SailFast™ User Manual

Program Version 10.3

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www.sailfastLLC.com

Overview

SailFast ™* is a PC-based optimum routing navigation program as well as a powerful grib file weather viewer suitable for both offshore racing and cruising. As a routing program, SailFast uses the vessel's speed characteristics, predicted wind and current (where available) to find the fastest course between any two points. Tidal current for the Gulf of Maine derived from NOAA's GOMOFS model is available as a file download similar to a grib file. Other surface currents, such as the Gulf Stream, are supported via standard grib files. SailFast has been used in the biannual Marblehead to Halifax Ocean race since 2005, in the Newport-Bermuda race, the Marion-Bermuda race, the Solo Transpac, the Vic-Maui and many other offshore events world-wide. Cruisers are using SailFast for Atlantic crossings, visiting the Galapagos and circumnavigations.

While racers may only be seeking the fastest route, cruisers can specify optional routing parameters to increase sailing comfort and safety. This includes avoidance of extreme winds and wave height, and options to motor when light wind results in slow sailing.

SailFast ™ predicts vessel speed using standard polar diagram information which may be input by the user. Samples of polars for 16 popular boats are included. These may be used as is or modified by a scale factor if one has similar performance to your boat.

SailFast is a powerful tool for weather analysis. Edition 1 grib weather files may be viewed independent from routing simulations. Forecasts of wind, current, mean sea level pressure, sea temperature, total precipitation (i.e. accumulated rain), wave height, wave direction, wave period and 500 mb height may be accessed from one or more grib files. Forecast data does not need to be combined into a single file before use, which is a restriction for some other programs. Historical forecast data can be displayed as well as current and future forecasts.

The user may modify wind predictions, scale polar speeds and restrict sailing areas as a means to explore alternative routes and to determine predicted finish times for a variety of weather and course scenarios.

When interfaced to a GPS, wind instruments and heading via NMEA 0183, vessel position and track may be displayed and sailing performance against ideal polar speed presented. Current Set and Drift is calculated in real time and is also available with saved track data. Knowledge of actual real time current is valuable when trying to maximize speed over ground in the Gulf Stream and other similar ocean currents. Learn more at: http://www.sailfastllc.com/AppNoteCurrentSetAndDrift

System Requirements

SailFast is compatible with Windows 7 and Windows 10. It will probably run on XP but is not recommended. If in doubt try installing and running the free demo version before purchasing.

The minimum recommended hardware requirements are:
1 GHz processor
4 GBytes RAM
200 Mbytes free disk space
USB port or Internet Connection (or other means to install program files)

Any PC that works well with Windows 10 should be ok. The optimum routing process is computationally intensive. A fast processor with extra memory is always desirable.

* SailFast is a trademark of SailFast LLC

Installation

IMPORTANT: If you have a previous version of SailFast™ installed on your PC, it may need to be uninstalled before the new version can be installed. Uninstall using Windows Control Panel Add/Remove Programs.

SailFast™ is available as a web site file download. You are licensed to use SailFast™ on only two PCs. This would normally be a home PC and laptop you use on your boat.

The downloaded version is a single "zipped" ≈120 Mbyte file named SailFastVerX.X.X.zip. This file should be saved to the PC you intend to run the program on. Save or copy the file to a folder of your choice. Please note that SailFast is only licensed for use on up to two computers.

Next unzip the file by extracting all zipped files to the same or another folder. The extracted files are:

SailFastInstaller.msi
setup.exe.
readme.txt
SailFast User Manual ver X.X.X.pdf

The readme.txt file contains basic installation instructions and any last minute changes. The User Manual includes full installation and program activation instructions and is normally preferred.

> Note: If WinZip is installed on your computer, double clicking the .zip file should start the unzipping/extracting process or the files may be displayed in Windows Explorer with an "Extract All Files" menu option. If you do not have WinZip, free trial downloads are available at www.winzip.com .

To complete the installation double click and run setup.exe. This will begin a typical Windows program install. Unless you override it during the installation, the application program is installed at C:\ProgramFiles\Sailfast or C:\ProgramFiles(x86)\Sailfast. User folders and files are created at Documents\Sailfast. (or MyDocuments\SailFast with older operating systems).

To start SailFast™ use the shortcut installed on your desktop or access the program from Start\Programs\SailFast menu. The user manual pdf may be accessed in a number of ways:

- Included as one of the zipped install files
- Copy located in C:\ProgramFiles\Sailfast unless you installed the program elsewhere.
- A shortcut to the User Manual is in the Start\Programs\SailFast menu.
- From the Help menu in the SailFast™ program.

Program Uninstall

To uninstall SailFast use the Add or Remove Programs in the Windows Control Panel. The Documents\SailFast folder and related files are not affected by uninstall. These folders and files include user entered polars and waypoints which are retained for use when installing upgrades.

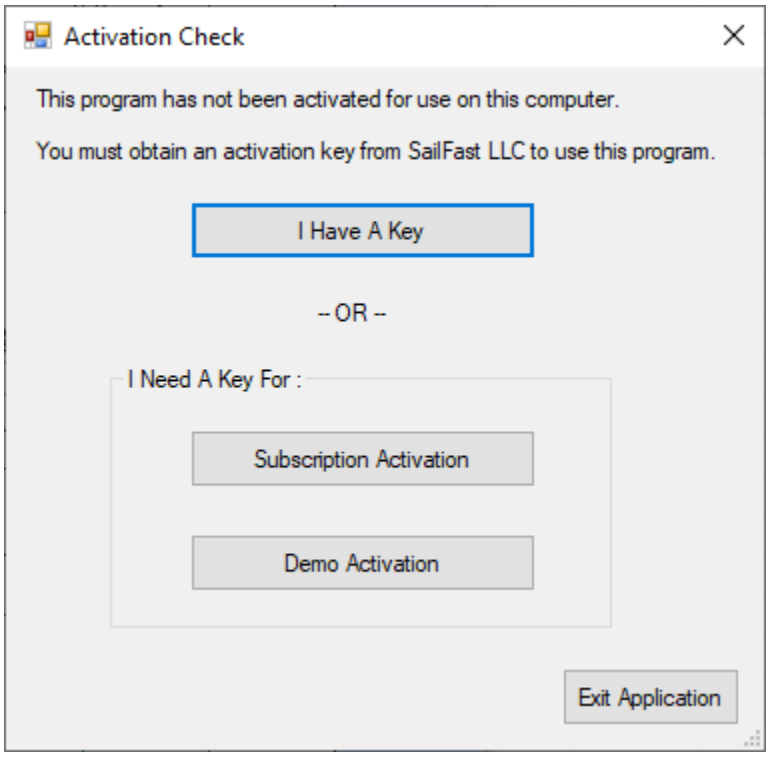
First-Time Use – Program Activation

To activate the program follow these steps:

1. Install and start SailFast™ on the PC you plan to use.

2. When SailFast™ starts it will detect that the program is not activated on this computer and ask you if have or need an activation key.

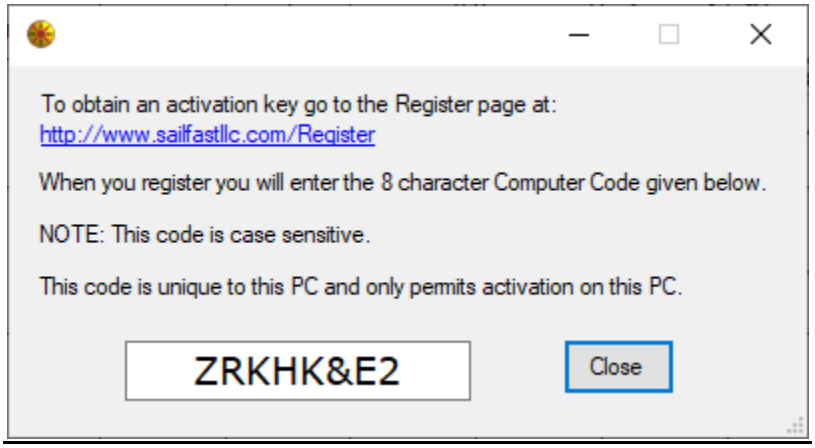
   Select either ***Subscription Activation*** or ***Demo Activation***, depending on your need.



For Subscription Registration go to step 3. For the free Demo please skip to step 11.

3. ***Subscription Activation*** will display this dialog which shows an 8 digit Computer Code unique to the PC being used. Write down this code you will need when registering the program. Note: **computer code** is NOT the same as the **activation key**.

   Your SailFast™ license agreement permits you to install the program on two computers. Typically this might be a land-based PC and a PC on your vessel.

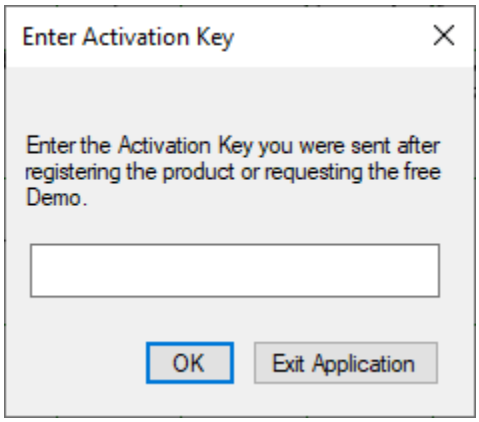


4. Go to the Register page on the http://www.sailfastllc.com/Register web site. Follow the directions for Subscription Registration. You will be asked to provide the Computer Code you obtained in step 3.

5. After you register, a 16 character Activation Key will be emailed to you. The creation of the Activation Key is a manual process and you may not receive an email for up to 12 hours.

6. When you have the Activation Key, restart SailFast™ . When you see the dialog of step 2 above, select "I have a Key"

7. Enter the Activation Key with no added spaces. Note that the key is case sensitive and all letters are capitalized.



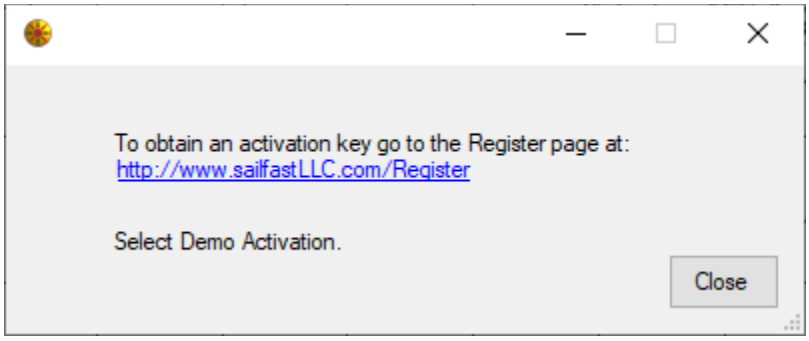
8. SailFast™ should now be operational on this computer. No further activation or passwords will be required to run the program. However, to install and run SailFast™ on a second computer the complete registration and activation process must be completed again. Note that the Computer Code is unique to each PC.

9. To view the subscription end date and the Activation Key, select Help / Activation Settings from the SailFast menu.

10. ***Write down and SAVE THE ACTIVATION KEY. If you have to re-install SailFast on the same PC while at sea you will need the key!***

The Following applies to the free Demo Activation only.

11. ***Demo Activation*** will display these instructions for obtaining an activation key.

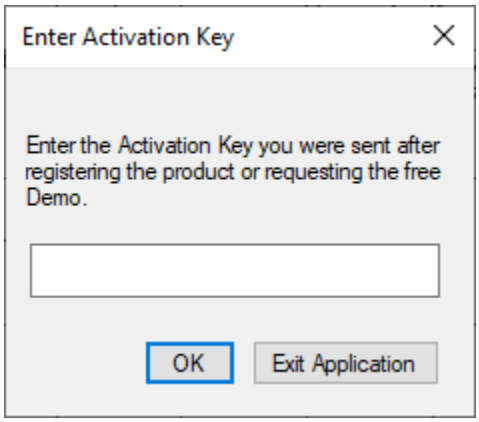


12. Go to the Register page on the http://www.sailfastllc.com/Register web site. Follow the directions for Demo Activation.

13. After you submit the Demo request a 10 character Activation Key will be emailed to you. The creation of the Activation Key is a manual process and you may not receive an email for up to 12 hours.

14. When you have the Activation Key, restart SailFast™ . When you see the dialog of step 2 above, select “I have a Key”

15. Enter the Activation Key with no added spaces. Note that the key is case sensitive and all letters are capitalized.



16. SailFast™ should now be operational on this computer. No further activation or passwords will be required to run the program.

17. To view the demo end date and the Activation Key, select *Help / Activation Settings* from the SailFast menu.

18. The demo will normally be activated for 5 days from the time the activation code is sent to the user. The demo is intended for product evaluation prior to purchase, NOT for race use to avoid making a purchase. Blackout periods corresponding to popular off-shore races may apply. Certain features in the demo may be disabled.

What's New in This Version

The following features have been added to SailFast version 10.X

- NOAA's new Gulf of Maine tidal currents are now supported. Current forecasts from the Gulf Of Maine Ocean Forecasting System (GOMOFS) are available as hourly forecasts out to 72 hours (3 days). The NOAA data is in NetCDF format and not directly useable by software using grib weather files. GOMOFS forecasts may be download by SailFast via the SailFast server, which processes the NetCDF data into a custom compressed format useable by SailFast.

- The built-in Gulf of Maine tidal currents included in earlier versions are no longer available. The new GOMOFS forecasts have much greater resolution and are based on a vastly improved fluidic dynamic model.

- Laylines on a windward waypoint can be displayed along with VMG target data and estimated time to layline. Audible notifications when approaching laylines can be enabled.

- "Draw Lines" button added to toolbar. May be used for drawing rhumb lines or lines of position on the chart.

- Waypoints may now be locked in position preventing unintentional dragging by mouse movement.

- Display lengths in either feet or meters. Select in Tools/Options/Display. Long distances are displayed in nautical miles (NM). Improved the range/bearing distance resolution for short distances.

- The forecast intervals for RTOFS (Real Time Ocean Forecast System) is now 3,6,12,18, or 24 hours instead of 12 or 24 hours. RTOFS is now a global model. NOAA has discontinued the RTOFS regional models.

- Added support for the High-Resolution Rapid Refresh (HRRR) forecast model. Produces hourly forecasts out to 18 hours, with 3 km grid resolution.

- The Optimum Route Table can now display bearings in either °T or °M.

- Polars for 8 additional boats have been added. Included sample polars now totals 16.

Program Operation – Basic Concepts

Typical SailFast™ operation involves setting start and finish waypoints, specifying start time, setting up boundaries for the racing area, and loading a grib file with the appropriate wind predictions. Once an optimum route has been determined each segment of the route may be displayed on the chart and analyzed. Periodically during the course of a race SailFast™ is used repeatedly to find new optimum route solutions from the current vessel position. If the navigator has the ability to communicate to the internet or receive email attachments, then updated grib weather files can be used to produce updated optimum route predictions. For long races getting new wind forecasts every day is highly desirable.

"What-If" capabilities are used to explore the affects of modified wind conditions and alternative courses. The results of these racing simulations are used by the navigator to decide on an appropriate strategy, and to make informed adjustments as expected sea and weather race conditions change. Outdated grib file predictions may also be overridden and replaced by current observed conditions.

User Folders and Files

When you install and first start up SailFast™ it will create a directory and various sub-directories (i.e. folders) where user data and configuration files are stored. Some files you will create directly and modify, like the polar diagram data. Other files are created and maintained automatically, and are available to use when program updates are installed. The recommended location for these user folders is in the Documents\SailFast directory. If one of the folders is moved, renamed or deleted, SailFast will create a new one the next time the program is run.

Windows XP Users: *The* ***MyDocuments*** *folder used in Windows XP and earlier operating systems is now called simply* ***Documents*** *in Windows 7 and 10. This manual is using the Windows 10 convention.*

User Folders Created First Time SailFast Runs

```
Documents
    SailFast
        GRIBS
        GRIB Archive
        OptimumRoute
        Polars
            CustomPolar1
            (And other polar folders
            of sample polars)
        Routes
        Track
```

Degrees and Direction Conventions

All internal compass calculations in SailFast are done in true degrees. You may display bearings in either degrees true (°T) or degrees magnetic (°M). To display in °M SailFast must receive valid magnetic variation values via NMEA 0183 input to your PC or input manually by the user. NMEA data is obtained from the NMEA RMC sentence provided by a GPS. A chartplotter should provide the complete RMC data including magnetic variation. However a small GPS may not. An example of the later is the USB connected Globalsat BU-353 USB GPS receiver.

When °T values are converted to °M for display, the magnetic variation for the present boat position is used. As a result there will be an error introduced when a bearing or heading in °M is displayed for a position a large distance away. Normally the error is small. If of concern you can look at the data in °T which will always be correct.

Set the display for either °T of °M via the *Tools/Options/Compass* menus. The *Compass* tab also allows you to manually specify the magnetic variation, which SailFast will use to convert from °T to °M if NMEA GPS data is not available. If NMEA RMC sentence data is not available and there is no user specified magnetic variation the display will show °T regardless of setting. Selection of °T or °M can also be made at *Tools/Options/Display*.

For data values where the degrees are relative to the bow (heading) of the boat, values are shown with no qualifier, such as “53°”. Apparent and True Wind Angle are examples of this.

The convention for wind direction is the compass degrees that the <u>wind is coming from</u> . Text or audio forecasts from weather agencies are always in degrees true. As noted above, wind direction in SailFast may be displayed in either true or magnetic degrees.

Generally all other directional parameters use the oceanographic convention, that is <u>the direction going to</u>. Examples are current direction and wave direction.

Screen Features

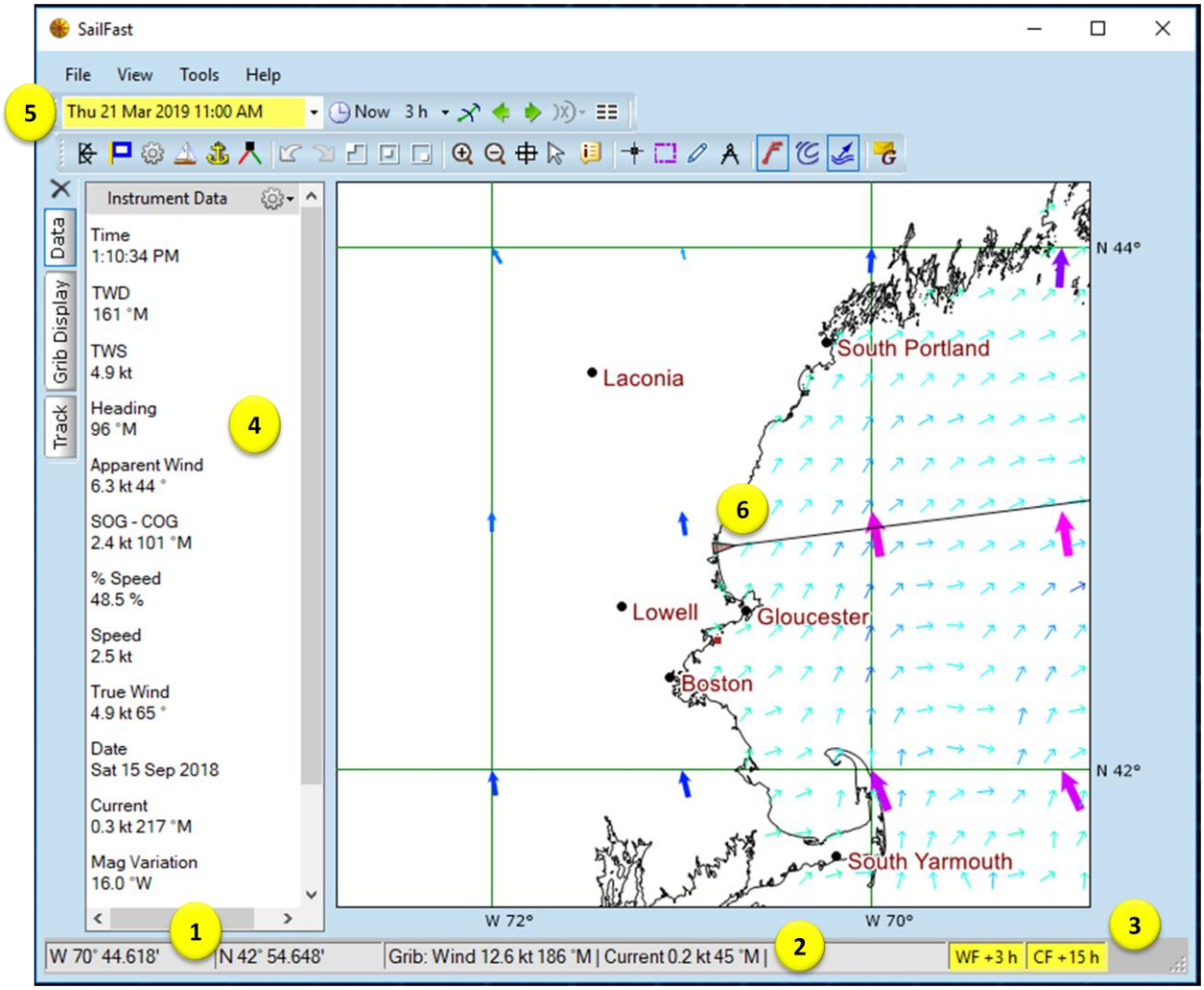


Figure 1 Chart Screen Features

(1) The latitude and longitude values at the cursor position.

(2) When grib data is available, the predicted wind, current and MSL pressure at the cursor position.

(3) When wind or current forecast data is extended past the end of the last available forecast, as set in *Weather Routing Settings - Wind & Current Tabs* the time past the forecast time is displayed. The background will be yellow as a warning that the forecasts are old and may be in error. In this case "WF +3h" indicates the wind forecast is for a time 3 hours earlier than the toolbar display time (item 5). Likewise, "CF +15h" indicates the current forecast is for a time 12 hours earlier.

(4) Instrument data, Optimum Route data, grib selection & settings and Track data is shown in he left side pane. Select the data type with the left side tabs. The width of the data area may be resized by dragging the divider between the data area and the chart. The "X" above the tabs closes the data window.

In real time mode *Data* displays wind instrument and GPS data if available via a NMEA 0183 connection. In Show Isochrons mode, best track segment data is displayed.

Grib Display permits selection of which grib parameter to be displayed and the display settings.

Track shows detailed point by point performance data for the active track or saved tracks.

(5) The date and time for the chart information displayed.

When the chart is “real time” the date-time is the PC system time and the background of the text box is gray. Press the *NOW* button for real time display. When the chart is not real time, the background color is yellow. This applies during optimum route simulation and isochron display.

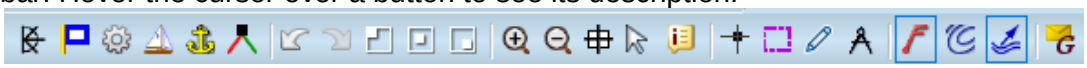
CAUTION: *Make sure your PC System time is set correctly.*

For a display at another time, either edit the date time in the box or select *Set Custom Time* from the drop down list. If a grib file is loaded in the GRIB folder that covers the area displayed in the chart then the drop list will show all available forecast times in the grib file.

(6) Shows the present vessel position with COG line extension. Requires NMEA input.

Toolbars

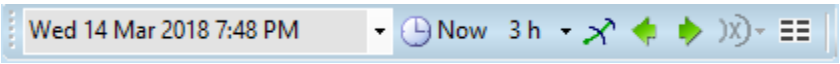
There are 2 toolbars which may be repositioned onto one line by dragging the vertical bar on the left of each bar. Hover the cursor over a button to see its description.



- ***Polar Diagram.*** Shows the present boat polars. Alternative polars can be selected.
- ***Start & Finish.*** Sets the start and finish positions and the start time used to find the optimum route.

  Weather Routing Settings. Sets the routing time step, adjustments for night time sailing, avoidance of extreme wind or wave height, on-engine operation with light wind, and "what-if" modifications to grib forecasts of wind and current.
- ***Start Sailing.*** Initiates solving for isochrons and the optimum route.
- ***Abort Isochron Sailing.*** Stops the simulation without saving any isochron information.
- ***Laylines.*** Displays windward laylines plus time, distance and target speed. Requires NMEA wind instrument and heading data.
- ***Backward Chart Position*** Go to previous chart position (size and location)
- ***Forward Chart Position*** Go to next forward (redo) chart position (size and location)
- ***Chart Position #1*** Go to preset chart position (size and location). User settable.
- ***Chart Position #2*** Go to preset chart position (size and location). User settable.
- ***Chart Position #3*** Go to preset chart position (size and location). User settable.
- ***Zoom In.*** Zooms in by factor set in the *Tools/Options/Display* dialog.
- ***Zoom Out***. Zooms out by factor set in the *Tools/Options/Display* dialog.
- ***Pan / Center***. Centers the chart display where the cursor is left clicked. May also be used to zoom into an area by left click and dragging.
- ***Arrow.*** Sets cursor to the default arrow. Cancels other modes such as setting waypoints or boundaries. Use to highlight and drag waypoints or zoom in by left click and dragging.
- ***Weather Data At Cursor.*** Displays available grib parameter values in a pop-up window as the cursor is positioned over the chart.
- ***Set Waypoint.*** Waypoint set at cursor position with left click.
- ***Draw Sailing Boundaries.*** Boundary waypoints set at cursor position with left click.
- ***Draw Line.*** Draws straight lines on chart while displaying range and bearing. Mouse left click sets line beginning and end points. Useful for rhumb lines and lines of position.
- ***Range/Bearing.*** Shows a temporary range bearing line and data. Set points with cursor left click.
- ***Toggle Wind Display.*** Turns display of wind arrows on/off.
- ***Toggle Pressure Display.*** Turns display of mean sea level pressure on/off.
- ***Toggle Current Display***. Turns display of current arrows on/off.

- ***Create Grib Email.*** Opens dialog for sending a grib file request to Saildocs.



- ***Display Date/Time.*** Wed 14 Mar 2018 7:50 PM Displays the date & time for the chart display. Background is grey when the display is in real time. When not in real time the background is yellow.
- ***Real Time Display (Now).*** Now Sets the display time to the present PC system time.
- ***Next/Previous Time Interval.*** 3 h Sets the time interval increment change when the *Next* or *Previous* button is pressed.
- ***Show Isochrons.*** Toggles the display between normal mode and isochron mode. In isochron mode the last complete isochron and optimum route solution is shown.
- ***Previous.***
  In isochron mode: displays the previous fastest track segment. Press and hold to repeatedly step to previous segments in increasing step size.

- In normal mode: decrements the present display time by the Next/Previous Time Interval. Use to step through and view grib file forecasts.
- ***Next.***
  In isochron mode: displays the next fastest track segment. Press and hold to repeatedly step to previous segments in increasing step size.

  In normal mode: increments the present display time by the Next/Previous Time Interval. Use to step through and view grib file forecasts.
- ***Isochron Display Spacing.*** Sets how many isochron lines in an optimum routing solution are displayed.
- ***Optimum Route Table.*** Displays a table of detailed sailing data for the most recent optimum route solution.

Pan, Zoom and Position Chart

To Pan: Select the Pan/Center cursor . Left clicking at any point and the chart will be repositioned with that point at the center.

To Zoom: Zoom in or out with the toolbar buttons, or right click the mouse and select Zoom In or Out from the context menu. **Or**, left click and drag the cursor to create a rectangle that shows the area you wish to zoom to. Release the mouse to zoom to the selection. If the *Zoom In* or *Out* buttons are held down then repetitive Zooms will be made until released.

To Position: The forward and back arrows let you navigate to previous chart positions. Only the position is changed by the arrows. No other settings or grib displays are not affected.

Preset position buttons also re-position the chart. To set a button to a position of your choice simply pan and zoom to the desired position, then press and hold the button for a second.

Base Maps

SailFast™ includes two global base maps. The appropriate map is chosen based on the chart area displayed. Unless overridden in the *Tools/Options/Display dialog,* the more detailed World Vector Shoreline map is used when the displayed longitude span is less than 20°, otherwise the World Coastline map is used.

World Coastline

Here the full global chart is displayed within ±80° latitude. Note that the range bearing is also shown from a point on the Alaskan coast to Japan. The range and bearing values are shown in the text box at the top of the chart. The range is the distance assuming a great circle course. The bearing course assumes Mercator sailing. Since the course cannot be plotted as a continuous line on this chart display, the magenta course line is shown as a arrow leaving the “from” point and another arrow ending at the “to” point.

The Range/Bearing mode is activated using the Toolbar button  .

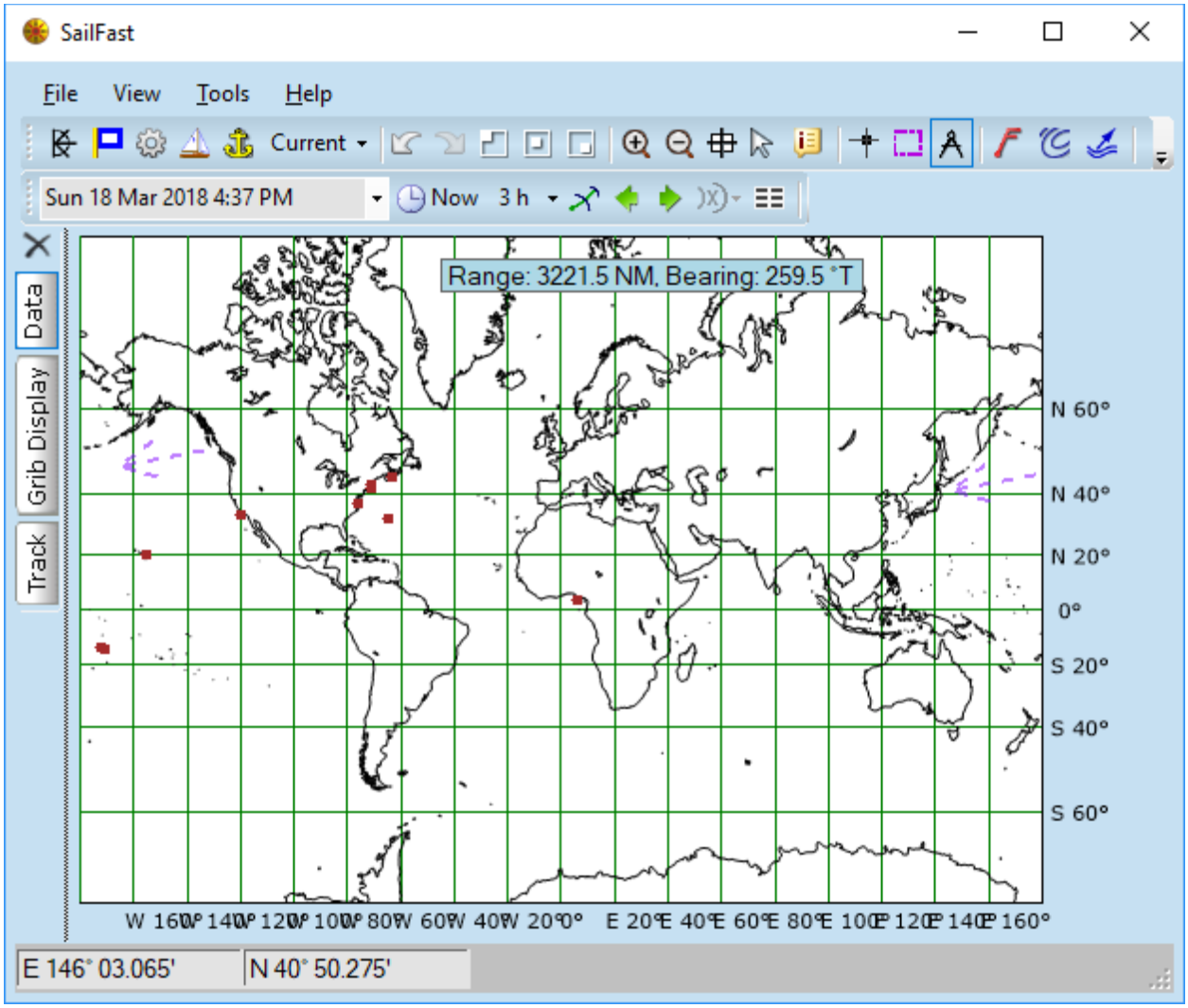


Figure 2 World Chart With Range Bearing

World Vector Shoreline

This map is used to display coast details when the chart is zoomed in to a span of less than 20° of longitude. This example shows Cape Cod, Martha's Vineyard and Nantucket. A range/bearing line from Woods Hole to Nantucket is shown.

