



SeaSonde® Remote Unit
Operator's Manual
SSRS-100 Product Series

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SeaSonde Product Overview

System Description

The SeaSonde® is a simplified, compact oceanographic Doppler radar system for use in coastal ocean observing systems. A network of two or more units, physically separated by tens of kilometers along the coast, can combine data to produce two-dimensional surface current maps. In some situations, measurements of wind direction, ocean surface waves and tsunamis can be made as well. The surface current maps are the primary data product and are used by ocean scientists for a variety of research topics and by organizations like the National Oceanic and Atmospheric Administration (NOAA) and the US Coast Guard (USCG) for applications such as Search & Rescue and Spill Response.

Near real-time surface current data for the U.S. can be accessed at:

<https://hfradar.ndbc.noaa.gov>

Introductory videos on oceanographic radar applications can be found at the following URLs:

Search and Rescue: <https://youtu.be/9A9LXT2cHZM>

Spill Response: <https://youtu.be/li83ob2cwhE>

The SeaSonde transmits a linear FM pulsed chirp with a duty cycle of 50% or less over tens to hundreds of kHz, depending on the licensed bandwidth, with a center frequency in the HF or lower VHF frequency bands, between 4 & 50 MHz. Typically, SeaSondes are licensed to sweep over a frequency range that corresponds with all or part of one of the ITU Bands listed above, with radiated power up to 80 Watts peak and 40 Watts average. Patented high precision GPS-assisted sweep timing allows multiple SeaSondes to transmit simultaneously within the same frequency range without interference to each other and without data acquisition interruption.

Frequency Allocation

Frequency bands defined by the International Telecommunications Union (ITU) for use by oceanographic radars are listed below.

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ITU Ocean Radar Frequency Bands (MHz)	
4.438 - 4.488	26.200 - 26.350 ^a
5.250 - 5.275	26.200 - 26.420 ^b
9.305 - 9.355 ^a	39.000 - 39.500 ^a
13.450 - 13.550	41.015 - 41.665 ^c
16.100 - 16.200	42.000 - 42.500 ^d
24.450 - 24.600 ^a	43.350 - 44.000 ^c
24.450 - 24.650 ^b	
<p>a – Regions 1 & 3 only b – Region 2 only c – U.S. and South Korea only d – Region 1 only</p>	

System Selection Considerations

<p>Step 1: First choose a specific operating frequency between 4-50 MHz and find applicable column (at right) the selected frequency falls inside. Then select from the configurations options below.</p>		<p>Frequency Band (MHz) Select applicable column below</p>		
<p>"Std": option already included as part of standard configuration "N/C": option available at no extra charge "Opt. Add-On": option available for a fee in addition to the base price Grey boxes indicate option not available.</p>		>20-50	11-20	4 - <11
↓ Configuration Options ↓				
<p>Power Supply (select one)</p>	110 V (AC)	Std	Std	Std
	220 V (AC)	N/C	N/C	N/C
	24 V (DC)	Opt. Add-On	Opt. Add-On	Opt. Add-On
	Low Power Transceiver (only available <27 MHz)	Opt. Add-On	Opt. Add-On	Opt. Add-On
<p>Frequency Modulation Multiplexing (SHARE) (single-use license)</p>		Opt. Add-On	Std	Std
<p>AutoAPM Kit (single-use license)</p>		Opt. Add-On	Opt. Add-On	Opt. Add-On

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Multi-Static Data Processing Software Package (single-use license)			Opt. Add-On	Opt. Add-On	Opt. Add-On
Tsunami Detection Software Package (single-use license)			Opt. Add-On	Opt. Add-On	Opt. Add-On
Vessel (Ship) Detection Software Package (single-use license)			Opt. Add-On	Opt. Add-On	Opt. Add-On
Chassis & Antenna Configuration (select one)	Tx & Rx Antennas Separate	Single Transmit Antenna	N/C	Std	Std
		Twin Transmit Antennas		Opt. Add-On	Opt. Add-On
		Dual-Transmitter w/ Twin Tx Antennas (not presently optional w/Low Power Transceiver)			Opt. Add-On
	Tx & Rx Antennas Combined		Std	Opt. Add-On	Opt. Add-On
Extended Lightning Protection Kit			Opt. Add-On	Opt. Add-On	Opt. Add-On
Antenna Base Hinge Assembly (compatible only with dome-style antennas & 5 MHz TX antennas)			Opt. Add-On	Opt. Add-On	Opt. Add-On

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Dome Antenna Guy Rope Holder (rope included)			Opt. Add-On	Opt. Add-On	Opt. Add-On
Dome Antenna Guy Rope Holder (rope NOT included)			Opt. Add-On	Opt. Add-On	Opt. Add-On
Tx/Rx Cable Combine Tx/Rx Antenna Only (select one)	1 X RG-8 2 X RG-58	75 meters	Std	N/C	N/C
		price per meter (beyond 75m)	Opt. Add-On	Opt. Add-On	Opt. Add-On
Rx Cable Separate Antennas Only (select one)	4 X RG-58	100 meters	N/C	Std	Std
		custom length >100m	Opt. Add-On	Opt. Add-On	Opt. Add-On
	3 X RG-8	100 meters	Opt. Add-On	Opt. Add-On	Opt. Add-On
		custom length >100m	Opt. Add-On	Opt. Add-On	Opt. Add-On
Tx Cable Separate Antennas Only (select one)	1 X RG-8	75 meters	N/C	Std	Std
		custom length >75m	Opt. Add-On	Opt. Add-On	Opt. Add-On
Smart Uninterruptable Power Supply (UPS)			Opt. Add-On	Opt. Add-On	Opt. Add-On

External Hard Drive	Opt. Add-On	Opt. Add-On	Opt. Add-On
Electronics Enclosure (ENC36)	Opt. Add-On	Opt. Add-On	Opt. Add-On
Electronics Rack	Opt. Add-On	Opt. Add-On	Opt. Add-On
BackUp Battery Bank	Opt. Add-On	Opt. Add-On	Opt. Add-On
UPS Power Conditioning Unit with Battery Array and Rack	Opt. Add-On	Opt. Add-On	Opt. Add-On
24 V(DC) to AC converter (choose one of either 110V or 220V)	Opt. Add-On	Opt. Add-On	Opt. Add-On
Mfr. Limited Warranty Extension (extending warranty beyond first year)	Opt. Add-On	Opt. Add-On	Opt. Add-On
Technical Support Service Contract (enquire on the variety available)	Opt. Add-On	Opt. Add-On	Opt. Add-On

Site Planning

Antennas & Cables

The following are requirements for siting SeaSonde antennas to operate at maximum performance. It is not always possible to meet the requirements listed below. For example, a site may not be as close to the water as possible in order to avoid objects between the antenna and the water. Advanced planning and site scouting greatly benefit antenna siting. A temporary setup is ALWAYS recommended in order to evaluate the SeaSonde's performance at any given location.

Summary of planning tasks for siting antennas

- Plan antenna location with respect to receive antenna and other vertical structures.
- Plan cable routes between SeaSonde transmitter and transmit antenna making sure that the cable is long enough to reach at both ends.
- Plan antenna support.
- Plan to protect against animal damage.
- Plan to protect area around antenna against tampering and vandalism.

Distance Between Antennas

The following distances are the minimum allowable between SeaSonde transmit and receive antennas. (Not applicable to combined transmit/receive antennas.)

SeaSonde frequency	Min Antenna Separation
4.3–9.5 MHz	60 meters
11.5–17.0 MHz	25 meters
24.0–27.0 MHz	12 meters
39.0–44.0 MHz	6 meters

Distance to Water

- Locate antennas as close to the water's edge as possible. The following distances are the maximum allowable between a SeaSonde antenna and water:

SeaSonde Frequency	Max Distance to Water
4.3–9.5 MHz	250 meters
11.5–17.0 MHz	150 meters
24.0–27.0 MHz	150 meters
39.0–44.0 MHz	100 meters

Terrain

- Antennas should be located on flat or gently sloping land.
- Avoid locating antennas directly in front of steep hills or cliffs.

Note: Locating antennas on top of a hill or cliff is acceptable as long as the steep section is below the antennas.

- Avoid terrain that rises between the antenna and the water, like rocks, points or cliffs.

Objects Near Antennas

The following "clear area" should be maintained. **Distances are minimums.** The farther away any electrically conductive object is from an antenna, the better.

- Ensure that above-ground objects are at least five times their height from the antenna location. The taller the object, the farther away it must be.

Note:

For example, a six-meter-tall light pole should be at least

*6 * 5 = 30 meters away from an antenna.*

Electrically conductive objects (metal poles, wires, etc.) affect performance more than non-conductive.

- Ensure that no electric power lines or transformers are within 100 meters of antennas. Avoid high power electric lines. Electric power lines cause radio interference.

Underground Objects

SeaSonde performance is adversely affected by nearby underground electrical conductors, such as metal pipes, steel reinforcement bars or cables.

- Ensure that there are no long (any length greater than one meter) underground electrical conductors within a 100-meter-radius and 10-meter-deep area below the antenna base.
- Ensure that there are no shorter (any length less than one meter) underground electrical conductors within a four-meter radius below the antenna base.

Note: Underground non-conductors do not affect SeaSonde performance.

Objects Between Antennas and Water

- Avoid objects that rise between the antenna and the water, like buildings or metal fences.

Objects That Affect Antenna Performance

The following is a list of common objects that affect antenna performance. These kinds of objects should be kept outside the clear areas defined above.

Above-ground objects:

- metal railings or fences*
- buildings
- rocks
- cliff or steep slope BEHIND antennas
- non-SeaSonde antennas
- towers
- overhead cables
- large metal objects
- trees
- electric power lines, especially high voltage

Note: Mounting antennas on top of metal fences or light poles can help to mitigate the effects of these objects if there is not sufficient clearance.

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Below-ground objects:

- metal pipes
- cables
- steel reinforcement bars

Radio Transmitters

- Avoid any non-SeaSonde transmitters operating in the area, including commercial navigation radars.

Radio Interference Environment

Please contact CODAR customer support at support@codar.com for additional information.

Antenna Support

- Plan how to support the antenna.

Antenna support depends on the characteristics of the site. If the site's soil can be excavated, it is common to use a reinforced-concrete in-ground pier. Plans for such a pier are included in this guide. A drawing of the antenna feed is also included and shows the mounting bolt hole pattern. For temporary or short-term installations, the antenna can be bolted to a sturdy plywood base (not supplied), which sits on the ground, and stabilized with guy ropes. The base should be 0.75–1 meters in diameter or square, with four holes drilled in the center and matching the antenna feed bolt hole pattern. A hinged base-plate at the base of the mast is highly recommended for convenience of installation and maintenance.

- Decide whether guy ropes will be needed.

If the support is very stable (for example, a concrete pier), guy ropes are not needed. Guy ropes should be made of *non-conductive* material. **Do not use metal guy wire or cable.** For long-term installations, Kevlar rope with UV-resistant outer braid is recommended. To reduce cost, nylon can be used for short-term installations. If guy ropes are needed, plan how they will be anchored. Simple or cork screw stakes are commonly used. Metal stakes can be used. Determine the required length. Guy ropes and stakes are not provided with the transmit antenna and must be procured separately.

Cable Protection

Animals (rodents in particular) can gnaw through cables. Plan to avoid this potential damage. Covering the cable with plastic split loom tubing (1 inch nominal size) is an inexpensive way to protect the cable. Running the cable through conduit is also an option. Conduit can be buried. Schedule 40 PVC pipe can be used as conduit.

Security and Safety

People should not touch the antenna or risk tripping over the wires on the ground that radiate in a circle from the base of the antenna. Use a non-metallic fence, markers and/or signage, especially if the site is accessible to the public. To comply with RF exposure requirements the antenna must be installed to provide a minimum separation distance from persons as shown in the table below based on the operating frequency of the system:

Operating Frequency (MHz)	Minimum Separation Distance (m)
4.48	10.66
5.25	
13.45	3.55
16.10	
24.45	2.30
26.20	
41.00	2.60
43.35	

Electronics Housing

Dimensions

SeaSonde electronics consist of one each of a transmit and receive chassis. Both are rack-mountable and designed to fit industry standard 19 inch (48 cm) wide racks. Each chassis is 3U (13.335 cm) tall and requires a depth of 56 cm including space for cable connections.

A SeaSonde also comes with a computer, keyboard, mouse and monitor. Space needs to be provided for these items. Unless specified otherwise, a Mac Mini computer is provided: (5.08H x 16.51W x 16.51D cm). Typically, a 17" monitor is provided but needs only be connected during user interaction.

Additional room in the rack should be budgeted for the recommended UPS and extra battery banks or other peripherals. When installed, the transmitter and receiver chassis should be positioned such that an operator can easily disconnect it from the power source.

Climate Control

Depending on the transmit power, the SeaSonde will generate approximately **1000 BTU per hour**. This heat needs to be dissipated or displaced as well as any additional heat from other peripherals (DSL /cable modems, etc.) or external sources, such as the ambient air or solar radiation. Ambient air temperature inside the electronics enclosure should be kept at / below 95° F (35° C) if possible. If ambient air temperature is consistently higher, the performance and life of your system may be degraded and manufacturer's warranty will be voided.

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Also, a closed system should be used to isolate SeaSonde electronics from the salt air found near the coast. Additionally, if air conditioning is installed on the electronics rack within an exterior housing, be sure to vent warm air exhaust outside or into a room with climate control or volume of sufficient size to prevent overheating.

Power

SeaSondes are delivered with one of three possible input voltages: 240VAC, 120VAC or 24VDC. Be sure your SeaSonde electronics match your power source's voltage. Clean reliable power is a necessity for SeaSonde operation. CODAR recommends using an Uninterruptible Power Supply in line with the computer and electronics. This will protect against unstable power and brownouts. The AC SeaSonde's power consumption is approximately 650 W continuous. Air conditioning and peripheral devices will add to this amount.

Communications

Robust communications are an essential part of maintaining a SeaSonde® network. A fast and reliable data connection will allow you to transfer data files, browse the remote file system, run commands and view/control the remote screen. This will reduce downtime by allowing the operator to diagnose and fix problems sooner or even prevent problems before they affect data acquisition. When working with Radio Frequency (RF) signals, the ability to view real-time spectral graphs is invaluable for diagnosing problems and identifying solutions. Lastly, it is the responsible thing to do because most frequency-granting authorities require the ability to shutdown broadcast equipment immediately, if necessary. As much as reliable power and good environmental controls, communications should be considered and planned well ahead of SeaSonde installation.

With the above ideas in mind, remember the following guiding principles when choosing your SeaSonde's communications solution:

- Data transfer should be robust with minimal dropouts or downtime
- The **upload** bandwidth should be 256 kbit/s or greater for screen control
- You should be able to find the SeaSonde computer on the internet and initiate an *incoming* connection at a moment's notice

The SeaSonde computer allows for data transfer to the SeaSonde combine server or any file server that the user chooses. The best options for data transfer are SSH and Timbuktu Pro transfers, which are scheduled through Unix cron commands. The following should be considered when planning and implementing a communications solution for your SeaSonde remote unit.

Public IP Address

Internet Protocol (IP) addresses are the way devices find each other over the network. When making a decision about which method to use for communications, make sure that the IP address assigned to your computer is not private. Private IP addresses are reserved for devices behind routers that share a single public IP address using network address translation (NAT). They will match one of the following patterns:

192.168.x.x 10.x.x.x 172.16-31.x.x

If the SeaSonde Computer is assigned an IP address matching one of these patterns, then you will not be able to access it remotely unless you are able to implement port forwarding. Traffic on port 22 (SSH) and/or port 407 (Timbuktu Pro®) that arrives at the public address is forwarded to the SeaSonde computer's private address. Not all ISPs are willing or able to provide this service.

Static IP Address

In addition to having a public IP address, it is also important to have a static IP address that you can always rely upon to contact your SeaSonde remote unit computer. A static IP address is one that will only be assigned to your computer and will not change, even when the computer is rebooted or reconnects to the internet. If you cannot get a static IP address, use one of these solutions:

Dynamic DNS Service

Domain Name System (DNS) matches name internet addresses like *codar.com* to numeric addresses like 72.41.175.235. Dynamic DNS service allows you to choose a name address like *mysitename.dyndns.com* and then dynamically match it to your computer's numeric address, even if that numeric address changes. Software runs on the remote computer to keep the match up to date. There are several of these services available online that support Mac OS X. The ones most often used by CODAR customers are www.dyndns.com and www.noip.com. Typically, you sign up for an account using your email address. For each account/email address, you may get 1-5 dynamic name IP addresses for free. You can get more per account/email address with a monthly fee. There is rarely more than a 30 minute lag between the IP address being updated and the match being updated. All TCP/IP protocols can use Dynamic DNS.

Timbuktu IP Locator

Timbuktu (included on every radial SeaSonde computer) has a feature similar to dynamic DNS service whereby you supply your email address to the Timbuktu software on the SeaSonde computer and it reports the public ip with your email address to a Netopia server. The service is included with the software license and does not interfere with dynamic DNS services but you can only use each email address once per computer and it only works with the Timbuktu remote control and file transfer software (no SSH, rsync, FTP, etc.). This is a great secondary method in case dynamic DNS fails.

Push Data

If your remote unit computers do not have static IP addresses and the combine site has a fixed, public IP address, then the preferred solution is to set up your remote machines to "push" data back to the central site. This has the advantage that the remote machine IP address can change without interrupting data collection. This can be done in addition to all of the above methods. The disadvantage is that you have to dig through log files to find out the current IP addresses of the radial site computers.

Firewalls

If your ISP has a firewall in place, be sure to have them open at least the following ports to the SeaSonde computer:

<u>Protocol</u>	<u>Port</u>
<i>Secure SHell (SSH)</i>	22
<i>Timbuktu Pro</i>	407
<i>Apple Remote Desktop</i>	3283, 5900
<i>RadialWebServer</i>	8240 (can be changed)

Assembling the Antennas

Inventory and Preparations

If the installation site is remote, a missing part or tool will delay the installation. Ensure that you have all the required parts, tools and support equipment before departure. Checklists are provided in this guide.

Pack a clean work surface in your field kit. A piece of cardboard, paper, or cloth will work. The surface will be placed under threaded antenna parts to keep them clean. In addition, many small parts are used to assemble the antenna. The small parts are difficult to find if dropped in grass or dirt. A surface under the work area makes it easy to find dropped items.

Include spare fasteners in your field kit, in case any are lost. Spare fasteners must be made of the material specified in the checklists. In particular, do not replace stainless steel parts with non-stainless steel.

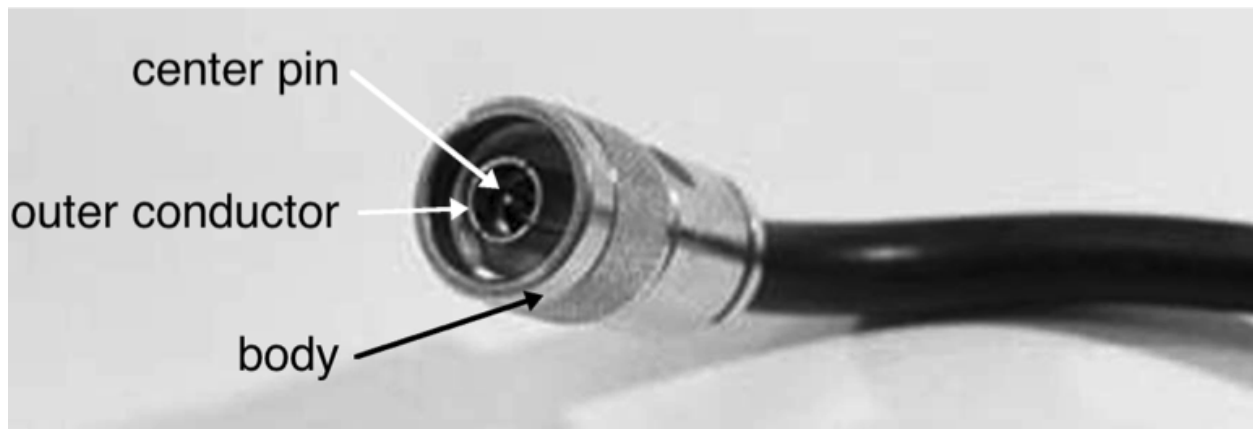
Inspection

Summary procedure:

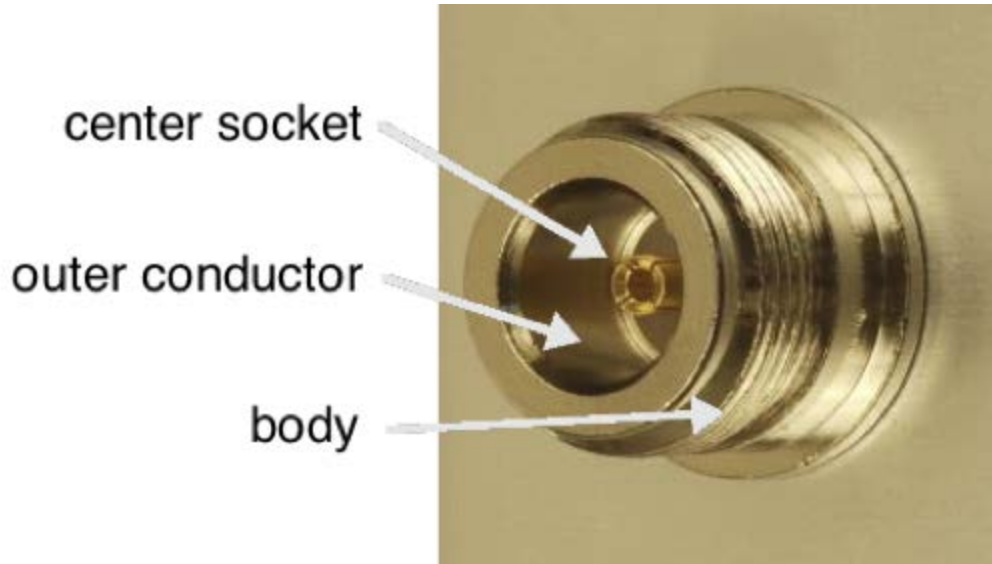
- Inspect physical condition.
- Perform electrical continuity checks.

A damaged or malfunctioning part will delay installation. The following inspections and tests should be performed prior to departure to a remote installation site.

The transmit cable and corresponding connectors on the antenna and transmitter are Type N coaxial connectors. Each connector has two conductors, a central pin or socket and an outer hollow cylinder. The conductors are enclosed by a threaded metal body.



Type N Connector Plug



Type N Connector Socket

Inspect the physical condition of all electrical connectors.

- Connector bodies should not be bent or damaged.
- Connectors should be securely attached to cables.
- Connector pins, sockets and outer conductors should not be bent or loose.
- Center pins and outer conductors should not extend beyond connector bodies.
- Center pin should sit flat with the outer conductor. Should not be recessed in too much(not more than 1mm) or extend beyond the outer conductor.

Perform electrical continuity checks with an ohmmeter or multimeter. Remember, zero or low resistance indicates continuity, the ability to conduct electricity. Infinite or large resistance indicates no continuity. Some meters have a continuity test mode.

Continuity checks for the spooled cable are performed easily while the cable is on the spool.

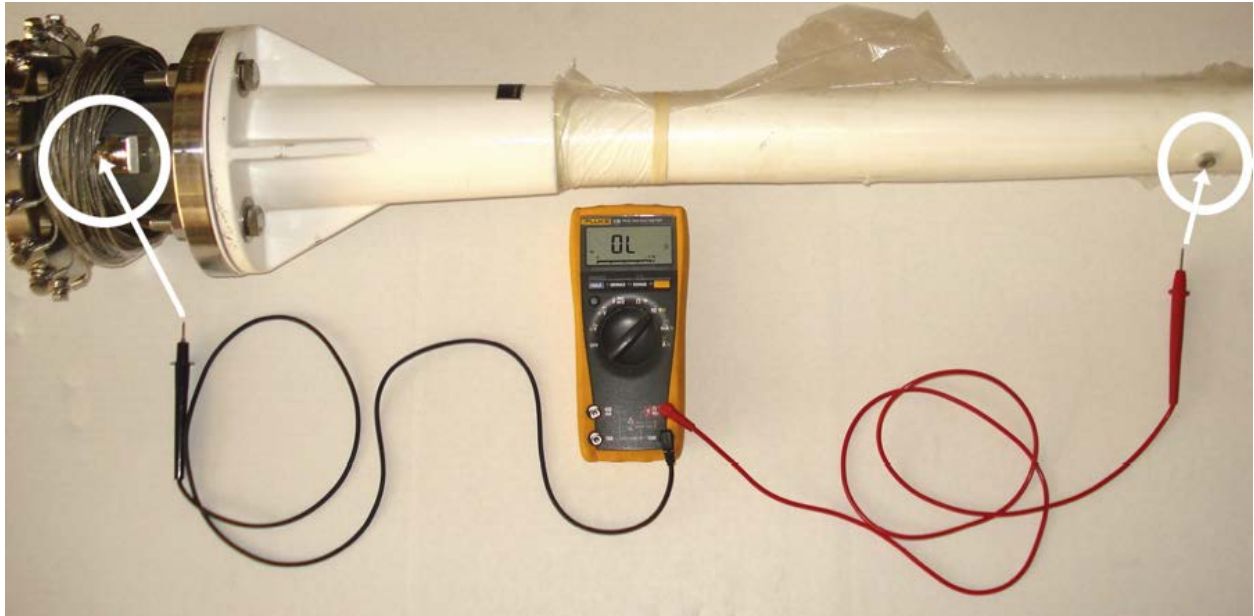
- On the spooled transmit and receive cables, measure continuity between the connector center pins at the two ends of the cable. There should be continuity (very low or zero resistance).
- On the spooled transmit and receive cables, measure continuity between the connector outer conductors at the two ends of the cable. There should be continuity.
- On the spooled transmit and receive cables, measure the continuity between a connector center pin and the outer conductor of the same connector. There should be no continuity (very high or infinite resistance). Repeat for the antenna cable connector at the other end of the cable.

Transmit Antenna Check (Long Range only)

- A lightning arrester with a Type N socket connector is mounted on the spool-shaped ground-plane feed subassembly, attached to the lower antenna section. Measure the resistance between the center socket of the connector and the lightning arrester housing. Be careful. Do not bend or damage the center socket when measuring. There should be no continuity.
- There is an exposed metal fitting on the lower antenna section, 0.75 meters above the base. Measure the resistance between the center socket of the lightning arrester connector and the metal fitting. There should

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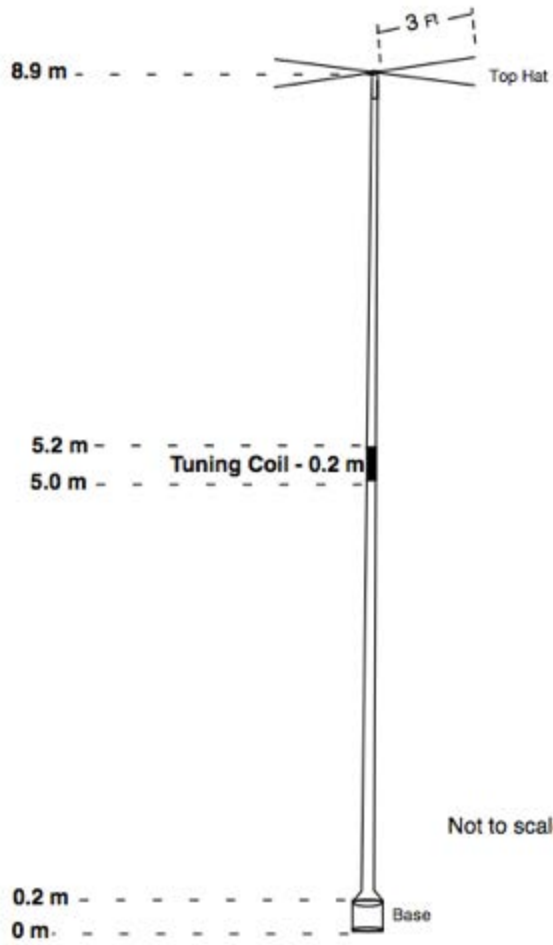
be continuity. (There is an epoxy seal opposite the metal fitting. Be careful. Do not remove or damage the seal.)



Transmit Only Antennas

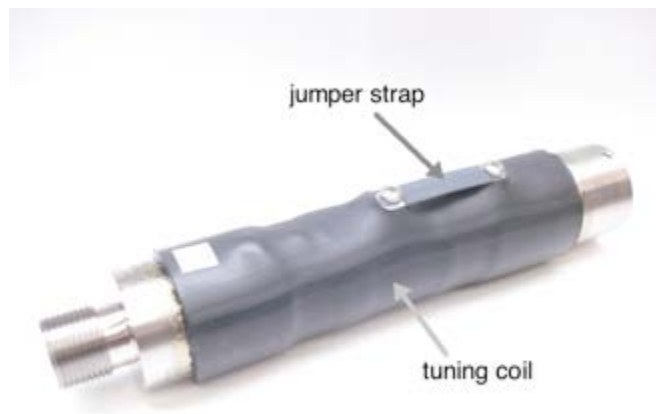
5 MHz Transmit Antenna

When assembled and raised, the long range transmit antenna is approximately 8.9 meters (29.2 feet) tall and weighs approximately 45 kilograms (100 pounds). The antenna assembly consists of two long sections with a tuning coil connecting them. A “top hat” adapter is mounted at the top of the antenna assembly. Eight ground plane wires, 7 meters long, are connected to the base and form a circle on the ground.



Tuning Coil Jumper Strap

The tuning coil is shipped with a metal jumper strap installed. If you plan to transmit at a frequency greater than 4.6 MHz, leave the jumper strap installed. If you plan to transmit at a frequency less than or equal to 4.6 MHz, the jumper strap should be removed.



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The tuning coil jumper strap is held in place by screws and star washers at its upper and lower ends. To remove the jumper strap:

- Loosen, but do not remove, the lower screw (nearest the socket end of the tuning coil).
- Remove the upper retaining screw (nearest the exterior-threaded end of the tuning coil).
- Rotate the strap 180 degrees around the lower screw.
- Replace and tighten the upper screw and star washer. Tighten enough so that the screw stays in place. Do not over tighten.
- Tighten the lower screw enough so the strap does not move. Do not over tighten.

Installation

A crew of at least three strong people is needed to raise the antenna.

Transport all the parts and tools to the installation site.

Installing Cable

Antenna Parts Checklist

Parts marked "not supplied" are not supplied by CODAR and must be procured from other sources.

Note: many parts are pre-assembled. For example, the antenna feed is completely assembled and mated to the lower antenna section.

Check	Qty	Description
		UPPER ANTENNA SECTION PARTS
	1	transmit antenna, upper section
	2	set screw, cup point, 10-32 x 3/8", 3/32" hex socket, stainless steel
		LOWER ANTENNA SECTION PARTS (The fasteners and gasket listed mate the lower antenna section to the antenna feed subassembly.)
	1	transmit antenna, lower section
	4	cap bolt (full thread), 1/2-13 x 2-3/4", stainless steel
	8	flat washer, 1/2", stainless steel
	4	lock washer, 1/2", stainless steel
	4	nut, 1/2-13, stainless steel
	1	(optional), teflon gasket (Gasket goes between lower antenna section and antenna feed.)

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ANTENNA FEED PARTS		
1		spool-shaped base, stainless steel
9		ground plane wires, 25 feet long, stainless steel
9		bolt, 1/4-20 x 3/8", stainless steel (fastens ground plane wire to antenna feed)
9		lock washer, 1/4" (on ground plane wire bolt)
9		flat washer, 1/4" (on ground plane wire bolt)
1		antenna feed connector, Type N, attached to base
1		lightning arrester with Type N connector, attached to antenna feed connector
TUNING COIL ASSEMBLY PARTS		
1		tuning coil
1		tuning coil jumper strap, stainless steel, with black shrink tube insulation
2		screw, phillips head, 10-32 x 1/4", stainless steel
2		internal star washer, #10, stainless steel
2		set screw, cup point, 10-32 x 3/8", 3/32" hex socket, stainless steel
TOP HAT ASSEMBLY PARTS		
1		top hat adapter, stainless steel sleeve
4		antenna element, 0.062" diameter, 3 feet long, titanium alloy (6 AL/4V ELI)
1		retaining washer, 1" outside diameter, with five holes
4		cap screw, 8-32 x 7/16", 9/64" hex socket, stainless steel
4		internal star washer, #8

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	3	set screw, cup point, 10-32 x 3/16", 3/32" hex socket, stainless steel, red marking on threads (inserted in upper holes of top hat adapter)
	3	set screw, soft point (nylon), 10-32 x 3/16", 3/32" hex socket, stainless steel, green tipped (inserted in lower holes of top hat adapter)
		MOUNTING HARDWARE (not supplied)
	4	(not supplied) bolt, 5/8"-11, length as required
	4	(not supplied) nut, 5/8"-11
	4	(not supplied) lock washer, 5/8"
	4	(not supplied) flat washer, 5/8"
	4	(optional, not supplied) guy ropes, non-conductive, length as required (10 m nominal). For long-term installations, Kevlar with UV-resistant outer braid is recommended. To reduce cost, nylon can be used for short-term installations.
	4	(optional, not supplied) stakes or anchors to tie down guy ropes
	1	(for temporary install, not supplied) base, plywood, 1-inch thick (minimum), 0.75–1 m diameter or square, holes drilled with antenna feed bolt hole pattern
		CABLE
	1	cable, RG-8 with N-type connectors, 75 m
		OPTIONAL EQUIPMENT
	1	lightning protection kit, CODAR part LP-100
	as required	(not supplied) non-metallic fencing, markers, and/or signage
	as required	(not supplied) split loom tubing, plastic, 1 inch nominal, or conduit, (e.g., Schedule 40 PVC), 1 inch nominal, (to protect cables from animal damage)

Tool Checklist (Tools not supplied.)

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Check	Qty	Description
	1	hex (Allen) driver or key, 3/32"
	1	hex (Allen) driver or key, 9/64"
	1	strap wrench
	as required	hammer(s) to drive ground plane wire stakes and guy rope stakes
	1	Ohmmeter or multimeter for continuity checks
	1	tape measure or rangefinder
	as required	Moisture-proof insulating silicone lubricant. Dow Corning 4 Electrical Insulating Compound is recommended.
	as required	clean working surface (cardboard, towel, etc.)
	1	(optional) pipe, 1 m long, to put through cable spool

Summary:

- Locate antenna site.
- Unspool and route cable.

Exercise care when installing the cable. Do not crush the cable or allow it to kink. (Minimum bending radius is 4 inches.) Do not exert excessive pulling tension on the cable. (Maximum pulling tension is 230 pounds.) Do not pull on the connectors. Do not damage the connectors.

- Find the desired transmit antenna location. Pace off the distance or measure with a rangefinder or tape. Ensure that the cable length is adequate for the distance between the SeaSonde electronics and antenna.
- Start at the SeaSonde electronics and ensure the transmit cable can be mated to the transmitter (or optional LP-100 lightning protection kit, if installed) and is properly routed.
- Unspool the transmit cable from the antenna site to the SeaSonde electronics. Insert a 1 meter pipe through the spool and have two people walk the pipe and spool to the electronics. Excess cable should be stored near the electronics, not near the antenna.
- Double-check the routing and ensure there is enough slack to mate the connectors at each end.
- If needed, install split loom tubing or other protection around the cable to avoid damage by animals.

Assembling Top Hat Adapter

The top hat adapter is so named because it fits over the top of the antenna. It consists of a metal sleeve and four stiff wire elements. The wire elements are held in place by a washer-like retainer and four fasteners. The top hat adapter is secured to the antenna with set screws.

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Summary:

- Flag the sharp ends of the wire elements with tape for safety.
- Loosen retaining washer screws.
- Insert wire elements.
- Tighten retaining washer screws.

Injury warning: the wire elements may cause injury to eyes or other parts of the body. Mark the end of each wire, so that it is seen easily. Safety glasses are recommended.

- Place a piece of adhesive tape on one end of each wire, so that it is seen easily.
- Using a 9/64 inch hex (Allen) driver or key, loosen the four cap screws that hold the retaining washer in place at the end of the top hat adapter. Loosen just enough to slip the wire elements snugly between the retaining washer and one of the grooves in the top hat adapter.
- Insert a wire element between the retaining washer and a groove in the top hat adapter. Repeat for all four wire elements.
- Tighten the four cap screws on the top hat adapter.
- Set the top hat adapter aside. It will be installed on the antenna a few steps later.

Assembling Antenna

Summary:

- Arrange antenna sections.
- Lubricate with non-conductive silicone grease (Dow Corning DC-4 or equivalent) and screw upper antenna sections and tuning coil together. Tighten set screws.
- Lubricate and screw together lower antenna section and tuning coil. Tighten set screws.
- Install guy rope collar and guy ropes if used.
- Install top hat adapter.
- Lay out the two antenna sections on the ground and arranged end-to-end for assembly. The tuning coil is installed between the lower and upper antenna sections. Ensure that the connecting parts remain clean by placing a clean surface (cardboard, paper, a towel or rag, etc.) under them.
- Ensure that the tuning coil jumper strap is in the correct position. It should be installed (secured with both screws) when transmitting greater than 4.6 MHz. It should be uninstalled (removed from the upper screw) when transmitting less than or equal to 4.6 MHz. If the tuning coil jumper strap must be uninstalled, follow the instructions earlier in this guide.
- Coat the socket threads at the bottom of the upper antenna section with a moisture-proof insulating lubricant. Dow Corning DC-4 Electrical Insulating Compound is recommended.
- Coat the threads at the upper section of the tuning coil (Dow Corning DC-4 or equivalent works well).
- Screw the tuning coil tightly onto the upper antenna section.
- Tighten the two set screws at the bottom of the upper antenna section using a 3/32 inch hex (Allen) driver or key.
- Coat the socket threads of the tuning coil with moisture-proof (e.g. Dow Corning DC-4).
- Coat the threads at the top of the lower antenna section with moisture-proof insulating lubricant.
- Screw the tuning coil with upper antenna section tightly onto the lower antenna section. Use a strap wrench if necessary.
- Tighten the two set screws at the bottom of the tuning coil using a 3/32 inch hex (Allen) driver or key.
- Wrap the metal sections of the tuning coil with electrical tape or self fusing tape for added protection.
- (Optional.) If using guy ropes, slip the top of the antenna through the center hole of the guy rope collar. The eye bolts on the guy rope collar should point downward, i.e., the eyes should be closest to the ground when the antenna is raised. Slide the collar to the center of the antenna until it stops in place at the metal fitting of the upper antenna section.



- (Optional.) If using guy ropes, attach four **non-conductive** guy ropes to the four guy-rope-collar eye-bolts.
- Begin installing the top hat adapter by placing it over the top of the upper antenna section. Ensure that the top of the antenna is completely inserted in the top hat adapter.
- Tighten the three upper top hat adapter set screws (cup point with red marking) using a 3/32-inch hex (Allen) driver or key. These metal-tipped screws should make firm contact with the metal tip of the antenna whip.
- Tighten the three lower top hat adapter set screws (soft point, green-tipped) using a 3/32-inch hex (Allen) driver or key. These nylon-tipped screws are designed to make contact with the fiberglass whip just below its metal tip. Do not overtighten.
- Remove the adhesive tape markers from the top hat adapter wire elements.

Raising and Securing Antenna

Summary:

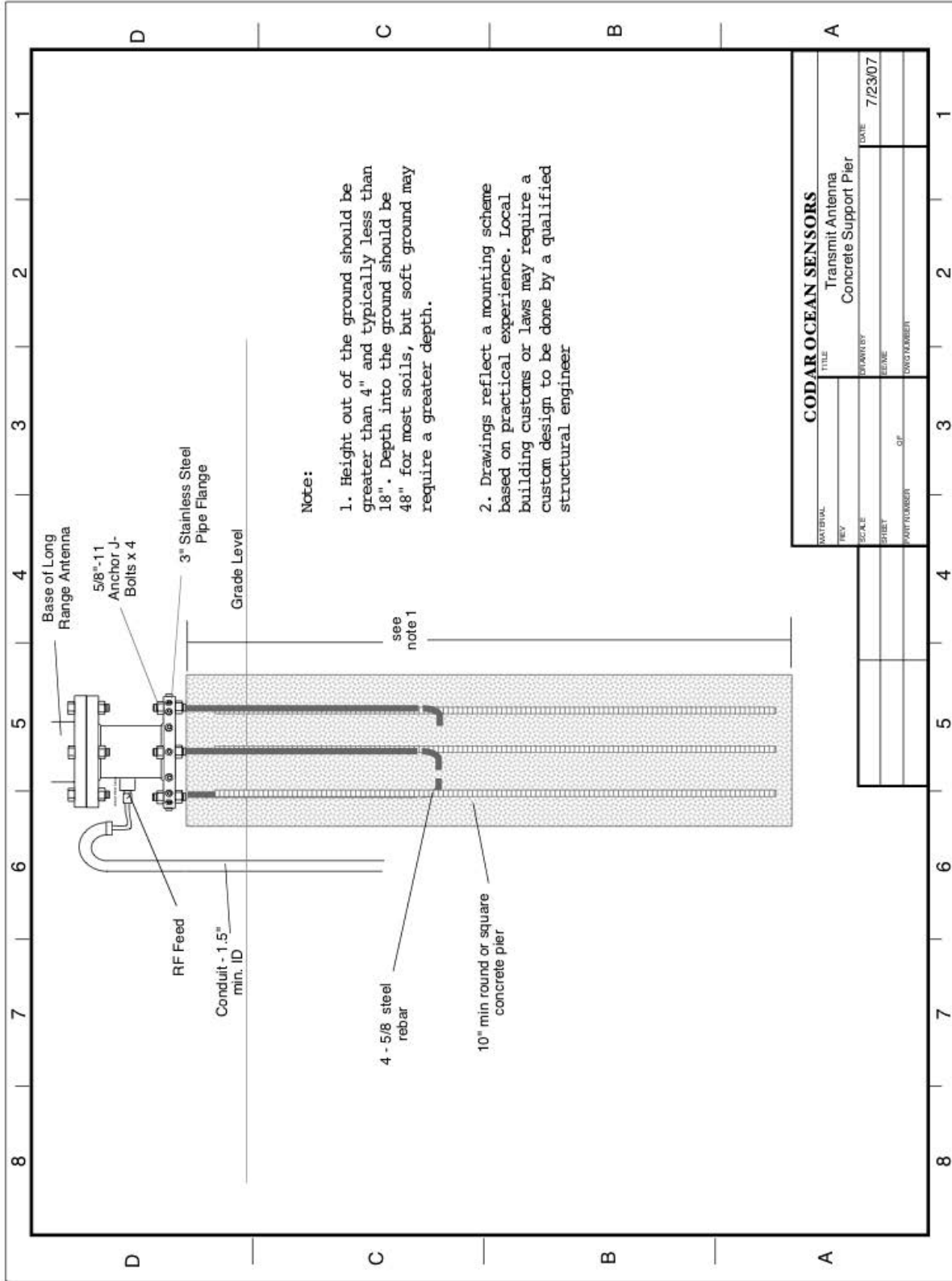
- Orient antenna.
- Raise antenna.
- Place antenna on support and tighten fasteners.
- Secure guy ropes if used.
- Release and arrange ground plane wires. Stake if needed.
- Mark keep-out area if needed.
- Take up cable slack.
- There are nine evenly spaced ground-plane wires connected to the ground-plane feed assembly in a 360 degree arc and secured to the feed with bolts.
- If needed, attach a temporary base to the ground plane feed assembly base.
- Hold the antenna base in position while others lift the antenna at its middle (near the tuning coil) and raise the antenna by walking it toward the base.
- If using a permanent support, lift the antenna and place the ground plane feed assembly over the support bolts. Install and tighten support nuts. A hinged baseplate adapter is highly recommended as a safety measure and ease of antenna maintenance in the future.
- If using guy ropes, secure them while one or more people hold the antenna in place.

