

# UC-50 & ST-731

## Startup Guide

Only available for UC-50 Firmware v2.0r636 and higher



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Pyxis Lab Inc.  
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## 1. UC-50 Overview

The Pyxis UC-50 is a universal and preconfigured micro-display and data logging terminal that can connect any Pyxis sensor via RS-485. The UC-50 requires no user configuration when connected to Pyxis inline sensors. When Pyxis sensors are landed via RS-485 Modbus, the UC-50 allows the user to select the Pyxis sensor through a pre-programmed drop-down menu. Once the user has selected the Pyxis sensor from the menu, the UC-50 immediately recognizes the sensor for live sensor value, data (Turbidity) trend charts as well as sensor diagnostics and calibration interface while logging data for USB download. The ST-731 offers 4-20mA output signal directly from the sensor itself. This signal is not utilized by the UC-50 and users may connect to the sensor 4-20mA output for connection to in house controller, PLC or DCS network. The UC-50 also provides RS-485 and 1x 4-20 mA (user defined) output as well as one 24VDC Relay output for use.

**\*NOTE\*** This manual uses the Pyxis ST-731 inline Turbidity sensor as an example to describe the UC-50 functions and features and is only available for UC-50 Firmware v2.0r636 and higher

## 2. Specifications

UC-50 Display & Data Logging Terminal

Item	UC-50	UC-50A
P/N	43007	77065
Power	110/220 VAC 50/60 Hz, 0.6A	24 VDC, 2A
Display	2.8" Color 320 x 240 Resolution	
Output	1 x 4-20 mA / RS-485 Modbus-RTU	
Input	1 x 4-20 mA / RS-485 Modbus-RTU	
Relay Output	One channel relay output, 24VDC – 10 Watt Maximum	
Data Storage	32 M Flash	
USB	1 x USB host for data downloading	
Dimension	6.3-inch L x 3.9-inch W x 2.6-inch D	
Weight	4.6 lbs / 2.1 kg	
Operation Temperature	32 – 122 °F (-0 – 50 °C)	
Storage Temperature	-4 – 158 °F (-20 – 70 °C)	
Humidity	5 – 95% No Condensation	
Protection	IP-65	
Regulation	CE, RoHS, UKCA	

**\*NOTE\*** Specifications are subject to change without notice.

### ST-731 Inline Turbidity Sensor

Item	ST-731
P/N	53505
Turbidity Output Scale 4-20mA Set At Factory	0-10
Resolution	0.05 NTU
Accuracy	±2% of Reading
Method	Nephelometric, with white LED
Power Supply	22 – 26V DC, Power Consumption – 1W
Outputs	Isolated 4 – 20 mA Analog Outputs & Isolated RS-485 Digital Output -7Pin
Dimension (L x W x H)	Length 6.8 inch (172.7 mm), body diameter 1.44 Inch (36.6 mm)
Weight	170 g (0.37lbs)
Installation	ST-001 Inline Tee CPVC (included with ST-731) ¾-inch FNPT Socket & Thread
Material	CPVC
Operational Pressure	Up to 100 psi (0.7 MPa)
Operating Temperature	4°C – 49°C (40 – 120 °F)
Storage Temperature	-7°C – 66°C (20 – 150 °F)
Calibration	Two-point calibration against standard solution
Rating	IP66
Regulation	CE / RoHS / UKCA
Cable Length	1.5 meter 7-pin Bulkhead w Adapter/ 1.5 meter 7-pin Flying Lead w/ Adapter

