FLOWLINE

EchoSpan
LU80-5101, LU8-5161,LU81-5101, LU81-5161, LU83-5101, LU83-5161, LU84-5101 & LU84-5161 Series
Series
Revision A.1

Preface

This manual explains how to use the EchoSpan, LU81, LU83 and LU84 series transmitter.

Warranty, Service & Repair

To register your product with the manufacturer, go to the Flowline website for on-line registration. The website address is as follows:

www.flowline.com

On-line Warranty Registration can be found on the Flowline home page.

If for some reason your product must be returned for factory service, go to the Flowline website to receive a Material Return Authorization number (MRA), providing the following information:

1. Full Part Number, Full Serial Number
2. Name and telephone number of someone who can answer technical questions related to the product and its application.
3. Return Shipping Address
4. Brief Description of the Symptom
5. Brief Description of the Application

On-line Material Return Authorization can be found under Support in the Navigation Bar along the side of the home page. Click on *Return Authorization* to begin the MRA request. Once you have received a MRA number, ship the product prepaid in its original packing to:

> Flowline Factory Service
> MRA_____
> 10500 Humbolt Street
> Los Alamitos, CA 90720

To avoid delays in processing your repair, write the MRA on the shipping label. Please include the information about the malfunction with your product. This information enables our service technicians to process your repair order as quickly as possible.

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Warranty

Flowline warrants to the original purchaser of its products that such products will be free from defects in material and workmanship under normal use and service in accordance with instructions furnished by Flowline for a period, which is equal to the shorter of one year from the date of purchase of such products or two years from the date of manufacture of such products. Flowline's obligation under this warranty is solely and exclusively limited to the repair or replacement, at Flowline's option, of the products or components, which Flowline's examination determines to its satisfaction to be defective in material or workmanship within the warranty period. Flowline must be notified pursuant to the instructions below of any claim under this warranty within thirty (30) days of any claimed lack of conformity of the product. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original warranty period.

Returns

Products cannot be returned to Flowline without Flowline's prior authorization. To return a product that is thought to be defective, go to www.flowline.com, and submit a customer return (MRA) request form and follow the instructions therein. All warranty and non-warranty product returns to Flowline must be shipped prepaid and insured. Flowline will not be responsible for any products lost or damaged in shipment.

Limitations

This warranty does not apply to products which: 1) are beyond the warranty period or are products for which the original purchaser does not follow the warranty procedures outlined above; 2) have been subjected to electrical, mechanical or chemical damage due to improper, accidental or negligent use; 3) have been modified or altered; 4) anyone other than service personnel authorized by Flowline have attempted to repair; 5) have been involved in accidents or natural disasters; or 6) are damaged during return shipment to Flowline. Flowline reserves the right to unilaterally waive this warranty and dispose of any product returned to Flowline where: 1) there is evidence of a potentially hazardous material present with the product; or 2) the product has remained unclaimed at Flowline for more than 30 days after Flowline has dutifully requested disposition. This warranty contains the sole express warranty made by Flowline in connection with its products. ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED. The remedies of repair or replacement as stated above are the exclusive remedies for the breach of this warranty. IN NO EVENT SHALL FLOWLINE BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND INCLUDING PERSONAL OR REAL PROPERTY OR FOR INJURY TO ANY PERSON. THIS WARRANTY CONSTITUTES THE FINAL, COMPLETE AND EXCLUSIVE STATEMENT OF WARRANTY TERMS AND NO PERSON IS AUTHORIZED TO MAKE ANY OTHER WARRANTIES OR REPRESENTATIONS ON BEHALF OF FLOWLINE. This warranty will be interpreted pursuant to the laws of the State of California. If any portion of this warranty is held to be invalid or unenforceable for any reason, such finding will not invalidate any other provision of this warranty.

Introduction:

The EchoSpan is a general-purpose ultrasonic level transmitter that provides a loop powered 4-20 mA output. The 4-20 mA output can be used to provide the proportional level of liquid in any tank or vessel. The signal can be connected to any device that accepts a loop powered 4-20 mA signal, such as a PLC, SCADA, DCS, display, controller, etc.

New Features

- Simple configuration with push button configuration
- Adjustable Loop Fail-Safe, Hold Last, Empty, Full, 21 mA, 22 mA
- Easy to reverse mA output, 4-20 mA to 20-4 mA
- Increased output filtering

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About this Manual:

PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on the EchoSpan series Ultrasonic Level Switch from FLOWLINE. Please refer to the part number located on the switch label to verify the exact model configuration, which you have purchased.

User's Responsibility for Safety:

FLOWLINE manufactures a broad range of level sensing technologies. While each of these sensors is designed to operate in a wide variety of applications, it is the user's responsibility to select a sensor model that is appropriate for the application, install it properly, perform tests of the installed system, and maintain all components. The failure to do so could result in property damage or serious injury.

Proper Installation and Handling:

Only professional staff should install and/or repair this product. Install the switch with the included Viton gasket and never over tighten the switch within the fitting. Always check for leaks prior to system start-up.

Wiring and Electrical:

A supply voltage of 12 to 28 VDC is used to power the EchoSpan. Electrical wiring of the transmitter should be performed in accordance with all applicable national, state, and local codes.

Material Compatibility:

The enclosure is made of Polycarbonate (PC). The transducer is made of Polyvinylidene Fluoride (PVDF). Make sure that the model, which you have selected, is chemically compatible with the application media.

Enclosure:

While the switch housing is liquid-resistant the EchoSpan is not designed to be operational when immersed. It should be mounted in such a way that the enclosure and transducer do not come into contact with the application media under normal operational conditions.

The enclosure has a flip cover with dual 1/2" NPT female conduit ports and an internal terminal strip for wiring. To open the enclosure, you will need a small insertion tool such as a screwdriver. Loosen the locking screw located at the top front of the enclosure. Rotate the hinged cover up for 135° access to the faceplate and terminal strips. Before closing the enclosure, make sure that the enclosure gasket is properly seated, and that any conduit fittings, cable connectors or plugs are installed correctly and sealed.