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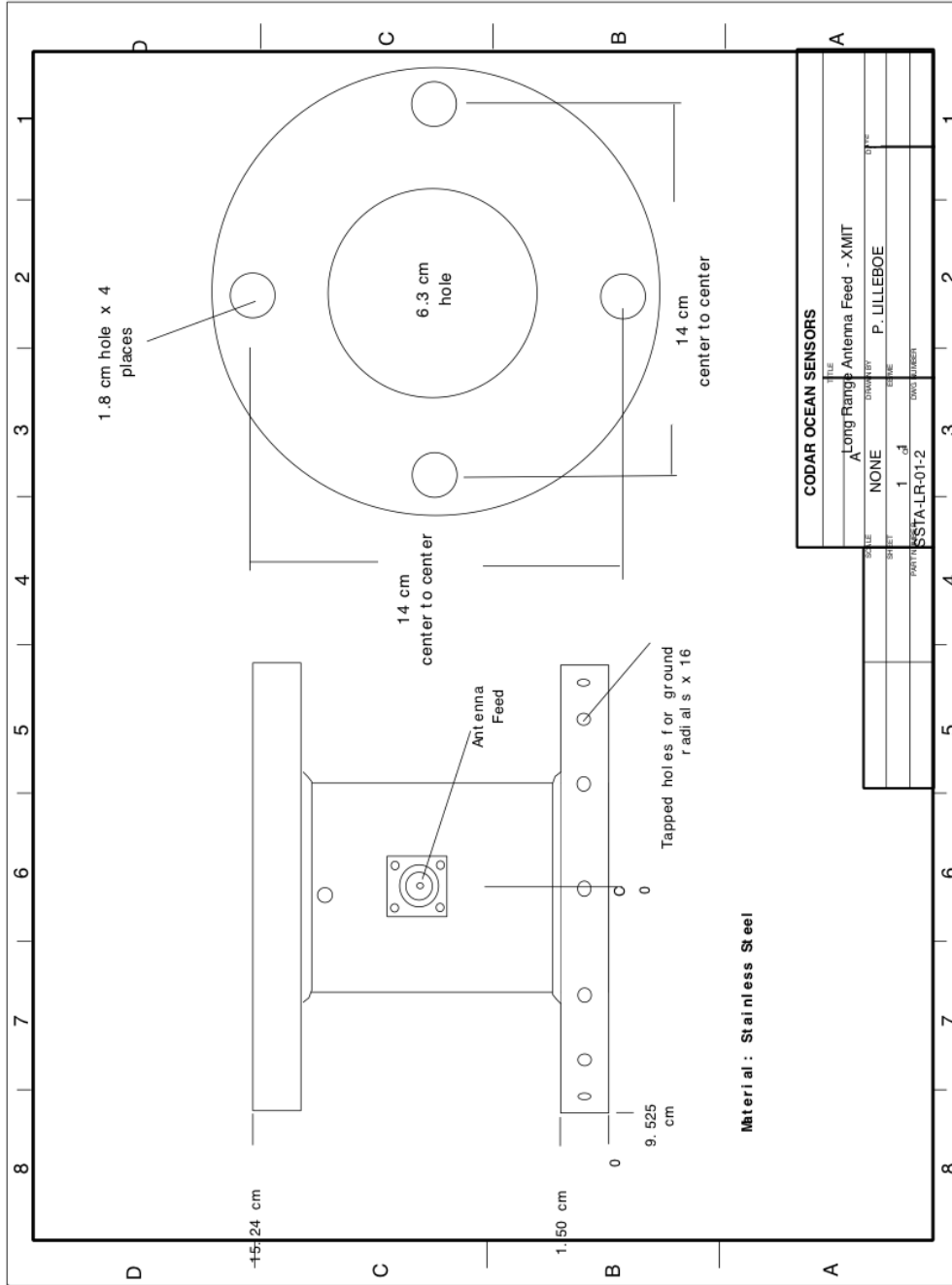
- The ground plane wires are wrapped around and secured to the ground plane feed assembly. Remove the material that secures the ground plane wires.
- Unwrap the ground plane wires from the ground plane feed assembly.
- Arrange the ground plane wires so that they are evenly spaced 360 degree around the antenna base.
- If needed, secure the ends of the ground plane wires with long nails or irrigation hose stakes to keep them in their proper orientation. Metal stakes can be used.
- If needed, mark or secure the area with non-metallic fence, markers and/or signage to keep people from tripping over the ground plane wires or touching the antenna.
- Take up any cable slack at the antenna by looping the cable into a 0.3 meter diameter coil at base of antenna.
- Connect the transmit cable to the lightning arrester at the base of the antenna.
- Connect the transmit cable to the transmitter connector or the optional LP-100 lightning protection kit.

Drawings

Concrete Support Pier



Antenna Feed



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9 MHz Transmit Antenna

The 9 MHz transmit antenna is a trimmed down version of the 5 MHz transmit antenna. There is no tuning coil and top hat. The top whip is 8 feet long instead of 12 feet long. For installation, follow those for the 5 MHz transmit antenna except for the 3 items mentioned above.

Dome Style Combine Antennas

5 MHz Combine Antenna

The design 5 MHz combine antenna consists of a monopole element and a cross loop. The monopole element is omni-directional and is used both as a transmit antenna and a receive antenna. The cross-loop antennas have sinusoidal patterns orthogonal to each other and are housed inside the dome.

When assembled and raised, the antenna is approximately 8 meters tall. The antenna consists of one antenna element (a fiberglass whip), a dome-shaped base that contains electronics, a fiberglass mast, inner mast assembly, the tuning element, the hinge and ground plane assembly and Transmit-Receive (TR) cable spool. (see Table and Figures below).

Antenna Parts

Item # (refer to images below)	Antenna Parts	Qty	Model Number	Ship Bund led
1	TR Antenna Assembly (Dome-Style)		SSRA-101-05TR	
2	Dome Assembly	1	SSRA-SA101-05	X
3	Inner Top Antenna Tube	1		
4	Antenna Tube Joint	1		
5	Hand hole cover	1		
6	Sight Pins	2		
7	Assembly Screws			
8	Spare Screws			
9	Tuning Element	1		
10	Lower Antenna Tube	1		X
11	RG-316 cable assembly	1		
12	Bottom guide plastic tube	1		

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13	Antenna Whip	1		
14	Antenna Mast (Dome-style)	1	SSRA-SA301-13	
15	Hinge Assembly	1		X
16	Ground Plane Assembly	1		
17	Mounting Screws			
18	TR Antenna Cable (75m)	1	TRCBL-STD	X
19	J-bolts	4		X

Items 2, 3 & 4 are shipped pre-assembled. Similarly items 10,11 & 12 are shipped pre-assembled. These upper and lower antenna tubes are connected together and then secured to the outer fiberglass mast.

Lastly, the cable connectors at the base of the mast are attached to the mast strain relief fixture and cable connectors are attached. The next few pages describe the assembly procedure in detail.

Tools List

- Phillips screwdriver #2 size
- 2 Adjustable wrench or spanner wrench with 1 1/2" or 300 mm opening
- 7/16" fixed opening wrench, or 7/16" socket.
- Allen key - contact customer support for exact size for your antenna.

Procedure

- Identify the upper and lower antenna tube assemblies.
- A plastic tube with the RG-316 cable assembly is present inside the lower antenna tube as shown in the above picture.
- Pull out the plastic tube so that you can see the RG-316 cable assembly.
- Align the upper and lower inner antenna tube assemblies. Packing foam could be used for convenience to support the antenna tubes.
- Connect the RG-316 cables to the respective TNC connectors on the antenna tube joint of the upper antenna tube. Use silicon grease on TNC connectors and the portion of the antenna tube joint where the top and bottom tubes make a connection (Dow Corning 4 Electrical Insulating Compound is recommended). Cables are labelled as shown below. Hand tighten the connectors. Connectors #2 has reverse polarity so it is not possible to connect them wrong.
- Once both cables are connected, slide the bottom mast over the antenna tube joint so that the two tubes are connected. Plan the clocking so that the bottom connector joint faces the hand hole after the antenna tube of the dome assembly is installed inside the mast. Use 1/4-20 hex screws (as shown in the picture below) to fix the lower tube to the joint.
- This completes the assembly of the inner tube assemblies..
- Locate the connectors at the bottom of the lower antenna tube (1 RP TNC and 2 TNC bulk-head jack connectors) and ensure that they are still inside the protective bag. If not, use a protective wrap to avoid damage.
- Install guy rope holder if so equipped.

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- Next, slide the entire inner assembly into the outer fiberglass mast. When the inner assembly hits a stop, go to the Hand hole end, reach in to guide the bottom plastic tube through the centering rods.
- Insert hardware screws in the fiberglass mast collar.
- Align dome base with fiberglass mast collar screws. Tighten all collar screws to attach the dome base.
- Attach antenna whip element to top of the dome. Use silicon grease to attach the whip.
- There is a locknut at the base of the threads on top of the dome. Do not remove this lock nut. After attaching the whip element, tighten this lock nut counter-clockwise against the nut on antenna whip. This prevents the whip from unscrewing itself due to wind induced vibrations.
- Install the top part of the hinge assembly to the bottom of the antenna mast with the 4 x 5/8-13 screws. Use flat washers on mating surfaces and lock washers on top. While installing the hinge plate, make sure the cables and connectors are not jammed in the interface. Tighten the bolts and install jam nuts.
- At the base of the fiberglass mast, pull bulkhead connectors down and out through the hole in the hinge top plate..
- Affix two TNC bulkhead connectors to the bottom connector panel. Make sure that channel 1 and 2 are matched to the labels on the panel.
- Connect the TNC RP connector to the TNC RP jack on the tuning element. Apply silicone grease to the contacts before engaging. Hand tighten the connector.
- Connect the channel 3 connector from the connector panel to the TNC jack of the tuning element. Apply silicone grease to the contacts before engaging. Hand tighten the connector.
- Apply electrical tape to the connector for protection.
- Stuff tuning element and loose cables into the mast. Use 4 knobed screws to fix the connector panel to the bottom of the hinge plate. Use grease on the thread. Hand tighten the screws.
- Install the ground plane assembly if not already installed.
- Mate the top hinge plate with the bottom hinge plate and erect the mast.
- Install 2 x 1/2-13 bolts to secure the hinge assembly.
- Connect the N connector from ground plane assembly to the N jack on the connector panel.
- Connect 3 connectors from TR cable with matching cable label or color code. Apply silicone grease before engaging connectors. The color coding convention is: red - #1, blue - #2, white - #3. #1 and #2 connectors connect to the connector panel. #3 connects to the lightning arrestor on the ground plane assembly
- To complete assembly, connect the TR Cable Spool cable TNC & N connectors to connector jacks of this cable set. Apply weather resistant tape (shipped with the choke cable) on all three connectors.
- If using guy ropes, secure them while one or more people hold the antenna in place.
- The ground plane wires are wrapped around and secured to the ground plane feed assembly. Remove the material that secures the ground plane wires.
- Unwrap the ground plane wires from the ground plane feed assembly.
- Arrange the ground plane wires so that they are evenly spaced 360 degree around the antenna base.
- If needed, secure the ends of the ground plane wires with long nails or irrigation hose stakes to keep them in their proper orientation. Metal stakes can be used.
- If needed, mark or secure the area with non-metallic fence, markers and/or signage to keep people from tripping over the ground plane wires or touching the antenna.

13 MHz Combine Antenna

The procedure outlined below is the same for all dome style receive and T/R combined antennas. The photos were taken for a 13 MHz combined antenna and so minor manufacturing differences may exist between your antenna and those shown here. If you have any questions, please contact CODAR support. Use the instructional video located on the Support website along with the instructions below for the dome antenna set-up.

When assembled and raised, the antenna is approximately 8 meters tall. The antenna consists of one antenna element (a fiberglass whip), a dome-shaped base that contains electronics, a fiberglass mast, inner mast assembly and Transmit-Receive (TR) cable spool. (see Table and Figures below).

Dome Style Combine Antenna Parts

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Item # (refer to images below)	Antenna Parts	Qty	Model Number	Ship Bundled
1	TR Antenna Assembly (Dome-Style)		SSRA-101-13T R	
2	Dome Assembly	1	SSRA-SA101-1 3	X
3	Inner Top Mast	1		
4	Antenna Tube Joint	1		
5	Hand hole cover	1		
6	Sight Pins	2		
7	Assembly Screws			
8	Spare Screws			
9	Inner Bottom Mast	1		
10	RG-316 cable assembly	1		
11	Bottom guide plastic tube	1		
12	Antenna Whip	1		
13	Antenna Mast (Dome-style)	1	SSRA-SA301-1 3	
16	TR Antenna Cable (75m)	1	TRCBL-STD	X

Items 2, 3 & 4 are shipped pre-assembled. Similarly items 11,12 & 13 are shipped pre-assembled. These top and bottom inner masts are connected together and then secured to the outer fiberglass mast.

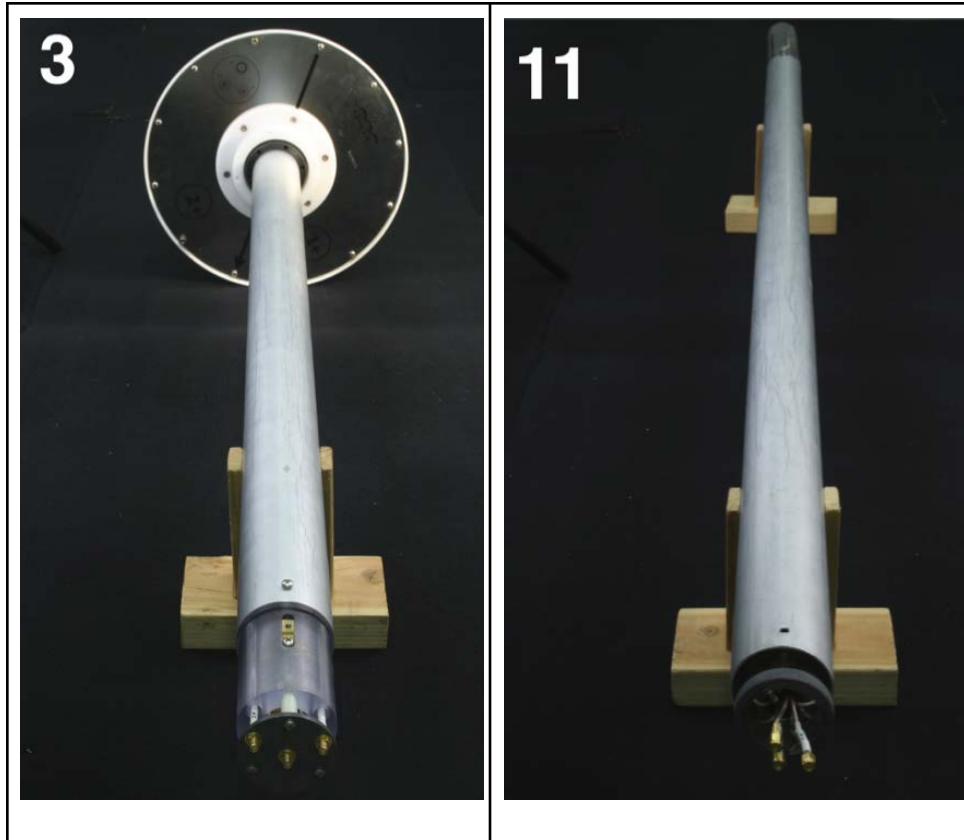
Lastly, the cable connectors at the base of the mast are attached to the mast strain relief fixture and cable connectors are attached. The next few pages describe the assembly procedure in detail.

Tools List

- Phillips screwdriver #2 size
- Adjustable wrench with 1 1/2" or 300 mm opening
- 7/16" fixed opening wrench, or 7/16" socket.

Procedure

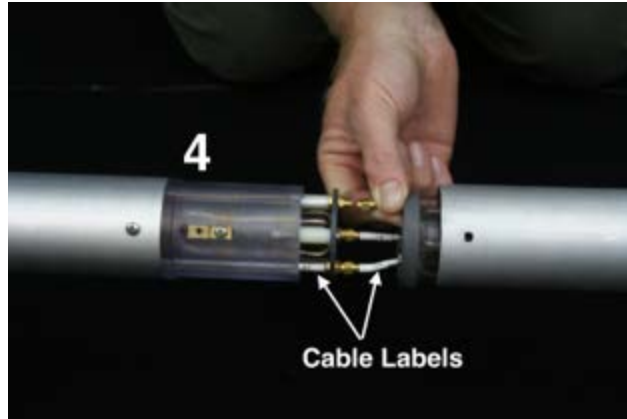
- Identify the top and bottom inner mast assemblies.
- A plastic tube with the RG-316 cable assembly is present inside the bottom inner mast as shown in the above picture.
- Pull out the plastic tube so that you can see the RG-316 cable assembly.



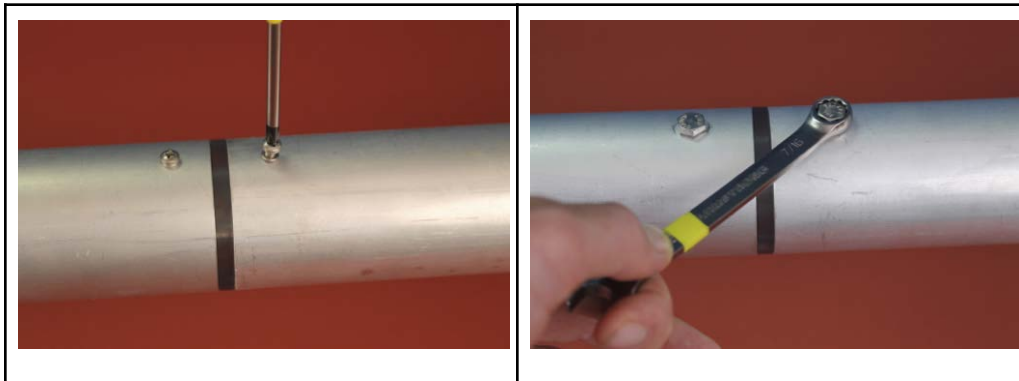
- A plastic tube with the RG-316 cable assembly is present inside the bottom inner mast as shown in the above picture.
- Pull out the plastic tube so that you can see the RG-316 cable assembly.



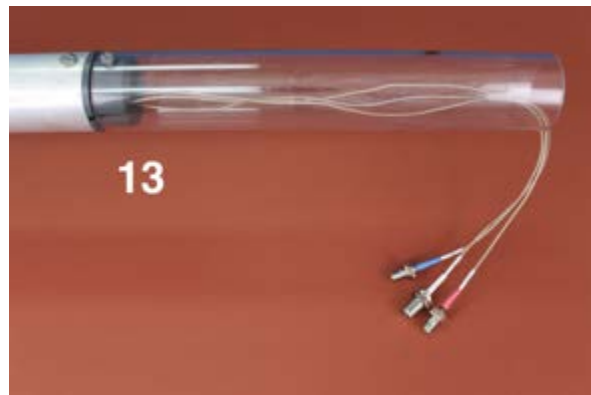
- Align the top and bottom inner mast assemblies using the mast stands.
- Connect the RG-316 cables to the respective SMA connectors on the dipole feed assembly of the inner top mast. Use silicon grease on SMA connectors and the polycarbon coupler portion of the Dipole Feed Assembly where the top and bottom inner masts make a connection (Dow Corning 4 Electrical Insulating Compound is recommended). Cables are labelled as shown below. Optimal tightening of the SMA connectors is 8 inch-lbs, or ~ 1 N-m. This can be done with a torque wrench, or by hand tightening and adding an extra 30 degrees turn.



- Once all the 3 cables are connected, slide the bottom mast over the polycarbon coupler so that the two masts are connected. Use 8-32 Phillips head screw with spring washer for feed connection (the brass terminals) and 1/4-20 hex screw (as shown in the picture below) for mechanical attachment to the polycarbon support.



- This completes the assembly of the inner masts.
- Locate the bottom guide plastic tube at the end of the bottom mast. 3 RG-316 cables with 1 N and 2 TNC bulk-head jack connectors exit through the bottom guide.

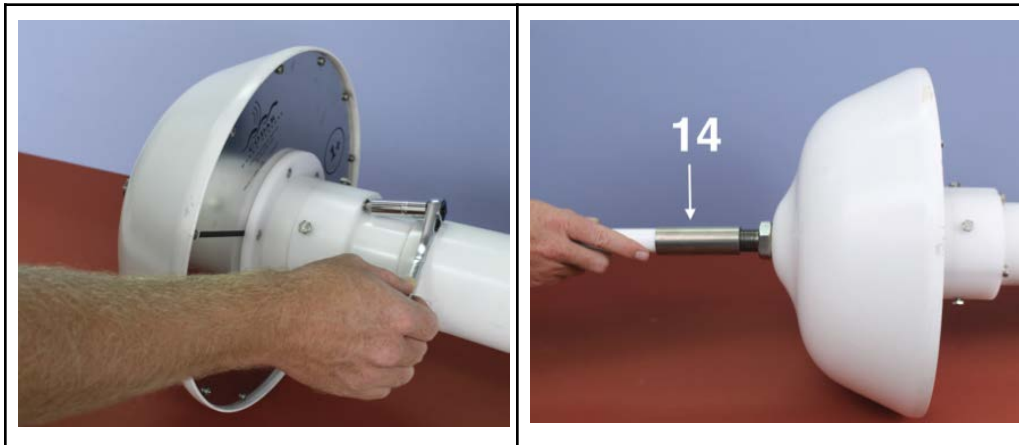


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- Have bulkhead connectors tacked into the plastic tube to avoid breaking them while sliding into the outer mast.
- Next, slide the entire inner assembly into the outer fiberglass mast. When the inner assembly hits a stop, go to the Hand hole end, reach in to guide the bottom plastic tube through the centering rods.



- Insert hardware screws in the fiberglass mast collar.
- Align dome base with fiberglass mast collar screws. Tighten all collar screws to attach the dome base.
- Attach antenna whip element to top of the dome. Use silicon grease to attach the whip.
- There is a locknut at the base of the threads on top of the dome. Do not remove this lock nut. After attaching the whip element, tighten this lock nut counter-clockwise against the metal antenna whip fitting. This prevents the whip from unscrewing itself due to wind induced vibrations.

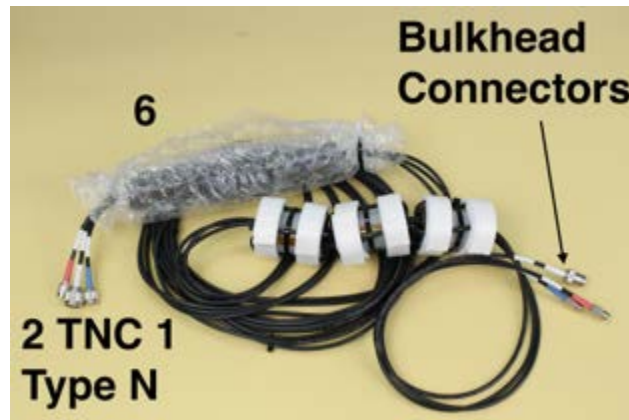


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- At the base of the fiberglass mast, pull bulkhead connectors down and out through the access port.
- Find strain relief flap on back interior of mast.
- Connect all three bulkhead connectors to cable strain relief. Secure the connectors with the nuts provided along with the connectors.



- Locate the 22 feet cable bundle with ferrites (13 MHz only). There are 3 cables in this bundle with cables for the two loops each and the dipole.
- Lay out the cables on the ground. One end of the cables has 2 TNC and 1 N plug connectors. The other end has bulkhead connectors. There are ferrites on each end of each cable. Place the ferrites gently on the ground do not drop them. Ferrites can crack or break easily which will compromise performance.

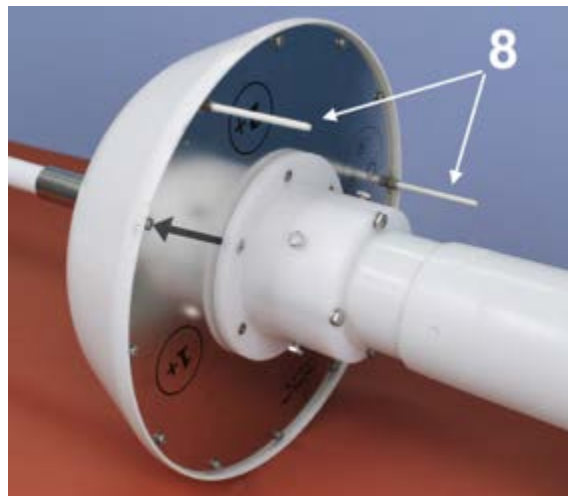


- Feed the plug connectors into the bottom of the fiber glass mast or the side hole.
- Connect 3 connectors with matching cable label or color code. Apply silicone grease before engaging connectors. The color coding convention is: red - #1, blue - #2, white - #3.
- To complete assembly, connect the TR Cable Spool cable TNC & N connectors to connector jacks of this cable set. Apply weather resistant tape (shipped with the choke cable) on all three connectors.



Antenna sighting method

- Dome antenna is shipped with sight pin screws.
- These are index markers for sighting the bearing of the black arrow. Two of the fasteners on the bottom plate of the Dome antenna, which are parallel to black arrow, are standoffs into which the sight pins can be inserted.
- In certain sites, it would not be practical for the user to stand back in the direction of the black arrow due to landscape limitations. The user may desire to change the standoff to other orientations and make the corresponding changes for the bearing measurement.



- After attaching guy ropes (if required), erect the antenna and secure via permanent antenna mount.



- Stand back about 20m from the Dome in alignment with the two sight pins and measure bearing to the sight pins using a compass.
- This completes your Dome antenna assembly.

16 MHz Combine Antenna

The 16 MHz combine antenna is the same in physical design as the 13 MHz combine antenna. See instructions in the last section for installation.

25 MHz Combine Antenna

Please contact CODAR customer support at support@codar.com for additional information.

42 MHz Combine Antenna

Please contact CODAR customer support at support@codar.com for additional information.

Configuring the SeaSonde

This configuration section is for brand new systems that have been pre-configured at CODAR. To pre-configure your own computer and load the SeaSonde software see the computer set-up manual that corresponds to your operating system

Rack Mounting Chassis System.

The rack mounting chassis system consists of a SeaSonde Receiver (RX), a SeaSonde Transmitter (TX), a Mac Mini computer with monitor, keyboard and mouse.

All connections to the RX and TX chassis' are on the back panels. The following pictures show the connectors on the back panels.



SeaSonde Receiver Back Panel Connections



SeaSonde Transmitter Back Panel Connections

Connector Descriptions

1. DATA/COMM. OUT TO COMPUTER: USB-B style connector for data interface. Use a USB A/B cable (supplied) to connect to one of the USB ports on the computer.
2. TRANSMIT CONTROL: DB-9 female connector. This is a port for communication and pulsing control between RX and TX. Use a DB9 male to male cable (supplied) to connect to TRANSMIT CONTROL (14) of the transmitter. The DB9 cable is a pin-to-pin cable.
3. REMOTE: DB-9 male connector: This connector is for advanced users. For normal operation, this connector is not used.
4. ANTENNA 3/MONOPOLE: BNC female connector. This is the input for channel 3 signal. For separate transmit/receive antenna configurations, connect this to antenna 3 of the receive antenna. For combine antenna systems, connect this to RECEIVER ANTENNA 3 (OPTIONAL) (12) with the brown BNC cable supplied.
5. ANTENNA 2/LOOP 2: BNC female connector. This is the input to channel 2 signal. Connect this to antenna 2 cable.
6. ANTENNA 1/LOOP 1: BNC female connector. This is the input to channel 1 signal. Connect this to antenna 1 cable.
7. TRANSMIT DRIVE OUT: BNC female connector. This is the transmit r.f. signal waveform to be amplified by SeaSonde Transmitter. Connect this to TRANSMIT DRIVE IN (13) on the transmitter use the black BNC cable (supplied).
8. GPS ANTENNA (OPTIONAL): BNC female connector. This is to connect the GPS antenna to the SHARE module. Connect this to the GPS antenna with the cable supplied.
9. Power inlet connector. Connect this to one of the outlets of the surge protector (supplied) with a power cable (supplied).
10. Switched Outlet to Computer: AC Outlet. This connector is not used in normal operation. For special situations where the computer experiences frequency freeze ups, this outlet can be used to reboot the computer with a watch-dog setup during freeze ups.
11. TRANSMIT OUT TO ANTENNA: N female connector. This is the r.f. power output of the system. Connect this to the transmit antenna cable.
12. RECEIVER ANTENNA 3 (OPTIONAL): BNC female connector. This is the receive signal from the combine antenna TR channel. See connector 4 above for connection.
13. TRANSMIT DRIVE IN: BNC female connector. This is the input to the r.f. power amplifier. See connector 7 for connection.
14. TRANSMIT CONTROL: BNC female connector. See connector 2 for description and connection.
15. Power inlet connector. Connect this to one of the outlets of the surge protector (supplied) with a power cable (supplied)

Mode of operation

SeaSonde electronics and associated computers are designed for continuous operation. In the event of power interruption, the system would resume normal operation upon power recovery. It is recommended that the system uses a UPS for uninterrupted operation of the SeaSonde data collection. The UPS also provides power regulation and filtering.

Confirm electronics rack cable connections

Confirm that following cable connections are made.

- TRANSMIT DRIVE OUT (receiver) ↔ TRANSMIT DRIVE IN (transmitter)
- TRANSMIT CONTROL (receiver) ↔ TRANSMIT CONTROL (transmitter)
- ANTENNA 1 LOOP 1 (receiver) ↔ Loop 1 (receive antenna)
- ANTENNA 2 LOOP 2 (receiver) ↔ Loop 2 (receive antenna)
 - TRANSMIT OUT TO ANTENNA (transmitter) ↔ transmit antenna
 - GPS to GPS antenna

For separated transmit and receive antennas:

- ANTENNA 3 MONOPOLE (receiver) ↔ Monopole (receive antenna)

For combined transmit and receive antenna:

- RECEIVER ANTENNA 3 (OPTIONAL) (transmitter) ↔ ANTENNA 3 MONOPOLE (receiver)

Initial Power Up

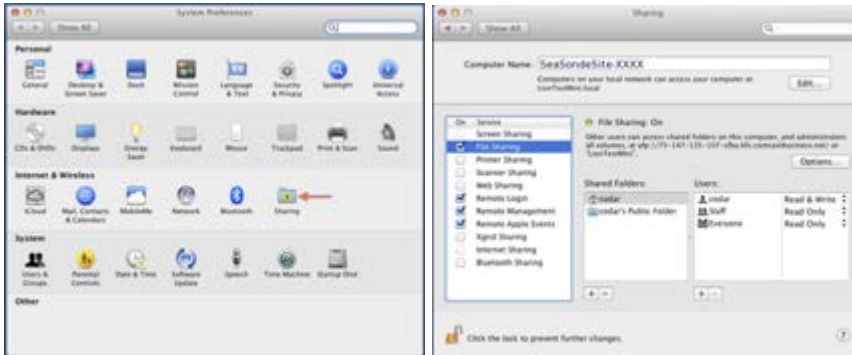
The SeaSonde is shipped with a surge protector where the equipment should be plugged in. The power cord for the surge protector input is of the US plug if the system is for 110 V and European plug for 220 V systems. This power cord should be plugged into the UPS power supply. For temporary testing, this plug can also be plugged into the wall mains if the power from the mains is not too dirty.

- Confirm the transmitter is switched off and unplugged.
- Connect the computer to the receiver with the supplied USB cable
- Plug in the computer to the power cord extension and plug into the surge suppressor shipped with your system.
- Turn on the surge suppressor power.
- Press the power button on the computer.
- After the computer starts up, quit all applications.
- Plug in and switch on the receiver.
- Click the SeaSondeController icon in the Dock or in SeaSonde/Apps/RadialTools.
- Choose Receiver Controller > Select Port... menu item.
- Confirm SeaSonde Receiver is displayed in the pop-up menu. If not, choose SeaSonde Receiver from the pop-up menu.
- Click OK.

Configure Site Information

Computer Name

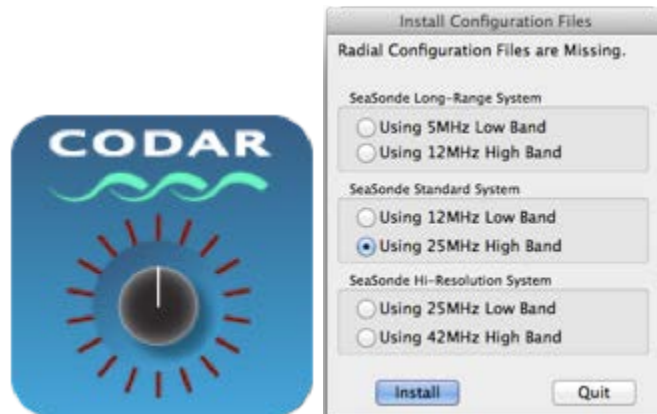
- Select a descriptive four-character code for your site (characters A-Z, a-z, 0-9)
- Change the computer name in System Preferences-> Sharing by adding your site code using the format SeaSondeSite-XXXX (where XXXX is your four-character code)



- Delete any existing RadialConfigs folders found in /Codar/SeaSonde/Configs

Site Parameters

- Launch the SeaSondeRadialSetup program. Located in the Dock on the Desktop or in SeaSonde/Apps/RadialTools.
- Select the type of system (Long/Standard/High Res) you are operating.



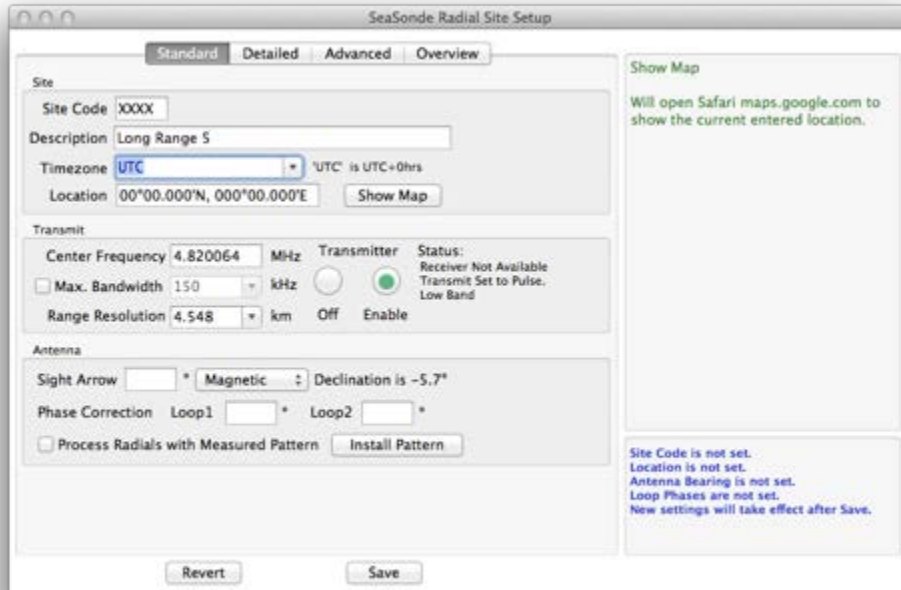
Site Parameters in SeaSondeRadialSetup:

- Enter your four-character site name in the "Site Code" box

Optional: add a site description in "Description" box.

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- Select your preferred timezone. Your data files will be referenced to and labeled with the selected timezone. CODAR suggests using UTC. The timezone should match the timezone selected in System Preferences -> Date & Time.
- Enter the WGS-84 latitude and longitude of the receive antenna separated by a comma in the "Location" box. Make sure the N/S and E/W are correct. CODAR uses the Garmin handheld GPS to obtain this location point.



Transmit parameters:

- Enter your licensed operating frequency in MHz. Use the center frequency of your authorized bandwidth.
- Check mark the "Max Bandwidth" box and type in the maximum bandwidth you are allowed for your licensed frequency.

Antenna parameters:

- Enter the magnetic compass bearing of the black arrow of the two nylon index markers.

Note: Phase corrections and the measured antenna pattern file will be installed later.

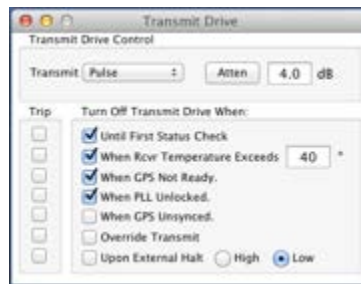
Configure Receiver Settings in SeaSondeController

- Choose Receiver Controller > Advanced Control.... The Advanced Receiver Controller dialog appears.

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- Set Attenuation to 20 and press the “Atten” button next to the value field.
- Choose Receiver Controller > Transmit Drive Control



- Uncheck the check marked Transmit Drive Trips so that the Transmit Drive Control window looks like the pic below. This is to make sure that the Transmit does not get tripped off during startup. You will be resetting the Transmit Drive Trips later in the configuration.

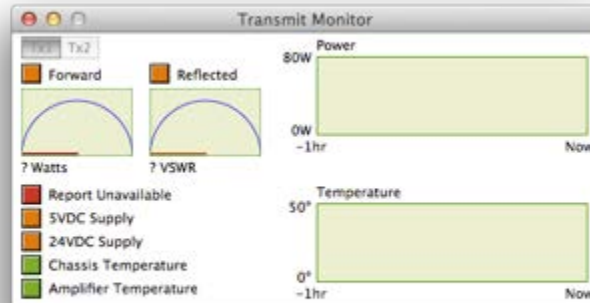


- Press Store in the Receiver Advanced Controller window to save these settings before you start up the transmitter.

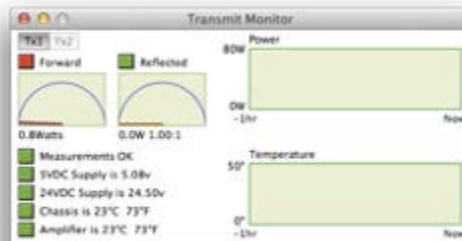
Call sign recommendations

Powering up the transmitter

- Confirm that the transmitter power switch is off.
- Plug in the transmitter power cord.
- Click the SeaSondeController icon in the Dock.
- Receiver Controller > Transmit Monitor.... The RC1 Transmit Monitor window appears.



- In the Advanced Receiver Controller window, attenuation (Atten) should be set to 20 dB and settings should be stored.
- Switch on the transmitter. The question marks under the Forward portion and Reflected portion of the window should turn from question marks as in the picture above, to values similar to the picture below.



Confirm that the values in the Transmit Monitor are as follows:

- Reflected (power) is less than 25% of Forward (power).
- VSWR is 3 or less. VSWR is the ratio next to the reflected power measurement.
- Identify and correct problems if VSWR is greater than 3.

Repeat the following steps until Forward (power) in the RC1 Transmit Monitor window is 40-50 watts and VSWR is less than 3.

- Reduce Atten from 20 to 10 and press the Atten button. If VSWR is less than 3 continue.

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- Reduce by 1 the entry in the Atten field of the Receiver Controller window. For example, enter "9" if the current value is "10".
- Click the Atten button.
- Forward power should be around 40 - 50 watts, VSWR should be 3 or less.

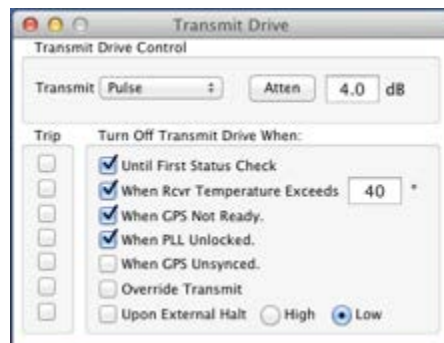
Configure GPS synchronization (SHARES systems only)

- Confirm the GPS antenna has a clear view of the sky.
- Confirm the GPS antenna cable connects the GPS antenna to the receiver.
- Click the SeaSondeController icon in the Dock to make it active.
- Choose Receiver Controller > GPS Monitor....

The RC1 GPS Monitor dialog appears:



- Confirm that at least four satellites are shown by the Satellites indicators.
- Observe the Survey progress bar . Wait until Survey is complete.
- Store the SeaSonde's position:
 - Confirm the Position Stored indicator is green. If it is not, follow below steps.
 - Select the checkbox next to the pop-up menu labelled *Get Versions*.
 - Choose Store Survey GPS Position from the pop-up menu.
 - Click the Go button. The SeaSonde's position is stored.
 - Repeat this step if the position is not stored.
- Confirm all indicators are green.
- Go to the open Transmit Drive Control window and recheck all of the Transmit Drive Trips as shown in the Window below; Until First Status Check, When Rcvr Temperature Exceeds 40, When GPS Not Ready, and When PLL Unlocked should all be checked.



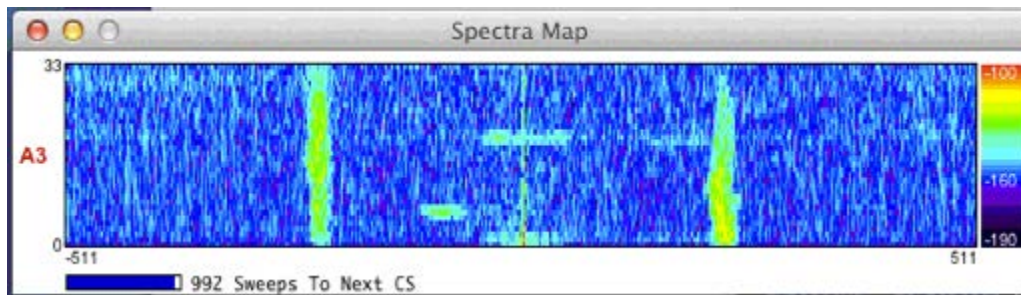
- Store these settings in the Receiver Advanced Controller window:

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- Click *Store* to store settings as switch-on defaults. The settings are stored in receiver memory location 1.
- Enter "SAVE 2" in the Send field.
- Click *Send* to store settings in receiver memory location 2. This is a backup.
- Capture an image of the Advanced Receiver Control dialog:
 - Press Command-Shift-4.
 - Press the Space bar. The pointer changes to a camera.
 - Click the Advanced Receiver Control dialog.

Note: An image of the dialog named "Screen Shot #" (where # is a time stamp) is saved to the Desktop. Rename it to something like "ControllerSettings."

- Click the SeaSondeAcquisition icon in the Dock and look for Bragg peaks in the Spectra window. Note that shape of Bragg peaks will change from site to site. A typical Spectra with Bragg peaks for a long range system is shown below.
- Confirm that Bragg peaks are present in A3 (Monopole - Channel 3) Spectra Map
- Select "Monitors" menu->Cross Spectra Power Map->Antenna 3



- Confirm that Bragg peaks are present in A2 (Loop 2 - Channel 2) Spectra Map
- Select "Monitors" menu->Cross Spectra Power Map->Antenna 2
- Confirm that Bragg peaks are present in A2 (Loop 1 - Channel 1) Spectra Map
- Select "Monitors" menu->Cross Spectra Power Map->Antenna 1

Computer reboot test

- Choose Apple menu > System Preferences.... The System Preferences window appears.
- Click the Users & Groups icon. The Users & Groups pane appears.
- Click the SeaSonde user's icon. (The user is normally "codar".)
- Click the Login Items tab.
- Confirm Sentinel is listed in "These items will open automatically when you login:".
- If Sentinel is not listed, add it to the list:
 - Click the "+" button.
 - Select /Codar/SeaSonde/Apps/RadialTools/Sentinel
 - Click the Add button.
- Choose Apple menu > Restart.... The "Are you sure you want to restart your computer now?" dialog appears.
- Click Restart.
- After the computer starts up, confirm that Sentinel launched the processing suite.
- Confirm that data are being acquired in SeaSonde Acquisition's Spectra Map window.

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- Re-visit the site in 6 or more hours and confirm that CSQ, CSS, RDLi radials are being created and stored in their respective folders in /Codar/SeaSonde/Data/Spectra/... and /Codar/SeaSonde/Data/Radials/IdealPattern/

••The Rack Mount Style SeaSonde remote unit is configured and operating••

Low Power SeaSonde System

Scope

Low Power SeaSonde (LP SeaSonde) is a self contained instrument which, in conjunction with relevant SeaSonde antennas and interconnect cables, measures the radial currents of the ocean surface. The LP SeaSonde can be powered with 110 V/220 V AC power with the supplied AD to DC converter or directly powered by a 24 V DC supply. The system is of a weather proof design with built-in cooling system.



Unpacking

The system is shipped in a hard case with the following items included:

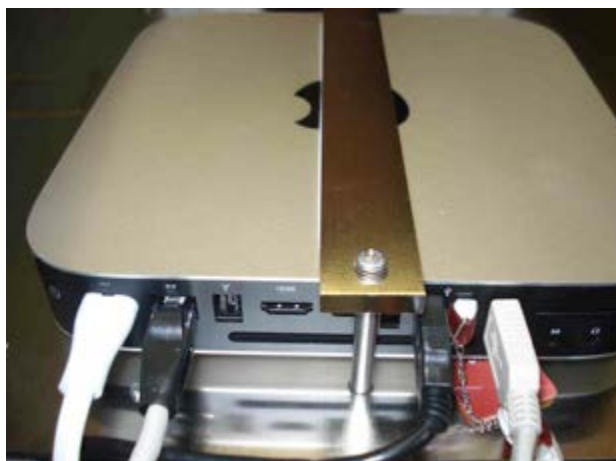
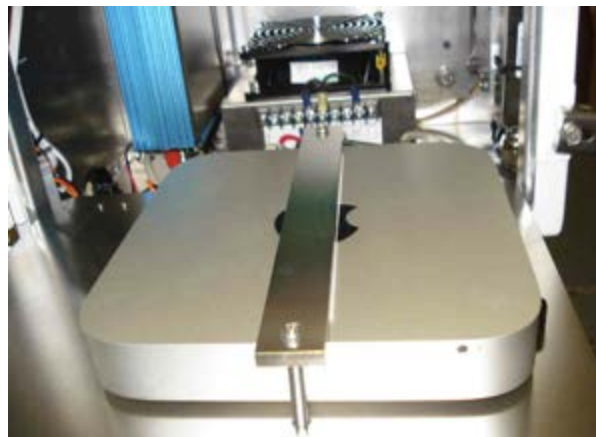
Item	Qty	Description
1	1	LP SeaSonde transceiver enclosure
2	1	AC-DC 24V power supply
3	2	24V power cable
4	1	Power surge suppressor
5	1	AC power cord (110 V US plug or 220 V European plug depending on your order)
6	1	Power cord from surge suppressor to AC-DC 24V power supply
7	1	Power cord adapter for laptop
8	1	Mac Mini
9	1	GPS antenna for SHARE
10	1	Mast for GPS antenna
11	1	SHARE cable
12	1	Drain hose

WARNING: DO NOT power on the system without following the instructions. Damages might occur!!!

