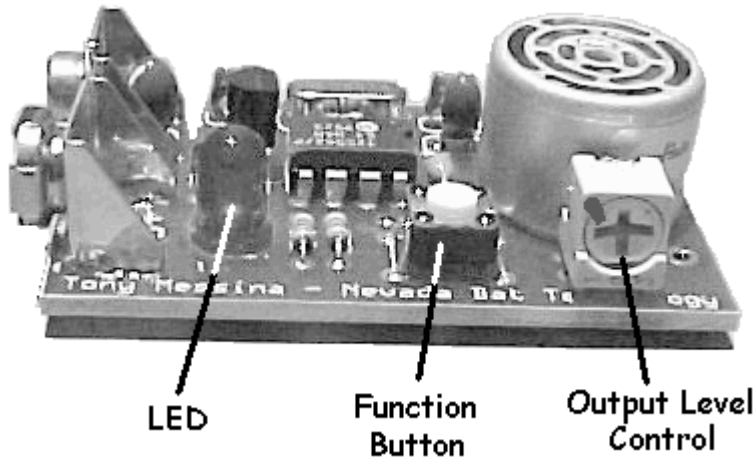


The Bat Chirp Board

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The **Bat Chirp** board was designed to provide a means for exploring and demonstrating the characteristics of acoustic ultrasound, as well as for functionally testing bat echolocation detection and recording equipment.

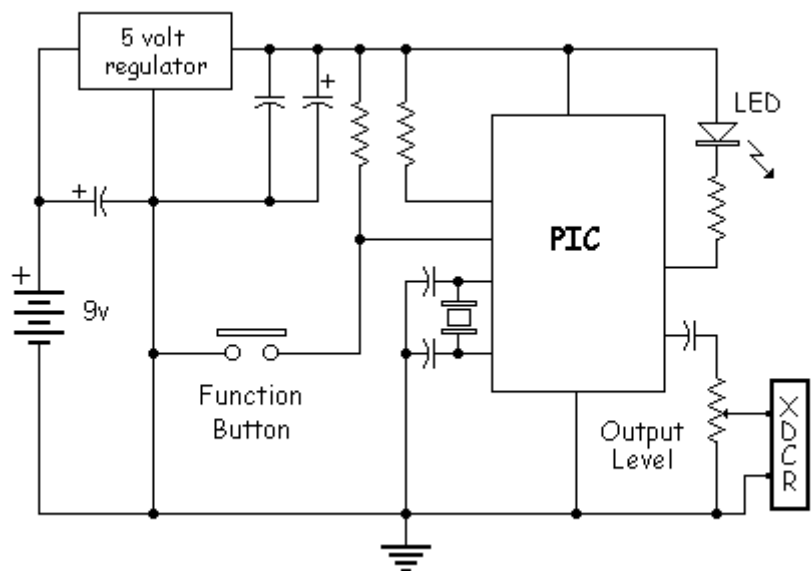
Simply explained, the **Bat Chirp** is a microprocessor controlled acoustic ultrasound signal generator.

The **Bat Chirp** can synthesize one of three types of sounds: A 40kHz tone, a two frequency chirp, and a simulated bat call sequence.

The sounds are synthesized by a Microchip PIC microprocessor, and emitted via a 40kHz piezo transducer. A quick look at the circuit diagram of the **Bat Chirp** gives a good overview of its inner workings. A 5 volt regulator IC drives the entire circuit well below normally useful 9 volt battery levels, so this is a good way to polish off used batteries from Anabat detectors !!

The PIC processor is crystal controlled for stability, and provides all of the functions of the circuit – from driving the output transducer and *LED*, to checking the *function button*.

By pressing the *function button*, see diagram above, you sequentially step through the various signals. You may need to hold the button down a few seconds until the bat call signal stops to effect the switch to the next signal. The *LED* will illuminate to indicate that the **Bat Chirp** is working, as well as to identify which signal is active.



The setting of the *Output Level Control* requires a bit of discussion. When the **Bat Chirp** boards are made up, a specially adapted sound pressure meter is used to set the output of the 40 kHz tone to a standardized level (I'll call it one bat unit). As long as this level is used, any calibration of detectors made with the unit would result in similar calibration levels with other detectors of the same type, calibrated with other **Bat Chirp** boards – as long as those boards are still set to their factory output level of one bat unit. For your own use, you may wish to make the **Bat Chirp** board louder or softer. Please feel free to do so ... but keep track of what levels you use if trying to match bat detector thresholds !!! Readjusting the *Output Level Control* to the painted calibration marks will get you back to *factory standards*.

When using the **Bat Chirp** to set sensitivity thresholds on Anabat detectors it is imperative to work in an open, uncluttered area. One way to get the **Bat Chirp** away from sound reflecting objects in the field is to hang it from a nearby tree. There are two holes at the top of the circuit board which can be used to add a piece of fish line or wire to provide a hanger.

Two methods are available for setting detector thresholds. The first is to use the calibrated 40 kHz tone to set the sensitivity of the detector to the point that the tone just drops out. This will usually result in a lower setting of the sensitivity than one normally uses, unless the detector and **Bat Chirp** are separated by quite some distance. The other method is to use the 2 tone chirp, and set the threshold at the point where one tone is heard clearly, and the second tone just disappears. In either case, start with a high sensitivity setting and reduce it to the point desired.

To demonstrate Doppler shifts, use the continuous 40kHz tone and a heterodyne style detector. Set the frequency of the heterodyne just off from 40 kHz. You should hear a low frequency tone when the detector is held at a fixed distance from the **Bat Chirp** board. As you move the detector towards and away from the **Bat Chirp**, you will hear the frequency shift up and down. It is instructive to realize that the direction that the frequency appears to shift in relation to the movement of the detector is dependent on whether you set the heterodyne frequency above or below 40 kHz !!! This crossover frequency shift, as well as the uncertain base conversion frequencies, are the main reasons it is difficult to do frequency analysis with standard heterodyne style detectors.

If you use Anabat bat call analysis to study the structure of the **Bat Chirp's** simulated bat call sequence, you will see a strange characteristic ... it is a series of stepped frequencies rather than a simple swept curve. This is due to the way the microprocessor synthesizes the various chirps – using a series of distinct fixed frequency bursts. Once you become familiar with the structure of the **Bat Chirp** signals, you will be able to see how differing environmental conditions affect the way the ultrasound is conducted and recorded.

I hope you find the **Bat Chirp** to be a useful tool. Please don't hesitate to email me with ideas, comments, and questions relating to the **Bat Chirp** and its use at: Tony@NevadaBat.com

