SeaSonde Combine Suite Release 6
User's Guide
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About

This document gives the overall description of all software that runs on the SeaSonde Combine Site. Its purpose is to show you the computer configuration, SeaSonde configuration, actively running applications, and the many utilities to maintain the health of the system. 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 Radial Site, you will need to refer to the SeaSondeRadialSuite documentation.

Requirements

Please read the Combine Suite Installation guide for hardware and software requirements.

SeaSonde Processor as Delivered

With the purchase of a new SeaSonde Combine Site you will receive the most current model Macintosh computer that has been tested and approved for use with SeaSonde Combine 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 in sub folders (folders are labeled according to usage).
Archives	Archived data 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 preferences you have set in the Archivalist program.
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 and FileTransfer logs are stored in here.
Users	This folder is for storage of user software and documents.

Apps folder:

Bin	Command line utilities for advanced users.
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.
CombineTools	This contains the real-time processing applications and tools for producing total vectors
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.

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

InstallBillsScripting installs a daemon service with an applescript to support Sentinel in restarting the computer.

InstallCombineSentinelStartup installs a location to "/CODAR/SeaSonde/ Apps/CombineTools/Sentinel" in the System Preferences Login Items.

CombineTools Folder

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

Sentinel is a helper 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 combine 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 reboot command. This lower level reboot is required as the Finder will not restart the computer unless all visible applications are terminated first.

RunCurrentAnalysis is a shell script that
- ❑ Opens a Terminal window and starts up the AnalyzeCurrents script. You can double click its icon to restart combine processing at anytime.

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

AnalyzeCurrents is a shell script, which continuously looks for new radials and processes them into total vector maps. 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 AnalyzeCurrents. Note: If the dialog is not dismissed (manually), then Finder will not restart the computer.

The shell tools that AnalyzeCurrents runs are:

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

- ❏ **CheckCombineSetup** - Checks the setup files in the CombineConfigs folder and updates them to OSX format from OS9 format if needed.

- ❏ **CheckForRadials** - Looks for complete/partial sets of radials transferred from the sites that need to be combined into total vectors. It will combine partial sets of radials into a total and when other radials from the same time have been transferred, it will cause the new set to be combined into a newer total vector. If a radial from a Site has been retransferred, it will also cause the total vector to be regenerated. CheckForRadials will also convert the radials to XY distances from the grid origin; this method will account for longitudinal rotation effects at higher latitudes.

- ❏ **CheckCombineGrid** - Checks the grid file site locations to see if they match the current set of radial site locations. It is configured by default to automatically correct the grid file if necessary.

- ❏ **RadialsToCurrents** - Takes the set radials from CheckForRadials and combines them into a total vector file.

- ❏ **TotalArchiver** - Writes the final total output to the Totals folder using the old style totals format and/or the new LLUV Totals format. It is currently configured to create both formats. In the future only LLUV Totals will be created by default. The output setting in "CombineConfigs/TotalArchiver.pref" can be modified. If running, Archivalist will be told about the radials so that it archives the radials folder. If running, SeaDisplay will be told to open the total for display and automatic jpeg creation if configured.

Archivalist is an application that automatically archives data into weekly, monthly archive folders. 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).

LostTheDate (Applescript applet)

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

❑ Waits for a valid date & time (for ten minutes) and then will either tell Sentinel to run the SeaSonde10 applications and at which time LostTheDate will terminate.

SeaSondeCombineOptions is a utilty to help change combining options after you have already created a combine grid using SeaDisplay.

FileExchange is the folder, which contains all the file exchange tools for automatically transferring remote radials and other files to the central combine site. You will need to carefully read the FileExchange documentation in order to configure and use.

The Scripts folder

The scripts folder contains folders for various types scripts used by SeaSonde. Some of these are user convenience utilities while the rest are used by other SeaSonde software.

SeaSondeReports.pl –is meant for Terminal command line usage to capture all the system log files pertinent to SeaSonde and zip into a date stamp file into the SeaSonde/Logs/ folder.

SeaSoneReportsHigh.pl – 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.pl – 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 CODARTableFormat (Lon,Lat,U,V) files. Just drag and drop the files you want to convert onto its icon or window.

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

GPSTracker is a utility application to convert GPS Track files into a Bearing Track file and is used with SeaSondeAcquisition and a transponder Time Series files to produce a Loop measurement files for CrossLoopPatterner.

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

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.

MagneticDeclination is a helpful application when setting-up a new SeaSonde Radial Site 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.

RadialAdjuster is a utility application 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 is a utility application to create site map files for use by RadialDisplay and SeaDisplay to plot radial vector files. It requires that the MapDataBase is installed. These databases contain coastline information around the world.