Mounting

Installing Mac Mini

1. Open the front door by sliding 4 latch locks out and pull the door open.
2. Open the front plate by pulling on the knob.
3. Remove all the packing materials (foam blocks).
4. Install Mac Mini as show in picture below



Power connection:

1. Power cord connects from wall outlet to surge suppressor.
2. Adapter cord connects from surge suppressor to DC power supply.

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3. Make sure DC power supply switch is turned off when making connections. DC cables (orange cables with circular connectors on both sides) are identical on both ends and from each other. They connect from DC power supply to 24 DC and 24 V AIR CON connectors at the bottom of the SeaSonde enclosure.

Cable connections

1. Connect one end of SHARE cable to GPS antenna via mast and the other end to the enclosure. Both ends of the SHARE cable are fitted with TNC connectors. It is important that the GPS antenna has a clear view of the sky to ensure good GPS signal reception.
2. Connect transmit antenna cable to the N connector at the enclosure bottom labeled 'TX'.
3. Connect receive antenna cables to Ch1, Ch2 and RX3 at the bottom of the enclosure. For combine antenna system, RX3 will not need to be connected. Ch2 uses reverse polarity TNC so Ch1 and Ch2 connections are not interchangeable.
4. Connect lightning protection ground to a proper ground. Use local guidelines for grounding practices or consult a licensed electrician.
5. Connect internet to the ethernet connector at the bottom of the enclosure.
6. Archive drive (not supplied) can be connected to the USB connector at the bottom of the enclosure.

Power On/Power Off Procedure

To turn on the system, press the power switch to on. See picture below for the 24 V power supply and the corresponding switch.

To turn off the system, press the power switch on the 24 V power supply.

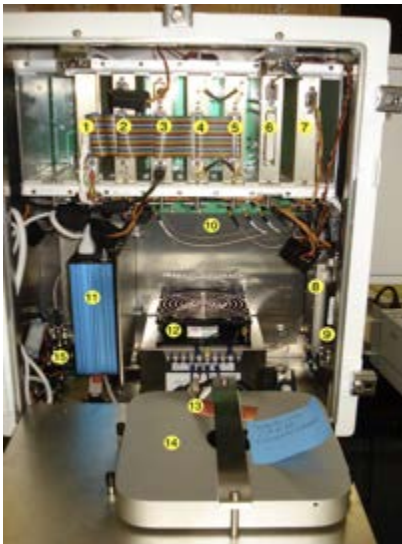


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For users who desire to observe the actions during the turn-on sequence, here are the steps to follow:

1. Slide the 4 stainless steel spring locks outwards to unlock the front door. One might need to loosen the bolts on the spring locks if the bolts have been previously tightened. It is recommended to press the front door while sliding the locks to minimize the paint scratch.
2. Open the front door.
3. Pull on the knob near the top of the face plate. You should see the interior of the unit as shows in the following picture. In the picture is also shown the names of various components inside the unit.

Internal Module Layout



1. Front Panel Board Module
2. GPS Module
3. AWG Module
4. TR Module
5. Rx Module
6. Filter Module
7. Power Reflector Module
8. RF Power Amplifier
9. Low-pass Filter
10. DC Power Supply Board
11. DC/AC Converter
12. TEC Cooler
13. SeaSonde Software License Key
14. Computer
15. Lighting Protection Surge Arrestors

4. When the power switch is first turned on, one would expect the following events to follow:
 - a. On the back plane board, one should see reflections of 4 LED's as shown in the picture below. A few minutes after power on, one should hear a click sound followed by the turning on of a fifth LED which indicates the turning on of the power amplifier.



- b. On the left side of the Front Panel Board Module, one should see green LED on steadily, flashing yellow LED and no red LED. If one sees a steady red LED, it indicates communication issue between the computer and AWG module. If red LED flashes, it indicates a low voltage condition.
 - c. On top of the DC/AC converter, one should see a green LED light up.
 - d. In front of the Mac Mini computer, one should see a white LED light up. The white LED is a little dim and one might not see it clearly with strong background light.
 - e. The interior fan on the TEC cooler should be running at all times. The fan outside the enclosure turns on only when the TEC cooler is activated.
5. It is essential that one closes the front door of the Low Power SeaSonde unit during normal operation. Coastal climate can cause corrosion of the components inside the unit if the door is left open for extended period of time.

Connecting to the SeaSonde computer from a laptop

The SeaSonde computer does not come with its monitor/keyboard/mouse set. It is strongly recommended that one communicates with the SeaSonde computer via internet preferably with static IP or with domain name server. This should be done during the installation with coordinated efforts from the local internet providers.

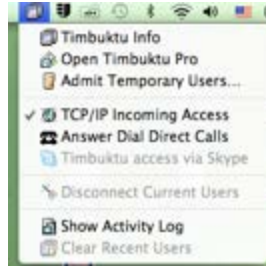
In the event that an internet connection is not available, one can connect to the SeaSonde computer through one of the following methods. Such connection will be going through the wireless ports (airport) of the computers. It is highly recommended that the front door of the Low Power SeaSonde unit is left open and the front plate pull open to expose the computer.

1. Via Timbuktu software.

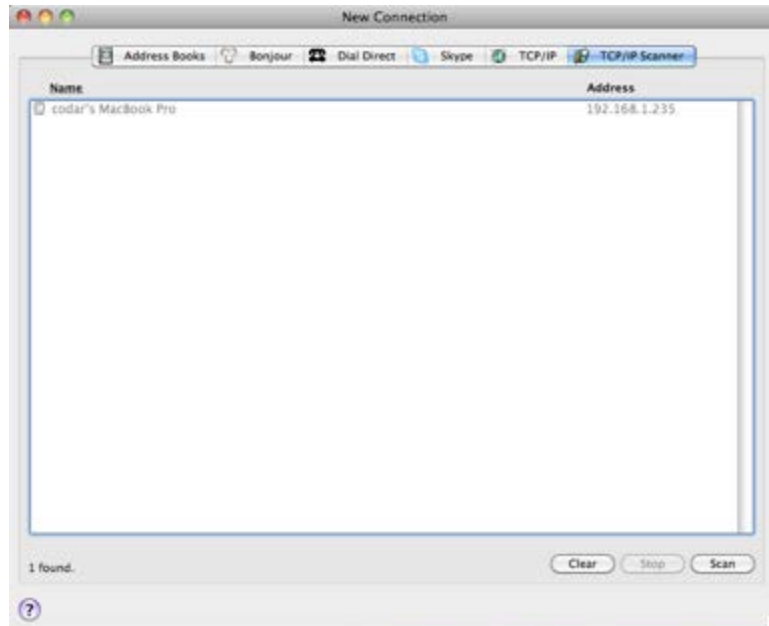
If your laptop is installed with Timbuktu software, you can connect to the SeaSonde computer by the following steps:

- Open TimbukTu by click on Open Timbuktu Pro

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- Choose TCP/IP Scanner tab and click Scan button

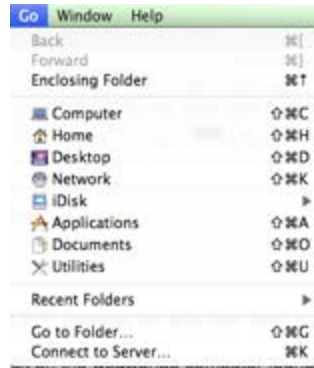


- Double click on the SeaSonde computer found on the list. You will then be prompted for the login information.
- After log in, you will be able to control the SeaSonde computer from your laptop.

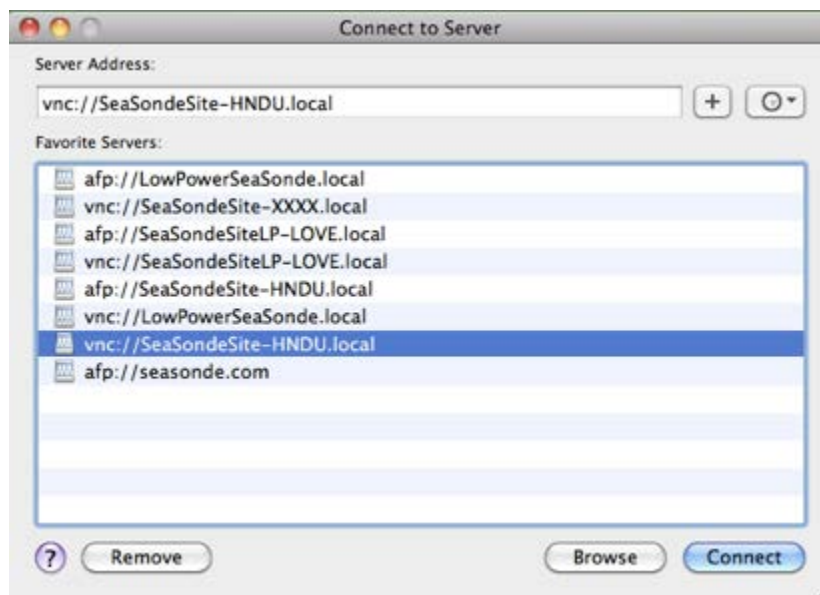
2. Via VNC

If your laptop has Mac OS 10.6 or later, VNC is already installed as part of the operating system. To connect via VNC:

- Click Go on the top menu bar of the finder window (For novice Mac users: click on the desktop once to get to finder window).



- Click Connect to Server... to pop up the following window



- type in the vnc server address for the SeaSonde computer or click on the address in the list.
- Click Connect button
- You will then be prompted for the login information.
- After successful login, you will be able to control the SeaSonde computer from your laptop.

If you have trouble finding or log into your SeaSonde computer with either of the above methods, you might want to turn off the 24V power supply and start over from power on. It has been observed that for some of the Mac OS 10.7 operating systems, timbuktu or VNC might not work after a Sentinel reboot.

Initial Status Check

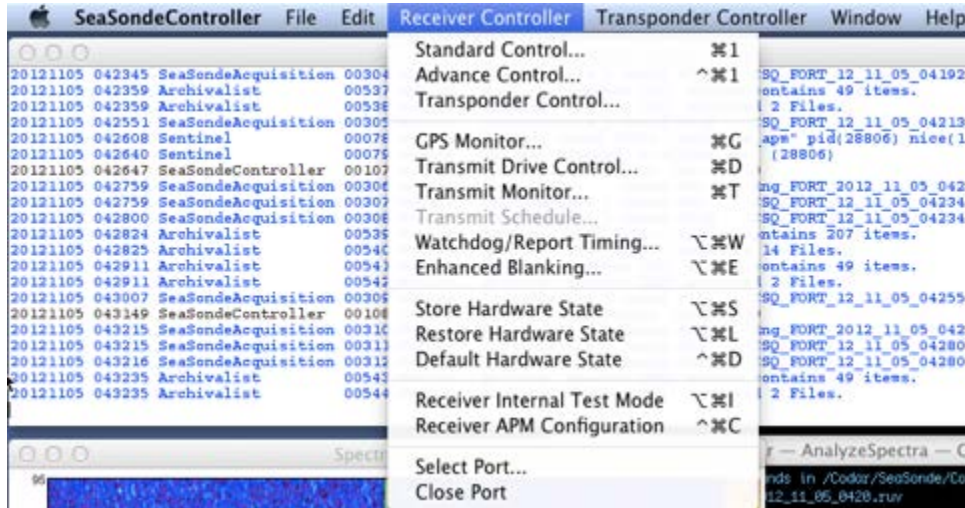
A few minutes after power on, the Sentinel program (For details of Sentinel, please attend Codar Training) which automates the SeaSonde control and data acquisition process would reach a steady state. One can now check some of the key status information. The following are the suggested steps.

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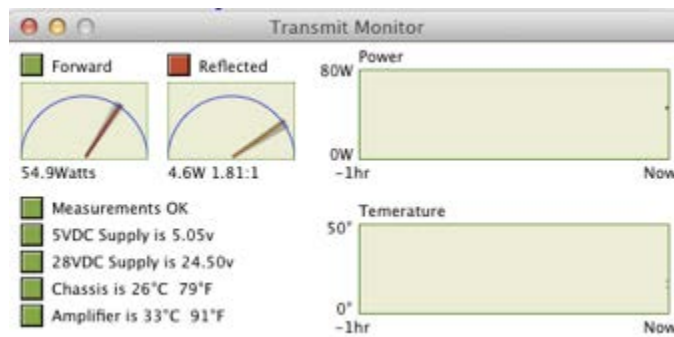
1. Bring SeaSonde Controller to the foreground by clicking on the following icon on the dock.



2. Activate the power monitor window by clicking Receiver Controller -> Transmit Monitor ...



3. The power monitor window now opens as shown below.

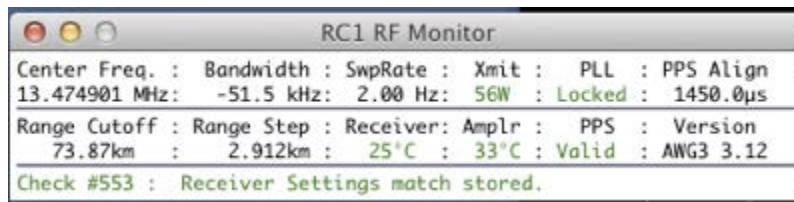


4. Check the forward power and reflected power. The forward power should be about 40 W and it is desirable to have the forward power light on green. The VSWR is the value underneath the Reflected meter. Its value should be less than 3:1. For VSWR values larger than 5:1 or at inf:1, the user should turn off the Low Power SeaSonde unit immediately and contact Codar Support (support@codar.com) for further actions.
5. Activate GPS monitor window by clicking Receiver Controller -> GPS Monitor ... as shown in step 2 above.
6. You will see the GPS monitor window as shown below.

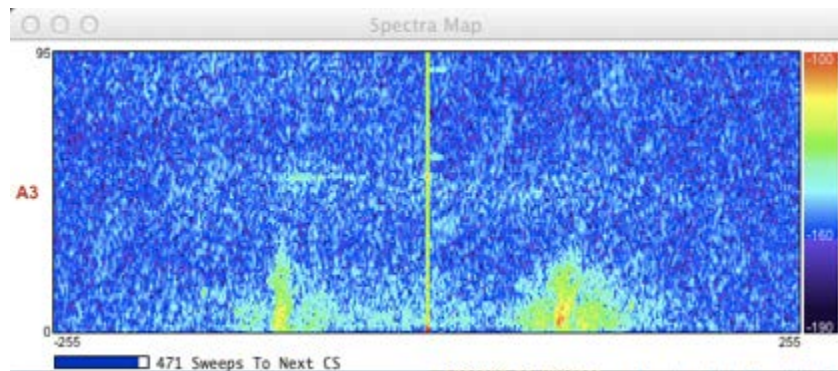
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- One should see at least 4 green bars on GPS satellites. Otherwise consult the SeaSonde Operator's Manual or contact Codar Support.
- Check the RC1 RF Monitor window for proper operating parameters. The center frequency, bandwidth and sweep rate should match what is expected for the site. PLL should always show 'Locked' in green. PPS should show 'Valid' after some time.



- By now if everything checked above is normal, one should see sea echo signals on the Spectra Map window of SeaSonde Acquisition.
- The following figure shows a typical sea echo signal from the SeaSonde system. By default, the signal from dipole antenna (channel 3) is shown. One can control click (press and hold control key while clicking) the graph to look at signals from one of the two loops (channel 1 or channel 2). The vertical axis label will change to A1 or A2, respectively after your selection.



If you see sea echo signals from all 3 channels, it implies nominal normal operation of the SeaSonde system. Further details on signal integrity falls outside the scope of this guide and should be pursued by advanced users only.

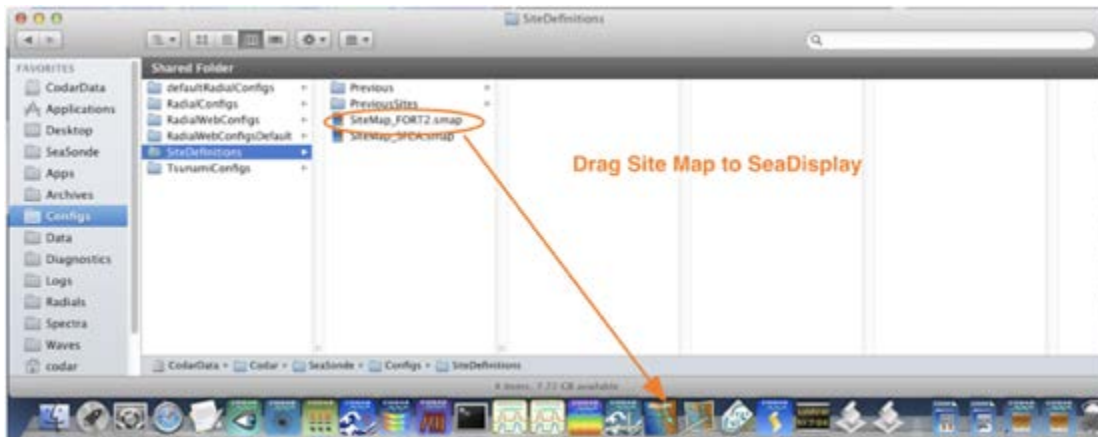
Radial Velocity Vector Examination

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Depending on the operating frequency and the radial site settings (See SeaSonde Operators Manual for details), the first set of radial velocity vectors (commonly called radials) will be generated 1 to 3 hours after system turn on. For a 5 MHz system, the first set of radials will normally be generated 3 hours after system turn on.

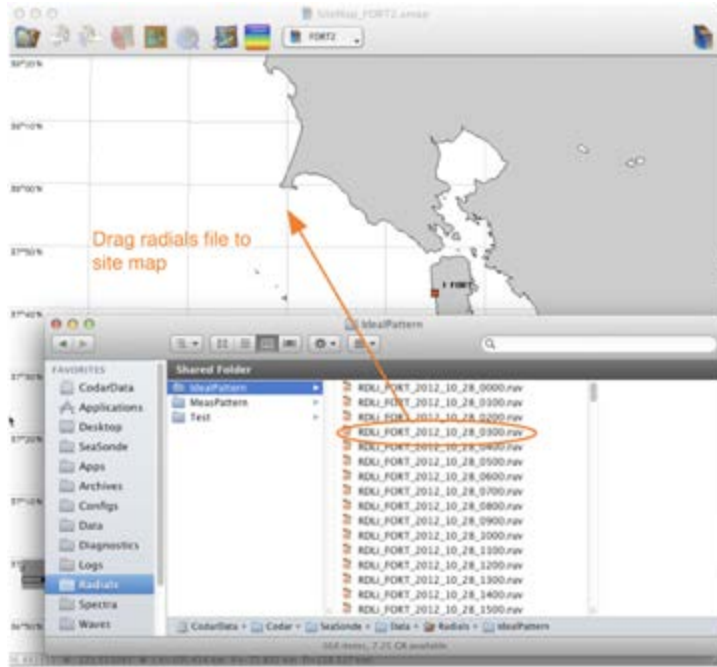
To examine the radials:

- Click on the finder icon on the lower left corner of the dock to launch finder window.
- Select Configs, SiteDefinitions and drag the corresponding site map into SeaDisplay as shown in the following picture. The site map is normally generated during SeaSonde installation. For details of site map generation, consult SeaSonde Operators Manual.

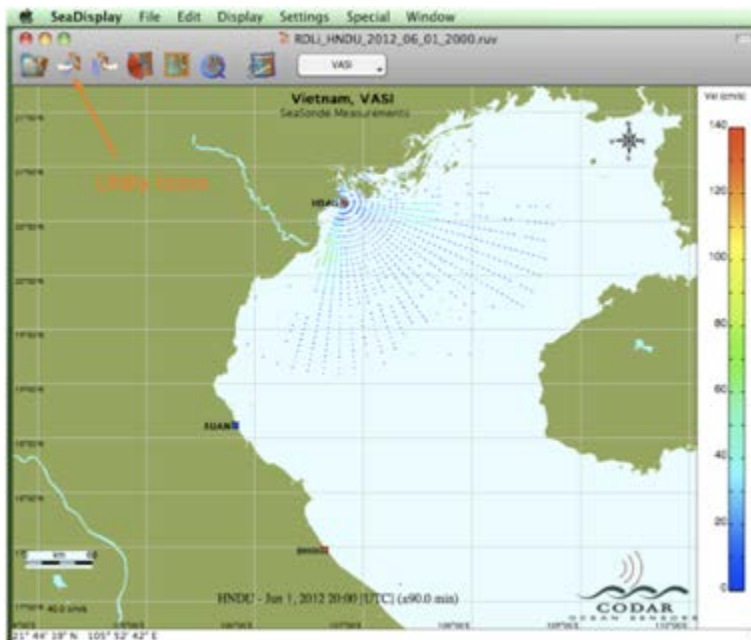


- Now select Radials, IdealPattern or MeasPattern and drag one or more of the .ruv files into the site map. The MeasPattern files are only available after the antenna patterns are measured, processed and installed. For details of the antenna pattern measurement and installation, see SeaSonde Operator's Manual for details.

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- One should now see the radials plotted on the site map as shown below. By placing the pointer at one of the utility icons, the pop up would display the function of that icon. one can browse the radials plots frame by frame, making a radials distribution plot, save the image to a file or save the frame by frame plot into a movie file.



- To print the plot, one can save the image to a file and send it to a printer. Alternatively, one can save any part of the screen display into an image file (screen dump) by:
 - ♦ cmd-shft-4
 - ♦ drag a window in the portion of the screen which one intends to dump
 - ♦ the image will be saved on the desktop with a file name like "Screen shot date time"

Radial Web Server

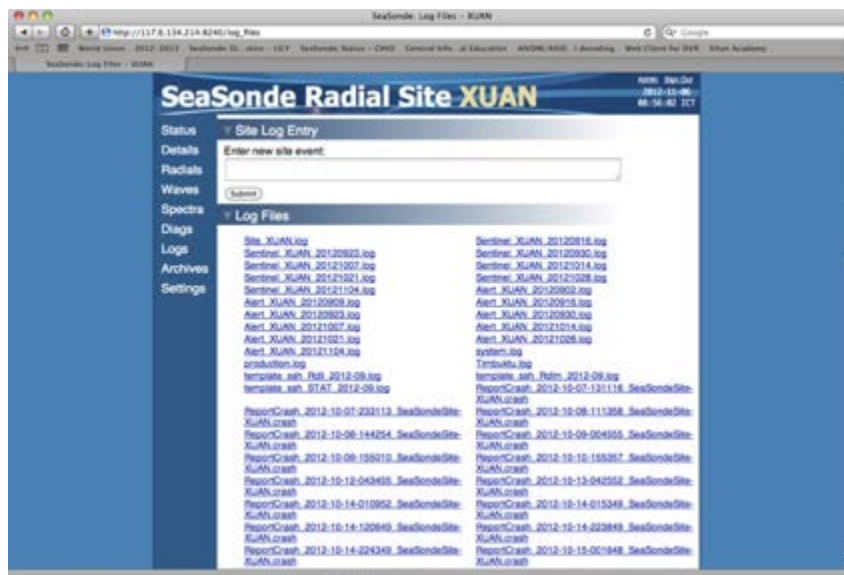
Radial web server is a convenient tool for users to monitor SeaSonde remote sites with any device which has a web browser such as laptops, tablet computers, mobile phones, etc.

To access the radial web server, open your browser and connect to the site computer using the link:

http://static_ip:8240

where static_ip is the IP address of the SeaSonde computer. :8240 is the port used by the web server

Contact the site installer or the person maintaining the site for the user-id and password for that site.



If you click Logs on the left column, the browser will bring you to a page like the following.

If you change something to the SeaSonde system or observe a significant event at the site, you should write them in the box marked by “Enter new site event” and click “Submit” after done.

If you scroll down to the bottom of the page, you will see all the log entries entered.

For other details of the radial web server, you can play with various links or consult SeaSonde Operator's Manual.

SeaSonde Controller deviations from conventional SeaSonde

1. Do not change attenuation settings as they no longer function the same way a conventional SeaSonde functions.
2. Do not change pulse shape to on. Leave it at off position. SeaSonde may not function properly with the pulse shape on. (With the pulse shape off, pulse shaping is done automatically by the RF amplifier).
3. For normal operation, keep the freq band in 'high'. Switch to 'low' only for diagnostics purposes only. (Low Power SeaSonde is fitted with a single band filter. The freq band switch is now used to turn on/off the DC bias of the loop stick antenna pre-amp).

Measuring the Antenna Pattern

Measurement with a transponder

This section describes how to perform a SeaSonde **antenna pattern measurement (APM)**. The SeaSonde uses an APM to calibrate the antenna response vs bearing for local, site-specific conditions resulting in increased accuracy and reliability of the data outputs.

It is necessary to do a dry run / walking APM before hiring a boat. Follow the steps below within a day to a week before doing the actual boat pattern. This ensures that all of your equipment is working and you can actually get the transponder peak located for the APM !!!!! During this dry run we recommend following the below steps for an APM and trying to collect the land points that are described at the end of this section.

Items Required

- Transponder (SSTR-101) including:
 - Transponder charger
 - Custom USB data cable
 - Whips
- SeaSonde Remote Unit (SSRS-100) including:
 - Antenna(s), cables, Rx chassis, Tx chassis and computer
- GPS navigator capable of storing time-stamped track. Garmin GPS 60, GPSMAP® 60 or GPSMAP® 76 product lines are recommended.
- Transponder Extender Kit (SSTR-EX) if operating frequency < 20 MHz, including:
 - four piece green whip antenna
 - whip antenna feed/base
 - grounding cable
 - custom transmit cable
- Voice communications (2 x two-way radios, cell phones, etc.)
- Boat

Whip Configurations Required

SeaSonde Model	Antenna Configuration (Boat Run-APM)	**Antenna Configuration (Walking-WAPM)
5MHz	Antenna feed w/green whips + OCEAN GND	three 8' white whips on sides and top
9MHz	Antenna feed w/green whips + OCEAN GND	three 8' white whips on sides and top
12MHz	Antenna feed w/green whips + OCEAN GND	three 8' white whips on sides and top
16MHz	Antenna feed w/green whips + OCEAN GND	three 8' white whips on sides and top
25MHz	White whips (2 - 4' whips on sides + 8' on top)	two 4' white whips on sides and 8' top

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42MHz	White whips (2 - 30" whips on sides + 64" on top)	White whips (2 - 30" on sides + 64" top)
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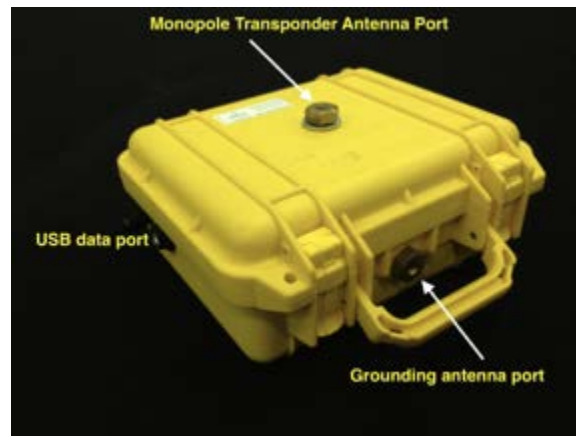
Charging the transponder battery (done at least one day before the APM)

- Open the transponder case. Inside, there is a printed circuit board with a socket labeled CHARGER and a power switch.
- Plug the transponder charger into an electrical outlet.
- Plug the transponder charger's round plug into the CHARGER socket on the printed circuit board. The FAST CHARGE indicator on the charger will light red while the battery charges.
- When the FAST CHARGE indicator light turns off, the battery is charged. Keep the battery fully charged to lengthen battery life.
- Unplug the round plug from the CHARGER socket.



Configuring the transponder

- Plug the USB data cable into the USB data port on the side of the transponder case.
- Plug the standard USB connector of the data cable into any available port on the SeaSonde computer, or laptop with R7U1 or later.



- Switch on the transponder.
- On the computer, open SeaSondeTransponder app located in SeaSonde/Apps/RadialTools. The Transponder Controller window will appear. If the transponder is being recognized there will be green lettering saying, "Transponder Connected."

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- If the transponder is plugged into the site computer, you simply press the Initialize button in the Transponder Controller window. This will set the transponder center frequency to match the site and set the appropriate Offset for that frequency. Press Store when done.
- If the transponder is plugged into a computer other than the site computer. You can press Initialize in the Transponder Controller window, enter the desired center frequency (which is your SeaSonde operating frequency) and press the Frequency button. The offset will be entered in automatically. Press Store when done.
- The center frequencies and corresponding offsets for transponder configuration are listed below.

SeaSonde Model	Frequency (center)	Offset
5MHz	Your center frequency	20.7 Hz
9MHz	Your center frequency	20.7 Hz
13MHz	Your center frequency	40.7 Hz
16MHz	Your center frequency	40.7 Hz
25MHz	Your center frequency	40.7 Hz
42MHz	Your center frequency	80.7 Hz

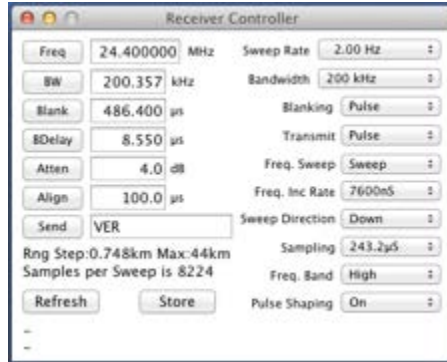
- Switch off the transponder.
- Quit SeaSondeTransponder app.
- Switch on the transponder.
- Launch SeaSondeTransponder app.
- Confirm the transponder settings are the same as what you stored.
- Switch off the transponder.
- Unplug the USB data cable connector from the transponder.

The transponder is set up for an APM.

- Place the transponder at least 1 wavelength away from the SeaSonde receive antenna.
- Use the whip configurations in the table at the beginning of this section for walking APM.
- Turn the transponder on.

Configure the Receiver and Locate the Transponder Peak

- Quit all applications except SeaSondeController and SeaSondeAcquisition.
- Click the SeaSondeController icon in the Dock.
- Choose Receiver Controller > Advanced Control.... The Advanced Receiver Controller dialog appears, take a screenshot of your original operating settings if one does not already exist on the desktop (shift + command +4).



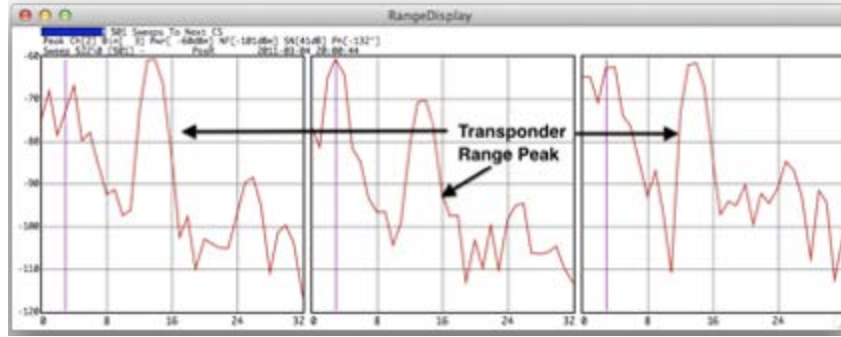
- Choose Receiver Controller > Receiver APM Configuration. When prompted by the dialogue box press OK. The proper settings should be entered into the Advanced Controller window automatically. The values can be checked to the look up table below.



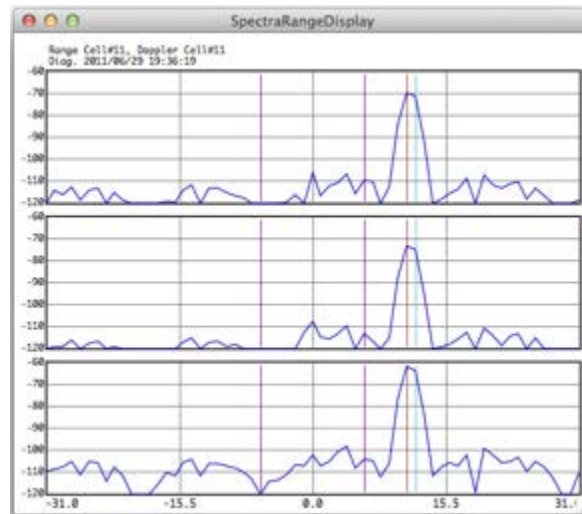
SeaSonde Model	Bandwidth	Blanking	Bdly µs	Attenuation Boat/Walking	Sweep Frequency	Pulse Shaping
5MHz	25kHz	60*	~4.75	15/30db**	2Hz	Off
9MHz	25kHz	60	~4.75	15/30db**	2Hz	Off
13MHz	50kHz	60	~4.75	15/30db**	4Hz	Off
16MHz	50kHz	60	~4.75	15/30db**	4Hz	Off
25MHz	150kHz	60	~4.75	15/30db**	8Hz	Off
42MHz	150kHz	60	~4.75	15/30db**	8Hz	Off

- At the SeaSonde computer, click the SeaSondeAcquisition icon in the Dock.
- Choose Processing > Enable Loop Diagnostics. Two windows appear, The Loop Diagnostics window and the SpectraRangeDisplay window.
- In SeaSondeAcquisition go to Monitors > Range Display menu item.
- Confirm that the transponder signal peak appears in the Range Display window.

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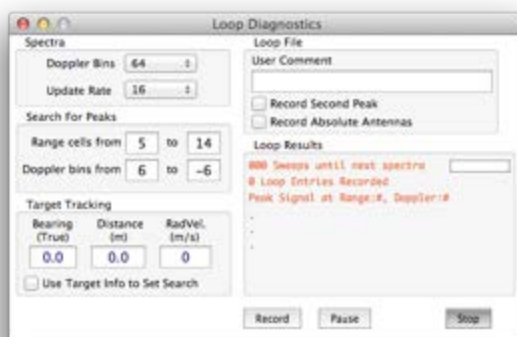


- Note. RangeDisplay is usually the easiest way to locate the transponder peak, and determine approximately what Range cell it is in. You see what range cell the peak is in on the X-axis of the RangeDisplay. The Transponder peak in the picture above is in approximately range cell 11. However, occasionally the peak can not be seen in this window.
- After the initial set of sweeps, confirm that the transponder signal peak appears in the SpectraRangeDisplay.



- The APM settings should put the transponder peak around range cell 11. To define the peak to the range cell where it is strongest, use the Loop Diagnostics window. Change the range cells in the Search For Peaks section. Start out with the range cells wide open, in the pic below the software will be looking for the transponder peak between range cells 5 to 15. At the top of the SpectraRangeDisplay the Range Cell with the strongest peak is reported, in the example above is it range cell 11. Fine tune the Loop Diagnostics Range Cells so that the transponder peak is isolated between 1 or 2 range cells.
- Set Doppler cells search limit from 6 to -6 to search for transponder peak between these doppler cells.

(Note: It should be 6 to -6 as shown in the picture and not -6 to 6). Reason for this is we want to avoid searching near the DC region(Doppler cell 0) where you can pick up bragg peaks instead of transponder peak. You can always adjust the range cell and doppler cell search region depending on where the transponder peak is actually located during your APM.



- Once the peak is located. Turn the transponder off and watch the peak go away in the SpectraRangeDisplay window.
- Turn the transponder back on and make sure that the peak you have determined as the transponder peak returns in the SpectraRangeDisplay.
- Shut off the transponder and get in position for the boat or walking APM.

Set up the transponder antenna on the boat

Transponder on a boat (SeaSondes operating below 20 MHz)

- Assemble and mount to the boat the four-piece whip antenna and feed included with Transponder Extender Kit (SSTR-EX).
- Attach the transmit signal cable type N connector to the antenna feed, the white wire to the Monopole Transponder Antenna Port and the black wire to one of the grounding antenna ports.
- Ground the antenna feed or one of the transponder grounding antenna ports to the seawater connecting the 20' grounding wire to seawater
 - directly over the side of the boat with end of wire weighted to stay in water or
 - via a seawater ground point on the boat or propellor motor.

Transponder on a boat (SeaSondes operating above 20 MHz)

- Attach an eight-foot fiberglass whip antenna element in the Monopole Transponder Antenna Port on top of the yellow transponder case.
- Attach an eight-foot fiberglass whip antenna to BOTH of the grounding antenna ports on the front and back of the transponder case.



Transponder carried on land

Attach an eight-foot fiberglass whip antenna element in the Monopole Transponder Antenna Port on top of the yellow transponder case. Attach eight-foot fiberglass whip antennas to BOTH of the grounding antenna ports on the front and back of the transponder case. See table for the whip configuration that is suggested for your operating frequency.



Set up tracking on your GPS handheld

- Set up your GPS navigator to log a track.
- Record track entries by time increment: 1 to 5 seconds for a boat APM, depending on memory available in your GPS. Always use 1 second intervals for walking antenna pattern. At least one GPS measurement (called an epoch) needs to be made in each angular bin of the coverage arc.



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- Synchronize the SeaSonde computer clock with the GPS navigator clock by going to SeaSonde Controller then Receiver Controller > GPS Monitor and comparing it to the time on the GPS device being used for the APM

Note: Track files downloaded from the GPS unit must contain a date and time stamp for every position recorded. Garmin models only save this information in the ACTIVE track log

Set up the SeaSonde to Log Data

- Click the SeaSondeAcquisition icon in the Dock to select SeaSondeAcquisition.
- Choose File > Log Cross Spectra to deselect Cross Spectra logging.
- Confirm there is no check mark next to the File > Log Cross Spectra menu item, indicating the item is deselected.
- Choose File > Log Time Series. Confirm that Time Series are being created in the SeaSonde/Data/TimeSeries folder.

Measure Antenna Pattern

- For a pattern from a boat transport the transponder to a test point directly in front of the antenna (~300m - 500m from shore) before moving to the starting point of the first arc. Turn the transponder on and make sure the peak shows up in the SpectraRangeDisplay. Turn it off when confirmed.
- Move the transponder to the starting point. For walking pattern it should be at least a wavelength away. If performing a boat pattern try to be at least 500 m to 1.5 km away close enough to shore to maintain a strong signal while traversing the two arcs.
- Switch on the transponder.
- Confirm that the transponder peak appears in the SeaSondeAcquisition's SpectraRangeDisplay window as described above. The transponder signal peak may be hidden from view if it is around a land feature on a boat.
- Confirm that Time Series are being created.
- Start track logging on the GPS navigator.
- Move the transponder (on a boat or by walking) in a circular arc centered on the receive antenna. Maintain a constant speed no more than 4 knots. Walk slower than you think you should. The transponder signal peak should remain in the same location in the SpectraRangeDisplay window. If the ship is traveling too fast the peak will shift to the edge of the display and will serve as a warning to slow down.
- For boat, at the end of arc 1, reverse course and retrace the arc in the opposite direction. Try to get the the boat as close to shore as safely possible at the end of each arc.
- For walking, if possible make two complete circles around the receive antenna. Keep the antenna at least a wavelength away. Make one circle, at the end of the first circle, walk a circle in the other direction. This is best case scenario, if a complete circle is not possible get as close to a complete circle with your arcs.
- After completing two full arcs in opposite directions, uncheck File > Log Time Series in SeaSondeAcquisition to end logging.
- The person with the GPS should turn it off.

APM is complete.

Store APM data

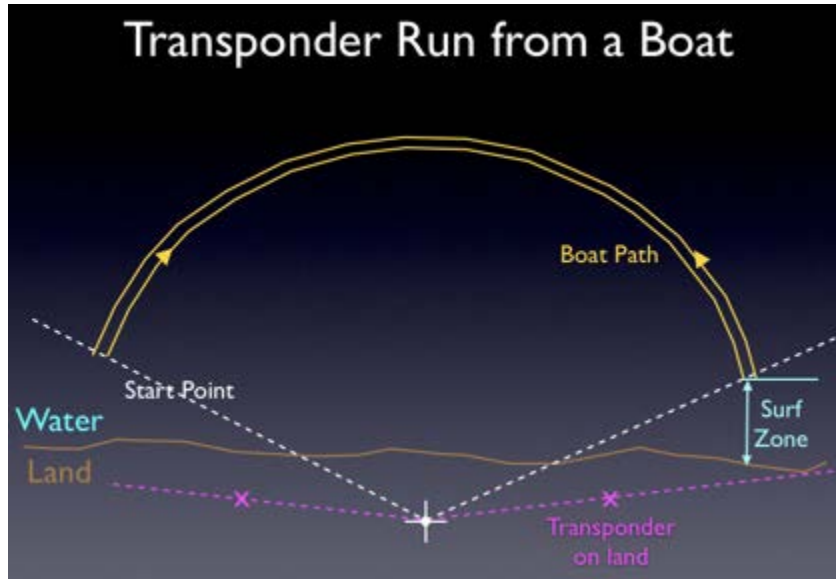
Copy or move the following data to a separate folder. The data will be used to generate an antenna pattern file for use with your SeaSonde remote unit.

- The directory /Codar/SeaSonde/Data/TimeSeries, including the files in that folder.
- The directory /Codar/SeaSonde/Configs/RadialConfigs, including the files in that folder.
- The GPS navigator track log file.

Land Points

Note: Land points may not always be possible due to geographic limitations. Perform land points only if it is safe to do so.

- Using the GPS points at the end of both sides of the arc taken during the main APM, plot a straight line from the SeaSonde antenna and a point on the land that would connect the point where the ship would have touched the coast and the antenna.



- Create an APM land point by placing the transponder at the point described above following the APM procedure for each land point individually. At the end of the process you will have the main APM data set of TimeSeries (Lvl files) and GPS track files and two short segments of time with land point TimeSeries files and their GPS track files. Measure the SeaSonde antenna position with the GPS immediately after collecting land points. This position information will be used as a reference when merging the land points and APM arcs together.
- Send this information to CODAR Ocean Sensors for consolidation into a single file set. Usual charges will apply.

Store APM data

Copy or move the following data to a separate folder. The data will be used to generate an antenna pattern file for use with your SeaSonde remote unit.

- The directory /Codar/SeaSonde/Data/TimeSeries, including the files in that folder.
- The directory /Codar/SeaSonde/Configs/RadialConfigs, including the files in that folder.
- The GPS navigator track log file.

Re-Configure SeaSonde for normal operation

- Click the SeaSondeController icon in the Dock.

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- Choose Receiver Controller > Restore Hardware State. Press Load, Receiver settings should be back to normal operation.

Making an Antenna Pattern File

- The GPS and SeaSonde data collected during the APM needs to be processed into an antenna pattern file before it can be used to make measured pattern (calibrated) radial vectors. This can be done by CODAR (fees may apply) or by someone trained in antenna pattern data processing. Refer to *SeaSonde Radial Suite Application Guide for CrossLoopPatterner* and CODAR training materials for more information.

Measurement with AIS

Overview

The SeaSonde Realtime Automatic Pattern Generation Suite is a suite of software which utilizes the radar echoes in CSQ files generated by ships of opportunity near a SeaSonde site, along with ship track information provided by the Automatic Identification System (AIS) to automatically generate estimates of antenna patterns in realtime. It was developed and has been tested with the Comair AIS-3R Receiver.

The software consists of four main components: the AIS Logger (sec. 3.1), the AIS Web Server (sec. 3.2), the AIS Track Generator (sec. 3.3), and the AIS Looper (sec. 3.4). All of these components run in the background after being installed, and work in sequence along with SeaSonde Radial Suite software to generate AIS Loop files. These loop files can then be used to create SeaSonde antenna patterns to increase accuracy of Radial Suite output data.