Handling Static-Sensitive Circuits/Devices:

When handling the transmitter, the technician should follow these guidelines to reduce any possible electrostatic charge build-up on the technician's body and the electronic part.
1. Always touch a known good ground source before handling the part. This should be repeated while handling the part and more frequently after sitting down from a standing position, sliding across the seat or walking a distance.
2. Avoid touching electrical terminals of the part unless making connections.
3. DO NOT open the unit cover until it is time to calibrate.

Make a Fail-Safe System:

Design a fail-safe system that accommodates the possibility of switch and/or power failure. FLOWLINE recommends the use of redundant backup systems and alarms in addition to the primary system.

Flammable, Explosive or Hazardous Applications:

EchoSpan should not be used within classified hazardous environments.

Warning:

Always use the Viton gasket when installing the EchoSpan, and make sure that all electrical wiring of the switch is in accordance with applicable codes.

Components:

EchoSpan is offered in three different models. Depending on the model purchased, you may or may not have been shipped all the components shown below. You do however, need an EchoSpan and Viton® gasket to configure, install and operate EchoSpan.

- EchoSpan

    - LU80-5101 – 9.8' (3 m) range,   Type 4X encl.,   1" NPT
    - LU80-5161 – 9.8' (3 m) range,   Type 4X encl.,   1" G
    - LU81-5101 – 18.0' (5.5 m) range,   Type 4X encl.,   2" NPT
    - LU81-5161 – 18.0' (5.5 m) range,   Type 4X encl.,   2" G
    - LU83-5101 – 26.2' (8 m) range,   Type 4X encl.,   2" NPT
    - LU83-5161 – 26.2' (8 m) range,   Type 4X encl.,   2" G
    - LU84-5101 – 32.8' (10 m) range,   Type 4X encl.,   2" NPT
    - LU84-5161 – 32.8' (10 m) range,   Type 4X encl.,   2" G

- Viton Gasket

    - Part #220128 – for LU80 series only
   - Part #220129 – for LU81, LU83 and LU84 series

- Quick Start Guide

Specifications:

Range:	LU80: 4" to 9.8' (10 cm to 3m)	Supply voltage:	12-28 VDC
	LU81: 8" to 18.0' (20 cm to 5.5m)	Loop resistance:	500 Ohms @ 24 VDC
	LU83: 8" to 26.4' (20 cm to 8m)	Signal output:	4-20 mA, two-wire
	LU84: 12" to 32.8' (30 cm to 10m)	Signal invert:	4-20 mA / 20-4 mA
		Signal fail-safe:	4mA, 20 mA, 21 mA, 22 mA, hold last
Accuracy:	± 0.2% of range	Process temp.:	F: -4° to 140°
Resolution:	LU80: 0.019" (0.5mm)		C: -20° to 60°
	LU81/83: 0.039" (1mm)	Temp. comp.:	Automatic
	LU84: 0.078" (2 mm)	Ambient temp.:	F: -31° to 140° C: -35° to 60°
Dead band:	LU80: 4" (10cm)	Pressure:	MWP = 30 PSI
	LU81\83: 8" (20 cm)	Enclosure rating:	NEMA 4X (IP65)
	LU84: 12" (30 cm)	Encl. material:	PC/ABS FR
Beam width:	LU80: 2" (5cm)	Encl. hardware:	Brass and stainless
	LU81/83/84" 3" (7.6 cm) dia.	Enclosure vent:	Water tight membrane
Configuration:	Push button	Conduit entrance:	Dual, 1/2" NPT
Memory:	Non-volatile	Trans. material:	PVDF
Display type:	LCD, 6-digit	Process mount:	LU80: 1" NPT/1" G LU81/83/84: 2" NPT/2" G
Display units:	Inch, cm, Feet, m or percent	Mount. gasket:	Viton®
		Classification:	General purpose
		Compliance:	CE, RoHS

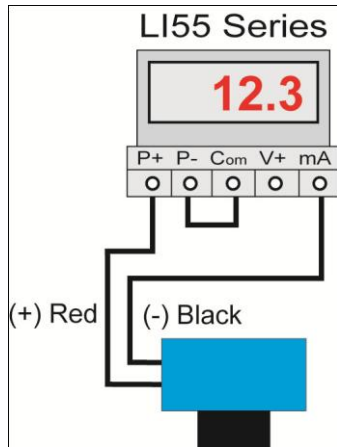## Dimensions:

Side View / LU80 Series
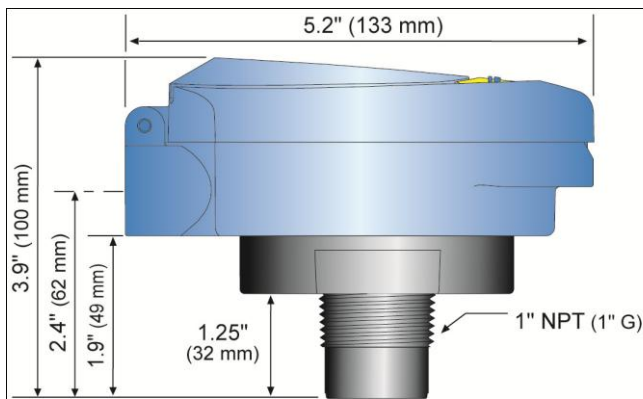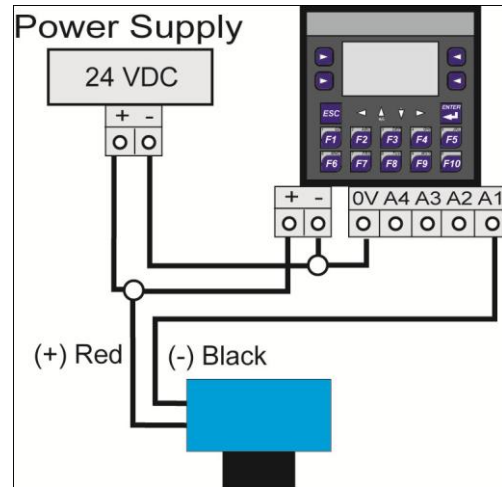

