

Spar-Buoy Usage & Deployment

Cornell Bioacoustics

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1. Equipment List

Buoy Support Materials

Hydrophone(s)	Extra foam spacer disks (internal)
Antenna(e)	Extra 20 oz. weights (internal ballast)
Power Dongle(s)	Snap rings for Buoy tether line
Buoy wrench (end-cap)	Tether rope (yellow floating), >500m
3/4" socket, extension and drive	Orange floating buoy(s), 2'+diam.
Battery charger	Silicon spray & contact cleaner
Buoy charger adapter cable	Spare battery lugs & connector pins
Tie wraps (12" for antenna cable)	Silicon (RTV) glue
Plumber's grease (end-cap threads, connectors)	Epoxy
Screw gun (packing crate)	
Spare buoy battery	

Acquisition Equipment

See the 'Receiver Supplement', page 4 and figure 3 for more information.

Sonobuoy receiver(s) & cables	FD901 filter box
Receive antenna(e) -- YAGI	12VDC, 2Amp power supply
DOLCH acquisition system w/sound card	VCR recorder
AR powered speaker	VCR tapes
BRP 12VDC heterodyne box	VCR recorder head cleaner

2. Setup / Deployment Procedures

- a) Setup receiver and recording equipment per figure 3.
- b) Secure the crates and open them by removing the screws from along the upper edge of the long sides and along the top short ends as noted by the markings.
- c) Remove the crate tops and place alongside to use as working cradles.

- d) Remove the desired buoy and place it in the cradle with the side-mounted connectors facing upwards.
- e) Check the buoy's voltage by measuring pins 1 (ground) and 4 (+12VDC). The voltage should be at least 12.4VDC. Charge the buoy as necessary using the battery charger and buoy charger adapter cable.

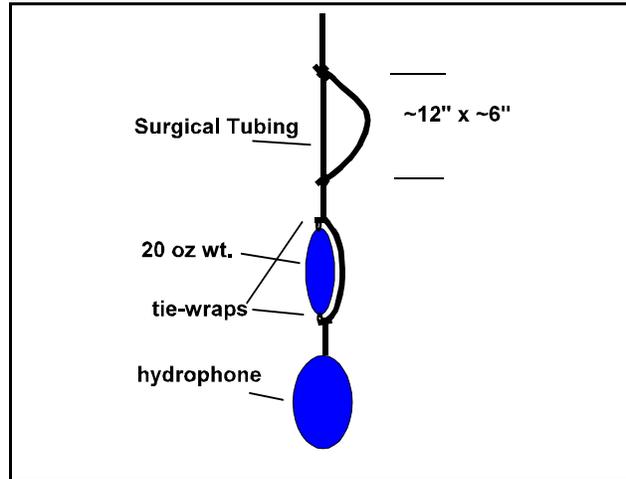


Figure 1. Hydrophone dynamic loading

- f) Remove the antenna and screw it onto the buoy's antenna mount. Plug in the antenna cable to the appropriate buoy connector and secure the connector's sleeve. Tie-wrap the antenna cable along the buoy mast, starting from above the connector. The antenna cable slack should be at the antenna base and free.
- g) Connect the hydrophone to the buoys bottom connector and secure its connector sleeve. Unravel the remaining hydrophone cable and drop it over board. Note that the hydrophone should be dynamically loaded as per figure 1.

- h) Secure the buoy tether line to the ship and clip the other end to the buoy's wire-rope bridle. Note that the tether line should include one or more 'sail buoys' per figure 2.

