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Water Level Measurement with the Ping))) Ultrasonic Distance Sensor (#28015)

General Description

Parallax customers frequently ask about measuring water level with the Ping))) Ultrasonic Distance Sensor. The Ping))) sensor isn't designed to be water resistant, and the specifications for the transducer don't provide any details for humidity sensitivity. Therefore, customers attempting to measure water level are doing so at their own risk of damaging their Ping))) hardware. At some point the humidity and moisture will likely damage your Ping))) Ultrasonic Distance Sensor, but depending on your circumstances and need this may or may not be a problem.

The purpose of this explanation is to convey the results of a brief test conducted at Parallax headquarters.

Ping))) Sensor Specifications

The Ping))) sensor's ultrasonic transducer emitter and detector have the following specifications:

Rated Freq	40 kHz
Sensitivity	-65 dB
Sound Pressure	115 dB
Capacitance	2 nF
Driving Voltage	0 VDC
Operating Temp	30° to 75 °C

No humidity exposure rating is provided by the transducer manufacturer.

Water Measurement Level Setup

We started our experiment by placing the Ping))) sensor in a two-inch diameter ABS plastic pipe. This provided readings to a maximum of five feet. Using a three-inch ABS pipe we obtained readings all the way to the end of the ten-foot length. This simple experiment showed that water level could be measured with a Ping))) sensor through the middle of an ABS pipe.

Next the Ping))) sensor was mounted in a plastic case to keep water away from most of the electronics. Silicon caulking was put around the transducers. The Ping)))
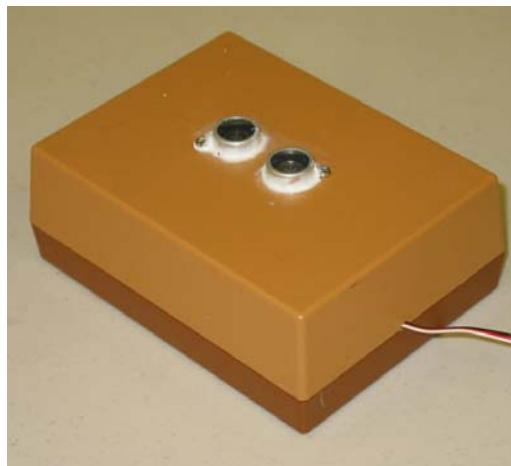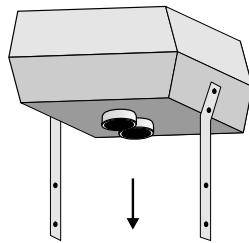
sensor setup was placed on top of the pipe with water in a bucket and left to rest for ten days to see if storage in a humid environment would be a problem. After this period, we tested the Ping))) sensor and it still operated (California is also a dry climate).

To continue with our tests, we attempted to measure the water level of boiling water (based on another customer request). We held the operating Ping))) sensor over boiling water for a few seconds at various heights, and it did indeed measure the distance to the boiling water. When steam was thick (closer to the water, and when the water was boiling hard) condensation droplets would accumulate on the transducers; we then moved it out of steam for a minute for the droplets to dry then continued with the test. The Ping sensor continued to operate throughout the 10-minute test. We concluded that the Ping))) sensor could sense the surface of the boiling water, but the measurements were affected when the cloud of steam was particularly thick.

The distance measurements through the ABS pipe were initially obtained using a ping pong ball taped to the end of a tape measure. The ball was moved up and down the pipe in one inch increments and the Ping))) showed accurate measurements.

Then the ten-foot pipe was inserted in a bucket of water and we moved the pipe up and down in the bucket. Though the bucket was only a foot deep the Ping))) showed accurate readings for each inch of movement ten feet away.

Ping))) mounted in case

Ping))) and case mounted to pipe

3" pipe

3" pipe

water level