Side View / LU81, LU83 and LU84 Series
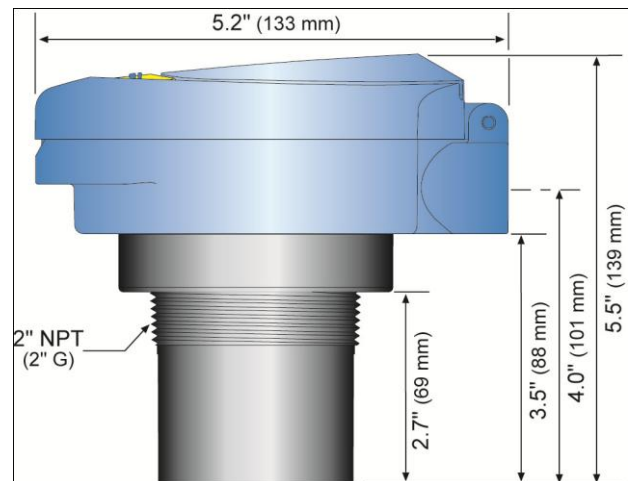
Wiring to Display, Controllers & PLC's

Below is a quick review of wiring the EchoSpan to common display, controllers and PLC's.
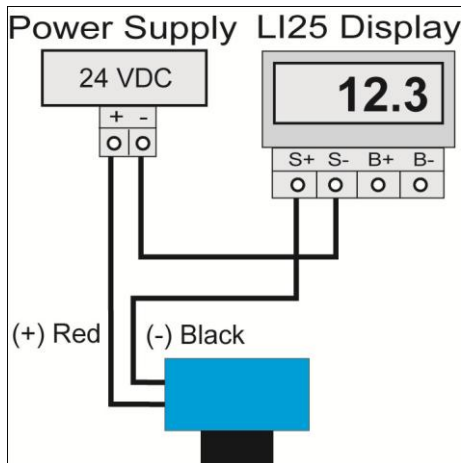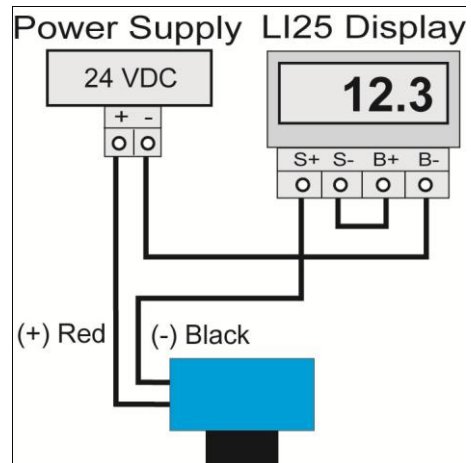
DataView LI55 Series
Level Controller

Commander LI90 Series
Multi-Tank Level Controller

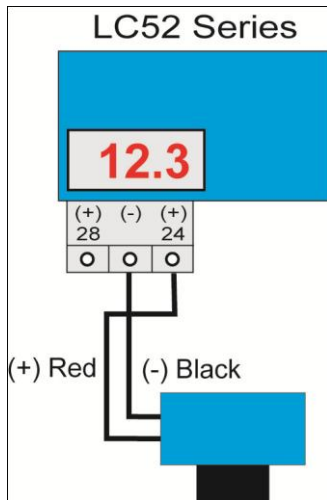*DataLoop LI25 Series*
Level Indicator
without the backlight

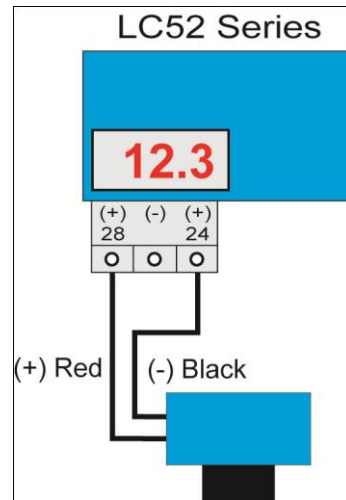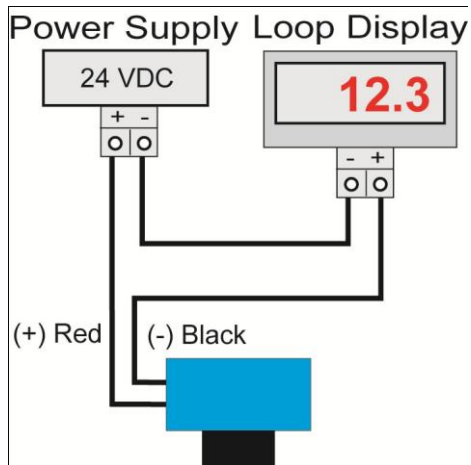*DataLoopLI25 Series*
Level Indicator
with the backlight

DataPoint LC52 Series
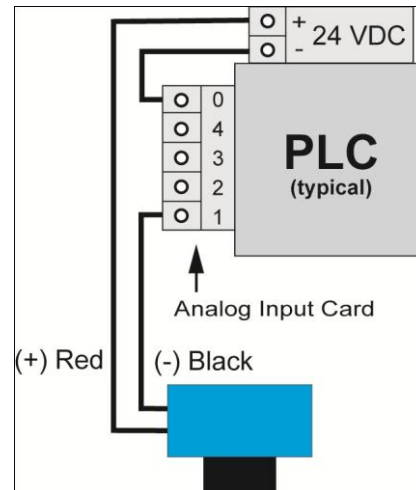*Level Controller*
JWA mode (Factory Setting)

DataPoint LC52 Series
Level Controller
*JWB mode*

Generic Loop
Powered Display

Generic PLC

General notes for electrical connections, usage and safety:

- Where personal safety or significant property damage can occur due to a spill, the installation must have a redundant backup safety system installed.
- Wiring should always be completed by a licensed electrician.
- Supply voltage should never exceed 28 VDC.
- The sensor materials must be Chemically compatible with the liquids to be measured.
- Design a fail-safe system for possible sensor and/or power failure.
- Never use the sensor in environments classified as **Hazardous**.

