CODAR
OCEAN SENSORS

SeaSonde Radial Site Release 6

Radial Suite User's Guide

About

Radial Suite User's Guide gives an overall description of all software that runs on the SeaSonde Radial Site. Its purpose is to show the computer layout, SeaSonde configuration, actively real-time applications, and useful utilities. Most applications have their own user guides for in depth details. Separate hardware guides show how the SeaSonde hardware is setup and configured.

To use and understand this document you will first need some background on OS X and SeaSonde.

For the Combine Site, you will need to refer to the SSR6-Combine-Suite documentation.

Requirements

SSR6-Radial-Install document describes the minimum required processor and system software and how to install the Radial Suite Software

Newly delivered computers from CODAR should already have the SeaSonde Radial Suite installed.

SeaSonde Processor as Delivered

With the purchase of a new SeaSonde Radial Site you will receive the most current model Macintosh computer that has been tested and approved for use with SeaSonde Radial Suite software.

Your computer will be delivered with the SeaSonde software installed. However, the computer will still need to be configured for a specific site location once the transmitter, receiver and antenna are installed. CODAR technical support will configure the computer with a default login/user with admin rights and CODAR's default password. You can change the user/password, however, in order for CODAR to provide full support you will need to provide us with your admin username and password. This will enable us to access your computer for troubleshooting and diagnostic purposes.

The SeaSonde Software Directory Structure

Except for system extensions, all the SeaSonde applications, configuration files, and data products are located in the SeaSonde folder in a Codar folder on the boot volume (hard disk) The SeaSonde applications and data files can be found by opening the boot volume then the Codar folder followed by opening the SeaSonde folder (the path is "/Codar/SeaSonde/") . The directory structure is hierarchical, grouping like applications and data under subfolders.

SeaSonde folder:

Apps	All applications are found here organized into further subfolders labeled according to usage.
Archives	Archived data products are stored here. Backup this folder periodically as this will contain all of the latest data you have collected and stored in “archive” folders labeled according to the settings in the Archivalist application.
Configs	All major configuration files are located here and separated into Radial and Combine Site sub folders.
Data	Data products are all store here and separated into sub-folders according to type.
Docs	All SeaSonde documentation is available here. The majority of the documents are in PDF (Portable Document Format).
Logs	Sentinel logs are stored here.
Users	This folder is for storage of user software and documents.

Apps folder:

Bin	Command line tools.
Installations	All system installers that SeaSonde needs are in here. These items are installed into the system folder and will need to be reinstalled if the OS or SeaSonde software is overwritten.
RadialTools	This contains the real-time processing applications and tools for producing radials and waves.
Scripts	Utility helper scripts are stored here. These are primarily for used for routine maintenance tasks.
Tools	Utility applications are kept here. These tools are for setup, diagnostics and maintenance.
Viewers	All applications used for viewing data are kept here. Radial site viewing tools are used primarily for diagnostic purposes.

Applications

This section briefly describes each application and its purpose. Most of these applications have their own detailed user guides (see /Codar/SeaSonde/Docs/ folder).

Installations Folder

InstallBashProfile modifies the Bash scripting login so that some useful SeaSonde commands can be performed at the command line. Very useful for those that know how to and have access to ssh into the site.

InstallBillsScripting installs a daemon service and applescript service to support Sentinel in restarting the computer and to support SeaSondeController in setting the time from SeaSonde receivers with GPS.

InstallSeaSondeExtensions installs the USB kernel extension SeaSondeAwgiii.kext into "/system/library/extensions/". This kext is required by SeaSondeController and SeaSondeAcquisition in order to access the USB SeaSonde Receiver. The kernel extension is only loaded by the system when a powered SeaSonde Receiver is plugged into one of the computer's USB ports. Removing the extension will require deleting the SeaSondeAwgiii.kext bundled folder with root access rights.

InstallRadialSentinelStartup modifies the user System Preferences login to startup the Sentinel app. Puts "/Codar/SeaSonde/Apps/RadialTools/Sentinel" in the Login Items.

RadialTools Folder

The RadialTools folder contains all the real time software tools for data collection and radial processing. Most of these applications run continuously during normal operation.

SeaSondeRadialSetup application installs the default configuration files and edits the required basic operating parameters. This application needs to be run at least once before running Sentinel and can be run again at any time to modify or just view the processing parameters. You will find this icon in the Dock, click to edit or view the SeaSonde Radial Site configuration.

SeaSondeRadialSiteCheck application is run once each time the system starts up through Sentinel in order to check whether Radial Site configuration files have been installed and configured. If not, then it tells Sentinel not to run any other SeaSonde applications and launches SeaSoneRadialSetup.

Sentinel is a real-time support application which:

- Starts up the necessary SeaSonde applications.
- Creates a weekly log file to which it continuously appends information on the status and condition of the SeaSonde radial site. Several applications send messages to Sentinel, which it then records into a Sentinel log file.
- Restarts the computer once a day (or at longer) intervals. Restarting helps the System to recover from crashed applications and other System problems. Sentinel restarts the computer by sending a message to the background application "BillsScripting" which then issues a Unix shutdown command. This lower level reboot is required, as the Finder will not restart the computer unless all visible applications are terminated first.
- Watches critical SeaSonde applications to ensure they are running at all times. When SeaSondeAcquistion, SeaSondeController, or CSPro crashes or quits, Sentinel will after a set time, relaunch the application.

