Pyxis®

LS-200 Ultrasonic Level Sensor
User Manual

Water Professionals Deserve Better Tools.

www.pyxis-lab.com

LS-200 Ultrasonic Level Sensor
User Manual

September 28, 2020
Rev. 1.02

Pyxis Lab, Inc.
1729 Majestic Dr. Suite 5
Lafayette, CO 80026 USA
www.pyxis-lab.com

Table of Contents

Warranty Information

Confidentiality

The information contained in this manual may be confidential and proprietary and is the property of Pyxis Lab, Inc. Information disclosed herein shall not be used to manufacture, construct, or otherwise reproduce the goods described. Information disclosed herein shall not be disclosed to others or made public in any manner without the express written consent of Pyxis Lab, Inc.

Standard Limited Warranty

Pyxis Lab warrants its products for defects in materials and workmanship. Pyxis Lab will, at its option, repair or replace instrument components that prove to be defective with new or remanufactured components (i.e., equivalent to new). The warranty set forth is exclusive and no other warranty, whether written or oral, is expressed or implied.

Warranty Term

The Pyxis warranty term is thirteen (13) months ex-works. In no event shall the standard limited warranty coverage extend beyond thirteen (13) months from original shipment date.

Warranty Service

Damaged or dysfunctional instruments may be returned to Pyxis for repair or replacement. In some instances, replacement instruments may be available for short duration loan or lease.

Pyxis warrants that any labor services provided shall conform to the reasonable standards of technical competency and performance effective at the time of delivery. All service interventions are to be reviewed and authorized as correct and complete at the completion of the service by a customer representative, or designate. Pyxis warrants these services for 30 days after the authorization and will correct any qualifying deficiency in labor provided that the labor service deficiency is exactly related to the originating event. No other remedy, other than the provision of labor services, may be applicable.

Repair components (parts and materials), but not consumables, provided during a repair, or purchased individually, are warranted for 90 days ex-works for materials and workmanship. In no event will the incorporation of a warranted repair component into an instrument extend the whole instrument's warranty beyond its original term.

Warranty Shipping

A Repair Authorization (RA) Number must be obtained from Pyxis Technical Support before any product can be returned to the factory. Pyxis will pay freight charges to ship replacement or repaired products to the customer. The customer shall pay freight charges for returning products to Pyxis. Any product returned to the factory without an RA number will be returned to the customer. To receive an RMA you can generate a request on our website at https://pyxis-lab.com/request-tech-support/.

Pyxis Technical Support

Contact Pyxis Technical Support at +1 (866) 203-8397, service@pyxis-lab.com, or by filling out a request for support at https://pyxis-lab.com/request-tech-support/.

1   Introduction

The Pyxis LS-200 is a general-purpose ultrasonic sensor. It provides continuous level measurement up to 86 inches (7.2 ft or 2.2 m) with a 4–20mA output, RS-485, and Bluetooth digital outputs. It can be configured via the **uPyxis®** App on your mobile phones or computers. The sensor is powered by a 24 VDC external power supply. This non-contact liquid level sensor is well suited for corrosive liquids and can be used for industrial and municipal liquid storage and chemical feed applications.

2   Specifications

Table 1. LS-200 Specifications

Specification*	LS-200
Part Number (P/N)	54011
Range	4–86 inch (0.01–2.2 m)
Resolution	0.02 inch (0.5 mm)
Accuracy	$\pm$0.15% of the range
Measurement Interval	Continuous, 10 or 30 seconds, 3 or 30 minutes, 1 or 4 or 6 hours, or stopped
Output	Bluetooth 5, 32 ft (10 m) Line of Sight, 4–20mA Analog Output, RS-485 Digital Output with Modbus protocol
Installation	1" male NPT
Cable Length	9.8 ft (3 m), extension cable available
Power Supply	24 VDC, 2 W
Dead Zone	4 inch (10 cm)
Dimension (H $\times$ Dia)	4.33 $\times$ 2.95 inch (110 $\times$ 75 mm)
Weight	0.45 lbs (210 g)
Enclosure Material	Polycarbonate (PC)
Transducer Material	Polyvinylidene Fluoride (PVDF)
Operational Temperature	5–122 °F (-15–50 °C)
Storage Temperature	-4–140 °F (-20–60 °C)
Pressure	14–30 psi (0.1–0.2 MPa)
Enclosure Rating	IP67
Regulation	CE

* With Pyxis's continuous improvement policy, these specifications are subject to change without notice.

