

LPU-2127

User Manual

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Introduction

Thank you for purchasing a LPU-2127 ultrasonic sensor from BinMaster. We appreciate your business! Please take a few minutes to familiarize yourself with your LPU-2127 and this manual.

The LPU-2127 loop-powered ultrasonic sensor provides a low-power, non-contact level measurement solution rated for hazardous locations and suitable for harsh chemical environments. It offers a built-in keypad and four digit LCD display for easy setup, and a NEMA 4X cover for outdoor applications.

Reading your label

The LPU-2127 comes with a label that includes the instrument's model number, part number, serial number, and a wiring pinout table. Please ensure that the part number and pinout table on your label match your order. The following electrical ratings and approvals are also listed on the label. Please request the Certificate of Compliance for further details.

Electrical ratings



Input: 12 to 28 Volts DC; Output: 4-20mA

Class I Division 2; Groups C, D T6

Class I, Zone 2, Group IIB

AEx nA IIB T6: Ta: -40°C to 60°C; IP65

Ex nA IIB T6: Ta: -40°C to 60°C; IP65

i **IMPORTANT:** The LPU-2127 must be installed as shown on drawing 9002745 to meet listed approvals. Faulty installation will invalidate all safety approvals and ratings.

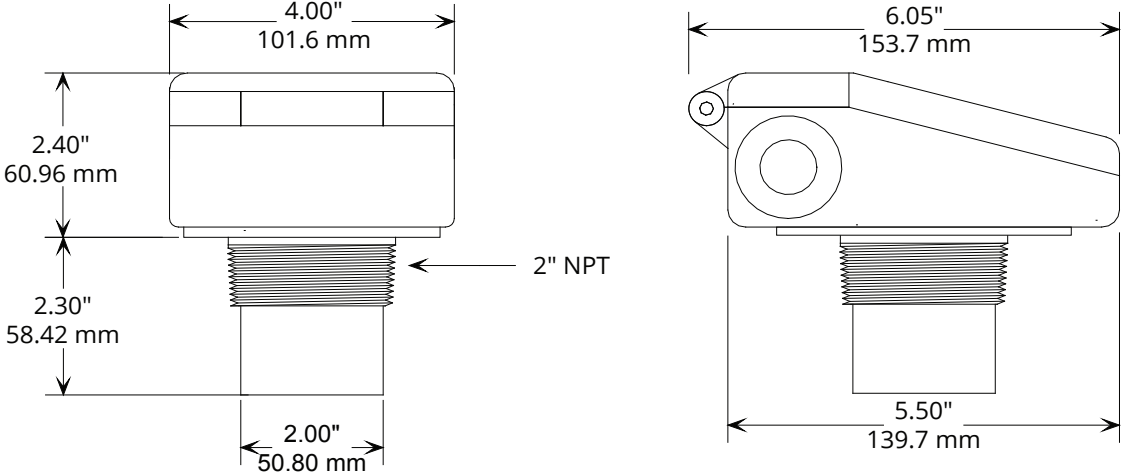
Warranty and Warranty Restrictions

BinMaster warrants this product against defects in material and workmanship for two (2) years according to the following terms;

- 1.) This warranty extends to the original purchaser only and commences on the date of original purchase.
- 2.) BinMaster's sole obligation under said warranty is to repair, or at its option replace the defective parts. The buyer shall have no other remedy. All special, incidental and consequential damages are excluded. The buyer must deliver the product under warranty prepaid to the factory. BinMaster's obligation is limited to the cost of material and labor to repair or replace, and does not include transportation expenses.
- 3.) This warranty shall be voided, in our sole judgment, by alterations of equipment except by BinMaster, or tampering with, improper installation or maintenance, accident or misuse, or act of God. This warranty expressly excludes all damage to the product resulting from careless or neglectful packaging or transportation. The warranty does not extend to repairs made necessary by normal wear.
- 4.) This warranty is in lieu of all other warranties, expressed or implied including any implied warranties or merchantability or fitness for particular purpose. No employee, agent, franchise dealer or other person is authorized to give any warranties of any nature on behalf of BinMaster.
- 5) BinMaster shall in no event be responsible for any warranty work done without first obtaining BinMaster's written consent.
- 6) Except as provided herein, BinMaster shall have no liability, loss or damage caused or alleged to be caused directly or indirectly by this equipment.
- 7) This warranty gives the buyer specific legal rights, and you may also have other rights which vary from state to state.
- 8) For service, please call 402-434-9102.