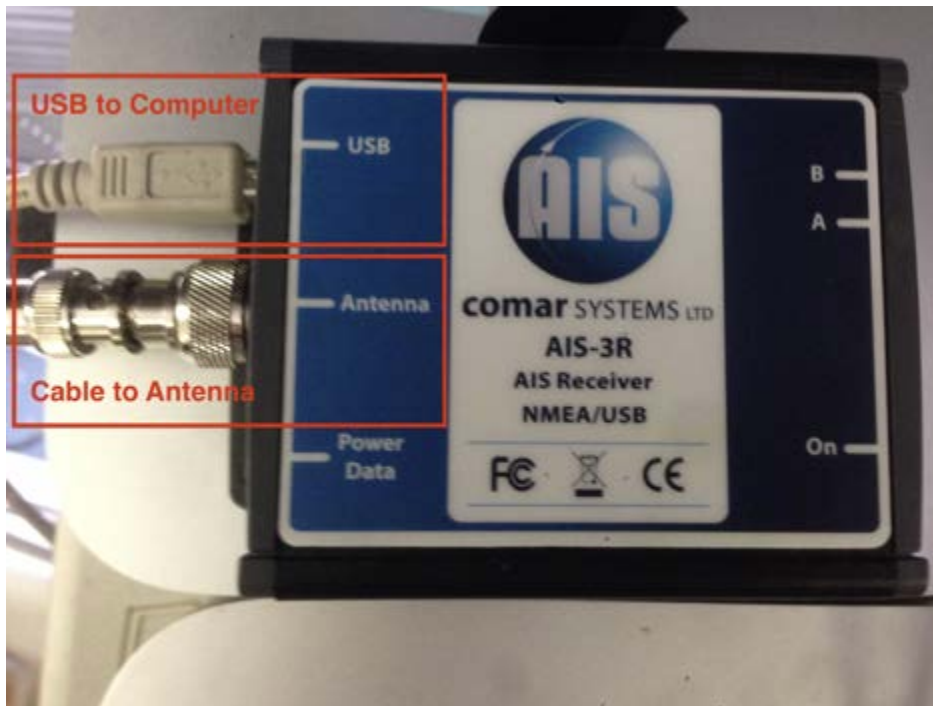
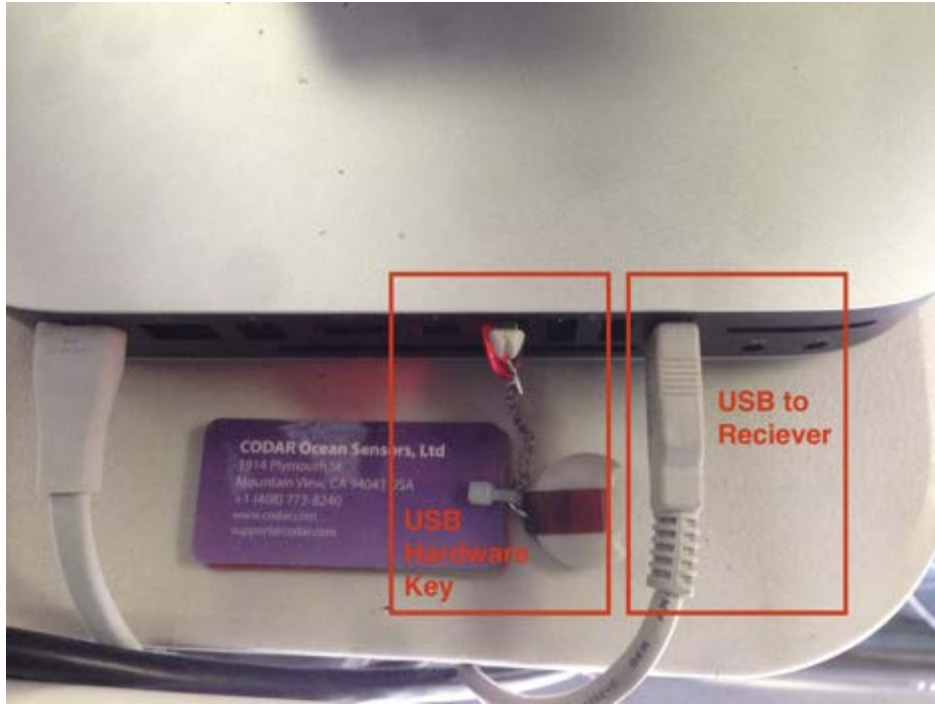
Installation

Installation of the AIS Antenna Pattern Generation Suite requires the SeaSonde AISPattern software installer file, a Comair AIS-3R Receiver, an AIS antenna, and a SeaSonde USB Hardware key containing an AIS Suite license. The AIS Suite is an add-on to the SeaSonde Radial Suite software, and requires SeaSonde Radial Suite 7 installed on the computer.

Hardware Installation

Connect the Comair AIS-3R Receiver to the Mac computer with the supplied USB cable.

Connect the AIS antenna to the input on the AIS receiver labelled "Antenna."



No other connectors or cables are required. Continue to software installation.

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Software Installation

Plug the SeaSonde USB Hardware key in to the computer if it is not already plugged in. If an older Hardware key does not contain an AIS Suite license, it can be upgraded to include the AIS license by CODAR staff (support@codar.com).

Double click the installer file labelled "SeaSonde10R1-AISPattern-Suite" and then double click on the InstallAISPatternSuite app. Follow the onscreen instructions to install all AIS software components. Restart the computer to finish the installation.

Operation

Operation of the AIS software to generate loop files is entirely automated. The necessary components launch in the background when the computer starts up. The Logger, Tracker, and Looper processes use data from the AIS receiver and the SeaSonde receiver to generate Track and Loop files in the */Codar/SeaSonde/Data/AISData/* directory.

AIS Logger

The AIS Logger process takes the raw AIS data from the antenna and decodes the messages into usable ship data. It stores the relevant ship information in a database to be used by other AIS Suite processes.

AIS WebServer

The AIS WebServer is a tool that provides access to the basic AIS data such as ship positions, headings, and other details. It is not necessary to use this for normal operation and generation of loop files, but can be useful in determining how much data the AIS receiver is collecting. The web server can be accessed through a web browser at the address localhost:8241 to view ship position data. The address localhost:8241/ships also provides more detailed ship information.

AIS Tracker

The AIS Tracker runs in the background. It takes the AIS ship data interpreted by the logger and generates GPS Track files. These files are created in the */Codar/SeaSonde/Data/AISData/AISTracksToProcess/* directory. New Track files are generated approximately every ten minutes. Track files have the .trk file extension.

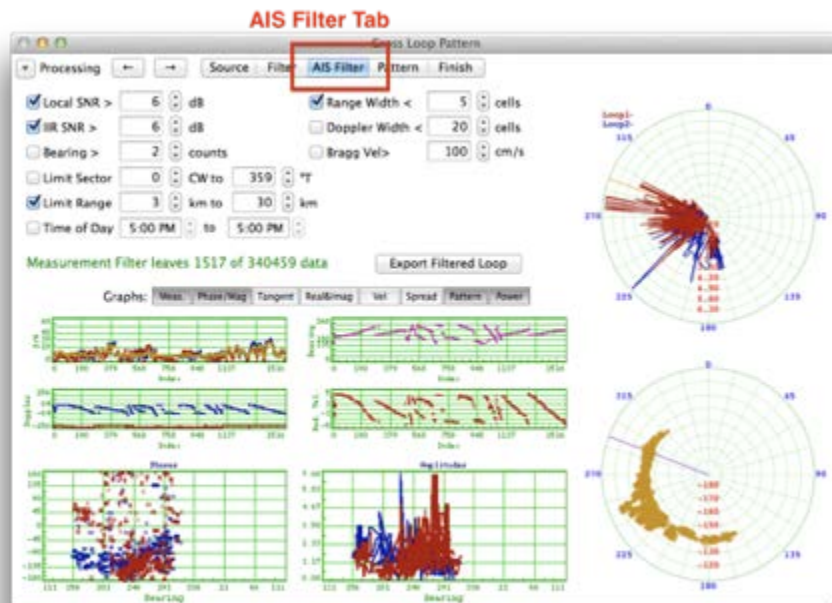
AIS Looper

The AIS Looper also runs in the background. It processes the GPS Track files and generates daily Loop pattern files. Processed Track files are moved to the *AISData/AISTracksProcessed/* directory, and new loop files are created in the *AISData/AISLoops/* directory. Loop files have the .loop file extension.

Cross Loop Patterner

In order to create usable antenna patterns for use with radial suite software, AIS loop files should be filtered using the Cross Loop Patterner app. Cross Loop Patterner is included in SeaSonde Radial Suite software and can be found in */Codar/SeaSonde/Apps/Tools/CrossLoopPatterner.app*.

Open Cross Loop Patterner and drop a selection of AIS Loop files on the application window. If they are properly formatted AIS Loop files, the top navigation tabs in the Cross Loop Patterner app will contain an option "AIS Filter." Select this tab.



After filtering the data down to a usable set of points, the "Pattern" and "Finish" tabs can be used to smooth and save the pattern for use in measured pattern data. See next section for more details.

AIS Pattern Generation

AIS LOOP files are obtained by the use of the SeaSonde AutoAPM pattern kit. This kit consists of an AIS antenna and receiver that are plugged into a SeaSonde Remote Site computer and used in conjunction with the AIS Pattern software suite to generate LOOP files in a similar manner as using a transponder signal. The difference between a transponder signal generated LOOP file and LOOP files generated from the AIS Pattern Suite is that instead of using a transponder to generate a signal the SeaSonde instead uses the reflected signals from passing ships to determine phase and amplitude values for the cross loops as well as the power pattern received but the mono pole/ di pole antenna. Today ships around the world use the AIS ship positioning system to determine vessel speeds and direction in three dimensions which is in turn used by the AIS Pattern Suite to determine the radial velocity and bearing of each ship signal detected by the SeaSonde

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receive antenna. At any given time there are a multitude of ships crossing the section of ocean that a SeaSonde is collecting data from. These ships normally show up as small blips in the cross spectra.

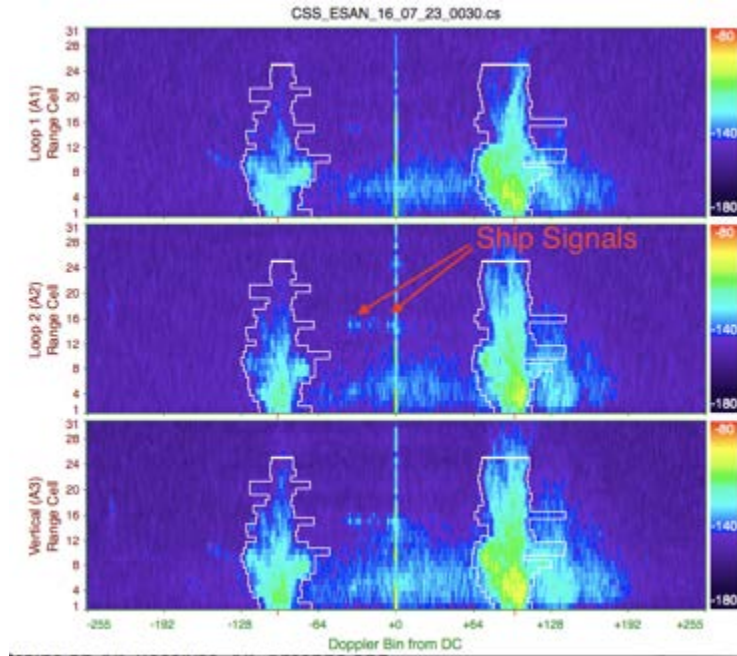


Figure 1

By using the AIS signal to marry the precise location of these vessels with the reflected signal echoes detected by the SeaSonde, the AIS Pattern Suite can create LOOP files in a similar manner as using a transponder and handheld GPS. The difference is that there will be more than one signal source for each LOOP file created. Normally the AIS Pattern Suite is set to generate a composite LOOP file each day from the number of ship echoes the SeaSonde receives. Using Cross Loop Patterner the LOOP files can be visualized (see CrossLoopPatterner Application Guide for more information of using CrossLoopPatterner).

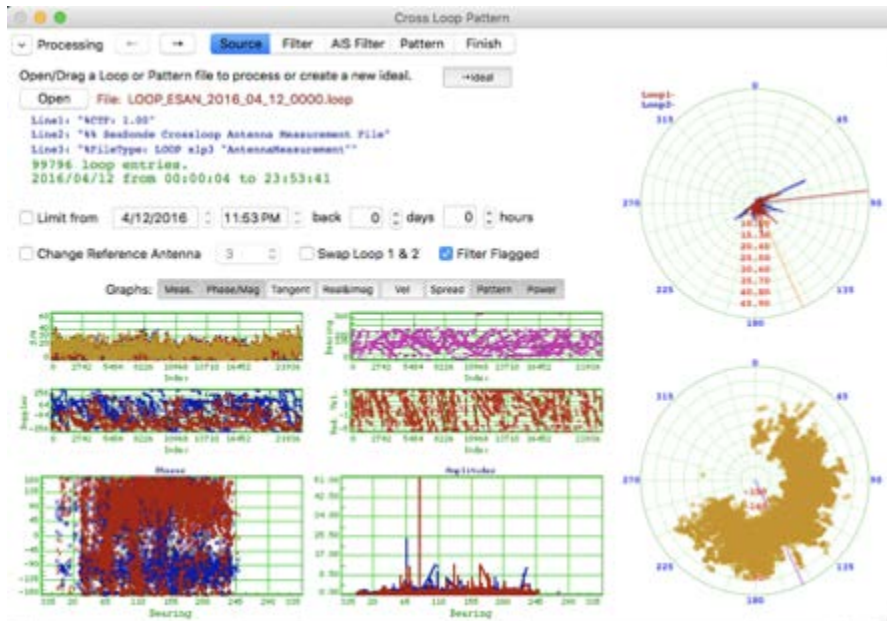


Figure 2

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As is evident there are a lot of signal sources in this LOOP file, each with varying peak signal strengths and quality. In order to better determine the actual pattern one must use the filters in CrossLoopPatterner in order to get past the noisier or more spurious data. Also it is possible and it is preferred to load multiple LOOP files in order to accentuate the stronger, better quality signal that come from larger slower ships than from smaller or faster moving vessels. For the purposes of this document three LOOP files will be used from a single SeaSonde spanning three consecutive days of coverage.

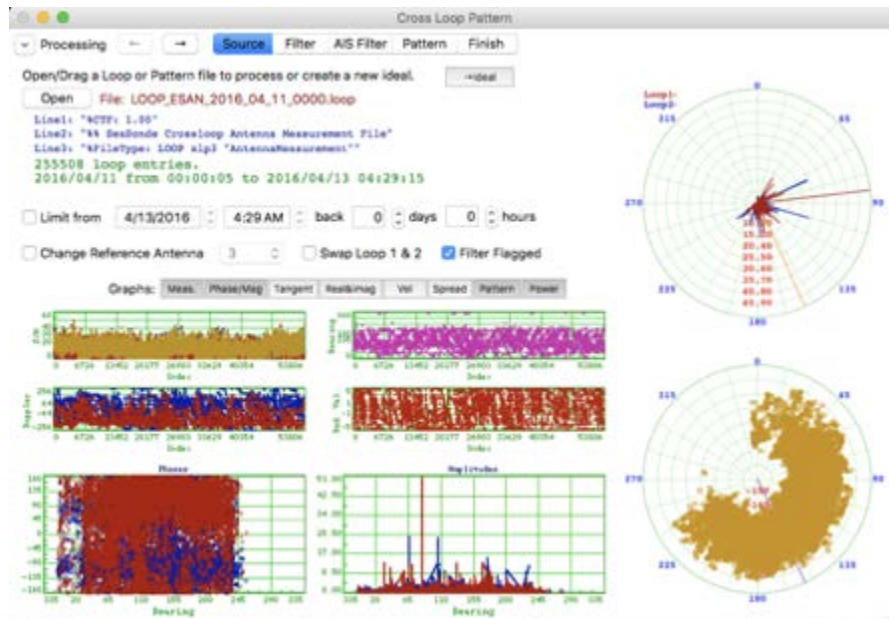


Figure 3

Note the difference between Figures 2 and 3, Figure 2 shows the data in a single LOOP file while Figure 3 shows CrossLoopPatterner loaded with three consecutive LOOP files spanning 3 days.

If the Pattern tab is clicked the following pattern is calculated:

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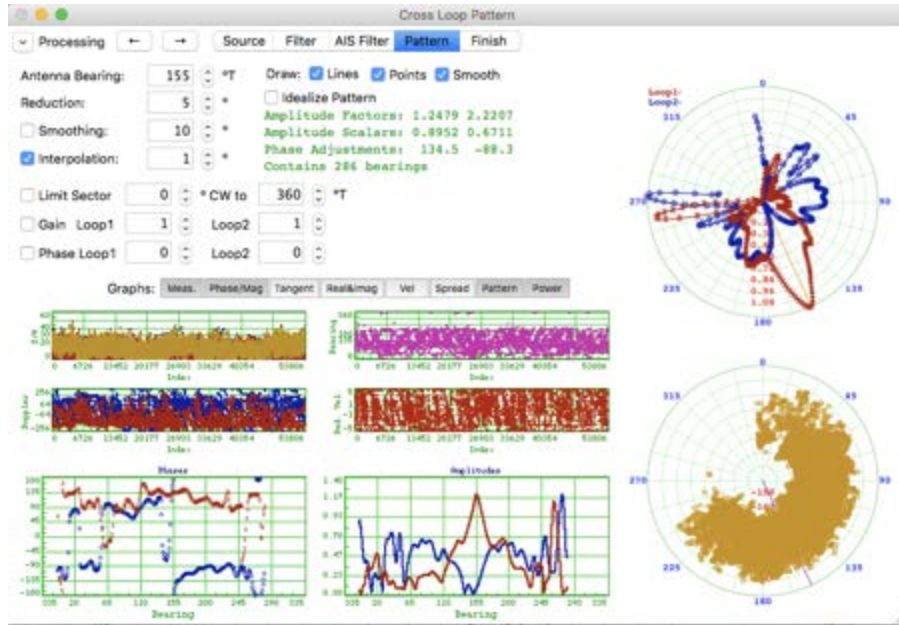


Figure 4

For comparison here is the transponder measured pattern of the same location using the traditional transponder APM approach:

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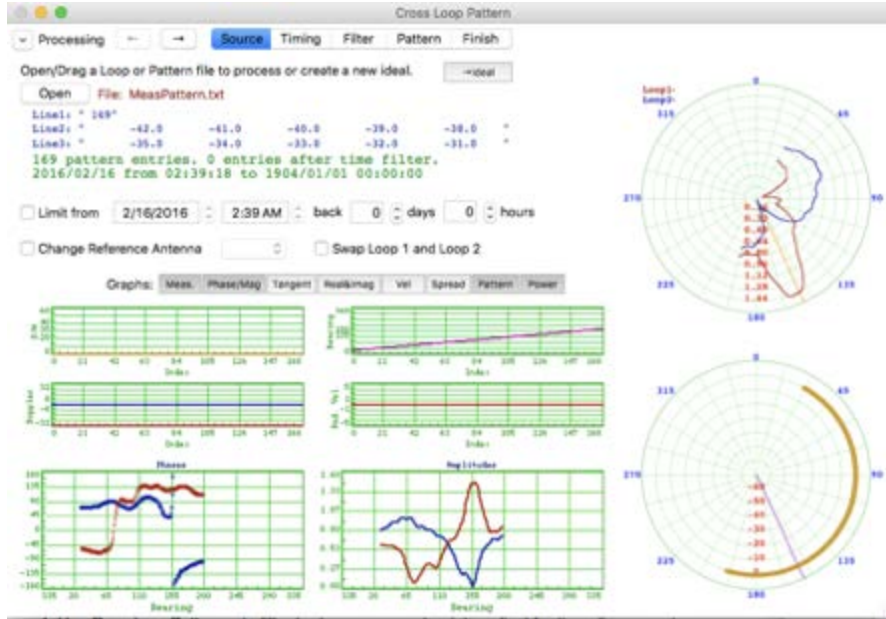


Figure 5

Even in this unrefined state the main features of the antenna pattern are already evident but in order to get to the actual pattern the low quality signal elements must be filtered out. CrossLoopPatterner is equipped with several data filters to help with this task. The following section will detail each of these filters.

CrossLoopPatterner Filters

The following is a brief description on these filters and how they can be used to help clean up an antenna pattern data set.

In the Cross Loop Patterner application there are two tabs that contain filters to help clean up the signal found in the LOOP file. The first tab is called "Filter", this tab contains the standard filters that are used in conjunction with a normal APM done with a transponder carried by a person or on a boat.

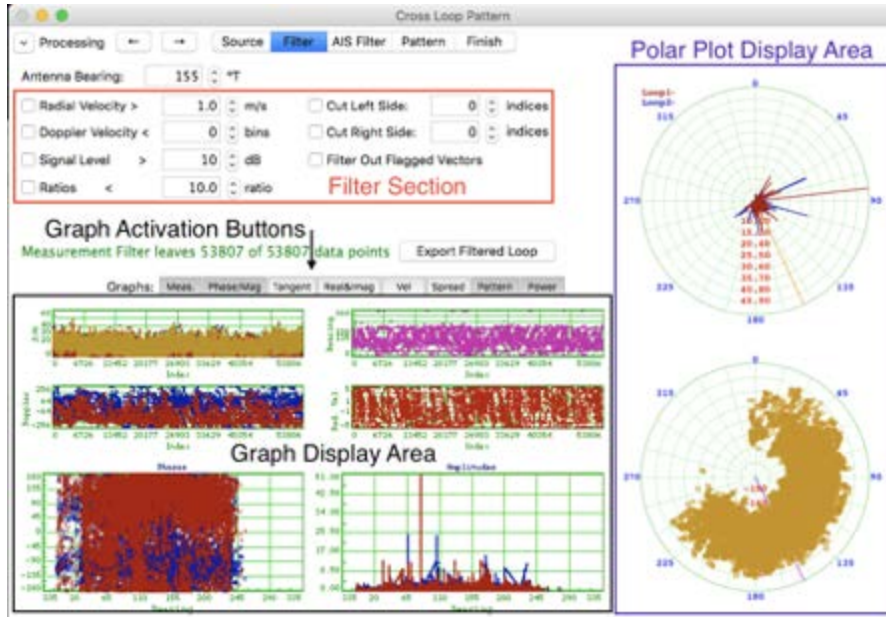


Figure 6

Radial Velocity - Keeps all points which have less than the entered velocity value. This filter is mostly used for filtering transponder radial velocities (usually zero if the transponder is kept on a perfect arc) and is not very useful when using AIS LOOP data.

Doppler Velocity - This filter keeps all points which are less than plus/minus the value entered in the filter window from the average doppler velocity cell. Normally this doppler velocity cell is referring to the the doppler cell of the transponder peak but in a AIS LOOP file there are multiple signal peaks to be considered, in this case the Doppler Velocity filter can be used to remove the lower quality signals that may contribute erroneous information to the pattern file.

Signal Level - This filter will retain all the data points that have a signal to noise ratio greater than the threshold value inputted by the user into the filter value in dB. These values will be visualized in the S/N graph from the Meas. graph tab. This filter will remove any di-pole (monopole for older SeaSondes) channel signals that score less than the filter value. It will only remove points from the cross loop channels (red for loop 1, blue for loop 2) where both loop 1 and loop 2 signal to noise values fall before the set threshold value. This filter will have a large impact on the pattern and should be used carefully to remove the worst data points only. There are finer filters that will be described later on to do further fine tuning.

Cut Left/Right Side - These filters are designed to remove the entered number of points from beginning or end of the LOOP file. Usually used with a transponder LOOP to remove a bad part of a particular arc, these filters are not very useful in AIS pattern generation and should be avoided for this particular application.

Filter Out Flagged Vectors - If this check box is activated this filter will remove any points whose Flag column is not zero. Normally SeaSonde Acquisition sets this value to zero but a user can hand edit the loop file to remove certain points that are deemed undesirable and are not removed by other filters.

When CrossLoopPatterner detects an AIS LOOP file or LOOP file set an extra filter set is activated and will be accessible from the "AIS Filter" tab

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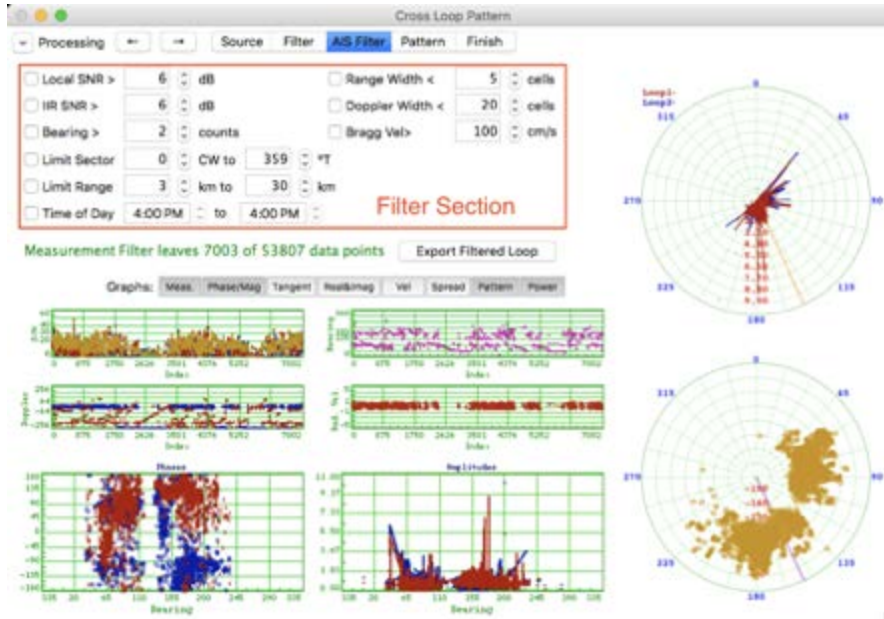


Figure 7

In the AIS Filter tab:

Local SNR Filter - Removes points that fall under the Signal to Noise value entered in the filter in terms of dB. The base level is determined by the average noise floor calculated from the range cell of the peak signal calculated in LOOP file plus/minus one range cell around this peak plus 6% doppler.

IIR SNR - Removes points that fall below the dB threshold entered from the calculated base value. This value is the noise floor calculated after removing the peak signal and making a running average of the background noise of the LOOP file throughout all ranges.

Bearing - This is a filter that removes the points that have fall below the histogram of bearing counts from the value given. The histogram can be seen visually in the "Spread" graphic. This filter may help in removing spurious bearings that have small amounts of data.

Range Width - Removes all points that are not within plus or minus of the range cells that are entered into the filter. The centroid of this filter would be the range cell that contains the peak signal calculated in the LOOP file.

Doppler Width - Removes all points that are not within plus or minus of the doppler cells that are entered into the filter. Note this also removes faster moving ships and tends to keep larger, slower vessels for APM calculation.

Bragg Vel - Removes all the points that are not within plus/minus the entered value in cm/s of the surrounding center of the Bragg Peaks generated by normal SeaSonde operation. This filter can remove any ship echoes that may be influenced by noise associated with the normal sea echo used to generate radial data.

Limit Sector - This filter limits the data points to be considered in terms of degree arc. Sometimes ships may be transmitting AIS behind a SeaSonde on in a marina berth that would extend the pattern into a land path region that would normally not be used for radials.

Limit Range - Excludes any points outside of the set radial range in terms of kilometers. This filter can be useful to omit ships that are too far or too close and returning low quality data points. Creating patterns from AIS Generated LOOP files

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AIS generated pattern measurements are created from the measured reflected signal of a passing ship whose position is known from the AIS (Automatic Identification System) transponder on the vessel. The method is similar to a normal boat APM but in this case a transponder is not used rather the reflected signal echo off the vessel's hull. The size of the vessel very much determines the strength of the return signal echo. By using the AIS signal the Auto APM software generates a TRAK file that is married to the returned signal echo information which in turn is used to create a LOOP file. This process generates a LOOP file every day for each ship track that is identified and can be monitored. By using these aggregate LOOP files it is possible to construct a current antenna pattern that will yield a more accurate pattern for measured pattern radials than the yearly recommended boat APM.

Having a definite path to making AIS patterns from multiple LOOP files is not really possible. There are many factors that make every site a unique challenge. The scope of this document will be to outline some general techniques that should be applicable to most cases.

General guidelines

In order to get the most out of the AIS data it is best to proceed with the following guidelines.

The Signal to Noise filters (Signal Level, Local SNR, IIR SNR) should be considered as the rough refinements of all the filters involved and should be used to remove only the worse data points and nothing more. A favored approach is to adjust these filters so that they only *begin* to remove data. Once these filters are used in this manner move on to the other finer tools to continue developing the antenna pattern.

After every adjustment click on the Pattern tab and see if any improvement has been made to the pattern data. In this method one can see if the filtering is helping or not.

If the site has a traditional pattern installed try to create a pattern within one week of the AIS installation, this way a benchmark pattern is established and the AIS Auto APM system can take over from there. Though it is not necessary to have a standard pattern, using the traditional pattern as a starting point is very helpful.

Do not extend the pattern over land. Because the AIS pattern is being created from the local shipping traffic it may be possible to get pattern points that would put a land path between the antenna and the ocean, use the limit sector filter to avoid this as land path signals tend to give bad data. One exception to this is the long range SeaSonde but even then try not to allow any land path greater than 1-2 km.

Example of Using CrossLoopPatterner to Create an AIS Pattern

First select the set of LOOP files to be used. Normally a week or more of data can be used for pattern making purposes.

1. Go to /Codar/SeaSonde/Data/AIS/LOOPS
2. Select the data set to be used. There is no limit on the number of LOOP files that can be used but the more LOOP files implimented the slower CrossLoopPatterner will operate.
3. Open the files with /Codar/SeaSonde/Apps/Tools/CrossLoopPatterner.app

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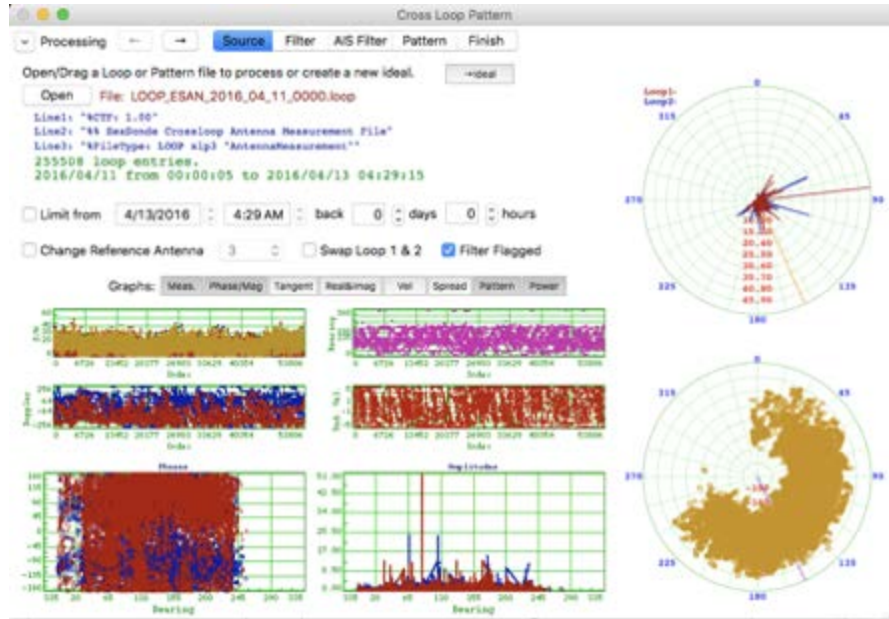


Figure 8

Once this is done begin to apply the filters to remove the lesser quality signal hits from smaller, faster moving ships. Use the Filter tab filters as the rougher over all data removal and the AIS Filters for finer improvements to the data.

Beginning with the Signal Level filter remove enough points to begin to see a clear pattern in the phases or at least to see the phases from each cross loop distinctly. In this case the value decided upon is 11 dB.

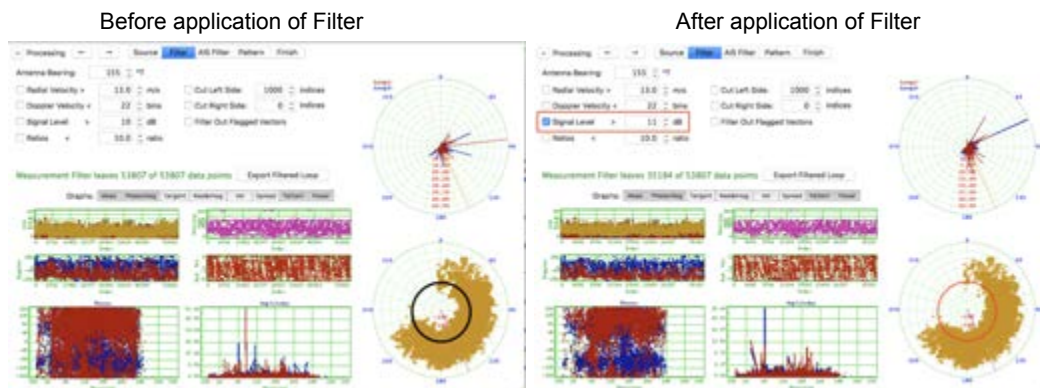


Figure 9

At this point click in the Pattern tab to see how the pattern has changed with the application of this filter.

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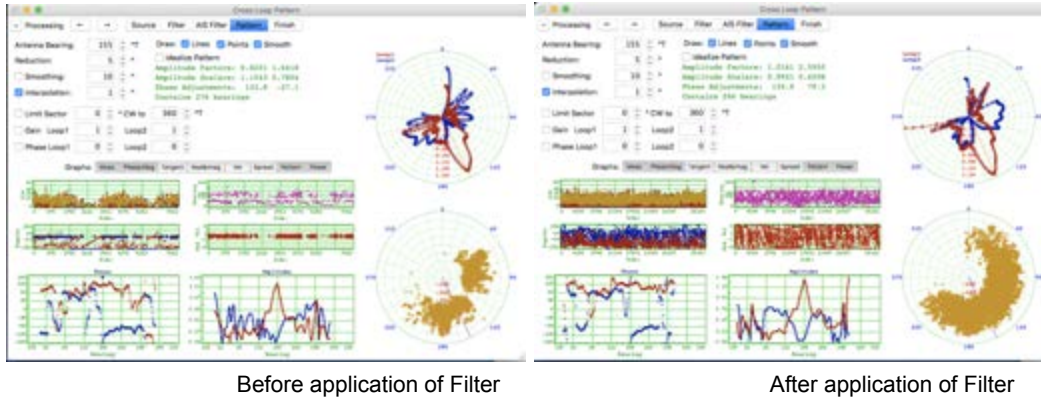


Figure 10

With the application of the Signal Level filter the lobes of cross loop 2 have begun to show a more distinctive characteristic. Note, this result was arrived by changing the filter and checking the pattern with every step.

Proceed to the other S/N filters found in the AIS Filter. Use the Local SNR filter and IIR SNR filters to remove the larger noisier peaks seen in the amplitudes. Remember to check the pattern tab for improvement. Use only the minimal amount of filtering as these are supposed to be rough refinements.

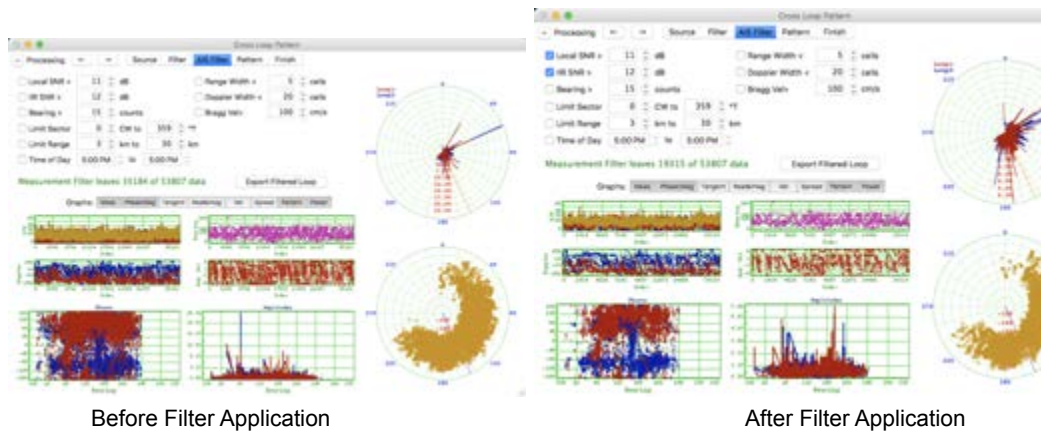
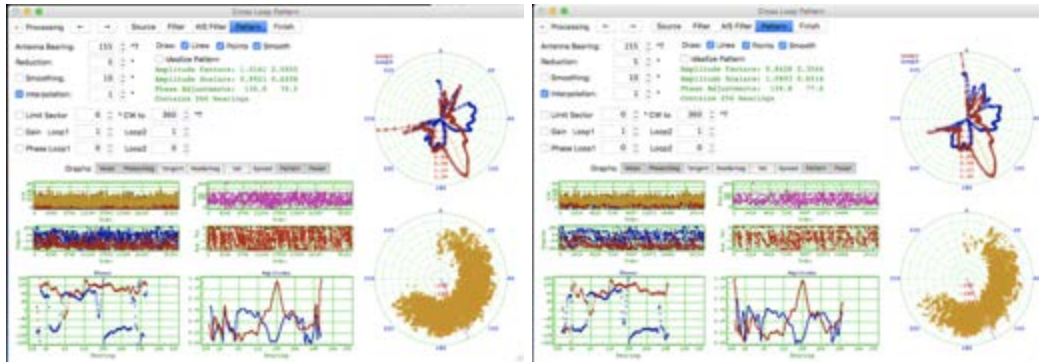


Figure 11

As note, check the pattern as the filter values are modified.

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Before Filter Application

After Filter Application

Figure 12

Check the coast line angles of the SeaSonde, use Limit Sector Filter to remove over land points.

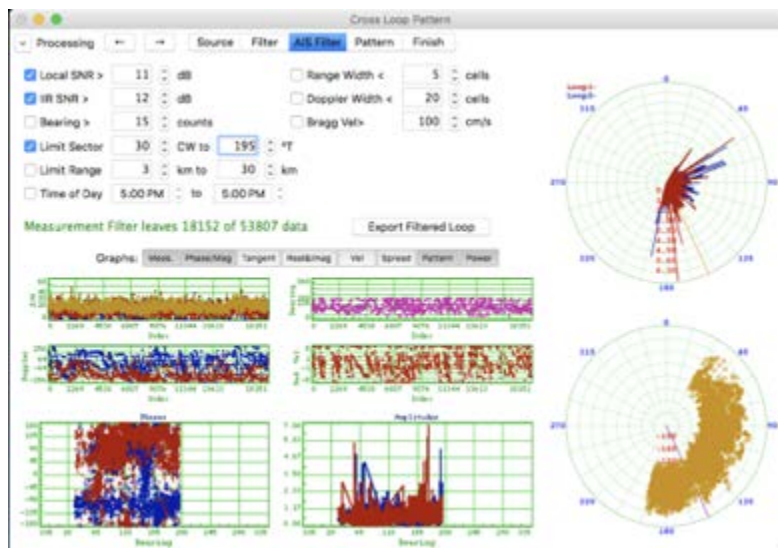


Figure 13

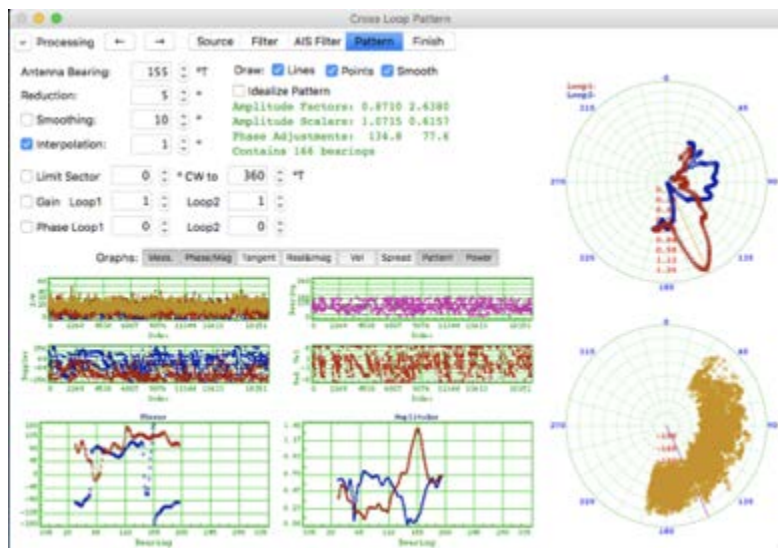


Figure 14

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Use the Range width, Doppler width and Bragg Velocity filters to continue refinement of the antenna pattern. As noted before check the Pattern tab for improvement with each change of the filters.

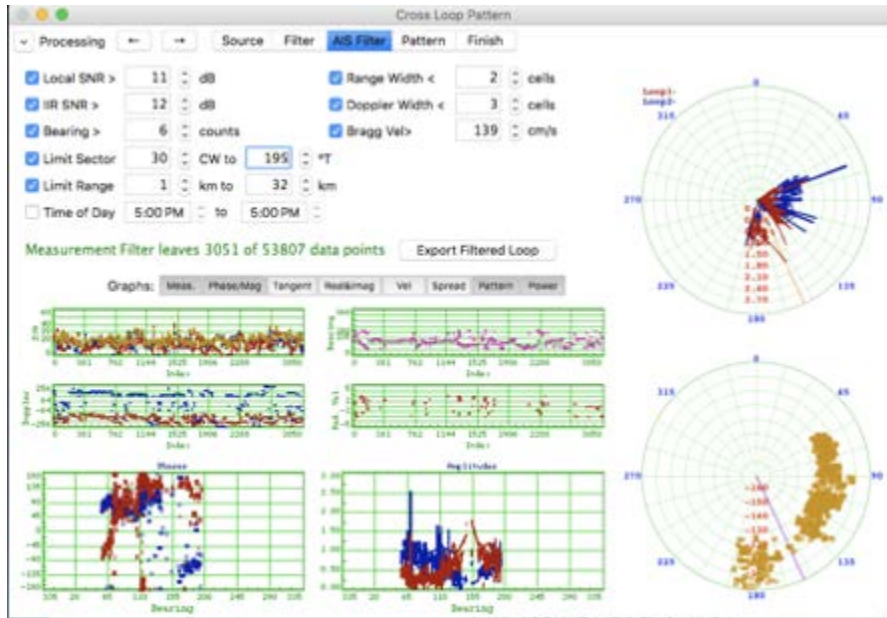


Figure 15

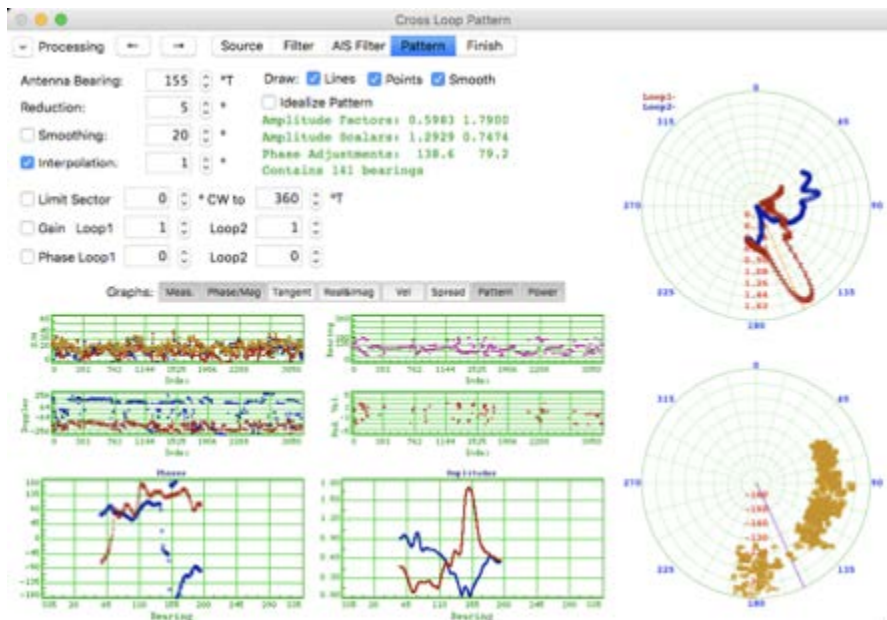


Figure 16

At this point all relevant filters have been employed. Click the Pattern tab. Use the Smoothing parameter to improve the pattern. As noted in previous documentation 20 degrees should be the maximum amount of smoothing used.

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Click the Finish tab and save the pattern. The AIS APM generated pattern is now complete.

