

### *8. Tape-recordings*

It is common practice to record the output of a bat detector into a standard, audio-frequency tape-recorder, using the tape as a method of storage. There is a penalty to this procedure, as the resulting analysis will be affected by noise, flutter and wow introduced by the recording and playback processes. There is also a risk that the tape will be played back at a different speed to that at which it was recorded. In that case, all time intervals and frequencies will be displayed incorrectly. ANABAT6 offers the facility to record a calibration tone onto the tape, and in that case, the software can be re-calibrated to compensate for the tape speed difference.

The typical consequence of using a tape-recorder is that a periodic error will be introduced to the frequencies calculated as if the tape fluctuates regularly in speed. The resulting degradation of the signal being analyzed will result in a display that can be more difficult to make measurements from, though the errors will average out in time. It is unlikely that such errors will result in incorrect identification of bat species, but it may obscure some call features that may be useful in species identification.



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## ANABAT CF Storage ZCAIM

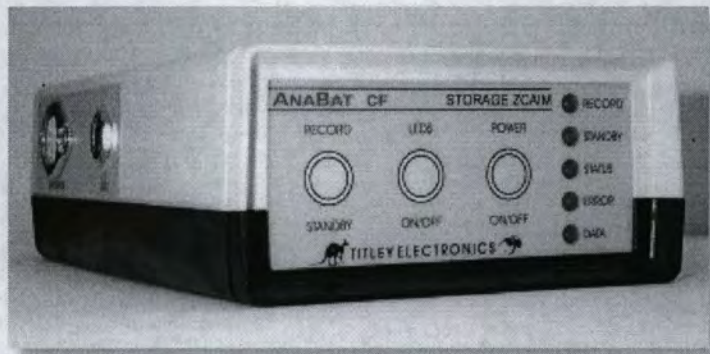
### ANABAT CF Storage ZCAIM

The AnaBat CF Storage ZCA Interface Module uses Compact Flash Memory Cards (the same cards as used in digital cameras) to store bat call data. The CF Storage ZCAIM is compatible with the current model AnaBat II Bat Detector\* and eliminates the need to have computers, tape recorders, Delay Switches, Timers, or large batteries and various cables, in the field. Memory capacity is almost limitless, depending on the capacity of the CF card you use, and of course you can carry as many spare cards as you wish. A CF card of 64 MB for example, should record around one week's worth of information, in continuous use.

*\*Current model AnaBat II Bat Detectors have the letter 'G' at the end of the Serial Number (as inscribed inside the battery compartment). Older models that do not have the letter 'G' can have an inexpensive modification carried out either by Titley Electronics in Australia, or by Dave Dalton in the USA [Email [anabatrepair@earthlink.net](mailto:anabatrepair@earthlink.net)] to make the unit compatible with the CF Storage ZCAIMS.*

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Front view of the ANABAT CF Storage ZCAIM - please [click here for larger picture](#)

Timer facilities are incorporated into the unit so it can be programmed to switch on and off at selected times, simultaneously switching the Bat Detector on and off. A port is available for connection to a GPS unit so that GPS data can be downloaded continuously, even while bat call data is being accumulated. The software for reading the Memory Card, extracting AnaBat files and GPS data will work on computers using any of the Windows versions from Windows 95 and later.



Rear view of the ANABAT CF Storage ZCAIM - please [click here for larger picture](#)

The CF Storage ZCAIM will operate on 4 x standard 1.5 volt AA cells, or 4 x 1.2 volt rechargeable AA cells, or a 12 volt gel cell; averaging ten days use in a field monitoring situation, using 4 x alkaline AA cells.



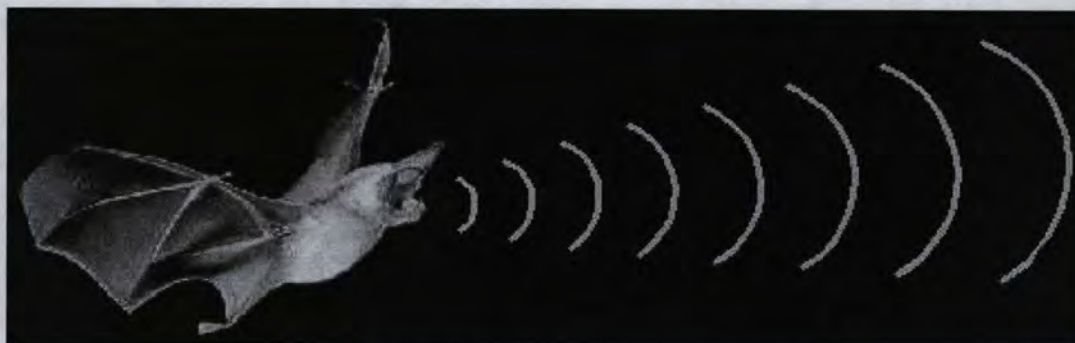
Latest Anabat CF Storage ZCAIM Software

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## Anabat File Analysis



### Call recognition of echolocating bats using the *Anabat* bat detection system

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The *Anabat* electronic bat detection system is widely used to record bat echolocation calls. Recorded calls are stored as computer files, and graphical images of the calls are typically used to identify different species. Unfortunately the process of visually comparing different call is subjective and error prone.

*Anabat* files are packed with volumes of data, so it seems silly not to use an objective, quantitative analysis of calls. It is a great credit to Chris Corben, the developer of *Anabat*, that from a typical 5K *Anabat* file one can extract an array of over 4 000 frequency values (kHz to three decimal places) with corresponding times (msec to three decimal places).

This document is about the objective analysis of *Anabat* files. The extraction of quantitative attributes is now relatively simple, using either *Analook*, *Analyse* for DOS, or *Analyse* for Windows 95. *Analook* is a program written by Chris Corben. I wrote *Analyse* for DOS a few years ago, and more recently, I completed *Analyse* for Windows 95.

Following user requests, *Analyse* for DOS, has been upgraded with a number of keyboard shortcuts and other features to speed up file analysis.

In this document I present my ideas on the different attributes that can be extracted from *Anabat* files and how pulses can be accurately described using mathematical models. I also look at some statistical analyses that can be performed.

A new feature of this site is a worked example which walks users through the objective analysis of *Anabat* files with the goal of determining the numerical probability that unknown sequences belong to particular species.

The work presented here is mostly based on the use of *Analyse* and *Analyse* rather than *Analook*, because *Analook* does not use a mathematical modeling process. I make both programs available to interested *Anabat* users free of charge. I am always pleased to receive e-mail messages with suggestions on how the programs might be improved.

This Web site also shows some examples of the statistical analyses that are possible using quantitative measurements. Using discriminant analysis, for instance, it is possible to identify species with a high degree of accuracy. Cluster analysis can be used to measure call similarity and provide an indication of the closeness of genetic relationships.

Those with an academic interest in the analysis of bat echolocation calls should also look at the following:

Identification of Bat Echolocation Calls Using a Decision Tree Classification System - Herr, Klomp & Atkinson.














[Acoustic Bat Species Recognition by Synergetic Pattern Recognition - Obrist et al.](#)

Anabat call libraries, some text references, and links to more general bat sites can be found on the [concluding page](#).

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### Available topics

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  -  [Information about \*Analyse\* for Windows 95](#)
  -  [Information about \*Analook\*](#)
  -  [Species discrimination: A worked example](#)
  -  [Software downloads](#)
  -  [Mathematical models of echolocation pulses](#)
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