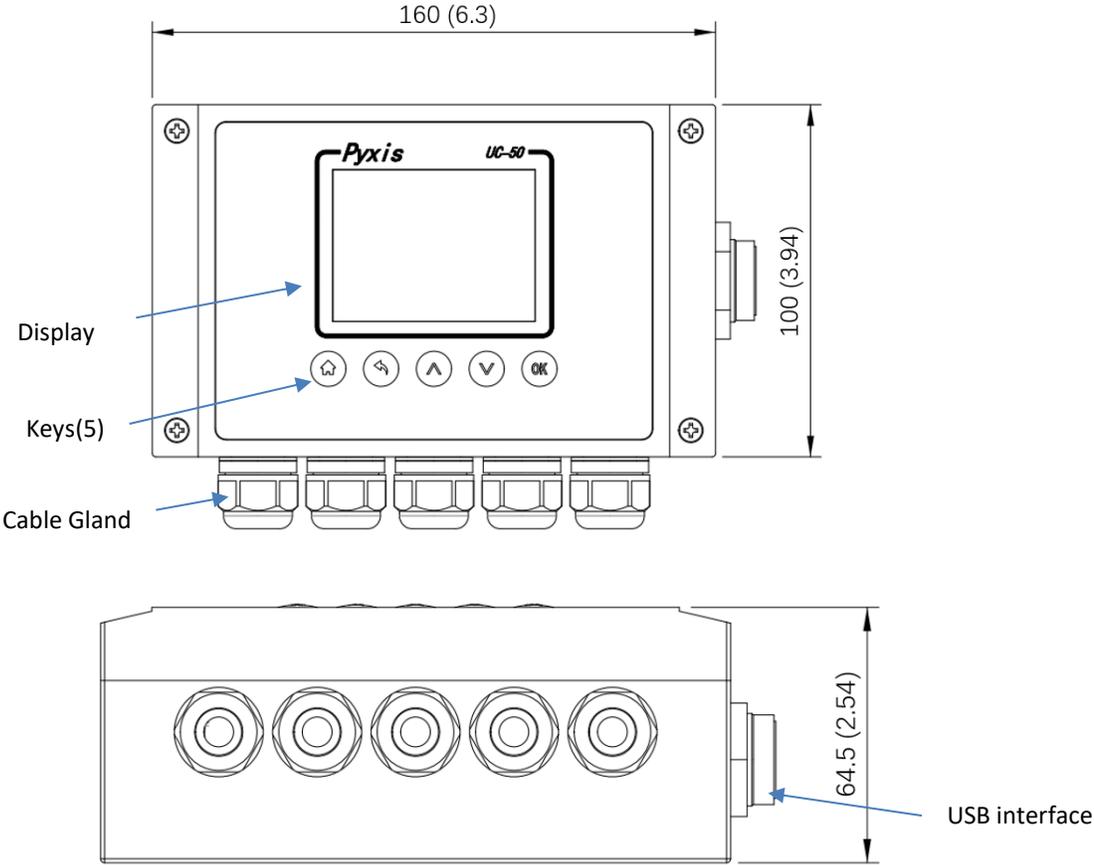
**\*NOTE\*** Specifications are subject to change without notice.

### 3. Unpackaging & Sensor Connection

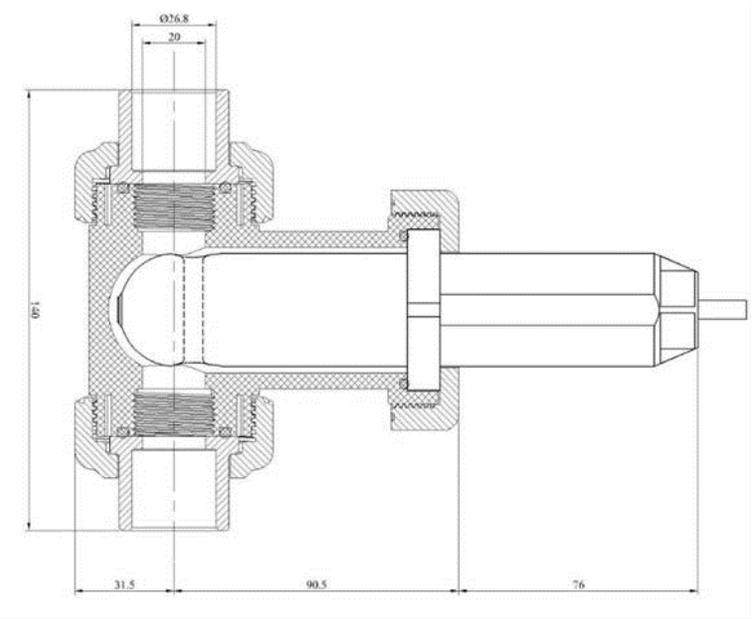
The UC-50 is provided as one item with no loose wiring or power cord. The internal power supply terminal input allows users to install in a hard-wired format for safety. For users desiring to power the UC-50 via outlet, a NEMA-5 power supply with plug should be utilized. Each Pyxis Lab ST-731 sensor is provided with a 1.5m-flying lead/adapter cable (P/N: MA-1100) and 1.5m bulkhead cable. The flying lead cable should be landed to the UC-50 terminal board and sensor bulkhead cable will attach to the flying lead cable via the provided 7-pin (blue) adapters.



### 4. Dimension



Dimension of the UC-50, unit: mm(inch)



