OpenCPN

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OpenCPN User Manual

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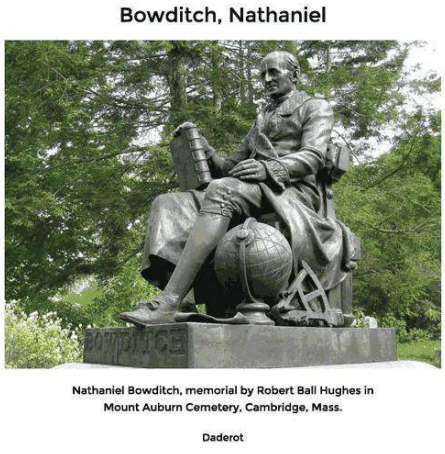
Organization

Note about organization of the Pages or Namespaces.

1. Getting Started Help for new users and direction to key sections.
2. Getting Around Controls, charts and significant features.
3. TOOLBAR Buttons Each page represents a Toolbar button organization.
4. MENUBAR Each page represents the menu selection.



This User Manual is dedicated to

- Modern Science[1]
- Isaac Newton (1643-1727)[2]
- Galileo Galilei (1564-1642)[3]

- Nicolaus Copernicus (1473-1543)[4]

with great thanks for their vision and persistence.

Modern Science: What's Happening[5]

“Science will always look for explanations for what goes on in the natural world and test those explanations against evidence from the natural world — but exactly how this gets done may evolve. The scientific enterprise is not static.”

FlatLanders stay away.

Getting Started

OpenCPN 4.8.2

Welcome! This is the Documentation for the OpenCPN 4.8.2 stable release. There are still areas that are not fully updated, however an excellent summary of Improvements since v4.8.0[6] is available. It is very easy and intuitive to get started with OpenCPN. The different menus, including the clever context-sensitive right-click menu, make it likely that you will find what you need. The program contains a lot of options to fit users with special demands and hardware.

Required reading YachtValhalla's PDF Tutorial for the new user starting up Exploring OpenCPN v3.0[7]

HELP, FAQ & OpenCPN User Manual

The most frequently asked questions by new users, seen in the OpenCPN Forum[8], are, in most cases, already answered in the **OpenCPN USER MANUAL**. If you are going to use this program for actual navigation, you need to read through this document to fully understand the scope of the program, as well as all the details.

If you have difficulties finding a particular subject, please **use your browser's built-in search ability**, often called just "**Find**". This works best using the stable release which is all on one web page.

In the Program "OpenCPN" Press  and then the **Help Tab** to access the built-in version of this document. The installed documentation will open in your default browser. **This is the first place to go for help, read the documentation please**. To download a current snapshot of this wiki as one huge web page, Click here for fullindex[9] (only works if you are online). Note that the details of downloading a single file html formatted properly have not been worked out yet.

Also the Opencpn v4.8.0 User Manual can be downloaded as compressed HTML files and directories:

- OpenCPN-4.8.0-Help.7Z (16m)[10]
- OpenCPN-4.8.0-Help.zip (19mb)[11]

You will need to uncompress them into a new folder and use your browser to access the help files.

The other way to download/mirror the html help files is to use HTTrack Website Copier[12]. Download it and make mirror a copy of the current manual to your computer. Don't forget too add filters so that file links are not downloaded! See FAQ[13] For example, add file filters for -*.zip, -*.7z and any other linked files you do not want downloaded.

To help you get started:

- Links in *italic* are internal to this document. Placing your cursor over a link will cause the link to be underlined.
- External links may be **Bold**, Underlined, or in the "http:/\…" format and need an Internet connection.
- **Marks** and **Waypoints** may have somewhat different definitions; however, in this document they generally mean the same thing.

Copy Settings File & Log File to Clipboard

If you encounter difficulties in using OpenCPN you may be asked to submit your **Settings File** and/or your **Log File**. This data will help the developers to diagnose your problem.

To locate these files, in the program "OpenCPN" Press  and then the **About Tab** and two tabs will show as shown below:

Copy Settings File to Clipboard Copy Log File to Clipboard Donate

Use these tabs for an easy way to copy these files, and then paste the clipboard contents to a document and attach it to a Cruiser's Forum post.

As you can see above,  also documents the people contributing to OpenCPN and a copy of the license OpenCPN uses, GNU GENERAL PUBLIC LICENSE Version 2. We are always looking for volunteers.

Agreement Before Using OpenCPN

Here is the note that all users have to approve when installing the program.

```
OpenCPN is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
See the GNU General Public License for more details.
OpenCPN must only be used in conjunction with approved paper
charts and traditional methods of navigation.
DO NOT rely upon OpenCPN for safety of life or property.
```

This is not a text on general navigation. We assume that you are familiar with nautical navigation. Reading this text and using OpenCPN will not in itself make you a “navigator”.

IMPORTANT NEXT STEPS

Getting started using OpenCPN consists of 4 basic steps:

- OpenCPN Installation Will lead you through installing OpenCPN on your particular OS and computer.
- Chart Installation of Charts to be read by OpenCPN (OpenCPN does not include charts)
- Charts Basic Features - Main Source for using charts
- GPS Setup to communicate with your computer and OpenCPN (Optional, but very useful) Completing these 4 steps will get you started and allow you to check out the program.

There is also a very useful PDF Tutorial for the new user starting up called Exploring OpenCPN [14]

If you still have questions or would just like to get in touch with other OpenCPN users, there is a large community behind OpenCPN. You can find us in this Cruisers Forum.[15]

If you are an advanced users with programming experience we recommend the Developers Manual[16].

OpenCPN Installation

OS Installation pages

- Windows
- Ubuntu PPA
- Linux
- Fedora
- Mac OS X
- Dedicated Marine OS
- Orange Pi
- RaspberryPI RPI2
- Release History

Software

Download your version of OpenCPN here[17]

- Use a “stable”, official release for actual navigation. The latest stable release is always available at the top of the download page or from Source Forge.
- Beta releases are snapshots of the development process, and may contain errors or temporarily be unstable. Show stoppers are normally fixed very quickly however. This is where the latest features first are seen. Most of the time the beta releases are quite stable and the OpenCPN team appreciate it if more experienced users test the releases and report back.
- The place to report bugs and suggest features is the Tracker[18]. To reach the Tracker[19] from the OpenCPN Web pages[20] click on the “Tracker” tab at the upper right (above the blue bar). The sticky thread Tracker/Flyspray - How and When to use it[21] gives some hints.
- To see what version you are using either look in (Help) **?** → **About** or at the top of your display. A lot of information is also available in the **Log file**. See below.

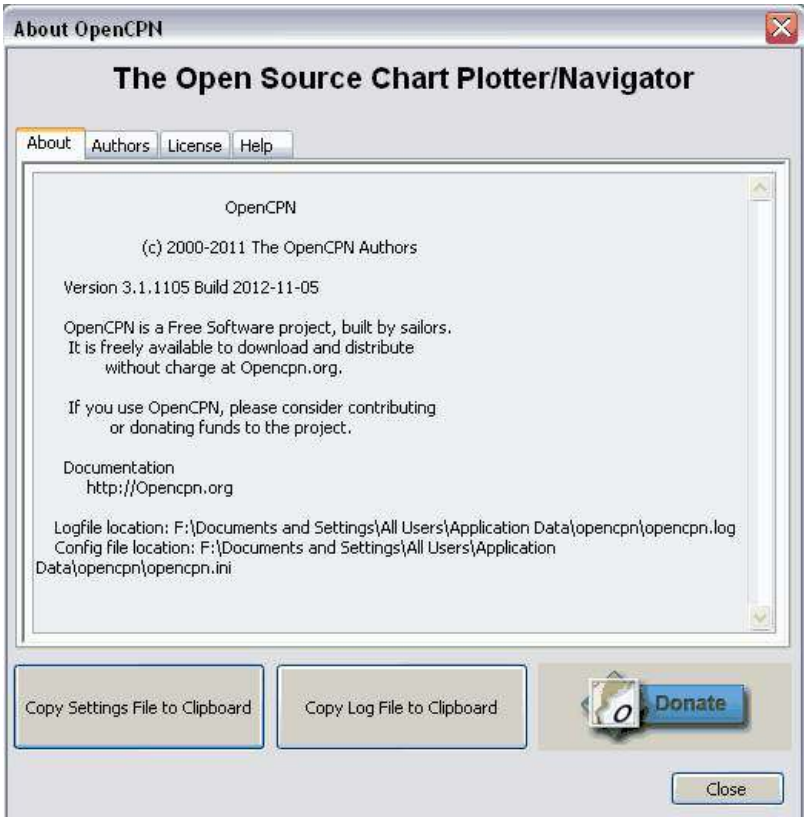
(#log-config)

Location of Important Files. Log and config files.

- It is important to know the location of the **log file** and the **configuration file**, **opencpn.conf (Linux)** or **opencpn.ini** (Windows), on your computer. If you ask

questions on the forum, there is a fair chance that you will be asked about the content in these files. Once you get familiar with OpenCPN, have a look at the files!

- Through out this documentation there will be many references to the **configuration file**, as it often is possible to change the default settings. This is an advanced subject once you are familiar with OpenCPN. All editing in the **config files** must be done with a text-editor, such as "**notepad**" in Windows, or **notepad++**.
- The **configuration file** is where all data, that needs to be persistent between sessions, are stored. The logfile keeps tab of what's going on in the current session.
- To find the locations of the files go to the ToolBar click on "**About OpenCPN**", the button looks like a blue book with a "**?**" on the cover. Look at the bottom of the "About" Tab, highlighted below. The illustration below is from a Win XP. A quick way to view the logfile is to copy the full file path and then paste this into the address field in a web browser.



- For quick copying of the **opencpn.ini** and **Log files** use the two "Copy" buttons. This is useful for publishing on the forum if asked to do so. Please use the Forum "Code" button before pasting, as this guarantees an exact copy.
- On **Linux** the "**opencpn.log**" is in your home directory.
  The "**opencpn.conf**" is in a hidden directory, called "**opencpn**", also in your home directory.
  For a quick way to view the files you can try these commands.

```
$gedit `echo $HOME/opencpn.log`

$gedit `echo $HOME/.opencpn/opencpn.conf`
```

  Of course you can swap "gedit" for your favorite editor.

- On Windows 8, Windows 7, **Windows 2000, XP and Vista** the two files are more difficult to find, so use the "**About**" dialog as described above. On many windows installs the folder containing the logfile will also be **hidden**, so you need to change your

systems “Folder Options” to show it.

For example, the **C:\ProgramData** folder is by default hidden in Windows 7. Here's how to get to it. To access it you need to un-hide it by doing the following:

1. Go to **Control Panel > Folder Options**
2. Switch to **View** tab
3. Select “Show hidden files, folders and drives”.
4. Unselect “Hide extensions for know file types” to get this state:

Now you will be able to find your logfile.

On **Mac OS X** , the **logfile**, “**opencpn.log**” , is in / Users/ “user name” /Library/Logs/ and the “**opencpn.ini** ” is in the / Users/ “user name” /Library/Preferences/opencpn/ directory.

Windows

Windows XP SP3/Vista/7/8/10 (except W8 RT)

Download the installation package for Windows from Download OpenCPN[22].

- Use the stable release for navigation en route, or if you just started using OpenCPN.
- Exit all other programs, including your anti virus program - known to create problems in some cases. Unplug your network cable, to be on the safe side.
- Run the downloaded installer. Re-start your anti-virus. Re-connect the network
- If upgrading from a previous version of OpenCPN, there is no need to un-install the old version. Simply install the new version and it will upgrade OpenCPN, saving all your existing configuration and preferences.
- If this is a new installation, click on the Toolbox icon  and configure your GPS source, chart directories, and other settings. It is highly recommended that you use the Chart Downloader Tab to setup directories and download charts.
- If your installation goes well, but OpenCPN does not start as expected, try to download and install these runtime components[23].

Versions no longer supported:

Win 8 RT is not supported.
Win CE is not supported.
Win XP SP 2 or 1 are not supported. The last OpenCPN version that included support was 2.6.1624.
Win XP SP 3 will be dropped in the next release. Get ready.
Win 2000 is not supported. The last OpenCPN version that included support was 2.5.0.
Win 98/ME are not supported. The last OpenCPN version that included support was 2.1.0.

-

Old versions of OpenCPN are available on SourceForge[24].

Ubuntu PPA

How to add the OpenCPN PPA into an Ubuntu system

You have two options to add the PPA to your system, either using the commandline Terminal or the GUI provided by the system, chose one that suits you better, not both.

If you are using a non-standard variant of Ubuntu or a newer/older/whatever version than the one used while creating this guide, the GUI may be slightly different, try to use common sense before you start to be furious that the guide below does not work - it does. If it still does not work for you, ask in the support forum, providing exact steps you performed and exact error output you get.

There are two PPA repositories, one for stable versions only and one that includes beta versions. If you want the beta versions replace the "ppa:opencpn/opencpn" string in the following instructions with "ppa:bdbcat/opencpn".

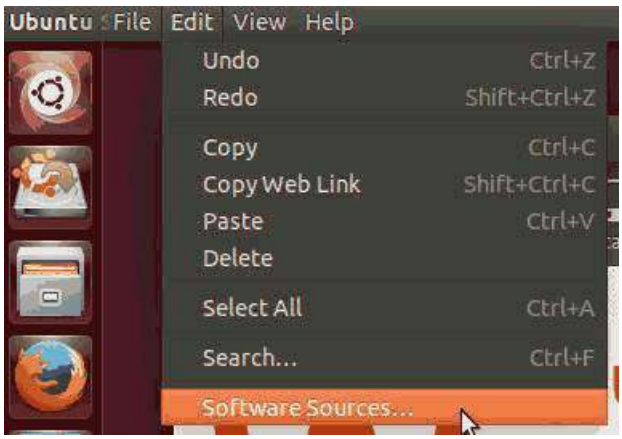
From the command line

Open a **Terminal** and enter the following commands:

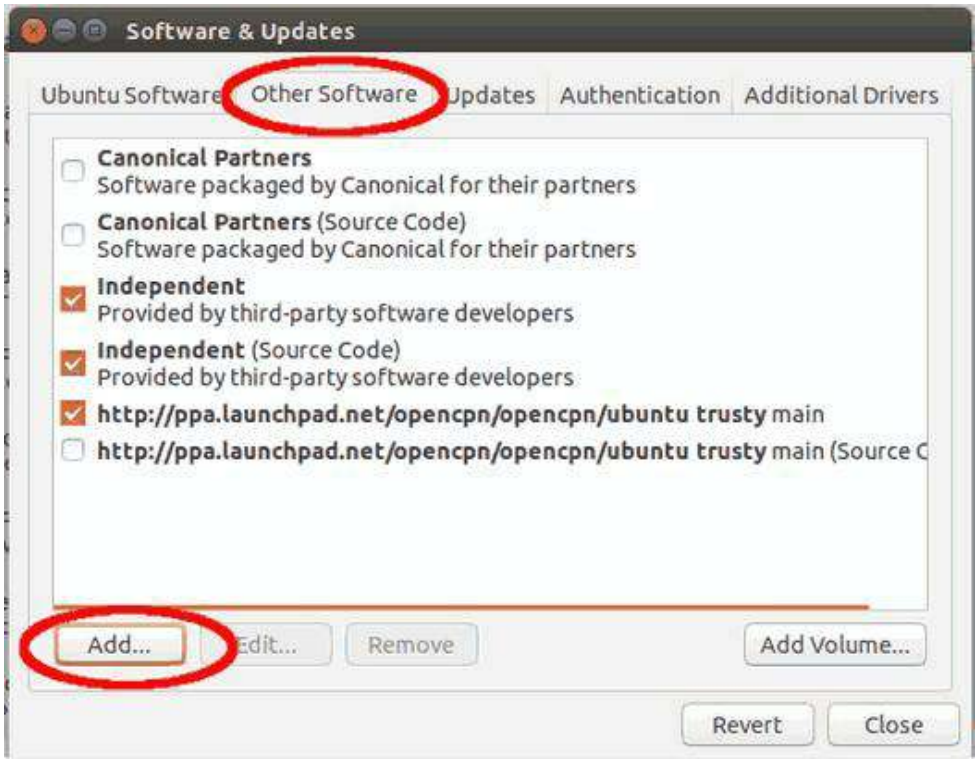
```
sudo apt-get install software-properties-common
sudo add-apt-repository ppa:opencpn/opencpn
sudo apt-get update
sudo apt-get install opencpn
```

===
Using the graphical configuration tools ===
Start the **Ubuntu Software Center**

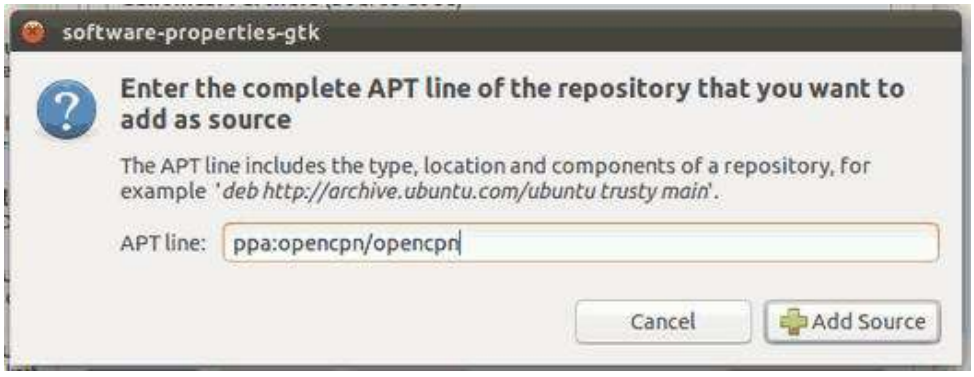
From the **Edit** menu, select **Software Sources…**



On the **Other** tab, click on **Add…** button



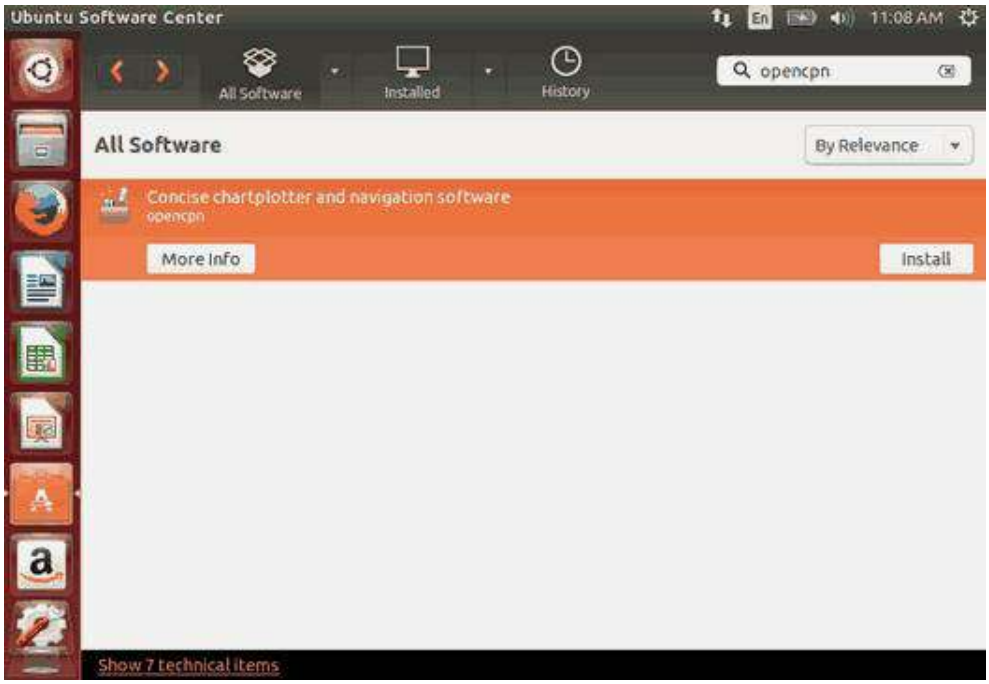
In the dialog shown, fill in **ppa:opencpn/opencpn** (for stable versions) or **ppa:bdbcat/opencpn** (for beta versions) and click on the **Add Source** button



Wait until Ubuntu Downloads the necessary information and the progress indicator

disappears

From now on you are able to install OpenCPN as any other software. You will also get new stable versions automatically while updating your system.



Linux

Ubuntu/Debian Distributions

Prebuilt packages are available, go to
https://opencpn.org/OpenCPN/info/downloadopencpn.html[25]

Fedora / CentOS

Prebuilt packages are available, go to
https://opencpn.org/OpenCPN/info/downloadopencpn.html[26]

Gentoo / OpenSuSE

Prebuilt packages are available, go to
https://opencpn.org/OpenCPN/info/downloadopencpn.html[27]

Other Linux Distributions and the BSD operating systems

- If your distribution is not currently provided with packages linked from https://opencpn.org/OpenCPN/info/downloadopencpn.html[28] you may still build OpenCPN from source.
- Download the source code from the Github project[29]. More about compiling on Linux here Compiling - Linux.[30]
- Interested in maintaining a package for your favorite Linux distribution? Let us know in the support forum.
- This also includes the different BSD distributions. Report your experiences back to the forum.

Using Linux repositories.

Installing on Ubuntu

Add the OpenCPN ppa repository as explained in *configuring Ubuntu PPA*
- If you are using Synaptic, add the repository, reload the software sources as it suggests, search for and install opencpn
- No need to install anything manually

Fedora

Using Linux repositories, an easier way to install and update.

Installing in a different, easy way. RPM

Installing on Fedora A full repo is now available and can be used to install and update opencpn.
To install the repo, please run this as root:

```
dnf install [[http://je.onfray.fr/repo/fedora/23/x86_64/jeo-release-1.2-
1.fc23.noarch.rpm|http://je.onfray.fr/repo/fedora/23/x86_64/jeo-release-1.2-
1.fc23.noarch.rpm]]
```

[SethDart Reports 3/6/17]
I maintain my Fedora packages. Stable repo has 4.4, beta has 4.5.221. They are built for all current Fedora releases : that is #24 and #25 now, both for i386 (32 bits) & x86_64 (64 bits). I'm also building EPEL (RHEL/CentOS) packages for EPEL 6 & 7, x86_64 only. I can add more if requested.

There's nothing magic in these packages : I regularly update my .spec file (cmake automatically generated one breaks dependencies with subpackages and libraries) The .srpm is then built in a separate chroot for each flavour using regular Fedora mock tool. I'll upload all these recipes to my github repo when I've enough time.

When I tried to help building OpenCPN for OpenSUSE, I created a VM, it must be laying somewhere around. I can give it another try.

Keep up the good work. Jean-Eudes

Install above RPM

You can install the above **rpm**, no matter if you're using i386 or x86_64, be it Fedora 22 or Fedora 23, it'll work on all these (you should be able to install it right from your browser clicking the above link and then install)
By default, only the stable repo is enabled ; you can install opencpn-4.2 from your favorite package manager (dnf, Gnome package kit or KDE package kit).

I've created two separate packages:

opencpn with the program and the two default plugins
and
opencpn-doc with the whole html doc to browse it offline.

When a new stable is released, you'll be automatically notified and able to update… so easy!

Security/Trust: all packages are signed with **Key ID: 7e53dbe19add462d**

OpenCPN for OpenSUSE and Fedora

From Dominig,
I keep a precompiled version of OpenCPN for OpenSUSE and Fedora ready to install in the OpenSUSE build system (OBS). As both distro are rpm based, it's very easy for me to suport both.

Getting the correct wx release built and installed is a pain as notonly you need to get the right version built, but you also need to compile it with the right option set (no stl) and then make sure that the system does load what you want. Getting the right wx installed may require to change some priority or even wx repo manually on the target PC.

My OpenSUSE wiki page is here.

- OpenCPN for openSUSE English[31]
- OpenCPN for openSUSE French[32]

Alternative:

- opensus.org - OpenCPN for openSUSE French[33]

I hope that it can help. Regards Dominig

Mac OS X

Note: You must install OpenCPN into your Applications folder where it belongs. The installers of the plugins of course expect it to be there.

OpenCPN is distributed as a Mac ".dmg" file

1. Download the .dmg file.
2. Open the dmg file by double-clicking on it - this will mount the dmg as a virtual device and create a mount on your desktop.
3. Drag the OpenCPN.app icon to the Applications icon in the installer window. This may require the administrator password.
4. Unmount the dmg by right-clicking on the desktop icon and selecting “Eject”

- You can have a look at this tutorial[34] How to Install and Remove Apps for general instructions on installing Mac OS X applications.
- If you have a message that installations are only accepted for programs from qualified developers, navigate to Applications in Finder, Control-click OpenCPN.app, select Open from the context menu and confirm that you want to start it in the displayed dialog.
- To save a previously installed version rename the app in the Applications directory before installing the new version.
- If OpenCPN.app is replaced, the installed plugins will not be there anymore and have to be re-installed on the new OpenCPN.app. The userdata of the plugins will still be there.

Plugin Installation

1. Download the installation package (*.pkg)
2. Make sure that the OpenCPN application is not renamed. The plugin will only install on OpenCPN.app
3. Double-click the downloaded file to start the installation. In case your security settings are tight, which is the default on modern macOS versions, Control-Click on the file, select Open from the context menu and confirm your intention to open the installer.
4. Follow the instructions provided by the installer
5. In case your security settings are tight and the OS refuses to start the installer, control-click it, select Open from the context menu and confirm your intention to install the plugin in the subsequent dialog.

Use of your iPad with RealVNC and OpenCPN[35]

Dedicated Marine OS

XINUTOP

Another way to run OpenCPN or test it without installation on your current system is to use a specialized marine OS, which also include essential marine applications. Xinutop is a free an opensource Linux-Debian based solution and can operate on a large variety of x86 processors compliants. Xinutop can run as a live system on USB key. Perform a key is fast and simple, just download and grab the image. It can also be installed on a HDD/SSD, as primary, secondary or rescue OS.

More under Supplementary Software Xinutop Marine OS[36]
Infos and download at http://marinux.tuxfamily.org[37]
See also in Supplementary Software Xinutop Marine OS[38]

OpenPlotter

The open-source sailing platform for ARM computers

There are people who buy boats but there are also people who build them, why not build your own electronics too? OpenPlotter is a combination of software and hardware to be used as navigational aid on small and medium boats. It is also a complete home automation system onboard. It works on ARM computers like the Raspberry Pi[39] and is open-source, low-cost and low-consumption. Its design is modular, so you just have to implement what your boat needs. Do it yourself.

You will need the basic parts and some optional parts. It will depend on what kind of data you want to collect, process or display and what kind of equipment your boat already has.

http://www.sailoog.com/en/openplotter[40]
Openplotter Cruisers Forum[41]

Orange Pi

What's Orange Pi PC ？

It's an open-source single-board computer with an arm based CPU. It uses the AllWinner H3 SoC. It also has a Mali-400 GPU that can run accelerated OpenGLES. There are several versions that differ only in the amount of flash, memory, number of USBs and type of internet.

The primary Linux distribution available is armbian[42], a linux for ARM development boards.
These instructions are for the **armbian 5.38** release of Ubuntu desktop 16.04. Older releases are in the repo also. This release uses the legacy kernel, 3.4.113 because the mainline kernel for the H3 arm doen not yet support accelerated graphics.

To install from a *.deb package please see:
https://github.com/svkatielee/OpenCPN-repo[43]

To compile your own version please see the developer manual:
Developer Manual[44]

Building on armhf linux - Armbian - Orange Pi[45] and

KB7KMO Projects: Compile OpenCPN 4.8.2 for Armbian[46]
And for the older release:
KB7KMO Projects: OpenCPN on Orange Pi an Allwinner H3 Arm SBC[47]

Raspberry Pi 2/3

Installing Raspbian

OpenCPN works on Raspberry Pi 2 and 3 (recommended) models. You can install OpenCPN adding an Ubuntu PPA (Personal Packages Archives) to your system's Software Sources. We will see how to do this but first of all you need to have a running system.

Raspbian is the official Operating System for Raspberry Pi. You have two options to install Raspbian on an SD card: with NOOBS (New Out Of Box Software) or installing an SD image directly. We recommend NOOBS.

Follow this easy guide for both options: https://www.raspberrypi.org/learning/software-guide/quickstart/[48]

If you feel lazy you can try OpenPlotter[49], a complete marine Operating System for Raspberry Pi with OpenCPN + plugins installed and amazing extra tools ready to use. OpenPlotter can be installed with NOOBS following this guide: https://sailoog.gitbooks.io/openplotter-documentation/content/en/getting_started.html[50]

Apt-Key Deprecated - May 2018

See http://www.cruisersforum.com/forums/f134/opencpn-version-4-8-4-released-200246-2.html#post2627925[51] and the later posts from bdbcat and CaptRon. How do I fix the GPG error “NO_PUBKEY”?[52] Apt-key is deprecated, see gpg: keyserver receive failed: No dirmngr[53] and GPG error: http://ppa.launchpad.net precise Release: The following signatures couldn't be verified because the public key is not available[54]

Adding OpenCPN Ubuntu PPA to Raspbian Software Sources

Once you have Raspbian running on Raspberry Pi, go to Menu → Accessories → Terminal, and type:

```
sudo nano /etc/apt/sources.list
```

A text editor will open. Move the cursor to the end and add this line if you are on Raspbian Stretch:

```
deb http://ppa.launchpad.net/opencpn/opencpn/ubuntu/ xenial main
```

Or, if your Raspbian is Jessie:

```
deb http://ppa.launchpad.net/opencpn/opencpn/ubuntu/ trusty main
```

Save the file pressing Ctrl+X, say Yes and press enter. Now type:

```
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys C865EB40
```

and press enter. Now be sure you have Internet connection and type:

```
sudo apt-get update
```

The Software sources will be updated and finally you will have to type:

```
sudo apt-get install opencpn
```

and you are done!

Installing plugins

All the plugin packages are named as **opencpn-plugin-<*pluginname*>** , to install a plugin, use a command like shown on the example bellow:

```
sudo apt-get install opencpn-plugin-watchdog
sudo apt-get install opencpn-plugin-statusbar
…
```

Wildcards can be used in the installed package names, so to install **all** the available plugins, you may use:

```
sudo apt-get install opencpn-plugin*
```

If a new version of OpenCPN or a plugin is released and you want to update (this **IS** a good idea), just type:

```
sudo apt-get update
sudo apt-get upgrade
```

Advanced

Installing OpenCPN betas

Coming soon

OpenGL acceleration

Coming soon

Compiling OpenCPN on Raspberry Pi

https://opencpn.org/wiki/dokuwiki/doku.php?id=opencpn:developer_manual:developer_guide:compiling_linux:rpi2[55]

Android

Any special instructions for cell phone?

I think last time I installed, I just got it from the Google Play repository. Installed easily on a Tab 2, my Note 3's, and a Note 4. So I would just open up the Google Play store on your Android, and search OpenCPN. Click, and let it happen.

Adjusting the settings is where you have to actually do some work yourself. You will have to point it to your chart collection on your phone. Try downloading a few NOAA charts to a directory on your phone. If you are like many Android users, this is the hardest part.

A lot of users who have not dug deeply into Android do not realize that an Android phone is actually a computer that just happens to also be able to make phone calls. The thing is, much of the file system is sort of hidden and not readily and obviously accessible. The first thing you have to do is install a good file manager that makes it easy to at least access the storage on your device in a practical manner. I use Root Explorer. There may be better ones, I guess, but this is just the one I have always used. You do not need root to install or use this one, AFAIK but the Google Play store will tell you if it will install on your device.

When you download the charts you want for initial testing of OCPN, you need to first figure out where they are stored. Probably /storage/sdcard0/Download or something like that. You should create a directory for your charts with a descriptive name like /storage/sdcard0/CHARTS/ or something like that. Typically the internal storage of your phone will be sdcard0 which is not removable, and the user installed microSD card will be /storage/sdcard1/ and the Android file system has other path names that will get you to the same places. You may want charts on your removable microSD card due to limited storage on your phone, or you may want them on your internal storage for slightly faster run time.

Once you have charts on your phone and you know where they are, you can open up OCPN and in the Settings/Charts/Chart Files menu select “Add Directory” and a file browser will open. Navigate to your charts and hit “OK”. Then you will be back in the Chart Files menu. Click “OK” again and OCPN will build the chart database and then your charts will be loaded and ready to use. There are other settings to fiddle with but I don't want to write a book here and the app has a manual accessed by the question mark button. The crescent wrench is the settings button. Sometimes they disappear for some reason on my Note 3, not sure why, but they are always there when I start the app.

Oh, and in your phone's settings menu, under “Location”, you may want to enable “Device Only” so that the actual GPS chip in your phone is providing location information to your phone, and not your cell phone network.

—

I'm not sure I get this. I have no “device only” option. When I go to location services it shows a bunch of my apps like contacts Cruiser forum, Phone, Etc and then Google location history and Sharing.

Go back to “Location” in the Settings menu. Above the list of “Recent location requests”,

you will see a “Mode” setting. Underneath it will probably say “High accuracy” which works nicely sometimes, like when you are near 3 or 4 cell towers with a good bearing split. But if you click on “Mode”, you can change it to “Battery saving” or to “Device only”. Pick “Device only” for marine use.

It actually could be different depending on the Android version and phone type. On mine it's under Privacy and safety then election Location and it gives 3 choices: -Wi-Fi, Mobile data and GPS - Wi-Fi and Mobile Data - GPS

Release History

1.2.0 2007-04-20

1. Opencpn was built with the following objectives in mind.
2. Intended use as primary navigation interface for vessels with full-time helm-visible navigational suites.
3. Other tools may be better for offline route planning, tide and current prediction, online logging, etc.
4. Quick startup and shutdown.
5. Those and only those toolbar buttons really needed for daily operation.
6. Portability, thus wxWidgets core components. Currently tested and in production use on W98, XP, and Linux.
7. Conventional (i.e. popular and modern) chart format support. In the real world, this means BSB format raster
8. charts, and S57ENC format vector charts.

1.2.2 2008-01-02

1. Improved AIS symbology and diagnostics, including RateOfTurn indication.
2. Improved toolbar icon symbology, supporting day/dusk/dark color schemes.
3. Rationalized home directory selection for Windows, allowing program installation in arbitrary directory/folder.
4. Improved accuaracy of Great Circle distance/bearing calculations.
5. Optional Depth Units displayable on chart as embossed character image.
6. Ownship position indicator on thumbnail charts accurately follow true GPS position.

1.2.4 2008-04-20

1. Configure/build modifications for Unicode systems, especially Ubuntu.
2. Added Route and Mark property sheets.
3. Improved S57 ENC symbology.

1.2.6 2008-08-31 This is a maintenance and feature update release,

1. containing some S57 ENC symbology improvements,
2. greater compliance with IHO S52 standards,
3. and various enhancements and bug fixes.
4. Especially interesting are the DUSK and NIGHT display modes, for which user feedback is highly desired…

1.2.8 2008-12-25 Mac OS X Support, including installable application bundle (OpenCPN.dmg),

1. GNU/gcc compatible system build files, and XCode project files.
2. Garmin USB GPS device support for Windows platforms.
3. Miscellaneous bug fixes and user optimizations.

1.3.0 2009-05-09

1. CM93 worldwide vector chart support, with automatic chart scaling.
2. Improved AIS target tracking with configurable CPA/collision warning options.
3. GPX compatible waypoint and route exporting tools.
4. Configurable range rings centered on ownship position.
5. And, as usual, miscellaneous bug fixes and user optimizations.

1.3.2 2009-07-11

1. Improved AIS target depiction and collision detection alerts.
2. Hot keys and scroll mouse support.
3. Help File.
4. Various display speed and quality optimizations, especially for CM93 charts.

1.3.4 2009-10-01

1. Ship's position tracking function, with GPX export and import.
2. Enhanced icons and screen graphics, for improved visibility.
3. Import and export of Routes using GPX interface protocol.
4. Implement CM93 vector chart detail control slider.
5. Assorted usability and reliability improvements.

1.3.6 2010-01-07

1. Add basic GRIB file decoding and chart overlay display.
2. Improve and expand NMEA message type support.
3. Improved documentation.
4. Add modular international language support.
5. Assorted usability and reliability improvements.

2.1.0 2010-06-26

1. BSBv3 raster and S57 ENC chart support.
2. CM93 vector chart support.
3. IHO S52 compliant display of S57 vector charts.
4. Single-chart and Quilted display modes.
5. North-up and Course-up display modes.
6. Moving-map display mode.
7. Route navigation with ship tracking functions.
8. Waypoint navigation.
9. NMEA 0183 GPS interface at selectable baud rate.
10. gpsd library support.
11. Autopilot output support.
12. AIS input with full target tracking and collision alerting.
13. Anchor watch/alarm functions.
14. GRIB file input and display for weather forecasting.
15. GPX Waypoint and Route input and output file support.
16. Tide and Current prediction and display by location.
17. Multi-language support.
18. linux and Windows compatible.

2.3.0 2010-12-18

1. Integrated PlugIn architecture, allowing third-party development and deployment of auxiliary features.
2. Two useful PlugIns available immediately
3. Graphical overlay of GRIB (weather)file data
4. Dashboard for configurable on-screen display of ship's NMEA data.
5. Enhanced Route, Track, and Waypoint management functions by selectable dialog.
6. Many new languages added to basic package, including Portuguese, Estonian, Greek, Turkish, Finnish, Norwegian, etc.
7. Support Garmin Host mode Route and Waypoint interchange and upload to remote GPS receivers.
8. Advanced internationalized Windows Program Installer.
9. Full support for North-up and Course-Up display of all chart types.
10. Expanded AIS target message decoding to include European Inland AIS specifications.
11. AIS Target List Dialog, allowing easy selection and monitoring of all active AIS targets.
12. Many, many improvements in the basic User Interface, while maintaining the ease-of-use that.

2.3.1 2010-12-31

1. Correct logic regarding ownship AIS messages (AIVDO)
2. Correct fault closing AIStarget list with target query dialog open (FS#310)
3. Correct occasional geolocation problem with routes on BSB chart switch.
4. Improve Toolbar refresh logic.
5. Increase maximum chart stack size from 20 to 30. (FS#316)
6. Correct GoTo waypoint and subsequent route delete logic. (FS#244)
7. Various language file updates.
8. Correct Depth unit display for quilted charts, with non-english language setting.
9. Correct Win7 Garmin USB Device interface reset in User Mode.
10. Correct Windows vc redistributable installation command in NSIS script.

2.5.0 2011-07-26

1. Per-Cell offset adjustment for cm93 charts
2. Transverse Mercator chart quilting.
3. Selectable full screen quilting option.
4. Configurable lat/lon gid lines.
5. Variable screen dimmer function.
6. Improved Tide/Current information window.
7. Configurable “Layers” function, enabling selectable display of fixed objects.
8. Improved and extended AIS functions, including Euro Inland support & Base Stations and ATONs
9. Selectable FullScreen display mode.
10. Integrated Route Planner function, with Tide table support.
11. Enhanced GUI functions, with floating transparent Toolbar.
12. Several new language options.
13. Improved internal memory management.
14. Improved Autopilot output support.
15. New Multi-leg Measurement tool.
16. Improved Vector chart symbology.
17. Improved integrated Tide/Current data accuracy.
18. Improved Route definition interface, including selectable Route colors.

19. Full conformance for all platforms, especially including Macintosh OS X.
20. Greatly improved staility on all platforms, as a result of extended Beta testing.
21. Many, many improvements in the basic User Interface, while maintaining the ease-of-use that OpenCPN is widely known for.

3.0.0 2012-06-05

1. New and Enhanced Features for OpenCPN Version 3.0
2. OpenGL support, for enhanced graphics performance and functionality.
3. Improved ENC object Query interface
4. Portable execution option, allowing easy migration to new systems.
5. Upgrade to wxWidgets 2.8.12.
6. Support ENC Overlay cells.
7. Upgrade gpsd support to Version 2.96
8. Implement enhanced PlugIn system, enabling a wide variety of PlugIn types.
9. Implement DSC and GPS_Gate Buddy tracking.
10. Implement user defined Chart Groups.
11. Implement AIS SART transponder display and tracking.
12. Improved ENC object rendering and display.
13. Implement user definable Tide/Current datasets.
14. Full conformance for all platforms, especially including Macintosh OS X.
15. Greatly improved stability on all platforms, as a result of extended Beta testing.
16. Many, many improvements in the basic User Interface, while maintaining the ease-of-use that OpenCPN is widely known for.

3.0.2 2012-07-07 This Service Release corrects several small bugs found in the recent 3.0.0 field release. It incorporates no new features.

3.2.0 2013-02-27

1. Complete update of user Options dialogs and context menus, incorporating modern graphics and uniform styles.
2. Significantly enhanced navigation instrument input and output options, including extensive network connection capabilities supporting TCP, UDP, and GPSD data sources.
3. New User Interface theme support, with OpenCPN traditional as well as two new low profile themes.
4. Enhanced clipboard support, including interfaces to external KML data sources.
5. Enhanced Tide and Current dataset support, including modern fully binary datasets.
6. Various improvements in the display and tracking of AIS[56] data targets.
7. Automatic Great Circle route generation options.
8. Significant enhancement of the Dashboard PlugIn, including new user interface options and a variety of stylish, new instruments.
9. Improved sound system support for linux hosts.
10. Major update to embedded Users Manual.
11. Measurably improved performance and reliability over all supported platforms.

3.2.2 2013-05-08 This Service Release corrects several small bugs found in the recent 3.2.0 field release. It incorporates a command line switch to turn off OpenGL completely.

4.0.0 2015-01-08

1. A major release.
2. Increased performance in all modes, particularly when using OpenGL graphics acceleration.
3. Additional network interface methods, including TCP/IP client/server and UDP broadcast.
4. Support for multiple data source instances,
5. including Filtering and prioritization of messages
6. Output of NMEA data streams for real-time integration into ship systems
7. Improved support for Mac OS X systems, including 64 bit native support.
8. Integrated Tablet/Touch screen support.
9. AIS Personal Locater Beacon (PLB) configuration and tracking.
10. Enhanced AIS target tracking modes.
11. GRIB PlugIn feature additions.
12. Graphical GRIB email request generation.
13. Moving particle wind overlay.
14. Enhanced GRIB data type support.
15. Dashboard PlugIn feature additions.
16. More selectable instruments.
17. Several new and updated Plug-ins, including
18. Digital Radar overlay for popular radar scanners
19. World Magnetic Model variation compensator
20. Climatology analysis
21. Dynamic route planning
22. Integrated logbook
23. Realtime datastream capture, record and playback
24. Google Earth integration
25. Weatherfax overlay
26. Vector chart object and feature search tool
27. S63 Encrypted vector chart support
28. Major update to embedded Users Manual.
29. Measurably improved performance and reliability over all supported platforms.
30. And much more.

4.2.0 2016-02-03

1. Increased performance in all modes, particularly when using OpenGL graphics acceleration.
2. Integrated Chart Downloader PlugIn, allowing systematic tracking and donwload of latest online charts from several popular sources.
3. Integrated World Magnetic Model (WMM) PlugIn, providing accuratley calculated magnetic variation worldwide.
4. Major update to embedded Users Manual.
5. Measurably improved performance and reliability over all supported platforms.

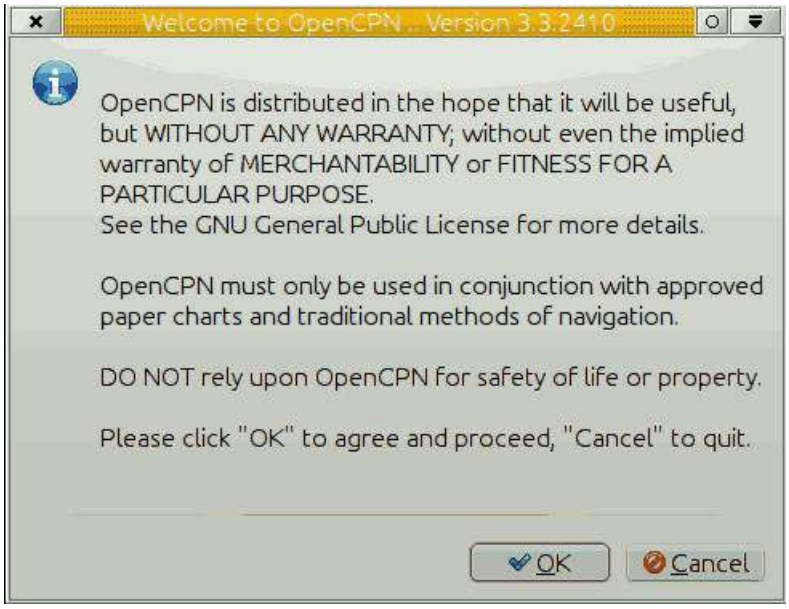
4.4.0 2016-06-13

1. Support for GRIB V2 format files.
2. Measurably improved performance and reliability over all supported platforms.

OpenCPN First Use

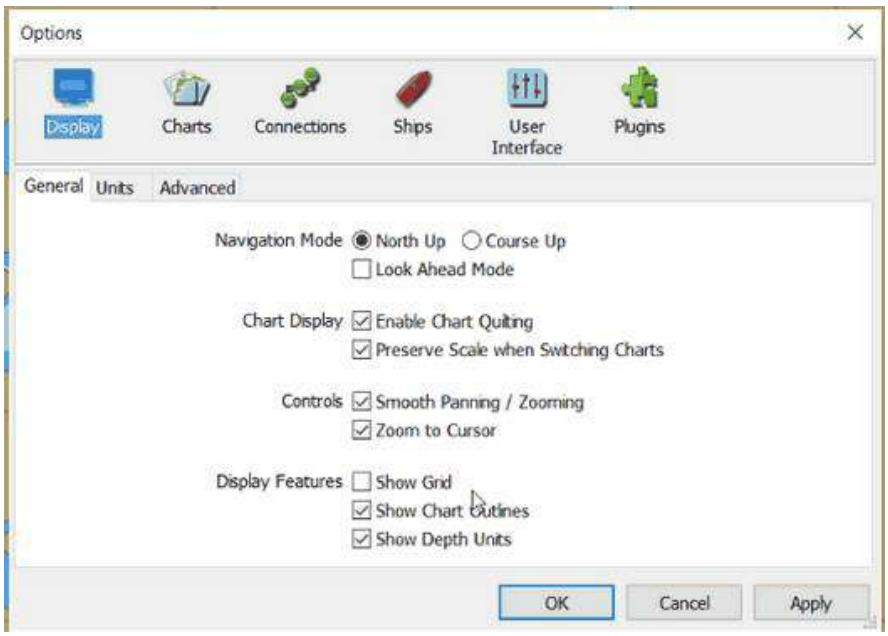
Here is what happens once OpenCPN is installed and you start the program for the first time.

First this message greets you. Please remember what you agree to when clicking OK.

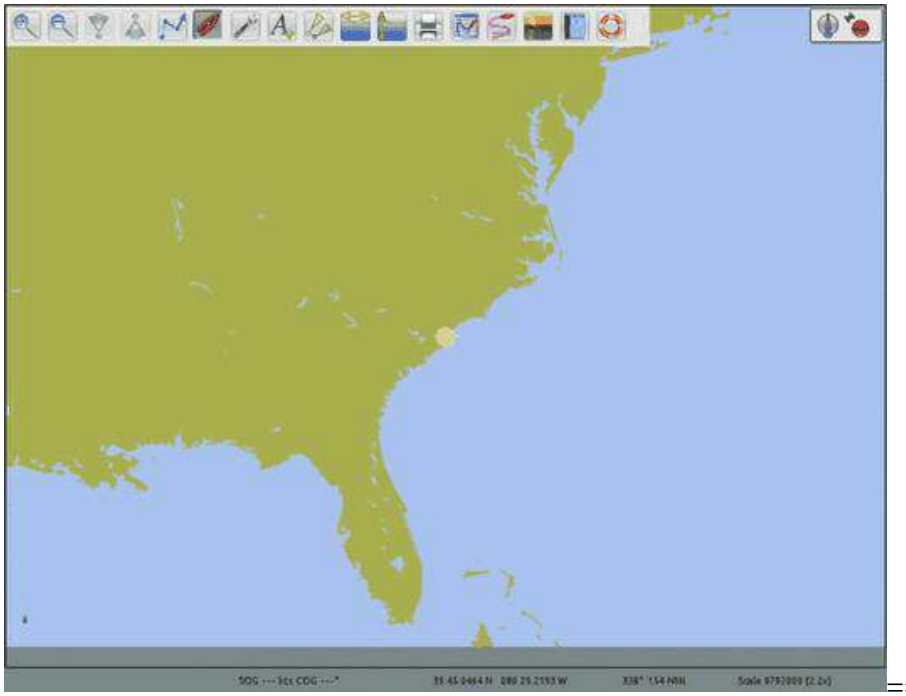


Next OpenCPN prompts you to install charts.

And sends you to “Options” to do so. Click on the Charts tab, to install charts. Read all about installing charts in *Chart Installation*
If you're not quite ready to install yet just click “OK” in the Options dialog.



The worldwide background Map will greet you.
From here explore the different features in OpenCPN by clicking around, or read on…



=====

IMPORTANT NEXT STEPS

Getting started using OpenCPN consists of 3 basic steps:

1. *Chart Installation* of Charts to be read by OpenCPN (OpenCPN does not include charts)
2. *Charts* Basic Features - Main Source for using charts

3. *GPS Setup* to communicate with your computer and OpenCPN (Optional, but very useful)

Completing these 3 steps will get you started and allow you to check out the program.

If you still have questions or would just like to get in touch with other OpenCPN users, there is also a fairly large community behind OpenCPN. You can find us in this Cruisers Forum.

GPS Setup

Below we describe only the basics of getting a gps up and running.

For a full description of all options read *Options Setting*

Make sure your GPS is not being used by some other program!!!! Only one program can at one time use the connection. when your GPS program is using the GPS, Opencpn will not be able to do the same. Please quit all other programs using the same connection.

Make sure your GPS is set to output positions using the WGS 84 Geodetic Datum. This is less of an issue nowadays, compared to, say 10 - 15 years ago.
Some units can't be changed, and is permanently set to WGS 84. The BU-353 is one of those.

Matrix of GPS Devices
Matrix of GPS Devices[57]

Refer to GPS Setup & Status

Windows 10

Windows 10 users generally must purchase a new GPS Puck specifically configured for Windows 10. For Example, the BU-353 which works with earlier versions of Windows does not work without an elaborate work around involving preventing automatic update of Prolific USB drivers by the OS. It is far easier and more reliable to simply purchase another Windows 10 compatible GPS Puck (similar to the BU-353 S4) and use the associated drivers.

Method One: Dedicated GPS & Driver.

Follow the notes below under Windows XP/7/8.

Method Two: GNSS Drive using GeolocationTCP

This Windows 10/8 Microsoft GeolocationTCP -GNSS drive[58] by Petr Simon has been found to be very helpful. Also described more completely See below -Method 2: Windows 10/8 Tablets & Notebooks with GNSS Sensor- GeolocationTCP.

Windows XP/Vista/7/8

Note that the extensive use of the cheap gps mouse BU-353 as an example below, should only be seen as an illustration.
To use OpenCPN with a GPS, a GPS receiver is needed.

There are a variety of possible choices for a GPS receiver:

- A computer, such as a Sony Vaio P has a built in GPS receiver
- A NMEA Expander to amplify a nmea stream to multiple listeners
- A hand-held GPS receiver
- A dedicated GPS receiver

The remainder of this section describes using OpenCPN with a dedicated GPS receiver, however, the instructions for a dedicated receiver will be similar for any serial/USB connected NMEA data stream.

Method 1: A Dedicated GPS Receiver & Driver

There are several companies making dedicated GPS receivers. The Supplementary Hardware section for GPS devices lists several manufacturers.

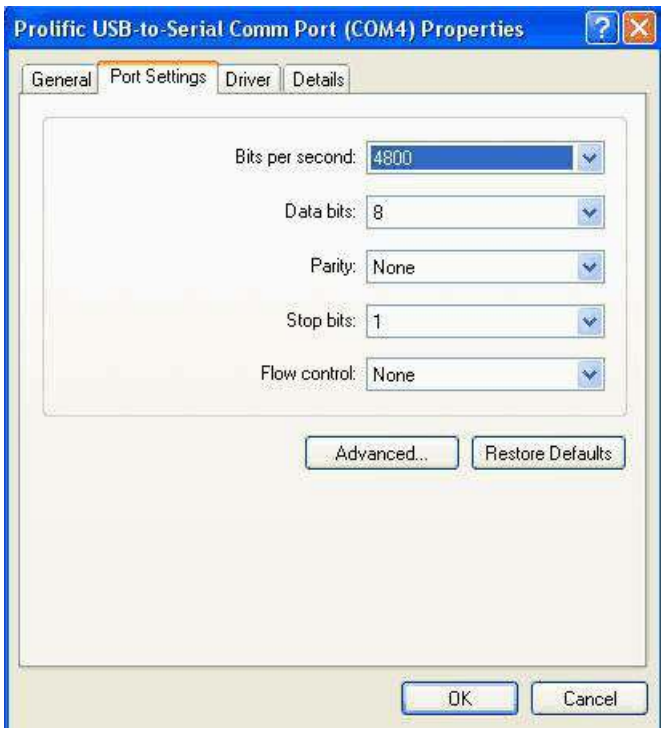
NMEA has traditionally been implemented as a serial protocol and therefore, even if a USB connection is used, there needs to be a USB to Serial Port conversion. The specific driver for the each GPS receiver will handle this conversion.

An Example - Configuring BU-353

It is not necessary to use the installation disk to setup the BU-353. Following the steps listed below will result in the latest driver being installed.

1. Download the latest driver from Prolific - http://www.usglobalsat.com/s-24-support-drivers.aspx#A[59]
2. Unzip and install the driver
3. Plug in the BU-353.
4. Start → (Right Click) My Computer → Properties → Hardware →Device Manager or Start→Run devmgmt.msc
5. Expand Ports
6. Look for the “Prolific USB-to-Serial Comm Port” and note the com port number (e.g., COM4)

1. Right click on the “Prolific USB-to-Serial Comm Port”. Choose Driver
2. Select 4800 bits per second, 8 data bits, None parity, 1 stop bit, and None for Flow Control



1. Start OpenCPN
2. Click on the Options Icon 
3. Select “Connections”, and “Add Connection” and “Serial”
4. Under “Data Port” select the Com port noted in #6
5. Choose OK
6. Select Auto Follow to center the map over your GPS location

Troubleshooting

There is a small LED located on the BU-353. If the LED is off there is no power being received. Check the connection.

If the LED is solid it indicates the BU-353 is searching for a GPS signal. Try moving the GPS receiver to a clear location.

If the LED is flashing it indicates the BU-353 has a position fix and is transmitting data.

1. Try viewing the NMEA data stream in OpenCPN. Choose Options→Connections→Show NMEA Debug Window
2. Alternatively, a diagnostic program is included on the installation CD called GPSInfo.exe. Launch this program to install the diagnostic utility.

If it appears that the NMEA data stream is being received, the most likely issue is that OpenCPN is not centered over your location. Click AutoFollow to center the map at your GPS location.

Known Issues

If you change the USB port for the GPS receiver Prolific will reassign the COM port number. This will require repeating steps 4-12 above. If you are having trouble with Prolific drivers and an Error Code, try reading this page http://www.ifamilysoftware.com/news37.html[60]

On some computer / GPS receiver combinations when the computer resumes from Stand By the GPS receiver will no longer transmit its NMEA data stream, and only garbage instead of ASCII characters will be visible in the NMEA Data Stream Window. The red indicator led will not work.

To change back to NMEA mode search for and download SIRFDemo.exe.
Unpack and start. Set correct Baud rate and and com port as above.
Click connect to data source button. Action → Switch to NMEA protocol, then exit.
There are many more settings available in SIRFDemo.exe

An alternative workaround for this issue is provided by using a COM port splitter such as XPort http://www.curioustech.net/xport.html[61]

1. Download XPort[62].
2. Unzip it to a folder of your choice
3. Double Click XPort.exe
4. Set the Baud Rate to 4800
5. Under Enable Ports add an entry for COM10
6. Click “Find GPS”. The port returned should match the port identified in Step #6 in the Configuring BU-353 Section
7. Select Prolific USB-to-Serial Comm Port in the check box section
8. Return to OpenCPN
9. Click on the ToolBox Icon 
10. Select GPS

Under NMEA Data Source change the Com port to COM10

Method 2: Windows 8/10 -Tablets & Notebooks with GNSS Sensor

GNSS Sensor

Windows with GNSS Sensor outputs Location/Sensor API data, but OpenCPN needs an NMEA data stream over a virtual serial port. In most cases the integrated GPS receivers just support the Windows Sensor API, the program below uses the API and produces NMEA sentences that OpenCPN can use.

Win 10/8 Tablet and Notebooks

Only if your Win 10/8 tablet or notebook has a **GNSS Sensor** and **turning on the GPS** in the OS doesn't seem to work, try this program. First make sure to

1. Turn ON Windows Location Service (Settings > Location Privacy Settings)
2. Turn ON the GPS device (Settings > Turn Wireless Devices On or Off)

Beware: Windows can and will use other location services such as WiFi and Cellular if the GPS is not available. This may lead to navigation errors.

GeolocationTCP

A small application that enables windows 8/10 tablets and notebooks (with a GNSS sensor) to use OpenCPN. Tested and GNSS sensor seems to be able to pick up the signal quite well. Find a more complete installation description here GeolocationTCP with Win8 GNSS Sensor[63]. Author Petr Simons Home page GeolocationTCP[64] but Download current version (r9) here[65]. See the Cruiser's Forum Thread How to use OpenCPN on a Windows Tablet[66]

Test GPS sensor accuracy

When you get done, test your installation for gps accuracy. Especially moving slowly, check if the course is stable. Many internal gps chips are not up to the task. Takes a lot of smoothing on the side of the software in use. On many mobile devices with gps built-in) the gps must be switched off and connected to a nmea0183 gps data stream over wifi. Much more stable. Quality tablets and phones do not show this limitation.

Linux

To proceed, the "**user**" you use on your computer must belong to a **group** that is allowed to open **serial connections**. This group is normally "**dialout**" on Debian based Linuxes, including Ubuntu, and "**uucp**" on Red Hat based distributions. Read more in *Connections for Linux*.
Check your status by writing "groups" on a command line. The response will be all groups that the user belongs to. Make sure that "dialout" or "uucp" is included. If not, you have to add your user to this group. There are many ways to do this, one is to issue this command: "sudo usermod -a -G dialout $USER". Logout of your current session for group changes to take effect.
This applies to many Debian based distributions, for other distros just drop the sudo and do the command as root, using "su".
All major Linux distribution includes a graphical user settings dialog, where adding a user to a group, could be fixed.

Two methods are available, direct connection or through gpsd.

We start with gpsd.

- Install the gpsd and gpsd-clients packages

```
$ sudo apt-get install gpsd gpsd-clients
```

- Go to Options→ Connections→ Add Connection and select "Network" plus the GPSD radio button. Address should be "localhost" and DataPorts should be set to 2947.
- On Ubuntu 10.04 and later, that is really all you have to do. When you plug in your gps

this will trigger gpsd to start.
- “xgps” is client that comes with the gpsd-clients package, and is useful for testing that the gps and gpsd is working properly. If xgps isn't working, it's a gps or gpsd problem, not an OpenCPN problem

Direct connection.

- Make sure that gpsd isn't running then connect your gps and start OpenCPN. On Ubuntu 12.04 the easiest way to achieve this is to uninstall gpsd.
- In the Options→Connections → Add Connection, select “Serial”.Set “dataPort to the port where you plugged in your gps. If you plugged in BU 353 this will probably be /dev/ttyUSB0.
- Choose 4800 baud, unless you know that the gps is set to something else.
- The gps should now work…if not, check the NMEA data stream window. If only binary garbage is visible, the gps has to be reset to NMEA mode, see more about this above in windows section. An alternative is to use gpsd, that will work with the gps in Sirf mode.
- To do this in Linux for BU 353 as well as many other gps:es, make sure that gpsd is running and that the package “gpsd-clients” is installed. On Ubuntu 12.04 gpsd needs to be temporarily installed. Make sure to kill any instances of gpsd with the command:

```
"sudo killall gpsd"
```

- This command will put the GPS into NMEA mode.

```
* $gpsctl -n
```

- If that doesn't work, try

```
$ gpsctl -f -n /dev/ttyUSB0
```

- This will force a low-level access, bypassing gpsd. For more information: $man gpsctl
- More information is as always available through “man gpsctl” Close down OpenCPN before running gpsctl.

  None of this is normally noticed when using gpsd, as this program reads both NMEA and SIRF binary sentences.

More Linux hints

- If you can't connect to a physical port, such as **/dev/ttyUSBO**, indicated by a line in the opencpn.log file. Check that you, as a user, belong to the group “dialout”. To see which groups you belong to, run the command “groups”. Not all Linux distributions add the user to this group by default. To add yourself to the dialout group

```
"sudo usermod -a -G dialout $USER"
```

- Check if gpsd is working:

```
$ ps aux | grep gpsd
nobody 12338 0.3 0.1 4124 1448 ? S<s 18:31 0:00 gpsd -F /var/run/gpsd.sock
you 12356 0.0 0.0 3036 800 pts/3 S+ 18:32 0:00 grep –color=tty -d skip gpsd
```

- This or similar responses indicate that gpsd is running. If you only have something like the second line,…it is not running.
- Run the command

```
"$ls -lrtd /dev/*|tail -10"
```

- and see the 10 latest created device files. Run this just after plugin in your gps to see which device was created.
- Determine which device your GPS is on your linux system by checking the startup. Look for a line that says something about GPS and /dev/ttyUSB# in the command "dmesg"
- Or even better, after connecting a gps mouse, BU-353, we look for a dmesg by running this command.

```
$ dmesg | grep tty
and get this response back.
[13616.095305] usb 2-3: pl2303 converter now attached to ttyUSB0
```

- Add a script to start gpsd, if this is not done by your distribution. I saved mine as startgps and set the executable attribute. Edit line 3 to match your device, ie /dev/ttyUSB0

```
#!/bin/sh
sudo killall gpsd
sudo gpsd -n -D 2 /dev/ttyUSB0
```

- Run the script:

```
$ ./startgps
```

If this is a new installation, click on the Toolbox icon  and configure your GPS source, chart directories, and other settings.

Other Distributions

- Install gpsd from source. More information is available here: http://catb.org/gpsd/[67]

Udev Rules

- If you have problem with, for example gps, connecting to different ports each time you restart udev is your friend.
- udev supports persistent device naming, which does not depend on, for example, the order in which the devices are plugged into the system. The default udev setup provides persistent names for storage devices.
- There is a lot about udev on the Internet. For OpenCPN specifics, read the cruisersforum.

Bluetooth GPS

More user experience of setting up bluetooth GPS are welcome, as the notes below just

reflects a few users experience. Please use the Forum.

Ubuntu 10.10 and older.

If you have a bluetooth GPS you will need to first configure it through the standard Ubuntu Bluetooth “set up new device ” proceedure. Once you have done that you will need to find what the address of the GPS is. To do that you run this command:

```
"sudo hcitool scan"
```

it will then start looking for the Bluetooth GPS and hopefully find your GPS. You should see something similar to:

```
Scanning …
00:1C:88:10:D3:4D    iBT-GPS
```

In this case I have a IBT-GPS at address 00:1C:88:10:D3:4D (Your GPS address will be different)

Next we have to bind the GPS address to a “virtual” device OpenCPN understands in this case rfcomm0. We do this with the following command:

```
sudo rfcomm bind /dev/rfcomm0 00:1C:88:10:D3:4D
```

Note put your GPS address in this line You should not have to run these commands each time your linux is restarted as it will remember your GPS address.

Now all you need to do is go into OpenCPN Toolbox and select GPS. Now in the NMEA Data Source options select from the pulldown menu: “**/dev/rfcomm0**”, or write it in the box, if not present as an alternative.

That's it - you should now have a Bluetooth GPS Connected.

Ubuntu 12.04

-Pair GPS with bluetooth icon -break connection with bluetooth icon -get device id: sudo hcitool scan -get channel for gps: sdptool records 00:02:78:0A:4E:E9 (put your actual number here) -sudo gedit /etc/bluetooth/rfcomm.conf #edit rfcomm input file. Text should be:

```
# RFCOMM configuration file.
#
# $Id: rfcomm.conf,v 1.1 2002/10/07 05:58:18 maxk Exp $
# rfcomm0 {
# Automatically bind the device at startup
bind yes;

'


# Bluetooth address of the device
device xx:xx:xx:xx:xx:xx;

'


# RFCOMM channel for the connection
channel 1;#use channel number as provided by sdptool records XX:XX:XX:XX:XX:XX
```

```
'

# Description of the connection
comment "Your GPS Device Here";
}

'

sudo rfcomm release 0 (not strictly neccesary)

.

sudo rfcomm connect 0
```

You only need to to this once, not required if you reboot at this point).

```
…connected /dev/rfcomm0 to 00:00:00:00:00:00 (whatever)
Press CTRL-C for hangup
```

in a separate terminal, you can test the connection with

```
rfcomm show /dev/rfcomm0
…rfcomm0: 00:08:1B:14:18:B6 channel 1 connected [tty-attached]
```

Your bluetooth GPS should now be working in open CPN. Run

```
sudo opencpn
```

To check that it works (/dev/rfcomm0 under GPS NMEA data source). If it works, try running opencpn without sudo, chances are that you cannot see the gps. if this is the case, use the following fix:

```
sudo usermod -a -G dialout $USER ''
```

Fedora

Run

```
hcitool scan
```

to get the ID of your bluetooth gps device. Make a file “rfcomm.config” and put it in /etc/bluetooth.