SeaSondeController controls the receiver and:

- Provides the interface for changing the receiver's settings (e.g. frequency, bandwidth, and other control features).

- Tickles (i.e. queries) the receiver “watchdog” to let it know that it has an active link to the computer. If the computer hangs and a “Tickle” is not issued over a period of ten minutes the receiver will cycle power to the computer. Power cycling will also occur under normal operation (after about ten or fifteen minutes depending on how the receiver is configured) if you quit SeaSondeController. For OS X, the receiver should be configured for a fifteen-minute timeout by using the Watchdog Control window in SeaSondeController; be sure to store afterwards.
- Monitors the receiver and transmitter temperatures.
- Monitors the transmit power (on later model transmitters).
- Monitors GPS synchronization for stability (on optional GPS Timing receivers).
- SeaSondeController can also update the computer clock using BillsScripting by reading

the correct time embedded in GPS signals (on optional GPS Timing receivers).

 **SeaSondeAcquisition** handles the receiver data stream and:

- Processes the receiver data stream into time series and optionally time series files.
- Processes time series into range data and (optionally) range files.
- Processes range data into cross spectra and saves them as unaveraged cross spectra.
- Has several diagnostic windows for real time plotting of each step. The spectra map feature is a convenient way to check if your system is working. The Bragg energy and any contaminating signals are plotted for all range cells at once.

 **CSPro**

- Picks up the unaveraged cross spectra file from SeaSondeAcquisition and produces averaged cross spectra after removing interference and ship echoes. These cross spectra are saved as 'CSS' files for the AnalyzeSpectra tool to process.

 **RunSpectraAnalysis** is a shell script that

- Opens a Terminal window and starts up the AnalyzeSpectra script. You can double click its icon to relaunch the AnalyzeSpectra at anytime.

  Note: RunSpectraAnalysis prevents multiple copies of AnalyzeSpectra from being launched accidentally, which would result in problems.

 **AnalyzeSpectra** is a shell script, which continuously looks for new 'CSS' cross spectra and when found processes cross spectra into radial and/or waves. The script is an endless loop so telling the Finder to restart will result in a terminal window query asking if you want to abort AnalyzeSpectra. Note: If the dialog is not dismissed (manually), then Finder will not restart the computer.

The shell tools that AnalyzeSpectra runs are:

- **GetParameter** is used by AnalyzeSpectra to obtain integer parameters from the setup files in order to determine what settings to use and how to process the incoming data.

- **CheckRadialSetup** checks the setup files in the RadialConfigs folder and updates them to OSX format from OS9 format if needed.

- **CheckForSpectra** searches in the SpectraToProcess folder to determine which, if any, spectra file is to be processed next. It will recognize valid spectra files starting with

"CSA_", "CSS_", and "CSR_". Spectra starting with "CSR" are reduced spectra files and are temporarily expanded into the processing folder (see SpectraShortener for more information on shortened cross spectra).

- **SpectraSlider** creates an averaged spectra using the recent CSS spectra for later use by SpectraToRadial to determine the Bragg first order Doppler region. It also creates a CSA spectra file used for wave processing.

- **SpectraToRadial** processes a CSS spectra into temporary short time radial vectors.

- **RadialSlider** tracks at the recent series of short time radials to determine which radials to pass to RadialMerger for the next radial file to output.

- **RadialMerger** processes short time radials over the set time coverage to produce the final radial output.

- **RadialArchiver** writes the final radial output to the Radials folder using LLUV radial format. If running, Archivalist will be told about the radials so that it archives the radials folder. If running, RadialDisplay will be told to open the radial for display and automatic jpg creation if configured.

- **WaveModelForFive** checks setup files and if needed updates the "ForFiveModel" configuration file need for wave model processing.

- **SpectraToWavesModel** processes spectra into wave model data across configured range cells (multi-range).

- **WaveModelSlider** tracks the output of the wave model data and averages it over time.

- **WaveModelArchiver** adds the latest wave model result to a monthly wave history file. If WaveDisplay is running, it will tell WaveDisplay to open and show the wave file.

- **SpectraArchiver** attaches "FirstOrder" data to the spectra files and moves spectra files from the SpectraToProcess folder to the SpectraProcessed folder and tells Archivalist about the spectra so that it archives the SpectraProcessed folder.

Archivalist application automatically archives data files into weekly, monthly archive folders, etc in order to keep the hard disk from filling up. Archivalist is user-configurable, very flexible and has numerous archiving options. It can be configured for periodic archiving or from an AppleEvent "open file" (This is how the archiving steps in the processing tools communicate with Archivalist). It is up to the owner to archived data off site.

LostTheDate (Applescript applet)

- Runs when Sentinel detects that the computer date is not valid.

