



Ω OMEGA™ **User's Guide**

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LVRD10 SERIES **Guided Wave Radar Transmitter**



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The sensor utilizes TDR (Time Domain Reflectometry) technology. It is best described as low-energy, high-frequency electromagnetic impulses, generated by the sensor's circuitry that is propagated along the probe as it is immersed in the liquid to be measured. Impulses hit the surface of the media and part of the impulse energy is reflected back up the probe to the circuitry. Level Measurement is calculated from the time difference between the impulses sent and the impulses reflected. The sensor analyzes the level output as a continuous measurement reading from its analog output. TDR-Sensors are also known as Guided Radars or Guided Wave Radars (GWR).

New Features

- Precise continuous level measurement in one device
- Complete galvanic insulation of device electronics from its inputs/outputs and the tank potential (no problems with electrochemical corrosion protection)
- Highly robust measurement due to 3-wire design, innovative signal analysis and disturbance signal suppression

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Electrical

Analog output: 4 to 20mA, 3-wire
 Total load resistance: < 250Ω
 Lower range value: 4.0mA (span 0%)
 Upper range value: 20.0mA (span 100%)
 Response time: 5s
 Supply voltage: 10 to 30VDC (reverse-polarity protected)
 Current consumption: <50mA at 24VDC
 Start-up time: <6s
 Cable terminals: terminal block for wires 16 to 26 AWG (solid or stranded)

Measurement

Reference condition: (dielectric constant $[\epsilon_r] = 80$, water surface, tank 01m, DN200 metal flange)

Accuracy: $\pm 3\text{mm}$

Repeatability: <2mm

Resolution: <2mm

Probe type:

Rod: 4mm

Cable: 4mm, type 7x19

Coaxial: 21.3mm (0.843") ½" pipe

Probe length Standard Lengths

Rod: LVRD11: 9.84' (3.0m)

LVRD11-3FT: 3.0' (0.91m)

LVRD11-6FT: 6.0' (1.82m)

Coaxial: LVRD12: 9.84' (3.0m)

LVRD12-3FT: 3.0' (0.91m)

LVRD12-6FT: 6.0' (1.82m)

Cable: LVRD13: 18.0' (5.5m)

Custom Probe [can be ordered in 5mm (0.2") increments from the reference point]

Rod: 2' to 9.8' (0.61 to 3.0m)

Cable: 3.3' to 18' (1.0 to 5.5m)

Coaxial: 2' to 9.8' (0.61 to 3.0m)

Probe loading

Rod: Maximum lateral load: 6Nm... (0.2kg at 3 m)

Cable: Maximum tensile load: 5kN

Coaxial: Maximum lateral load: 100Nm... (1.67kg at 6 m)

Top dead band: 100mm (4")

Bottom dead band: 50mm (2")

Application Specifications

Intended Installation:

Rod: Metallic tank or below grade concrete basin

Cable: Metallic tank or below grade concrete basin

Coaxial: Non-metallic, plastic, fiberglass or metallic tank or below grade concrete basin

Dielectric $[\epsilon_r]$ >1.8

Conductivity: no restrictions

Density: no restrictions

Application Specifications (continued)

Process temperature

Rod:	F: -40° to 302°	C: -40° to 150°
Cable:	F: -40° to 302°	C: -40° to 150°
Coaxial:	F: -40° to 266°	C: -40° to 130°

Ambient temperature

Operation:	F: -13° to 176°	C: -25° to 80°C
Storage:	F: -40° to 185°	C: -40° to 85°C

Application pressure: -14.5 to 250 psi -1bar to 17.2bar

Rate of level change: 1"/s

Mechanical Specifications

Wetted materials:

Rod:	1.4404 / 316L SS, PEEK
Cable:	1.4404 / 316 SS, PEEK
Coaxial:	1.4404 / 316L SS, PEEK

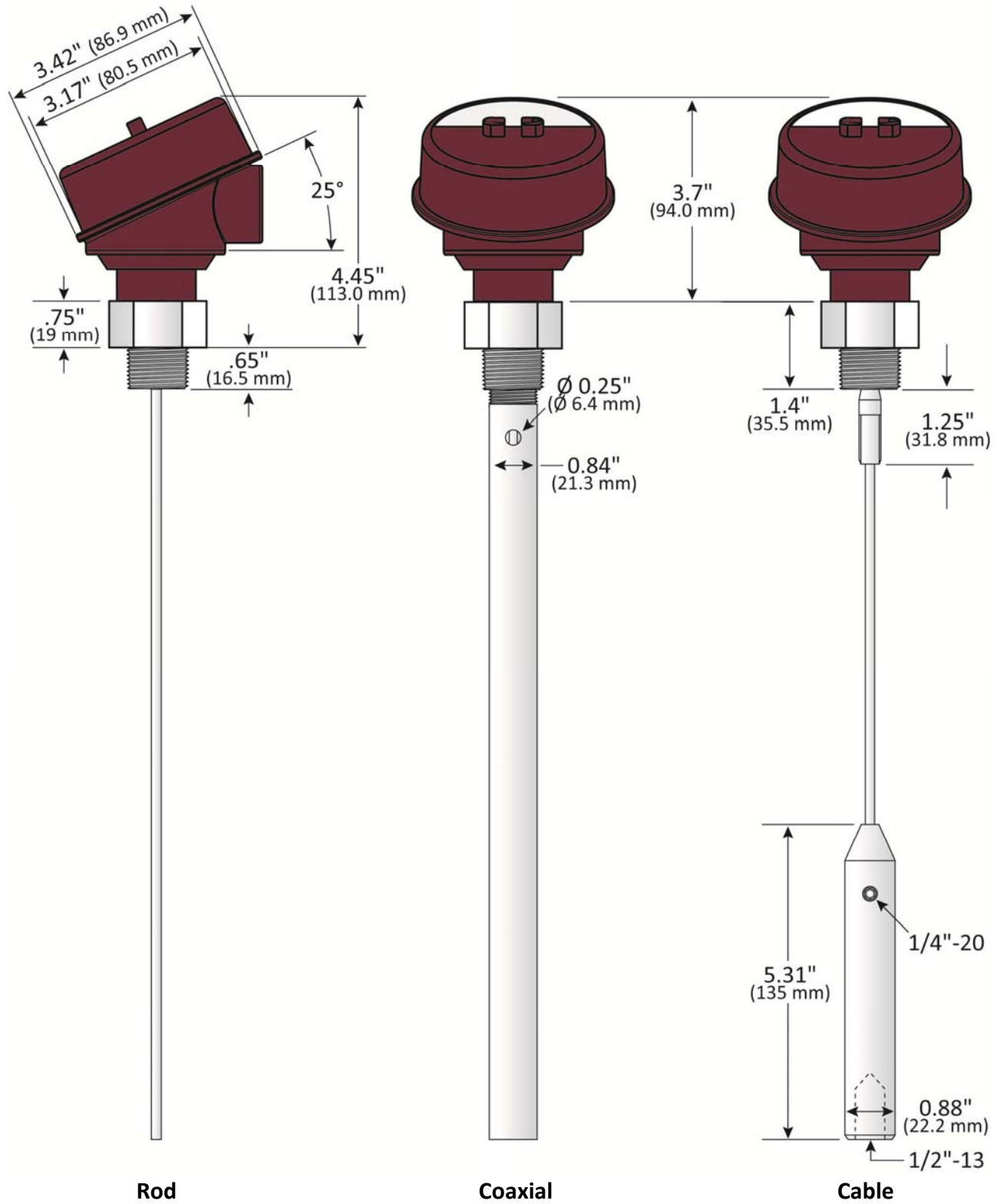
Housing materials

Housing body and cover:	Aluminum alloy EN AC-ALSi9Cu3 (DIN EN 1706), epoxy spray coating (~70µm) other alloys and coatings on request.
cover o-ring:	silicone rubber (Elastosil R 750/50)
screws; cover locking screw;	1.4301 / 304 external earth terminal
screw:	tin plated stainless steel 1.4301 / 304

Housing rating:	IP66, NEMA 4
Cable entries:	Single cable entry ½" NPT
Cord grip:	½" NPT, Ferrite Bead included
Cord grip mat'l:	Nylon
Cord grip Cable	
Minimum Size:	0.170" (4.3mm)
Maximum Size:	0.450" (11.4mm)
Process mount:	¾" NPT

Compliance:	CE: EN61326-1: 2013 & EN55011 Class A Group 1
	CRN
	RoHS

Dimensions:



⚠ About this Manual: PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on the LVRD10 series Guided Wave Radar Level Transmitter from Omega Engineering®. 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: Omega Engineering® 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. Never over tighten the sensor within the fitting. Always check for leaks prior to system start-up.

⚠ Wiring and Electrical: A supply voltage of 10 to 30 VDC is required to power the LVRD10 Series. 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 metal. Make sure that it is chemically compatible with the application media.

⚠ Enclosure: While the sensor housing is liquid-resistant the LVRD10 Series is not designed to be operational when fully immersed. It should be mounted to insure the enclosure does not come into contact with the application media under normal operational conditions. The probe is designed for full liquid contact.

⚠ 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. Omega Engineering® recommends the use of a redundant backup system and alarm in addition to the primary system.

⚠ Flammable, Explosive or Hazardous Applications: The LVRD10 Series sensor is not certified for application in a hazardous locations.

Setup Overview

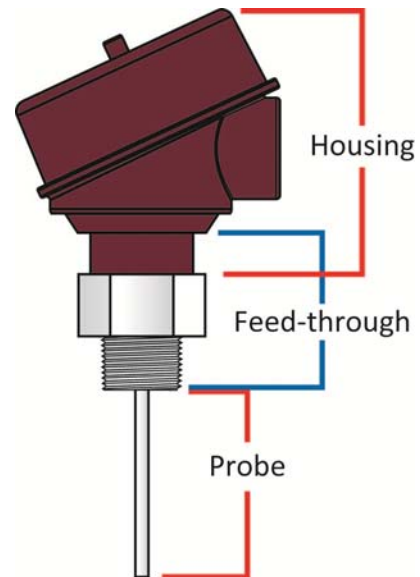
Below highlights the initial steps in setting up your sensor for operation.

1. **Check Part Number** (Section Two)
 - a. Confirm that the sensor's part number matches the ordered part number and all components are provided with the model delivered.
2. **Measure Probe & Installation** (Section Two)
 - a. Prior to installation, measure the length of the probe. Confirm that the probe length matches the actual installation location.
 - b. If the probe length is too long, refer to Cutting the Probe in Section 8.
 - c. Understand the location of the sensor's Measurement Range as well as Minimum Fill-Height and Maximum Fill-Height settings.
3. **Install the sensor** (Section Three)
 - a. Section 3 contains information on the location and mechanical installation of the sensor.
4. **Wire the sensor** (Section Four)
 - a. Section 4 contains information on electrical wiring and power requirements for the sensor.
5. **Configure Sensor with LVCN414-SW Software** (Section Five)
 - a. Section 5 contains information on using the LVCN414-SW configuration software.
6. **Perform an Empty Scan** (Section Six)
 - a. Section 6 contains information on how to run an empty scan.
 - b. An empty scan may not be required on a sensor that has a coaxial probe.

Components: LVRD10 Series is offered in 12 different models. Depending on the model purchased, you may or may not have been shipped the configuration component shown below.

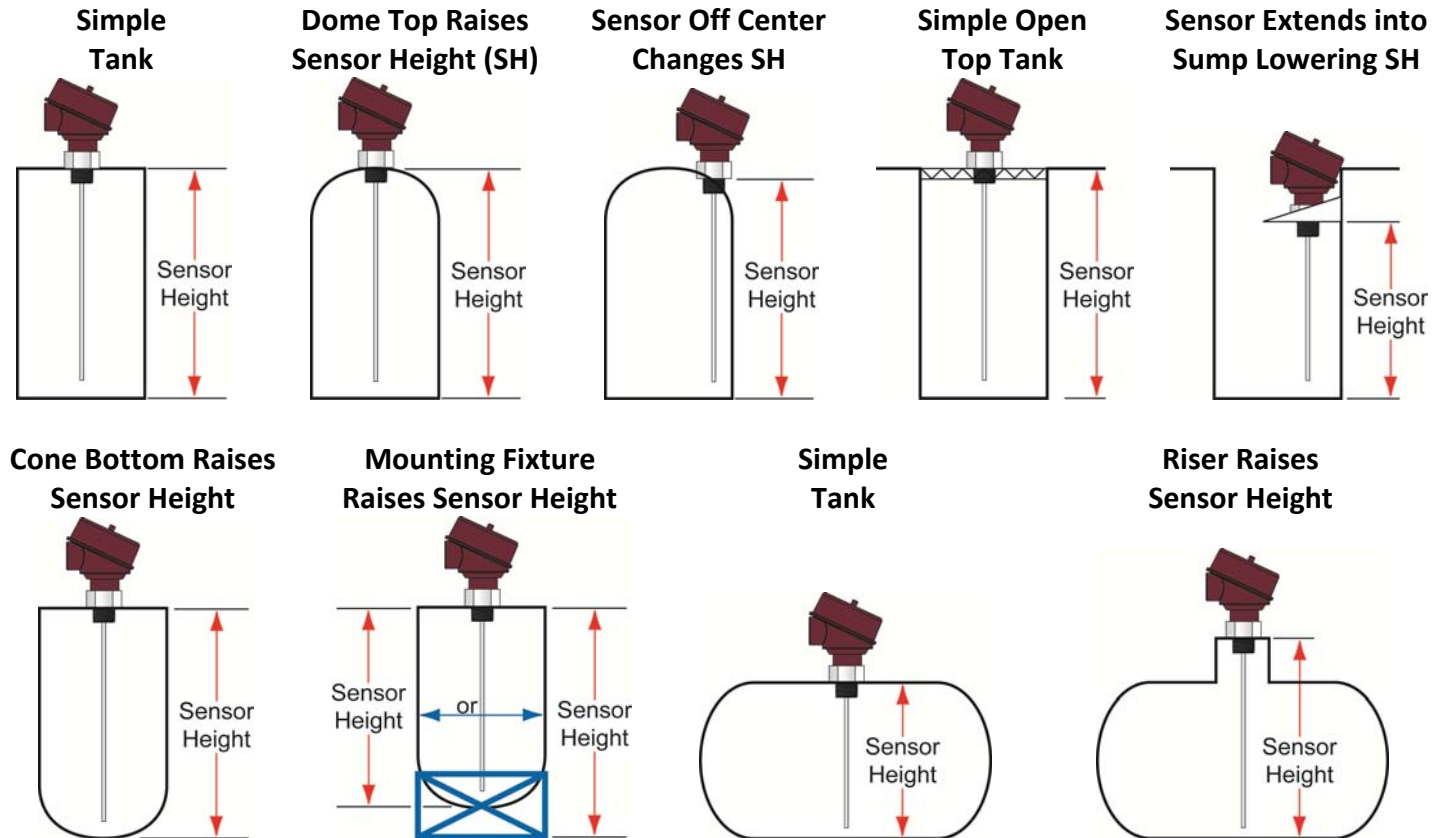
Part Number	Maximum Range	Probe Style	Probe Mat'l	Thread	Fob Included	Components
LVRD11-B	9.8'	Rod	316L SS	¾" NPT	No	Housing, feed-through, rod style probe
LVRD11	(3m)				Yes	
LVRD11-3FT-B	3.0'				No	
LVRD11-3FT	(0.91m)				Yes	
LVRD11-6FT-B	6.0'				No	
LVRD11-6FT	(1.82m)				Yes	
LVRD11-B	9.8'	Coaxial	316L SS	¾" NPT	No	Housing, feed-through, coaxial style probe ¹
LVRD11	(3m)				Yes	
LVRD11-3FT-B	3.0'				No	
LVRD11-3FT	(0.91m)				Yes	
LVRD11-6FT -B	6.0'				No	
LVRD11-6FT	(1.82m)				Yes	
LVRD13-B	18.0'	Cable	316 SS	¾" NPT	No	Housing, feed-through, cable style probe ²
LVRD13	(5.5m)				Yes	

- Coaxial style probe¹ - includes rod, threaded $\frac{1}{2}$ " pipe and spacers
- Cable style probe² - includes counterweight
- Manual



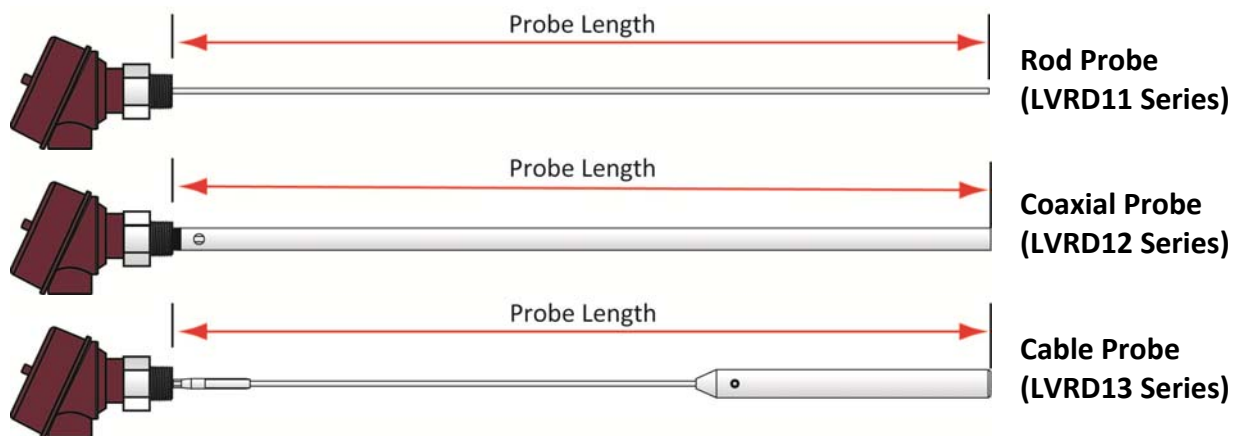
Understanding Sensor Height

This is a critical setting for LVRD10 Series. Sensor Height defines the height of the sensor above the bottom of the tank. The height value must take into account the shape of the tank and any risers, fittings, structures or extensions associated with the tank or the installation (see examples below). The reference point for definition of the Sensor Height is always the bottom of the mounting nut.