Dimension of the ST-731 and ST-001 Tee Assembly, unit: mm

### 5. Electrical Connection

#### 5.1 ST-731 wiring

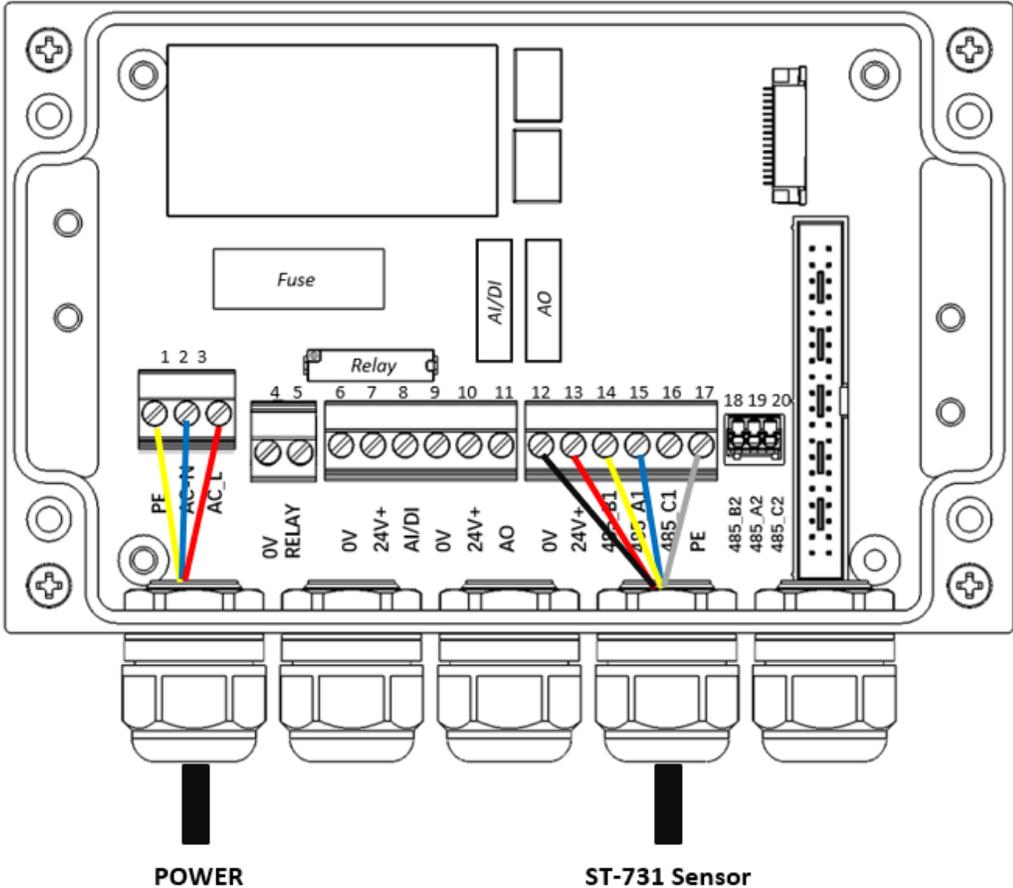
Follow the wiring table below to connect the ST-731 sensor to the UC-50.

Wire Color	Designation
Red	24 V +
Black	24V Power Ground
White	4-20 mA+ for Turbidity
Green*	4-20 mA -
Blue	RS-485 A
Yellow	RS-485 B
Clear	Shield, Earth Ground

**\*NOTE\*** The ST-731 should be connected to the UC-50 via RS-485 communication (Yellow & Blue Leads) and 24VDC power supply (Red and Black Leads) and Shield, Earth Ground (Clear Lead) only. See Terminal Assignment Section for details. The 4-20mA+ and 4-20mA- wires from the ST-731 sensor are not used in the UC-50 however, may be passed through for use elsewhere as desired.

#### 5.2 UC-50 TERMINAL BOARD WIRING DIAGRAM

Please refer to the wiring terminal diagram below for the UC-50 display/data logger.



## Terminal Assignment

NO.	NAME	ASSIGNMENT	TYPE
1	PE	Earth Ground	Power Supply
2	AC-N	Null line for AC	
3	AC-L	Live line for AC	
4	OV	Power/Signal ground for relay	Relay Output
5	RELAY	Relay output (24V, active)	
6	OV	Signal ground for 4-20mA input	4-20mA Input/Output
7	24V+	24V power supply (reserved)	
8	AI/DI	4-20mA input	
9	OV	Signal ground for 4-20mA output	
10	24V+	24V power supply (reserved)	
11	AO	4-20mA output (UC-50 Generated)	
12	OV	Sensor power ground	ST-731 Sensor Connection
13	24V+	24V Sensor power supply	
14	485_B1	Sensor RS-485 B	
15	485_A1	Sensor RS-485 A	
16	485_C1	Signal ground for sensor RS-485	
17	PE	Sensor shield, earth ground	DCS/PLC Communication
18	485_B2	DCS/PLC RS-485 B	
19	485_A2	DCS/PLC RS-485 A	
20	485_C2	Signal ground for DCS/PLC RS-485	

