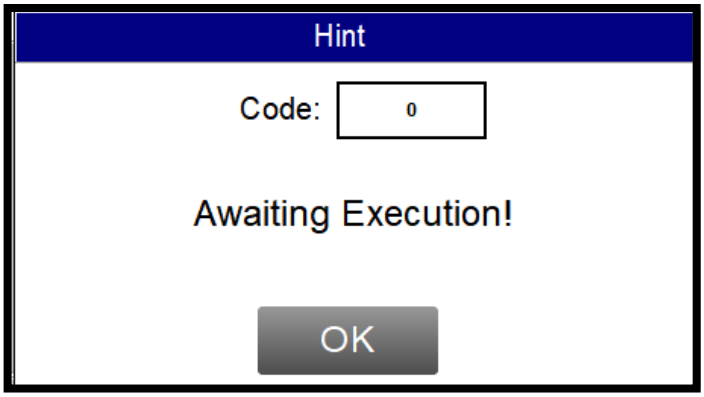


Figure 34 - Data Recovery Screen

7.9. Alarm View

Click the "Alarm View" button on the main screen to enter the alarm view screen.

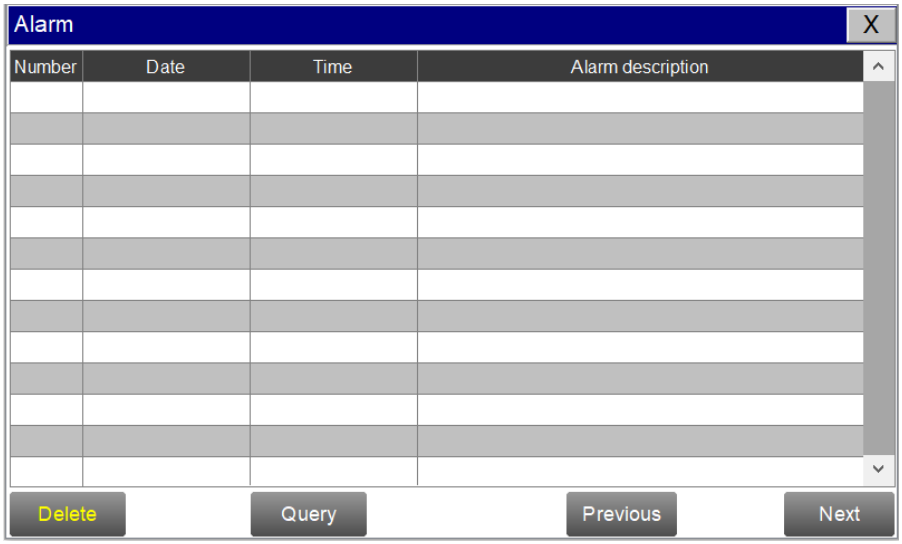


Figure 35 - Alarm View

In this screen users can browse all logged alarms. Drag the right scroll bar up and down to view the history of alarms. Click "Previous" and "Next" to advance to the next page. Click “Query” then enter the alarm number in the pop-up box to query that alarm.

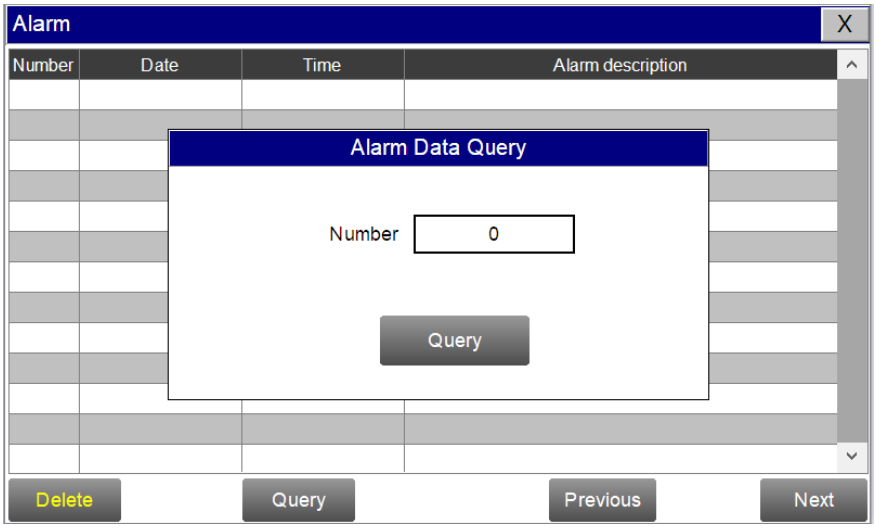


Figure 36 - Alarm Data Query Screen

The Delete button in the lower left corner will delete all alarm records. After clicking delete, you must exit the screen and reenter before the historical data within the data report will be cleared.

