SUMMER 2006

CODAR CURRENTS

CODAR OCEAN SENSORS

In this Issue:

SMILE & PARTICIPATE IN CODAR PHOTO CONTEST

Send us your favorite SeaSonde hardware photo or data product image. If it makes it onto our home page web site, then you'll receive big kudos and a special gift!

Submit images electronically (as either jpg, gif, tiff or pict) by 30 September 2006. Higher resolution is preferred. Send to laura@codar.com, using PHOTO CONTEST for subject title. Be sure to include your name, e-mail and mailing address within the body of the e-mail. Note: Submission implies you are giving consent to CODAR for use of this material.

San Francisco Bay, California

IMPORTANT NOTE: After running Release4 installers, please check/change the Archivalist preferences before running the software. Default preferences will be installed the delete all but 7 days worth of CSS files!!

Software can be downloaded from http://SeaSonde.com using standard SeaSonde OS X login and password. Please call us if you have trouble logging in.

CODAR FALL 2006 Training Course

- Santa Cruz, CA

CODAR Ocean Sensors will be holding its semi-annual training course this fall in sunny California. The course will run from Tuesday 31 October at 9:30AM through Friday 3 November at 3:00PM in the La Feliz Room of Long Marine Laboratory (UCSC). Lodging is available at the Coast Hotel Santa Cruz (Link to hotel info). A happy hour gathering on Monday Oct. 30 at 6PM will take place at Olitas Cantina & Grill on the Santa Cruz Municipal Wharf/Pier.

Tuition is USD $750 per person, and includes course materials, 4 lunches, two dinners. New SeaSonde owners should contact Company for priority reservations.

A DRAFT Schedule is available on our website for download (PDF 34K).
Software sessions will focus on SeaSonde10 - Release 5 (For Intel and PPC Macs).

Seymour Discovery Center
& Long Marine Lab
in Santa Cruz, California.

Group Lodging:
The Coast Santa Cruz Hotel
175 West Cliff Drive, Santa Cruz, CA 95060 Phone: (831) 426-4330
Rooms have been reserved at the hotel, with check-in dates either Monday 30 October or Tuesday 31 October, and check-out on Friday 3 November.

Special Group Rate is USD $118 + tax per room per night.

For making hotel reservation, call the hotel Reservations Department at (831) 426-4330, or e-mail ressantacruz@coasthotelsusa.com, and be sure to reference "CODAR" in the e-mail subject title for receiving discounted rate.

Reservations MUST be made directly with hotel by 14 October 2006 to obtain discount rates. Rooms will not be held beyond that date.

The hotel is situated on the beach next to the Santa Cruz Beach Boardwalk and the Santa Cruz Municipal Wharf. Located just up the street is the Santa Cruz lighthouse and some of the best surfing spots in the country. Visit the hotel website for more information:
http://www.coasthotels.com/home/sites/santacruz/

COCMP Techs Convene for Advanced SeaSonde Training Course

HF radar technicians for the California Ocean Current Monitoring Program (COCMP) attended an Advanced HF Radar Training workshop August 23 - 24. The two-day workshop was the first of its kind and was organized by Regan Long of San Francisco State University. The specialized training provided COCMP technicians with advanced knowledge and skills to help them better support California's new HF radar network. The trainers included several CODAR staff members and researchers from COCMP participating institutions.

Topics included: Interference diagnosis and solutions, techniques for measuring and analyzing antenna patterns, transmit pattern procedures, using "SHARE" (CODAR's patented GPS synchronization method) and alternative processing options. The sessions were held at SFSU's Romberg Tiburon Center on San Francisco Bay.

State funding for a COCMP HF radar network was awarded in 2005 and provides for a continuous network of 40+ SeaSondes along the California coast. Thirteen new sites have been installed within the last year.

HF Radar Technicians with the California Coastal Ocean Currents Program pose with CODAR's new Long Range "TopHat" transmit antenna

What goes in should come out...

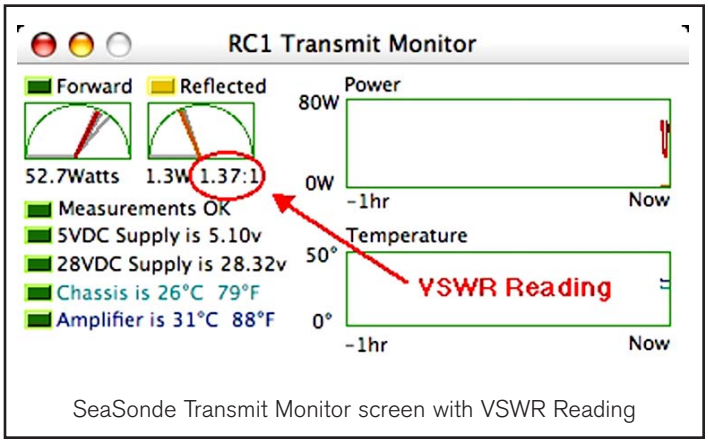
-- A solution for high VSWR on some 12MHz SeaSondes --

VSWR (voltage standing wave ratio) is a relative measure of forward power produced by the transmitter to the amount of power that is reflected back by the antenna. In an ideal world, we would like ALL of the power going into the transmit antenna to be radiated out to the sea and not reflected back to the transmitter where it will be lost in the process of generating unwanted heat. If you have one of our newer SeaSondes with a built-in wattmeter you can read the VSWR value directly from the meter (see image to the right). With dual needle external meters, there is a VSWR scale that can be read just below the point where the two needles intersect .