Understanding Probe Length

The reference point for definition of the probe length [**Length**] is always the bottom of the threads [bottom of the feed through (see below)]. **Note:** This is a different reference location from the Sensor Height. The probe **Length** is an important mechanical dimension which is needed to make sure the probe physically fits into the tank at the anticipated mounting location. Probe length has an influence on the actual measuring range of the sensor, but it is a different aspect of the sensor.

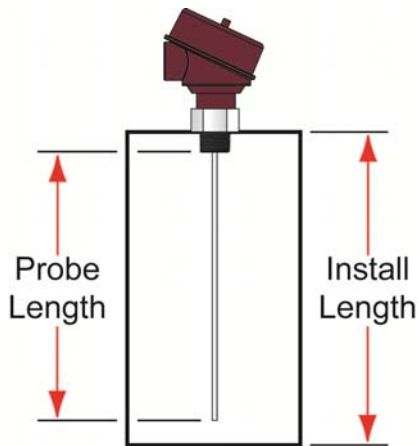


Note: Sensor Height and Probe Length have different reference points for measurement.

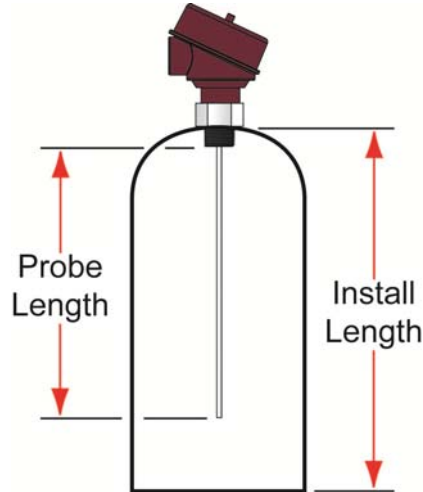
Understanding Install Location Length

Measure the space below the actual installation location for the sensor. This distance (install length) must be greater than the probe length. In many tanks, the install length corresponds to the height of the tank. With dome top, cone bottom and horizontal tanks, include the added height of the curved surface. Be sure to take into account the height of fittings, risers, tank flats etc. which may be added for installation. All of the above can raise the bottom of the probe higher in the tank than what was originally expected resulting in a reduced lowest level of measurement (see Measurement Range).

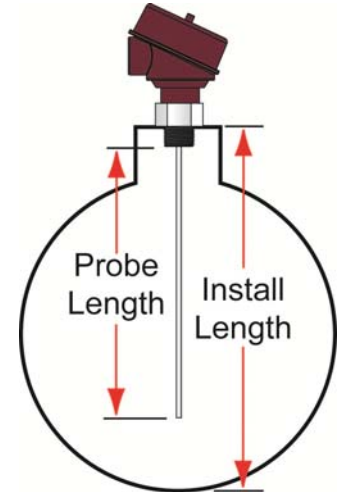
**Tank with Flat Top
& Flat Bottom**



**Tank with Dome Top
& Flat Bottom**



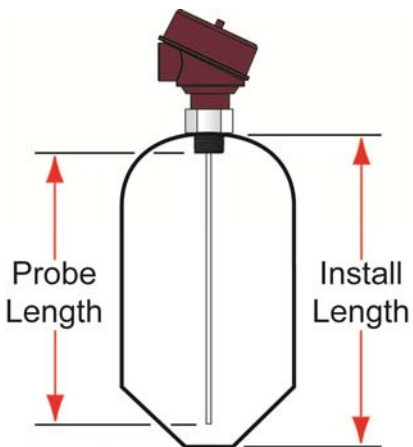
**Horizontal
Tank**



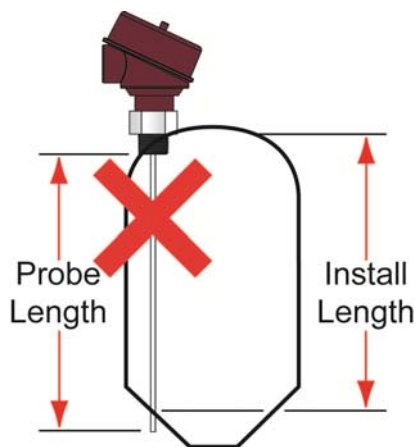
Dome Tops and Cone Bottoms

The location of an LVRD10 Series installed along the top of a dome top tank may have an effect on the installation of the sensor. Be sure to measure from the actual point of installation. Round or cone bottom tanks will reduce the install height available, depending on install location. If this occurs, either the sensor can be raised using fittings (see Adding a Riser to Avoid Cutting the Probe) or the probe's length may be reduced by cutting the probe (see Cutting the Probe in Section 7).

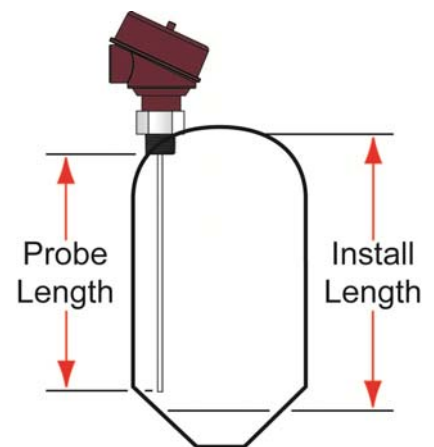
**Install Height >
Probe Length**



**Install Height <
Probe Length**



**Install Height >
Probe Length**

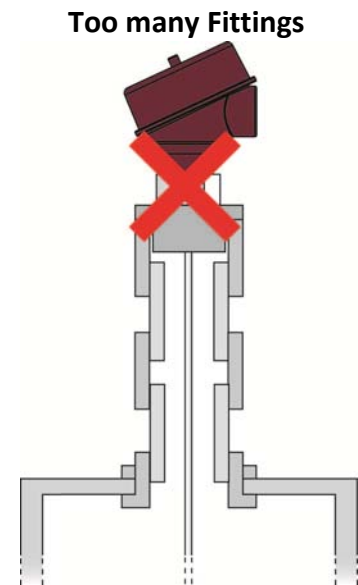
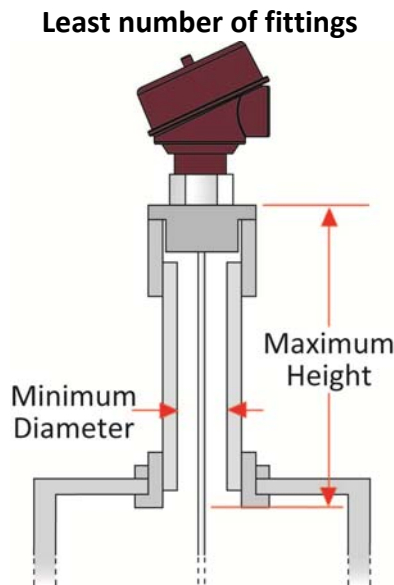


Adding a Riser to Avoid Cutting the Probe

In some conditions, a riser may be added to avoid cutting the probe.

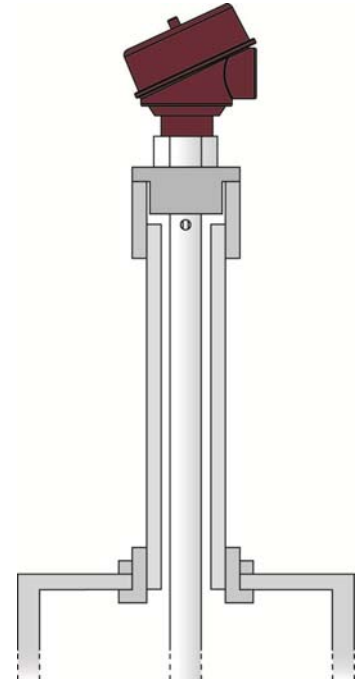
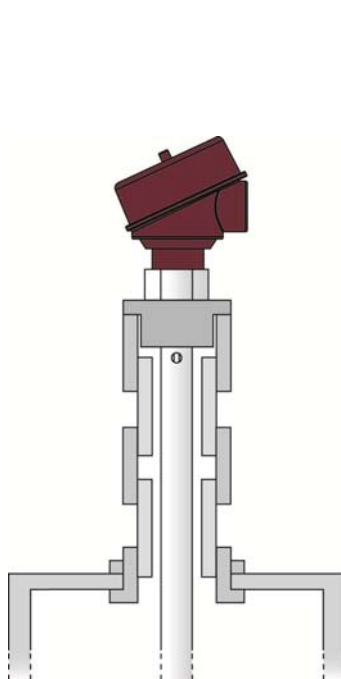
Rod and Cable Probes

With the Rod and Cable versions of the probe, the maximum height for the riser is 12" (300mm). The minimum diameter of the riser is 2" (50mm). The riser must be metallic in construction using the least number of fittings/connections. **Note: An Empty Signal Scan is a requirement so that the EchoWave® can eliminate the odd geometry created by the riser.**



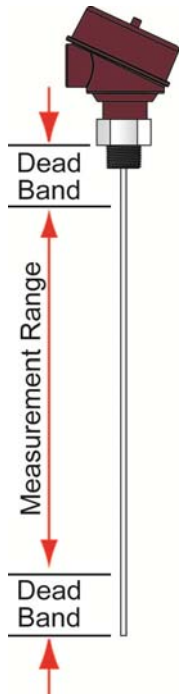
Coaxial Probes

With the coaxial probe, there is no maximum riser height or minimum riser diameter. This is because the coaxial shield isolates the physical changes to the installation from the sensor's energy signal. In both examples, the energy signal cannot see any changes to the fitting/connections or from being installed in an extension that exceeds the maximum height for rod and cable probes.



Understanding Measurement Range

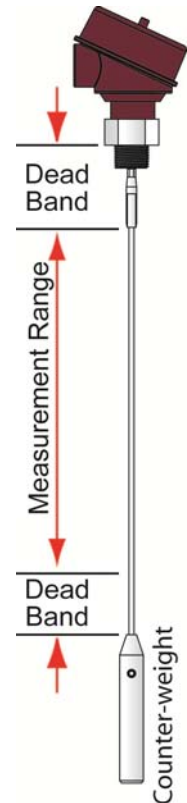
LVRD10 Series level transmitters have small dead band areas at both the top and bottom of the probe. It is due to the presence of unavoidable signal disturbances at both ends of the probe. In these dead band areas the measurements are non-linear or have reduced accuracy. Therefore, it is not recommended to actually measure level within those dead band areas. Their length depends on the probe type and the reflectivity (i.e. dielectric constant) of the liquid to be measured.



The **Measurement Range** of LVRD10 series extends between the top and bottom dead band areas; this is the area in which a sensor will have the specified measurement performance. It is recommended that the maximum and minimum levels to be measured in the tank are actually within the **Measurement Range** of the sensor. The span between the lower range value [4mA] and the upper range value [20mA] of the current output is proportionally equal from 0 to 100% of your continuous level measurement reading. It is recommended that the span between these two range values stays within the **Measurement Range**.

The [**Top Dead Band**], closest to the threads, is set to 4" (100mm). This is measured from the bottom of the nut down to the probe. This is consistent for all styles of probe. **Note:** *the measurement location for the Top Dead Band is different to the measurement location for the probe length.*

The [**Bottom Dead Band**], closest to the end of the probe, is set to 2" (50mm). This is measured from the end of the probe on rod and coaxial probes. For cable probes, it is measured from the top of the counter-weight. The counter-weight must be included with the dead band as the sensor's inactive area.

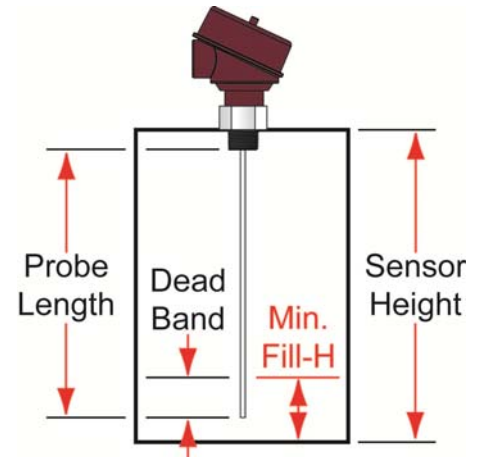


Understanding Minimum Fill-Height (putting it all together)

LVRD10 Series has a Minimum Fill-Height (Min. Fill-H), which is measured from the bottom of the tank to the top of the Bottom Dead Band. As shipped from the factory, Min. Fill-H is where the 4mA current is located and is the lowest point on the probe where the sensor can detect a liquid level. Any point below this position will stop at 4mA. The Min. Fill-H is influenced by the Sensor Height (SH), Probe Length (P), Height of the Threads [0.65" (16.5mm)] and Bottom Dead Band.

$$\text{Min. Fill-H} = (\text{SH}) - [0.65" (16.5\text{mm})] - (\text{P}) + (\text{Bottom Dead Band})$$

- With a cable probe, include the height of the counter-weight.
- Switch output to volumetric will allow Min. Fill-H to be set to (0).
- If the 4-20 mA output is reversed (20mA at bottom and 4mA at top), then the level will max out at 20 mA when the level falls below the Min. Fill-H.



Note: Because of the bottom dead band, the Minimum Fill-Height can never be at the end of the probe.

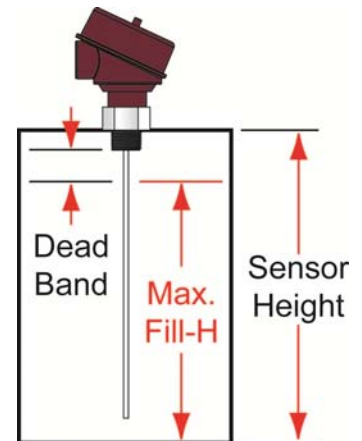
Note: The configuration of the sensor (Distance or Volume) will affect the current output at Minimum Fill-Height. Upon selecting Distance, the current will be set to 4mA at Min Fill-H. However, upon selecting volume, the current at Min Fill-H will be the calculated based upon 4mA being set at the bottom of the tank [see Distance (Height of Liquid) vs. Volume of Liquid].

