


Tank Continuous Liquid Level Detector

Installation Manual

105-0003

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Page 1 of 13						
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Tank Continuous Liquid Level Detector

Installation Manual

Introduction

INTROTEK's® Continuous Liquid Level Detector (CLM) utilizes a unique pulsed ultrasonic non-invasive design that enables bottom up continuous liquid level detection in a variety of fixed vessels and tanks. The installation process includes identifying a location on the bottom of the tank or vessel in which it will be monitoring in addition to a setup process that is described herein. It is essential that certain guidelines are followed in order to ensure that an optimal configuration is obtained.

Note: *The sensor head is designed for IPX 4 splash resistance. Submersion or outdoor use may result in degradation. The processor is IP 0 and any contact with water or liquid may result in damage.*



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Page 2 of 13

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Required Reference Document

1. CLM-0000-OUTLINE

Included Components and Hardware

1. Sensor Head
2. Processor
3. Connecting Cable
4. Epoxy Packet and Material Safety Data Sheet
5. Coupling Gel Packet and Material Safety Data Sheet
6. Installation Manual

Setting up the Sensor

The following steps will be required for setting up and configuring the sensor.

STEP 1: Aiming Process

STEP 2: Configuration Process

STEP 3: Bonding the Sensor to the Tank

STEP 4: Saving Setting and Finalization

Other Addition Tools Needed:

- DC Voltmeter
- Shim or fixture arrangement to hold the sensor in place while the epoxy cures.



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Page 3 of 13

DOC
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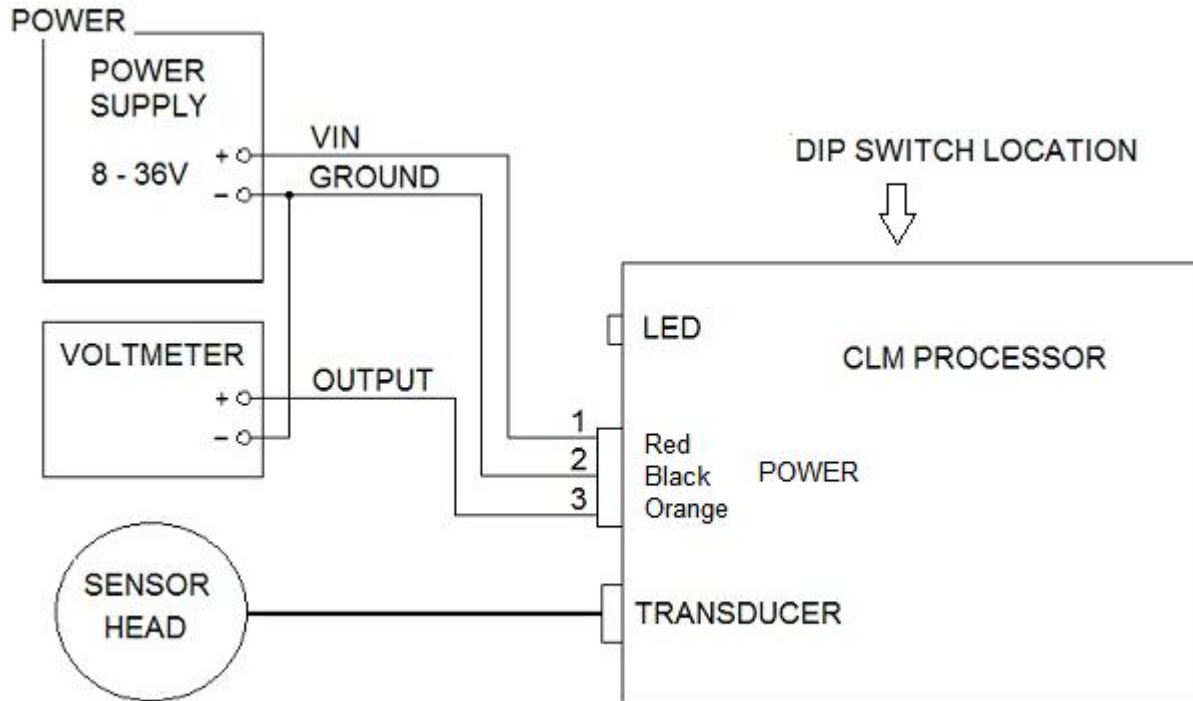
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Wire Diagram



Mounting

Find a mounting location on the bottom of the Tank / Vessel to be measured. The location must satisfy the following criteria:



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Page 4 of 13

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- a. The tank or vessel **Must Be Level** and the transducer will need to be parallel to the top surface of the liquid to be measured.



Bad



Good

- b. Find a location that has a clear line of sight to the top surface of the liquid. Ensure there are **No Obstructions** such as mixers, agitator and plumbing.