This file is already present in Ubuntu, but needs editing for persistent connection.

```
# RFCOMM configuration file.
#
# $Id: rfcomm.conf,v 1.1 2002/10/07 05:58:18 maxk Exp $
#
rfcomm0 {
# Automatically bind the device at startup
bind yes;
# Bluetooth address of the device
device XX:XX:XX:XX:XX:XX;
# RFCOMM channel for the connection
channel 1;
# Description of the connection
```

```
comment "Your GPS Device Here";
}
```

Change XX:XX:XX…. to your device ID Open Opencpn and write **/dev/rfcomm0** as GPS NMEA device. Note that you can add it yourself by writing directly into the scroll down box. Permissions for **/dev/rfcomm0** are for group "**dialou**t". Make sure you belong to that group. The command "groups" will show all the groups you belong to. Make sure that "gpsd" isn't running, issuing "killall gpsd" as root.

Mac OSX

Attaching a GPS device to a Mac is done via one of the USB ports. Whether using a device with its own USB lead or via a serial-USB adapter lead or an NMEA multiplexer with USB port, the appropriate OS X driver needs to be installed. Nearly all hardware uses one of just two chip makes: those from FTDI or Prolific. Both those companies make OS X drivers available on their web sites, but manufacturers of GPS devices usually package the driver with device.

When the driver is installed and the device connected, start OpenCPN, select the Toolbox and click the GPS tab. Open the "NMEA Data Source" menu & select the the device from the list. It is not always obvious which is the correct one, but in general the device will have a name starting: "/dev/cu." or "/dev/tty.". Some manufacturers make it obvious, like "/dev/cu.MiniPlex-99000125", but others may be more generic, like: "/dev/cu.usbserial". Set the "NMEA Baud Rate" to 4800 and click "OK". If the correct selection has been made, you should see the GPS status icon change from red to green.

Virtualized Environments

Use of Virtualized Environments such as Parallels, VM, VirtualBox, etc to run an alternative version of Opencpn on your Mac or PC are beyond the scope of this section. However experienced users are invited to report the specifics about using USB ports with Virtual Configurations. Please be specific about the setup and software and explain how virtual USB ports work in that environment. These commenta will eventually make their way into this section.

It should be noted that each Virtual Software handles virtualization of USB and Sharing differently. This can affect the connection and reliability of the connection for GPS.

OpenCPN is user powered, so we depend on User's sharing their experiences. Please assist us.

Chart Installation

Several steps suggested to obtain & setup charts.

For first time users we suggest you use the Chart Downloader Tab which helps to find and download free charts and is included with the installation of OpenCPN 4.2. If you choose to manually load charts please pay close attention to the following:

Know the path to the the “Chart” directory. Make note of the Charts Folder path you selected.

- Chart Files Tab
- Chart Downloader Tab
- Chart Manual Install

If you choose to manually download charts, be sure uncompress and install them in your Charts directory

Charts Overview

OpenCPN itself does not come with charts.
Charts are a complex subject. Having accurate and current charts is important for safe navigation.
There are a number of resources on this website and others to obtain charts.
However the USA provides free NOAA Charts and many other countries do as well. See Chart Sources below.

- Charts

Main resource for Charts.

- Chart Files Tab OpenCPN does not come with charts. Description of how to Install Charts.
- Chart Downloader Tab Chart Downloader provides an easy way to download and install free NOAA and RNC and ENC charts around the world. It is the easiest way to get started with charts. Download a few charts in your area and use them to learn, then later add more as needed. NOTE: Free charts are not assured everywhere.
- Chart Sources Extensive list of free charts available, mostly covered by Chart Downloader Plugin
- Chart Formats See why this is a complex subject
- Chart Manual Install Download & install yourself
- NOAA's Chart Download website[68]
- High resolution background maps can be obtained through the integrated Chart Downloader plugin. Use with Watchdog Landfall alarms and WeatherRouting plugins for land detection.
- Background Map (GSHHS Low Res) - Installed, used by Opencpn for the initial rough background map.

Setting Options

Options contains user configurable settings.

The full Options Setting page is here: ***Options Setting*** 
OpenCPN uses some basic settings or limitations.

- **Courses are by default true, not magnetic.** Change this in **Options → Display → Units**.
- **All distances and routes are calculated using Mercator Sailing**. Great Circle Sailing is an option in route creating.
- **For Windows**: only one instance of OpenCPN is allowed. Use the portable option if more instances are needed.
- **Do not edit the opencpn.ini (opencpn.conf) file when OpenCPN is running**.

Marks and Routes

- *Marks*
- *Create a Mark*
- *Move a Mark*
- *Delete a Mark*
- *Undo-redo a Mark*
- *Right-Click on a Mark*
- *Use your own Icons*

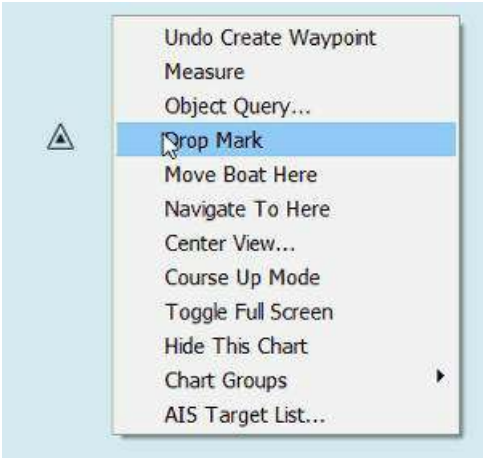
Located in Toolbar Buttons Pages

- *Create Route*
- *Route Concepts*
- *Create a Route*
- *Create Route*
- *Modify a Route*
- *Multiple Routes*
- *Saving and Loading Routes and Marks*
- *Activate Route & Active Route Console*
- *Active Route Console Window*
- *Active Leg and Full Route Data*
- *Route to Autopilot*
- *Route to Autopilot*

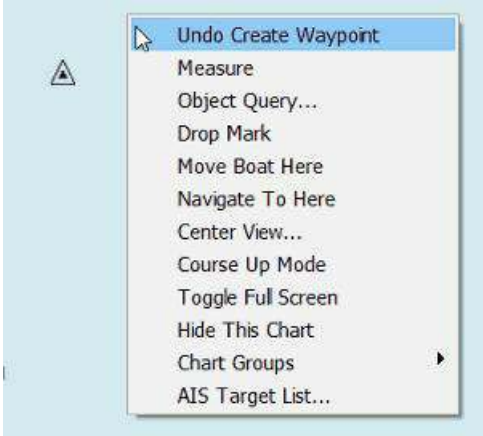
Marks Routes

Route Triangle Shipwreck MOB Create Route

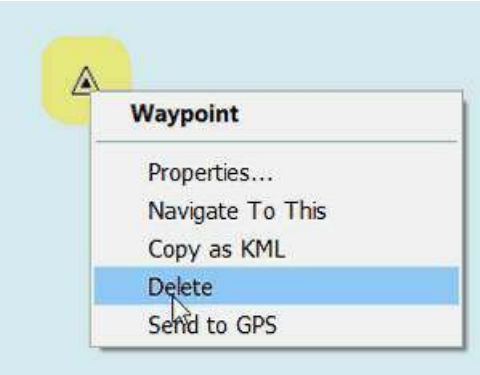
First right-click on the chart and pick “Drop Mark”



Then right click nearby and select “Undo Create Waypoint”



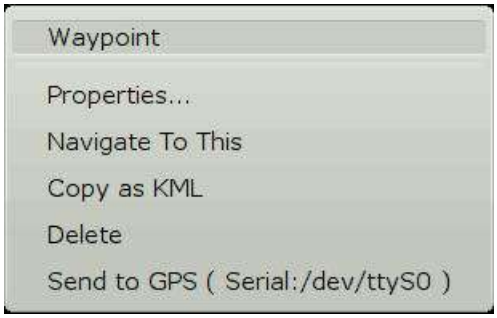
Or right-click on the Mark and select “Delete”



Marks

Are the basic points that are used for many things, such as creating routes, marking fishing spots, good anchorages or anything of interest.

Once a mark is created a focused **right-click dialog** becomes available, when clicking on the mark.



Create a mark

There are a few ways to directly create marks.

- at boat's position “Ctrl + O”.
- at cursor position “Ctrl + M”.
- at cursor position “Right-click” & press “Drop Mark”.

Marks are created at the start of each leg in a route, and one at the end of the route. More about routes a bit further down this page.

Marks created these ways will have a triangular icon, except for routes that uses a diamond, but no name.

The default icon, when creating a mark, is possible by changing the the value **“DefaultWPIcon”** in the **opencpn.ini** (config) file. Use the name of any available icon in the properties dialog.

More Detail In the **[Settings/Others]** section set the option **DefaultWPIcon** to one of:

empty, airplane, anchorage, anchor, boarding, boundary, bouy1, bouy2, campfire, camping, coral, fishhaven, fishing, fish, floating, food, fuel, greenlite, kelp, light, light1, litevessel, mooring, oilbouy, platform, redgreenlite, redlite, rock1, rock2, sand, scuba, shoal, snag, square, triangle, diamond, circle, wreck1, wreck2, xmblue, xmblue_, xmgreen, xmgreen_, xmred, xmred_, activepoint

values representing the default set of built-in icons or to a filename of any of your UserIcons, without the the path and .xpm extension. If you have a file called **MyICON.xpm** in the *user icons folder*, the value will be simply **MyICON**

Move a Mark

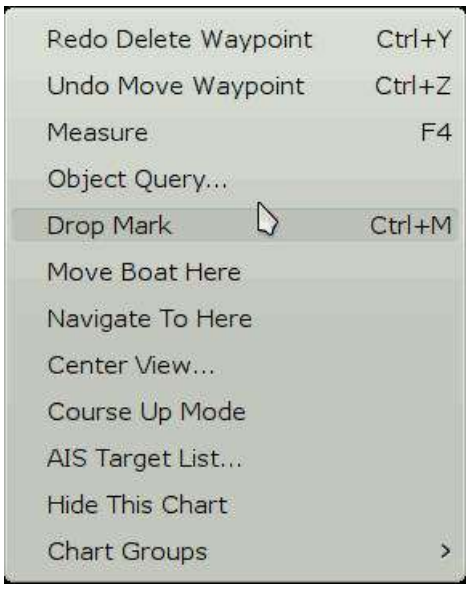
You can **move** the mark by left-click-dragging it around. To prevent accidental movement of marks go to **Options>Display>Advanced** and click the box “**Lock Waypoints**”.

Delete a Mark

You can **delete** a mark by right-clicking its icon, and selecting “Delete”.

Undo-Redo a Mark

There is an built in **undo/redo** buffer for creating, deleting or moving marks or waypoints. If you have just created, deleted or moved a mark the right-click dialog will have relevant entries. The undo/redo, for moving or creating marks, follows a straight time-line and is not tied to an individual mark.

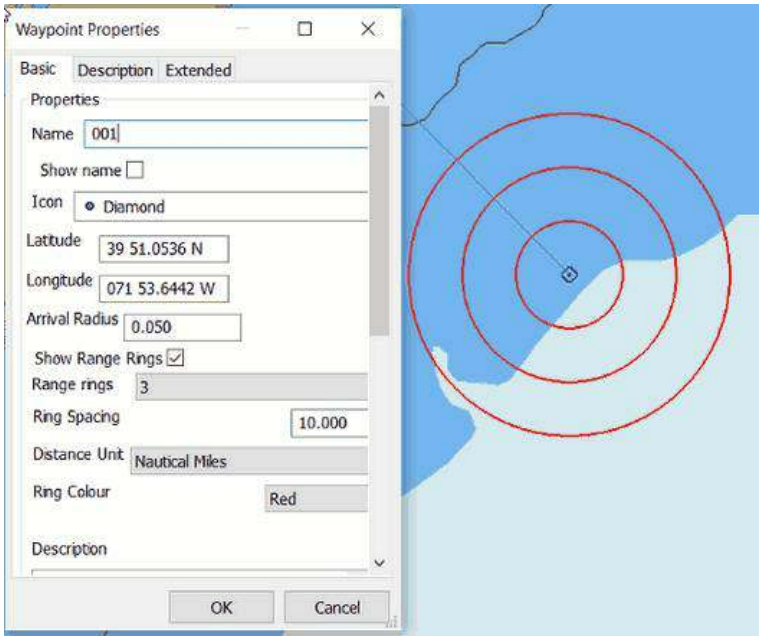


Right-click on a Mark

Above is a right-click menu just after moving a mark a few times and undoing the last move, and one mark was deleted, and then the deletion was undone. CTRL + Z and CTRL + Y works as hot-keys for undo/redo.

Mark Properties

All marks have properties that can be seen by right-clicking and pressing “Properties”, or even simpler just double click the mark.



Read all about the properties dialog in *Extended Marks*Marks can be manipulated through the Route & Mark Managers Waypoints tab as well. Deleting a mark that is part of a route, will also change the route. Marks that are a part of a “layer” cannot be changed at all. Marks

can also be imported into OpenCPN in a number of ways. Hidden waypoints are not offered as “Use nearby WPT” while creating a route.

Read all about this in the ***Route & Mark Manager***
A general locking of all marks is available. Goto **Options → Display →Advanced**

and tick the box. This feature is handy, to prevent accidentally moving a mark. Activate this feature when underway, deactivate it when planning.

The ***Man OverBoard*** mark can be activated through the icon  in the toolbar, or through hitting Ctrl + Space-bar. The mark looks like the button and is dropped on own boats present gps position. This mark cannot be moved or deleted with the cursor or keyboard (by mistake), but can still be deleted from the Route/Waypoint manager dialog. More about ***Man OverBoard*** here.

All the details of the Mark/WP Properties dialog are dealt with in ***Extended Marks***

Use your own Icons

OpenCPN comes with a handful of different icons that can be assigned to a mark. Right click or use the Route Manager and activate the properties dialog. The Mark Icon window in the dialog shows the available icons.

A user can install his or her own icons to use with marks and “own ship”.

1. Create a directory called “UserIcons” in the same place that holds your opencpn.ini(config) file. Instructions to find the directory (folder) location here: ***OpenCPN Installation***

2. Add .jpg image files to this directory. The legacy .xpm format works as well. The icons can be any size. The name of the file (without the extension) becomes the name of the new waypoint icon. These new icons will appear on the Waypoint Properties dialog, and can be assigned to any waypoint. They can also be assigned in GPX Import files.

3. The ***User Icons***page contains links to a few sets of user contributed icons.

4.To replace the default own ship icon  , just put a file “ownship.jpg” or “ownship.xpm”, containing the ownship picture you prefer, in the UserIcons directory, described above. More about “ownship” icons and setting “ownship” size in ***Options Setting - Own Ship[69].***

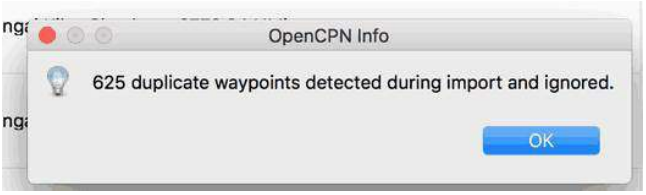
Read about Creating Routes in Create Route

Located in Toolbar Button Pages

- *Create Route*

Technical: Routes, Waypoints, Navobjects, Gpx and Guid

- Waypoint is a waypoint (“wpt” entity in the GPX file).
- Route point (“rtept” entity in the GPX file) may, but does not have to, also be a waypoint.
- All the navobjects with the exception of track points (“trkpt” entity in the GPX file) do have a “GUID” in GPX produced by OpenCPN.
- The “GUID” is the primary identifier used to see if the object already exists or not (with the exception of “wpt” import, see below).
- Two objects with the same “GUID” can not exist at the same time.
- A waypoint may also be included in zero to many routes.
- A route point may not exist without a route though (= must be included in 1 to many existing routes and unlike a waypoint, it is also for example deleted with the last route it is a part of).
- It is not possible to have the same waypoint in a layer and then import it from a GPX file.
- The logic used for “wpt” entities during the import to determine duplicates is the “Name” and “lat” + “lon”, (because we can not rely on the imported entity having the OpenCPN specific GUID extension during the import).
- The “GUID” represents the internal globally ***unique*** identifier of the navobject in OpenCPN and is completely irrelevant in the waypoint import from GPX as you can see above (It is used elsewhere for other purposes).
- Import of a Route Gpx File with duplicate waypoints will result in a message, and the existing waypoint will be shared.



Touch Screen Tablets

It is no wonder that iPads and Android tablets have become so popular. They offer superior ergonomics vs. laptops in many settings, including areas with limited space and power such as boat cabins and cockpits. Tablets usually offer superior battery life, lower power consumption, and are easier to waterproof via inexpensive pouches.

With the recent release of OpenCPN for Android on the Google Play Store[70], a huge selection of phones and tablets are now able to run OpenCPN very easily.

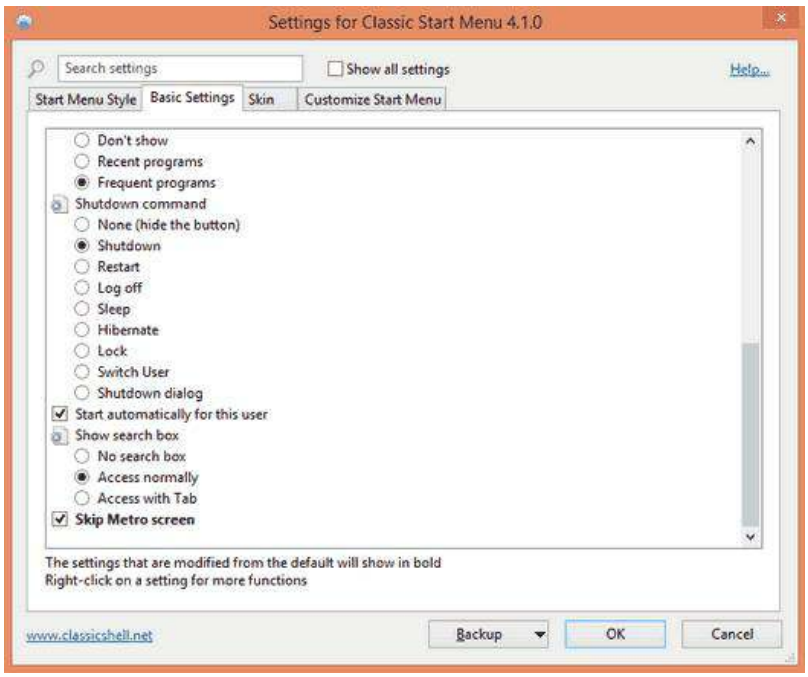
OpenCPN can also run very nicely on Windows 8 tablets, many of which are available at very low cost. Here are some suggestions for running on Windows tablets:

Running OpenCPN on a Windows 8 tablet

Although Windows 8 tablets are not as common as iPads or Android, they have the advantage of running on the exact same Windows platform as PCs and laptops. This means you can install OpenCPN onto a tablet using the same installer that is used for Windows laptops and desktops. Just dowload the installer and appropriate charts, run the installer, and select the chart location just like you would on any PC.

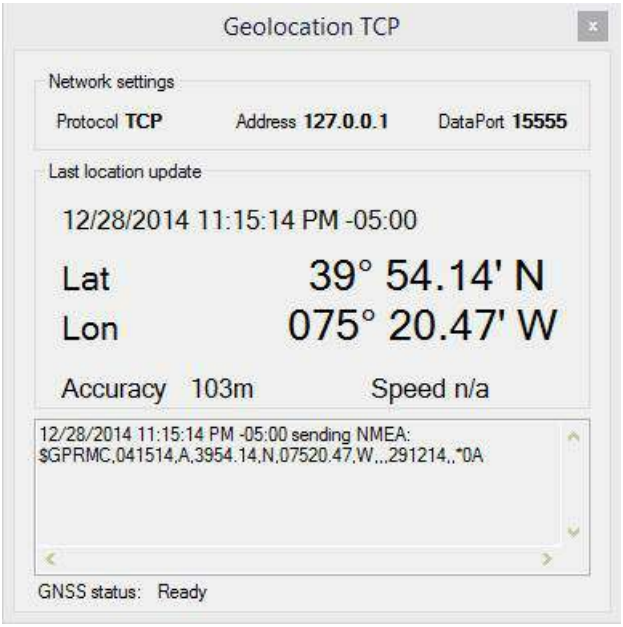
Because of differences in Windows 8 vs. prior Windows versions, and configuration differences in the tablet hardware, your user experience with OpenCPN on a Windows tablet may be enhanced by considering these optional tips and tricks:

1. **Install** the Classic Shell[71] free software. This facilitates using the tablet with traditional Windows desktop programs, and will make the Win8 environment more familiar for those who are coming from XP, Vista, or Win7. You can still bring up the Start Screen to use the newer “Metro” tablet apps, but Classic Shell restores the familiar Start menu that Windows users are accustomed to having.

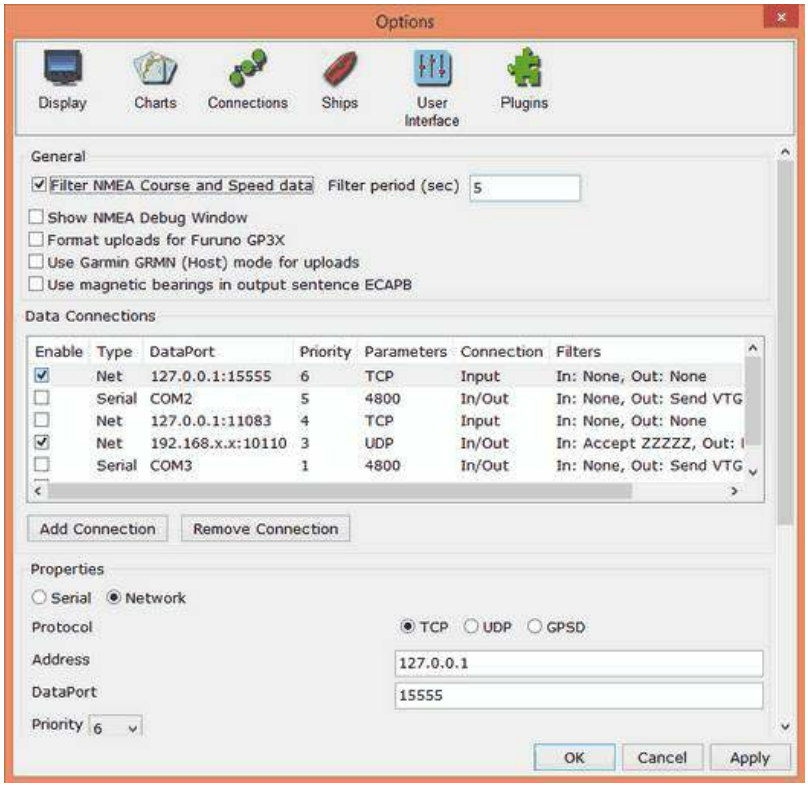


2. **Check Device Manager**-Sensors to verify whether your tablet has a GNSS Geolocation sensor. If so, your tablet has GPS capabilities already built in. (Some tablets have been discovered to have GPS even though the specifications may not mention it.)

However, the Windows 8 tablets initially are configured in a way that only Metro apps can see the built-in GPS. In order to overcome this limitation, try installing petrsimon's excellent GeolocationTCP utility[72]. Set this utility to launch at bootup so it's always there by putting a shortcut in the Startup folder created by Classic Shell.



Then you need to configure OpenCPN to receive the NMEA data over the appropriate TCP port.



3. **GPS** If you do not have an internal GPS and want one to interface with your tablet, I recommend a Bluetooth GPS transmitter instead of a wired dongle or puck. There are Android and iPhone apps that will transmit from your smartphone, or you can purchase a freestanding Bluetooth GPS made by GlobalSat or others. Transmitting GPS to the tablet via Bluetooth also facilitates putting the tablet into a waterproof pouch. Some have reported that hanging a USB connector off the side of the tablet may weaken the microUSB plug over time.

4. The excellent form factor of the tablet opens up some great possibilities for use in the cockpit, if you select a tablet with a sufficiently bright screen. A suggested tablet model and more comprehensive list of tips can be found on this message thread[73].

OpenCPN runs remarkably well on a tablet with practically no modifications. Microsoft has emulated many mouse functions in their OS. The right-click context menus are emulated by tap-hold. Zooming and unzooming in OpenCPN is accomplished by pinching gesture, or using the magnifying glass icons in the toolbar.

Mouse hover (aka "rollover") is not generally supported on tablets, and accidentally tapping the chart can lead to unexpected re-centering of the chart. To address this and other tablet needs, OpenCPN adds some some custom features available in the Options-User Interface menu:

Activating "**Enable Touchscreen Interface**" alters the effect of tapping/clicking on the chart in the following ways:

-Suppresses re-centering of the chart by tapping (you need to tap-drag to pan the chart)
-Tapping waypoint selects it for subsequent dragging
-Tapping Routes and AIS[74] targets shows popup info
-Tapping tide/current icons shows appropriate dialog

Here are some additional behaviors with "**Enable Touchscreen Interface**" activated:

-Optimize several common dialogs for screen rotation, i.e. landscape or portrait
-Route Create workflow: "Done" by clicking toolbar "Route" icon, or normal context menu.
-Toolbar navigation items (e.g. Zoom/Scale) are available during route creation.
-Chart drag (a.k.a. swipe) is available during route creation.
-Routepoint/Waypoint edit by drag is supported.
-Increase pixel select radius, to allow for finger tip selection of routes/waypoints

A second option, "**Enable Tablet Scaled Graphics Interface**" can improve the display, especially on tablets with high pixel density. At present, Windows tablets are generally lower pixel density than Android and iPad, but this may change with future hardware. This option does the following:

-Increase toolbar icon size
-Increase context menu text item size
-Increase selectable item sizes for several common dialogs

Tablet Scaled Graphics may enlarge the toolbar icons too much for some tastes, especially on small tablets with limited screen space. As an alternative, Microsoft provides a **Magnifier utility** that temporarily zooms the view and allows for panning across the enlarged screen. It can be found in Start-All Programs-Windows E**ase of Access** (if you have Classis Shell installed), or by searching the Start Page in the Modern interface. I recommend pinning a shortcut to the taskbar for quick one-tap access. While zooming the OpenCPN menu can enlarge many chart features, Magnifier can enlarge additional elements like the very small depth soundings and the green-over-black status text displayed by the Active Route:

* Read more about the **XTE** in **Connections** *Add a Serial Connection*, "APB bearing precision"

Following are Dave's comments on "**Enable Tablet Scaled Graphics Interface**":
- It is important that the screen width dimension be properly set for this option to work.
- Manual override of screen width can be done at **Options→Display→Advanced** Options Settings-Display-Advanced.
- Dave found, on his W8.1 tablet, that the automatically calculated size value was wrong, leading to extra large toolbar icons. Easy to correct with a physical measurement.

In the "**Tablet Scaled Graphics Interface**", the toolbar icon target minimum size is 9mm square.
This is the generally accepted minimum button size for several mobile platforms.

Other Tablets and Operating System details.

OpenCPN for Windows also runs successfully on:

- Microsoft Surface Pro 3 with Windows 8 and Globalstar Bu-343 puck gps.
- Microsoft Surface Pro 3 with Windows 10 and Globalstar Bu-343 S4 puck gps.
- Opencpn should run successfully on most Windows 10 Computers.

Help Fix Bugs!

If you experience a crash in OpenCPN, the developers are very keen on knowing why. This is how you can help making OpenCPN, even better.

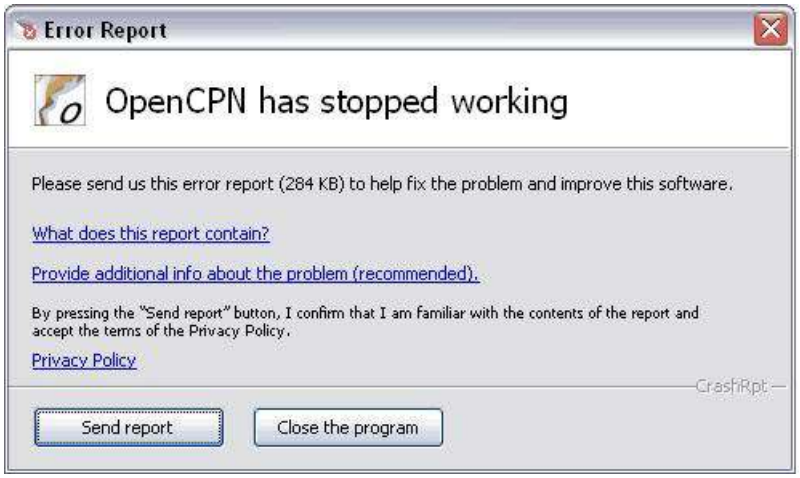
Windows

In OpenCPN ver 4.0 the semi-automatic Crash reporting for Windows is disabled by default. Crash Reports are saved in the OpenCPN config directory, i.e. where the log file is stored now. End users may occasionally be asked privately to send these reports to a designated recipient.

The semi-automatic Crash reporting can be enabled by editing the opencpn.ini file.

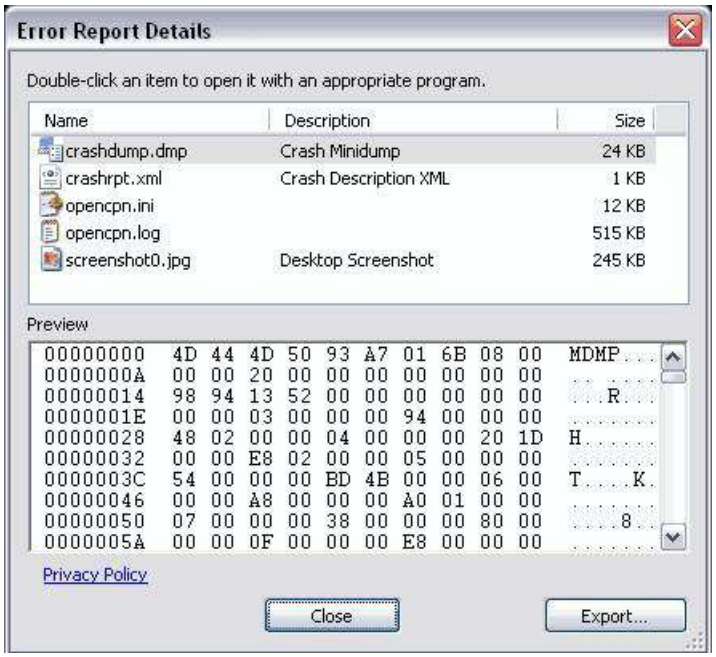
```
[Settings] …..
EmailCrashReport=1
```

Here is what you will see if OpenCPN causes a crash with the crashreport enabled.



Provide additional information, such as your email or forum name, so the developers can contact you for more info, if necessary.

This is what the report will contain. Use the “Export” button if yoy don't have an Internet connection at the time of the crash. Mail the report later.



Also, for fun, you may test this option by the keystroke Alt-F12. This will induce a benign crash, and give you a chance to see what it will look like before the real thing happens. Please don't send this kind of report by pressing “Send report”. Just press “Close the program” when you are done. Restart OpenCPN!
This feature is temporary and will not be available in the Beta Release following 3.3.814.

Linux

In Linux there is an excellent tool, “ddd”, the Data Display Debugger, to help the developers pinpoint where an error, or bug, is located in the source code. “ddd” is a graphical front-end to the text based “gdb”, the GNU debugger.

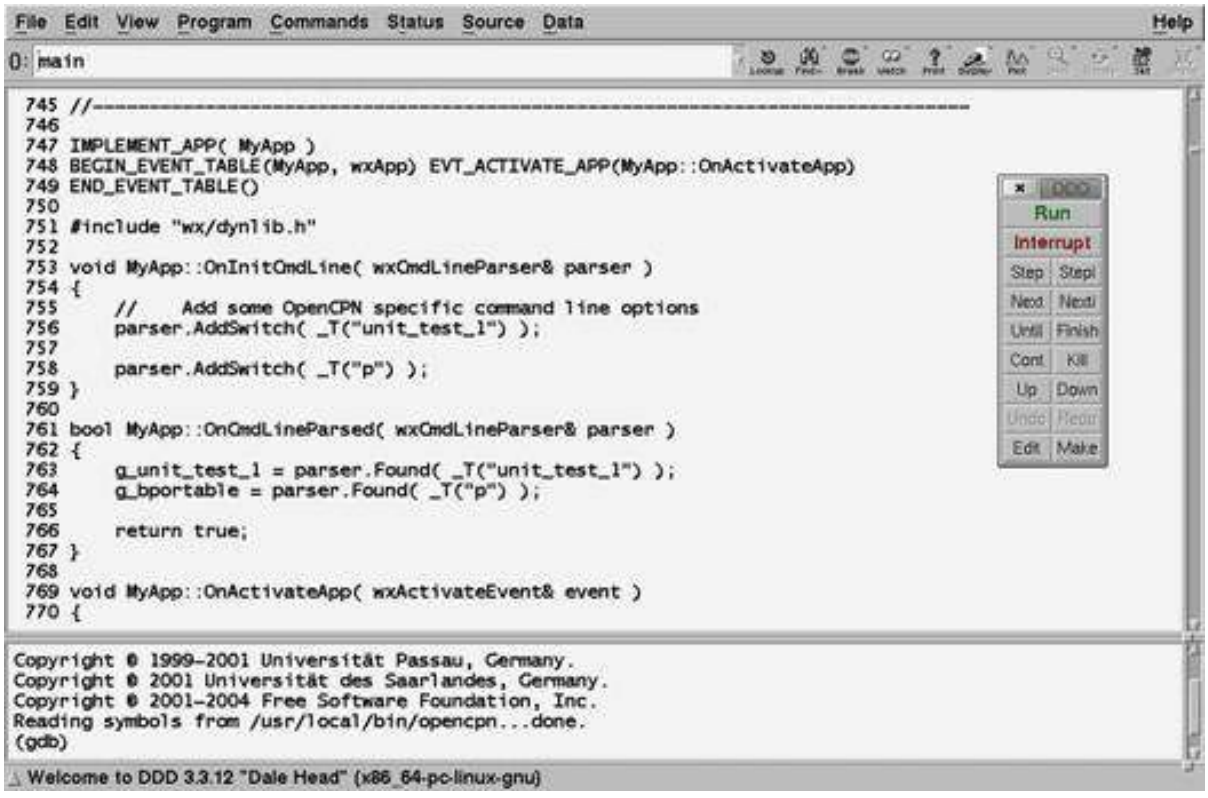
Install ddd through Synaptic, Ubuntu Software Center or similar for other Linux distributions.
From a command line, in a Debian based Linux, such as Ubuntu, issue this command:
$sudo apt-get install ddd

- The “$” sign above, just marks that this is a command line for a normal user. Do not include it in the actual command. This is a Linux convention used everywhere.

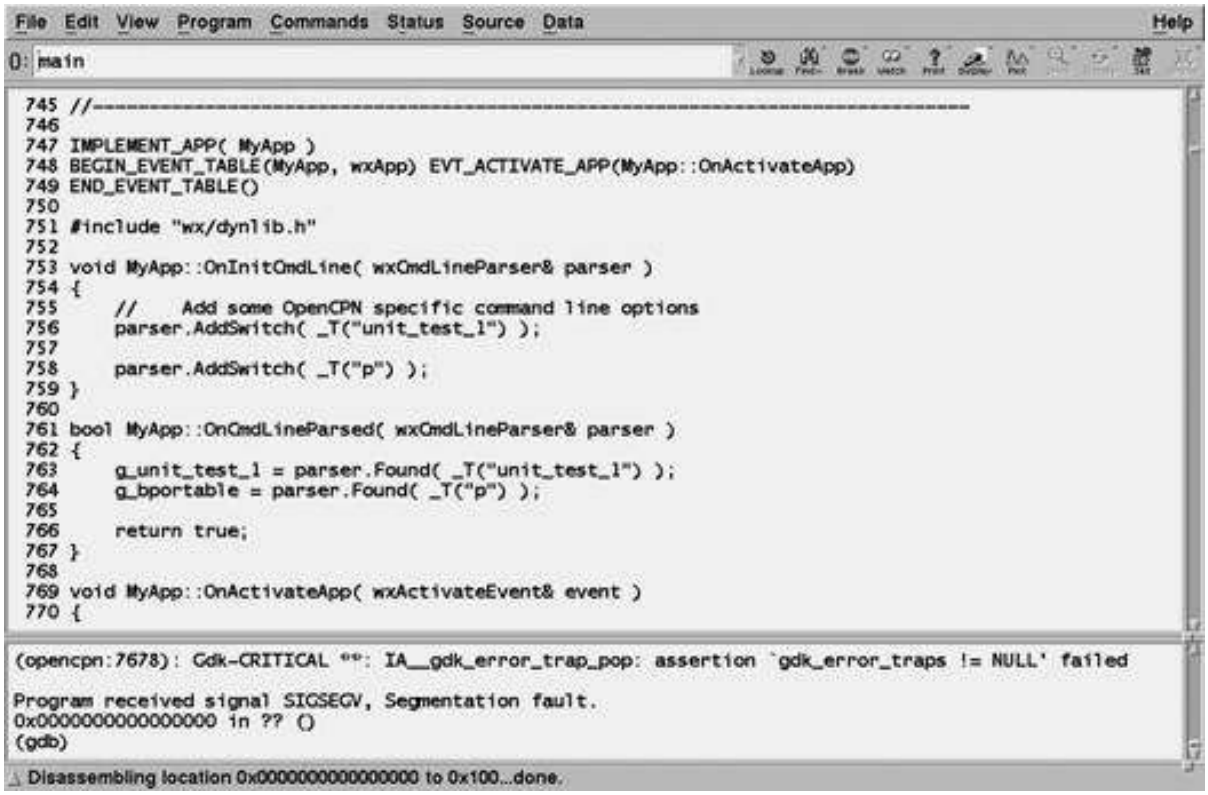
Start ddd

To start ddd, find a command-line and
$ddd opencpn

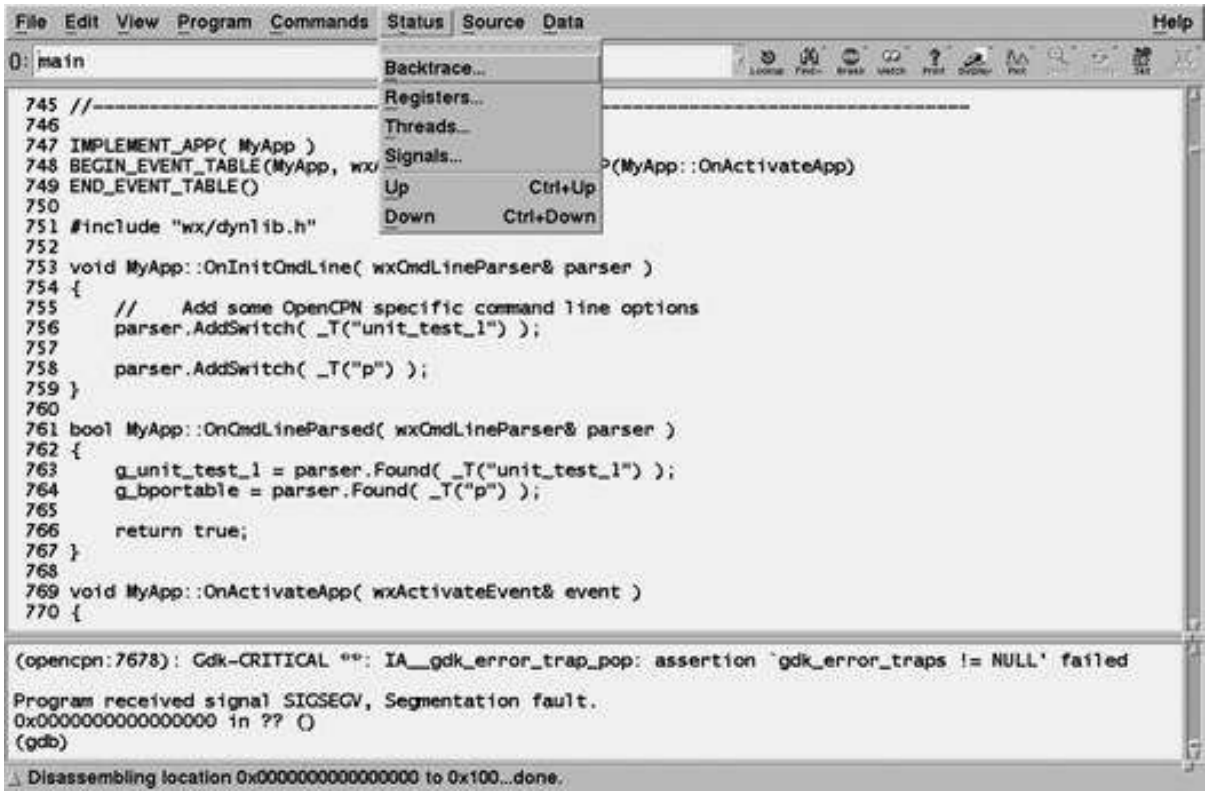
ddd starts and this is what you will see.



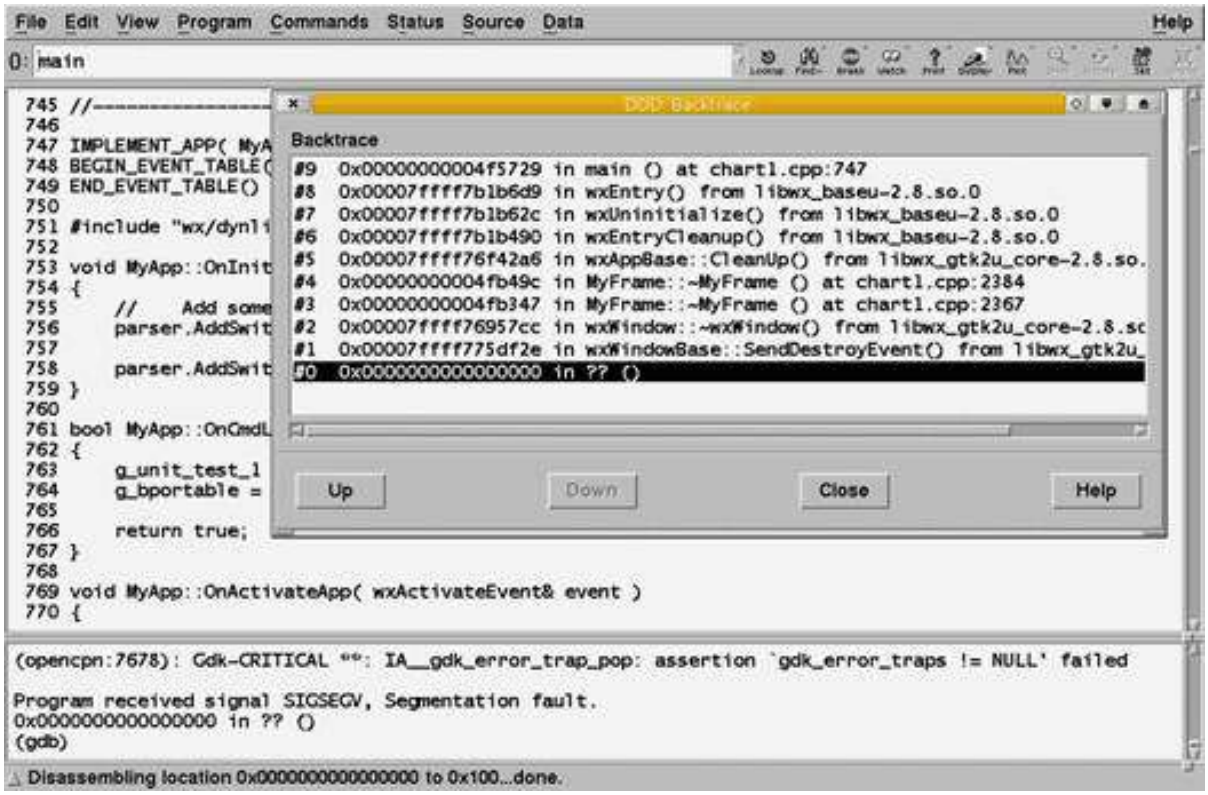
Click “Run”. If you don't get this small dialog, go to Program → Run, or hit F2
This will start OpenCPN. Just continue in OpenCPN and proceed to create a crash.
Then go back to the ddd window.
This is how it will look like after a crash.



Notice “Program received signal SIGSEGV, Segmentation fault.”
This is programmers way of saying a “crash”. Exactly what this means, does not matter for a normal user. Interested anyway? Read more,
http://en.wikipedia.org/wiki/Segmentation_fault[75]
To actually help the developers we need a back trace from the crash. This is the path that the program followed in the source code, leading to the crash.



Go to Status → Backtrace.
This is what comes up, from this particular crash.



The crash happened at #0 and this very short back trace started at #9.
Your job now is to take a screen-dump, similar to the picture above, and send it on.

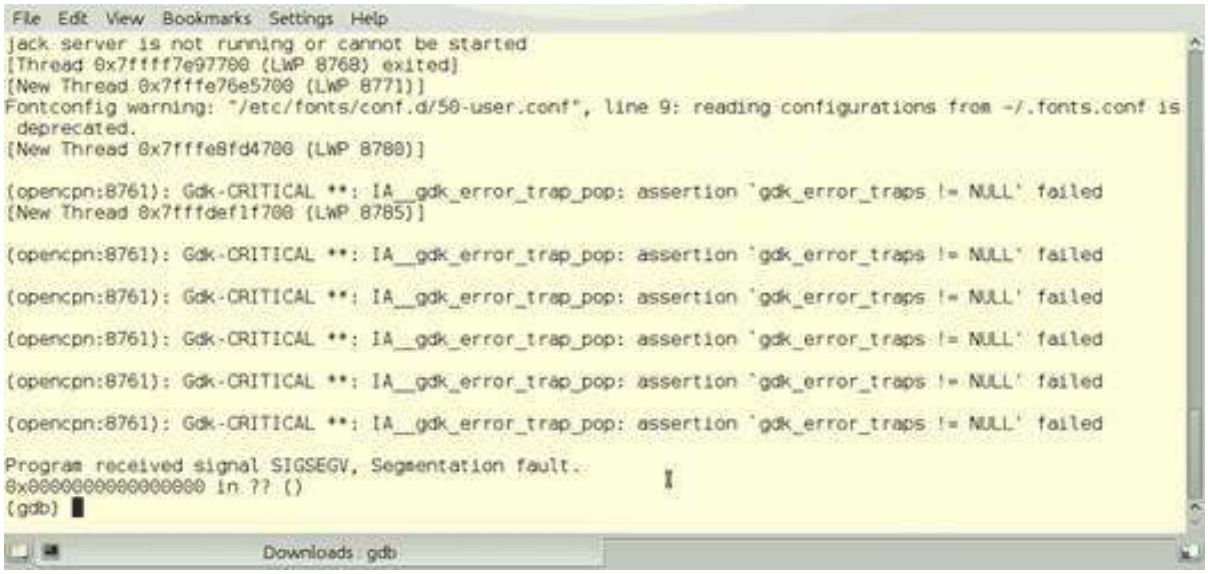
Try to get as much of the back trace as possible, by expanding the Back trace dialog.
This is important, so the developers can see the trouble point in the source code.
Look at #3 above, ending in "….chart1.cpp:2367". "chart1.cpp" is a part of the OpenCPN source code, and something on line 2367 was involved, directly or indirectly in the crash.
Lines ending in "…… .so.0" are external libraries used to run OpenCPN.

On the odd occasion, when the back trace is very long, the developers may still complain that they need to see more.

Using gdb

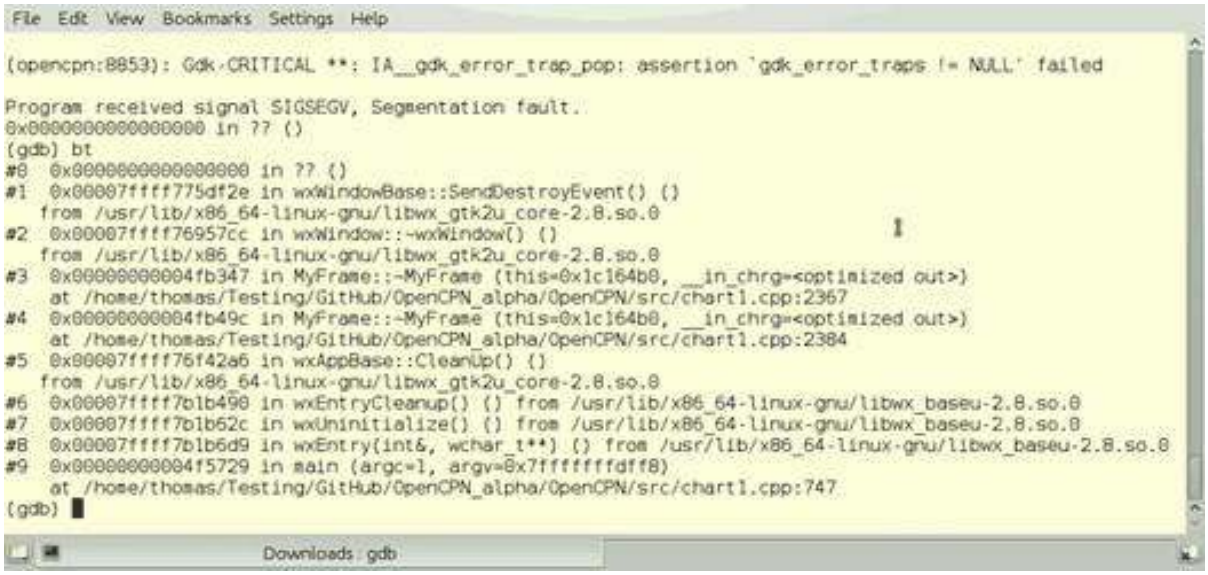
Gdb, the command line debugger, is the answer.
Start like this
$gdb opencpn
Gdb starts and you get the gdb command prompt (gdb).
Just type "r", for run and hit Enter. Like this:
(gdb) r

OpenCPN will now start, once again, make it crash.
The console will look similar to below.



All the lines before the "Segmentation fault" line, are just "chatter" from PortAudio and Gdk, and are not directly related to OpenCPN.

To get a back trace, simply
(gdb)bt
That is type "bt", for back trace, and hit enter.



You will now have access to the full back trace, with more details and reverse order to “ddd”. Copy the text, and send it on.
Press “q” to exit gdb.

Send it on to the Programmers
Tell the programmers about your findings through an entry in the tracker https://opencpn.org/flyspray/[76] , or through posting on the forum http://www.cruisersforum.com/forums/f134[77] , if you have found a new bug.

Getting Around

- GPS Setup and Status
- Display Orientation
- Chart Status Bar
- Chart Info
- Right Click Menu
- Keyboard Shortcuts

GPS Setup & Status

GPS Setup

Please refer to

- GPS Setup
- Display Orientation

GPS Status

The default Ownship icon is rendered as grey  if there is no valid gps position fix available

and like this when a gps fix is available 

The GPS status is also indicated all the way to the right along the top of the screen, together with the North Up/ Course Up Indicator, unless this position is covered by the floating ToolBar. The GPS status is then found bottom left.

This windows visibility is user settable in *Options → User Interface → Show Compass/GPS Status* Window. Short cut "**Ctrl-I**"

The GPS Status Icons should be interpreted as follows:

 No GPS data at all, or position not available.

 GPS fix, the position is known and received from the GPS. Signal is frequent enough and good for navigation, satellite count is not available in the data feed .

 Active/Valid GPS data + GPS reporting 1 - 4 satellites. Only if satellite count is available from GPS receiver.

 Active/Valid GPS data + GPS reporting 5 - 9 satellites. Only if satellite count is available from GPS receiver.

 Active/Valid GPS data + GPS reporting 10+ satellites. Only if satellite count is available from GPS receiver.

Ball: A Ball could be 1,2 or 3 bars, the number of satellites is unknown because the GSV sentence may be unavailable. There is a good fix, the ball just means we get the position often enough. We know a good GPS fix requires a minimum of 4 satellites to resolve the four unknowns X,Y,Z (spatial) and t (time). That is the minimum and one more satellite is better because it is likely to be more stable. The Ball may be using position data with more than 4 satellites available, but not showing any bars because the sentence is filtered out by your network or multiplex filters.

Bars: The GPS may also send data about the satellite constellations (its name/the PRN, azimuth and elevation for each of the sats). The GSV Sentence contains this information. If your network or multiplex filters the GSV sentences out, the only indicator showing will be the Green Ball.

- If there are many fluctuations in the number of bars, there might be problem with reception but there is no direct relation (such as many satellites = good quality). With more bars it is more probable that the fix is better (however there is no guarantee), and with more satellites the reception is more stable. Bars are interesting to watch in urban & treed environments, but for boating a minor issue in general. The bars are not better than the dot, the only difference really is they show we have data about the number of sats available.
- In real life, various gps receivers may behave slightly differently, especially when starting up and finding satellites. Five sats with a strong signal can give a better fix than ten at low elevation pinned on the horizon. Some modern designs of GPS chip sets disregard “low quality” sats and rely on few ones with optimal reception. What they will show in the GSV NMEA sentence - all sats in sight or just the ones used varies from manufacturer to manufacturer.

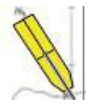
The small dialog, containing the GPS indicator and the Course Up / North Up indicator, can be toggled on/off with the “**Ctrl+i**” shortcut.

The GPS status, including available satellites, is also available as an instrument on the DashBoard.

GPS and low accuracy charts.

OpenCPN is checking loaded charts for accuracy as far as possible. If there is a problem with a chart, the chart info box that becomes visible when holding the cursor over the chart rectangle in the chart bar, will say ” Warning: Chart georef accuracy is poor.”

A visual warning is that Own Ship turns from Red to Yellow when receiving a gps signal.



First is a real scale vector version and then. the default OwnShip bitmap

There is no quick fix for a bad chart, but try to switch to another chart if using single mode chart display. If quilting is on, right-click on the chart button in the chart-bar and select “Hide this chart”. Both suggestions assumes that the bad chart can be replaced by other charts, which of course isn't always possible.

Display Orientation

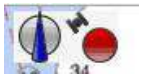
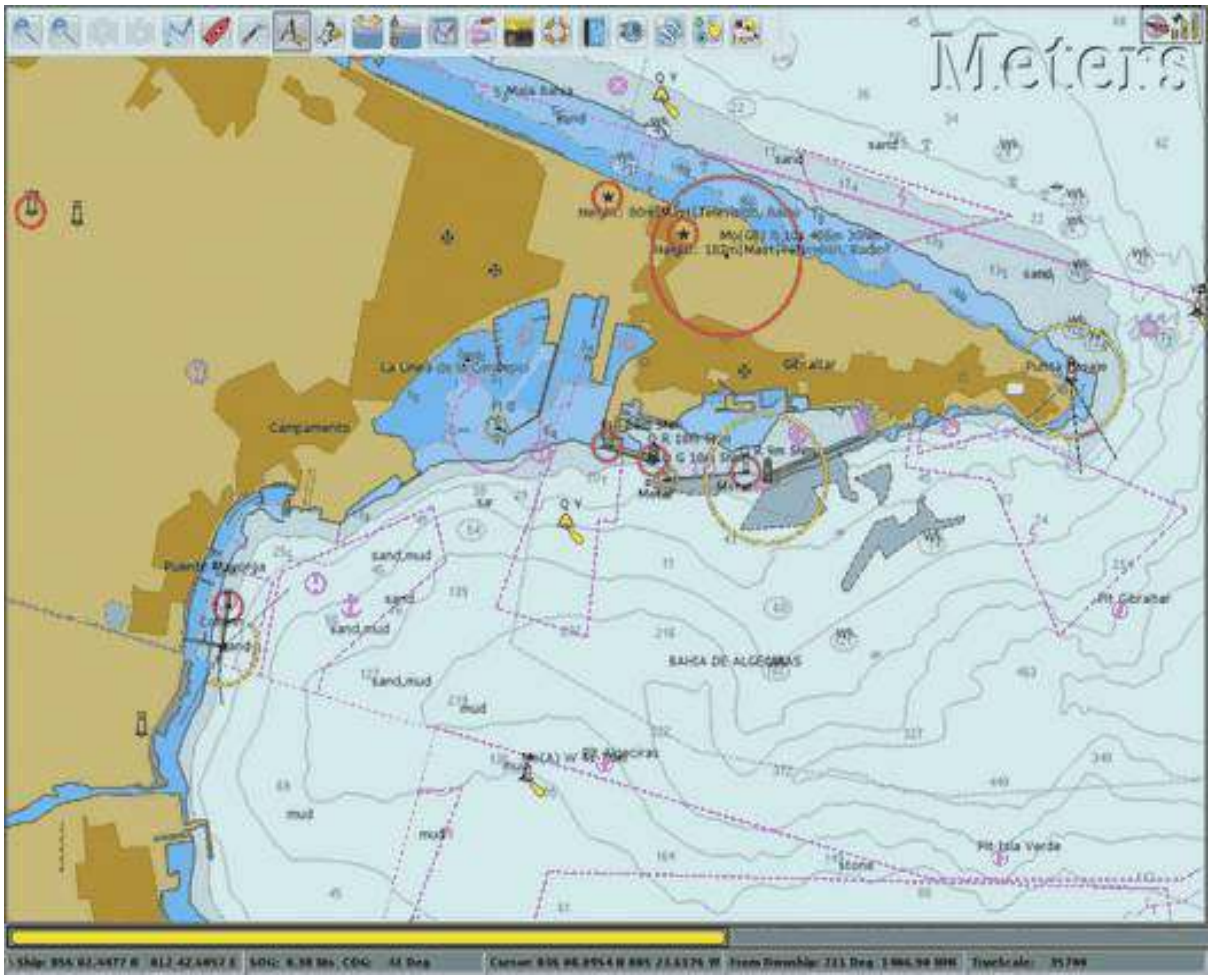
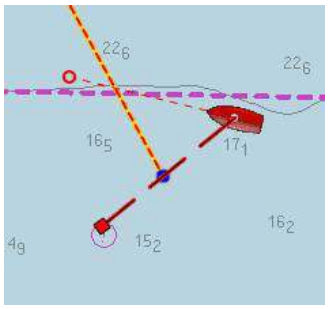


Chart Orientation and GPS Status Icon

- There are three main options for display orientation: **North Up**  (for planning), **Course Up**  (for navigating with a GPS) and **Chart UP** (for skewed charts). With Course Up OpenCPN uses COG (Course Over Ground). A head Up mode, is available in the RotationCtrl plugin. The easiest way to change between these two modes is through the "Right Click" menu. One situation where course up might be considered is when navigating a river or a canal. The third orientation is when skewed charts are displayed, they are simply shown as "**Chart Up**", but an optional setting exists to show them as "**North Up**".
- In the picture below the Course Up is active. COG is 41Deg. Notice how all text on the vector chart, is aligned correctly. This only works in OpenGL mode. The red arrow, in the upper right corner, is always pointing North.



- If the option “Show skewed raster charts as North-up” in the **Options → Display → Advanced tab**, is **not** ticked, the right-click toggle option “Course Up Mode/North Up Mode” will be replaced by “Course Up Mode /Chart Up Mode”, for skewed charts.
- If an electronic compass is available in the NMEA stream the own ship icon will be orientated according to this heading. The difference can be seen on the chart if there is a cross current, for example. The boat below is heading WNW but is being set SW. An AIS CPA, Closest Point of Approach is also visible.



-  This icon (blue color) to the far right in the ToolBar indicates that the display is in **North Up** mode. It may also indicate Chart Up mode for skewed charts, if chart up mode instead of North up mode i selected. See above
-  The red version of the icon indicates **Course Up** mode. Clicking the icon toggles North Up / Course up. These settings can also be toggled in the rightclick menu, as well as in Options → Display →General Tab. In the Options-Display→Advanved Tab, the update period for course up, can be set. This comes in handy, for example, to prevent the display jerking around in a chop.
- The Course Up/North Up icon share a small dialog with the GPS indicator. This dialog can be toggled on/of with the “**Ctrl + i**” shortcut.
- Note that both the red and the blue arrows are **always** pointing North.
- **Look Ahead!** To see more of the chart in front of the boat, activate **Options → Display → Look Ahead Mode**. Your own boat will no longer be in the center of the screen. Instead it will be located away from the center, in the opposite direction to your present gps course(COG).
- **Don't always Look Ahead!** If you are at anchor, swinging on the hook produces random courses and low speeds.If Look Ahead is on in this situation the chart rendering will constantly be redrawn, with the boat in all possible lookahead positions as the course changes. To prevent this kind of scenario OpenCPN works like this:

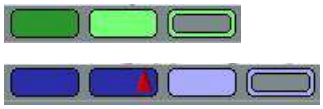
- If the boat speed is less than 1 kt, then lookahead is disabled.
- If boat speed is greater than 3 kts, lookahead is enabled.
- In between 1 and 3 kts, the lookahead “distance” is adjusted smoothly.
- If the problems still there when doing more than 3 kts, consider using “**Options→Connections → FilterNMEA Course and Speed data**” to average out the “jumpiness”.

- **Show skewed raster charts as North-up**. Skewed charts are normally showed “chart up”, as intended by design. If ticking this box, these charts are shown North-Up. In both cases, activating course up, works as expected, the difference is when course up is **not**

on.

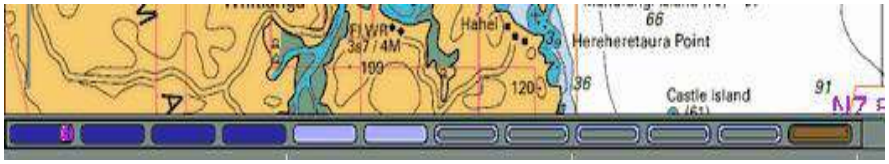
- **Full Screen**. Enter Full Screen Mode with the F11 toggle. Toggling full scree is also possible through the **Menu Bar → View**. Once in full screen mode the **Right-Click-menu** contains the item "**Toggle Full Screen**".

Chart Status Bar



At the bottom of the display, is the Status Bar, activated from "**Options → User Interface → Show Status Bar**".
Just above the Status Bar is the 'Chart Selection Bar'. **Ctrl+B toggles** this bar on/off.
It shows all the available chart for the present view, represented by one colored segment for each chart. The order between the segments represents the scale of the charts. Largest scale to the left, smallest to the right. If CM93 is available, it is always furthest to the right.
The segmented color bars in the Status Bar represent:

- Blue for Raster
- Green For ENC's
- Brown/Yellow for CM93 charts
- The current chart displays as a lighter shade of its color, or if quilting is active, the charts currently making up the quilt are displayed in lighter shade.
- The Chart bar below consisting of 12 segments shows a quilt of two active charts. Five charts in the quilt are hidden, due to small scale. CM93 is in it's place, to the right. Four charts of larger scale than the present view are available. The largest scale chart is a Transverse Mercator chart.



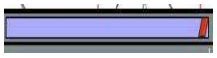
Limitation

The Chart Bar handles a maximum of 100 charts. The largest scale charts will be dropped first if more than 100 chart are available on a position. It is unlikely that this will be much of a limitation, but the possibility certainly exists if a lot of info charts, pilot charts and weather charts etc, are loaded. The symptom will be that large scale charts becomes impossible to display.
When you hover the mouse pointer over the bar, and not in quilting mode, a thumbnail of the chart will appear under the *Scaling Charts* icons and a chart information box will pop up just above the button. If quilting is on, instead of a thumbnail, the chart represented by the button will be highlighted in a transparent reddish color. By clicking on the appropriate bar, or using the appropriate *Keyboard Shortcuts*, you will switch to the chart shown in the thumbnail. This feature is especially useful if you wish to view an ENC or a Raster chart of the same area.

The bottom line starting from the left, a bar, that imitates a paddle wheel, if a gps position is received, and the gps position. Then follows SOG, COG, the position of the cursor, and course and distance from the gps position to the cursor. To the far right there is true Scale of the display and the Zoom Factor. The Zoom factor is the Scale (as above) divided with the natural scale of the chart.
The buttons, or colored segments, are displaying a lot more information however.

These buttons shows that the two charts are **Transverse Mercator**, and that single char mode is used as the corners of the segments are not rounded.

