LPU-2127

Loop Powered Ultrasonic Sensor

USER MANUAL

Automation Products Group, Inc.

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Doc # 9002657
Rev. C | 01/2026

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NOTE: Find additional product documents, specifications, accessories, and more on the LPU-2127 online product page. Go to: apgsensors.com/product/loop-powered-ultrasonic-sensor/

INTRODUCTION

Thank you for purchasing a LPU-2127 ultrasonic sensor from APG. 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

Every APG instrument 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 lable match your order. The following electrical ratings and approvals are also listed on the label. Please refer to the Certificate of Compliance on the website product page for further details: apgsensors.com/product/loop-powered-ultrasonic-sensor/

Electrical Ratings

C 237484 US

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

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 STATEMENT

This product is covered by APG's warranty to be free from defects in material and workmanship under normal use and service of the product for 24 months. For a full explanation of our Warranty, please visit

apgsensors.com/warranty-returns/.

Contact Technical Support to receive a Return Material Authorization (RMA) before shipping your product back.

If your product needs to be returned for evaluation, contact us via email, phone, or online chat on our website. We will issue you an RMA number with instructions. You can also find the form on our website by clicking "RMA" in the web footer, or go to

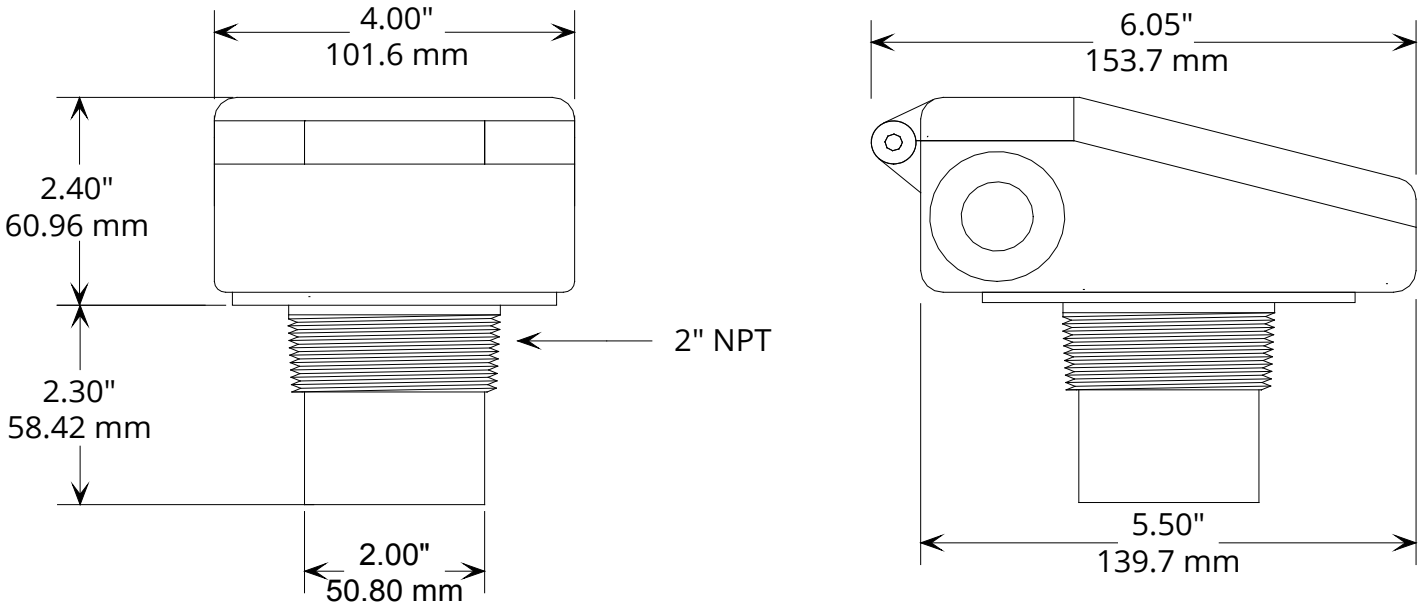
apgsensors.com/RMA-form/.

- Phone: (435) 753–7300
- Email: sales@apgsensors.com
- Online chat at apgsensors.com

Please have your part number and serial number available.

