Ultrasonic Terminology

Ultrasound behaves like normal sound with the exception that its frequency has a higher pitch than can be heard. We hear sound in the frequency range of 20 Hz to 20 kHz. Ultrasound used for distance ranging commonly uses FREQUENCY ranges from 20 kHz to 200 kHz. The Ultrix 100 sensors transmit in the 35 to 56 kHz range.

The ultrasonic pulses move in a wave out from the source (transducer). When the wave hits a solid object (acoustical impedance), an echo is reflected back from the target. The sound travels as a pressure wave in a similar fashion to a ripple on the surface of water. The further the distance to the target, or the less acoustical impedance the target has, the more energy the transmitter must emit in the sound wave to ensure its ability to "make the round trip" and be strong enough to be sensed/detected.

The distance between a source and a target can be determined by measuring the time between the transmission of the sound and receipt of the return echo. Sound waves travel at approximately 1000 feet per second.

RANGE / EFFECTIVE DISTANCE The maximum distance for a given sensor is usually the distance that can be detected under the most favorable conditions (target reflectivity, alignment, etc.). As a rule of thumb, select a sensor for a working distance 2/3 of the maximum distance (i.e. a 26 foot sensor for an 17 foot application.)

BEAM ANGLE The ultrasonic sound wave spreads out like a cone from the sensor. The bigger the cone angle or the farther the distance to the target, the greater the influence from nearby objects. The Ultrix 100 sensors have a narrow beam angle from 7 to 11 degrees.

DEADBAND / BLANKING The ultrasonic sensor sends out a sound pulse and then switches into a "listening" mode. The time required for the sensor to recover from transmitting a sound pulse until it can detect a return echo translates into a minimum distance from the end of the sensor required before a target can be detected. The Ultrix 100 sensor's deadband ranges from .8 to 1.6 feet.

TEMPERATURE Air changes density with temperature. This causes sound to travel at a different rate (approximately 1% per 10 degrees F). The Ultrix 100 sensors have an integral temperature sensor to compensate for temperature fluctuations.

RESPONSE RATE If a measured parameter fluctuates (e.g. wave action in a tank), a sensor may be adjusted to slow its response rate to ignore those fluctuations. The Ultrix 100 sensors have several selectable rates: immediate, 6, 17, 33, or 66 feet per minute.

PRESSURE Pressure in a tank increases the density of the "air path" and therefore introduces an error of measurement. A change of a mile in elevation causes a change of approximately 1.8%. Up to 14 PSI, the Ultrix 100 sensors will maintain their specified accuracy.

DEFAULT OUTPUT The ULTRIX 100 defaults to transmitting the "default mA" if it is unable to find a valid "target". Two instances where the default mA is transmitted are: 1) if no echo can be found for approximately one minute (after power up or during normal operation) or 2) an echo is being received but the distance it represents is out of the calibrated range.

TRACKING SPEED The Ultrix 100 software incorporates algorithms which enable accurate sensing of faint return signals, thus allowing a loop powered sensor to measure up to 50 feet. These algorithms only allow the sensed media to move (relative to the Ultrix) by a maximum rate, the "Tracking Speed". The Tracking Speed is 12 feet per second when the media approaches the sensor and 15 feet per second as the media recedes.

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