Chapter 1: Specifications and Options

- **Dimensions**



• Specifications

Performance

Operating Range	1 - 25 ft. (0.3 - 7.6 m) on liquids and hard, flat surfaces 1 - 10 ft. (0.3 - 3 m) on bulk solids
Analog Output	4-20 mA
Beam Pattern	9° off axis
Frequency	69 kHz
Response Time	0.6 - 3 seconds (dependent on output range)
Sample Rate	3 seconds @ 4 mA 0.6 seconds @ 20 mA

Accuracy

Accuracy	±0.25% of detected range
Resolution	0.1 inch (2.54 mm)

Environmental

Operating Temperature	-40 to 60°C (-40 to 140°F)
Internal Temperature Compensation	Yes
Enclosure Protection	IP65
NEMA rating	4X

Electrical

Supply Voltage (at sensor)	12-28 VDC
Current Draw	22 mA max
Output Signal	3-30 mA max
Load Resistance	150Ω max @ 12 VDC 600Ω max @ 24 VDC
Cable Connection	2-terminal connector

Materials of Construction

Transducer Housing	PVDF (Kynar®)
Upper Housing	PET

Chapter 2: Installation and Removal Procedures and Notes

• Tools Needed

Tools are not necessary for installing the LPU itself. If you are using a stand pipe to mount your LPU, you will probably need tools to install the stand pipe, but not for the LPU.

• Installation Notes

- Mount your LPU sensor so that it has a clear, perpendicular sound path to the surface being monitored. Your sensor should be mounted away from tank or vessel walls and inlets. See Figure 2.1.
- The sound path should be free from obstructions and as open as possible for the 9° off axis beam pattern.

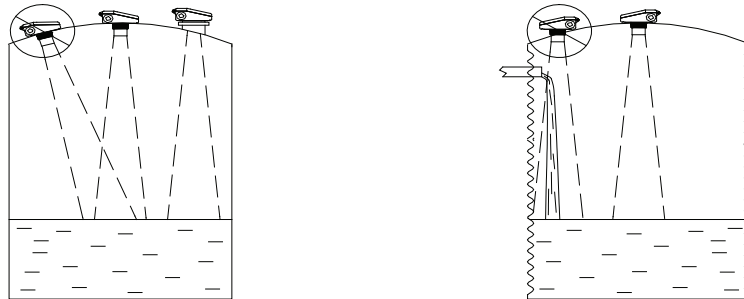


Figure 2.1

NOTE: Do not mount the sensor where the beam will intersect objects such as fill streams, pipes, ladder rungs, wall seams, or corrugated tank walls.

• **Mounting Instructions**

Mounting your LPU is easy if you follow a few simple steps:

- Never over-tighten the sensor.
- Always screw in your sensor by hand to avoid cross-threading. Thread failure can be a problem if you damage threads by over-tightening them or by crossing threads.

i **IMPORTANT:** Do not over tighten! The sensor should be threaded in only hand tight.

• **Electrical Installation**

- With the lid of your LPU closed, remove the cable knock out.
- Clear the flashing.
- Open the lid of your LPU and install cable gland or conduit connection.
- Connect 12-28 VDC supply wire to (+) Terminal
- Connect 4-20 mA output wire to (-) Terminal.

• **Removal Instructions**

- Remove the sensor and store it in a dry place, at a temperature between -40° F and 180° F.

Chapter 3: Set Up and Operation

• **User Interface**

The LPU display and programming buttons can be accessed by loosening the screw that secures and seals the sensor's lid. The LCD display shows the distance measurement. The display is also used to view the individual modes and their values when programming.

The LPU controls operate similar to a digital wrist watch. The LPU has four buttons, MODE UP, MODE DOWN, VALUE UP, and VALUE DOWN (See Figure 3.1). The MODE UP/DN buttons allow the user to select the desired mode while VALUE UP/DN buttons allow the user to view and alter the settings.

To select a mode, press the MODE UP or MODE DOWN button until the desired mode is displayed. Press the VALUE UP or VALUE DOWN button once to view the current setting of that mode.

To change the selected mode setting, press the VALUE UP or VALUE DOWN button until the desired value is displayed.

To STORE or SAVE the changed mode value, press the MODE UP or MODE DOWN button once. At this point, the display will show the distance measurement. The values are stored in a nonvolatile memory, and will not be lost when power is turned off.



Figure 3.1

Along with the buttons and the display, the LPU-2127 includes a detected signal strength indicator. On the leftside of the display are bars to indicate the strength of the signal returning to the sensor (See Figure 3.2). Three bars indicates excellent signal strength; two bars indicates good signal strength; one bar indicates fair signal strength; no bars indicates loss of echo (no signal).