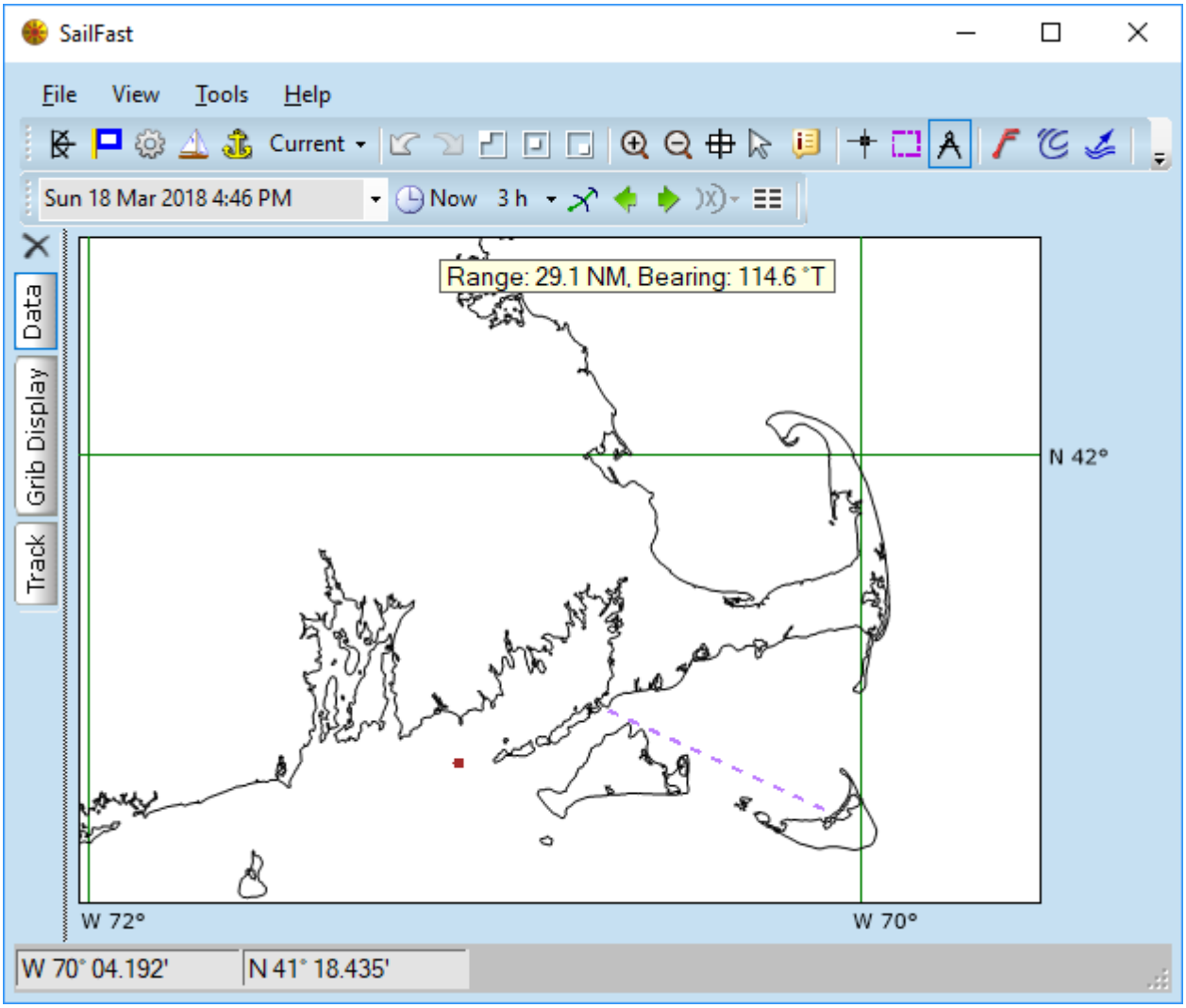


Figure 3 World Vector Shoreline Example

City Names

When the chart uses the World Vector Shoreline (span of less than 20° of longitude) selected city names may be optionally displayed. This may be helpful when coastwise navigating. Priority is given to cities with the highest population. Enable city display on the *Tools/Options/Display* menu. Text size and color may also be modified.

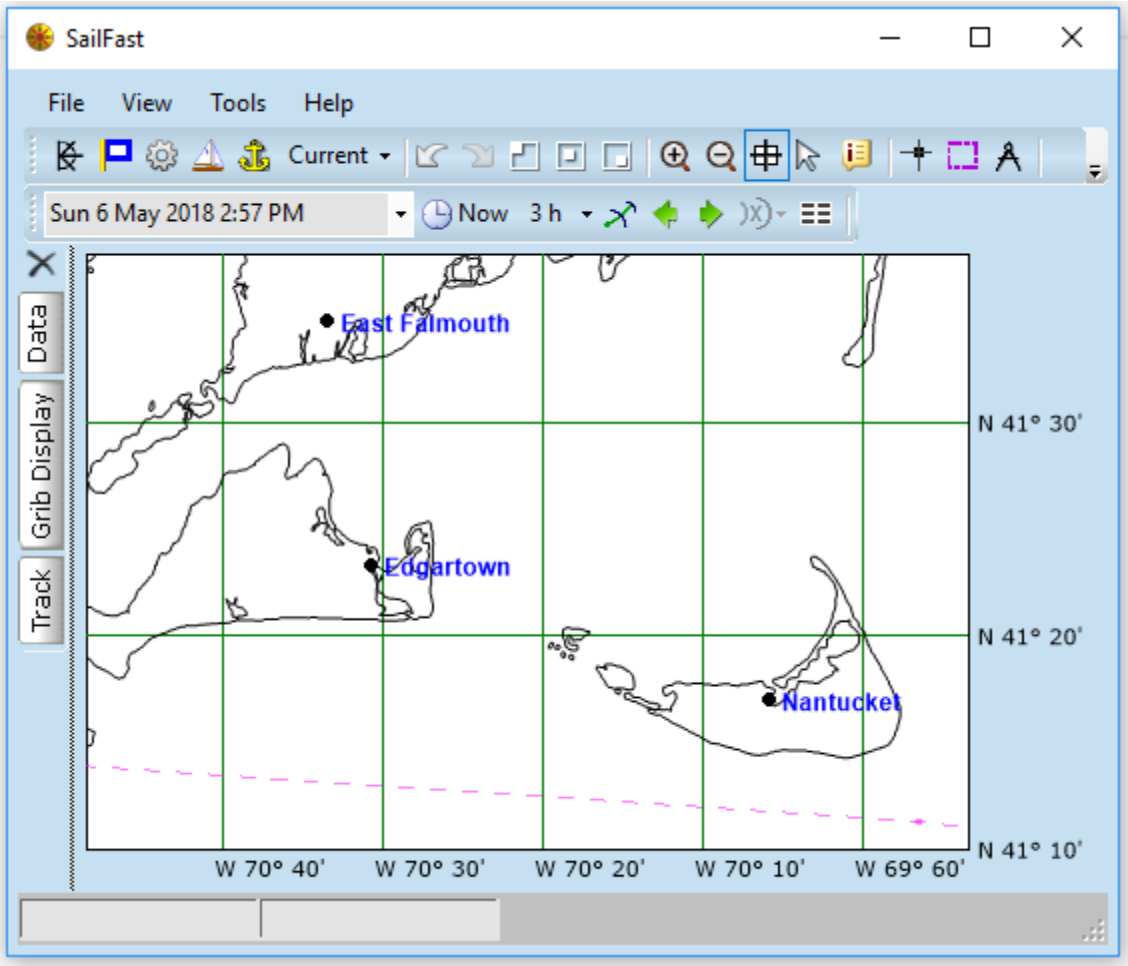


Figure 4 Chart With City Names

Using SailFast as a Grib Weather Viewer

Grib Files

The primary weather input to SailFast™ is made using grib files. These contain detailed weather forecast data such as wind speed and direction and atmospheric pressure. The data is typically specified on a regular lat lon grid of points, and normally a single grib file will include multiple sets of forecasts over a period of days. An example would be a forecast for every 3 hours for the next 72 hours. Gribs contain highly compressed binary data to minimize file size. A special reader is required to view the data and there are a number of these available, both commercially and free.

SailFast will let you conveniently view wind, current, mean sea level pressure, sea temperature, accumulated rain, wave height, wave height & direction, wave period and 500 mb height. The grib file must have data on a regular lat lon grid of points and be an Edition 1 grib. Most Gribs are in this format. Unlike some other routing products, the data does not have to be in a single grib file. When there is more than one grib file with data for a given parameter, such as wind, SailFast will extract the data from the most recent grib forecast automatically. The user can also manually specify which grib file to display when there are more than one. This is useful when comparing forecasts from more than one source, such as the NOAA GFS model versus the US Navy COAMPS model.

In spite of being compressed, grib files can be very large when the geographic area is large, the grid of points are closely spaced, the number of days forecast is large or unnecessary weather data is included. SailFast will work much more efficiently if the grib file is tailored to your specific need. For example, the raw grib files produced by NOAA can contain hundreds of parameters at various atmospheric elevations or sea depths which are of great interest to scientists but are of no use to you. It is best to obtain repackaged gribs with only the data you need for the area and time period of interest. We'll describe a few sources to get you started and you can find more with some web searches. There is also more information on gribs on our web Support page http://www.sailfastllc.com/GribWeatherResources

Before an offshore race it is straight forward to download a GFS grib file from the internet which has forecasts for up to 16 days. If you have the ability to access email from your boat via cell phone, sat phone or SSB radio; then you can get updated forecasts during a race or offshore passage. Of course with a cell phone one is limited to fairly close to shore distances. Like any weather forecast, grib accuracy declines rapidly the longer the forecast. Reasonable accuracy out to 72 hours may be achieved. Being able to get updated forecasts while offshore is highly desirable. Even with frequent updates having long term forecasts are valuable for route planning.

Weather forecasts and grib files are produced regularly by various national meteorological organizations. NOAA produces both global and more specialized coastal forecasts, all of which are free. A number of companies repackage NOAA data to make it more streamlined or user friendly. Modified forecasts that are not free may violate racing rule 41. If in doubt consult your race organizers. For a rules discussion see the FAQ on the SailFast™ web site: http://www.sailfastllc.com/FAQ#NOR

Where Do Grib Files Go? - The GRIBS Folder

Once you have obtained useful grib files they need to be placed where SailFast can find them. The Saildocs tool described in the following sections can do this automatically. If you need to place files manually they will go into the Sailfast/GRIBS folder. Refer to the users folders description. All files in this folder are evaluated during program execution and consume some computer resources. So once a grib becomes obsolete it is best to remove it from this folder. If you want to keep these old gribs for later use you can drag them to the grib Archive folder. Old gribs can be useful to analyze prior weather data and/or sailing events.

You may also view grib file information and archive or delete grib files from the Grib Data dialog on the View menu.

When downloading grib files from third party vendors like OCENS WeatherNet or Grib.US set up the program to place the files in Documents\SailFast\GRIBS and they will immediately be accessible by SailFast.

Saildocs Grib Files

A recommended source of free and efficient grib files is Saildocs. Saildocs provides a gateway to internet forecasts files and other weather related data and images. Saildocs is supported by Sailmail*: "The SailMail Association is a non-profit association of yacht owners that operates and maintains an email communications system for use by its members. SailMail email can be transferred via SailMail's own world-wide network of SSB-Pactor radio stations, or via satellite (Iridium, Inmarsat, Globalstar, Thuraya) or any other method of internet access (cellular networks, WiFi)."* View Sailmail information at http://www.sailmail.com/

Saildocs issues this general disclaimer. You should apply this warning to all information and decisions made using grib files, regardless of the source.

> *"By requesting a document or subscription from Saildocs, you are acknowledging that you have read and agree to the following terms and conditions: The Saildocs is an automated service which is offered without charge on an as-is basis, without any warranty or assurances that it will work, be useful, or that the information delivered will be correct. Saildocs is an automated computer system which is subject to a variety of hardware problems and software errors, and also depends on internet communications with other computers which themselves may or may not work. Saildocs has no control over the content of the information from other sources, and in particular, weather forecasts may be missing, incorrect or out of date."*

For detailed information on grib data available from Saildocs view the web pages listed below. Alternatively send an empty email to the listed email addresses. The later may be more practical if you are on the water.

Table 1 Saildocs Documentation

Web	Email Message Address
www.saildocs.com/info	info@saildocs.com
www.saildocs.com/gribinfo	gribinfo@saildocs.com
www.saildocs.com/gribnews	gribnews@saildocs.com
www.saildocs.com/gribmodels	gribmodels@saildocs.com Historically this document gets updated most frequently as available forecast models change, are added or become obsolete. Also grib parameters supported by Saildocs for a given model may be added. However a new parameter such as CAPE (Clear Air Potential Energy) may not currently be supported by SailFast.

The following is a brief summary of the available weather and ocean models that may be selected in SailFast as described in the next section. Saildocs has additional models and text weather bulletins available which you can also access. Refer to www.saildocs.com/info. Note that the various forecast centers often upgrade the models and offer results on smaller grids as faster computation times allow. I recommend you read the www.saildocs.com/gribmodels document for a more complete understanding of the various models and how Saildocs responds to model requests.

There are five atmospheric weather models: GFS, NAVGEM (NOGAPS) , COAMPS and HRRR.

GFS (Global Forecast System) is the standard NOAA global model with data available on a 0.25 x 0.25 degree grid out to 120 hours. The grid is 0.5 degree out to 240 hours, and a 1 degree grid out to 384 hours (16 days).

NAVGEM (NOGAPS) is a US Navy global forecast model which replaced NOGAPS in 2013. Forecasts are available every 3 hours out to 24 hours, 6 hours to 96, and every 12 hours to 144 hours (6 days) on a 0.5 degree grid.

COAMPS is a US Navy regional mesoscale model with finer mesh that attempts to better model near land effects. Global data is not available as the forecast is run only for certain regions. Forecasts are available every 3 hours out to 72 hours (3 days) on a 0.15 degree grid.

The HRRR is a NOAA real-time 3-km resolution, hourly updated, cloud-resolving, convection-allowing atmospheric model, initialized by 3 km grids with 3 km radar assimilation. Radar data is assimilated in the HRRR every 15 min over a 1-h period adding further detail to that provided by the hourly data assimilation from the 13km radar-enhanced Rapid Refresh. The model covers the continental US and adjacent waters. An updated forecast is produced every hour, with hourly forecasts out to 18 hours. Every 6 hours there is a forecast run with hourly forecasts extended to 36 hours.

There are two NOAA oceanographic models: RTOFS (Real-time Ocean Forecast System) and WW3 (WaveWatch III). RTOFS provides current and sea temp forecasts while WW3 gives significant wave height, direction and period.

The RTOFS current forecasts are available in 3 hour intervals to 72 hours, and with 24 hours intervals to 192 hours (8 days). Maximum resolution is 0.08 degrees. Prior regional models have been replaced by a global model. Unlike some of the earlier regional models, the RTOFS global model <u>does not include tidal current</u>. RTOFS models ocean currents such as the Gulf Stream and wind driven surface currents.

OSCAR is a NOAA project to produce a surface current forecast derived from satellite altimeter and scatterometer data. Satellite data is assimilated over a 5 day period to create the forecast. Grid size is 0.33 degrees. The result is a single nowcast. Future forecasts of current are not available since this is not a computational model.

Refer to the Saildocs documentation listed in the previous table for more details on each model.

The traditional way to obtain a Saildocs grib is to send an email to Saildocs with a grib request in the proper syntax, and a few minutes later receive a response with a grib file attached. After downloading the attachment and putting it in the SailFast GRIBS folder, SailFast can read and use the file.

Grib requests sent to Saildocs via email go to query@saildocs.com. The email subject can be anything, but the body of the message should only be the grib request. The message needs to be on a single line and without extra spaces. An example valid message is:

```
send gfs:41N,45N,73W,63W|0.5,0.5|0,3..96|wind,prmsl
```

Download Saildocs Gribs Using SailFast

SailFast contains a convenient tool for generating Saildocs grib requests which avoids the tedious process of composing a request manually. If your PC has internet access then SailFast can also obtain the requested grib file and download it to the SailFast GRIB folder. When off shore an alternative method is to copy the Sailfast generated grib request into an email and send it to query@saildocs.com. This approach may work best when using SSB (single side band) communication or a Sat phone.

To create a request use the grib request tool bar button . This opens the Saildocs dialog.

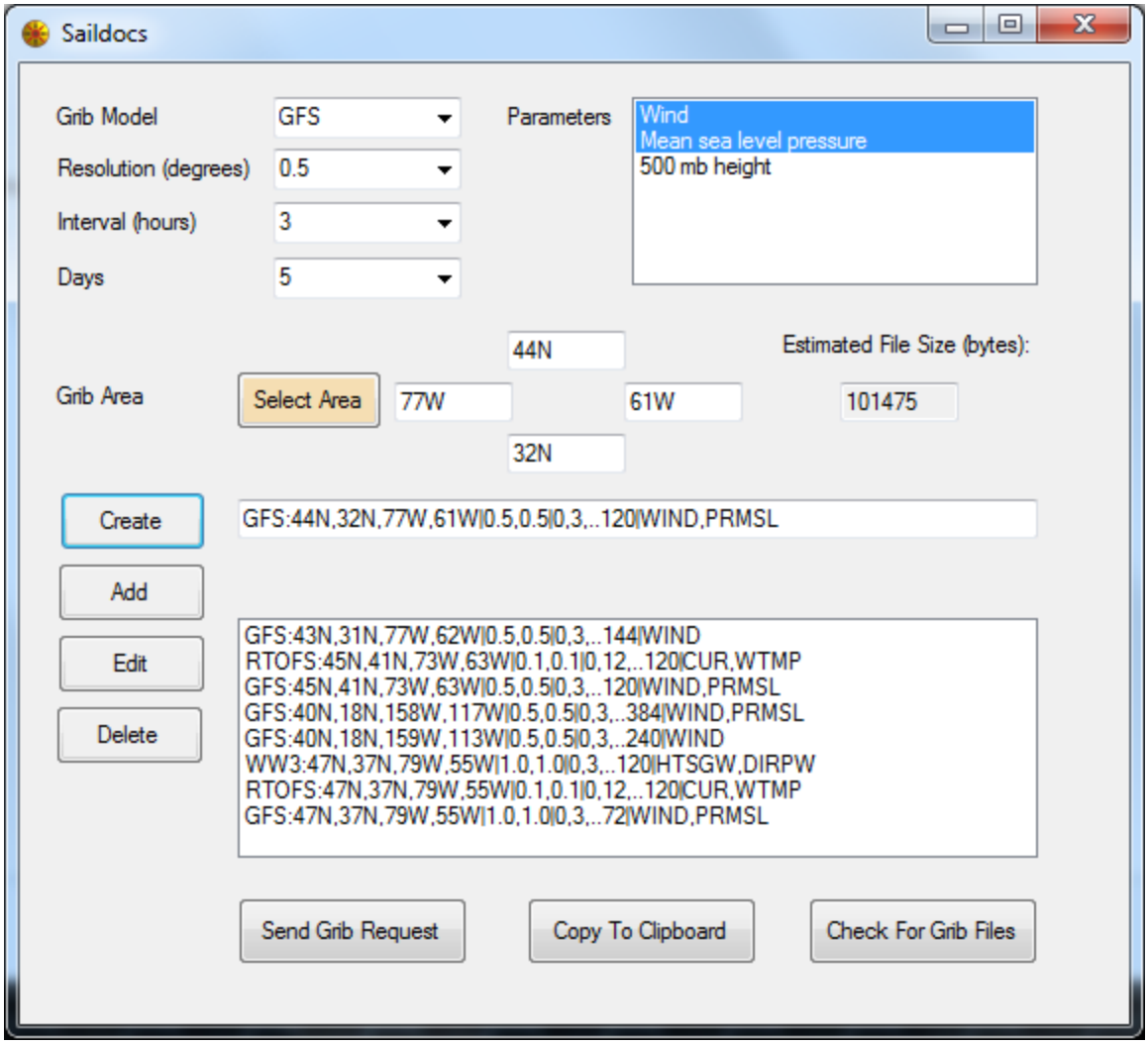


Figure 5 Saildocs Dialog

- ***Grib Model.*** Select one of the 6 grib models. Always select the model first before making other selections. The choices of the other selections depends on the selected grib model.
- ***Parameters.*** Select one or more of the grib parameters that are available for the given model.
- ***Resolution.*** The spacing in longitude and latitude degrees between grib data points.
- ***Interval.*** The time between grib forecasts.

- ***Days.*** The number of forecasted days.

- ***Select Area.*** When pressed the main SailFast window displays Select Grib Area Mode at the top of the chart window. Left click the mouse and drag a box on the chart for the area that you want a grib forecast for. As you drag the box you will see the lat and lon values on the Saildocs dialog. You may also manually enter or edit the values in the 4 lat/lon text boxes. Press Return to return to the Saildocs dialog and to take the main SailFast window out of the Select Grib Area Mode.

  The maximum span of longitude for Saildocs gribs is 180 degrees. If you select an area > 180° Saildocs returns a grib file with the requested longitude end points but spanning the other side of the globe. If you want to see a larger area you would have to break it up into 2 grib requests.

- ***Create.*** Once all selections have been made, this button creates a grib request in the text box to the right. You can also edit this text. If you manually edit be sure you comply with the Saildocs syntax rules.

- ***Estimated File Size.*** This is the estimated size of the grib file. It is calculated when Create is clicked. Avoid unnecessarily large files that can result from very small grids and long forecasts when they are not needed.

- ***Add.*** This puts a copy of the created grib request in the list box.

> **Note**
>
> Twenty-five (25) is the maximum entries in the list box. When the list box is full a new request can still be added, however the oldest request at the bottom of the list will be deleted.

- ***Edit.*** Used to manually edit a request in the list box. Select a line in the list box then click edit. A copy is placed in the text box next to Create. After manually editing use Add to put a copy back in the list box.

- ***Delete.*** Select one or more lines in the list box. Clicking Delete will then permanently remove the selected line(s).

- ***Send Grib Request.*** First select one to three lines in the list box. When clicked, internet communication to the SailFast server will be established and the grib request(s) transmitted. The server then sends a grib request email to Saildocs.

- ***Copy to Clipboard.*** Grib requests that have been selected in the list box are copied to the clipboard. Use this to then paste the requests into an email when that method is used to obtain grib files.

- ***Check for Grib Files.*** When clicked , a connection to the Sailfast server is made if an internet connection is available. You are notified whether or not grib files on the server are ready to be downloaded. If the automatic checking for server grib files is enabled and active, this manual checking inactivates further automatic checks.

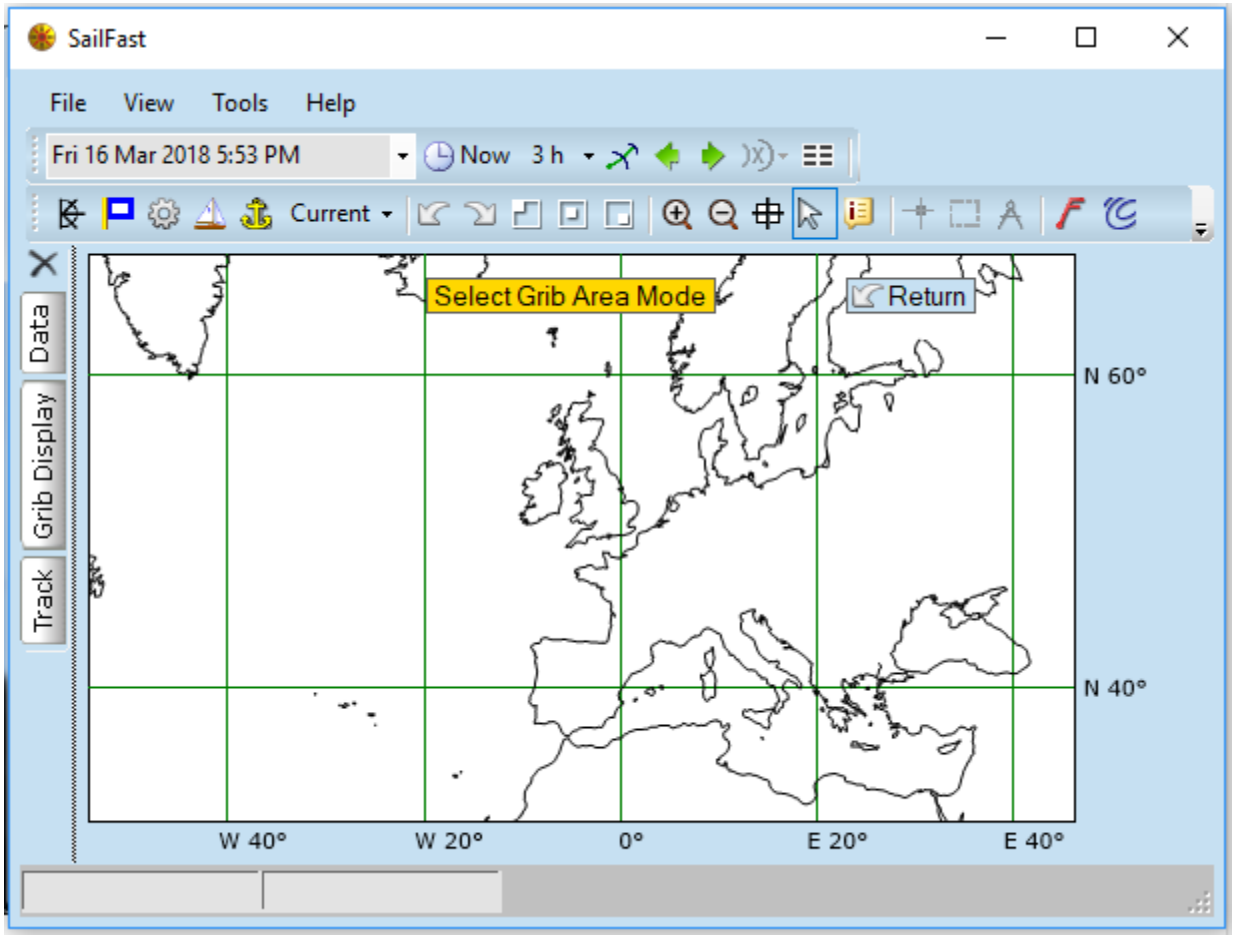


Figure 6 Use The Mouse To Drag A Selection Area On The Chart.

Once a grib request has been sent to the SailFast server a message is displayed confirming that an email has been sent to Saildocs. Next you will check if the server has received a response from Saildocs. You can check for file(s) to download manually using the *Check For Grib Files* button. SailFast will also automatically make the check if enabled in the *Tools/Options/Gribs* dialog. Typically it takes at least 2 minutes for Saildocs to process the grib request and for the email to be received by the SailFast server. If you are off shore using a Sat phone and want to minimize data charges, then wait 15 minutes before checking for a file and do it manually.

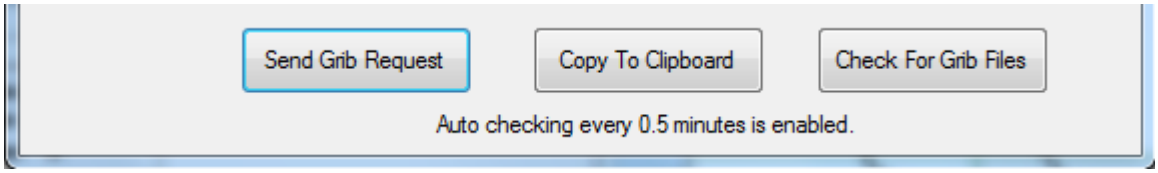


Figure 7 Example of Auto Checking Message At Bottom of Saildocs Dialog

If one or more files are available for download you can either have them downloaded automatically to your SailFast/GRIB folder or view the files information before deciding to download. Select the mode you desire in *Tools/Options/Gribs* dialog.