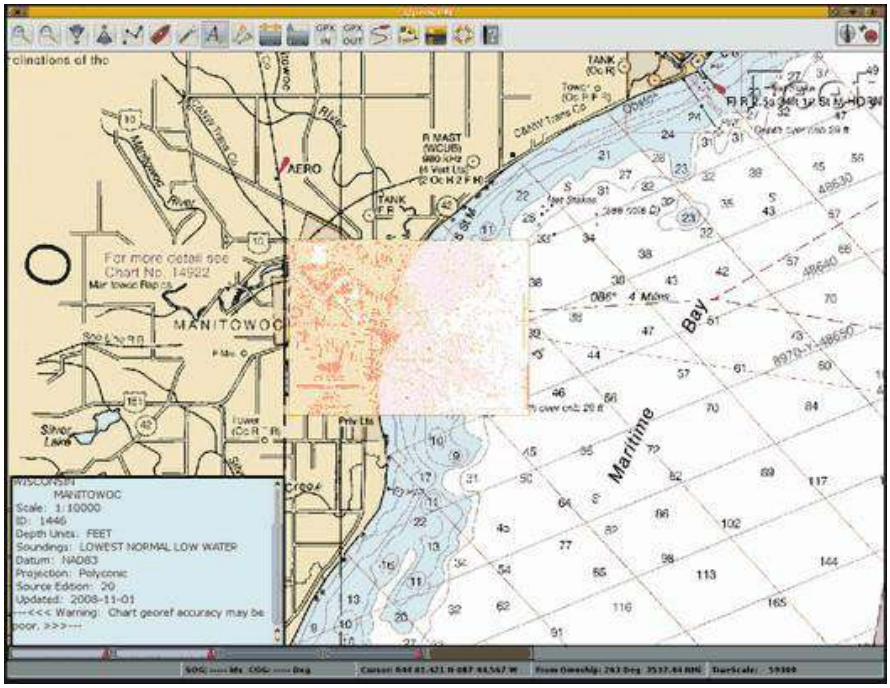
This button indicates that the chart is a **Polyconic** chart.



This button shows that the chart is **Skewed**, meaning that north is **not** up on the chart.

This chart is **excluded from quilting** because of user action. Right click to include in quilting again. Notice the rounded corners due to quilt mode.

The raster chart represented by this button don't participate in the quilt because it is hidden by other, larger scale charts. Vector charts are represented similar.
To illustrate a lot of this, here is a screen shot in quilting mode.



The screen is a quilt of two Polyconical charts. Hovering the mouse pointer over the left chart-button highlights the lager scale chart for Manitowoc. Two smaller scale charts that cover the area displayed on the screen are included in the quilt, but are invisible as they are covered by the larger scale charts. To view these charts, right-click anywhere on a chart in the quilt and select “Remove this chart from quilt”, one of these charts will now be shown in the quilt.
The Brown right most button shows that CM93 version 2, charts are available for the area,

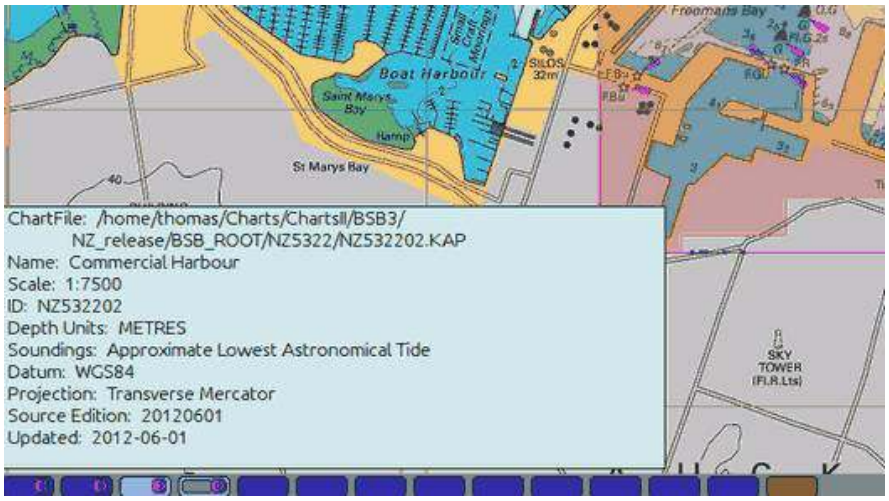
but not currently displayed.
The information box shows relevant information about the chart.

To Hide the Chart Bar

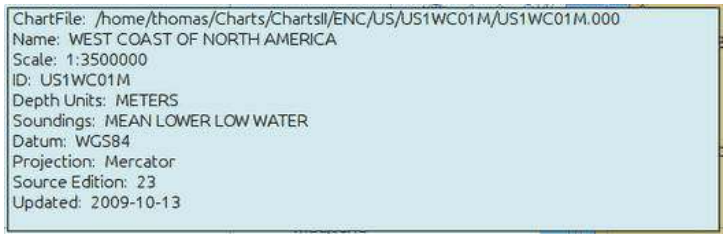
Use these hotkeys: **Ctrl + B** hide/show the Chart Bar.

Chart Info

Chart Conversion Manual[78]
If you hover the cursor above one of the segments, representing a chart, in the Chart Selection Bar, a chart information box pops up. The chart info refers to the chart in the upper right corner, outlined in red and with pink-ish overlay.



The information on a vector chart is similar.



For CM93, switch to single chart mode, to see the information.
If there seems to be a lot of information missing, it's because the chart has not been viewed in the present session. Get the chart up on the screen, the try again.
The Chart Info Box can be inactivated by hiding the Chart Bar. Use Hot keys
Ctrl + B to hide/show the Chart Bar.

What does all the information mean?

ChartFile: The file on the local computer where the chart is.

Name: The Name of the Chart. Not all vector charts have names, while raster charts always have names.

Scale: The scale of the chart.

ID: The chart number. For raster charts this is the same as the number of the paper chart.

Vector chart cells have their own numbering scheme.

Depth Units: For raster charts this is the units for the printed soundings. For vector charts this is the sounding units set in Options → Display → Units → Depth.

Soundings: The datum for soundings. It is the level that all printed depth figures refers to. Consult a text book on Navigation for details.

Datum: The geodetic datum. This will be WGS 84 for all new charts, compiled later than about 1993.
If this value is unknown to OpenCPN, or stated as "UNKNOWN", or the value is missing altogether, OpenCPN will load the chart using WGS84.
This is a potential source of errors and far from ideal. The reason is that a number of chart-agencies, at least in the past, failed to state the correct GD value.
See below for an example of this kind of chart.

If the chart is not using WGS 84, but a named, recognized datum, OpenCPN will automatically add necessary corrections.

Projection: OpenCPN accepts Mercator, Transverse Mercator, UTM or Polyconical projections.

Source Edition: The Chart Edition.

Updated: The date when the chart was released. Expect the chart to be updated to this date, unless otherwise stated.

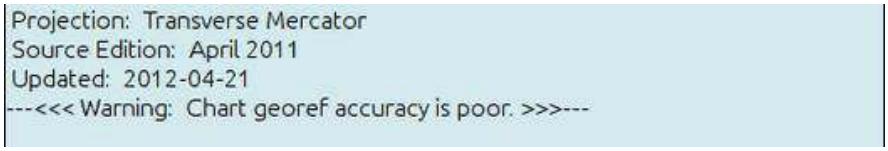
The OpenCPN Logfile

The file contains a wealth of information, and should be your first stop if your chart(s) don't load or if there is an error message.

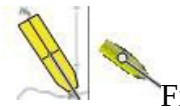
Chart Accuracy

First… make sure your GPS is set to output positions using the WGS 84 Geodetic Datum.

If you see a **warning** like the one below:



Be careful. The warning means that the charts geographic accuracy is bad. **The position of Own Ship may not be correct.**
A visual warning is that Own Ship turns from Red to Yellow when receiving a gps signal.

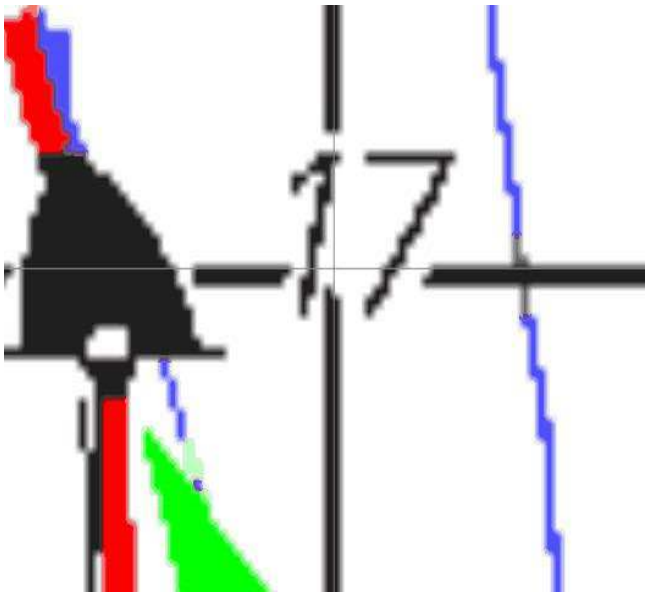
 First is a real scale vector version and then the default OwnShip bitmap

There is no quick fix for a bad chart, but try to switch to another chart if using single mode chart display. If quilting is on, right-click on the chart button in the chart-bar and select “Hide this chart”. Both suggestions assumes that the bad chart can be replaced by other charts, which of course isn't always possible.
The chart will probably be OK for navigation with traditional methods. Use bearings, vertical or horizontal sextant angles of conspicuous landmarks to confirm your position, as well as soundings or any other available resources.

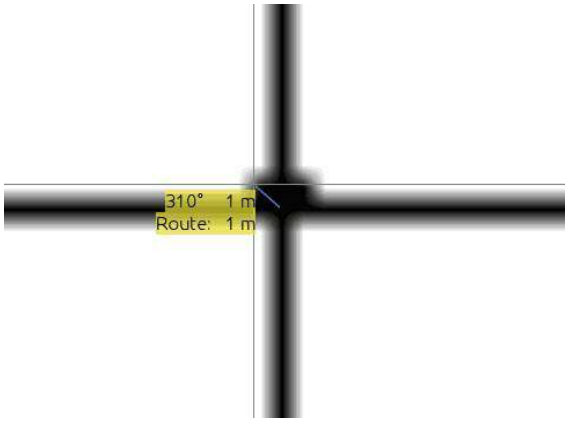
Checking a chart for accuracy

A raster chart, using WGS 84, can easily be checked for the accuracy of the chart grid. This does not necessarily guarantee the position of the individual features on the chart. Refer to Calders book.
Activate Options → Display →General → Show Grid. A Latitude and Longitude grid will be displayed as a layer on top of the chart. This grid is OpenCPNs view of how a proper WGS 84 should look like. For raster charts this grid can be compared to the “printed” grid on the chart picture. Chart errors are to complicated to be treated in a few sentences. Refer to Nigel Calders book “How to Read a Nautical Chart” for an in depth but still easy to read text.
For a quick check, we are happy with a grid error that is in the region of 1 mm at the chart scale. For a chart in 1:50.000 this means an error of 50 m.

Use OpenCPNs ability to grossly over-zoom a chart. Home in on a printed lat/long crossing. Below is a test on a commercial BSB3 chart in 1:60.000. The width of the printed grid - thick black lines - is about 12 m. The thin gray lines is OpenCPNs grid layer. The accuracy of this chart is very good.



Another example. This time we are looking at a chart in 1:10.000. Very accurate.



This method cannot be used unless the chart is WGS84. For other geodetic datums, expect a difference between the printed grid on a raster chart and OpenCPNs grid. To check for accuracy on this kind of chart find a wellknown object with an established position, for example a major Lighthouse, and compare this position with OpenCPN.

Adjusting charts to agree with WGS 84.
This is an **advanced subject**.
For CM 93 read CM93 Offsets.
BSB/KAP chart can also be adjusted. For example the chart above can be made to agree exactly with the grid. Read the Chart Conversion Manual[79] and make sure to understand imgkap and the kap file format[80].
The work flow to correct any kap chart is:

1. Use imgkap to extract the chart picture
2. Copy the text header from the kap chart to a .txt file.
3. Adjust the DTM values in the .txt file
4. Use the imgkap with the picture and the .txt file to produce a new updated kap file.
5. Check for accuracy and go back to #3 if necessary.

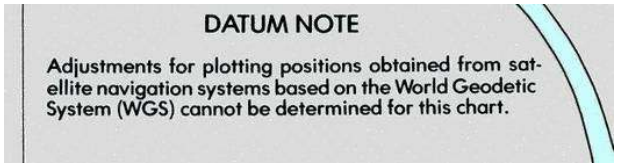
No Projection -> Chart rejected.

If the chart does not contain any information about the projection, OpenCPN doesn't know how to display it. Such a chart will not be loaded, but a note about the problem will appear in the log file.
Missing a chart? Check your OpenCPN logfile.

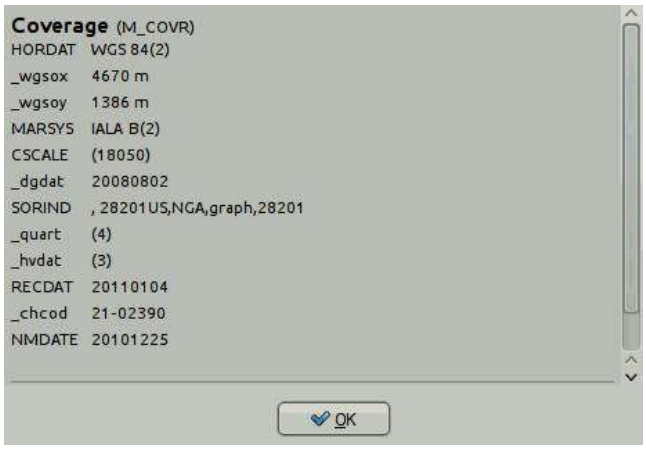
No Datum -> —<<< Warning: Chart Datum may be incorrect. >>> —

The message will be in the Chart Info Box.
This is a warning that the chart probably is not accurate enough for GPS navigation. It still should be OK with traditional methods. A minimum recommendation is to check the GPS position with traditional methods, a couple of compass bearings, for example.

One example, that unfortunately have lead to problems for a few yachts, is DMA/NGA chart 28201, Puerto Morelos, in Mexico, from 1995. This chart, based on a Mexican survey from 1905, has a Datum Note, similar to this:



Comparing 28201 with CM93 that is correct, in this particular case. Note the substantial corrections applied in CM93,



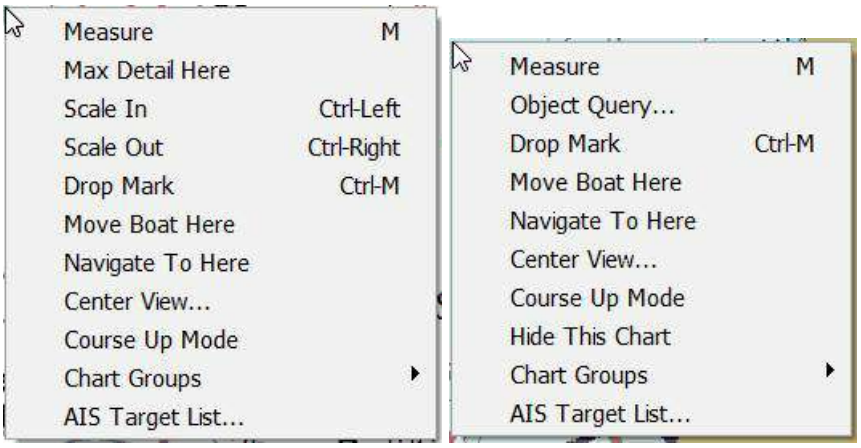
Right Click Menu

The right click menu is always available as long as the cursor is somewhere in the chart area. **The content of this menu is very context sensitive.** The reason for the "Focused Context Menus", is to keep the number of options down to a reasonable level, and still be able to deal with all situations. Additionally, many Plugins add items to the right-click menu.

There are basic right-click menus when clicking at a random point, and very focused menus when clicking on a waypoint, a route, a track or an AIS target. If you have just created or deleted a waypoint, or if chart groups are defined, there are further entries added to the basic menu. Some plugins also adds entries to the right-click menu when they are used. Below, the basic entries are explained.The more context specific entries are dealt with as the concerned feature is explained.

The basic single charts right-click menus.

Below is first the rastercharts menu to the left and then the vector chart menu. Available "hotkeys", if any, are shown to the right.



Starting with the **left menu** for **rastercharts**.

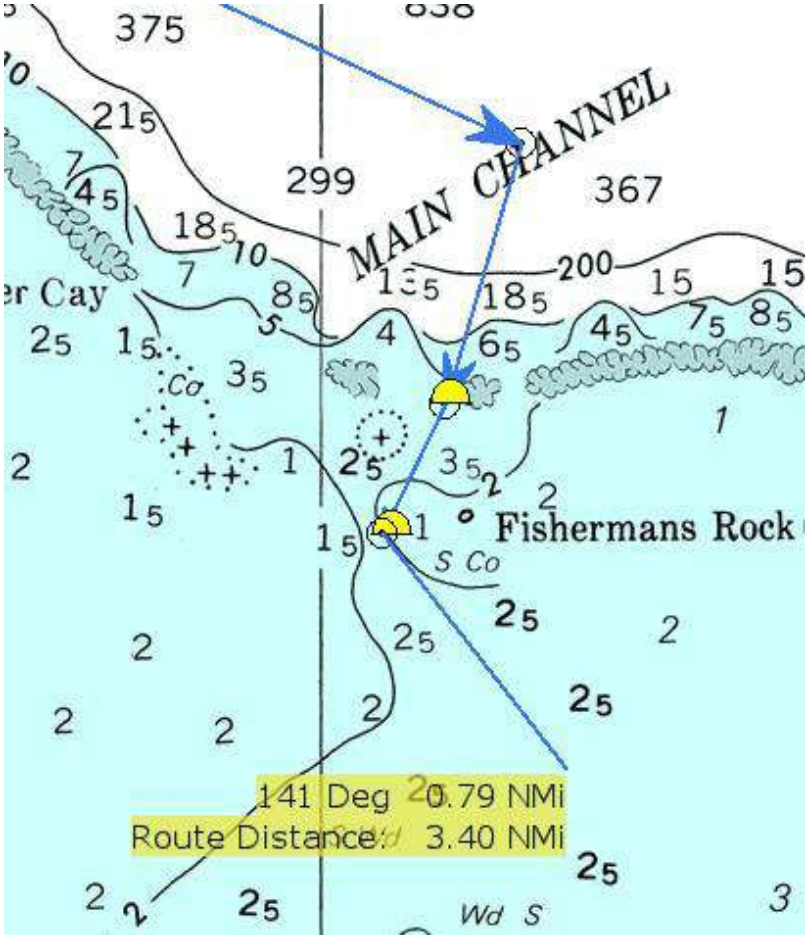
Measure

Activates a "pencil". Move the pencil with the cursor. Put the tip of the **pencil on a position** that you want to measure from. **Left-click**, a dot Position with a circle around is created. **Move the pencil with the mouse** and s**ee the distance and bearing from the point** to the pencil-tip in "real time". **Left-clicking again** creates a temporary waypoint. When moving the "pencil" again, distance and bearing, once again are shown from the temporary waypoint. The total distance from the original measure point, via the temporary wapoint(s) are also shown as "Route Distance". **Right click** and mark **"Measure Off"** to stop measuring.

For longer distances, specially on east.west courses on higher latitudes, the measure tool seamlessly switches to display and measure great circles instead of Mercator rhumb-lines. Read more ***Great-circle Sailing***

The “Create Route” tool works in a similar way, but you can't use the two tools at the same time.

Max Detail Here



Displays the largest scale, most detailed chart, available in the position of the cursor.
It is assumed that there are more than one chart available at the position.

Scale In

Displays the next larger scale chart.
It is assumed that there are more than one chart available at the position.

Scale Out

Displays the next smaller scale chart.
It is assumed that there are more than one chart available at the position.

Create a Mark

Drops a mark in the position of the cursor. Further explained on this page ***Marks and Routes***

Move Boat Here

Moves own boats position to the position pointed at. This item is only visible in the right click-menu if the GPS isn't connected.

Navigate to here

Creates an instant active route from own boat to the position clicked. The option does not appear when following an active route. More about routes: ***Marks and Routes***

Center View

Activates a small dialog where latitude and longitude can be entered. Pressing “OK” centers the display on this position, keeping the same scale. If a position has been copied, and is in your copy buffer, it will be displayed as default values. OpenCPN accepts a wide variety of position formats. The values entered is kept during a session, but goes when restarting OpenCPN.

Course Up Mode

Is shown because we are in North Up Mode. Clicking this entry changes the display to “North Up Mode.” It is a toggle switch between “North Up” and “Course Up”. Read more about display orientation: ***Display Orientation***

Hide This Chart

Hides the chart from quilting

Chart Groups

Selector list of all defined Chart Groups. Very useful.

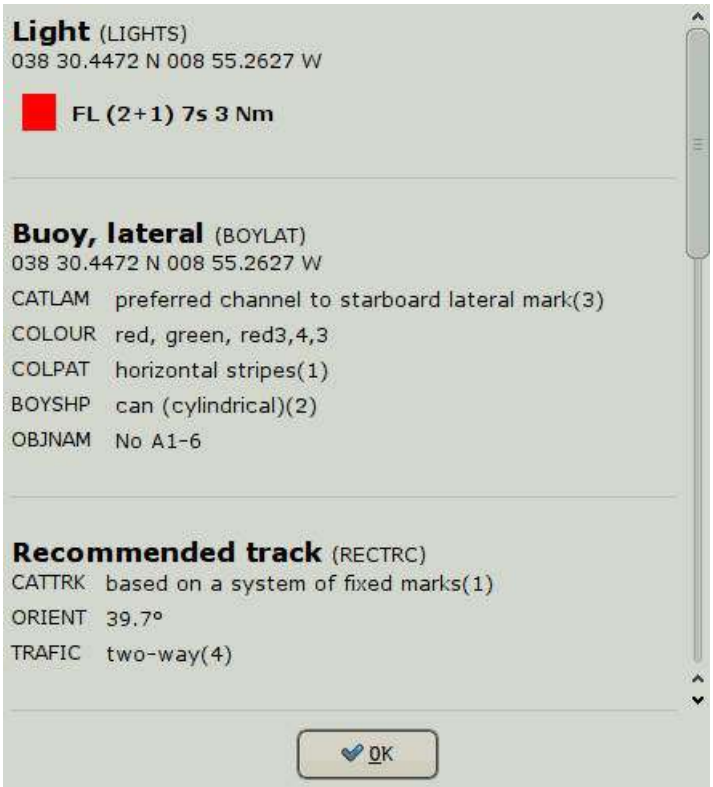
AIS Target List

Shows a list of discovered AIS targets, if any. Read more on ***AIS***

Looking at the right click menu for vector charts, to the right above,we can see these additional entries.

Object Query

Every point on a vector-chart has certain attributes, or information. This can vary from just the depth in mid ocean to much more. Double clicking is an alternative to display the object query dialog. Here is an example from a lateral buoy in the entrance channel to a medium sized port.

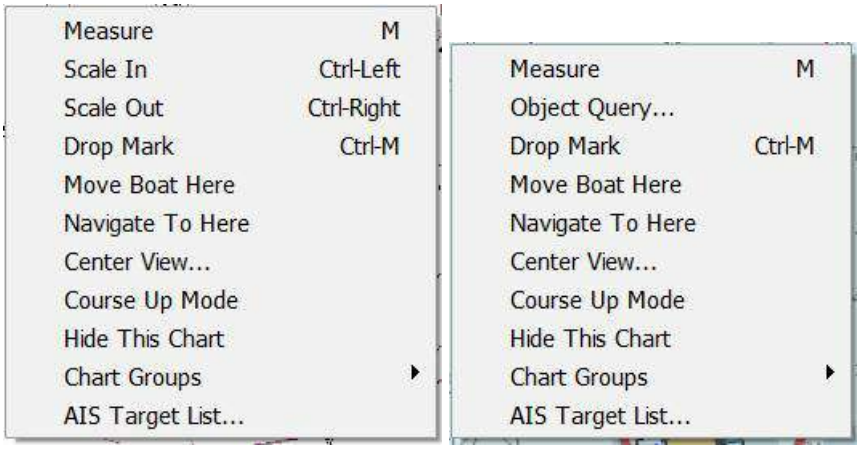


The scrollbar on the right side of the dialog, reveals that more info is available by scrolling down. Much more about this on the ***Vector Display***

CM93 Offset Dialog

Apply corrections to CM93 chart cells through this dialog. Read more on the ***CM93 Offsets*** page in the Advanced section of this manual.

The basic quilted charts right-click menus, for raster charts and vector charts



The only new item in the quilted menus is

Hide this chart

The chart becomes excluded from the quilt. To show the chart again, find it in the chart bar, now marked with a red "X", right click and press "**Show this Chart**". Read more here: ***Chart Quilting***

Left Mouse Click

Left Mouse click on chart moves to center of view
When **Options> UI > Touchscreen interface** is checked **Left-mouse Click** becomes a "Hand" which will grab and pan the screen.

Scroll Wheel

Scroll Wheel, zooming in/out
Alt + scroll wheel, zooming in/out in small steps.

Keyboard Shortcuts

	Windows	Linux	OS X	Comments
Menu Bar	Alt			Toggle if Show Menu is unchecked.
Zoom In	+			
Zoom Out	-			
Zoom In	PgUp			
Zoom Out	PgDn			
Fine Zoom In	Alt +			
Fine Zoom Out	Alt -			
Larger Scale Chart	Ctrl+LeftArrowKey (or F7)		Cmd+LeftArrowKey	
Smaller Scale Chart	Ctrl+RightArrowKey (or F8)		Cmd+RightArrowKey	
Panning	Arrow keys			
Panning Slowly	Alt + Arrow keys			
Quit OCPN	Ctrl+Q		Cmd+Q	
Preferences			Cmd+,	
Full Screen	F11		Ctrl+Cmd-F	
Auto Follow (on/off)	Ctrl+A (or F2)		Cmd+A	

The List sorted by Keys

Function Keys

- **F2** toggle Auto Follow on / off
- **F3** toggle ENC Text.
- **F4** activates the chart measure pencil. **Esc** Stops it
- **F5** toggle Daylight, Dusk & Night mode, if built into the Chart (“C”, Ctrl+C, Ctrl+G)
- **F6** General Dimming, in steps, of the entire Screen. (except Mac OS X) OpenGL must be off.
- **F7** Larger Scale Raster Chart (Scale In) or **Ctrl + Left-Arrow**
- **F8** Smaller Scale Raster Chart (Scale Out) or **Ctrl + Right-Arrow**
- **F9** Chart Quilting . Toggle on/off
- **F11** toggle Full Screen view.
- **F12** toggle Chart Outlines
- **SHIFT + F6** reverses the dimming.

Hot Keys or Shortcut Keys

- **C** change color scheme -new similar to Ctrl+C, Ctrl+G and F5
- **D** open/close the XX-charts zoom/scale weighting or detail slider.
- **L** toggle ENC Lights on/off. “Mariners Standard” display category.
- **O** toggle Chart Outlines. or **F12**
- **T** toggle ENC Text or **F3**
- **S** toggle ENC soundings.
- **U** toggle Quality of Data for Vector Charts.
- **V** toggle All navobjects except Active route & track, when enabled in View menu.
- **A** toggle bottom features, useful when anchoring. “Mariners Standard” Anchorage area & Anchor berth display category.
- **D** toggle Detail Slider (ENC, CM93 & Raster). Hide only works, if the slider lost focus.
- **M** toggle Measure Tool **F4**
- **P** toggle Pause of oesenc charts test
- **Q** toggle Chart Quilting
- **+** Zoom In
- **-** Zoom Out

Alt Keys

- **Alt + “.”** Toggles Menu Bar on/off of Show menu is not checked.
- **Alt + Arrow Keys**. Moves the chart view in very small steps.
- **Alt + “+“** for fine scale zooming in.
- **Alt + ”-“** for fine scale zooming out.

Control Keys

- **Ctrl + scroll wheel**, zooming in/out in small steps
- **Ctrl + Left-Arrow-Key** Larger Scale Chart (Scale In) (F7)
- **Ctrl + Right-Arrow-Key** Smaller Scale Chart (Scale Out) (F8)
- **Ctrl + A** Auto Follow
- **Ctrl + B** toggle the Chart Bar.
- **Ctrl + C** Change color scheme - new similar to Ctrl+G, “C” and (F5)
- **Ctrl + G*** cycles through green, red and normal screen.
- **Ctrl + I** toggle small dialog, containing GPS status & Course/Up North Up Icons, on/off.
- **Ctrl + M** Drops Marker at current cursor position.
- **Ctrl + N** Activate next waypoint in an active route.
- **Ctrl + O** Drops Marker at current ownship position. (or Spacebar)
- **Ctrl + Q** Quits OpenCPN
- **Ctrl + R** Starts the Routing tool. **Esc** ends creating route.
- **Ctrl + Y** Redo Mark/waypoint create, move or delete.
- **Ctrl + Z** Undo Mark/waypoint create, move or delete.
- **Ctrl + ,** the option Window is displayed.

Numerical Keys

- **Keyboard number keys 0,1,2,…9** Changes view between the first 10 chart groups, if available.

Other Keys and Clicks

- **Keyboard Arrow Keys**. Moves the chart view.
- **Left clicking on a chart**, centers the chart on that point.
- **Double clicking a vector chart**, displays all info for that point (exception below).
- When the **cursor** becomes a **green arrow**, clicking pans in the direction od the arrow.
- **Double clicking on an AIS[81] target**, displays the target query dialog.
- **Double clicking on a mark or waypoint**, displays the Mark Properties Dialog
- **Double clicking on a route or track**, displays the Route/Track Properties Dialog
- **Right clicking on any chart**, access a context sensitive menu.
- **Esc** ends the process of route creation or stops the measure pencil.
- **Right Mouse click on chart** View center lat & long
- **Left Mouse click on chart** moves to center of view (Touchscreen interface becomes a "Hand")

Scroll Wheel

- **Scroll Wheel**, zooming in/out
- **Alt + scroll wheel**, zooming in/out in small steps.

Cursor

- **When the cursor becomes a green arrow**, clicking pans in the direction of the arrow.

—-

* **Ctrl-G** Works on some Windows systems (depending on graphic driver)

* **MAC Cmd+A** overrides standard "Select all text in current text box", might possibly be able to change to Ctrl+Cmd+A in next version.

* **Spacebar** Drops Marker at current GPS position NOTE: This must be enabled by manual edit of the opencpn.ini file. [Settings] …"SpaceDropMark=1", to activate this feature. [Settings] …"SpaceDropMark=0" deactivates the feature.

NOTE: This list may not be completely detailed and correct for now, but it does try to establish all the shortcuts available.

We may need to add some things to Caesar's Functional and tabular list to make it more complete. Please contribute ideas and corrections/improvements!

CHARTS

Introduction

This section will cover the universe of charts thru the lens of OpenCPN: installing, using, finding, different formats supported, using purchased charts, and more.

Options > Charts > Tabs

Chart Files Tab Install charts & manage directories
Vector Display Tab Vector Display options
Chart Groups Tab Create & Manage chart groups
Chart Downloader Tab Download & update free charts.
Chart Manual Installation Instructions for installing charts.

Chart Plugins - Fee Based

S63 Vector Charts Plugin
oeSENC Vector Charts Plugin
Fugawi Raster Charts Plugin
BSB4 Charts Plugin
NV Charts Plugin

Chart Use and Management

Scaling Charts Use Scale tool to change chart scale.
Chart Quilting Display portions of charts at the same scale.
Chart Status Bar Chart Buttons for current charts at screen bottom.
Chart Information Right-click Chart Buttons at bottom of screen.

Chart Resources

Chart Sources Free chart sources list.

Chart Formats Supported chart formats.
Background GSHHS Shoreline
High Resolution Background GSHHS Shoreline

Advanced Chart Work

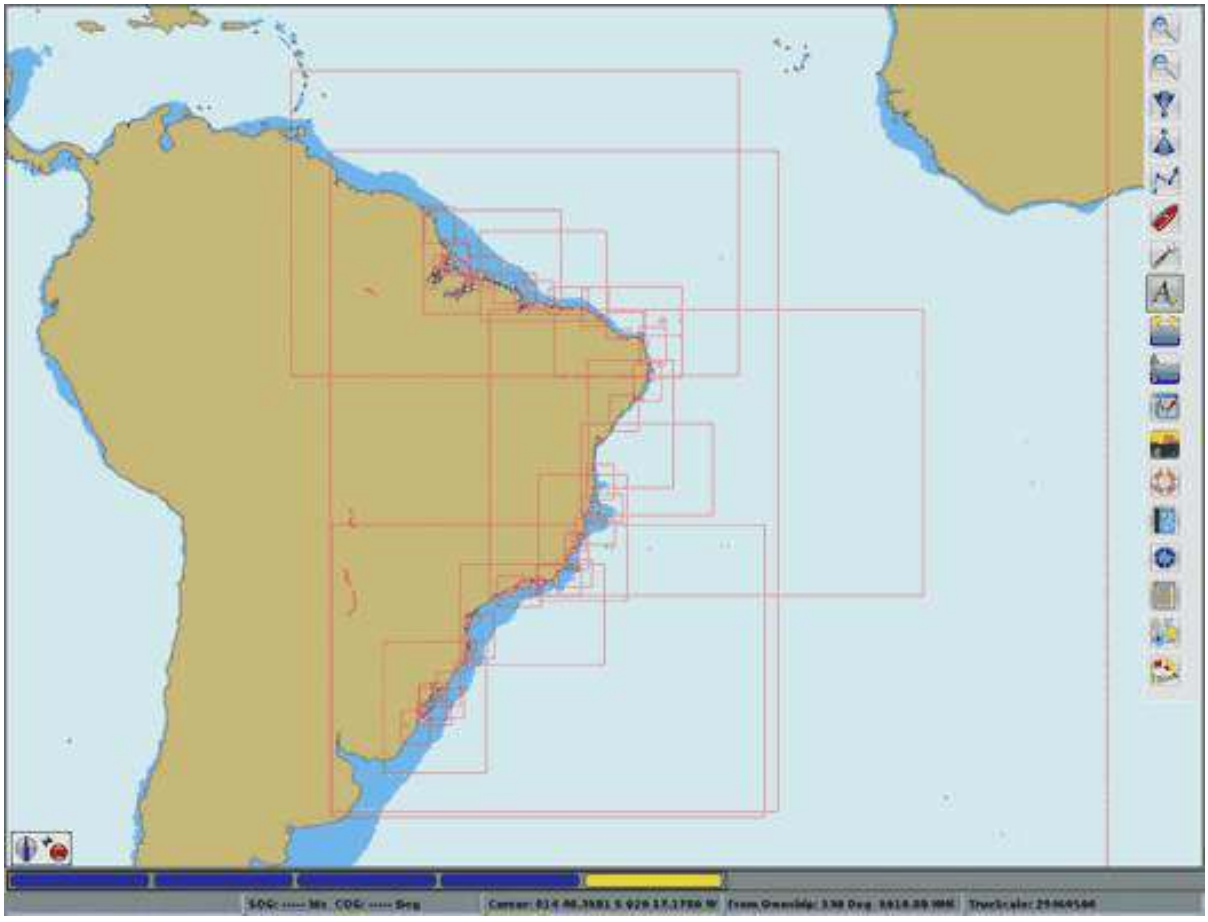
IMHO ECDIS ECDIS Standards
Advanced Chart Work
CM93 Offsets How to correct Offsets at your own risk.
Chart Conversion Manual[82] Kap, Imgkap, libBSB GE

Chart Files Tab

The potential danger to the mariner increases with digital charts because by zooming in, he can increase the chart scale beyond what can be supported by the source data. The constant and automatic update of the vessel's position on the chart display can give the navigator a false sense of security, causing him to rely on the accuracy of a chart when the source data from which the chart was compiled cannot support the scale of the chart displayed. Bowditch 2002 Ed p 412.

Installing Charts

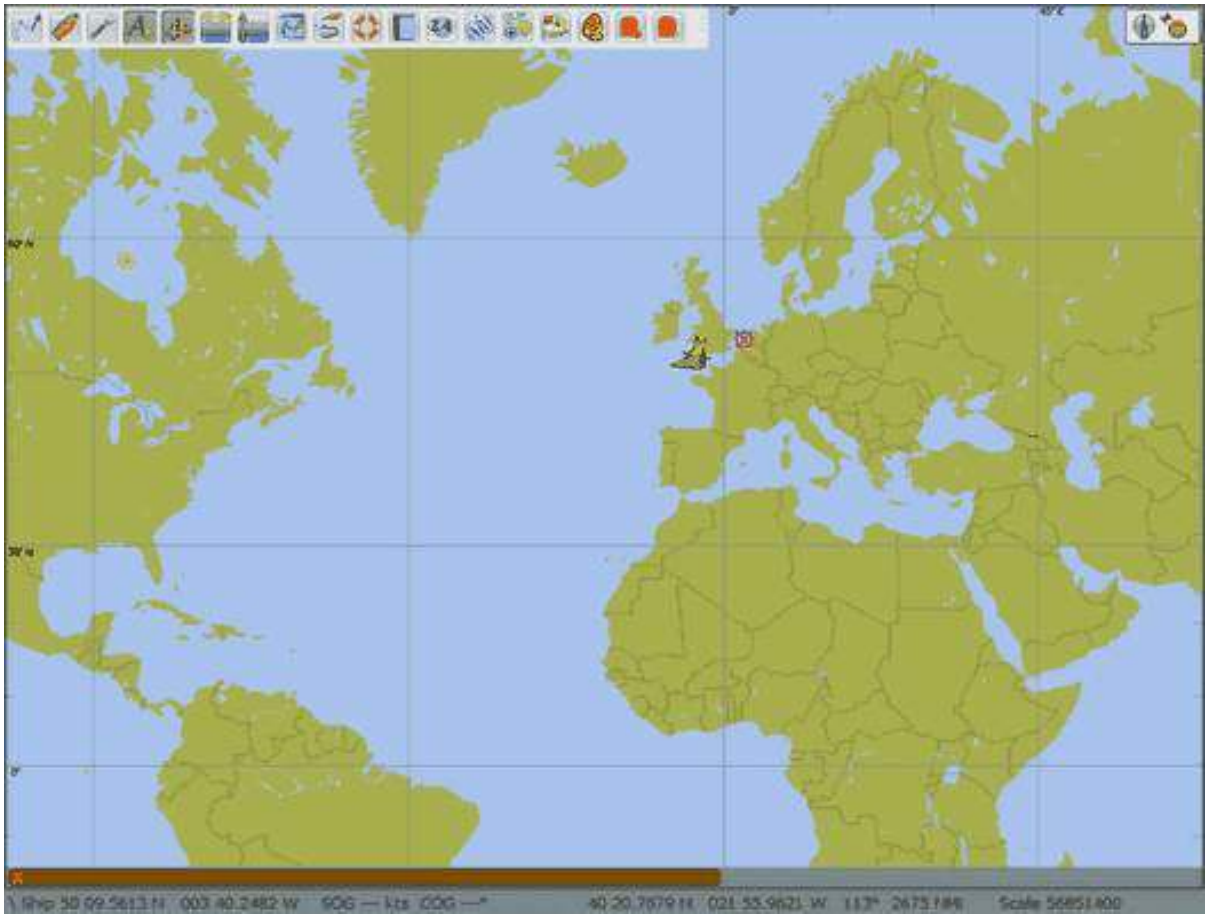
For the first time user, the easiest path is to use **Chart Downloader Tab** **First**, even if your primary charts are found somewhere else. It's possible, even desirable, to find charts in many places that the Chart Downloader doesn't cover (e.g. CM93 Vers 2). But when getting started, take the easier path. You will learn how things work and will make better choices when adding charts from other sources.



Free Brazilian charts **OpenCPN** doesnot come with any pre-installed charts**.** It is up to the user to find and install charts**.** Read on, and you will find detailed information about which chart formats that OpenCPN can display, as well as pointers to all available charts for OpenCPN, free downloads as well as commercial, that we know of.

Background Chart

OpenCPN comes with a worldwide background map, in GSHHS format, displayed if no charts are available for an area.



To install charts, OpenCPN must be pointed to a directory containing Charts of one of the recognized

Chart Formats **Don't point OpenCPN to individual charts.** You must specify the directory that contains the charts.

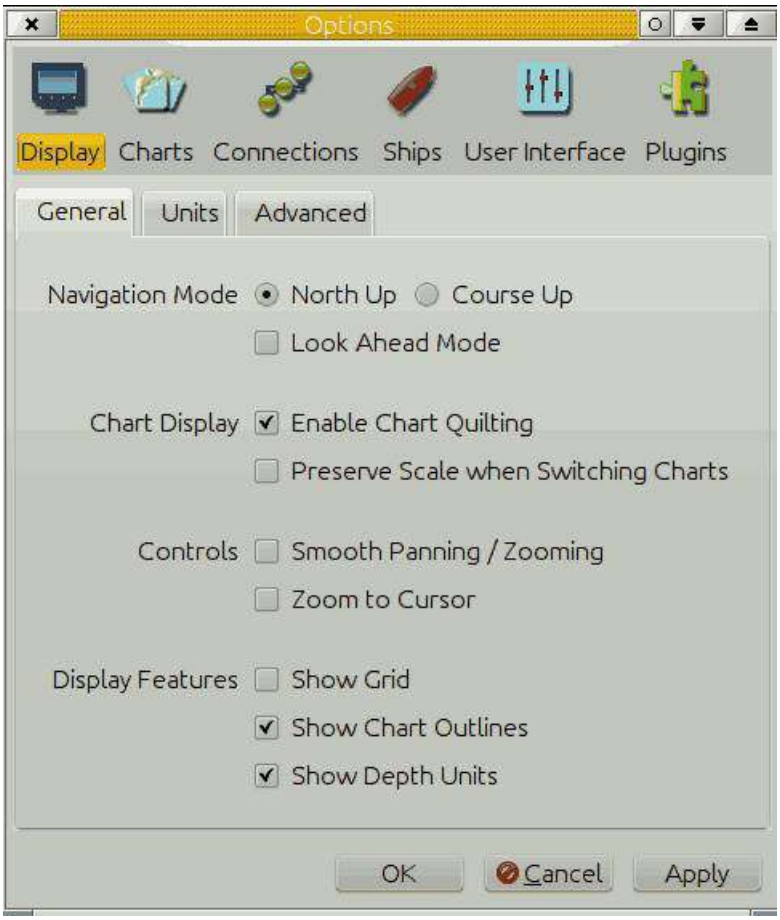
Where do I keep my charts ?

The installation tells you to go to the Options → Charts → Chart Files tab to install charts.

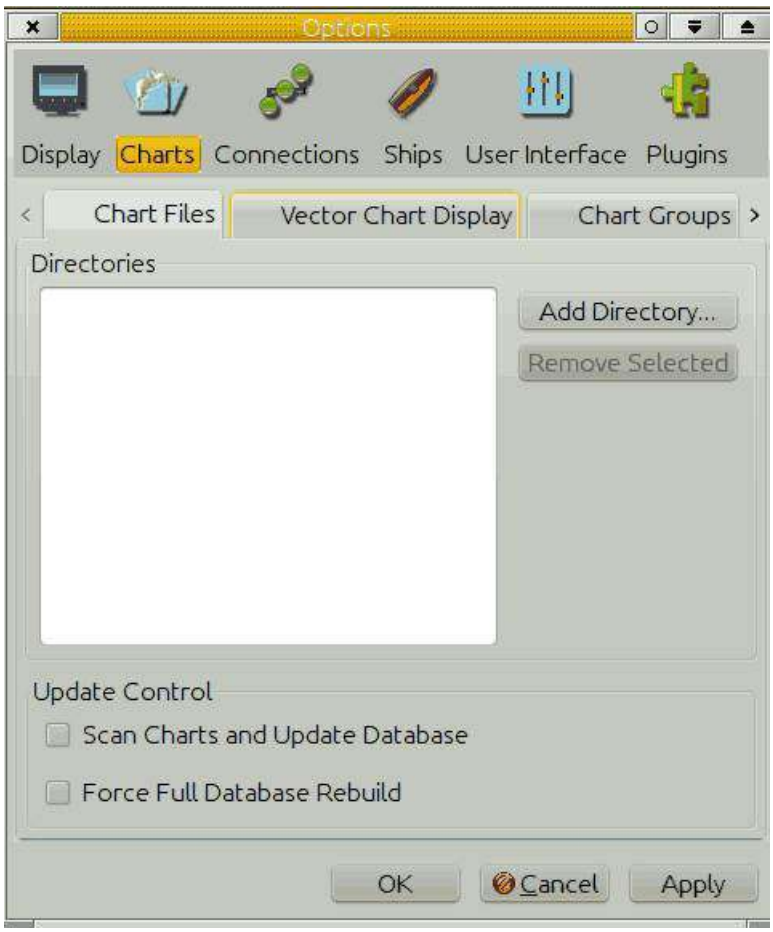
When you press the “**Add Directory**” button the default directory will be “**My Documents**” for Windows, and the users home directory, for Linux and Mac. These are good places to keep your charts. Create a “**Chart**” directory, and maybe some sub directories, to keep your charts in, and you can't go far wrong.
We suggest you can create a **“Chart”** directory, and possibly two or three sub directories, **“RNC”** and **“ENC”** and possibly “CM93” to keep your charts in, and you can't go far wrong. Seasoned users knows where they want their charts.
Regard charts as data, independent of OpenCPN. Store them in a place that is convenient for you and that is left alone by the operating system.
Download some charts (see **Chart Sources**) to your newly created Chart directory. Follow the directions below to make this directory an “Active Chart Directory”
The main consideration for charts is storing them in a directory where they will not be tampered with or moved accidentally.

Installing Charts

Open the Options Dialog by clicking 
You are sent to the first tab “Display”. Tick the box “Show Chart Outlines”. That will help you visualize the loaded charts.

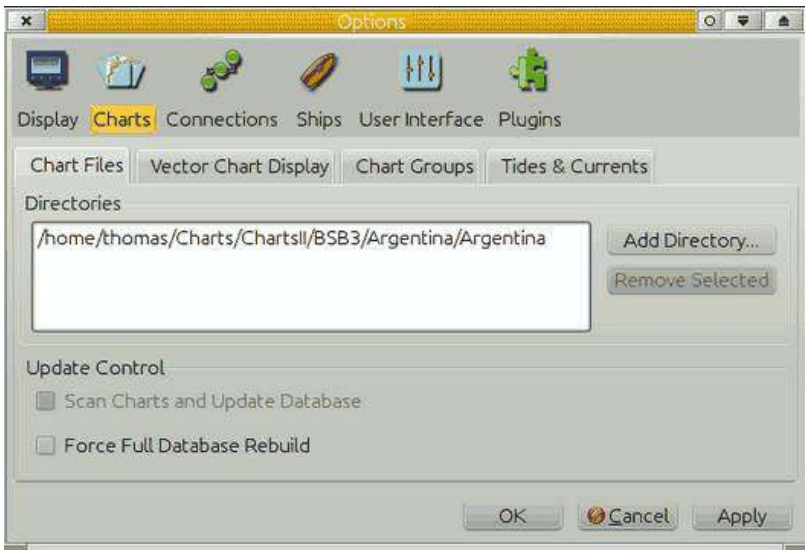


Then click the tab “Charts” and then the tab “Chart Files”.



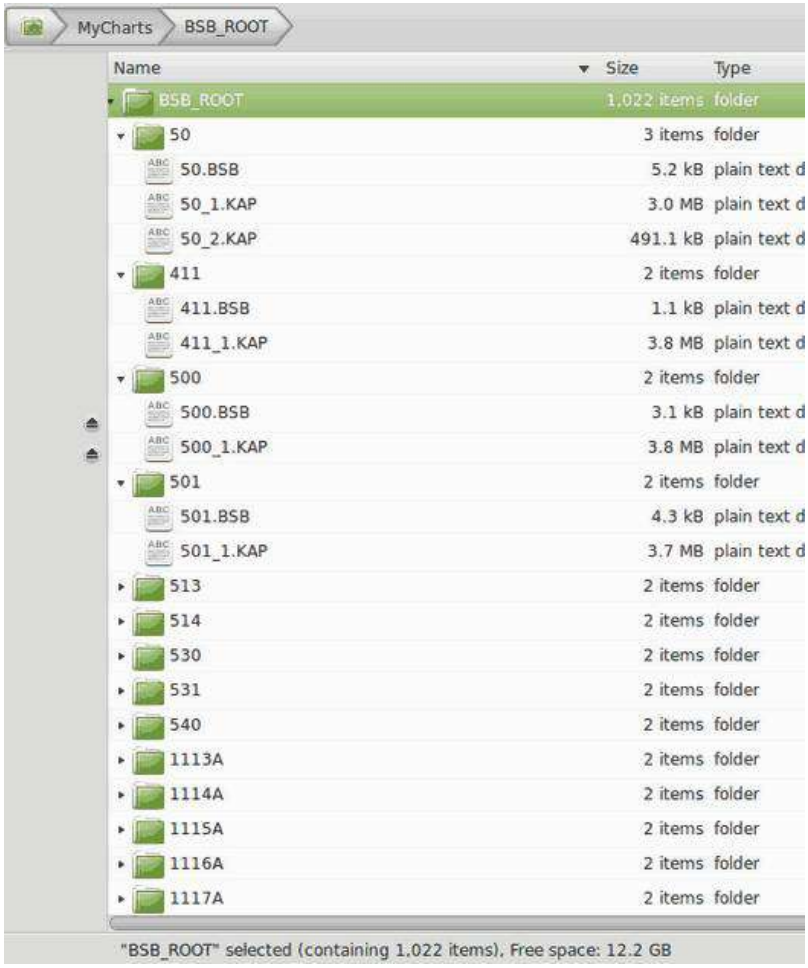
There are no charts loaded. To add charts we have to add a directory that contains charts of a recognized format. To get started press “Add Directories” and navigate to your chart-directory.

Exactly how the dialog looks like depends on your operating system, and is not a part of the core OpenCPN.
When clicking the button “Open” above, the highlighted chart directory is added to the box “Directories”. The screen-shots are from Linux, but this process works similarly on all platforms. Add more chart directories using the same process again. It's OK to load both raster- and vector-charts together.



All that remains is to click the “Apply” button. OpenCPN will then process your selection. You can now start using your charts. When you are done with your settings click “OK” and the Options Dialog closes. If you are just adding a chart directory, it works fine to just click the “Ok” button.

The charts often come in a compressed package eg. a ZIP archive. You must first uncompress them to your disk to be able to set them up. The following screenshot shows the file and directory structure of the NOAA raster charts (RNC) on a local disk



Note that in OpenCPN you must add directories (folders) containing charts, not the

individual charts.
For **BSB4** and **nv-charts**, first install the *latest plugin version[83]*, then point OpenCPN to the correct chart directories and finally do a "**Full Database Rebuild**".
Eager to get some charts quickly, to get started? Go to: Use the integrated ***Chart Downloader Tab*** or go to ***Chart Sources*** to learn where you can get charts.

Check your charts after installation

This step is important if you just installed some old BSB charts, say from the ninties, or charts of dubious origin. For example, there are a lot of old Maptech charts that uses the Geodetic Datum "Unknown".
It is not a problem with recent charts.
OpenCPN Version 4.0 will reject charts **without a projection** and add a note in the log about the problem.
Charts with an unrecognized Geodetic Chart Datum will be loaded as if they were WGS84. This may lead to unacceptable errors. The Chart Information Dialog will contain the sentence:**"Warning: Chart Datum may be incorrect."** , and the log will contain a note with the words "Chart datum {XXXX} invalid on chart".
For practical use, it's very important that the implication of this is understood.
Read up on the subject in the ***Chart Info*** page

Start using your charts

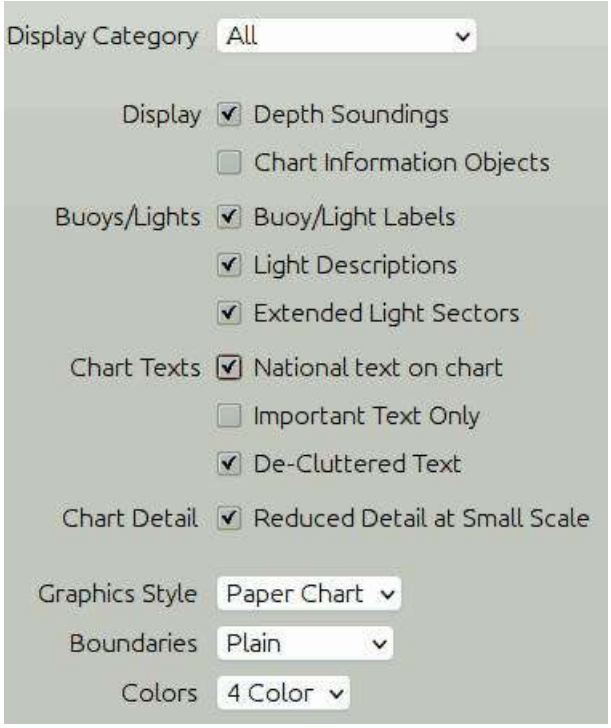
You can click and drag the chart with your mouse. The cursor changes to an triangular green arrow near the edges of the OpenCPN window, left clicking in this situation, pans the chart in the direction of the arrow. The scroll wheel zooms in and out. Left clicking anywhere centers the view on that position. Right clicking brings up a menu with useful actions. Exactly what the menu contains depends on the circumstances. Read the rest of the manual for a full explanation.

If you are running OpenCPN for the first time you may see the background chart instead of the charts you installed. That simply means OpenCPN is pointed at a location that is not on any of the charts you installed. Click and drag, or use the arrow keys, to move the view-point to the location of one of your installed charts as described under "**A few hints**" below. Look for the rectangular outlines of the installed charts. An alternative is to right-click, and then click "Jump to position". Enter a location that is within the perimeters of your entered charts. The first time you start OpenCPN the view will be centered on Georgetown in South Carolina.

Quilting Chart Mode is the default display mode. In this mode all available charts at the viewpoint will be quilted together seamlessly according to certain roles. Read more in ***Chart Quilting***.
The other display mode is **Single chart Mode** were only one chart at a time is used. It is possible to read all the information printed in the perimeter of a raster chart. To change to another chart, select and click in the Chart Selection Bar. Read more in ***Chart Status Bar***.

Starting with vector charts?

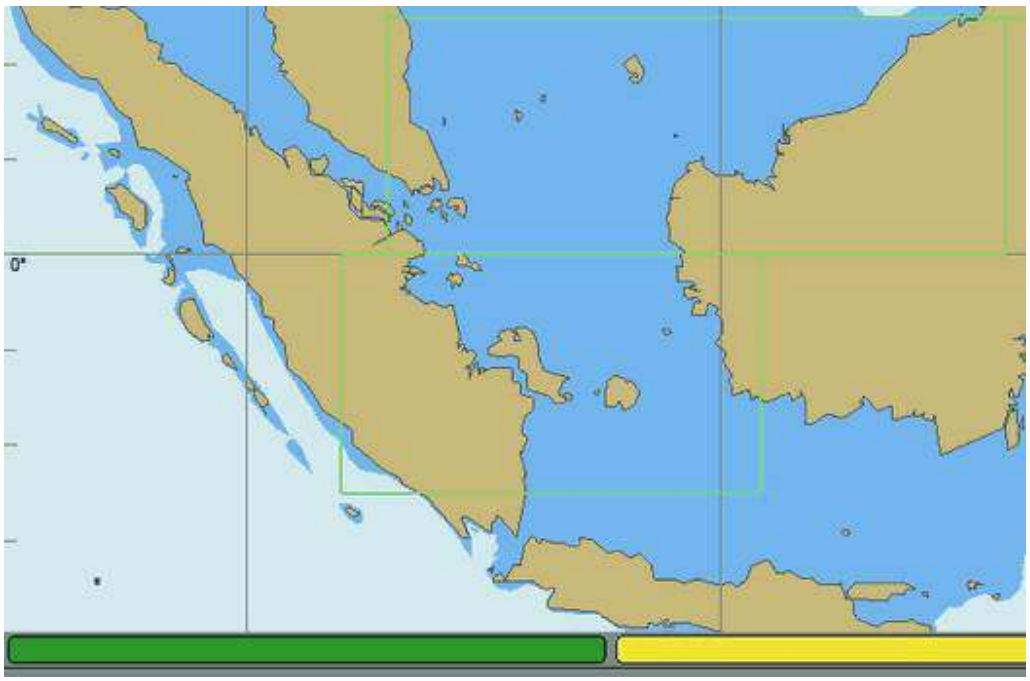
If you are new to vector charts, including CM93 v2, on OpenCPN follow this quick-start guide:
Go to Options {:opencpn:opencpn_user_manual:settings.jpg?nolink&32×32}} **Charts> Vector Chart Display** and copy the settings below for the Display Category.



Press this button  in the ToolBar to toggle text display. Alternatively, the "**T**" hotkey does the same thing.
These are not the "perfect" settings, but you will see most of what you expect from a vector chart.
As soon as you have made yourself reasonably comfortable with OpenCPN and before using Vector Charts for actual navigation, make sure you understand all the settings in the **Options> Charts> Vector Display Tab** by reading the ***Vector Display Tab*** page.

Loading Vector Charts

When using a vector chart for the first time, OpenCPN has to process the data, and transform the information to an internal display format. Click the green chart rectangle in the chart-bar to start the process.



This can take some time, depending on your computer. This internal SENC chart, is saved for future use. The created files are quite large, but is in a format optimized for quick loading. OpenCPN is trading, creation time and size, for fast rendering when actually using the vector chart. The SENC files are saved in the SENC directory, in the same place as the opencpn.conf file - opencpn.ini on windows.
To avoid getting a very long series of SENC charts being built at the same time, use single chart mode, for better control. This is certainly called for in areas that are densely populated with vector charts. Single chart mode and quilting are explained on this page ***Chart Quilting*** . You probably do not want to build SENCs for all of your loaded S57 ENCs unless you plan to actually go there….

The new and easy way to do all this in OpenCPN version 4.8.0 is to go to Options → Charts → Chart Files and press the button “Prepare all ENC Charts”. The button is found at the bottom left of the dialog. The process will take quite some time, depending on the computer and number of charts, the first time. Adding a few charts or updating existing charts should be quick once the initial processing is done.

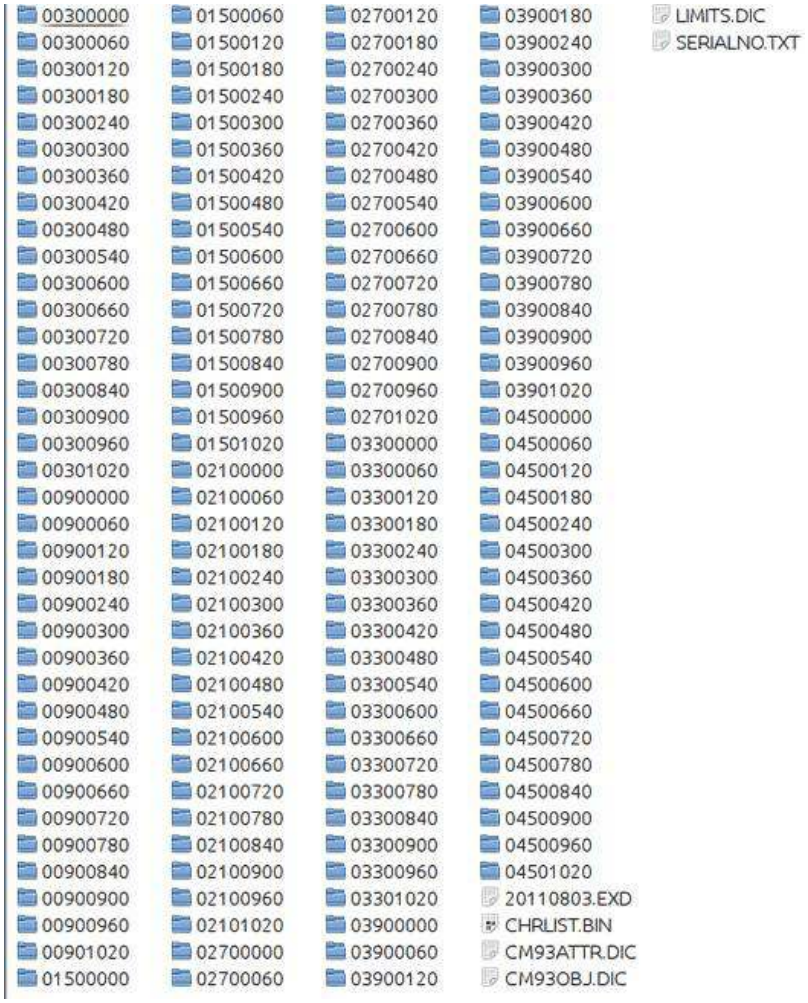
Updating Vector Charts

Publishers of Vector Charts, such as NOAA and EAHC issues regular updates. OpenCPN updates the created SENCs automatically. The chart itself, the base-chart, is named “name”.000 , the first update is “name”.001 and so on. As a user you only have to make sure that the update files are saved in the same place as the base-chart. In the case of a new edition of the chart a new “name”.000 file is issued. Just replace the old file with the new file and OpenCPN will update the SENC file. Don't forget to remove the updates to the old edition of the chart.
In case of missing revisions in a series of updates errors may be introduced. OpenCPN will pop up a warning dialog with this content:

“ S57 Cell Update chain incomplete ENC features may be incomplete or inaccurate. Check the logfile for details.”

CM93 Charts

CM93-version2 Charts are different from the S57 vector charts, and has it's own data structure consisting of a number of folders and files. To load these charts in OpenCPN just add the top directory to the list of “Active Chart Directories”.
In the top CM93 directory is an empty file with the “.EXD”, for example 20110803.EXD. The format is YYYYMMDD.EXD. This is the version, or edition, of the CM93 -v2 release.
OpenCPN supports partial CM93 datasets, covering one or a few of the available regions. There is also support for multiple, as well as multiple partial, CM93 datasets.
The CM93 top directory contains a number of (144) subdirectories named from “00300000” to “04501020”, as well as six other files. These sub directories each cover a geographical area of 40° x 40° . The first four numbers describes the latitude and the last four, the longitude of the SW corner of the area covered.



This is a typical content of the CM93 V2 top directory.

The key to understanding the numbers is to realize that CM93's coordinate system of the world starts at the South Pole or to be exact at lat -90° long 0° and from there proceeds North a East with a factor of 3 for each degree of lat and long.

The tile 00300000 hence has the SW corner at lat from -90° + 0030:3 = -80° or 80°S to and longitude 0°E , and covers the area from 80°S latitude to 40°S and from 0° longitude to 40°E. Looking at 04501020 it brakes down to lat -90° + 0450:3 = 60° and long 1020:3 = 340° subtracting 360° results in -20° or 20°W. So we have he SW corner at 60°N and 20°W . One more example, the tle 03900840 has the SW corner at 40°N and 80°W.

Each of these sub-directories in turn contains directories with the individual charts. Ordered in scale from smallest to largest they are Z,A,B,C,D,E,F and G. Where Z contains overview charts and G contains harbor plans. Note that, generally, not all of these are present in each subdirectory.

- Z covers 40° x 40° deg area and OpenCPN typically uses 1:3.000.000 scale
- A covers 20° x 20° deg area and OpenCPN typically uses 1:1.000.000 scale
- B covers 10° x 10° deg area and OpenCPN typically uses 1:200.000 scale
- down to..
- G covers 20' x 20' and OpenCPN typically uses 1:3500 scale.

The individual chart tiles in these directories have the same logic in the naming scheme as described above.

A few hints. If you ticked the “Show Chart Outlines” box under the “Display” tab the loaded charts will be outlined in red for raster and green for vector charts. In CM93 the charts will be outlined in purple, but only in Single Chart Mode. The smallest scale charts in CM93, the Z scale and A scale charts, will not be outlined. Neither will all available charts be visible as outlines at the same time. The reason for this is computing speed and clarity. Generally the next level or two of larger scale charts are shown. When large scale plans are available directly from A scale charts, with no intermediate charts, the outline of the larger scale charts will be visible from a zoom level between 1.5 and 2.0, but only, as already mentioned, in single chart mode and with chart outlines switched on. **Generally in areas where only A or Z scale charts are available, expect potentially dangerous omissions.**

Warning, do not use CM93 small scale charts alone for navigation without referring to other sources.

