Ultrasonic Level Switch

User Guide

Revision A.0

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Ultrasonic Level Switch User Manual

Thank you for purchasing an ABM Ultrasonic Level Switch. Your Ultrasonic Level Switch is adaptable to your tank environment. This guide will help you understand the operation and setup of your Ultrasonic Level Switch. In this guide the Ultrasonic Level Switch will be referred as “Level Switch” or “Switch”.

Ultrasonic Level Switch Wiring

The Switch housing has 2 wiring cables as shown in Figure 1. The power and communication wire cable is #24 AWG. The relay cable is a three conductor #18 AWG capable of carrying higher currents. The wires are colour coded as shown in Figure 1. The Level Switch requires an input voltage between 12 and 30 volts DC.

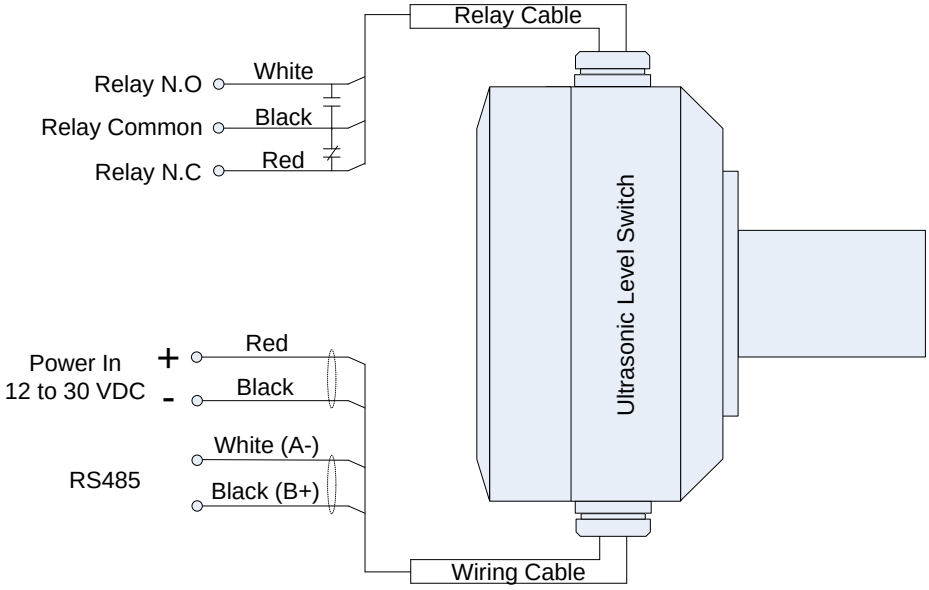

Figure 1 The Ultrasonic Level Switch has 2 wiring cables, one for power and communication and a one for the relay.

Basic Switch Operation

Your Ultrasonic Level Switch emits a short burst of ultrasonic energy. The energy is coupled through a rubber membrane to the tank causing the tank to vibrate. The tank vibrations are detected and analysed by the Switch. Based on the vibration patterns the Switch is able to detect the presence or absence of liquid inside the tank, and directly opposite the Level Switch.

When the liquid inside the tank is below the switch point of the Switch (see Figure 2) the Switch’s relay will be in the energized state referred to as the Normally Open (N.O) state (connecting the relay common to the relay normally open connector see Figure 1 for wiring). When the liquid inside the tank is above the detection zone of the Switch (see Figure 3) the relay will be in the non-energized state referred to as the Normally Closed (N.C) state (connecting the relay common to the relay normally close connector see Figure 1 for wiring).

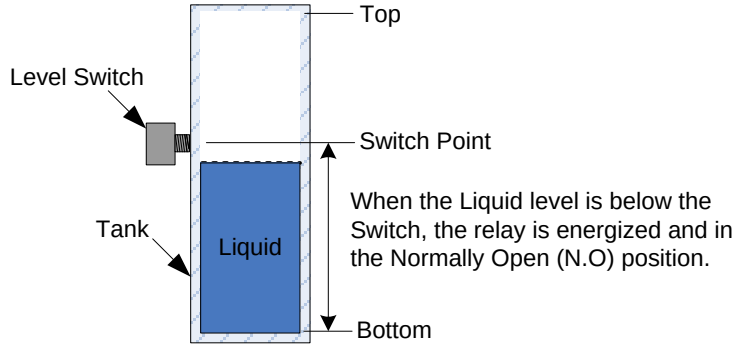

Figure 2 The Switch's relay will be in the Normally Open (N.O) position when the liquid in the tank is below the Switch.