Figure 3.2

- **Operation Modes**

MODE	DESCRIPTION	PARAMETERS
1	<i>Units</i>	Range = 0-2 Default = 0 0 = feet 1 = inches 2 = mm

Mode 1 is used to select the units of measurement that will be used throughout the setup process and also for display. The units will also determine the resolution of the display and the outputs. The resolution is: feet 0.01, inches 0.1, and millimeters 1.

 **NOTE:** All modes must be set using the units selected in Mode 1.

MODE	DESCRIPTION	PARAMETERS
2	<i>4 mA distance</i>	Units = Mode 1 Range = 0-9999 Default = 1.00 ft.

Mode 2 sets the 4 mA distance, measured from the Zero Point (See mode 10).

MODE	DESCRIPTION	PARAMETERS
3	<i>20 mA distance</i>	Units = Mode 1 Range = 0-9999 Default = 25.00 ft.

Mode 3 sets the 20 mA distance, measured from the Zero Point (See mode 10).

For Distance configuration (i.e., greater mA output for target surface further from sensor), set the mode 2 distance to be less than the mode 3 distance (See Figure 3.3).

For Fill configuration (i.e., greater mA output for target surface closer to sensor), set the mode 2 distance to be greater than the mode 3 distance (See Figure 3.4).

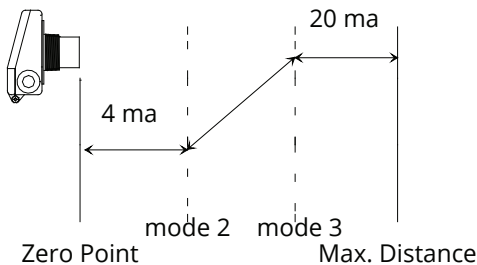


Figure 3.3

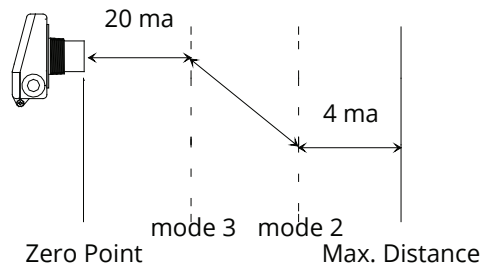


Figure 3.4

MODE	DESCRIPTION	PARAMETERS
4	<i>Response Time</i>	Range = 1-3 Default = 1 1 = 3.3 ft/min (1m/min) 2 = 15ft/min (4.5m/min) 3 = >15 ft/min (4.5/min)

Mode 4 is used to select the desired response time of the sensor. The response time represents the maximum rate of change in target level that the sensor will accurately display. Thus, setting 1 (3.3 ft/min) is the slowest setting, and setting 3 (>15 ft/min) is the fastest.

MODE	DESCRIPTION	PARAMETERS
5	<i>Fail-safe</i>	Range = 0 - 2 Default = 1 0 = hold last 1 = 22 mA 2 = 3.75 mA

Mode 5 sets the output condition that the sensor will revert to in the event of a loss of echo condition. If this mode is set to 0, the sensor will hold the last reading until the signal is regained. If set to 1, the output of the sensor will go to 22 mA. If set to 2, the output will go to 3.75 mA.

MODE	DESCRIPTION	PARAMETERS
6	<i>Fail-safe Delay</i>	Units = Seconds Range = 5-9999 Default = 15

Mode 6 sets the delay, in seconds, before the output will show a loss of echo condition set in Mode 5. When this time has expired, the display and output will change to their fail-safe settings.

 **NOTE:** Most applications do not require the user to manipulate modes beyond 6.

• Calibration Modes

MODE	DESCRIPTION	PARAMETERS
7	<i>4 mA Trim</i>	Range = 0-9999 Default = 5000

Mode 7 fine tunes the minimum current sourced on the analog output.

MODE	DESCRIPTION	PARAMETERS
8	<i>20 mA Trim</i>	Range = 0-9999 Default = 5000

Mode 8 fine tunes the maximum current sourced on the analog output.

MODE	DESCRIPTION	PARAMETERS
9	<i>Calibration</i>	Range = 0-1999 Default = 1000

Mode 9 is used to calibrate the sensor for variations in the speed of sound due to variations in atmospheres. The default of 1000 is used for most applications. Assume a decimal after the first digit.

