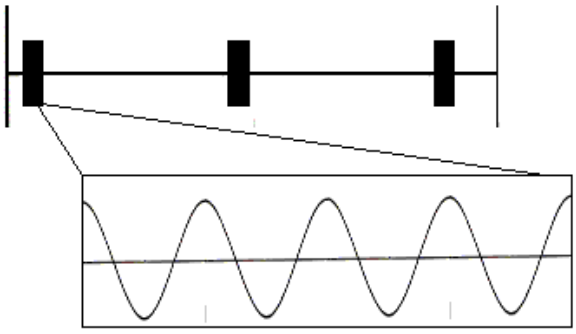
Understanding Sonotronics Unique Pinger ID Algorithm:

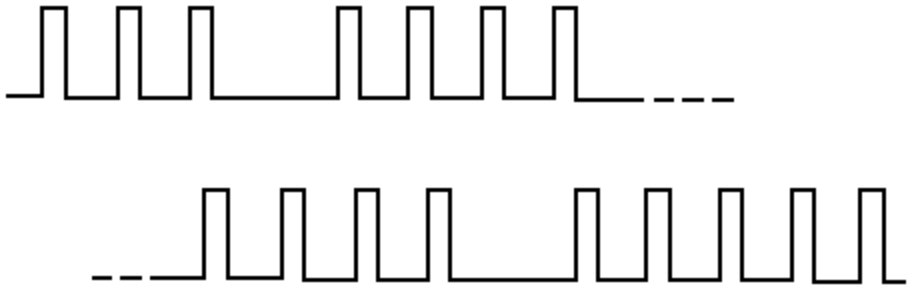
Sonotronics utilizes three separate items for uniquely identifying transmitters:

1. Frequency
2. Code
3. Interval Time

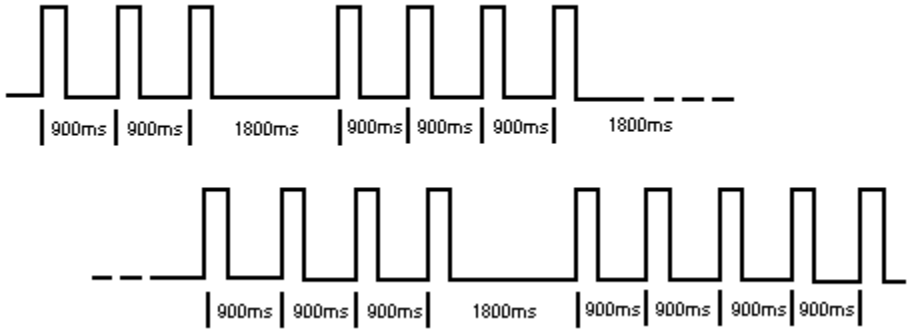
Frequency:
The frequency is the number of times per second that a wave completes a cycle. Ultrasonic transmitters emit a wave of high frequency (above human hearing) sound. The diagram below demonstrates that if you were to "zoom in" on a ping, there would be a sine wave transmitted, which would have a certain frequency. Transmitters are spread out across different frequencies in order to make differentiation between pingers easier. This is similar to radio stations being spread out across different frequencies. Using the USR-96 narrow band receiver, a transmitter with a frequency of 74kHz will not be heard when the receiver is tuned to 75kHz.



Code:
Sonotronics transmitters each have an aural code, intended for manual tracking. This is only for manual tracking, and is not identified by automated stations (SUR, CUB, USR-90). An example of a code would be 3,4,4,5. A transmitter with this code would ping three times, pause, ping four times, pause, ping four times, pause, ping five times, pause, and then continue by pinging three times, etc. The diagram below gives an example of this code.



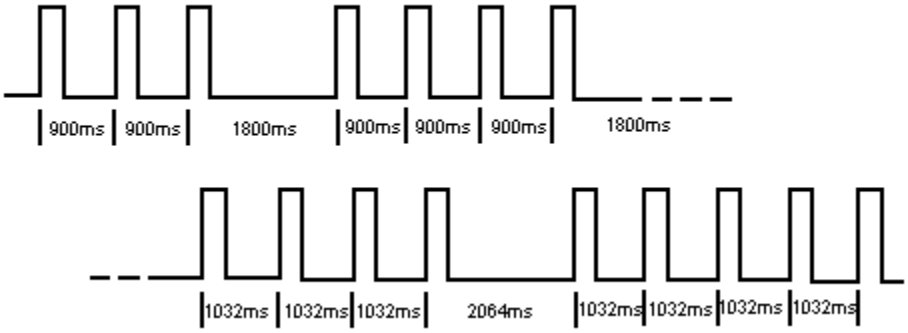
Interval Time:
The interval time is a fixed time between pings in milliseconds. This is very important in the use of automated receivers. (USR-90, SUR, CUB) This time is displayed on the LCD display of all new generation Sonotronics receivers. This time is also decoded and stored along with frequency in all automated receivers. It is important to note that if there is a fixed interval time between pings, say 900ms, then the pause time that separates digits in a code is 2x the interval time, in this case 1800ms.



The reason for the use of interval time is to maximize the range and environment noise level in which tags can be identified. Because the only data transmitted is the pings themselves, with the time between pings being monitored, it is possible to transmit ID in situations in which transmissions of a more complex data structure would not be possible. On the display of a USR-96 receiver, on would see the frequency on the top line of the display, with 900ms on the bottom line of the display. Occasionally when a pause occurs, you will see 1800ms, which is easily determined to be the 900ms transmitter.

Interval Time in Telemetry Transmitters:
Sonotronics telemetry transmitters (temperature or depth) actually have two interval times. The first is the fixed interval time for identifying the particular transmitter, the second is a varying interval time which communicates the telemetry data to a receiver. The diagram below is an example of a transmitter with a 900ms fixed interval, with a telemetry interval that is currently 1032ms. This means that the 900ms will never

change, allowing receivers to identify the particular transmitter, and that the current telemetry value is 1032ms. The 1032ms corresponds, for example to a particular temperature. If 1032 is the interval representing 20°C, then when the temperature becomes 21°C, this interval will change to 1045ms. The telemetry intervals are on a calibration sheet that is included along with the transmitters.



Code Sheets:

Sonotronics transmitters have a code sheet with them which includes the frequency, code, and interval. An example would look like the following:

Tag number	Frequency	Code	Interval
1	70kHz	3,3,4,4	900ms
2	71kHz	3,5,5,5	912ms
3	72kHz	5,5,6,6	920ms
4	73kHz	4,4,4,4	935ms
5	74kHz	3,3,5,5	942ms

More on Automated Receivers:

The automated receivers again only record the frequency and interval of the particular transmitter. If a telemetry transmitter is detected, this is easy to see as there will be intermittent recordings of the fixed ID interval and the telemetry interval. An example given below of logged data with tag number 1 from the code sheet above being a telemetry transmitter, and the others being standard coded tags:

00>17:37:29 01/13/05,70.0,900 ←ID interval for tag number 1
01>17:37:34 01/13/05,70.0,900
02>17:37:37 01/13/05,70.0,1032 ←Telemetry interval for tag number 1
03>17:37:40 01/13/05,70.0,1032
04>17:37:42 01/13/05,74.0,942 ←ID interval for tag number 5
05>17:37:45 01/13/05,70.0,900
06>17:37:48 01/13/05,71.0,912 ←ID interval for tag number 2
07>17:37:53 01/13/05,71.0,912
08>18:58:29 01/13/05,74.0,942

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