CHAPTER 1: DIMENTIONS

Dimensions



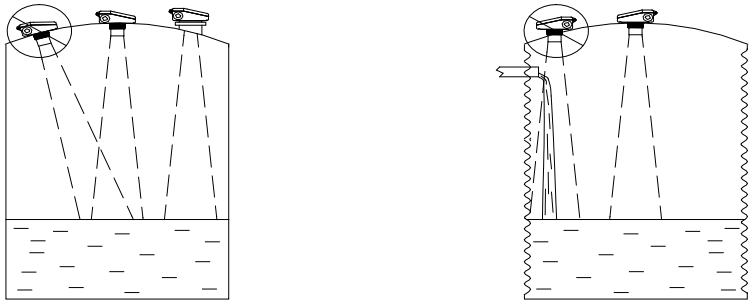
CHAPTER 2: INSTALL & REMOVAL PROCEDURES & NOTES

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.Thread tape or sealant compound for threaded connections.

Physical 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.
- If you are using a stand pipe, please see our guide to stand pipes on our website: https://apgsensors.com/how-to-install-a-standpipe/



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.

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 intall 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

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	Units	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	4 mA distance	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	20 mA distance	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).

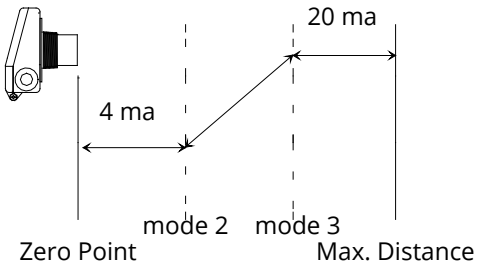


Figure 3.3

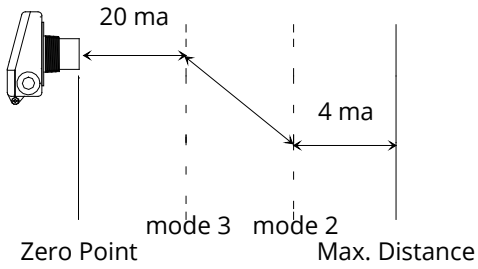


Figure 3.4

MODE	DESCRIPTION	PARAMETERS
4	Response Time	Range = 1-3
		Default = 1
		1 = 3.3 ft/min (1m/min)
		2 = 15 ft/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	Fail-safe	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	Fail-safe Delay	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	4 mA Trim	Range = 0-9999
		Default = 5000

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

MODE	DESCRIPTION	PARAMETERS
8	20 mA Trim	Range = 0-9999
		Default = 5000

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

MODE	DESCRIPTION	PARAMETERS
9	Calibration	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	Distance Offset	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 5.

Utility Modes

MODE	DESCRIPTION	PARAMETERS
11	Temperature	Range = 0-2
	Compensation	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	AutoSense	Range = 0-1
		Default = 1
		0 = Manual (user contols 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	Sensitivity	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.

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.