Bad



Good



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Page 5 of 13

DOC
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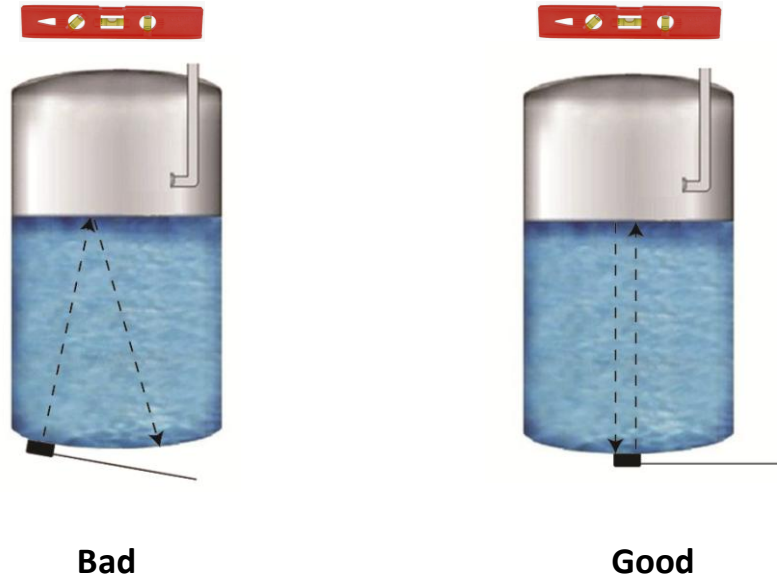
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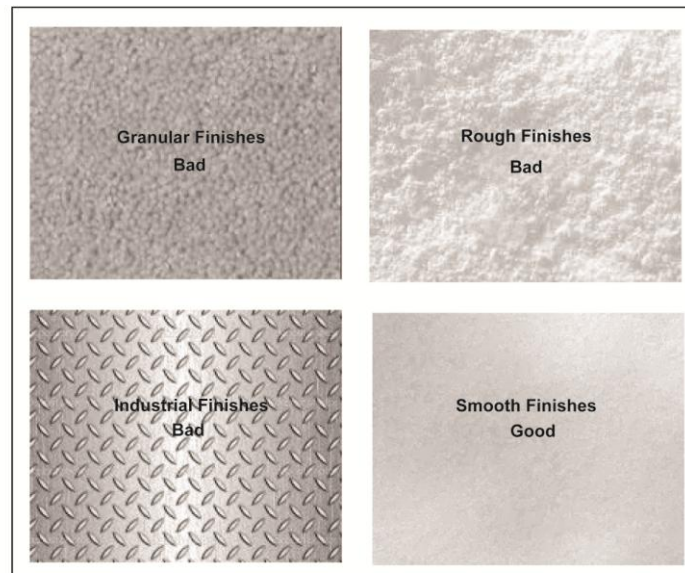
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- c. Locate a position on the bottom of the tank that is flat, level and **Parallel** to the surface of the liquid.



- d. Transducer mounting **Surface Must Be Smooth and Unpainted**. Painted or coating surfaces will need to be prepared by sanding (or sand blasting). Final sanding using fine grit to obtain a smooth contact point for mounting.



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Other Additional Requirements:

- Tanks can not have double wall
- Tanks can not have liners
- Tanks can not have obstructions interfering with transmission path
- Tanks can not have sediment or rust
- Tanks can not have excessive turbulence
- Tank can not have flexure due the weight of the liquid or other mechanical influence

Tank Preparation:

Locate a position on the bottom of the tank where the sensor will be mounted. In addition to the illustrated criteria described above, the mounting surface must be clean and free of dirt and debris. If the mounting surface is not smooth sanding and polishing may be required. This can be accomplished using a wire wheel or 200 grit emery paper. This will help facilitate sensor coupling to the tank and provide maximum signal strength.

Prior to setup adjust the liquid level to be as near as possible to the normal full tank Height (see Table 1 for the permissible height range for each dip switch setting). Failure to Adjust the height will cause repetitive failure to auto set.

Aiming Process.

Step 1 – The aiming process is a location finding process to obtain adequate signal strength. A DC volt meter for monitoring the output during this process will be required. Reference wiring diagram

Remove power by disconnecting the power cable if connected.

- a) Set Dip switches 1, 2 and 3 to the anticipated maximum liquid height level in the tank. Round up to the closest liquid height level; i.e. select 24" for a height level of 20". Ref. Table 1.



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Page 7 of 13

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The wrong dip switch setting will cause an error and result in an incomplete setup.






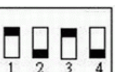


DIP settings		Max Liquid Height Level To be Detected		
1	2	3	4	(inches)
Up-Up-Up-Up		12		
Up-Up-Down-Up		24		
Up-Down-Up-Up		36		
Up- Down - Down -Up		48		
Down -Up-Up-Up		60		
Down -Up- Down -Up		72		
Down - Down -Up-Up		84		
Down - Down - Down -Up		96		

Table 1: Dip Switch Settings



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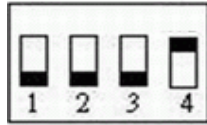
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*If the DIP switch setting is changed the processor will need to be powered down and re-powered up for height setting to update.

b) The aiming process is initiated by setting dip switch #4 (right most switch) to the down position. Reference Below



Apply Power Supply (connect the power cable)

Apply ultrasonic gel liberally to the sensor head sensing surface. Press the sensor to a central location on the bottom of the tank. Slide the sensor head around making small positional changes to find the best location for the maximum possible output voltage. Observe the signal strength as indicated by the volt meter reading. Attempt to achieve a 1 volt reading or better.

