



# Department of Defense Legacy Resource Management Program

PROJECT 07-345

## **Automated bird and amphibian species identification computer program**

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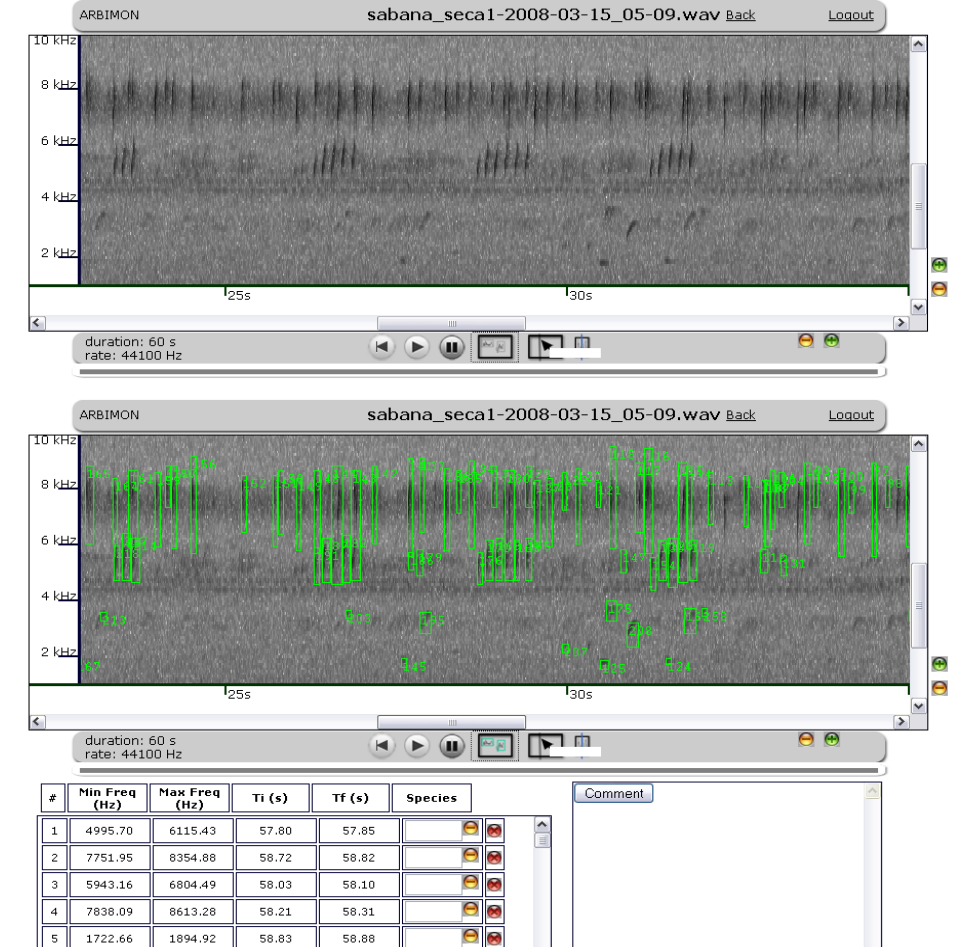
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## Draft of Expected Products

1. Core program for species identification
2. Specifications for a remote wireless recording station and receiver
3. A detailed account of the software development and its accuracy (Attached - separate file)
4. The Fact Sheet is a required product for all Legacy projects. (Attached- separate file)

## Core program for species identification

The program for species identification is actually a combination of many different programs that have been linked in a user friendly website (arbimon.net). We believe that a website open to all end-users will be the most efficient way to provide the community with the best service for storing, processing, and analyzing recordings. The beta version of the web-based visualizer/analysis tool (Fig. 1a) is presently being used by members of the laboratory and we will make it available as soon as all major “bugs” have been fixed and data/code security measures have been added. This tool provides a user-friendly GUI that allows experts to access recordings and associated data stored in our servers, play the recordings, annotate recording by marking notes



or complete song as an area of interest and specifying a code or species name. To facilitate the analytical process, the visualizer/analysis tool also includes a browsing/search component that locates recordings based on location, date, or species name (Fig. 2).