- Be aware that it is possible to “Over-zoom” charts in OpenCPN. A warning will appear on the display. Please respect that warning. It is recommended to not zoom more than a factor 2, for safe navigation. The actual zoom-factor appears in the lower right-hand corner of the display.
- It is safe and reasonably efficient, to put all your charts **except** the CM93 database in one large directory, and set that directory in Options → Charts → Chart Files. The CM93 database contains its own file and directory structure. The top-level directory only, of this database, should be loaded, as described above.
  If you do a lot of chart downloads, updates, etc., then it will be faster to break the charts folder into smaller groups, and specify them individually in the **Options > Charts > Chart Files** dialog. Consider using ***Chart Groups Tab***
- “**Scan Charts and Update Database** ” Use this option if you have made any changes to the contents of your chart directories, as for example after downloading new charts from NOAA, etc. It need not be checked if directories are added or subtracted, as the entire database will be scanned and updated automatically in this case.
- “**Force Full Database Rebuild**” is mainly aimed at users converting or correcting existing charts, in a situation where changes are made to the geo-referencing, outline of

the chart, or other attributes in the kap file header section.

- OpenCPN, supports **Mercator Charts, Transverse Mercator Charts, Universal Transverse Mercator (UTM) Charts and Polyconical Charts** (used in parts of US and Canada). Charts using other projections will not be displayed. A note about the reason for the display refusal, will be found in the “opencpn.log”.
  “Other” projections could be **Lamberts Conformal Conic Projection**, mainly used in high latitude polar areas.**Gnomonic** charts, mainly used in older, larger scale BA charts, for smaller areas, for example harbor plans, in scales larger than 1:50,000. Newer editions of these charts are generally re-issued as Transverse Mercator charts. Gnomonic projection charts are also traditionally used for Great Circle Sailings. Such charts are not needed in OpenCPN, as Great-circles are handled internally.
- OpenCPN is **not** suited for Polar Navigation N/S of about 70 degrees. As long as there are Mercator charts available, OpenCPN is OK though. There are some charts available up to 80 N, for example Norwegian chart for the Northern part of Svalbard. The Mercator projection is not generally suited for polar areas, with quickly converging meridians. Small scale (less than 1:100,000) high latitude **Transverse Mercator Charts**, with clearly converging meridians, cannot be displayed correctly. Other projections suited for polar areas can't be displayed at all in OpenCPN.

A Linux/Unix Note

These operating systems have a problem[84] handling chart names containing spaces and non ASCII characters. A typical example is Swedish chart names.
To sort this out use the utility program "detox[85]“. Detox changes the file names so space becomes “_”; ”(“ and ”)“ become ”-“; and “å”,”ä“ and “ö” become “a”,”a“ and “o”, etc.

To see what “detox” suggests to do, try a dry run first, like this:

```
detox -n File_with_swedish_charts > outfile \\
```

Vector Display Tab

OpenCPN makes a serious effort to be compliant with IHO standards for ECDIS display of cartography.

Starting with vector charts requires some learning. In some respect they are different than paper/raster charts. This page deals mainly with the specifics of OpenCPN and is **not** a vector-chart tutorial.

See David Burch's book “Electronic Chart Navigation”, and the 2013 (or later) US Chart 1, available from: https://nauticalcharts.noaa.gov/publications/docs/us-chart-1/ChartNo1.pdf[86]

Note: On the forum there are quite a few questions regarding these chart symbols.

Read on to find out more. Chart Information Objects and Quality of Data

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First One very important setting for vector charts is handled directly from the main toolbar. This button toggles all text displayed on a vector chart On and Off. The hotKey “**T**” is an alternative for toggling the text. In OpenGL mode, all text will always be horizontal when using the “Course Up” option.

Second Double clicking on a vector chart, as long as the cursor hasn't changed to a green arrow near the edges, brings up an information dialog, displaying the available vector-chart information at the selected point. Scroll down to see all the information. An alternative to double clicking is right-clicking an select “Object Query”. Note that a single normal (left) click will center the chart at that point.

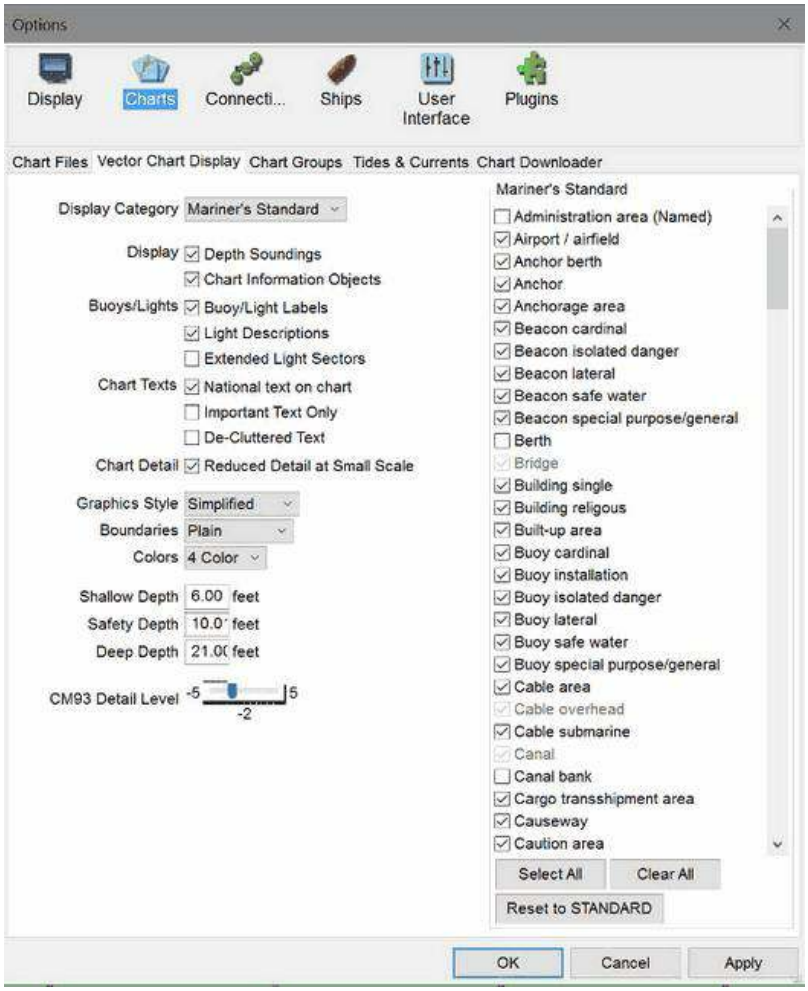
The example shown above is the result of double-clicking on a lighthouse in a busy area.

Exactly what is shown in this dialog depend on the settings described below in “Display Categories”.

Third It is possible to select what font is used for the text on vector charts. There is an entry in *Options > User Interface > Fonts* in the dropdown menu select **ChartTexts**. Here you select what font-face to use, and a template size. Weight and final size of the displayed texts depends on the charts you are using, but if the charts contain various weights and sizes, they will all scale together depending on what size you select.

Options > Charts > Vector Charts Tab is where everything else is handled.

If the S63 chart plugin is active, there will also be a “S63 Charts” tab. Read more about ***S63 Vector Charts*** , when you have read this page.



Display Categories

If you are new to OpenCPN and vector charts please start with the "All" Display Category, to avoid risks and possible confusion. The Display Category is selected from the drop down menu. More below.

Navigators have the choice of three different pre-defined presentations of ENC content, Base, Standard and All. OpenCPN also has the very flexible Mariners Standard, which is better described as "Mariners Choice".

Base

- Displays general information, including coastline, safety-contour, isolated danger,
- buoy, beacon traffic separation zone, etc.
- From the IMO definitions:
- Display Base means the level of SENC information which cannot be removed from the display, consisting of information which is required at all times in all geographic areas and all circumstances. It is not intended to be sufficient for safe navigation.

Standard

- Everything in “Base” and aids to navigation, fairways, channel limits, restricted navigation zones, restricted areas, etc..

All

- Everything in “Standard” and more. This level shows all informatio, not contolled in other settings options. More about what the ***IMO ECDIS*** says about the content of these three levels. This is also a good choice for actual, underway, navigation, avoiding the possible risks involved in “Mariners Standard”. See more below.

Mariners Standard

- **Reset to STANDARD** button. Change the tick marks to match STANDARD.
- **Select All** button. Select all items.
- **Clear All** button. Clear all items.
- These buttons only work with Mariner's Standard.
- Users can use the filter tick box to set the display of items. A large set of filters, about 186, can be employed. They are all to the IHO S57 standard (Caris.com)[87], but has been given a label that is easy to understand.
- Note that Mariners Standard gives the user a much wider choice of what to display, however it conforms to the approved IHO recommendations IHO S57 (s-57.com)[88].
- NOTE: We now follow strictly the IHO recommendations. This modification will appear in the next OCPN Beta series. See FS#2091
    1. Items classed as DISPLAYBASE are always displayed in Mariners Standard, and may not be removed by the user.
    2. Following S52 guidelines, four special safety items (“OBSTRN”, “WRECKS”, “DEPCNT”, “UWTROC”) are also visible in BASE and Mariners Standard, if their attributes (depth relative to containing depth area, mainly) require them to be so displayed.
    3. The selected Safety Contour is always displayed in Mariners Standard.
    4. User is free to add/remove items whose classification would normally have them appear in STANDARD or OTHER categories, allowing user customization if desired. These selections will be persistent across OCPN sessions.
    5. There is a **“Reset to STANDARD”** button, which does what it says.

WARNING - it is possible to suppress essential information with “**Mariners Standard**”. If in doubt, switch to the “ **All** ” Display Category, or use the “**Select All**” or **“Reset to Standard”** button for Mariners Standard.

1. The first time you use a vector chart with a brand new installation you will see nothing, if you use Mariners standard. Why?
2. The Mariners Standard list of Feature types is empty on a fresh install. When you load the first vector chart, the list is populated with the Features that are discovered on that particular vector chart.
3. The default visibility of the added Features in Mariners Standard category now shows all features as the are discovered.
4. If you load another ENC, any newly discovered Feature types are added to the list, again with viz=0, off. However, the visibility of Feature types as set previously by the tick

boxes is not modified.

5. Use the “Select All” button frequently until you have initiated all the charts you intend to use and-or the feature list is fully populated.

Vector Chart Hot Keys

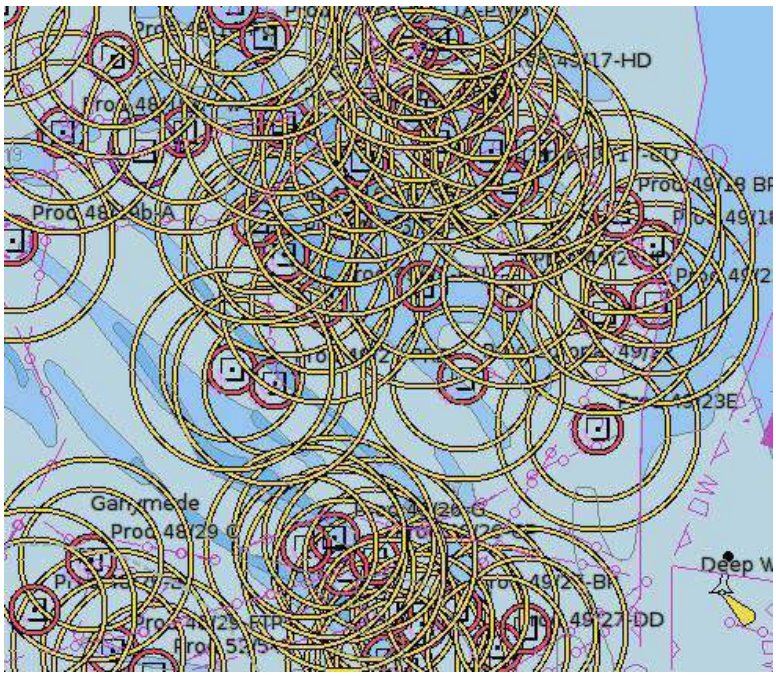
The **Hot Keys** or **Keyboard Shortcuts** below all work in “**ALL**” and “**Mariners standard**”. The hotkeys also work in the other display categories, as long as the feature exists in the category. In “**Base**” for example, “**S**” works, but “**L**” does not. Features are toggled on-off with the keys.

Note: Hot Keys can be different for OS's. See ***Keyboard Shortcuts***

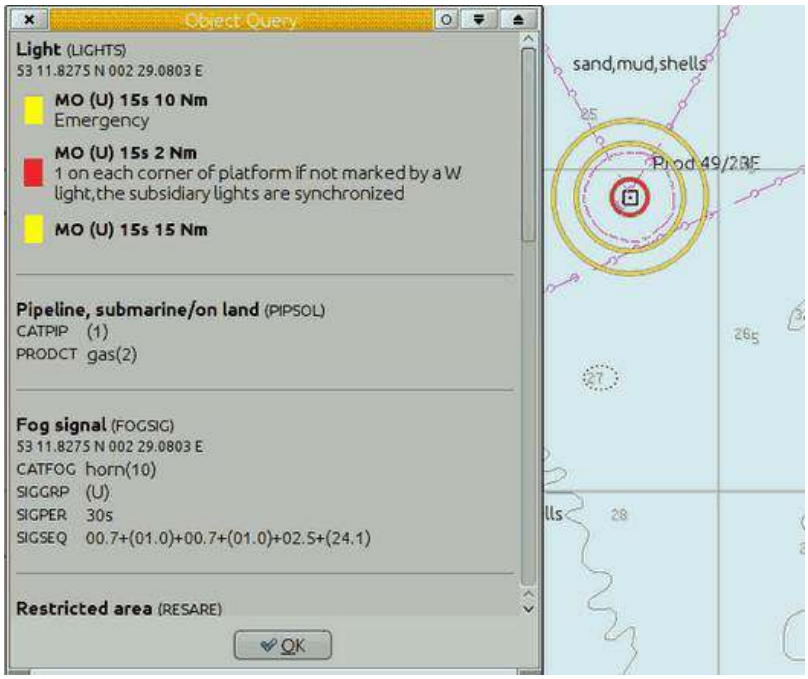
- **T** Texts. The visible text is still affected by the settings in the Vector Charts settings tab.
- **L** Lights. Lighthouses as well as buoys etc are all affected.
- **S** Soundings.
- **A** Anchoring. This will affect information needed when anchoring. Anchor berth and Anchorage areas. Submarine cables and pipelines. Type of bottom. Mariners Standard - Anchor berth and Anchorage area display categories.
- **O** Chart Outlines.
- Watch the active GIF image below as it changes using hot keys.

Practical Use

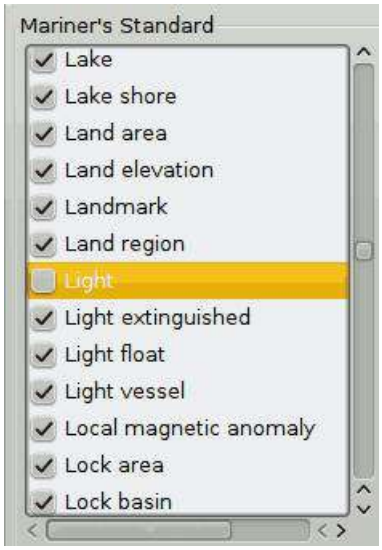
A general recommendation would be to use the “All” display category or “Mariners Standard” with “Select All” marked , and then switch of certain features as required. As an example let's look at passing through the British gas fields in the SW North Sea



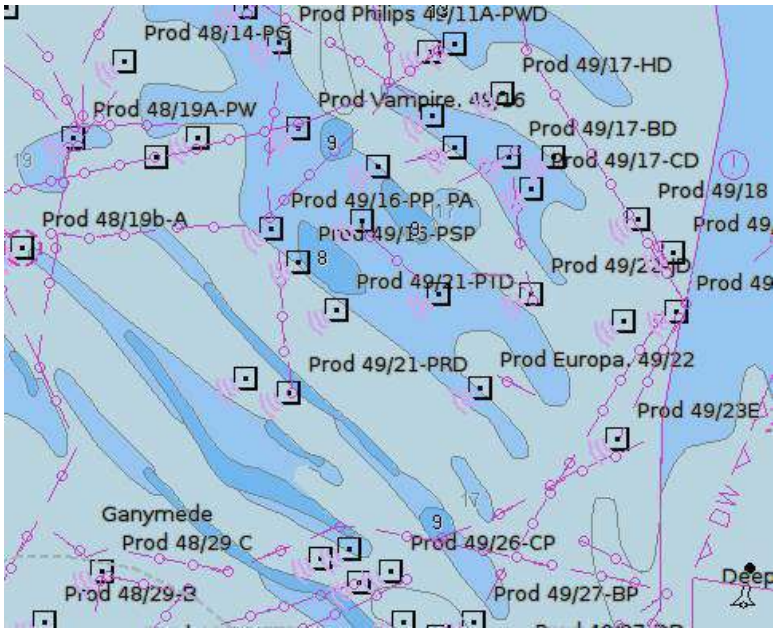
This is not easy, so we want to get rid of all those red and yellow circles.
Double click on one of the platforms, square with a dot.



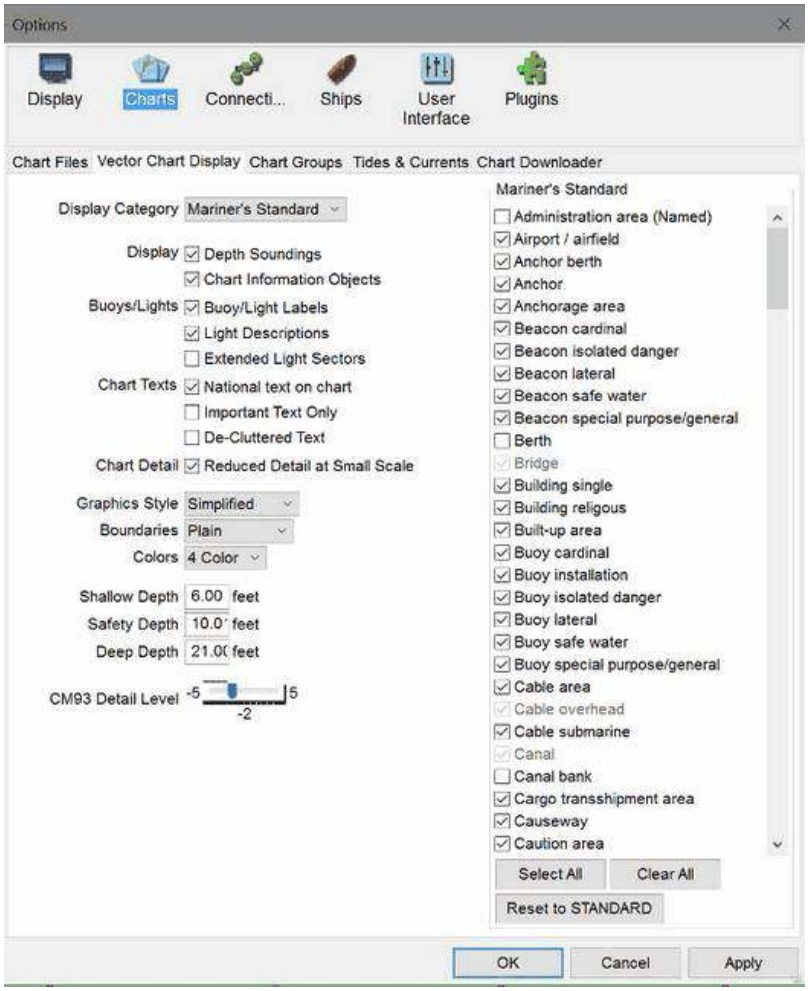
At the top it reads “**Light** (Lights)”, which means that you clicked on a light, which belongs to the Feature Class “Lights”. Find “Light” in the Mariners Standard list of available filters, and uncheck it.



Press the “Apply” button



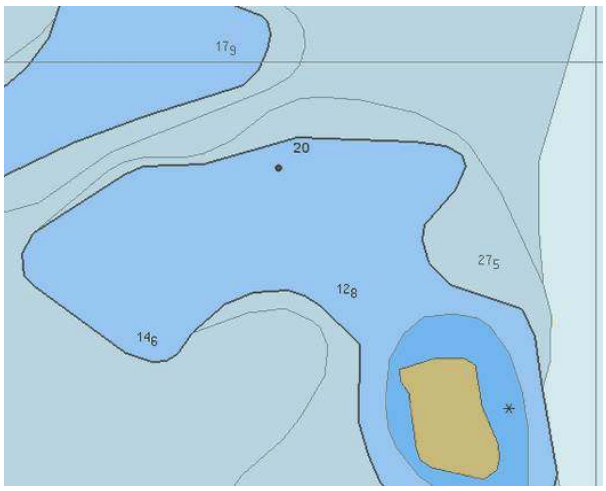
Much better In this particular case, there is a shortcut, use the Hot Key “**L**” to toggle all lights on/off.



Display

Depth Soundings

Turns the depths on and off. Other settings also affects when soundings are displayed, for example “Reduced Detail at Small Scale”. The bold black numbers are not soundings. Instead they refer to heights of nearby islets or cays. On official paper charts the soundings are printed in italics.



The bold number 20 refers to the land height of the unnamed cay SW of the number. Safety Depth is set to 20 m, so the 20 m contour stands out in black.

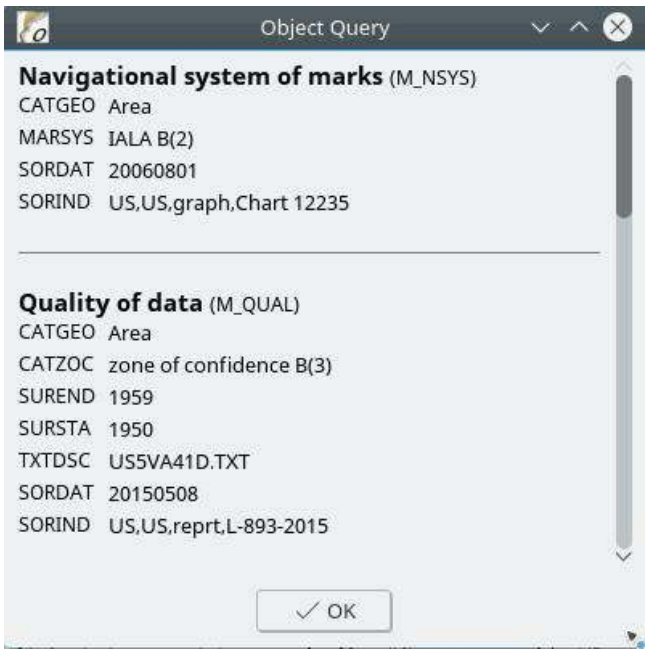
How soundings behave when zooming. “Chart sounding symbols” are represented by small raster images. As a chart is zoomed in, these raster symbols will increase in size by about 2x. Currently they increase in size well after the “**Overzoom**” notice, for the largest scale chart available.

Chart Information Objects

Provides information about the chart itself. With this switch on, an object query reveals such information as the buoy system for the area, the **Quality of the Survey**, the latest NTM update and sources for the chart.

On raster-charts there is often a diagram showing the sources and age of surveys of the charts.

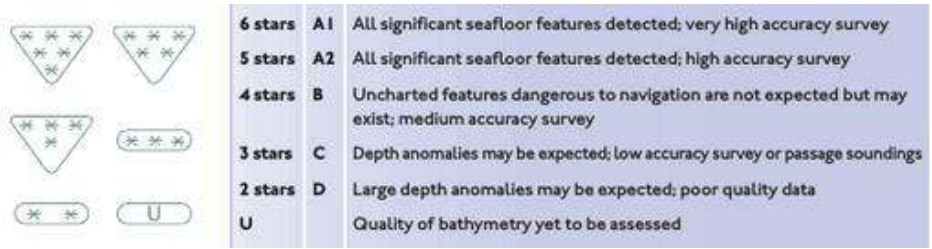
On vector-charts, when activated, symbols are shown all over the screen. An object query of these symbols gives the details. When using “Mariners Standard” and “Chart Information Objects” is ticked, it is possible to get rid of the quality symbols covering the chart by unchecking “Quality of data”.



1. On paper or Raster charts there is usually a source diagram showing the dates of the survey of different parts of the area covered by the chart.
2. If the source is from ,say 1850, we know that it's an unreliable lead-line survey. On the other hand if it's a recent survey done with a multi-beam sounder it's a quite reliable chart.
3. The same info is present in modern vector charts, but in a different format. Click image for larger version Name: rty.jpg Views: 7 Size: 48.5 KB ID: 157270 This is essential info about the reliability of the chart. At the same time you definitely don't want to see this info all the time. To see this information in OpenCPN you have to activate “Chart Information Objects” in vector settings.
4. Most users just want to get rid of the triangles, but please consider that information informs you about the Quality of the Survey Documentation.

QUALITY OF DATA

1. Category of Zone of Confidence = Un-assessed.
2. The feature being rendered is S57 Text relating to **M_QUAL**, called “Quality of Data” in “Mariners Standard”
3. This is a meta-object describing the quality of data shown. The Attribute of interest is **CATZOC**, or “Category of Zone of Confidence”.
4. The value on most US ENC's is “6”, or “Un-assessed”. Thus, the 'U'.



ZOC	Position Accuracy	Depth Accuracy	Seafloor Coverage
A1	± 5m + 5% depth	0.5m + 1% depth	Full area search undertaken. Significant seafloor features detected and measured.
A2	± 20m	± 1m + 2% depth	Full area search undertaken. Significant seafloor features detected and measured.
B	± 50m	± 1m + 2% depth	Full area search not achieved; uncharted features, hazardous to surface navigation are not expected but may exist.
C	± 500m	2m +5% of depth	Full area search not achieved, depth anomalies may be expected.
D	Worse than ZOC C	Worse than ZOC C	Full area search not achieved, large depth anomalies may be expected.
U	Unassessed – The quality of the bathymetric data has yet to be assessed.		

Development of New Data Quality Representation in ENCs[89]

How to remove those "U" and * on my vector charts (M_QUAL and CATZOC)?**

1. In *Options* > *Charts* > *Vector Charts Tab* when using Display Category “All”, Uncheck *“Chart Information Objects”* which hides the “U” symbols .
2. In *Options* > *Charts* > *Vector Charts Tab* for a finer grain control when using Display Category “Mariners Standard”, In the selection List Box, Uncheck *“Quality of Data”* which hides the “U” symbols.

Buoys-Lights

Bouy-Light Labels

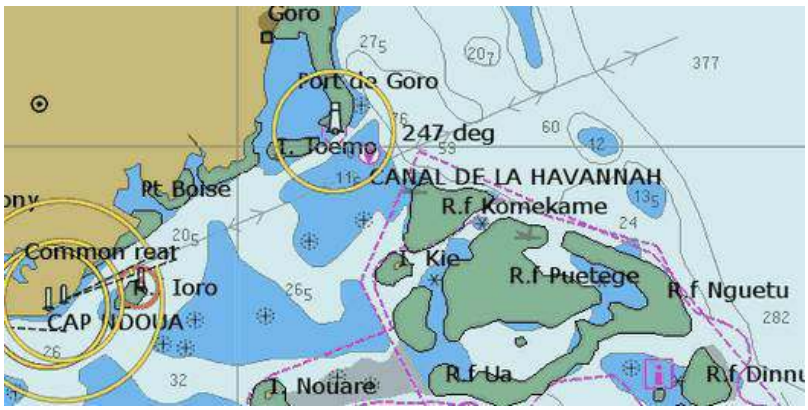
Displays names and purposes of aids to navigation, such as number or name of buoys, information about conspicuous objects etc.

Light Descriptions

This tick box control display of light characteristics. Checking this displays a label with a text describing the marker or lighthouse's characteristics.

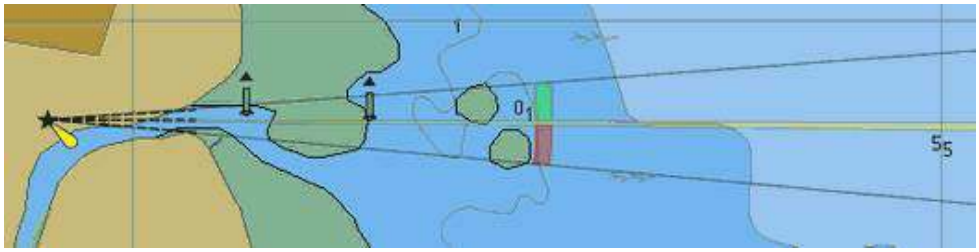
Extended Light Sectors

It is often difficult, on a vector chart, to see exactly what the light-sectors are supposed to do.



Activating the Extended Light sectors clarifies the situation. All sectors are extended and leading white sectors are emphasized in yellow and extend the full nominal range of the light. Just hold the cursor over a light and the extended sectors are activated.

Light sectors as narrow as 0.3° are displayed.

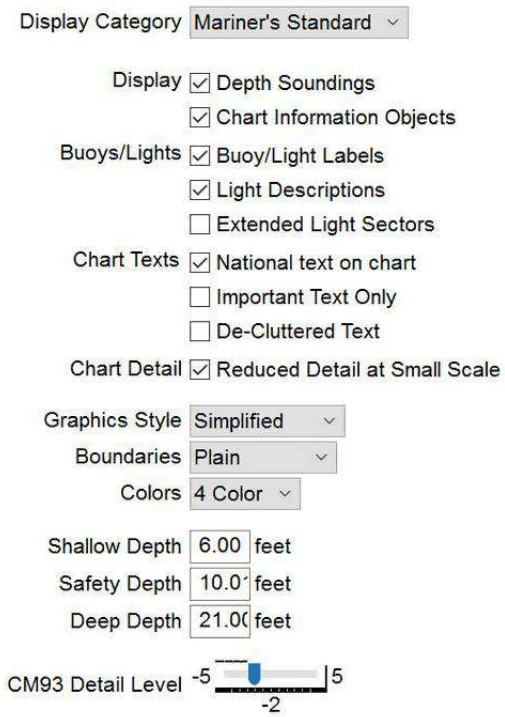


This sector is 0.5°.
A light sector is extended if:
The words “Leading” or “Directional” can be found in the Object Query.
Otherwise, the rules are

- The sector is < 15° wide.
- It is White.
- The light also has Red and-or Green sectors.

These rules work quite well, but there are exceptions that are difficult to catch.
As always, it's the responsibility of the navigator, how a light and its sectors are used for

practical navigation.



The parameters above are described in more detail below.

Chart Text

National text on chart

Vector charts may have attributes with the texts in the national language. For example a Russian chart with texts in Cyrillic. With this option activated OpenCPN will display text in the local language and character set, in this case Russian written in Cyrillic.

Important Text Only

Displays only a bare minimum of text essential for navigation, such as course and bearing in a leading line (range) and bridge clearances.

De-Cluttered Text

Even when using “Reduced Detail at Small Scale”, there are cases when text labels overlaps or overwrites other labels and creates a cluttered impression. Ticking this box tries to clear the view, dropping overlapping text labels in the interest of legibility. The labels that get dropped are the last that would have been drawn. But, as there is no built-in priority scheme for text labels in ENC vector charts, this setting may hide needed information.

Chart Detail

Reduced Detail at Small Scale

A Check makes sure that a minimum scale is required before certain objects are shown. If this box is **not checked**, everything is always shown, leading to very cluttered view at small scale (zoomed out).

Graphics Style

Paper chart

Draw the markers and lights just like the printed paper chart.

Simplified

Uses icons to represent the same. Some like the one and some the other, a matter of taste. Paper Chart mode closely follows the IHO standard standard in this area. This mode is currently more developed than the simplified mode, as it has a higher priority in the development effort.

Boundaries

Plain

Normally just uses a dashed line.

Symbolized

Also uses triangles pointing into the area.

Colors

Depth on the chart can be displayed with **either 2 or 4 colors**. This setting is closely related to the “Depths Settings”.

2 Colors

With 2 Colors and using a relatively large scale,

- Areas with depth less than “Safety Depth” is blue
- the rest is white.

4 Colors

With 4 colors, there are different colors for areas less than “Shallow Depth”,

- Areas between “Shallow Depth” and “Safety Depth”
- Areas between “Safety Depth” and “Deep Depth”
- Areas deeper than “Deep Depth”.

Depth Settings

Units

Units for depths is set in ***Options > Display > Units***. All depths units are rounded off to the nearest number. If the value is half way between, the nearest higher number is used. Underlined values indicates drying heights.

Feet

Only whole digits are shown. A value of 12 feet covers all soundings between 11.5 feet and 12.4 feet.

Meters

Meters are shown as whole numbers for depths greater than 30 m. Depths below 30 m are shown as whole meters and decimeters as subscript, like this 12_7 This is the same as 12.7 meters and is shown for all soundings between 12.65 m and 12.74 m.

Fathoms

Fathoms are shown as whole numbers for depths greater than 31 fathoms. Depths below this value are shown as whole fathoms and tenths of fathoms as subscript. Compare to the notes above for meters.

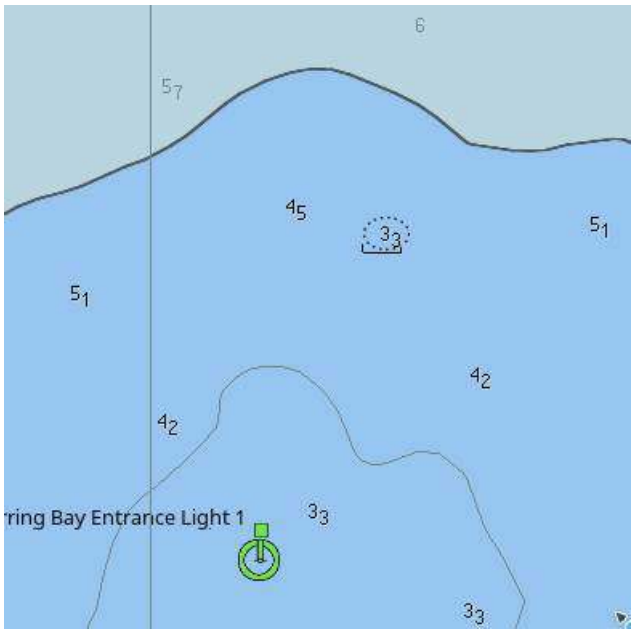
Shallow, Safety and Deep depths

Safety Contour

The most important of these three settings, it affects the presentation of depths and dangers. The safety depth directly affects the displayed bold safety contour.

- OpenCPN can only display contours that are already built into the chart. If the safety depth is between two built in contours, the deeper one will be the safety contour, displayed bolder than the other contours.
- Depths less than the safety depths will be printed in black, depths greater than this value will be printed in gray. So it is possible to see gray depths inside the safety contour, depending on settings.
- One example of how the safety depth affects the chart display is how isolated dangers, for example a wreck is displayed.

The safety contour is 3.6 m and the wreck is marked by the magenta cross, as the wreck is surrounded by safe water but the depths over the wreck is less than the safety depth.



The safety contour is 5.4 m and the wreck is marked as wire swept to 3.3m.

Other Settings

Important as they affect how the different depths are colored.

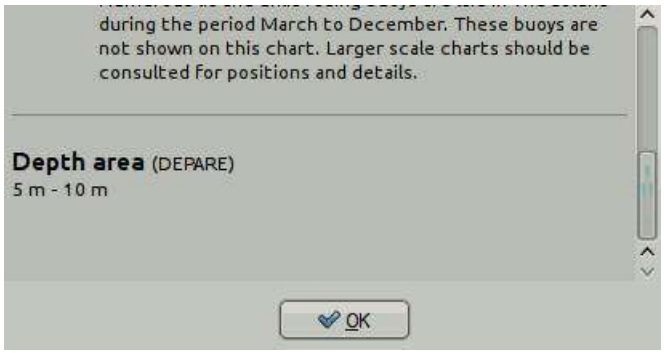
- They can help you identify a deep channel for example, or they can, in the worst case scenario, prevent you from being aware of a shallow area.

- There is no setting that fits all circumstances. For example a Sea Mount with a depth of 20m in the middle of an ocean should be regarded as “shallow” and be avoided, while 20 m depth in a harbor approach in protected water, probably is safe.
- The Depth Settings controls the coloring of the water as a function of depth.
- By setting the Safety and Deep water right you will have a visible border to show when to take care about shallow water.

CM93 Charts and ENC

Work very similar. The charts contain depth area features according to fixed depth cutoff zones, usually 5, 10, and 20 meters.

- Intermediate values are not available in the database, if you select a value between those available, OpenCPN chooses the next higher value available for display of color.
- The charts are inconsistent in this area, depending on the country issuing the original charts. For example in UK and the Netherlands the depth contours in CM93 are 2, 5 and 10 meter while in US the are based on feet but expressed in meters, such as 3.7, 5.5, 9.1 and 18.3 m.
- **Generally** for both ENC and CM93, find these fixed depth cutoffs by double-clicking so the Object Query dialog pops up. The last entry is usually Depth Area. The two values in the range, represents these built in cutoffs.



An example from UK with cutoff values of 5m and 10m. **If for example** as is the case on the South China Sea Hydrographic Commissions charts, the shallowest area has a range “0 m - 10 m”, there is, in most cases, no point in setting “Shallow Depth” to anything but 10 m. Find out these cut off depth for your area and set the “Depth Settings” with this knowledge together with your preferences and activity.

With all the reservations above, the general case for 4 colors, will be described.

Shallow Depth

Will color all water areas with water depths shallower than the set depth to a dark blue color. Soundings are in black.

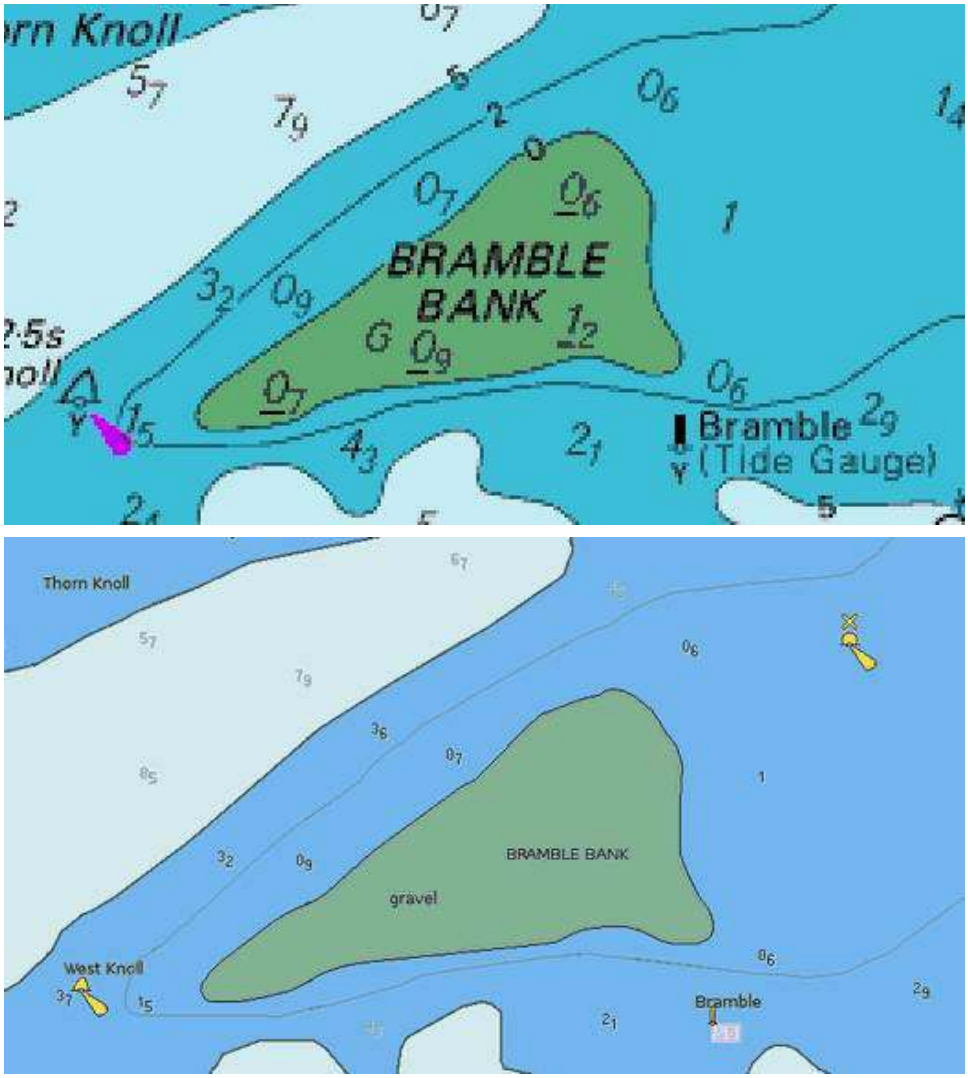
Safety Depth

Water deeper that Shallow but shallower that this depth will have a paler blue color. The

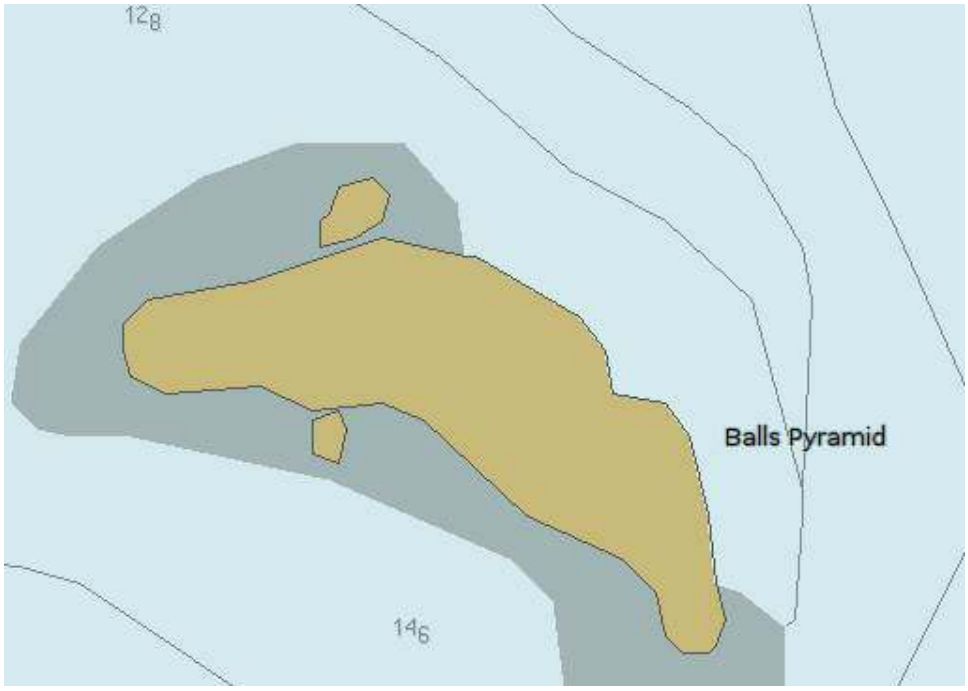
Shallow Depth contour clearly marked with a thicker black borderline. Soundings less than this depth are in black, while soundings greater than this value are gray.

Deep Depth

Water deeper than Safety Depth but less than Deep Depth will display a light gray color. The Safety Depth contour is clearly marked with black borderline. Water deeper than Deep Depth is displayed in white.
Finally a word about **drying heights**, displayed in green. There is no detailed information available for drying heights, neither in CM93 ver2 nor in many ENC charts. Some ENC charts have negative ranges, for example "-2 m - 0 m" in areas with drying heights. This adds very little, as it really only gives the information that the drying height is less than the first value in the range, in an area of unspecified size.
This situation is changing though. A set of new charts released in april 2012, by the Dutch Authorities, sets a standard for others to follow in this regard. See picture below. Modern Australian S63 charts are equally good.



While a raster chart tells us that we need a Height of Tide that is 1.2m + safety margin + the draft of our own vessel.



Heights of islands etc. are not available in CM93, while ENC charts, in many cases, have info about heights of summits and some contour lines. Is Balls Pyramid a high Island, that the name implies, or is it named with the same sarcastic humor as “Greenland” ? CM93 can't tell.

CM93 Detail Level

The CM93 charts slider control that allows the user to adjust the screen complexity to suit the actual situation as well as the available processor capability.
Normal settings depend on a combination of personal preferences and present usage of map. To see more details, the “**CM93 Detail Level**” slider, can be set to a higher positive number or for navigation in shipping lanes to a negative numbers. Typical zoom level 5 is good for fishing when as much details are possible is of interest. Zoom level of +1, zero or -1 is usually fine for normal use.
Positive values give more detail, but at a cost:

1. It simply takes longer to render larger scale charts covering more screen real estate.
2. There will be more instances of gray (NODATA) areas surrounding the larger scale charts as you zoom out, unless quilting is activated.
3. It can become dramatically slower if high detail is specified, and chart outlines are requested. In this case, the program has to read a lot more cells to get their outlines.
4. Conversely, negative values give less detail. Zooms are faster.
5. The slider can also be activated through the “d” hotkey, and displayed directly on the screen.

Vector Palettes

It's possible to change the whole look of a vector chart. One example below….
Detailed information is available in ***Vector Palette[90]***

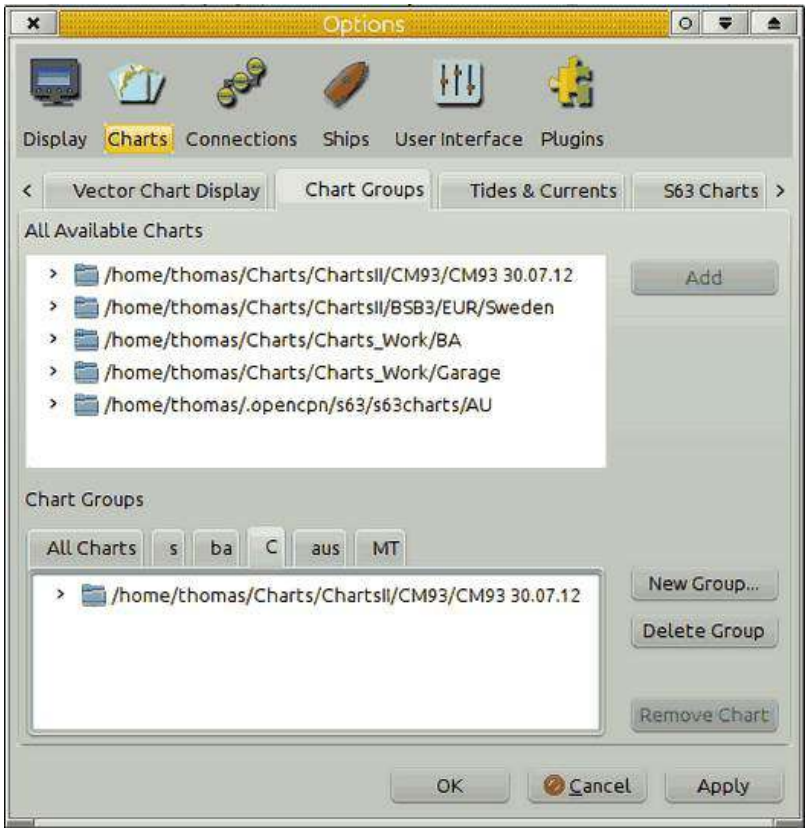

179 deg
Camarinas
Rear
Masonry
Pta. de Chorente
Rio de Lago
Arena
Pta. R
stone
sand
mud
gravel

Chart Groups Tab

If this is a new of, or if new chart directories need to be added, use:
Options>Charts>Chart Files Tab or
Options>Charts>Chart Downloader Tab
to Add the new chart directories.

Then click **OK** to exit from Options and to ***Scan Charts and Update Database*** .
After the update finishes, select:
Options>Charts>Chart Groups Tab
in order to **Add** a **New Group**.

Now, directories of charts or individual chart file(s) can be added to the chart group(s).



In **Options → Charts select "Chart Groups Tab"**

You will see two panes. The top pane contains "All Available Charts", which are the charts you have installed. The bottom pane allows you to create, edit, and delete Groups. Note that there is always an "All Charts" group. This Group is not editable. New Groups which you create may have chart directories or individual charts added to them by selecting the item in the top pane and touching the "Add" button.

You may also remove individual charts or directories from Groups by selecting the desired item in the bottom pane, and touch "**Remove Chart**". Please note that "removing" an item from the Group does not remove it from your "Available" set of charts. The item is simply

made unavailable when the Group is in use.

It is a good idea to have a empty chart group, only the background Map will be shown. “Unlimited” zooming is allowed. This can be useful for very large scale plotting, for example.

Chart Groups solve the following problem

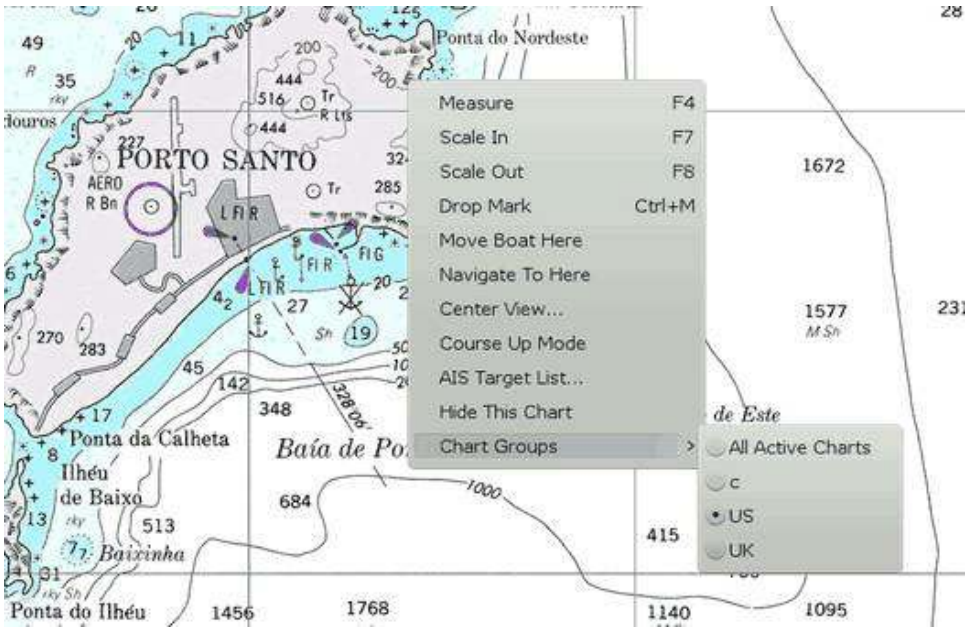
You may have many charts loaded in your active database. Some of them have overlapping coverage at the same scale, so that when quilted the logic does not know which of potentially several charts at the same scale to choose from. Some examples:

1. In the Bahamas there are a few publishers of charts, covering the same areas, with radically different presentations. Sometimes you may want to see one set (say planning charts of small scale), and other times you only want navigation charts of the best scale possible.
2. Leave a Group empty, in which case only the background chart will be displayed, very useful sometimes.
3. Pilot charts as one Group, normal navigation charts as another Group, makes it possible to quickly switch between them.
4. You have both Raster and Vector charts of the same area and want to be able to display each type separately, and switch quickly between them.
5. In another universe, NGA charts in one group, standard NOAA RNCs in another, standard NOAA ENCs in another group, British UKHO in a third group or even a group with both ENC and RNC of a particular USCG District.
6. The Chart Group function allows us to define multiple Groups, with different chart directories in each group. The Group desired for viewing may be selected quickly, through the right-click menu, without adding or deleting charts from the Active database.

If there are no chart directories listed under **All available charts** you will not be able to **“Add”** Chart Groups. A newly added chart directory (also called a folder) cannot be added to a Chart Group unless the ***Chart Database has been Updated*** .

Using your Groups

From version 4.8.0 it's possible to quickly change between the first 10 listed chart groups. The numerical keys 0,1,2……..9 corresponds to the chart groups 1,2,3…..10, whatever their name is. It is very simple to use, for example just press “4” and the display changes to show chart group #4 that the user added. Note that group “0” always contains the “All Charts” Chart group.

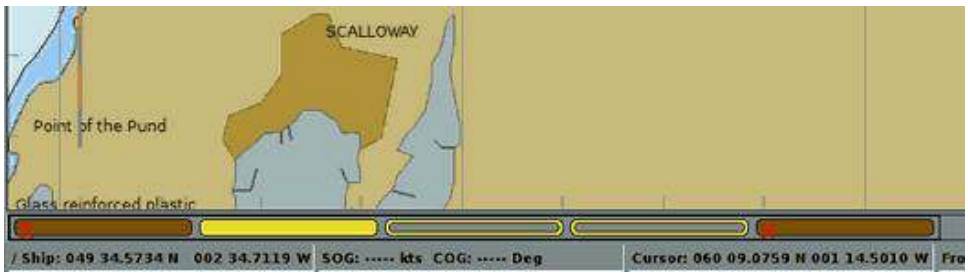


In this illustration the navigator generally uses the US charts, when available. Coming into Baia do Porto Santo a detailed chart would be great, but no such US chart is available on board. A switch to the UK chart group solves the problem.

Select the Group you want to use, by a right-click context menu item called “Chart Groups”. As you switch Groups the logic tries to select a chart and scale that closely matches the situation present before the switch. As you may understand, sometimes the fit is not reasonable, so the resulting view may be surprising.

Finally, if you have no Groups defined, as in the default installation, all installed charts are always available.

Chart Groups and CM93



It is possible to have multiple instances of CM93v2 in different Chart Groups. Above we have 5 instances loaded in various chart groups. The view is of “All Active Charts”.

OpenCP also supports multiple partial CM93 data sets.

The instances are loaded, from left to right, in the order of the chart groups.

In this situation, only the leftmost instance of CM93, that is not excluded from the quilt, will be displayed. Above, it is the instance represented by the yellow rectangle.

Chart Downloader Tab

Chart Downloader

The **Chart Downloader Plugin** is now included in your OpenCPN installation. It lets you download, install and keep up to date the navigational charts provided by various free governmental sources worldwide directly from within OpenCPN's Toolbox. **The Chart Downloader plugin is an Internal Plugin, always distributed with OpenCPN, no separate download is required.**

Links

- Source: Opencpn Internal Plugin[91]
- Forum: Chart Downloader Forum[92]

The supported charts include both the raster and vector charts for the US waters provided by the NOAA, official raster navigational charts published by Argentina, Brasil and New Zealand (covering also huge areas of the Pacific ocean) as well as electronic charts of the inland waterways of the USA and more than a dozen European Union countries.

For Manual Installation Instructions but Chart Downloader is preferred.

A Few Basic Concepts

Chart Catalogs

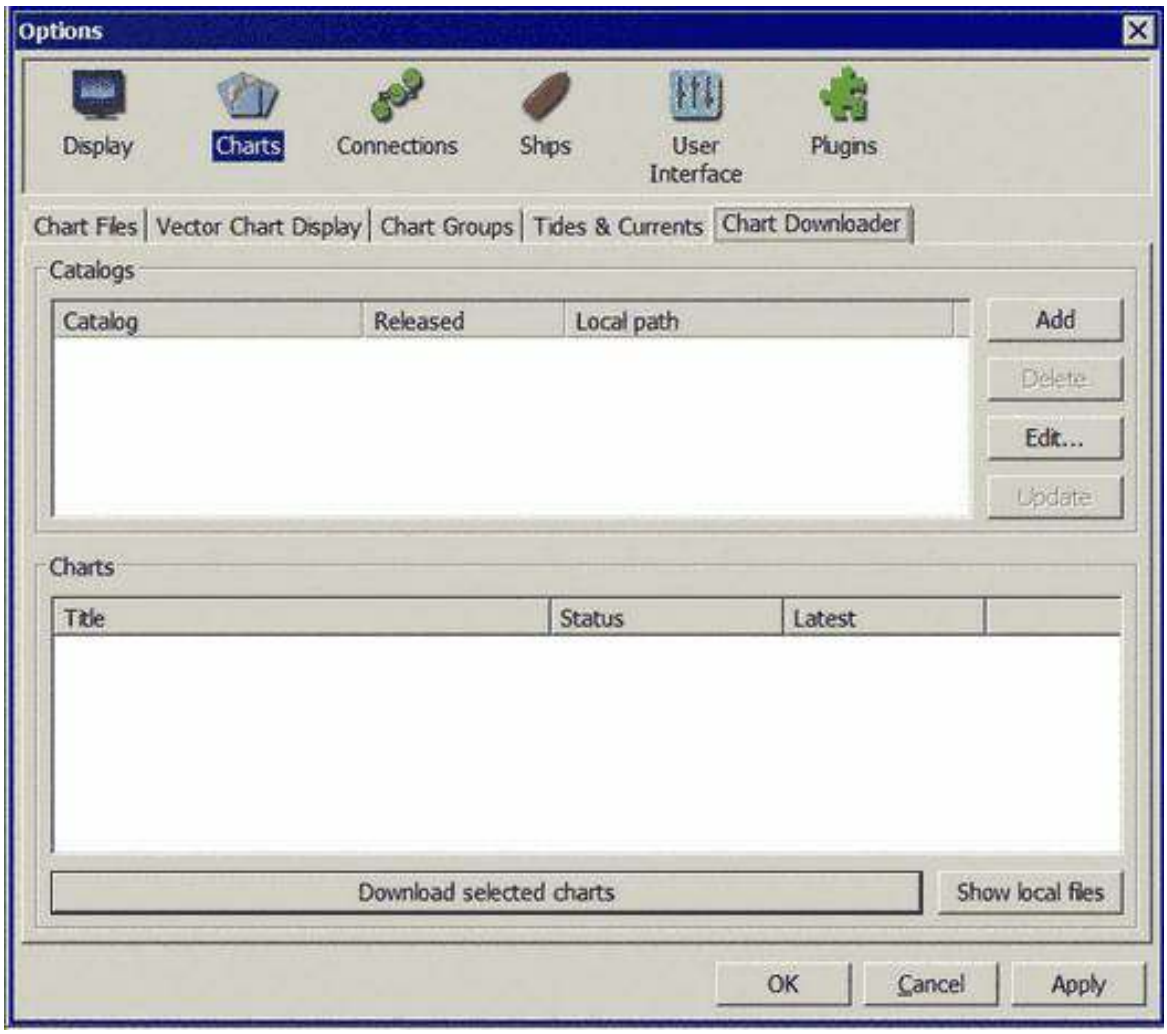
The **Chart Downloader** relies on **catalogs** of charts. A **catalog** is an **XML** file containing the names of charts along with the most recent chart update date and time together with the Internet address of the actual chart data. Before being able to **download any charts** we have to **configure** and **download one or more chart catalogs**.

The **catalogs** are provided by the agencies publishing the charts (NOAA and the Army Corps of Engineers in the USA) and by the **ChartCatalogs [93]** project created by the author of this plugin. When a catalog is loaded the **Chart Downloader** automatically scans the existing charts on your computer looking for updated or new charts listed in the catalog.

Chart Downloader Tab

In the current version of OpenCPN, **Chart Downloader** is automatically included.

This is what the plugin looks like when first opened by clicking Chart Downloader



Using the Chart Downloader

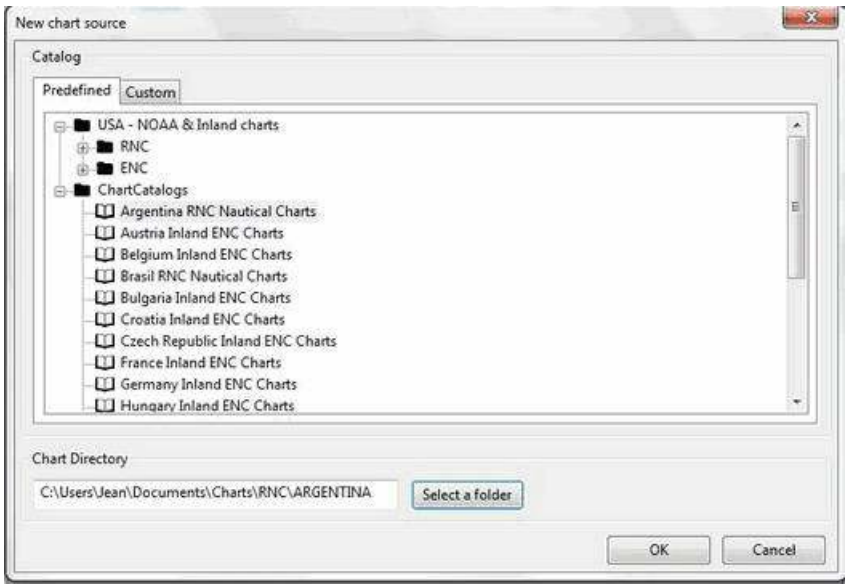
The screen has two sections.

The **top section** is for **Chart Catalogs**.

Some chart sources provide many different catalogs for the same set of charts. For example, in the USA, NOAA provides chart catalogs for each state, region and Coast Guard district as well as the huge complete set. There are also separate catalogs for raster (RNC) and vector (ENC) NOAA charts. The first step in getting new charts is to select the appropriate Chart Catalog, make sure you think first though - having everything is not always the best option to organize your charts, so especially in the US, consider using more smaller catalogs over the one with the complete set of thousands of charts.

Adding a chart source

Click the button to get the dialog. There are catalogs for all the free chart sources worldwide known at the time of the release of this plugin. The catalogs are organized in a folder structure. Open each folder to see subfolders. Open subfolders to see catalogs. Select any catalog you like by clicking the catalog description.

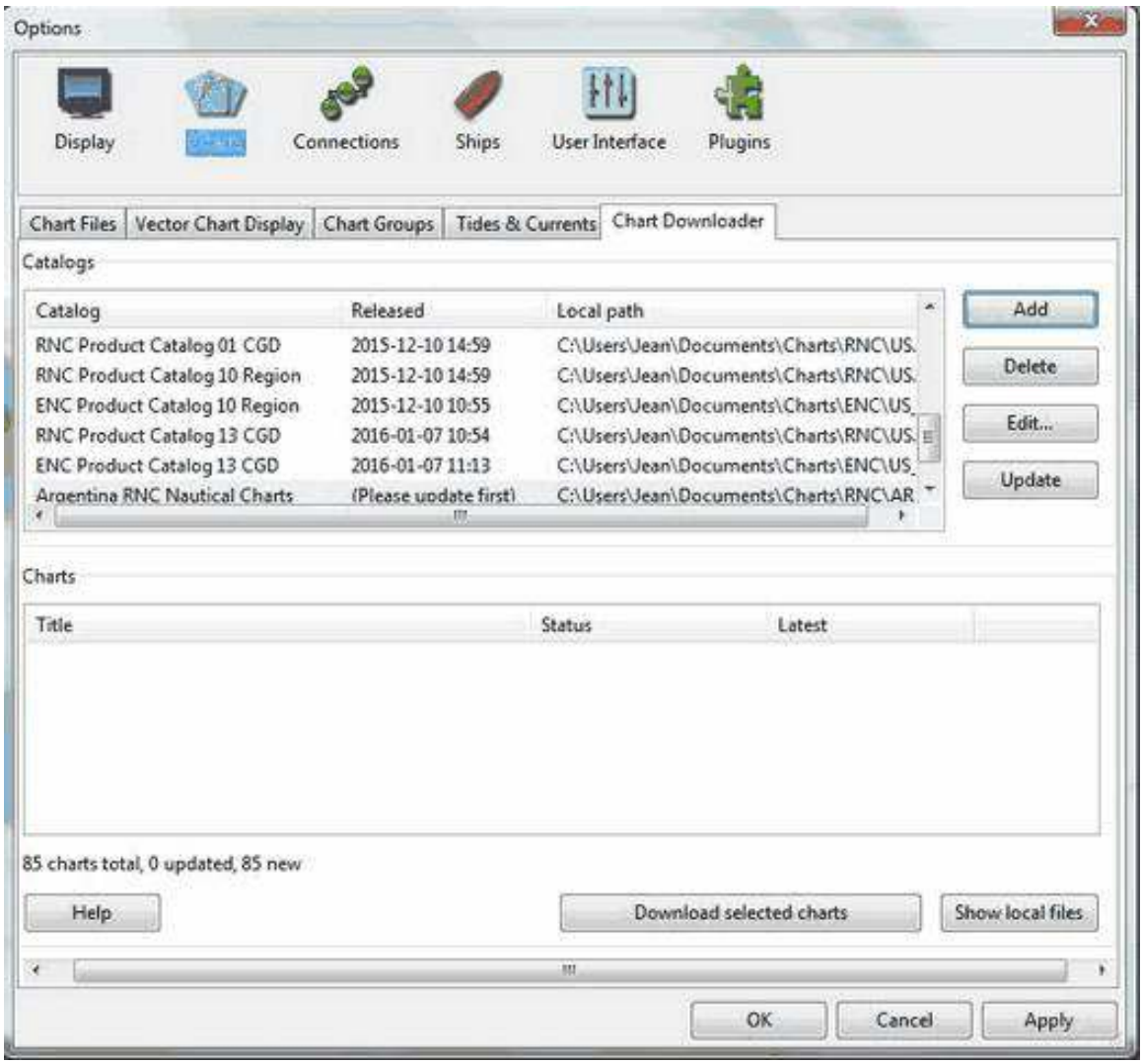


After clicking the catalog you want, the "**Chart Directory**" will be **automatically filled in**. This is the directory on your computer where the catalog and the charts for this catalog will be downloaded. If the recommended directory is acceptable click "**OK**".

