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TEMPERATURE

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- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- ☑ Transducers & Strain Gauges
- ☑ Load Cells & Pressure Gauges
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

FLOW/LEVEL

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
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- ☑ pH Electrodes, Testers & Accessories
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- ☑ Controllers, Calibrators, Simulators & Pumps
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- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Datalogging Systems
- ☑ Recorders, Printers & Plotters

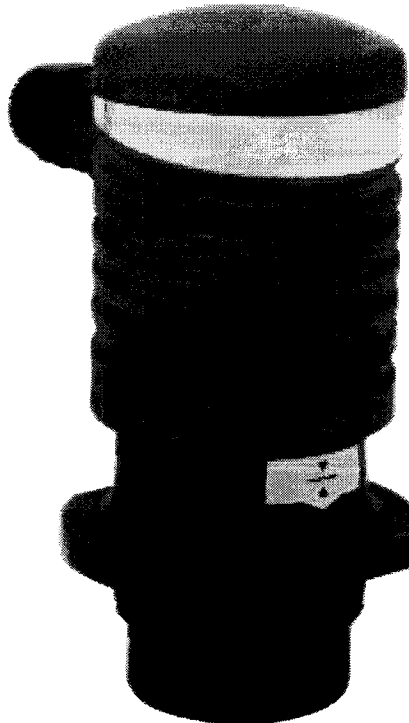
HEATERS

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

**ENVIRONMENTAL
MONITORING AND CONTROL**

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments

M2754/0503



User's Guide



<http://www.omega.com>
e-mail: info@omega.com

**LVU-201 Series
Ultrasonic Level Transmitter**

**MA
US**

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion, or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence. The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED.
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair.
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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USA and Canada:
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Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN*
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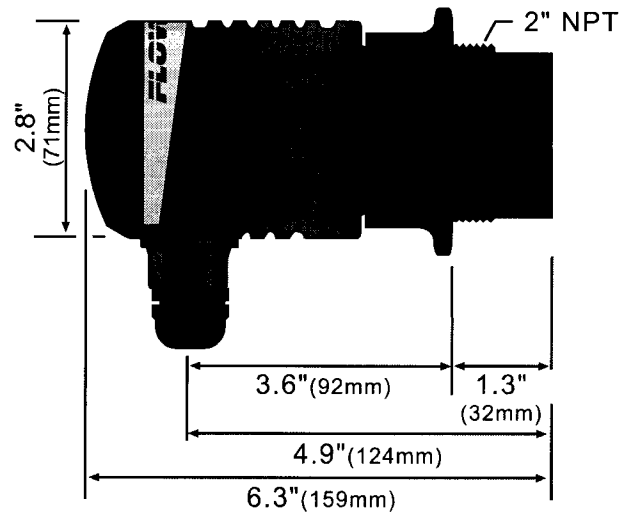
It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.
WARNING: These products are not designed for use in, and should not be used for, human applications.

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:	12-36 VDC
Max loop resistance:	900 Ohms @ 36 VDC (see below)
Signal output:	4-20 mA, 12-36 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: -40° to 140° C: -40° to 60° (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
Conduit connection:	1/2" NPT
CE Compliance:	EN 50082-2 immunity EN 55011 emission



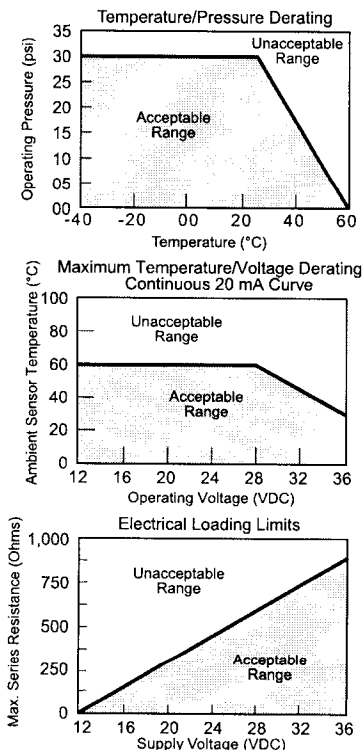
Technology

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 microprocessor 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.

LOST Signal:

A reading of LOST in the display of the LVU-201 series 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 LVU-201 series beam cone.
2. Proper installation such that the LVU-201 series is installed level and free from interference from the installation fitting or flange.
3. Sufficient power being supplied to the LVU-201 series. The transmitter requires 12-36 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. *For optimum performance, always set the MINR value to it's greatest setting.*
5. Make sure that the transmitter is not installed at an angle. Even a 5 degree offset can reduce the signal return strength greatly.



Warning

The LVU-201 series is a loop powered device. The load should never exceed 900 Ohms.