## 6. Start-up Procedures

### 6.1 Keys

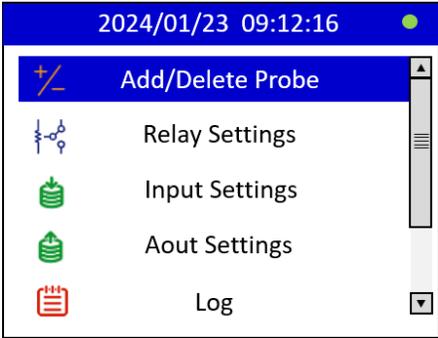


-  **Main key** -Return to the *main screen* from any interface
-  **Back key** -Return to the last displayed screen
-  **Up / Down key** -Select different settings or adjust parameters
- OK key** - Confirm to enter a settings screen, confirm parameters

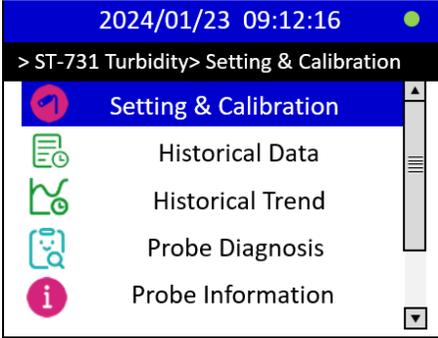
### 6.2 Software Structure

The UC-50 controller has two menus which are **Controller Setting Menu** and **Sensor Setting Menu**. Please enter the corresponding menu according to different keys from the main screen.

Main Screen    Controller Setting Menu

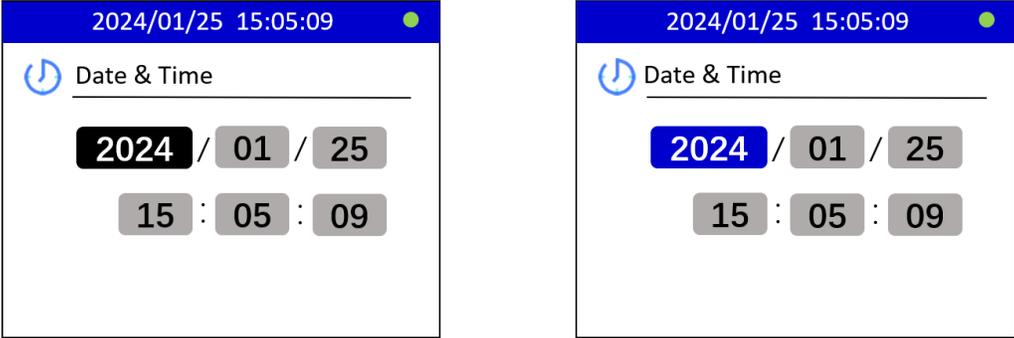


Main Screen  **OK**  Sensor Setting Menu



### 6.3 Changing Parameters and Displayed Values

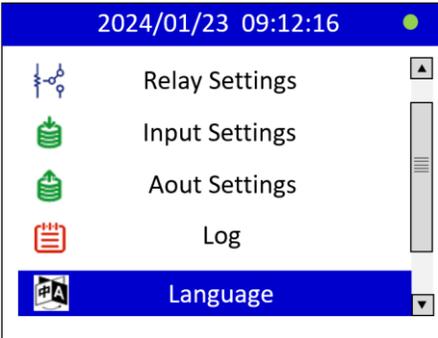
**Changing Displayed Values:** The following example shows how to change the date and time.



1. Use the ▲ or ▼ key to highlight the **Date/Time** field (highlighted field is **black**).
2. Press the **OK** key to enter **edit mode** (edit mode is **blue**).
3. Press the ▲ or ▼ until the desired value is selected.  
 \***SUPPLEMENT\*** Short press to fine-tune the displayed values and long press to coarse-tune displayed values.
4. Once set, press the **OK** Key to confirm the new desired value and exit edit mode.

**Changing Parameters:** The following example shows how to change the language

1. Select **Language** from the controller menu and press **OK** key.



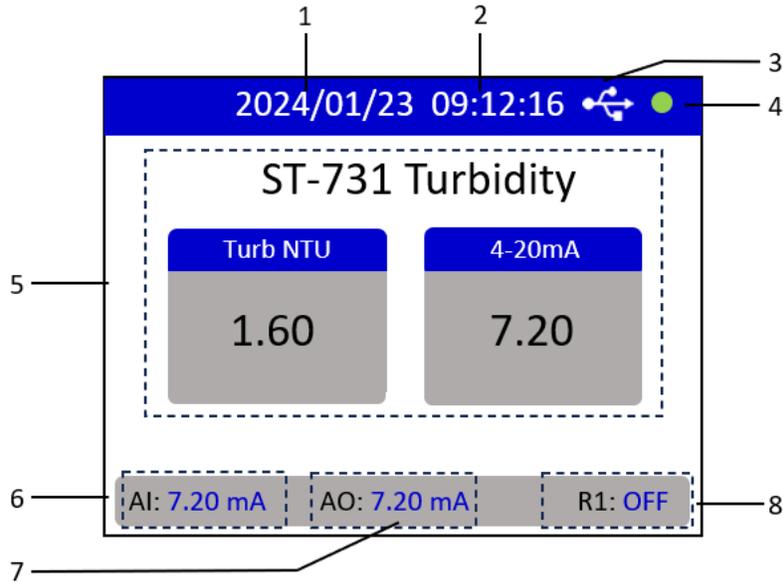
2. Use the ▲ or ▼ key to highlight the required language.



