Warranty, Service & Repair

To register your product with the manufacturer, fill out the enclosed warranty card and return it immediately to:

> Flowline Inc.
> 10500 Humbolt Street
> Los Alamitos, CA 90720.

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

1. Part Number, 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

Once you have received a Material Return Authorization 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.

FLOWLINE®

Ultrasonic Level Transmitter
Model LU20
Owner's Manual

CE

CSA®

NRTL/C

Version 3.1A
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Manual # LU900005   11/99

WARRANTY

SPECIFICATIONS

Step One

Range:	0.5 to 18 feet (15 cm to 5.4 m)
Accuracy:	± 0.25% of span in air
Resolution:	0.125" (3 mm)
Frequency:	50 kHz
Pulse rate:	2 pulses per second
Beam width:	8° conical
Deadband:	0.5' (15 cm) minimum
Blocking distance:	0.5 to 18 feet (15 cm to 5.4 m)
Display type:	4 segment LCD
Display units:	Inch (cm)
Memory:	Non-volatile
Supply voltage:	GP: 12-36 VDC
	IS: 12-32 VDC
Max loop resistance	GP: 900 Ohms @ 36 VDC (see below)
	IS: 900 Ohms @ 32 VDC (see below)
Signal output:	GP: 4-20 mA, 12-36 VDC (see below)
	IS: 4-20 mA, 12-32 VDC (see below)
Signal invert:	4-20 mA / 20-4 mA
Calibration:	Push button
Fail-safe diagnostics:	Reverts to 4 mA, 22 mA or remains constant
Temperature rating:	F: -40º to 140º C: -40º to 60º (see below)
Temp. compensation:	Automatic over entire range
Pressure rating:	30 psi (2 bar) @ 25 °C., derated @ 1.667 psi (.113 bar) per °C. above 25 °C. (see below)
Enclosure rating:	NEMA 4X (IP65)
Enclosure material:	Polypropylene (PP), U.L. 94VO
Transducer material:	Polyvinylidene Fluoride (PVDF)
Mounting threads:	2" NPT (2" G)
Mounting gasket:	Viton (2") metric only
Conduit connection:	1/2" NPT (1/2" BSP)
CE Compliance:	EN 50082-2 immunity
	EN 55011 emission
CSA Certificate:	LR79326-10

*GP = General Purpose   IS Intrinsically Safe
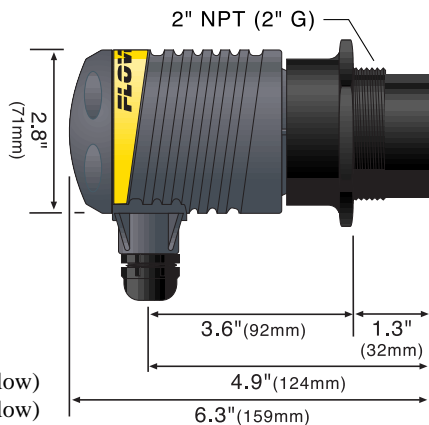
Technology

An ultrasonic sound wave is pulsed two times per second from the base of the transducer. The sound wave reflects against the process medium below and returns to the transducer. The micro-processor based electronics measure the time of flight between the sound generation and receipt, and translates this figure into the distance between the transmitter and process medium below.
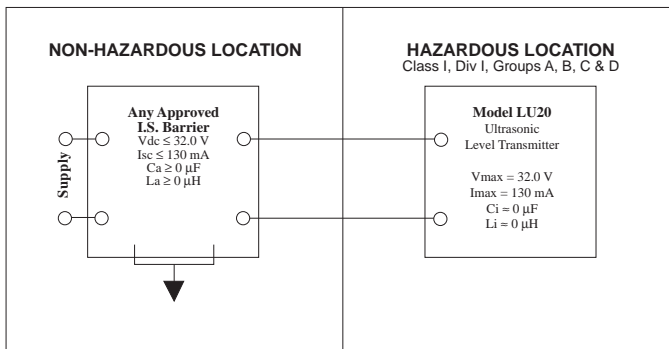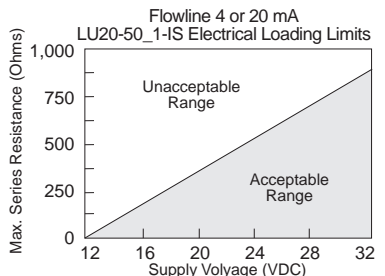