- Directs SeaSondeController to maintain power to the computer.
- Instructs SeaSondeController to turn off the transmitter output (there's no point in collecting and processing data when the System cannot determine the date and time of acquisition.
- Communicates with SeaSondeController to determine if the receiver has a GPS installed (an optional feature in newer model SeaSonde) and if so will auto-correct the computer's date and time (provided the GPS is stable and has a valid date and time).
- Tells GpsReader, if running, to correct the computer's date and time.
- Waits for a valid date & time (for ten minutes) and then will either tell Sentinel to run the SeaSonde applications and at which time LostTheDate will terminate. If the computer has an internet connection and network time server is enabled, then the corrected date & time, will also cause LostTheDate to finish and tell Sentinel to continue with the SeaSonde applications.


GpsTimeSync applescript applet run by Sentinel prior to doing a scheduled restart of the computer. It communicates with SeaSondeController to check if the computer time needs to be adjusted using GPS time.


SeaSondeStartupExtras applescript applet run by Sentinel after SeaSondeController to perform one time extra startup features.
Issues to SeaSondeController a clear command to the receiver TR Module (with id. D4), in order to recover from a rare lockup condition causing a loss of transmit power on some sites. In the future, this applet may include other system recovery issues as needed.
Arranges the SeaSonde windows nicely in the Finder.

Scripts folder


SSCleanOutProcessing applescript applet, which moves all temporary processing files to the trash. When reprocessing cross spectra, it is desirable to start from a known start up state. The processing folder contains files that hold information about past processing such as amplitude factors, spectra averages and radial merging.


SSMoveCSSforReprocessing applescript applet to move all CSS spectra in the SpectraProcessed folder to the SpectraToProcess folder. This is simple way to reprocess all the recent spectra. For example, you would need to reprocess after you change phases or any other of the configuration files so that the radials will be regenerated with the new settings.

SeaSondeReports.pl –is meant for command line usage to capture all the system log file pertinent to SeaSonde and zip into a date stamp file into the SeaSonde/Logs/ folder. The RadialWebServer uses this to create and download report files

SeaSoneReportsHigh – when double clicked capture all the system log file pertinent to SeaSonde and zip into a date stamp file into the SeaSonde/Logs/ folder plus configs plus latest CSS and total vector.

SeaSoneReportsMedium – when double clicked capture all the system log file pertinent to SeaSonde and zip into a date stamp file into the SeaSonde/Logs/ folder plus configs.

Tools folder:

CrossLoopPatterner is a utility application to process Loop measurement files into an antenna pattern correction files.

CtfRadialer is a utility application to convert older radial and total vector files into the newer LLUV in the CODAR Table Format (Lon,Lat,U,V) files. Just drag and drop the files you want to convert onto its icon or window.

GPSTracker is a utility application to convert GPS Track files into a Bearing Track file for use within SeaSondeAcquisition along with a transponder Time Series file to produce an Antenna Loop measurement file.

RadialAdjuster application is used to adjust groups of radial files. It can adjust their times, site name, and/or bearing. This utility is used when a SeaSonde Radial Site is found to have been running with incorrect time or bearing settings. After changing the preferences, drag n drop the radials to be adjusted onto its icon or window.

 **SeaDisplaySetup** application is used to create site map files for use by SeaDisplay to plot radial vector files. It requires that the MapDataBase is installed.

 **SpectraScrambler** application is used to unscramble cross spectra, which have been generated with the antenna cables crossed. It supports any possible combination but you must know before hand how the cables were switched.

 **SpectraShortener** application is used to reduce the size of cross spectra to help with archiving and/or sending files across the Internet. Standard cross spectra files, for example, are 628KB and will not compress significantly when using Zip or other utilities. SpectraShortener is a lossy compression scheme, which typically reduces the data to .01dB resolution. This provides over 2.5 to 1 compression without significantly changing the radial results.

 **SpectraSlicer** application is a utility to cut partial ranges out of one or more cross spectra. The big advantage is size. You can cut the ranges of interest out and email them to support.

 **SeaSondeAwgiiiLoader** is used when the receiver firmware needs to be upgraded. This is only for newer receivers that are equipped with an AWGIII module. This utility cannot be used for receivers manufactured before January 1, 2002. The newer models have frequency generation/timing control modules that can be updated by CODAR staff via a remote connection. Please do not go updating receiver firmware without first consulting with CODAR support staff.

Tools/Extras folder:

 **GapFinder** is a utility application to search for data gaps in lots of archived data files.

 **GreatCircle** is a utility application to calculate distance between two or three lat, lon points using a version of Vincinty's great circle calculation. This calculation is used to generate the LLUV radial files.

 **MagneticDeclination** is a helpful application when setting-up a new SeaSonde installations. The magnetic compass bearing of the receive antenna's directional arrow (stenciled in black on the bottom of the receive antenna box) is entered into this application. It calculates local deviation based on the geographic coordinates and will supply the true north bearing to enter into the RadialConfigs file Header.txt.

 **LLUVtoKML** converts any LLUV radial, total vector, elliptical or grid file to kml format for viewing in GoogleEarth®. Just drag and drop the LLUV file on the application icon or window. There's a preference dialog, which will allow you to scale the vectors and color them.

 **PATTtoKML** converts any antenna pattern file to kml format for viewing in GoogleEarth®. Just drag and drop the pattern file on the application icon or window. There's a preference dialog, which will allow you to scale the loops and color them.