3   Unpacking Instrument

Remove the instrument and find the standard accessories from the shipping container as listed below. Inspect each item for any damage that may have occurred during shipping. Verify that all accessory items are included. If any item is missing or damaged, please contact Pyxis Lab Customer Service at service@pyxis-lab.com or by phone at +1 (866) 203-8397.

3.1 Standard Provided Accessories
- Waterproof Cable Adapter/Flying Leads (10 ft)   P/N: 50774

- User Manual available online at https://pyxis-lab.com/product/ls-200-ultrasonic-level-sensor/

3.2 Optional Accessories
The following optional accessories can be ordered from Pyxis Customer Service (order@pyxis-lab.com) or Pyxis eStore at https://pyxis-lab.com/shop/.

PYXIS LEVEL SENSOR ACCESSORIES

Accessory Name / Description	Part #	Photo
10' LS/LSP Series Waterproof Cable - 7Pin Adapter w/Flying Leads	50774	
MA-L25 25' Waterproof Extension Cable (4-20mA/RS485)	50775	
MA-L50 50' Waterproof Extension Cable (4-20mA/RS485)	50776	
MA-L100 100' Waterproof Extension Cable (4-20mA/RS485)	50777	

Figure 1.

4 Installation

4.1 Tank Top Installation and Precautions
The sensor should be installed to a 1-inch bulkhead fitting on the top of the tank. The major dimensions of the sensor are shown in Figure 2. If a flat horizontal surface is not available on the top of the tank, please use a self-aligning bulkhead fitting so that the sensor can be adjusted to be perpendicular to the liquid surface.

- Install and adjust the sensor to be perpendicular to liquid surface

- Installation location shall not be too close to container wall to avoid interference.

- The sensor has a 3.94 inch (10 cm) dead zone (DZ). Raise the probe to avoid the DZ if desired

- Do not install in a location which will cause the ultrasonic wave to be obstructed

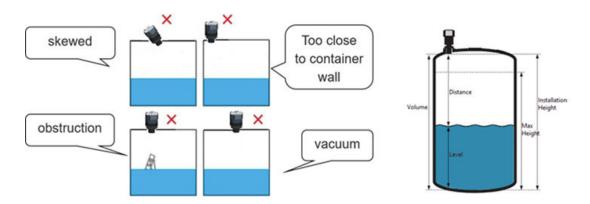- Do not install the sensor in a vacuum environment

Figure 2. Installation illustration

Figure 3. Dimensions, inch (mm)

4.2 Wiring

If the power ground terminal and the negative 4–20mA terminal in the controller are internally connected (non-isolated 4–20mA input), it is unnecessary to connect the 4–20mA negative wire (green) to the 4–20mA negative terminal in the controller. If a separate DC power supply other than that from the controller is used, make sure that the output from the power supply is rated for 22–26 VDC @ 65 mA.

> ∗**NOTE**∗ *The negative 24V power terminal (power ground) and the negative 4–20mA terminal on the LS-200 <u>are</u> internally connected.*

Follow the wiring table below to connect the LS-200 to a controller:

Table 2.

Wire Color	Designation
Red	24V +
Black	24V Power ground
White	4–20mA +
Green*	4–20mA -
Blue	RS-485 A
Yellow	RS-485 B
Clear	Shield, earth ground

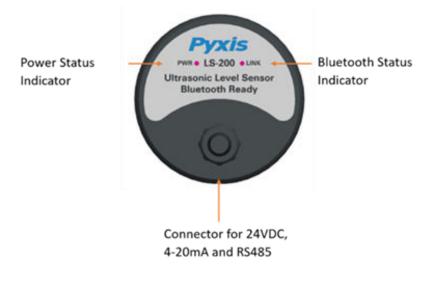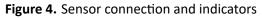* Internally connected to the power ground

5   Instrument Overview

The indicators on the top of the sensor (Figure 4) are used to indicate power status and Bluetooth connection status.

Table 3.

LED Status	On	Off
Green LED	Power Supply is on	Power Supply is off
Blue LED	Bluetooth is connected	Bluetooth is disconnected

∗**NOTE**∗ *The Bluetooth connected LED will illuminate within 30 seconds of powerup of the device. This feature is designed to minimize controller power draw during startup.*

Figure 4. Sensor connection and indicators

6   Setup with uPyxis® Mobile App

6.1   Download uPyxis® Mobile App

Download **uPyxis®** Mobile App from **Apple App Store** or **Google Play**.

Figure 5.

6.2   Connecting to uPyxis® Mobile App

Connect the LS-200 sensor to a mobile smart phone according to the following steps:

1. Open **uPyxis®** Mobile App.

2. On **uPyxis®** Mobile App, pull down to refresh the list of available Pyxis devices.

3. If the connection is successful, the LS-200 and its Serial Number (SN) will be displayed (Figure 6).

4. Press on the **LS-200 image**.

Figure 6.