7.10. Historical Data

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

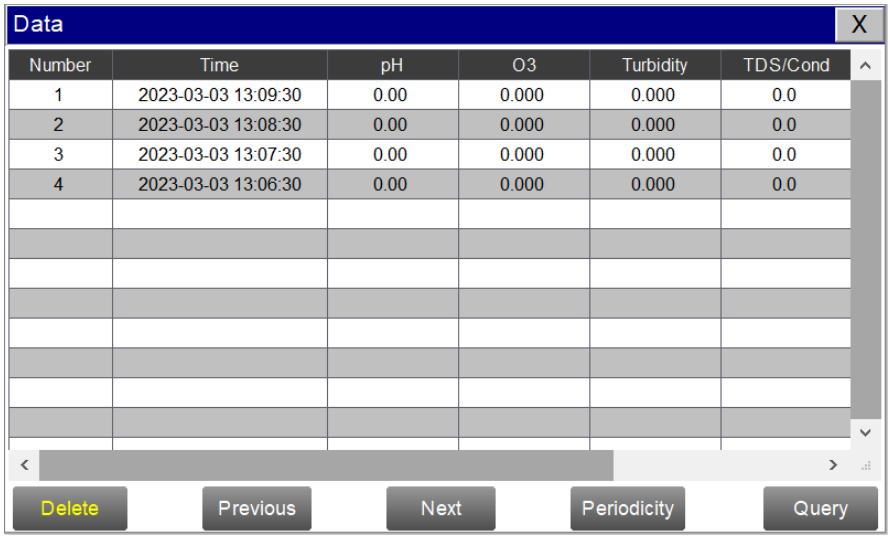


Figure 37 - Historical Data Screen

In the data report, the user can view the stored data of all parameters. The system records sensor readings every 4 seconds by default but this can be edited by the user if desired. 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 up to 100,000 data entries. New data will overwrite the previously saved data after recording 100,000 data entries. The user can click the “Periodicity” button to change the data recording time interval.