Voltage Output

EchoSpan can be used as a 0 to 5 or 0 to 10 VDC output device. A resistor will need to be added to the circuit to enable a voltage output (refer to the wiring diagram below).
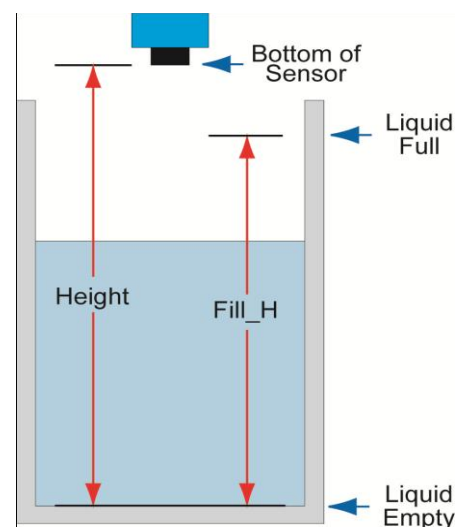
- 0-5 VDC output
  - Add a 250 Ohm resistor
  - Actual output will be 0.8 to 5 VDC
- 0-10 VDC output
  - Add a 500 Ohm resistor
  - Actual output will be 2 to 10 VDC
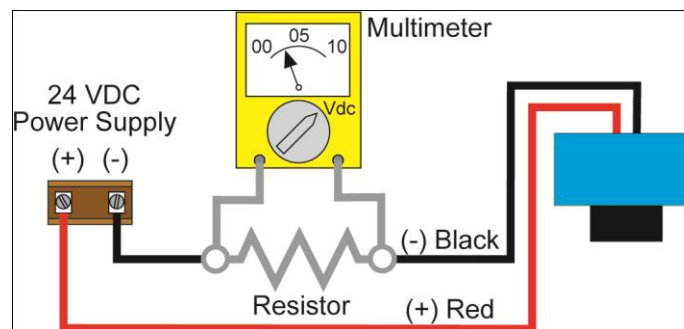
Getting Started:

EchoSpan can be configured before installation. The switch features non-volatile memory, so the set points configured before installation will not be lost when the switch is powered down. To start, all you need is the following information:

- Basic Tank Information:
  - *HEIGHT* – Distance from the transducer face to the bottom of the tank.
  - *FILL-H* – Maximum fill height of the liquid from the bottom of the tank.
  - These values will all be in the same distance value (inches, centimeters, feet or meters) and will all be measured from the bottom of the tank.
- Power:
  - Provide 12 to 28 VDC input power to the EchoSpan.

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Feature Guide:

FEATURE	ACCESS BY
Easy to use **MENU**	Press and hold *SELECT* key until **MENU** is displayed approximately 5 seconds. The **MENU** items will rotate through display, press *SELECT* to change an item.
Many **UNITS** of measurement.	In the **MENU** mode, press *SELECT* when **UNITS** is display, then select *INCHES*, *CM* (centimeter), *FEET*, *METERS* or *PERCENT*.
No cumbersome measure required. Set point distances are relative to the tank bottom.	In **MENU** mode, select the **TANK** item and set the *HEIGHT* of the tank from the transducer face to the bottom of the tank. Set the Fill Height (*FILL-H*) to the maximum fill height of the liquid from the bottom of the tank. Now all of the set points are from the bottom of the tank up.
Optional Target Calibration	Use this feature if the tank is at the empty or full setting. This will accept the current level as either empty (*TG CAL EMPTY*) of full (*TG CAL FULL*).
Fail-Safety	Use the **SAFE** function to preset the output to either Empty (*4 mA*), Full (*20 mA*, *21 mA* or *22 mA*) or *Hold* Last Value in case the transmitter looses its signal (**LOST**).

Getting around:

EchoSpan is configured by the use of three push buttons (UP, DOWN and SELECT) and a LCD display. As a lockout feature, the buttons are inactive until the SELECT button is held down for 5 seconds, and then the display will begin to scroll through the top level of the configuration menu.

Steps for Basic Configuration:

1. Select and Set the units of operation in the **UNITS** menu.
2. Configure the Sensor *Height* and *Fill-H* under the **TANK** menu.
3. Set the **SAFE** vaule.

Top Level

- The Configuration menu will continue to scroll through the items below until the **SELECT** button is pressed.
- **UNITS – TANK – SAFE – TG CAL – VALUES - HELP – RUN**.
- To return to the Operational mode of EchoSpan, press *SELECT* while RUN appears in the display.
- **UNITS** – Allows end user to select the units for configuration and operation. Select between Inches, Centimeters, Feet, Meters or Percent. Press *EXIT* to return to the Top Level menu.
- **TANK** – Allows the end user to configure the operational range for the switch.
  - *HEIGHT* – Distance from the transducer face to the bottom of the tank.
  - *FILL-H* – Maximum fill height of the liquid from the bottom of the tank.
  - *REV MA* – Allows the transmitter to reverse the current output such that 4 mA is at FULL and 20 mA is at EMPTY.
  - Press *Exit* to return to the Top level Menu.

- o *Note: if UNITS is set to Percent, then TANK will not appear. To view TANK, set UNITS to any of the following: Inches, Centimeters, Feet or Meters.*
- **SAFE** – The fail-safe for the EchoSpan can be preset to the customer's requirement.
  - o *22 mA* – Overfill fail-safe setting.
  - o *21 mA* – Overfill fail-safe setting.
  - o *20 mA* – Full fail-safe setting.
  - o *4 mA* – Empty fail-safe setting.
  - o *HOLD* – Keeps the output at its last current reading when fail-safe condition occurs.
- **TG CAL** – Target Calibration (allows for the sensor to accept the current level as either EMPTY or FULL.
- **VALUES** – Provides setup information, the ability to reset the EchoSpan and a simulation mode to test the relay function.
  - o **SETUP** – Will display the setting for all functions of EchoSpan.
  - o **DIAG** – This is a production test feature used by the factory to confirm operation. *This mode should only be used when supervised by a Flowline representative.*
  - o **RESET** – Will reset the EchoSpan back to its original factory setting.
- **HELP** – Provides information for contacting Flowline no-line.
- **RUN** – Returns the unit to normal measurement and control mode.

How to enter the MENU:

1. Press and hold *SELECT* key (approximately 5 seconds) until **MENU** is displayed.
2. The menu items will rotate through display.
3. Press *SELECT* to change an item.