6.3   Overview Screen

When connected, the **uPyxis®** Mobile App will default to the **OVERVIEW** screen. The **Overview** screen displays the current liquid level and volume of liquid remaining.
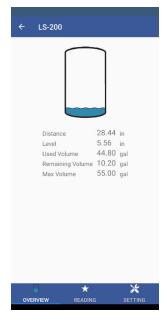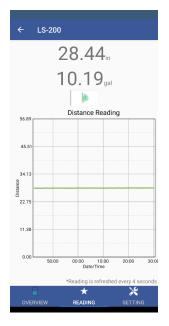

Figure 7.

6.4   Reading Screen

The **READING** screen displays the current volume of liquid remaining and liquid level over time.

Figure 8.

6.5   Settings Screen

The sensor measures the distance between the liquid surface in the tank and the bottom sensor surface. Converting this measured distance to other parameters such as the tank level, the remaining liquid volume, or the consumed liquid, requires the tank dimensional and volume capacity information. Common vertical tanks have a uniform horizontal cross section.

> ∗**NOTE**∗ *For horizontal or other tanks that have a non-uniform cross section, please contact Pyxis Technical Support team (service@pyxis-lab.com) for assistance.*

To convert the measured distance to volumetric information, the user must enter three parameters via the **uPyxis®** Mobile App's **Setting** screen:

- **Tank Volume** (rated volume capacity of the tank)

- **Installation Height** (from the bottom of the tank to the bottom of the LS-200)

- **Max Level Height** (from the bottom of the tank to the liquid surface when filled to the rated capacity)

    ∗**NOTE**∗ *Max Level Height must be at least 4 inches less than **Installation Height***

Figure 9 illustrates these parameters for the tank.

In the **SETTING** screen, the you can also set the **Device Name**, the **Sampling Mode**, **LCD Display Value**, **LCD Screen Off Time (in seconds)**, and the **Display Unit**. To save the settings, press **APPLY SETTINGS**. You may also create or change a password for the LS-200 by pressing **MANAGE PASSWORD**.
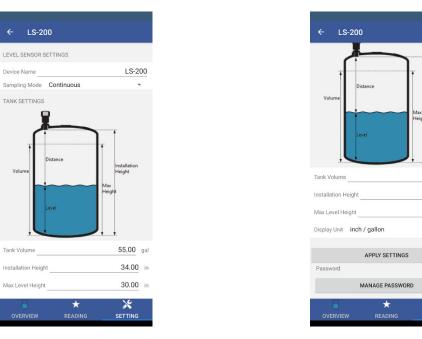
Figure 9.

Figure 10.

7 Setup with uPyxis® Desktop App

7.1 Install uPyxis® Desktop App

Download the latest version of **uPyxis®** Desktop software package from: http://www.pyxis-lab.com/support.html. This setup package will download and install the Microsoft.Net Framework 4.5 (if not installed on the PC before), the USB driver for the USB-Bluetooth adapter, the USB-RS485 adapter, and the main **uPyxis®** Desktop application. Double click the **uPyxis.Setup.exe** file to install.
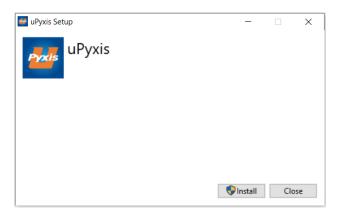

Figure 11. uPyxis® desktop app installation

Click **Install** to start the installation process. Follow the screen instructions to complete the USB driver and uPyxis® installation.

7.2 Connecting to uPyxis® Desktop App

Connect the LS-200 sensor to a Windows computer using a Bluetooth/USB adapter (P/N: MA-NEB) according to the following steps:

1. Plug the Bluetooth/USB adapter into a USB port in the computer.

2. Launch **uPyxis®** Desktop App.

3. On **uPyxis®** Desktop App, click Device → Connect via USB-Bluetooth (Figure 12).

4. If the connection is successful, the LS-200 and its Serial Number (SN) will be displayed in the left pane of the **uPyxis®** window.

    ∗**NOTE**∗ *After the sensor and Bluetooth is powered up, it may take up to 10 seconds for the adapter to establish the wireless signal for communication.*
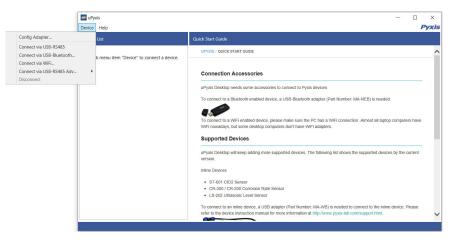

Figure 12.