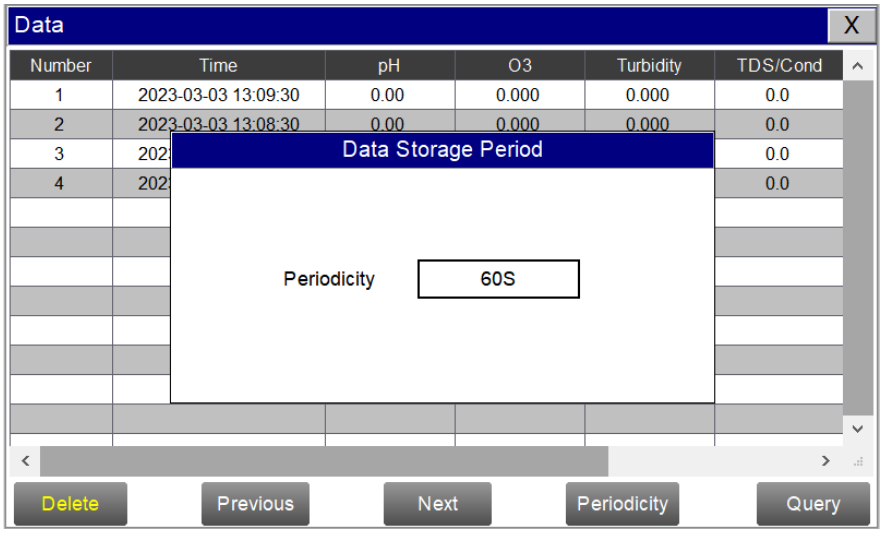


Figure 38 - Data Storage Cycle Time Setting

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

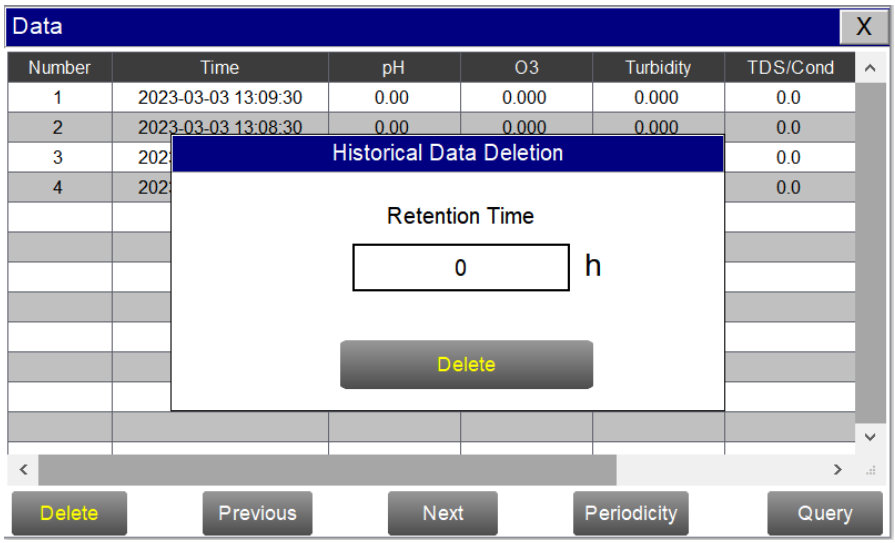


Figure 39 - History Data Deletion Screen

Click the “Query”button in the lower right corner, enter the start time and end time and then click the “Query” button. Note that the start time and end time must be filled in exactly and completely according to the system time format.

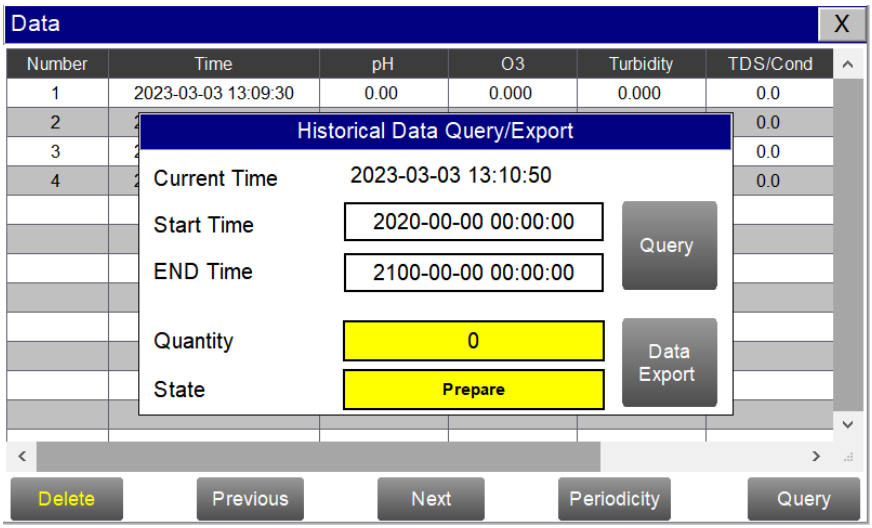


Figure 40 - Historical Data Query and Export Screen

Insert a USB disk behind the display screen and enter the time range of the data to be exported in the query area. Click on the “Data Export” to download the data to the USB disk. The data quantity will be shown as a positive number if data export is successful. If the data export was not successful, please check whether the time format is correct.

If a USB Download Alarm appears please refer to the following table for description of the problem.

Alarm	Description
-1001	Progress or control data object type is incorrect
-1004	Group object name does not exist or the group object does not have the save property
-1020	The start time of the export is greater than the end time
-1021	USB flash drive is not inserted
-1022	Only one export task is allowed at the same time
-1023	The number of records read is 0
-1024	File operation failed
-1025	Export path is empty
-1026	Export path is not legal
-1027	Incorrect time format
-1028	Unsupported export mode

Figure 38A – USB Download Alarm Description

7.11. Historical Data Curves

Click the "Historical Curve" button in the menu bar to enter the trend curve interface. You can click the buttons below the X-axis to browse and view the values in a different time range. Click on Y-axis Range to change the minimum and maximum Y-axis values for a proper range.