MODE	DESCRIPTION	PARAMETERS
10	<i>Distance Offset</i>	Units = Mode 1 Range = -3.00 to 3.00 Default = 0

Mode 10 is used to change the Zero Point of the sensor. This not the zero output (4 mA) point of the sensor. The Zero Point of the sensor is the point from which the calculated distance is measured. See Figures 3.3 and 3.4 on page 6.

- **Utility Modes**

MODE	DESCRIPTION	PARAMETERS
11	<i>Temperature Compensation</i>	Range = 0 - 2 Default = 1 0 = OFF 1 = ON 2 = View Temperature (degrees C)/ON

Mode 11 activates or deactivates the internal temperature compensation circuit. The speed of sound changes with changes in temperature, therefore changes in temperature can affect distance measurements. These affects can be minimized by activating temperature compensation. If the mode is exited while viewing temperature, temperature compensation is turned ON.

MODE	DESCRIPTION	PARAMETERS
12	<i>AutoSense</i>	Range = 0 - 1 Default = 1 0 = Manual (user controls Sensitivity and Pulses) 1 = AutoSense (sensor controls Sensitivity and Pulses)

Mode 12 activates or deactivates AutoSense. When operating with this mode active, the LPU-2127 will automatically change the sensitivity and pulses to match the application. Modes 13 and 15 limit the maximum level that sensitivity and pulses can be manipulated when operating in AutoSense. Modes 13 and 15 set the sensitivity and pulses when operating in manual mode.

MODE	DESCRIPTION	PARAMETERS
13	<i>Sensitivity</i>	Range = 0 - 100% Default = 100%

Mode 13 sets the level of gain that is applied to the echo. When operating in AutoSense, this parameter limits the gain that can be applied to the echo. If operating in manual, this parameter sets the receive gain. When in manual mode, set the sensitivity to the minimum value that will allow the target to be reliably tracked through the full range of expected environmental conditions.

MODE DESCRIPTION PARAMETERS

14 *Blanking* Units = Determined by Mode 1
 Range = 0.5 -16 ft.
 Default = 1.00 ft.

Mode 14 sets the Blanking distance, which is the zone from the sensor to a point where the first echo will be accepted. While blanking distance can be used to ignore unwanted targets -- such as welds, seams, pipe fittings, or gaskets -- between the sensor and the closest acceptable target level, such objects generally create additional reflections and echoes, which are hard to filter out. More often, Blanking distance is used for a sensor installed in a stand pipe.

Because of the physical properties of an ultrasonic sensor, objects cannot be detected closer than approximately 1 foot from the face of the transducer. However, this distance varies according to how much energy is being transmitted (Mode 15) and the installation. Low pulses and soft mounting may allow target detection as close as 6 inches.

MODE DESCRIPTION PARAMETERS

15 *Pulses* Range = 1-20
 Default = 16

Mode 15 sets the maximum number of pulses the sensor can transmit when operating in AutoSense or simply the number of pulses when operating in Manual (mode 12). The LPU emits a burst of pulses and measures the time it takes for the burst to travel to and from the target. The more pulses that are sent in a burst, the stronger the returning echo. When operating in Manual, increase the strength of the transmission by increasing the number of pulses for detecting soft targets in damping environments. In acoustically active environments or small enclosed areas, decrease the number of pulses to reduce multiple echoes.

MODE DESCRIPTION

16 *Software Version*

Mode 16 displays the software version of the LPU.

MODE DESCRIPTION

17 *Reset*

Mode 17 resets the LPU to factory default settings.

Chapter 4: Maintenance

• General Care

Your LPU-2127 ultrasonic sensor is very low maintenance and will need little care as long as it was installed correctly. However, in general, you should:

- Avoid applications for which the sensor was not designed, such as extreme temperatures, contact with incompatible corrosive chemicals, or other damaging environments.
- Inspect the threads whenever you remove the sensor from duty or change its location.

• **Trouble Shooting**

Should you have problems with your LPU-2127, here are some troubleshooting steps.

- Check the received signal strength (See Figure 3.2 on page 5). If the signal strength is low, alternately increase Pulses (mode 15) and Sensitivity (mode 13) until the signal strength improves.
- Ensure Temperature Compensation (mode 11) is turned on.
- Ensure AutoSense (mode 12) is turned on.
- Ensure that Blanking (mode 14) is accurately set to account for any unwanted targets between the sensor and the closest acceptable target.

• **Calibration**

This procedure uses targets at known distances to calibrate the sensor's accuracy. A wall or other large, flat object is recommended for the long range target.