Understanding Maximum Fill-Height

LVRD10 Series has a Maximum Fill-Height (Max. Fill-H), which is measured from the bottom of the tank to the Top Dead Band. As shipped from the factory, Max. Fill-H defines the 20mA current depicting the highest point on the probe where the sensor detects liquid level. Any point above this position will stop at 20mA. The Max. Fill-H is influenced by the Sensor Height (SH), Height of the Threads [0.65" (16.5mm)] and Top Dead Band.

$$\text{Max. Fill-H} = (\text{SH}) - [0.65" (16.5\text{mm})] - (\text{Top Dead Band})$$

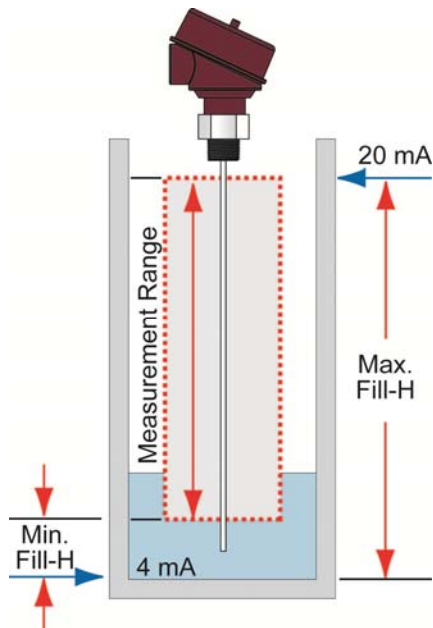
- The Max. Fill-H may be decreased to lower the 20mA location, but it cannot be raised above its original setting.
- If the 4-20 mA output is reversed (20mA at bottom and 4mA at top), then the level will max out at 4 mA when the level rises above the Max. Fill-H.



Note: Because of the top dead band, the Maximum Fill-Height can never be at the bottom of the threads.

Distance (Height of Liquid) vs. Volume of Liquid

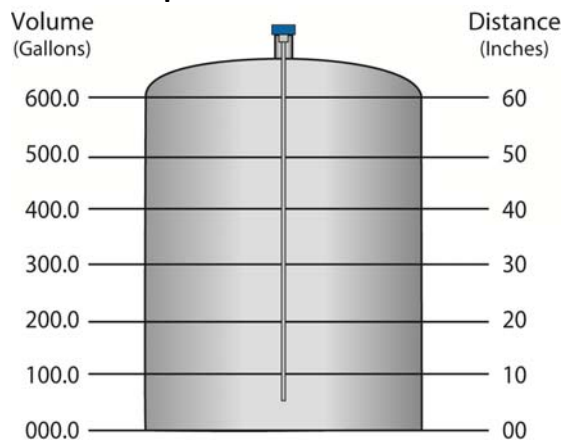
With the LVCN414-SW software, the LVRD10 series can be configured to operate as a device that reads the distance (height of liquid) or volume of a liquid. The location of the empty current will adjust depending on which configuration method is selected. **Note:** *The empty (4mA) location is placed at a different location based upon selecting liquid height or liquid volume.*



Distance (Height of Liquid): When the LVRD10 Series is configured to read the height of the liquid, the default for the sensor Empty will be at the bottom of the measurement range (end of the probe minus the bottom dead band). This is where 4mA will be set. The default for sensor Full will be at the top of the measurement range (Top Dead Band), where 20mA will be set. The 20mA can be set by the Maximum Fill-Height.

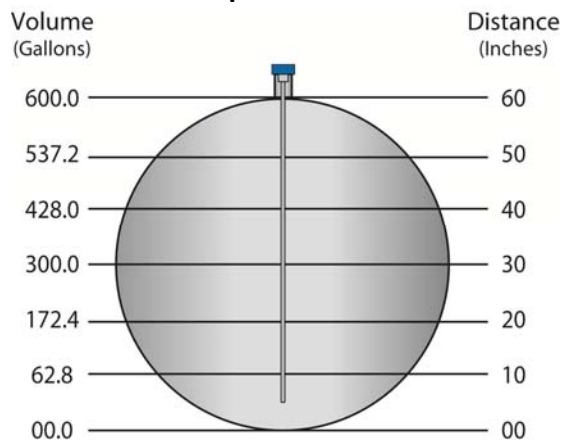
Volume of Liquid: When the LVRD10 series is configured to read the volume of liquid, the output will track the volume of the tank as the level increases and decreases. Like Distance, the Empty and Full settings will default to the low and high end of the Measurement Range. The location of the 20 mA can be adjusted with the Maximum Fill-Height settings. However, the shape of the tank can influence the current output, depending upon the tank being linear or non-linear (see below).

Linear Tank Example



Note: In the above illustration, 10" of liquid will always be equal to 100 gallons of liquid (1" = 10 gallons).

Non-Linear Tank Example



Note: In the above illustration, 1" of liquid does not equal 10 gallons. The 10" at the bottom represents a rise of 62.8 gallons. As a change between 10" and 20" represents an increase of 109.6 gallons (i.e. 172.4 gallons – 62.8 gallons).

LVRD10 series is mounted vertically into the tank via its connection thread. It is then screwed directly into a standard threaded tank connection, i.e. tank adapter, bushing, weld-in socket, or it can be screwed into a flange which is connected to a tank nozzle.

The sensor should not be welded directly into the tank. Neither should flanges be welded onto the sensor. Welding on the metal parts of LVRD10 Series will cause serious damage to the transmitter.

Do not lift or handle the LVRD10 series by its probe: this will cause excessive stress on the probe connection. LVRD10 Series should be handled by the hexagon or the lower section of the housing. Do not screw in the sensor by its housing. It should be tightened only via its hexagon (wrench size 32mm).

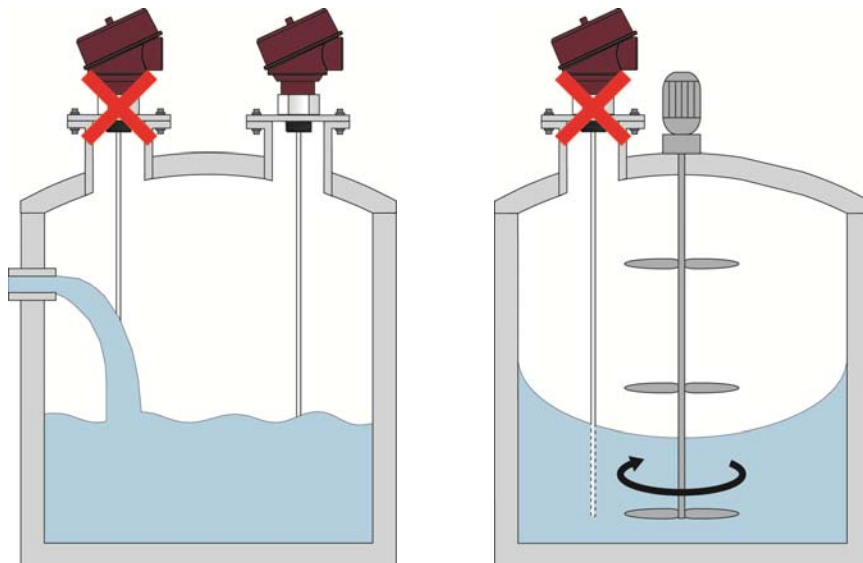
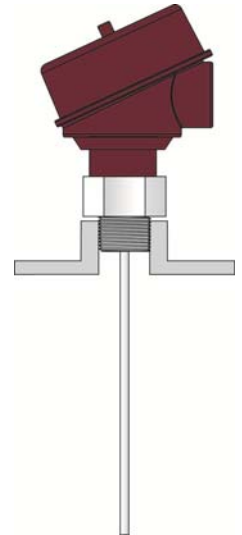
The end user has to ensure proper sealing of the sensor connection; based upon process conditions, i.e. temperature, pressure and resistance against the process liquid's atmosphere.

For NPT thread connections, pressure-tight joints require a sealant directly on the threads.

In the case that the sensor is delivered with a detached probe (cable version only), attach the probe onto the small threaded stud below the hexagon. Make sure to avoid cross threading or misaligning the threads.

Mounting Considerations

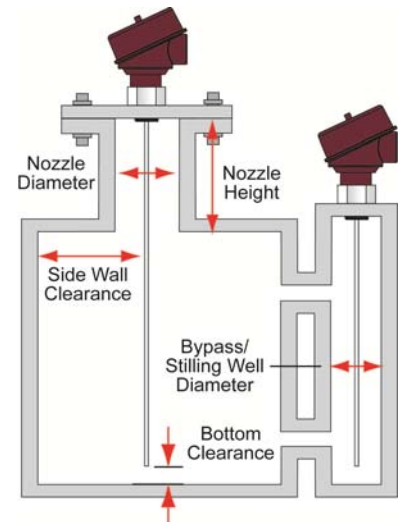
The probes should be installed so that they are not directly impacted by liquids flowing out of the filling inlet. They should neither touch nor sway towards other objects inside the tank or the tank/nozzle walls; e.g. by agitator or mixer swirls. In applications with very strong fluid movements which can also cause excessive lateral force on the probe, it is recommended to anchor the probe. The anchoring fixtures are end user supplied.



Mounting Considerations (continued)

The rod and cable probes are suitable for a very wide range of applications in liquids. However, the signal has a wider detection radius around the rod/cable. Therefore, it is more responsive for measurement signal disturbances that are overcome by a few Mounting Considerations (see below) as well as simple configuration adjustments to the sensor. In most cases it is enough to activate and utilize the powerful LVRD10 series empty signal scan feature. It works most efficiently on stationary interference targets like tall and narrow nozzles or close-by objects.

In case a non-stationary interference target is close to the rod probe, like slowly rotating agitator blades causing problems with the measurement, it is recommended to use the coaxial probe. In any case, the rod and cable probes should never get in direct contact with the tank/nozzle wall or other objects in the tank.



	Rod	Cable	Coaxial
nozzle diameter	>2" (50mm)	>2" (50mm)	+ ⁽¹⁾
nozzle height	<12" (300mm)	<12" (300mm)	+
clearance to tank wall or other internal objects	>4" (100mm)	>4" (100mm)	+
clearance between probe end and tank bottom	>0.1" (2mm)	>0.1" (2mm)	+
diameter of bypass chamber / stilling well	>1" (25mm)	>1" (25mm)	+ ⁽²⁾
metallic tank or below grade concrete basin	+	+	+
Non-metallic or plastic tank	NR	NR	+
+ = recommended + ⁽¹⁾ = enough diameter to fit in the coaxial tube (0.843" / 21.3mm) + ⁽²⁾ = enough diameter to fit in the coaxial tube (0.843" / 21.3mm) with allocated room around the probe for liquid flow through the bypass chamber / stilling well NR = Not Recommended			

The rod probe is also the recommended probe type for mounting the LVRD10 series into bypass chambers or stilling wells. In this case, plastic centering spacers are needed to prevent the probe from contacting the wall.

The cable probe is recommended for installations in tall tanks where limited installation headroom is available. Its performance characteristics and mounting considerations are similar to the rod probe.

The coaxial probe does not have restrictions regarding mounting position, tank connection, proximity to the tank wall and other objects inside the tank. The coaxial probe is recommended for installing LVRD10 series into a non-metallic tank or open pit

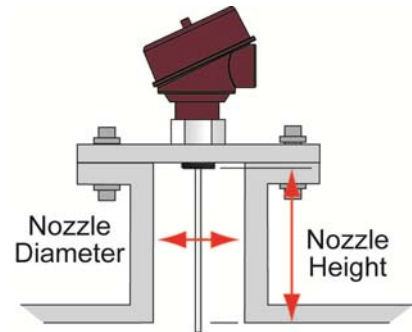
Installation Tips

Tall and Narrow Risers

Rod and Cable probes can be installed in tall and narrow risers under the following criteria:

- Nozzle Diameter must be $>2"$ (50mm),
- Nozzle Height must be $<12"$ (300mm),
- Riser must be metallic,
- An empty signal scan is required after installation.

Coaxial probes are not affected by tall and narrow risers.

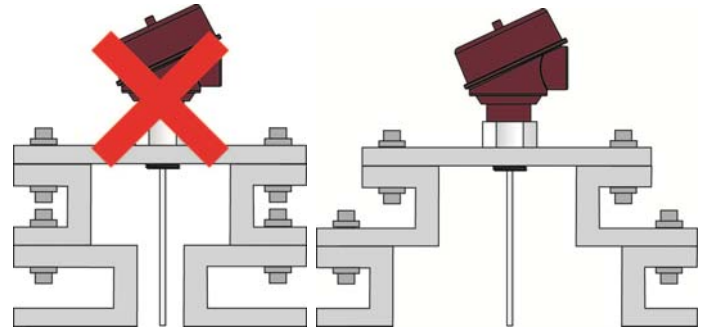


Difficult Tank or Riser Geometries

Rod and Cable probes must follow the criteria below:

- Tall and Narrow Risers criteria must be followed,
- Nozzle diameter remains the same diameter,
- Nozzle Diameter does not decrease,
- Nozzle Diameter may get larger, but a empty signal scan is required.

Coaxial probes are not affected by the shape of the tank or the geometry of the nozzle as the above is not applicable.

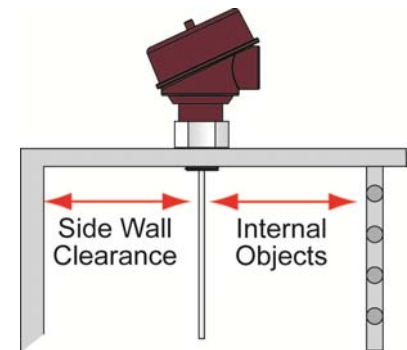


Close to Side Wall or Internal Obstructions

Rod and Cable probes must follow the criteria below:

- $>4"$ (100mm) from the side wall,
- $>4"$ (100mm) from any objects or obstructions within the tank,
- A empty signal scan may be required after installation.

Coaxial probes are not affected by the distance from the side wall or from other objects / obstructions within the tank.



Moving Probe

Rod and Cable probes must follow the criteria below:

- Avoid applications where the movement of the tank will cause the probe to swing or touch objects and obstructions in the tank or the side wall of the tank.
- Avoid applications where the tank is truck/vehicle mounted.

Coaxial probes are not affected by the movement of liquid within a stationary tank.

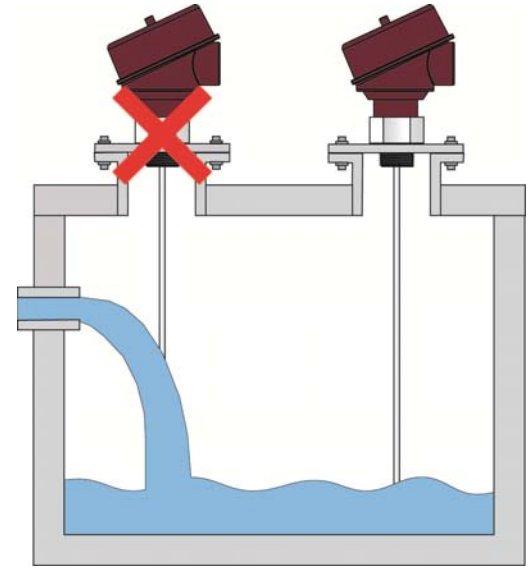


Installation Tips (continued)

Liquid Spray

Rod and Cable probes must avoid any liquid that sprays or pours onto the probe.

Coaxial probes are not affected by liquid spraying on parts that are above the liquid surface. However, avoid installing probe where liquid will pour onto the probe.