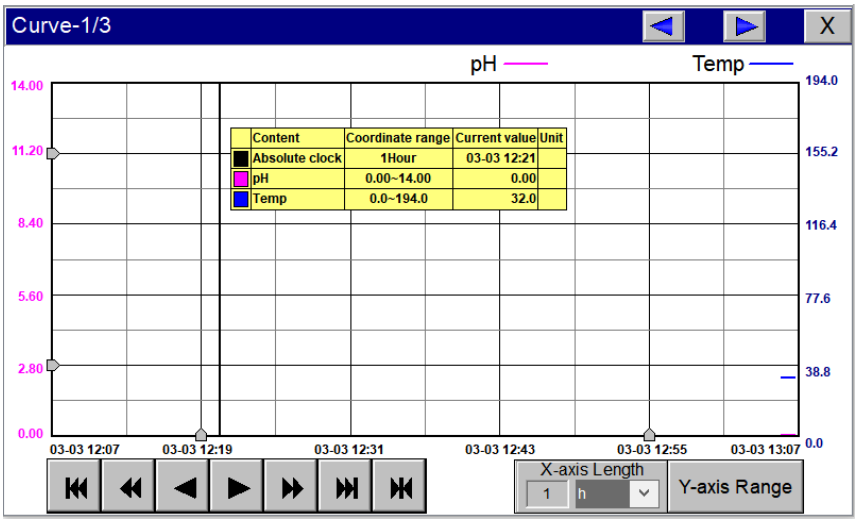


Figure 41 - History Curve Screen

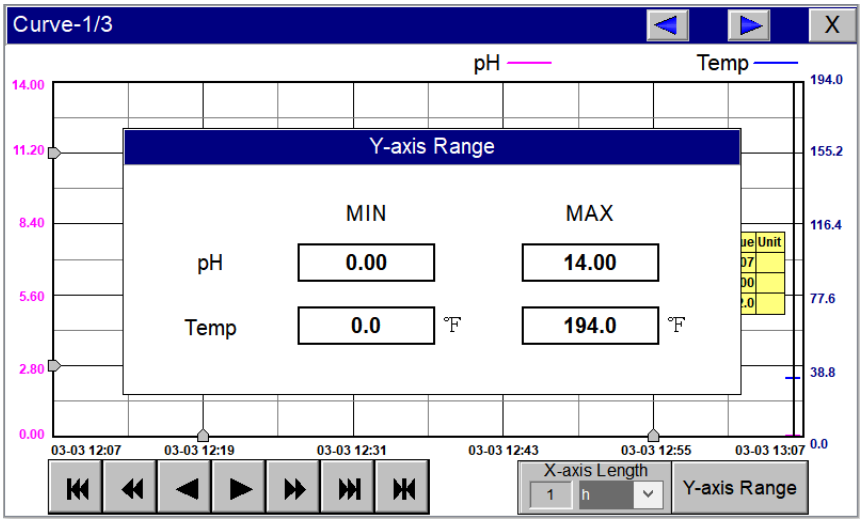


Figure 42 - Y-axis Range Setting

- 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 43 - Button Function Review

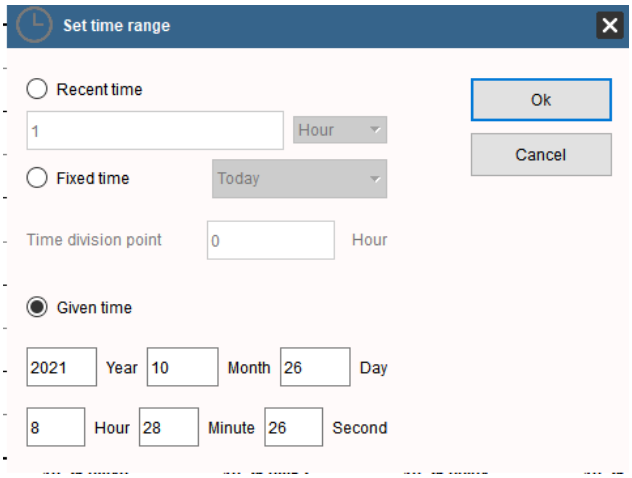


Figure 44 - Time Setting Screen

7.12. User Management

Click the "User Management" button on the menu bar and then you can select "Login", "Logout" and "Manage" operations.

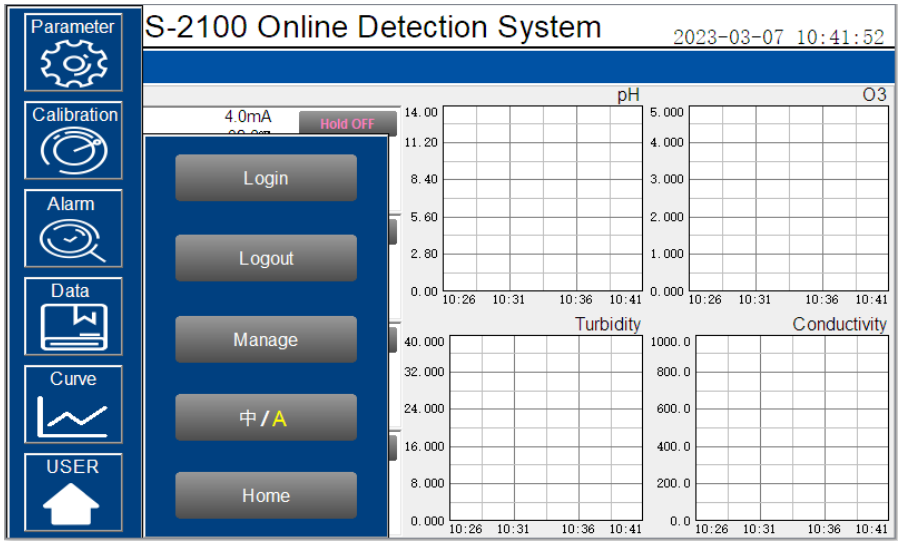


Figure 45 - User Management

Logout enables the user to log out of the logged-in state and only view the real-time readings, but cannot perform operations such as parameter settings. Click “Manage” to enter the user management interface, where you can add users, change passwords and other operations. Users can set their own user name and password and select the user group they belong to. ***NOTE*** Only users in the administrator group can set parameters such as calibration (See WQMS-2000 Series Administration Instruction Guide for Details).