First time users will find it much easier to accept this default. Otherwise you can use the "**Browse**" button to browse to another directory where you want the catalog and charts to be kept. Once you are happy with the Chart Directory click "OK".

In case you selected a path to save the charts not covered by the current OpenCPN configuration, the plugin configures it for you.

You can check the configuration on the "**Chart Files Tab**". For more details about managing your charts, you should definitely read *Chart Files Tab* - *Installing Charts*



Now you will see the **Chart Catalog** listed in the **Catalogs section**. Note that it will say (**Please update first**) under the **Released column**.

Click the catalog name then click the "**Update**" button. The Downloader will retrieve the catalog from the server. After the catalog is saved a list of charts will appear in the lower section. Each chart has a check box. If the box is checked then that chart is scheduled to be downloaded. Depending on the Preferences you selected earlier the boxes will be automatically checked. You can check or uncheck individual charts or use the right mouse button to check and uncheck groups of charts.

Updating the catalogs

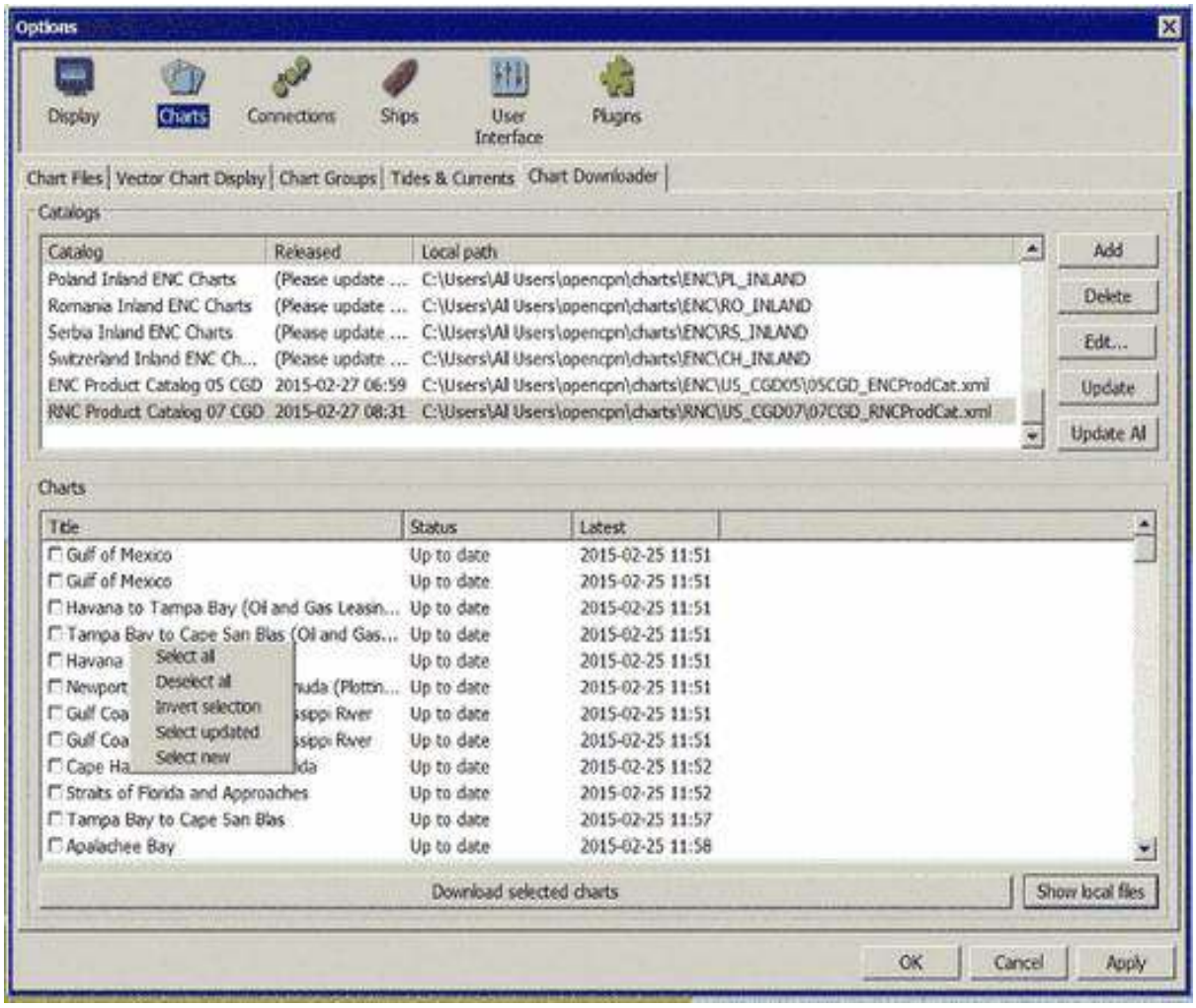
The US agencies update their catalogs on a standard weekly schedule, related to the Notice to Mariners releases. The catalogs from the Chart Catalogs project are updated occasionally, without any fixed schedule. You should select the chart source and click the **Update** every once in a while to get the latest chart updates.

Selecting charts for download

You can select the charts to be downloaded by ticking the check boxes in the list of charts. In case you want to select multiple charts at once, **right-click** in Chart Window will show a context menu, allowing you to

- Select all
- Deselect all
- Invert selection
- Select updated
- Select newly released

charts. You can configure the plugin to automatically preselect the updated and/or new charts after an update of the chart catalog in the preferences.



NOTE: In addition to the right-click chart selection, you can Highlight a chart, then use "**Spacebar**" to check or uncheck. Then hit the **down** or **up button** and repeat. This is faster than Mouse clicking for groups of files.

Downloading charts

After selecting the charts for download, click the "Download selected charts" button to start downloading the charts. It can be a lengthy progress and a dialog box showing progress will

pop as each chart is downloaded. If any charts do not download correctly a warning will pop up at the end. The status of the charts that have been downloaded successfully will change to **Up to Date**. Sometimes a slow or flaky Internet connection will cause a chart not to download and the status will remain the same. You can just click the **Download selected charts** button again give them a second chance.

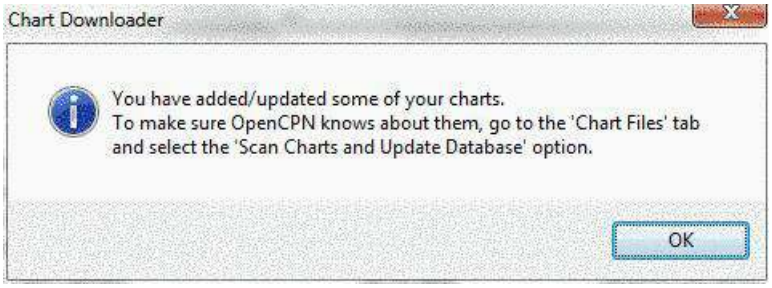
A recent improvement is the use of a separate CPU thread (when it is available) for downloading charts.

Chart Folder Tab and Chart Group Tab reminder. A reminder box will pop up to tell you that you have to notify OpenCPN where to find the charts. We'll do that in the next step.

After the download

Upon **Closing** the Chart Downloader will automatically complete a **Scan and Database Rebuild** of the Chart Database, so the charts will be ready for use. For vector charts, one sensible step remains. Go to Options→Charts→Chart Files and press the button **Prepare all ENC Charts**. This will preprocess all new vector charts and updates, and prevent delays when actually using the charts

If you should see the dialog below please Update the internal chart database and the plugin will remind you about it with a dialog.

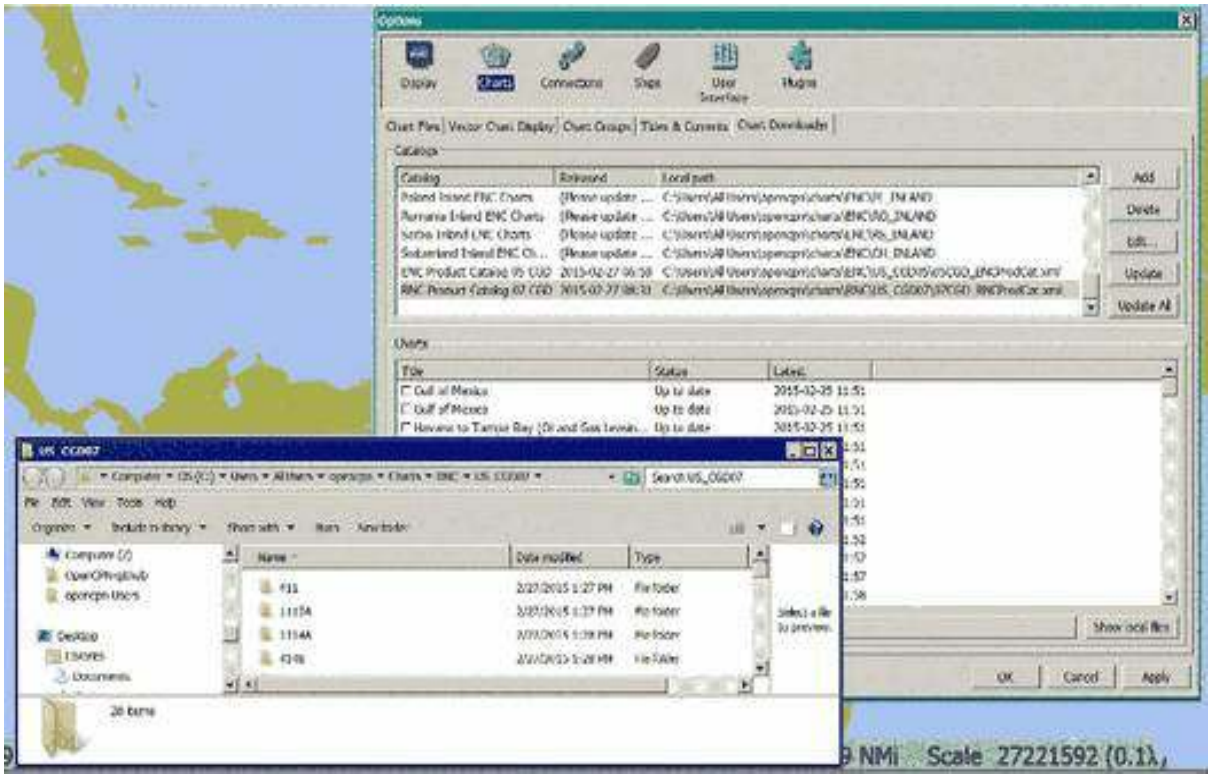


For more details about managing your charts, you should definitely read *Chart Files Tab* - *Installing Charts*

To make it short, go to **Options > Chart Files Tab** and tick the **Scan Charts and Update Database** checkbox and when you **close** the Toolbox using the **OK**, your newly downloaded charts will be scanned and made available for viewing.

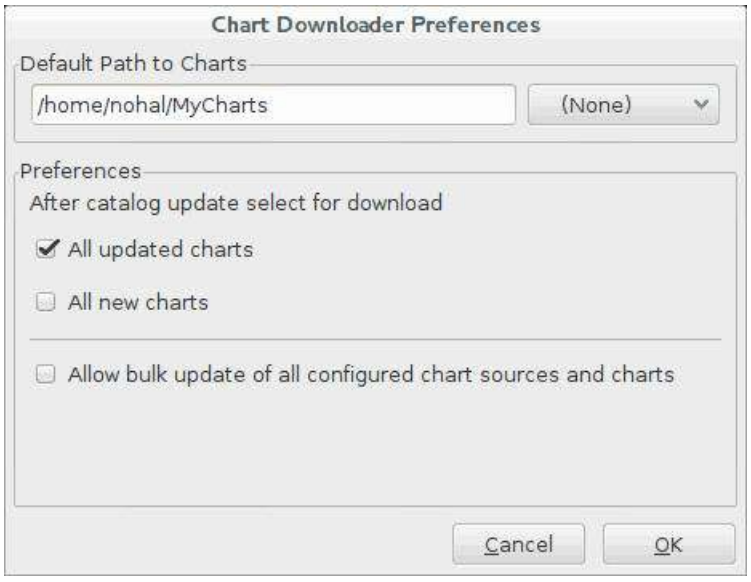
Checking the downloaded charts

The button **Show Local Files** on the lower right will open your default file manager in a separate window, which allows you to check files and directories easily.



The Preferences

You can customize the behavior of the plugin to certain extent. To access the preferences, select the Chart Downloader plugin on the **Options > Plugins Tab** and click on the **Preferences** button



The **Default Path to Charts** option allows you to set the top directory for all your charts, used to construct the suggested locations for the chart sources you configure.

The **All updated charts** and **All new charts** check boxes tell the plugin which charts you want to select for download automatically upon a catalog update.

The **Allow bulk update of all configured chart sources and charts** checkbox adds a new button to the Chart Downloader Tab, allowing you to update and download all the charts you are managing using the plugin with a single click. The behavior of this function depends on the aforementioned check boxes - either it downloads only new or updated charts or both.

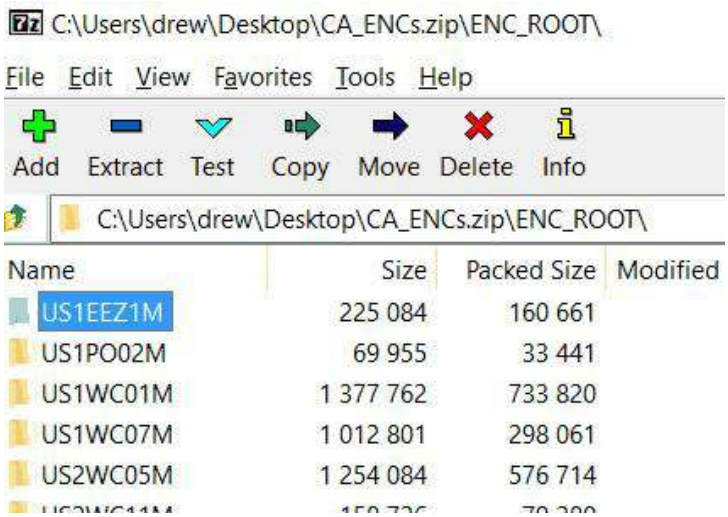
Chart Manual Install

Chart Downloader is the easier, preferred way to install charts, but at times manual techniques are useful.

For this example, we will use the freely distributed NOAA US charts. NOAA's Chart Download website[94] Bring this page up in your browser. On the left,

Click on Download **ENC**s (electronic navigational charts for Vector Style charts ENC (vs Raster Charts)[95]

Download your desired region. For this example, we selected the State of California, CA_ENCs.zip

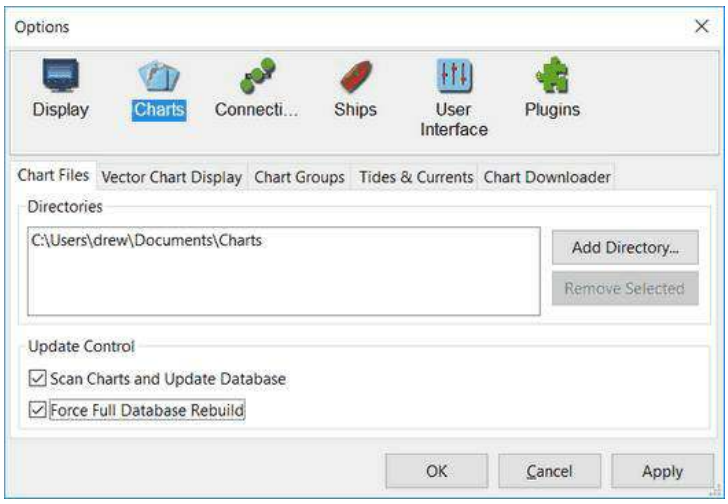


Unzip all those folders (US1EEZ1M, etc…) to a location on your hard drive. For this example we used **My Documents/charts**.

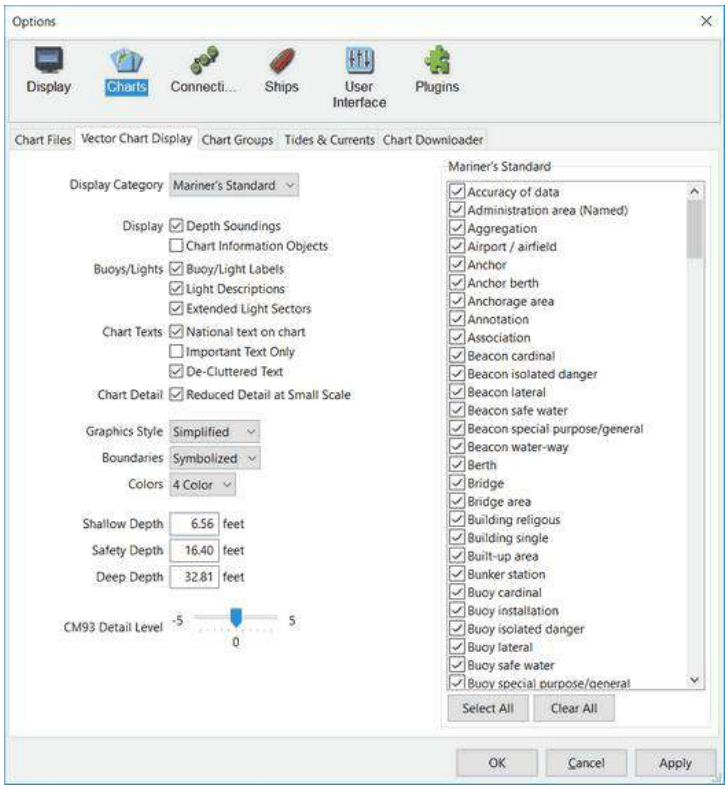
Start OpenCPN, and point it to your chart directory **Settings > Charts > Chart Files > Add Directory** (remember **My Documents** is actually something like **C:\Users\user-name\Documents\Charts**)

Click **Select Folder**

Tick boxes "**Scan Charts and Update Database**" and "**Force Full Database Rebuild**"

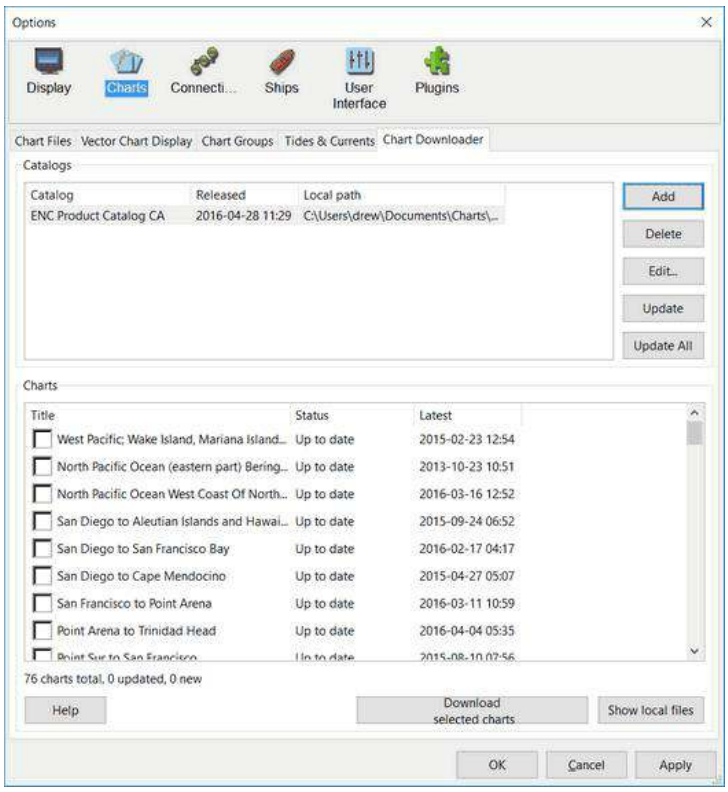


Fix up a few of your Chart settings, mine are below, more info [Vector Display Tab]

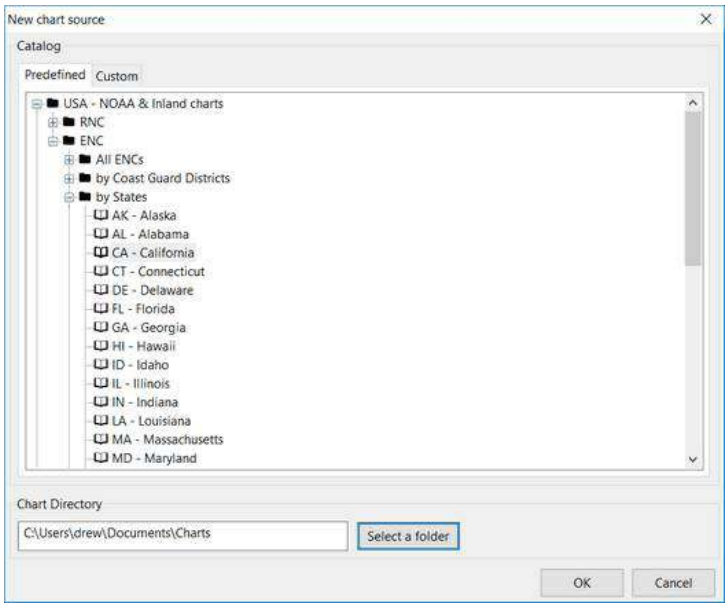


Check your new ENC charts into the Chart Downloader to stay current with Chart Updates, more info [Chart Downloader Tab]

Go to **Settings > Charts > Chart Downloader** Click **Add** and navigate to the section that you downloaded. For example it is **USA > ENC > by States > CA - California**



You should also hit the **Select Folder** button and navigate to where you put your ENC charts. Once you hit **OK** on that window, a list of all your charts should populate in the bottom half of the window.



Click **Update All**, and your charts will update, and continue to update. that's it!

Chart Quilting

Chart quilting is a way to display parts of several charts together on the screen, redrawn to the same scale.

Former Limitation Removed - With the introduction of OpenCPN 4.2; Raster Mercator charts, Raster Transverse Mercator charts, Raster Polyconic charts and Raster skewed charts, of these same projections, may exist in the same quilt. The transition from one type of projection to another is seamless. Quilting the skewed charts is very computationally heavy and can't be used in non-OpenGL, make sure you have the use of accelerated graphics (OpenGL) enabled in **Toolbox → Display → Advanced.**

Quick Start

1. Go to **Options → Display → General → Enable Chart Quilting**. Tick the box.
2. Another, more simple way, is to use the "**Q**" short-cut key to toggle quilting on/off.

Zooming in, automatically brings up larger scale charts, if available. Panning reveals a continuous quilt of the available charts. If you started with a raster chart, only raster charts will, with the exception noted below, be in the quilt. The same logic applies to S57 and S63 Vector Charts (ENCS). Make sure you are familiar with the ***Chart Status Bar*** as this will help you interpret all available information.

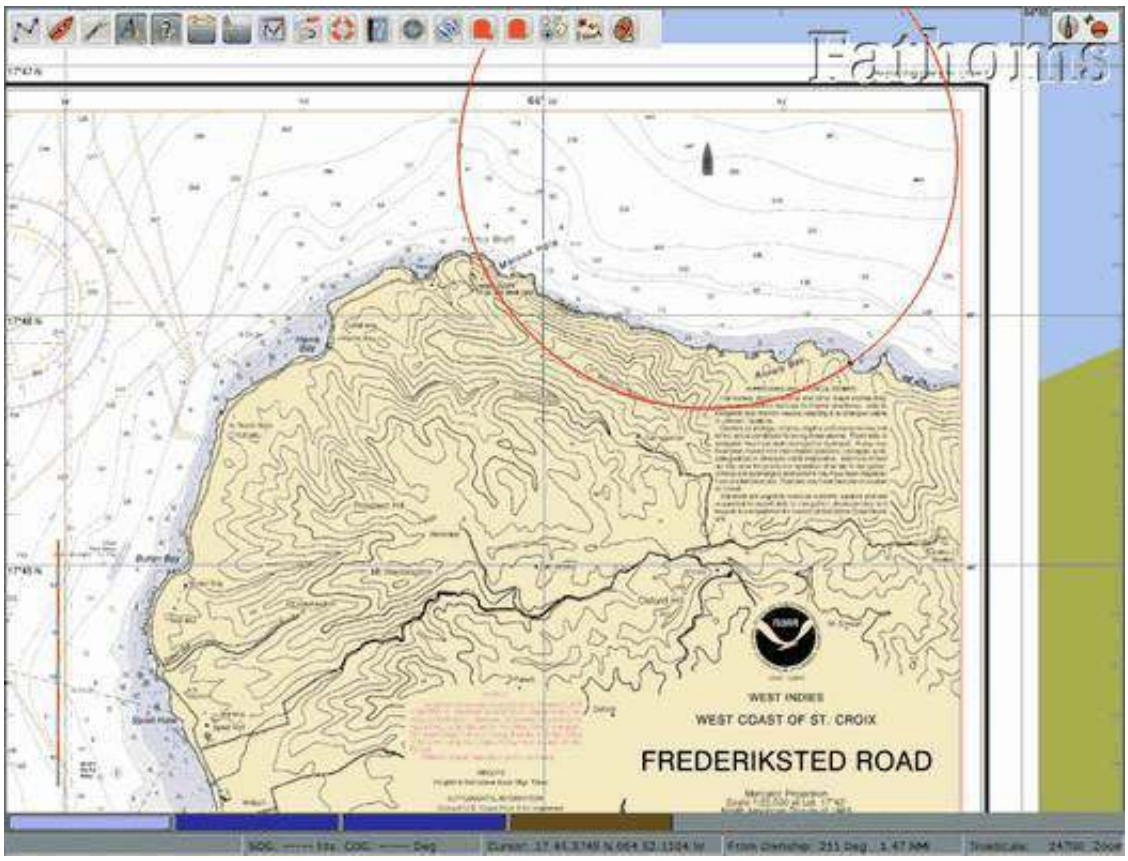
The quilt, like a single chart can be displayed North Up or Course Up

Read more

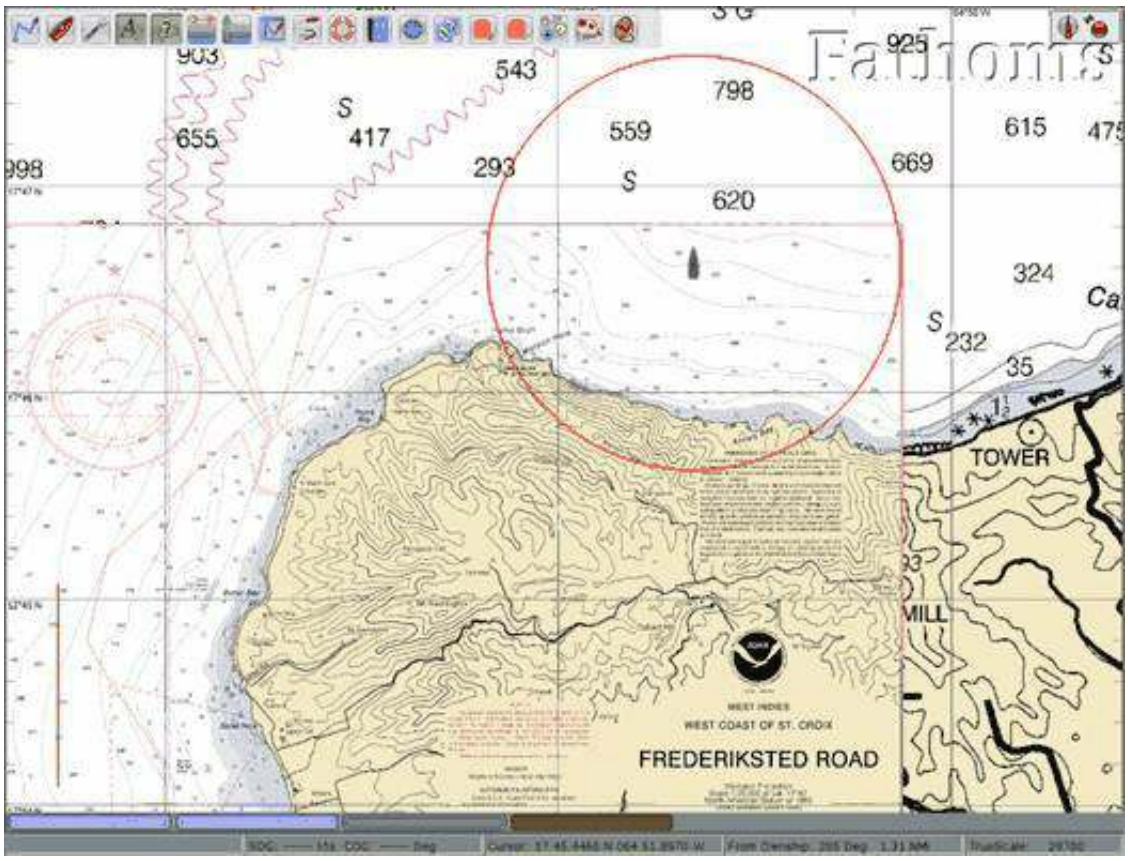
Own Ship ***Auto Follow*** and ***Display Orientation***

The one quilting exception occurs when quilting Raster or ENC charts. If a Raster or ENC chart is not available to be displayed and a CM93 ver2 chart of suitable scale is available, then the CM93 ver 2 chart will be added to the quilt.

What is the use of Quilting?



In single chart mode, getting near the edge of the chart there is no information outside the chart. You manually have to change to the next chart, by selecting one of the charts in the chart bar.



The situation changes dramatically when quilting mode is activated. The amount of relevant information on the screen increases, and the next chart is automatically available.

Displaying charts

OpenCPN has two modes of displaying charts, **single chart mode** and **quilting mode**. In a new installation, quilting is on by default.

To activate single chart mode

Go to **Options → Display → General** and deselect the box **Enable Chart Quilting**. This mode only shows one chart at a time, and a switch to other charts must be done by clicking another chart in the Chart Bar. All printed general chart information, outside the chart proper, can easily be read.

To activate chart quilting

Go to **Options → Display → General** and tick the box **Enable Chart Quilting**, or use the shortcut key **Q** to toggle quilting. Tick the box “Show Chart Outlines” at the same time as this will help you see individual charts.

Full Screen Quilting

Options → Display → Disable Fullscreen Quilting. By default all visible charts of an

appropriate scale are used in the quilt. With this box checked only charts that overlap the center of the screen are used in the quilt. Checking this box may give a performance boost in certain circumstances.

To determine if Chart quilting is on

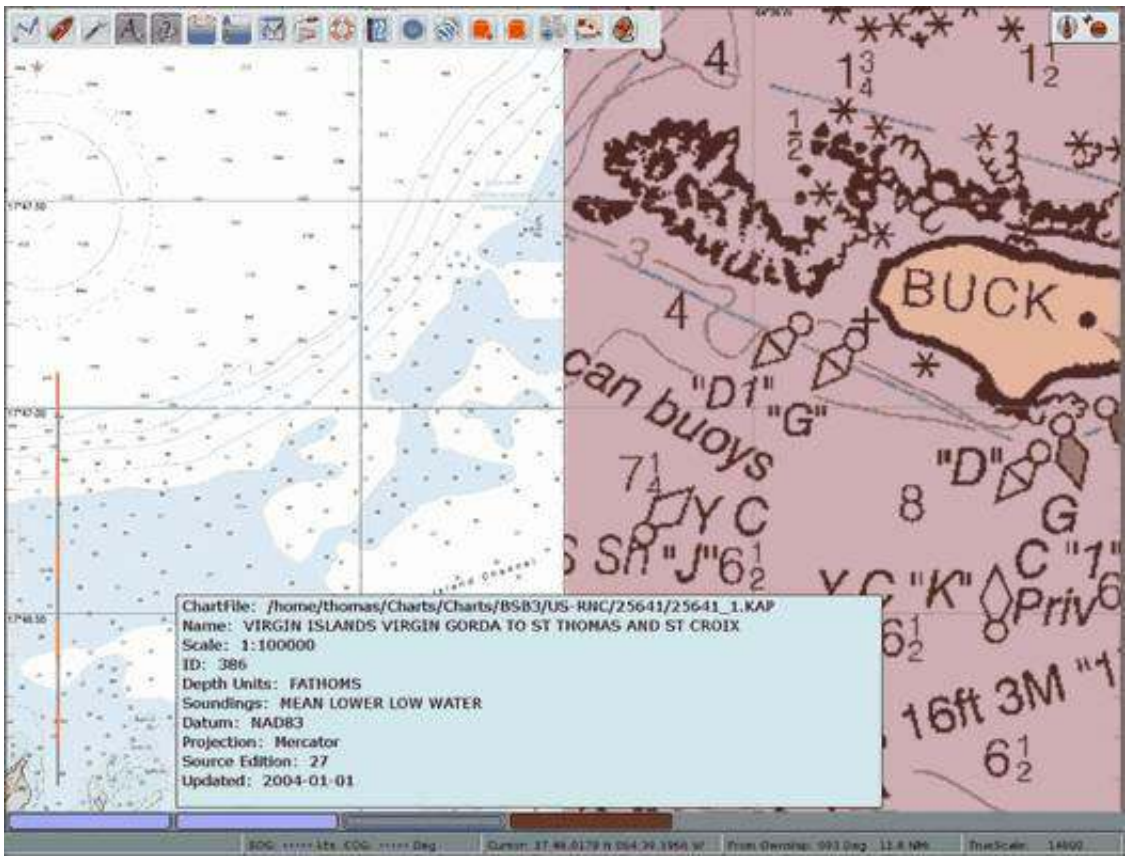
There are some visual indications on screen to confirm if quilting is on or off.

- If the right click menu contains the entry “Hide This Chart”, quilting is on. Clicking the entry excludes the chart from the quilt.
- The colored rectangles in the status bar have rounded corners and the white borders of the charts are invisible when quilting is on. When quilting is off in ToolBox → Settings, the colored rectangles have “square” corners.r.
- When hovering with the mouse pointer over a inactive raster chart button in single chart mode, a thumbnail of the chart is displayed in the upper left corner of the screen. At the same time an information box pops up above the button with details about the chart. This changes with quilting, as the thumbnails are replaced with a transparent reddish high-lighting of the charts that is a part of the present quilt or has a larger scale than the reference chart in the quilt.
- The exception to the last rule is CM93 charts. When an area is only covered by CM93 charts, indicated by a long yellow chart button in the status bar, and in quilting mode, no info-box is displayed and no reddish highlighting takes place.
- CM93 individual cells are outlined in magenta.

With chart quilting more than one chart can be displayed and active at the same time, in the screen above, for example there are two pale blue buttons, as there are two raster-charts in this quilt. In single mode only one chart button is highlighted at a time.

Depth units. that are normally shown in the upper right corner of the display (if activated in the toolbox), are only displayed in quilting mode if all participating charts uses the same unit.

Many of these features are illustrated in this screen-dump.



This is a quilt consisting of three raster charts, two that are actually displayed and one smaller scale chart that is hidden behind the larger scaled charts of St Croix.

This is the button for the not displayed chart in the quilt.

The mouse pointer is over the middle raster chart and the chart information box is shown, together with the red highlighting of the chart on the screen.

If the chart info box contains much less info than above, just click the button to display the chart, then go back and hover with the cursor over the chart button again. The full info will now be available.

No depth unit is shown in the quilt as the left chart is in Feet and the right in Fathoms and parts thereof. Notice the lack of zoom level in the status bar, a quilt , by definition, consists of several different zoom levels.

Which charts are quilted?

There are several rules built into OpenCPN governing exactly how different chart styles reacts to the quilting mode.

1. Raster charts and Vector charts are quilted separately. You can quilt either raster charts or vector charts, but not both at the same time.
    - The exception to this rule is: CM93 ver2 charts, if available, may be quilted with

raster and vector charts under certain conditions e.g. the view is so far zoomed out that the rightmost (smallest scale) raster chart is too small to be useful.

2. CM93 ver2 charts can be quilted separately.
3. BSB4 and nv-charts, using plugins, quilts with other Raster Charts, following the rules above.

User control

Users can control if an individual chart, is allowed in the quilt or not.

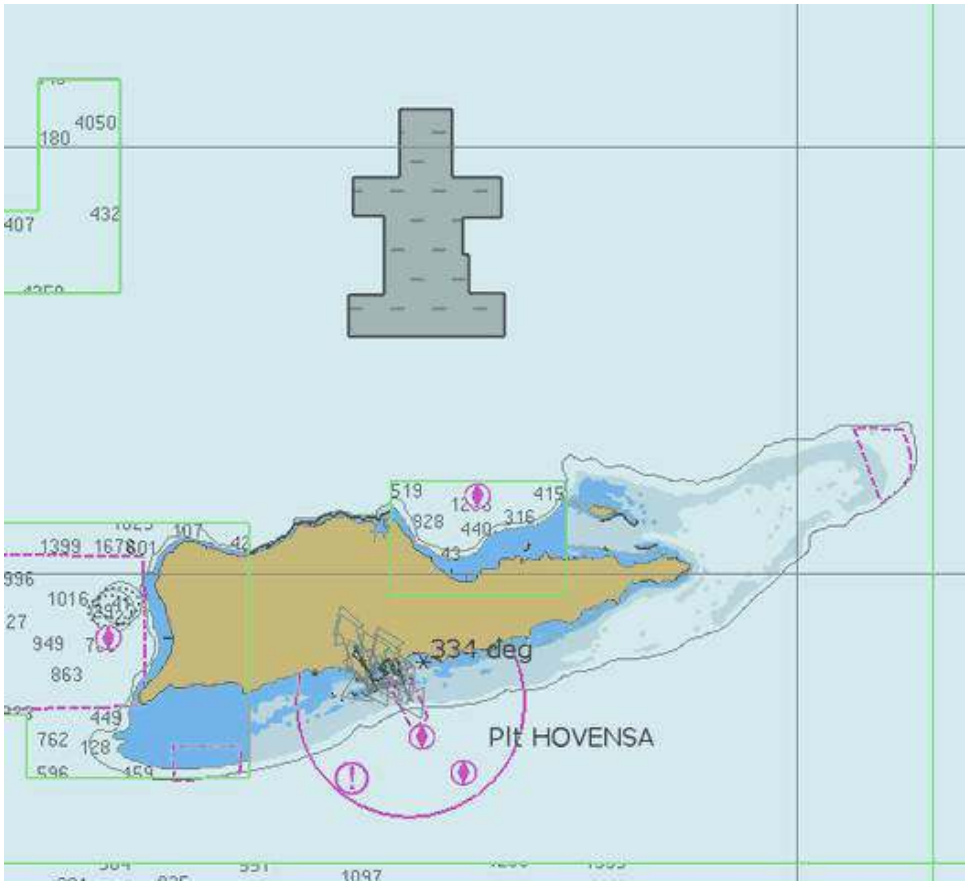
- Right clicking on any chart in a quilt in the chart-bar and clicking “Hide This Chart” on the pop up menu, removes the chart from the quilt. The chart button in the Status bar changes to {opencpn:manual:not_participate.jpg?nolink&60×20}}.
- The same thing can be achieved through the right-click menu when clicking on a displayed chart.
- To activate the chart again **right click** this button an then click “Add this chart to quilt”

Controlling the scale of the quilt view.

The “quilt reference chart” is the left-most, largest scale chart, highlighted in the chart bar. This is the left of the two pale blue chart buttons above.

Click the next chart blue button “one-to-the-right” of the of the current reference chart. The reference scale of the quilt will be decreased, but the viewpoint will not change. The same logic applies if clicking a chart-to-the-left of the present reference chart, except that the scale of the quilt will increase. Zooming in/out will also move the reference chart to the left/right.

Known issue with some NOAA ENC:s



Some NOAA ENC:s are produced with “holes” in. OpenCPNs handles almost all of these cases. The picture above is from S:t Croix in the Caribbean, using an old version of OpenCPN. There are still some gray areas in this vicinity but only if the scale is larger than 1:10,000. Very few users are likely to notice this.
The gray rectangle above is a “hole” in a chart, where a smaller scale chart with coverage exists. The “hole” is due to the fact that this area wasn't surveyed to the scale of the chart.

Clipped Objects
Clipped objects at the edge of quilted vector charts S57/S63 of different scales may not show the complete object.“

Chart Sources

High Resolution Background Map

A more detailed version of the built in background GSHHS map is available through the integrated Chart Downloader plugin. Go to Options > Charts > Chart Downloader and Pick “Add” a new Catalog. Select GSHHG and then All GSHHG Basemaps. Then check and if desired change destination path name to suite your liking. (You may add a GSHHG folder under your Charts directory, which is the most effective location.) Then select OK and proceed with downloading and “Apply”. Remember to add a Chart Directory “GSHHG” and add the path to the GSHHG folder.

Older OpenCPN versions

If for some reason you use OpenCPN older than 4.8.2, you may still obtain and install outdated High Resolution GSHHS files manually.

- *Gshhs High Resolution[96]*

It is a big file, 230 mb(unzipped) compared to the standard 26mb, and may slow your computer down. The presentation is better when zoomed in, but most users don't need it.

Install by unzipping and placing the files from the opencpn/gshhs folder in the *<data_install_dir>/gshhs (where there already are some files with similar names)*. which is normally:

- Windows …/Program Files/OpenCPN
- MacOS …/Applications/OpenCPN.app/Contents/SharedSupport
- Linux default ../usr/share/opencpn/

A Windows installer is available here[97].

ECDIS Vector Chart Reference Cards

The US Chart No 1 from 2013 is updated and includes full ECDIS reference[98].

An even better alternative is the new book Electronic Chart Navigation[99] by David Burch, with annotated ECDIS Chart No 1.

Anyone using official vector charts should have one of these on board.

Free Nautical Charts

Chart Downloader - Get started quickly

The Chart Downloader Tab-Plugin, included with Opencpn 4.2 and above, will help you to download, update and organize almost all free chart sources described below.

Free Chart Sources

- *NOAA's Chart Downloads[100]* For those interested in U.S. waters, raster charts and S57 vector charts are available as free downloads from NOAA. Find all NOAA charts, both raster (RNC) and vector (ENC) charts, for your region through *NOAA OCS Website[101]*. US charts cover a wide area, apart from the mainland states, Puerto Rico, the US Virgin Island, the Hawaiian Island chain as far as Midway Island, American Samoa, Guam and the Northern Marianas Islands are all included.
- *Official Inland Electronic Navigation Charts (IENC) by US Army Corp of Eng - U.S. Inland Waterways[102] and AWS IENC Download Link[103]*
- *Argentinian Charts[104]* Free raster charts (RNC) for a large part of their coast as well as parts of Antarctica: Note that the downloadable “zip” files actually are “rar” files.
- *Brazilean Charts[105]* publishes free raster charts (RNC) for their whole coast and new charts for inland waters are published regularly. There is also coverage for part of Antarctica.
- *New Zealand[106] now publishes free BSB3 raster charts, as of 2013-11-22* NZ has moved away from a proprietary UKHO encrypted format, to the, de facto, standard BSB format. NZ charts cover most of the Pacific in small scale charts, as well as the Southern Ocean, down to Antarctica, South of New Zealand. Detailed charts for the Kermadec Islands, Cook Islands, Niue, Tonga, Western Samoa and the Tokelau Islands, are included.
- *NZ charts compiled by Marco Certelli[107]* includes a better coverage of the Tonga/Samoa area. The official version does not include charts with soundings in fathoms, for example.
- *East Asia Hydrographic Commission[108]* provides free offshore S57 vector charts for the South China Sea. See the Note at the bottom of this section.
- *Colombia[109]* and *Australia[110]* publish sample S57 single charts.
- Many **European** countries publish free S57 ENC charts for their Inland Waterways:
  - *Austria[111]*
  - *Belgium[112]*
  - *Bulgaria[113]*
  - *Croatia[114]*
  - *Czech Republic[115]*
  - *France[116]*
  - *Germany[117]*
  - *Hungary[118]*
  - *Netherlands[119]*
  - *Poland[120]*
  - *Romania[121]*
  - *Serbia[122]*
  - *Slovakia[123]*
  - *Switzerland[124]*
- *Ukraine[125]* offers some non-calibrated char downloads
- *US Pilot[126]* are BSB charts
- *OpenSeaMap.org[127]* project publish raster charts in many formats (including KAP which work with OpenCPN). This project relies on mariners to survey their local waters and upload their data using the OpenStreetMap database and editing tools. This project

is still in its infancy, so only a few areas have been mapped to any extent. Currently only sea-marks are displayed, but it is planned to include depth & other data in due course.

Other Charts

- *Scotland Antares Charts[128]* are producing a lot of very large scale charts covering “The West Coast of Scotland”. All platforms. These charts are available in many formats, including BSB3. A nominal sum is charged for the charts, to support this impressive effort by unqualified enthusiasts.

Commercial Nautical Charts for OpenCPN

All platforms

- *O-Charts.org[129]* S63 Encrypted ENC charts. Worldwide coverage is available using the 4.0.0 version of OpenCPN. These are the official vector charts that big ships use. Detailed coverage of popular cruising grounds is not always available.
- *O-Charts.org Oesenc Website[130] and Oesenc Plugin* These are proprietary vector charts licensed from official bodies for OpenCPN, especially for users in Europe. This is an encrypted format with its own plug-in, the oeSENC plug-in. Special and exclusive for OCPN. Derived from S-57, but already in an easy to digest format for OCPN (ocpn encrypted SENC).
- *Fugawi-charts for Opencpn[131]* All charts available for OpenCPN are listed on Fugawis web site - . Among the available charts are: Canadian CHS charts, Blue Latitudes Mexican charts, NV-charts, Delius Klasing charts, Swedish charts, including Hydrographicas charts, Finnish Charts and more.
- *Hydrographica[132]* a Swedish company produces large scale BSB 3 charts for some popular local areas, based on their own surveys. The charts are available from soltek.se. The BSB 3 charts will be phased out in favor of the same charts available from Fugawi.
- *Soltek.se[133]* another Swedish outfit, provides all official charts for Sweden and Finland in BSB 3 format. If you want to buy a CD-area, and don't have access to a Windows computer, contact “soltek” first, as their installation program is Windows only. The BSB3 charts will be phased out in favor of the same charts available for all platforms from Fugawi.
- *Datacharter[134]* a Dutch company, offers the entire set of “1800”-series nautical charts for the Netherlands as KAP-files for use in OpenCPN. These charts cover the Dutch coastal zone of the Northsea and Belgium (including the Zeeland estuaries and the Westerschelde river up to Antwerp), the Waddensea up to the island of Norderney in Germany and the Dutch IJsselmeer and adjacent ports and waters. The charts are locked by means of your own personal code, but once unlocked can be used on all your devices running OpenCPN.

Windows

- *VisitMyHarbour - ChartSticks[135] and OpenCPN[136]* Unified Charts a virtual DVD version of our legacy ChartSticks, covering UK, Ireland, Belgium, Netherlands,Spain (including the Canary Islands) and Portugal (including Madeira and the Azores) with

UKHO rastercharts, updated yearly. New for 2015 is a coverage of the French coast from Dunkirk to Brest through large scale SHOM charts on some USB sticks.
- *NV-Charts[137]* has an extensive coverage of both sides of the North Atlantic. The Windows only NV-Charts Plugin is needed. Charts in some areas, such as the Bahamas, the Windward and Leeward Islands, were until recently traditional BSB3 charts. This is no longer the case.

Android

- *VisitmyHarbour 2018 Android Charts[138]* buy Android: Marine Navigator Charts

Links to more chart sources

- *Open Sea Chart[139]* worldwide free nautical charts:
  - *Open Sea Chart - Vector[140]*
  - *Open Sea Chart - Raster[141]*.
  - The collection and the updates are community driven.
- *U.S. inland waters and other countries[142]* Links to a wide selection of ENC's

GE2KAP Tool to Make Chart Overlays

- This is a windows only program. The produced charts can however, be used on any platform
- GE2kap is a program that semi-automatically creates kap charts from Google Earth, and many other sources.
- The new Jan. 08, 2016, edition creates charts from GE, chart images and SasPlanet. Can overlay opencpn chart and chart images including GeoTiff. Support for GeoPDF is expected in the near future. Enhanced support for SasPlanet.
- Download from GE2KAP[143]
- GE2KAP now supports SASPlanet and all the sources it can use.

KAPS

Terry's Topics[144] Indonesia, Malasia, Philippine, Singapore & Thailand Resources - Anchorages, Routes & Kaps.

Chart Formats

OpenCPN supported chart formats

Raster Charts

BSB Versions 1, 2 and 3, with chart files ending with ".kap". Many of these charts also comes with a text file with the ".bsb" extension, that is not used at all in OpenCPN.
This is the de facto standard format used by the US NOAA, New Zealand and Brazil, just to name a few.

Fugawi-charts, based on BSB4, with files ending with BAP. The charts works with all operating systems supported by OpenCPN through the Fugawi OFC plugin.

BSB Version 4, with chart files ending with ".cap"
works with a non free plugin, for Windows only. See the *PlugIns[145]* download page. This format is used for Canadian charts and others.

Nv-charts with chart files ending with ".eap"
are supported through a non free plugin, for Windows only. See the *PlugIns[146]*download page. "nv-charts" are available for many parts of the world.

NOS/GEO Version 1, with chart files ending with ".nos" and ".geo"
Subsequent versions are probably supported but need to be tested. However, this format is obsolete for new charts.

Vector Charts

S57 ENC charts, with chart files ending with ".000".
ENC update files (ending with .001, .002, …) are included automatically, if present, and must be placed in the same directory as the corresponding base chart (.000). OpenCPNs internalSENC files has a ".S57" file extension.

Senc (Proprietary)
If a chart is said to be a S57 Vector chart, and has a different file ending, it is likely to be a SENC file, a processed version of a ".000" chart file, in a proprietary, platform specific format, that OpenCPN can't handle, unless the extension is ".oe*".

*oeSENC*or *oeEVC* (Proprietary) O-Charts
These are vector charts licensed from official bodies for OpenCPN, with the ".oesenc" file extension. In the case of Australia the charts are called ".oeevc" and are technically identical. This is an encrypted format with its own plug-in, the oeSENC plug-in. Special and exclusive for OCPN. Derived from S-57, but already in an easy to digest format for OCPN (ocpn encrypted SENC).

Inland ENCs
OpenCPN supports the international Inland ENC standard (S57 based).

S63 Encrypted ENC charts, with chart files ending with ".os63".
This chart format is supported in OpenCPN from version 4. It is the format for all vector charts from national hydrographic offices worldwide. Apart from being encrypted, S63 charts are exactly the same as S57.

All *S63 charts* worldwide, from *O-charts.org* are available for purchase.

- The support is through a two part plugin, one part open source and the other part closed. The encryption and the commercial aspect is handled by a separate entity, *o-charts.org[147]*

CM93 Version 2.
(C-map Version 3, and later, are in a preprocessed proprietary SENC format and are not supported.)

- Read this please: *"The first thing to check if using CM93 is the version!!! Of course we read that version 3 could not be used but we didn't verify it to the bitter end. It was our fault. One way to tell what version you have is that V2 has extra chart folders plus extra files which include the .EXD file. V3 does not have the extra files."*
- Read the whole sad story with a happy ending *On Cruisers Forum[148]*. So use **CM93 Version 2**
- Check **Chart Files tab** go to the directory that is listed and have a look at the files you see. If you have the whole world, there should be 144 folders with 8 digit numeric names, and a handful of separate files. If you see less than 144 folders, that's OK. It just means you don't have the whole world. If the folder does not look like that then it is not the standard CM93 format. – If they don't work, verify that they are Version 2.

Pictures of charts, can be converted, and used.

Generally chart pictures in **gif, jpeg, pdf, png, tif, bmp** and other formats can be used, when properly geo-referenced, to generate raster charts. For the details about this process read the *Chart Conversion Manual[149]*. Also, make sure to browse around the forum as there are a handful of interesting chart related threads.

Not supported formats that can be converted.

WCI charts

This is the native format for SeaClear generated with *SeaClear and MapCal[150]*. WCI charts can also be transformed to BSB charts and used by OpenCPN. The key is to open a WCI chart in MapCal and then "Tools → Convert → Current WCI to BMP" to convert the chart to a BMP picture. More about using MapCal, a part of SeaClear, for chart conversions, is available here: *Conversion Using Linux[151]*. MapCal works just fine with Linux, using Wine.

The necessary utilities for making or converting charts usually only run on Windows or Linux. For **Mac OS X**, use boot camp, Parallels or VMware to run one of these operating systems.

OziExplorer

Charts consisting of picture in one of the standard formats, together with a georeferencing ".map" file, can be converted to a bsb kapfile. A Ruby script for this conversion is available *Ruby Script[152]* and a more developed windows version *Map2kap-Ozi-2-[153] OpenCPN[154]*Ozi charts of the ozfx2 or ozfx3 format can not be converted with this tool. These Ozi formats are not documented and proprietary, and cannot be displayed in OpenCPN.

HDR/PCX Charts

Used prior to the BSB format, was used from the late eighties to mid nineties. While these charts cannot be used directly in OpenCPN, the chart-picture as such, can be extracted. These charts consists of many picture tiles in **pcx** format, more than 100 tiles is not unusual. The tiles can be merged to one big picture, and then used as any other picture, to make an OpenCPN compatible chart. For details on this process see the *Chart Conversion [155] Manual[156]*and *Cruiser's Forum [157] Post[158]*and the following posts in the forum. *Script for merging PCX files to one picture.[159]*

The HDR format is from an era when computer-memory and processing power were less powerful than today, as a consequence these charts are not of the same quality as more modern charts. Furthermore, most of these charts are not using WGS 84 as reference datum. These charts should not be the first choice, but can be useful if nothing else is available.

Other formats that are not supported.

The Hydrographic Chart Raster Format, **HCRF**, used by the United Kingdom Hydrographic Offices' ARCS (Admiralty Raster Chart Service). This is also due to proprietary encryption algorithms and copyright issues. UKHO is now alone in using this format, since New Zeeland switched to the BSB/Kap format and Australia no longer publishes official raster charts.

Charts from **Mapmedia**, **Navionics**, **C-map** (with the exception of CM93 version 2), **Garmin** and various other private vendors, are not supported, for the same reasons as for the other proprietary charts. It is not possible for users to convert these charts to an OpenCPN recognized format, but it is possible for these companies, to release OpenCPN plugins, if they wish.

Advanced Chart Work

The process of making a chart from a “picture of a chart”, including geo-referencing is called “Chart Conversion”. How to do Chart Conversions is in a separate document

Chart Conversion[160]

If this link does not work you will find the information on the website under

Supplementary Software > Chart Conversion Manual[161]

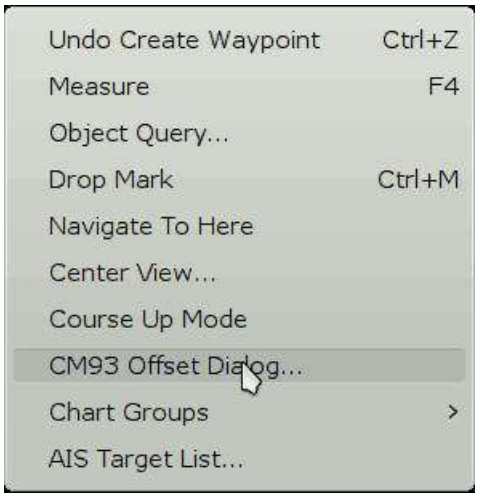
CM93 Offsets

Caveat lector[162]

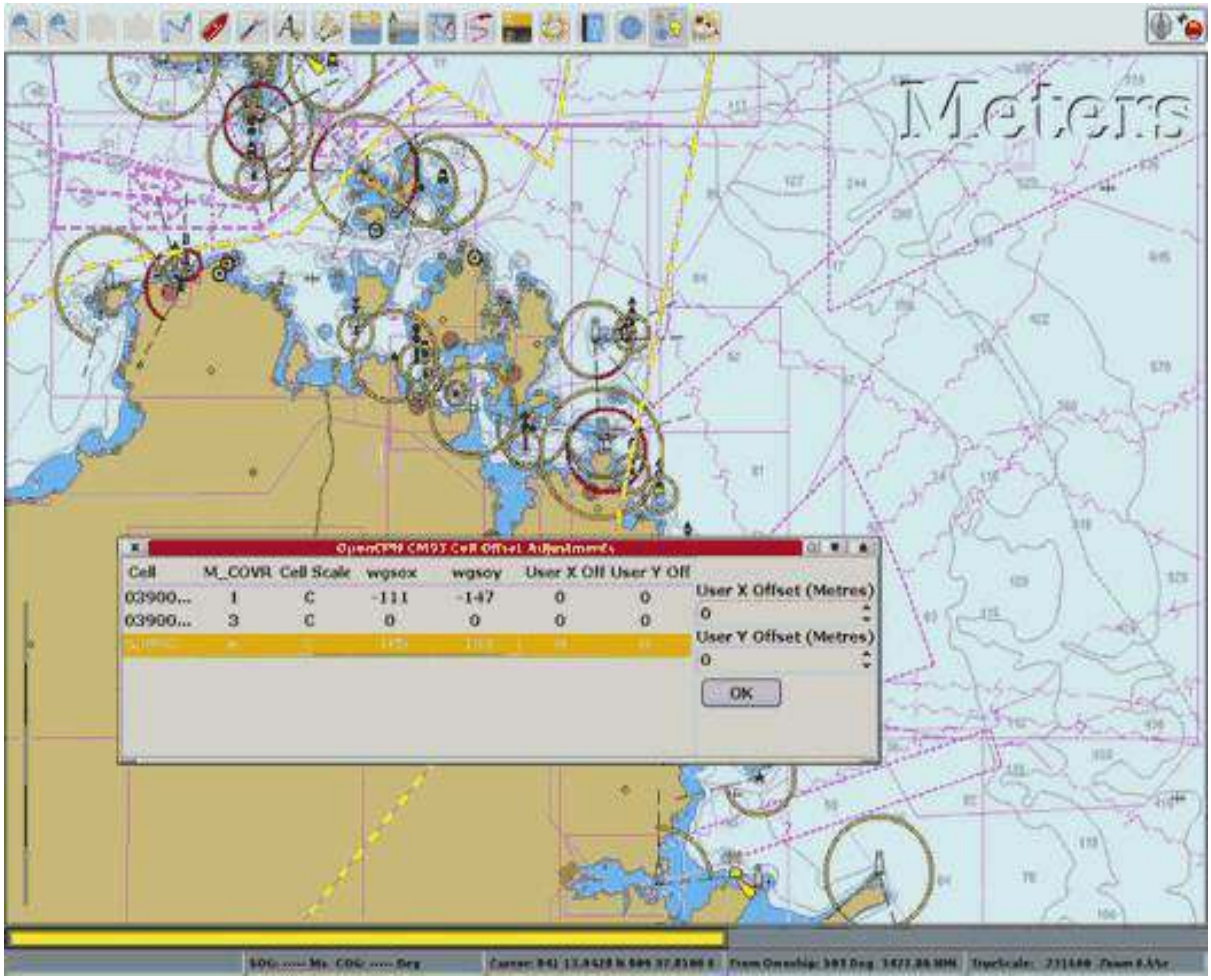
There is absolutely no guarantee that a correction, based on one point, as described below, will be valid for the whole chart cell. Be very careful when using this feature.

Starting with offsets.

- Go to Single Chart Mode (non-quilted), with cm93 charts displayed. Use **Q** or **F9** to toggle quilting on/off
- Zoom/Pan to the region of interest.
- Right click and activate “CM93 Offset Dialog”



- In the list of cells/MCOVR IDs, selected the one MCOVR of interest. The coverage area for this MCOVR object will be outlined with a heavy yellow border.

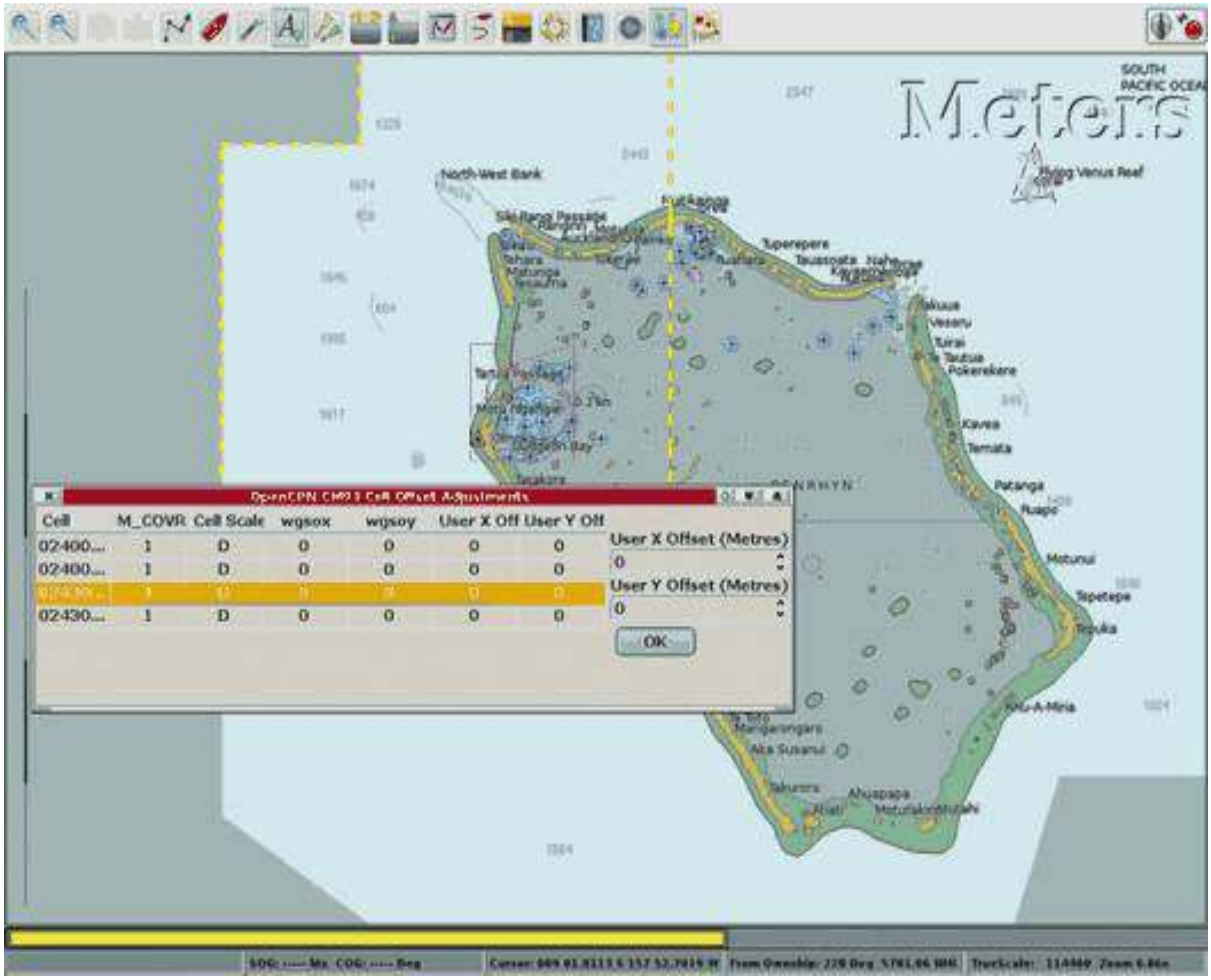


Some cells have built in corrections already applied. The values wgsox and wgsoy, are offsets to bring the original chart cell to WGS84. See the first and third cell in the picture above. The values are for information only, and cannot be changed. These corrections are generally correct, but not always. Sometimes the corrections are wrong and sometimes there are no corrections where there ought to be. This is where this manual offset feature comes in handy.