 **TRAKtoKML** converts a GPSTracker track file to kml format for viewing in GoogleEarth®. Just drag and drop the track file on the application icon or window. There's a preference dialog, which will allow you to scale the target symbol and select it's color. The kml contains time so that you can do a movie replay of the track.

Viewers folder:

 **DiagDisplay** is a viewer application to graph radial diagnostic files. You can determine what the antenna phase corrections should be with this. You can see if and when significant changing in antenna setup or transmitter problems occurred.

 **SeaDisplay** is a viewer application to plot radials. You will need to create a SiteMap_XXXX.smap file using SeaDisplaySetup.

 **SpectaPlotterMap** is a viewer application to graph cross spectra as a color intensity map for over all range cells and Doppler. This application can also be use to modify how the first order Bragg region is determined during spectra to radial processing. See the document HowTo_FirstOrderRegion for more information.

 **WaveDisplay** is a viewer application to graph wave model files.

Built-in OS X and Third Party Applications

 **Terminal** is an Apple® application for Unix shell windows. RunSpectraAnalysis, for example, runs in shell window. Users familiar with Unix can open new windows and run their own shell scripts or commands.

 **TextEdit** is an Apple® application to view and edit text files. This application is useful for editing changes to the configuration files.

 **Preview** is an Apple® application to view generic pictures and documents in many formats such as jpg, pict, png, or pdf.

 **Console** is an Apple® application to view the OS X diagnostic text files. It is great for viewing the system.log and console.log

 **Activity Monitor** is an Apple® application shows all the currently loaded processes. When using the Process Viewer you should be able to see all of the real-time SeaSonde applications running in addition to numerous processes required by the System.

ScriptEditor is used to create or edit AppleScripts. AppleScripts are an easy way to control applications and perform common tasks. Apple scripting can invoke shell commands and vice versa (i.e. shell commands can invoke Applescripts.

DiskUtility is an Apple® application used check and erase hard disks and mount or create disk image files. A disk image file is suitable for file transfer over the Internet. When a disk image files is opened it is mounted as a new disk volume showing up in the Finder. A disk-image file is created by running DiskCopy and then dropping the folder or files onto the DiskCopy window.

BBEdit is a versatile text editor. It has fewer frills than a full-blown word processor but is loaded with useful features. For example, it can deal with different line endings and has a grep search and replace feature. You can find it at www.barebones.com. The free shareware version is named TextWrangler.

Timbuktu is an application installed on remote and local computers to allow users and CODAR Support Staff to view and control the site remotely from another computer over a phone line or Ethernet. It can also be used with the Combine site FileExchange scripts to transfer radials and other data using TCP/IP or DirectDial. A licensed copy of Timbuktu is typically installed by CODAR with new systems. Additional licenses and platform versions can be purchased at www.netopia.com

Data Products

This section provides an overview of the various types of output files produced by SeaSonde.

CrossSpectra

CrossSpectra files are a range and Doppler matrix of signal levels and phases received from the cross loop antennas. Each cross spectra file covers a specific period of time centered on a time stamp. The coverage time that SeaSondeAcquisition uses is a function of the number of Doppler cells divided by the receiver waveform sweep rate. A typical SeaSonde configuration will use 512 Doppler cells and a 2Hz sweep rate which results in 256 seconds of data per cross spectra (NOTE: Long range SeaSonde uses 1024 Doppler cells and a 1Hz sweep rate). The output coverage time of a cross spectra produced by CSPro depends upon its settings. A typical configuration will also have 15 minute averaging with an output every 10 minutes creating a 2.5 minute overlap between the previous and following cross spectra. All cross spectra are in a binary file format. Details about their contents are described in the document File_CrossSpectra.

CrossSpectra use one of the following name formats depending on where they are in the data processing stream.

NOTE: Previously to SeaSonde 10 Release 4, the 'CrossSpectra 0000' files were produced SeaSondeAcquisition and the deleted by CSPro. Now, the default configuration causes SeaSondeAcquisition to create the CSQ_XXXX_YY_MM_DD_HHMM.cs files and CSPro to moved them after processing. This will allow you to possibly change CSPro settings and reprocess archived CSQ files (how far back on the computer depend on Archivalist and hard disk space.)

CSQ_XXXX_YY_MM_DD_HHMM.cs
(where XXXX is the site name, YY_MM_DD is the year, month and day and HHMM is hour, minutes that mark the start time stamp of the file). These cross spectra files are written by SeaSondeAcquisition to "/Codar/SeaSonde/Data/Spectra/SpectraSeries/". CSPro reads the files in sequence and then moves them to "/Codar/SeaSonde/Data/Spectra/SpectraSeriesProcessed/".

CrossSpectra 0000
(where 0000 is a sequentially increasing integer assigned by SeaSondeAcquisition). These cross spectra files are written by SeaSondeAcquisition to "/Codar/SeaSonde/Data/Spectra/SpectraSeries/". CSPro reads the files in sequence and then deletes them.

