SONOTRONICS

Tilt-Tracker System
And
EMT-AR
Angle reporting pinger

Manual

SONOTRONICS

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Updated 10/14/2011

Tilt-Tracker system manual

Sonotronics EMT-AR angle reporting pingers are typically used in conjunction with a Sonotronics Tilt-Tracker system, this manual covers the operation and use of the pingers, as well as the Tilt-Tracker system. The basics of the EMT-AR pingers will be covered first so that users of these pingers with other systems or sonar equipment can read only this section.

Understanding ACT Coding:

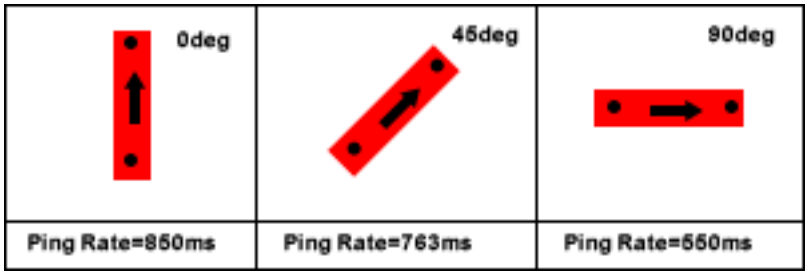
Sonotronics has developed a proprietary coding scheme called "ACT", aural coded transmission, a technique that aids in the unique identification of transmitters in a geographic area. ACT coding also improves the quality of data collected by passive logging receivers such as the Sonotronics' SUR (submersible ultrasonic receiver). This coding preserves the simple code, interval, and frequency sets of classic Sonotronics transmitters: ACT coding lies in the organization of these sets. Please see our document on ACT coding for more information.

EMT-AR pingers

ACT Angle reporting Algorithm:

The basic angle-reporting algorithm consists of the following repeated audio sequence: an ACT code, a separating pause, *11 telemetry pings,* and another separating pause. During the 11 telemetry pings, the pulse interval (time between pings) is directly related to the last angle measured. Note that the sensor is measured just before the first ping of this 11 ping pulse train, hence the refresh rate is simply the time that it takes to repeat the entire ping pattern, typically 2 times per minute.

EMT-AR pingers report the current tilt angle via changing ping rate. This angle is measured using an accelerometer, which detects the force of gravity, and the tilt angle is calculated based upon the vector component of gravity detected by the accelerometer



The telemetry pings actually report the measured acceleration as 'percent of full scale'. Vertical 'up' , indicated by an arrow on the side of EMT-AR pinger, is defined as 100% FS, and transmitted as a fixed interval of 850ms in the ACT telemetry algorithm. Horizontal is defined as 0% FS, and is transmitted with a fixed interval of 550ms. Diagonal (90 degrees off vertical) is defined as 71% FS, and is transmitted with an interval of 763mS. Note that the actual conversion between measured acceleration and angle from vertical is a trig function (%FS>2%):

Tilt Angle = 90 - ASIN(%FS/100)

Note: The USR08 will display the value "Tilt=xx", where XX is the tilt angle from 0 to 90 degrees in 5 degree increments, when the RxMODE "ID Tilt" is selected. Please refer to the USR08 manual for more details.

There are 101 3ms "slots" between 550ms and 850ms (0 - 100%), and some sample values are shown in the following table:

Reported Interval	Corresponding %FS	Angle (deg) from vertical (up)
550ms	0	90 (or greater)
700mS	50	60
763mS	71	45
811mS	85	30
850ms	100	0

It should be noted that at the steepest angles, less than 10 degrees from vertical, the sensor resolution is poorest, and the sine function reports minimal changes, consequently readings of 1% and 2% are fixed at tilt angles if 5 and 10 degrees respectively, and do not follow the formula shown before.
It is also important to note that the pinger is activated via magnetic reed switch. Units are shipped with a magnet taped to the side, which must be removed for operation. When the magnet is replaced, the pinger de -activates, and goes into a 'sleep' mode. In this state, a small amount of energy is still consumed, the consquence of this is that the pingers have a finite shelf life. Please contact the factory for more details on the shelf life of particular pingers. Note quoted lifetimes are operating life (magnet off).

A tip for using telemetry transmitters:

An advantage of the 11 ping pulse train used to relay telemetry information is that a stopwatch may be used to calculate the interval. If the stopwatch is started when the first ping of the 11 ping train is heard, and stopped when the last (eleventh) ping is heard, this value can be divided by 10 and the result will be the interval.

TILT-Tracker System:

A Tilt-Tracker System consists of 2 EMT-AR pingers and a MANTRAK kit (USR08 receiver, hydrophone, and accessories). Optionally, a SUR-Archer (Archer Field PC with tilt monitoring software installed) may be used to enhance this system.

The operation of the system is as follows. The EMT-ARs emit their pings at a pulse rate based upon the tilt angle, as well as ID intervals, and the USR08 receiver times and decodes these intervals, and passes the data through its serial port. If attached, the SUR-Archer receives the incoming data, performs the necessary calculations and changes the graphic display to reflect the tilt angle. In addition, the angle in degrees as well as the ACT ID of the particular pinger as displayed along with the angle graphic.

Note the TILT-Tracker system contains individual manuals for the USR08 receiver and DH-4 hydrophone (both in the MANTRAK kit), and the Archer Field PC manuals for the SUR-Archer so the details of their operation will not be covered here.

The SUR-Archer is a Windows Mobile palmtop computer, with a custom application loaded at startup, enabling the user to start using the application 'out-of-the-box. The screen will continue displaying the last angle it detected until a new one is detected. In addition, there is a feature that allows monitoring of a 'critical angle', allowing the user to specify an angle above which an audible alarm is sounded on the SUR-Archer. When not in use as a tilt tracker accessory, the SUR-Archer may be used to configure and download data from logging receivers, or used as standard Windows Mobile PC: please consult the included reference material for use of its native functions for applications such as internet access and email access. Copies of the installed software are included, in the event re-installation is required, and it is recommended to check for updates on the Sonotronics' website (www.sonotronics.com).

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