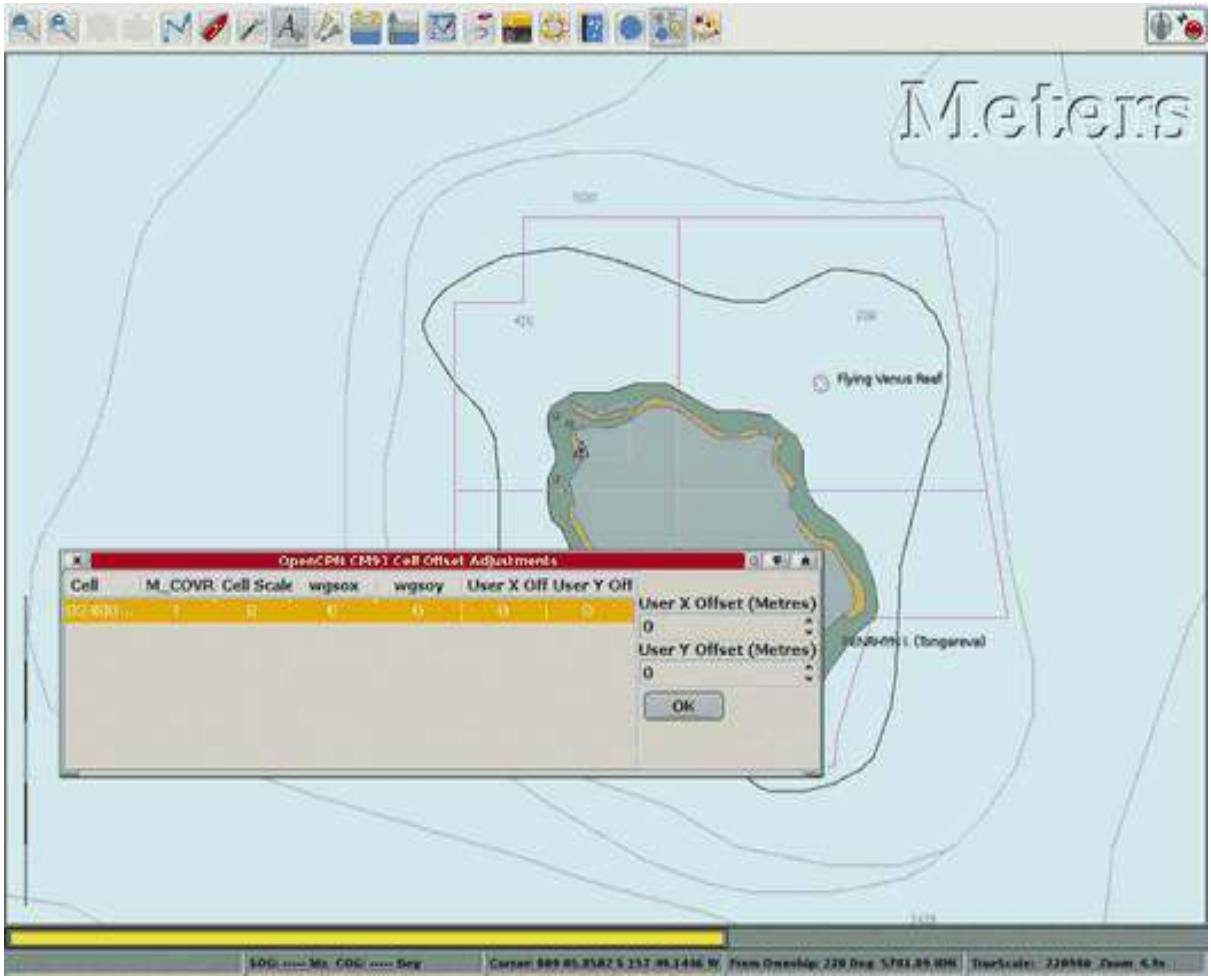
In order to use this feature effectively, one needs a geographically known reference point. As an example, say there is a NAVAID present on the chart cell with known WGS84 lat & long, as from a light list. In this case, one can drop a waypoint on the chart, edit the waypoint properties to the known lat/lon, and then use the CM93 Offset Dialog to slew the cell/MCOVR so that the dropped waypoint coincides with the NAVAID feature on the cm93 cell (chart).

You may also use a geographical feature such as a Cape or point whose location is absolutely known, as by reference to observation, or by rendering on another, more accurate chart such as a trusted scanned raster chart or georeferenced photo chart.

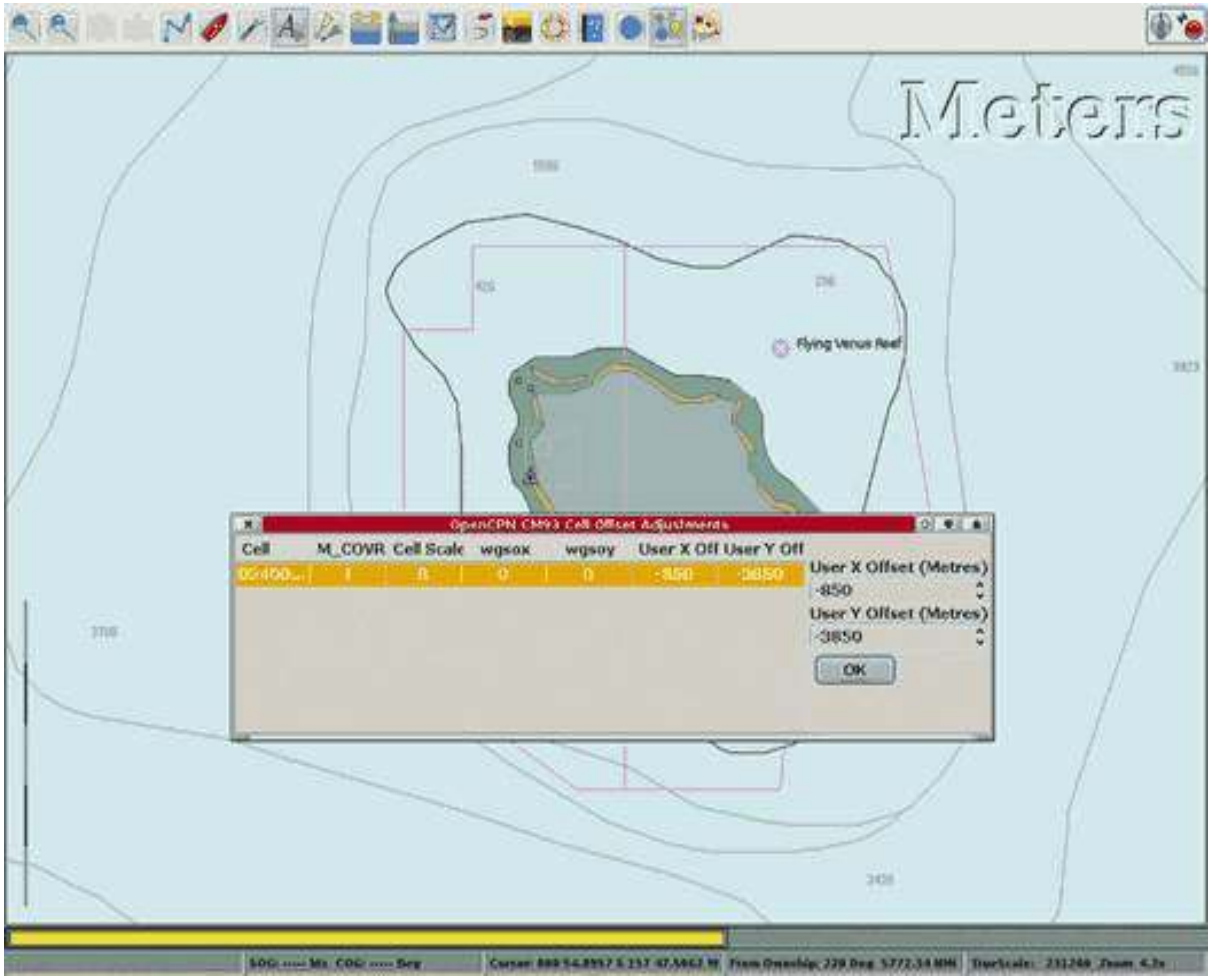
To see how this feature works, here is an example from the South Pacific.



This is Tongareva, also called Penhryn atoll. A mark, with a triangle is dropped at the westernmost point of the Island.



Zooming out to next smaller scale chart makes the triangle mark jump NNE. Time for some corrections, as we, at least for the purpose of this example, are confident that the larger scale chart is correct.



Quite large corrections brings the chart into reasonable agreement.

- Use the spin controls on the right side of the dialog to adjust the desired user offsets. It is also possible to write numbers directly. Notice that positive corrections is towards North and East.
- In some cases it is not clear exactly which M_COVR ID that represents your position. A simple test will reveal if a mark reacts to (large) corrections.
- The offsets are automatically saved in the binary MCOVR cache files found in the program data directory as CM93/…

IMHO ECDIS

IMO ECDIS

IMO RESOLUTION A.817 (19)
PERFORMANCE STANDARDS FOR ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)
……

APPENDIX 2
SENC INFORMATION AVAILABLE FOR DISPLAY DURING ROUTE PLANNING AND ROUTE MONITORING

1. Display base

Permanently retained on the ECDIS display, consisting of:

1. coastline (high water);
2. own ship's safety contour, to be selected by the mariner;
3. indication of isolated underwater dangers of depths less than the safety contour which lie within the safe waters defined by the safety contour;
4. indication of isolated dangers which lie within the safe water defined by the safety contour such as bridges, overhead wires, etc., and including buoys and beacons whether or not these are being used as aids to navigation;
5. traffic routeing systems;
6. scale, range, orientation and display-mode;
7. units of depth and height.

2. Standard display

To be displayed when the chart is first displayed by ECDIS, consisting of:

1. Display Base
2. drying line
3. indication of fixed and floating aids to navigation
4. boundaries of fairways, channels, etc.
5. visual and radar conspicuous features
6. prohibited and restricted areas
7. chart scale boundaries
8. indication of cautionary notes

3. All other information

All other information displayed individually on demand, for

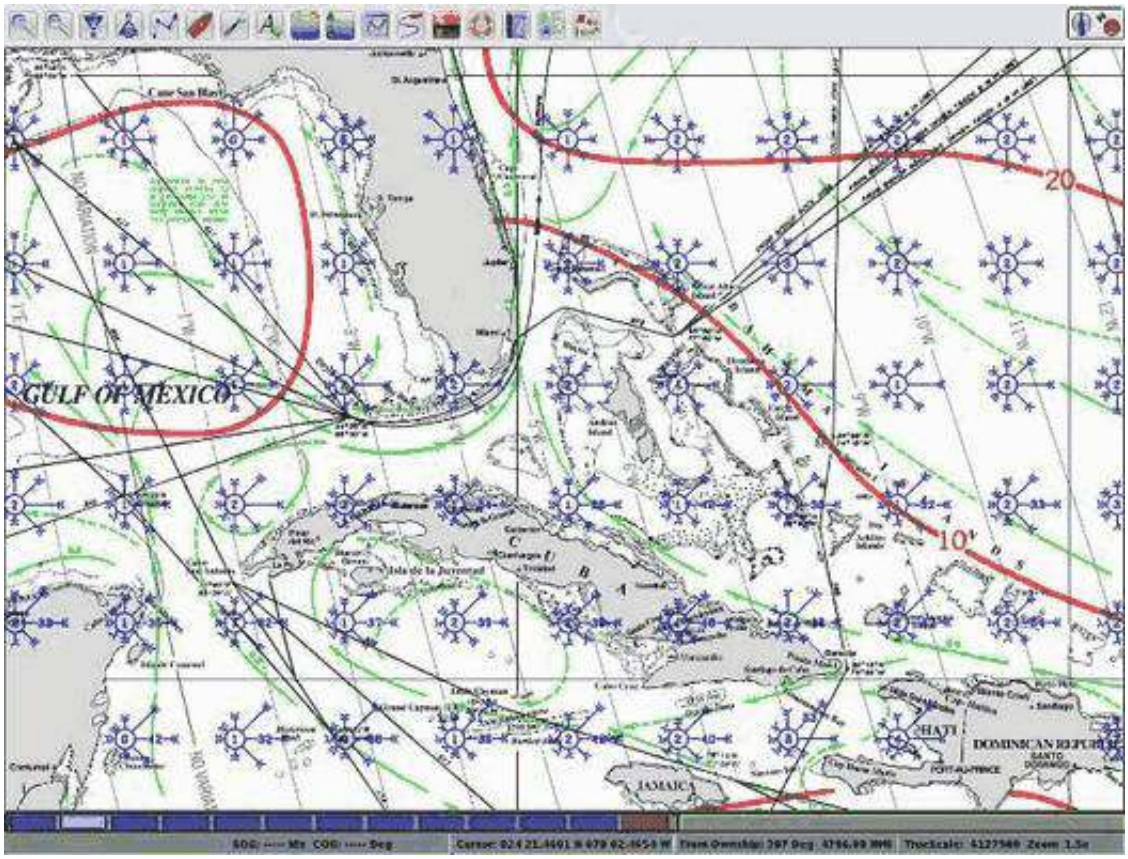
example:

1. spot soundings
2. submarine cables and pipelines
3. ferry routes
4. details of all isolated dangers
5. details of aids to navigation
6. contents of cautionary notes
7. ENC edition date
8. geodetic datum
9. magnetic variation
10. graticule
11. place names

US Pilot Charts

An image based version which works with Opencpn. Slightly outdated.

Note: Climatology Plugin has a true digital version of pilot charts that provides NOAA 35 year average montly wind, currents, water & surface temps, etc. which can be used with Weather_Routing Plugin.



All US Pilot Charts[163] are available for download through the integrated chart downloader plugin and also bellow for manual download, in the **BSB ver2** electronic Raster Chart format. The conversion from the official pdf files to BSB/kap files was done by the OpenCPN team. The Latest version was Published January 1st 2011 and have these updates:
* There is a new clearer naming scheme for the files.
* The Chart Names are changed to reflect the months more clearly.
* The Charts now have a built in dimming palette for dawn/dusk/night viewing.
* All charts now are compressed to 7z files. This is a superior compression algorithm, resulting in smaller files and faster downloads.

- Download this open source free software www.7-zip.org/[164].
- For Mac OSX, try http://www.kekaosx.com/en/ .[165]

* OpenCPN has a limit of 100 charts in the ChartBar. When this limit is reached, the largest scale chart will be dropped. If all Pilot Charts are loaded at the same time, there are many areas where the different Pilot Charts overlap. Be very careful when navigating in these areas

as the larger scale, more detailed charts, may not be available.
* For this reason, when underway, as opposed to planning a passage, it makes sense to only have one or two sets of Pilot Charts loaded in OpenCPN, covering the actual route.
*Chart Groups are is ideally suited for viewing and organizing Pilot Charts.
* For quick switching between consecutive Pilot Charts use the Buttons

 Shift to larger scale chart.

 Shift to smaller scale chart.

Download Pilot Charts

Download Pilot Charts from the main website[166]

The monthly Pilot Charts for The North Atlantic are split into four separate charts.
The Northern North Atlantic - the far north
The Central North Atlantic - main area
The Western North Atlantic - the Caribbean
The Mediterranean
The South Atlantic
Pilot Charts for The North Pacific Ocean

The monthly Pilot Charts for The South Pacific are split into two parts, the charts proper, and the information part.
The information part in The South Pacific is not a part of the Pilot Chart itself, as in the other oceans, due to lack of space.
Pilot Charts for the South Pacific
South Pacific Information Sheets
Pilot Charts for The Indian Ocean

Other useful charts

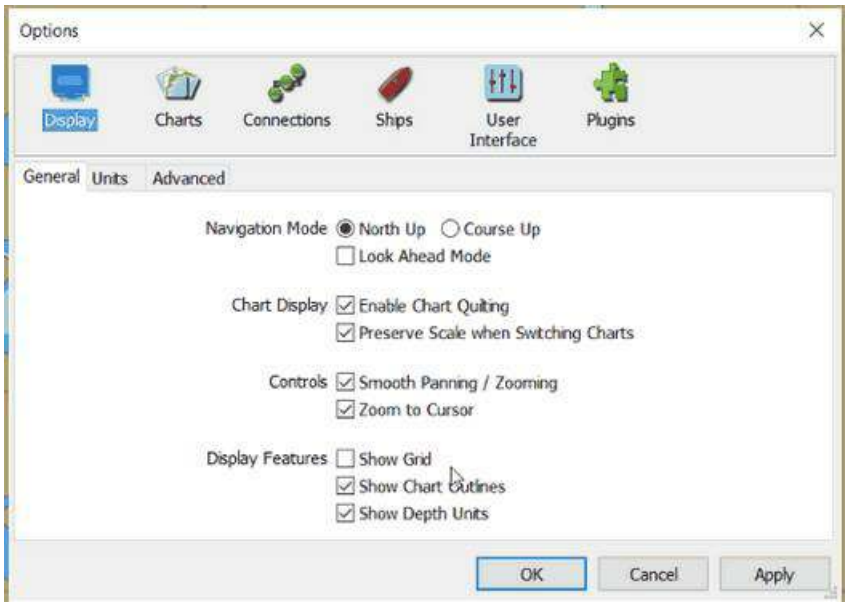
Download these charts from the Pilot Charts Page from the main website[167]

World Wide Magnetic Variation Chart 2010 -best viewed as a single chart. **Hit F9** to turn off quilting.
NOTE: The *WMM Plugin* is a better and easier way to view Variation.

BlueMarble World Chart

OPTIONS Setting

Click the  icon to open the **Options Dialog** which has 6 tabs, as seen below. All Settings that are not context sensitive are set in Options. The Settings are persistent, meaning that settings entered in one session will still be there on restart.



Quick links to content on other pages.

The Display
General
Units
Advanced

The Chart
Chart Files
Vector Charts Display
Chart Groups
Tides and Currents

The Connections
Linux Serial Connections
Connections Window
Example Data Connections Window
Filter NMEA Course and Speed Data
Show NMEA Debug Window
Data Connections - Add and Remove
Add a Serial Connection
Add a Network Connection
Network GPSD connection

Connections Filter
Input Filtering
Output Filtering
Connection Notes
Sending an Active Route to an Autopilot
Sending Routes and Waypoints to a GPS
Broadcast and Multicast

The Ships
Own Ship
AIS Targets
MMSI Properties

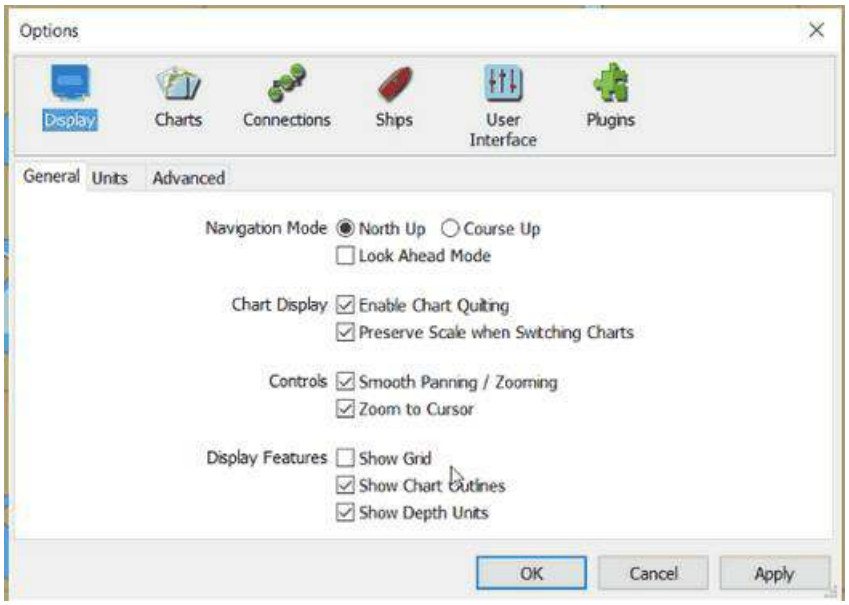
The User Interface
Enable Graphical User Interface
Enable Touch Screen Tablets
Use Settings for InlandECDIS

The Plugins
Plugins

Click the  icon to open the **Options Dialog** which has 6 tabs, as seen above. All Settings that are not context sensitive are set in Options. The Settings are persistent, meaning that settings entered in one session will still be there on restart.

The Display

General



Navigation Modes

North Up /Course Up

North Up is the normal way charts are shown, with north at the top. Course Up rotates the chart so what you see in front of the boat in real life is above the Own Ship icon on the display.

Lookahead Mode

The Own Ship icon will be offset from the center of the screen so that more of the chart is in front of Own Ship than behind. Read more in ***Auto Follow*** and ***Display Orientation***

Chart Display

Enable Chart Quilting

The screen shows several charts seamlessly stitched together. More in ***Chart Quilting*** .

Preserve scale when switching charts

Normally when switching charts OpenCPN will open the new chart scaled close to it's natural scale, the zoom factor stays the same. With this box ticked OpenCPN will keep the scale

from the last chart as close as possible when switching. The zoom-factor will increase as you switch to smaller scale charts.

Controls

Smooth Panning/Zooming

This works best together with OpenGL. Test to see how it works with your graphic card. If you are using OpenGL, tick this box as well.

Zoom to Cursor

With this box ticked the display is centered at the location of the mouse pointer when you zoom using the mouse wheel. When the box is not ticked the center of the display remains the same when you zoom with the mouse wheel just as it does when you zoom with the + and - keys or the zoom icons on the toolbar. In either case, if you click on the screen the point where you clicked will be moved to the center of the display.

Zoom to Cursor Summary

1. Keyboard, Menubar, and Toolbar zooms always zoom to center screen.
2. Wheel zoom behaviour changes depending on ZTC (Zoom to Cursor) and SmoothZoom settings.
3. ZTC (Zoom to Cursor) applies only to wheel zooms.

Display Features

Show Grid

Activate a latitude and longitude layer on the display. This feature only works if the display is in North Up mode. The grid is handy on vector charts, that normally lack this feature.

Show Chart Outlines

The borders of the available charts are shown.

- Vector charts are green
- Raster charts are red
- CM93 available larger scale charts are purple.

The CM93 chart outlines are not shown if using quilting mode. As a safety precaution, the outlines of isolated dangers with large scale charts available, are shown in CM93 even if “Show Chart Outlines” is off, provided that quilting is not used and the scale is large enough. At a scale of 1:200.000 or larger these isolated islands and dangers will be shown. Hence **it is recommended not to use quilting with CM93 when on a longer offshore passage.** Read more on ***Installing Charts***

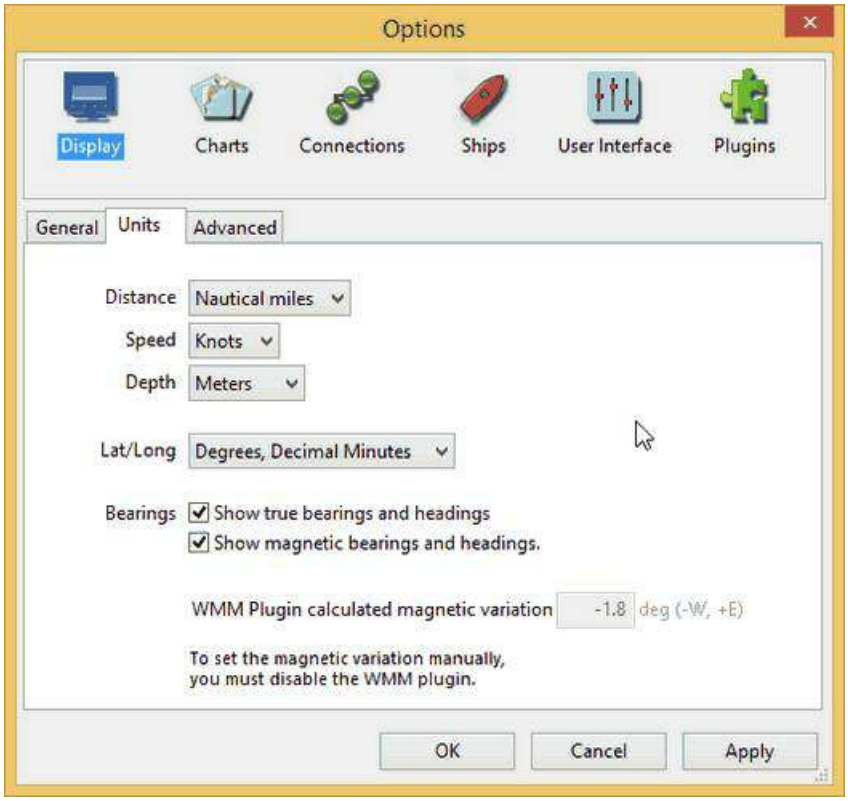
Show Depth Units Shows the charts' depth units on the screen in embossed letters in the

upper right corner. When in quilt mode, depth units are only shown if all charts in the quilt have the same depth unit.

Units

Choose the units that suit your way of navigating. These settings apply to everything in the core program. The exception is Radar rings, where the unit for distance between rings is selected separately.

Plugins have their own settings for units.



Distance

The options are: Nautical miles, Statute miles, Kilometers, and Meters. Short distances are less than 0.1 mile or 0.1 kilometer. If nautical miles or kilometers are selected short distances are shown in meters. If statute miles are selected short distances are shown in feet.

Speed

The options are: Knots, Mph, km/h, and m/s.

Depth

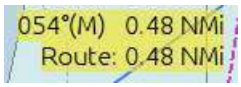
The options are: Feet, Meters and Fathoms.

Lat/Long

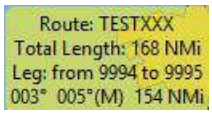
The options are: Degrees, Decimal Minutes; Decimal Degrees; and Degrees, Minutes, Seconds

Bearings

If “Show Magnetic bearings and headings” is ticked OpenCPN will use magnetic courses and bearings. By default OpenCPN uses true courses and bearings etc. Note that OpenCPN knows nothing about deviation. All magnetic courses and bearings will have an (M) suffix to show they are magnetic.



If BOTH “Show magnetic bearings and headings” and “Show true bearings and headings” are ticked you will get both values displayed.



The following settings will be affected: Bearings and Courses in the Route Properties dialog, route leg rollovers, and Active Route console will show true and (M). COG displayed on the bottom status line will be true COG and COG(M). AIS target reports will show target true COG and COG(M).

Variation will be calculated at Own Ship's position, if possible. AIS targets however, will use the targets position for variation, if possible.

OpenCPN is looking for the variation in the the following order.

1. If a GPS receiver that reports variation as part of HDG sentence is available, and if the HDG message also contains the E/W flags then O will use that.
2. If a GPS receiver that reports variation as part of RMC sentence, is available, this value will be used.
3. Otherwise, if the WMM plugin is activated, it will supply the variation, unless the user has selected the variation manually in options.
4. Lacking the above alternatives, the manually entered “Assumed Magnetic variation”, will be used for all calculations.

Assumed Magnetic variation

This value will be used if variation is not available through the GPS or the WMM plugin. The default value is 0°. Positive values denote easterly variation, negative values denote westerly variation.

Advanced

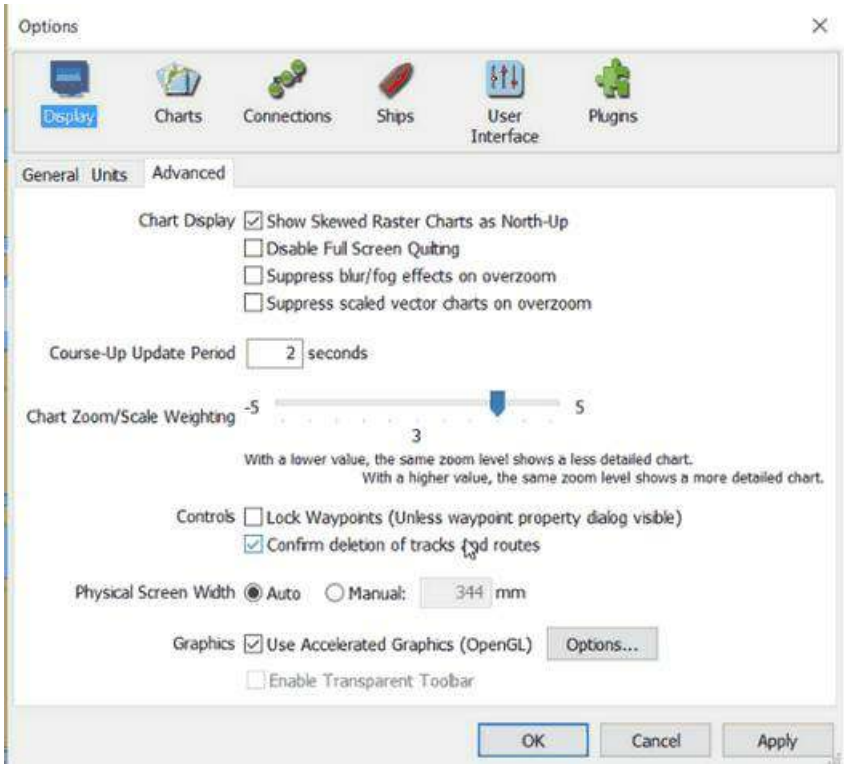


Chart Display

Show skewed raster charts as North-up

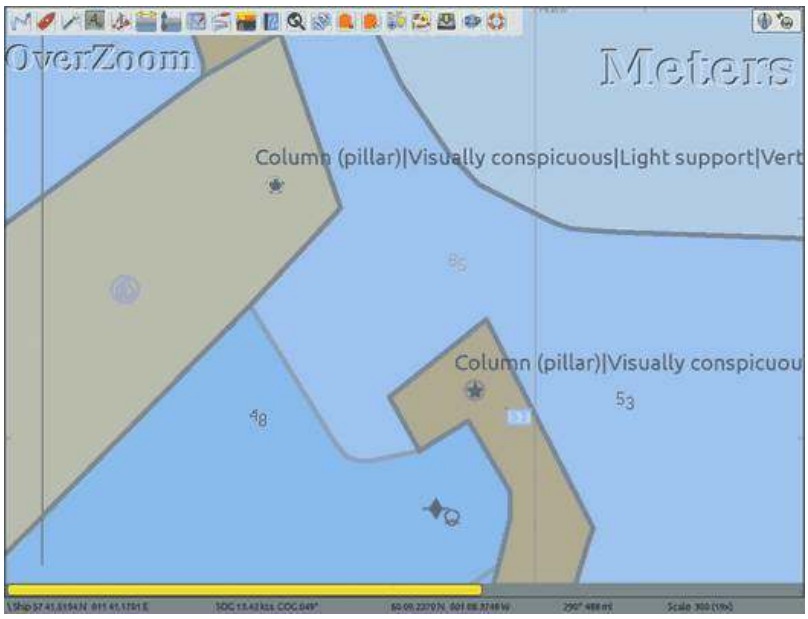
Skewed chart are normally shown as intended by the cartographer, “Chart up”. If this option is selected they are rotated to show North-Up. If you are looking for speed, don't tick this box. It slows down the screen rendering. Skewed charts are a common along the US Inter-coastal Waterway. More here: ***Auto Follow*** and ***Display Orientation***

Disable Full Screen Quilting:

By default all visible charts of an appropriate scale are used in the quilt. With this box checked only charts that overlap the center of the screen are used in the quilt. Checking this box is easier on the system and may give a performance boost in certain circumstances.

Suppress blur/fog effect on overzoom

Charts are commonly based on surveys that are twice the scale of the charts natural scale. For example a chart in 1:50,000 would be based in a survey in 1:25,000. Once a vector chart is zoomed in to a factor 2, the data do not support any more details. OpenCPN makes the navigator aware of this fact in a few different ways.



This screen-shot shows an example how overzoom warnings are shown.

At a zoom factor of 4 the embossed OverZoom warning will be displayed in the NW part of the screen. This applies to vector charts and raster charts using the Mercator projection.

From a factor 10 to 30 a blur or gentle bluish fog will be overlaid on vector charts. Overzoom blurring is performed only for those systems with modern and fully capable OpenGL drivers/cards. Otherwise, a very gentle “fog” is applied to extreme overzoom displays, as a visual que to the user that the chart is highly overzoomed. From a factor 10, lines and depth numbers on vector charts will be scaled and appear bigger, to further indicate the imprecision of chart features at high overzoom. This imitates what happens with a raster chart, when the individual pixels gets bigger and bigger.

If “Suppress blur/fog effects on overzoom” is selected the blurring or bluish fog, will be turned off.

Suppress scaled vector charts on over-zoom

If this option is selected the scaling of lines and numbers on vector charts will be turned off.

Note that the blurring effect and scaled vector charts does not apply to single chart mode, so these effects can be turned off temporarily by toggling the “Q” hotkey.

Below is how it looks like with both the above options activated.

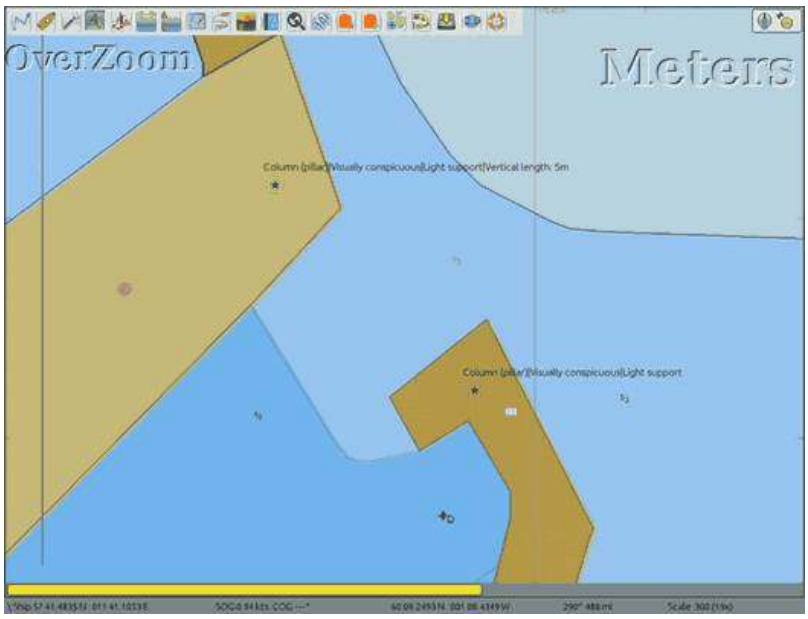


Chart Rotation Averaging Time

Chart Rotation Smoothing. *Course-Up Mode Display Update Period (old title)* Controls how often the entire displayed chart is updated when Look Ahead and/or Course-Up mode are activated. The Own Ship and AIS icons are still updated every second. The default value is 15 seconds. A “zero” value is allowed! The default mode is North-up. It's easy to switch between the two modes through the right-click menu or Display Orientation Icon next to the GPS Status Icon located upper right corner.

Chart Zoom/Scale Weighting

This option has a short description, on screen. Here are some further notes. The slider applies to zoom operation dynamics, not to static chart selection. The option really asks you this question. “On zooming in, when do we switch to a smaller scale chart if available?” Your answer may depend on your screen resolution and other preferences. The slider affects zoom-in operations most directly. Setting the slider to -5 delays switching to smaller scale to improve performance and visibility. Setting the slider to 0 restore the default behavior. Setting the slider to +5 switches sooner to a smaller scale chart to show more detail. It ias not intended that a user exercise this control very often. Maybe experiment, set it to your liking for average charts in your area, and leave it set.

Controls

Lock Waypoints (Unless waypoint property dialog visible)

Locks waypoints and prevents accidentally moving them unless a waypoint property dialog is visible. Selecting this option reduces the risk of accidentally altering routes and waypoints but makes editing them more cumbersome.

Confirm deletion of tracks and routes

If selected this option provides a safeguard against deleting important data by mistake.

Physical Screen Width

If set to “Auto”, the default setting, OpenCPN will use the size that the operating system reports. Unfortunately this is not always correct, leading to an incorrect scale on screen for the charts. The OpenCPN log will state what your operating system thinks about your screen size.

19:03:44 CET: Detected display size: 338 mm

You can manually enter the width of your screen by selecting “Manual” and entering the width in millimeters. The value shown is from a sample 17“ screen.

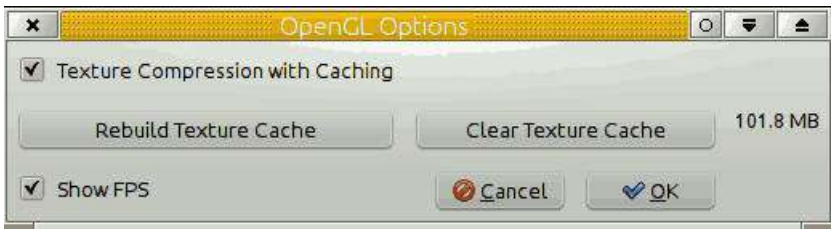
Graphics

Use Accelerated Graphics (OpenGL)

The net effect of full OpenGL optimization on raster charts with compatible hardware is nothing short of amazing, especially with low-spec, low-power systems. Unfortunately the support for OpenGL on Windows is sometimes problematic. Intel's OpenGL graphics drivers on Windows are very buggy, for example. **Read more on the *OpenGL* page!**If you have started OpenCPN without OpenGL support, this option will be greyed out.

Options

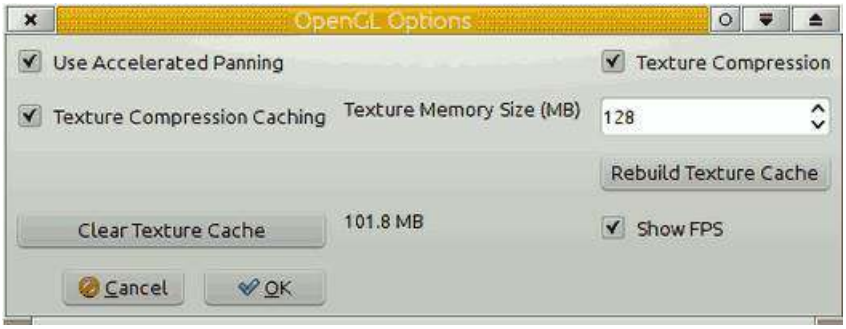
The standard Option dialog looks like this



An expert version is available by adding a line to the opencpn.ini (opencpn.conf) file.

```
[Settings]
....
OpenGLExpert=1
```

To turn the expert version off, change the value from “1” to “0”, or delete the line.



Use Accelerated Panning

Works if your graphics card supports Frame Buffer Objects.

Texture Compression

Greatly improves the speed of raster chart display. It works by treating raster charts as compressed textures instead of bitmaps, and these textures are loaded and displayed much more efficiently by the graphics hardware. They also consume much less GPU memory space.

Texture Compression with Caching

A further improvement to raster chart display loading and panning. This option uses the system hard drive to store pre-calculated raster chart compressed images in a way that is optimized for direct loading into the graphics card. When enabled, the texture cache is created dynamically, as charts are visited in normal navigation. Depending on the OpenGL hardware capabilities, there may be some slight, but noticeable, delay as a chart is accessed the very first time while the textures are created, compressed, and written to disk. Once a particular chart section has been cached, subsequent accesses are very fast. If the OpenGL hardware texture buffer is capable, then rendering on-screen is virtually instantaneous.

- The cache understands color scheme changes. Cache entries are automatically created for each of the 4 possible BSB color schemes, as they are encountered in normal operation.
- The cache understands chart Edition Dates. So, if one manually updates a chart (thus changing the chart's Edition Date), the old cache contents will be discarded, and a new cache will be built automatically as the new chart(s) are visited.
- Using compressed texture caching retains all the benefits described earlier. It is very much faster on low spec hardware, at the expense of more disk space usage.
- There is a command line option which will build/update your compressed texture cache. You may execute opencpn like this: opencpn /rebuild_gl_raster_cache (-rebuild_gl_raster_cache on linux)
- “Texture Compression” and “Texture compression caching” may actually slow down some machines, depending on the capabilities of the video system.
- If you are using OpenGL on a low-spec machine, you will have better performance if you
    1. disable texture caching, or
    2. Pre-build the texture cache in a region of interest. That is, move the boat to say

Dover. Then do Options → openGLOptions → Build Texture Cache. You do not need to wait the entire time, which may be hours for a large chart set. “Skip” out when the distance reported is 100 miles or so. Eventually, after steady use, your texture cache will be filled automatically in the background, and performance Show FPS will increase steadily.

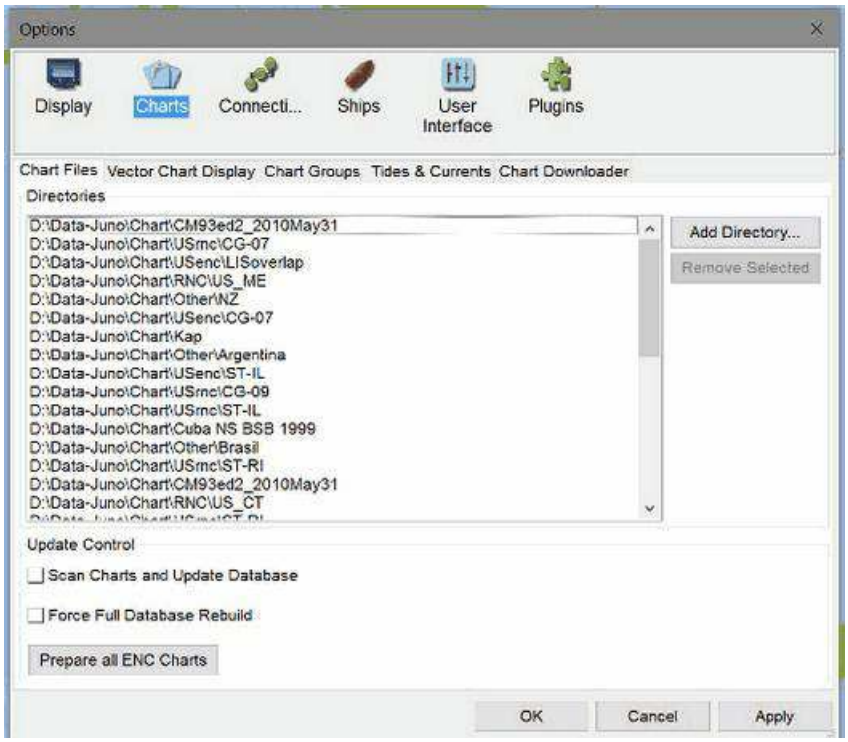
The size of the current "Texture Cache"

Appears just to the right of the button “Clear Texture Cache”. In the picture above this value is 101.8 MB.

- **Show FPS** FPS stands for Frames Per Second, and is one way measure OpenGL performance. The number appears in the lower right hand corner of the display, to the right of “Scale”. Above you see “26 fps”. If you report a graphical problem, expect the devolopers to ask you about this figure.
- **Enable Transparent Toolbar.** This option is grayed out in OpenGL mode, as the feature only works in traditional mode. On Linux it is necessary to activate a window manager compositing system, such as Compiz or GNOME Shell, to have a transparent toolbar.

The Chart

Chart Files



Add Directory

In OpenCPN charts are added by adding the directory (folder) that contains the chart files. This tab is where charts are added and removed. Read about the details in ***Installing Charts***

Remove Selected

Mark the chart directories that are no longer needed, press the button an then “Apply” or “OK”.

Scan Charts and Update Database

Use this option if you have made any changes to the contents of your chart directories, as for example after downloading new charts from NOAA, etc. It need not be checked if directories are added or subtracted, as the entire database will be scanned and updated automatically in this case.

Force Full Database Rebuild

Is mainly aimed at users converting or correcting existing charts, in a situation where changes

are made to the geo-referencing, outline of the chart, or other attributes in the kap file header section.

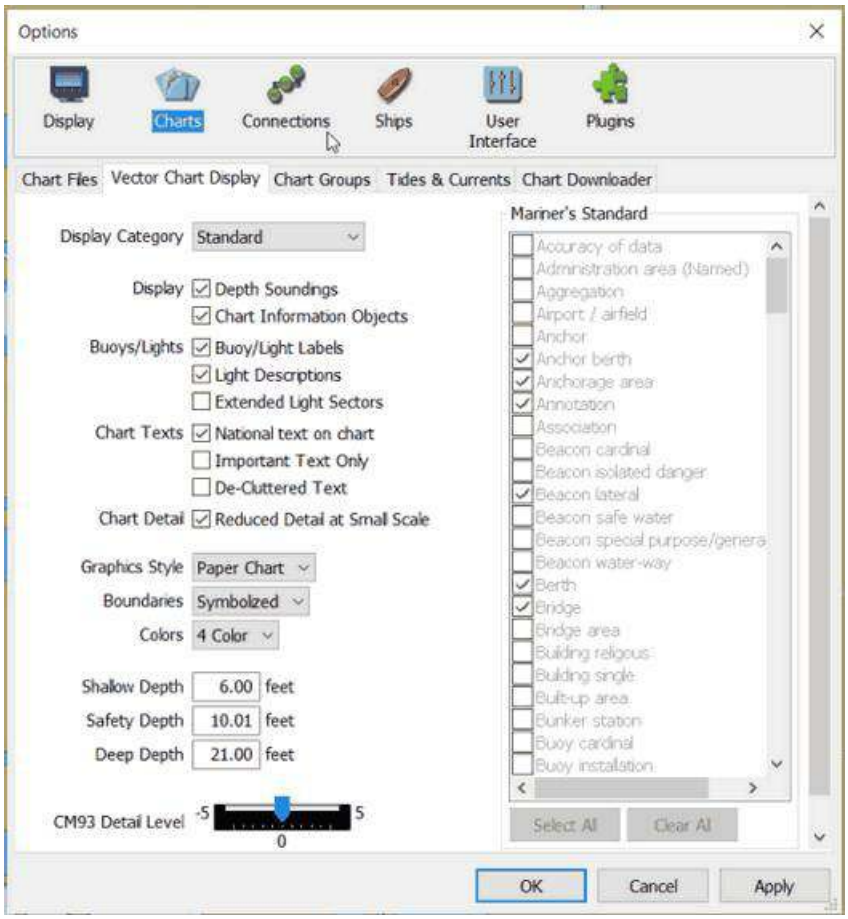
Prepare all ENC charts

Batch processes all ENC Charts to Senc format, which can take a long time and is not required.

The process converts all existing S57/S63 charts to an internal SENC format for fast loading. The button is there on popular request, and means that when completed, OpenCPN will not pause to process a chart when encountered the first time. Instead all charts are processed at once when the button is pressed. The process can take quite some time, depending on your system. If you have recently done the new conversion and add a chart, pressing the button will be fast as only the new chart is processed.

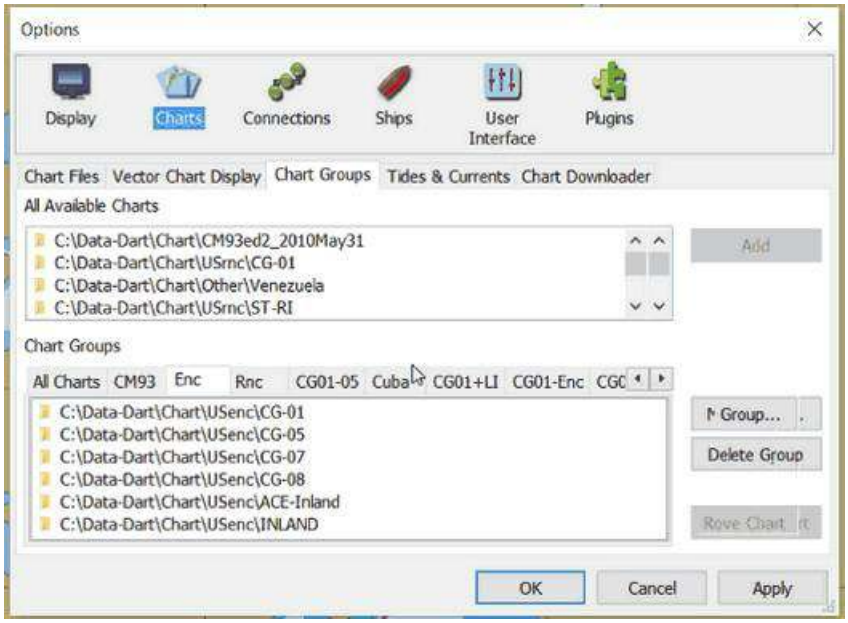
NOTE about Version 4.8.0: There is a new naming system for the processed files. It's a good idea to delete the SENC folder the first time you use the new beta, and then press “Prepare all ENC charts”. The only reason for this is to save some space on your hard disk.

Vector Charts Display



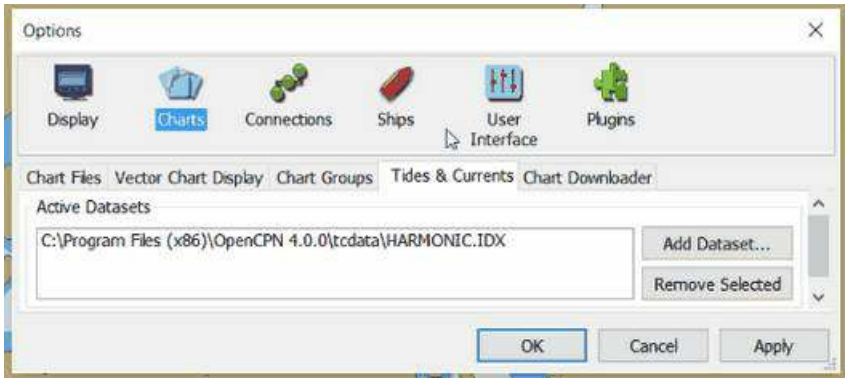
Read more about ***Vector Charts*** .

Chart Groups



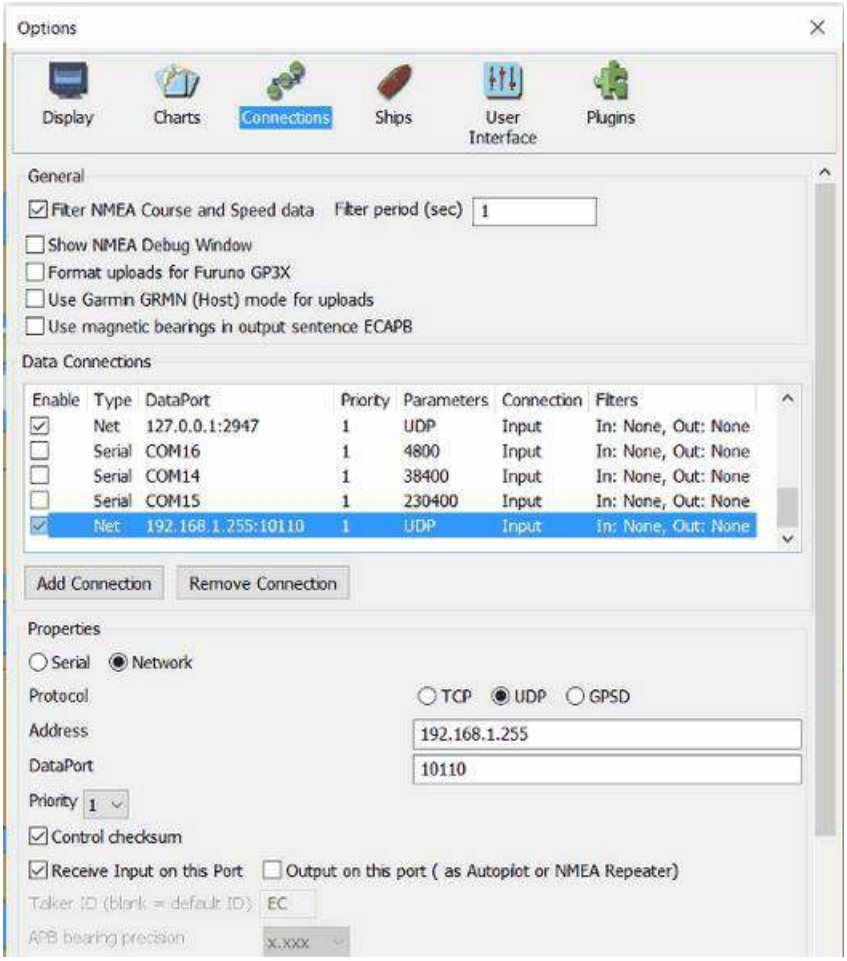
Read more about ***Chart Groups*** .

Tides & Currents



Read more about ***Tides and Currents*** .

The Connections



Features and Improvements

NMEA Sentences moved to “Advanced Features”

OpenCPN version 3.2 featured a complete redesign of the NMEA message handling structure, including a new GUI and monitor window. This feature has been further improved and tuned in version 4.2. The current scheme provides extensive NMEA management capabilities, including:

- Input message filtering, by TALKER ID and/or message type.
- Implement configurable NMEA Talker ID.
- Virtually unlimited input port multiplexing, with shared I/O and individual data rate settings.
- Selective message echo capability, similar to third-party mux applications.
- Programmable output port messages, for e.g. autopilot interfaces.
- Full Network input and output, including TCP, UDP, and GPSD services.
- GPSD client support for Windows platforms.

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Linux Serial Connections
Connections Window
Example Data Connections Window
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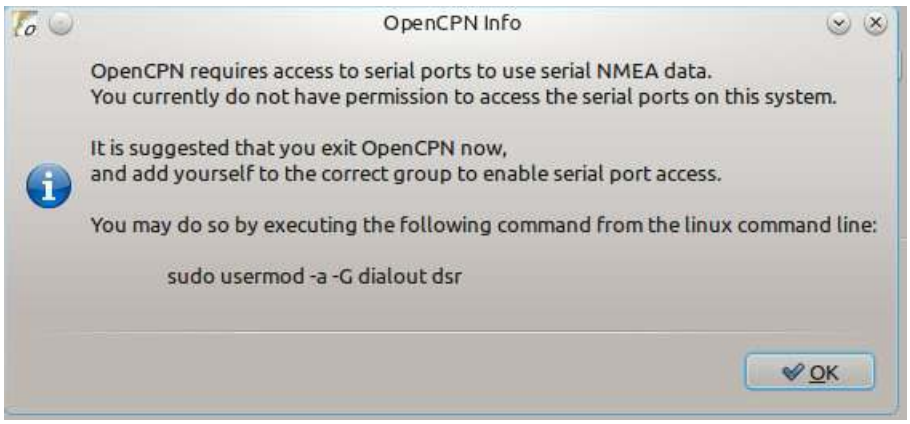
Show NMEA Debug Window
Data Connections - Add and Remove
Add a Serial Connection
Add a Network Connection
Network GPSD connection
Connections Filter
Input Filtering
Output Filtering
Connection Notes
Sending an Active Route to an Autopilot
Sending Routes and Waypoints to a GPS
Broadcast and Multicast

Linux Serial Connections

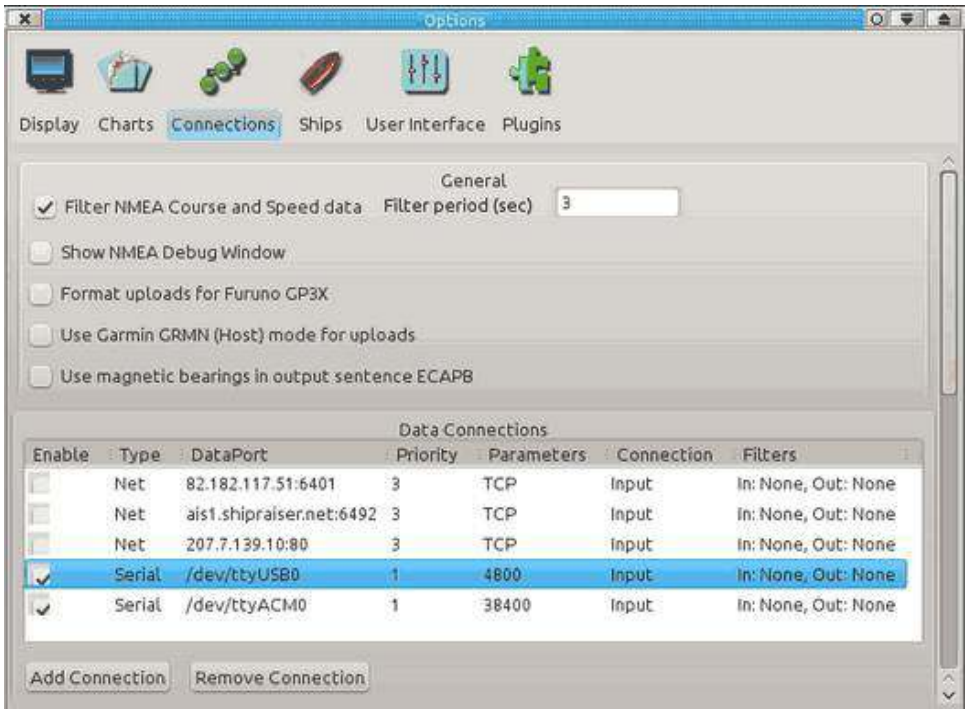
Make sure that you belong to the “`dialout`” group. To find out, run the “`$groups`” command. If you're not in “`dialout`”, add yourself with the command “`$sudo usermod -a -G dialout $USER`”. Logout of your current session for group changes to take effect. Check this straight away, it will save you from frustration later on. If there is a problem connecting the GPS to a physical port, such as `/dev/ttyS0`, the reason is probably that you don't belong to “dialout”. OpenCPN will display a warning, once per session, if you try to configure a serial connection, or starts the program with an active serial connection, and don't belong to the right group.

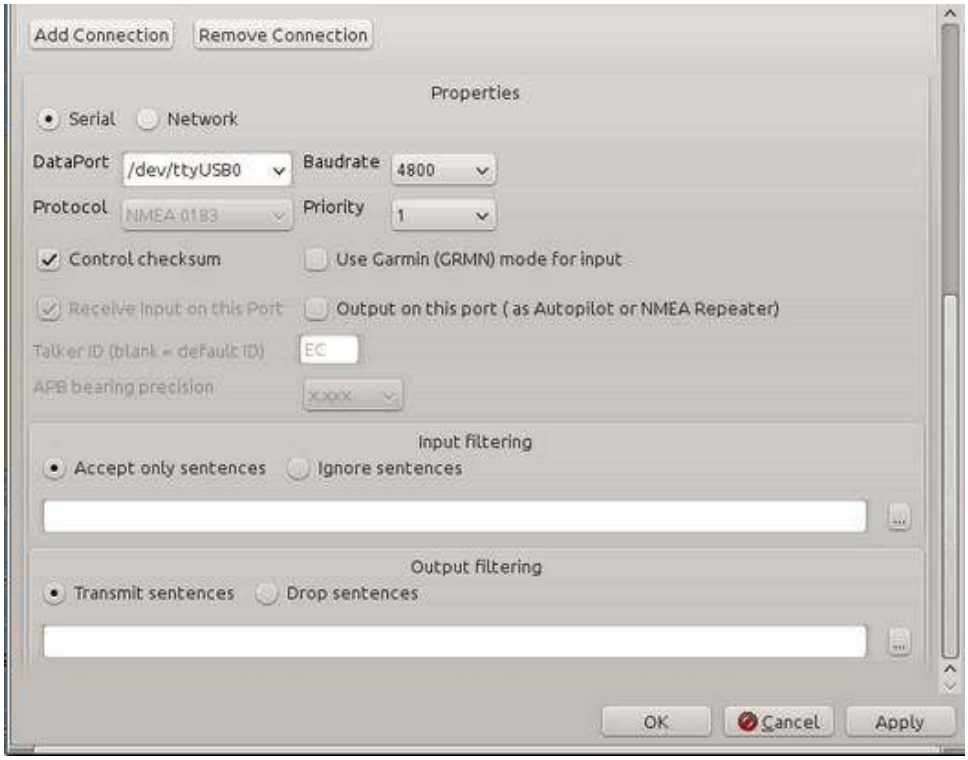


Red Hat based Linux versions are using the "uucp" group. Check what applies to your version of Linux, by using the return from the command `stat -c %G `ls /dev/*|grep -m1 tty[A-Z,a-z][0]` If the return is "`root`", upgrade to a contemporary Linux version.

Connections Window

All this is different from the logic in earlier versions of OpenCPN. From version 3.2, there is no defined "autopilot" port. The autopilot is simply connected to any available output-enabled data-stream, and gets everything on the bus, subject to user specified output filtering. There is no specific "shared" AIS and GPS port, as all ports are shared.

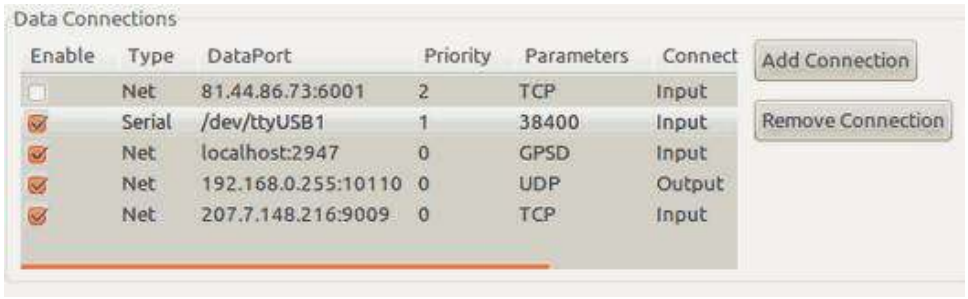




The key point to keep in mind with this new setup is the complete orthogonality between message sources, message destinations, and transport media. All messages come and go from an internal “bus”, and all internal modules have access to all messages. Any message can be received, and possibly re-transmitted according to the configuration established. If the messages get onto the bus,

OpenCPN will do the right thing. For example, if it is an AIS message, the AIS module will get the message and act accordingly. Plugins also get all messages.

Example Data Connections Window



To get a taste of what can be done, we start with a lab scenario. In the screen-shot above, four Data Ports are enabled.

- **GPSD on localhost port 2947**
- **/dev/ttyUSB1 as ais port**
- **output port** to a computer on the local network
- **San Fransisco AIS** feed.

Note that the connections are automatically sorted in order of the priority setting The picture is from a Linux computer, but the receiving box is an Win XP. Both boxes are configured to use the same broadcasting address '192.168.0.255' on the local network, using the default 10110 port. Note that **UDP**, and not TCP, is used. OpenCPN on the XP box receives and shows all info from the three first ports and even data from the VDR plugin, if it's running. *All input sources are merged together and available to transmit to an external computer. Every computer on-board can be used as a repeater to the main box!*

Note that in this scenario the UDP connection is output only. In previous releases of OpenCPN all UDP data connections would read data as well as write. This is a possible configuration in the current release but neither required nor generally desirable. If a broadcast connection is read/write, all data written will be read back leading to the potential for data loops.

- To avoid this, the priority of any read/write broadcast connection should be set lower than that of any other interface on which OpenCPN receives data for re-distribution over that interface.
- For most purposes **setting a broadcast connection to either read or write is the preferable solution**.
- The San Francisco AIS feed has now changed to ip address 76.103.90.196, also on port 9009.

There is no advantage to using a broadcast address on the local network with just a few computers. It's as easy to just specify the addresses of the receiving computers as outgoing connections on the transmitting computer. The “receivers” specify the “transmitter” as address for a connection.

In real life, **a common setup** will include input from GPS, AIS and output to an Autopilot. If your GPS produces GPRMC, then this will be automatically shipped to the autopilot.

- Everything on the internal multiplex bus will be sent to the output port that the autopilot is connected to, even if a route is inactive.
- If, a route is active, OpenCPN will create and send NMEA (EC)RMC sentences to output data ports.
- The only reason OpenCPN “synthesize” an ECRMC sentence is to cover those odd cases when there is no other source of RMC in the system, and the Autopilot wants variation, SOG, etc. This might be the case if an older GPS produces GPGLL alone, for instance, which has no var. There is no “new” information in the transmitted, synthesized ECRMC.
- The autopilot might be complaining that it is getting RMC information from two different talkers (GP and EC) at the same time, and cannot decide what to do. The easiest solution if don't like the ECRMC, is to filter it out of the output stream of the port connected to the autopilot. Or choose a filter to allow only GPRMC and ECRMB for this port.

Filter NMEA Course and Speed Data

Providing a rolling average of COG/SOG, with configurable sampling period. This feature is useful, for example, if you find that course and speed from the gps is varying erratically due to the sea state. The Dashboard plugin is not affected by this setting - COG and SOG are

updated about once per second.

Show NMEA Debug Window

If you check this box you will get a window that shows the NMEA data sentences coming into or going out from OpenCPN. In the picture above we can see the color-coding at work. Messages in red could occur as well, and indicates a transmit error. Connections Priority change messages, will also be printed to the NMEA Debug Window. The reason that AIVDM messages are both dropped and appear as “Output message”, is that there is more than one source for this message, and the filter just applies to one source.

Have a look at the page NMEA Sentences to see which messages are understood. OpenCPN generally does not care about the Talker ID, the first two letters in the message type. $GPGGA above, is the talker GP = the gps, sending a GGA = position message, for example. At the end of each sentence there is a “*” followed by a calculated checksum.

To see all messages it's important to close the Options dialog completely, while leaving the NMEA Debug window open. *The ECAPB sentences etc, will not appear while the Connections dialog box is open as autopilot output is disabled during this time.*

Known issues: The pause button only works if the main Options dialog is closed. In Linux, the debug window can only be closed by unticking the *Show NMEA Debug Window* box, unless the the main **Options** dialog is closed.

If there are NMEA sentences in the debug window, then OpenCPN has opened the port set in the Data Connections. Note that the source of each NMEA sentence is printed after the time stamp o each line. If your GPS port is configured, and there is no “red” boat, then the only reasons are: no gps fix or wrong sentence configuration from the GPS.

Messages originating from **GPSD** or the VDR (Voyage Data Recorder plugin) will also show up in the debug window.

For simple NMEA data stream debugging, add the following to your **opencpn.ini** file:Under *[Settings]* add a line *DebugNMEA=1500* This will provide up to 1500 debug messages pertaining to NMEA traffic to the *opencpn.log*.

Format uploads for FurunoGP3Xinputfiltering: If the special Furuno gps protocol is needed, tick this box. The reason is that Furuno uses their own version of NMEA for uploading routes. Furuno GPS users take note. It is now allowed to use a numeric, two digit OpenCPN route name (e.g. 10, 21, etc).

Use GarminGRMN (Host) mode for uploads. Make sure that this box is ticked, if you have a Garmin GPS. The reason for this is that Garmin units cannot accept route uploads via standard NMEA0183. This is a “design feature” of all Garmin receivers.

