

WHOI Micromodem-2 and Underwater Acoustic Networking Hardware

Lee Freitag, Jim Partan*, Keenan Ball, Sandipa Singh, Eric Gallimore, Peter Koski, Jon Shusta, Scott Hiland, Ian Vaughn, Tyler Andrade, Neil Forrester

Woods Hole Oceanographic Institution, Acoustic Communications Group

* Woods Hole Oceanographic Institution and University of Massachusetts-Amherst

We will present acoustic communication and networking hardware from the Acoustic Communications group at the Woods Hole Oceanographic Institution (WHOI). We are currently finishing the development of the Micromodem-2, and will present both Micromodem-1 and Micromodem-2 hardware at the workshop.

Compared with the Micromodem-1, the Micromodem-2 will have higher computational capability, more RAM and flash storage, lower hibernate power consumption, and lower detection power consumption (low-power listening). The analog front end can be configured in software to operate from bands with center frequencies from 1kHz up to over 125kHz, with programmable filters and gain. The increased memory and computational power, as well as an FPGA, will allow new communications modulation, algorithms, and coding to be ported more easily to the Micromodem. A high-precision, low-drift clock will aid in time synchronization and better assist navigation for autonomous underwater vehicles (AUVs). Various expansion headers will allow connections to future boards, including the future WHOI Optical Modem, being developed separately, as well as multiple Micromodem-2's, making the Micromodem-2 scalable for applications requiring high computational power.

In addition, the WHOI Acoustic Communications group also has developed a set of robust yet easily deployed buoys for acoustic networking experiments, which we will show as well.

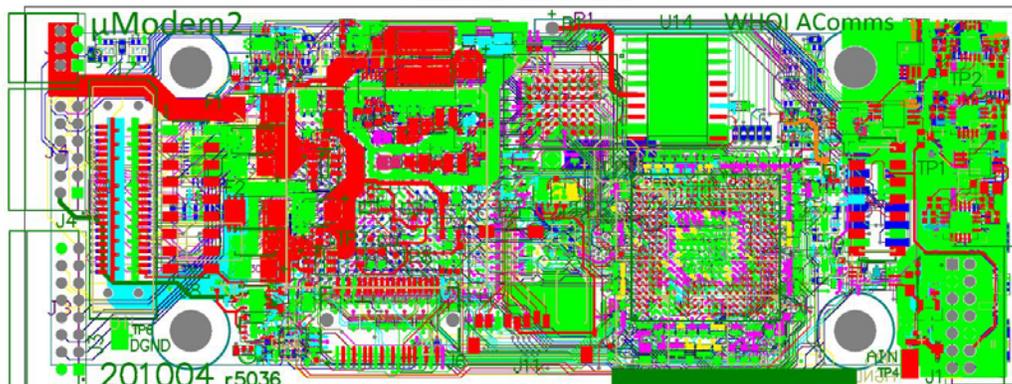


Figure 1: WHOI Micromodem-2 layout design, October 2009. Boards are currently in fabrication.

Figure 2: (Left) WHOI Micromodem-1.3 with power amplifier. (Right) Micromodem-1.3 with multi-channel analog input board and floating-point coprocessor. The Micromodem-2 has the same form-factor as the Micromodem-1.3, and has connectors compatible with the existing power amplifiers, multi-channel analog input boards, and floating-point coprocessors.

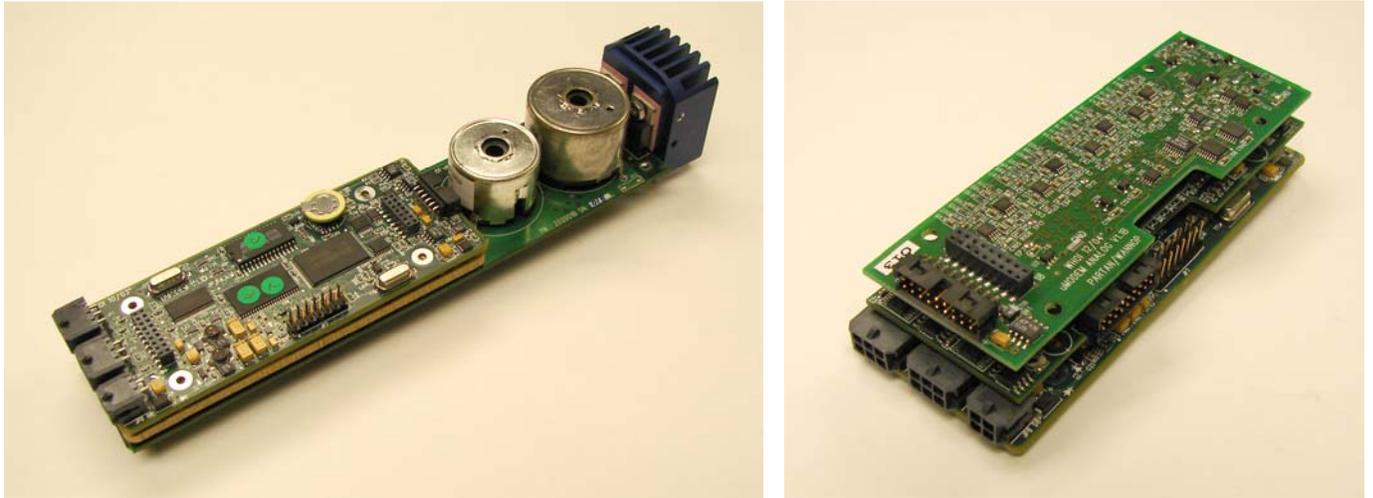


Figure 3: Buoys for rapid deployment of shallow-water underwater acoustic networks, developed by the WHOI Acoustic Communications group. The buoys include a Micromodem, transducer, four-element receive array, Freewave serial radio link, GPS, and Gumstix board.