- i) Connect the power dongle to the applicable buoy connector and secure its sleeve. *The buoy is now live.*
- j) Slip the buoy into the water being careful to keep the connectors facing away from the side of the ship (or dock). Watch the hydrophone cable and the tether line to ensure neither gets tangled and to prevent unnecessary loading on the cables or connectors. *Note that the PVC connector protective extensions will not support a load and should not be used as handles!*

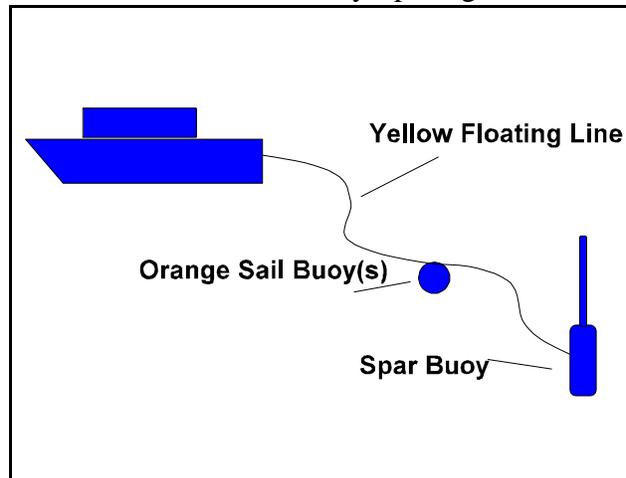


Figure 2. Buoy tether

3. Recovery and Stowage

- a) Pull in the buoy slowly using the tether line. Lift it from the water (by the tether and the antenna mast) and place it in the cradle. When lifting it from the water, do not use the

PVC connector protective shrouds and ensure the connectors themselves are facing away from the ship's (dock's) side.

- b) Pull up the hydrophone.
- c) Disconnect the power dongle / connector.
- d) Disconnect the antenna cable and remove the tie-wraps securing the cable. Then unscrew the antenna from its mount.
- e) Using the 'buoy wrench', remove the buoy's endcap and allow any water inside to drain.
- f) Rinse all equipment with fresh water, including inside the end of the buoy.
- g) Dry out the open section and then replace the endcap using fresh plumber's grease on the threads.
- h) Stow the buoy in its crate. If necessary, connect the charger (using the adapter cable) to the buoy to prepare it for the next usage.
- i) If preparing to ship, secure the cover with the screws in the reverse of the unpacking steps.

4. General Notes

The expected transmitting life of the buoy is 100 hours on a fresh battery. Charging of the battery should be on the 2-Amp setting for a minimum of 8 hours.

The so-called 'sail buoys' are an important addendum. Originally we believed fluorescent marking tape would aid in location of the spar-buoy. It did not. Additionally, to get the buoy away from the ship (to the extent of the tether line), a means of catching the wind was necessary. Standard orange inflated buoys (~2' diameter) accomplish both of these aspects. They should be tied approximately 25' from the spar buoy for maximum effectiveness.

Lastly, it is important to note that spar-buoys are not meant to be tethered to a fixed / anchored point. Deployed from a ship, both should be drifting. Deployed from shore, line should be continuously payed out.