2" NPT (2" G)

2.8" (71mm)
3.6" (92mm)   1.3" (32mm)
4.9" (124mm)
6.3" (159mm)

NON-HAZARDOUS LOCATION

Any Approved I.S. Barrier
Vdc ≤ 32.0 V
Isc ≤ 130 mA
Ca ≥ 0 μF
La ≥ 0 μH

Supply

HAZARDOUS LOCATION
Class I, Div I, Groups A, B, C & D

Model LU20
Ultrasonic Level Transmitter

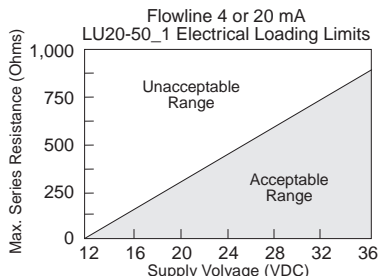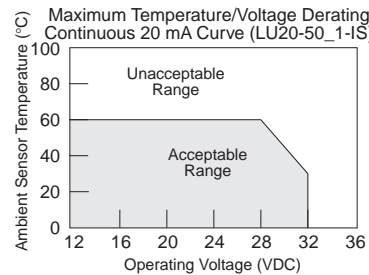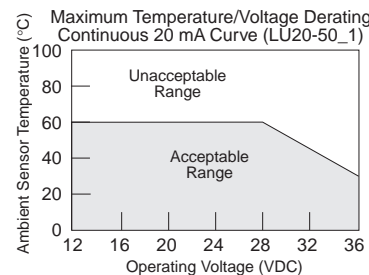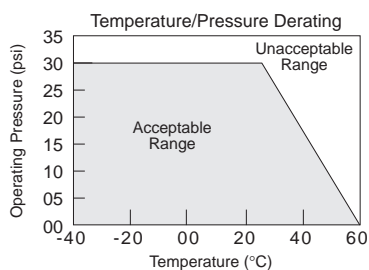Vmax = 32.0 V
Imax = 130 mA
Ci = 0 μF
Li = 0 μH

Control drawing for the LU20-5001-IS ultrasonic level transmitter approved under the entity concept as an I.S. apparatus

Control Drawing: LU20CD
Rev. 7-24-97

LR79326-10

NRTL/C
Intrinsically Safe/
                Securite Intrinseque
Exia

For use in
     Hazardous Locations:
          Class I, Groups A, B, C & D
          Class II, Groups E, F & G
          Class III
          Temperature Code: T3C

Intrinsically Safe when used with an approved I.S. barrier. Entity Parameters
V$_{max}$ = 32.0 VDC
I$_{max}$ = 130 mA
C$_i$ = 0 μF
L$_i$ = 0 μH

Warning: Suitable for Class I, Groups A, B, C & D; Class II, Groups E, F & G; Class III, T3C; when used with an approved I.S. barrier. Substitution of components may impair intrinsic safety LU20-50X1-IS requirements for Intrinsically Safe operation

Temperature/Pressure Derating

Operating Pressure (psi): 35, 30, 25, 20, 15, 10, 05, 00
Unacceptable Range
Acceptable Range
Temperature (°C): -40, -20, 00, 20, 40, 60

Part#	Description	Thread
LU20-5001	General Purpose	2" NPT
LU20-5061	General Purpose	2" G
LU20-5001-IS	Intrinsically Safe	2" NPT
LU20-5061-IS	Intrinsically Safe	2" G

Maximum Temperature/Voltage Derating Continuous 20 mA Curve (LU20-50_1)

Ambient Sensor Temperature (°C): 100, 80, 60, 40, 20, 0
Unacceptable Range
Acceptable Range
Operating Voltage (VDC): 12, 16, 20, 24, 28, 32, 36

Maximum Temperature/Voltage Derating Continuous 20 mA Curve (LU20-50_1-IS)

Ambient Sensor Temperature (°C): 100, 80, 60, 40, 20, 0
Unacceptable Range
Acceptable Range
Operating Voltage (VDC): 12, 16, 20, 24, 28, 32, 36

Flowline 4 or 20 mA
LU20-50_1 Electrical Loading Limits

Max. Series Resistance (Ohms): 1,000, 750, 500, 250, 0
Unacceptable Range
Acceptable Range
Supply Voltage (VDC): 12, 16, 20, 24, 28, 32, 36

Flowline 4 or 20 mA
LU20-50_1-IS Electrical Loading Limits

Max. Series Resistance (Ohms): 1,000, 750, 500, 250, 0
Unacceptable Range
Acceptable Range
Supply Voltage (VDC): 12, 16, 20, 24, 28, 32

⚠ **Warning** ⚠

The LU20 is a loop powered device. The load should never exceed 900 Ohms.