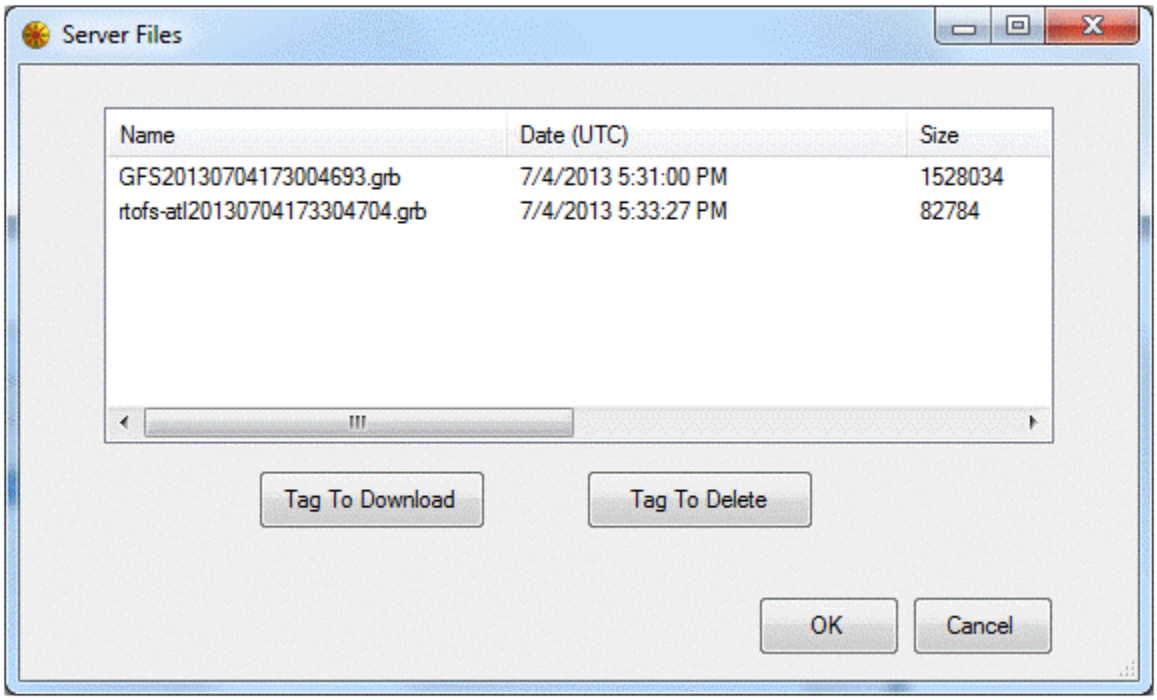


Figure 8 Dialog Showing Files Ready For Download

Files that have been received from Saildocs and are on the SailFast server ready for download are shown in this dialog. The file date is the UTC date/time when the SailFast server received the email from Saildocs. If the grib file is downloaded to your GRIBS folder Windows will change the date to the time when file was downloaded.

Select one or more files to take action on.

- ***Tag To Download.*** When clicked, all selected files will be designated for download and removed from the displayed list. Actual download does not occur until OK is clicked.
- ***Tag To Delete.*** When clicked, all selected files will be designated for deletion from the server and removed from the displayed list. Actual deletion does not occur until OK is clicked.
- ***OK.*** Download and deletion of tagged files is executed.
- ***Cancel.*** No action is taken and the dialog is closed. To open the dialog again do a manual *Check For Grib Files.*

Note: Whenever a file is downloaded it is also automatically deleted from the server. The use of *Tag To Delete* is to remove files from the server without downloading.

Once the grib file(s) are downloaded to the GRIB folder you have the option to process them immediately so SailFast can use them. If you do not process the file now you can do it later using *Tools/Refresh Grib Files.*

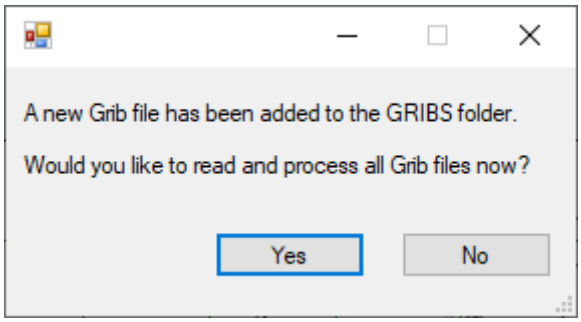


Figure 9 Message When File Is Added To The GRIB Folder.

More On Gribs ...

The Saildocs dialog user selections covers the most common options available from Saildocs and should be adequate in most situations. To use advanced options you have the ability to manually edit the grib request text. Refer to the Saildocs documentation sources to fully understand the options and required syntax (Table 1, page 19).

In some cases the requested lat/lon resolution or interval may not be available from the original NOAA file. In such cases Saildocs will create grib files that match as close as possible. Likewise some NOAA model outputs are only valid for certain geographic areas and available resolution may vary depending on lat/lon area selected. Again Saildocs will attempt to provide what is requested within these constraints.

Grib Files From GRIB.US

Another convenient source of global GFS model grib data when you have a high speed internet connection is GRIB.US at www.grib.us . To use the service you download an application program that runs locally on your PC. You can graphically select a region you want the grib data for. The file is downloaded from the web automatically to a PC folder you specify. If you make the download folder the SailFast GRIB folder then it will be available for SailFast to use. GRIB.US may also be used as a convenient grib viewer however grib data is limited to wind, pressure and accumulated precipitation (rain).

GOMOFS - Gulf Of Maine Tidal Currents

In January 2018 NOAA's Gulf of Maine Ocean Forecast System (GOMOFS) , part of the Operational Nowcast and Forecast Hydrodynamic Model Systems(called OFS), became operational. GOMOFS is one of 14 regional models which provide nowcast and short-term (typically 0-48 h) forecast predictions of pertinent parameters (e.g., water levels, currents, salinity, temperature, and waves). GOMOFS data output includes surface currents in hourly intervals from 1 to 72 hours (3 days) over a region from Buzzards Bay Massachusetts to Halifax NS. The model is run 4 times per day at (00z, 06z, 12z, and 18z UTC). The model grid is roughly 700 meter (=.37 NM) while SailFast's minimum grid spacing is 0.01 degrees (~ 0.6 NM). GOMOFS combines a tidal model with wind driven surface current and is forced by the NAM and RTOFS model outputs.

OFS forecast data is made available as NetCDF files. This file format allows more complete model and data information compared to grib files, which is beneficial for long term analysis by scientists. Unfortunately NetCDF files are much larger than equivalent grib files and are not directly compatible with weather programs like SailFast.

SailFast users can access GOMOFS data using the same method as Saildocs files (). However only the "Send Grib Request" method can be used for GOMOFS. Saildocs itself does not support GOMOFS, so sending a request directly to Saildocs via email will fail. This means that you must have the equivalent of an internet connection to get GOMOFS data. When off shore a satellite phone can provide an internet connection, however steps must be taken to prevent unwanted communication from consuming all your expensive satellite minutes. You don't want a Windows update to start running in the background.

For convenience the syntax for the GOMOFS data request looks the same as a Saildocs grib request. When a GOMOFS request is sent it goes to the SailFast server. The server interprets the request and downloads the needed NetCDF files from the most recent model run to the server. It then extracts the data for the lat lon area and grid resolution requested and produces a compressed binary zip file. This zip file is then downloaded in the same manner as a grib file using the "Check For Grib File" button. Because of the large NetCDF file size the server processing may take as much as 10-15 minutes. Subsequent requests to the same model run are usually much quicker.

When downloaded the zip file is automatically placed in a folder with the same zip file name, in the users GRIBS folder. No other special handling by the user is required. The GOMOFS data is accessed and used just like a grib file.

Prior to version 10 SailFast included built-in Gulf of Maine tidal currents based on the Canadian Hydrographic Service Atlas of Tidal Currents. These have been removed in favor of the much more detailed GOMOFS model data.

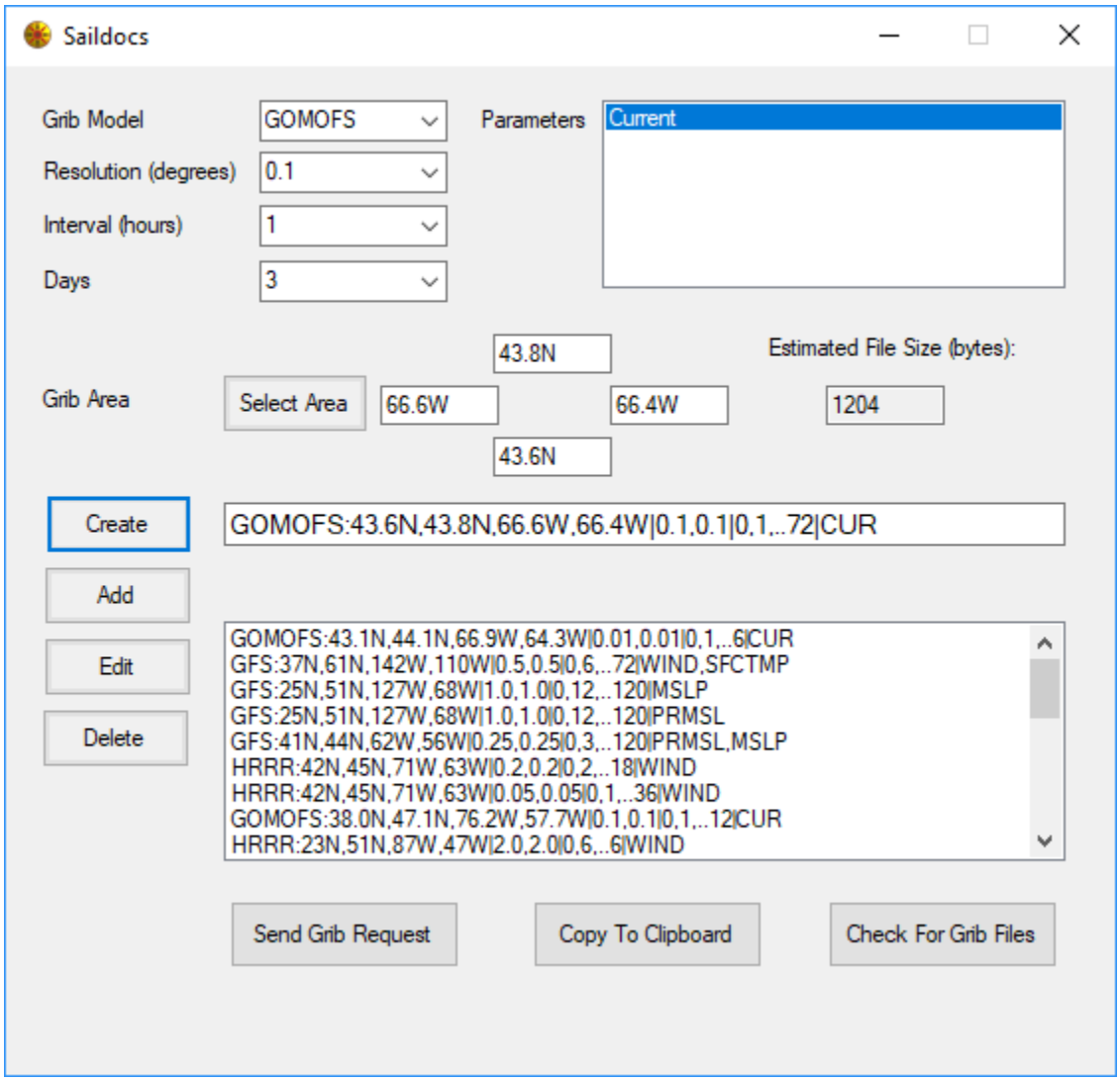
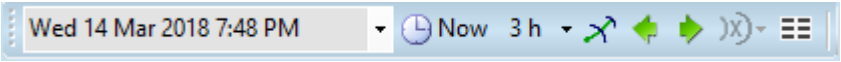
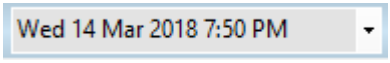


Figure 10 GOMOFS Forecast Request

Grib Viewing Controls



Weather parameters available from grib files you place in the GRIBS folder may be displayed at any time. The toolbar controls described here control the display. The function of these controls varies depending on the active display mode. There are 2 modes: normal mode and isochron mode. When an optimum routing solution is displayed SailFast is in isochron mode.

- ***Display Date/Time.*** 

Displays the date & time for the chart display. Background is grey when the display is in real time. When not in real time the background is yellow.

  To view a grib at other than real time, either edit the date time in the box or select *Set Custom Time* from the drop down list. If a grib file *with Wind* forecast is loaded in the GRIB folder that covers the area displayed in the chart then the drop list will show all forecast times available in the grib file.

- ***Real Time Display (Now).*** 

Sets the display time to the present PC system time. The Date/Time display will have a grey background.
- ***Next/Previous Time Interval.*** 

Sets the time interval increment change when the *Next* or *Previous* button is pressed.
- ***Show Isochrons.***  Toggles the display between normal mode and isochron mode. In isochron mode the last complete isochron and optimum route solution is shown.
- ***Previous.*** 
In isochron mode: displays the previous fastest track segment. Press and hold to repeatedly step to previous segments in increasing step size.

- In normal mode: decrements the present display time by the Next/Previous Time Interval. Use to step through and view grib file forecasts.
- ***Next.*** 
In isochron mode: displays the next fastest track segment. Press and hold to repeatedly step to previous segments in increasing step size.

  In normal mode: increments the present display time by the Next/Previous Time Interval. Use to step through and view grib file forecasts.
- ***Isochron Display Spacing.***  Sets how many isochron lines in an optimum routing solution are displayed.

- ***Optimum Route Table.***  Displays a table of detailed sailing data for the most recent optimum route solution.

Grib Display Panel

Select the *Grib Display* tab on the left of the screen to select which grib parameters to display on the chart. When a parameter is first checked the bottom half of the panel will open showing the display settings for that parameter. Note the name of the parameter, Wind 10m (kt) in this example, is repeated at the top of the lower settings panel.

Hint: To see the settings of another parameter without toggling its display on/off, simply right click it in the top list of parameters.

Note that the 3 most used parameters, Wind, Pressure and Current may also be toggled on/off by using the buttons in the main SailFast toolbar.

Close the Grib Display panel by selecting the “X” above the *Data* tab.

In the screen shot below, Wind is displayed as “filled” arrows that are scaled with speed. So the light wind arrows are small and higher wind strength arrows are larger. The Density slider is at maximum which means that all the data points contained in the grib file are being displayed, unless SailFast has reduced the displayed number for improved clarity. Sea temperature is displayed using a color gradient. There are also brown contour lines. Each line represents the points of constant temperature and there is a 2 °C temperature change between adjacent contour lines.

There are number of ways weather parameters may be displayed to suite your personal preference. These are explained in the following section.

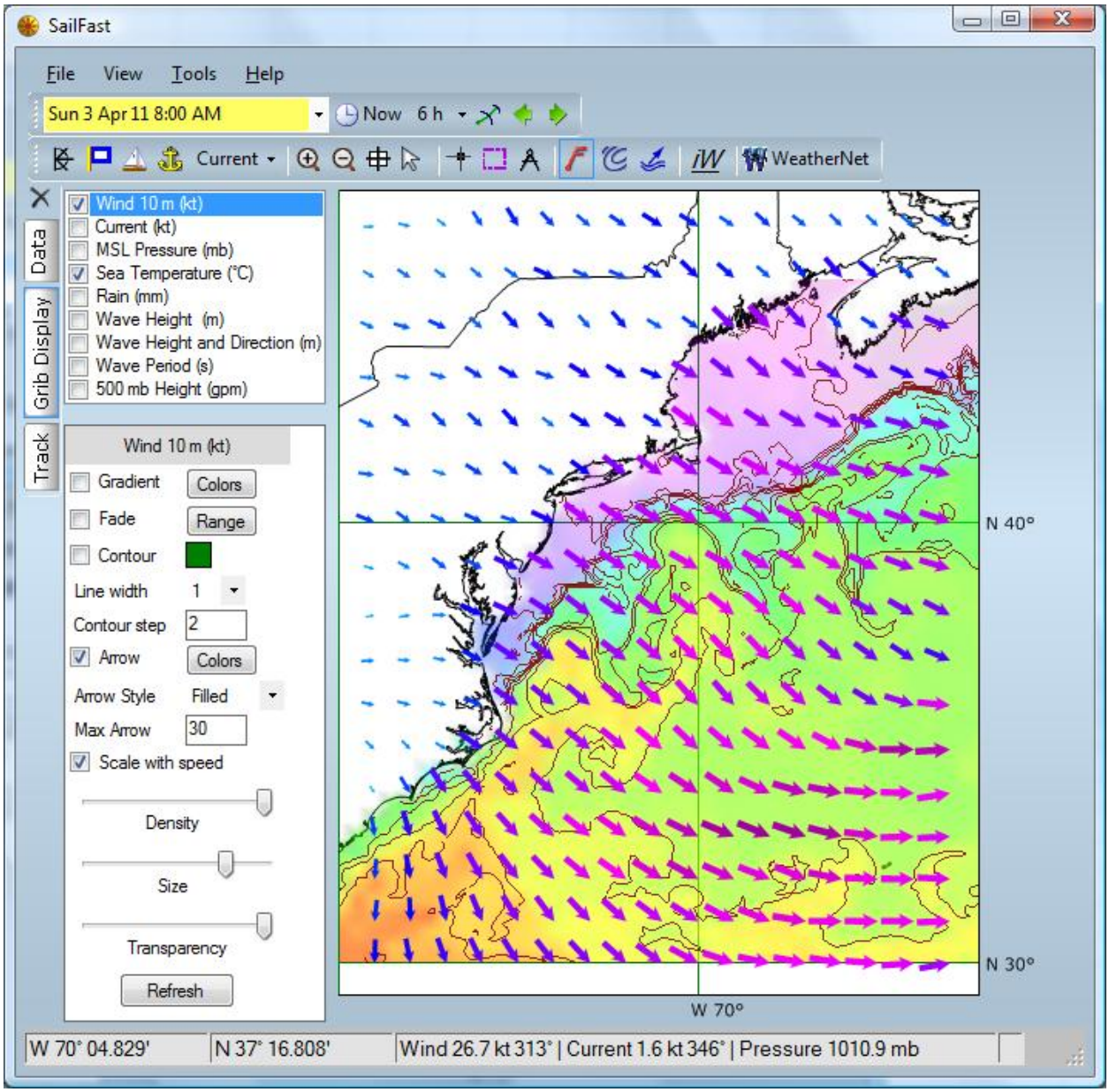
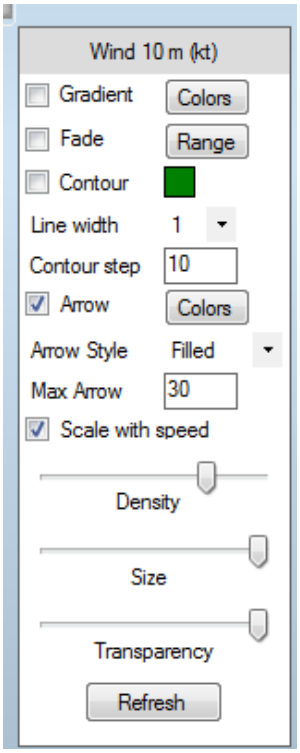


Figure 11 Gulf Stream Sea Temperature With Wind Overlay

Grib Display Settings



Gradient – Displays a color gradient. The color corresponds to the magnitude of the grib parameter. Select the Color button to adjust the gradient colors.

Fade – Adjusts the gradient and arrow display transparency based on the parameter magnitude. Select the Range button to set the magnitudes for transparent and opaque display.

Contour – Shows a contour mapping of the parameter magnitude. Click the color box to select a different contour color.

Line width – Sets the contour line width.

Contour step - Sets the change in parameter magnitude between contour lines.

Arrow – Displays an arrow shape. Select the Colors button to set the color.

Arrow Style – Choose from 3 styles: Simple, Chevron and Filled.

Max Arrow – When arrow size is scaled versus the speed (i.e. magnitude), arrow size will not increase for speeds greater than this value.

Scale with speed – Displayed arrow size is roughly proportional to the speed.

Density – Lowering the density decreases the number of arrows displayed. SailFast will automatically make some density adjustments based on the zoom factor. Adjusting this control will not always result in a change to the display.

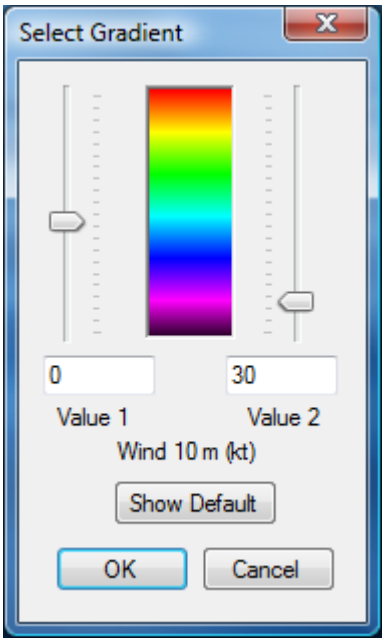
Size – Adjust arrow size.

Transparency – Adjusts overall transparency.

Refresh Button - Updates the chart display. Most adjustments to the display settings will be shown immediately on the chart. Slider adjustments and Contour step and Max Arrow changes will not be shown until the next manual or automatic chart update

Note that only Wind, Current and Wave Height & Direction parameters have arrow related settings.

Gradient Color

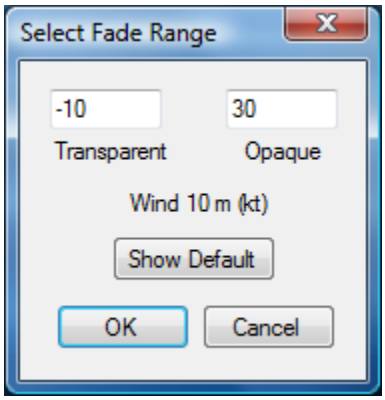


This color dialog sets the colors displayed for Gradients and for the Arrow. There are independent settings for each. The 2 vertical track bar positions correspond to the color that will be displayed at the parameter values for Value 1 and Value 2. In this example a Wind of 0 kts will display light blue and 30 kts will display magenta. For other Wind speeds linear interpolation is used to find the display color. Interpolation continues beyond the end points, so a Wind of 40 kts will be nearly black in this case.

Adjust the values and track bars for your display preference. *Show Default* changes the settings to factory defaults which may be accepted with *OK* or rejected via *Cancel.*

If you want a single color only for an arrow, set the track bars at the same color position.

Fade Range



The Range dialog sets transparency levels of the Gradient and Arrows when either are displayed. Parameter values corresponding to total transparency to fully opaque are set. Actual values beyond these limits are either transparent or opaque. The degree of transparency is interpolated between the limits.

In this example the transparent value was set to -10 which means arrows are still partially visible even as Wind becomes very light.

Setting Up Polars

Polar diagrams, or simply “polars”, describes the ideal boat speed for a given wind speed and wind angle. Polars are usually created from a velocity prediction program (VPP) and generally assume ideal conditions such as steady wind, ideal sails with ideal reefing, optimum sail trim, nominal wave conditions consistent with the wind, clean bottom and design weight. Serious racing programs like the Americas Cup will spend a great deal of time adjusting and validating the initial VPP polars to obtain the most accurate understanding of the boats capability.

In order to analyze boat performance and to calculate an optimum route and other what-if routes, you need to tell SailFast the polars to use. SailFast comes with some sample polars for a number of boats. These have been obtained from a variety of sources including the web and their accuracy and usefulness is not warranteed. Even if your boat is the same type as the sample polar, the sample polar will not be an exact match for your boat if the configuration used for the polar doesn’t match your boat. Variations in product options, such as keel type and mast size are examples. Also items like with or without a spinnaker, and folding prop or fixed prop. Having said that, if you find a polar that seems reasonable for your boat you will likely be able to use it.

Polar Diagram 

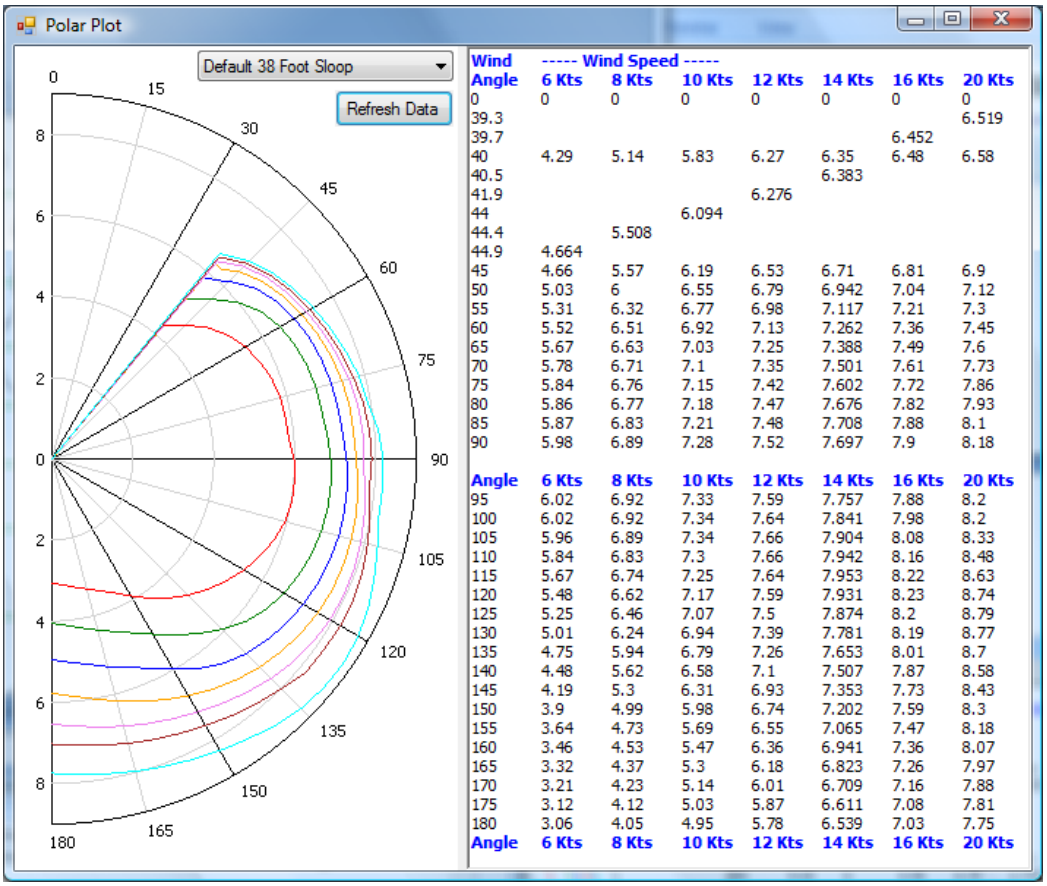
The toolbar Polar Diagram button opens a window showing the selected boat polar that will be used for optimum routing. The drop down list gives the choices for boat polars that are available. As first installed, the list includes all sample production boat polars included with SailFast plus a *Default 38 Foot Sloop* and *CustomPolars1.* To add other boat polars to the list you will first create a new folder for the polar files and then specify that folder in the *Tools/Options/Polars* tab. Detailed instructions are given in the Custom Polars section.

The default polars are for a Sabre 38 MK2 with symmetrical spinnaker, this is our SailFast test boat. The CustomPolars1 folder contains the same Sabre 38 polar data. You may modify the files in this folder to match your boat or make a new folder(s) with appropriate data files. The file format requirements are detailed below.

Most skippers will want to obtain polars for their boat and install them in SailFast™ . The polar information in terms of boat speed and true wind angle is entered in a simple text file. The data and the resulting polar diagram curves are displayed as shown below. During optimum routing simulation SailFast™ uses the predicted wind speed, predicted current (if any), and the boat heading relative to the wind to find the resulting boat speed from the polars. Interpolation of wind angle and wind speed is used to obtain the correct results for the given sailing conditions.

More than one custom polar may be created. This is useful if you race with different sail combinations or boat configurations, such as alternate keels. You could also analyze a competitors performance during a race if you had a suitable polar.

Polars are available from various sources. US Sailing is one recommended source. If the manufacturer of your boat is still in business they may be able to supply polars.



Wind Angle	----- Wind Speed ----- 6 Kts	8 Kts	10 Kts	12 Kts	14 Kts	16 Kts	20 Kts
0	0	0	0	0	0	0	0
39.3							6.519
39.7						6.452	
40	4.29	5.14	5.83	6.27	6.35	6.48	6.58
40.5					6.383		
41.9				6.276			
44			6.094				
44.4		5.508					
44.9	4.664						
45	4.66	5.57	6.19	6.53	6.71	6.81	6.9
50	5.03	6	6.55	6.79	6.942	7.04	7.12
55	5.31	6.32	6.77	6.98	7.117	7.21	7.3
60	5.52	6.51	6.92	7.13	7.262	7.36	7.45
65	5.67	6.63	7.03	7.25	7.388	7.49	7.6
70	5.78	6.71	7.1	7.35	7.501	7.61	7.73
75	5.84	6.76	7.15	7.42	7.602	7.72	7.86
80	5.86	6.77	7.18	7.47	7.676	7.82	7.93
85	5.87	6.83	7.21	7.48	7.708	7.88	8.1
90	5.98	6.89	7.28	7.52	7.697	7.9	8.18
Angle	**6 Kts**	**8 Kts**	**10 Kts**	**12 Kts**	**14 Kts**	**16 Kts**	**20 Kts**
95	6.02	6.92	7.33	7.59	7.757	7.88	8.2
100	6.02	6.92	7.34	7.64	7.841	7.98	8.2
105	5.96	6.89	7.34	7.66	7.904	8.08	8.33
110	5.84	6.83	7.3	7.66	7.942	8.16	8.48
115	5.67	6.74	7.25	7.64	7.953	8.22	8.63
120	5.48	6.62	7.17	7.59	7.931	8.23	8.74
125	5.25	6.46	7.07	7.5	7.874	8.2	8.79
130	5.01	6.24	6.94	7.39	7.781	8.19	8.77
135	4.75	5.94	6.79	7.26	7.653	8.01	8.7
140	4.48	5.62	6.58	7.1	7.507	7.87	8.58
145	4.19	5.3	6.31	6.93	7.353	7.73	8.43
150	3.9	4.99	5.98	6.74	7.202	7.59	8.3
155	3.64	4.73	5.69	6.55	7.065	7.47	8.18
160	3.46	4.53	5.47	6.36	6.941	7.36	8.07
165	3.32	4.37	5.3	6.18	6.823	7.26	7.97
170	3.21	4.23	5.14	6.01	6.709	7.16	7.88
175	3.12	4.12	5.03	5.87	6.611	7.08	7.81
180	3.06	4.05	4.95	5.78	6.539	7.03	7.75
Angle	**6 Kts**	**8 Kts**	**10 Kts**	**12 Kts**	**14 Kts**	**16 Kts**	**20 Kts**

Figure 12 Polar Diagram

Polars Folder

User inputted boat polars are specified in files placed in folders under the Polars folder. Refer to the users folders description. The Polar folder and file details are described in a later section. SailFast™ ships with default polars for a Sabre 38. The default files are hidden from the user and cannot be deleted or modified. Additionally there are other child folders for a number of polars of popular production boats. These are:

Archambault A35
Aerodyne38
Aerodyne43
Baltic44_(Asym&Sym)
Beneteau First 36.7
Beneteau First 40.7
Beneteau Oceanis 351/352 (WK)
Catalina 22
Catalina 36
C&C34-36 XL (WK)
C&C 402 (DK)
Farr 40
J109

Quest 33
Sabre362
Sabre38-2

If you delete one of these folders it will be created again next time SailFast is run. We make no claim to accuracy of these polars. Note also that polars for a given boat design can vary when they are created based on a given sail inventory, keel type or optional rig size.