Use magnetic bearings in output sentence ECAPB. Some autopilots, among them Simrad, require navigational bearings, contained in the APB sentence, to be transmitted as Magnetic bearings rather than as True bearings, OpenCPNs default.

Data Connections - Add and Remove

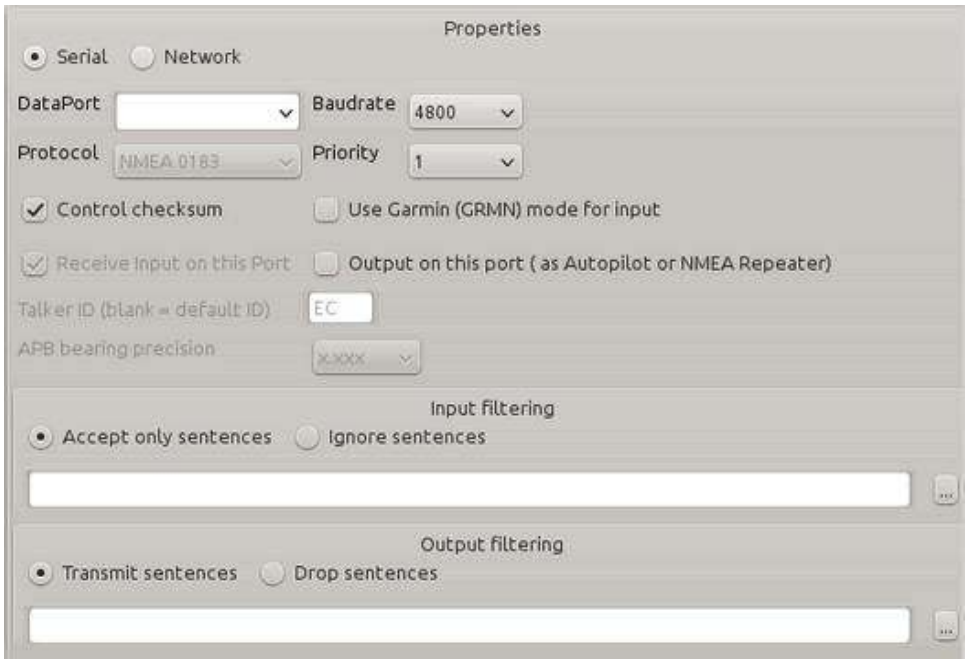
Two Buttons “Add Connections” and “Remove Connections”, to the right of the Connections window are the key to this whole tab.

The enable choice at the start of each connection line, is handy to organize connections, but still only use those that are needed for the moment. Tick or un-tick, and then press “Apply”, to activate the setting.

A connection can be used for input and output at the same time, with the reservation that they have to use the same Baud rate. For more details, read on.

When pressing “Add Connections” two basic choices are given, a serial or a network connection.

Add a Serial Connection



DataPort: Pick a port by pressing the \/ o the right side of the field. If the port you are looking for does not appear in the selection, write the correct port yourself in this field.

Baud Rate: This is normally 4800 for GPS and 38400 for AIS, but check the documentation for the connected device. It's important to get this right and not just guess.

Protocol: For future use, as only NMEA 0183 works, for now.

Priority: Higher number equals Higher priority. The priority is set for each NMEA sentence individually. As long as a higher priority stream is available it's used. If this fails the next stream in line, with lower priority, kicks in and is used, until a higher priority stream appears. The present filter does not handle the case where, for example position messages, are received from different sentences.As an example, GPGLL and GPRMC both transmits the position information. The last received of either message will be used.

Control Checksum. At the end of each NMEA sentence is a checksum, that makes sure that sentences are correctly received. This box is ticked by default, as OpenCPN calculates the checksum and compares it to the received checksum. Only sentences with a valid checksum are passed through. Un-ticking may help, if an application calculates checksums incorrectly or if the checksums are missing.

Use **Garmin(GRMN)** mode for input: Make sure that this box is ticked, if you have a Garmin GPS set to this mode. The reason is that Garmin uses their own serial protocol.

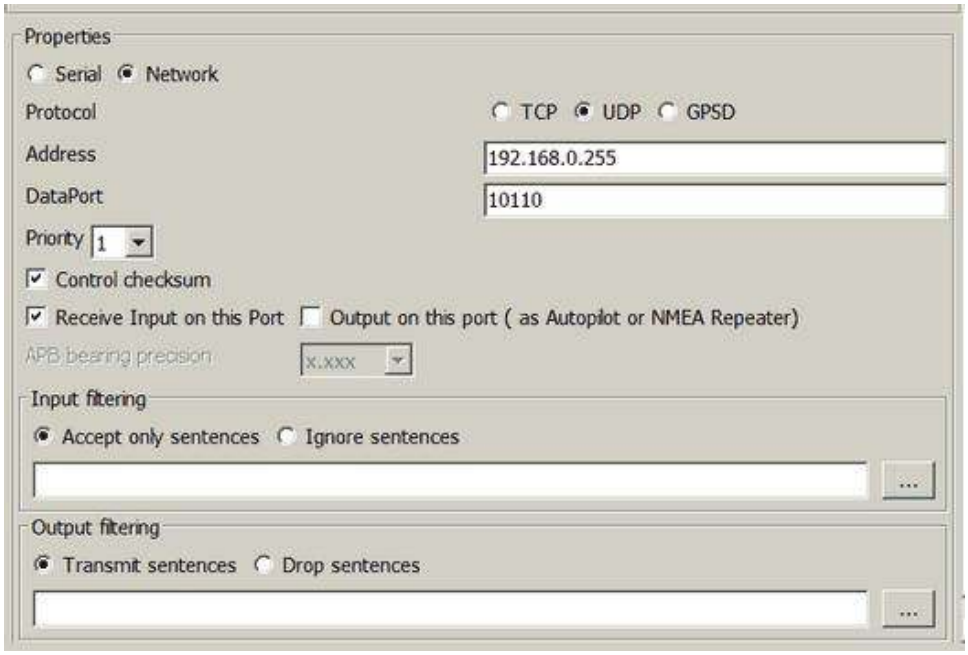
Receive input on this Port Greyed out here as it only applies to a network connection. see more below.

Output on this port (as Autopilot or NMEA repeater): Tick this box if the connection will be used for output. A common case is sending NMEA to an Autopilot. * Talker ID solves the problem where some “temperamental” devices, which should accept given sentences irrespective of the talker ID, in fact only accept for example GPRMC and not ECRMC

APB bearing precision is greyed out unless “Output on this port” is checked. APB is the NMEA sentence “Autopilot Sentence 'B'”. The precision can be set to between 0 and 4 decimals, were 3 is the default. Some autopilots requires a different precision than the default, to work. Check your AP documentation.

- Note: The **APB bearing precision** (or NMEAAPBPrecision in Opencpn.ini file) setting is set in the Options > Connections settings page for connections that have outgoing messages. The precision is applied in the src/nmea0183/ apb.cpp file and is applied to:
  - CrossTrackErrorMagnitude
  - BearingOriginToDestination
  - BearingPresentPositionToDestination
  - HeadingToSteer
- This change was made as some auto pilots are limited in the precision they can accept in the APB message. So all other messages and internally the precision is not changed. There is no change to the XTE message as that was not requested at the time. “XTE - Measured cross track error” NMEA message, that is a part of the APB message is not adjusted by the APB bearing precision setting.

Add a Network Connection



Protocol Choices: TCP, UDP or GPSD

TCP

A “connection-oriented” protocol which provides a reliable link between two network endpoints. TCP ensures that any network packets lost in transit are re-transmitted. Internet AIS servers normally accept TCP connections as do many serial-to-network/wifi devices.

To make a connection to a remote TCP server, enter its *IP address* or *hostname* in the “**Address**” box and the TCP port on which the server listens in the “**DataPort**” box. Many devices use a non-standard TCP port rather than OpenCPN's standard 10110, so do check the server's documentation.

If “**0.0.0.0**” is entered in the **Address** box, OpenCPN will act as a **TCP server** accepting a connection from a **remote TCP client**. OpenCPN will **listen** on all its host computer's network interfaces for **TCP connections** to the port specified in the “**DataPort**” field. There should normally be no reason to select a “**DataPort**” value other than the **standard 10110** unless multiple servers are required:

- In the current implementation a single data connection can accept only one client.
- If multiple clients wish to connect to OpenCPN, a dedicated data connection must be provided for each and each data connection must have a different DataPort.

UDP

A method of transmitting data as simple “**datagrams**” without negotiating a connection between two endpoints. It involves no detection and retransmission of data lost in the network. Within a small home/boat network such data loss should not normally occur and in any case, NMEA data is generally updated by “talkers” on a regular basis. Unlike TCP which involves a connection between two endpoints, UDP data may be received by many “listeners”.

- For UDP input no IP is required. Try just going with the port. 0.0.0.0 :1456
- For UDP NMEA senders if you make the last octet of the IP address 255 then messages should go to all devices on that subnet. In OpenCPN the address should be 0.0.0.0 (don't care) and the port number must match the sending port number. Also, any router in between the sender and O must be configured to not block the assigned port number. Sometimes a really high port number (like 10110) will not be blocked.

An **OpenCPN UDP data connection** will listen for data destined for the **specified DataPort** on any system interface or the broadcast address of any connected network.

- If you don't need to receive multicast data or transmit any data, you may enter "**0.0.0.0**" in the "Address" box, if you are unsure of what to enter there. Alternatively you may specify the address on which you *intend to receive data*. In both cases behavior will be the same.
- If you wish to receive multicast data you must enter the multicast address to which those data are being sent or the system will not see them.
- If you wish to transmit any data ("**Output on this port**" checked) you must *put the address you wish to send data to in the "Address" box.*
- In all cases (transmit, receive or both) the DataPort must be specified.

For more information about broadcast and multicast, see Broadcast and Multicast below.

GPSD

A Unix/Linux gps server, which means that several different applications can share one gps receiver. Linux users have the choice between using serial or GPSD connections for their gps input.

- **Ubuntu users take note!** If gpsd is installed - use it. If you prefer a serial connection, un-install gpsd. The reason is that gpsd starts automatically when,for example, an USB gps is connected. This will block the serial port that the gps communicates with(/dev/ttyUSB0 in many cases), hence no separate serial connection to the gps is possible. So it's an either or situation.
- **OpenCPN also has support for Windows clients.** So a windows computer should be able to connect to GPSD running somewhere on a network (testing), as an alternative to an UDP connection, described earlier. * Address: The network address to connect to. In the example above we used the broadcast address for convenience, but specifying host to send to, and host to receive from, works as well.

Port: The port to connect to on the network address. The default port for UDP is 10110. Port 10110 is designated by IANA for "NMEA-0183 Navigational Data". There should not be any reason to change this port, but it is possible. See below. The default port for GPSD is 2947. Do not change this!

- For your own local connections use port-numbers greater than 1023 and avoid ports used by other applications. *Ports in the range 49152 through 65535 are not assigned to other applications and should be OK.* Make sure that no firewall is blocking the port you pick.

Network GPSD connection

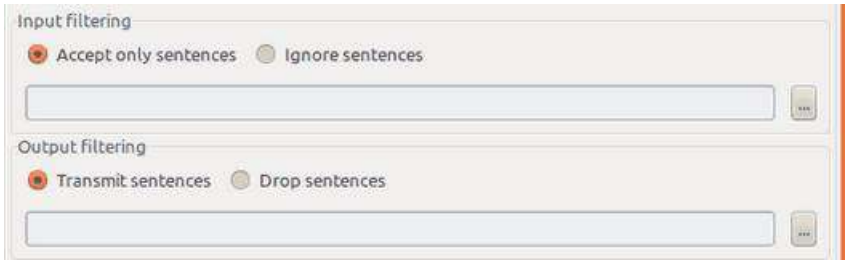
When connecting to GPSD, running on your local computer, use the settings shown above.

Connections Filter

For each source line in the data connection windows, it's possible to specify exactly which NMEA sentences to receive, and which ones to drop. Similarly it's possible to control exactly which sentences to send out to, for example, an autopilot.

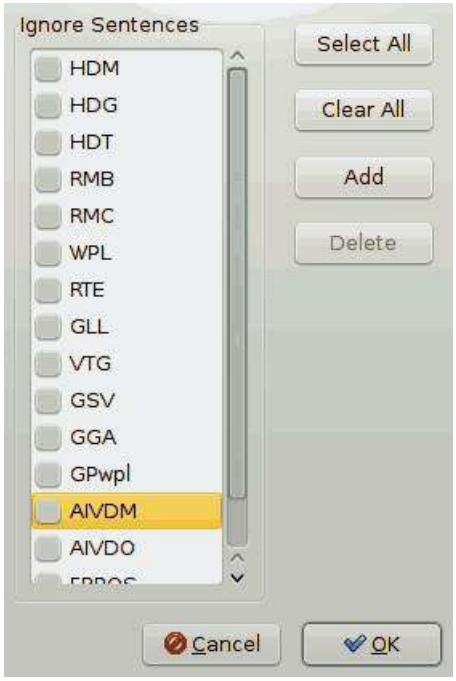
The applied filters for each connection are stated in in the “Filters” column in the Data Connection window. The default for a connection is no filters at all. * The set filters applies to both the core program and the plugins.

Filtering can be observed in real time, through color coding in the Debug Window.

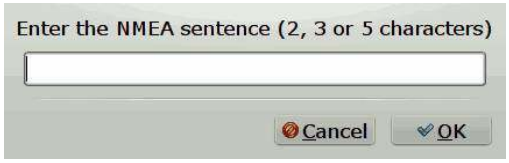


Accept only sentences: Either base your filtering on stating which sentences to accept or which to ignore.

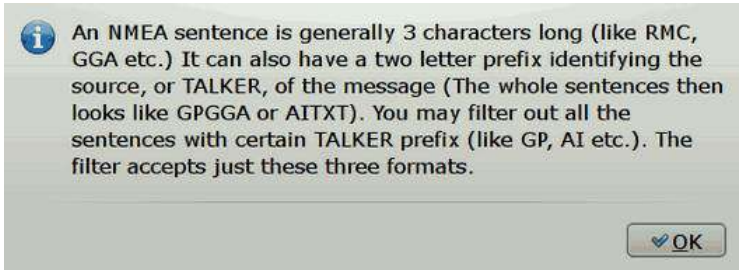
Ignore sentences: Same as above. To select filters press the button. The dialog below becomes available.



A lot of NMEA sentences are listed. Just tick the box to select a sentence. “Select All” or “Clear All” are also available. For sentences not listed press “Add”, and enter a new NMEA sentence.



Your entry must conform to these rules.



When you are finished, press “OK”, your new entry will appear at the bottom of the list of NMEA sentences to filter. It will already be ticked, so just press “OK” until you are back in the original Connections tab. Now press “Apply”. The implemented filtering should now be visible on the connection line. For more, see below

Receive input on this port: This box should be ticked if you want to receive receive data on this connection. If the connection will only be used to output to other devices it should not be ticked. If you wish to broadcast UDP data for consumption by other devices or programs, leaving this box unticked will save you having to worry setting the priority of the connection to avoid data loops.

Output on this port (as Autopilot or NMEA repeater): Tick this box if the connection will be used for output. A common case is sending NMEA to an Autopilot. * APB bearing precision is greyed out unless “Output on this port” is checked. APB is the NMEA sentence “Autopilot Sentence 'B'”. The precision can be set to between 0 and 4 decimals, were 3 is the default. Some autopilots requires a different precision than the default, to work. Check your AP documentation and see Note below.

OpenCPN creates and sends the NMEA ECRMB and ECRMC sentences to the A/P output port when a route is activated. If variation is not otherwise present, OpenCPN includes variation, coming from the WMM plugin, if installed and enabled.

Note: The “APB bearing precision” (or NMEAAPBPrecision in Opencpn.ini file) setting is set in the Connections settings page for connections that have outgoing messages. The precision is applied in the src/nmea0183/ apb.cpp file and is applied to:

- CrossTrackErrorMagnitude
- BearingOriginToDestination
- BearingPresentPositionToDestination
- HeadingToSteer
- This change was made as some auto pilots are limited in the precision they can accept in the APB message. So all other messages and internally the precision is not changed. There is no change to the XTE message as that was not requested at the time. “XTE - Measured cross track error” NMEA message, that is a part of the APB message is not adjusted by the APB bearing precision setting.

Fix Me! {{opencpn:manual:action-filter.jpg?nolink&28×30}}

Input Filtering

Some examples to illustrate how things works.

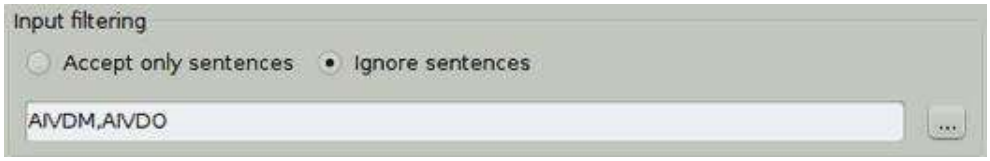
Accepting the filter above leads to this in the filter column on the connection line:

In: Just AIVDM,AIVDO, Out: None

If “Ignore sentences” is marked instead, the line looks like this:
In: All but AIVDM,AIVDO, Out: None

Output Filtering

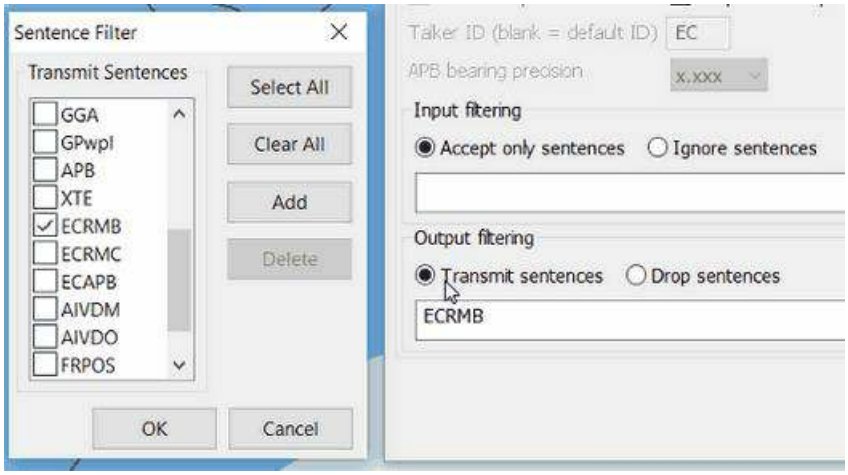
Similar to input filtering above.



Transmitting three sentences.

In: None, Out: Just WPL,GSV,GPwpl

Another Example of Output Filtering



Feature: Can now select the NMEA talker ID of sentences output by OpenCPN on a given port.

Situation: OpenCPN (correctly) outputs its NMEA sentences with the “EC” talker ID as is normal and expected behavior (see below).

Problem : Some “temperamental” devices which should accept given sentences irrespective of the talker ID in fact only accept for example GPRMC and not ECRMC.

Example: An Icom VHF is a such example. and because the multiplexer has been set to give precedence to nav info provided by OpenCPN, rather than the GPS, the result is that when OpenCPN is driving the autopilot, the VHF does not receive any position anymore for its DSC feature. Safety-wise, this is not desirable.

Solution: Being able to either change the ECRMC sentences into GPRMC, or duplicate ECRMC on the output port should solve the issue.

Send to GPS

Dropping them instead.

In: None, Out: All but WPL,GSV,GPwpl

Connection Notes

If you already have an application connected to your gps, on a serial port, OpenCPN will not be able to connect to the same port. Two applications cannot use a port simultaneously . __On Linux use Gpsd in such a situation. Of course this only works if your “other application” supports the Gpsd. As an alternative on Linux you can use Kplex (also for Mac) or Muplex which can create pseudo terminals (“virtual serial ports”) to share NMEA data between applications.

If a NMEA sentence is filtered on an input connection and “LegacyInputCOMPortFilterBehaviour=1” setting in opencpn.conf|ini, it will still enter the internal multiplexer. So, it will be available to output connections, unless it's filtered there as well. If “LegacyInputCOMPortFilterBehaviour=0” then the message will not be placed on the internal multiplexer. This will only work for serial connections. Echoing back a network connection, on the input port for output, will not work

- NMEA data can also come from the VDR plugin. They will be labeled as such in the Debug Window and have “0” priority.

No Flow Control on Serial Ports By nature NMEA doesn't do flow control. If a message gets lost, it gets lost… It will be repeated at some point, and buffering a delayed message that has lost it's meaning, when there is more current & accurate data available is not useful. f interfacing the NMEA-specified way, there is no path for hardware flow control. It's not compatible with NMEA in any way.

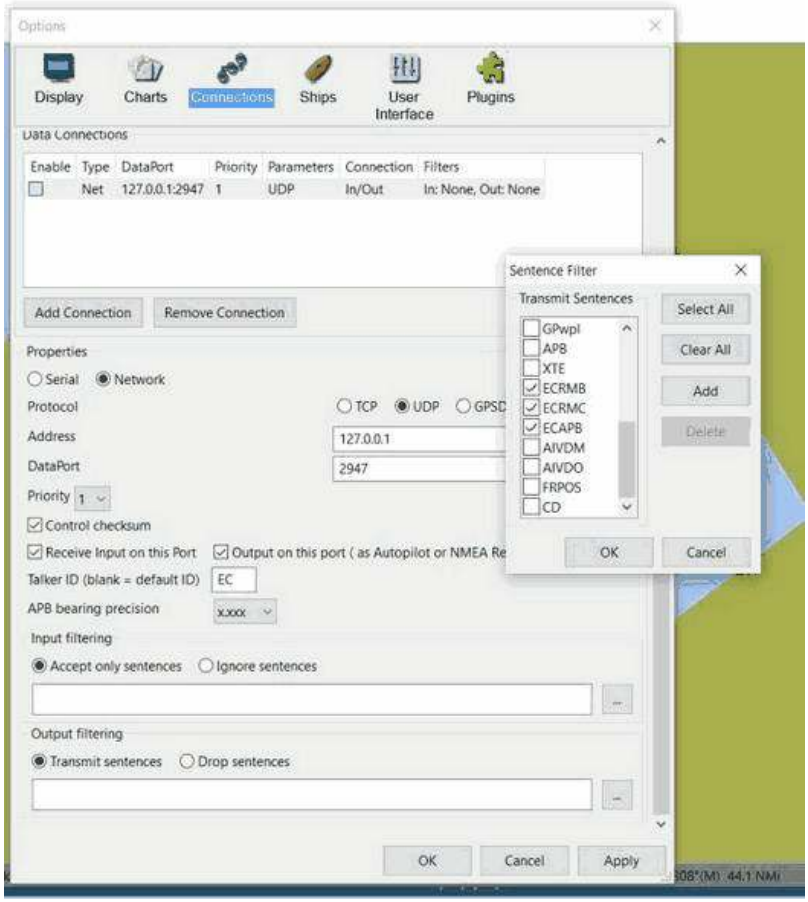
Sending an Active Route to an Autopilot

Autopilot APB and **XTE precision** settings are harmonized to always be the same.

See Send a Route to the Autopilot, the basics. Upon **Route activation**, OpenCPN sends the ECRMB, ECRMC and ECAPB NMEA sentences to an Auto Pilot, if it is connected to a port, with output activated.

- Implement configurable NMEA Talker ID
- To test that the ECRMB, ECRMC & ECAPB sentences are being sent, simply set up a port with output activated and

Right-click on the chart and select “**Navigate to here**”, then bring up the **Options > Connections > Nmea Debug** window and look at the Blue output sentences for ECRMB, ECRMC and ECAPB. Below is one example of output connection settings.



In the example above we have used NavMonPC to read a previously recorded nmea file, and then set up a Virtual Com Port (Com14) which **OpenCPN Options > Connections** to a Serial **Com14 port** is then established to read the nmea data stream from NavMonPC.

When you **send to the autopilot** you should see **blue output sentences in the Nmea Debug window**, **once the Options Menu is closed** (very important, because all data is frozen until this menu is closed.) * Another way to test for the EC sentences see "**Send to GPS**" below.

Broadcast and Multicast

UDP data may be delivered to more than one system when sent to certain special addresses

A "broadcast address" is listened to by all devices on a network. It is normally formed by taking the network address (the first part of the IP address common to all systems on your local network) and setting the last part (the number which is different for every computer) to a value represented by all "1"s in binary. If all your devices' addresses start with "192.168.1", your network's broadcast address will likely be 192.168.1.255 (255 is "11111111" in binary. This is why IPv4 addresses written like this never contain numbers higher than 255. Except for in the movie "The Net" and we don't talk about that). If you specify an address ending with "255", OpenCPN assumes you mean a broadcast address. This is not always true but will result in desired behaviour in almost all cases.

The special broadcast address "255.255.255.255" is also listened to by all devices. It should not normally be used to transmit data from OpenCPN. Use your local network's

broadcast address instead.

A “multicast address” is listened to only by devices which wish to receive information on that address. IPv4 addresses in the range 224.0.0.0 - 239.255.255.255 are multicast addresses. If you specify a multicast address for a UDP data connection, OpenCPN will tell your computer to listen for datagrams on that address. * More than one system may send data to broadcast or multicast addresses, so this is a “many to many” communications medium. * You cannot use broadcast or multicast addresses with TCP. TCP is a “one to one” connection.

Devices must to some extent process all broadcast packets on the network whether they are interested in them or not. Multicast packets are normally only seen by devices which have registered an interest in a particular multicast address. Consequently multicast is more efficient than broadcast although this is usually of little consequence in a small network. Despite being used by NMEA-over-IP protocols such as IEC 61162-4 and the forthcoming NMEA OneNet, NMEA-0183 over IP multicast is far less widely supported in marine applications than NMEA-0183 over IP broadcast.

There is no multicast address mandated for NMEA-0183 data in this context although you should avoid those addresses used by other protocols.

When using multicast with OpenCPN it is suggested that an address be used in the range 239.192.0.0/14 specified by RFC 2365 as the “Organization Local Scope”. If in doubt, try 239.194.4.4.

There is no mechanism in OpenCPN to specify the network interface through which multicast packets are sent or received. This will be determined by your system. In some cases it may be necessary to manually adjust your system's routing table to ensure that the desired network interface is used. Refer to your system's documentation if this proves necessary.

If you transmit UDP broadcast or multicast, then you should set the priority of the “real” NMEA input to something higher than the UDP stream. If not, prepare for problems. The reason is that if you are broadcasting, then you yourself will get the UDP message as well, which again will be retransmitted…… Obviously, it duplicates the “real” incoming data. Thus we get source priority flip-flop on each message, since they have the same priority. For example set the UDP priority to “0” and real incoming connection to “1” or higher. Multicast loopback is not disabled for consistency with broadcast behaviour. This means that priorities must be set as detailed above when transmitting over multicast, but multicast communication between multiple instances of OpenCPN on the same system remains possible. * The firewalls on some systems (e.g. OpenSuSE linux) may block broadcast and multicast data that you wish to receive. Refer to your system's documentation to determine how to allow such data to reach OpenCPN.

Also read about the Activating Routes and Active Route Console in **Marks and Routes** towards the bottom. *It is essential to have turned on an Active Route in order to send waypoints to the Autopilot.*

Also read about Route to Autopilot in **Create Route** and Route to Autopilot in **Advanced Features** for more details.

Sending Routes and Waypoints to a GPS

The feature “Send to GPS”, which appears in the right click menus for waypoints and routes and in the Route Manager, is not linked to connections. The upload port does not even need to appear in the Datastream connections list. Its a completely separate concept. For this reason users must define a separate upload port, that is remembered by OpenCPN. The port can be changed by clicking the button in the Route Manager.

NMEA provides no handshake protocol for Route and Waypoint upload. So, OpenCPN simply sends the Route/WP information out on the port, without having any way to know if there is actually a device connected to the port.

The Garmin protocol does provide handshaking, so OpenCPN can be sure that the information is uploaded correctly. The Garmin protocol will fail if the device is not a Garmin.

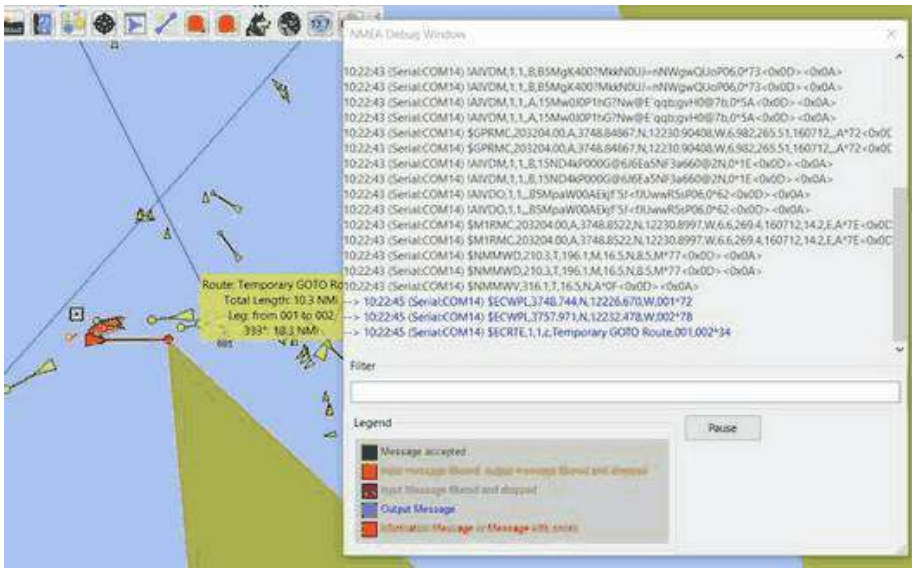
In the case of standard NMEA, the indication “Route successfully uploaded” is not very meaningful. You can say that it just means that a port was found, and writing to that port succeeded.

In the case of “hockey puck” GPS receivers, they probably ignore Route and WP uploads, since there is nothing for them to do with this information anyway.

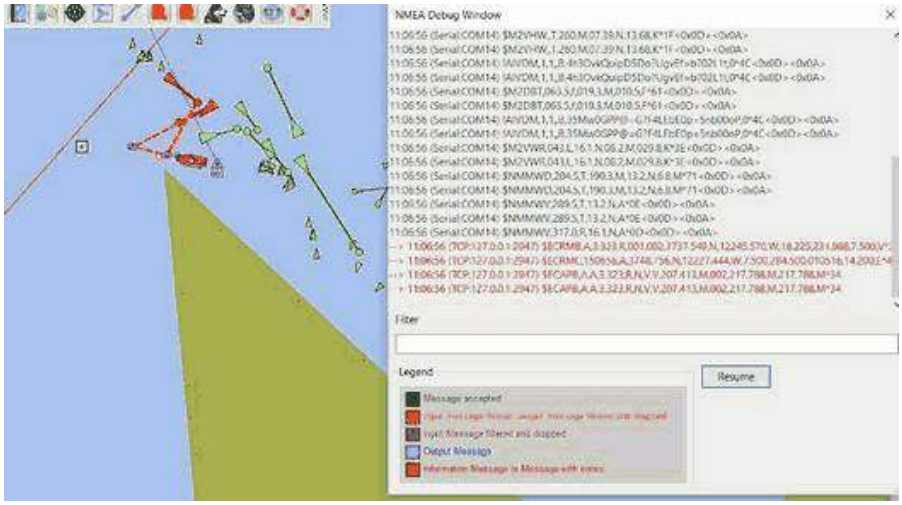
The key to remember is that Route and Waypoint upload process is completely independent of normal running Datastream operation. They are two separate sub-systems.

It does no harm to assign the Datastream GPS port as an output and input device together. Some users might reasonably expect that this would be required for Route and W/P uploads. Most GPS receivers would ignore input sentences other than Route and W/P uploads anyway.

Then in the Chart window we hover over the temporary goto waypoint and right click, then select “Send to GPS (Serial Com 14)” and by quickly looking at the NMEA Debug window (Options > Connections > Check Nmea Debug Window, then be sure to CLOSE the Connections Menu leaving the Nmea Debug Window up, or nothing will happen!). Then you will see the sentences sent. See screenshot below.



- Note the active route above was a 4 point route, but the active leg and active wp was the 3rd point for the above screen.



- Note the screenshot above is for the same Active Route, but the active waypoint is the 2nd point.
- Note: There are many technigues for testing and simulation. Using NavMonPC to read a previously recorded file is one very good way. The other is to use OpenCPN's VDR_pi to read the nmea file, which is in some respects simpler for a new user.

Configurable Null header acceptance on UPD receiver for Furuno

Most, if not all Furuno equipment sending data over UDP is including a binary header at the beginning of the packet payload causing the data not to be parseable as normal NMEA0183 datastream directly. Since the 4.8.2 release, it is possible to configure OpenCPN to handle this problem by editing the *opencpn.ini* configuration file in the **[Settings]** section to add the line

```
EnableUDPNullHeader=1
```

NOTES

Win 8.1 com ports stop working

Refer to http://willkamp.com/opencpn/flyspray/index.php?do=details&task_id=1706[168] Check the cables and connectors and for USB Port timeout. How to Add or Remove “USB 3 Link Power Mangement” in Power Options in Windows 8 http://www.eightforums.com/tutorials/50276-power-options-add-remove-usb-3-link-power-mangement.html[169] http://helpdeskgeek.com/windows-xp-tips/prevent-windows-from-powering-off-usb-device/[170]

UDP Protocol vs TCP Protocol

UDP is a method of transmitting data as simple “datagrams” without negotiating a connection between two endpoints. It involves no detection and retransmission of data lost in the network. Within a small home/boat network such data loss should not normally occur and in any case, NMEA data is generally updated by “talkers” on a regular basis. Unlike TCP which involves a connection between two endpoints, UDP data may be received by many “listeners”.

UDP “For UDP mode the IP address 127.0.0.1 is also known as localhost and used when sending to a client on the same machine. The IP address of any other machine on the network may be given.”

To reach all machines within a local network, like a wifi router, use the address 192.168.x.255 with the Protocol set at UDP.

```
  Example for a local net where the router address is 192.168.1.0:
python VDRplayer.py Hakefjord.txt 192.168.1.255 10110 0.05 UDP
Any receiving machine can then use IP address 0.0.0.0 and port 10110 in the
connection properties
```

TCP For TCP mode the IP address is the address of the machine running VDRplayer. It may be localhost or 127.0.0.1 if the client is running on the same machine.

If VDRplayer is running on its own machine then give the IP address: of that machine that other clients can reach (e.g. 192.168.1.6 assuming that is the address of the machine running VDRplayer.py).

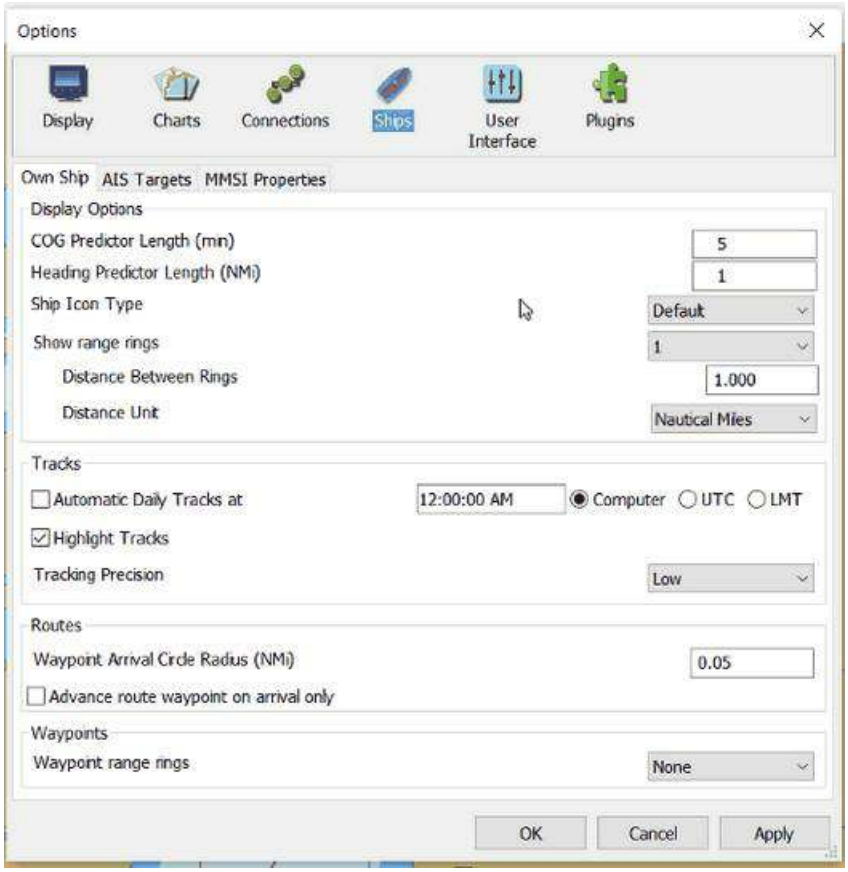
The Port Number: 10110 is somewhat arbitrary but it is the “undocumented standard” for NMEA over IP and must match the client receiver port number. Any port number permitted by the local firewall will work. It is best not to use well known port numbers such as 80, 22, etc.

The time delay of 0.05 (50mS) is the delay between each line in the file.

UDP received When adding a network connection for UDP receive there is no need to specify the IP address. The port is required but not the IP address. The sending end needs to specify both IP address and port number.

The Ships

Own Ship



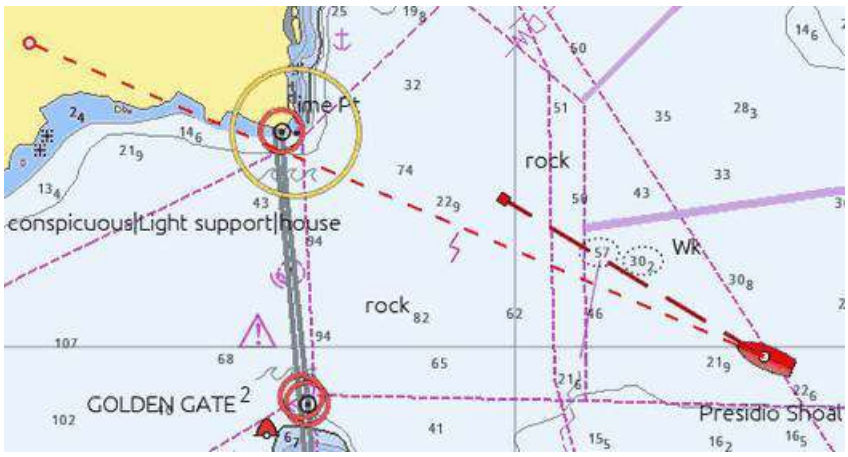
Display Options

COG Predictor Length (min)

Shows a red dashed line in front of your own boat, with present COG and ends in a small square, which represents where you will be in the set number of minutes, with the present speed. 6 minutes is a good starting value for piloting. If your vessel has a SOG of 10 knots the dashed line will be 1 nautical mile long. 60 minutes makes sense on a coastal passage and 24 x 60=1440 minutes on longer blue water passages.

Heading Predictor Length

If a heading sensor is available and outputs an nmea data stream, this is shown as a finer line with shorter dashes ending in an open small circle. The length is set in Nautical miles.



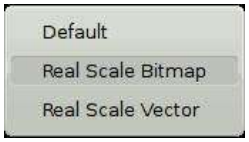
The width of the COG Predictor can be adjusted in the opencpn.ini configuration file. Find the line below and adjust the value.

OwnshipCOGPredictorWidth=3

Warning: Don't edit the opencpn.ini (opencpn.conf) file when OpenCPN is running.

Ship Icon Type

The following options are available for Ownship:



Default

This will use the icon that comes with OpenCPN, unless you have installed your own icon, “ownship.png”. More about installing your own icons in ***Marks and Routes*** .

Real Scale Bitmap

This option will adjust the size of the default icon, depending on your settings. When using this setting, the dialog expands and five more options related to the size of “ownship” become available. See picture below

Length Over All (m)

The overall length of Own Ship in meters

Width Over All (m)

The overall width of Own Ship in meters

GPS Offset from Bow (m)

The distance in meters from the bow of Own Ship to its GPS antenna

GPS Offset from Midship (m)

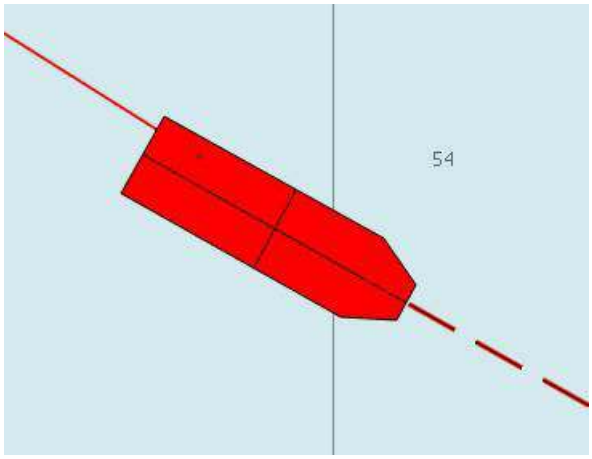
The distance in meters from Own Ship's center line to its GPS antenna. Use a positive value for an offset to starboard and a negative value for an offset to port.

Minimum Screen Size(mm)

The size of the Own Ship icon on the screen. Default is set to 1mm.

Real Scale Vector

Works the same as the previous option with the exception that ownship is a somewhat boxy, computer rendered ship. It's currently not possible to change the vector-own-ship.



The dot represents the set location of the GPS.

Show radar rings

These show up as red rings centered on your gps position and can be useful in different circumstances, such as keeping clear of dangers. The settings are, hopefully, intuitive.

Once the number of radar rings are selected, and not equal to “None” the dialog expands, and shows more settings. The Distance Unit for Radar rings is set here, and does not follow the the global settings in Options → Display → Units. The choices are Nautical Miles and Kilometers

Tracks

Automatic Daily Tracks

Automatic Daily Tracking ensures that the track-points collected throughout a single day

(midnight to midnight in local zone time) are stored and managed as a single (possibly multi-segment) track.

If the Automatic Daily Tracking check-box is selected, the “Toggle Tracking” tool will turn tracking on and off. However, on turning it off, the accumulated track will be extended with the previous one if it does not extend into yesterday. Disjoint segments are kept separate, time-adjacent segments are merged into a single segment. Disjointed track segments can be joined through the right-click menu when they are selected in the Route Managers Tracks Tab.

Every Midnight the tracking is turned off and on again automatically to ensure that the track does not span dates. If Automatic Daily Tracking is selected during the day, when some tracks have already been created, only the last one will be merged with future daily tracks.

Assuming Automatic Daily Tracking is on, normally during tracking periods there will be two tracks visible in the Route Manager: the current track (red color track-points on the chart) and the previously accumulated track for the day. After toggling tracking off there will be just one track for this day.

If the timezone needs to be changed, it is a good idea to close OpenCPN application before.

With the manual capability of splitting and extending, the daily tracks can be easily managed at any time.

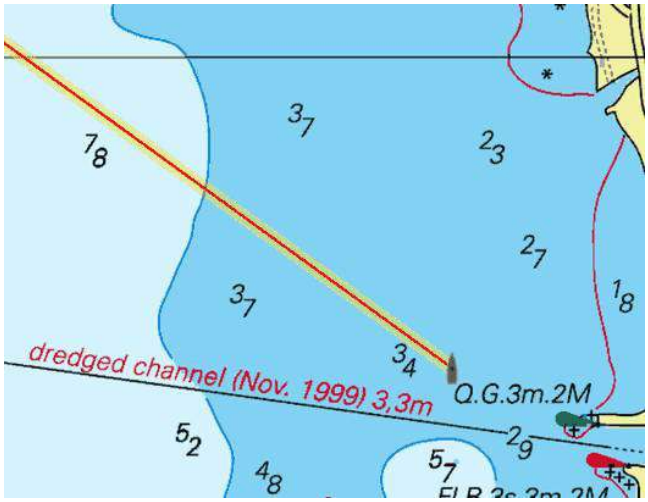
The daily tracks will be automatically named with the date in the local Time Zone, but can of course be changed manually.

The Automatic Daily Tracks follow the settings in **Tracking Precision**, see below.

Without Automatic Daily Tracks selected, OpenCPN handles tracks as before.

Highlight Tracks

Shows a 7 to 10m wide highlighting on either side of the track. This is not selectable for individual tracks. The idea of the highlighting is to remind us that following a previous track exposes us to the inherent inaccuracy of GPS, and that the real track followed is most likely within the highlight region, but not necessarily in the middle. And this says nothing about the accuracy of the underlying cartography. For many charts it is prudent to assume at least 1.5 mm inaccuracy using the nominal scale of the chart. For a chart in scale 1:20,000 this translates to 30m.



Tracking Precision

With track button in the ToolBar activated this setting affects the size of the data saved. It also affects the “smoothness” of the track, though this is only visible when zoomed in to a very large scale. OpenCPN uses smart dynamic tracking, and only uses those track points that actually contributes anything to the track. A straight line track for example is only represented by it's endpoints. This is done by analyzing the track just behind the boat. The process is visible in real time, close to Own Ship. The end result is good track accuracy while keeping the size small.

- Low: Good for offshore passages.
- Medium: Very good for all normal uses.
- High: Only necessary when very tight maneuvering needs documenting.

Routes

Waypoint Arrival Circle Radius

Gives an answer to this question. When following a Route with the autopilot engaged at what distance from the upcoming waypoint should OpenCPN tell the autopilot to change to the next waypoint? The default is 0.05 nautical miles. This is equal to about 93 meters or 300 feet. The default setting does not fit all circumstances. A number of factors are involved, for example,

- the type of navigation,
- the waypoint selected,
- Own Ship's turning radius and speed.

Find what settings suit your boat by testing.

The arrival radius can also be set individually for each waypoint in the Waypoint Properties dialog.

Advance route waypoint on arrival only

Routes are explained in ***Marks and Routes*** . With an active route, the Dialog “This Leg” is visible near the upper right corner of the screen. This dialog contains “RNG”, the “actual range”, or distance to the next waypoint. The “normal range” is different. It is the distance from ownship to a line which passes through the destination waypoint and is at right angles to the current route segment. The actual range is always equal to or greater than the normal range. When the difference is greater than 10% both values are shown in “RNG” (Shown in the ***Active Route Console*** 

The “normal” range is the second number shown. 1.88 in this case. When following a Route OpenCPN normally decides to advance to the next waypoint if at least one of the following two conditions apply.

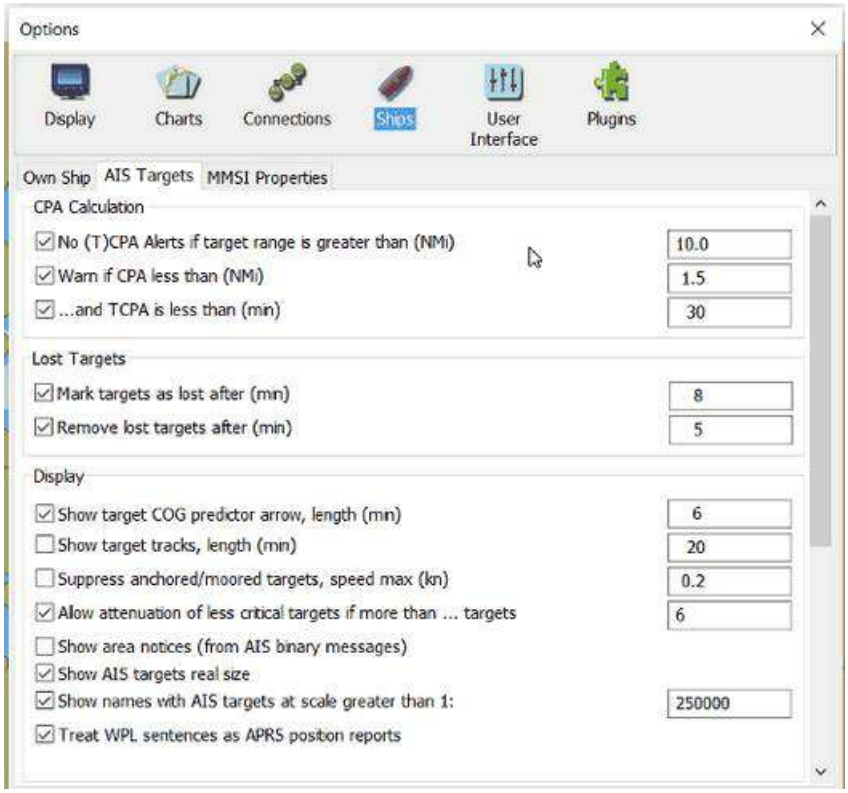
1. The “normal range” is less than the declared arrival radius.
2. Own Ship is moving away from the target waypoint, and has been for more than two seconds.

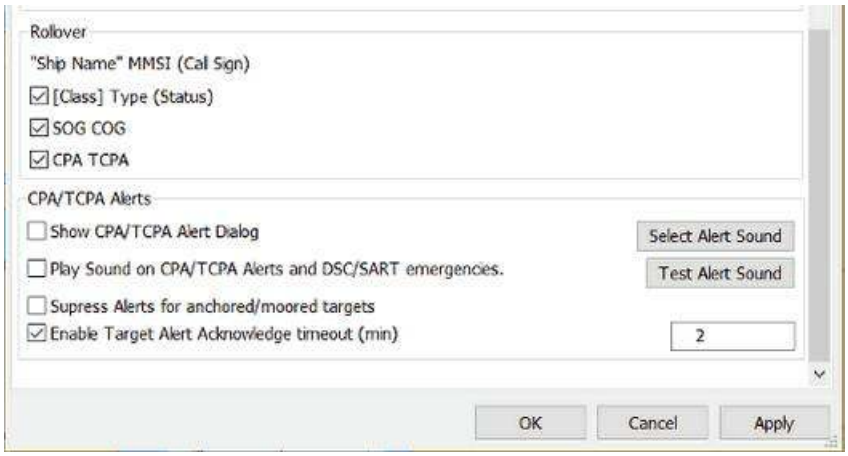
With **Advance route waypoint on arrival only** activated, OpenCPN **only** advances the route to the next waypoint, if condition **1** above is true. Condition **2** is ignored.

This feature is useful when sailing and you can't lay the next mark and are forced to tack a few times to reach it. It allows a ship to move away from waypoint without automatically advancing to next waypoint. This ensures that the next waypoint stays active until you either reach it, or you reach a line through it, which is perpendicular to the marked route. In the latter case you have a cross track error greater than the arrival radius.

On the other hand…. Option 2 helps you if you really want to cut a corner by a large distance in such a way that the “normal range” will never be less than the arrival radius. We want to automatically advance the route in this case.

AIS Targets





Read more about ***AIS*** .

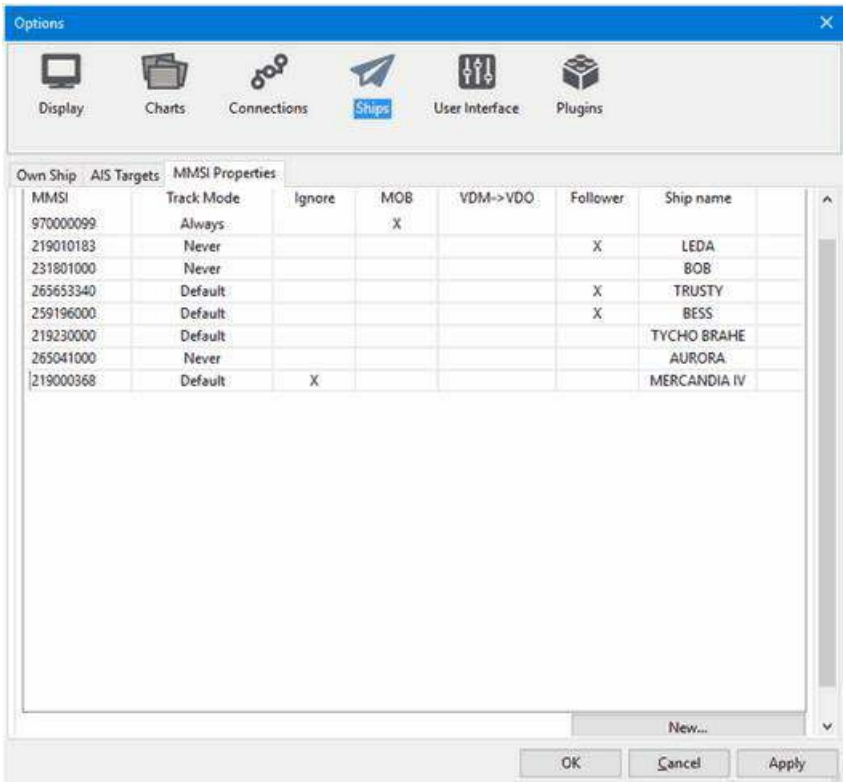
MMSI Properties

Maritime Mobile Service Identifier (MMSI) is a number identifying a ship in communication. MMSI consists of nine digits. All VHF units using Digital Selective Call (DSC), are programmed with the vessels MMSI. The same applies for AIS and EPIRBs. For more about MMSI from Miltech[171]

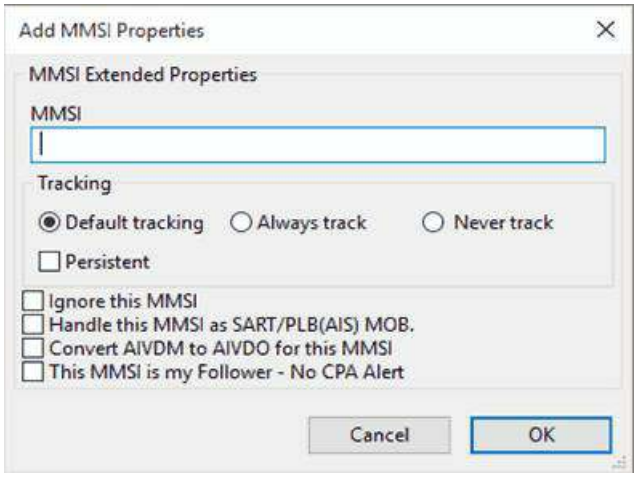
MMSI numbers, individual targets, can be handled in a few preset ways. Below we have set 970000099 as an MMSI that should be tracked as a MOB. The number could for example belong to a crew member's Personal Locator Beacon.

Several MMSI IDs below are set to never show their tracks. This can be used on frequent targets in your neighborhood, like ferries etc. The MMSI 219000368 is set to never be shown. Be aware that neither this target nor its track will ever be seen on your screen.

The MMSI 219010183 is set as “Follower”. This is a buddy and no AIS Alert is shown. The “MMSI Properties” popup becomes available when right-clicking. Doubleclicking on the MMSI bypasses the popup an takes you directly to the Properties edit dialog.



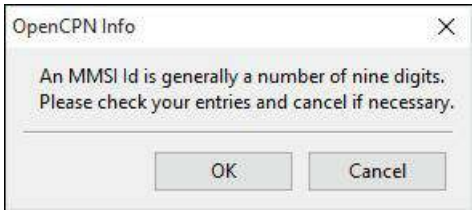
Add a new target to track



MMSI:

Enter the MMSI number that the new action should apply to.

Note: An MMSI Id used to be nine digits. A warning message will be shown if the entry is more or less.



If you for some reason, wish to save a non-nine-digit number click “OK”, otherwise “Cancel” will take you back to edit the number.

MMSI Tracking

Default tracking

This is the normal tracking controlled by Options → Ships “OwnShip” and “AIS Targets” tabs.

Always track and Never track

The MMSI Properties dialog allows one to preset the tracking behavior of a particular MMSI target, even if the target is not presently visible. Always track a friend or a ship you are interested in. Ignore that ferry that just clutters your screen. Just a few examples.

Ignore this MMSI

The target will not show at all on the screen.

Handle this MMSI as SART/PLB MOB.

With this setting a MOB from your ownship will be signalled immediately. Special Search and Rescue Transponders, SARTs, are now available, using the AIS system. Personal Locator Beacons transmitting on the AIS frequencies are also available. These are sometimes called Personal AIS MOB Devices. Don't confuse these with the more common personal EPIRB, that cannot be tracked by OpenCPN.

Entering the the MMSI number makes it possible to use these devices as an onboard emergency MOB tracking system. Setting off a device alarms all vessels that can receive the signal but it tells you that this emergency is directly related to your vessel. OpenCPN will now treat this MMSI as a standard MOB. Read more ***Man OverBoard*** .

The alarm is entered in Options → Ships → AIS Targets →“Play Sound on CPA/TCPA and DSC/SART emergencies.” Have a look at AIS ***SART*** to see how OpenCPN reacts to an alarm.

Convert AIVDM to AIVDO for this MMSI

- AIVDM NMEA 0183 sentence → AIS position reports from other vessels
- AIVDO NMEA 0183 sentence → AIS position reports from own vessel

The setting is intended for the following very specific scenario:

1. You have an AIS transponder, not connected to your computer.
2. You have a separate AIS receiver, used to monitor your own AIS signal, as well as all other traffic.
3. You desire not to collide with yourself, virtually.

So you instruct O to convert the AIVDM for your MMSI coming in via your AIS receiver into AIVDO, or Own Ship. Thus, no collision.

The option is also handy to clear a non-sense “ownship” AIS icon from the screen when the AIS transponder is misconfigured.

Note that the option **Ignore this MMSI** can be used to achive the same result

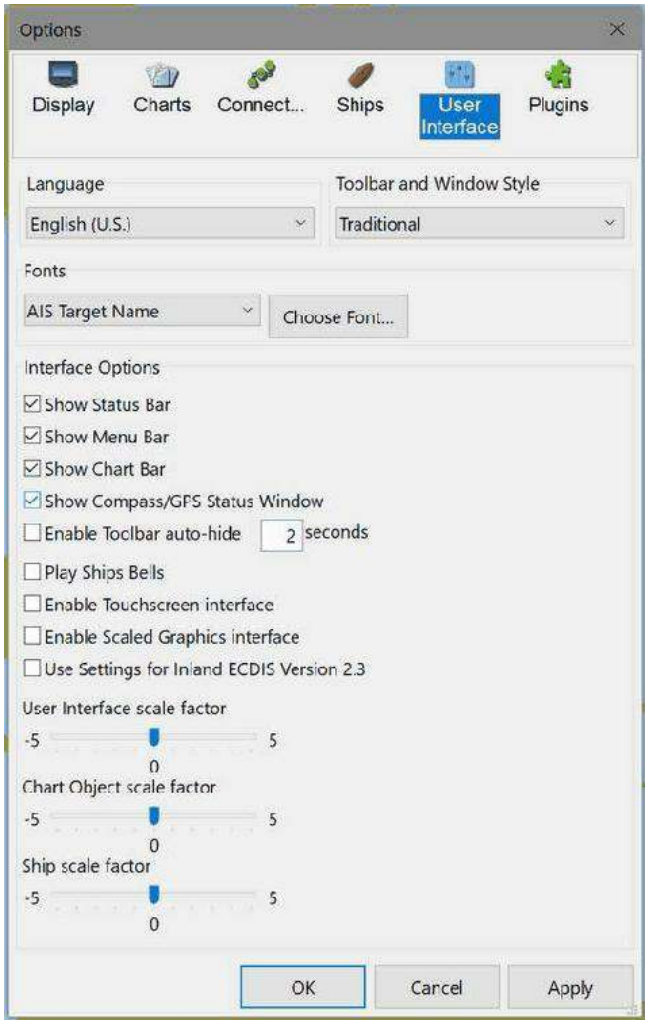
This MMSI is my follower – No CPA Alert

When this option is active no AIS Alert will be shown for that target. This can be used for a buddy sailing close to you and you don't wont a CPA alert message for that target but still for other ships coming too close.

Ships name

The Ship name connected to a MMSI ID will be added to the list once the new ID is saved or edited. The ship name is automatically printed provided that the actual ship is present on screen or has previously been and was saved in the AIS ship name file. In either case the ship name will be added first time the boat is present in OpenCPN.

The User Interface



Languages:

The following languages are available in OpenCPN:

- Brazilian Portuguese
- Catalan
- Chinese
- Traditional
- Czech
- Danish
- Dutch
- English
- Estonian
- Finnish
- French
- Galician

- German
- Greek
- Hungarian
- Italian
- Norwegian Bokmaal
- Polish
- Portuguese
- Russian
- Spanish
- Swedish
- Turkish

Choose your language here. Make sure your selected language has the support files installed on your computer (Linux). Default language is US English.

Remark: Changing the language will reset the font settings.

Toolbar and Window Style Menubar. The alternatives are described in ***Toolbar Buttons*** and Windows/Mac style ***MenuBar***

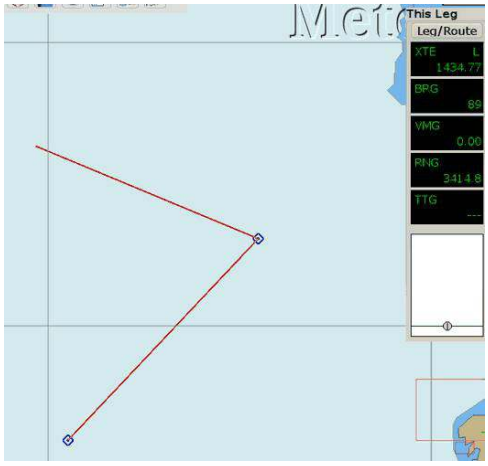
Fonts

On a new installation OpenCPN uses the operating system's default fonts. This can be changed to suit the user through this dialog. Fonts can be selected for many elements on the display. Selecting the right size of font can have a dramatic impact on how values are presented. It's well worth playing around with these settings if you think that something is difficult to read for example. Note that even the text displayed on vector charts can be adjusted.

Pick from the Dropdown List

- AIS Target Name - Target List font size
- AIS target List uses the “Dialog” font key.
- AISRollover - Yellow rollover font size
- AISTargetAlert - Popup alert font size
- AISTargetQuery -Query Popup
- ChartTexts -
- Console Legend - Active Route Console XTE, Bearing, etc (upper right black box, see below)
- Console Value - Active Route Console - Font Size of the data presented.
- CurrentValue -
- Dialog - AIS Target List
- ExtendedTideIcon -
- Marks - Properties font size
- Menu - Main menu font size
- ObjectQuery -Object Query font size
- OD_PathLegInfoRollover - OD Plugin Yellow Rollover font size
- OD_PointInfoRollover - OD Plugin Yellow Rollover font size
- RouteLegInfoRollever - Route Leg Yellow Rollover font size
- StatusBar - Status Font at bottom

- TideCurrentGraphRollover -
- ToolTips -



The result of adjusting the “Console Value” font size.

There is a side effect of the Font management module, which is worth noting. One must actually display something in a particular Font List category (ChartText, Console Legend, Console Value, etc.) in order for the item to appear in the list for the first time. Thereafter, the item should stay in the list and be available for editing. For Example: You may not see the Font List entry for “AIS Rollover” unless you have actually displayed an AIS Rollover message at least once. Of course, if you re-install OpenCPN or start with a new config file there may be limited entries in the FontList.

Change Font Color

To suit your taste.

Show Status Bar

The status bar at the bottom of the display contains a lot of navigation information. If you have this info available elsewhere turning this setting off increases the available space for the chart.

Show Menu Bar

Show/Hide the Menu Bar. More about ***MenuBar***
Short Cut: “Alt”

Show Chart Bar

Show/Hide the Chart Bar. More info available on the ***Chart Status Bar*** page.
Short Cut: “Ctrl + B”

Show Compass/GPS Status Window

Show/Hide the Compass/GPS Status Window. More info on the ***GPS Status*** page.
Short Cut: “Ctrl + I”

Enable Toolbar Auto Hide

Enter number of seconds for the Toolbar to automatically hide.

Play ship bells

Every half-hour the traditional ship's bell will be heard. Refer to https://en.wikipedia.org/wiki/Ship%27s_bell[172] if you are not familiar with them.

Enable Touchscreen Tablets Interface

Touch Screen Tablets

Read more at ***Touch Screen Tablets***

Enable Graphical User Interface

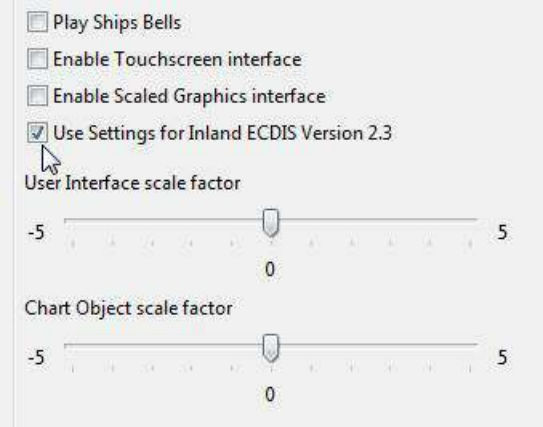
Enable [Responsive] Graphical User Interface for Touchscreens and Tablets.

Enlarges Toolbar Buttons & other elements for touch purposes.