LU20-50_1-IS must be installed in accordance with drawing LU20CD rev B (see steps) for safe operation in a hazardous area.

When installing the LU20, never tighten the transmitter from the body. Always use the wrench flat located above the threads.

Always install the 2" Viton gasket with the LU20-5061 and the LU20-5061-IS. The G threaded version of the Echotouch will not seal unless the gasket is installed properly.

SAFETY PRECAUTIONS

⚠ About this Manual:

PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on all four versions of the continuous ultrasonic level transmitter from Flowline; model LU20-50_1 and LU20-50_1-IS. Please refer to the part number located on the sensor label to verify the exact model which you have purchased.

⚠ User's Responsibility for Safety:

Flowline manufactures a wide range of liquid level sensors and technologies. While each of these technologies are designed to operate in a wide variety of applications, it is the user's responsibility to select a technology 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:

Because this is an electrically operated device, only properly-trained staff should install and/or repair this product. Use a proper sealant with all installations. Note: Always install the 2" Viton gasket with the LU20-5061 and the LU20-5061-IS. The G threaded version of the Echotouch will not seal unless the gasket is installed properly. Never overtighten the transmitter within the fitting. Always check for leaks prior to system start-up.

⚠ Wiring and Electrical:

A supply voltage of 12-36 VDC is used to power the LU20-50_1 transmitter and a supply voltage of 12-32 VDC is used to power the LU20-50_1-IS. The sensor systems should never exceed a maximum of 36 VDC for the LU20-50_1 and 32 VDC for the LU20-50_1-IS. Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.

⚠ Temperature and Pressure:

The LU20 is designed for use in application temperatures from -40 °C (-40 °F) to 60 °C (140 °F), and for use at pressures up to 30 psi @ 25 °C, derated @ 1.667 psi per °C above 25 °C.

⚠ Material Compatibility:

The continuous ultrasonic level transmitter, LU20, is made of two materials. The enclosure is of Polypropylene (PP) and the transducer is made of Polyvinylidene Fluoride (PVDF). Make sure that the model which you have selected is chemically compatible with the application liquids. While the transmitter housing is liquid-resistant when installed properly, it is not designed to be immersed. It should be mounted in such a way that it does not normally come into contact with fluid.

⚠ Flammable, Explosive and Hazardous Applications:

Only the LU20-50_1-IS is rated for use in hazardous locations. Refer to the Certificate of Compliance for all applicable intrinsically safe ratings and entity parameters for the LU20-50_1-IS. Refer to the National Electric Code (NEC) for all applicable installation requirements in hazardous locations. DO NOT USE THE LU20-50_1 GENERAL PURPOSE TRANSMITTER IN HAZARDOUS LOCATIONS.

⚠ Make a Fail-Safe System:

Design a fail-safe system that accommodates the possibility of transmitter or power failure. In critical applications, Flowline recommends the use of redundant backup systems and alarms in addition to the primary system.

DEFINITIONS
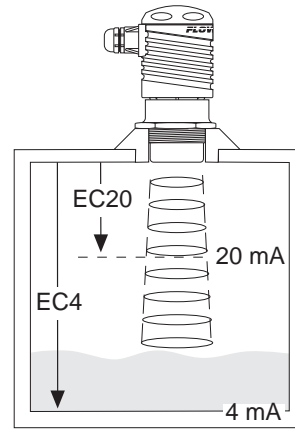
EC4: The 4 mA setting for the LU20. The EC4 is the distance from the bottom of the LU20 to the 4 mA set point. This setting is measured in either inches or centimeters on the display. The EC4 setting is typically greater that the EC20 setting.

EC20: The 20 mA setting for the LU20. The EC20 is the distance from the bottom of the LU20 to the 20 mA set point. This setting is measured in either inches or centimeters on the display. The EC20 setting is typically greater that the EC4 setting.

SAF1/SAF2/SAF3: Fail-Safe setting for the LU20. Use the SAF_ settings to determine a fail-safe mode for the current signal. When [SAF1] is set, the current will increase to 22 mA if the signal becomes LOST. When [SAF2] is set, the current will decrease to 4 mA if the signal becomes LOST. When [SAF3] is set, the current will remain constant if the signal becomes LOST.