Custom Polars

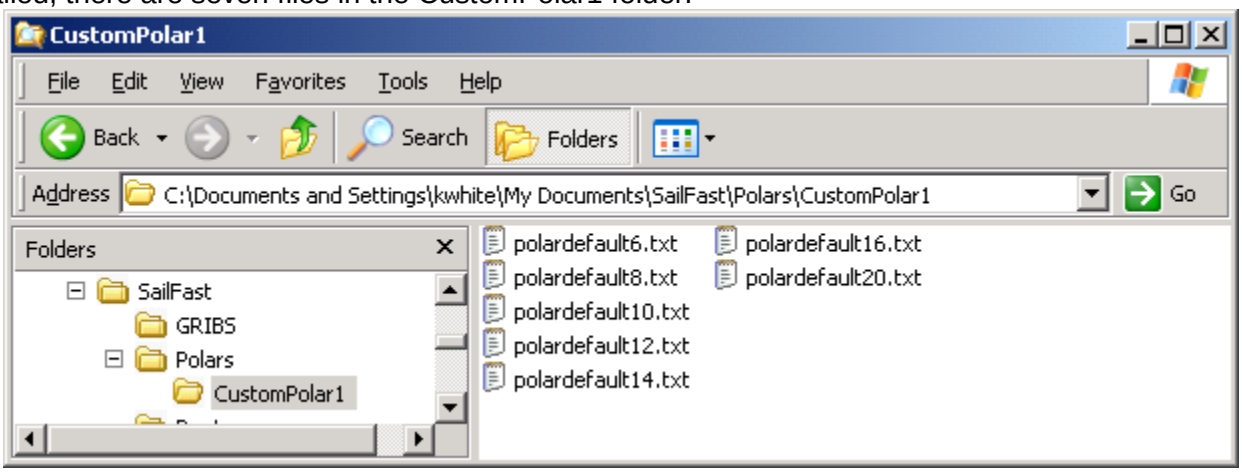
User custom polars are normally located in child folders under Polars, such as:

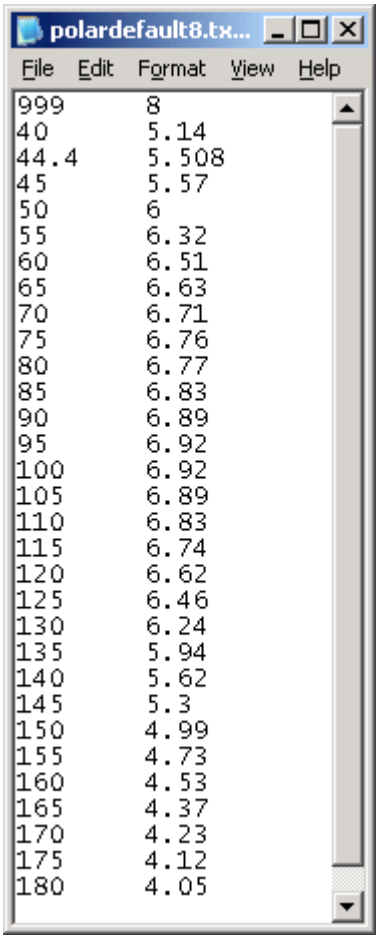
Documents/SailFast/Polars/CustomPolar1

In this example there is a custom polar folder named “CustomPolar1.” When SailFast™ is installed this folder is created as an example. You may change the folder name to a more meaningful name like your boat name. You may wish to leave CustomPolar1 and its files alone as a working polar example. You can then make a copy of the entire folder and paste it in the Polars folder and rename it. Then make adjustments to or replace the files in this new folder.

The folders you create under the Polars folder will be shown as items in the Polar Plot list box, <u>but only after you designate the folder in the *Tools/Options/Polars* dialog</u>. Up to 5 custom folders may be specified.

As installed, there are seven files in the CustomPolar1 folder.





These files are copies of the default 38 foot sloop files. These may be modified or deleted without affecting the actual default polars which are hidden and located elsewhere. The file names are arbitrary and may be changed to be meaningful to you. To make the file name user friendly we have included a number corresponding to the wind speed for the file. So polardefault8.txt is a file with 8 knot true wind speed data.

Here you see the contents of this file as displayed by Windows NotePad. This data is typical of what is provided by US Sailing polars. For the file to be understood by SailFast™ you need to follow these rules:

1. Each line contains only 2 numbers. There is a single “Tab” between each number. No extra tabs or spaces should be added.

2. The first number on the first line is always “999”.

3. The second number on the first line is the true wind speed. In this example it is 8 knots.

4. All following lines begin with the true wind angle relative to the bow, in degrees. This is followed by the boat speed in knots. For this file the second line represents wind at 40 degrees off the bow and boat speed of 5.14 knots.

5. The degrees of each line must be in ascending order. So if you had data to enter at 82 degrees, it would need to be inserted between the existing 80 and 85 degree lines.

6. The smallest degree entry, which is made on line 2, must be greater than 0. It is 40 degrees in this example.

7. The last line <u>must be for 180</u> degrees.

8. The number of lines may vary from file to file. The more lines the smoother the polar curve. SailFast™ uses linear interpolation between values to estimate boat speeds at other angles and wind speeds.

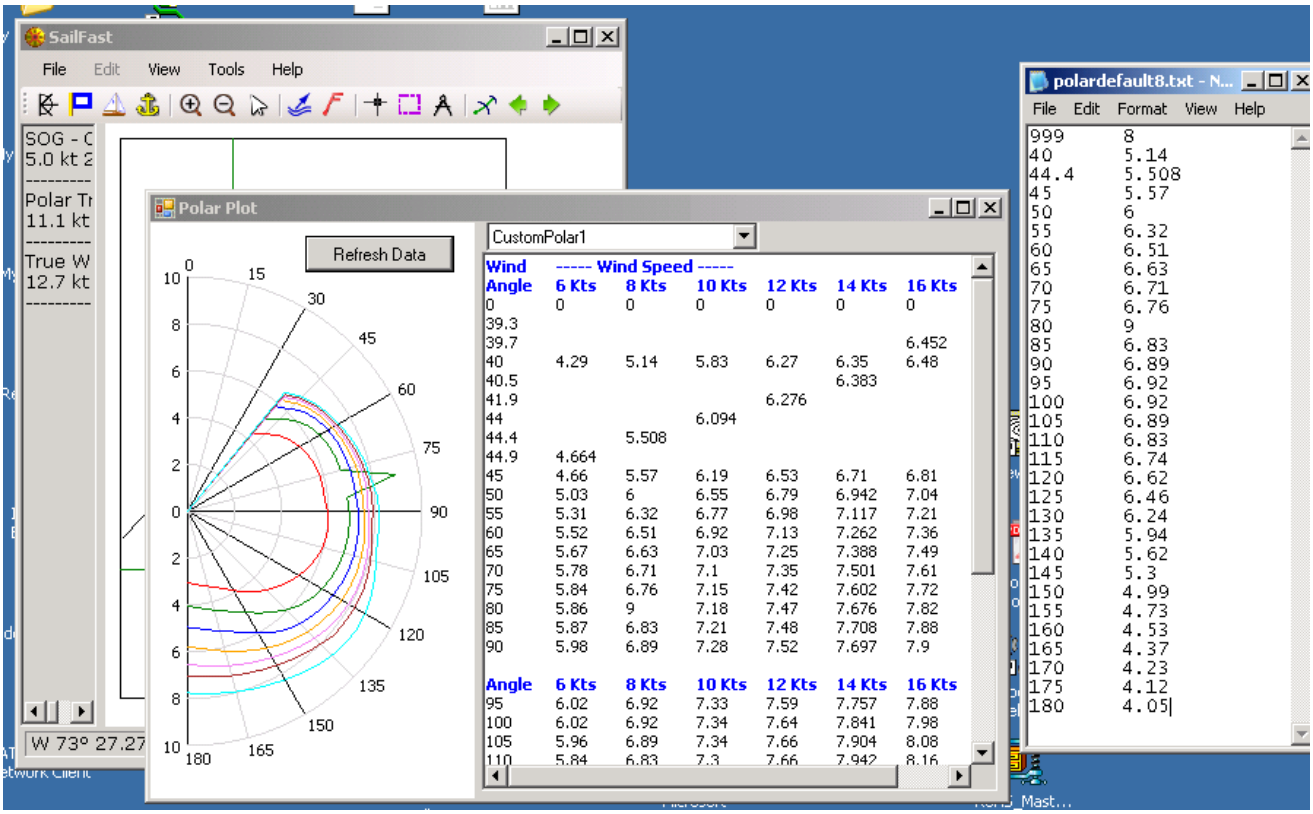
To input your polars you can modify these files or create new ones from scratch. <u>Do not place any other files in a Polar folder. Do not have more than one file in a folder at a given wind speed. Doing so will cause a program error.</u>

To create more than one set of polars create another folder in the Polars folder. Be sure to designate folders you want to use in the *Tools/Options Polar* tab dialog in SailFast™ . For instance you might end up with these folders if you had polars for two different style chutes, but only one type is used in a given race.

Polars
    Intrepid Asymmetric
    Intrepid Symmetric

To see how entered data changes the polars, adjust the SailFast™ screen to a reduced size, then open the Polars Diagram and select a custom polar with the list box. Then navigate to the folder location and open the file for the wind speed data you are adjusting.

The screen shot shows that the data in NotePad at 8 knots and 80 degrees has been changed to 9 knots, giving a big bump in the curve. For this to be shown on the polar diagram, save the NotePad file (File/Save) and hit the Refresh Data button on the Polar Diagram. You can easily see if your entered data makes sense and if there are enough points for a smooth curve. Some polars give speed data at widely spaced angles and you will want to add additional angle & speed data points to get a better curve.

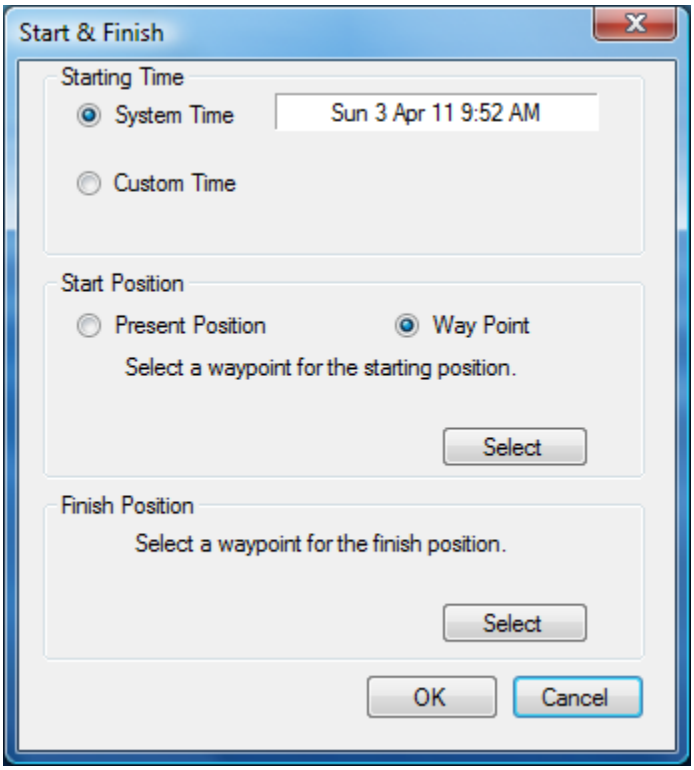


How To Do Optimum Routing

Before you can do optimum routing you will need to obtain a grib file with a Wind forecast that covers the area where you will be sailing. Preferably the grib file will have multiple forecasts and each forecast will be 3 or 6 hours apart. The last forecast time in the grib file should be later than the time when you expect to reach the designated finish waypoint for the routing you will be doing. There are options for handling the situation where the wind forecast does not fully span the sailing times for the routing. This is covered in the Weather Routing Settings And "What – If" section. To get started with your first routing we suggest you obtain a grib using NOAA's GFS model and follow the directions in section Download Saildocs Gribs Using SailFast

Start & Finish

To determine an optimum route the first step is to define the start and finish locations, and the start time. Start time can either be the present date and time according to your PC time setting (System Time), or some other time in the past or future. Start position is either a fixed lat lon location or the present vessel position based on NMEA input to your PC from a GPS, if available. Fixed start and finish positions are picked by selecting waypoints from a list. The waypoints need to have been created previously, however. (Refer to the next section for setting waypoints.)



Setting Waypoints

To create a new waypoint select the Waypoint button on the toolbar. The cursor will change to a small cross. Position the cursor at the location for the waypoint, either visually from the chart display or with the help of the lat lon position shown at the bottom left of the chart window. Place the waypoint by left clicking the mouse.

Once the waypoint is placed the Set Waypoint dialog is displayed which may be used to fine tune the location by entering exact lat lon values if desired. An optional short name and longer description may also be entered. Using short names like “Start” , “Finish” or “Breaking Rocks Bell” is helpful later when choosing a waypoint from a long list of points. Checking *Lock Waypoint* will prevent the waypoint from being moved by dragging with the mouse. This will prevent inadvertent moves.

Once a waypoint is created it may be moved by dragging, or the Set Waypoint dialog can be opened and the position, Name, Description or locking edited. The next section on Sailing Boundaries describes how to move and edit waypoints.

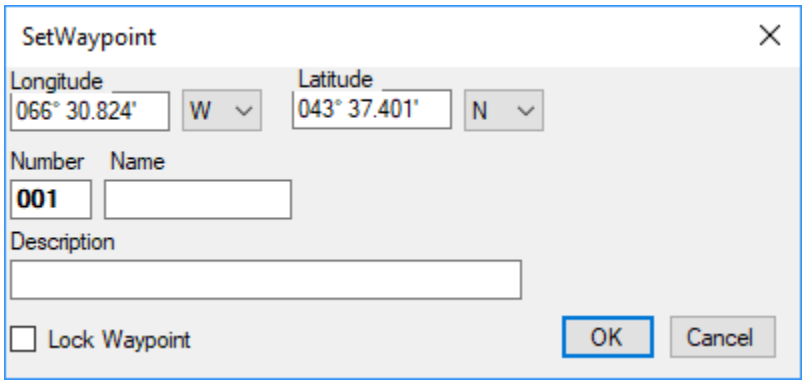
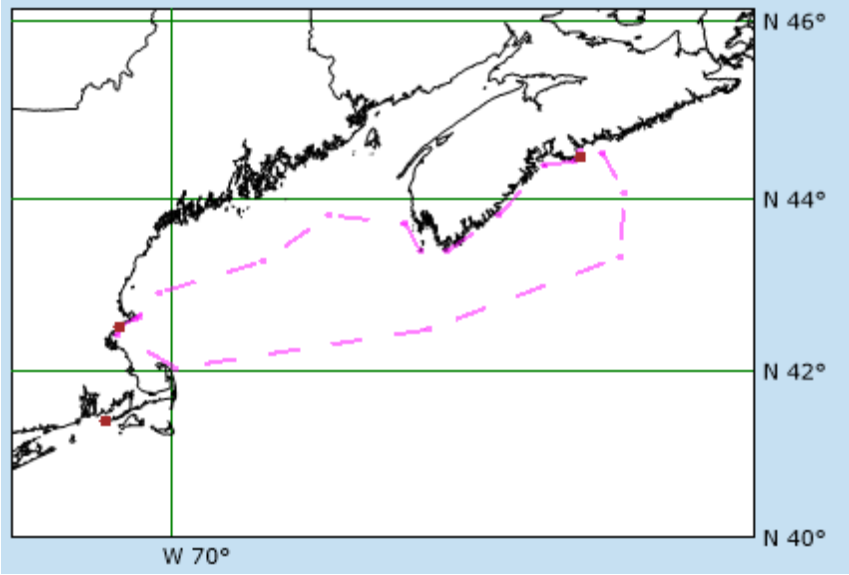


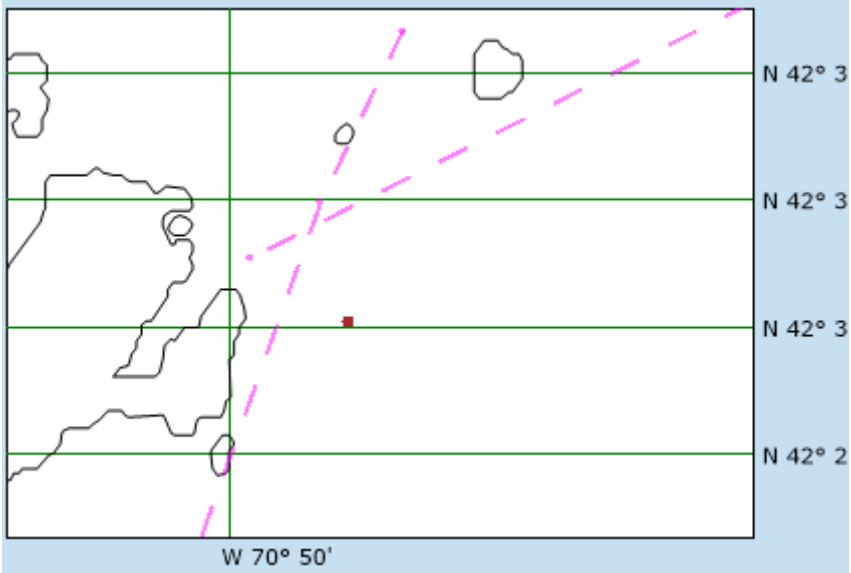
Figure 13 Set Waypoint Dialog

Sailing Boundaries 

Sailing boundaries should be created to define realistic limits of the race course for which an optimum route is to be found. This reduces the time it takes to compute the solution and can also prevent a solution that might take you over land or un-navigable water. Expanding or contracting the sailing boundary is also an effective way to find "what-if" solutions, like "how about if I only sail close to the rhumb line and don't go wide?" However if you make the boundary too small there may not be any solution and the routing will fail with an error message.



More than one boundary may be created. These may be enabled or disabled. Refer to *Menu / View / Sailing Boundary.*



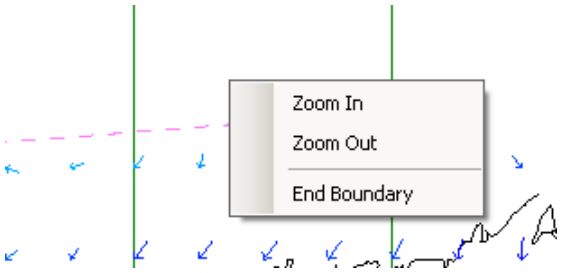
The magenta dashed line in these screen shots is the sailing boundary. The line segments connect special waypoints that are created when the boundary is defined This is an example boundary for a Marblehead to Halifax race. You can adjust the displayed boundary line width in *Tools/Options/Display*.

To make a boundary click the *Sailing Boundary* toolbar button. Position the

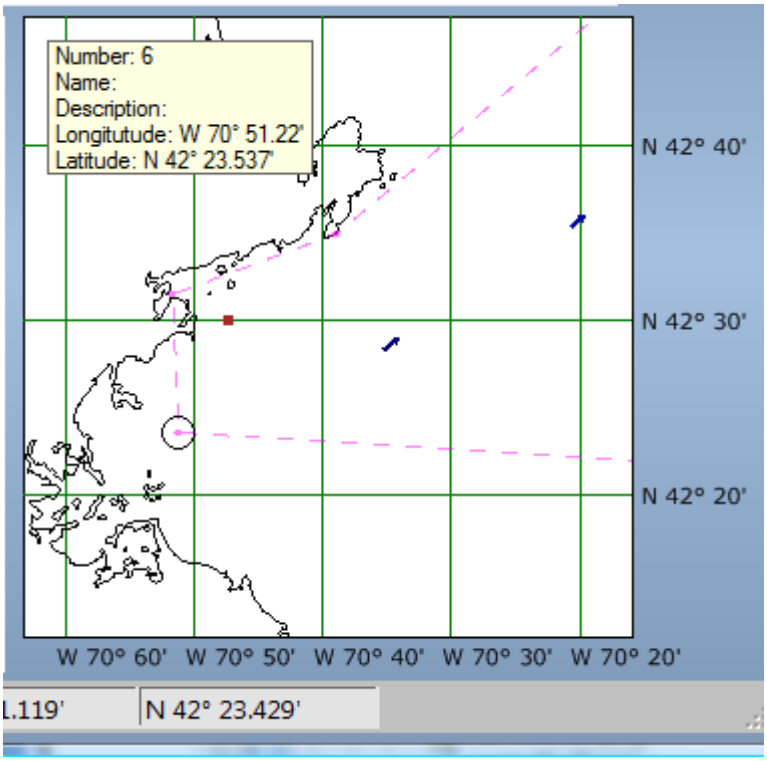
mouse at the first position and left click. Go to the next position with the mouse and repeat the process until the boundary is complete. To set a boundary near to an irregular coast line you may want to initially place extra waypoints. If later you find there are more than you need to adequately define the boundary you can delete extras. It is best not to delete the boundary line end points however. Do not make boundaries too close to the Start and Finish waypoints as this can overly constrain the course calculation and cause convergence errors.

Generally the boundary will fully enclose an area. It is not necessary for the ending waypoint of a boundary to exactly land on the starting boundary point. You can just have the lines intersect as shown in the zoomed in portion of the Marblehead starting area (2nd screen shot).

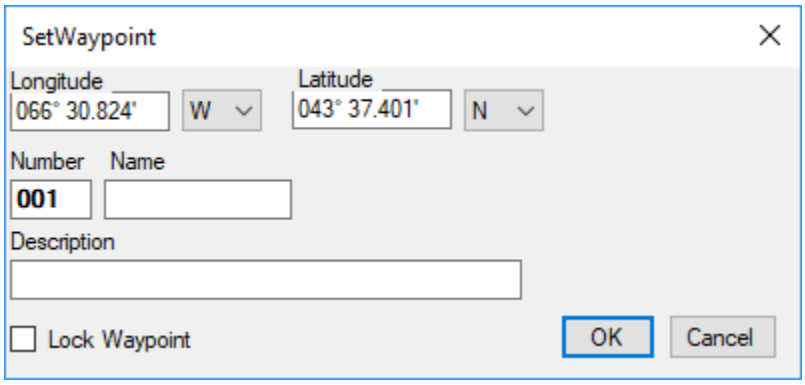
When you have completed the boundary click the toolbar button again to leave that mode, or click the toolbar arrow button. Or right click the mouse and select *End Boundary* from the context menu.



Once the boundary has been established you may go back, zoom in and reposition any of the "waypoints" as needed. If you mouse over a waypoint it is highlighted by a small circle on the chart and a data display pops up in the top left corner of the chart. You can now left click and hold down the mouse, and drag the waypoint to a new location. If the waypoint is locked the mouse over circle will be red and the way point can not be moved by dragging unless lock is unchecked.



An alternative to dragging a waypoint is to edit the lat lon in the waypoint dialog box. For this, mouse over the waypoint, right click, and select edit in the context menu.



Weather Routing Settings (The Basics)

We will cover all the available settings and other "what-if" techniques in a later section: Weather Routing Settings And "What – If" . For now let's just consider the most common settings needed for doing a routing.

Pressing the routing settings button opens a dialog with 3 tabs: *General, Wind* and *Current.*

On the General tab set the Simulation Time Step in hours. For off shore sailing the normal recommendation is to start with 3 or 6 hours. When the total distance being sailed is relatively short or there are relatively rapid changes in the wind or current during the time step, then a shorter time step is appropriate. Usually you won't have to go shorter than 1 hour. In any case, once you get a simulation to run well you can try various time steps to see the effect. Leave all the other options on the General page disabled (unchecked).

On the Wind tab, for *Wind At Start* select *Use Grib forecast if available.* Under *After Grib Forecast Ends* select *Extend last forecast.*

On the Current tab, under *For Display and Simulation* select *Use Grib File Currents.* Under *Before Earliest Grib Current Forecast* select *Use Earliest Forecast.* Under *After Last Grib Current Forecast* select *Extend Last Forecast.*

Start Sailing

The Start Sailing button begins simulated sailing from the designated start to finish waypoints. Of course these waypoints do not have to be the actual race start and finish lines, but can be any intermediate points you wish. Determining the optimum route begins with the boat at the start and computing what happens if the boat is sailed at a fixed heading for a set length of time called the time step. The time step is user selectable on *Weather Routing Settings* dialog. The computation is performed for all headings and the position the boat reaches for each course is noted. Then the end points are analyzed to find the points that make up the farthest distance sailed from the start. These end points define the first **isochron**. The word isochron is derived from “iso” for constant and “chron” for chronometer. So it refers to a grouping where time is constant. In our case it is the locus of farthest points that can be reached in a single time step period.

The second isochron is found in a similar way, except now the starting point is every point on the first isochron. Where the boat can sail in another time step is now determined from each of these starting points. The end points are again evaluated and the 2nd isochron determined. If the boat headings evaluated are taken in 1 degree increments there are 360 course calculations required for the first isochron. For the 2nd and later isochrons there could be 360 starting points x 360 headings tested. This would result in 129,600 possible

sailing segments being evaluated for each time step! The sailing boundaries and other internal methods are used to reduce this considerably.

The simulated sailing continues until the finish waypoint is reached. During the simulation isochrons are updated on the screen periodically. Once the finish is reached the display changes to the Show Isochrons mode.

Show Isochrons 

After a successful sailing simulation the isochrons are displayed as well as the optimum route from start to finish. The screen shot below shows typical isochrons (blue lines) and the best track (green lines). The time step was 3 hours and it took 80.6 hours from start to finish as shown by the ETA at the bottom of the data display area on the left. Two grib files where downloaded from Saildocs for this simulation. A GFS grib with wind and mean sea level pressure for 10 days, and an RTOFS grib with current and surface sea temperature for 5 days. Using the Grib Display tab any of the available weather parameters may be displayed with the isochrons and best track.

This example could apply to the Newport to Bermuda race or the Marion to Bermuda race. The Gulf Stream current and sea temperature forecast obtained from the NOAA RTOFS model is displayed. In this case the Gulf Stream has a well defined south easterly flow position somewhat below the rhumb line. SailFast correctly recommends a course from the start that picks up this portion of the stream and rides it towards Bermuda. Note how the shape of the isochrons bulges out where the stream is most favorable. Of course the wind forecast is also a key component of the optimum solution, and can easily dominate current effects. Note the areas where the isochrons are spaced closely together. This indicates that the wind is light and the boat speed is low during this sailing segment. This can be confirmed by displaying the grib wind on the chart or by looking at the segment data. If I was prepping for a race I would study the forecasted wind closely and the sea level pressure. Any high or low pressure areas that move through the race area during the course of the race can have a major impact on the routing. During a race it is useful to monitor and record the measured sea level pressure, and compare it to the forecast. This can help validate the forecast and anticipate changes.

The fastest route is shown in green and when first displayed the final segment when the finish is reached is highlighted. Use Tools/Options/Display to adjust the line width of the fastest route. The data display shows key sailing data for this final segment. The next and previous buttons on the toolbar may be used to step through each segment sequentially. Hold down Next or Previous to step quickly.

As each segment is displayed the time at the beginning of the segment is shown at the top of the data display and also in the yellow highlighted text box on toolbar at the top of the chart. The date/time text is displayed with a yellow background whenever the display is not real time information. The green boat icon is positioned at the beginning of the current course segment. Hover over the boat icon and right click the mouse to change its size.

The isochron display may be closed by hitting the *Show Isochrons* button again or by pressing the *Now* button. The chart display then reverts to real time mode. Assuming an optimum route has been found previously, the isochron display can be activated or closed at any time.

Only the last isochron solution is saved for display, so a newly completed sailing simulation will overwrite a previous solution. The last optimum route solution is saved in a file and consequently will be available if the program is closed and later opened. If you have access to a printer you can use the File/Print menu to print an image of the chart for comparison to other routing solutions. If you can select a printer that prints to a PDF you

could save the image to a PDF file for comparison. Another alternative is to use the Windows Snipping Tool to capture an image of the chart and save it to a file or paste it into an app such as Word or Excel.

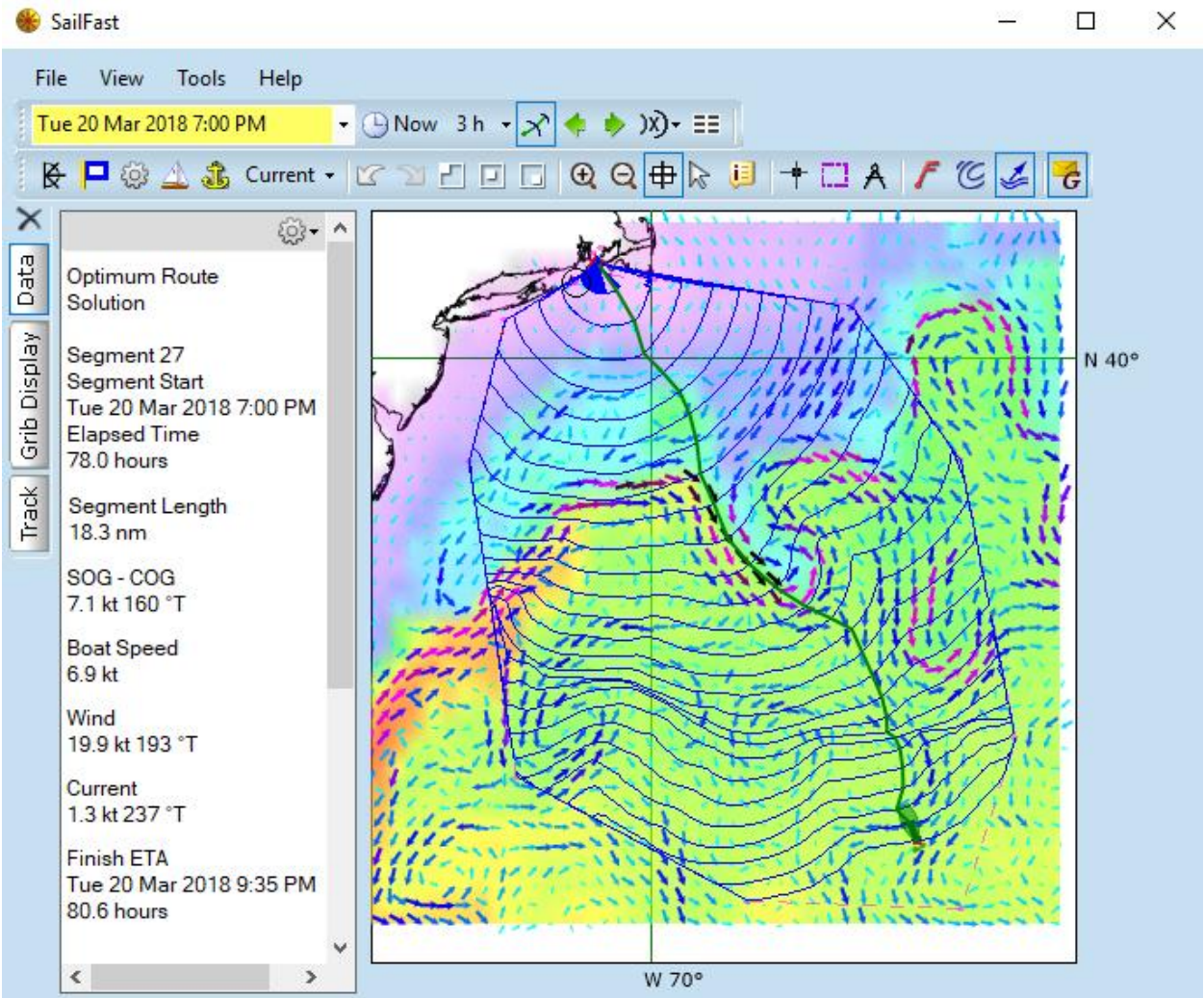


Figure 14 Newport - Bermuda Race Example

When an optimum route simulation is successfully completed, file OptimumRoute.csv is created in the Documents\SailFast\Optimum Route folder. If the file already exists from a previous simulation it is overwritten.