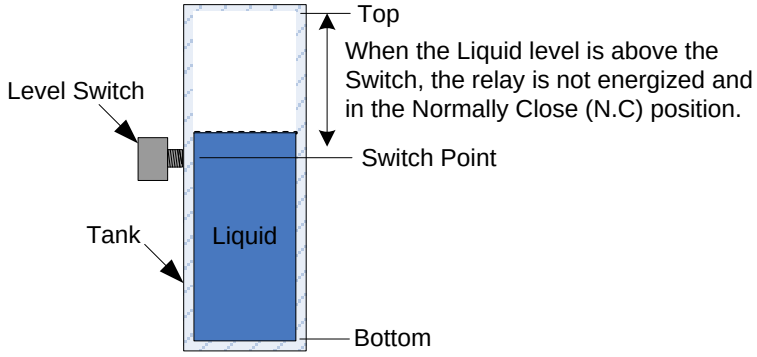

Figure 3 The Switch's relay will be in the Normally Closed (N.C) position when the liquid in the tank is above the Switch.

Hysteresis Zone – Preventing Relay Clatter.

When the liquid in the tank crosses the switch point, the relay will change to energized or non-energized. To prevent the relay from changing state a small hysteresis zone is created around the switch point see Figure 4. The relay cannot change state until the liquid level in the tank increases or decreases beyond the hysteresis zone.

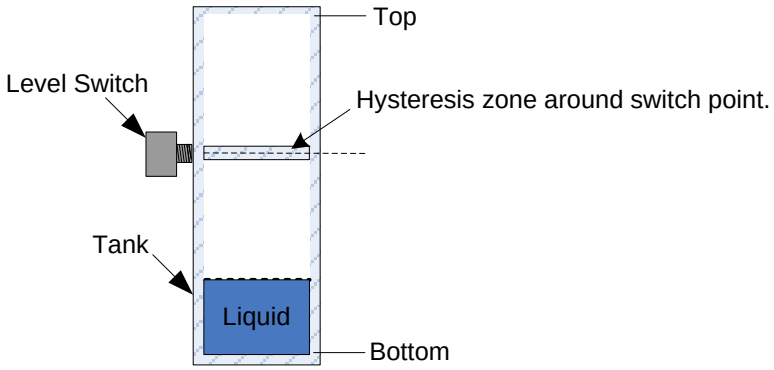

Figure 4 The hysteresis zone prevents the relay from toggling states when the liquid level is at the switch point.

Training Your Level Switch

After your Switch has been installed a simple 2 step training process must be performed using the training button on the Switch. Your Switch must learn the dynamics and characteristics of your tank when the liquid level is above and below the Switch. After training your Switch will calculate the switch point value.

Level Switch Training Button

Your Switch is equipped with a training button that can be used to train your Switch to match your tanks characteristics. To access the calibration button on the Switch remove the Switch's lid by unscrewing it. To activate the training mode using the button, power must be supplied to the Switch and the button must be pressed for time specified in Table 1. Press the button until the LED turns the desired color and then release the button.

Table 1 Training Button

Button Timing of the Ultrasonic Level Switch.		
Seconds Pressed	LED Color	Description
< 5	Off	If the button is pressed for less than 5 seconds it is ignored and no action is taken.
> 5	Yellow	The tank liquid is below the Switch. Train the Switch for below Switch tank characteristics.
> 10	Red	The tank liquid is above the Switch. Train the Switch for above Switch tank characteristics
> 15	Off	If the button is pressed for greater than 15 seconds it is ignored and no action is taken.

Where: < means less than and > means greater than.

Training the Level Switch - Liquid Level Below the Level Switch

For this step the liquid level must be a minimum of 2 inches (5 centimeters) below the Switch as shown in Figure 5. With the Switch powered on the LED should be green. Press and hold the training button. The LED will turn off, 5 seconds later it will turn yellow. Release the button when the LED turns yellow. The LED will blink green for 10 seconds while it is training. When the Switch is finished its training cycle the LED will stop blinking and remain green.