VSWR is read directly below the crossed needles on some analog wattmeters

How high is high?

There is no hard and fast rule for determining what a high VSWR reading is. Some SeaSondes have been operating with VSWR values > 3 for many years. The downside is that their range is compromised. As a general rule, if your VSWR reading is < 2.5 then you can disregard the solution below -- don't worry about it. If your VSWR is 2.5 to > 3 then you should consider a balun. For example, if VSWR is 3, then 75% of the power down the line goes into the antenna to be radiated, and 25% comes back at you; that may be marginally tolerable to some. If the VSWR rises to 5.8, then 50% gets radiated and 50% gets reflected; that's no good in anybody's book! A perfect antenna impedance match has a VSWR of 1; all power gets radiated and none reflected. This is rarely attainable but is worth shooting for.



SeaSonde Transmit Monitor screen with VSWR Reading

Why is high VSWR more common on a 12MHz SeaSonde than other systems?

You may be surprised to hear that our 12MHz SeaSonde transmit antennas are not optimally designed for the lowest VSWR. In theory, the two 8' horizontal whips should be twice as long as they are to optimize the antenna for the frequencies in that band. The physical limitations of two 16' horizontal side whips are obvious (the whips would droop conspicuously). This led us to a compromise design which works well in most cases and for most frequencies between 12-14MHz.

What is a balun?

(http://en.wikipedia.org/wiki/Balun)
You may have never heard the term balun, but I guarantee you've seen one. The little adapter gadget that comes with every TV set to adapt a ribbon cable to a coax is an impedance-matching balun. The term itself is a contraction of the words BALanced/UNbalanced. It has two functions: (1) To match like a transformer at terminals with two different impedances on either side, so that no reflections (high VSWR) will occur and (2) to ensure that radiating currents do not flow where they are not wanted, for example on the outside of a coaxial line that feeds a dipole; the coax is an unbalanced line while the dipole is a balanced device, and -- without a balun -- one will get the undesired current flowing on the outside of the coaxial cable braid.

What does our balun look like?

Balun's are usually made with transformer components... coils and the like. Our 12 MHz baluns consist of an air coil (potted in resin) which attaches to the base of the transmit head. A length of RG-58 wire connects to the air coil and then wraps around a stack of ferrites (metal rings) sealed in a PVC container. Tuning adjustments are made by changing the number of wraps of RG-58 wire through the stack of ferrites.

Sequence of balun installation

1) Disassemble transmit antenna to access the transmit feed (antenna head),

2) Thread the RG-58 cable segment through the mast and attach the potted air coil,

3) Attach the other end of the air coil to the antenna's transmit feed (antenna head),

4) Adjust the position of the ferrite stack on the cable to fine tune (minimize) your VSWR reading.

How do I know when to use a balun?

First check to be sure your system's transmit cables and antenna are in good condition. Then try adjusting the coil of RG-8 cable that the COS engineer attached to the antenna mast at installation time. Small adjustments to the tightness and orientation of the coil on the mast can have a significant effect on the antenna impedance match and VSWR reading. In a sense this coil also functions as a balun.

continued >>

Where do I get one?

If you still can't get your VSWR below 2.5 then contact us for a consultation at support@codar.com. Once we have determined that your high reflected power is a result of a mismatch for the frequency that you are using (and not antenna damage), we will be happy to provide you with a balun for your 12MHz system along with instructions on how to install it.

For additional information
please download PDF (204K): "Effects of VSWR"
from our website.

Tech's Corner

Care and Feeding of Your Loopstick Antenna Receive Box

Loopstick antennas are very robust and with the exception of lightening strikes and hurricanes they will often run for years without service. However, we highly recommend that you do a complete inspection of your receive antenna at least once per year. The best time to do this is right after the rainy season and if budget permits you should conduct an antenna pattern measurement as well. A sample annual maintenance checklist is included at the end of this article.

Antenna Failure

The most common cause of loopstick antenna failure is leakage of water through the lid gasket or o-ring seal on the monopole antenna connection on the lid. High winds can work the monopole fitting loose over time but operator error is the cause of leaks in the majority of cases.

Always use a second wrench when applying torque to unscrew the whip from the monopole fitting on the receive box lid. If this fitting is accidentally loosened it will also need to be tightened using two wrenches. The box lid will need to be removed in order to do this. Check the condition of the o-ring and that the fitting is tight whenever you have the opportunity (at least once a year).