SeaDrift is a analysis application to create drifter studies using SeaSonde's total vector results. It requires a SeaDisplay map, which are created with SeaDisplaySetup.

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

SpectraShortener is an application reduces 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 Stuffit 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 is a utility application 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.

The 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 totals & radials. You will need to create a SiteMap_XXXX.smap file using SeaDisplaySetup.
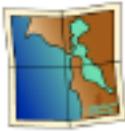
SeaDisplay525 is an older SeaDisplay included in order to create grid and angseg files.

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 FirstOrder_Settings for more information.

WaveDisplay is a viewer application to graph wave spectra and wave history 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 SeaSondes.

Totals

Totals files contain a list of current velocities for each configured grid point which contained enough information from the radial sites to form a current vector. Each Totals 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 Combine Site.

TOTL_XXXX_YYYY_MM_DD_HHMM.tuv
(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 format includes a columnar table of longitudes, latitudes and uv vectors of the current velocities. 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.

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.

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 latitudes longitudes 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.wls, contains a list of wave history information over time created from the wave model tools.

SeaSonde Configuration

There are two major parts to configuration a combine site. They are combining and file transferring.

Combining Configuration.
The combining process requires that you collect information on all the Radial Sites to be combined. This will normally come from the Radial Sites' Header.txt files. You will need to know where each site is located. If you which to create coverage analysis, you will also need to know the range cells and range cell size of each site. You will need to read the documentation for SeaDisplaySetup and SeaDisplay.
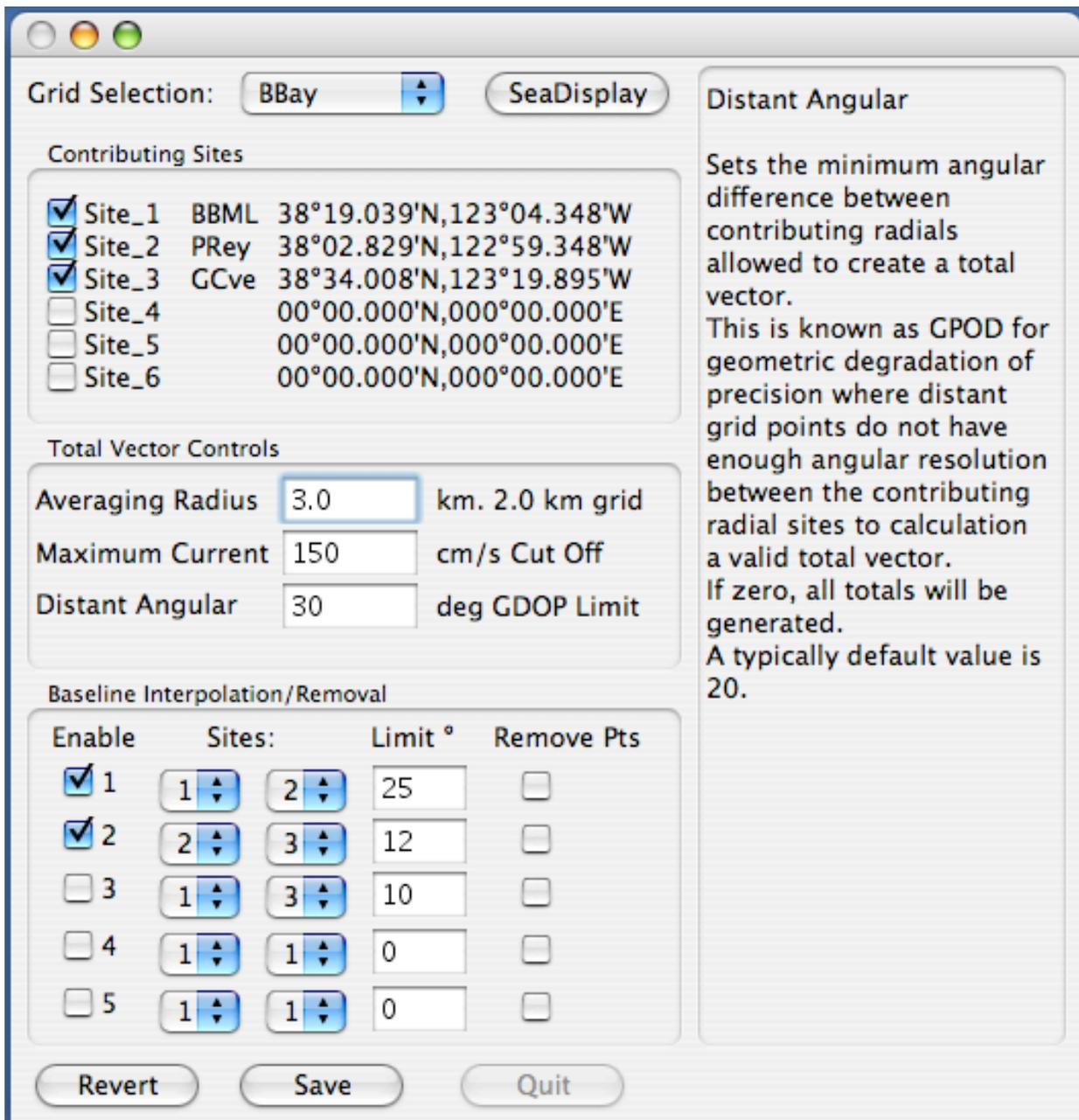
1. Use SeaDisplaySetup to create new Site Map covering the area of interest. There is an existing sample site map of the San Francisco bay to use as an example or staring point. Here you will enter your radial site info so that each site is plotted on the map. Save the map as 'SeaDisplay_Site_XXXX' where XXXX is the four-character site code you wish your total vector files to be named with. (Don't duplicate a Radial Site code). Save this file into the folder "/CODAR/SeaSonde/Configs/SiteDefinitions/".
2. Open the Site Map with SeaDisplay525 and create a grid file for the area of interest.
3. Edit the grid file.
4. Install the grid files into "/CODAR/SeaSonde/Configs/CombineConfigs/"

