

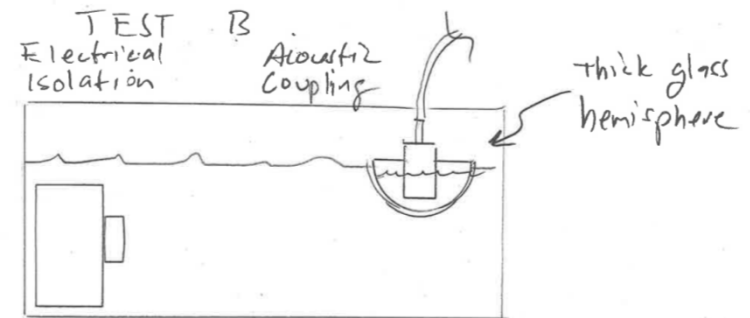
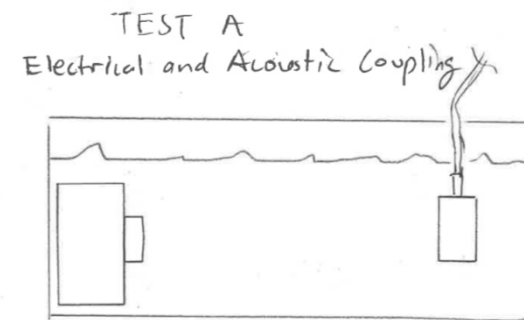
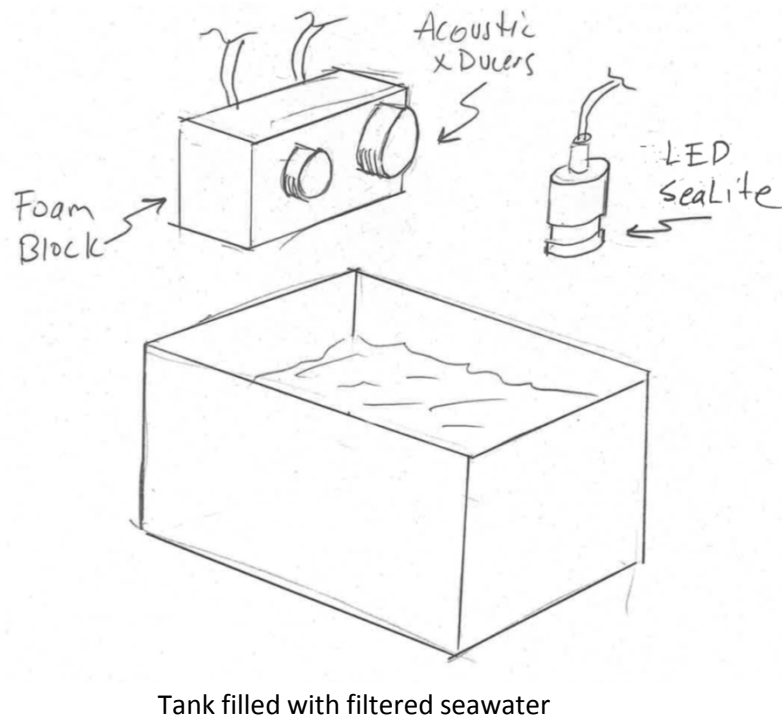
901807 Dorado BioAcoustics Noise Testing

14JAN19 MRC

Steps to Identify and Reduce Noise Interference from the Lighting System

1. Create a repeatable lab test setup and establish a quantified baseline measurement of the existing light head noise interference.
2. Determine the relative contribution of electrical vs acoustic noise.
3. Characterize the light head, measuring sources of noise including the dimming system.
4. Modify the light head to reduce the conducted and radiated noise.
5. Re-test the light under the same conditions as #1 above and quantify the results.