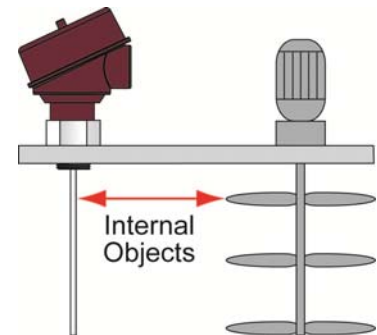
Non-Stationary objects

Rod and Cable probes follow the criteria below:

- >4" (100mm) from any objects or obstructions within the tank,
- An empty signal scan may be required after installation,
- Non-stationary objects must not be moving when empty signal scan is performed.

Coaxial probes are not affected by the movement of non-stationary objects, such as mixer blades or pump lifting chains.

Note: All probes (rod, cable and coaxial) can be affected by any liquid vortex created by a mixer.

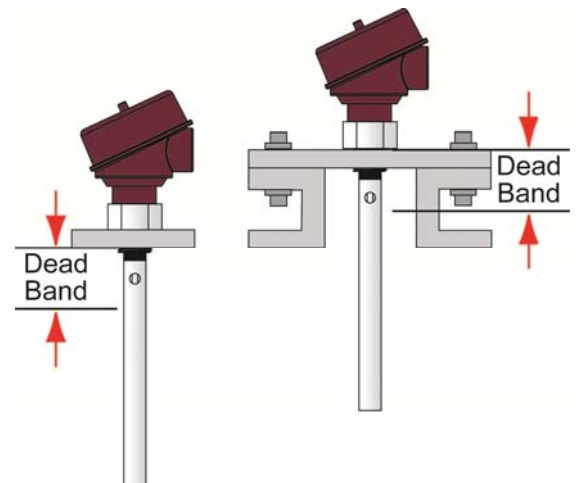


Measurement readings at the very top or bottom of the tank

Rod and Cable probes do not have the outer tube and must adhere to all mounting requirements, specifically:

- >4" (100mm) from any objects or obstructions within the tank, including the bottom of the tank,
- Criteria for difficult tank or riser geometries must be followed.

Coaxial probes can easily be mechanically mounted to ensure the measurement of liquid up to a full or empty tank. Because the coaxial is encased within the outer tube, the sensor is self-contained so other objects or obstructions are not an issue. This makes raising or lowering the sensor simple and straight forth.



Installation Tips (continued)

Non-metallic tanks

Unlike coaxial, rod and cable probes have no containment mechanism. This energy must be contained by the tank wall, requiring that **all rod and cable probe sensors be installed in metallic tanks or within below grade concrete sumps.**

Coaxial probes can be installed in any type of tank, including non-metallic tanks. This is because the outer tube acts as an insulator preventing the sensor's energy emanating beyond the probe.

Stilling Wells / Bypass Chambers

Installations within a stilling well or a bypass chamber are recommended with a rod probe. A metallic pipe is required. A coaxial probe can be used in a stilling well or bypass chamber if required.

Note: *Never use a cable probe within a stilling well or bypass chamber.*

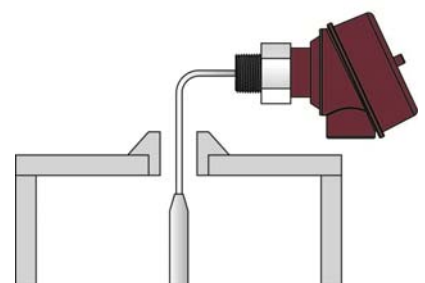
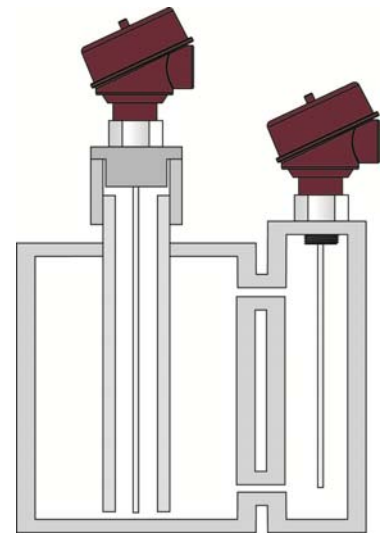
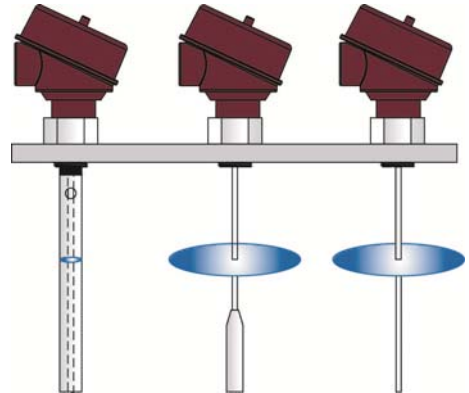
- Make sure that the probe does not come into contact with the inner wall of the stilling well or bypass chamber
 - Non-metallic spacers may be required to keep the probe within the center of the stilling well or bypass chamber
- Make sure the liquid is able to freely fill, empty and that no residue remains within the stilling well or bypass chamber.
- All other mounting criteria must be observed
- A empty signal scan may be required after installation

Limited headroom

When installing in a tank where there is limited space above the top of the tank, the cable probe is the recommended solution. The cable probe design allows for the probe to be installed through a small space above the tank.

The rod and coaxial probes may be installed as long as the probes are not damaged or bent and as long as the sensor is not held by the probe (sensor must be held by the head).

- All other mounting criteria must be observed.

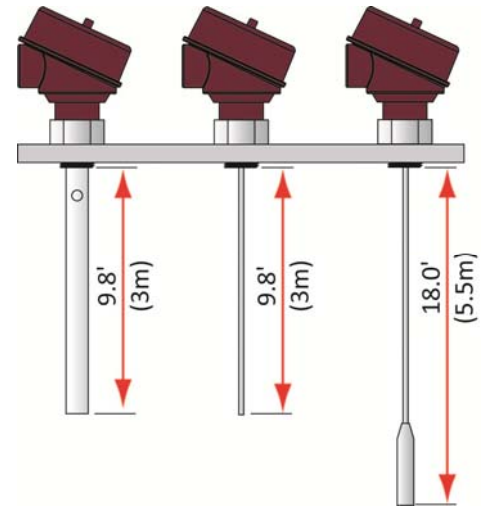


Installation Tips (continued)

Tall Tanks

The rod and coaxial probes have a maximum insertion length of 9.8' (3m). For metal or concrete tanks that are taller/deeper, the cable probe can be used for lengths up to 18.0' (5.5m).

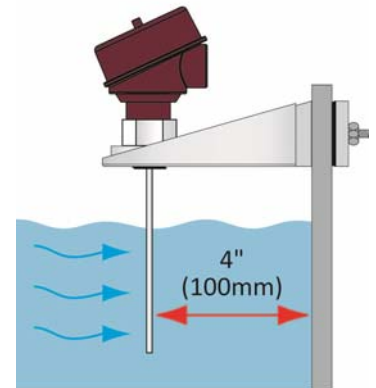
- The maximum length is based from the bottom of the threads.
 - **Note:** the coaxial probe consists of a rod probe with a metal outer tube installed around the original rod. The bottom of the mounting threads are used as the reference point for measurement.



Side Mount Brackets (LMV-30 Series)

Rod and Cable probes can be installed with the side mount bracket under the following criteria:

- The side wall or any object / obstructions do not come within 4" (100mm) from the probe
- Any movement of the liquid will not cause the probe to swing into the side wall or any object / obstruction
- The tank must be metallic or a below grade concrete basin
- An empty signal scan may be required after installation
- A metal plate of 6" in diameter may be required if there is no roof to the tank/basin

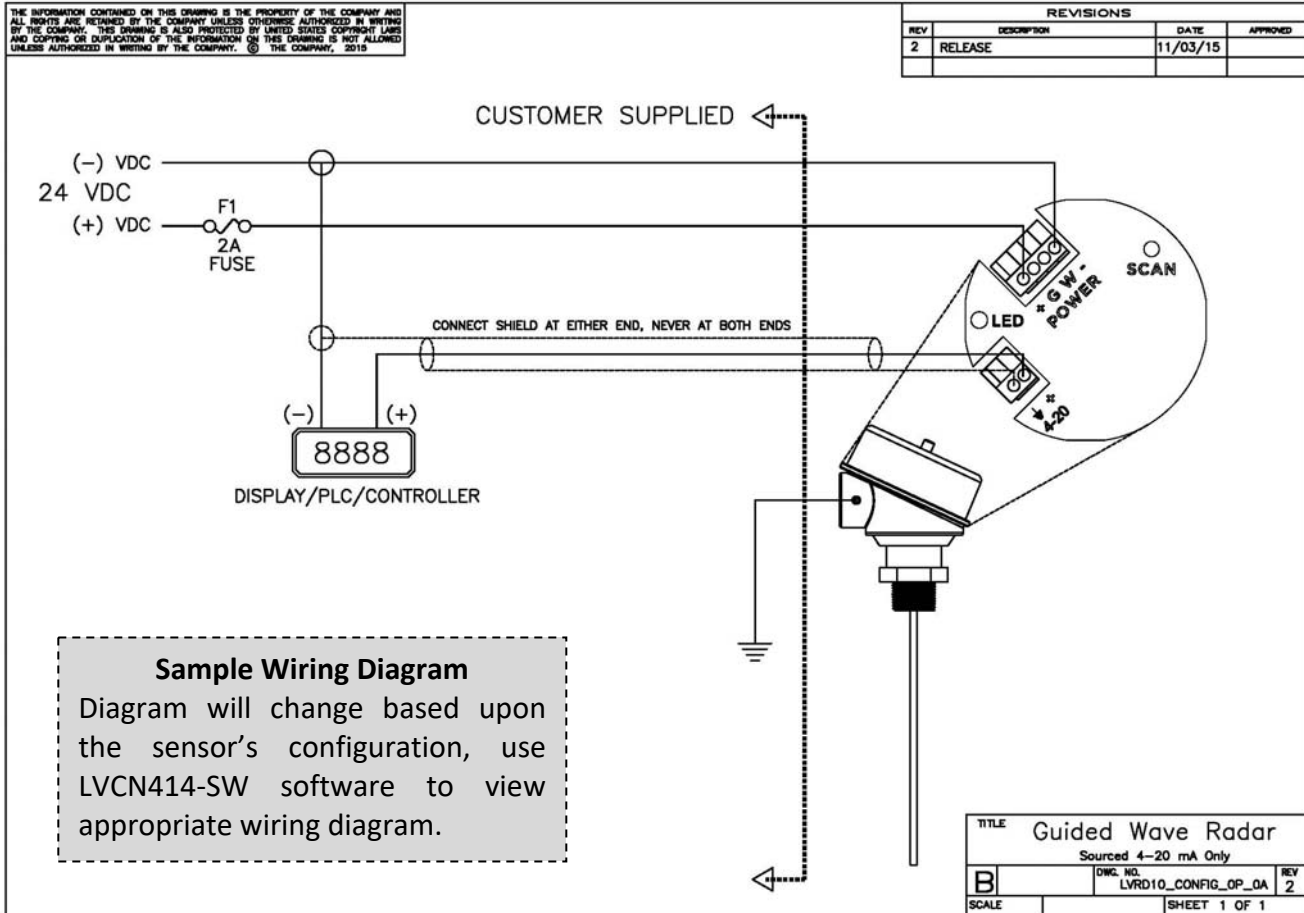


Coaxial probes are not affected by the side mount bracket.

Probe Too Long

For information on cutting the probe, see **Cutting the Probe** within the **Appendix, Section 7**.

Analog Output (4-20 mA): The analog output of the LVRD10 Series is a sourced 4-20 mA control circuit. The typical way to use this feature is to connect a positive supply to the (+) input terminal, a negative supply to the (-) input terminal and to connect the current output out of the 420 (+) terminal. The device that accepts the 4-20 mA current signal must reference the same negative supply listed above (see diagram below).



The cabling should be shielded and twisted to minimize EMI interference. Its shield should be connected at either end and **never connected at both ends**. Typically 18 to 24 gauge wire is used in this application.

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.
- Protect the sensor from excessive electrical spikes by isolating the power, whenever possible.
- Supply voltage should never exceed 30 VDC.
- Make sure that the power supply does not have a current more than 2A or that there is 2A rated fuse in the electrical circuit that energizes the device.
- 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.**

Wire Connections

The housing has single cable entry and can be attached to screw plugs, cord grips or conduit with the ½" NPT thread. **Note:** *the customer must confirm the suitability of those connectors for the specific application requirements and cabling; and replace them when necessary.* IP66-rated screw plugs and cord grips have to be properly mounted and tightened around cable of suitable type and diameter to ensure the IP66 rating of the housing.

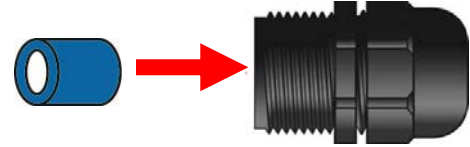
Note: *A liquid-tight cord grip and ferrite bead are included with the sensor (see Specification Section for cord grip data).*

Note: *Always include the ferrite bed when using the cord grip or when using non-metallic conduit.*

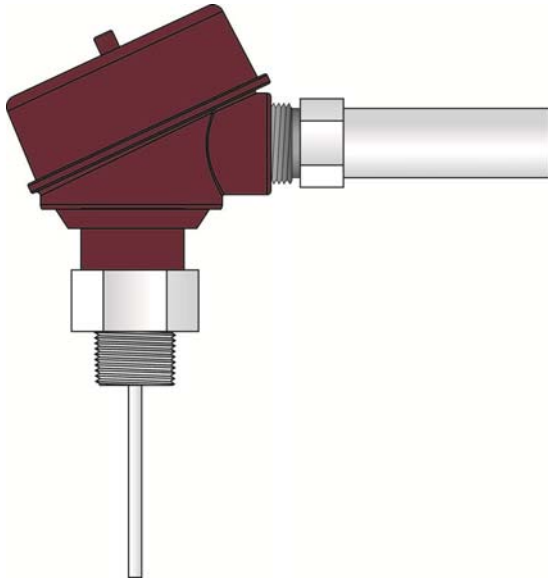
Note: *Always shield the signal wire per instructions on the wiring diagram.*

Ferrite Bead

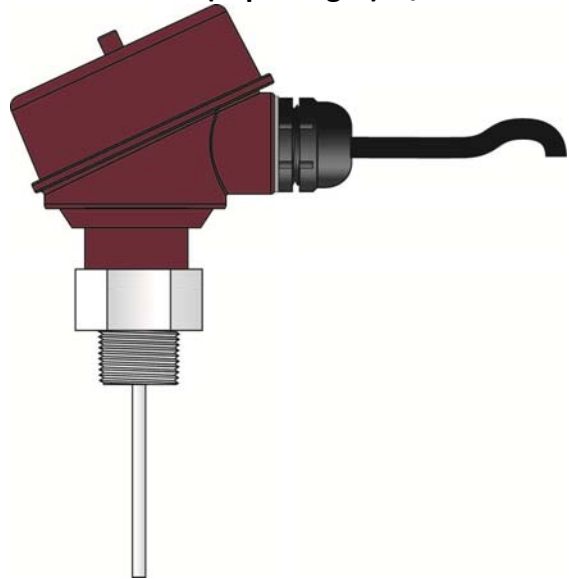
Liquid-Tight Cordgrip



Conduit Connection

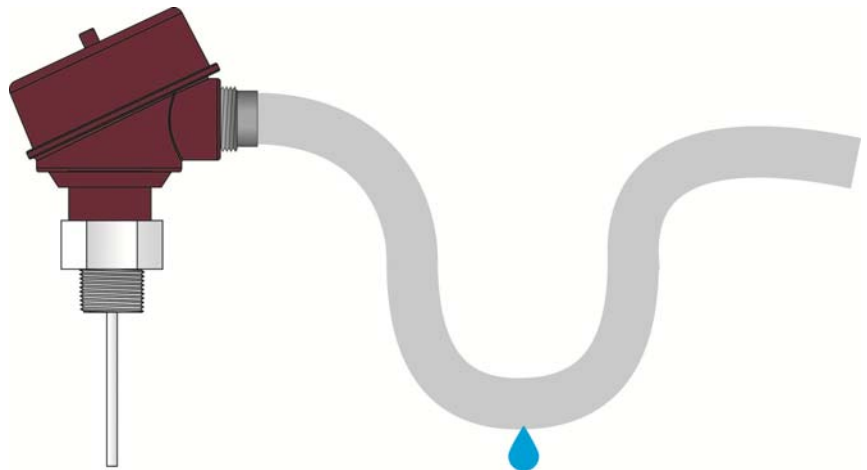


Cable Gland (Liquid Tight) w/ Washer



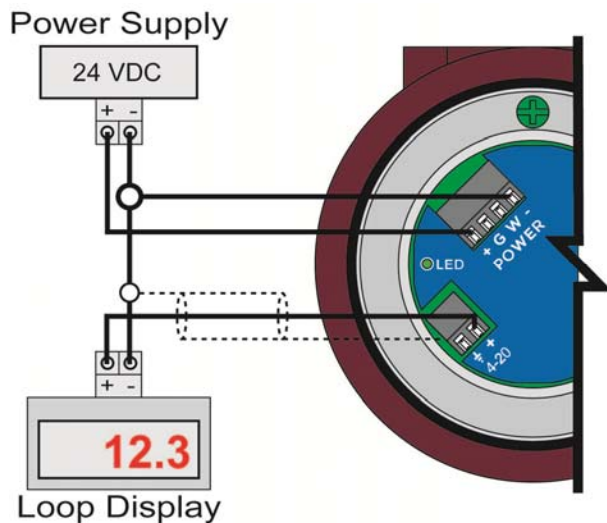
Avoid Condensation in the Conduit

You can give your instrument additional protection against moisture penetration by leading the conduit connection or cable downward in front of the cable entry. Condensation in the conduit will thus not enter the sensor enclosure.