3. Press the **OK** key to confirm the selection or press ↶ key to keep the previous language.

### 6.4 Main Screen

In most cases, the UC-50 is not pre-configured to connect any sensor when it leaves the Pyxis factor. The user needs to select the sensor name through the menu interface (refer to [Section 6.5](#)). After adding a sensor, the main interface of the UC-50 will display the turbidity value of the tested solution.



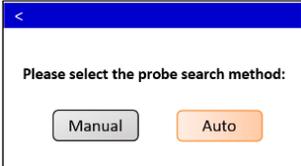
NO.	DESCRIPTION
1	Date
2	Time
3	USB icon, appears when inserting a USB thumb drive
4	Run Status, ● flashing indicates that the controller is operating normally
5	Sensor Name, Sensor Turbidity values (Unit: NTU) and Sensor 4-20mA output values
6	Controller 4-20mA input
7	Controller 4-20mA output
8	Relay Status

### 6.5 Adding/Deleting a Sensor

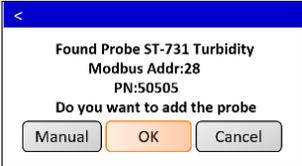
Main Screen → [Add/Delete Probe] → OK

#### Adding a Pyxis Sensor

1. The UC-50 controller supports manual selection of the sensor type or automatic identification of the sensor type.



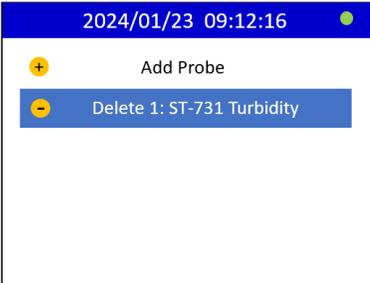
2. If the user selects **Auto**, after a few moments of searching, the UC-50 will automatically display the attached sensor info. Select OK to confirm.



3. Press ↶ key back to the main screen and check whether the sensor connection status is successful.

#### Adding an alternate Pyxis Sensor

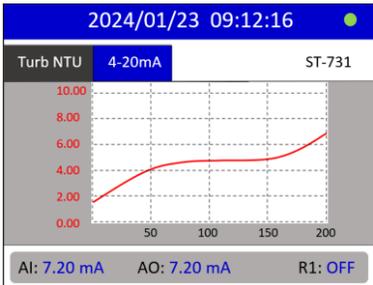
If the user needs to match an alternate sensor, the user should delete the current sensor first and re-perform the sensor addition operation as outlined above.



### 6.6 Trend Chart

Main Screen → ▲ or ▼

Measured values will be displayed as a line graph to show the real-time trend. Press ▲ or ▼ to return to the main screen.



## 7. UC-50 Controller Operation

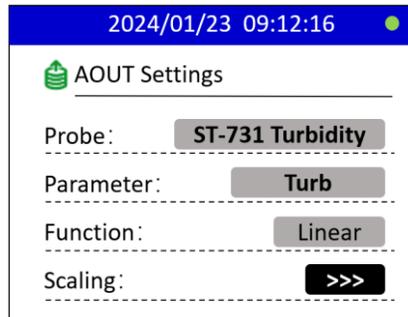
### 7.1 UC-50 4-20mA Output Settings

The UC-50 outputs one (1) 4-20mA signal (independent of the sensor 4-20mA output), which the user can associate to a parameter of the sensor and adjust the output scale. [See Section 5.2 for electrical connection.](#)

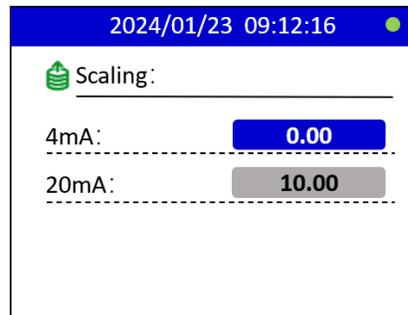
- 1 Navigate to **AOUT Settings** screen:

Main Screen      [AOUT Settings]  **OK**

- 2 Press **OK** key when highlight **Scaling** field.



- 3 The default scaling ratio of 4-20mA is consistent with the sensor range (0-10NTU). The new scale can be customized in the figure below. **\*NOTE\***: This operation does not affect sensor 4-20mA output.