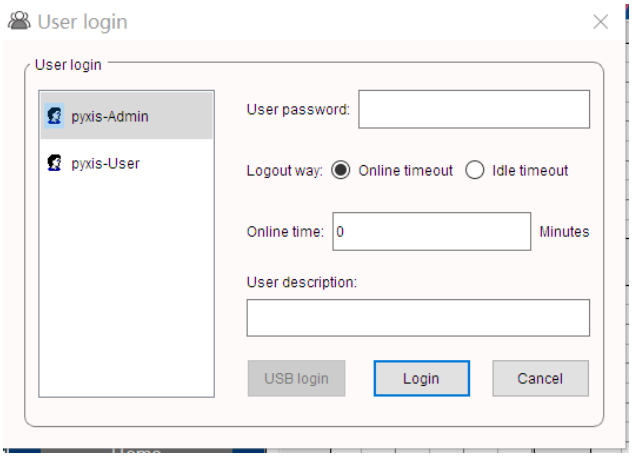


Figure 46 - User Management Screen

Modify Password: Select the user you want to change, then click Modify 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 you do not want to set the password, you can delete the password and save it.

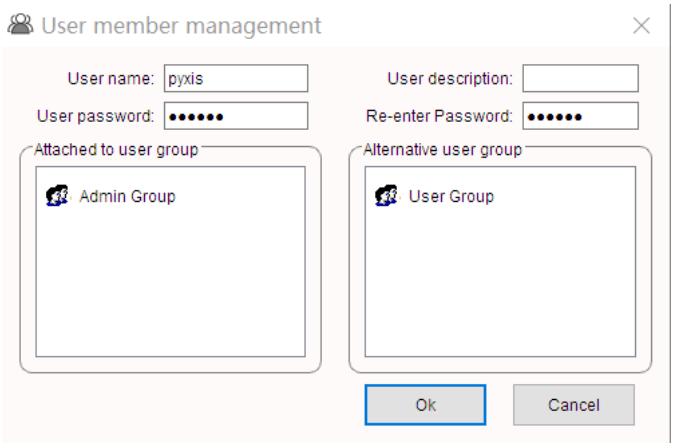


Figure 47 - Modifying the User Screen

8. Modbus Communication & Recommended Maintenance

8.1. Modbus Correspondence Address

Number	Definition	Address	Format	Mode	Unit	Note
1	pH	1	float	Read only	pH	Data format: ABCD
2	O3	3	float	Read only	mg/L	Data format: ABCD
3	Turbidity	5	float	Read only	NTU	Data format: ABCD
4	TDS/Conductivity	7	float	Read only	ppm / µS/cm	Data format: ABCD
5	Temp	9	float	Read only	°F / °C	Data format: ABCD
6	Flow	11	float	Read only	L / min	Data format: ABCD
7	Upper pH alarm	13	uint	Read only		0=Normal / 1=Alarm
8	Lower pH alarm	14	uint	Read only		0=Normal / 1=Alarm
9	Upper O3 alarm	15	uint	Read only		0=Normal / 1=Alarm
10	Lower O3 alarm	16	uint	Read only		0=Normal / 1=Alarm
11	Upper Turbidity alarm	17	uint	Read only		0=Normal / 1=Alarm
12	Lower Turbidity alarm	18	uint	Read only		Data format: ABCD
13	Upper Conductance alarm	19	uint	Read only		0=Normal / 1=Alarm
14	Lower Conductance alarm	20	uint	Read only		0=Normal / 1=Alarm
15	O3 Sensor Communication abnormal	21	uint	Read only		0=Normal / 1=Alarm
16	Turbidity Sensor Communication abnormal	22	uint	Read only		0=Normal / 1=Alarm
17	Conductivity Sensor Communication abnormal	23	uint	Read only		Data format: ABCD
18	FT-100-PLUS Cleaning module Communication is abnormal	24	uint	Read only		0=Normal / 1=Alarm
19	Analog Module Communication is abnormal	25	uint	Read only		0=Normal / 1=Alarm
20	Brush FT-100-PLUS Error	26	uint	Read only		0=Normal / 1=Alarm
Communication Protocol: Standard Modbus-RTU						
Communication Parameters: Baud Rate -9600, Data Bit -8, Stop Bit -1, Check 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						

Table 2 - Correspondence Address

8.2. Suggested Maintenance

After the analyzer is installed by a qualified technician, it can begin to monitor water quality. The WQMS-2000 series inline detection system is designed to be simple to operate, but still requires some regular maintenance. Actual system maintenance may vary depending on the installation conditions and usage. Please refer to the table below as a general recommended maintenance schedule guideline. Little operator intervention is required during normal operation.