CSS_XXXX_YY_MM_DD_HHMM.cs
(where XXXX is the site name, YY_MM_DD is the year, month and day and HHMM is hour,

minutes that mark the center time stamp of the file). These files are produced by CSPro written to the folder "/Codar/SeaSonde/Data/Spectra/SpectraToProcess/" where they are then passed to AnalyzeSpectra for processing. In SeaSonde 4 (OS9) these files had no extension. In SeaSonde, these files will have one of the following extensions ".cs", ".cs4" or ".cs5"

CSA_XXXX_YY_MM_DD_HHMM.cs
(where XXXX is the site name, YY_MM_DD is year, month and day and HHMM is hour, minutes that marks the center time stamp of the file). These files are produced by the SpectraSlider tool and written to the folder "/Codar/SeaSonde/Data/Spectra/SpectraToProcess/" and are then passed on to AnalyzeSpectra for processing. They are an average of the last CSSs used and are needed for processing second order energy into wave height estimates for the defined interval. They can be used to create radials where the original CSS files are lost but this is not recommended.

CSR_XXXX_YYYY_MM_DD_HHMMSS.csr
Reduced Crosspectra.
(where XXXX is the site name, YYYY_MM_DD is year, month and day and HHMMSS is hour, minute, second that mark the center time stamp of the file). CSR files are produced by SpectraShortener, by SpectraArchiver (if so configured) and by the RadialWebServer when asked to upload spectra files. They are reduced cross spectra files and have a different format than the three previous cross spectra types. These files can be run through radial processing directly and will be recognized as CSS.

Radials

Radial files contain a list of radial current velocities for each detectable bearing and range ring progressing outwards from the SeaSonde receive antenna. Each radial file covers a specific amount of time (typically 1 hour) centered on a time stamp. These files are the primary output product of the SeaSonde Radial Site. The files are copied to the SeaSonde Combine Site for combining with other SeaSonde Radial Sites in order to generate 2D Total Vectors. The radials can be recreated if needed by reprocessing the CSS files for the same time span. Most users will archive their CSS files for this reason.


RDLi_XXXX_YYYY_MM_DD_HHMM.ruv
(where XXXX is the site name, YY_MM_DD is the year, month and day and HHMM is hour, minutes that mark the center time stamp of the file). The '**i**' following the prefix 'RDL' can be either '**i**' for ideal antenna pattern or '**m**' for measured antenna pattern. The format includes a columnar table of longitudes, latitudes and uv vectors of the radial velocities in addition the attributes noted in the first format above. The new file format is easily imported to into MatLab or spreadsheet applications. It's expandable with extra keywords for more information about

how the radial was generated. A description of this format can be found in the document File_LonLatUV_RDL_TOT_ELP and File_CodarTableFormat.

Waves

WVLM_XXXX_YYYY_MM_DD_HHMM.wl4,
Wave Model List file contains a columnar list of wave history information over time created from the wave model tools. These are created on a monthly basis in the CODAR Tabel file text format. See documentation File_Waves and File_CodarTableFormat.

Time Series

Lvl_XXXX_YYYY_MM_DD_HHMMSS.ts
TimeSeries files are an optional output format produced by SeaSondeAcquisition. Time series are the raw unprocessed data collected immediately after the conversion of analog voltages to digitized values by the receiver module. Each file is a collection of continuous samples over each frequency sweep of the receiver. They are stored in a binary RIFF (Resource Index File Format; see the document File_TimeSeries for a description). Each sample is the measured voltage of I & Q at a point in time (I&Q are a quadature voltage measurements. All voltages consist of real and imaginary parts.). A standard SeaSonde will generate 48 kilobytes per second in time series format, which means that a 4GB hard disk would fill up in one day if this option were to run continuously. Time Series is not normally recorded except for transponder runs (Range Files will also work). TimeSeries and Range Files can be imported via SeaSondeAcquisition to regenerate cross spectra or perform diagnostic processing.

The format is:
Lvl_XXXX_YYYY_MM_DD_HHMM.ts (where XXXX is the site name, YY_MM_DD is the year, month and day and HHMM is hour, minutes that mark the center time stamp of the file).

Range Series

Rng_XXXX_YYYY_MM_DD_HHMM.rs
Range files are optionally saved from SeaSondeAcquisition. Range files are the second step in SeaSondeAcquisition processing before generating cross spectra. Each file is a collection of signal energy verses range over a continuous time period. They are stored in a binary RIFF (resource index file format. See File_RangeSeries. A standard SeaSonde would generate 384kBytes every 2.5minutes. TimeSeries and Range Files can be imported back into SeaSondeAcquisition to regenerate cross spectra or perform diagnostic processing.

The format is:
Rng_XXXX_YYYY_MM_DD_HHMM.rs (where XXXX is the site name, YY_MM_DD is the

year, month and day and HHMM is hour, minutes that mark the center time stamp of the file).

Diagnostics

There are currently two types of diagnostic files produced in the Data/Diagnostics/ folder.

The first diagnostic type is generated by Spectra Processing into radials. Their file names end with .rdt for Radial Diagnostic Text.

STAT_XXXX_YYYY_MM_DD.rdt
(where XXXX is the site name, YY_MM_DD is year, month and day and HHMM is hour, minutes that mark the center time stamp of the file). STAT files are weekly summary files of diagnostic information collected as cross spectra data are being processed into radials. A daily temporary file is stored in the processing folder and appended the STAT file. These files contain such information as measured sea amplitude and phase, measured signals, number of radial vectors and more. Radial Diagnostics files are created and updated during radial processing.