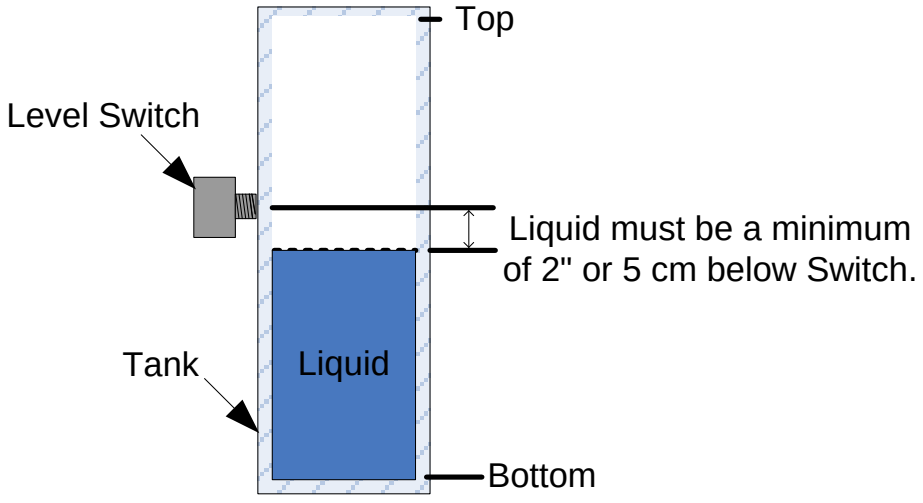

Figure 5 Training the Switch when the liquid level is below the Switch.

Training the Level Switch - Liquid Level Above the Level Switch

For this step the liquid level must be a minimum of 2 inches (5 centimeters) above the Switch as shown in Figure 6. With the Switch powered on the LED should be green. Press and hold the training button. The LED will turn off, after 5 seconds the LED will turn yellow, after another 5 seconds the LED will turn red. Release the button when the LED turns red. The LED will blink green for 10 seconds while it is training. When the Switch is finished its training cycle the LED will stop blinking and remain green.

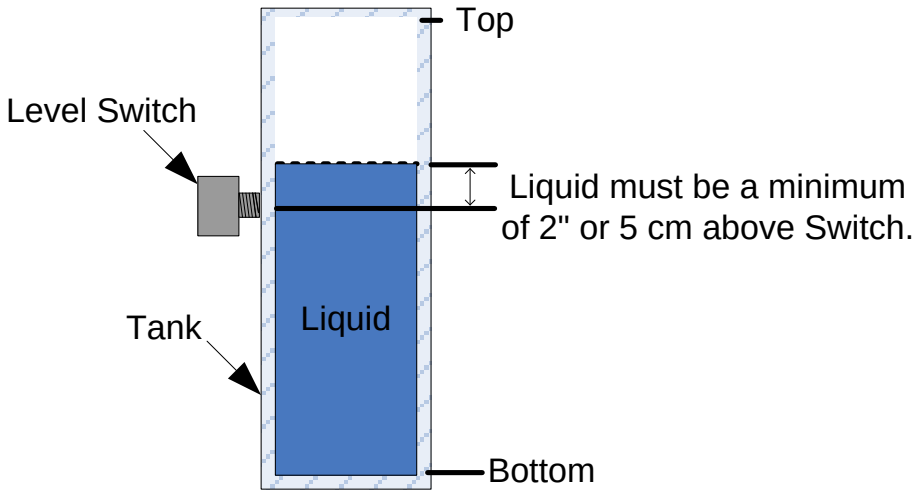

Figure 6 Training the Switch when the liquid level is above the Switch.

Switch Point

When the Switch has been correctly trained the switch point will be located at the center of the transducer face as shown in Figure 7.