Required Services	Recommended Frequency
Cleaning WQMS-2000 Series Inlet Water Filter	Monthly or Cleaned As Needed
Cleaning of FT-100/FT-100-PLUS Flow Reservoir	Monthly or Cleaned As Needed
Replacement of FT-100-PLUS Brush Head	Annually or As Needed
Replacement of ST-765SS-O3 Sensor Electrode Head (EH-765-O3)	Every 6 -12 Months or As Needed
pH Calibration	Every 6 Months or As Desired
Turbidity Calibration *(Low Point Only For Pure Water)*	Every 6 Months or As Desired
Chlorine Calibration	Every 6 Months or As Desired
TDS / Conductivity Calibration	Every 6 Months or As Desired

Table 3 - Maintenance Intervals

8.3. Instrument Alarms and Descriptions

Please refer to the instrument alarms and descriptions table when troubleshooting the WQMS-2000 series system issues an alarm or indicates abnormal measurement data.

Alarms	Description	Symptoms	Solutions/Recommendations
PLC Communication Abnormalities	PLC without Communication		Check if the wiring inside the PLC and control box is loose
Turbidity Sensor Communication Abnormality	Turbidity Sensor without Communication	No Turbidity Measurements	Check the connection between the sensor and the circuit board. If the problem persists, contact Pyxis.
pH / Chlorine Sensor Communication Abnormalities	pH / Chlorine Sensor without Communication	No pH and Chlorine Measurements	
pH Upper Limit Alarm	pH above the Alarm Setting	Information Only	Compare with manual measurement readings. Check and clean line valves. Check that water flow is normal. Check that the sensor is clean.
pH Lower Limit Alarm	pH below the Alarm Setting	Information Only	
Turbidity Upper Limit Alarm	Turbidity above the Alarm Setting	Information Only	
Turbidity Lower Limit Alarm	Turbidity below the Alarm Setting	Information Only	
Chlorine Upper Limit Alarm	Chlorine above the Alarm Setting	Information Only	
Chlorine Lower Limit Alarm	Chlorine below the Alarm Setting	Information Only	
Turbidity Calibration Failure Code 259	Low Calibration Standard Solution out of Range	Turbidity Calibration Failure	Check that the flow cell and sensor are clean and that the standard solution is not contaminated
Turbidity Calibration Failure Code 260	Mid Calibration Standard Solution out of Range	Turbidity Calibration Failure	
Turbidity Calibration Failure Code 261	High Calibration Standard Solution out of Range	Turbidity Calibration Failure	
Turbidity Calibration Failure Code 262	Slope f1 out of Range	Turbidity Calibration Failure	
Turbidity Calibration Failure Code 263	Slope f2 out of Range	Turbidity Calibration Failure	
pH/Chlorine Calibration Failure Code 2		Calibration Failure	Check whether the water flow is normal, whether the sensor is clean, whether the standard liquid is contaminated
pH/Chlorine Calibration Failure Code 3	Standard Solution Value out of Range	Calibration Failure	
pH/Chlorine Calibration Failure Code 5	Wrong Data Type for the Liquid Value	Calibration Failure	

Table 4 - Common Alarms

9. Replacing pH and ST-765SS-O3 Electrode Head

The pH/oxidizer electrode head of ST-765SS Series can be replaced when the original electrode head reaches its working life. Order a replacement electrode head EH-765-O3 (P/N 22630) from Pyxis and follow instructions as below.

1. Turn off the sensor if it is powered on.
2. Make sure there is no water on the sensor.
3. Hold the ST-765SS main body with one hand and use the other hand to twist the stainless-steel locking ring counter-clockwise until the front end of the black electrode is completely unscrewed, as shown in *Figure 46-2*.
4. Pull out the electrode head as shown in *Figure 46-3*.
5. Loosen the electrode plug connector, and remove the electrode head, as show in *Figure 46-4*.
6. To assemble the new electrode head, connect the plug, then insert the new electrode head into the main sensor housing and ensure that the two protrusions on the electrode head are aligned with the notches in the sensor main housing.
7. Then twist the stainless-steel lock ring of ST-765SS in a clockwise direction until the threads of the electrode head completely enter the ST-765SS housing as shown in *Figure 46-1*.