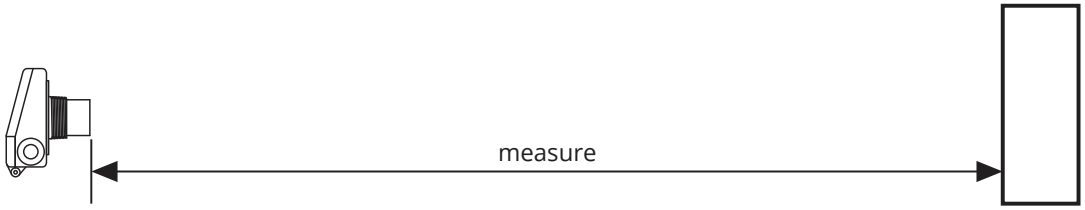


Figure 4.1

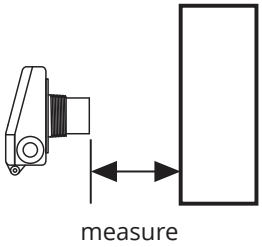


Figure 4.2

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

Repair and Returns

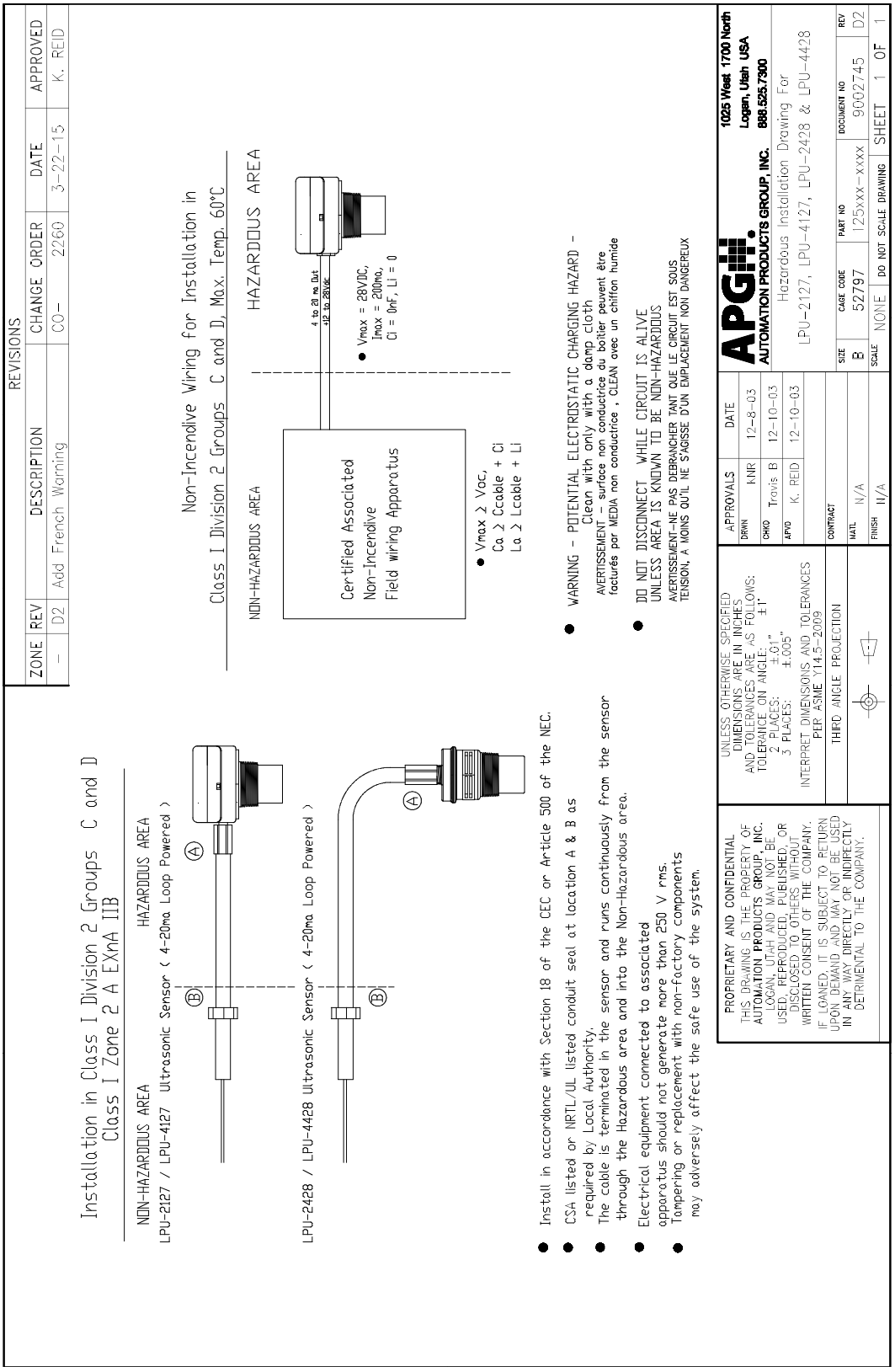
Should your LPU-2127 ultrasonic sensor require service, please contact the factory via phone, email, or online chat. We will issue you a Return Material Authorization (RMA) number with instructions.

- Phone: (435) 753-7300
- Email: sales@apgsensors.com
- Online chat at apgsensors.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

Hazardous Location Drawing



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