[Logout](#)

**Recording Browser**

Browse recordings by ARBIMON station

- ◆ [Select Place](#)
- ◆ [La Selva](#)
- ◆ [Sabana Seca](#)
- ◆ [El Verde](#)

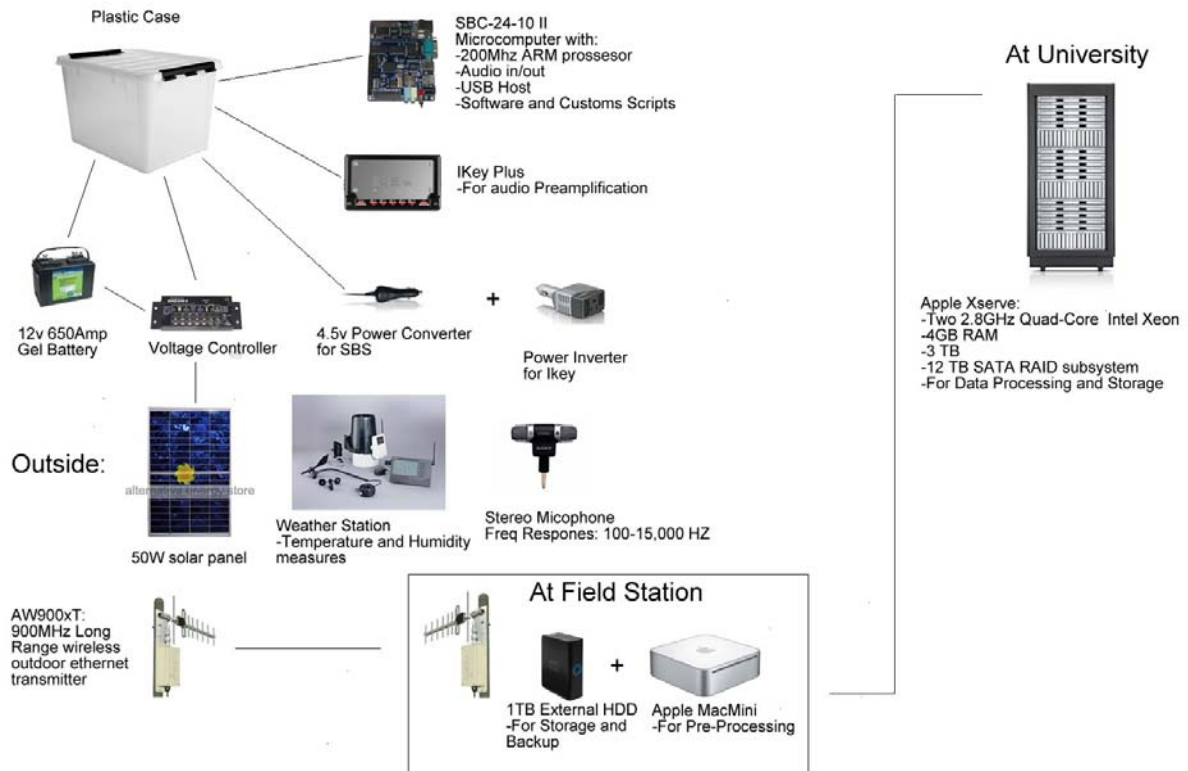
Browse recordings by Taxonomy

- ◆ [Select Taxonomy](#)
- ◆ [birds](#)
- ◆ [amphibian](#)
- ◆ [insects](#)
- ◆ [bats](#)
- ◆ [mammals](#)
- ◆ [others](#)

Another important tool that we have added to the system automates the marking of areas of interest in each recording (Fig. 1b). Once these marks have been identified by experts, the machine learning algorithms can be trained to automate species identifications in future recordings (see product #3 for more details).