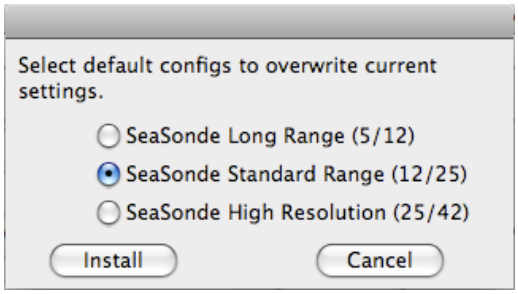
STAT_XXXX_YYYY_MM_DD.hdt
(where XXXX is the site name, YY_MM_DD is year, month and day and HHMM is hour, minutes that mark the center time stamp of the file). These files contain such information as various temperature sensors, GPS status, Power supply status, Transmitter power and more. Hardware Diagnostics are created and updated by SeaSondeController.

SeaSonde Configuration

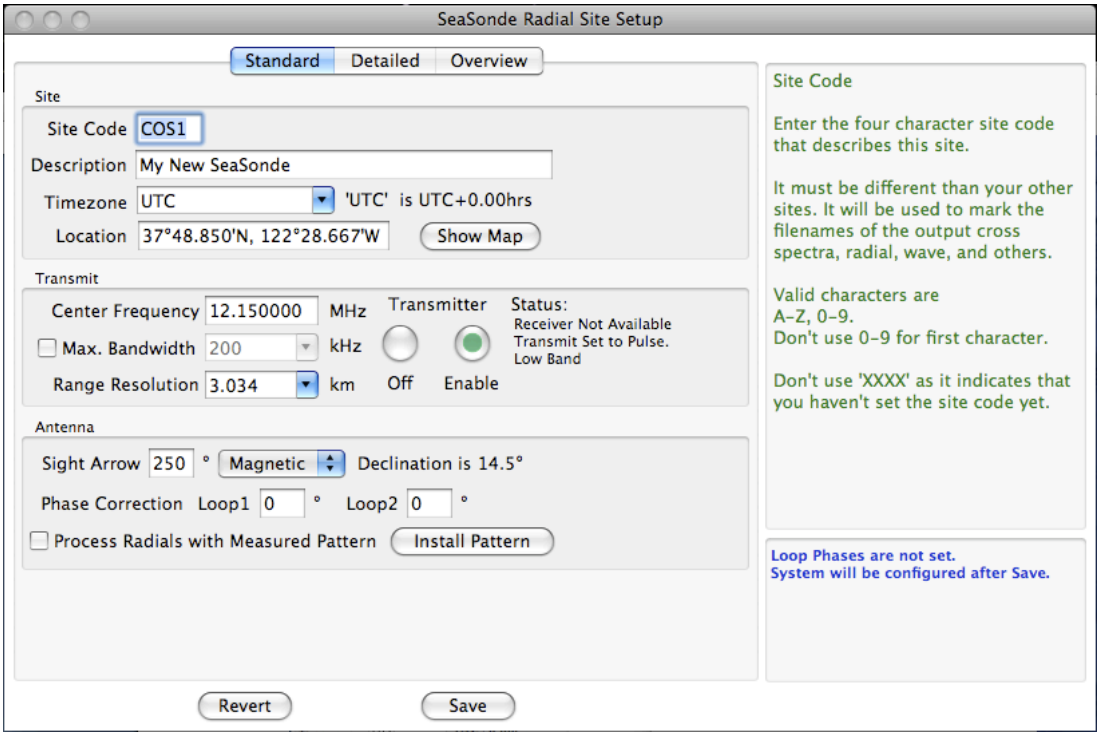
Once your hardware (transmitter, receiver, antennas, etc.) are installed, you will need to enter the following settings in order to begin collecting data with your SeaSonde.

Run SeaSondeRadialSetup. (This application will run automatically when system starts up and configuration files are missing or not yet configured.)

If this is a new site or all or some configuration files are missing, SeaSondeRadialSetup will ask you to install the correct set for the type of SeaSonde Receiver you are using.



Clicking Install button will install default configuration files into RadialConfigs.
The SeaSonde Radial Setup window shows what the current configuration is. The blue text window to the lower right shows what must be entered before running the SeaSonde software.



- **Site Code**: Enter a four-character site name. This site name is added to all output spectra, radial, and wave files.
- **Timezone**: This will default to the system timezone; please do not change.
- **Location**: An accurate latitude and longitude for the receive antenna.
- **Center Frequeny**: Enter your approved operating frequency for the site.

- **Max. Bandwidth**: Enter your approved maximum allowed bandwidth for the site.
- **Range Resolution**: Enter your desired range resolution for the site.
- **Site Arrow:** Enter accurate compass (Magnetic) or (True) bearing of the Antenna Alignment arrow.
- **Phase Correction:** For a first time setup, the phase corrections are unknown enter 0 or leave blank. After the system has run for at least 24 hours, use the DiagDisplay to determine the phases and enter them here. You should then reprocess any collected CSS into radials using the new phases.