File Transfer Configuration.
You will need to read the documentation for FileExchange and configure the system to transfer radials from each site into separate folders in "/CODAR/SeaSonde/Data/RadialSites/Site_XXXX" where XXXX is site code of the radial source.

Changing Combine Options.
After you have created a SiteMap and Grid files, you can change some of the combining options by running application SeaSondeCombineOptions in the CombineTools folder.
It looks like this:

Grid Selection: BBay ⬍   (SeaDisplay)

Distant Angular

Contributing Sites

☑ Site_1	BBML	38°19.039'N,123°04.348'W
☑ Site_2	PRey	38°02.829'N,122°59.348'W
☑ Site_3	GCve	38°34.008'N,123°19.895'W
☐ Site_4		00°00.000'N,000°00.000'E
☐ Site_5		00°00.000'N,000°00.000'E
☐ Site_6		00°00.000'N,000°00.000'E

Total Vector Controls

Averaging Radius `3.0`   km. 2.0 km grid

Maximum Current `150`   cm/s Cut Off

Distant Angular `30`   deg GDOP Limit

Baseline Interpolation/Removal

Enable	Sites:		Limit °	Remove Pts
☑ 1	1 ⬍	2 ⬍	25	☐
☑ 2	2 ⬍	3 ⬍	12	☐
☐ 3	1 ⬍	3 ⬍	10	☐
☐ 4	1 ⬍	1 ⬍	0	☐
☐ 5	1 ⬍	1 ⬍	0	☐

(Revert)   (Save)   (Quit)

Sets the minimum angular difference between contributing radials allowed to create a total vector.
This is known as GPOD for geometric degradation of precision where distant grid points do not have enough angular resolution between the contributing radial sites to calculation a valid total vector.
If zero, all totals will be generated.
A typically default value is 20.

The Contributing Sites section allows you disable or re-enable contributing radials sites to the total vectors.
The Total Vector Controls section allows you to change the averaging radius, maximum current, and distant angular cutoff.
The Baseline section allows you to change which sites are used for baseline interpolation.

Real-Time Processing and Data Flow

Real-time processing refers to the normal combine site operation and the continuous collection and processing of data.

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". Sentinel will then open a weekly log file and begin adding information about the System. 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 wait until 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 launches each required SeaSonde application in order.

RunCurrentAnalysis is then launched. It opens the Terminal application and initiates the AnalyzeCurrents script. The AnalyzeCurrents script runs the tools, which process each set of radials into totals.

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.

Reprocessing Totals, 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 "AnalyzeCurrents" 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.

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 Totals

To reprocess totals

You should stop AnalyzeCurrents if running by selecting the Terminal window that is running the AnalyzeCurrents 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) or move all of the items in the folder "/CODAR/SeaSonde/Data/Totals/".

Lastly, double click 'RunCurrentAnalysis' in "/CODAR/SeaSonde/Apps/CombineTools/". This will startup the Terminal window, which in turn runs the combine processing tools. Totals will be created from latest radials sources.

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.

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

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