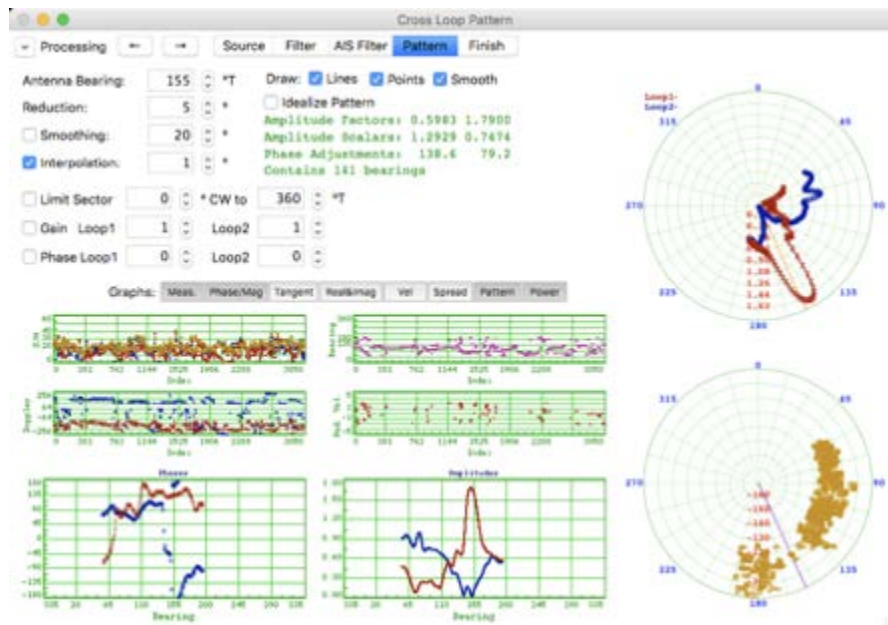
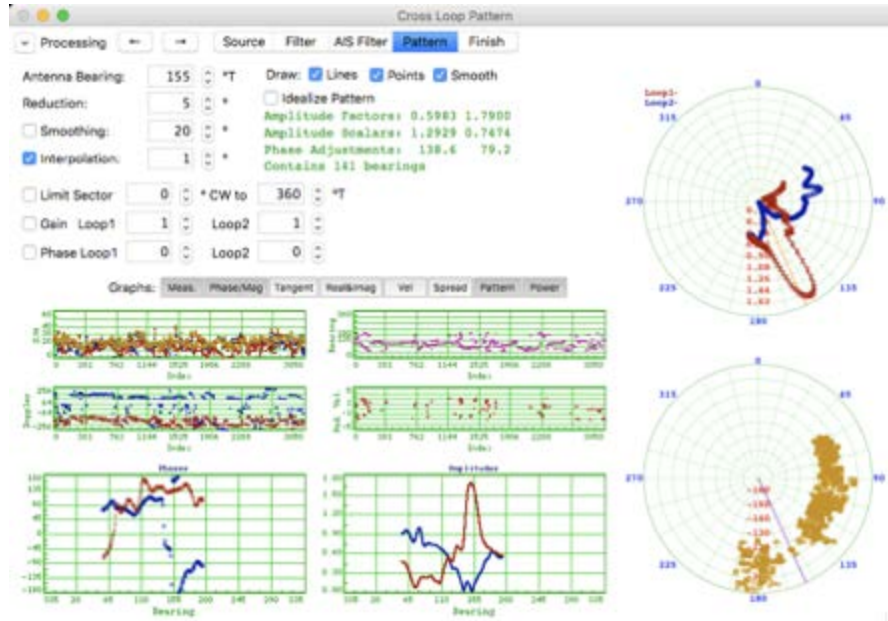


Figure 17

Now that all the filters are in use one can use the smoothing filters in the Pattern tab. In this case we used 20 degrees in the smoothing tab after careful examination,



It is of note that one should not use more than 20 degrees of smoothing.

Troubleshooting

GPS Track files should be created every ten minutes and Loop Pattern files should be created once per day. If this is not occurring, then there are several ways to try and determine the cause.

The easiest check is the AIS WebServer. Load localhost:8241/ in a browser window. All AIS position messages should show, with the most recent messages at the top. If there are no messages then the antenna may not be receiving signals properly, or the AIS Logger may not be running. It is possible for AIS messages to be infrequent in areas with low ship traffic.

Output logs for all AIS related processes can be found in /Codar/SeaSonde/Logs/AISLogs/. In the AISTrackerStatus log or AISTrackerError log, a License Key Not Found error suggests that the SeaSonde USB Hardware Key is not plugged into the computer properly, or does not include the AIS Suite license.

Installation of Other SeaSonde Accessories

Extended Lightning Protection Unit

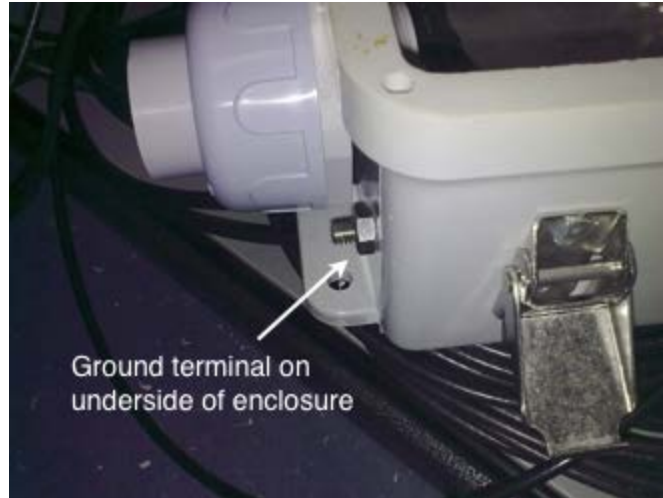
The SeaSonde Lightning Protection Kit (product code LT-E1) is an optional accessory that is compatible with all SeaSonde models. It consists of an all-weather industrial enclosure containing an array of spark gap arrestors and 30' (9 m) coaxial extension cables (three RG-58 & one RG-8). See photos below.



This kit is intended to be installed inline between the SeaSonde electronics and the Rx/Tx antenna(s). It provides no protection for the antennas, only for the electronics chassis. The enclosure should be mounted upright and, preferably, outside of the room/enclosure containing the electronics chassis. Four 1/4" diameter holes are available for mounting screws.

Installation

- Pass the transmit and receive cables from the antennas through the open cable-hole of the lightning protection kit enclosure.
- Connect the transmit (or T/R) RG-8 cable to the N connector of the spark gap arrestor labelled TX ANT. Similarly, connect the receive antenna RG-58 cables to the arrestors marked channels 1-3. You will connect only cables 1 & 2 to the arrestors if you are using a T/R antenna.
- Close and secure the box.
- Connect the coaxial extension cables of the Lightning Protection Kit to the respective channels on the back of the transmit and receive chassis channels.
- **IMPORTANT: Grounding the enclosure.**
 - There is a small terminal on the outer side of the enclosure to the left of the cable hole as shown below. Connect a heavy duty gauge#8 copper wire or strap (not included) to this terminal and connect the other end to a proper electrical ground.
 - Proper electrical ground can be a metal stake driven into the soil or an existing ground system for a local building/structure.
 - Consult a local electrician if you have questions about the proper length of ground stake for local soil conditions.



UPS

Activating Network “Smart” Feature on UPS Using PowerAlert™ Console

These instructions are for the Tripp Lite PowerAlert Smart Online™ model #SU1500RTXL2UA (100V - 120V) or the equivalent 220V version model #SU1500RTXL2UA, with add-on Tripp Lite SNMPWEBCARD UPS Remote Monitoring and control (via SNMP, Web, or Telnet).

- 1) Once the system is powered up use an IP Scanner to search for the UPS IP address. The address will be connected to the MAC address that is found on the UPS back panel.
- 2) Open the PowerAlertConsoleV64 application found in the /Applications folder of the SeaSonde computer.
- 3) The PowerAlert login dialog appears. Enter the IP indicated at the top of the window into the Host dialog. The name and password will be the default login 'localadmin'. When the OK button becomes active click it.
- 4) The PowerAlert main page appears. This page will indicate the status for the utility power, battery status and status of load output for the devices connected to the UPS. Note the communication status is now indicating a green light denoting a secure connection. For the purposes of this manual focus will be exclusively on the Actions section of the PowerAlert app. It is encouraged the user read the online manual found in the Help section of the PowerAlert app if interested how to fully use this software. Click on the Actions link.
- 5) The PowerAlert Actions page appears. This page allows the user to configure email alerts and create other actions that will affect the behavior of the UPS if certain conditions arise. This manual will concentrate on the Load Actions section, the user is encouraged to read the Help section to setup email alerts or other actions. Click on the Load Actions link found on the left side of the window.
- 6) The PowerAlert Load Actions page appears. This page allows the user to configure commands and actions that will affect the behavior of the two loads used by the UPS.

The UPS will now be set to turn off Load 1, as shown in the wiring diagram aforementioned Load 1 powers the TX chassis which is the device that draws the most power of the Sea- Sonde system. The UPS will be set to turn off the TX chassis in order allow maximum up time for the SeaSonde during a brown out or black out of Utility power. Click on the Name section as shown below and enter the name L1OFF.

- 7) Follow the instructions indicated and click on the section next to the action name as shown below.
- 8) The Action Configuration dialog will pop up. Carefully read the alert window. When finished press the OK button to begin configuration of the L1OFF action.
- 9) Select the load 1 by clicking on the '1' in the Select a load on Device 1 window. Note when selected the red X next to the 1 turns into a green check mark.
- 10) Proceed by clicking on Device 1 in the Select trigger devices window at the bottom of the dialog.
- 11) The Select events to trigger this action dialog appears on the right of the popup window. There are three sections of interest now in the window. The Load Action menu located in the bottom selects the type of action to be done. There are three possible actions; On, Off and cycle. Make sure the load action selected is the Off action. The load control delay menu sets a time to delay the load action selected. The delay time will be set later on in this manual. The Select events to trigger this action dialog is separated into two columns. These columns are for Set events or Clear events. In this case the event selection will be the Set event 'OnBattery:1' which indicates Device 1 (the UPS) is running on battery power. Other events are detail in the help section.
- 12) Set the Load Control Delay to one minute as shown below. This will allow for the UPS to remain in normal operation in case of a short time brown out power situation without turning the TX chassis off. If the power remains off the chassis will shutdown.
- 13) Select the 'OnBattery:1' Set event from the Event(Set) column as shown below. Note the Action is indicated in the text dialog at the top of the popup window as an ASCII command.
- 14) Click the Save button at the bottom of the Actions Page now highlighted.
- 15) The Set Action is now saved.
- 16) A new action will now be added that will allow the UPS to turn power back on to Load 1 when utility power is restored. This is what is known as a Clear action. Begin by clicking on the plus sign button at the bottom right of the window as indicated below.
- 17) In the name section enter the name L1On
- 18) The Action Configuration dialog will pop up. Set the Load Control Delay to one minute and the Load Action to On as shown below.
- 19) Select Device 1 in the Select trigger devices window as shown below.
- 20) In the Select events to trigger this action window, select the Clear event 'On Utility Power:1'. This will finish setting up the Clear Action and it will be shown at the top of the popup window as an ASCII command as shown below.
- 21) Click the Save button at the bottom of the page. The Actions page will now indicate the two saved load actions.
- 22) Configuration of the UPS is now complete. Click on the Log Out button highlighted at the top right of the console window to log out of the PowerAlertConsoleV64 application.

Environmental Control Enclosure

The SeaSonde Enclosure 36-B is a small, rugged closed-loop temperature-controlled enclosure for containing the SeaSonde remote unit electronics. The small enclosure is just large enough to fit the SeaSonde transmit and receiver chassis and mini-style computer, plus a UPS device and another small piece of electronics. This enclosure is appropriate for both indoor and limited outdoor use.

Tools required

- #2 Phillips Screwdriver (medium tip)
- 2 Small Bungee Ties (included)
- Velcro Ties (Optional)

Equipment required

- SeaSonde ENC enclosure (fully assembled)
- SeaSonde Receive Chassis w/Power & Antenna Cables!SeaSonde Transmit Chassis w/Power & Antenna Cables!SeaSonde Rack Mount Bolts (qty: 8)
- Computer (Mac Mini) w/ Power Cable (qty: 1)
- Computer Peripherals (Monitor w/ Power Cable, Mouse, Key- board w/Extension Cord, qty: 1 ea)
- Power Adaptor Cables (qty: 5)
- USB Cable (qty: 1)
- UPS
- Video Cable (qty: 1)
- Ethernet Cables (qty: 3)
- Router/Modem w/ Power Cable (qty: 1)
- SeaSonde Cross Connect Cables (qty: 3)
- Optional: AIS Receiver & Antenna Cable, USB Cable (qty: 1 ea)

Installing Enclosure Contents

- 1) Open the Enclosure doors to expose the three sliding trays. Note the front of the enclosure will have the modem/MacMini tray to the rear.
- 2) Place SeaSonde receive chassis on the bottom tray.
- 3) Place SeaSonde transmit chassis on the tray above the receive chassis.
- 4) Place any UPS device on the floor of the enclosure beneath the receive chassis.
- 5) Push the trays back into the enclosure.

- 6) Pull out the computer peripherals tray and place the monitor along with the keyboard and mouse.
- 7) Use the provided bungee cables to secure the monitor as shown below.
- 8) Connect the peripheral cables and a keyboard extension cord to the keyboard USB connector. [Note: Disconnect keyboard when not in use.]
- 9) Lean the monitor forward to put the peripheral tray into storage mode.
- 10) Secure the Chassis by bolting them to the side rails. The picture below shows the two chassis bolted with a single bolt per side.
- 11) Install the Mac Mini and modem onto the computer/modem secure with velcro straps if desired. Refer to the wiring diagram to install cables, note use the power cable adapters provided to use the inline power strips provided. Please refer to the appendices for UPS setup and cabling instructions.

Wiring Diagrams

The following section deals with the wiring of the typical enclosure contents including an Uninterruptible Power Supply (UPS). UPS make and model shown in these examples is the Tripp Lite PowerAlert SmartOnline™ 110 V model # SU1500RTXL2UA or the equivalent 220 V version model # SUIN- T1500RTXL2UA.

Here is the general diagram that will be used for the guide. Note the three sections detailed below. The diagram assumes that all the peripherals, SeaSonde chassis and a UPS are installed in the ENC36 enclosure. Note the Peltier coolers are built into the doors of the enclosure.

At the time of this document creation, the UPS offered by CODAR Ocean Sensors is the Tripp Lite SmartOnline™ UPS. Diagrams in this document depict the back of the APC SmartOnline™ product.

- 1) Plug the two Peltier cooler power cords into the power strips with the rear Peltier cooler power cord into the top inline power strip and the front Peltier cooler into Load 2 section of the UPS (as shown below).
- 2) Plug the bottom inline power strip into Load 1 of the UPS. Plug the UPS to the top inline power strip.
- 3) Plug the top inline power strip into outside power.
- 4) Plug the Mac Mini power cord into Load 2 of the UPS.
- 5) Plug the video cable into the Mac Mini and the monitor.
- 6) Plug the Ethernet cable into the modem/router and Mac Mini.
- 7) Plug the provided USB cable into the receive chassis and the Mac Mini.
- 8) Connect an Ethernet cable from the outside Internet wall outlet into the modem/router primary Internet plug.
- 9) Connect the UPS into the modem/router with another Ethernet cable.
- 10) Plug the modem/router power cable into Load 2 of the UPS.
- 11) Plug the monitor power cable into the bottom inline

- 12) Connect the TX and RX chassis using the three SeaSonde cross connect cables as shown.
- 13) If AIS is installed, install the AIS antenna cable to the AIS receiver and USB from the Mac Mini to the AIS receiver as shown below.
- 14) Plug in the RX (receive) chassis power cable into the bottom inline power strip.
- 15) Connect the GPS cable into the GPS antenna BNC connector on the RX chassis.
- 16) Connect the Loop 1 and Loop 2 antenna cables into the antenna loop 1 and antenna Loop 2 BNC connectors on the RX chassis.
- 17) Connect the transmit antenna cable (or transmit/receive cable) to the TX chassis at the Transmit Out to Antenna Type-N connector.
- 18) Plug in the TX chassis power cable into the bottom power strip.

External Hard Drive

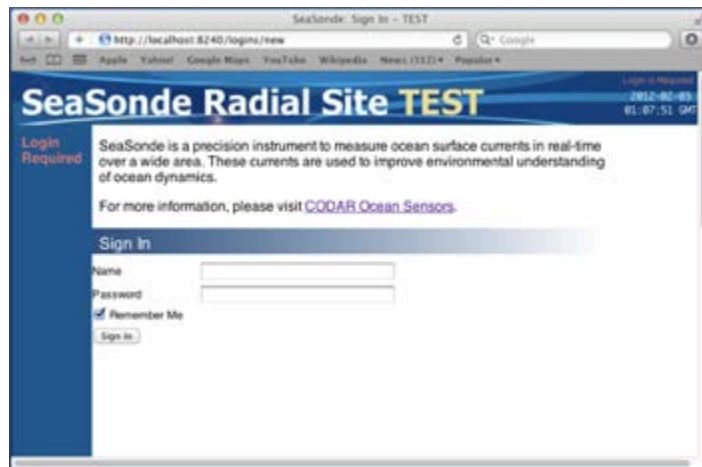
Routine Monitoring

via RadialWebServer Display

The SeaSonde's RadialWebServer provides you with a means to remotely monitor its performance via a web browser. This application is installed with SeaSonde Radial Suite Release 6 and Release 7. Remote monitoring is limited to viewing and downloading the site's status, configuration, spectra, diagnostic, wave, and radial data.

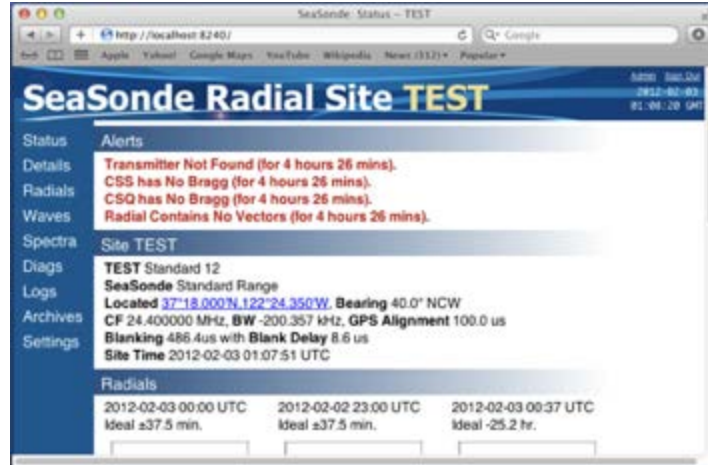
A browser client will need the site's URL or IP address and RadialWebServer user name and password to gain access.

- To gain remote web browser access the site must be configured with a static IP or a DNS service to allow the site to be visible on the Internet.
- You also need to specify the port number to use. The default Codar port is set to 8240. Using the default port is recommended. **[Note:**Please read the RadialWebserver-Admin.pdf document included with the Release 6 and Release 7 installer, before you customize with a non-default port number.
- To access the remote site, enter the site's static IP address or the DNS URL and the port number. Example: <http://x.x.x.x:8240>, where x.x.x.x is the site's static IP address.
- Test the RadialWebServer on the site. Open Safari and enter "<http://localhost:8240>" (use your selected port number, if not 8240)
- The login page shown below is displayed when accessed using Safari.

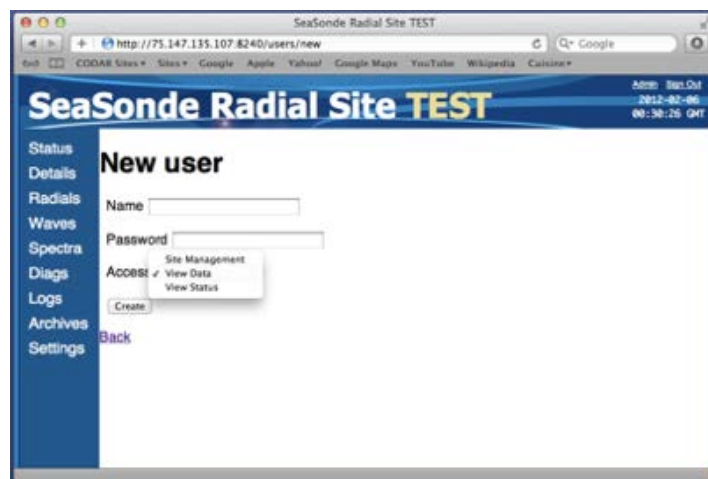
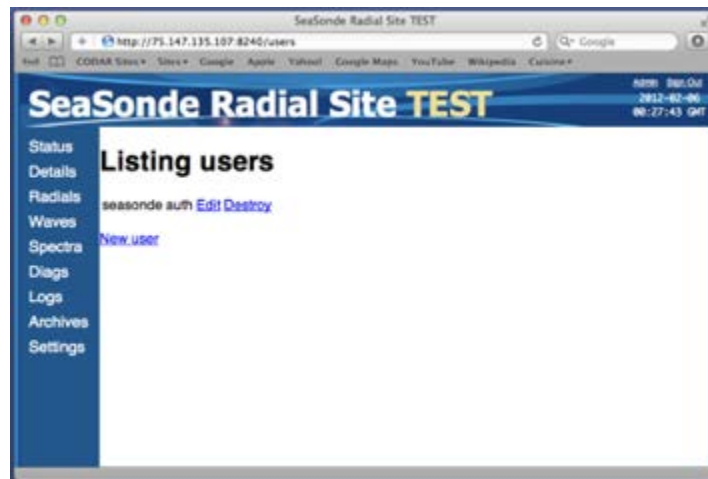


- Enter the RadialWebServer Admin user name and password. A successful login will result in showing the status of the site. Don't be concerned about the alerts, yet, if you are still setting up your site.

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Click on the Admin link in the upper right corner of the window. This will allow you to view and enter more user accounts to access the site. Click on the New user to add more accounts. If you want CODAR support staff to be able to access your site, create an account for them.



- User name and password are case sensitive.
- Three kinds of authorizations can be set up for a user:
 - **Site Management:** administrative user who has permission to add/remove/edit users.

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- **View Data:** user who can see Status, Details, Radials, Waves, Spectra, Diags, Logs, and Refresh Settings. This user cannot view or edit the other users and will not see the Admin link.
- **View Status:** user limited to Status, Details, and Refresh Settings. Clicking the other views will jump to the login view. This user also cannot view or edit the other users and will not see the Admin link.

Note: You will be unable to remove the first Admin user. If you try, you will see a "Cannot delete admin user." message. You can remove all users by reinstalling the RadialWebServer; the installer has an option to rebuild the user account database and will create a new first admin user as explained in the beginning.

The above steps should be enough to set up the Radial Web Server

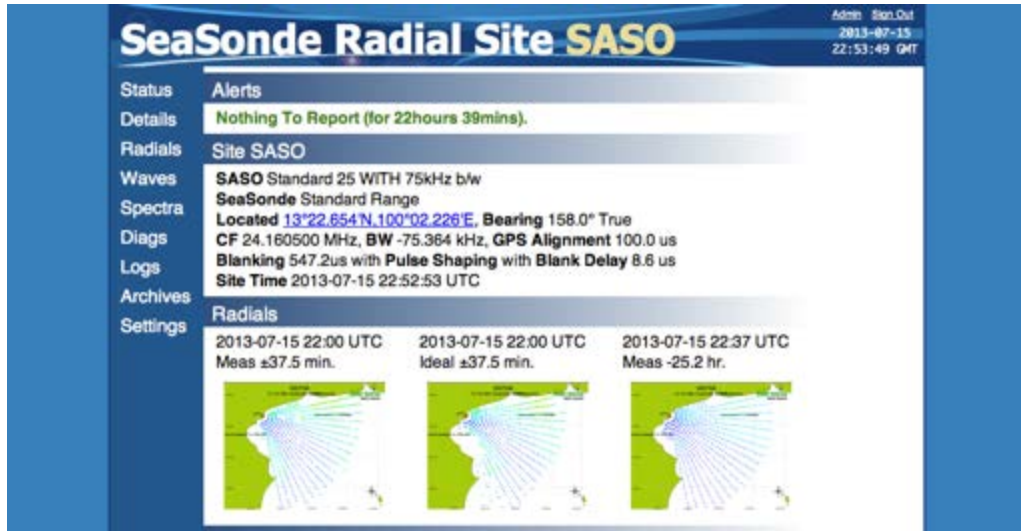
- If there are any problems with the RadialWebServer, use a text editor or Console to open the log files RadialWebError.log and RadialWebStatus.log located in /Codar/SeaSonde/Logs/ These are included in SeaSondeReports file which should be sent to support@codar.com.
- For any additional information about RadialWebServer, please read the RadialWebServer Admin document.

Navigating the RadialWebServer interface

- Open your browser and enter "x.x.x.x:port" where x.x.x.x is the static ip address of the site and :port is the port number used to install the RadialWebServer (the default is :8240). If using at the Remote Unit computer, you can enter "<http://localhost:port>" to open the RadialWebServer page.
- Login Page will appear as in the image below.



- Enter the username and password.
- If login details are correct, the Status View page will open.
- The 4 letter site code is displayed next to the SeaSonde Remote Unit banner.
- On the right are Admin and Sign Out links. Below these 2 links, the date and time at the site are displayed. Vertical menu list of views is on the left.



The different views are as follows:

- Status :Site's current status
- Details :More detailed status about the site's configuration, status, hardware, and data.
- Radials :Plot any radial within last year on the site.
- Waves :Plot any wave data within last year on the site.
- Spectra :Plot any spectra within last year on the site.
- Diags :Plot the hardware and radial diagnostic files.
- Logs :View critical site logs and create/download a SeaSondeReport file
- Archives :Download archived data from the site
- Settings :Change the refresh interval and setup the alert email service.

Status view gives a quick look of whether the site is working well or not.

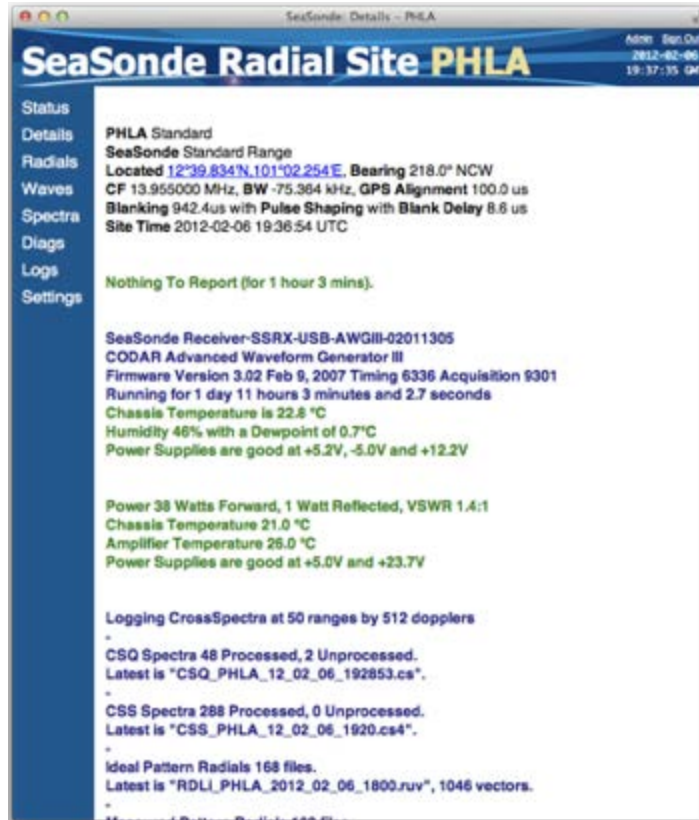
- Alerts section lists any problems with the site. IF no problems exist, then "Nothing to Report" message is shown.
- "Site XXXX" section shows basic information about the site like name, location and other settings. Clicking on the co-ordinates opens a google map of the site's location in a new window.

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- The Radials section shows thumbnails of the last radial vectors for both Measured and Ideal patterns plus a 25hr averaged radial for the site. Clicking on the thumbnail will open a full size plot.
- The Spectra section shows the last CSS and CSQ cross spectra power maps. Clicking on the thumbnail will open a full size plot. Carefully look at the radials and spectra plots can tell you how well the site is operating.

The **Details View** shows sections with detailed information about the Site, Alerts, Receiver, Transmitter, Data Files, Processor, and SeaSonde Applications running. Some of the useful information here is receiver firmware, hardware temperature, transmit power, disk space available, and applications' version numbers.

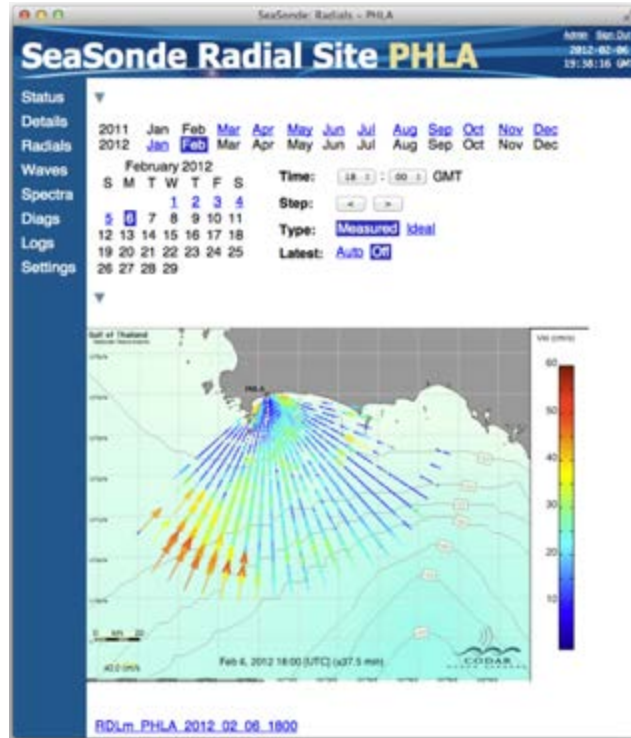


The **Radials View** allows you to plot and download radials up to one year ago on the site.

- The first section allows selection of the radials to plot and/or download.
- The months during which the radial data is available, are highlighted with blue and an underline. Click on the blue text to select the month.
- This will display the corresponding month's calendar below the selection.
- The days with at least one radial file are highlighted in blue with an underline.
- To the right of the calendar is the Control Time bar with hours and minutes pop-up menus. Select the hour and minute to display the corresponding radial.
- Use the Step arrows to step back or forward in time to plot each existing radial.
- Click on "Measured" or "Ideal" links in the Type bar to display corresponding radials. If the selected type does not exist, you will get a "No Matching Radials" instead of a plot below.
- The Latest: Auto Off control, if set to Auto, will automatically show the latest radial.
- The section below this is the Radial Plot section, which displays the radial image

plot. You can drag and drop this image to the desktop or Right Click and select "Save As" to save the image.

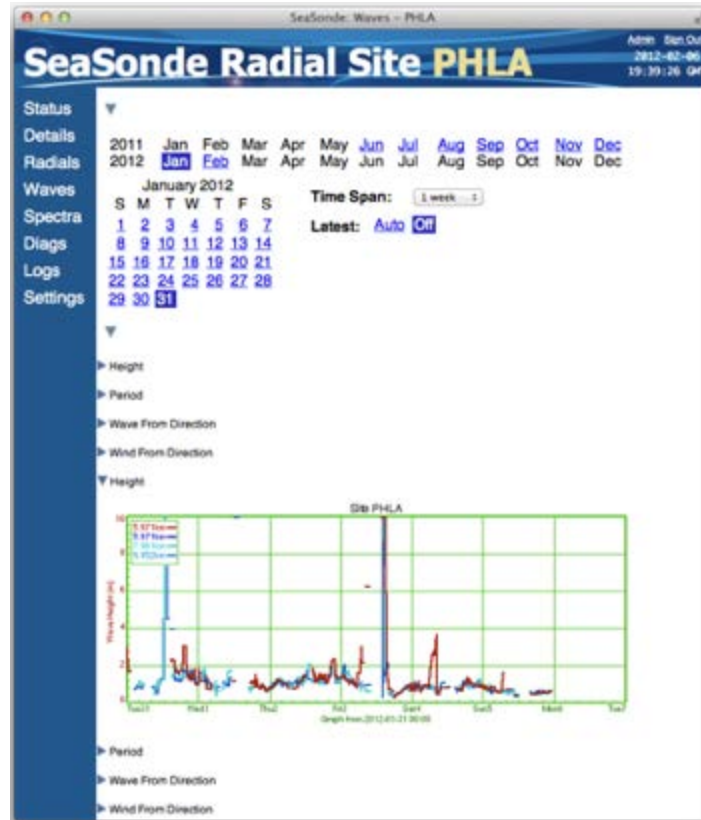
- Download section is at the bottom. It shows the link to download the selected radial.
- The small white triangles next to the section titles "Radials" and "Radial



RDLm_2009_03_29_0600". if clicked on will collapse the section so that it is hidden.

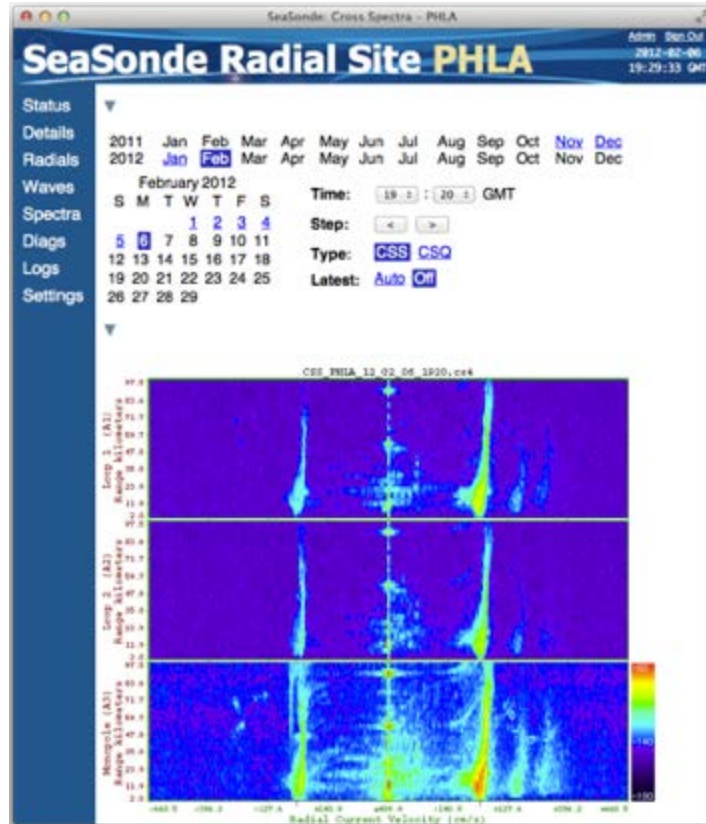
The **Waves View** can plot wave data up to one year ago on the site.

- Select the start time to plot using the calendar as in the Radial view.
- Time Span pop-up menu allows to set the time span of the plot.
- The Latest control when set to auto will periodically refresh the page with the latest wave data.
- The Wave plot section contains eight plots. Four plots for range cell 3 of wave height, wave period, wave direction, and wind direction followed by four plots each containing range cells 2, 3, 4 & 5 of wave height, wave period, wave direction, and wind direction.
- The Download section shows one or two waves files for the current time. Since Wave files are monthly, the current month and the previous month both might be shown here. Clicking on the link will download the selected wave file.



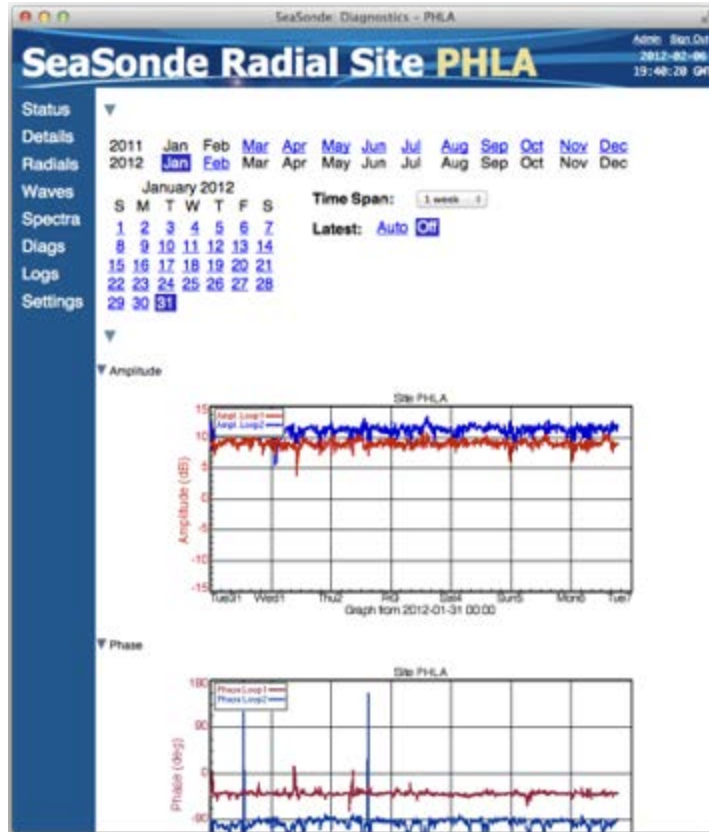
The **Spectra View** can plot spectra data up to one year ago on the site.

- Selects the spectra time to plot in the Cross Spectra section.
- Select CSS or CSQ in the Type control to switch between the averaged CSS spectra and the more raw CSQ spectra.
- The first plot is the power map which shows the power returned as color intensity across all doppler and range cells for the three cross loop antennas.
- The second plot section is a single range slice of power versus doppler. Use the slider and arrow control to select the range cell to look at.
- The download section allows to download a reduced cross spectra file. is a special variation of the standard cross spectra files which is compressed about 3:1. The utility SpectraShortener can expand this file to a standard cross spectra format.

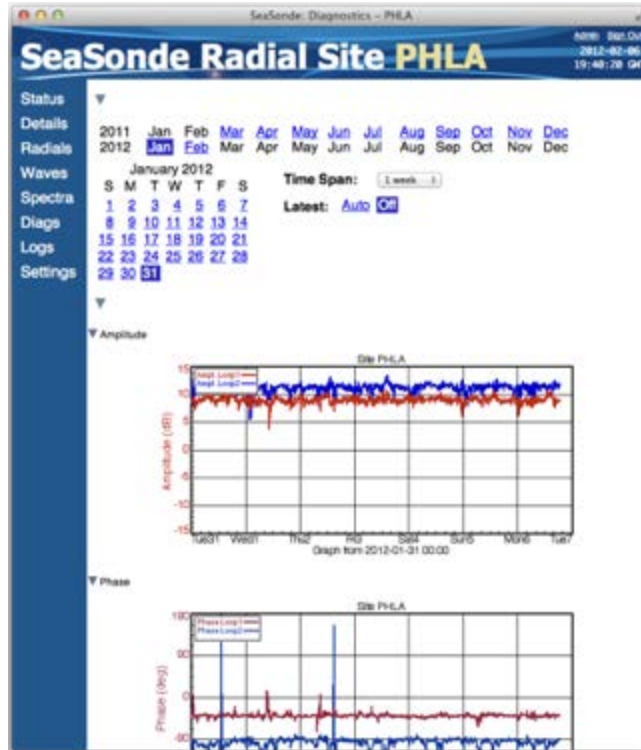


The **Diags View** can plot the diagnostics history of the hardware and radial status diagnostic logs.

- Use the Control section to set the start time and the time span to plot.
- Next is a radial diagnostic section containing 10 different plots followed by a hardware section containing 7 plots.
- The Download section shows one to four diagnostics files for the current time.



- The **Logs View** shows a list of system and SeaSonde logs for the site and also allows the web user to enter notes into a site log and generate /download a SeaSonde Report file.
 - Enter any notes, logs in the Site Log Entry section and click the Submit button.
 - This entry will be time stamped and tagged with your RadialWebServer name and appended to the Site_XXXX.log file where XXXX is the site code.
 - Click on any log file in the Log Files section to view the log file in the next section.
 - The Diagnostic Report section allows you to generate and download a SeaSonde Report file which you can send to CODAR support personnel for diagnosing problems. Customers are recommended to send this file to CODAR support whenever contacting for any issue.
 - Click the Generate button to start downloading a RPT_XXXX_yyyymmdd_hhmm_web.zip file. The file size can vary between 2MB to 5MB, hence can take couple of minutes to download



The **Settings View** is used to control settings for the RadialWebServer and the email alerts. The “System Settings” section will only be available to admin users.

- Currently, the only configurable setting available is the Web Page Refresh Interval. This time sets how often the browser requests new data from the site.
- The refresh setting applies to the Status, Detail and any other views using Latest: Auto mode.

Setting up Email Alerts

The Settings View in the RadialWebServer interface allows to set up email alerts.

- RadialSiteReporter tool on the remote unit computer generates the site alerts and optionally emails them.
- Read RadialSiteReporter document for detailed information on its function.
- Click on Alert Mail Configuration link to enter the email address to whom the email alerts should be mailed. (This feature is available only to admin user account).



- Click on the Create New link to add the email address to the list. Remove link will delete the email address from the list. Edit link will enable editing the settings for the particular email address in the list.
- Enter one or more email addresses separated by comma.

Note: Please, do not abuse this feature; do NOT send alert emails to an unsolicited address.

- Select the Enabled checkbox to activate that email address(es) to receive alerts.
- Select the Send Alert Changes checkbox to send an email to addresses whenever an alert is tripped or cleared.
- Select the Send Periodic Report checkbox to send out the Site info plus the Alert logs periodically selected by the Schedule: popup. (**Currently, this feature is not available.**)

Below is an example of the email alert:

From: codar@SeaSondeSite-XXXX.local
Date: March 30, 2009 12:14:24 AM PDT
Subject: [SeaSonde] TEST Alerts [TxNotFound,CSSNoBragg,CSQNoBragg]
To: you@yourisp.com
2009-03-26 13:14 UTC-7 Failure: Transmitter Not Found.
2009-03-26 13:14 UTC-7 Failure: CSS has No Bragg.
2009-03-26 13:14 UTC-7 Failure: CSQ has No Bragg.

2009-03-26 13:14 UTC-7 Failure: Radial Contains No Vectors.

2009-03-27 18:53 UTC-7 Failure: Radial is Not Up-to-Date.

2009-03-30 00:14 UTC-7 Success: Computer is Running

via Timbuktu Pro (Screen Sharing)

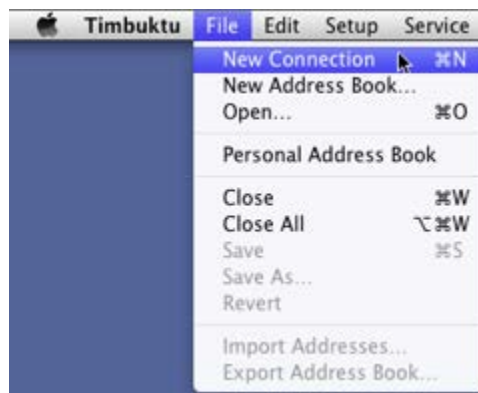
Timbuktu Pro is a screen sharing and data transfer application for PC and Macintosh computers. It is installed by default on computers shipped with SeaSondes or spare units ordered from CODAR. It is a valuable tool for viewing real time data displays on remote SeaSonde computers.

Controlling the Screen of the Remote Unit Computer

Locate the Timbuktu Pro menu found in the upper right hand portion of the Desktop menu bar (Macintosh) or on the widget tray (Windows) and select the *Open Timbuktu Pro* menu item, this will open/activate the Timbuktu Pro program.



Go to the *File* menu on the left side of the menu bar and select the *New Connection* menu item:



In the New Connection window, select the *Internet* tab bar item as shown below and enter the IP address of the SeaSonde Remote Unit computer.

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Next, click on the *Service* menu bar item. Select the *Control* from the drop down menu:



A Control Session Login Panel will appear:



Select either the *Registered User* or *Registered User (Secure)*, enter in the Name and Password of the account and click OK.

Note: Consult SeaSonde Support if you do not know account login information

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The Remote Screen Control window should appear. This will allow you to interact with the computer over the internet as if you were physically in front of the computer screen:



Transferring Data to/from the Remote Unit computer

In order to transfer files, an Exchange Session must be activated. Click on the Service Menu at the top of the Desktop. Select the Exchange Menu Item.



This will bring up a Exchange Session Login Dialog.

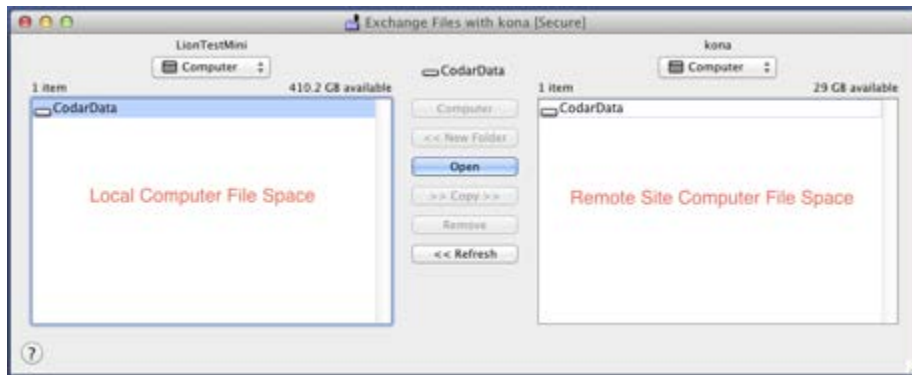
Select either the *Registered User* or *Registered User (Secure)* account login and enter in the Name and Password associated with the account. Consult SeaSonde Support if you do not know the account login information.