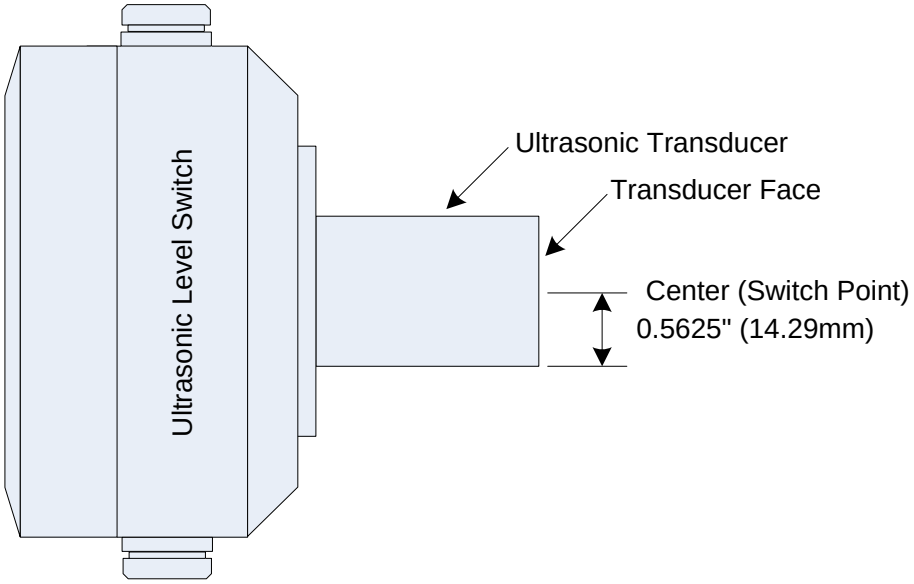

Figure 7 The switch point of a trained Switch is the center of the transduer face.

Level Switch Installation

The Switch is installed against an outside vertical tank wall. When installing the Switch a generous amount of High Vacuum Grease should be applied to both sides of the Silicon Rubber disk as shown in Figure 8. The grease should cover the entire rubber disk. The grease provides an “air free” connection between the transducer face and the rubber disk and an “air free” connection between the rubber disk and the tank wall. For proper operation it is important that enough grease be used and carefully spread to prevent air bubbles being trapped between the Switch, the rubber disk and the wall.

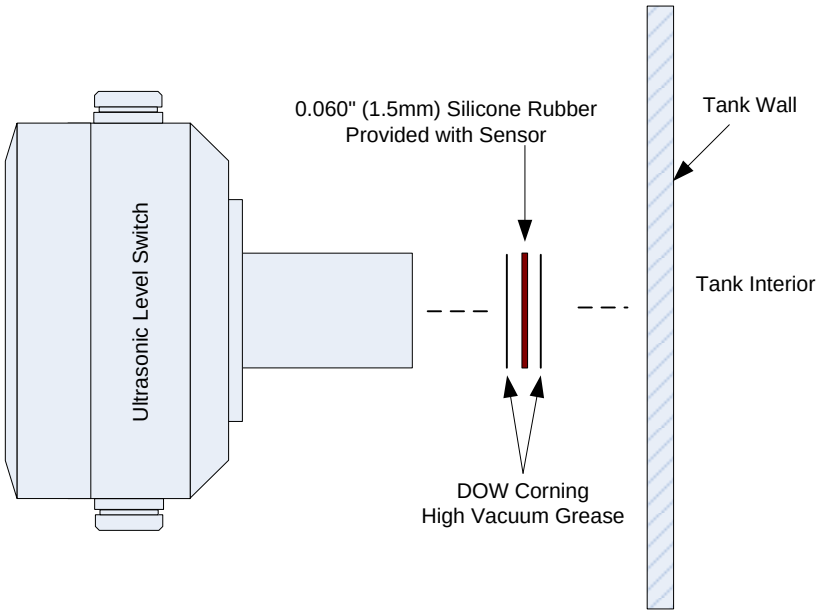

Figure 8 A small silicon rubber disk coated with grease is inserted between the tank and the Switch during installation.

The Switch must be securely pressed against the tank wall to prevent the Switch from tilting or moving. Figure 9 shows a correctly mounted Switch.

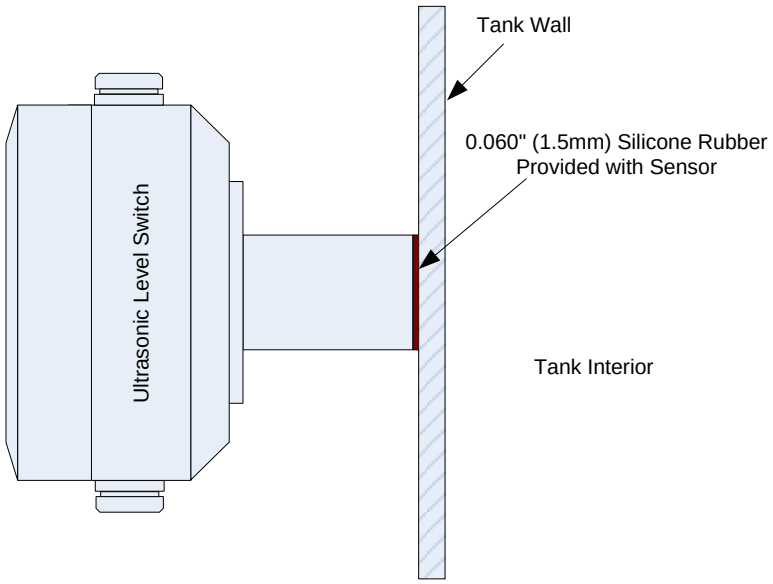

Figure 9 An installed Switch with no gaps or air pockets.