Also check phases after a few days to a week to possibly revise. Use DiagDisplay on .rdt status files or measure the antenna pattern to determine.

When your site is first set up you will need to use the ideal antenna pattern until the true antenna pattern can be measured. Measuring the antenna pattern allows you to minimize positional errors of the vectors and results in more accurate current measurements. Once the antenna pattern measurement has been completed, you will have the option to produce measured pattern radials. The pattern can be retroactively applied to the first ideal radials by re-running SeaSondeRadialSetup selecting the "use measured pattern" option and then re-process the cross spectra. (See the hardware documentation Antenna_Measurement to learn more about measuring antenna patterns.)
GPS-equipped receivers using the same transmit frequency will also need a timing adjustment parameter entered into the SeaSondeController. This timing offset value prevents multiple sites with the same frequency from interfering with one another and is a function of the frequency, site distances, and processed range cells.

Currently, only CODAR staff can perform the calculations necessary to determine the correct GPS timing adjustment values. These values will be determined by CODAR's support staff at the time of installation.

Real-Time Processing and Data Flow

Real-time processing refers to the normal radial site operation and the continuous collection and processing of data from the receiver into radial and/or wave files.

Operating System Boot-up
When the computer powers up, it performs an internal hardware check and then searches for an available operating system to load.

A cursor spins as the System starts loading. Normally the startup process takes only a minute or two but can take up to five minutes or longer if the system has just recovered from a power failure or undergone a hard reboot. The added delay under these circumstances is a result of the computer initiating a self-correcting disk check.

Once the System has loaded, the Finder will load. The Finder is the file system manager for the user.

Sentinel Startup
The SeaSonde program Sentinel is launched by the System as a user "Login Item

If Sentinel detects that the System time is not valid, then it won't launch the other SeaSonde applications. Instead it will run the “LostTheDate” application script. LostTheDate tells SeaSondeController to turn off the transmitter and wait until it can either correct the time using a GPS signal (on SeaSonde receivers equipped with GPS) or by using a network time server (via an Internet connection) or until someone visits the site and sets the clock. Once the System has maintained a valid time for ten minutes, LostTheDate will tell Sentinel to continue launching the other SeaSonde applications.

Sentinel will then launch SeaSondeRadialSiteCheck. SeaSondeRadialSiteCheck will check the radial configuration files. If it detects that one or more files are missing or some settings are invalid, it will launch SeaSondeRadialSetup application and tell Sentinel to stop the start up sequence.

Sentinel launches each required SeaSonde application in order.

SeaSondeController is started first. In normal operation, SeaSondeController needs to query the receiver at least once every ten minutes otherwise the receiver will think the computer has hung up and it will call for power to be cycled to the computer. The computer’s power cord is plugged into a software-switchable outlet in the receiver’s chassis and provides power control over the computer.

SeaSondeAcquisition is launched next. It communicates with SeaSondeController to get the current settings and enables the receiver to continuously collect time series data and process it into cross spectra.

CSPro starts next and picks up the cross spectra from SeaSondeAcquisition and produces averaged cross spectra that have had ship interference removed.

RunSpectraAnalysis is then launched. It opens the Terminal application and initiates the AnalyzeSpectra script. The AnalyzeSpectra script runs the tools which process each averaged cross spectra (CSS) into a radial and/or wave files.

Archivalist then starts and begins to manage the data products. Archivalist is configured (by default) with optimal settings to keep the hard disk from filling up and directories from having too many files for the System to handle. It also backs up the data into archive folders. The "/Codar/SeaSonde/Data" folders contain the most recent data and the "/Codar /SeaSonde/Archives/" folders store all of the older data.

Common Tasks: Reprocessing Cross Spectra, Restarting the Computer

Restarting the Computer

Restarting the computer is the simplest way for the new SeaSonde user to relaunch all of the processing software and re-initiate the data processing sequence. To restart the computer you have several options:

- Under the Apple menu you can select “Restart”. You will then need to click OK to dismiss

the Terminal application if “AnalyzeSpectra” is running. If any application fails to quit then the Restart command will abort.

- Under Sentinel’s “Control “menu select Restart Computer. This action cause Sentinel to attempt to quit the current applications and restart.

- In the RadialTools folder, you can create a folder or file named "Sentinel Restart", "Sentinel_Restart", or "SentinelRestart". Sentinel looks for one of these items every two minutes. If it sees one of these folders or files and can successfully delete it, then it will restart the computer the same as the previous method.

- Lastly, you can type 'sudo reboot' in a shell (i.e. terminal window). In order to do this you must have administrative rights as the System will prompt you for your administrative password.

Reprocessing Cross Spectra

To reprocess cross spectra into radials and/or waves...

- You should stop AnalyzeSpectra if running by selecting the Terminal window that is running the AnalyzeSpectra script (i.e. bringing to the front)

- Close the window and click OK when asked if you want to stop the Terminal window

- Delete (move to the trash) all of the items in the folder "/Codar/SeaSonde/Data/Processing/".

Note: Alternatively, you can run "/Codar/SeaSonde/Apps/Scripts/SSCleanOutProcessing" to do this.

- Move all of the CSS files that you want to reprocess to the "/Codar/SeaSonde/Data/Spectra/SpectraToProcess/" folder. (For speed, you should keep CSS to 1500 files or less.)