Select *Optimum Route Table* to view detailed data for each routing segment. This data is more comprehensive then the data in the left panel of the chart window. Figure 15 shows the table with the first 21 sailing segments corresponding to the previous example. The time at the start of each segment is given along with the lat lon coordinates. The vessel is steered according to the Heading. The course over ground (COG) will be different then the heading in the presence of current. Note that SailFast does not make any adjustment for vessel leeway. Wind is the grib forecasted value that would be observed if the vessel remained in a fixed position. Apparent and true wind speed and angle as would be observed while sailing will help with selecting sails and sail trim.

Segments 10-13 show the vessel in favorable current of 4+ knots. Note the beneficial effect on speed over ground (SOG). While SailFast will find the best track in a forecasted current stream, actual wind and current can be expected to differ. To maximize SOG you need to know what the actual current is doing as you move with or across the current stream. Learn more at: http://www.sailfastllc.com/AppNoteCurrentSetAndDrift

OptimumRouteTable

Print

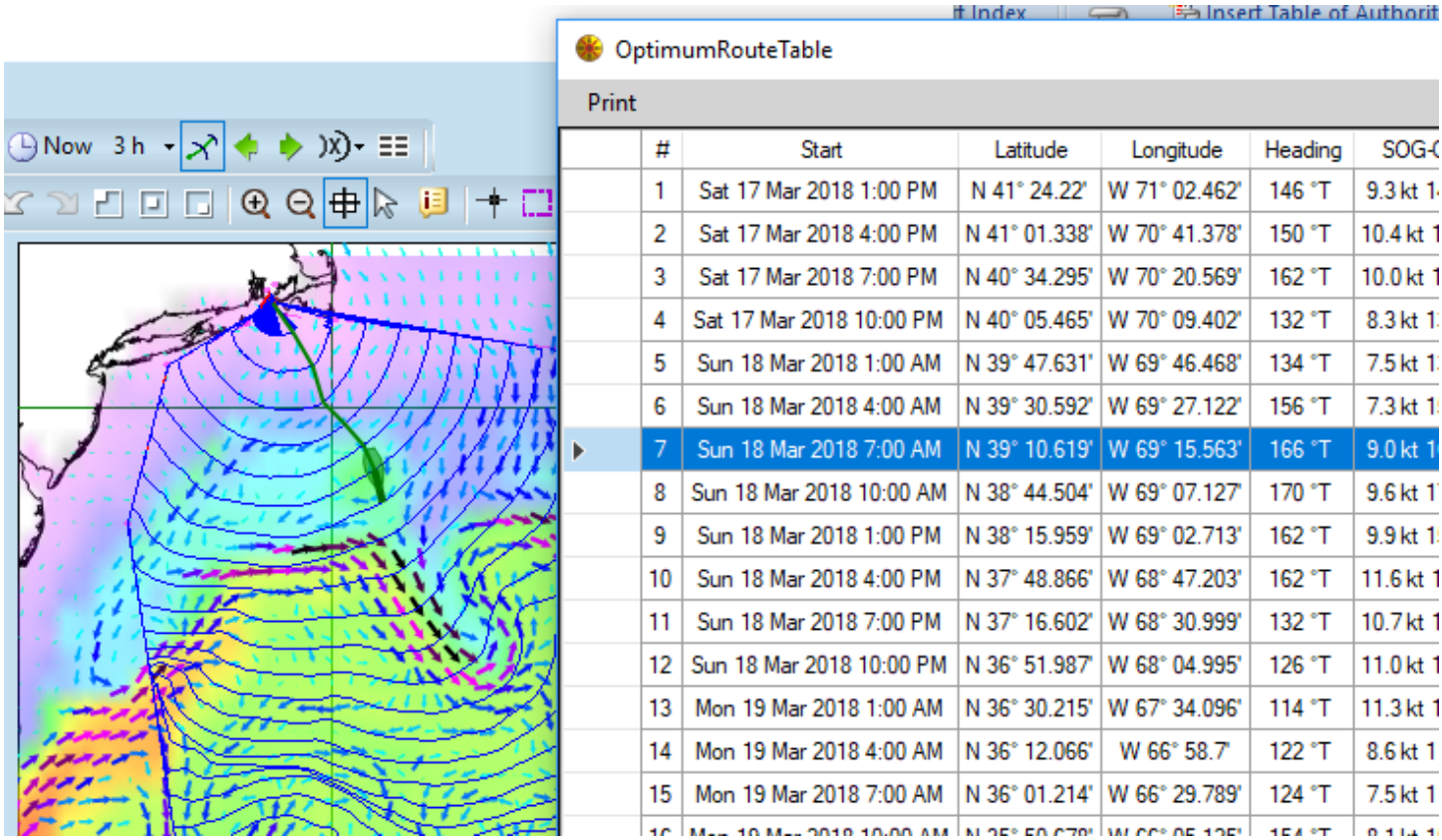
#	Start	Latitude	Longitude	Heading	SOG-COG	Boat Speed	Distance	Wind	AWS-AWA	TWS-TWA	Current
1	Sat 17 Mar 2018 1:00 PM	N 41° 24.22'	W 71° 02.462'	146 °T	9.3 kt 145 °T	9.0 kt	27.8 nm	20.0 kt 96 °T	15.6 kt 103 °	20.0 kt 130 °	0.3 kt 126 °T
2	Sat 17 Mar 2018 4:00 PM	N 41° 01.338'	W 70° 41.378'	150 °T	10.4 kt 150 °T	10.0 kt	31.3 nm	24.0 kt 107 °T	17.9 kt 113 °	24.0 kt 136 °	0.5 kt 145 °T
3	Sat 17 Mar 2018 7:00 PM	N 40° 34.295'	W 70° 20.569'	162 °T	10.0 kt 164 °T	9.5 kt	30.1 nm	23.4 kt 127 °T	16.5 kt 123 °	23.4 kt 143 °	0.6 kt 190 °T
4	Sat 17 Mar 2018 10:00 PM	N 40° 05.465'	W 70° 09.402'	132 °T	8.3 kt 135 °T	7.7 kt	25.0 nm	20.0 kt 146 °T	11.8 kt -159 °	20.0 kt -167 °	0.8 kt 168 °T
5	Sun 18 Mar 2018 1:00 AM	N 39° 47.631'	W 69° 46.468'	134 °T	7.5 kt 139 °T	7.5 kt	22.6 nm	17.6 kt 154 °T	10.5 kt -149 °	17.6 kt -162 °	0.6 kt 220 °T
6	Sun 18 Mar 2018 4:00 AM	N 39° 30.592'	W 69° 27.122'	156 °T	7.3 kt 156 °T	7.0 kt	21.9 nm	16.5 kt 145 °T	9.4 kt 161 °	16.5 kt 169 °	0.2 kt 153 °T
7	Sun 18 Mar 2018 7:00 AM	N 39° 10.619'	W 69° 15.563'	166 °T	9.0 kt 166 °T	8.3 kt	26.9 nm	19.1 kt 133 °T	12.6 kt 124 °	19.1 kt 146 °	0.7 kt 165 °T
8	Sun 18 Mar 2018 10:00 AM	N 38° 44.504'	W 69° 07.127'	170 °T	9.6 kt 173 °T	9.2 kt	28.8 nm	21.6 kt 133 °T	15.6 kt 119 °	21.6 kt 141 °	0.6 kt 227 °T
9	Sun 18 Mar 2018 1:00 PM	N 38° 15.959'	W 69° 02.713'	162 °T	9.9 kt 156 °T	8.4 kt	29.7 nm	22.8 kt 137 °T	13.8 kt 141 °	22.8 kt 155 °	1.8 kt 125 °T
10	Sun 18 Mar 2018 4:00 PM	N 37° 48.866'	W 68° 47.203'	162 °T	11.6 kt 158 °T	7.9 kt	34.7 nm	22.1 kt 140 °T	11.7 kt 139 °	22.1 kt 156 °	3.8 kt 151 °T
11	Sun 18 Mar 2018 7:00 PM	N 37° 16.602'	W 68° 30.999'	132 °T	10.7 kt 140 °T	6.9 kt	32.2 nm	19.7 kt 145 °T	9.0 kt -162 °	19.7 kt -170 °	4.0 kt 154 °T
12	Sun 18 Mar 2018 10:00 PM	N 36° 51.987'	W 68° 04.995'	126 °T	11.0 kt 131 °T	6.8 kt	33.0 nm	17.8 kt 146 °T	7.7 kt -139 °	17.8 kt -158 °	4.3 kt 140 °T
13	Mon 19 Mar 2018 1:00 AM	N 36° 30.215'	W 67° 34.096'	114 °T	11.3 kt 122 °T	6.8 kt	33.8 nm	16.5 kt 143 °T	7.2 kt -117 °	16.5 kt -148 °	4.7 kt 135 °T
14	Mon 19 Mar 2018 4:00 AM	N 36° 12.066'	W 66° 58.7'	122 °T	8.6 kt 115 °T	7.0 kt	25.8 nm	15.8 kt 138 °T	8.6 kt -141 °	15.8 kt -159 °	1.8 kt 87 °T
15	Mon 19 Mar 2018 7:00 AM	N 36° 01.214'	W 66° 29.789'	124 °T	7.5 kt 118 °T	6.5 kt	22.6 nm	14.6 kt 134 °T	7.6 kt -155 °	14.6 kt -167 °	1.2 kt 83 °T
16	Mon 19 Mar 2018 10:00 AM	N 35° 50.678'	W 66° 05.125'	154 °T	8.1 kt 155 °T	6.9 kt	24.2 nm	13.3 kt 126 °T	7.4 kt 120 °	13.3 kt 149 °	1.2 kt 163 °T
17	Mon 19 Mar 2018 1:00 PM	N 35° 28.726'	W 65° 52.735'	152 °T	7.8 kt 156 °T	6.9 kt	23.5 nm	11.3 kt 116 °T	7.3 kt 101 °	11.3 kt 139 °	1.1 kt 181 °T
18	Mon 19 Mar 2018 4:00 PM	N 35° 07.214'	W 65° 41.014'	156 °T	7.7 kt 157 °T	6.6 kt	23.1 nm	10.2 kt 115 °T	6.8 kt 90 °	10.2 kt 134 °	1.2 kt 160 °T
19	Mon 19 Mar 2018 7:00 PM	N 34° 45.975'	W 65° 29.82'	170 °T	6.5 kt 166 °T	5.5 kt	19.5 nm	7.5 kt 121 °T	5.5 kt 74 °	7.5 kt 127 °	1.1 kt 147 °T
20	Mon 19 Mar 2018 10:00 PM	N 34° 27.022'	W 65° 24.22'	186 °T	5.0 kt 178 °T	4.3 kt	15.0 nm	5.4 kt 127 °T	4.5 kt 62 °	5.4 kt 118 °	1.0 kt 140 °T
21	Tue 20 Mar 2018 1:00 AM	N 34° 12.073'	W 65° 23.642'	120 °T	3.2 kt 125 °T	2.2 kt	9.7 nm	3.3 kt 162 °T	2.1 kt -69 °	3.3 kt -126 °	1.1 kt 135 °T

Figure 15 Optimum Route Table Example

Table Glossary:

SOG - speed over ground
COG - course over ground
AWS - apparent wind speed
AWA - apparent wind angle
TWS - true wind speed
TWA - true wind angle

When the chart displays an isochron solution and the Optimum Route Table is open the two will be synchronized. Selecting a table row in the left most column will highlight the row and the boatl will be positioned on the best track at the start of the same segment number. Moving the boat with the *Next* or *Previous* arrows also change the table's highlighted row.



#	Start	Latitude	Longitude	Heading	SOG-(
1	Sat 17 Mar 2018 1:00 PM	N 41° 24.22'	W 71° 02.462'	146 °T	9.3 kt 1
2	Sat 17 Mar 2018 4:00 PM	N 41° 01.338'	W 70° 41.378'	150 °T	10.4 kt 1
3	Sat 17 Mar 2018 7:00 PM	N 40° 34.295'	W 70° 20.569'	162 °T	10.0 kt 1
4	Sat 17 Mar 2018 10:00 PM	N 40° 05.465'	W 70° 09.402'	132 °T	8.3 kt 1
5	Sun 18 Mar 2018 1:00 AM	N 39° 47.631'	W 69° 46.468'	134 °T	7.5 kt 1
6	Sun 18 Mar 2018 4:00 AM	N 39° 30.592'	W 69° 27.122'	156 °T	7.3 kt 1
7	Sun 18 Mar 2018 7:00 AM	N 39° 10.619'	W 69° 15.563'	166 °T	9.0 kt 1
8	Sun 18 Mar 2018 10:00 AM	N 38° 44.504'	W 69° 07.127'	170 °T	9.6 kt 1
9	Sun 18 Mar 2018 1:00 PM	N 38° 15.959'	W 69° 02.713'	162 °T	9.9 kt 1
10	Sun 18 Mar 2018 4:00 PM	N 37° 48.866'	W 68° 47.203'	162 °T	11.6 kt 1
11	Sun 18 Mar 2018 7:00 PM	N 37° 16.602'	W 68° 30.999'	132 °T	10.7 kt 1
12	Sun 18 Mar 2018 10:00 PM	N 36° 51.987'	W 68° 04.995'	126 °T	11.0 kt 1
13	Mon 19 Mar 2018 1:00 AM	N 36° 30.215'	W 67° 34.096'	114 °T	11.3 kt 1
14	Mon 19 Mar 2018 4:00 AM	N 36° 12.066'	W 66° 58.7'	122 °T	8.6 kt 1
15	Mon 19 Mar 2018 7:00 AM	N 36° 01.214'	W 66° 29.789'	124 °T	7.5 kt 1

Figure 16 Synchronized Chart And Table

As noted earlier the Optimum Route Table is derived from file OptimumRoute.csv in the Documents\SailFast\OptimumRoute folder. If you wish to save the data from a routing solution then you can rename it prior to running a new simulation. The file is in csv (comma separated value) format and is best viewed with Excel. It can be opened in a text editor but will not have nicely formated columns.

If the file is opened in Excel by double clicking, the degree symbols (°) will likely be corrupted to something else. To get the correct formatting import the csv file instead. From the Excel Data tab select *From Text*. Browse to and select the csv file to import. Import as delimited using Unicode UTF-8. Select comma delimited and General data format. The procedure for importing files may differ depending on your version of Excel.

Weather Routing Settings And "What – If"

When doing an optimum/weather routing there are a number of optional settings that you can make to either place constraints on the routing or to explore variations of routing. Considering a variety of solutions permits the navigator to consider the risks involved in various routes and the consequences of actual forecasts and boat performance being different then the simulated results.

The first what-if technique is not a routing setting, rather it is the using the sailing boundaries to force a modified routing. In this case sailing the shortest course down the rhumb line would result in sailing in an adverse current for about 12 hours. The optimum route avoids this by sailing North East of the rhumb line. Elapsed time is 73.8 hours.

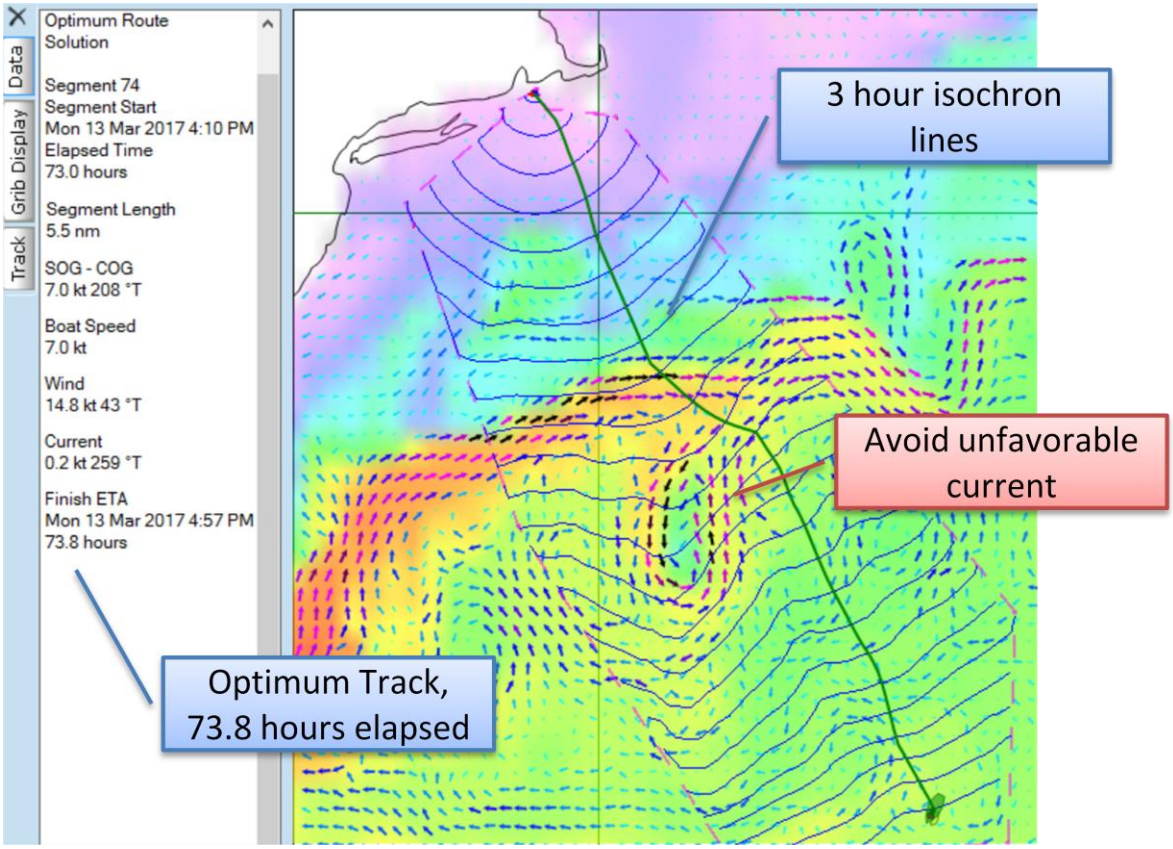


Figure 17 Routing With Normal Boundaries

Now let's answer the question, what happens if we sail South West of the rhumb line to pick up the favorable current eddy? To force this routing place an additional boundary line that cuts across the first optimum route but leaves a clear path open where we would like the new routing to go.

Figure 18 shows the result. Here we have turned off the display of the current, but the sea temperature gradient still allows us to see where the current eddy is. The fastest track now picks up the favorable current, goes past the end of the added boundary line and sails back towards the rumb line and the finish waypoint. Total race time is 76.2 hours, 2.4 hours slower than the original solution.

Armed with this information the navigator can now make a better decision on race strategy. It is often the case that alternative routes have quite close finish times and other factors may dictate the choice. For example a slightly slower route might be quite a bit shorter and therefore may be a less risky choice.

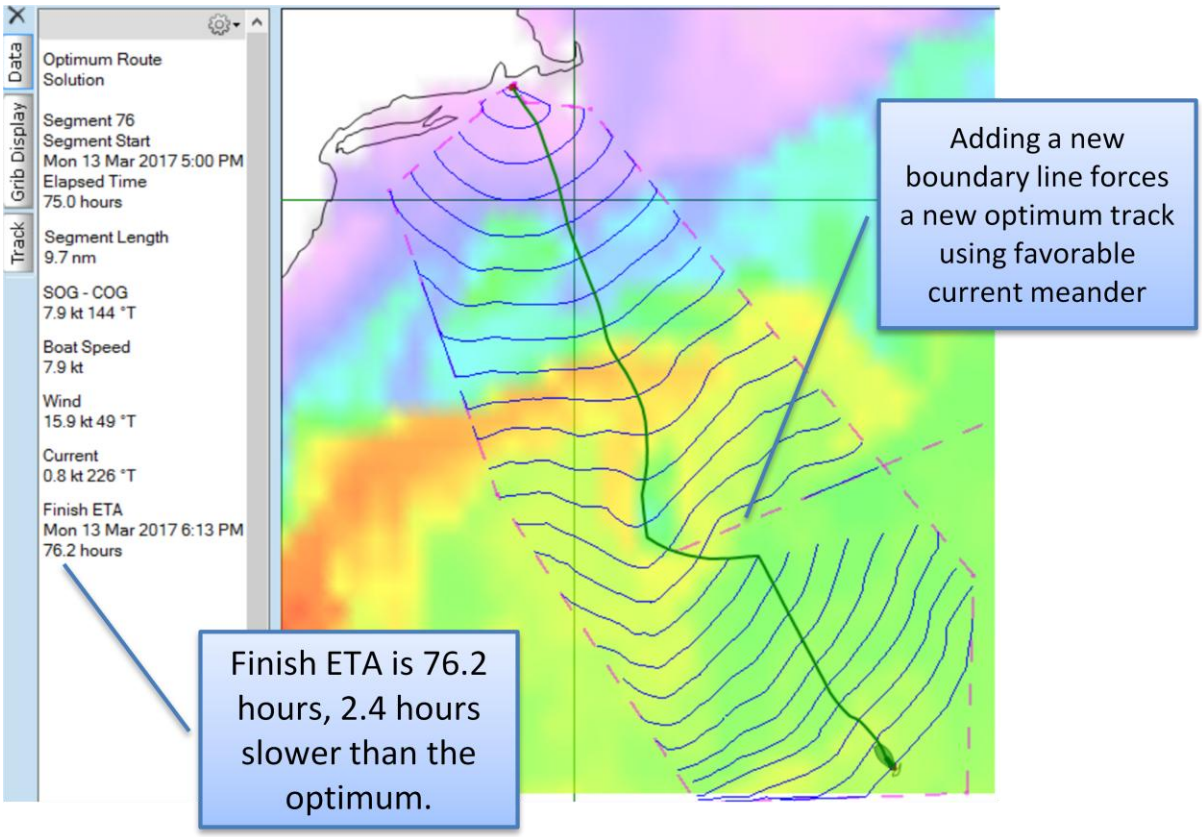


Figure 18 Routing With Added Boundary To Force Alternative Solution

Routing Settings - General Tab

(refer to Figure 19**)**

Simulation Time Step – Sets the length of sailing time between each isochron. The value selected is a tradeoff on finding a more precise optimum route and the time it takes to run the simulation. Also bear in mind that the absolute accuracy of the weather forecasts is limited and deteriorates over time, so after a point performing very accurate calculations with questionable data becomes pointless. For most situations a time step between 1 and 3 hours works best. Don't use short time steps like 0.25 hours for long duration races. The simulation will be painfully slow with no benefit to the routing solution.

Boat Polar Settings:

Enable Polar Boat Speed Multiplier - The value specified is multiplied by any boat speed value the program extracts from the boat's polar curves. Speed may be increased or decreased. For example, a set value of 0.95 yields a boat speed that is 5% lower than the normal polar speed. If you find that on average you can sail somewhat better or worse than published polars, use this factor to fine tune the polars. This can also be used to take the default polars or one of the sample polars and adjust them in a simple manner to approximately match your boat performance.

If you can't sail as fast as your polars which is likely since they are based on ideal conditions, you are better off using a realistic boat speed multiplier when you do optimum routing. Then the simulated boat position and

corresponding weather will be correct during the simulation and the optimum route will be realistic and achievable.

Enable Night Time Boat Speed Multiplier - Modifies the polar boat speed when sailing during the time of day and duration specified. For racers it recognizes that it is more difficult to consistently sail at best speed during the night time. For cruisers it may be more a matter of wishing to sail with reduced sail for general safety and comfort or because of shorthanded crew.

If both the polar multiplier and the night time multiplier are enabled then both will modify the speed when night sailing. For example, with multipliers of 0.98 and 0.95, the speed will be adjusted by 0.98 x 0.95 = 0.931

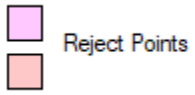
Safety/Comfort Routing :

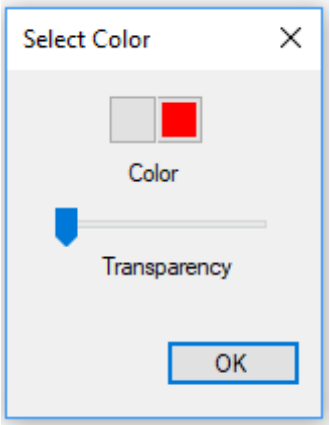
Avoid True Wind > - The routing will reject any sailing segments that end with a forecasted wind greater than the set value. This may be used to avoid extreme weather. If set too low there may be no routing solutions and the routing will fail with an error message.

Avoid Significant Wave Height > - The routing will reject any sailing segments that end with a forecasted significant wave height greater than the set value. This may be used to avoid extreme weather. If set too low there may be no routing solutions and the routing will fail with an error message. To use this routing option a grib file containing significant wave height must be installed. The Saildocs WW3 model (Wave Watch III) includes the needed data.

Note

Do not leave these avoidance options enabled if you are not really using them. Even if the avoidance values are set very high so routing is not affected, every possible sailing segment would still be evaluated resulting in longer times to compute the routing solution.





Reject Points gives you the option of showing every segment ending point that was rejected because the avoidance value was exceeded. Click on the box to specify a color and its transparency. Here the color is red but since it is fully transparent no rejected points will be visible on the chart.

Engine Operation:

Run Engine When Sailing Speed < - When enabled, the routing notes what the sailing boat speed is at the beginning of every segment. If it is less than the set value the boat speed used for that segment of sailing will instead be the *On Engine Speed is:* setting. Note that running on engine does not only occur when the wind is light. For sailing segments evaluated with headings above close hauled the boat speed will decrease and at some point the boat will run on engine. This means the routing will include the possibility of motoring directly

into the wind. While this option is most applicable to cruising there are some specialized races that permit the option of running the engine with suitable adjustment to handicap.

The two speed settings do not have to be the same value. You could turn on the engine at sailing speeds below 5 knots and then motor at 6 knots. This motoring speed might be chosen based on an efficient operating point for the engine and hull speed.

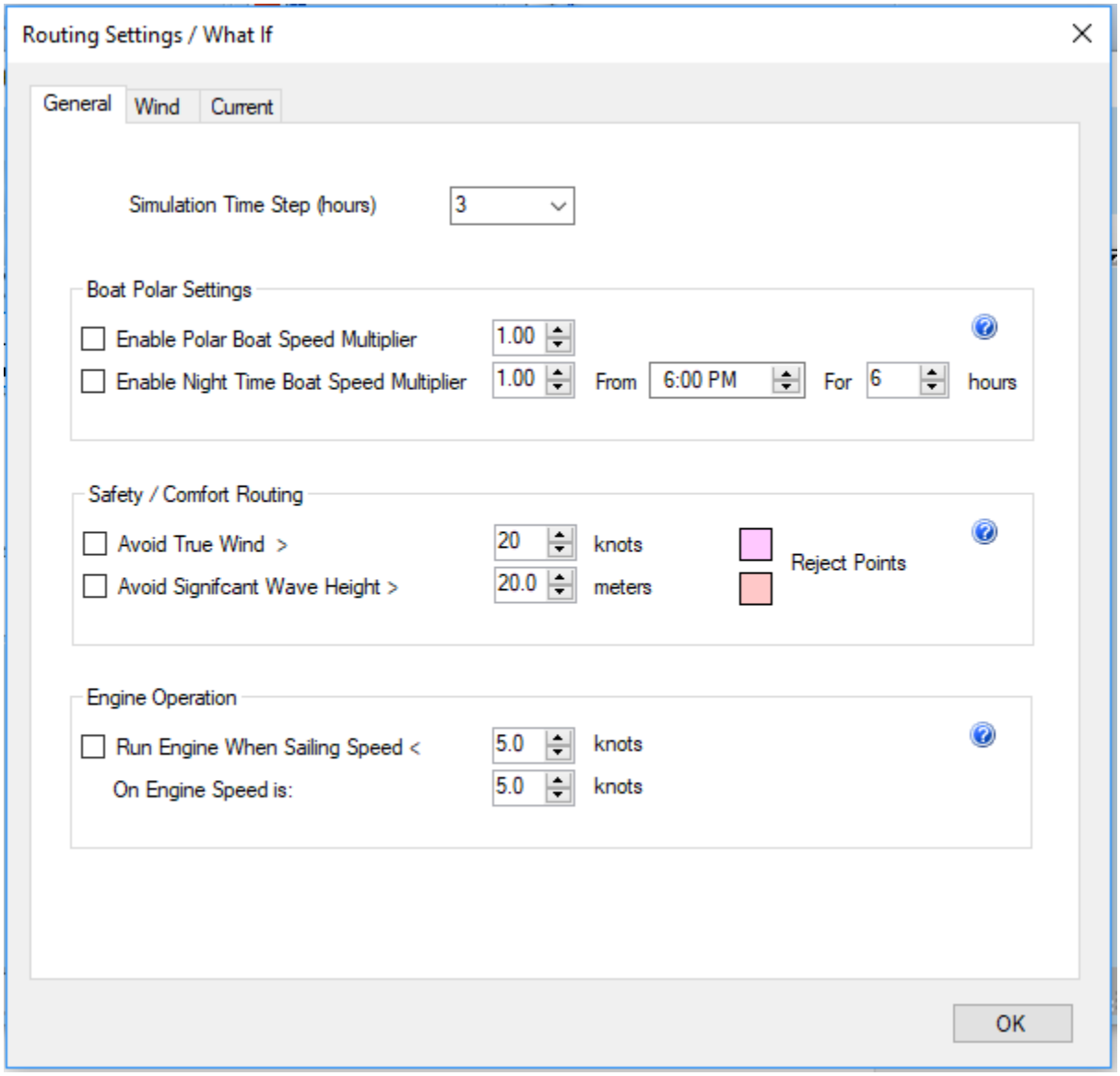


Figure 19 Routing Settings - General

Routing Settings - Wind Tab

The routing wind settings will let you handle these common scenarios:

- If a grib file forecast ends before your race does, you can keep using the last grib forecast data for optimum routing.