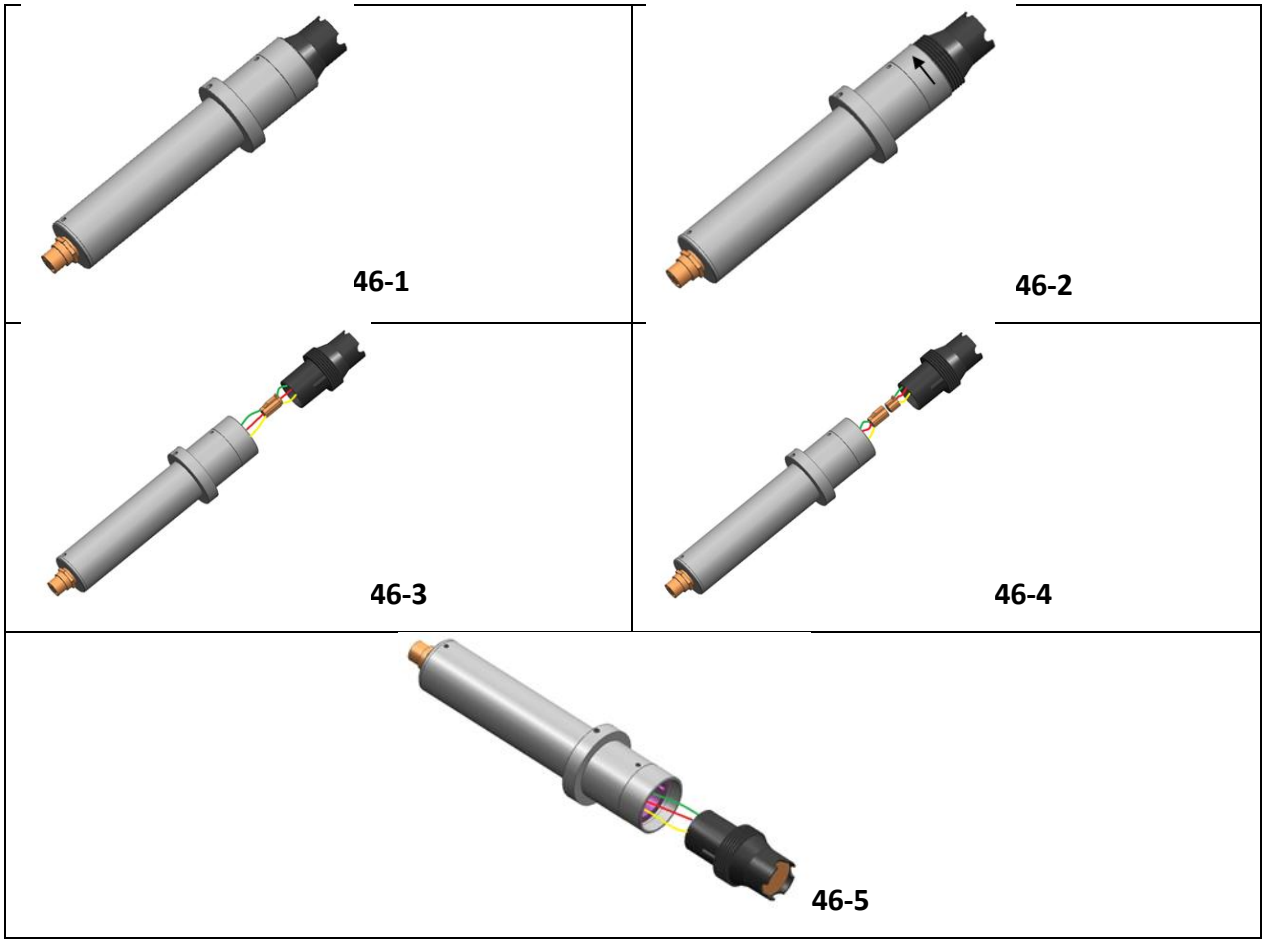
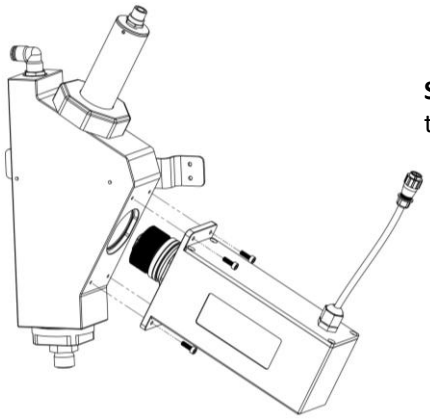