ParkerOLube is a "silicone safe" lubricant for most types of o-rings

Use a non-silicone based lubricant for both the lid gasket and monopole o-ring. Silicone based lubricants will degrade the box lid gasket material over time and prevent proper sealing. Parker O-Lube is a good choice for this. Use Dow Corning DC-4 silicone grease for cable connectors, whip antennas and insulators.

Dow Corning DC4

Grooved O-ring with monopole fitting (Note the groove in the new style o-ring)

Use household silicone caulk to seal the gap

Remove Monopole Whip
(Use a second wrench with opposing force to prevent monopole fitting from unscrewing)

Apply only enough silicone caulk to fill the crack, then wipe the excess off with a damp paper towel before it dries.

Wipe off the excess caulk

When re-installing the lid after an inspection, tighten the four corner screws a little bit at a time as you would when tightening the lug nuts on your wheel after a tire change. Then inspect the gap clearance around the perimeter of the lid to be sure it has been tightened evenly. As an added measure of protection, you can apply a small bead of silicone bathtub caulk to the gap. Use just enough to seal the crack and then use a damp finger tip or damp paper towel to wipe off the excess before it dries. You don't want to force the caulk into the gasket seal but just seal the crack.

Note: we have recently switched to a "grooved" O-ring for the monopole fitting which has better sealing properties and is somewhat resistant to degradation by silicone grease. If you are planning to visit and service an older loopstick antenna and would like to replace the o-ring with the new style, please contact us at support@codar.com.

Sprung Helicoil®??:
Another common problem that can put you out of commission in a hurry is a damaged Helicoil® on one or more of the ground plane whips. A Helicoil® is a stainless steel insert that prevents electrolysis from occurring between dissimilar metals. It also protects against damage to threaded holes in soft metals such as aluminum. The SeaSonde receive antenna box has an aluminum ground plate attached to a non-metallic box. The corners of the plate are tapped with a 25/64' bit and a 3/8'-24 thread stainless steel Helicoil® is threaded into the hole with a special tool.

Damage to the Helicoil® can occur when the ground plane whips are cross-threaded into the Helicoil® or the leading edge of the Helicoil® is pulled out of the tapped hole. If this occurs, the damaged Helicoil® can be removed with a small pair of needle-nose pliers and the hole can be cleaned out with a 25/64" tap. A new Helicoil® can then be inserted IF you have the "special tool". The tool can be purchased for about $40 (www.toolsource.com, part #HEL5528-6) and is highly recommended as an addition to your field toolkit.

Helicoil kit

Helicoil Thread Insert and Tool

Inserting Helicoil

Annual Receive Antenna Checklist:

- At the back of the receiver check loop 1, loop 2 and monopole RG-58 cables for proper resistance. The loop resistances between center pin and coax shield should be ~ 1550 ohms (+/- 75 ohms) and the monopole should be open (OL) or an extremely high resistance. Re-check these values at the connectors on the base of the receive box after it is removed and the cables are disconnected.

- Check the "black arrow" bearing of the receive box and note it in your desktop computer log before taking the antenna down.

- Check the aluminum mast for signs of metal fatigue or electrolysis damage. Replace any damaged parts.

- Take down the receive antenna mast. Mark the orientation of the receive box bracket on the mast and remove the antenna box (whips can be left in place if you like).

- If your whips have ferrules (joints) check to see that the fiberglass is secure in the metal fittings and that you have continuity between the base of each whip and the metal ferrule piece holding the tip section of the whip.

- Remove the box lid and inspect for leakage around the seals or moisture on the top of the loopstick's printed circuit board.

- Note the orientation of loop 1 on the loopstick board in the box. Use a black felt pen make index marks on the board and box if necessary.

- Carefully remove the board and inspect for water or water damage at the base of the box. Clean, repair or replace connectors as needed.

- Re-assemble the receive box and inspect carefully.

- Re-check the cables with the loopstick disconnected. Check for shorts between the center conductor and shielding on all three cables. Then short the center conductor to the shielding and measure the resistance through the center conductor and back along the shielding. This should be a very low resistance value.

- Re-assemble the receive antenna with the black arrow pointing in the direction that it was for your original antenna pattern measurement. Secure the mast screws at the plastic coupler with a couple of wraps of electrical tape over them. (if the screws fall out, the antenna can rotate and your bearing will be incorrect). If you plan re-do your antenna pattern you can reset the loop 1 bearing in the RadialSiteSetup program and use ideal radials until your new pattern file is created.

- At the receiver, re-check the settings for your loop 1 bearing (black arrow magnetic bearing converted to loop 1 True). Wait for at least one full CSS file and inspect to see that the noise floor and S/N values are within normal limits.

Take precautions now! "This could happen to you!!" Go to our website to downlaod the QuickTime movie - "Receive_box_trouble.mov"

If you have any questions, please email us support@codar.com

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