### 7.2 Setting the Language

- 1 Navigate to **Language** screen:

Main Screen      [Language]  **OK**

2. Select the desired language

### 7.3 Adjusting the Date & Time

- 1 Navigate to **Date & Time** screen:

Main Screen      [Date & Time]  **OK**

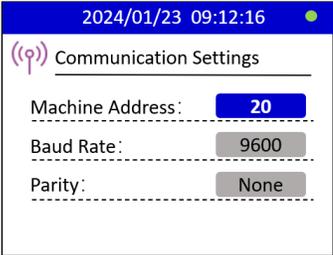
- 2 Adjust date and time

### 7.4 Modbus Communication Settings

Main Screen → ↶ → ▼ → [Communication Settings] → OK

The UC-50 controller is configured as a Modbus slave device, and this function allows users to change Modbus communication parameters. Please follow these settings when using **Modbus RTU** , [see Section 10](#).

Item	Range/Options
Machine (Slave) Address	1~240 (default: 20)
Baud Rate	9600
Parity	None



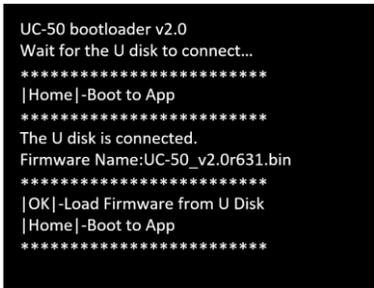
### 7.5 Upgrading the UC-50 Firmware

1. Copy the target UC-50 firmware file (file format: **UC50\_FirmwareVersion.bin**) to the root directory of an empty USB thumb drive. The USB thumb drive should be FAT32 format and 32-64mb in size.
2. Plug the thumb drive to UC-50 USB interface. If the USB thumb drive is recognized successfully, the USB icon will appear in the upper right corner of the screen.
3. Navigate to **Device Upgrade** screen:

Main Screen → ↶ → ▼ → [Device Upgrade] → OK



4. Long press the key and release until you enter the bootloader screen, as shown figure below



5. UC-50 will search for the latest firmware from the USB flash drive and display it on the screen. From this screen, the user can press **OK** to start firmware upgrading procedure or press key to cancel the upgrade. If the users choose firmware upgrade, Please wait for the **Process:100%.....Complete** message to appear and then press **OK** to load the new program.

## 8 ST-731 Sensor Operation

### 8.1 Turbidity Calibration

**Main Screen** → **OK** → **[Setting & Calibration]** → **OK**

The ST-731 sensor can be calibrated in a two-point (zero + slope) procedure using a deionized (DI) water and a Pyxis Turbidity calibration standard solution. **\*IMPORTANT NOTE\*** *Prior to any sensor calibration it is critical to ensure the optical channel of the sensor is properly cleaned. Please refer to Section 9.0 of this manual for details on the proper cleaning steps.*

#### Two-Point (Breaker) Turbidity Calibration

Two-point Turbidity calibration for the ST-731 requires the following depending on the sensor in use. ([see the Order Details Section 10](#)). **\*NOTE\***: *For best results, the ST-730 sensor should be calibrated in a completely light-proof environment by covering the beaker with a towel.*

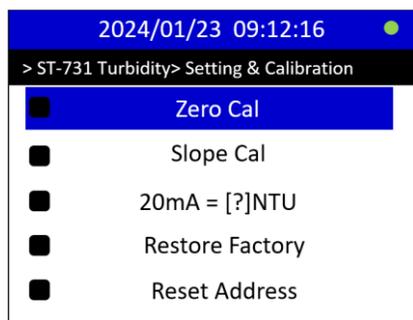
**ST-731 (0-10 NTU measurement capability)**

Zero Calibration = Use DI Water

Slope Calibration = Use Pyxis 2NTU or 5NTU Turbidity Calibration Standard (see below)

- **Pyxis NTU-2 Calibration Standard Solution – 500mL (P/N 57010-6)**
- **Pyxis NTU-5 Calibration Standard Solution – 500mL (P/N 57010-7)**

Place the sensor into a beaker containing deionized (DI) water and cover the beaker with a towel to shield from direct light. Then tap **Zero Cal** in the calibration screen. Please allow sufficient time (a few minutes) for the sensor to stabilize before performing the calibration. **\*NOTE\*** *Future UC-50 firmware updates will allow users to see live turbidity read-out during the calibration process. This feature is not yet offered but for future firmware updates, you may contact [service@pyxis-lab.com](mailto:service@pyxis-lab.com)*



After completing the zero calibration, place the sensor into NTU-2 or NTU-5 calibration standard solution (based on the application range) and cover the beaker with a towel to shield from direct light. Allow the sample to calm for a few minutes, then tap **Slope Cal** in the calibration screen. Manually enter the turbidity concentration of the calibration standard being used as shown in the *Figure above*. If the calibration is successful, the interface will return a message **“Turbidity Calibration Success”**. If the calibration fails, press **Slope Cal** again and repeat the process.