Easy Mounting Option for Round Tanks

The Ultrasonic Level Switch can be installed quickly and easily on round tanks using the ABM Level Switch flange mount system see Figure 10 and Figure 11. For other tank shapes please contact ABM Sensor Technology for different mounting options. A UV resistant 1 inch (2.5 cm) rubber strap is connected to the flange, then wrapped around the tank and connected to the opposite side of the mounting flange. The rubber strap is then stretched tight around the tank. The rubber strap must be stretched enough to ensure that transducer face is pressed tightly against the tank wall and cannot move. The rubber strap comes in lengths up to 100 feet or 30 meters.

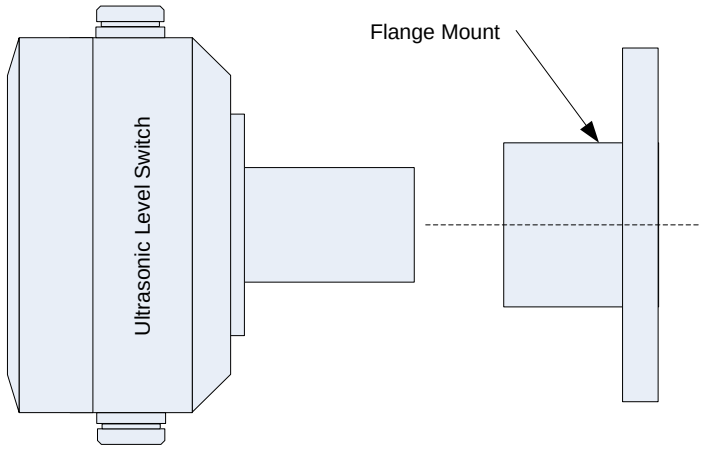

Figure 10 The flange mount screws onto the transducer nozzle allowing the nozzle to extend 1/4" (6.35mm) beyond the flange.

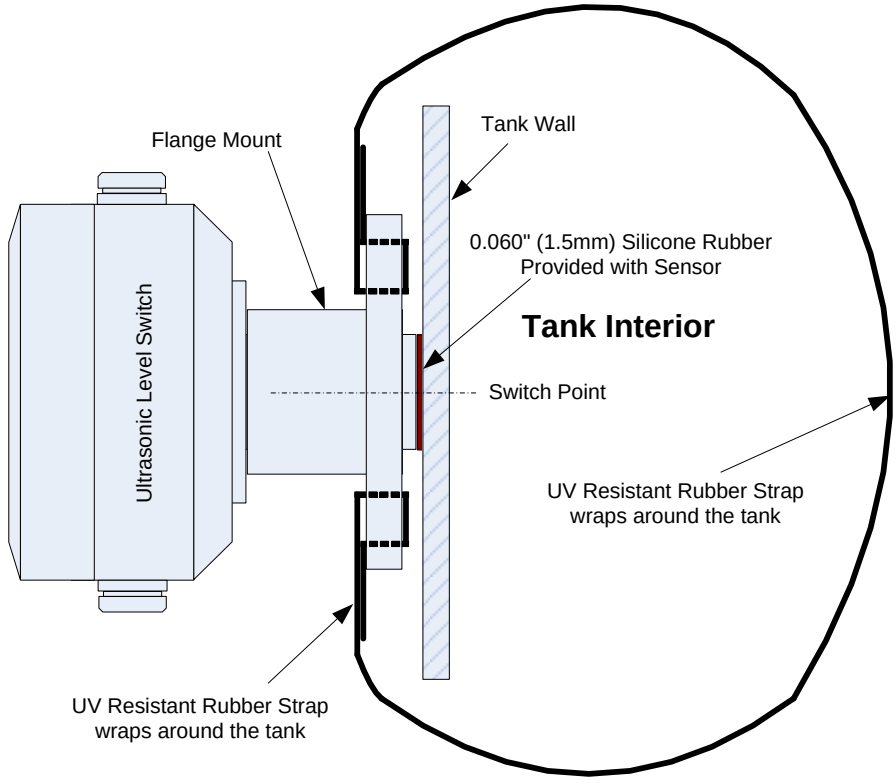

Figure 11 A UV resistant rubber strap is attached to the mounting flange and wraps around the tank.