How to configure UNITS:

1. In the **MENU** mode, press select when **UNITS** is display.
2. Press *SELECT* to choose between *INCHES*, *CM* (centimeter), *FEET*, *METERS* or *PERCENT*.
3. Select *EXIT* to return to the Top Level Menu.
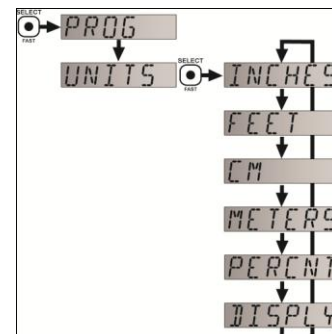
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Note: Reading the level of liquid in Percent:

- Flowline recommends that when selecting *PERCENT*, configure the *HEIGHT* and *FILL-H* settings before selecting *PERCENT* in order to span the EchoSpan for your application requirements.
- When in *PERCENT*, the operational span will be based upon the last **TANK** settings, typically the factory settings for *HEIGHT* and *FILL-H*.

| EchoSpan	*HEIGHT*	*FILL-H*
LU80 Series	118.1" (300 cm)	114.1" (290 cm)
LU81 Series	216.5" (550 cm)	208.5" (530 cm)
LU83 Series	314.9" (800 cm)	307.1" (780 cm)
LU84 Series	393.7" (1000 cm)	381.9" (970 cm)

- When *PERCENT* is selected, the **TANK** settings (*HEIGHT* and *FILL-H*) will be disabled. DISPLAY - AIR Mode vs. LIQUID Mode:
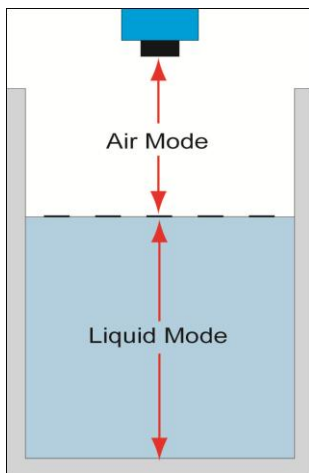
The display can be made to display either the height of liquid in the tank (*LIQUID* mode) or the amount of air in the tank (*AIR* mode).

*AIR* **mode** – Will display the distance from the bottom of the sensor to the surface of the liquid.

LIQUID **mode** – Will display the height of liquid measured from the bottom of the tank.
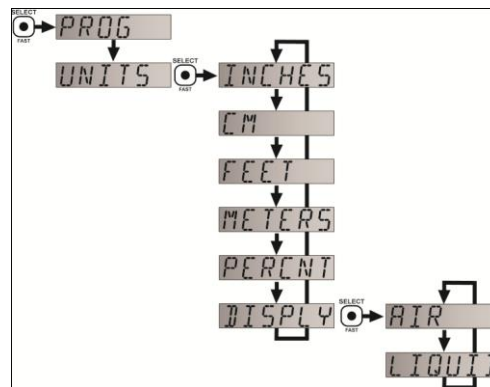
How to change the display mode:

1. In the **MENU** mode, press select when **UNITS** is display.
2. Press *SELECT* when *DISPLAY* appears.
3. Press *SELECT* to choose between *AIR* or *LIQUID*.
4. When *EXIT* appears, press *SELECT* return to Top Level Menu.

**How to configure the Operational range of EchoSpan:**
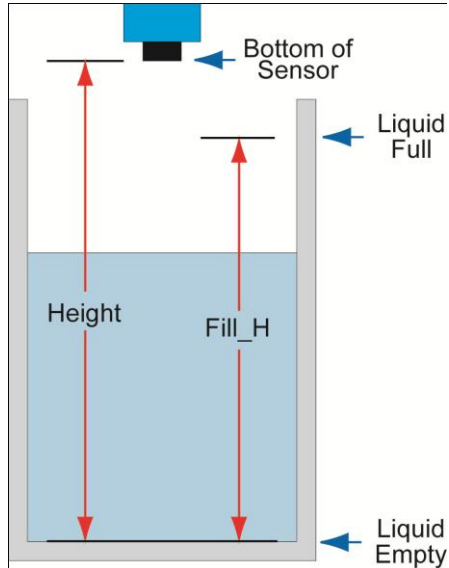
No cumbersome measurement is required via Target Calibration to establish set points. Set point distances are relative to the tank bottom.

1. In **MENU** mode, select the **TANK** item.
2. When *HEIGHT* appears, press *SELECT*.
3. Using the *UP* and *DOWN* buttons, set the **HEIGHT** of the tank from the transducer face to the bottom of the tank.
4. To enter the value, press and hold *SELECT* (Approximately 2 seconds) until **SAVED** is displayed.
5. When **FILL-H** appears, press *SELECT*.
6. Using the *UP* and *DOWN* buttons, set the Fill Height (**FILL-H**) to the maximum fill height of the liquid from the bottom of the tank.
7. Press and hold *SELECT* (2 seconds) to enter the value.
8. When **EXIT** appears, press *SELECT* return to Top Level Menu.
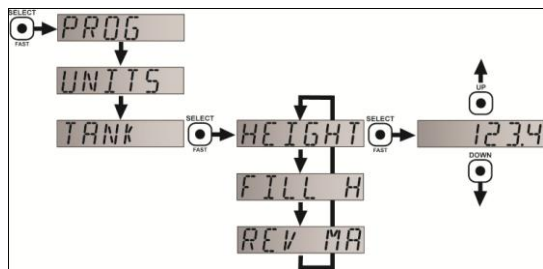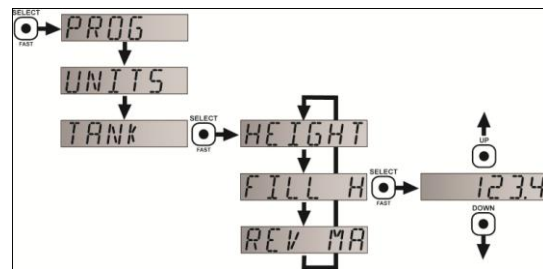
Sensor Height   **Fill-Height**

**Note:**
- Flowline recommends that when selecting PERCENT, configure the Height and Fill-H settings before selecting PERCENT in order to span the EchoSpan for your application requirements.
- When PERCENT is selected, the TANK settings (Height and Fill-H) will be disabled.