- If after a few days of sailing the grib file forecast you have is no longer matching the actual wind, you can manually specify the wind for the next X hours. You can do this for 4 time periods in sequence. This allows you to update your forecasting based on available information such as local observations, WeatherFax, VHF or SSB weather reports.

- The wind at the start of a race does not match your grib file prediction. You can manually set the wind to use at the start or use the actual wind reported to SailFast™ via a NMEA link to your wind instruments. After a time you specify, the optimum routing simulation will revert to using the grib forecast.

- You think a sustained wind shift or velocity change may occur and want to see how that will affect your optimum routing. You modify the wind values by an amount you specify for the next X hours. After that the wind reverts to the normal values.

Hint: Simple setup for two common situations

Have a wind Grib file to use for the entire optimum routing.
- *Select "Use Grib forecast if available"*
- *Set the Simulation Time Step*

Use a constant wind for the entire optimum routing.
- *Select "Override Grib Forecast"*
- *Check and set first "Use Wind at XX kt at XX degrees True for XX hours." Set the hours to be longer than the race duration.*
- *Set the Simulation Time Step*

(refer to Figure 20)

Wind At Start – The wind at the start may be modified if desired. If *Use Grib forecast if available* is checked then there will be no starting wind changes as long as there is a valid grib forecast for the start time and position. If there is no valid grib, then checked start wind conditions will be used.

If *Override Grib Forecast* is checked then the checked start wind options that follow will be used. These start wind options are:

Use NMEA measured wind - If the true wind direction can be determined from available NMEA data then that wind will be used for the specified number of hours.

To get true wind one of the following conditions must be met:
- A NMEA connected wind instrument outputs true wind . This true wind is relative to the bow and by itself does not yield the true geographic wind direction. In addition the boat heading is available from NMEA data, such as a heading sensor which may be independent or part of an autopilot. As

an alternative, SailFast™ will use GPS course over ground (COG) if available in lieu of a magnetic heading. Some few degrees of error will be introduced by this however.

- A NMEA wind instrument provides apparent wind data, plus boat speed relative to the water is available. With this SailFast™ computes true wind relative to the bow. As above a heading sensor input or COG is also required.

Use wind = X knots at X degrees true for X hours - After the NMEA wind is used if checked and valid, then the user can manually specify the starting wind. After the first wind specified times out the next wind checked is used. Up to 4 winds and durations may be specified.

Depending on the time duration values selected, the wind may be modified for a period of hours after the start, and then the simulation will revert to the grib forecast; or the various "start" winds may be in effect for the entire race, effectively replacing the grib forecast.

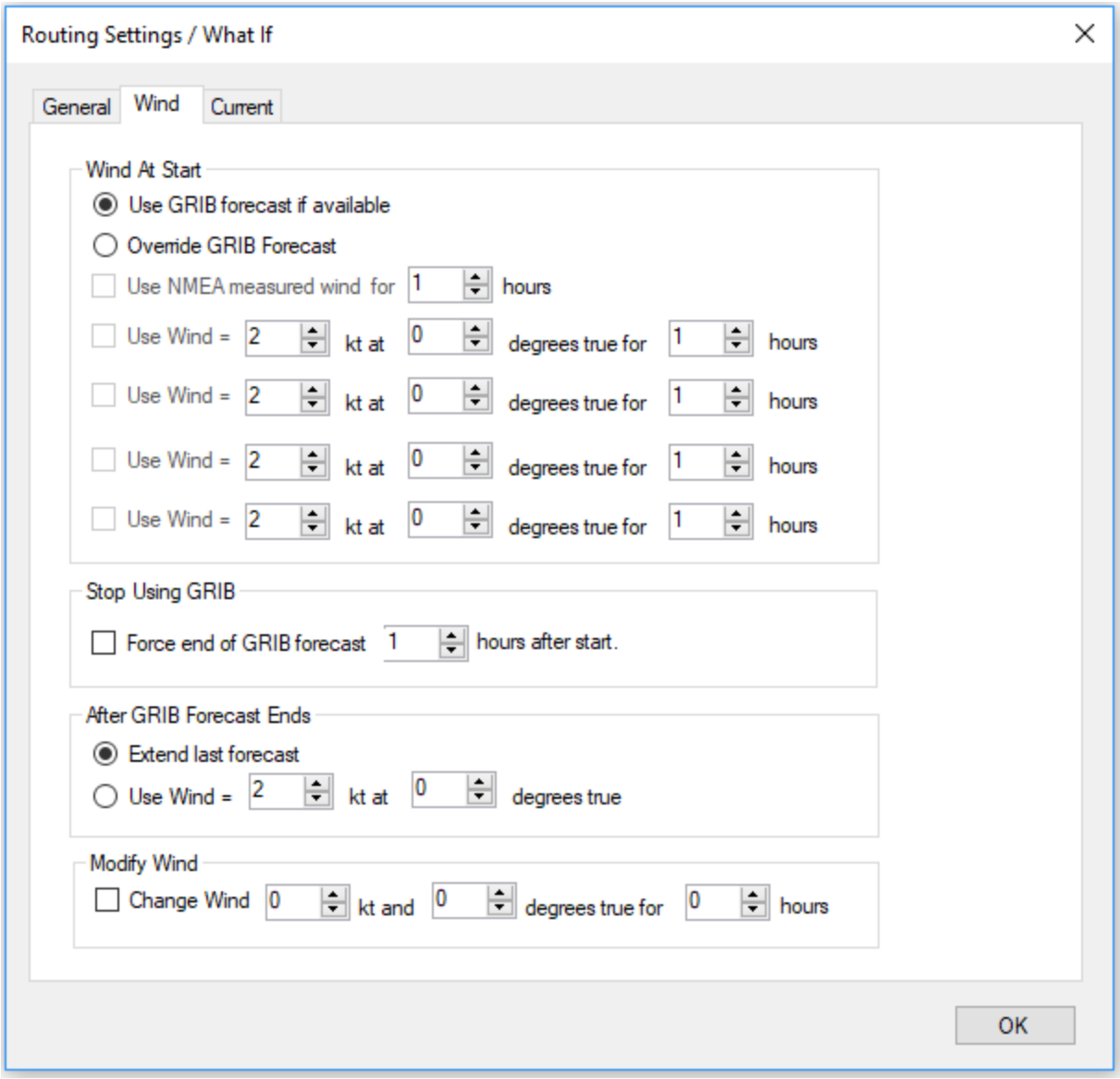


Figure 20 Routing Settings - Wind

Stop Using Grib – If desired, you can stop using the grib forecast X hours after the start of the race.

After Grib Forecast Ends - When the grib forecast ends either because it was forced or because the simulation time is past the last available forecast time, then there are two choices. The last available previous forecast will continue to be used indefinitely, or a manually set wind is used.

Modify Wind – This makes a change to the wind throughout the entire simulation. These changes are applied to all winds, whether derived from grib, NMEA data, or set manually. A wind strength and/or shift may be specified to be in effect for X hours.

Routing Settings - Current Tab

(refer to Figure 21)

The Current tab provides settings for the current to be used in routing simulations.

For Display and Simulation – The source of current values used both during normal chart display and routing simulation needs to be specified.

Select *Use Gulf of Maine Currents* to use the built-in Gulf of Maine currents. These are tidal currents. SailFast™ uses built-in tide tables and the PC system clock to display for every hour of the day relative to high and low water tides.

Select *Use Grib File Currents* if you have a suitable grib file you wish to use.

Selecting *No Current* sets current to zero.

Before Earliest Grib Current Forecast – These selections only apply when *Use Grib File Currents* is selected above. These selections specify the current that will be used if the display or simulation time is earlier than the earliest forecast time of the grib current file being used.

Selecting *Use Earliest Forecast* will cause the earliest grib current forecast to be used for all times earlier than the earliest forecast.

Select *Use Currents= XX kt at XX Degrees True* to specify a fixed current value to be used.

After Last Grib Current Forecast – These selections only apply when *Use Grib File Currents* is selected above. These selections specify the current that will be used if the display or simulation time is after the last forecast time of the grib current file being used.

Selecting *Extend Last Forecast* will cause the last grib current forecast to be used for all times after the last forecast.

Select *Use Currents= XX kt at XX Degrees True* to specify a fixed current value to be used.

Application Example

You have a grib file for the Gulf Stream with a forecast date of June 2. The actual race dates are June 4th- 9th. Selecting Extend Last Forecast allows you to use the grib throughout the race. Since the Gulf Stream changes slowly the errors by using an old forecast are manageable.

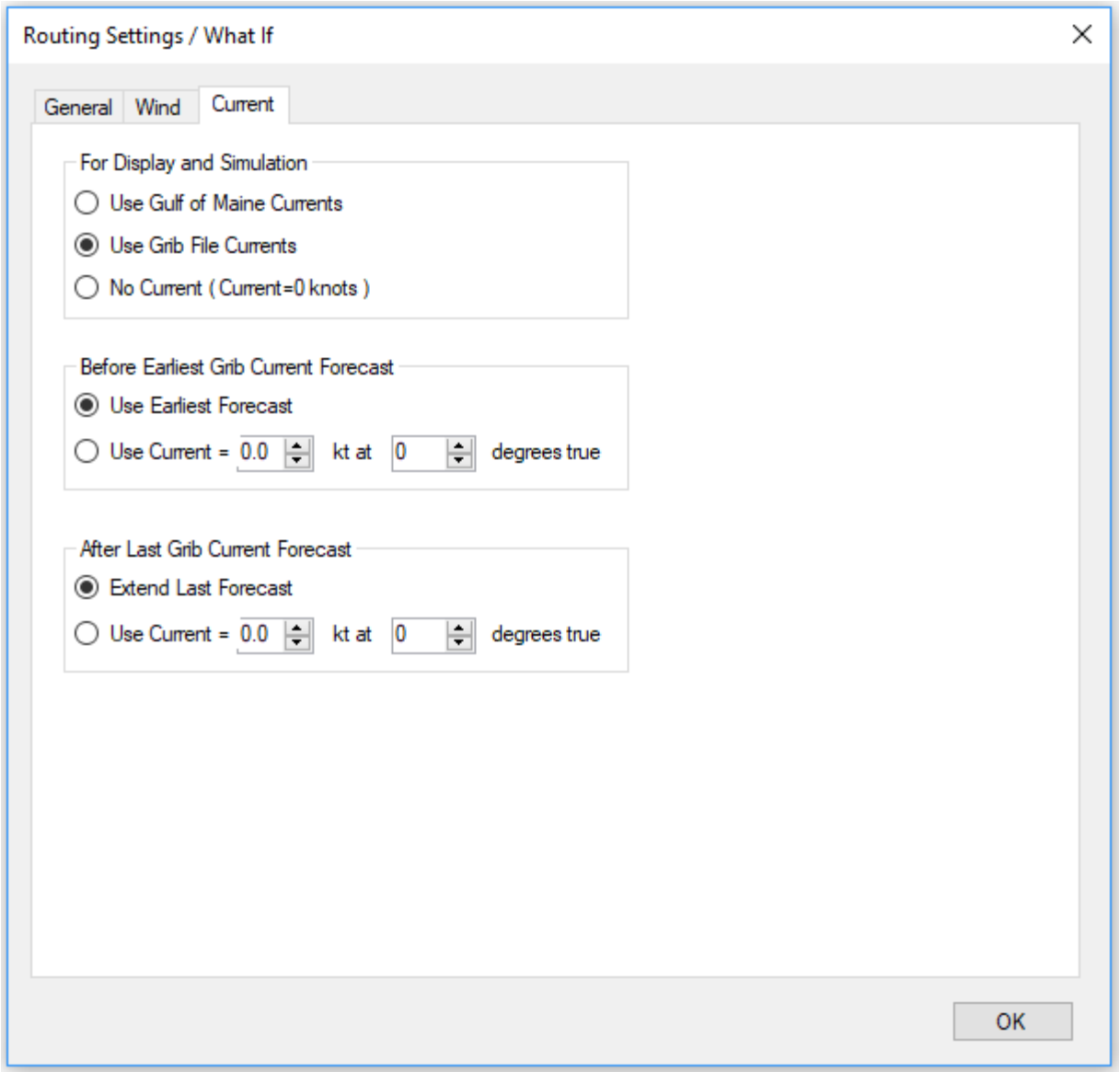


Figure 21 Routing Settings - Current

Laylines 

To show laylines on a windward mark select the Laylines button on the toolbar to open the Laylines dialog, Figure 22. On the settings tab select the appropriate waypoint that has been set previously. Ideally you will know the location of the waypoint from the sailing instructions or information provided by the race committee. Or for a local round the buoys race you may have sailed past it and set a waypoint as you went by. Check the Show Laylines box at the bottom of the dialog.

In many cases you may initially only know an approximate position. As you sail closer to the mark during a race you can refine the position by using Draw Line to set a line of position on the chart using the boats present GPS position and the bearing to the mark using a handheld compass. Later at another position, preferably with a significantly different bearing to the mark, draw another line of position. Where the lines intersect is the new mark position.

Layline angles are determined from the wind direction and speed, the boat's true wind angle, the boat's speed and the heading, and the maximum velocity made good (VMG) according to the boat's polars. Thus SailFast requires real-time NMEA data input for apparent wind speed and angle, boat speed and boat heading. For accurate laylines the instruments producing this data must be carefully calibrated.

Note: For accurate wind computations make sure you have set the wind sensor height above the water in the Tools/Options/General tab, page 63.

Even in steady winds the apparent wind angle data will appear quite erratic. If you look at the mast head sensor you'll most likely see the wind vane fluttering in the breeze. The angle data needs to be filtered (or dampened) to obtain a more reasonable average value. The Layline Data Filter does this. A value of 15 is a good starting point. Experiment and find a value that works best for you. A high filter number will give a nice smooth layline position but it will also be slow to respond to a real wind shift.

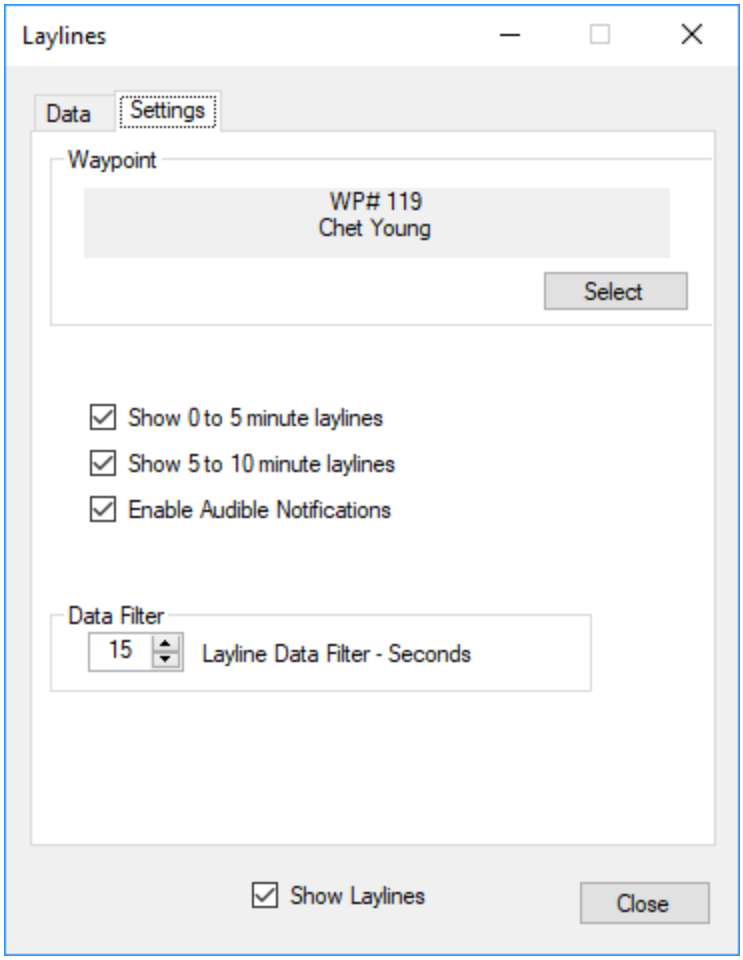


Figure 22 Laylines Settings

In addition to present time laylines you can also elect to show layline angles over the previous 5 minutes, or laylines over the previous 5-10 minutes. Previous layline information may be useful for understanding wind shifts or how much angles have been changing due to oscillating winds.

Audible Notifications may be enabled. When approaching a layline the ETA to the layline is estimated and audible warnings issued beginning at 15 minutes. Warnings are issued at 15, 10, 7, 5, 4, 3, 2, and 1 minute; and 30, 10 and 0 seconds. Audibles can be issued from the computers speakers or coupled via Bluetooth to a speaker of headphone.

Refer to Figure 23 showing a typical chart with laylines plus the Laylines Data dialog. The solid red and green lines are the laylines at the present time. The boat position is shown with a COG bearing line extended from the bow.

(1) The windward waypoint with wind direction arrow as calculated by SailFast.
(2) The shaded green area shows the starboard layline angles over the previous 5 minutes. The red shaded area shows the port laylines.
(3) The crosshatched areas are for laylines during the previous 5-10 minute period.
(4) The red dot is where the boats COG vector crosses one of the laylines.
(5) The 2 black dots are the ideal points where the boat would cross either layline if the boat was sailing on the ideal heading for best VMG. The course from boat position to black dot parallels one of the laylines as expected.

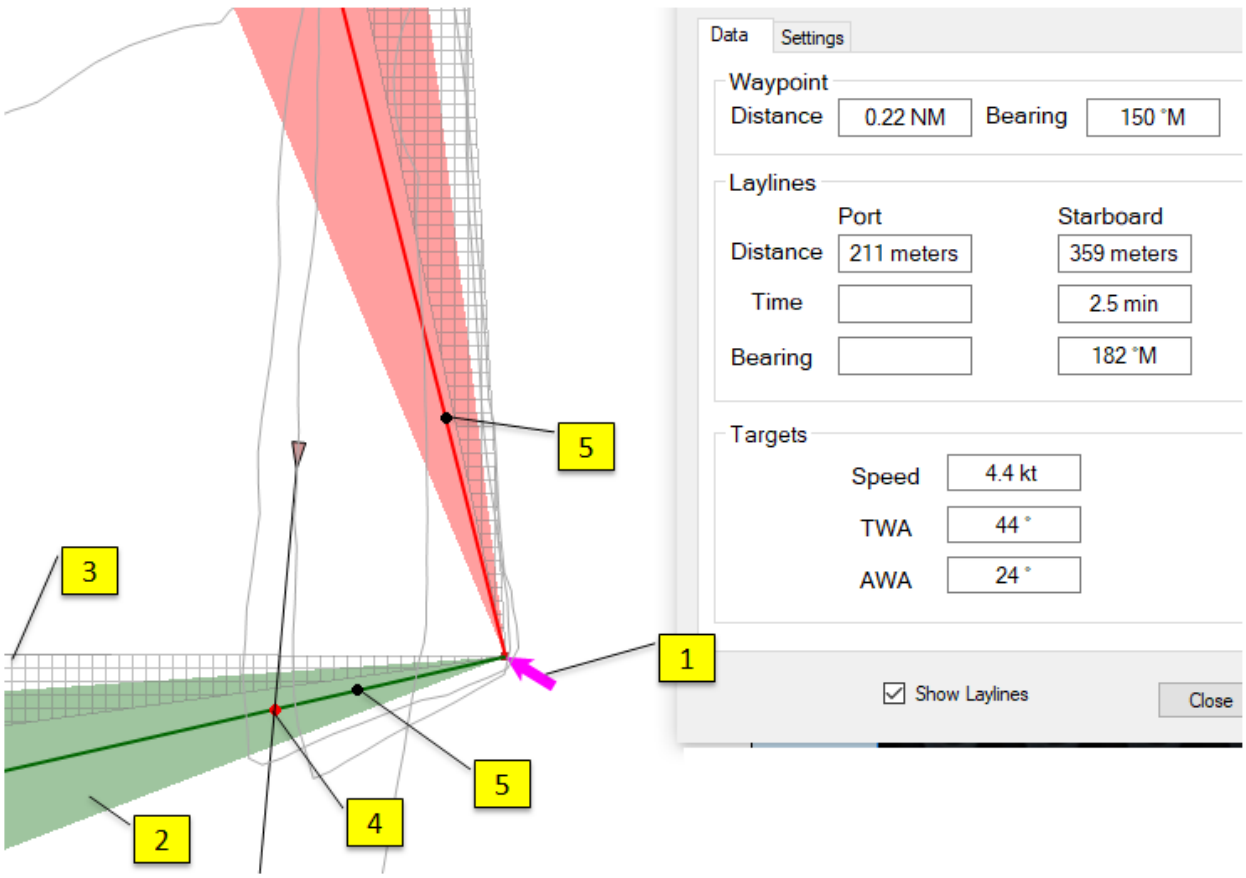


Figure 23 Laylines And Laylines Data

The Data dialog shows the boat is 0.22 NM from the waypoint at a bearing of 150 °M. The boat is 211 meters from the black dot on the port layline. Since the boat's course does not intersect the port layline there is no Port Time or Bearing data.

The Starboard data shows that the boat is 359 meters from the layline's red dot. At the present SOG and COG the layline will be reached in 2.5 minutes. However the bearing of 182 °M is not the bearing to the red dot, it is the bearing to the black dot. This is the ideal best VMG heading. The Targets shown are for best VMG. Ideally the boat should be on a heading of 182 °M, sailing at 4.4 kt boat speed, with a true wind angle of 44 °and apparent wind angle of 24 °. Armed with this information the navigator or tactician could suggest some changes to the skipper.

Look at the corresponding Instrument Data in Figure 24 to better understand what is happening. The boats actual heading is 193 °M and COG is 196 °M. The difference is a reasonable leeway of 3°. The boats is footing off from the ideal 182 °M. As a result the boat's speed is 5.1 knots through the water, faster than the 4.4 kt

target speed. True wind angle is -55° and apparent wind angle is -28° which also indicates that the helmsman is footing. Ideally the boat should be sailed higher with sails trimmed appropriately until the boat speed is the 4.4 kt target.

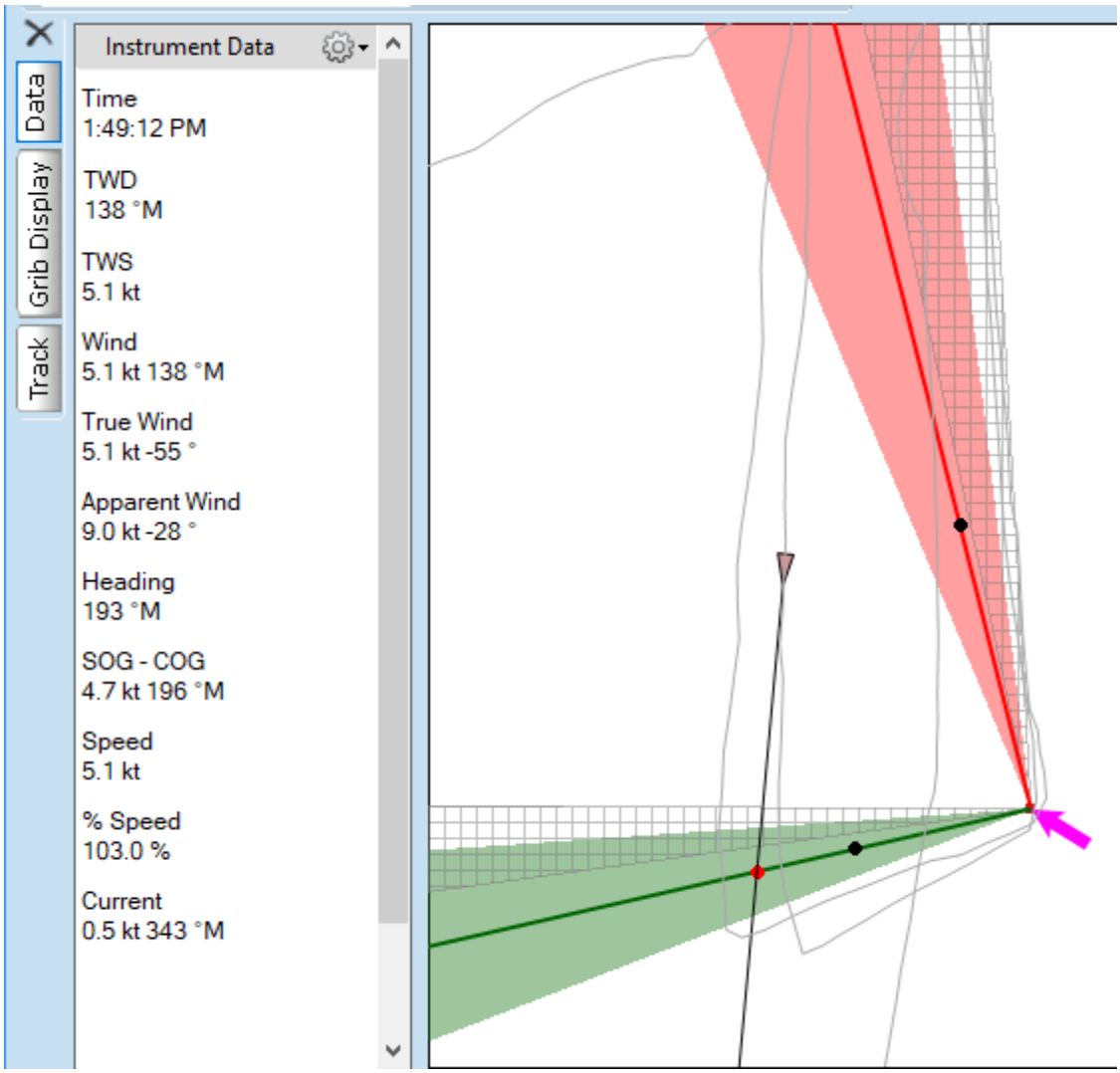


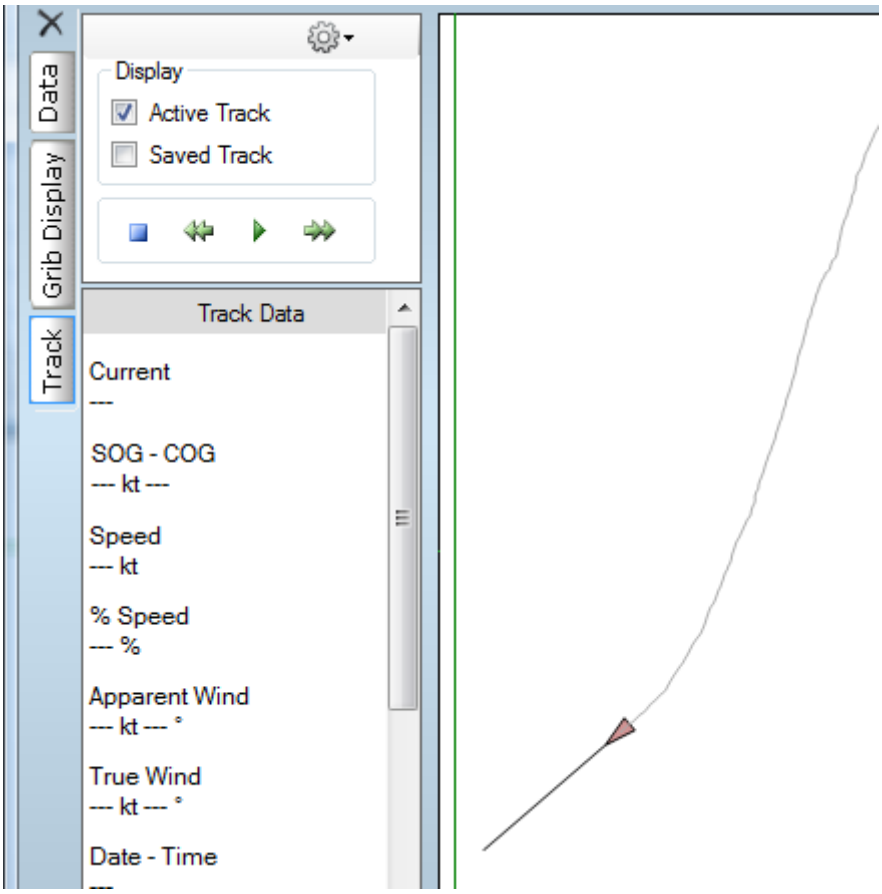
Figure 24 Instrument Data

Using the Laylines features may not prove suitable for the casual user. Proper calibrated instruments are essential for good results. Also experience will help in understanding how accurate the layline predictions are and how closely they should be followed.

Viewing Active and Saved Tracks

SailFast can record a variety of useful performance data as you sail. This data is associated with the Active Track. The active track may also be saved for later viewing. This may be repeated as desired so you may have many saved tracks.

As on a chart plotting GPS, the track shows where you have sailed. But the SailFast track shows you much more. It is a point by point record of detailed sailing data that you can analyze during and after a race. It is an opportunity to better understand the variables that affect your sailing and to improve your performance. For a complete list of the available performance data refer to the next section, Customize Displayed Data.



To the right we see an active track that is being recorded. The boat position and direction (COG) is taken from the GPS input. The active track is shown since it is checked in the top left panel.