## Specifications for a remote wireless recording station and receiver

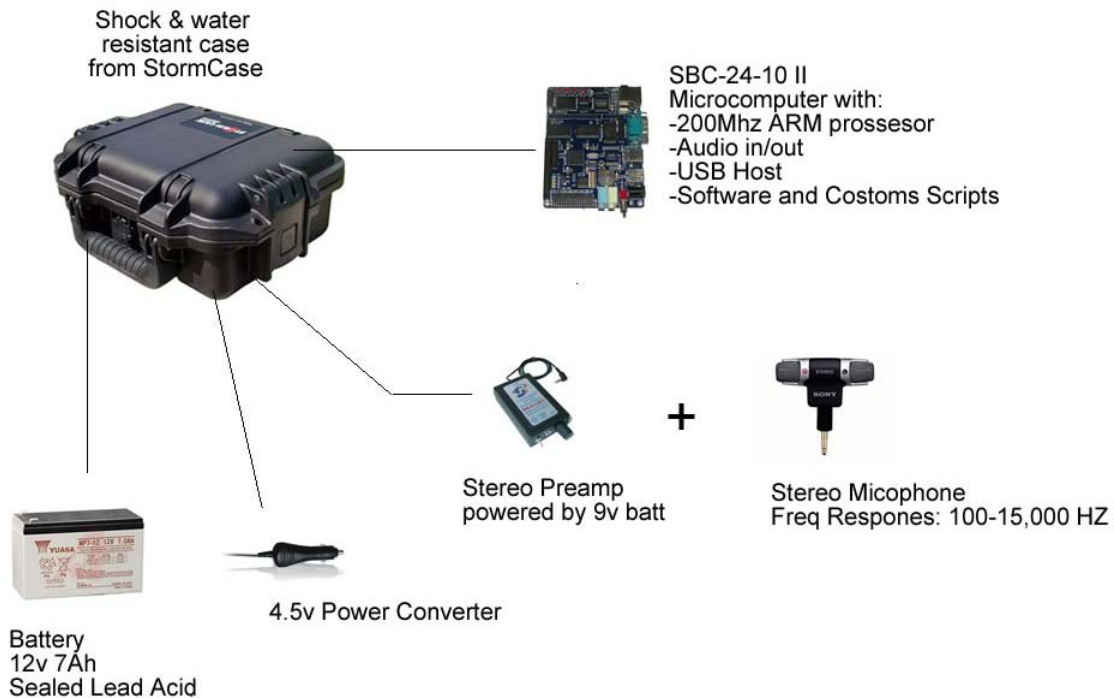
We have designed and tested permanent (Fig. 1) and portable (Fig. 2) recording stations. The permanent station is powered by a 50W solar panel, which is connected to a voltage controller. The voltage controller is connected to the battery and indirectly through the power converter to the IKEY (pre amplifier) and the embedded computer. During the day when the solar panel is producing excess energy, the electricity is routed directly to the equipment. During periods of low or no sunlight, the controller switches the energy source to the battery. The microphone is connected to the IKEY, which amplifies the audio. The IKEY is connected to the audio input of the embedded computer. Presently the computer is programmed to make a 1 minute recording every 10 minutes. The recording is stored locally on a USB memory stick until it has been successful transferred. If the transfer



**Figure 1. Permanent recording station.**

component fails, approximately 2 days of recordings can be stored on the memory stick. The embedded computer has an Ethernet connection, which is connected to the Ethernet transmitter and the long-range wireless antenna. The antenna has a range of 30 miles with line of site. At our sites, we are sending the signal < 2 km, but through dense vegetation and the system has worked well.

From the field the recordings are sent to a receiving antenna at a field station with an internet connection. The receiving antenna is connected to an Apple Mac Mini, which converts the 10mb stereo recordings into 5mb mono recordings. These recordings are stored on an external hard drive. Another copy of the each recording is compressed to 1mb and is sent by the internet to our server at the University of Puerto Rico. Here each recording is located in a searchable database and is displayed on the project website (arbimon.net).



**Figure 2. Portable recording stations.**

The portable recording station is powered by a small rechargeable 12 v battery, which can maintain the system for 2 to 3 days. As in the permanent station the microphone is attached to a preamplifier, which is connected to the same embedded computer. The recordings are stored on a USB memory stick. In the laboratory the recordings are downloaded to the database and are can be processed in the same fashion as the recordings from the permanent stations.