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How to set a Reverse the Current Output:
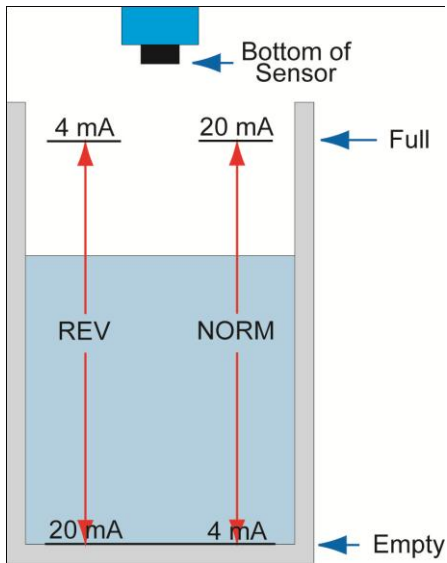
The default for EchoSpan is to have 4 mA at Empty and 20 mA at Full. This is the normal (*NORM*) setting. The output can be reversed (*REV*) with 20 mA at Empty and 4 mA at Full.
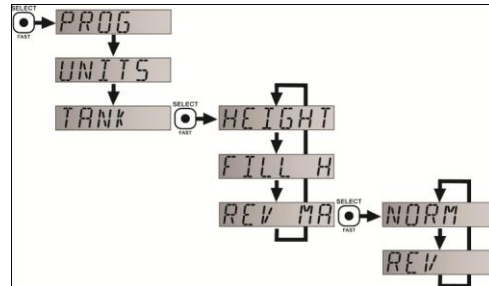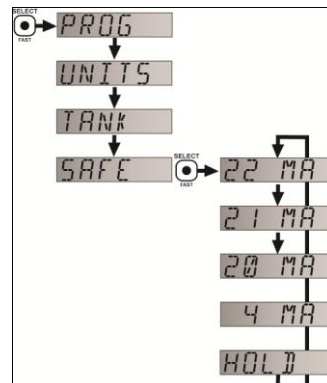

1. In **MENU** mode, select the **TANK** item.
2. When *REV MA* appears, press *SELECT*.
3. When *REV* appears, press *SELECT*.
4. When *EXIT* appears, press *SELECT* return to Top Level Menu.

EchoSpan is now in the Reverse mode. To switch back to the Normal mode, follow the instructions above and select *NORM* under step 3.

How to set the SAFE setting:
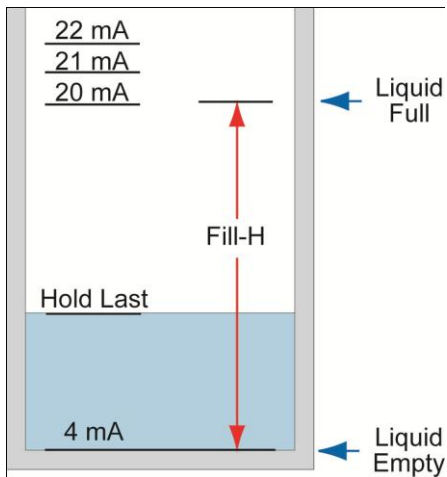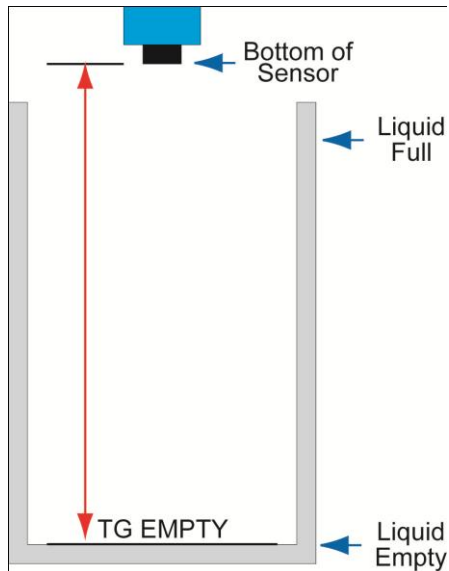

The default for Fail-Safety (LOST) can be preset. The choices are *4 mA*, *20 mA*, *21 mA*, *22 mA* and *HOLD*.

1. In **MENU** mode, select the **SAFE** item.
2. When the required setting appears, press *SELECT*.
3. When *EXIT* appears, press *SELECT* return to Top Level Menu.

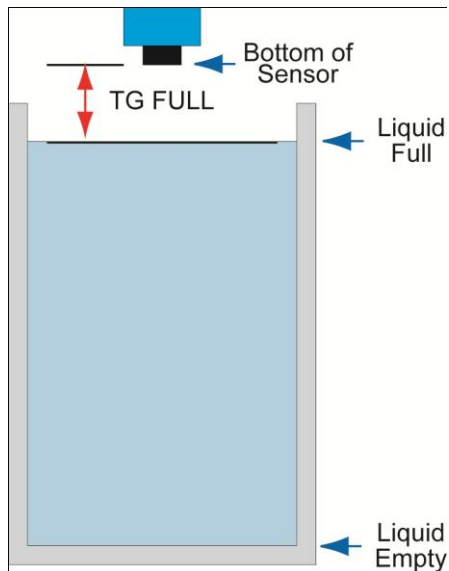**How to set using Target Calibration (Empty):**

Instead of measuring for Empty tank, the Empty distance can be set automatically. This method requires that the tank be Empty or at the level that is considered Empty in the application. To set *TG Empty*, follow the instructions below.
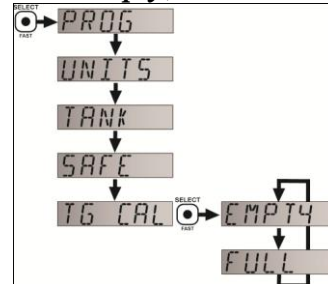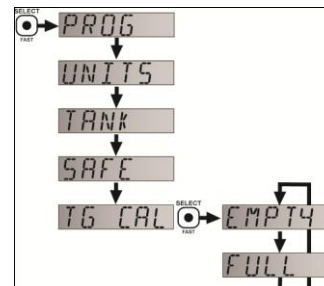

1. Before beginning, make sure the level is tank is at the Empty level.
2. In **MENU** mode, select the **TG CAL** item.
3. When *EMPTY* appears, press *SELECT*. This sets the current distance as the new Empty setting.
4. When *EXIT* appears, press *SELECT* return to Top Level Menu.

How to set using Target Calibration (Full):

Instead of measuring for Full tank, the Full distance can be set automatically. This method requires that the tank be Full or at the level that is considered Full in the application. To set *TG Full*, follow the instructions below.