LED Color

Red	No Signal
Yellow	Partial Signal
Green	Good Signal
Voltage	0 to 5 volts - The higher the voltage the better signal.

It is not necessary to have the max 5 volt output and/or a green LED. Only the maximum output voltage obtainable is what's important..

The sensor must be kept tightly coupled exactly at this location. This can be accomplished by chocking and or shimming the sensor head against the bottom of the tank for the remaining steps. It might be easier to achieve and maintain the highest signal position by moving the chocked/shimmed assembly to find the best signal.

The Sensor Power must remain On while continuing on to the next step.



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Page 9 of 13

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Configuration Process:

Step 2 – This step is necessary and will set the processor to an adaptive mode so that it can configure settings unique to your application. This can take from 30 seconds to 5 minutes to complete.

This Step 2 is initiated by restoring dip switch #4 (right most switch) to the up position. Do not move sensor head during this function.

The processor will now be automatically advancing through the process .

The Table below identifies the progress and will provide status indications.

The signal strength initially is not matched to the vessel and the configuration process is an iterative process in that a closer match of signal gain is approached with each auto-set attempt.

Note: Yellow= In-Progress

Output (V)	Process	LED status
0.5	Begin Auto Setup	RED
1	Adjusting gain	YELLOW
1.5	Gain Adjust Incomplete	RED
2	Adjusting GC delay	YELLOW
2.5	GC Delay Incomplete	RED
4	Incorrect liquid level	RED
5	Completed Successfully	GREEN

Table 2

The auto-setup has begun when the led briefly turns red and the voltage briefly is 0.5 volts. As the process continues the led will be yellow until the auto-setup successfully completes As indicated by a green led and a voltage of 5 volts OR a problem has been detected as indicated by a red led and the corresponding voltage level problem indicator as listed in Table 2.



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Page 10 of 13

DOC
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*(If a green light cannot be obtained at the end of the process
Check voltage output for the problem indication in the chart and repeat starting at
Setting up the sensor STEP 1: Aiming Process)*

Note: If successful results cannot be obtained factory default setting can be restored by toggling switch #4 down then up while still powered. (This can only be accomplished after a AutoSet has ended with either the Red or Green status Led On).

Remove power by disconnecting the power cable

Bonding Process:

Step 3 – The sensor will be permanently bonded to the tank in this step after configuration Process has been successfully completed.

Note: Observe all cautions and protective equipment requirements as per MSDS # 07895#1. Carefully mark or denote the precise location of the sensor on the bottom of the tank. Remove the sensor and clean the tank bottom and the sensor head to be completely free of coupling gel and residue.

Premix the contents of the 2 part epoxy. Apply a thick layer of epoxy to the sensor head as evenly as possible without any air bubbles. Press the sensor head to the location denoted on the bottom of the tank. Apply enough force to ensure that all the air has been displaced between the sensor and the tank.

It will be necessary to fixture or shim the sensor to bottom of the tank to ensure the sensor remains firmly in place while curing. 24 hours will be required for curing.

Finalization Process:

Step 4:

This step is performed 24 hours after the sensor has been bonded to the tank. Observe that the epoxy has completely cured before proceeding.

Apply Power Supply (connect the power cable)

Toggle Dip switch 4 to the down position. Observe the output voltage on the voltmeter displays a reasonable signal strength.



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Page 11 of 13

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Toggle Dip switch 4 to the up position.

The sensor will begin the finalization process and will advance through the automatic process similar to Step 2.

The Table below identifies the progress and will provide status indications.

Output (V)	Process	LED status
0.5	Begin Auto Setup	RED
1	Adjusting gain	YELLOW
1.5	Gain Adjust Incomplete	RED
2	Adjusting GC delay	YELLOW
2.5	GC Delay Incomplete	RED
4	Incorrect liquid level	RED
5	Completed Successfully	GREEN

Copy of Table 2

Save the configuration setting by **Disconnect and Reconnect the Power Cable** to the sensor.

After successfully installing the sensor the LED will illuminate green. The output voltage will correspond to the liquid level in the tank.

The sensor will require a minimum liquid level in the tank to operate. This is referred to as the “Dead Zone”. The Dead Zone can vary based on the tank material and thickness and is typically 4 inches. Therefore the sensor will require about 4” of liquid before it begins to operate. This is reflected in the output voltage equation on the last page.

The output voltage can be calculated as follows:

$$\text{Output Voltage} = \left(\frac{wl - dz}{ss - dz} \right) 5$$



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wl = water level

dz = Dead Zone= 4

Dead zone is typically 4 inches though depending on the tank material and thickness it may be less.

ss = Height Level Dip Switch Setting

During normal operation the LED indications are as follows:

Green = Good Signal

Yellow = Weak Signal or liquid turbulence

Red = No Signal



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Page 13 of 13

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