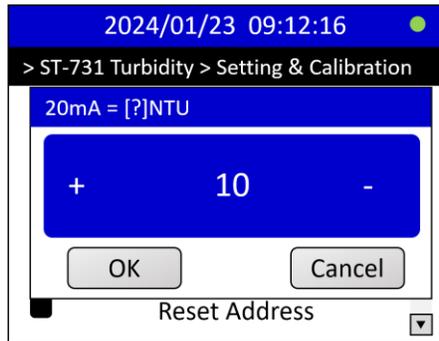
### 8.2 Adjusting Sensor Internal 4-20mA Span

Users may adjust the output scale using 4–20mA Span feature to alter the turbidity value corresponding with the 20mA output. **\*NOTE\*** The 20mA value span adjustment may only be equal to or lower than the upper range detection limit of the sensor (i.e. <10NTU).

**Main Screen** → **OK** → **[Setting & Calibration]** → **OK** → ▼ → **[20mA=?]NTU** → **OK**

The default 4-20mA span for ST-731 sensor is as follows.

Sensor Name	4mA Value	20mA Value
ST-731	0 NTU	10 NTU



### 8.3 Restoring Factory (Initial) Calibration Parameters

If an abnormal reading of the sensor is caused by improper calibration, users can restore the sensor to the factory calibration parameters by using the **Restore Factory** function.

- 1 Navigate to **Restore Factory** screen:

**Main Screen** → **OK** → **[Setting & Calibration]** → **OK** → ▼ → **[Restore Factory]**  
 → **OK**

- 2 Select OK in the prompt that appears.

### 8.4 Viewing, Exporting and Deleting Historical Data

#### Viewing Historical Data

Main Screen → OK → ▼ → [Historical Data] → [View Historical Data] → OK

The UC-50 controller stores measurement data of the ST-731 every 60-seconds. Users can browse the data of different time periods with the ▲ and ▼ keys. The data types from left to right are Turbidity concentration, Sensor 4-20mA output value and no sense. **\*NOTE\*** Future UC-50 firmware updates will allow users to alter the data log period from 60 seconds to whatever frequency is desired. This feature is not yet offered but for future firmware updates, you may contact [service@pyxis-lab.com](mailto:service@pyxis-lab.com)

Time	---
2024/01/25 13:32	1.60/7.20/0.00
2024/01/25 13:31	1.60/7.20/0.00
2024/01/25 13:30	1.60/7.20/0.00
2024/01/25 13:29	1.60/7.20/0.00
2024/01/25 13:28	1.60/7.20/0.00
2024/01/25 13:27	1.60/7.20/0.00
2024/01/25 13:26	1.60/7.20/0.00
2024/01/25 13:25	1.60/7.20/0.00
2024/01/25 13:24	1.60/7.20/0.00

#### Deleting Historical Data

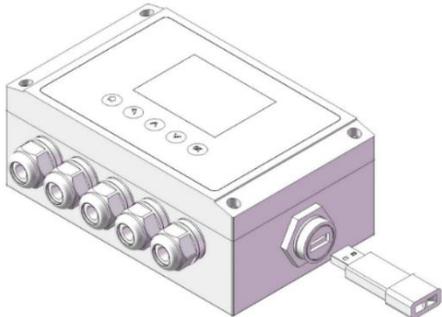
1. Navigate to Clear historical data screen:

Main Screen → OK → ▼ → [Historical Data] → ▼ → [Clear Historical Data] → OK

2. Select OK in the prompt that appears.

#### Exporting Historical Data

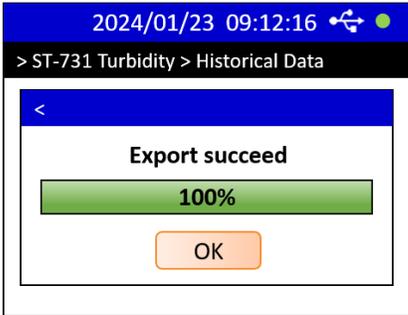
1. Plug the thumb drive to UC-50 USB interface. If the USB thumb drive is recognized successfully, the USB icon will appear in the upper right corner of the screen **\*IMPORTANT NOTE\*** It is important to use a USB disk containing no files and with FAT-32 format and data storage of 32-64GB.