The Exchange Session window will appear. This will allow to transfer files and folders to and from the remote site computer.

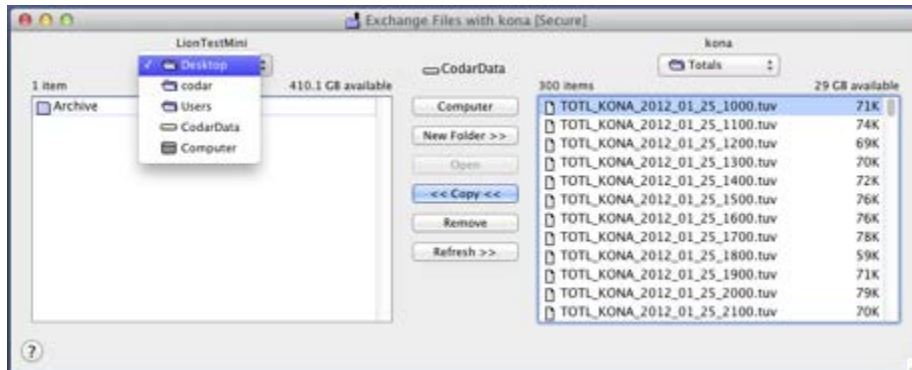
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The Exchange Session window has two main areas: the file space of the Remote Site Computer and the Local Computer. These areas can be used to navigate both remote and local file systems.

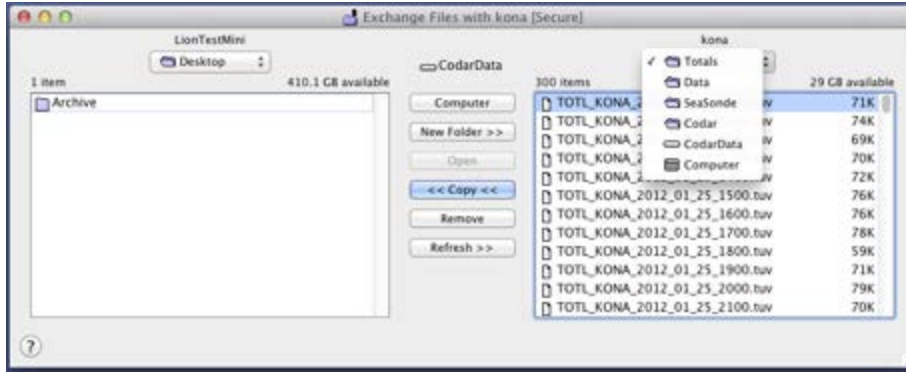


The following example will demonstrate how to navigate to and move a file from the Remote Site Computer to the Local Computer. First, navigate to the target folder on the Local Computer (left side) by clicking on folder or volume icons appearing in the Local Computer File Space to move down the folder tree or by using the drop down menu for the current folder to move up the folder tree:

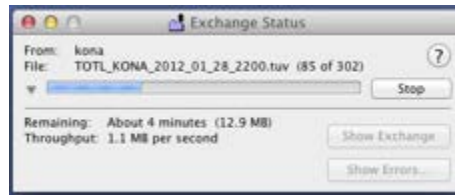


Next, navigate to the source folder in the Remote Site Computer (right side) and select a file to be transferred. The file will highlight in blue:

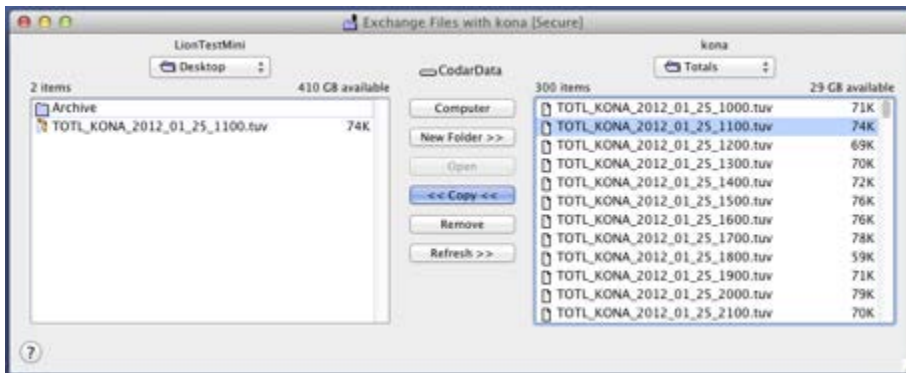
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Click *Copy*. A File Transfer Panel will appear with a progress bar.



The transferred file will appear on the Local File Space when the transfer is complete:



Viewing Vector Data with SeaDisplay

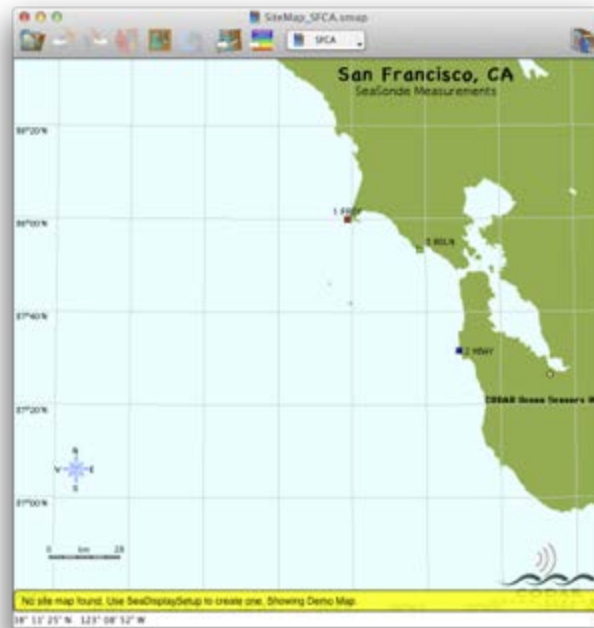
SeaDisplay is CODAR's surface current data visualization tool. It can be used to plot radial and combined surface currents as well as generate radial distributions, plot standard deviations and generate current vector animations.

Opening SeaDisplay

Click on the SeaDisplay Icon found in the Dock. Or SeaSonde/Apps/Viewers.



A map window showing the default map area should appear.



The task bar, located located above the map area on the left side, contains icons that control the most important functions. .

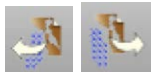
The velocity color scale is show along the right side of the map window.

Task Bar Icons



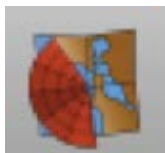
File Open

Display a *File Open* dialog and point to the Radial Files folder. When a file is selected, SeaDisplay will automatically load all matching radial files in the same folder.



Prev Next

Plot the previous or next sequential radial file in the same folder.



Radial Distribution

This is the Radial Distribution Plot Icon. Clicking on this icon will allow the user to see the radial density plots of the radials in the Radial Files folder.

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Save Image

Create a PNG image file of the current window display.



Create Movie

Create a Quicktime movie of all the radial data files contained in the current folder. The movie file will be written to the Desktop of the user's Macintosh computer.



Setup

Open the SeaDisplaySetup program to modify the current SeaDisplay site map. Please refer to *Creating Site Map* found in *Optional Configuration Tasks*.



Spectra Plotter Map

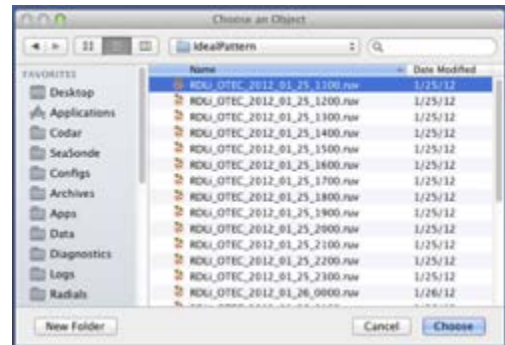
Opens the Spectra Plotter Map application.

Plotting Radial Files

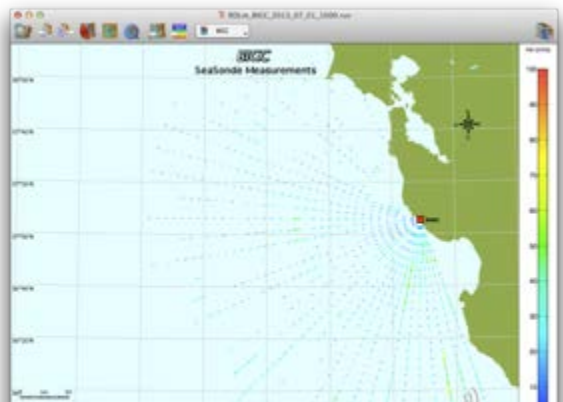
Click on *File Open* and select a radial file from the *Choose a File* dialog. Dragging a file and dropping onto the SDisplay icon will also open a file. Double-clicking a file will also open in SDisplay.

The selected file will be plotted and all matching files will be loaded into memory.

By clicking *Prev* or *Next* the user can step through sequential radial files one at a time.



To create a radial distribution, click *Radial Distribution* in the task bar.



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This may take a little time, depending on the size of the radial file list.

When the computation is complete, a radial distribution plot will be displayed on the map.

Note: the velocity scale on the right is now replaced with a Vector density scale.

Viewing Spectra

Spectra Plotter Map is a visualization tool that allows for the plotting of spectra data. This software also allows for analysis of signal to noise ratio, signal noise floors, maximum amplitudes and phases with regards to physical range and doppler range.

Plotting Cross Spectra Files

There are three primary types of spectra files that Spectra Plotter Map can plot and analyze:

CSQ files - These files are created after the first FFT process and are considered the lowest level cross spectra files

CSS files - These are merged sets of CSQ files that are created by the CPro program. These are the files that are used by the radial processing tools to extract radial vector files.

CSA files - These files are averages of CSS file sets over an hour.

This document will cover opening and analyzing a CSS file using Spectra Plotter Map. The other file types can be similarly opened and used in the same fashion.

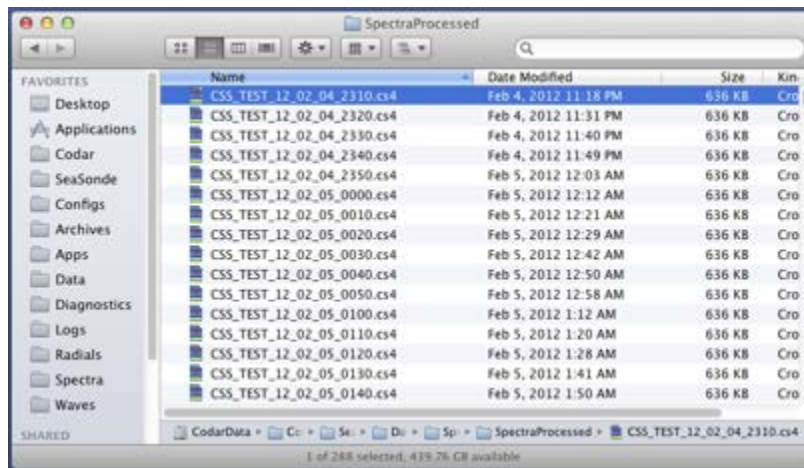
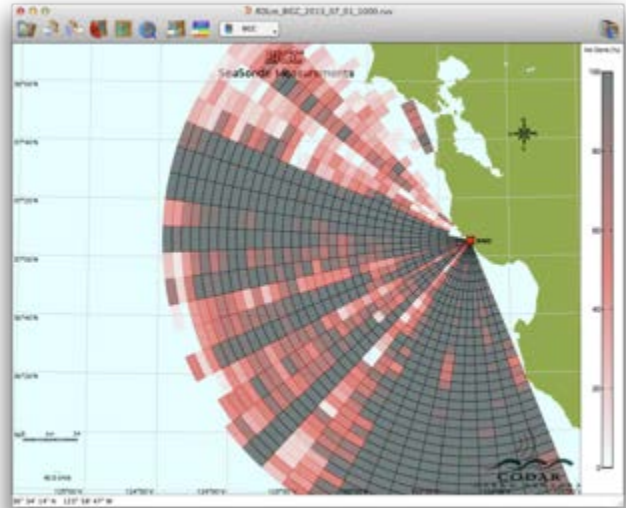
To open a CSS file mouse to the folder containing Spectra data. Normally the user can find the CSS files either in the following folders:

/Codar/SeaSonde/Data/Spectra/SpectraProcessed/

/Codar/SeaSonde/Data/Spectra/SpectraToProcess/

or alternatively in the Archives folder:

/Codar/SeaSonde/Archives/Spectra/



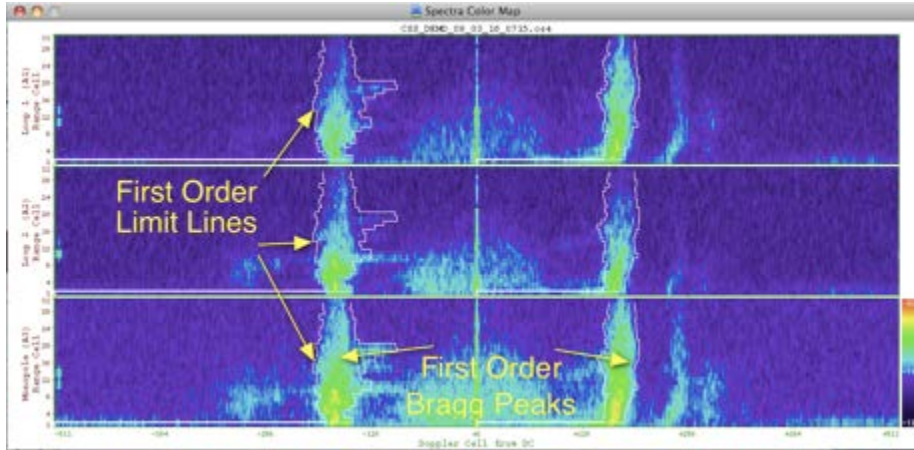
Spectra Processed Folder

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Simply drag and drop a CSS file onto the SpectraPlotterMap Icon on the Dock found in the Desktop.

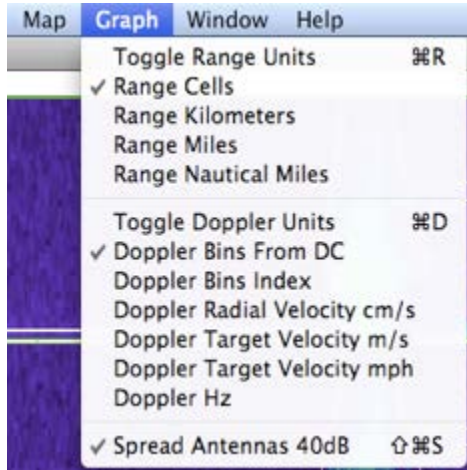


The SpectraPlotterMap program opens with four main dialogs; the SpectraColorMap, the Range Slice Map, the Doppler Slice and the CSS Informational Display dialog. A brief description of these main dialog follows:



Spectra Color Map

This dialog displays signal intensity via a color "temperature" display, cooler colors indicate lower signal or noise levels while warmer colors indicate greater intensities. Normally the dialog shows the signal and noise levels on all three antenna channels as indicated on the left hand side of the dialog. The horizontal axes are normally displayed as Doppler cells from the center or DC region of the graph going out in positive and negative Doppler directions and physical range cells distances for the vertical axes. These axes can be changed to translate the distular range and Doppler cell range to frequency and kilometer units (or other combinations) by mousing to the Graph menu and checking the options desired.



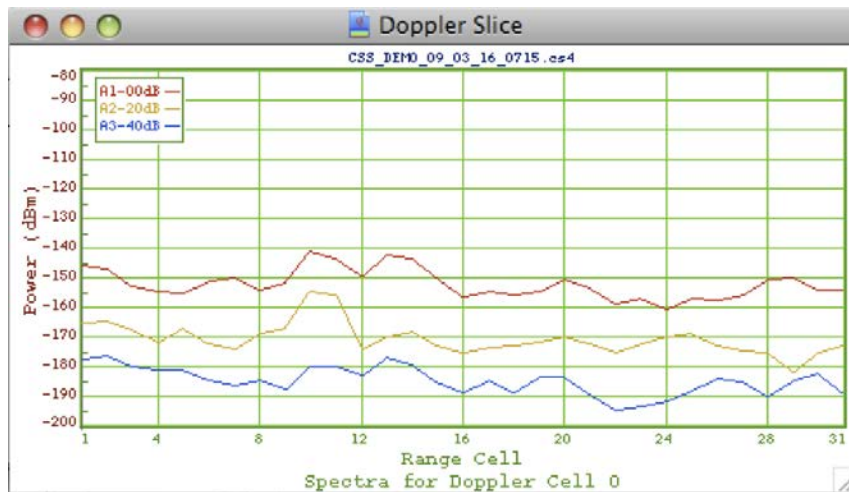
Graph Menu

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Range Slice Dialog

The Range Slice Map Dialog displays the signal strength of an individual range cell. This is in contrast to the the spectra color map that shows signal simultaneously for all range cells and frequency shift. Note the three antenna channels are displayed on this dialog are biased to be 20 dB apart with regards to each channel so that the spectra can be seen clearer rather than displaying the three channels directly on top of each other. The horizontal and vertical axes of this dialog will change along with the Spectra Color Map by changing options in the Graph Menu detailed above.



Doppler Slice Plot

The Doppler slice map shows the signal power in terms of decibel per meter for each doppler cell with regards to range. This dialog will change as the focus is moved along the Range Slice Map Dialog or the Spectra Map via the arrow keys on the keyboard.

Focus Indicator on the Range Slice Map

CSS_DEMO_09_03_16_0715.cs4	
File Valid	Selected Range 1 (0.300 km) (0.186 mi)
CS Version,Kind 4,2	Selected Doppler 673 +162(DC)
Site DEMO	Current Velocity -10.2 cm/s
Date 03-16-2009 07:15:00	Doppler Velocity +2.26 m/s
Coverage 8 minutes	Left Bragg 342 -169.3(DC) F0 [-1,-1]
Center Freq 42.000000 MHz	Right Bragg 680 +169.3(DC) F0 [511,511]
Bandwidth -499.877899 kHz	SN1,NF1 +25.2dB , -142.3dBm
Sweep Rate 4.000000 Hz	SN2,NF2 +34.3dB , -143.3dBm
Range Cells 1 to 31	SN3,NF3 +32.9dB , -135.8dBm
Doppler Cells 1024	A1 -117.1dBm , +5.1137E-09v
A3 Neg. Flagged 164 cells	A2 -109.0dBm , +3.2828E-08v
	A3 -102.9dBm , +1.3399E-07v, 1.0000qf
	A13 -110.8dB, 43.5° : +1.584E-08r, +1.504E-08i
	A23 -107.6dB, 25.6° : +4.096E-08r, +1.963E-08i
	A12 -114.1dB, 28.4° : +8.910E-09r, +4.816E-09i
	Phase Factor A12,A23 29.0° , -23.2°
	Ampl. Factor A12,A23 2.0100 , 2.2025

Cross Spectra MetaData

The Informational Dialog displays relevant spectral information for a specific range and Doppler bin. As the focus indicator is played around in range and doppler cells the dialog entries will change. Center frequency, bandwidth, FFT length and other transmit information normally found in SeaSonde Controller setting will also be recorded in blue text.

Viewing Diagnostics

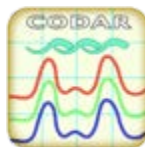
This section describes how to use DiagDisplay to perform routine monitoring of radial data collection and SeaSonde hardware operation. It is a valuable tool for troubleshooting of most problems.

About DiagDisplay

DiagDisplay is an application that is used to plot different SeaSonde radial and hardware data parameters from the diagnostic files, on a graphical display to evaluate/diagnose the radial data and the SeaSonde hardware operation. The diagnostic files (with the names beginning with "STAT_") are located in /Codar/SeaSonde/Data/Diagnostics. Two types of diagnostic files are produced weekly on Sundays with the name STAT_XXXX_YYYY_MM_DD.EXT, where XXXX is four character site code and ".EXT" is the extension of the file. ".EXT" is .rdt for radial diagnostic files and .hdt for hardware diagnostic files. DiagDisplay can be used to plot several weeks or months of diagnostic files at a time.

Opening Diagnostic Files

The DiagDisplay application is located in /Codar/SeaSonde/Data/Apps/Viewers. It can also be found in the Dock on a factory-installed SeaSonde computer.



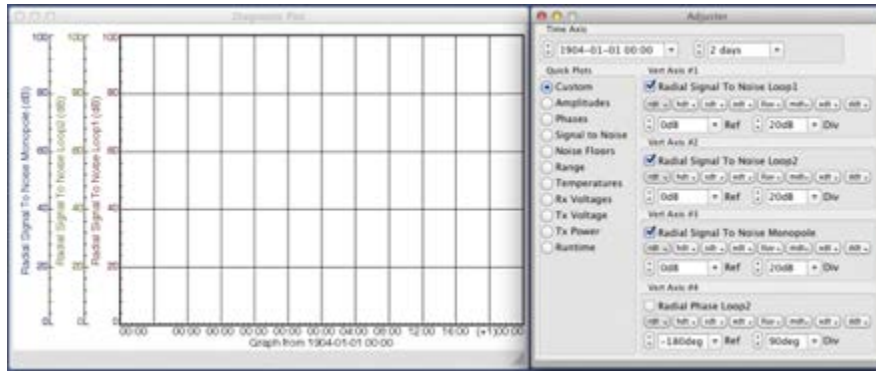
DiagDisplay Icon

You can monitor different parameters like Radial range, Radial vector count, Noise Floors, Signal To Noise Ratio, temperatures inside the SeaSonde Transmitter and Receiver chassis, some common voltages of the equipments, and so on, using DiagDisplay.

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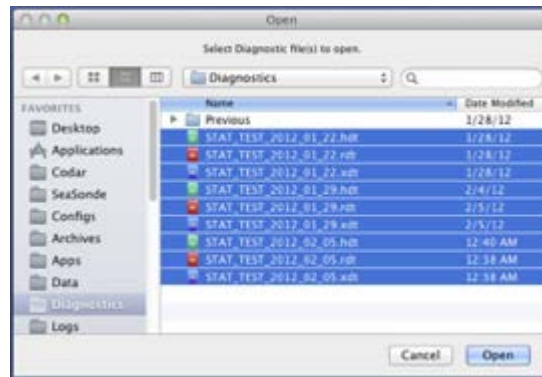
It is a good practice to plot the diagnostic files ("STAT_") weekly or bi-weekly to check the different radial and hardware parameters.

- Click the DiagDisplay icon on the Dock.
- The Adjuster Dialog and the Diagnostic History Plot window will open.



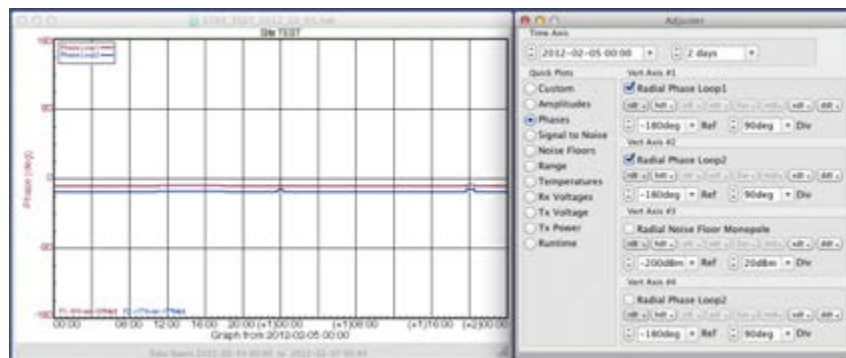
Diagnostic History Plot and the Adjuster Dialog

- Choose File > Open. Drag and drop method or double-click will also open a file.
- Select the "STAT_" diagnostic files and click on the "Open" button to open files.



File Menu Open

- By default it will plot one of the sets of parameters of the Diagnostic Files on the Diagnostic History Plot.



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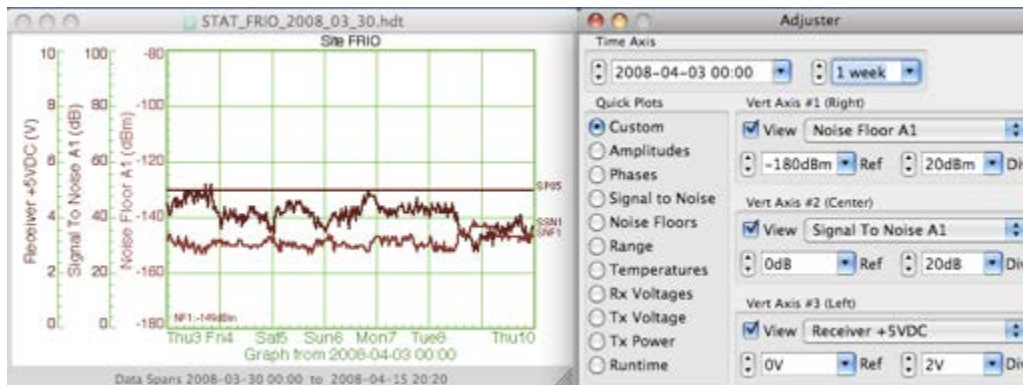
Diagnostic Files plotted on the Graph

- Quick Plots pane in the Adjuster Dialog is used for quick plotting of a default set of related parameters simultaneously, like Noise Floors, Signal to Noise Ratios, Phases, etc.
- Select “Custom” checkbox to plot parameters from different sets together.

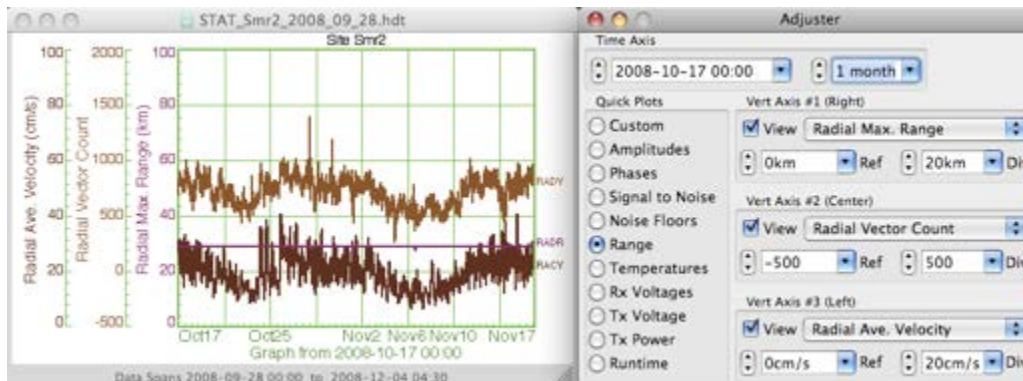
Custom Plots

Maintenance Check and Troubleshooting

The example below shows how you can use DiagDisplay for maintenance check of normal operation of radial data collection and SeaSonde hardware operation. This example specifically covers an instance, when a client observed a sudden reduction in radial range during their regular maintenance check. This example shows how DiagDisplay can be used in such cases to try to find out the suspected reason of problem. There can be more than one reason leading to the same problem. This example covers one of the many reasons leading to the same problem.



- Select the “Range” checkbox to plot the Radial Max Range, Radial Vector Count and Radial Average Velocity simultaneously.



Plotting Radial Range Parameters

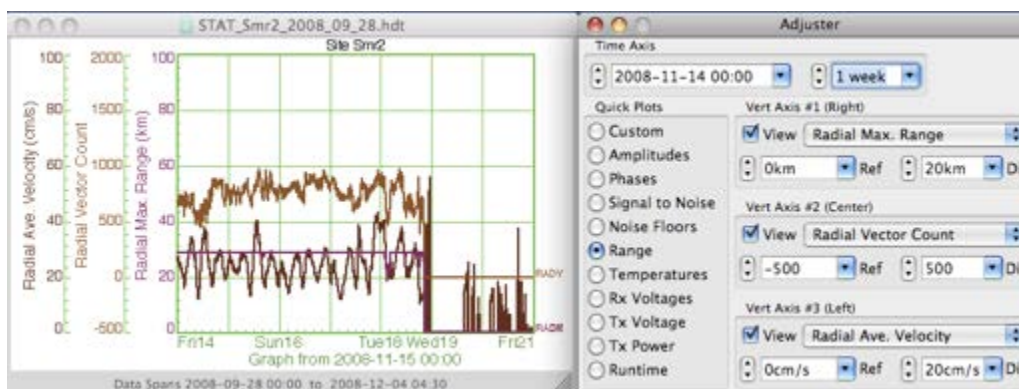
- Depending on your site's operating frequency and settings, confirm if the radial max range and the radial vector count seem reasonable.
- Verify if there is any period of time, when the range and/or vector count decreases.

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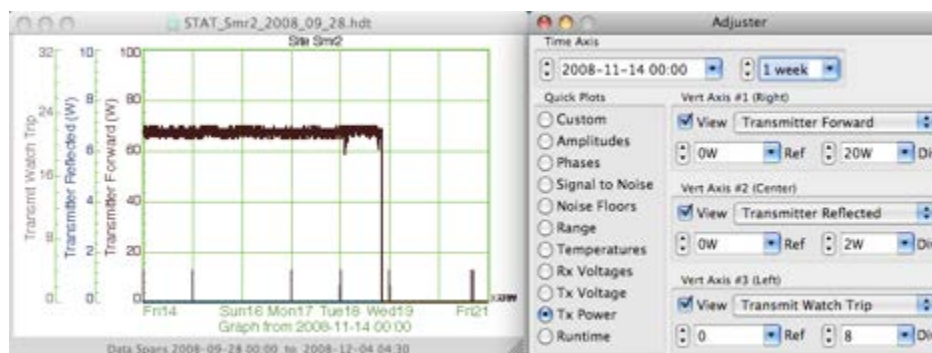
- Select different set of parameters from the Quick Plots section to plot on the graph and confirm if everything is working reasonably well.

Sudden reduction in Range

- The Radial Vector Count and Radial Max Range looked reasonable till Wednesday 11/19. The radial range and vector count suddenly dropped to zero on 11/19.
- So, you can plot other parameters to find out the cause of range reduction.



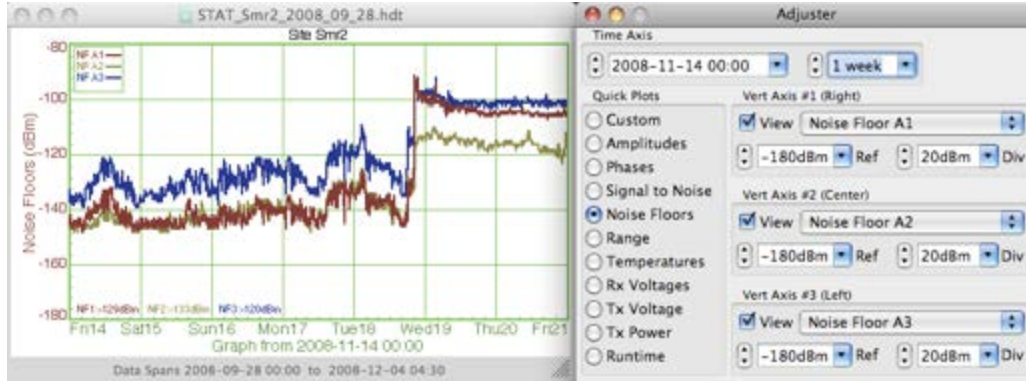
- Select "Tx Power" checkbox. This will plot Transmitter Forward power, Reflected power and the Transmit Trip parameters.
- Make sure that your site's forward/reflected power readings are reasonable depending on your settings.



Power Plot

- The plot shows that the forward power was reasonable till Wed. 19 and then suddenly drops to zero.
- This shows that the Transmitter is not transmitting any output power. It can be due to several reasons like tripped transmitter, fallen antenna, cable cut, bad transmit power supply, bad transmit amplifier or any other non-working module in the Transmit or Receive chassis.
- Since, there is no forward power, there is no radial coverage.
- The "Transmit Watch Trip" graph shows that the transmitter was not tripped at the time of failure. The default value is "0", the value rises to more than 1 when the TX gets tripped. So in this case, there is some other reason.
- Plot other parameters to try to find the reason for no forward power.
- Select "Noise Floors" checkbox. Check the noise floors on all three channels.

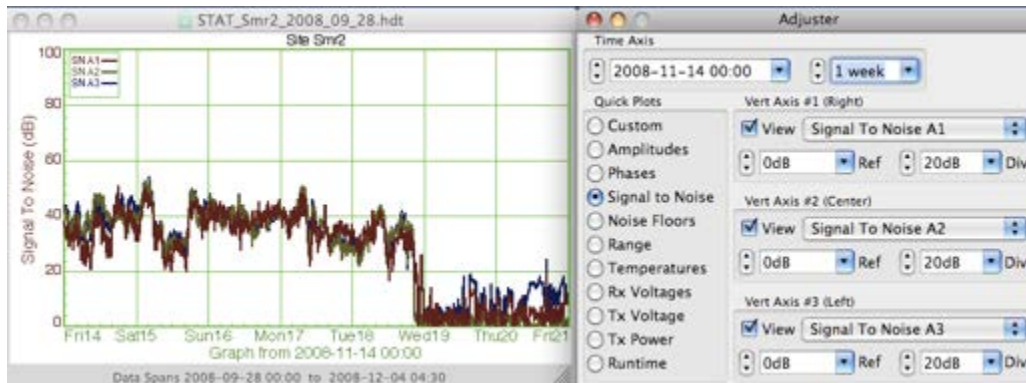
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Rise in Noise Floors

The noise floors suddenly increased around Wed 19. This can be due to several reasons like sudden increase in the environmental noise or some internal hardware failure or due to bad antenna.

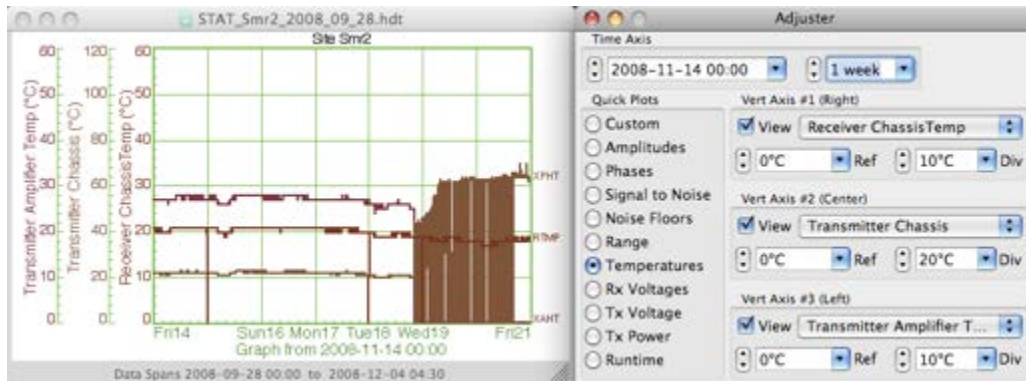
- Select “Signal To Noise” checkbox. Check the signal-to-noise ratios on all three channels.



Drop in Signal-to-Noise Ratios

The Signal-to-Noise Ratios on all the three channels dropped to almost zero, as there was no output power after Wed 19.

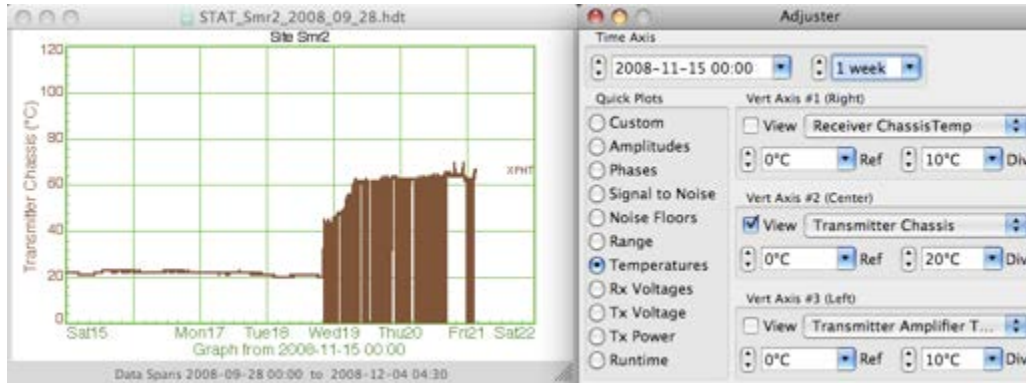
- Select “Temperatures” checkbox. Make sure that all the temperatures look reasonable.



Temperatures Plot

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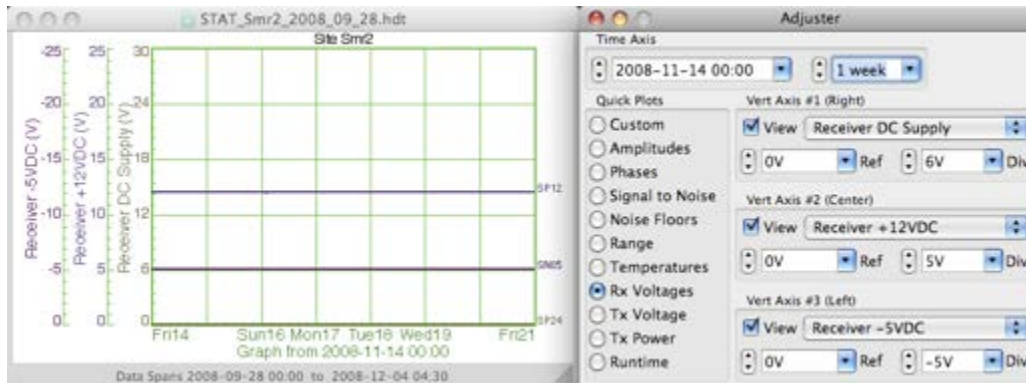
The transmitter chassis temperature was reasonable till Wed 19, but after that it went very high. This can be either due to the very high surrounding atmospheric temperature or very high temperature generated inside the chassis due to some hardware component failure.



Transmitter Chassis Temperature Rise

You can plot TX and RX voltages to confirm, if the common voltage readings inside the chassis are correct.

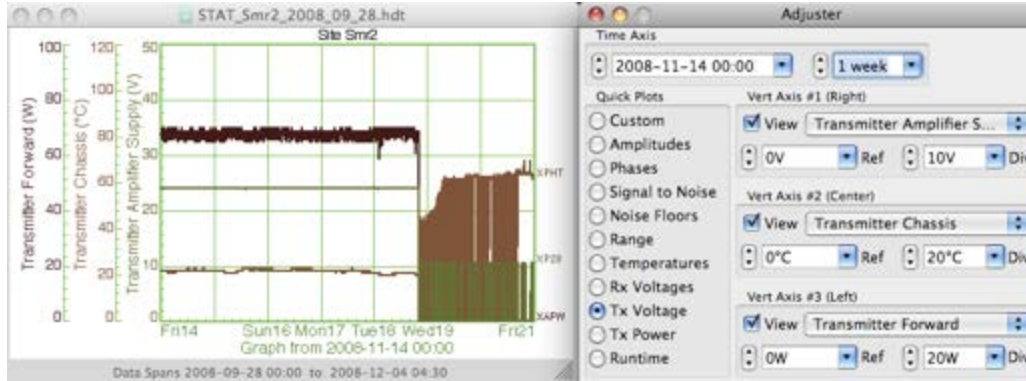
- Select “RX voltages” checkbox.
- Confirm, if the Receiver +5V and +12V readings are correct. (Receiver DC supply reading is only for systems with DC supply).
- If both the +5V or +12V supply reading are correct, it means there is most likely no failure in RX chassis components.
- If any of the supply readings is in-correct, then it means there is a hardware failure of one or more components inside the RX chassis.



RX voltage readings

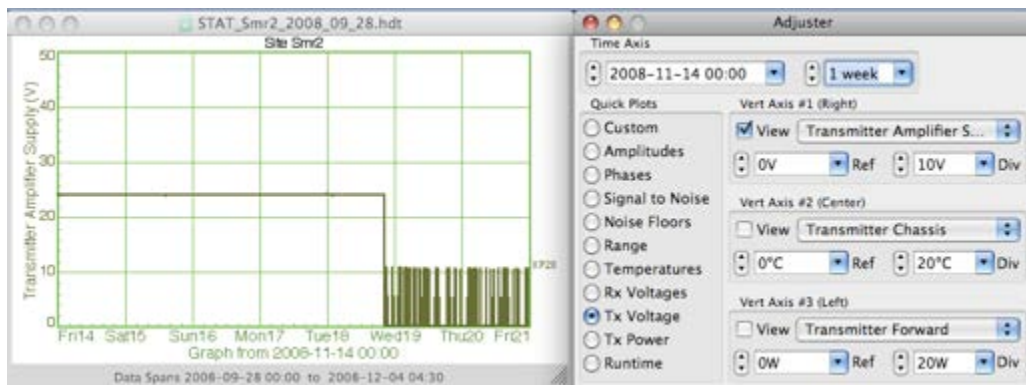
- Select “TX voltage” checkbox.

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TX Voltage Reading

- On Wed. 11/19, the TX power fell to zero, TX chassis temperature rose to a very high value and the Transmitter Amplifier supply dropped from its normal 24/28V value to a lower value.
- Un-check the "View" checkboxes with Transmitter Chassis and Transmitter Forward fields.



Transmit Amplifier Supply Drop

- This means that there may be some problem with the Transmitter amplifier power supply.
- Hence client was suggested to make a site visit and measure the Transmitter power supply voltage and few other voltage readings in the TX chassis.
- Finally, after all measurements, it was clear that there was some problem with the amplifier which was pulling down the Supply voltage.
- In this way, you can use DiagDisplay, to get an idea about the suspected reason for any failure in hardware operation or irregular collection of radial data.

Data Management

This section describes how to confirm that the Archivalist application is functioning properly and how to correct some common problems. The document also provides examples of common Archivalist configuration changes and guidelines for data archive maintenance. Note that Archivalist is not a backup utility and it is up to the SeaSonde user to periodically copy your important data and configuration files to a more permanent storage.

About Archivalist

Archivalist is a utility application for maintaining output folders that build up with

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lots of data files. Archivalist will create archived copies of the files while maintaining a limited number of source and archived folders/files (limiting means it will delete older data as configured.) The SeaSonde Radials Site produces many different types of output files time stamped at various intervals. Archivalist organizes copies of the data files into /Codar/Archives/ and keeps the data folders from filling up with too many files in order to prevent the hard disk from filling up. The default limits for a Radial Site are meant for typical hard disks with room left over for future data like bistatic and other add-ons. If your hard disk, is less than 80GB you will want to reduce these limits. If you hard disk is much larger, you might want to increase these limits to hold more data on site.

Archivalist can also copy data to an external drive which can be used to transport data offsite; see Copy an archive to an external disk below.

Check Archivalist function and configuration

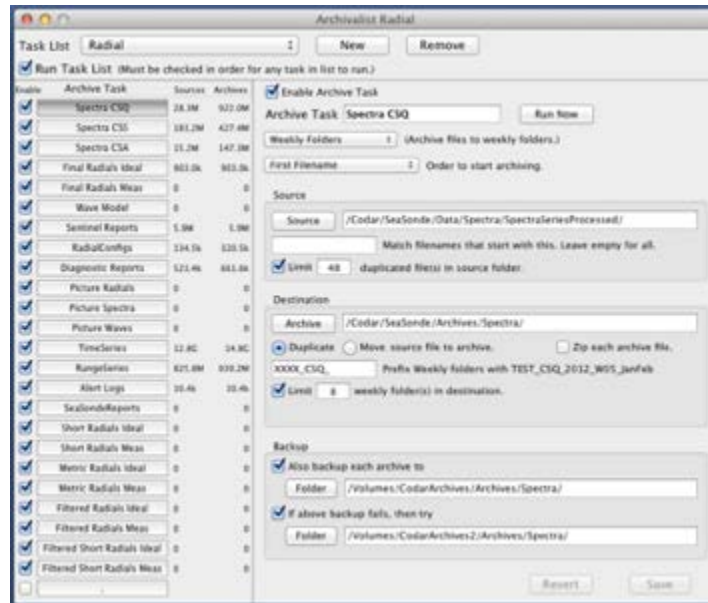
- Look at the Archivalist icon in the Dock. Confirm that there is an application-open indicator below the icon.



- Click the Archivalist icon in the Dock to open Archivalist or make it active.

Check settings

- Choose Control > Change Archives.... The Archive Control dialog appears.



- Review the checkboxes in the Archives pane and confirm that the expected archives are selected.

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- Click each archive name in the Archives pane and review its settings in the other panes. Confirm that the settings are correct.
- After the settings are confirmed observe the Sources and Archives data amounts and confirm that data is being stored.

Check archives

In the Finder, confirm that files are correctly archived. Archives are normally in /Codar/SeaSonde/Archives.

- Confirm that archives are located in the folders specified by the Archivalist settings.
- Confirm recent archiving by checking file-created dates for recent dates and times.