FAST/SLOW: Setting for echo averaging on the LU20. [FAST] is the typical setting for the LU20 to operate. [SLOW] is designed to help dampen out effects caused by severe turbulence. In the [FAST] mode, the LU20 will average 2 signal responses per second and update every second. In the [SLOW] mode, the LU20 will average signal returns over the preceding 10 seconds. When used with [SAF 1/2/3], the time for the current to default is 30 seconds for [FAST] mode and 2.5 minutes for [SLOW] mode.

ALIN: Indicates that the unit is in the Alignment mode. Display will show the return signal strength in dB's. Used as an indicator for mechanical alignment of the LU20 and/or signal attenuation. Typical readings range between 2 and 60 dB's. For optimum alignment, first energize the unit and receive a valid return signal. Then select the ALIN mode and adjust the LU20 until the display is maximized.

ON/OFF: Actual setting for ALIN mode. The ALIN mode must be turned [OFF] when alignment is completed. This mode will not automatically default back to [LEVL].

MAXR: Used as an indication for [MAXR] or maximum range. The MAXR sets the maximum tank height and will filter out all returns greater than this value.

(value): Actual MAXR setting. The maximum distance is 216.0 inches.

MINR: Used as an indication for [MINR] or the minimum range. The MINR value is the deadband closest to the transducer face where no signal will be generated. The MINR sets the minimum distance between the liquid and the transducer.

(value): Actual MINR setting. The minimum distance is 6.0 inches.
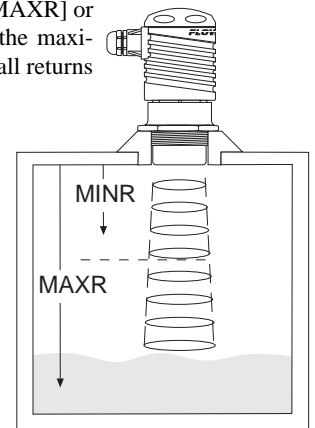
PROGRAMMING

EC4:
1. Hold [MENU] key until EC4 appears in display.
2. Release [MENU] key and wait until a value appears. This value is the current measured level value.
3. If this is acceptable, press [SET] to lock the value as the new EC4 set point. If not, press either the [▲] or [▼] keys once and the old setting for the EC4 will appear.
4. From here, use the [▲] or [▼] keys to raise or lower the value to the desired value.
5. Press the [SET] key to enter this value as the new EC4 set point.

EC20:
1. Hold [MENU] key until EC20 appears in display.
2. Release [MENU] key and wait until a value appears. This value is the current measured level value.
3. If this is acceptable, press [SET] to lock the value as the new EC20 set point. If not, press either the [▲] or [▼] keys once and the old setting for the EC4 will appear.
4. From here, use the [▲] or [▼] keys to raise or lower the value to the desired value.
5. Press the [SET] key to enter this value as the new EC20 set point.

SAF1/SAF2/SAF3:
1. Hold [MENU] key until SAF1, SAF2 or SAF3 appears in the display.
2. Release [MENU] key and hold [SET] key to toggle between SAF1, SAF2 and SAF3.
3. When desired setting is reached, release [SET] key. The last displayed setting will be locked into memory. To change, start again at step 1.

FAST/SLOW:
1. Hold [MENU] key until FAST or SLOW appears in the display.
2. Release [MENU] key and hold [SET] key to toggle between FAST and SLOW.
3. When desired setting is reached, release [SET] key. The last displayed setting will be locked into memory. To change, start again at step 1.

ALIN:
1. Hold [MENU] key until ALIN appears in the display.
2. Continue to hold [MENU] key until OFF appears in the display.
3. Release [MENU] key and hold [SET] key to toggle from OFF to ON.
4. Release [SET] key. The LU20 is now in ALIN mode.
5. To exit ALIN mode, repeat steps 1-4 changing from ON to OFF.

MAXR:
1. Hold [MENU] key until MAXR appears in the display.
2. Continue to hold [MENU] key until a value appears in the display. This value is the current MAXR setting.
3. If this is acceptable, press [SET] to lock the value as the MAXR setting. If not, use the [▲] or [▼] keys to raise or lower the value to the desired setting.
4. Press the [SET] key to enter this value as the new MAXR setting.