2. Navigate to Export data screen:

Main Screen → ← → ▼ → [Historical Data] → ▼ → [Data Export] → OK

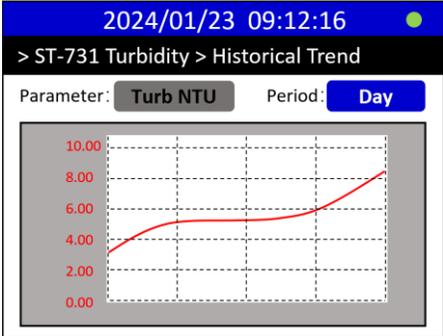
3. Select OK in the prompt that appears. UC-50 will export all historical data to the USB thumb drive. Once data export 100% completed, you can safely unplug the USB thumb drive. File format: Datalog\_Year\_Mounth\_Day\_Hour\_Minute\_Second.csv



### 8.5 Viewing Historical Trend

Users can view the historical measurement data saved by the UC-50 controller in the form of a trend graph. User can select to view the data of the last day, week or month when highlight **Period** field.

Main Screen → OK → ▼ → [Historical Trend] → OK



### 8.6 Sensor Diagnosis

The UC-50 controller supports displaying the diagnostic data of the ST-731 in use. This feature may be used for technical support when communicating with [service@pyxix-lab.com](mailto:service@pyxix-lab.com).

Main Screen → OK → ▼ → [Probe Diagnosis] → OK

PN:	50505	SN:	200000
Addr:	28	Ver:	1.2r28
1	106.71	11	---
2	0.00	12	---
3	4.00	13	---
4	0.07	14	---
5	17900	15	---
6	3	16	---
7	0	17	---
8	0.34	18	---
9	20.00	19	---
10	0.50	20	---

## 8.7 Methods to Cleaning the ST-730 Series Sensor

Any equipment in contact with industrial water systems is subject to many potential foulants and contaminants. The Pyxis Probe Cleaning Solution is specifically formulated to effectively remove the most common inorganic foulants and contaminants commonly experienced in industrial water applications. A small, soft bristle brush, Q-Tips cotton swab or soft cloth may be used to safely clean the sensor housing (ST-001 Tee Assembly) and the inner walls of the quartz optical sensor channel of the ST-730 series sensor itself. These components and more come with a Pyxis Lab Inline Probe Cleaning Solution Kit(P/N: SER-01) which can be purchased at our online E-Store <https://pyxis-lab.com/product/st-series-probe-cleaning-kit/>.



To clean the ST-730 Series sensor, soak the lower half of the sensor in 100 mL inline sensor cleaning solution for 10-15 minutes. After soaking, remove the sensor and use the small, soft bristle brush and Q-Tips cotton swabs as necessary to remove any remaining contaminants in the ST-730 Series sensor quartz optical channel tube. Rinse the ST-730 Series sensor with distilled water and then check for the flashing blue light inside the ST-730 Series sensor quartz tube while the sensor is powered. If the surface is not entirely clean, continue to soak the ST-730 Series sensor for an additional amount of time and repeat the process until clean.

## 9. Modbus RTU

The UC-50 controller is configured as Modbus slave device. Users can view the measured values via a **Modbus RTU** connection. [Refer to Section 5.2 for DCS connection.](#)

UC-50 Default Communication Parameters	
Device Address	20
Baud Rate	9600
Word Length	8
Parity	None
Stop Bits	1

### UC-50 Default Communication Parameters – (Writeable)

Register address	Type	Byte order	Register definition
42001	Unsigned int 16	AB	Device Address

### UC-50 Register Address of Measured Parameters – (Read-Only)

Register address	Type	Byte order	Register definition
46000-46001	float	CDAB	Turbidity
46040-46041	float	CDAB	4-20mA input
46042-46043	float	CDAB	4-20mA output
46044	Unsigned int 16	AB	Relay Status : 0 = close, 1 = on

**\*NOTE\*** If the base address is 1, such as PLC system, access directly according to the register address. If the base address is 0 system, the register address is reduced by 1 after access.

## 10. Order Details

Optional/Replacement Item	P/N
UC-50 <i>(Replacement UC-50 Display/Data Logging Terminal)</i>	43007
ST-731 <i>(Replacement ST-731 inline Turbidity Sensor CPVC)</i>	53505
ST-001 CPVC Inline Tee Assembly <i>(3/4-inch FNPT &amp; Socket CPVC Tee Assembly with Unions)</i>	50704
Pyxis NTU-2 <i>(Turbidity Calibration Standard 2NTU/ 500ml)</i>	57010-6
Pyxis NTU-5 <i>(Turbidity Calibration Standard 5NTU/ 500ml)</i>	57010-7
Pyxis Probe Cleaning Kit <i>(Includes Sensor Cleaner 500mL + Accessories)</i>	SER-01
SP-910 Handheld Turbidimeter <i>(Turbidity 0-200NTU)</i>	50603
MA-C10 <i>(10' Extension Cable for 7Pin Pyxis Sensors)</i>	50738
MA-C50 <i>(50' Extension Cable for 7Pin Pyxis Sensors)</i>	50705

## 12. Contact Us

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