- Point the sensor at a target at a known distance near the maximum range of the sensor, 25' for a single solid object (See Figure 4.1).
- Adjust the Calibration value (mode 9) until the distance reading on the sensor matches the actual measured distance to the target.
- Point the sensor at a target near the minimum measurement range, 1' plus any Blanking distance (See Figure 4.2).
- Adjust the Distance Offset value (mode 10) until the distance reading on the sensor matches the actual measured distance to the target.
- Repeat previous two steps until no further adjustment is required.



Figure 4.1

Figure 4.2

 **NOTE:** Mode 17 will reset the LPU to factory default settings.

- **Repair and Returns**

Should your LPU-2127 ultrasonic sensor require service, please contact the factory via phone or email. We will issue you a Return Material Authorization (RMA) number with instructions.

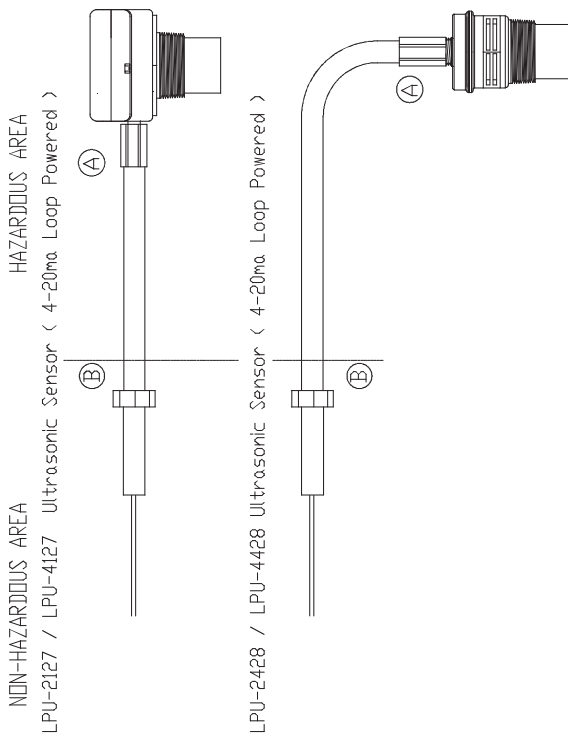
- Phone: 402-434-9102
- Email: info@binmaster.com

Please have your LPU-2127's part number and serial number available. See Warranty and Warranty Restrictions for more information.

Chapter 5: Hazardous Location Drawing and Certification

• Hazardous Location Drawing

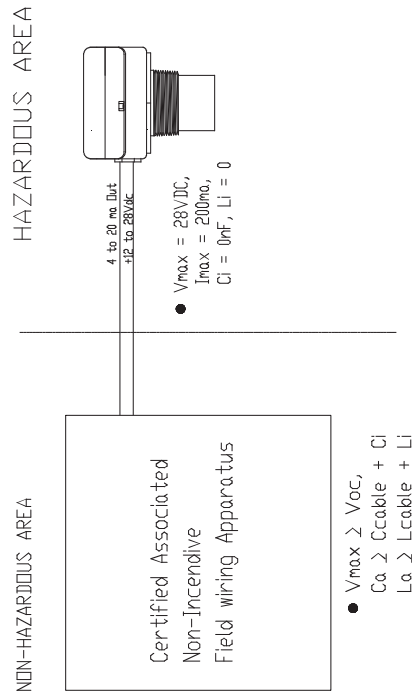
Installation in Class I Division 2 Groups C and D Class I Zone 2 A EXnA IIB



- Install in accordance with Section 18 of the CEC or Article 500 of the NEC.
- CSA listed or NRTL/UL listed conduit seal at location A & B as required by Local Authority.
- The cable is terminated in the sensor and runs continuously from the sensor through the Hazardous area and into the Non-Hazardous area.
- Electrical equipment connected to associated apparatus should not generate more than 250 V rms.
- Tampering or replacement with non-factory components may adversely affect the safe use of the system.

Drawing 9002745

Non-Incendive Wiring for Installation in
Class I Division 2 Groups C and D, Max. Temp. 60°C



- **WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD –**
Clean with only with a damp cloth
AVERTISSEMENT – surface non conductrice du boîtier peuvent être
facturés par MEDIA non conductrice ; CLEAN avec un chiffon humide
- **DO NOT DISCONNECT WHILE CIRCUIT IS ALIVE**
UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS
AVERTISSEMENT-NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS
TENSION, A MOINS OÙ IL NE S'AGISSE D'UN EMPLOI NON DANGEREUX