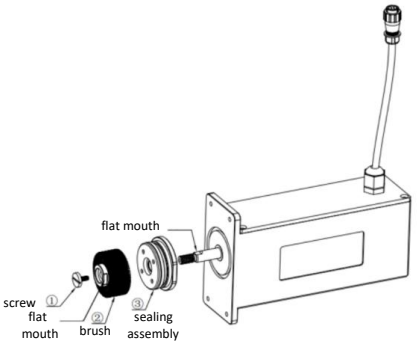
Figure 46 - Replacing EH-765-O3 pH and Ozone Electrode Head

10. Replacing the FT-100-PLUS Brush & Seal Assembly

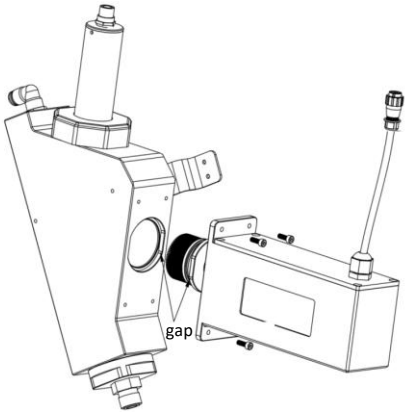
The WQMS-2000 panel comes equipped with FT-100-PLUS automatic brush assembly for inline sensor cleaning and air bubble removal. Replacement of the brush and seal assembly should be conducted annually or as needed by following the process steps below.



STEP 1: Remove the 4 screws(M4), separate the flow-reservoir from the motor box.



STEP 2: Remove the shaft tip screw then rotate the brush head and remove the sealing assembly. Then replace with a new sealing assembly and brush head kit then reinstall and tighten the shaft screw.



STEP 3: Reinstall the motor-box parts shown and tighten the screws snuggly.

Figure 47 - Replacing FT-100-PLUS Brush & Seal Assembly

Pyxis

11. **Order Information**

Order Information	**P/N**
WQMS-2000 *(Bottled & Beverage Water Quality Analyzer with Auto-Brushing Turbidity)*	41396
WQMS-2100 *(Bottled & Beverage Water Quality Analyzer)*	46817

Optional / Replacement Accessories Information	**P/N**
LT-739 *(Ultra-Low Turbidity Sensor Warm White LED 0.000 - 40.00 NTU)*	53221
ST-765SS-O3 *(Ozone + pH + Temperature Sensor w/Internal Compensation)*	53614
ST-724 *(Conductivity + Temperature Low Range 0.02 – 1,000 µS/cm)*	10009
EH-765-O3 *(Replacement Electrode Head for ST-765SS-O3)*	22630
FS-100 *(Replacement Ultrasonic Flowmeter with Display 0-3000mL/Minute)*	54200
Flow Regulating Motorized Valve w/4-20mA Control *(Replacement)*	21972
Rotameter Assembly Kit *(Replacement Rotameter Assembly Kit 0 – 1.0 L/Min)*	22876
ST-007 *(Replacement Inline Stainless Steel Tee Assembly for ST-765 / ST-724 Sensors)*	50700-A51
FT-100 *(Replacement Inline Tee Assembly for LT-739 Sensor)*	50780
FT-100-PLUS *(Self-Brushing Inline Tee Assembly for LT-739)*	16005
FTP-100-1 *(Replacement Brush & Seal Assembly for FT-100-PLUS)*	28698
UC-100A *(Replacement Touch Screen Display/Data Logging Terminal)*	43054
L-CAL *(Portable Liquid Formazin Calibration Kit for LT-73X Series Sensors)*	53247
Pyxis Turbidity Calibration Std – 2.0 NTU *(4,000mL)*	57010-2L
Pyxis Turbidity Calibration Std – 10.0 NTU *(4,000mL)*	57010-10L
Pyxis Turbidity Calibration Std – 20.0 NTU *(4,000mL)*	57010-20L
Pyxis ZERO Oxidizer Calibration Std *(500mL)*	20022
Pyxis pH Combo Calibration Pack *(pH 4-7-10 Calibration Solution 3-Pack - 500mL ea.)*	57007
Pyxis Conductivity Calibration Std – 1,000 µS/cm *(500mL)*	57008
SP-200 OxiPocket™ *(Pocket All-Oxidizing Disinfectants Colorimeter & Fluorometer)*	50802

12. Contact Pyxis Lab

info@pyxis-lab.com for general inquiries
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order@pyxis-lab.com for order and pricing inquires
1-866-203-8397 Phone USA for all needs
Office Hours 7AM – 5PM Central Time USA