Supplement A. Receive-End Equipment & Interconnections

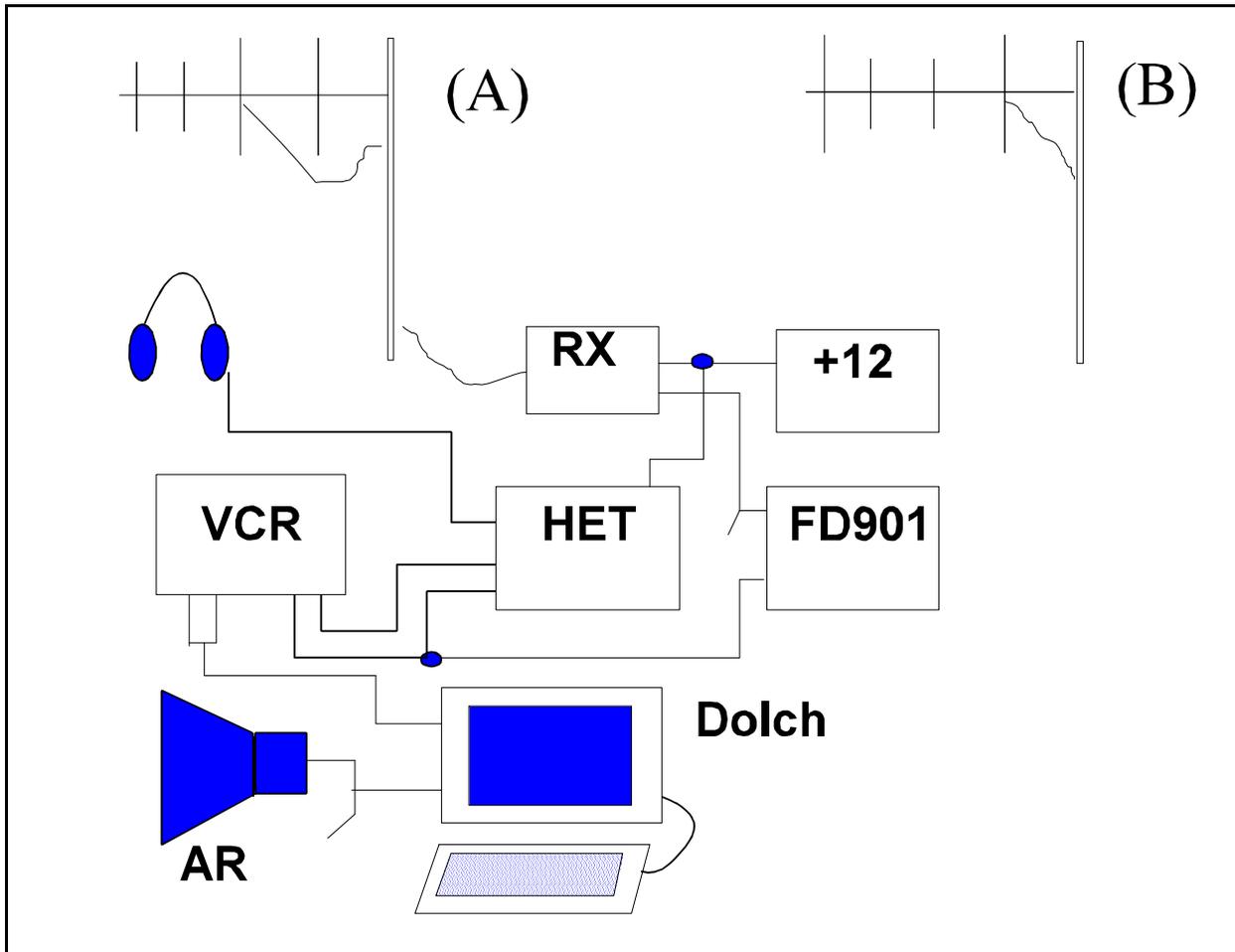


Figure 3. Receive station wiring

Antenna

Antenna orientation should be vertical (elements up and down) to reduce the effect of the ship's roll. Two methods of assembling the elements are shown. Configuration (A) is the normal method for a Yagi-style antenna, providing high gain and high directivity. Configuration (B) provides low gain but very broad (omni-directional) directivity and is used when the buoy will be moving around quite a bit. In addition, configuration (A) is necessary for distances 1km or greater, where (B) can only be used when the buoy is fairly close. It should also be noted that configuration (B) does not provide good channel separation when using multi-band receivers.

RX (Receiver)

The receiver is typically one of the L-tronics dual-band receivers. They operate on 12 VDC and output the signal directly on BNC cables.

FD901

This is a Frequency Devices (Model 901) Low-pass filter box. It is set nominally at 2KHz (or as applicable to your work), 0dB gain, and filter bypass OUT. The active receive channel feeds directly to this filter.

HET

This is a Cornell BRP Heterodyne unit, used to shift sub-audible sounds up by 400 Hz (e.g. for Blue, fin whales). The output from the FD901 is connected here AND to one of the VCR channels via a BNC 'T' connector with an RCA adapter for the HET connection. The Heterodyned output of this unit feeds the other VCR channel. Lastly, a pair of headphones are connected to provide a means of monitoring the heterodyned output.