When installing the LVU-201 series, never tighten the transmitter from the body. Always use the wrench flat located above the threads.

SAFETY PRECAUTIONS

Step Two

⚠ About this Manual:

PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on all versions of the continuous ultrasonic level transmitter from Omega; model LVU-201. 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:

Omega 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. 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 LVU-201 series transmitter. The sensor systems should never exceed a maximum of 36 VDC for the LVU-201 series. Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.

⚠ Temperature and Pressure:

The LVU-201 series 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 $^{\circ}\text{C}$ above 25°C .

⚠ Material Compatibility:

The continuous ultrasonic level transmitter, LVU-201 series, 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.

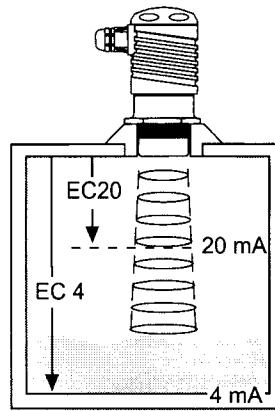
⚠ Flammable, Explosive and Hazardous Applications: DO NOT USE THE LVU-201 SERIES TRANSMITTER IN CLASSIFIED HAZARDOUS LOCATIONS.

⚠ Make a Fail-Safe System:

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

DEFINITIONS

Step Three



EC4: The 4 mA setting for the LVU-201 series. The EC4 is the distance from the bottom of the LVU-201 to the 4 mA set point. This setting is measured in either inches or centimeters on the display. The EC4 setting is typically greater than the EC20 setting and is equal to the distance from the bottom of the transducer to the bottom of the tank.

EC20: The 20 mA setting for the LVU-201 series. The EC20 is the distance from the bottom of the LVU-201 to the 20 mA set point. This setting is measured in either

inches or centimeters on the display. The EC20 setting is typically the distance from the bottom of the transducer to the highest level in the tank.

SAF1/SAF2/SAF3: Fail-Safe setting for the LVU-201 series. 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 LVU-201. [FAST] is the typical setting for the LVU-201 series to operate. [SLOW] is designed to help dampen out effects caused by severe turbulence. In the [FAST] mode, the LVU-201 series will average 2 signal responses per second and update every second. In the [SLOW] mode, the LVU-201 series 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 LVU-201 series 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 LVU-201 series until the display is maximized.

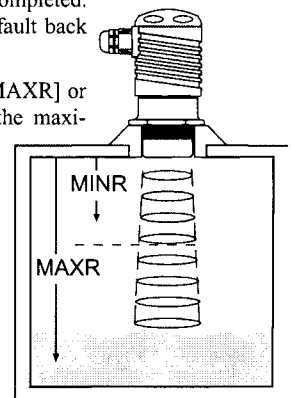
ON/OFF: Actual setting for ALIN mode. The ALIN mode must be turned [OFF] when alignment is completed. This mode will not automatically default back to [LEVL].

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. The MAXR value is typically set equal to the EC4 setting.

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. The MINR value is typically set equal to the EC20 setting.



PROGRAMMING

Step Four

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 [s] or [t] keys once and the old setting for the EC4 will appear.
4. From here, use the [s] or [t] 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 [s] or [t] keys once and the old setting for the EC4 will appear.
4. From here, use the [s] or [t] 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 LVU-201 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 [s] or [t] 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:

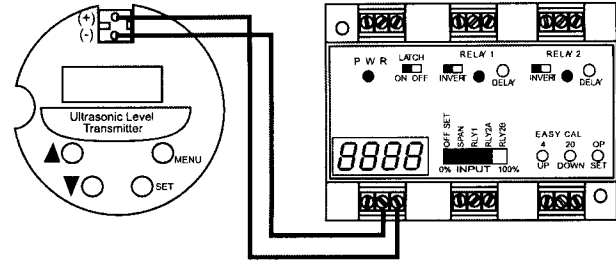
1. Hold [MENU] key until MINR appears in the display.
2. Continue to hold [MENU] key until a value appears in the display. This value is the current MINR setting.
3. If this is acceptable, press [SET] to lock the value as the MINR setting. If not, use the [s] or [t] keys to raise or lower the value to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

WIRING

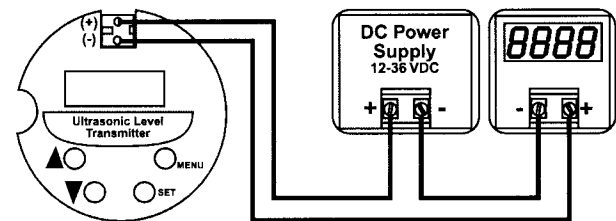
Step Five

the LVU-201 requires 12-36 VDC power with at least 25 mA supply in order to operate.