1. Before beginning, make sure the level is tank is at the Full level.
2. In **MENU** mode, select the **TG CAL** item.
3. When *FULL* appears, press *SELECT*. This sets the current distance as the new Full setting.
4. When *EXIT* appears, press *SELECT* return to Top Level Menu.

*Note: When setting either the **TG EMPTY** or **TG FULL**, make sure the reflective surface is perpendicular to the EchoSpan and not at an angle. Be careful if the tank has a sloped or cone bottom and the bottom of the tank is exposed to air.*
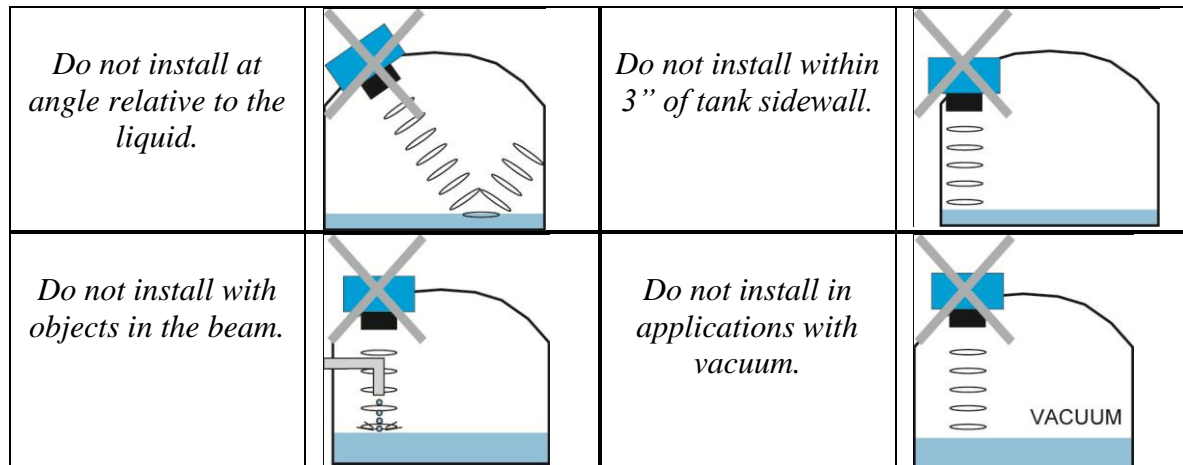
Installation

The EchoSpan should always be mounted perpendicular to the liquid surface and installed using the provided Viton mounting gasket. Make sure that the fitting and transmitter threads are not damaged or worn. Always *hand-tighten* the transmitter within the fitting. Perform an installed leak test under normal process conditions prior to system start up. ***Note: The preferred mounting fitting for the LU80 series is the LM52-1400 (2" thread x 1" thread) reducer bushing.***

Mounting Guide

1. Do not mount at an angle
2. Liquid should never enter the dead band
3. Side Wall:
    a. For LU80 Series - mount at least 2" from the side wall
    b. For LU81, LU83 & LU84 Series - mount at least 3" from the side wall
4. Do not mount where obstacles will intrude on sensor's beam width
    a. See Specifications on page 8
5. Do not mount in a vacuum
6. Avoid mounting in the center of a dome top tank.
7. In cone bottom tank, position the sensor over the deepest part of the tank.

Do not install at angle relative to the liquid.		*Do not install within 3" of tank sidewall.*	
Do not install with objects in the beam.		*Do not install in applications with vacuum.*	

Installation in existing fittings

If the existing fitting is larger than the threads of the EchoSpan, select a reducer bushing such as the LM52-1400 (2" thread x 1" thread) or LM52-2400 (3" thread x 2" thread).

Metal Tanks (LU80 series)

Flowline ultrasonic transmitters have been optimized for use in non-metallic fittings.
1. For best performance, avoid the use of metallic fittings.
    a. Use a plastic 2" x 1" reducer bushing, such as the LM52-1400 or a plastic 1" flange, such as the LM52-1850 for metallic tanks.
2. While installations directly into a 1" metal fitting are not recommended, acceptable results may be obtained if the 1" fitting is a half coupling in form and the outer diameter of the coupling is tightly wrapped in vinyl tape to dampen vibrations.

Fitting Selection:

Check the part number to determine the required fitting mount size and thread type. EchoSpan is commonly installed in tank adapters, flanges, brackets or standpipes. Note: Always include the gasket when installing the EchoSpan.

1. **Tank Adapter:** Select a tank adapter fitting, such as the LM52-1890 for the LU80 series or the LM52-2890 for the LU81, LU83 & LU84 series.
   a. *For best results, select a 2" tank adapter and add a reducer bushing such as the LM52-1400, thread x thread, reducer bushing.*
   b. Avoid tank adapter (thread x thread) styles and/or pipe stops forward of the installed transducer.

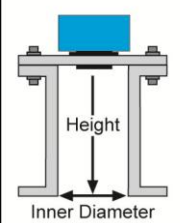| **2" Tank Adapter Socket x Thread**	**Tank Adapter w/ 2"x1" Reducer Bushing**	**Tank Adapter Thread x Thread**

Do not use thread x thread

2. **Riser:** Installations with tall, narrow risers can impede the acoustic signal.
   a. **LU81, LU83 & LU84 Series:** 2" (5 cm) diameter risers should be no taller than 5" (12.7 cm). Larger diameter risers should be no taller than 12" (30.5 cm).
   b. **LU80 Series:**

Riser Specifications	
Inner Diameter	Maximum Height
2" (5 cm)	3" (7.6 cm)
4" (10 cm)	8" (20 cm)
6" (15 cm)	12" (30 cm)

Note: Do not exceed the dimensions listed above

3. **Flange (LU80 series):** If installing on a flange, select a flange with a thread that is above the plane of the flange, such as the LM52-1850.
    a. *The LU81, LU81 & LU83 series works well with Flange installations.*
    b. Avoid the use of blind flanges with tapped threads or flanges where the threads are even with the plane of the flange, such as the Banjo 1" Poly ANSI Flange (series AF100).
    c. Use a flange with a 2" thread and add a 2" to 1" reducer bushing to complete the installation.