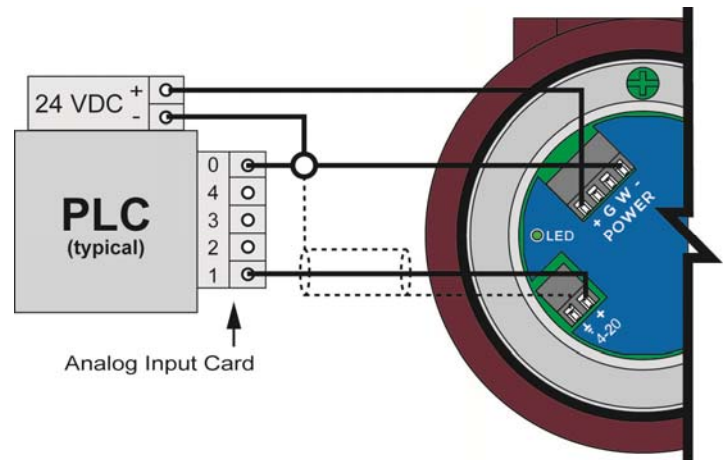


Common Wiring to Display, Controllers & PLC's (continued)

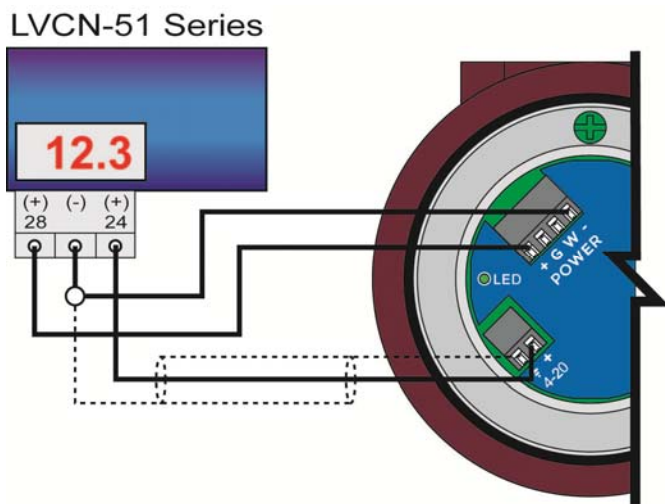
**Generic Loop
Powered Display**



Generic PLC



**DataPoint™ LVCN-51 Series
Level Controller
JWB mode**



Note: LVCN-51 shipped from factory with jumper in JWA mode. Jumper must be switched to JWB mode for operation with the LVRD10 Series.

Note: 4-20 mA signal wire requires shielding (power supply wires may use the same shielding as the signal wire). Shield wire can be connected at either end. **Never** connect shield wire at **both ends**.

Note: LVRD10 Series is a 3-wire sensor and should never be treated as a 2-wire loop powered device. Follow the illustrations above for wiring to the most common devices.

LVRD10 Series is configured through a free PC software program (LVCN414-SW, version 6.5 or greater). The software is a free download from Omega Engineering®'s website. **You must download and install the software prior to plugging in the USB® Fob.**

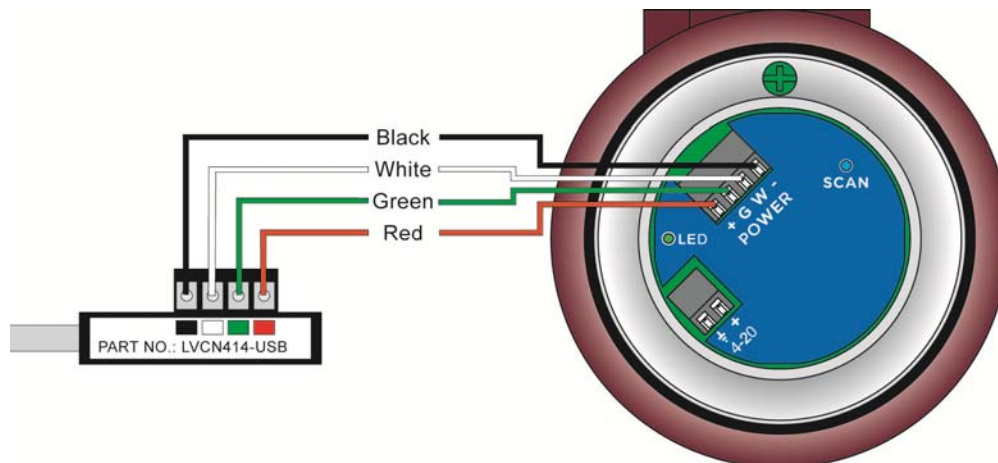
- Please go to <http://www.omega.com/ftp>.
- Click on Flow, Level, pH, Environmental, and Pressure Section and press on **Products**.
- Select the installer – LVCN414InstallerVerXpXX.zip.
 - This will download the installer onto your computer.
 - Once completed, run the installer.

LVCN414-SW Software System Requirements

Windows® 2000, XP, Vista, 7, 8
32 or 64-bit system
1 USB® 2.0 port
10 mB hard drive space
256 mB RAM
Internet connection

USB® Fob Interface: LVRD10 Series communicates with the LVCN414-SW software through a USB® interface called a Fob. Before plugging your Fob into your computer's USB® port, be sure that you have installed the software onto your computer.

Connect the red, green, white and black terminals on the Fob to the corresponding terminals within the LVRD10 Series. Tighten the screws on the terminals and plug your Fob into the USB® port of your computer.



Wiring is identical for all series of LVRD10 Series

- The maximum cable distance between the computer and LVRD10 Series is 15'. This only applies when configuring the LVRD10 Series.
- Once LVRD10 Series is configured and prior to installation, disconnect all wires from the center two terminals to prevent a short of the configuration circuit
- **Note:** When using the Fob, do not add VDC power. The Fob, when connected to the computer, will provide the required power to the LVRD10 Series.

With LVRD10 Series connected to your computer, open the LVCN414-SW software by clicking on the software's icon. Follow steps A to D to configure the transmitter. Click "Help" in the lower right hand corner and open the help menu for additional instructions on the software. If you need additional assistance using the LVCN414-SW software, please contact an Omega Engineering® application engineer.

Configuring LVRD10 Series with the LVCN414-SW Software

A. Sensor Configuration

1. Configures Loop Fail-Safe, Output at Empty, Startup Condition & Dielectric Range for the sensor.
2. Also confirm Probe Type (Rod, Coaxial or Cable) in the pull down menu.

B. Dimensional Entry

1. Distance Mode (default)
 - i. Basic information for operation (Sensor Height, Probe Length & Maximum Fill-Height).
2. Volumetric Mode
 - i. Defines the shape of the tank as well as the dimensional information for the tank with respect to the sensor's location on the tank.

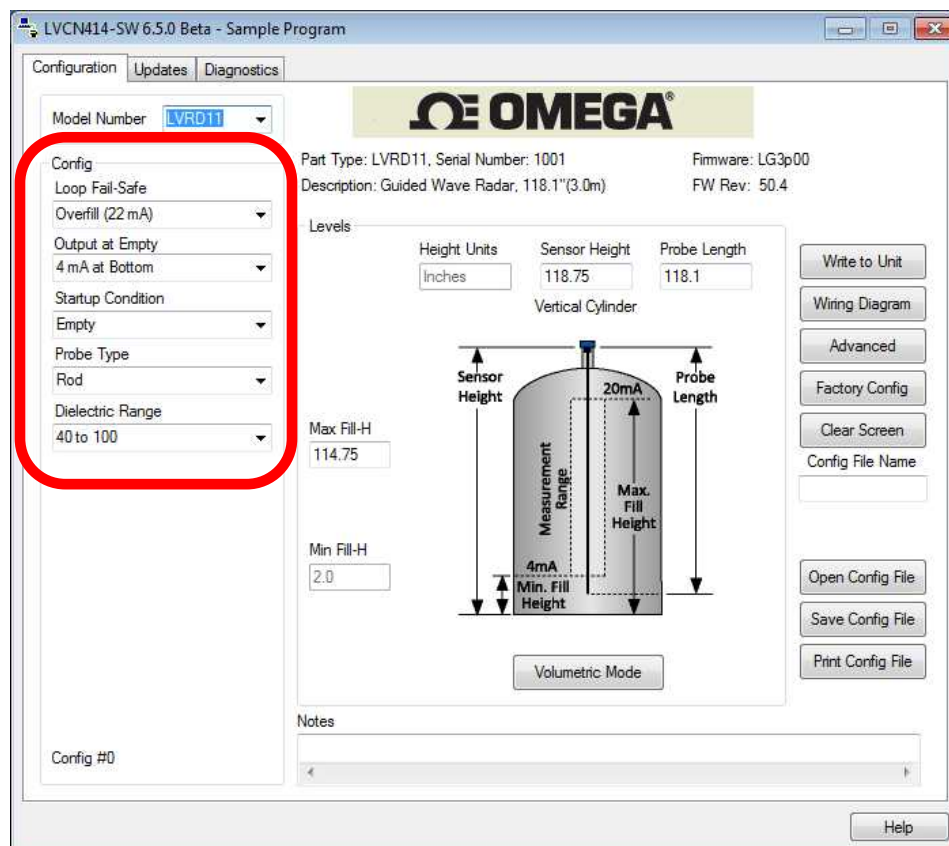
C. Tank Level Confirmation

1. Confirm the values are accurate for the application.

D. Write to Unit

1. Uploads configuration into the sensor.
2. Access to a customer wiring diagram specific to the relay configuration.

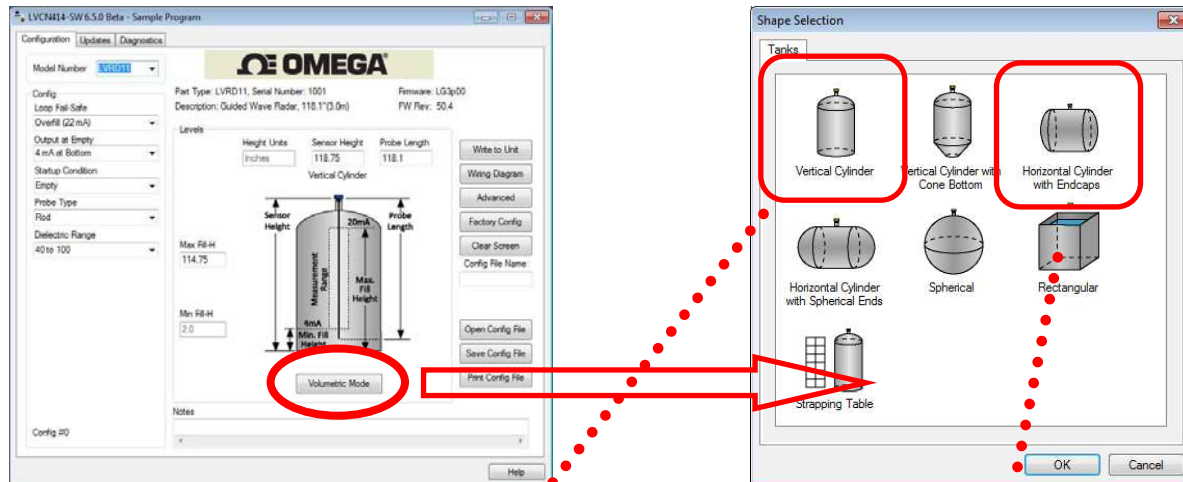
A. Sensor Configuration:



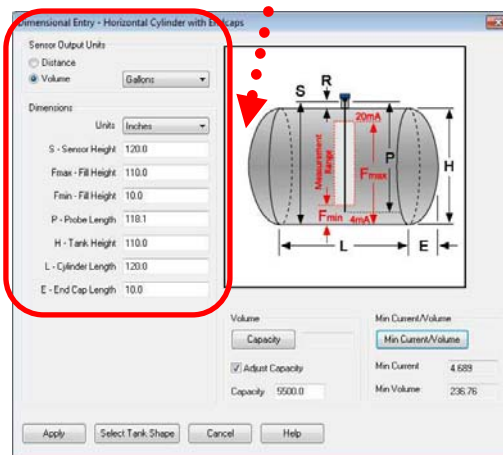
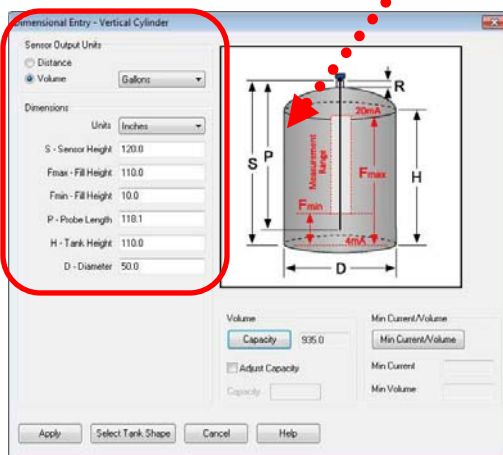
B. Dimensional Entry:

1. Distance Mode (default): Output of sensor is based on the distance (height of liquid) in the tank. Any change in liquid level will reflect linearly to the current output. Note: Most applications will fall into this category. The three settings you must enter for Distance Mode are Sensor Height, Probe Length and Maximum Fill-Height. All three settings can be entered on the main configuration screen.

2. Volumetric Mode: Allows the end user to switch from the standard distance output to an output based upon the volumetric shape of the tank. In Volumetric Mode, the shape of the tank is first selected followed by the entry of dimensional information for the tank with respect to the sensor's location on the tank.



Enter the operational dimensions for the sensor and tank within the defined application. All of the shown dimensions are required and will adjust depending on tank shape whether the operation is for volume or distance. Press **Apply** when information is completed.



Note: While in Volumetric Mode, the sensor may be switched between Distance and Volumetric outputs (under Sensor Output Units). When Distance is selected the units are inches, cm, feet or meters. When Volume is selected, the units are Gallons or Liters. The type of configuration output (Volumetric or Distance) and the measured units may be changed under Sensor Output Units.

D. Tank Level Confirmation: Verify the Height Units, Sensor Height, Probe Length, Maximum Fill-Height, Minimum Fill-Height, Capacity as well as the Max./Min. Volume and Max./Min. Current. All values were calculated in the previous Dimensional Entry window. To adjust these settings, click on **Volumetric Modes**.