Confirm the archive sizes for each archive folder:

- Select an archive folder.
- Choose File > Get Info. An Info window appears.
- In the Info window's General pane, confirm that the number of archived files or archive sizes are the same as the settings.

The Archive Control settings may be empty. If the settings are empty, see **Restore Archive Settings**.

Check status and disk usage

- In Archivalist, choose Window > Show Status Window. The Status window appears.
- Review the Status window entries for any red-colored error messages. If there are any errors, correct them.
- Click the CodarData disk on the desktop.
- Choose File > Get Info in the Finder. The CodarData Info window appears.
- In the Info window's General pane, confirm that the available disk space is at least 5 Gigabytes (GB) or 10% of the disk's capacity, whichever is less.

If the available disk space is less than 5 GB or 10% of the disk's capacity,

- change the Archivalist settings to reduce the archive size (see **Archive Configuration Examples**)

or

- delete the oldest archive files (after backing them up, if desired).

If an extra copy is made to a separate disk,

- check the disk's available space.

If the disk is nearing its capacity,

- delete the oldest files on the disk

or

- exchange the disk for a disk with more available space.
- If you encounter problems that you can not solve, open /Codar/SeaSonde/Apps/Scripts/SeaSondeReportsHigh. A report file

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/Codar/SeaSonde/Logs/RPT_XXXX_YYYYMMDD_HHMMSS_hi.zip is created. Email the report to support@codar.com with an explanation of the problem and your attempts to solve it.

Restore empty archive settings

Use the following procedure if you discover that the Archive Control settings are empty. That is, all the checkboxes in Archive Control dialog's Archives pane are deselected and all the archive names are blank.

- Quit Archivalist
- In Codar > SeaSonde > Configs > RadialConfigs delete the file Archivalist.plist
- On the Dock click the Archivalist Icon to restart Archivalist. The program will automatically generate a new default property list with standard archive settings.
- In Archivalist go to Control > Edit Archives
- Confirm the settings are correct.

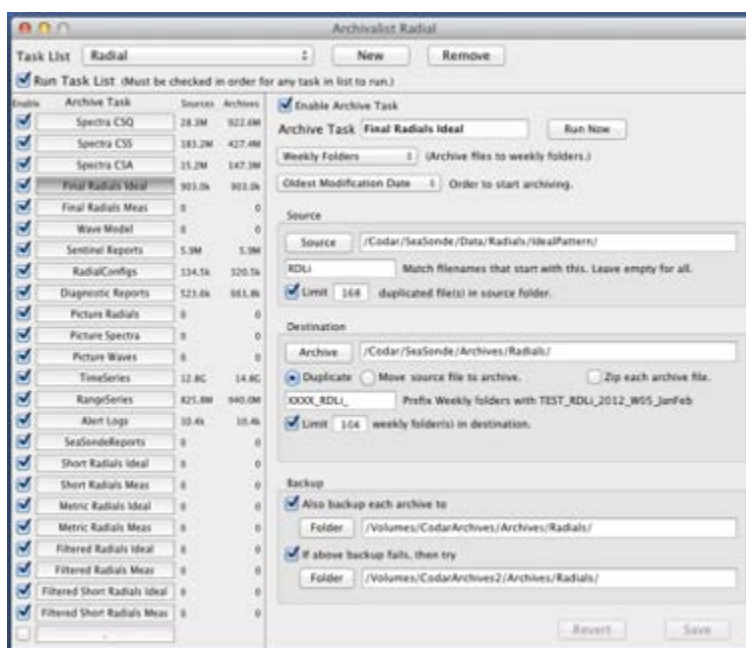
Archive Configuration Examples

The following examples demonstrate how to make some common configuration changes. Refer to the *SeaSonde Radial Suite Application Guide for Archivalist* for complete details on archive configuration.

Reduce archive limits to increase available disk space

You may discover that your archive configuration does not leave enough available disk space. In this example, you decide to reduce the number of ideal-pattern radials data files that are archived.

- Some of the archives will be deleted when the limits are reduced. If you want to back up the current archives, do it before reducing the limits.
- Choose Control > Edit Archives.... The Archive Control dialog appears.
- Click Radials LLUV Ideal in the Archives pane.



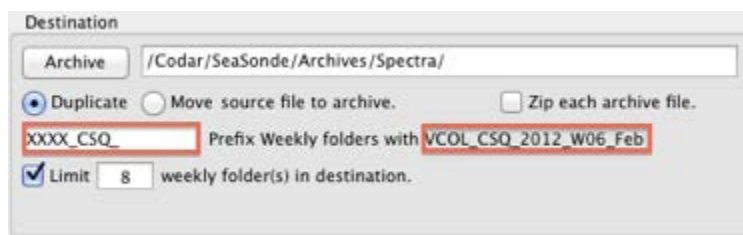
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Note that 168 files are duplicated in the source folder. These are seven days of data. (168 files / 1 file per hour / 24 hours per day = 7 days) You decide to reduce the duplicated files in the source folder to three days of data. 3 days * 1 file per hour * 24 hours per day = 72 files.

- Enter 72 in the “duplicated file(s) in source folder” field of the Source pane.

Note that 104 weekly archives are duplicated to the destination folder. (“Limit 104 weekly folder(s) in destination” in the Destination pane.) These are two years of data. (104 folders / 1 folder per week / 52 weeks per year = 2 years) You decide to reduce the duplicated files in the destination folder to 1 year of data. 1 year * 1 folder per week * 52 weeks per year = 52 folders.

- Enter 52 in the “Limit ... weekly folder(s) in destination” field of the Destination pane.
- Click the Save button. The changed configuration is saved.
- Click the Run Now button. If the previous archive sizes exceed the new settings, the archive sizes are reduced to the sizes of the new settings.
- Archivalist automatically organizes archived folders by using a token replacement system as shown below.



Note how the 'XXXX' token is replaced by the site four letter code.

Copy an archive to an external disk

In order to archive to an external drive proceed with the following.

- Connect the external FireWire disk drive to the SeaSonde computer.
- In the Finder, rename the external disk “CodarArchives”.

The normal settings backup all selected archives to the CodarArchives disk. To review the settings or change which files are backed up. A second drive can be simultaneously be connected to the computer under the name “CodarArchives2”.

- In Archivalist, choose Control > Edit Archives.... The Archive Control dialog appears.
- Click an archive button in the Archives pane.
- Deselect the “Also, backup the archives to” checkbox and/or the “if above fails, then try” checkbox for any archive items that are not to be save to the connected external drives. Archivalist is by default set to archive all active archive items to the “CodarArvchives” and “CodarArchives2” drives if they exist.
- Click the Save button if you change a setting.
- Repeat for each data archive.

CODAR Support Services

SeaSonde Training and Self-Help Resources

Training Courses

CODAR offers 3-day basic training courses at its Mountain View, CA Headquarters twice per year. One free basic course tuition is included with each SeaSonde purchased. Contact support@codar.com for course information and reservations. Course dates and descriptions are posted on our website <http://www.codar.com>. Onsite training can also be purchased.

CODAR highly recommends that operators of SeaSondes HF radar systems attend a basic training session prior to equipment installation.

SeaSonde Support Website

CODAR Technical Support hosts a support website at support.seasonde.com. The login and password for the T.I.P.S. page (Technicians Information Pages for SeaSondes) is provided to all new SeaSonde owners at the time of purchase. The TIPS pages are updated with the latest software bug fixes, answers to commonly asked questions and tutorial video screencasts for explaining how to perform the most common tasks.

HF Radar Library

A comprehensive "pdf library" of peer-reviewed publications pertaining to oceanographic applications for HF Radar can be found at <http://www.codar.com/bib.htm>. Most of the articles are full-text documents and can be downloaded as pdfs.

How to Get Technical Support

If you require technical assistance and have a support service contract on file with us, please feel free to email support@codar.com or call +1 408 773 8240 and ask the operator to speak with a member of our Technical Support staff. There is no charge for short answers (~ 5 minutes or less) but at a minimum, we do require that a CSERV-A support services contract be setup in advance.

The Principal Investigator/Owner of the SeaSonde(s) and his/her authorized technicians are identified in the contract forms along with correspondence and billing addresses.

Setting up a Support Services Account

To set up a Pay-As-You-Go (CSERV-A) service contract or to purchase pre-paid Time-Bundle (CSERV-B), please complete the appropriate form and email it to support@codar.com or fax it to the attention of Technical Support Services at +1 408 773 0514. Forms are also available on the support.seasonde.com website and in the Appendices at the end of this document.

CODAR also offers more comprehensive service plans that include pro-active service checks and maintenance by our staff. Annual site visits can also be provided if required. Please contact support@codar.com for custom pricing for our CSERV-C and CSERV-D plans.

No-Charge Services

CODAR will not charge for time spent diagnosing software bugs or for doing the requisite diagnostic checks provided that an RMA is issued and the equipment is returned to CODAR for repair.

If the software or hardware problem/complaint turns out to be a user configuration error or is a result of improper operation, then we will invoice the user for the Technical Support consultation on an hourly scale.

If an RMA is issued as a result of a remote diagnosis made by a CODAR technical support staff member and the hardware is not returned for repair within 30 days, we will also invoice for time spent diagnosing the problem.

Reporting Problems to CODAR

Identifying a problem

Prior to contacting CODAR's Technical Support Services department please prepare a detailed description of the problem and collect and email the latest SeaSondeReports log (if applicable). We will also need the serial numbers of the equipment and the remote contact information for the sites (IP addresses and any custom passwords).

If your SeaSondes are running CODAR SeaSonde Release6 or later software with RadialWebServer, please provide the URL and password for RadialWebServer access.

One-click Diagnostics Using SeaSondeReports

The best way to report information about your remote unit's status to CODAR Support is to run one of the SeaSondeReports scripts available on SeaSonde sites with Release 5 or higher installed. When run, the scripts create a zipped file containing a bundle of system logs, SeaSonde data and diagnostics files.

via the RadialWebServer Display

Go to the Logs section of the RWS page and click the Generate button



via the Desktop

The SeaSondeReports scripts are found in the /Codar/SeaSonde/Apps/Scripts/ folder. There are two scripts: SeaSondeReportsHigh and SeaSondeReportsMedium. The primary difference between them is the amount of data bundled. To keep the zipped bundle under most email file size restrictions, run SeaSondeReportsMedium. On computers set up by CODAR, it can also be run from the Dock by clicking the following icon:

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SeaSondeReports Icon

When run, SeaSondeReportsMedium will create a zipped file of bundled system logs, SeaSonde data and diagnostics on the Desktop approximately 10 MB in size with the following name format:

RPT_XXXX_YYYYMMDD_hhmmss_md.zip

This file should be emailed to support@codar.com and please include any additional description of the circumstances surrounding the issue and/or recent site configuration changes that might help us in our analysis. If immediate assistance or a prompt response is required, our standard support policy and rates apply, but submission of the zipped report files is always free and all submissions will be reviewed.

Returning Equipment to CODAR

Procedure

CODAR personnel **must authorize** any return of materials or hardware for repair, upgrade or exchange. Complete the following steps to avoid delays and additional charges:

- Confirm with a CODAR support engineer that your equipment needs to be returned
- Provide the following information to request RMA number.
- Serial number(s) of the equipment/modules/parts.
- Describe the problem/type of failure.
- If any troubleshooting steps were already carried out and results of the tests.
- Return shipping address for the equipment.
- Billing address for the RMA fee.
- Any corresponding diagnostic files or SeaSonde Report file that may help the CODAR support and testing teams to troubleshoot your problem.
- Send above information to CODAR by one of the following methods:
 - email: support@codar.com (preferred method)
 - fax: 408-773-0514. Attention to Technical Support department
 - voice: 408-773-8240; a Technical Support Representative will assist you.
 - mail: 1914 Plymouth St., Mountain View, CA 94043
- A CODAR Support Engineer will issue an RMA number for the authorized return.
- Pack the equipment/materials and clearly label the package with the RMA number.
- Ship the materials to CODAR in a sturdy packing to avoid damage in transit.

CODAR will notify the customer's contact personnel that materials were received.

CODAR will notify the contact person about analyses performed, recommended repairs, price estimates, etc.

Notes:

1. *Materials out of warranty will be assessed an analysis and repair fee.*
2. *Dirty or corroded materials may be assessed a cleaning fee.*
3. *Direct the inquiries about the status of any RMA to rma@codar.com.*

Hardware Troubleshooting Procedures

Troubleshooting Flow Charts

SeaSonde Receiver Tests

SeaSonde Receiver Bench Tests

If you see Red light in the front panel of the RX, then first test if the Receiver 5V supply is working properly.

Test 1:

- Using Multi-meter, measure voltage between pins 1(red and white cable bundle) and pins 2(black wire:ground) on the small power supply, located on the left panel of the RX chassis as shown in Figure.
- The multi-meter will read around +5V as shown in Figure, if the 5V power supply is working properly.
- If it is off by around + 0.3V, then there may be a problem with this power supply and you need to return the equipment to Codar.

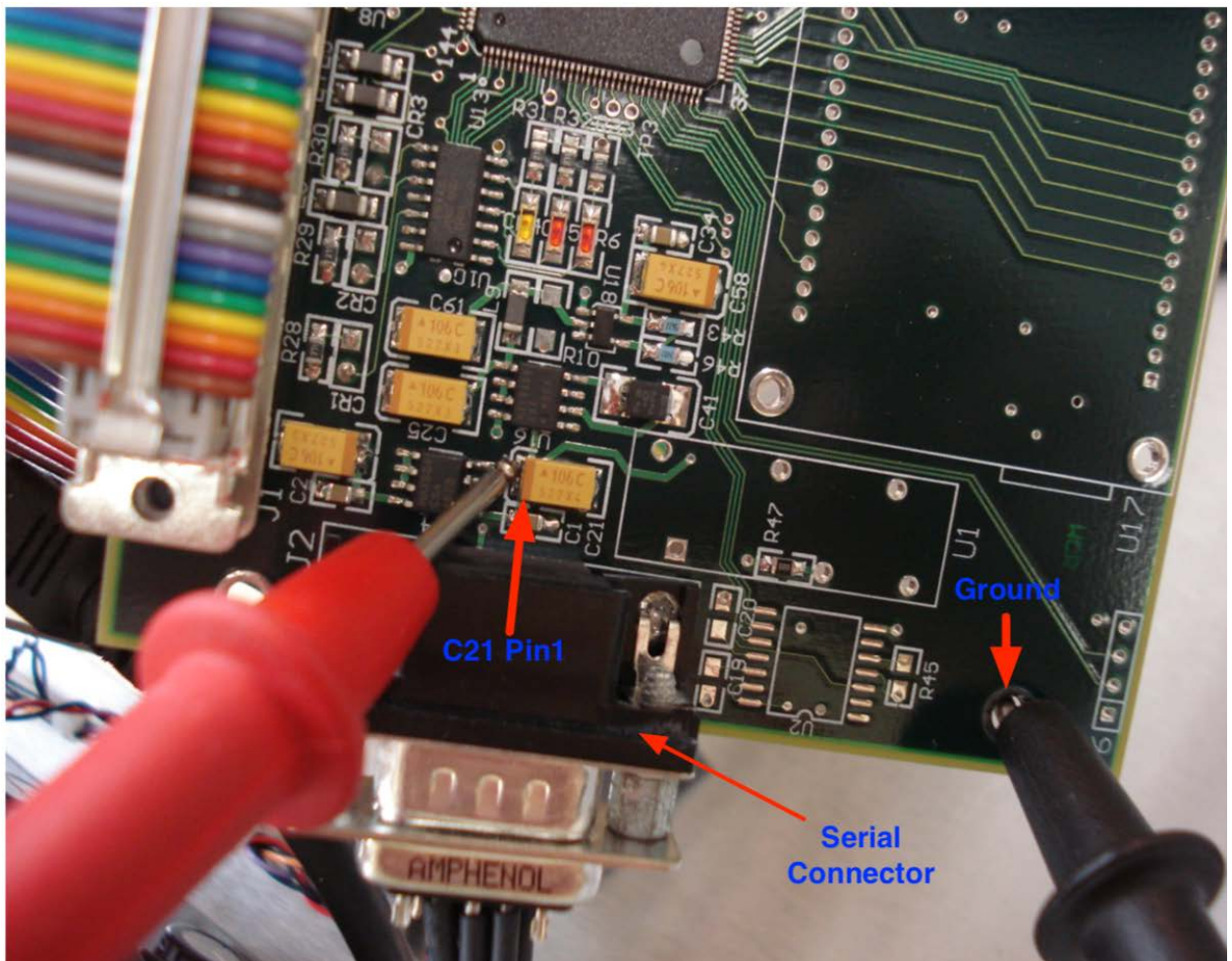


+5V supply in the receiver chassis.

If +5V power supply is working fine, check to see if the front panel board is receiving this +5V supply. Follow test 2 to measure +5V on the front panel board.

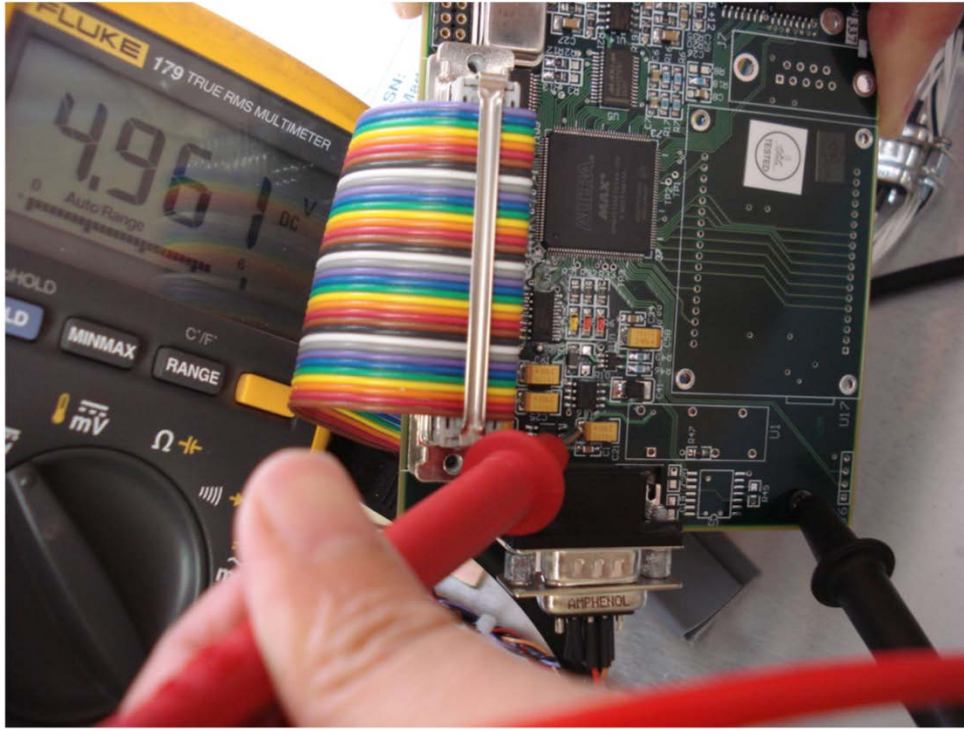
Test 2:

- Remove the screws from the front panel board and place it so that it is convenient to measure voltages using multi-meter as shown in Figure.
- Place the positive(red) probe on pin 1 of the big capacitor C21 in front of the serial connector as in Figure. Pin 1 is marked by a thin strip as shown by arrow in Figure.
- Place the negative(black) probe on the ground of the Front panel board as shown by arrow in Figure. You can use any one of the holes on the Front Panel Board, as in Figure as ground or the aluminum chassis as the ground.



Measuring 5V on C21 on Front Panel Board

- The multi-meter should read around 5V as shown in Figure.



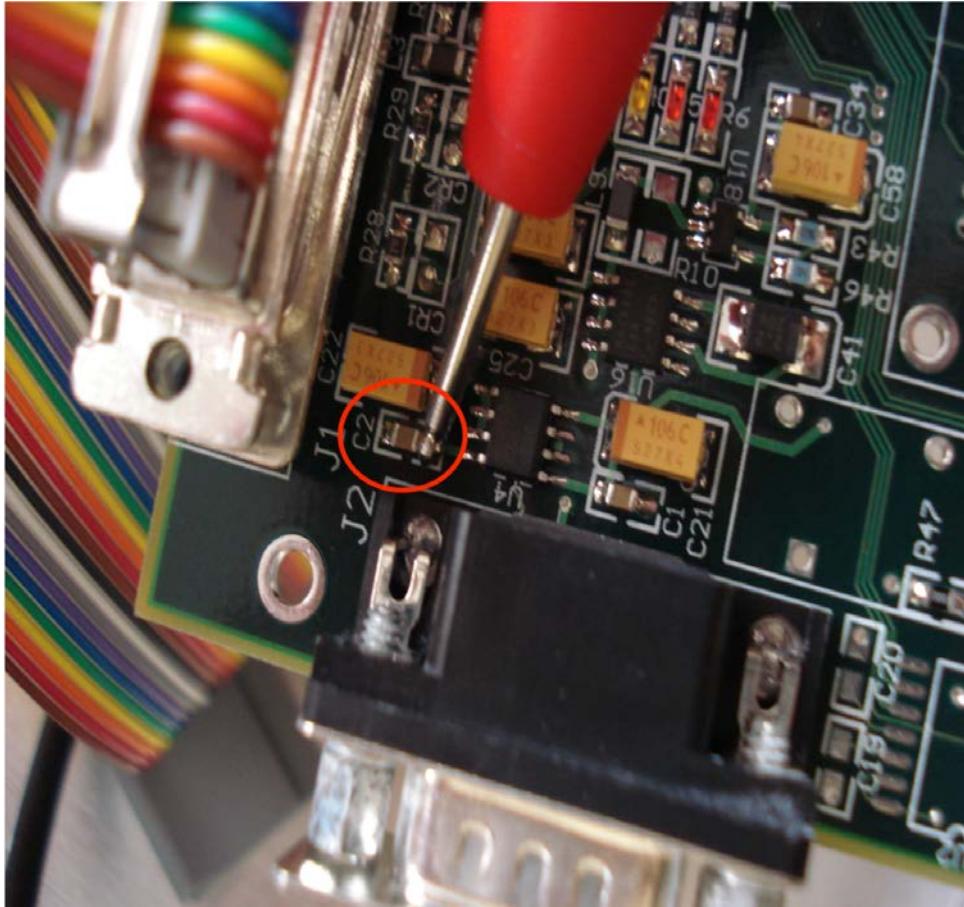
Front Panel Board 5 V measurement

- If +5V on Front Panel Board is not working correctly, and if the +5V supply as measured in Test 1 is working correctly, then either the ribbon cable is bad or there is a problem in the front panel board.
- In most of the cases, it is the front panel board problem and ribbon cable problem is extremely rare. So if you have a spare front panel board, then swap it and see if it works. Then you can determine, if it is the front panel board problem or any other problem.
- If Front panel 5V is working correctly, then follow Test 3. Next step is to measure 3.3V supply on the Front Panel Board.

Test 3

- First, locate capacitor C2 near serial connector J2 as shown in Figure 9 by red circle.
- Place positive(red) probe on pin 2 of C2 as shown in Figure 9 and place the negative(black) probe on one of the ground holes of the front panel board or the chassis as described in step 2.

The voltmeter should read around 3.3V. If its not close to 3.3V then it means that the power regulator is not working and you need to return the front panel board for repairing.



Measure 3.3V on Capacitor C2 on Front Panel Board

If, both 5V and 3.3V are working correctly on the front panel board, then most probably, it may be the problem with some other module.

Basic AWG module Test

To verify if AWG module is running properly follow the following steps.

The most basic measurement on AWG module that SeaSonde users can make, is to measure +5V supply on the AWG module.

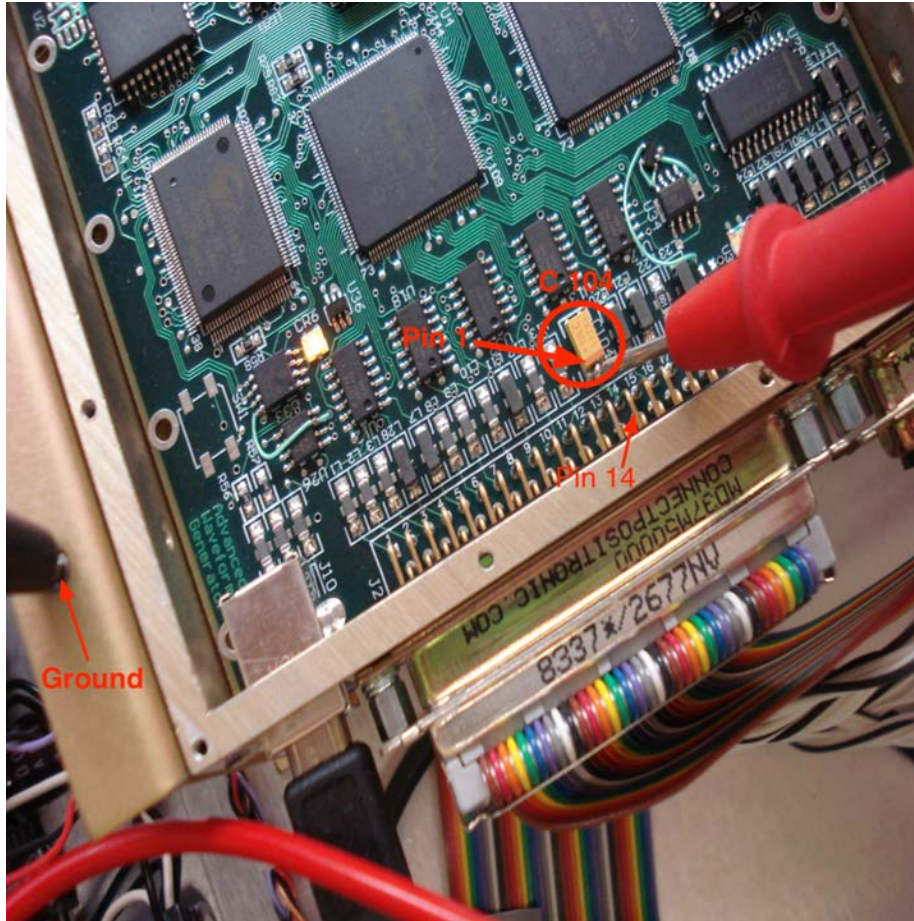
- Before that, you can first check the +5V reading using software.
- In the SeaSonde Controller “Advanced” controller window, type the command “prpt” in the “Send” window.
- The status window will show the reading of +5V as shown in Figure below.


```
2546 RC1:Write prpt\r
2547 RC1:Read prpt
2548 RC1:Read RFPV: F9
2549 RC1:Read FPAD: 00 00 C8 CA AC 00 00 F0
2550 RC1:Read SP05: +5.18v ←
2551 RC1:Read SN05: -5.13v
2552 RC1:Read SP12: +12.31v
2553 RC1:Read SP24: +0.00v
2554 RC1:Read FPHT: +27.C +80.F
2555 RC1:Read XRPT: 81 Unable to Get Transmitter Chassis 00
2556 RC1:Read OK.
2557 RC1:Read >
```

SeaSonde Controller Status Window

If the above reading is not close to +5V +/- 0.5V, then you can confirm the reading by manual measurement using multi-meter.

- First open the lid of the AWG module.
- Locate capacitor C104 as shown in Figure 11.
- Switch on the Receiver before making any measurements.
- Place the positive (red) probe of the multi-meter on pin 1 of Capacitor C104 as shown in Figure 11. Pin 1 is the pin with a marked thin stripe as shown.
- You can also probe on Pin 14 of the big serial connector J2 as shown in Figure 7.
- The reading should be close to +5V. If it is off by + 0.5 V or more, then there may be some problem with the 5V power supply or any of the other modules.



AWG +5V measurement

- In case of wrong reading on AWG module, measure +5V on the front panel board as explained above and the +5V on the main power supply as explained above.
- If both these supplies measure 5V correctly, then it may be a problem with one of the other modules or some cable problem inside the receiver chassis.

SeaSonde Transmitter Tests

Transmitter Bench Tests

There are three components in the transmitter that can affect the power output to the antenna. If any one of them has failed or is compromised you will likely have no forward power (signal) being transmitted. The primary components are the 28V DC Vicor power

supply,(or 24V DC power supply for systems shipped after Sep'08), the blanking board and the Kalmus amplifier. All the cases below are for 28V DC power supply.

Tools you will need:

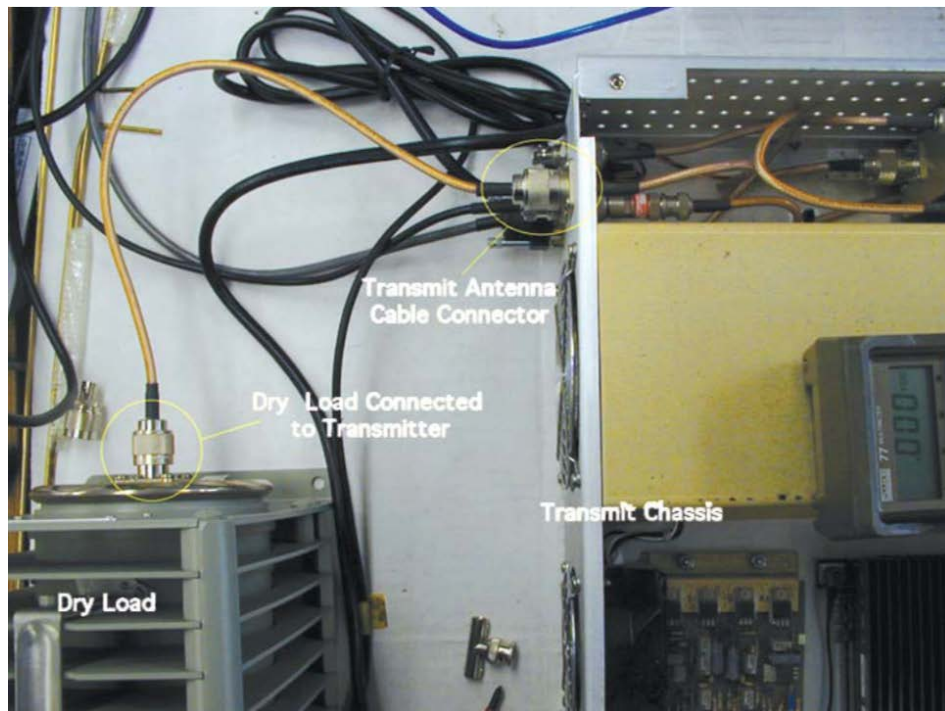
For these tests you will need a receiver chassis, a transmitter chassis, a multi-meter, a dummy load (also referred to as a dry load) and screwdrivers (flat bit and Phillips).

A NOTE OF CAUTION:

Some of these bench tests will require disconnecting wires or probing components with a multi-meter while the hardware is plugged in. For safety, turn off the transmitter

while preparing for each test and turn it on only when you are ready to take a reading. Always be aware of the power's on/off status.

- Before beginning any tests on a transmitter that has an input signal from a SeaSonde receiver, please be sure to connect a dummy load(or the Transmit Antenna RG-8 cable) to the transmitter's "N" type antenna connector (see Figure). Failure to do this can result in significant and expensive damage which may require replacement of the transmitter's amplifier. The first step (with the power off) is to remove the top covers from the receiver and transmitter chassis.



Dry load connected to Transmit chassis

Test 1:

- With the transmitter turned on, probe the two screws of the big blue capacitor (one probe on each screw) next to the Vicor power supply as in Figure.
- You should get a reading of approximately 28 V DC. If the voltage is off by more than a volt or two and the voltage has been consistently low (or high) in your diagnostic STAT files, then assume that there may be a power supply problem and continue to the next test.



28V DC power supply measurement.

- If the voltage is significantly low (less than 18 VDC for example), this may be an indication that the Kalmus amplifier has failed and is "pulling down" the voltage output from the Vicor. We will check this in the next step.
CAUTION: Be sure to turn off the transmitter before disconnecting any wires, then turn it back on again.

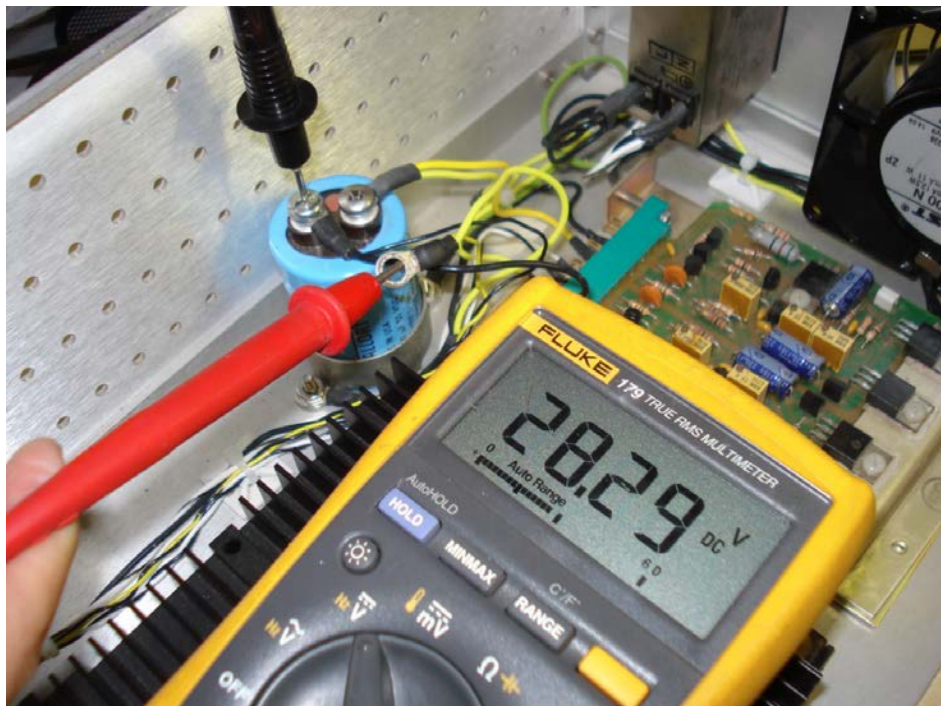
Test 2:

- To test if the amplifier is receiving power at all or if it is "pulling down" the voltage coming from the Vicor supply, disconnect the yellow wire bundle from the blue capacitor as shown in Figure. Disconnect the yellow wire bundle, which has one thin yellow wire as shown in Figure.



Disconnect Yellow wire Bundle

- Set the receiver to "pulse" mode using your normal operational settings so that a transmit signal is being sent from the receiver to the transmitter. The transmit drive cable and the serial control cable must be connected and a dummy load attached.
- Turn on the transmitter and probe between the yellow wire bundle that you disconnected from the capacitor and the negative terminal of the capacitor as shown in Figure.
- The reading on the multi-meter should be around 28 Volts DC. If the reading is lower than 28 volts by more than one volt then there may be a problem with the Vicor power supply.
- If the reading was previously ~ 18 VDC or less and is now reading 28 VDC with the wire bundle removed, then most probably, your Kalmus amplifier has failed.

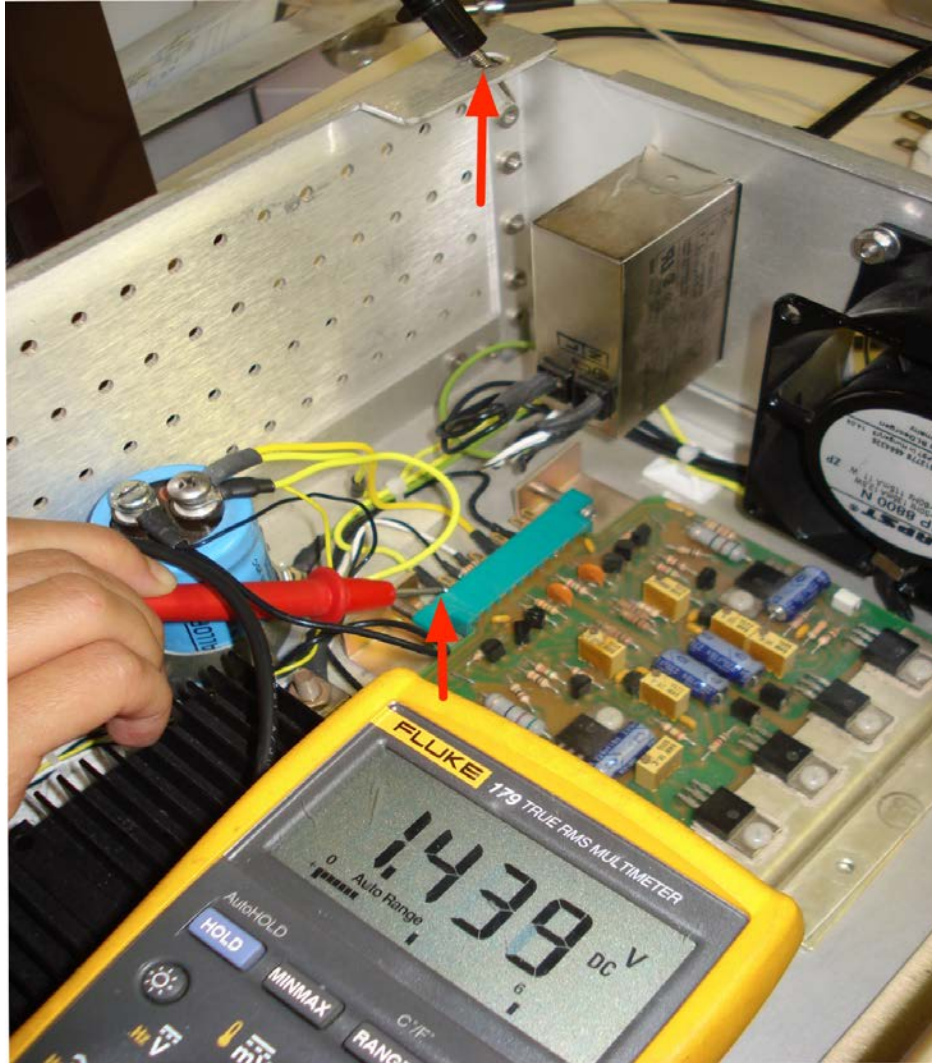


28V measurement across the cable bundle.

- If your power supply voltages are good and if still, there is no transmit power, the problem may be your blanking board.
- First, make sure that the serial cable and transmit drive cable are in good condition and attached, then proceed with the test below.

Test 3:

- To determine if the input signal is reaching the blanking board, place the positive(red) probe on the first wire terminal lug (a.k.a. pin "10") of the blanking board and the black probe on chassis ground as shown by arrows in Figure 5.
- The reading should be approximately 1.4-1.5 volts DC. If it is not and you're sure that the transmit drive cable and transmit serial control cables are in good shape, then you can assume the blanking board has failed.
- Blanking boards are user replaceable (for experienced users).
- Remove the two chassis mounting screws and pull the board out from its socket.
- Replace with a new board and re-assemble.
- If this solves the problem then you won't have to return your SeaSonde transmitter to COS.



Measuring Blanking Board voltage

Antenna Cable Tests

Antenna Tests

Test 1: Resistances of the Antenna Connectors at the Receive Antenna Box

- Turn off the transmitter chassis.
- Turn off the receive chassis.
- Take down the receive antenna.

- Unplug the antenna cables at the end of the receive antenna
- Set the multi-meter to measure resistance in the kilo-Ohm range.
- Measure the resistance across each connector from the bottom of the receive antenna box in the following manner:
Place the black probe on the outside shield of the connector.
Place the red probe on the center pin.
- Resistance of Loop 1 and 2 connectors should be each close to 1500 ohms.
If they are not close to 1500 ohms, there may be a problem in the Receive Antenna loop-stick box.
- Resistance of Monopole connector should read an open connection or some very high resistance in Mega Ohms range.

Repair and Maintenance

Rack Mountable Electronic Chassis

Repair

For electronic chassis (RX and TX), there is no user serviceable parts. The repairs should be done by the manufacturer or its authorized service representatives. See section "Returning Equipment to Codar" for instructions on procedures.

Maintenance

In general, if the equipment is housed in a sealed and environmental controlled room or cabinet as recommended, the equipment requires no regular maintenance.

Power Cords

If power cords were to be replaced and sourced locally, the power cord of the same design should be used with the current rating no lower than 10 A.

Fuses

Fuse housing is integrated into the power switch module. On each fuse holder there is also a spare fuse attached. To source the fuse locally, use a slo-blo fuse. The current rating should be 5 A for 110 V systems and 2.5 A for 220 V systems.

Cleaning

For cleaning, use a dry soft cloth to wipe the exterior only. No fluid should be used for cleaning. Cleaning of the interior of the instrument should be performed by the manufacturer and its certified representatives only.

Appendix A Specifications

Radiated Signal Specifications

Operators must adhere to local radiated signal regulations and receive proper authorization prior to operation. Licenses should be obtained by the system operator/owner prior to transmission. During manufacture, the system can be tuned for operation at a user-specified frequency, typically one of the authorized oceanographic radar bands as defined by ITU, or any other band authorized by presiding local authority. Transmitted signals are within the latest ITU guidelines for oceanographic HF radar.

Output Radiated Power: 80 W peak, 40 W average

Operating Frequency Range:

Electronics: 4.4 - 50 MHz (selected specific frequency for filter tuning_

Antennas: Select a frequency between 4.4 - 50 MHz

Modulation Format: Pulsed Swept Frequency CW (FMiCW)

Sweep Width: 12 - 300 kHz (typical)

Pulse Repetition Frequency: 1 - 4 Hz

Total Radiated Signal Bandwidth: (at -20 dB level) 65 - 200 kHz)

Polarization: Vertical

System Power Requirement (transmitter, receiver & computer):

350 W (24V DC version)

500 W (120 - 220 VAC version)

Transmitter Specifications

Transmitter Chassis model prefix: SSTX

Input RF Drive Level: 0 dBm

Output RF Power Level: 100 W peak, 50 W average

Power Requirements:

110 W (24 VDC version)

200 W Nominal, 300 W Maximum (120 - 220 VAC version)

24 VDC or 120 - 220 VAC, 50 - 60 Hz, single phase

Overvoltage Category: Category II

Power Amplifier Design: (gated FET) modular; solid state

Power Amplifier Operation: Class AB

Dimensions: (single chassis) 19" rack mountable, 3U tall; 13H x 49W x 53D (cm)

Weight: 15 kg

Environmental Condition Ratings:

Temperature Range (ambient): 0°F (-18°C) to 90°F (32°C)

Maximum Humidity: 80% non-condensing

Maximum Altitude: 2000 m

Pollution Degree: 2

Receiver Specifications

Receiver Chassis Model Prefix: SSRX

Maximum In-band Input Level: 0 dBm

Receiver Channel Impedance: 50 ohm

Sensitivity (noise level): -166 dBm in 1 Hz BW

Power Requirements:

200 W Nominal, 300 W Maximum

24 VDC, or 120 VAC, 50 - 60 Hz, single phase or 220 VAC, 50 - 60 Hz, single phase

Overvoltage Category: Category II

Design: Modular, solid state, three channel

Operation: I/Q homodyne

Output: USB digital output; digital data at 4096 16-bit/second per channel

Dimensions: (single chassis) 19" rack mountable, 3U tall; 13H x 49W x 53D (cm)

Weight: 14 kg

“SHARE” GPB-enabled modulation multiplexing Synchronization Feature:

GPS-assisted stability: 10 ns

PPS resolution: 0.1 ns

Environmental Condition Ratings:

Temperature Range (ambient): 0°F (-18°C) to 90°F (32°C)

Maximum Humidity: 80% non-condensing

Maximum Altitude: 2000 m

Pollution Degree: 2

Computer Specifications

Computer Model Number: SSSDA 101

For mini-style computer

Power Requirements:

150 W

100 - 240 VAC, 50 - 60 Hz, single phase

Operating Temperature: 50°F (10°C) to 95°F (35°C) for mini-style computer

Storage Temperature: -40°F (-40°C) to 116°F (47°C)

Relative Humidity: 5% to 90% non-condensing

Compatible Communications: 10/100/1000 Base-T Ethernet (RJ-45 connector) & Others
(such as dial-up modem)

Interface to SSRX: USB A

SeaSonde Enclosure Specifications

Model Prefix: ENC36-B

Enclosure construction

- NEMA 4X indoor/outdoor use
- Welded Type 304 Stainless steel construction
- 3/4" thick foam core insulation
- laminated poly/aluminum facers

Dimensions: 36"h x 24"w x 32"d

Weight: approx. 200 lbs.