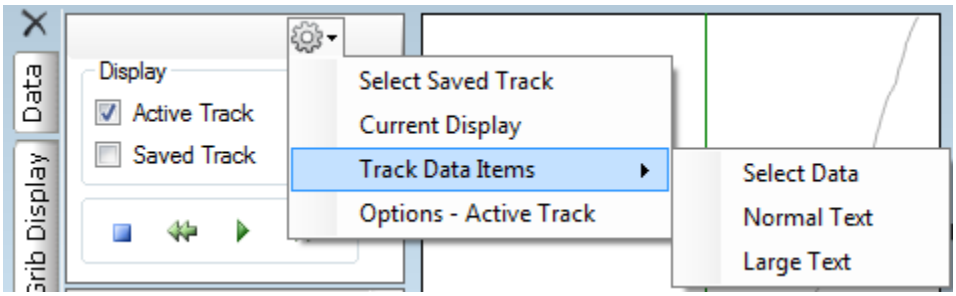
There is no data in the bottom left Track Data panel because we have not yet begun stepping thru any track points. If we wanted to see current performance data as we are sailing you would select the *Data* tab, to give *Instrument Data* .

To observe track data use the track animation controls.

To step through track points manually, use the left and right double arrows to move one point at a time. If held down then larger steps are taken progressively until released. To reset the track to the beginning use the *Stop/Reset* button. A “track position” boat icon with red outline will indicate the position on the track.

You can animate sailing the track by pressing the right arrow. This will cause the boat icon to move along the track in roughly real time. To make the animation faster or slower, use the double arrows once the animation has started. To stop the animation at a point use the pause icon which toggles with the right arrow. Once stopped you can use the double arrows to move point by point as described previously.

To evaluate saved tracks instead of the active track check the appropriate box. To select which saved track to display use the settings icon and choose *Select Saved Track.* The animation controls function the same for active and saved tracks.



Settings Menu

Lastly, you may display calculated current arrows representing Set and Drift. From the *Settings* menu select *Current Display.* This then shows the Track Current settings in the bottom panel. To show arrows check the arrow box. The setting options are similar to those for other vector grib parameters, such as wind and current.

Set & Drift calculations require NMEA data for boat speed, speed over ground (SOG), course over ground (COG), magnetic heading and magnetic variation. Errors in these values will produce small calculated currents even when there is none. To reduce errors have well calibrated boat speed and heading.

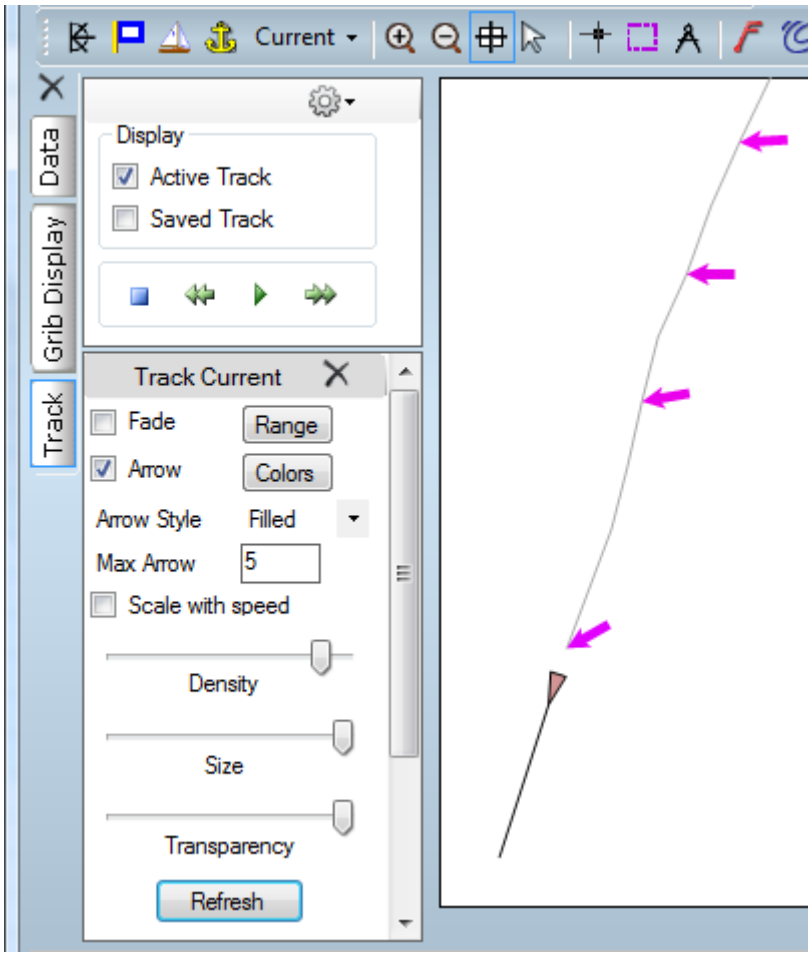
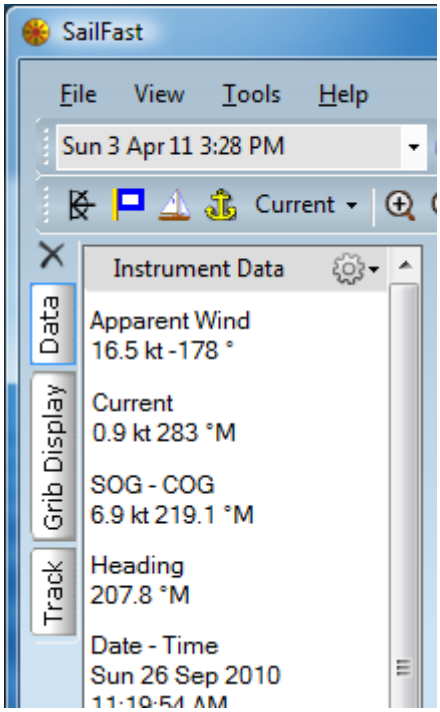


Figure 25 Actual Current Calculated From GPS Data, Heading & Boat Speed

Customize Displayed Data



The data items that are displayed when either the *Data* or *Track* tab panes are selected is fully customizable.

To specify the items to show select the Settings icon 

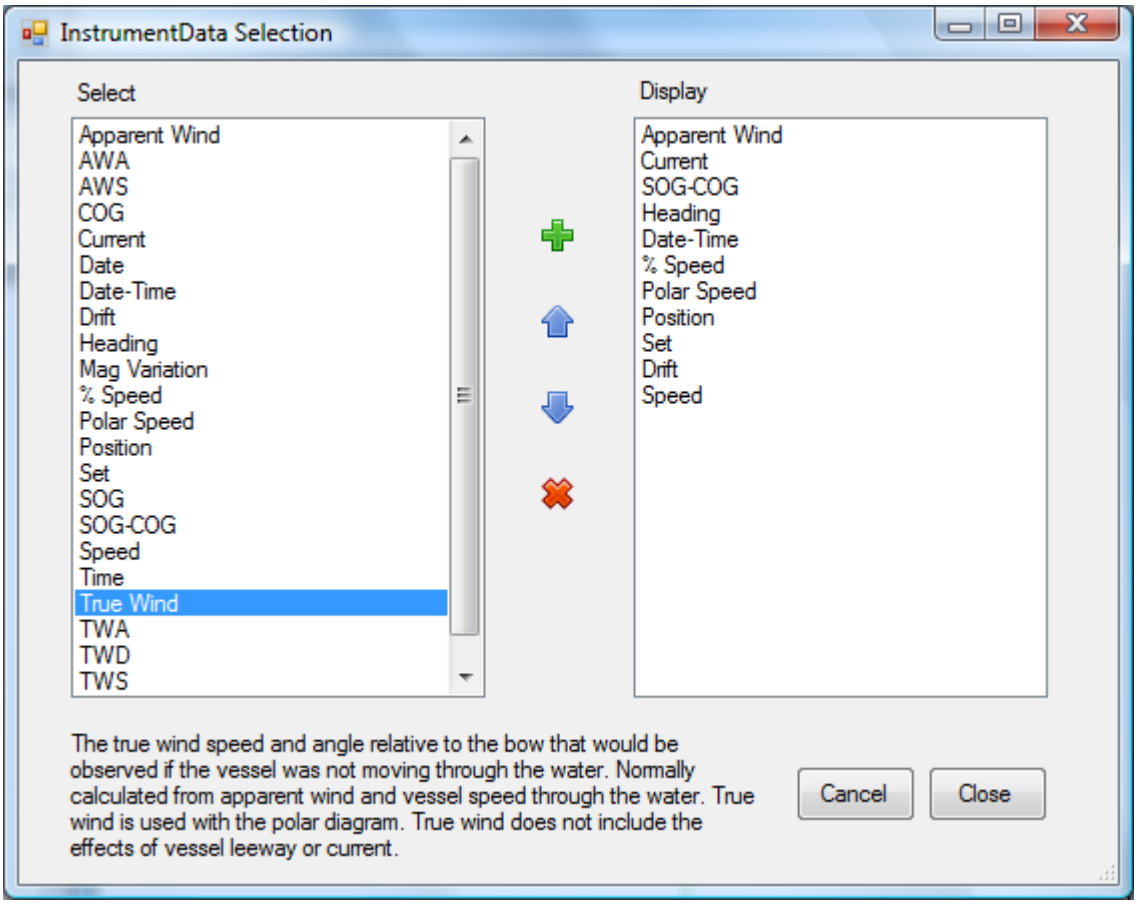
From the Instrument Data panel, choose *Select Data*.

From the Track Data panel, choose *Track Data Items* then *Select Data*.

A dialog opens with a *Select* list and a *Display* list. The select list is all the data items that may be selected for display. The display list shows the items that will be displayed and their order.

When a *Select* list item is highlighted with a mouse left click, a description of the data is presented at the bottom. To add that item to the display list, use the add (+) button. To change the order of an item in the list, first highlight it then move it with the up and down arrows. To remove an item use the delete button.

While any item may be displayed, data values will only be present if the necessary information is available. Often this will require NMEA data input.



Menu items

File

Save

– Save all settings.

Print

– Prints an image of the chart window.

Print Setup

– Set margins and paper orientation.

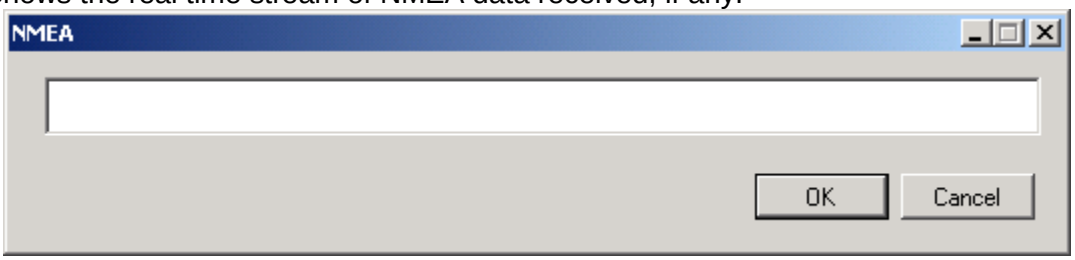
Exit

– Close the program. This also saves all settings.

View

NMEA Data

– Shows the real time stream of NMEA data received, if any.



Grib Data

– Shows details of the grib records contained in the grib files resident in the GRIBS folder and allows the user to specify which grib files will be used for display and optimum routing when there are multiple files to choose from.

More/Less Detail  Grib file information is presented in 2 formats. The short form is a more compact listing of basic information. The long form gives additional information on the forecasts contained in the file.

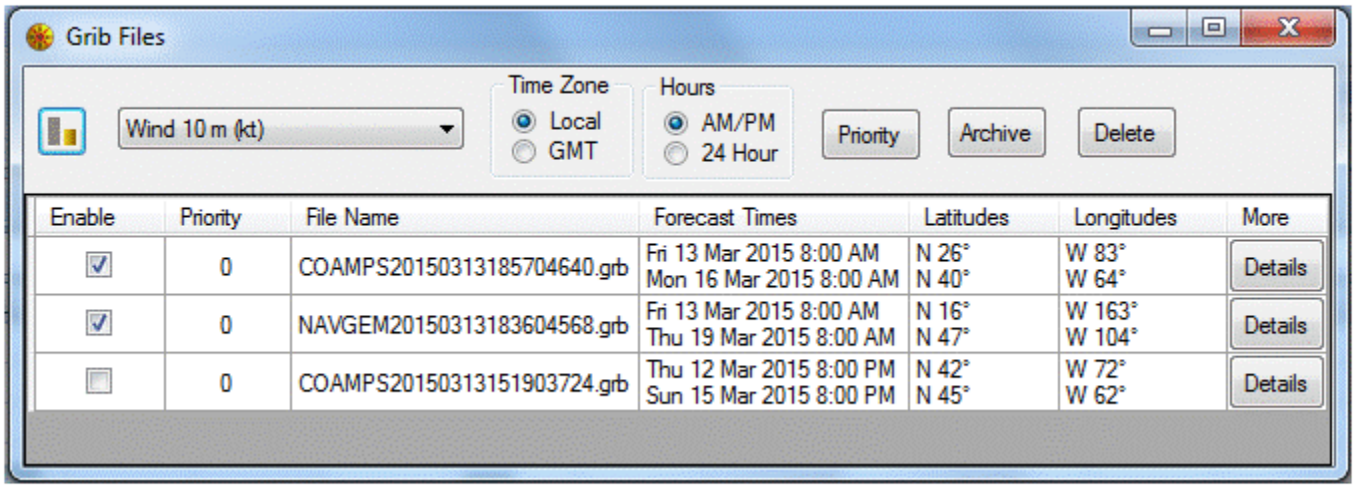
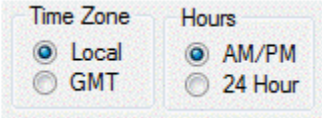
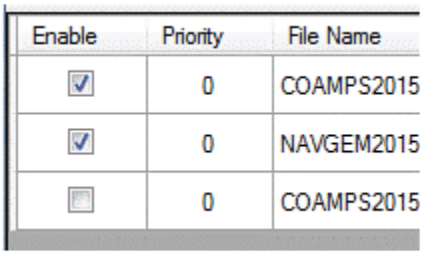


Figure 26 Short Form Grib Data

Select the grib parameter of interest. All grib files that contain this parameter will be shown in this dialog.



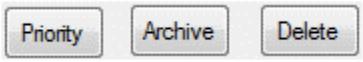
Select the time format to use. This only affects this dialog, time formats elsewhere in SailFast remain unchanged.



Initially Enable will be checked for all grib files.

When unchecked SailFast treats the file as if it was not present. No grib parameters from the file will be displayed and the file will not be used for optimum routing.

Use the enable check box to quickly observe multiple forecast models such as GFS, NAVGEM and COAMPS at the same time and individually.



The Priority button allows the user to specify different priorities when there is more than one grib file in the folder for a given parameter (ex. Wind). With no priority specified, SailFast™ will pick the grib that has the most recent Reference Time which also covers the needed lat lon. The default priority for all files is "0", the lowest priority. Normally priority will not need to be set.

Here is an example of using priority for optimum routing. You have both a COAMPS and GFS wind forecast with the same reference time. The COAMPS forecast covers areas near shore where racing will start. The GFS covers the entire race course. You believe the COAMPS forecast is better near shore and GFS is better offshore. Set the COAMPS file to a higher

priority so it will be used instead of GFS. When the routing simulation leaves the region covered by COAMPS it will start using the GFS forecast.

Archive will move selected grib files from the GRIB folder to the GRIB Archive folder.

Delete will permanently delete selected grib files.

Caution

Grib files typically contain data for multiple parameters. When you archive or delete a file it affects all parameters, not just the one selected in the Data View window.

Note

Grib files in the GRIBS folder consume some computer resources even if they are not being displayed. Delete or archive files when they are no longer actively needed.

Ref Time is the date and time for the initial baseline forecast, this is also known as the *nowcast.* grib forecast times such as +3 hours is relative to this time. Most grib files will include the nowcast, so the reference time and the first forecast time will be the same. Ref Time is only displayed in the long form.

Forecast Times show what forecasts are included in the grib file. The first 2 lines show the actual date–time for the first and last forecast. In the long form display each forecast time in the grib file is also listed as so many hours after the reference time.

Ref Time	Forecast Times
Fri 13 Mar 2015 8:00 AM	Fri 13 Mar 2015 8:00 AM Mon 16 Mar 2015 8:00 AM Ref + hours: 0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72
Fri 13 Mar 2015 8:00 AM	Fri 13 Mar 2015 8:00 AM Thu 19 Mar 2015 8:00 AM Ref + hours: 0, 24, 48, 72, 96, 120, 144
Thu 12 Mar 2015 8:00 PM	Thu 12 Mar 2015 8:00 PM Sun 15 Mar 2015 8:00 PM Ref + hours: 0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72

Figure 27 Long Form Reference and Forecast Times

Latitudes and Longitudes gives the positions that define the limits of the grid covered by the grib file.

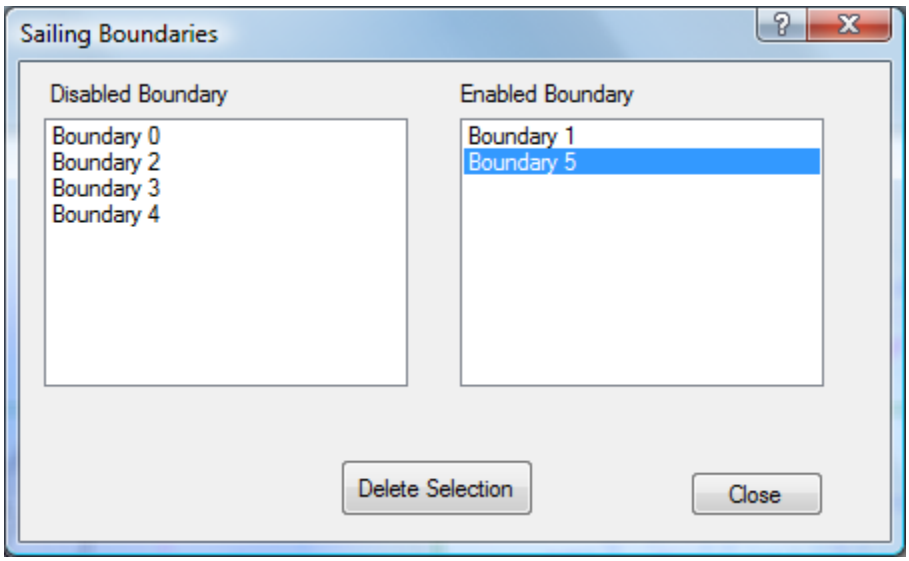
More displays another dialog showing detailed grib information for the first record of the selected parameter in the file.

Sailing Boundary

-Shows all existing sailing boundaries. Boundaries in the Enabled list box will be used for a new sailing simulation. Select one or more boundaries in a list and drag and drop them into the desired list. To permanently delete a boundary, select it and press *Delete Selection.*

When a boundary is selected, such as Boundary 5 in this example, the boundary line on the chart is highlighted. If a boundary in the Disabled list is highlighted the boundary becomes visible on the chart and is highlighted in green.

When doing what-if scenarios if may be convenient to set up various boundaries and to then enable / disable certain boundaries for various optimum routing simulations.



Optimum Route Table

- Displays a table of detailed sailing data for the most recent optimum route solution.

Equivalent to button.

Tools

Refresh Grib Files

This selection causes the grib files in the GRIBS folder to be read and loaded the same as if SailFast was starting up. This may be used if files have been manually added or deleted from the GRIBS folder.

Wind Speed Conversion

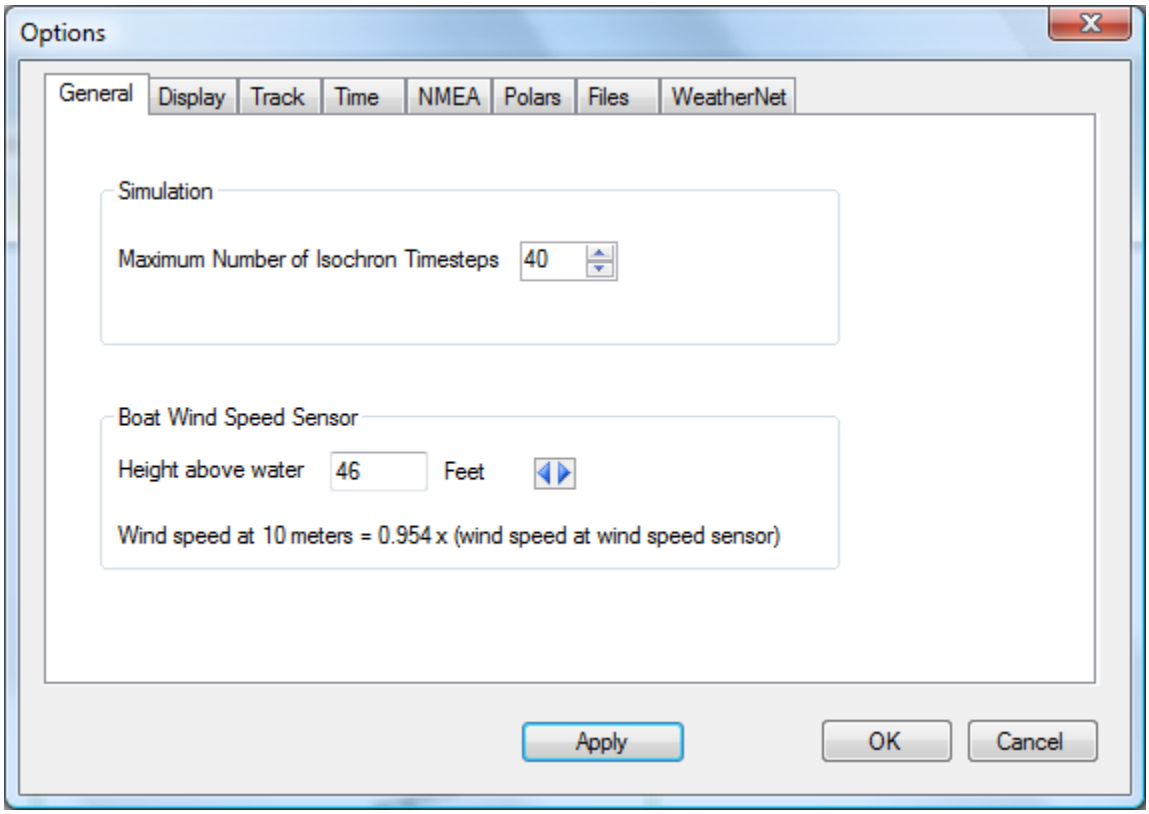
A dialog is opened that lets the user calculate the approximate wind strength at either 10 meters or at the height of the mast mounted wind sensor. Polar diagrams and grib wind forecasts are based on the wind at 10 meters above surface level. Enter the height of your wind sensor in the *Tools/Options/General* tab. SailFast automatically makes the wind strength conversions necessary when it performs optimum routing and displays ideal polar boat speeds.

Options

❖ *General Tab*

Maximum Number of Isochron Time steps. The default is 100. If the simulation time step is small and/or the sailing distance is large this value may need to be increased. If too small the simulation will abort and a warning message issued. If you need a very large number of time steps you should also consider increasing the time step value in the Routing Settings General tab.

Boat Wind Sensor Height. Enter a value in either feet or meters. Press the toggle icon to change units. In this example the wind at 10 meters will be about 95% of the wind strength measured by the mast sensor.



❖ *Display Tab*

Zoom Factor for Zoom In / Zoom Out. This is the amount the chart's displayed size changes on each Zoom In or Out.

Compass Bearing.

Select how compass bearings are displayed. To display in magnetic degrees the PC must be receiving valid magnetic variation data from a GPS or a manually set variation. Compass Bearing may also be set on the Compass tab.

Chart When Zoomed In.

When zoomed in so the horizontal axis is less than 20 degrees of longitude the World Vector Shoreline chart is normally displayed to provide the best detail. However the less detailed World Coastline chart may be specified instead.

Water Temperature selects units for temperature, either °F or °C.

Distance selects units of meters or feet. Long distances will be in nautical miles (NM)

City Names. Selected city names may be displayed when the chart is zoomed in (horizontal axis is less than 20 degrees of longitude.) City display uses a world wide database of 3.9 million entries and chart drawing response may be slow depending on location. Select *Font* to modify text size and color.

Coastline Line Width sets the number of pixels used to draw the coastline.

Select the color for the coastline by clicking the *Coastline Color* box.

Sailing Boundary Line Width. Select the line width for the sailing boundary.

Line Drawing Line Width. Select the line width.

Optimum Track Line Width. Select the line width for the optimum track.

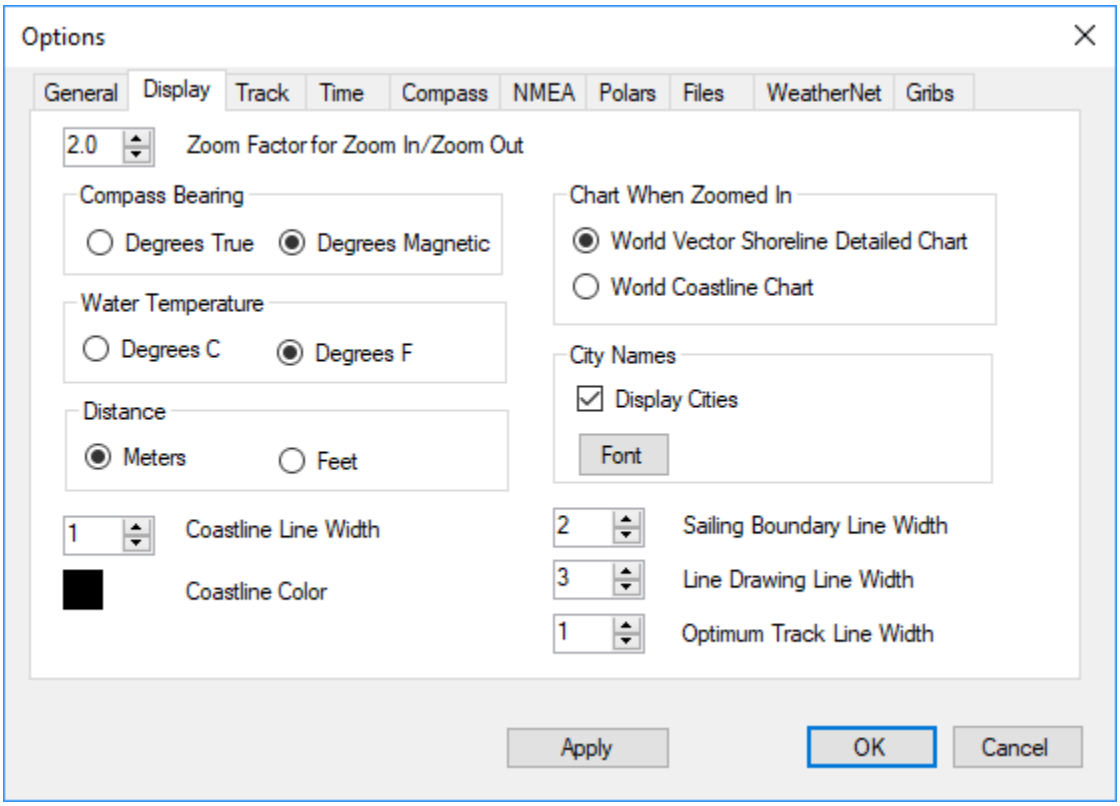


Figure 28 Tools / Options / Display

❖ *Track Tab*

Data may be recorded for the track the boat takes if NMEA 0183 position data is available. Data is recorded for the *Active Track*. Recording may be turned on and off. When turned on data is appended to previous active track data if it exists. Active track data is retained when SailFast is closed, and is available when started again.

At any time the active track data may be saved to a *Saved Track.* Once saved, the active track data is deleted and track recording is turned off.

Interval sets the time period between active track data points. Toggle to select either minutes or seconds for units. During the start portion of a race you may wish to record at short intervals. Later during the race recording at a longer interval may be adequate. This is especially true for long off shore races. A longer interval will keep file sizes manageable.

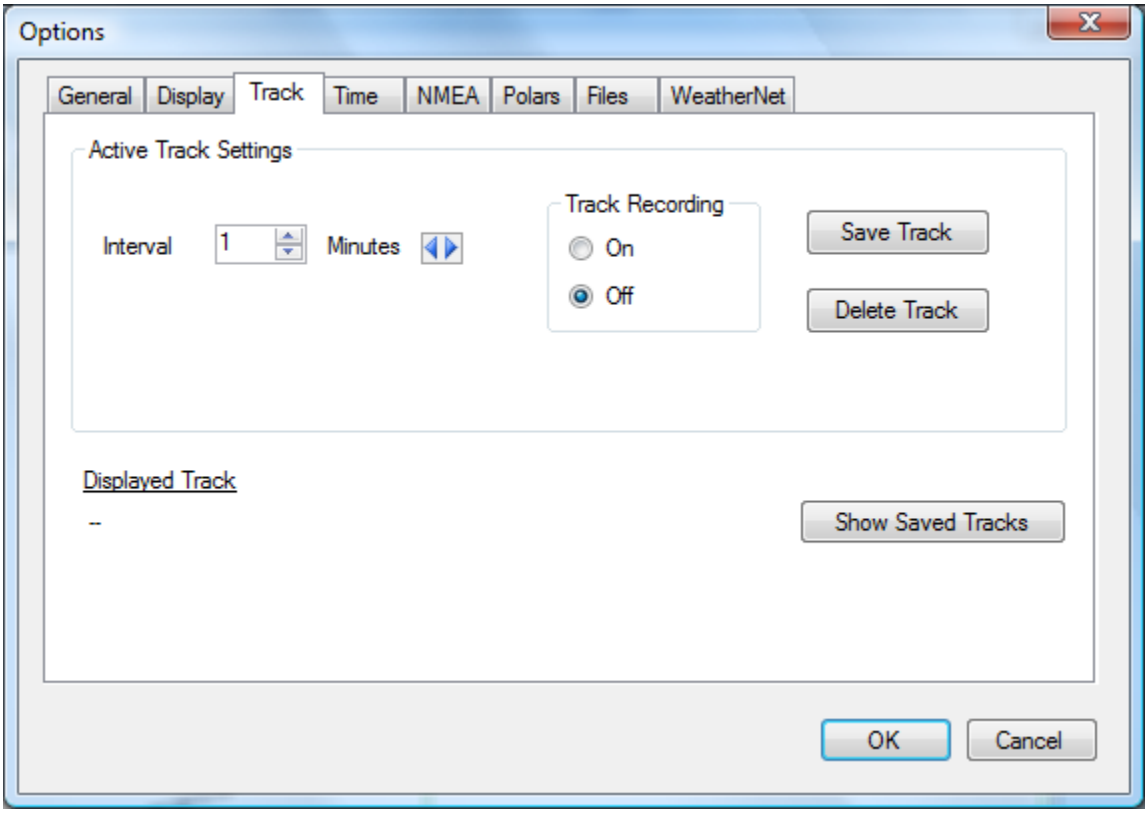
Recommendation-

Starting sequence: 1 second
Round the buoys day race: 1-10 seconds
Off-shore race: 1-10 minutes

Save Track opens a dialog in which you can name or describe the track being saved. Once saved the active track recording is turned off. To start recording a new active track you may turn recording back on.