E. Write to Unit – This operation uploads configuration into the sensor. Other features in the section include providing a custom wiring diagram specific to the signal output and saving the configuration file to your hard drive.

Volumetric Sensor Output
The Volumetric Mode button will be highlighted in Blue when a volume output is selected.

Empty Signal Scan

The empty signal scan is a powerful disturbance signal suppression feature of LVRD10 Series. The sensor scans its entire probe length for any disturbance/interference signals within the application that could potentially be misinterpreted as level readings by memorizing and suppressing them during operation. Therefore, the LVRD10 series only recognizes the actual level signals caused by the liquid being measured.

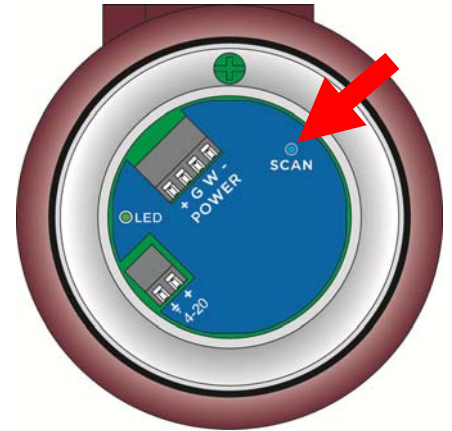
The empty signal scan is intended for the rod & cable probe, since its signal has a wider detection radius around the probe making it more responsive for measurement signal disturbances.

The empty signal scan works most efficiently on stationary interference targets like tall and narrow risers or close-by objects/obstructions. To enable an empty signal scan, the LVRD10 series has to be mounted in its final position. The tank has to be completely empty. This will ensure a reliable identification of the actual disturbance signals only. In case there are non-stationary interference targets close to the rod probe (slowly rotating agitator blades or streams of liquid filling into the tank), it is recommended to use the coaxial probe.

Activate Empty Signal Scan

When LVRD10 Series is shipped, this feature is deactivated. To initiate a empty signal scan, use the following instructions:

1. Make sure the LVRD10 series is installed in its final installation position.
2. Make sure the liquid is at its lowest level (empty).
 - a. Performing an empty signal scan when the tank is not empty will create an incorrect scan. It can affect the sensors performance especially at liquid levels below the empty signal scan tank level.
3. Press and hold the SCAN button for 6 seconds.
 - a. The LED will begin to flash Orange indicating the empty signal scan has begun, release the button.
 - b. Upon completion of the empty scan, a solid green LED will return
 - c. If the empty scan is not successful. The LED will flash red



Erase Empty Signal Scan

If there is a need to erase or turn off the empty signal scan, perform the following: First remove power to the LVRD10 Series. Next, hold down the SCAN button while applying power to the sensor. When the LVRD10 series acquires a signal (LED will flash Green), the disturbance signal scan will be erased.

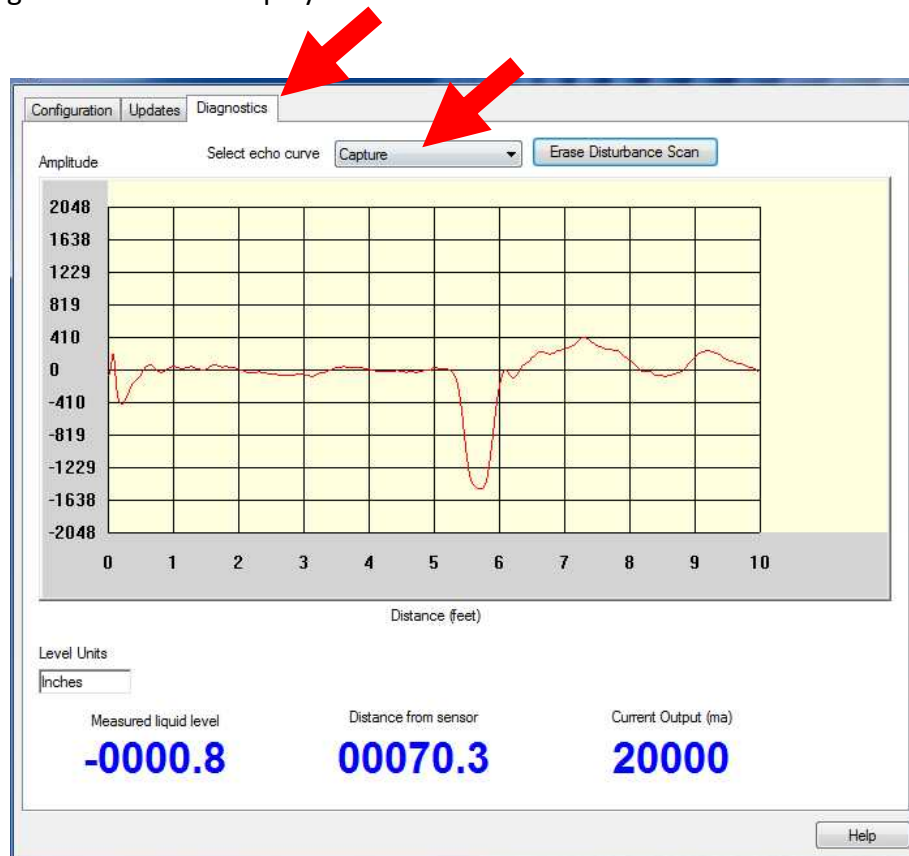
- No other setting or functions will be affected when this step is preformed.
- The empty signal scan cannot be retrieved once erased.
- A new disturbance signal scan must be preformed for this function to operate again.

The empty signal scan can also be erased using the LVCN414-SW software. Please refer to the instructions in the Appendix.

Viewing the Empty Signal Scan

The Empty Signal Scan can be viewed with the LVCN414-SW software (version 6.5 and greater). **Note:** Always consult a Omega Engineering® representative for reviewing of the signal data. To view, follow the directions below:

1. Activate an empty signal scan (see instructions in Empty Signal Scan, Section 6).
2. Connect LVRD10 Series to LVCN414-SW software via Fob
3. Click on Diagnostics Tab on the main screen
4. In the Select Signal Data pull down, select Empty Scan.
5. The empty signal scan will be displayed in the window.



Erase Empty Signal Scan with LVCN414-SW Software

If there is a need to erase or turn off the empty signal scan, perform the following:

1. Disconnect the sensor from the application wiring.
2. Connect LVRD10 Series to LVCN414-SW software via Fob.
3. Click on Diagnostics Tab on the main screen.
4. Click on Erase Empty Signal Scan.

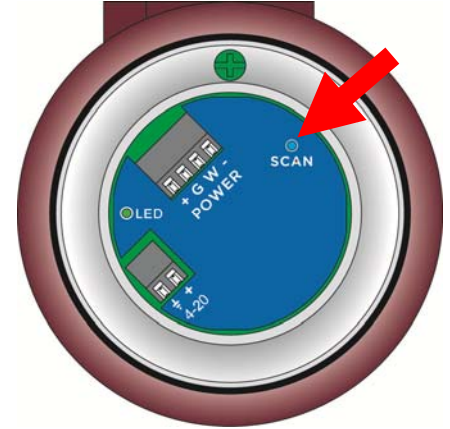
Echo Curve

This function displays the primary echo return(s) that the sensor is seeing graphically as well as the location and amplitude of the return(s). It can be used to confirm the correct level reading by the sensor or to troubleshoot any false signals. There is a two step process involving the creating and viewing of an echo curve. **Note:** Always consult a Omega Engineering® representative for reviewing of the signal data.

#1 - Create an Echo Curve

To create an echo curve, use the following instructions:

1. Make sure the LVRD10 series is installed within the actual application.
 - a. Echo curve will not provide any useful information when placed outside of the application.
2. Press and hold the SCAN button for 1 second (LED will turn off), then release.
3. Echo curve is completed.
 - a. To view, you must connect the sensor to the LVCN414-SW software.

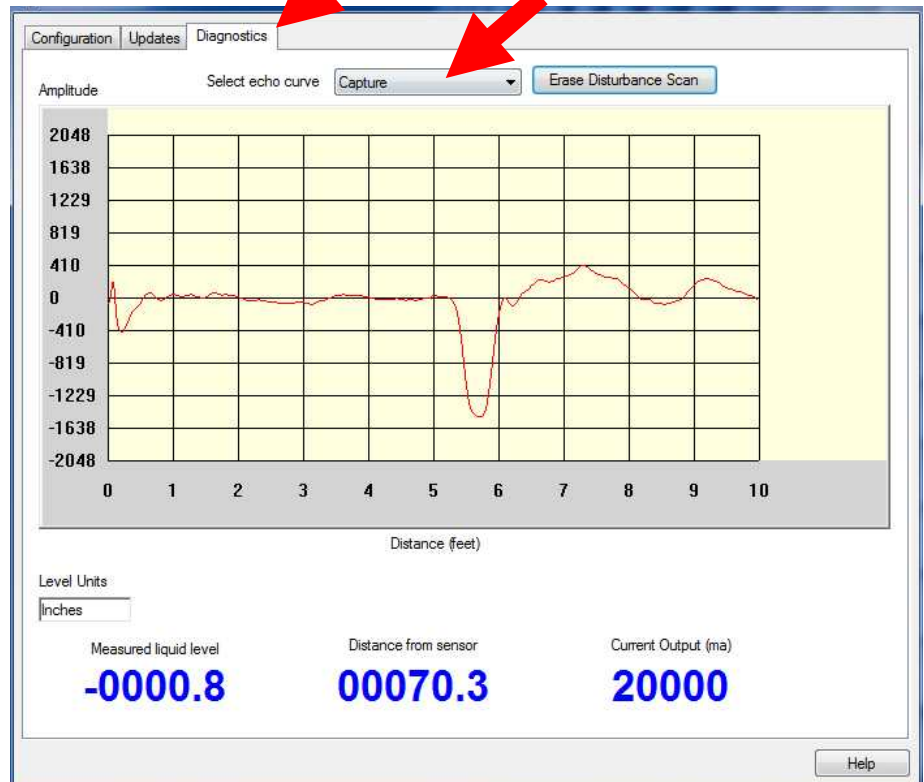


Note: LVRD10 series can store up to a total of three empty signal scans and/or echo curve. Example: If an empty signal scan is active, LVRD10 Series will only store two echo curves. If an empty signal scan is not active, three echo curves can be stores. Echo curves follow a first in first out logic.

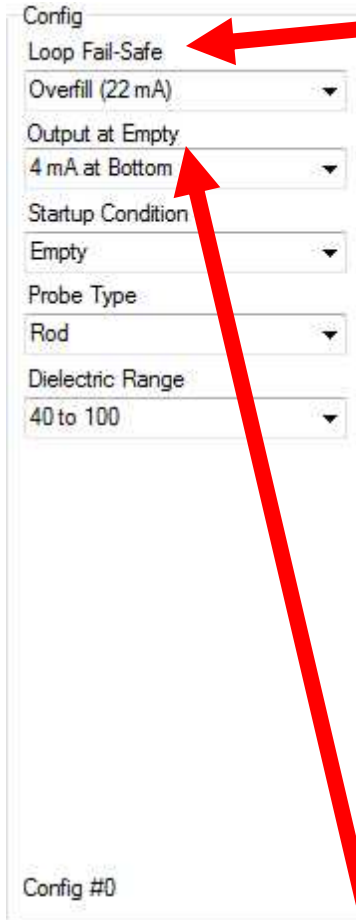
#2 - Viewing the Echo Curve

The echo curve(s) scan can be viewed with the LVCN414-SW software (version 6.5 and greater). To view, follow the directions below:

1. Create an echo curve (see instructions above).
2. Connect LVRD10 Series to the LVCN414-SW software via Fob
3. Click on Diagnostics Tab on the main screen
4. In the Select Signal Data pull down, select Echo Curve.
5. The echo curve will be displayed in the window.



A. Sensor Configuration



Config

Loop Fail-Safe

Overfill (22 mA)

Output at Empty

4 mA at Bottom

Startup Condition

Empty

Probe Type

Rod

Dielectric Range

40 to 100

Config #0

Loop Fail-Safe

This feature allows you to select the fail-safe current output if the sensor loses echo confidence (LOST). When the sensor regains echo confidence, the output current will revert back to the current level condition.

- **Hold Last Value** - The output will remain in the same state as the last confident echo detected. Example: If the output was 6.7mA just prior to the lost signal, the sensor will continue to output 6.7mA until echo confidence is regained.
- **Empty** - The output will revert to the current value for an empty condition. When **4 mA at Bottom** is selected, the sensor will output 4 mA during a fail-safe condition. If **20 mA at Bottom** is selected, the sensor will output 20 mA during a fail-safe condition.
- **Full** - The output will revert to the current value for a full condition. When **4 mA at Bottom** is selected, the sensor will output 20 mA during a fail-safe condition. If **20 mA at Bottom** is selected, the sensor will output 4 mA during a fail-safe condition.
- **Overfill (21mA)** - The sensor will output 21mA during a fail-safe condition.
- **Overfill (22mA)** - The sensor will output 22mA during a fail-safe condition.

Output at Empty

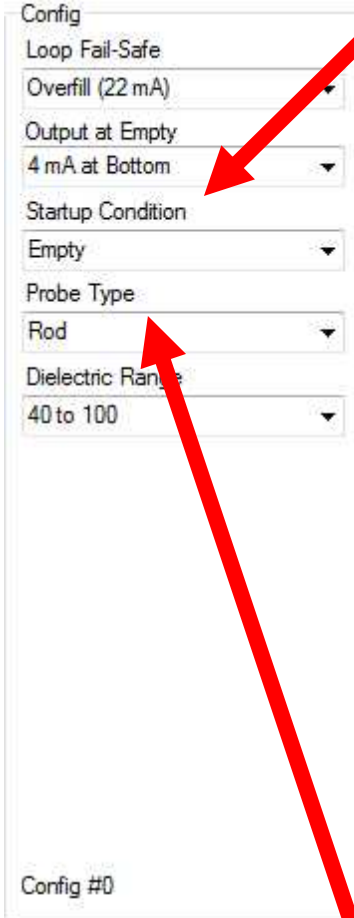
This feature allows you to select the orientation of the 4 to 20mA output (4 to 20 mA or 20 to 4 mA). Choose which output setting best fits the application. Typical applications are set with **4 mA at Bottom**. Factory default is 4mA at bottom and 20mA at top. *When connecting your sensor to a display, you must account for your output orientation setting.*

- **4mA at Bottom** - The output current will be 4mA when the sensor measures an empty tank and 20mA when the sensor measures a full tank.
- **20mA at Bottom** - The output current will be 20mA when the sensor measures an empty tank and 4mA when the sensor measures a full tank.

Note: Right click on any item to open the help menu.

Note: To reset the configuration table, press the Clear Screen button

A. Sensor Configuration



Config

Loop Fail-Safe

Overfill (22 mA)

Output at Empty

4 mA at Bottom

Startup Condition

Empty

Probe Type

Rod

Dielectric Range

40 to 100

Config #0

Startup Condition

This feature allows you to select the startup current when power is first applied to the sensor. The sensor will consume the selected power while it is acquiring the liquid level. When the correct level has been identified, the output will adjust to the level output. Use this feature to avoid false alarms with the controller when power is first applied to the sensor.

- **Empty** - The current output will revert to the selected current value for an empty condition.
 - **4 mA at Bottom** - The sensor will output 4 mA while the sensor powers up.
 - **20 mA at Bottom** - The sensor will output 20 mA while the sensor powers up.
- **Mid Tank (12 mA)** - The sensor will output 12 mA while the sensor powers up.
- **Full** - The output will revert to the selected current value for a full condition.
 - **4 mA at Bottom** - The sensor will output 20 mA while powering up.
 - **20 mA at Bottom** - The sensor will output 4 mA while the sensor powers up.
- **Overfill (22mA)** - The sensor will output 22mA while the sensor powers up.

Probe Type

This feature allows you to select the type of probe attached to the feed-through. It is critical to select the correct type of probe.