MINR:
1. Hold [MENU] key until MINR appears in the display.
2. Continue to hold [MENU] key until a value appears in the display. This value is the current MINR setting.
3. If this is acceptable, press [SET] to lock the value as the MINR setting. If not, use the [▲] or [▼] keys to raise or lower the value to the desired value.
4. Press the [SET] key to enter this value as the new MINR setting.
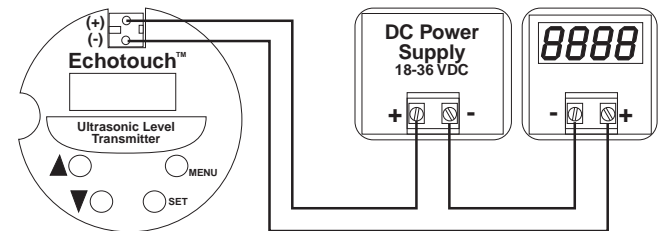
WIRING

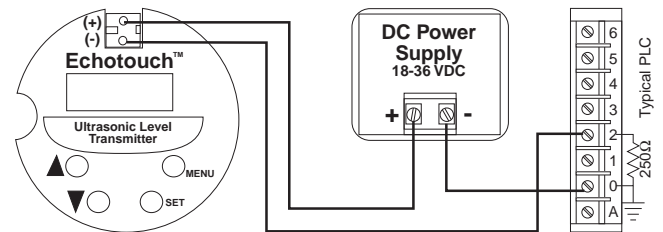The LU20-50_1 requires 12-36 VDC power with at least 25 mA supply in order to operate.

1. Wiring to a Flowline Continuous Controller (Model LC52):
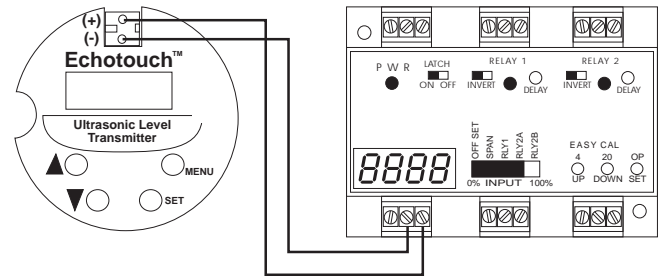
2. Wiring to a Two-Wire Loop Indicator (Model LU20-50_1):


3. Wiring to a PLC (LU20-50_1):

INSTALLATION

Step Six

The LU20-50_1-IS requires 12-32 VDC power with at least 25 mA supply in order to operate. The follow provides an overview of wiring the LU20-50_1-IS to various devices. Please note that a barrier must be installed between the Echotouch and the device and the barrier must be located within the nonhazardous location.
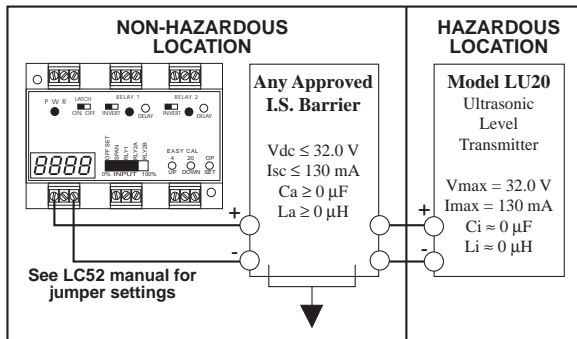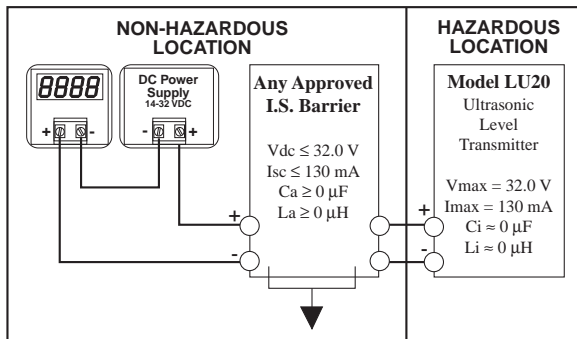
1. Hazardous System Diagram
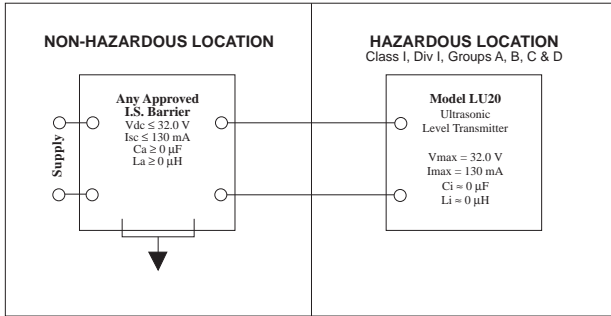
Control drawing for the LU20-5001-IS ultrasonic level transmitter approved under the entity concept as an I.S. apparatus
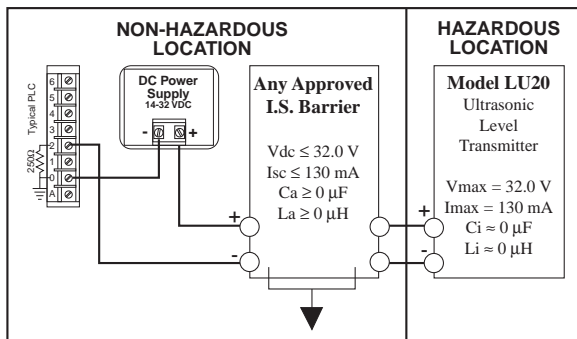
Control Drawing: LU20CD
Rev. 7-24-97