Mechanical Test Setup

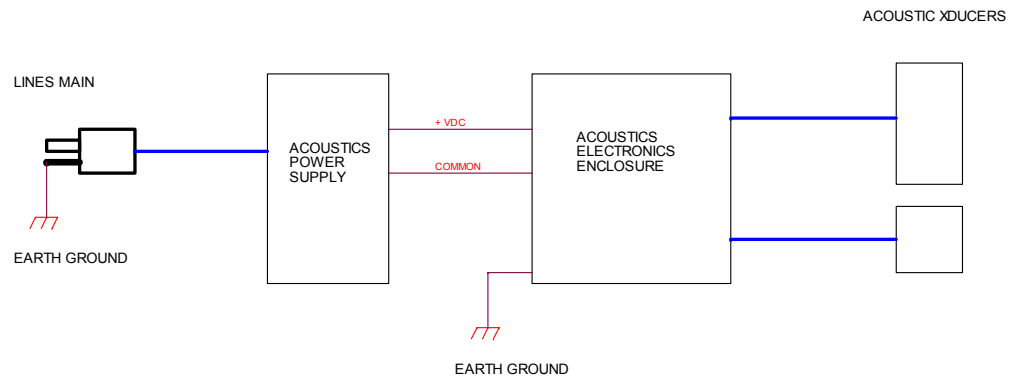


Thick glass hemisphere reduces capacitive coupling of electrical noise from light

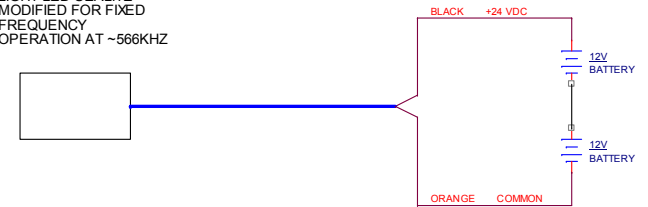
Electrical Test Setup

TEST SETUP #1

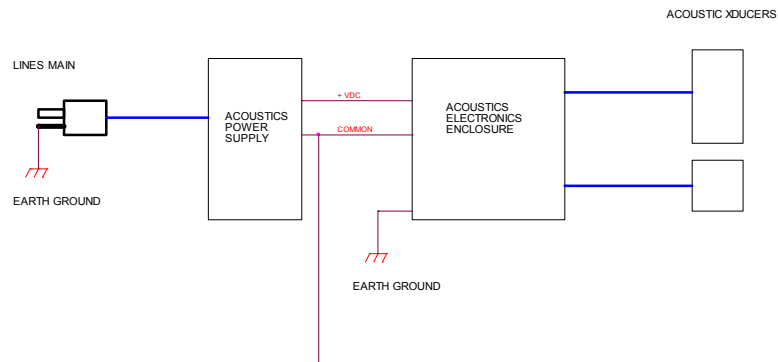
NOTE: THIS SET UP MOST ACCURATELY DUPLICATES THE AUV INSTALLATION WHICH HAS NO ELECTRICAL CONNECTION BETWEEN THE ACOUSTICS AND LIGHT/I2MAP ELECTRICAL SYSTEMS.



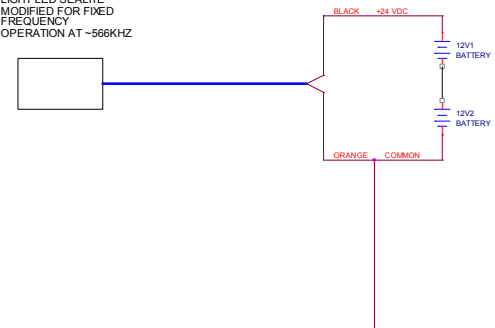
DEEPEA POWER &
LIGHT LED SEALITE
MODIFIED FOR FIXED
FREQUENCY
OPERATION AT ~566KHZ



TEST SETUP #2



DEEPEA POWER &
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MODIFIED FOR FIXED
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Notes:

- The initial assumption is that the light switching voltages are being capacitively coupled to the aluminum case and then radiating out seeking a path back to the light power conductors. This includes capacitively coupling along the way to the acoustic transducers and the transducer cabling.
- LED lights were originally delivered with an internal power switcher in spread spectrum mode. Very noisy on acoustic signal. Switcher was modified for constant frequency operation (measured at 566kHz). Fixed frequency reduced overall noise in acoustic band somewhat. Lights still have large amounts of noise showing up in acoustic signal (~20dB).
- The acoustic system is completely galvanically isolated from the AUV power bus and the i2MAP/Light system.
- The acoustic system as an upper cut-off at 433kHz.
- Numerous noise spikes occur in the acoustic spectrum in the 200-400kHz range. Possibly caused by beat frequencies between the 4 light heads used when in operation?

Possible Light Head Modifications (In order of difficulty)

1. Add bypass capacitor between LED light aluminum case and DC common.
2. Add common mode filter on power leads entering light head. Would force stray path to be through case and filter caps.
3. Add copper shielding between the light head power transistors and their heatsink and AC couple to power leads (Ed).
4. ??