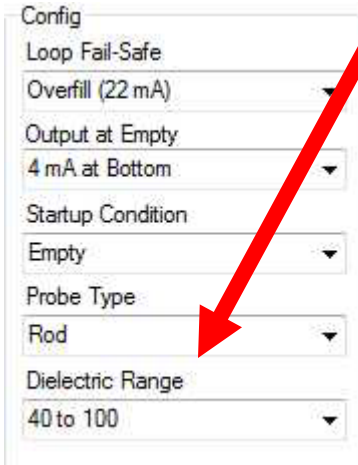
- **Rod** - Recommended for installations in liquids, in bypass chambers and stilling wells (when combined together with the rod emulate a coaxial probe).
- **Cable** - Recommended for installations in tall tanks and where limited headroom is available.
- **Coaxial** - Recommended for the use with clean liquids only. It cannot be used with viscous, crystallizing, adhesive, coating, or sticky liquids; fibrous liquids, sludge, slurry, pulp or any liquids containing solid particles.

Note: Only change the probe type when the probe has been physically changed. Never change this setting to improve sensor performance. This will only cause issue with the operation of LVRD10 Series.

Note: Right click on any item to open the help menu.

Note: To reset the configuration table, press the Clear Screen button

A. Sensor Configuration



Config

Loop Fail-Safe

Overfill (22 mA)

Output at Empty

4 mA at Bottom

Startup Condition

Empty

Probe Type

Rod

Dielectric Range

40 to 100

Dielectric Range

This feature allows you to select the dielectric range, which sets the amplitude threshold within the sensor.

- Water based media (water, H₂SO₄, HCl)
 - **40 to 100**
 - **20 to 39.9**
 - **10 to 19.9**
- Varying dielectrics (Alcohols, Ethyl Acetate, Caster Oil)
 - **9 to 9.9**
 - **8 to 8.9**
 - **7 to 7.9**
 - **6 to 6.9**
 - **5 to 5.9**
 - **4 to 4.9**
 - **3 to 3.9**
- Typical Hydrocarbons (Diesel Fuel, Mineral Oil, Solvents)
 - **2 to 2.9**

Note: It is very important to select the correct range for the dielectric value of the liquid. Choosing an incorrect range will affect the performance of the sensor.

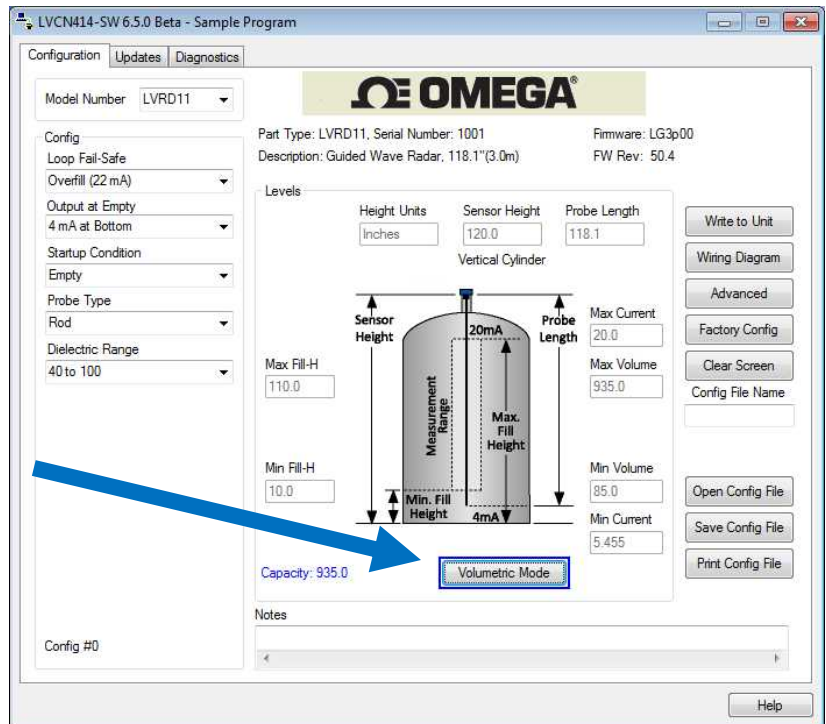
Note: Right click on any item to open the help menu.

Note: To reset the configuration table, press the Clear Screen button.

B. Tank Shape Selection

The sensor may be configured in volumetric units (Gallons or Liters) or Distance (Height of Liquid) units (inches, cm, feet or meters). LVCN414-SW software will default in Distance (Height of Liquid) with units of Inches. To change the units or to change from Distance to Volume, press the Volumetric Mode button located near the center of the window.

Note: The Volumetric Mode button will be highlighted in Blue when a volume output is selected.



LVCN414-SW 6.5.0 Beta - Sample Program

Configuration Updates Diagnostics

Model Number: LVRD11

Part Type: LVRD11, Serial Number: 1001, Description: Guided Wave Radar, 118.1" (3.0m), Firmware: LG3p00, FW Rev: 50.4

Config

Loop Fail-Safe

Overfill (22 mA)

Output at Empty

4 mA at Bottom

Startup Condition

Empty

Probe Type

Rod

Dielectric Range

40 to 100

Levels

Height Units: Inches, Sensor Height: 120.0, Probe Length: 118.1

Vertical Cylinder

Max Fill-H: 110.0, Min Fill-H: 10.0, Max Current: 20.0, Max Volume: 935.0, Min Volume: 85.0, Min Current: 5.455

Capacity: 935.0

Volumetric Mode

Notes

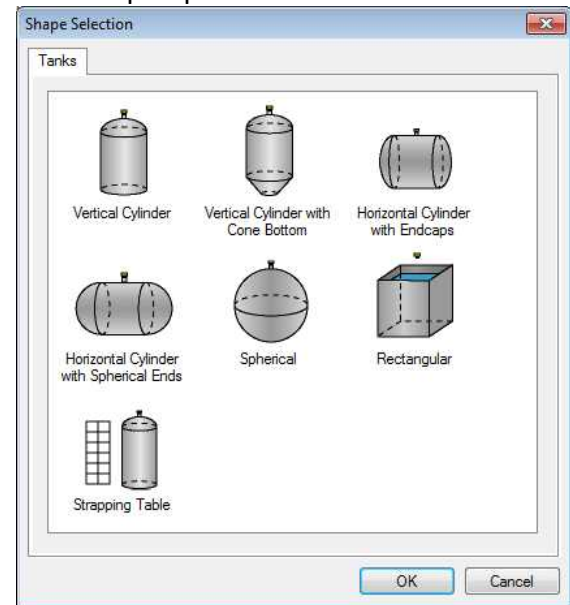
Config #0

Write to Unit, Wiring Diagram, Advanced, Factory Config, Clear Screen, Config File Name, Open Config File, Save Config File, Print Config File, Help

Shape Selection Window: This window will show the different tank shape options available.

- **Vertical Cylinder**
- **Vertical Cylinder with Cone Bottom**
- **Horizontal Cylinder with End caps**
- **Horizontal Cylinder with Spherical Ends**
- **Spherical**
- **Rectangular**
- **Strapping Table** – Use this feature for manual entry of measured tank distances and volumes.

Select any of the above tank shapes and press OK to confirm.



C. Dimensional Entry – Vertical Cylinder Example: Choose the Sensor Output Units as Distance or Volume. After choosing the Sensor Output Units, select the units of measurement in the pull down to the left.



Units of Measurement	
Distance	Volume
Inches	
Cm	Gallons
Feet	Liters
Meters	

Distance – Sensor Output Units (Vertical Cylinder Example):

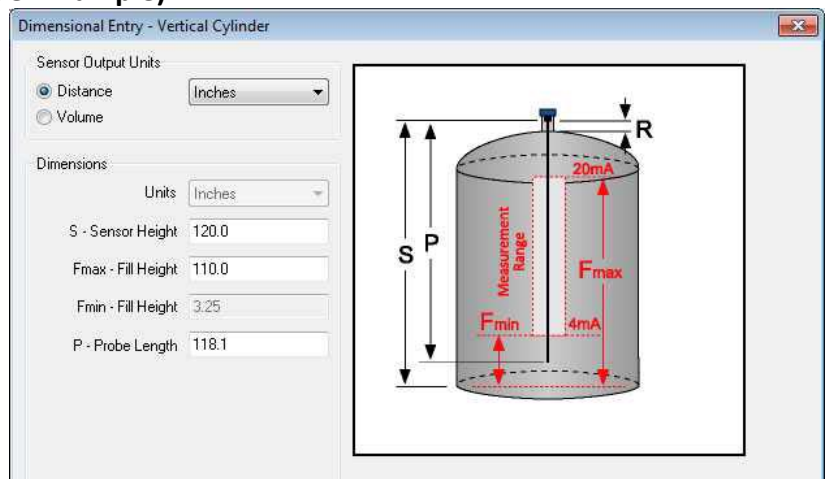
Enter the dimensions of the tank. You must enter data in all fields shown.

Sensor Height: Distance from the bottom of the tank to the top of the threads.

Max. Fill Height: Distance from the bottom of the tank to the operational full level of liquid (20mA). This setting defines the location of full current output and is the top of the sensor's measurement range.

Min. Fill Height: Distance from the bottom of the tank to the operational empty level of liquid (4mA). This setting defines the location of empty current output and is the bottom of the sensor's measurement range.

Probe Length: Distance of the probe from the bottom of the threads (feed through) to the end of the probe.



Volume – Sensor Output Units (Vertical Cylinder Example):

Enter the dimensions of the tank. You must enter data in all fields shown.

Sensor Height: Distance from the bottom of the tank to the top of the threads.

Max. Fill Height: Distance from the bottom of the tank to the operational full level of liquid (20mA). This setting defines the location of full current output and is the top of the sensor's measurement range.

Min. Fill Height: Distance from the bottom of the tank to the operational empty level of liquid (4mA). This setting defines the location of empty current output and is the bottom of the sensor's measurement range.

Tank Height: Distance from the bottom of the tank to the top of the straight side wall.

Diameter: Distance of the inside tank diameter.

Probe Length: Distance of the probe from the bottom of the feed through to the end of the probe.

Volume – Tank Capacity (Vertical Cylinder Example): After entering the dimensions, press the Capacity button to show the Calculated Capacity of the tank. If the Calculated Capacity is slightly different than the expected capacity, click on the Adjust Capacity box and enter the expected capacity of the tank. If the Adjusted Capacity is more than 10% of the Calculated Capacity, recheck the dimensions information entered above.

Volume:

Capacity 935.0

☐ Adjust Capacity

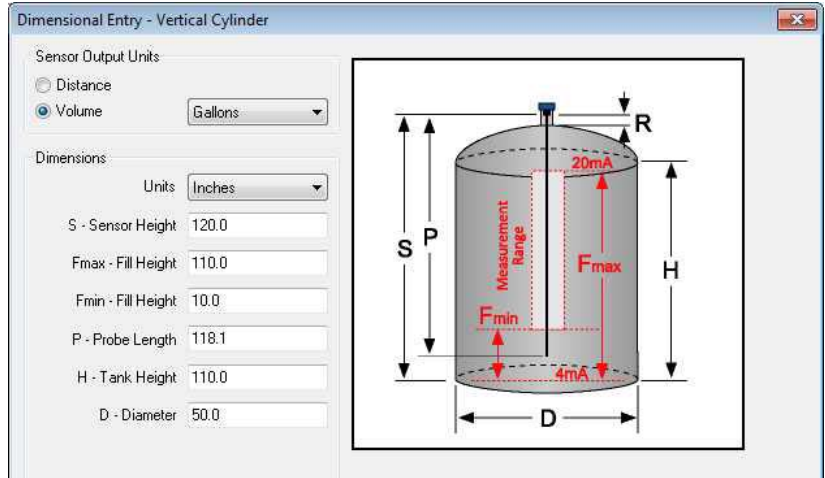
Capacity

Volume:

Capacity 935.0

☒ Adjust Capacity

Capacity 950.0



When all dimensions are entered, press the Apply button to return to the previous Configuration window.

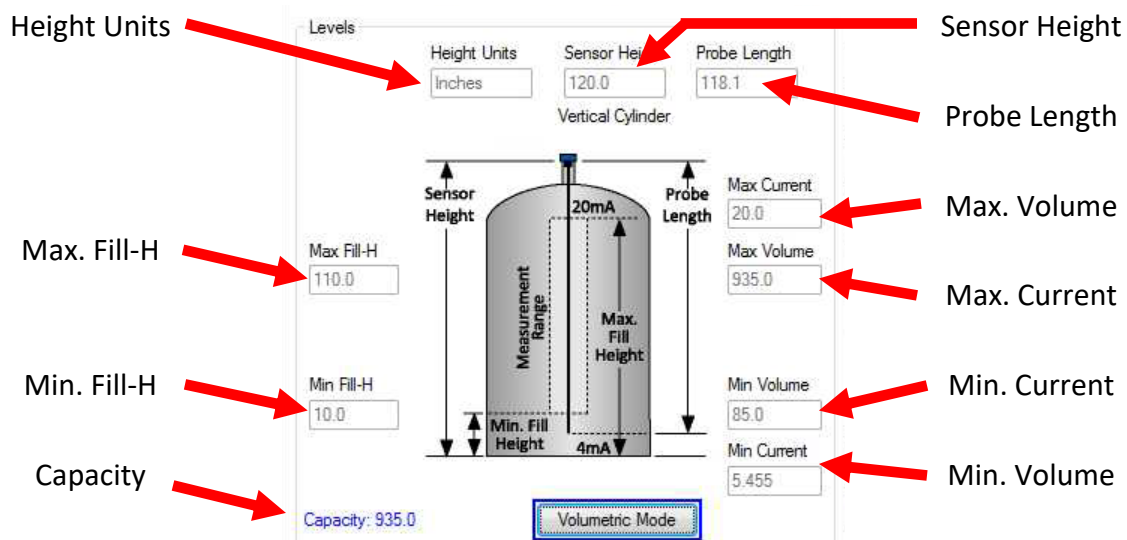
Apply Select Tank Shape Cancel Help

- **Apply** – Transfers the dimensions to the original Configuration window.
- **Tanks** – Returns to the previous Shape Selection window.
- **Cancel** – Returns to the Configuration window without saving any information.
- **Help** – Jumps to the Help menu.

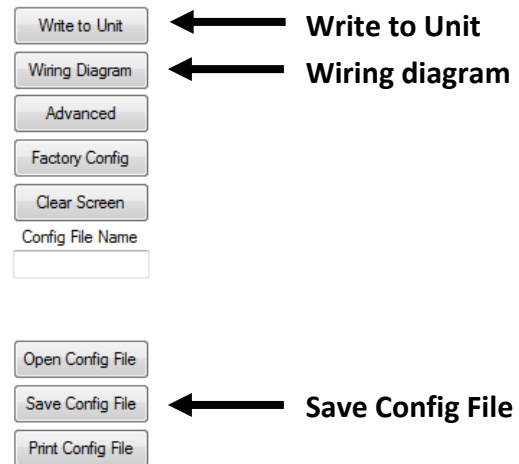
D. Tank Level Confirmation: This section of the LVCN414-SW software is where you confirm the values set in the previous step. The values were entered under the Dimensional entry window. To edit these settings, you must go back to the Dimensional entry window via the Volumetric Mode button.