Note: If you want to reprocess just the latest processed CSS files, you can use the script "/Codar/SeaSonde/Apps/Scripts/SSMoveCSSforReprocessing" . It will move the CSSs that are in "/Codar/SeaSonde/Data/Spectra/SpectraProcessed" to the "/Codar/SeaSonde/Data/Spectra/SpectraToProcess/" folder. You will find the older CSS files in the archived files folder "/Codar/SeaSonde/Archives/Spectra/".

- Lastly, double click 'RunSpectraAnalysis' in "/Codar/SeaSonde/Apps/RadialTools/". This will startup the Terminal window which in turn runs all the radial processing tools.

Troubleshooting

The most common problems encountered by SeaSonde users generally will fall into one of these categories:

- Antenna and antenna cabling problems

- Transmitter problems
- Receiver problems
- Computer problems
- Software configuration problems
- Software problems

If the computer does not seem to be operating properly or you are getting no data at all or the most basic diagnosis begins by answering the following:

- Does the Computer power up?
- Can it find a System to boot from?
- Does it finish the boot sequence?
- Are the clock and time zone right?
- Does it launch the Sentinel application?
- Is the hard disk full?

The first indication that your SeaSonde is not working properly or is configured improperly can generally be found by examining the quality of the radials. Note the following:

- What are the symptoms observed?
- Are radial files being generated?
- Are there few vectors or none at all?
- Do the vectors extend out to the expected range?
- Are a large percentage of the vectors over land?
- Are there extraordinarily large vectors?
- Do neighboring vectors contradict each other?
- Do the total vectors generated from these radials make sense?

Once you have identified a problem there are generally two approaches to diagnosing the problem(s). The first is the top down approach; you know that something is wrong and you back track to the source of the problem. The second is bottom up; the system is monitored looking at each step in the processing sequence to see that it is performing correctly.

The difficultly in making a diagnosis is that for each possible problem there are several potential causes. The SeaSonde uses sophisticated hardware and software to produce radial files and you will need to understand the processing flow to figure out which part has the problem. The preceding section describing the various applications provided an overview of how all the software pieces fit together. Start stepping through the software and processing sequences. Using the bottom up approach your troubleshooting path would begin with:

Checking SeaSondeController…..

- Can it see and talk to the receiver?
- Are the receiver settings correct?
- Is the receiver temperature below 40°C?
- Are the power supply voltages okay (available only on newer receivers)?
- Is the GPS functioning correctly (if the receiver is has a GPS installed)?
- Are the forward and reflected power readings okay?
- If “Transmit Watch” features are enabled, are any of them tripped (causing the transmitted signal to be turned off)?

Next, examine SeaSondeAcquisition…

- Can it see and acquire data from the receiver?
- Are the spectra maps free of obvious interference and does each antenna channel have well pronounced Bragg peaks?
- Are the cross spectra being saved without report of errors?

/var/log/console.log
This log file can automatically be viewed with Apple's Console application. It contains various messages from many background components of OS X.

/var/log/system.log
This log file can be opened by typing the location into the open dialog in Console application. It contains messages from system components like extensions. The SeaSonde USB kext will report messages here as it loads and unloads.

/library/logs/panic.log
This log contains information about kernel panics, which caused a complete system hang or restart.

~/Library/Logs/CrashReporter/
~ is the current user home folder ie /Users/Codar/
The folder contains logs for each crashed application. If you have one of the SeaSonde applications crash (unexpectedly quit) on you, locate this log and email it to support along with the circumstances of when it crashed.

If you are unable to diagnose the problem yourself, please record all symptoms noted and run a utility in SeaSonde/Apps/Scripts called SeaSondeReportsMedium. This application will create a date stamped .zip file in the SeaSonde/Logs folder which will contain a copy of all the system logs, SeaSonde logs, config files and other important information to send to support@codar.com which will help diagnostic problems with the SeaSonde.

You can also collect screen shots (picture files) of all error message windows. Screen shots can be made by pressing the “Apple” (Cmd) + “Shift” + “4” keys simultaneously. When the cross-hair cursor appears, hold down the mouse button and drag the cursor to define a rectangular picture area. When you let go of the mouse button, you’ll here a camera shutter sound and a .pdf file will be created on your desktop. The files are named “Picture 1.png”, “Picture 2.png”, “Picture 3.png”, and so on. The picture files should be attached with the SeaSondeReports result and sent to support@codar.com .

Support

We provide comprehensive technical support with all SeaSonde systems.

Email us at support@codar.com along with a thorough description of the problem. Please see the document Communications_Support on the level of support we provide and for tips on how to document and communicate any problems.

Our manuals along with answers to frequently asked questions (FAQs) can be found at www.codar.com.
Additional support for SeaSonde owners can be found at www.seasonde.com

You can contact us by phone at USA (408) 773-8240. Ask for customer support.

Apple Computers and their software can be found at www.apple.com

Disclaimer

CODAR Ocean Sensors, LTD.
1914 Plymouth St, Mountain View, CA 94043 USA
Tel. (408) 773-8240 FAX (408) 773-0514
www.codar.com
email: support@codar.com