2. Wiring to a Flowline Continuous Controller

See LC52 manual for jumper settings

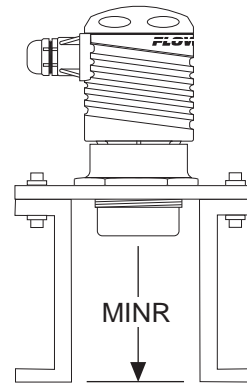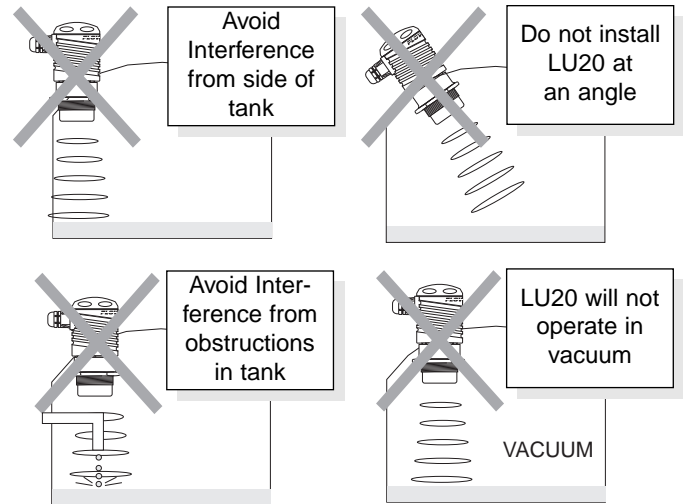### 3. Wiring to a Two-Wire Loop Indicator

4. Wiring to a PLC

INSTALLATION

Step Seven

Mounting the LU20 is critical to the successful operation of the transmitter. Avoid the following parameters:

Avoid Interference from side of tank

Do not install LU20 at an angle

Avoid Interference from obstructions in tank

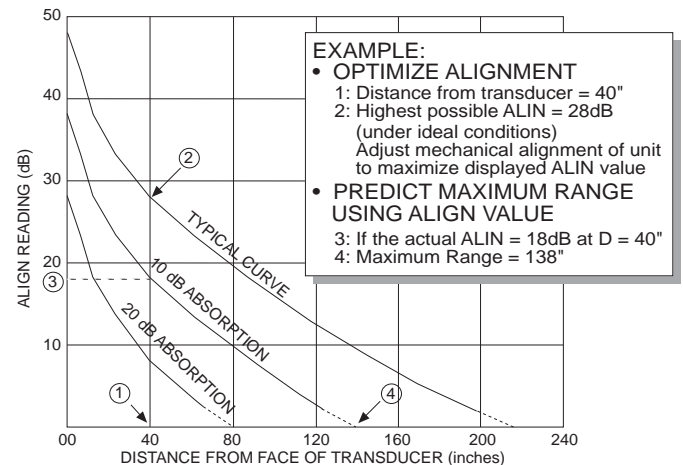LU20 will not operate in vacuum

VACUUM

Minimum Range (MINR) Setting

If installing the LU20 in a flange or any device which recesses the bottom of the transmitter, use the MINR setting. The minimum value for the MINR setting is the distance from the bottom of the transmitter to the end of the flange. Never set MINR to less than 6.0 inches.