VCR

The VCR is a standard Hi-Fi Stereo video cassette recorder, set to EP mode (L input). The purpose of using the VCR is that a single tape can hold 9 hours (T-180 style) allowing long-term recording by a single individual,

Dolch

The Dolch is a portable PC with a Turtle Beach Tahiti sound card installed and Sound Technology's SpectraPlus software running in real-time mode. This provides a means of monitoring the received signals for characteristic sonogram patterns inexpensively. The VCR line outputs are connected to the Dolch/sound card 'line-in' jack using a dual-RCA to 1/8" stereo multimedia cable. The same type of cable connects from the sound card's 'speaker' jack to the powered speaker.

AR

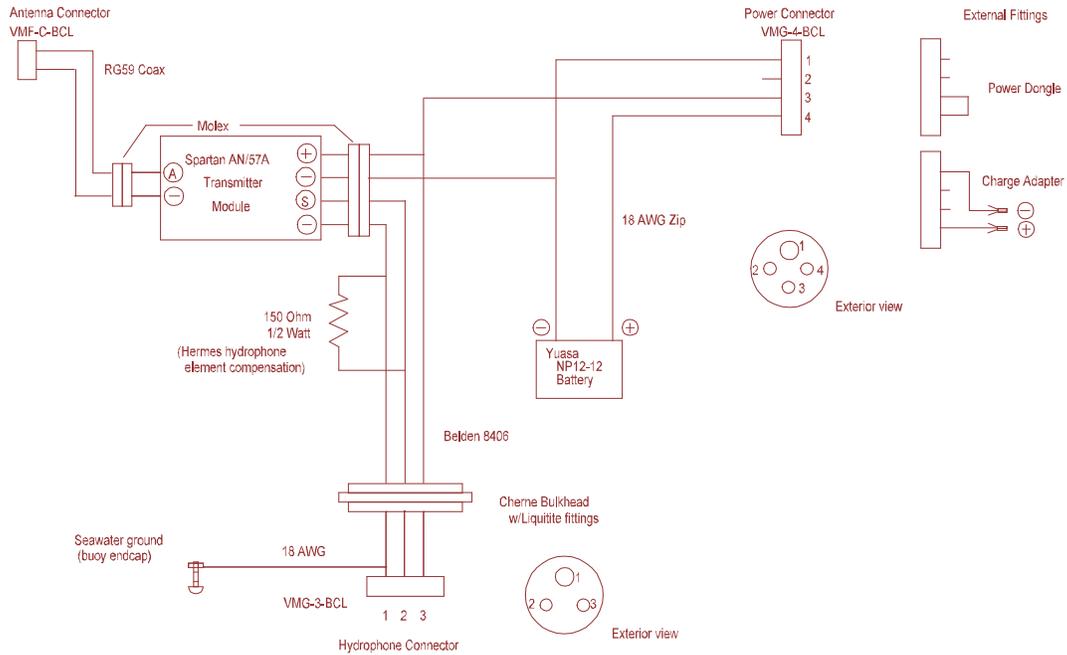
This is an Acoustic Research 'powered partner' speaker. It is driven by the Dolch/sound card combination to provide a means of monitoring the un-heterodyned sound being recorded.

+12

This is a MW122A or similar 2-amp regulated and filtered 12VDC power supply. It supplies the power for the receiver and the heterodyne units.

Supplement B. Wiring Diagram

The following figure contains the buoy's internal wiring diagram. It is presented here for monitoring voltages externally and for troubleshooting purposes.



NOTES:

- All wire groups are ~48"
- Buoy endcap is potted w/2130
- Connector cable color 1=W, 2=B, 3=G, 4=R
- Hydrophone cable W=sig, R=+, B/oraid=GND
- Molex connectors are 03-09-10XX series (+mates, pins)
- Transmitter configured per 'universal configuration'
- Water-block all cables!

Spar Buoy Wiring Diagram

Supplement C. Buoy Response Curve

On the page following is the response curve for the as-built system. This information is presented in order to help quantify the received levels.