Access Doors

- Two doors (front and rear),
- each fully gasketed, hinged left, latched right

Door Latches

- Standard 1/4 turn latches, top right latch per door,
- "barrel style" and padlockable (padlock not included)

Grounding Studs

- Grounding studs (4) on doors and inside enclosure

Rack Rails

- Side flange style with punched (not tapped) holes, for use with "clip-nuts" (included).
- Approx. 32" high and horizontally-adjustable (front-to-rear) on uni-strut

Cable Exit Plate

- Type 304 stainless steel
- Dimensions: 5.5"h x 13.5"w
- Gasket covering 2"h x 12"w cable exit cut-out, plate

Mounting Tabs

- 4 built into enclosure (two on right, two on left)

Air Conditioners- 2 included

- Thermoelectric solid state
- Built-in adjustable thermostat
- Stainless steel covers
- Stainless steel mounting flange (20-1/4"h x 13"w)
- Neoprene mounting gaskets
- Stainless steel mounting fasteners
- Certification to UL/CSA standards

Condensation Treatment

- One condensate drip pan per cooler
- Drip pan fittings and length of flexible PVC drain tubing plumbed with enclosure
- Small drain holes on right and left sides of enclosure (towards bottom)

Air conditioner Requirement:

- 1500 BTU/HR rating (each). Optional upgrade to 2500 BTU available for purchase.
- NEMA 4X configuration
- 220 VAC (4.6 amps) (or, specify 110V instead of 220V at time of ordering)

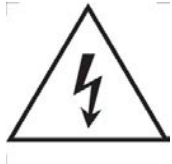
Air conditioner dimensions

Through-mount design, will protrude 3-5/8" into enclosure

†Exposure to direct sunlight can act as another heat input to enclosure and therefore should be avoided, especially in warm climates.

††Specifications and appearance are given as guidelines and may change without notice.

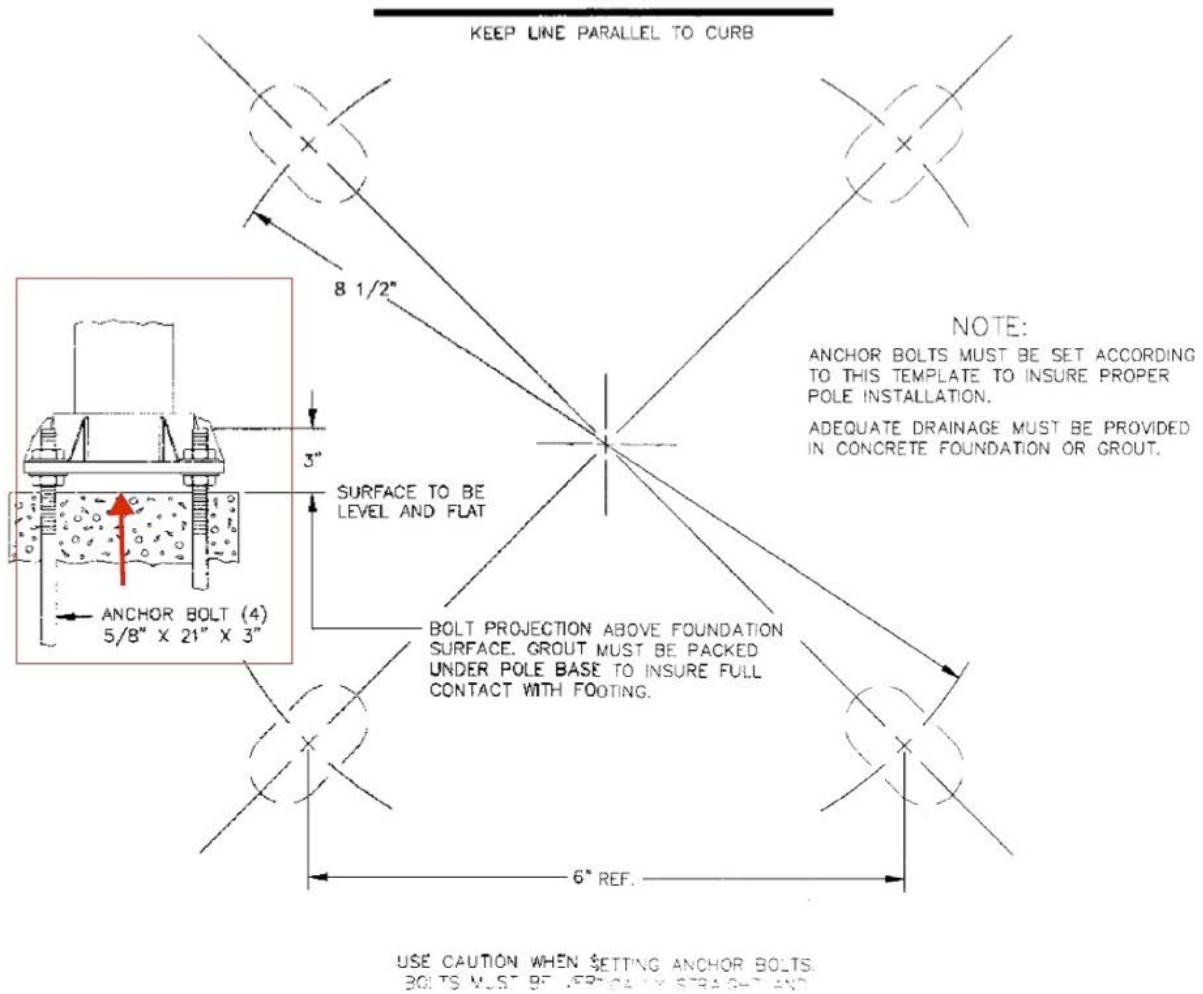
Transmitter & Receiver Chassis Symbol Explanations



Caution, risk of electric shock

Appendix B Dome Combine Antenna Mounting Template

LIGHTING STANDARD ANCHOR BOLT TEMPLATE
FOR RTF SERIES-5.6" ROUND TAPERED FIBERGLASS POLES

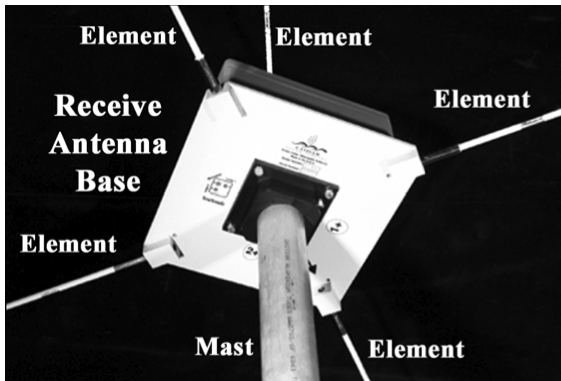


Appendix C Box Style Receive & Combined T/R Antenna

Note: the SeaSonde receive antennas and combined transmit/receive antennas are mechanically similar and identically assembled. These instructions are applicable to either type of antenna.

Box Style Receive Antenna

When assembled and raised, the antenna is approximately 7 meters tall. The antenna consists of five antenna elements, made of fiberglass whips, a base that contains electronics, a two-piece mast and cables. The cables are routed through the hollow aluminum tubing of the mast. The two mast pieces are mated with a plastic coupler. The cables are connected to the base. The base is connected to the mast. The antenna elements are attached to the base.



Parts List

Qty	Description
1	cable set, 100 meters
1	mast, lower section
1	mast, upper section
1	mast coupler
2	screw, hexagonal head (cap bolt), 4-20 x 3/8 inch

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1	antenna box
2	screw, hexagonal head (cap bolt), 4-20 x 3/8 inch
1	fiberglass whip, vertical element (see table below for lengths)
4	fiberglass whip, horizontal element (see table below for lengths)

Fiberglass Whip Lengths

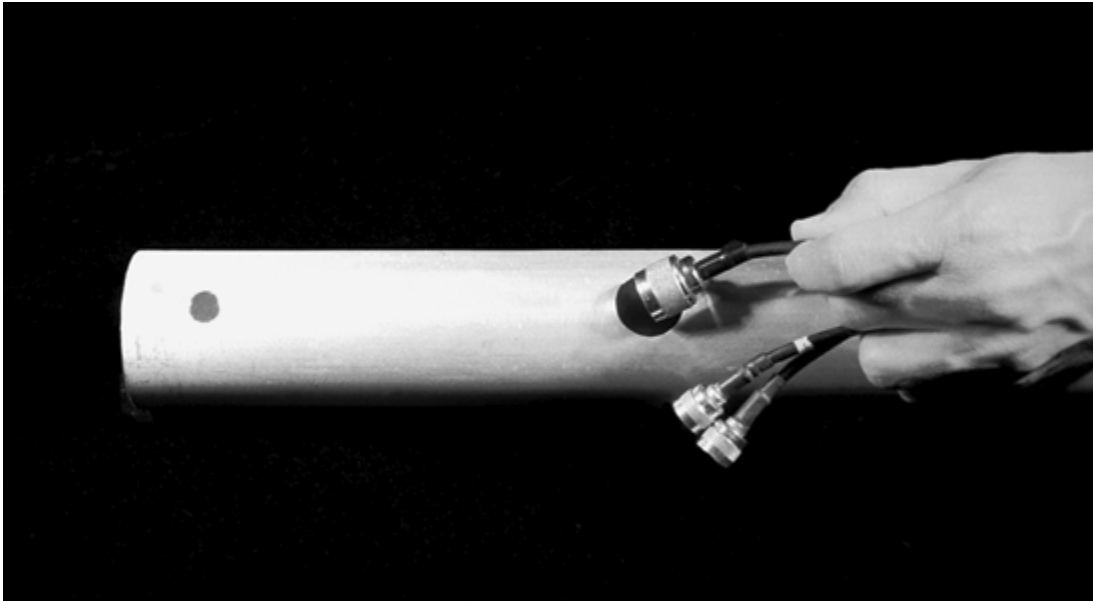
SeaSonde Frequency	Vertical Fiberglass Whip Length	Horizontal Fiberglass Whip Length
4.3 - 5.4 MHz	8 ft	8 ft
11.5 - 14.0 MHz	8 ft	8 ft
24.0 - 27.0 MHz	8 ft	4 ft
40.0 - 44.0 MHz	64 in	30 in

Tools List

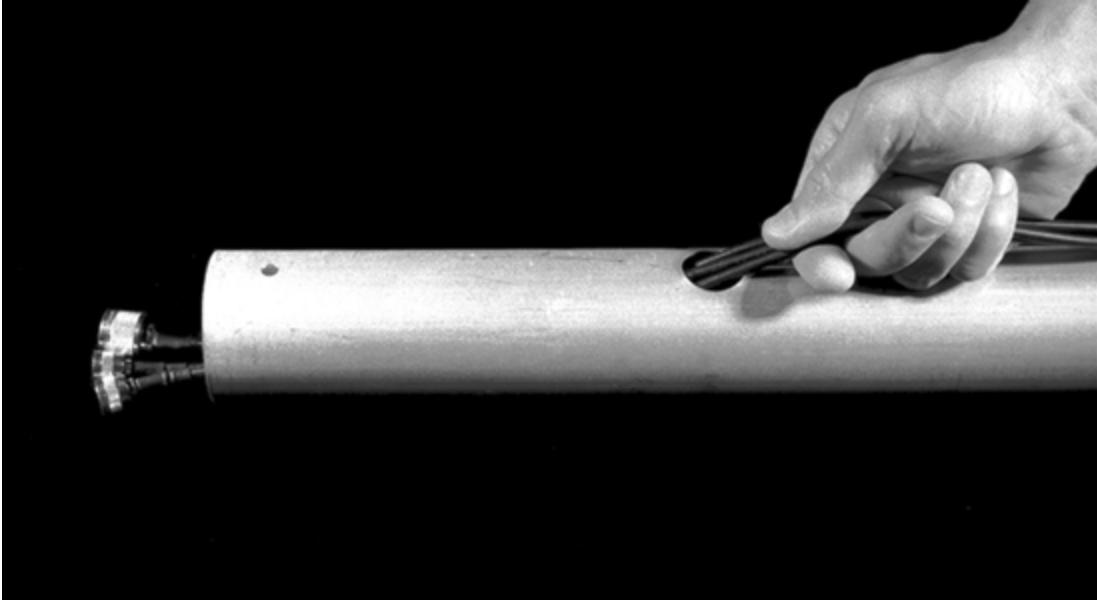
- wrench, 7/16 inch (socket with short extender recommended)

Procedure

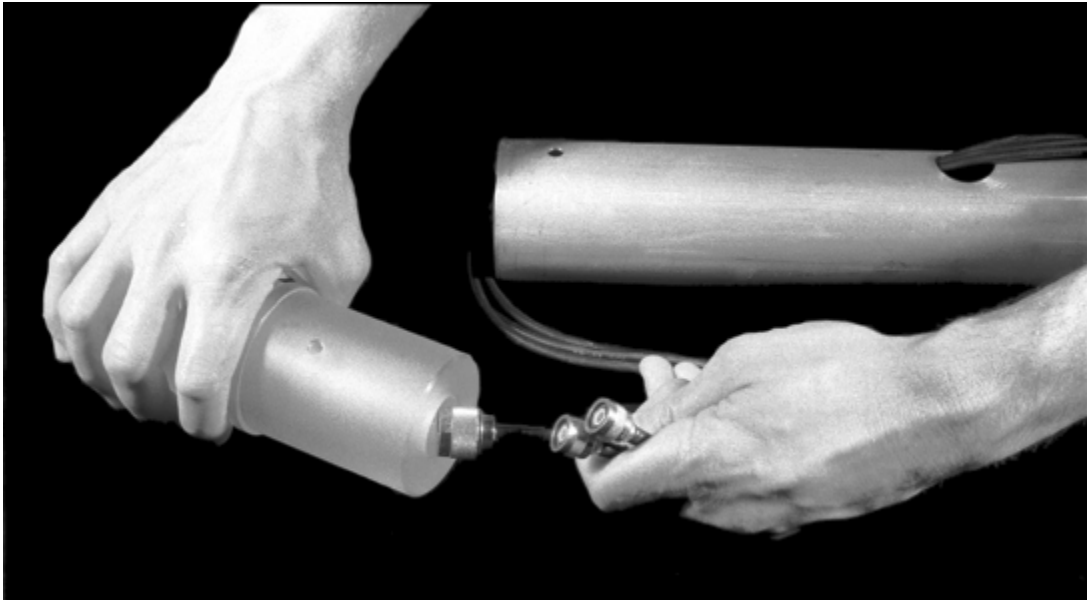
- One at a time, insert the end of each cable in the large hole at the upper end of the lower mast section. Be sure to start with the largest connector first.



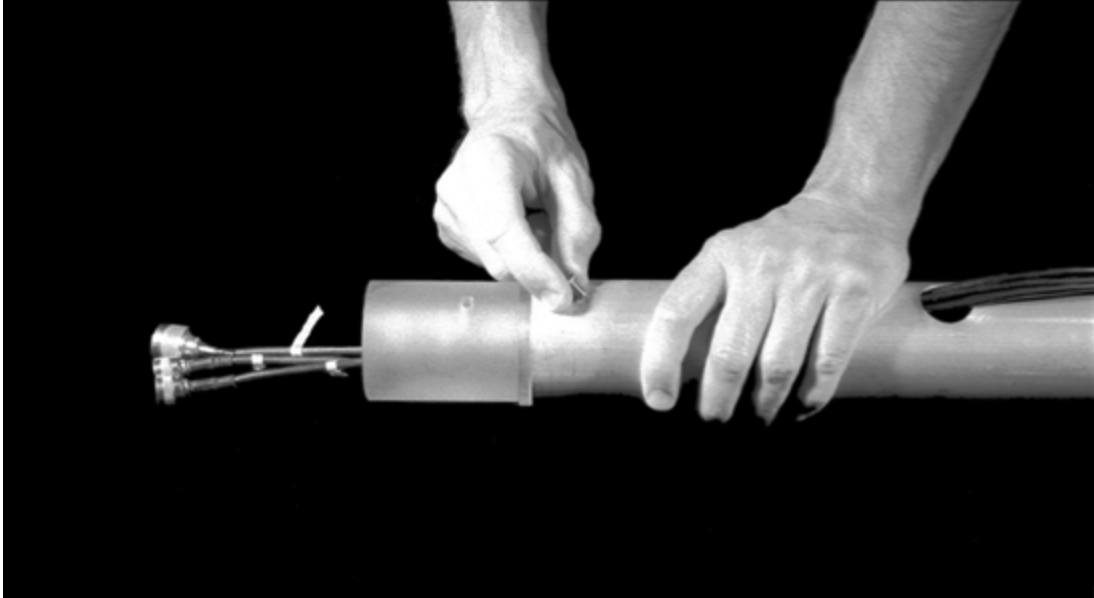
- With all connectors inserted, gently push the cables until they appear at the upper end of the mast section.



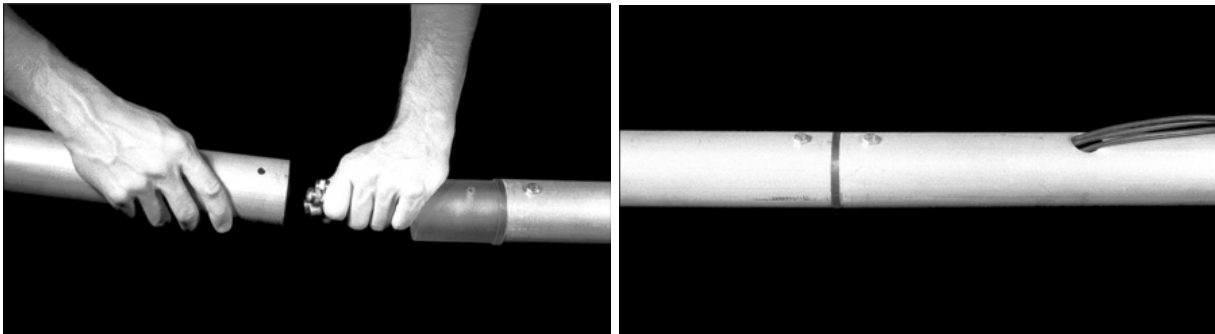
- One at a time, insert the end of each cable in one end of the mast coupler and push it through the coupler until it appears at the other end. Be sure to start with the largest connector first.



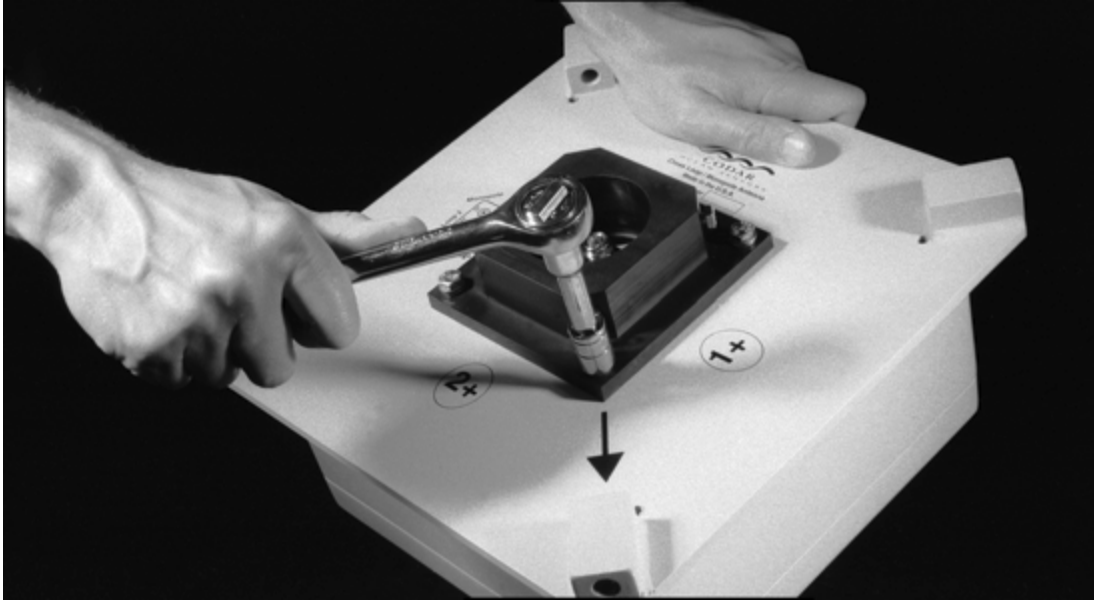
- With all cables threaded through the coupler, insert the coupler in the upper end of the lower mast section.
- Align the threaded hole in the coupler with the hole in the mast. Insert a 1/4-20 x 3/8 hexagonal-head screw (cap bolt) through the hole in the mast and screw it into the coupler. Gently tighten the screw with a wrench. Do not over tighten. The threads in the coupler are easily stripped.



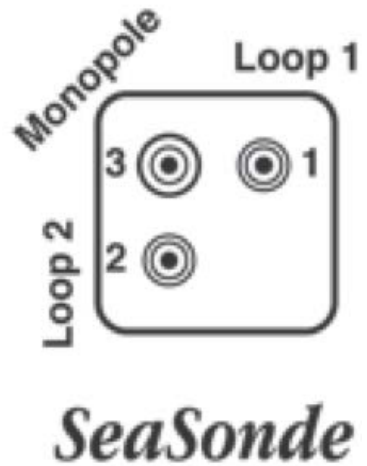
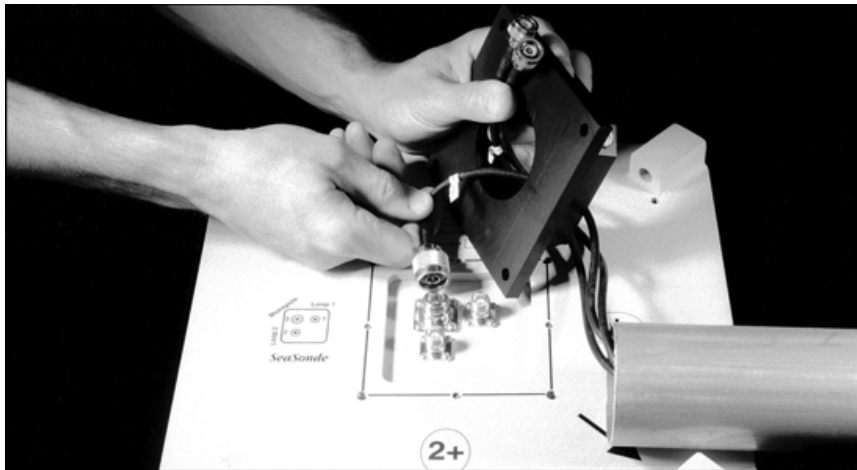
- Insert the cable ends and coupler in the lower end of the upper mast section.
- Align the threaded hole in the coupler with the hole in the upper mast section. Insert a 1/4-20 x 3/8 hexagonal-head screw (cap bolt) through the hole in the mast and screw it into the coupler. Gently tighten the screw with a wrench. Do not over tighten. The threads in the coupler are easily stripped.



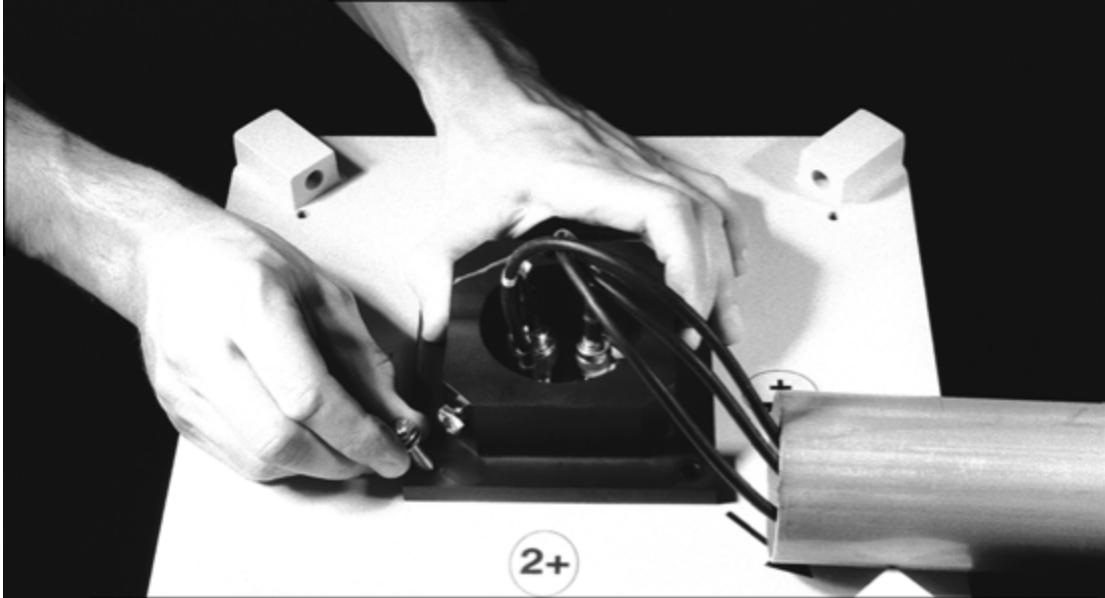
- Gently push the cables toward the top of the mast until they appear at the top.
- Remove the four bolts that fasten the black mounting sleeve to the antenna box.



- Thread the cables through the mounting sleeve and connect the cables to the antenna box. Refer to the diagram on the antenna box and match the cable labels with the corresponding base connectors. Finger tighten the connectors. Do not use a wrench or pliers.



- Reattach the black mounting sleeve with its four bolts. Tighten securely with a wrench.



- Mount the antenna box to the mast. Make sure the mast is fully seated in the mounting sleeve.
- There are two bolts that secure the antenna box to the mast through threaded holes in the black mounting sleeve. Tighten the two bolts securely with a wrench.
- The antenna has five fiberglass-whip elements. The elements are screwed into threaded holes in the antenna box. One element is oriented vertically, screwed into the top of the base. The remaining four are horizontal, screwed into holes at each corner of the base. The lengths of the elements vary, depending on the SeaSonde frequency.

Some older SeaSonde models have two-piece antenna elements. The two-piece elements are used with 4.3 - 5.4 MHz (Long Range) and 11.5 - 14.0 MHz (Standard Range) SeaSondes.

Coat the metal couplers with a moisture-proof lubricant. Dow Corning 4 Electrical Insulating Compound is recommended. Push the two pieces together, ensuring they are firmly and completely mated. Wipe off any excess lubricant. Wrap the exposed metal coupler where the two pieces mate in electrical tape.

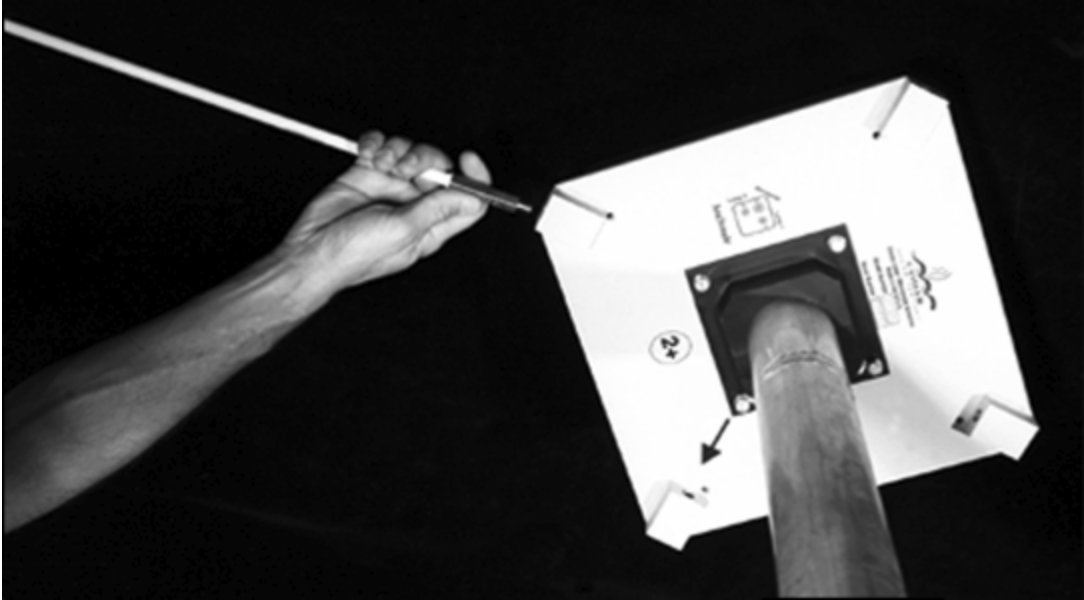
- Find the vertical element and coat its metal male threads with a moisture-proof insulating lubricant. Dow Corning 4 Electrical Insulating Compound is recommended.
- Insert the vertical antenna element in the threaded hole on the top of the base and screw it in. Tighten securely using a wrench.



- Coat the metal male threads of a horizontal antenna element with a moisture-proof insulating lubricant. Insert the antenna element in a threaded hole on side of the base and screw it in.

Note: The fine threads are easily cross threaded and can damage the Helicoil insert. Thread the whips by hand first, then tighten with a wrench.

- Tighten securely using a wrench. Repeat for the remaining three elements, installing at each corner of the base.

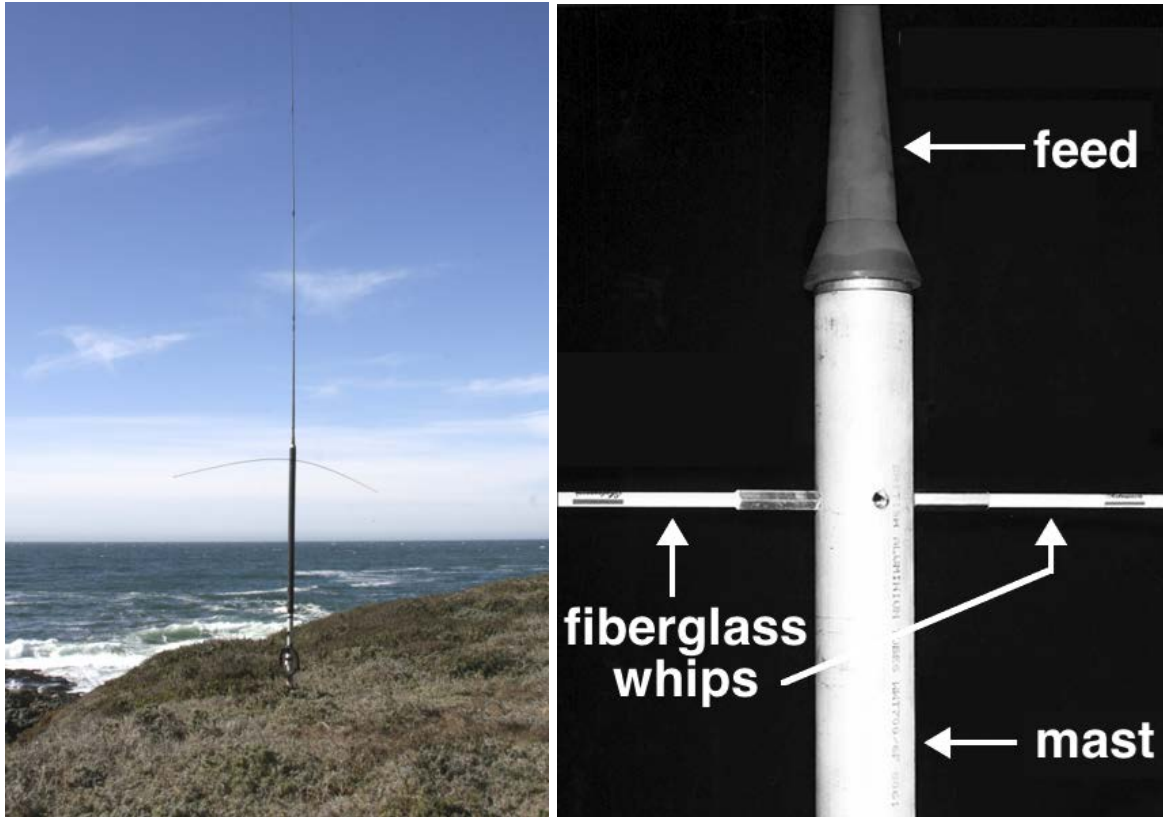


The SeaSonde receive or combined transmit/receive antenna is assembled.

Transmit Antenna Assembly

12 MHz and Above

The transmit antenna consists of a two-piece mast, a feed, fiberglass whips and a cable. The cable is routed through the hollow aluminum tubing of the mast. The two mast pieces are mated with a plastic coupler. The cable is connected to the antenna feed. The feed is connected to the mast and vertical and horizontal fiberglass whip elements are attached. When assembled and raised, the antenna is approximately 7 meters (24-27 MHz SeaSondes) or 9 meters tall (11.5-14 MHz SeaSondes).



Parts List

Qty	Description
1	cable, RG-8, 75 meters
1	mast, lower section
1	mast, upper section
1	mast coupler
2	screw, hexagonal head (cap bolt), 4-20 x 3/8 inch
1	antenna feed
2	screw, hexagonal head (cap bolt), 4-20 x 3/8 inch
1	fiberglass whip assembly, vertical element, four mating sections for 11.5-14.0 MHz SeaSondes or two sections for 24-27 MHz
2	fiberglass whip, horizontal element, 8 feet long

Tools List

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- wrench, 7/16 inch
- moisture-proof insulating lubricant. Dow Corning 4 Electrical Insulating Compound is recommended.

Procedure

- Insert the end of the transmit cable into the large hole at the upper end of the lower mast section.



- Gently push the cable until it appears at the upper end of the mast section.



- Insert the cable into one end of the mast coupler.



- Gently push the cable through the coupler until it appears at the other end.
- Coat the lower end of the coupler with moisture-proof insulating lubricant.
- With the cable threaded through the coupler, insert the coupler into the upper end of the lower mast section.
- Align the threaded hole in the coupler with the hole in the mast. Insert a 1/4-20 x 3/8 hexagonal-head screw (cap bolt) through the hole in the mast and screw it into the coupler.



Gently tighten the screw with a wrench. Do not over tighten. Over tightening can strip the coupler threads or crack the coupler.

- Insert the cable end and coupler into the lower end of the upper mast section.



- Coat the upper end of the coupler with moisture-proof insulating lubricant.
- Align the threaded hole in the coupler with the hole in the upper mast section. Insert a 1/4-20 x 3/8 hexagonal-head screw (cap bolt) through the hole in the mast and screw it into the coupler.

Note: Gently tighten the screw with a wrench. Do not over tighten. Over tightening can strip the coupler threads or crack the coupler.



- Gently push the cable toward the top of the mast until it appears at the top.
- Coat the cable connector threads and the antenna feed connector threads with moisture-proof insulating lubricant.
- Connect the cable connector to the antenna feed connector. Finger tighten the connectors. Do not use a wrench or pliers.



- Apply moisture-proof insulating lubricant to the lower metal section of the antenna feed. Coat the areas that will touch the mast when the antenna feed is inserted.
- Insert the antenna feed into the upper end of the mast.



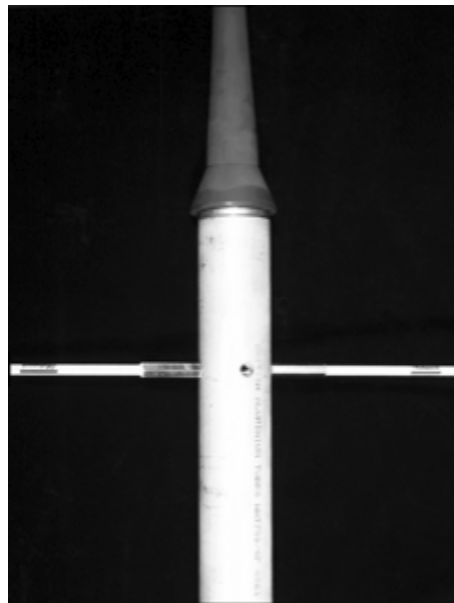
The horizontal antenna elements are white fiberglass whips.

Note: Some older SeaSonde models have two-piece antenna elements. Coat the exposed metal ferrule with moisture-proof insulating lubricant. Push the two pieces together, ensuring they are firmly and completely mated. Wrap the exposed metal coupler where the two pieces mate in electrical tape.

- Align the threaded holes in the feed with the holes in the mast.
- Coat the metal threads of a white fiberglass horizontal antenna whip with non-conducting silicone grease (Dow Corning DC-4 recommended).
- Insert the antenna element through the mast hole and screw it into the feed. Tighten securely using a wrench.



- Coat the threads of the second antenna whip with non-conducting silicone grease (Dow Corning DC-4 recommended).
- Insert the antenna whip through the mast hole opposite (180 degrees away from) the whip previously installed. Screw the whip into the feed by hand to ensure proper thread contact. Tighten securely using a wrench.



The vertical antenna element is a green fiberglass whip. The whip is made of four sections for 11.5-14 MHz transmitters or two sections for 24-27 MHz transmitters. From bottom to top, each section is progressively thinner.

- Insert each vertical antenna section's metal coupler into the the next section's socket. Coat the antenna connection with DC-4 silicone grease and push the sections firmly together and hand-tighten it
- Insert the antenna feed into the vertical antenna element. Twist the pieces firmly and completely together by hand. Do not use a wrench or tool.



Assembly of the SeaSonde transmit antenna is now complete.

Appendix D SeaSondeRadialSetup Default Settings

The following screen shots show the default settings for Standard Radial Site operations and data averaging times.

5 MHz Long-Range SeaSonde



12 MHz Standard Range SeaSonde

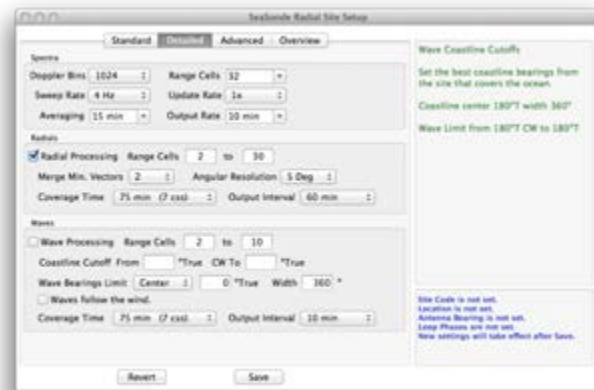


25 MHz Standard Range High Resolution SeaSonde

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42 MHz Hi-Res SeaSonde



Appendix E Optional Configuration Tasks

Find frequency with least interference

- With transmitter off, collect at least one full CSQ file for each of your assigned operating frequencies.
- Open a CSQ file collected at each frequency using the application SpectraPlotterMap.
 - Examine range cell #5 comparing noise floor values on each antenna.
 - Inspect each range cell for interference striping (horizontal or vertical stripes).
 - Choose the frequency with the lowest noise and no interference for your primary operating frequency.

Create a site map for viewing surface currents

- Launch SeaDisplaySetup (/Codar/SeaSonde/Apps/Tools/SeaDisplaySetup)
- Pull down File->New to create a new map



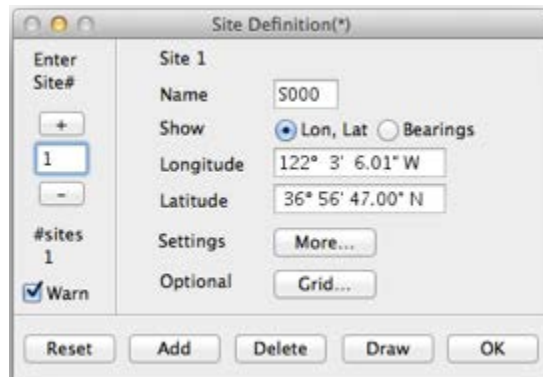
- Zoom the map in until it covers the area of interest:
- **Option** + Up arrow/Down arrow keys zooms in and out
- **Shift** + Left/Right/Up/Down arrows adjust the Left/Right/Up and Down frame boundary
 - Left/Right/Up/Down arrows adjusts Left/Right/Up and Down position within the frame
 - Choose the View > Map Navigation or View > Speed Hints to see details on navigating the map



- Pull down Map->Sites menu
- Click "OK" to dismiss "Sites dialog usage..." help box



- Click "Add" button in "Site Definition"



- Replace "Name" box entry "SCrz" with your four-character site name.
- Enter latitude and longitude as D.DDDD, DDD MM.MMMM or DDD MMM S.SS.

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Note: Disregard degree-minute-second symbols, make sure to include N,S,E,W as appropriate.

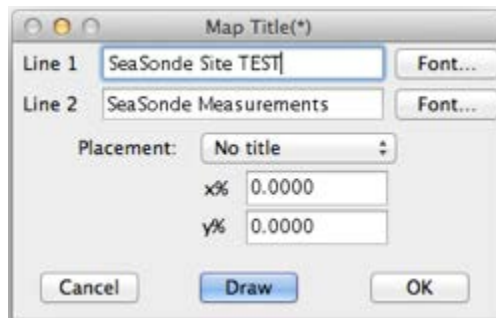
- Click “More ...” button
- Check mark “name” in Labeling options Release7-SeaDisplaySetup-SiteDialog



- Enter expected range in “Coverage display: Max Km”

(Defaults: 15km for 42MHz, 45km for 25MHz, 75km for 12MHz, 185km for 5MHz)

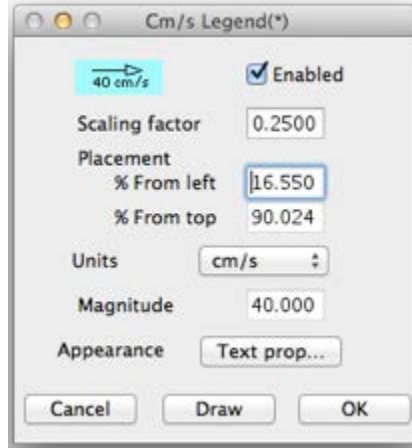
- Click “OK” to dismiss “More...” dialog
- Click “OK” to dismiss “Site Definition” dialog
- Pull down “Map->Title” menu
- Enter a title less than 32 characters in the *Line 1* text field
- Select “Top Center” in the *Placement* pull down menu



- Click “OK” to dismiss “Map Title” dialog

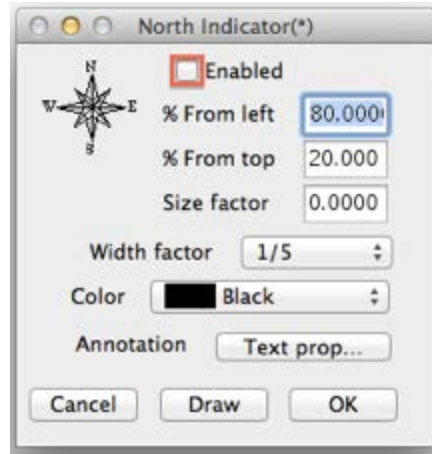


- Pull down “Map->Km Legend” menu
- Check “Enable” box
- Click “OK” to dismiss “Km Legend” dialog
- Pull down “Map->Cm/s Legend...” menu
- Check “Enable” box
- Adjust “Placement” boxes as needed
- Click “OK” to dismiss “Cm/s Legend...” dialog

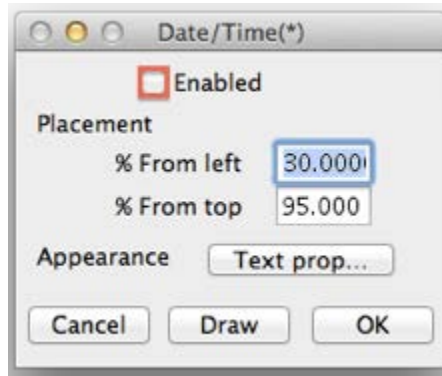


- Pull down “Map->N/S arrow...” menu
- Check “Enable” box

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- Click "OK" to dismiss "N/S arrow..." dialog
- Pull down "Map->Date/Time..." menu
- Check "Enable" box



- Click "OK" to dismiss "Date/Time" dialog
- Pull down File->Save (use default Site File Options) and click OK button
- Hyphenate (or delete) any old map files in the SiteDefinitions folder

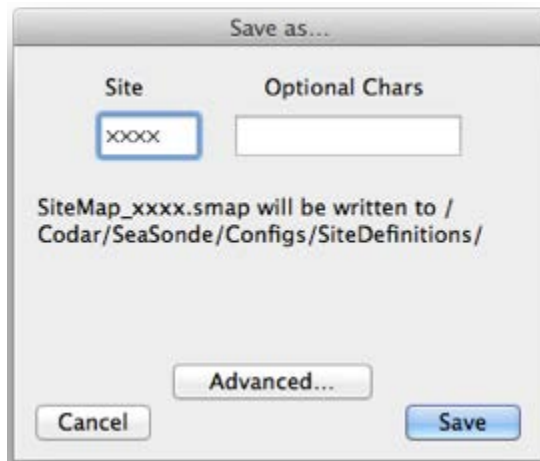
Note: The first SeaDisplay map file encountered in the SiteDefinitions folder having the name format SiteMap_XXXX.smap will be opened automatically when SeaDisplay is launched.

You have now completed a basic map for displaying your radial data. Your completed map should look something like this:

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- Once you have made a change to the default map, pull down File->Save (use default Site File Options)
- Enter your four-character site code
- Click SAVE button



Declarations

Use of Equipment

Use of this equipment in a manner not specified by CODAR may cause an impairment of protections as well as void any and all warranties.

FCC Supplier's Declaration of Conformity

CODAR SeaSonde model # SSRS-100-4144

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by CODAR could void the user's authority to operate the equipment.

CODAR

1914 Plymouth Street, Mountain View, California 94043 USA

Phone: +1 (408) 773-8240