Delete Track erases all active track data and turns off recording.

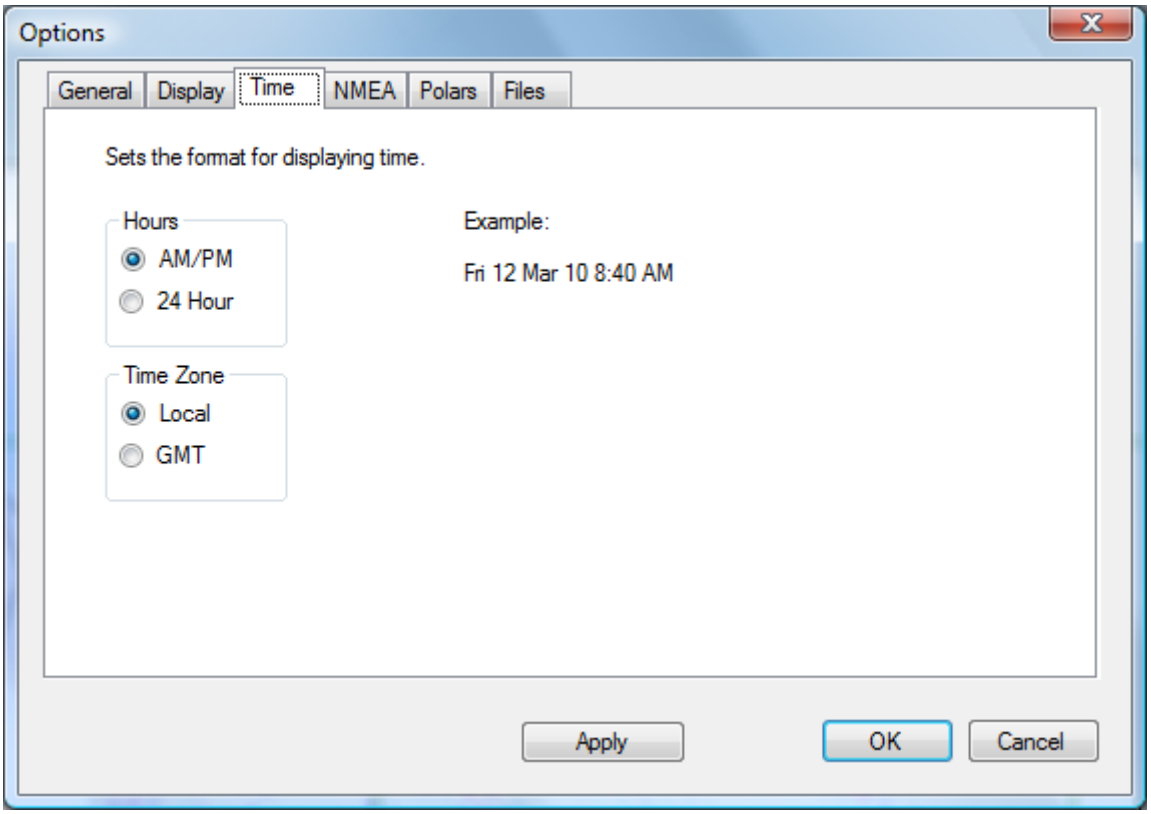
Show Saved Tracks gives a list of all saved tracks, the times when each track was started and when recording was finished, and the track description. Saved tracks may selected and deleted.



❖ *Time Tab*

The Time tab is used to specify how times are displayed.

> **Note**
>
> *It is important that the PC System time be properly set for whichever time zone is specified in your Windows date time setup. SailFast™ performs all internal timing based on GMT (UTC) time, which it determines from the PC System time.*



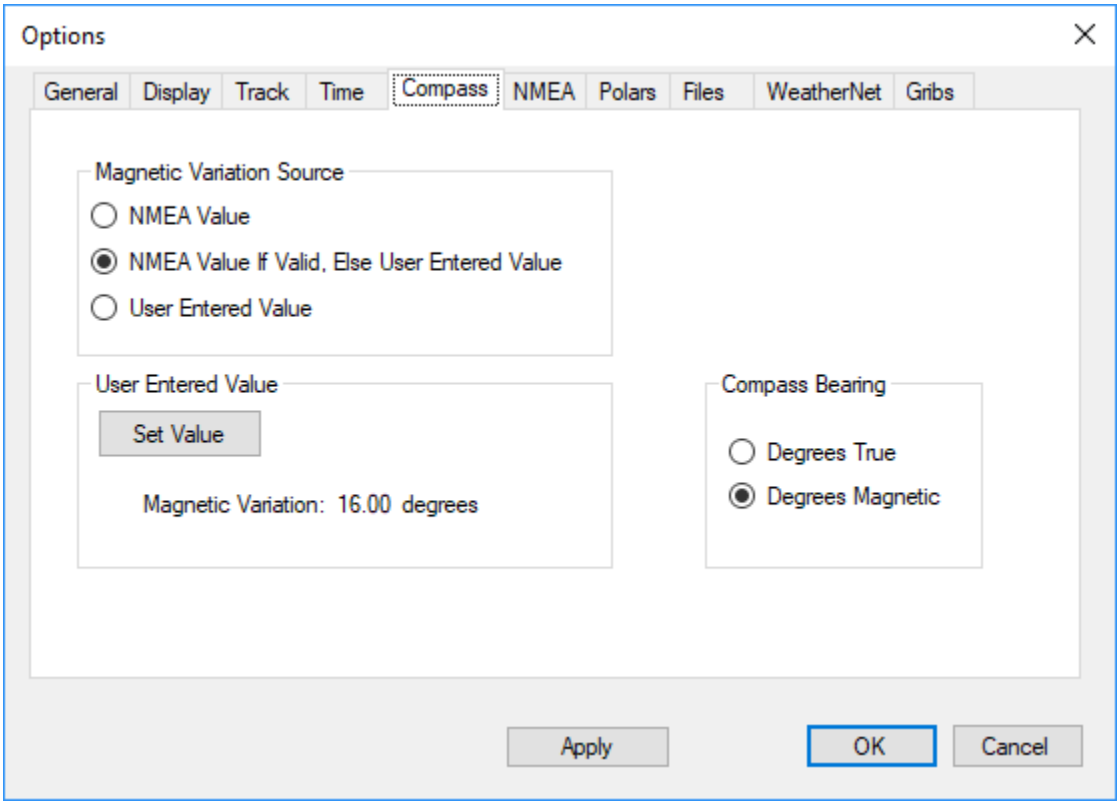
❖ *Compass Tab*

Magnetic Variation Source. Choose where SailFast will obtain the value of magnetic variation. All internal navigation calculations are performed using true degrees (°T). To display in magnetic degrees (°M) SailFast requires the magnetic variation.

> *NMEA Value*. Variation values are derived from the NMEA RMC sentence if available. If not available only °T will be displayed. Variation may also be sourced from the HDG sentence.
>
> *NMEA Value If Valid, Else User Entered Value*. If variation is available via NMEA it is used. If not, a user entered value is used. If neither are valid only °T will be displayed.
>
> *User Entered Value*. If a user entered value is set then it is used. Otherwise only °T will be displayed.

User Entered Value. Set Value displays a dialog for manually entering a magnetic variation value.

Compass Bearing. Select how compass bearings are displayed. To display in magnetic degrees the PC must be receiving valid magnetic variation data from a GPS or a manually set variation. Compass Bearing may also be set on the Display tab.



❖ *NMEA Tab*

The NMEA tab is used to select the COM port that NMEA 0183 instrument data is received on. There are also settings for the filtering of data.

To make NMEA input functional, first connect your NMEA output signal to the serial port of your PC. If your PC does not have a serial port you can use a USB to Serial adapter for this. Then run SailFast™ and on this options form select the serial com port you have connected to. If NMEA is working you should be able to see a stream of NMEA sentences on the *View / NMEA* Data dialog.

If you have multiple NMEA instruments to connect, such as a GPS and wind instruments, you will need an external NMEA combiner or multiplexer to combine these signals before sending them to your PC.

If a GPS is attached and run in a special simulation mode, then simulation data can be accepted by SailFast™ if the checkbox is checked. This may be useful for testing or debugging GPS operation. This box should remain unchecked normally.

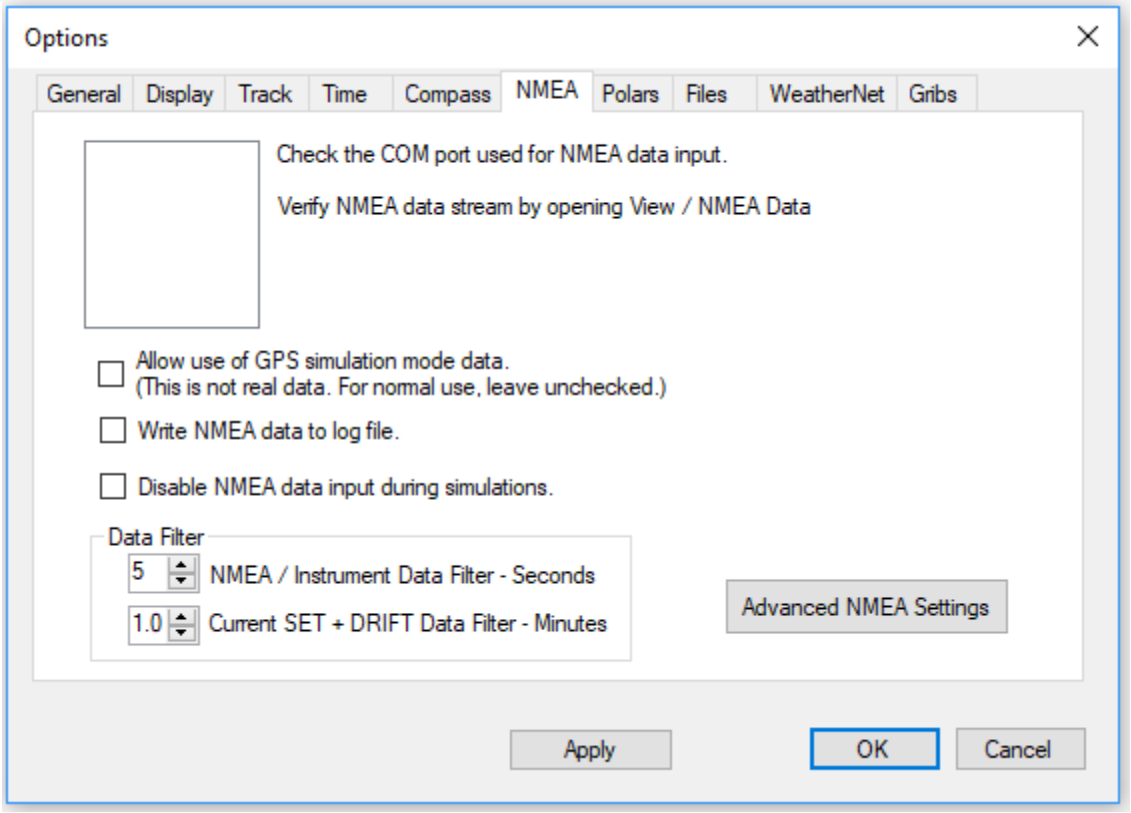
For NMEA system debugging it may be useful to capture the NMEA sentences that SailFast is receiving. Check the write to log file checkbox and NMEA sentences are written to the NMEADataLog.txt file in the SailFast folder of your user files (My Documents or Documents default). The file size is limited to 1 Mbyte. Once that size is reached no further data is written. Move, delete or rename the file to allow more data to be captured.

It has been found with some installations that SailFast can freeze during a sailing simulation if large amounts of NMEA data is being sent to the PC too rapidly. To minimize this problem check the *Disable NMEA data input during simulations.* If an external NMEA data combiner is being used, you may be able to program it to limit the type of data and/or the frequency of sending data. This should eliminate program freeze also. If all else fails try disconnecting the NMEA input during simulations.

Data Filter

Raw instrument data values often bounce around and some filtering or damping of the data is desirable. Trial and error will let you decide on a value that smoothes the data without unduly slowing down the response to real changes.

> *NMEA / Instrument Data Filter* applies filtering to all data transmitted via NMEA 0183.
>
> *Current SET + DRIFT* applies filtering to these calculations. To get accurate set and drift numbers the wind, boat speed and heading need to be reasonably steady.


Options
General
Display
Track
Time
Compass
NMEA
Polars
Files
WeatherNet
Gribs
Check the COM port used for NMEA data input.
Verify NMEA data stream by opening View / NMEA Data
Allow use of GPS simulation mode data.
(This is not real data. For normal use, leave unchecked.)
Write NMEA data to log file.
Disable NMEA data input during simulations.
Data Filter
5
NMEA / Instrument Data Filter - Seconds
1.0
Current SET + DRIFT Data Filter - Minutes
Advanced NMEA Settings
Apply
OK
Cancel

Advanced NMEA Settings

Apparent Wind Angle calibration is used to add or subtract a fixed numer of degrees from the reported NMEA value for apparent wind angle. Normally the actual wind instrument can be properly calibrated and no further calibration adjustment by SailFast is required. The SailFast calibration value would then remain at the default value of 0.

It has been found that the Raymarine ST60 wind instrument does not report the correct NMEA value for apparent wind angle. The NMEA value has a large offset when compared to the instrument display, even when the ST60 has been properly calibrated. The SailFast Apparent Wind Angle Calibration can be used to correct for this offset.

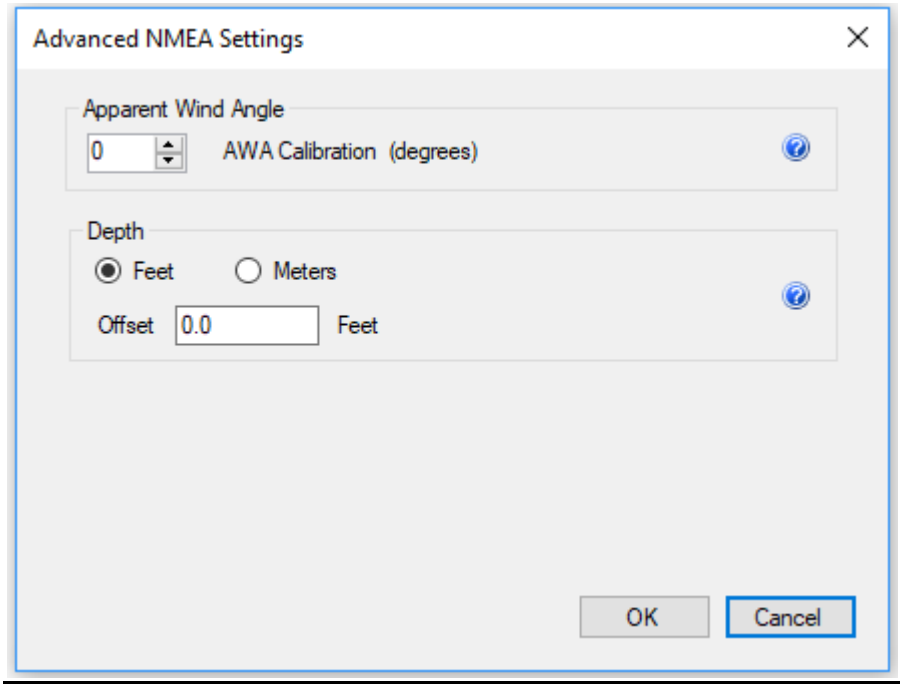
Once calibrated the actual apparent wind angle at the mast head, the wind instrument display angle and the Sailfast reported apparent wind angle (AWA) should all agree. For best accuracy calibrate and verify the results while under power and sailing directly into the wind.

Depth

These settings apply to the NMEA DBT (Depth Below Transducer) sentence. Depth may be displayed in units of feet or meters.

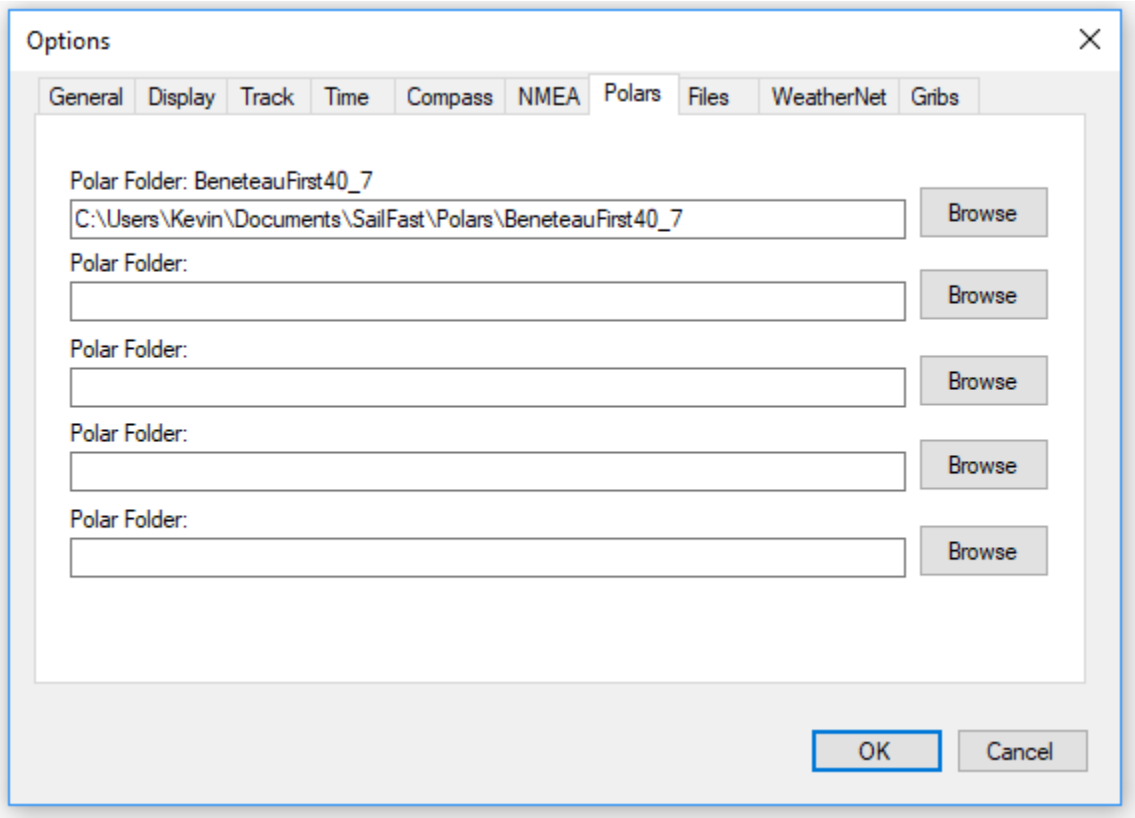
If Offset = 0 the displayed value is the depth below the transducer. If the Offset is set to the transducer distance below the water surface, then the displayed depth will be the distance below the surface.

Displayed depth = depth below transducer + Offset



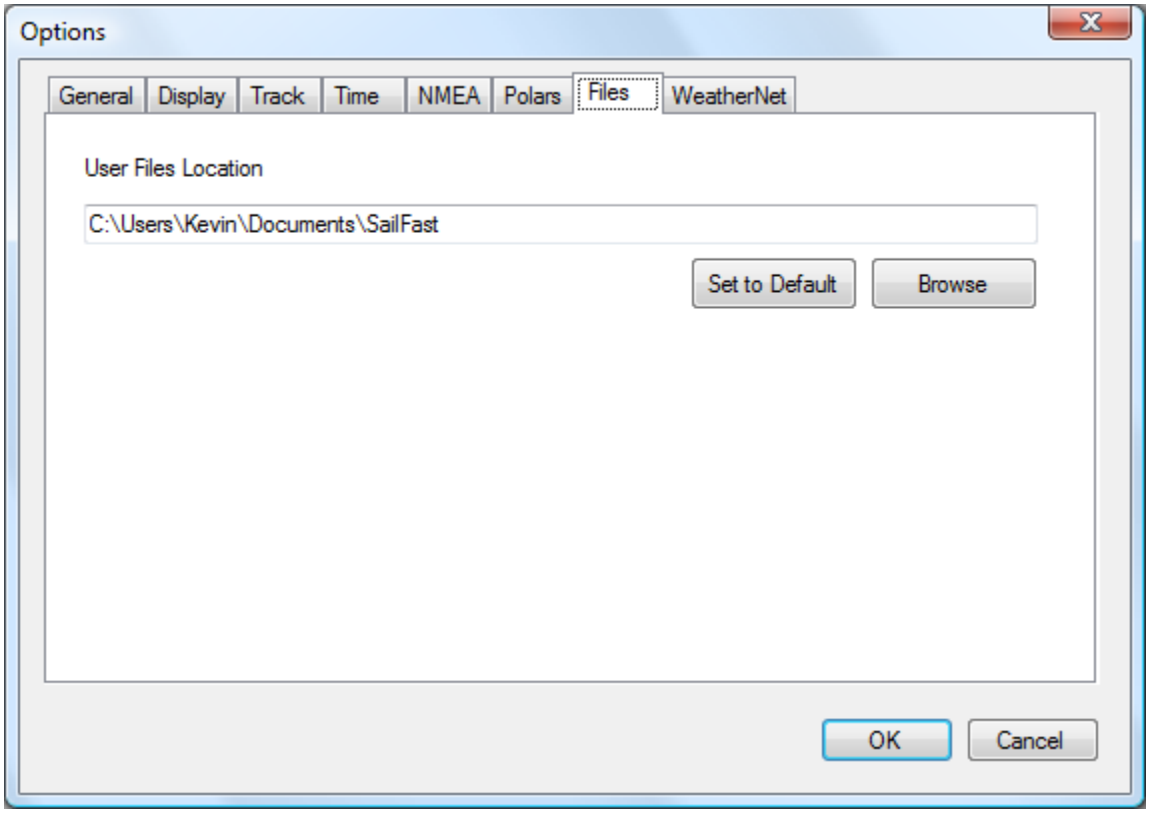
❖ *Polars Tab*

The Polars tab is used to specify unique folders for each custom polar that the user creates. Up to 5 folders may be specified. You can actually have as many custom folders as you want, but the program will only recognize the ones you specify here.



❖ *Files Tab*

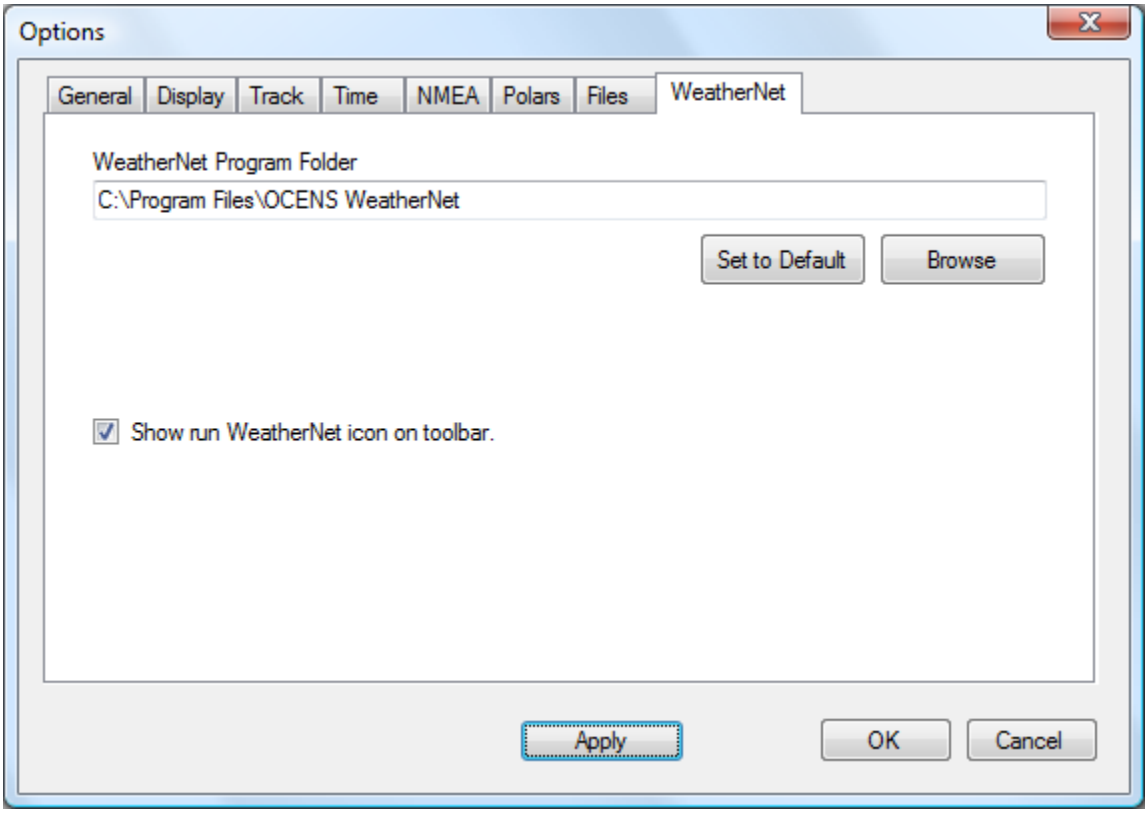
The Files tab allows the location of the User folders and files to be changed. The default location set during install is recommended.



❖ *WeatherNet Tab*

If you already have WeatherNet on your PC and you want to be able run if from SailFast, then SailFast will look for it in the normal WeatherNet install location. If the WeatherNet executable file is located in a different folder, then type in the full folder path or browse to the folder.

Use the checkbox to add the WeatherNet icon to the main toolbar.



❖ *Gribs Tab*

These option settings control the Saildocs dialog activated using the  tool bar button. Refer to the Download Saildocs Gribs Using SailFast section (page 21) for a complete description of this feature.

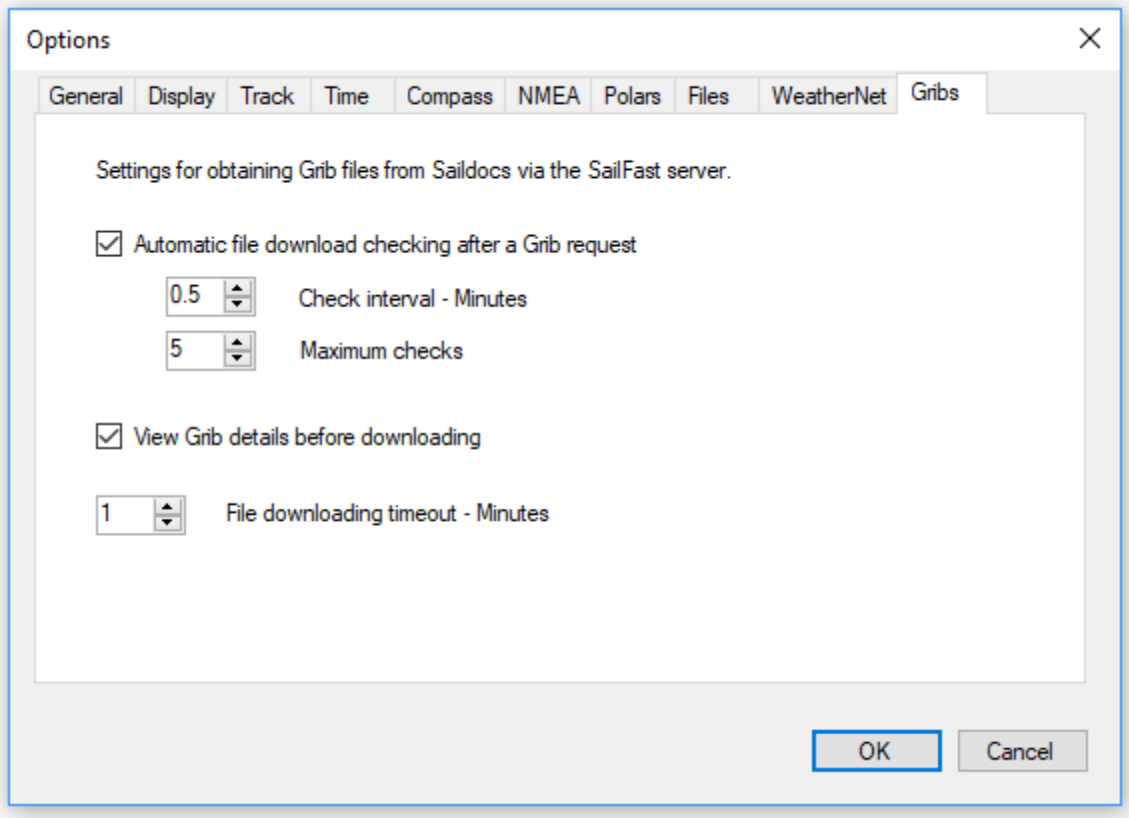
Automatic file download checking after a Grib request - When checked, SailFast will re-establish communication to the SailFast server periodically to see if there are any grib files available for download.

The *Check interval* between automatic checks is specified. The first automatic check after sending a grib request is made after a 2 minute delay.

Maximum checks - Automatic checking continues until a file for download is found or the number of checks made exceeds this value.

View Grib details before downloading - If checked, a dialog listing available files is displayed before downloading begins. Refer to **Error! Reference source not found.** page **Error! Bookmark not defined.** for a description of the dialog.

File downloading timeout - If a download exceeds this time the download and connection to the SailFast server is terminated.



Help

User Manual

– Opens the User Manual pdf file. Requires that you have an Acrobat Reader installed on your PC.

Activation Settings

-Shows the type of activation (Subscription or Demo), the expiration date and the Activation Key value.
Allows the current activation to be removed. This is useful when transitioning from a Demo activation to a Subscription activation, or when upgrading to a new subscription.

About

-Displays the program version number.

NMEA 0183 Sentences Supported

DBT (Depth below transducer)
GLL (Lat Lon position when RMC not available)
HDG (Magnetic heading when VHW not available)
MTW (Water temperature)
MWV (Wind speed and angle)
RMC (Minimum recommended GPS data)
VHW (Boat speed through water and magnetic heading)

NMEA input serial port data must be at the standard 4800 baud rate, 8 data bits, no parity, one stop bit.

Lat and lon position data is extracted from the RMC sentence if available. If RMC data is not present for more than 10 seconds lat and lon position is taken from the GLL sentence if available.

NMEA sentences are interpreted per NMEA 0183 Version 3.01, January 1, 2002 whenever possible. Otherwise sentences that comply to early 2.X versions are accepted.

Manual Revision 2
SailFast™ Program Version 10.3
Sept 11, 2019