- **Height Units:** Units selected for configuration. When used as a device to measure the height of liquid, the options are inches, cm, feet or m. When used as a device to measure the volume of liquid, the options are gallons or liters.
- **Sensor Height:** Distance from the bottom of the tank to the bottom of the top of the threads.
- **Max. Fill-Height:** Distance from the bottom of the tank to the operational full level of liquid (20mA). This setting defines the location of full current output and is the top of the sensor's measurement range.
- **Min. Fill-Height:** Distance from the bottom of the tank to the operational empty level of liquid (4mA). This value defines the location of empty current output and is the bottom of the sensor's measurement range.
- **Probe Length:** Total length of the probe from the bottom of the probe to the bottom of the threads.
 - **Cable version only:** The height of the counter-weight is included in this measurement.
- **Capacity:** The total volume of the tank. Only shown when gallons or liters are selected.
- **Maximum Current:** Displayed value of the largest operational current of the sensor's measurement range. Typically 20mA when **Output @ Empty** is set to 4mA.
- **Maximum Volume:** Displayed value of the largest operational volume of the sensor's measurement range. This is the calculated volume of liquid at the **Max. Fill-Height**. This feature is only shown when the sensor is selected to measure the volume of liquid in the tank.
- **Minimum Current:** Displayed value of the smallest operational current of the sensor's measurement range. This value is dependent on the location of the **Min. Fill-Height**.
- **Minimum Volume:** Displayed value of the smallest operational volume of the sensor's measurement range. This is the calculated volume of liquid at the **Min. Fill-Height**. This feature is only shown when the sensor is selected to measure the volume of liquid in the tank.

Note: By extending the empty (4mA) to the bottom of the tank, the 4-20 mA output will track the volume of the tank. This allows any local display to read the actual volume of liquid without the need for any unique configuration. This feature is very useful with any non-linear tanks such as horizontal, spherical or tanks with cone bottoms.



E. Write to Unit - After you have entered configurations, selected and configured the Tank Shape and entered the Tank Values, click **“Write to Unit”** and load the configuration into the memory of the sensor. When completed, this configuration will remain inside the sensor memory and will not change unless the sensor is connected to the LVCN414-SW software and a new configuration is written to the sensor. Loss of power will not change or lose the configuration within sensor memory.



Next, use the file management features to save your configuration by clicking **“Save Config File”** and print your wiring diagram by clicking **“Wiring Diagram.”**

“Save Config File” will save this configuration as a text file which can be loaded back into the LVCN414-SW software by pressing the **“Open Config File”** button. It is good practice to save the configuration file for each different configuration with a unique name for easy identification. If using multiple sensors in identical applications, then use of a single configuration file is recommended.

“Wiring Diagram” will display a PDF file showing the unique wiring for the specific configuration created in the LVCN414-SW software. The PDF can be printed or emailed. It is good practice to save the wiring diagram as a backup.

Cutting the Probe

If the length of the probe is too long (touches bottom of tank, prevents the sensor from being threaded into the tank or a shorter length is required for the application), the probe can be cut to length in the field. **Note:** *The most important requirement for cutting the probe is to protect the housing from being dropped, banging into other objects or swinging freely.* Follow the instructions for the appropriate probe style.

Rod (LVRD11 Series)

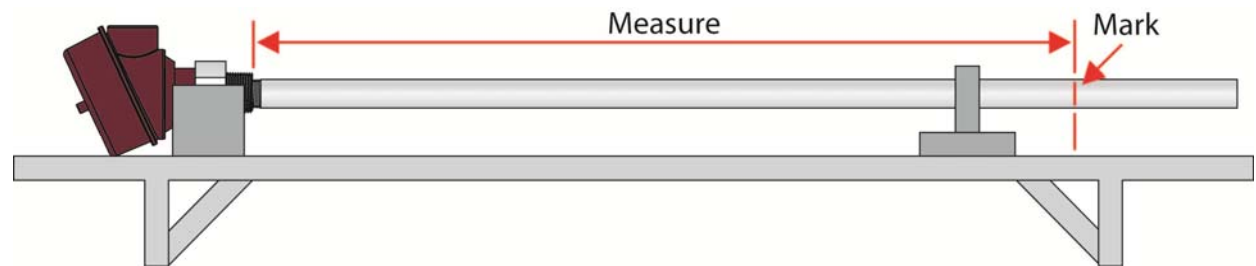
- Place the probe on a sturdy surface.
- Measure and mark the location for the cut.



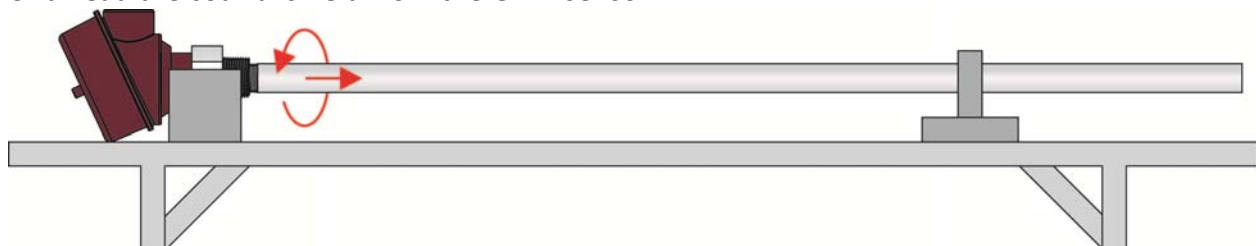
- Secure the rod to prevent it from moving during cutting.
 - Be sure to secure the housing to prevent it from moving when the probe is cut.
- Use a saw with a blade designed to cut 316L SS to cut the probe.
 - Examples include hack saw, diamond wheel rotary tool, etc.
 - Once the probe is cut, trim/file the fresh cut.
- Install the probe per mounting instructions.

Coaxial (LVRD12 Series)

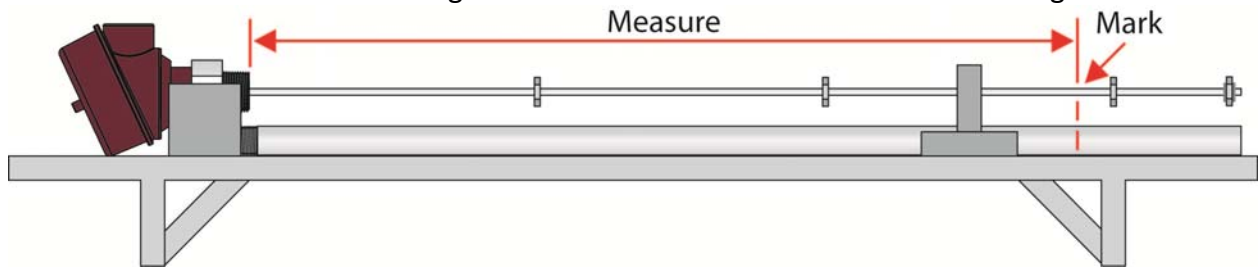
- Place the probe on a sturdy surface.
- Measure and mark the location for the cut on the coaxial shield.



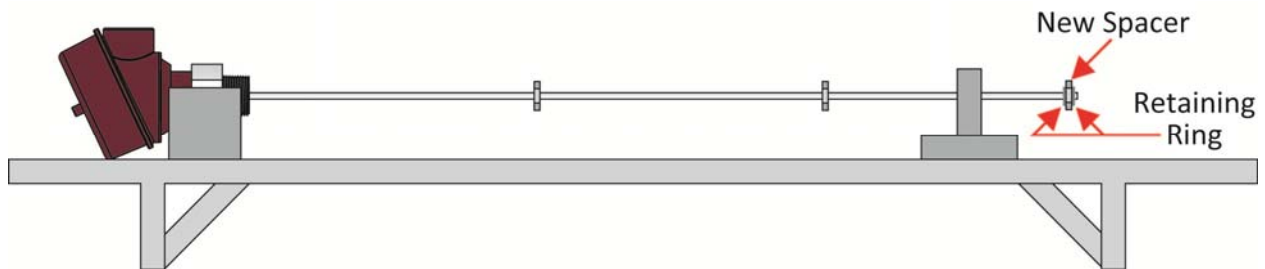
- Unthread the coaxial shield from the GWR sensor.



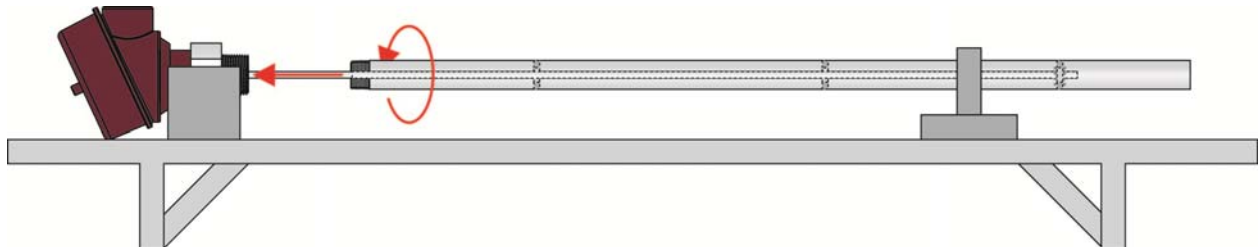
- Measure and mark the location for the cut on the exposed rod.
 - Use the coaxial shield as a guide to confirm both cuts are at the same length.



- Cutting the rod
 - Secure the rod to prevent it from moving during cutting.
 - Be sure to secure the housing to prevent it from moving when the probe is cut.
 - Use a saw with a blade designed to cut 316L SS to cut the probe.
 - Examples include hack saw, diamond wheel rotary tool, etc.
 - Once the probe is cut, trim/file the fresh cut.
 - Attach a spacer to the end of probe.
 - Offset the spacer approx. 1/8" (3mm) from the end of the probe.
 - Make sure the remaining spacers are no further than 39.4" (1m) apart.
 - Secure retaining rings on each side of the spacer.



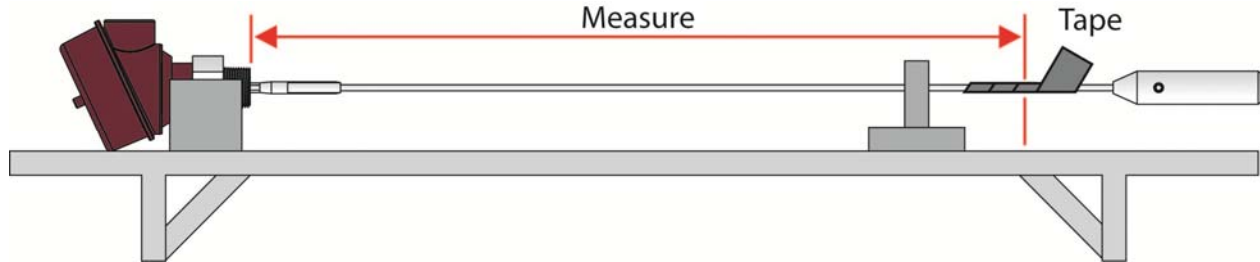
- Cutting the coaxial shield
 - Secure the coaxial shield to prevent it from moving during cutting.
 - Use a pipe cutter with a blade designed to cut 316L SS to cut the coaxial shield.
 - A hack saw can be used to cut the coaxial shield if the pipe cutter is too difficult.
 - Use the initial cut of the pipe cutter as a score line for the hack saw.
 - Once the coaxial shield is cut, trim/file the fresh cut.
- Slide the coaxial shield over the rod making sure not to move the spacers.
- Thread the coaxial shield to the GWR sensor.



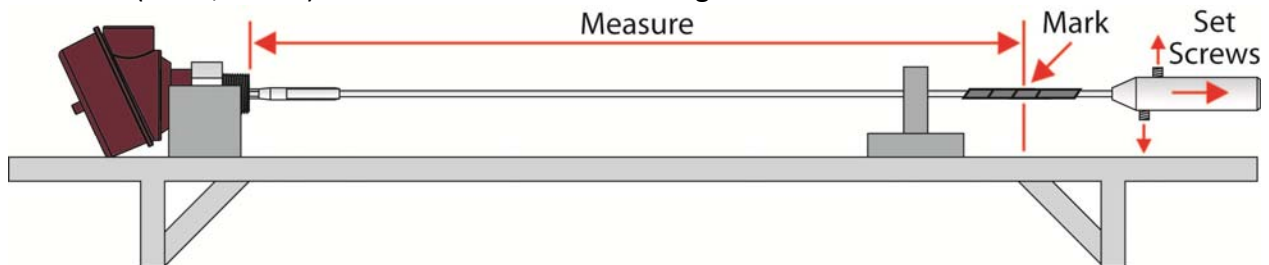
- Install the probe per mounting instructions.

Cable (LVRD13 Series)

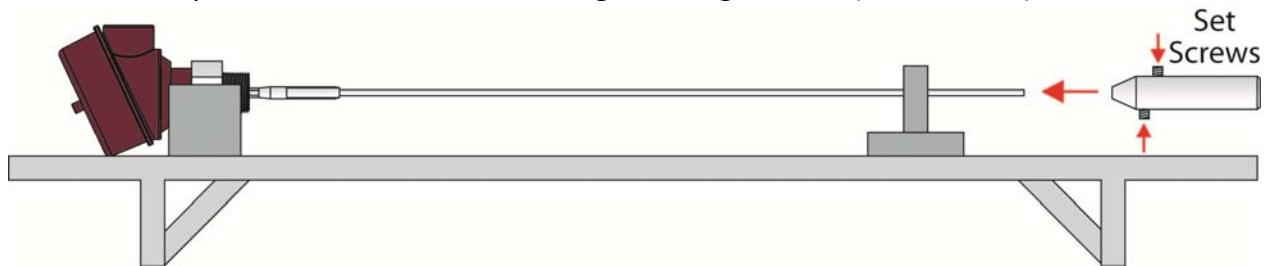
- Place the probe on a sturdy surface.
- Measure the location for the cut on the cable.
- Wrap the cable with electrical tape along the area of the cut.
 - This will prevent the cable from fraying while being cut.



- Mark the location of the cut on the electrical tape.
- Loosen the ($\frac{1}{4}$ -20, $\frac{1}{8}$ Hex) set screws in the counterweight and remove from the cable.



- Secure the cable to prevent it from moving during cutting.
 - Be sure to secure the housing to prevent it from moving when the probe is cut.
- Using a wire cutter or a rotary tool, cut the cable.
 - Once the probe is cut, remove the tape keeping the cable intact.
- Insert the freshly cut cable into the counterweight and tighten the ($\frac{1}{4}$ -20, $\frac{1}{8}$ Hex) set screws.



- Install the probe per mounting instructions.

Factory Settings:

Probe Style	Sensor	From Bottom (Lowest point of probe)		From Top (Bottom of Mounting Nut)	
		4mA	20mA	4mA	20mA
Rod (LVRD11 Series)	LVRD11 Series	2.0" (50.8mm)	114.8" (2915mm)	116.8" (2966mm)	3.4" (85.1mm)
	LVRD11-3FT Series	2.0" (50.8mm)	32" (812.8mm)	34" (862.6mm)	3.4" (85.1mm)
	LVRD11-6FT Series	2.0" (50.8mm)	68" (1727.2mm)	70" (1778.0mm)	3.4" (85.1mm)
Coaxial (LVRD12 Series)	LVRD12 Series	2.0" (50.8mm)	114.8" (2915mm)	116.8" (2966mm)	3.4" (85.1mm)
	LVRD12-3FT Series	2.0" (50.8mm)	32" (812.8mm)	34" (862.6mm)	3.4" (85.1mm)
	LVRD12-6FT Series	2.0" (50.8mm)	68" (1727.2mm)	70" (1778.0mm)	3.4" (85.1mm)
Cable* (LVRD13 Series)	LVRD13 Series	7.9" (200.7mm)	219.1" (5566mm)	216.2" (5145mm)	3.4" (85.1mm)

Cable - includes counter-weight

Note: Cable versions of the LVRD13 series must account for the counterweight attached to the end of the probe.

Note: When clicking on the **Factory Config.** Button in the configuration software, this will return the sensor to its based factory configuration which is for the full length sensor (i.e. LVRD11, LVRD12 or LVRD13) and not any of the shorter length configurations (i.e. LVRD-11-3FT, LVRD-12-6FT, etc.).

Troubleshooting:

PROBLEM	SOLUTION
No LED	Sensor is not receiving power (10 to 30 VDC). Check wiring to the sensor as well as the power supply.
LED flashes Red	Sensor cannot acquire a valid level reading. Make sure the sensor is installed properly within the application and the probe is touching liquid.
Sensor is locked on a level above the true level.	Sensor is likely acquiring a false echo from some interference close to the probe. Running an Empty Signal Scan should address this issue.

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 in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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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.

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