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Notes on the CU-BARP Prototype Stereo Underwater Wing and Associated Electronics

The Stereo Underwater Listening Wing and Field Kit Electronics was designed and built by the Cornell Bioacoustics Research Program. The purpose of the unit is to provide an inexpensive method of collecting sounds and identifying locations of the emitters while in the field. The wing unit employs standard preamplified hydrophones in a stereo configuration and can either be towed or dropped from an anchored boat into a moving current.

The wing's hydrophones are mounted roughly five times the distance of separation for a typical person's inner ears. This separation factor is based on the fact that sound travels five times faster in seawater than in air. This allows the listener to fairly accurately identify the bearing of the sound source being monitored without complex computer processing equipment (we are just using the built-in spatial processing ability of the human brain).

The complete package consists of the following items:

- Wing with integrally-mounted hydrophones and approximately 70 feet of cable.
- Field case with DAT, Heterodyne unit, Headphones, associated power conversion and filtering electronics, tapes, folder w/documentation, and DAT AC adapter (for home-base work).
- 12VDC battery, cable, charger and case

Each of these areas are touched on briefly below. Please remember that this unit is a prototype and therefore will not have the finely-tuned features of a production research tool. By that same token, we welcome modifications (within limits) to enhance the unit's performance as well as comments on how it could be improved.

Electronics Case:

Please wipe down the field case at the end of each day, including the internal electronics (they don't need to be removed). Isopropyl alcohol (70%) is recommended.

Power:

The Field Kit electronics are all powered from a single 12VDC battery. This battery should be a separate battery, powering only the field kit.

! Connect Procedure:
1) Connect cable/banana to case (R-R, B-B).
2) Connect negative (black) to battery.
3) Connect positive (red) to battery.

! Charge the battery nightly! (2 Amp setting).

DAT Recording / Monitoring:

The 2-channel TEAC DAT recorder is connected directly to the hydrophones by the field kit's internal wiring. The DAT's headphone jack has been extended to the outside of the case so that one can insert a tape and start the recording, then close the case to prevent water getting in to the electronics. For monitoring purposes, setup the DAT to record but leave it in pause. Note that the TEAC DAT has a power-save feature that will shut off the pause after 2 to 5 minutes.

The TEAC DAT should have the following set: PAD = unbalanced (right side), INPUT = line (TOP), POWER = adapter (rear), REC LEVEL = 8 to 10 (front).

! Due to the DAT's wiring, the playback of recorded DAT tapes cannot be performed with the input (hydrophone) XLR connectors attached. Disconnect these connectors to listen to a previously recorded tape.

Heterodyne Information:

The heterodyne unit provides the capability to monitor sub-sonic frequencies. Specifically, the heterodyne shifts all frequencies by 400Hz. It is enabled by disconnecting one of the channel's barrel connectors (in front of the unit) and routing the line through the heterodyne unit. This enables you to record one channel shifted and one normal on the DAT.

Towed Wing:

The wing was designed to work in at least some current -- this keeps the proper orientation. Deploy the wing from a standing boat. If you plan to tow the unit, begin movement after the wing is completely in the water and the tie line is secured to the boat. In a towed configuration, the use of a side-mounted outrigger (5 to 15') is recommended to prevent the unit from getting caught up in the props.

For your particular usage, the tow line and ballast positions may need to be adjusted. For standing configurations (dropped into current from an anchored boat), the ballast should be in the most forward position and the tow line may be in the 2nd position from the front. In towed configurations, both should be at the most forward position. A standard marine U-bolt can be used for easier reconfiguration (of the tow cable); but note that you may get clicking or similar noises from the movement of the same during deployment.

The buoy is provided for standing configurations only. It is tied to the tow cable near the boat to provide isolation of wave movement and surface cable noise from the wing's hydrophones. Secure the buoy via the surgical tubing, by tying the tubing tightly into the tow cable's helical wrap.

The two hydrophones on the wing are connected to XLR-style connectors at the boat end. The pinout is intended for mating to the accompanying field case. However, if you wish to use it separately (or the field case was not available), the pinout of the wing/hydrophone connectors is as following:

Pin 1	12VDC
2	Ground
3	Signal (preamplified)

! After each use, please spray the wing, etc. down with fresh water!

! Do NOT 'fly' the wing if the tow line is frayed or broken.

! Before deploying the wing be sure that the end of the cable is secured to the boat!

! When using the wing, note that you will not be able to discern between sounds directly in front or behind the wing. This is due to the sound arriving at both hydrophones at the same time.