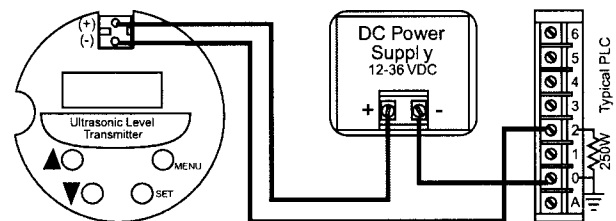
1. Wiring to a Omega Continuous Controller:



2. Wiring to a Two-Wire Loop Indicator:

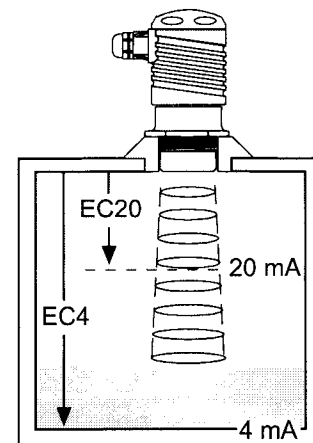


3. Wiring to a PLC:



Hints:

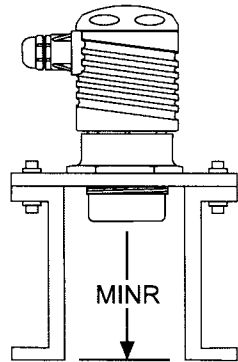
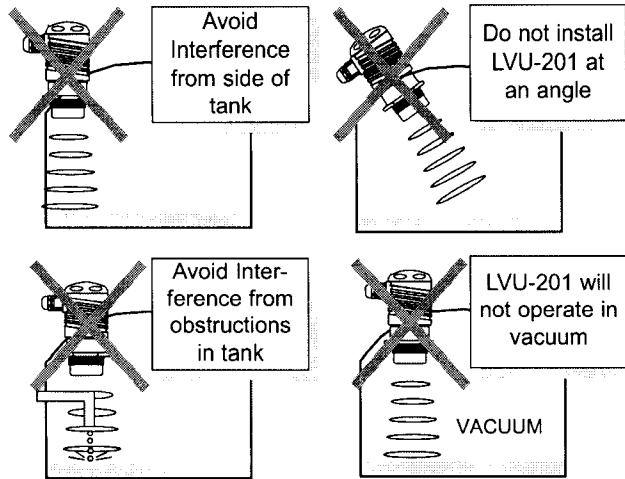
Current must change with changes in level. Example: For the illustration below, as level increases, the current output will increase and as the level decreases, the current output will decrease. If the output of the LVU-201 series is always reading 4 mA or 20 mA, check the input values for the LVU-201 series.



INSTALLATION

Step Six

Mounting the LVU-201 series is critical to the successful operation of the transmitter. Avoid the following parameters:



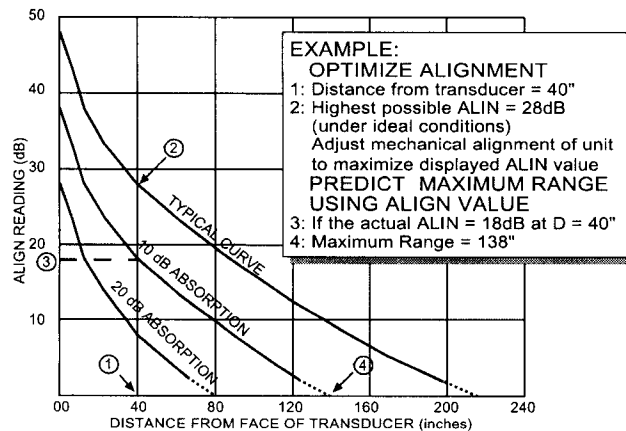
Minimum Range (MINR) Setting

The MINR setting is typically the distance from the bottom of the transducer to the highest level in the tank. When installing the LVU-201 series in a flange or any device which recesses the bottom of the transmitter, the minimum setting for the MINR is the distance from the bottom of the transmitter to the end of the flange. Never set MINR to less than 6.0 inches. *Always set the MINR value to it's greatest setting.*

Maximum Application Range

The maximum range of LVU-201 series 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



INSTALLATION

Step Seven

Factory Settings:

The LVU-201 series 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 LVU-201 series 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	8" (20.3 cm)

Changing Display Units:

The LVU-201 series comes preset to measure in inches. To change the unit to display centimeters, remove power to the LVU-201 series and wait 10 seconds. Press [s] and [Set] simultaneously while powering up the transmitter. The LVU-201 series will now read in centimeters. To return to inches, remove power and wait 10 seconds. Press [t] 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