7.3 Overview Screen

When connected, the **uPyxis®** Desktop App will default to the **Overview** screen. The **Overview** screen displays the current liquid level and volume of liquid remaining.
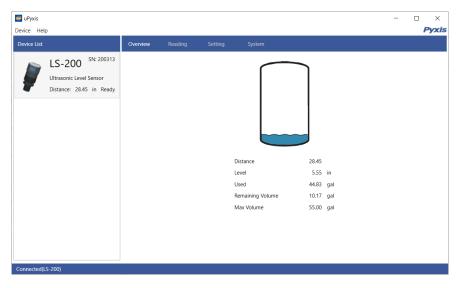
Figure 13.

7.4   Reading Screen
The **Reading** screen displays the current liquid level and the liquid level over time.

Figure 14.

7.5 Setting Screen

The sensor measures the distance between the liquid surface in the tank and the bottom sensor surface. Converting this measured distance to other parameters such as the tank level, the remaining liquid volume, or the consumed liquid, requires the tank dimensional and volume capacity information. Common vertical tanks have a uniform horizontal cross section.

> *NOTE* *For horizontal or other tanks that have a non-uniform cross section, please contact Pyxis Technical Support team (service@pyxis-lab.com) for assistance.*

To convert the measured distance to volumetric information, the user must enter three parameters via the **uPyxis®** Mobile App's **Setting** screen:

- **Tank Volume** (rated volume capacity of the tank)

- **Installation Height** (from the bottom of the tank to the bottom of the LS-200)

- **Max Level Height** (from the bottom of the tank to the liquid surface when filled to the rated capacity)

> *NOTE* *Max Level Height must be at least 4 inches less than **Installation Height***

Figure 15 illustrates these parameters for the tank.

In the **Setting** screen, the you can also set the **Device Name**, the **Sampling Interval**, **LCD Display Value**, **LCD Screen Off Time (in seconds)**, and the **Display Unit**. To save the settings, press **Apply Settings**.

Figure 15.

8 Outputs

8.1 4–20mA Output Setup

The 4–20mA output of the sensor is scaled as:

- 4 mA = (Tank is Empty) = (Level is 0) = (Distance is Installation Height),

- 20 mA = (Tank is Full) = (Level is maximum height) = (Distance is Installation Height – Maximum Height).

The 4–20mA analog signal can be converted to one of four values (Level, Distance, Volume Remaining, or Volume Consumed) in the controller receiving the output according to the above scale. For example, a nominal 100-gallon vertical tank, the maximum height is 36 inches and installation height is 42 inches. The tank volume is 100 gallons when it is filled up to the maximum height 36 inches. The controller should be set up to convert 20 mA to 100 gallons, at which the tank is full and the tank level is 36 inches and the distance measured is 6 inches.

> ∗**NOTE**∗ *The nominal capacity provided by the tank manufacturer may be greater than the maximum safe (net or effective) capacity that can be practically filled. Please keep this in mind as you configure your LS-200 for practical purposes.*

8.2 Communication Using Modbus RTU

The sensor can be configured as a Modbus slave device via RS-485. In addition to the level, volume, and distance, many operational parameters, including warning and error messages, are available via a Modbus RTU connection. Contact Pyxis Lab Customer Service (service@pyxis-lab.com) for more information.

9 Sensor Maintenance and Precaution

For best performance, keep the sensor ultrasonic surface clean using a soft cloth or towel. Notice that sometimes the maximum sound pressure level inside the beam area is up to 165dB, which exceeds the standard safe limit of 110dB. Never point the probe at the eye. The directivity pattern of the probe is shown in Figure 16.
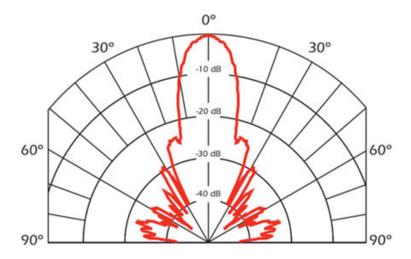

Figure 16. Directivity pattern of the LS-200

10   Regulatory Approval

United States

The LS-200 sensor has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in an installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help

Canada

This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible

11   Contact Us

Pyxis Lab, Inc
1729 Majestic Dr. Suite 5
Lafayette, CO 80026 USA
www.pyxis-lab.com
Phone: +1 (866) 203-8397
Email: service@pyxis-lab.com