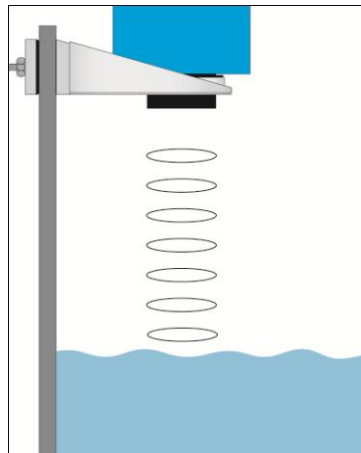| 2" Flange w/ thread out of plane	2" Flange w/ thread in plane	2" Flange w/ Reducer Bushing

Do not use thread in plane

4. **Side Mount Bracket:** For installations in open tanks and sumps, use the LM50 series side mount bracket.
    a. For the LU80 series, order the LM50-1001-1, which includes a 2"x 1" Reducer Bushing.
    b. For the LU81, LU83 & LU84, series, order the LM50-1001 side mount bracket.

5. **Stand Pipe:** A standpipe maybe used to dampen turbulence or when foam is present in the application.
   a. Pipe can be made of any material.
   b. Select a minimum 3" ID pipe for the stand pipe.
      i. A 2" pipe is usable with the LU80 series, but is the minimum.
      ii. Pipes larger than 3" can also be used.
   c. Use a coupling and reducer bushing to attach the EchoSpan to the pipe.
      i. With the LU80 series, be sure to use a plastic reducing bushing such as LM52-1400 2" T x 1" T fitting or the LM52-1410 2" S x 1" T fitting.
   d. The pipe length should run the measurement span and the bottom of the pipe should remain submerged at all times to prevent foam from entering the pipe.
   e. Cut a 45°notch at the bottom of the pipe and drill a 1/4"pressure equalization hole in the dead band.
   f. The pumps should not drive liquid past the open end of the stand pipe which causes the liquid in the pipe to oscillate.
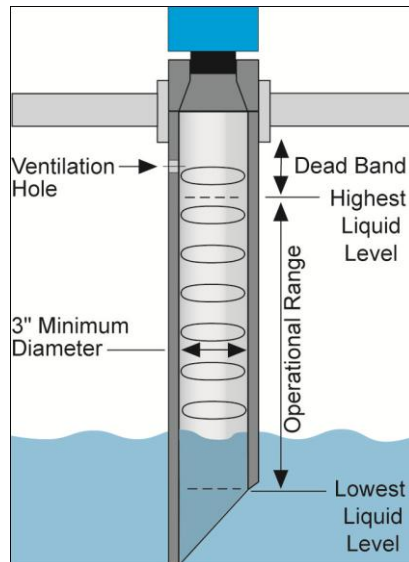
FLOWLINE

Appendix:

Setup:

You can view how the EchoSpan is configured.
1. From the main **MENU** level, press *SETUP* when **VALUES** appears.
2. When *SETUP* appears, press the *SELECT* key.
3. Setup will display the following information:
    a. *Units*, *Display*, *Rev mA*, *Safe*, **Height**, *Fill-H*
4. When completed, press *SELECT* when *EXIT* appears to return to the main program level.

Diagnostics (DIAG) Parameters:

This mode runs diagnostic tests that confirm operation of EchoSpan. *This mode should only be used when supervised by a Flowline representative.*

Reset:

EchoSpan enables the end user to reset the entire configuration back to the original factory settings. Follow the instructions below to reset EchoSpan:
1. From the main **MENU** level, press *SELECT* when *VALUES* appears.
2. When *RESET* appears, press the *SELECT* key.
3. When *YES* appears, press *SELECT* key to reset EchoSpan.
    a. To cancel the reset, press *SELECT* when *NO* appears.
4. When completed, press *SELECT* when **EXIT** appears to return to the main program level.

Factory Settings:

EchoSpan	HEIGHT	FILL-H
LU80 Series	118.1" (300 cm)	114.1" (290 cm)
LU81 Series	216.5" (550 cm)	208.5" (530 cm)
LU83 Series	314.9" (800 cm)	307.1" (780 cm)
LU84 Series	393.7" (1000 cm)	381.9" (970 cm)

Troubleshooting:

PROBLEM	SOLUTION
TANK does not appear on the main menu:	Units function is set for *PERCENT* on EchoSpan: When Units is set for *PERCENT*, the **TANK** function is disabled. To re-enable **TANK**, change units to *INCHES*, *CM*, *FEET* or *METERS*.
Display shows *FULL*:	Level of liquid is above the *FILL-H* setting: Check the *FILL-H* setting, making sure the *FILL-H* setting is high enough so the level of liquid is below the *FILL-H* setting. The *Fill-H* setting is the distance from the bottom of the tank to the Full level of liquid.
Display shows *EMPTY*:	Level of liquid is beyond the *HEIGHT* setting: Check the *HEIGHT* setting, making sure the *HEIGHT* setting is low enough so the level of liquid is above the *HEIGHT* setting.
Display shows *WARMUP*:	Typically occurs when power is being applied to transmitter. Indicates a weak power supply, bad wire connections or the sensor is out of the operational range.
Display shows *LOST*:	Sensor is in a Fail-Safe state. The return sound pulses are not reaching the transducer. First, cycle power off and on, waiting 5 seconds between the off and on states. If problem persists, check the installation fitting against the Installation instructions in the manual.
Display is opposite of the measured value:	Check the *DISPLAY* setting. *AIR* mode indicates the distance from the liquid to the sensor. *LIQUID* mode indicates the height of liquid in the tank. Change the *DISPLAY* mode from *AIR* to *LIQUID* or vice versa to correct.
Transmitter indicates a current of 0 mA:	Check the wiring for an open circuit. An open circuit is the most common issue with a 0 mA signal.
Transmitter jumps to a current reading between 19 and 20 mA:	Check the installation of the transmitter. Bad installation fittings will cause false signals near the top of the tank, which typically translates to a signal between 19 and 20 mA. Also look for interference just below the transmitter. If the transmitter is installed in a metal fitting, switch to a plastic fitting.
Transmitter indicates a current over 23 mA:	Immediately check the wiring for a short circuit. The EchoSpan is current limited to 22 mA. Anything above 23 mA indicates a short circuit.