MINR

Maximum Application Range

The maximum range of LU20 is 18 feet at 110 dB. Under less than ideal conditions, a number of factors can reduce the overall quality of signal return and shorten the accurate range of the transmitter. To determine the maximum application range of the product, follow the signal return formula against the echo attenuation graph below.

Echo Attenuation Graph

EXAMPLE:
- OPTIMIZE ALIGNMENT
  1: Distance from transducer = 40"
  2: Highest possible ALIN = 28dB (under ideal conditions)
     Adjust mechanical alignment of unit to maximize displayed ALIN value
- PREDICT MAXIMUM RANGE USING ALIGN VALUE
  3: If the actual ALIN = 18dB at D = 40"
  4: Maximum Range = 138"

INSTALLATION

Factory Settings:

The LU20 is preset at the factory. When powering up the transmitter the first time, the factory settings will be active. If at any time in you need to return to these settings, remove power from the LU20 and wait 10 seconds. Press the [Set] and [Menu] buttons simultaneously while powering up the transmitter.

EC 4	216" (548.4 cm)	OFF	OFF
EC20	8" (20.3 cm)	MAXR	N/A
SAF1/2/3	SAF1	value	216" (548.4 cm)
Fast/Slow	FAST	MINR	N/A
ALIN	N/A	value	6" (15.2 cm)

Changing Display Units:

The LU20 comes preset to measure in inches. To change the unit to display centimeters, remove power to the LU20 and wait 10 seconds. Press [▲] and [Set] simultaneously while powering up the transmitter. The LU20 will now read in centimeters. To return to inches, remove power and wait 10 seconds. Press [▼] and [Set] simultaneously while powering up the transmitter.

Depth (Feet)	Radius (Inches)	Radius (cm)
1	1.2	3.1
2	2.1	5.2
3	2.9	7.3
4	3.7	9.5
5	4.6	11.6
6	5.4	13.7
7	6.2	15.9
8	7.1	18.0
9	7.9	20.1
10	8.8	22.3
11	9.6	24.4
12	10.4	26.5
13	11.3	28.7
14	12.1	30.8
15	13.0	32.9
16	13.8	35.1
17	14.6	37.2
18	15.5	39.3
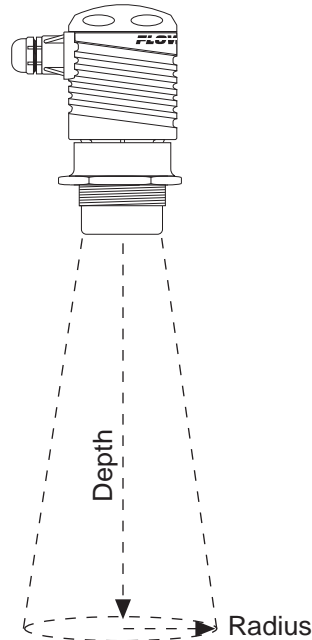
⚠ Warning ⚠

Always install the 2" Viton gasket with the LU20-5061 and the LU20-5061-IS. The G threaded version of the Echotouch will not seal unless the gasket is installed properly.

TROUBLESHOOTING

LOST Signal:

A reading of LOST in the display of the LU20 indicates the transmitter is not receiving a valid return signal. If LOST appears, please check the following troubleshooting items:

1. Beam cone interference such as the side wall, ladders, seams, rungs or pipes within the LU20's beam cone.

2. Proper installation such that the LU20 is installed level and free from interference from the installation fitting or flange.

3. Sufficient power being supplied to the LU20. The LU20-50_1 requires 12-36 VDC power with a minimum supply of 25 mA. The LU20-50_1-IS requires 12-32 VDC power with a minimum supply of 25 mA.

4. Proper programming of the MAXR or MINR function. For best results, set the MAXR function as the distance from the bottom of the tank to the bottom of the transmitter. Also set the MINR distance above the highest level in the tank. Do not set the MINR to less than 6 inches.

5. Make sure that the transmitter is not installed at an angle. Even a 5 degree offset can reduce the signal return strength greatly.

Other Hints:

Current must change with changes in level. Example: For the illustration below, as level increases, the current output will increase and as the level decreases, the current output will decrease. If the output of the LU20 is always reading 4 mA or 20 mA, check the input values for the LU20.