The option is intended for small (~8“) tablets with high definition displays. What it does is adjust the various graphic elements such as menus, icons, etc. so that they meet the best practice size standards for Win8/Android system displays. This makes them “big enough” to facilitate touching, dragging, etc with normal human fingers. You should not see much difference when selecting this option for normal desktop or laptop systems.

Use settings for InlandECDIS 2.2

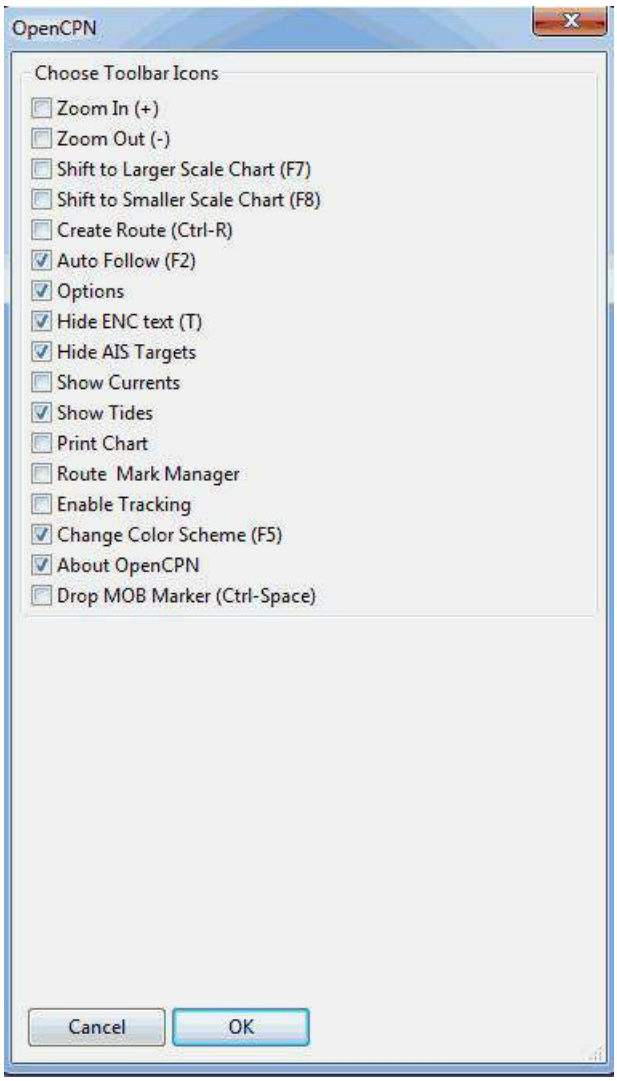
Use Settings for InlandECDIS 2.2 Switch to compliance mode for Europe Inland Waterways ECDIS in information mode. Read more at InlandECDIS



If either of the Graphical User Interface boxes are checked, the slider “User Interface scale factor” changes the size of the Tool Bar, Chart Bar and the GPS status icon.

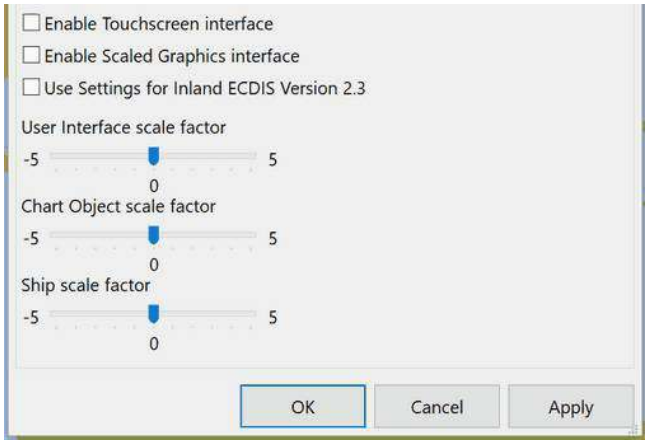
If the “Enable Tablet Scaled Graphics interface” is checked, the slider “Chart Object scale factor” changes the size of chart objects including: Marks, Routes, Buoys, Daybeacons, Wrecks, Rocks, and Depths.

Note: selecting “Use Settings for InlandECDIS Version 2.3” will have effect on your Toolbar Icons!
Only 7 of the 17 available Toolbar Icons will be visible.



You can select other Toolbar Icons, but your changes will not be saved when you exit OpenCPN.

Three Scale Factors



User Interface Scale Factor

If either of the Graphical User Interface boxes are checked, the slider “User Interface scale factor” changes the size of the Tool Bar, Chart Bar and the GPS status icon. Useful to adjust the size of the UI.

Chart Object Scale Factor

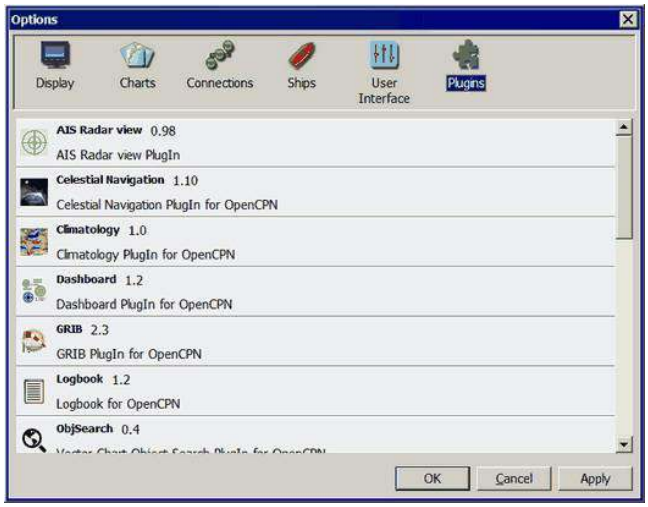
If the “Enable Tablet Scaled Graphics interface” is checked, the slider “Chart Object scale factor” changes the size of chart objects including: **Depth Soundings**, Marks, Routes, Buoys, Daybeacons, Wrecks and Rocks.

Ship & AIS Scale Factor

If the “Enable Tablet Scaled Graphics interface” is checked, the slider “Ship scale factor” changes the size of chart objects including: Ship Icon, AIS & ATON Symbols.

We do not reduce the ownship size below effective value of 0, so to be sure of always finding the ship on the screen. A user safety point.

The Plugins



The Plugin tab is treated on these pages:

Plugins
Install and Enable Plugins
Dashboard Plugin
Grib Weather Plugin
WMM Plugin
Chart Downloader Plugin

TOOLBAR Buttons

The Toolbar is floating and can be placed anywhere on the screen, vertical or horizontal. Note the “grabber” symbol at the far right side of the toolbar. Use this handle to drag the toolbar wherever you want it. The default position is horizontal and docked top left. It snaps to the edges. Right click on the grabber and a cross will appear. Left click on the cross and the toolbar shifts its orientation, to vertical or horizontal format. Right click on the cross to return to the grabber. On Windows (at least), unless in OpenGL display mode, the toolbar dims down transparently until you roll over it.

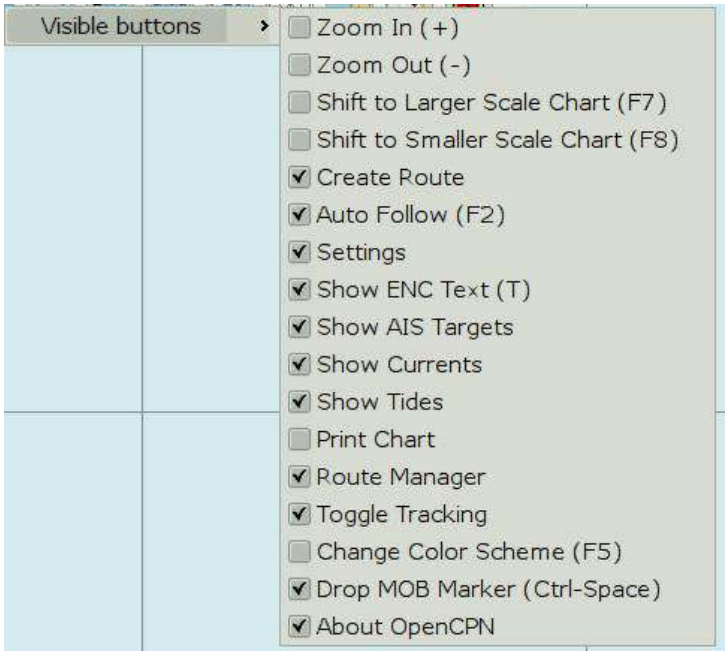
There are three different styles of Toolbars to choose from. Go to the ToolBox → “User interface” → “Toolbar and Window Style” and select one of the following styles:

Traditional

Journeyman

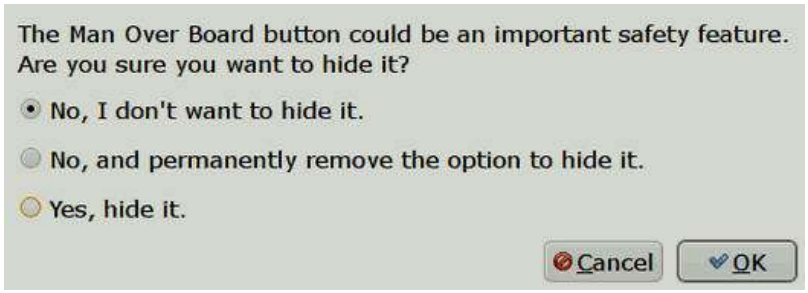
Journeyman Flat

There are a lot of buttons available in the standard Toolbar, even more, counting the many plugins. To control exactly which buttons to display, hold the cursor over any button and right-click. This dialog pops up.



Only the buttons with a ticked box will be displayed. The available shortcuts are also shown in parenthesis to the right of the button description.

The MOB button is special. If unticked, you will get these choices:



#1: The MOB button will still be there, but anyone (crew?) may later hide it.

#2: If OpenCPN is used to handle a MOB situation, choose this option. The MOB button will always be there. It is not possible to change the state as long as OpenCPN is running. The MOB button option will not even appear in the right-click menu. To reset this option open the opencpn.ini(config) file and change the value below from “1” to “0”. Restart and all the options are once again available.

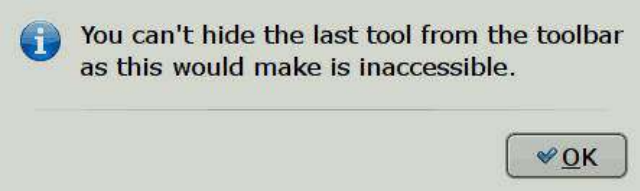
```
[Settings]...PermanentMOBIcon=1
```

#3: Use this option if a MOB situation is handled by other means, and OpenCPN is not a part of the standard operational MOB procedure.

If the MOB button is visible, it will always be the button furthest to the right. This way it's always easy to find in bad light etc.

The visibility of the plugin buttons is controlled in the ToolBox → Plugins Tab, by pressing the Enable/Disable toggle button.

Note that the Toolbar must have at least one active button.



When a toggle button is pressed, it changes and becomes darker, Traditional style also adds a stronger outer frame. For example, tracking off  , tracking on  .

A brief explanation of the use of each button is available by just hovering with the cursor over a button. 

Traditional Style (from left to right) : (For translation to other styles, check the buttons just below the Traditional in the above pictures.)

 Zoom In (*Zooming*)

 Zoom Out (*Zooming*)

 Scale Next Chart Down (*Scaling Charts*)[1]

 Scale Next Chart Up (*Scaling Charts*)[1]

 Create Route (*Create Route*)

 Find/Follow Boat. Toggles on/off. (*Auto Follow* *and* *Display Orientation*)

 Launch Toolbox (Options Setting)

 Show/Hide Text Labels on Vector Chart. (*Vector Display*)

 Show/(Attenuate less critical Targets[3])/Hide AIS Targets[2] (*AIS*)

 Show/Hide Currents On Chart (*Tides and Currents*)

 Show/Hide Tides On Chart (*Tides and Currents[173]*)

 Print. Prints your current view, using a simple dialog.

 Route/Track/Waypoints/Layer- Manager. (*Route & Mark Manager*)

 Toggle Track On/Off (*Ship Track*)

 About OpenCPN and Help File (*Help*and Getting Started)

 Adjust Screen Brightness for Dawn/Dusk and Night viewing. (*Night Navigation*)

 Show/Hide the Dashboard Plugin (*Dashboard//*)

 Show/Hide the Grib Overlay Plugin (*Grib Weather//*)

 World Magnetic Model (*WMM)*

 Drop Man Over Board marker (*Man OverBoard*) **Always the far right Button**.

More Buttons may be present if certain Plugins are activated. See the Documentation for Install and Enable Plugins

A separate **GPS status and Chart Orientation Status** is normally in the **upper right corner** of the display, **unless** the floating ToolBar covers this position. Then the “Status-bar” will be moved to the **lower left corner**, were it will stay, unless the main ToolBar is moved to cover this position, in which case the “Status Bar” goes back to the default position.

 Course Up/North Up[2] (*Display Orientation*)

 GPS status[2] (*GPS Status*)

 No GPS data or position not available.

 GPS fix, GPS position known and good for navigation. Sat count not available.

 Active/Valid GPS data + GPS reporting 1 - 4 satellites.

 Active/Valid GPS data + GPS reporting 5 - 9 satellites.

 Active/Valid GPS data + GPS reporting 10+ satellites.

---

1. These icons are grayed out when only CM93 vector charts are available, as the feature is not applicable to that format.
2. These icons change, depending on status.

3. Option available if activated in AIS settings.

Zooming

It is essential to understand what happens when both zooming in and zooming out in a chart view. Vector charts have their own issues, with both over- and under-zooming. Both can be potentially dangerous, and it's essential to understand what's going on.

How too Zoom in/out

Zooming in makes the chart scale larger while zooming out makes the scale smaller

 These buttons allow you to zoom in and out on the chart currently being displayed.

 Will zoom the chart in for more detail, larger scale.

 Will zoom the chart view out for more area, smaller scale.

Alternatively, the + and - keys on your keyboard will zoom in and out. If you have a mouse with a scroll wheel, it can also be used to quickly zoom in and out.

Other alternatives for zooming includes:

- Page Up for zooming in.
- Page Down for zooming out.
- Menu Bar → Navigate click Zoom In / Zoom Out

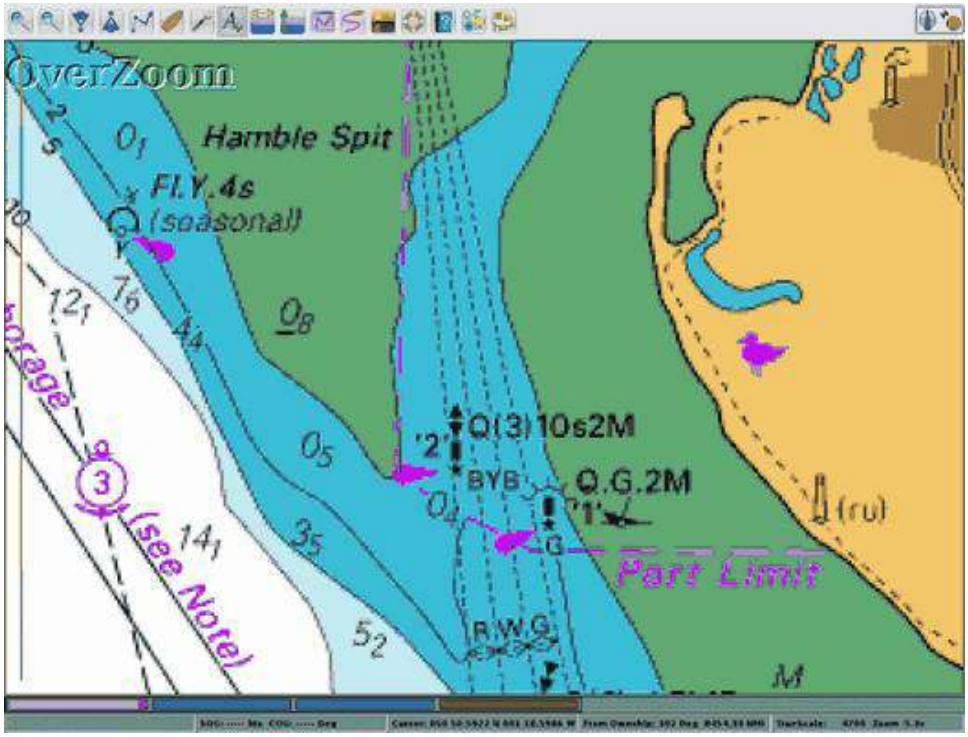
For zooming in smaller steps try

- Alt + for fine scale zooming in.
- Alt - for fine scale zooming out.
- Alt + scroll wheel, zooming in/out in small steps.

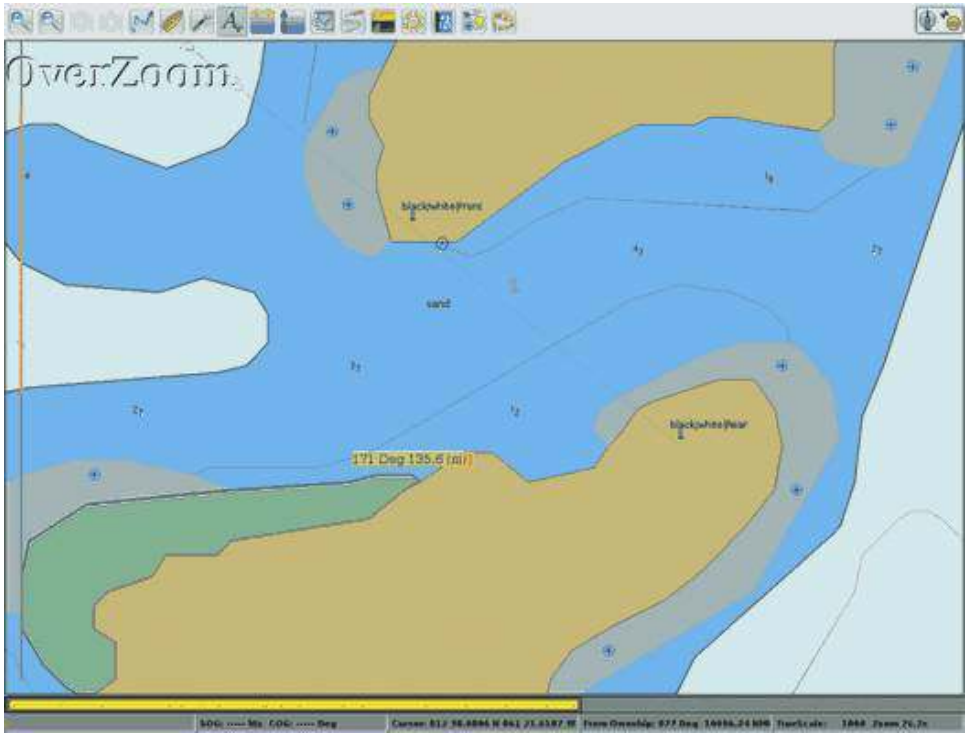
Some settings for zooming are available in the Options → Display → General tab. Read more about “Smooth Panning/Zooming” and “Zoom to Cursor” in Options Setting. Note that

- Keyboard, Menubar, and Toolbar zooms always zoom to the center of the screen.
- Wheel zoom behaviour changes depending on “Zoom To Cursor” and “SmoothZoom” settings.

Overzooming



Overzooming a raster chart.



Overzooming a vector chart.

If you zoom in enough there will appear a warning **"OverZoom"** in the upper left part of the chart area. This means that you have zoomed in way to far, and are using the chart at a scale that was never intended, and that is not supported by the original survey. **No new information will be seen, and the situation is potentially dangerous** as it could give the impression of increased distance between dangers. On a raster-chart pixelation will be seen, but on a vector chart it is not so obvious when you have over zoomed. This is where the

warning is useful.

Your first action when the warning appears should be to zoom out at least one snap. Charts are generally based on surveys in twice the scale of the released chart, so when zooming in beyond a factor of 2, there is no support, increased details etc, in the underlying survey. OpenCPN warns for “OverZoom” when zooming with a factor of 4 or more.

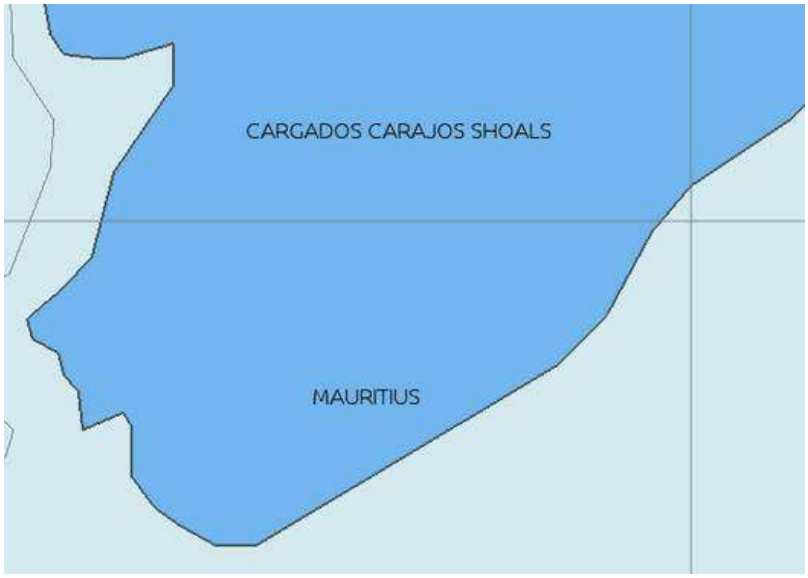
Overzooming settings are explained in Options Setting. In short OpenCPN, by default, blurs vector-charts and expands the text and lines to imitate what happens with raster charts when zooming in beyond a factor 10.0 x.

Unlimited zooming is available using the background Map. Just create an empty chartgroup and switch to this map at any time. More in Chart Groups Tab.

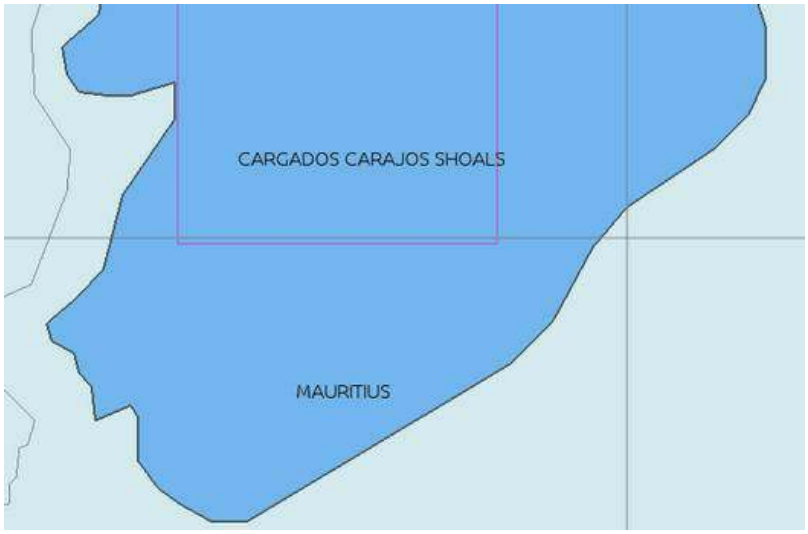
Underzooming

Underzooming is only a general problem with CM93 V2, in OpenCPN. The reason is the very poor graphical representation in small scale charts, of reefs, small islands and other dangers. The case with the Cargados Carajos Shoals in Indian Ocean is well known since Team Vestas grounding in the 2014/2015 Volvo Ocean Race.

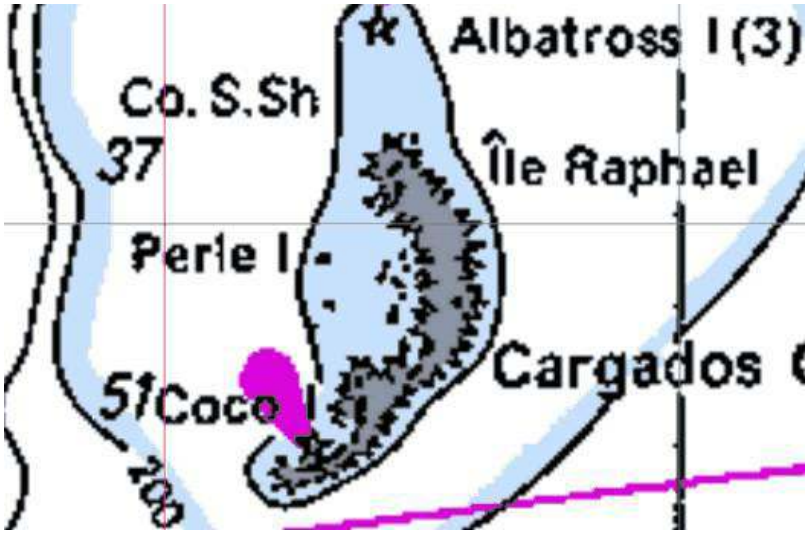
This is what you see. All pictures are in a scale of approximately 1:650.000. In the normal view, no indication at all appears of islands or reefs, even though the name in itself indicates, to a seasoned navigator, that more information should be sought elsewhere. Look upon a blue area as a warning sign. Zoom in to see if more deatails are available. If no more details show up, even using a large scale view, it indicates that the CM93 coverage is poor in the area. Once again, use alternative sources.



Switching to single mode view, and with chart outlines active, OpenCPN shows that a larger scale chart is available. This will show on zooming in further. The available chart does not cover the southern end of the reef where Vestas ran aground. In some editions of CM93 more charts of the area are available, including the southern part.



Compare this to the well thought out representation in the raster chart INT 702 in scale 1:3.500.000.



Using CM93 in OpenCPN

It all starts with passage planning. The bottom line is: Don't trust CM93. Always check with other reliable sources, meaning, for example, raster charts, paper charts, Pilot Books, or ENC charts, **not** another privately issued vector chart, with similar problems (for example Navionics).

Doing the best you can with OpenCPN and only CM93 available.

For passages including small scale CM93 charts (A or Z scale): Create a route that you plan to follow. Switch to single chart mode. (Shortcut key “Q”.) Activate chart outlines. (Shortcut key “O”.) “Fly” along the route, making sure you are zoomed in to a factor of at least 2.5 x. Available charts should now be outlined in magenta. Drop suitable marks documenting these charts, and the dangers they represent, for later reference.

Nigel Calder: “How to read a Nautical Chart, Second ed. 2012” is recommended to all

users who want to know more about charts, the surveys they are based on, and their horizontal and vertical accuracy.

Scaling Charts

These buttons will allow you to change the scale of chart you are using, **unless** only CM93 charts are loaded, in which case these buttons have no effect, and are grayed out. If just a yellow bar is visible in the Chart Selection Bar, above the Status Bar, then CM93 is the only available chart for the area.

Shift to larger scale chart. Will change to next chart of greater detail, covering less area, if available, within the current view.

Shift to smaller scale chart. Will change to the next chart of less detail, covering a greater area, if available, within the current view.

Chart Bar Buttons

The charts in the *Chart Bar* just above the *Status Bar* are ordered according to scale. The leftmost chart, is the largest scale chart available, and the rightmost chart is the smallest scale chart.

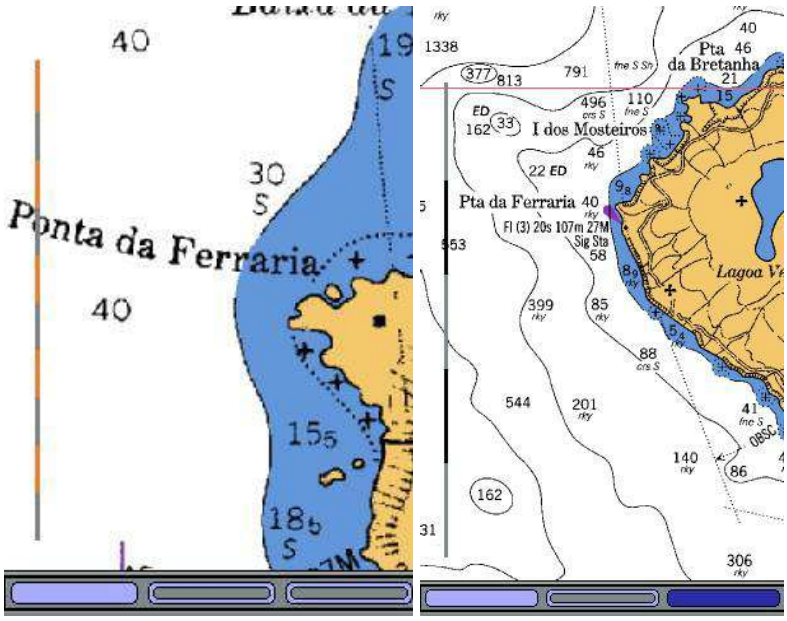
Also see Chart Status Bar

Above the largest scale chart is a raster chart (blue) on the far left. To the far right is CM93 (yellow), and it will always be there, if available. The green ENC vector chart, next to CM93, is the smallest scale raster/ENC chart available at the center of the display.

The scale of the displayed chart.

The chart display indicates the true scale of a particular chart at the present zoom level. Look to the far right on the bar above: “Scale 1299400 (1.7x)”.

There is also a quick reference visual indicator always present in the SW part of the display.



When the indicator is gray and orange the total length is 1 nautical mile an each segment is 1 cable. When the indicator is gray and black the total length is 10 miles and each segment is 2 miles.

Alternatively the ScaleBar can be horizontal in the lower right corner of the screen. Add this line to opencpn.ini (conf):

```
UseSimplifiedScalebar=1
```

Create Route

- *Route Concepts*
- *Create A Route*
- *Modify a Route*
- *Multiple Routes*
- *Exporting and Importing Routes and Marks*
- *Activate Route & Active Route Console*
- *Active Route Console Window*
- Active Leg and Full Route Data
- *Route to Autopilot*
- *Route Handling Techniques*

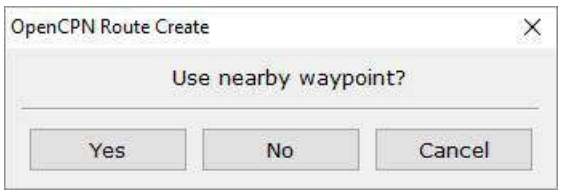
Route Concepts

Understanding how OpenCPN handles waypoints, routes, and route points will help you manage those objects efficiently.

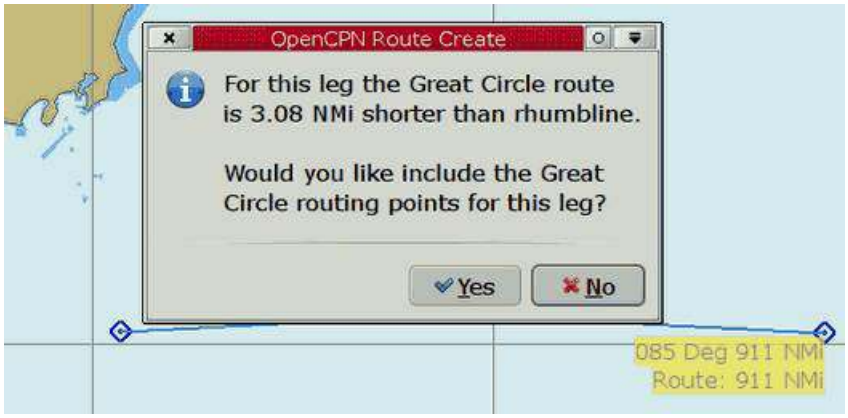
1. A route is a set of two or more points you want to visit in a given order.
2. Route points may be defined automatically as the route is created or a route may link existing waypoints or route points.
3. A waypoint is an independently defined point while a route point exists only as part of a route definition.
4. Multiple routes may share common route points.
5. When all the routes which pass through a shared route point are deleted that route point will be deleted.
6. When all the routes which share a waypoint are deleted the waypoint will persist independently.

Create A Route

Press the  button or use the short cut “Ctrl-R” to start the creation of a route. “Esc” ends the route. The cursor changes to a pencil (). Left click to create sequential numbered route points. The numbers will not be visible, but are available in the Route Properties Dialog, accessible through the right click menu or the Route Manager. The running total distance of the whole route will be shown along the “pencil” together with the course and distance from the last marked route point. When creating routes, OpenCPN will ask if it should use a nearby mark, when a route point is added that is close to an already existing mark.

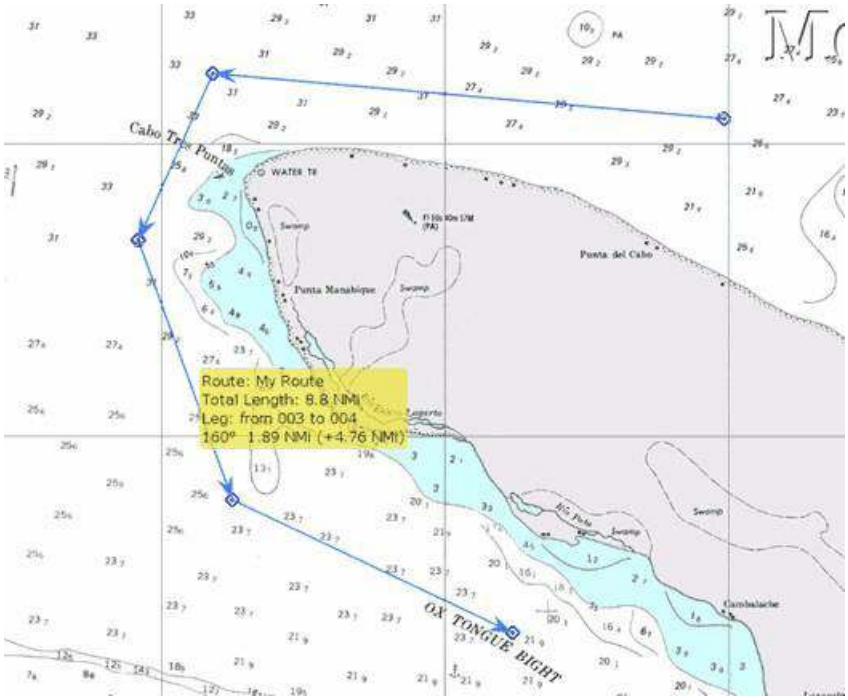


If you click “Yes”, the existing mark is copied to the route.



For longer distances, especially on east-west courses in higher latitudes, the Create Route tool seamlessly switches to also offer a Great Circle alternative to Mercator rhumb-line route legs.

Read more Great-circle Sailing.



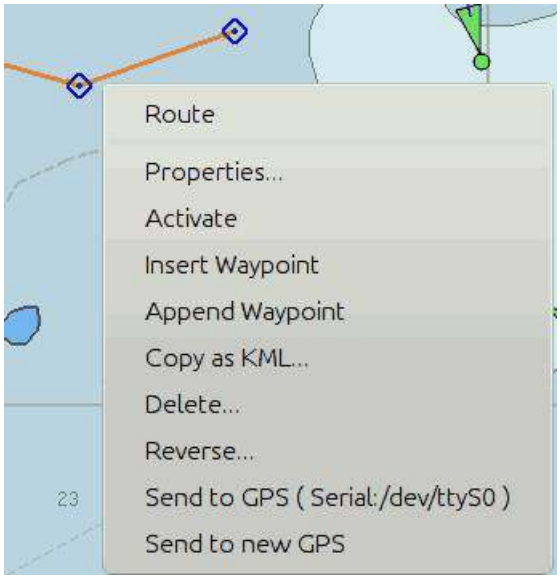
Hovering the cursor over the route brings up a yellow roll-over rectangle. It shows the name of the route (if it is set in the properties dialog), the total length of the route, the course and distance for the leg under the cursor and distance run so far along the route to the first waypoint in the current leg. Looking at the four legged route above. The total distance is 8.8 NMi. The third leg is 1.89 NMi in true direction 160° and the accumulated distance in the

first two legs is 4.76 NMi.

If your desired route extends off the currently displayed chart, move the route cursor in the desired direction and the display will automatically pan to show the area. You can zoom in and out with the mouse scroll wheel or keyboard +/- keys during route creating. You can also right click and select 'MAX DETAIL HERE' or 'Scale Out' during route creation. When finished right click and choose end route from the context menu or press the “Esc” key.

The new route will be shown in **blue** to indicate it is an *Inactive Route*. *Active routes* are **red**.

Right-clicking on a **Route** brings up a focused menu

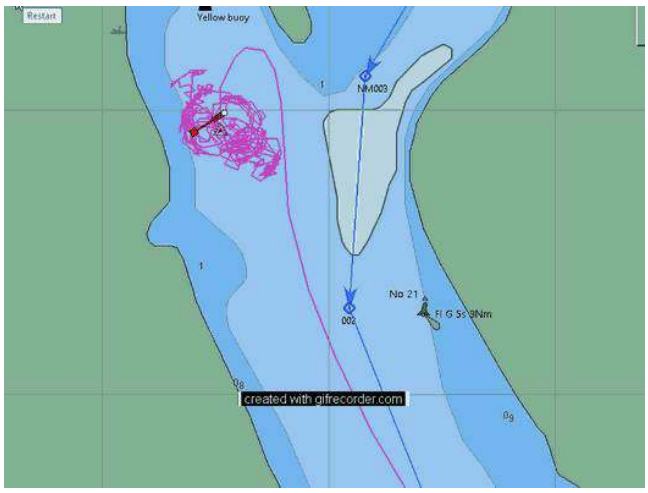


To *Activate* the Route, select **Activate**.

To prevent deleting a route by mistake, a confirmation dialog is activated when pressing **Delete** from the popup menu, if the box *Confirm deletion of tracks and routes* is ticked in *Options* > *User Interface*. If a Waypoint is deleted, the right click menu will have “*Undo Delete Waypoint*” in the *right click* menu, with a hotkey **Ctrl + Z**.

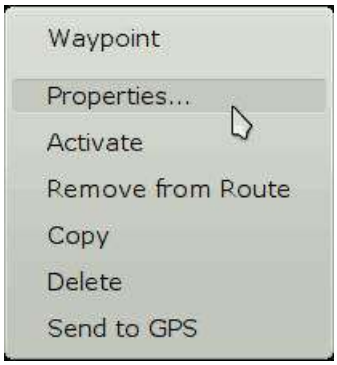
Modify a Route

To modify, add to, insert waypoints, remove or delete waypoints in a Route, *Right Click* on the **Route Segment** or at the **Waypoint** dependent on intent, and select the appropriate command.



Insert a Waypoint into a Route.(Click on the image to activate the gif recording) or Append a waypoint to the end.

Right clicking on a **Waypoint** in a route brings up a few options, otherwise not available.



*

- **Properties**. The dialog is the same as for an individual mark.
- **Activate** - Gives the direction to the chosen waypoint instead of the first waypoint in the route, which is the default. Useful when joining, for example, an imported route, at an arbitrary waypoint.
- **Remove** from Route, but don't delete it.
- **Copy as kml,** for use with Qtvlm or Google Earth.
- **Delete** Waypoint from Route.
- **Send to GPS** is seen in the rightclick menus for routes and waypoints. If a port is not selected, the case in the picture above, a dialog is shown to select an output port. To change the selected port, go to the route manager and select “Send to GPS”.
- **Ctrl + N**, a shortcut that activates the next waypoint in an active route.

Multiple Routes

In OpenCPN multiple routes can be handled in a couple of different ways. Many routes can be created in a session or imported into a session.

The visibility of every route is controlled in the Route Manager. There is an “eye” to the far left on the line for each route. This works as a toggle switch. A plain Eye means that the route is visible, while an eye with a red cross means that it's hidden. This allows you to show only

the routes of current interest.

Another way is to create and export routes, and later import them when needed. To keep the chart clear of useful, but not currently needed, routes follow these steps:

1. Create a folder called, 'GPX_Routes', or another suitable name.
2. Create your route.
3. Use the Route Manager to export the route with a descriptive file name and save it in GPX_Routes.
4. Delete the route from the chart.
5. Repeat for each new route.
6. When needed, simply use the Route Managers “Import” Button to open the route file.

You can export any number of routes to one big file or export each route to a separate file.

When you import a route that uses shared waypoints those waypoints will be left on the chart when you delete the route. To get rid of the way points left on the chart when a route has been deleted follow these steps.

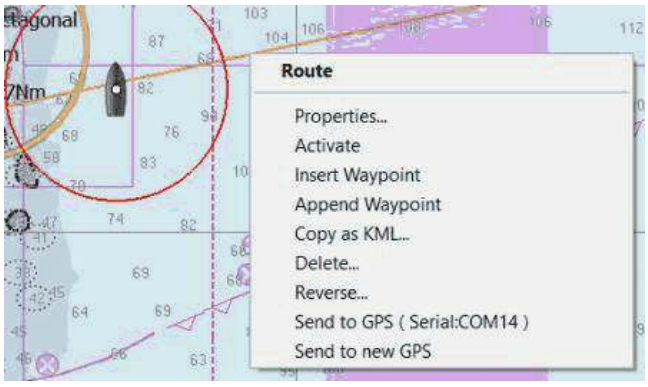
1. Open the Route Managers Waypoint tab and press the “Delete All” button
2. Say 'Yes' to: 'Are you sure you want to delete <ALL> waypoints?'

Exporting and Importing Routes and Marks

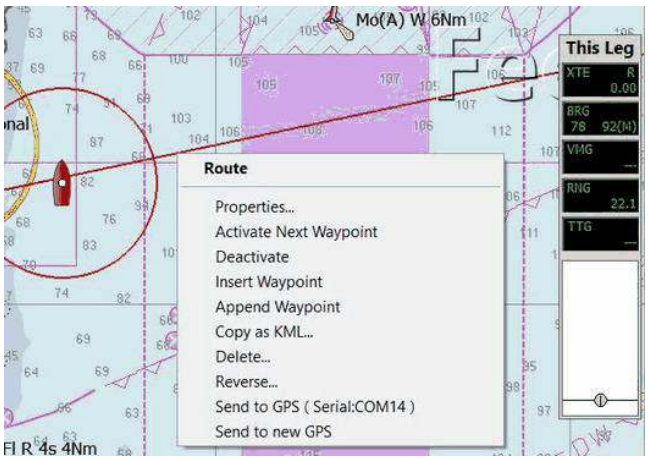
To learn how to export and import routes, waypoints, tracks, and layers read the Route & Mark Manager section of the manual. To open the Route & Mark Manager click the  button.

Activating Routes and Active Route Console

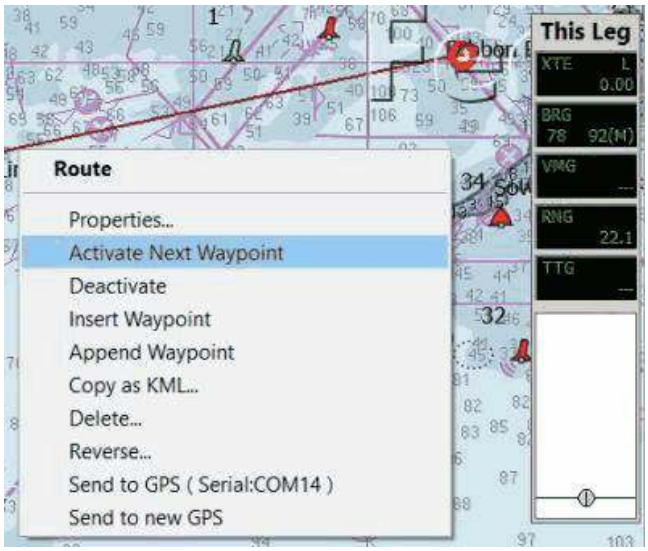
Right clicking on the **Route**, changes the color from blue to orange and brings up a comprehensive menu. Clicking “**Activate Route**” or performing the same action through the *Route Manager* changes the route color to red and a *new route information window appears on the right side of the display*. This **Active Route Console** displays data particular to the *Active Leg* (XTE, Bearing, VMG, RNG & TTG) or the *Active Full Route*.



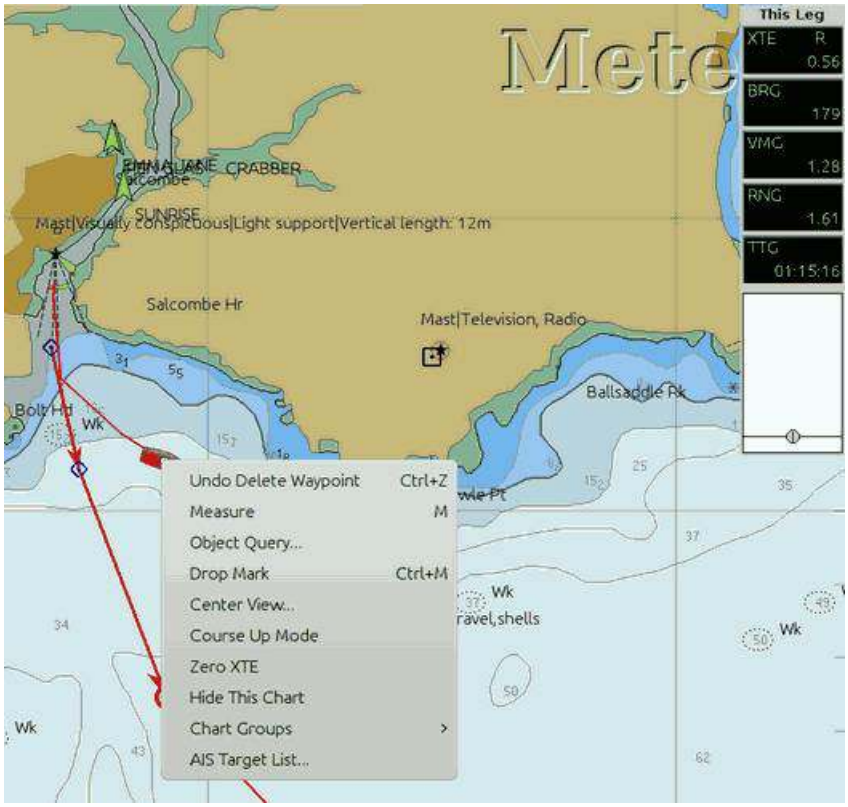
Right click on a an **Active Route**, brings up a menu with a choice for “*Deactivate*”.



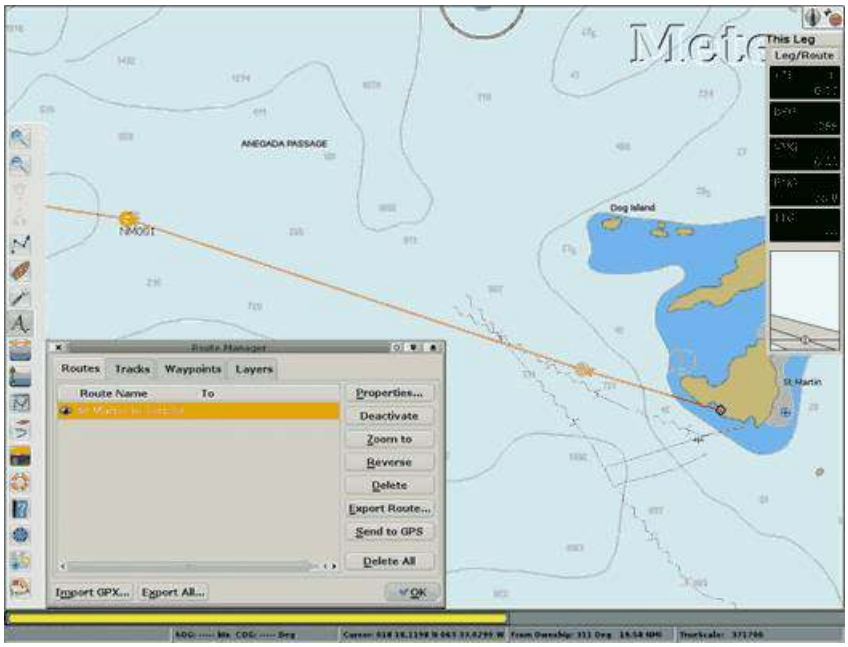
Right click on a an **Active Route**, brings up a menu with a choice for "*Activate next waypoint*".



Zero XTE only shows in the *right click* menu if there is a cross track error. When selected it resets the present XTE (Cross Track Error) back to zero. "Zero XTE" is useful if you are offset from the route and want the autopilot to follow a direct course adjusted for your current position, rather than the position of the last route waypoint.



Active Route Console Window



The Active Route Console Window (upper right black box) appears in the screen when a **Route** is set to *Active* by selection of **Activate** from the Route *Right Click* menu.

To change the Font Sizes in the **Active Route Console Window** go to *Options* > *User Interface* > *Fonts* and pick "*Console Legend*" and "*Console Value*" and change the values.

XTE Cross Track Error. How far off course your boat is. "**L**"=left, "**R**"=right

BRG Direction to next waypoint.

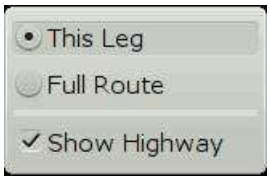
VMG Velocity made good to next waypoint

RNG Distance to next waypoint.

TTG Time To Go to next waypoint.

Showing Active Leg & Active Full Route Data

Right clicking at the top title "*This Leg*" of the Black **Active Route Console Window** above, brings up this dialog:



Select the "**Current Leg**" or the "**Full Route**" *Active Route Console*. There is an option to *Show* or *Hide* the "**Highway**".

Route to Autopilot

For sending a Route to an Autopilot several settings and conditions must be met.

Read more in Sending an Active Route to the Autopilot" *in Options > Data Connections* (at the bottom) for more information about connections and testing.

Note that a ***Connections Output Port*** must be configured to send ECRMB, ECRMC and ECAPB NMEA sentences to the Auto Pilot.

Also read about ***Route to Autopilot*** in Advanced Features for more details.

Under ***Options Settings > Ship > Own Ship*** See:

- Advance route waypoint on arrival only

- Waypoint Advance (normal default)

Route Handling Techniques

Any navigation object you create is saved by OpenCPN until you delete it. Having a lot of navigation objects makes for a cluttered chart display and slows down the program.

1. Export unused objects to GPX files and delete them from OpenCPN.
2. You can import them later when you need them.
3. Create a separate GPX file for each object so you can import only the ones you need.

Create routes for one-time use

1. Don't refer to saved waypoints,
2. Don't upload the route to a GPS,
3. Delete the route when you reach the end point

Route management is pretty simple.

Create routes for future use

If you want to save routes for future use, and want to build on a library of waypoints, and will upload routes to a GPS or chart plotter life will be simpler if you work out a *strategy for naming navigational objects and computer files*.

Here's a strategy for your consideration.

1. Build routes in short segments that don't duplicate other routes.
2. Routes should not share non-end points with other routes.
3. Route points should have meaningful, unique names related to the route name.
4. Routes should be exported to individual GPX files so they can be called up individually.

Example

You have a home port on Little River with a channel that leads to open water. You like to visit Clear Cove and Muddy Harbor, each of which has a channel leading from open water to the final destination.

1. Create a route from LR1 to your dock. Edit the route to name the route points LR1, LR2, LR3, … Dock. If you make the names correspond to the numbered channel markers where you need to make turns it will be easier to recognize the physical aids to navigation the route points represent. Name the route LR1-DOCK. Export the route to a GPX file (LR1-DOCK.gpx).
2. Create a route from CC1 to the Clear Cove anchorage. Rename the route points CC1, CC2, CC3, … CCn (where “n” represents the number of the last point). Name the route CC1-CCn and export it to CC1-CCn.gpx.
3. Create a route from MH1 to the Muddy Harbor dock. Rename the route points MH1, MH2, MH3, … MHn (or MHDOCK). Name the route MH1-MHn and export it to MH1-MHn.gpx.

4. Create three more routes, one from LR1 to CC1, one from LR1 to MH1, and one from CC1 to MH1. In each case, click on the existing route point and select “Yes” in response to “Use nearby waypoint?” Those routes may be straight lines with just a beginning and end point or they may be more complicated to take you around obstructions. Any obstructions should be identified with waypoints given meaningful, unique names. Again, each route should be saved to its own GPX file.

Use of the GPX Routes

When you want to cruise from your home dock to the Clear Cove anchorage, import the LR1-DOCK.gpx file, the LR1-CC1.gpx file, and the CC1-CCn.gpx file. Since the LR1-DOCK route goes in the wrong direction you want to reverse the route. OpenCPN will offer to rename intermediate waypoint for you. Don't. Remember, your numbers correspond to channel markers whose designations don't change when you traverse the channel in a different direction.

Advantages

1. Because your waypoint and route point names are unique you don't have to worry that importing one route will damage another.
2. You can also upload these routes to your GPS without worrying about duplicate waypoint names.
3. Most GPS receivers build routes on waypoints. They don't have the idea of route points that are not in the waypoint list.
4. You need your route point names to be unique so that uploading one route doesn't invalidate a route that was previously uploaded.

OpenCPN Import Operation

1. OpenCPN doesn't care about duplicate route or waypoint names.
2. When you create a route by clicking on points on the chart it names each route point with a number beginning with 001.
3. If you create a second route which joins the first and you “use nearby waypoint” to join the original route you can end up with route points named 001, 002, 003, 004, 002.
4. OpenCPN knows the two 002 points are different because they have different coordinates and different “guids”.
5. Your GPS receiver isn't that sophisticated and it will confuse the two.
6.

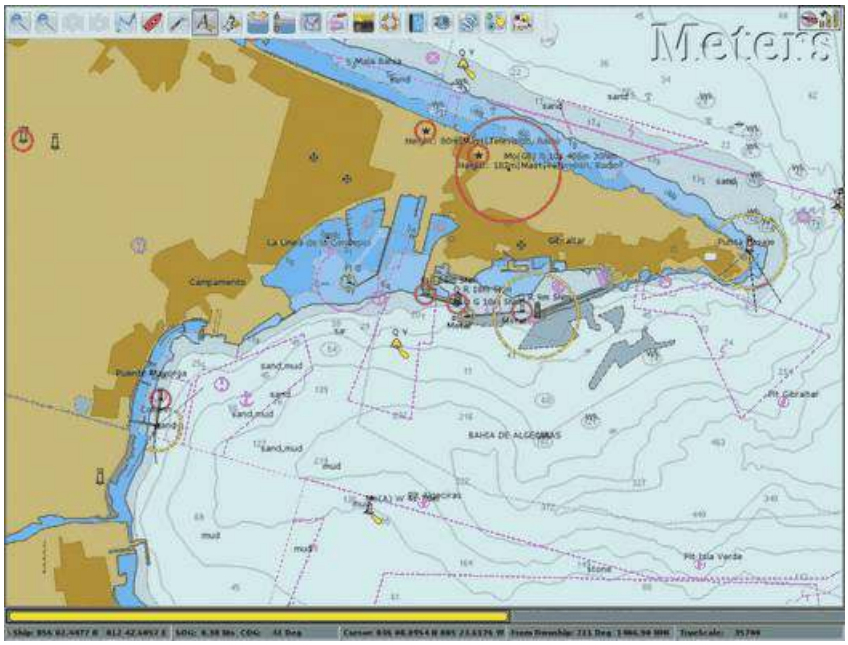
Read Route & Mark Manager for more information on exporting routes to GPX files and importing routes from GPX files.

Auto Follow

Clicking the **Auto Follow** button  will center the chart directly on your vessel's current location. This is a toggle button that looks like this  when on, unless the cursor is over the icon. If the the GPS is working the “Own Ship” icon is red  otherwise the icon is gray.  . It's also possible that a yellow own ship icon will appear. Read more: GPS Setup and Status.

If zoomed out to a scale that is smaller than 1:300.000 the icon changes to  , when receiving gps signals and  otherwise. More about the *Own Ship icon* is available in Marks and Routes

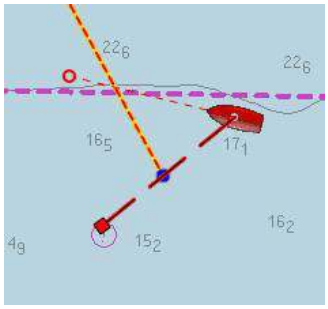
1. The default **Own Ship icon** can be replaced by putting a file **ownship.png** in the User Icons shared data directory. There is more about this shared directory here: Marks and Routes
2. The **Auto Follow** button is useful for two different situations:
   a. When you have panned the map away from your current location and want to quickly move back to your vessel.
   b. When underway, this will keep the display on the chart around your vessel, with the boat at the center of the chart, unless **Look Ahead Mode** is on.
3. *Panning* the chart will *disable***Auto Follow** mode. Simply click again to turn **Auto Follow** mode back on. *Zooming in/out* with the scrollwheel is OK as no panning takes place unless *Options → Display → “Zoom-to Cursor”* is ticked.



4. If the option “**Show skewed raster charts as North-up**” in the

Options → Display → Advanced tab, is **not** ticked, the *right-click* toggle option "**Course Up Mode/North Up Mode**" will be replaced by "**Course Up Mode /Chart Up Mode**", for skewed charts.

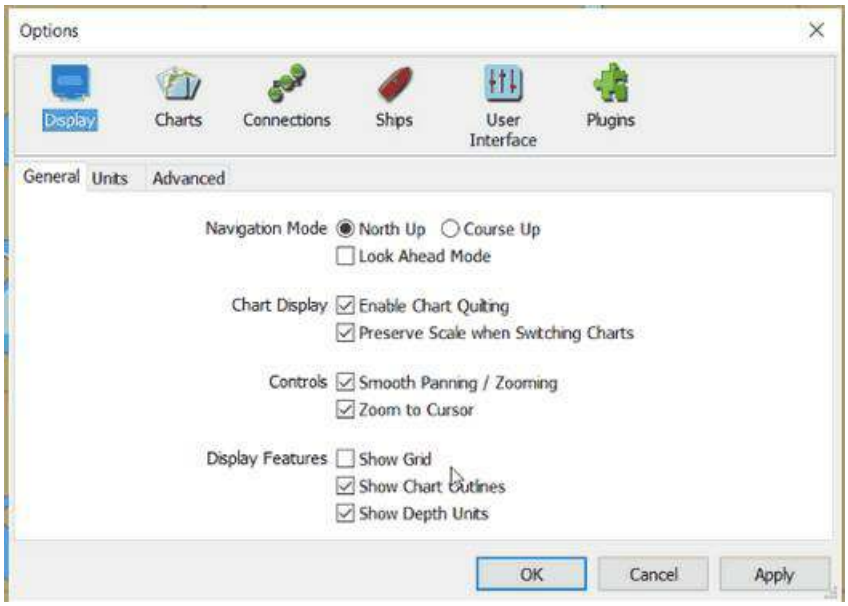
5. If an **electronic compass** is available in the NMEA stream the **own ship icon** will be oriented to this heading. The difference can be seen on the chart if there is a cross current, for example. The boat below is heading WNW but is being set SW. An AIS CPA, Closest Point of Approach is also visible.



Options

Click the  icon to open the **Options Dialog** which has 6 tabs, as seen below. All Settings that are not context sensitive are set in Options. The Settings are persistent, meaning that settings entered in one session will still be there on restart.

For more detail and information about this section please go to ***OPTIONS Setting***



Vector Text Display

OpenCPN makes a serious effort to be compliant with IHO standards for ECDIS display of cartography.

First, one very important setting for vector charts is handled directly from the main toolbar.

 This button **toggles all text displayed on a vector chart** On and Off. The **hotKey "T"** is an alternative for toggling the text. In OpenGL mode, all text will always be horizontal when using the "Course Up" option.

Second, double clicking on a vector chart, as long as the cursor hasn't changed to a green arrow near the edges, brings up an information dialog, displaying the available vector-chart information at the selected point. Scroll down to see all the information. An alternative to double clicking is right-clicking and selecting "Object Query". Note that a single normal (left) click will center the chart at that point.

The example is taken from double-clicking on a lighthouse in a busy area. Exactly what is shown in this dialog depend on the settings described below in "Display Categories".

Third, it is possible to select what font is used for the text on vector charts. There is an entry in the ToolBox→Languages/Fonts→Choose Fonts tab, called **ChartTexts**. Here you select what font to use, and a template size. Weight and final size of the displayed texts depends on the charts you are using, but if the charts contain various weights and sizes, they will all scale together depending on what size you select.

Options-Charts-Vector Charts Tab is where everything else is handled.

If the S63 chart plugin is active, there will also be a "S63 Charts" tab. Read more about *S63 Vector Charts* when you have read this page.

AIS

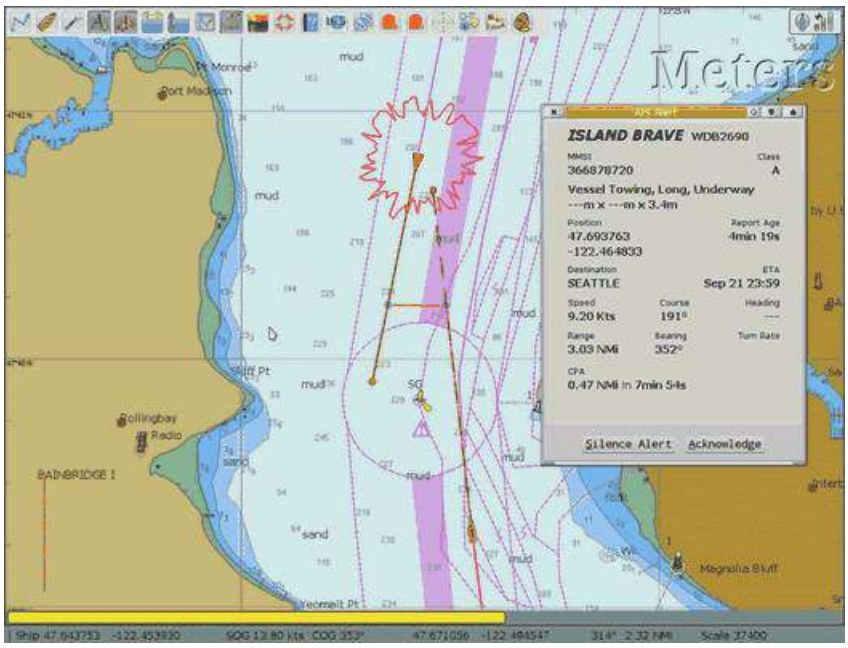
For a general introduction to **AIS**, Automatic Identification System[174] is a good place to start, also AIVDM/AIVDO protocol decoding[175] by Eric S. Raymond

AIS Operating Controls

- *Show AIS Targets*
- *Hide Suppress anchored/moored targets*
- *Attenuate less critical AIS targets*
- *Show AIS Target Tracks*
- *Show CPA Alert Dialogs*
- *Sound CPA Alarms*
- *AIS Target List*

AIS Target Query
Aids to Navigation AtoN
AIS Update Rate
AIS Target List
AIS Transponder and Ownship
AIS data port
ToolBox AIS Tab
CPA Calculation
Lost Targets
Display
Attenuation of less critical targets
Rollover
To track or not to track
Treat WPL Sentences as APRS Postion Reports
Toolbox MMSI Tab
When exactly is an alarm activated
AIS Target Quick Graphic References

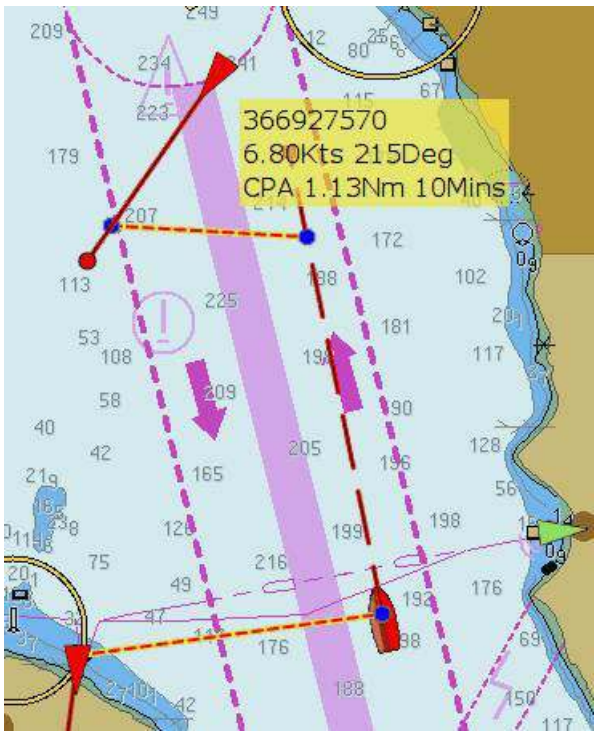
The screenshot below gives you a first feel for how AIS targets are presented and used in OpenCPN.



The Look ahead mode is activated here and our own vessel is proceeding 352 deg at 13.8 kts, leaving an activated **track** behind, and projecting a dashed line ahead representing the course. This ends in a dot, that represents where we will be in 6 minutes, or 1.38 nautical miles ahead.

We are meeting a vessel, steaming in the opposite direction following the traffic separation. This target also has a line and a dot in-front of it representing course and where it will be in 6 minutes(user configurable), and a track behind it. The red/yellow line terminated with two blue dots represents where the vessels will be at **CPA** –closest point of approach– or when the are nearest each other, with present courses and speeds. The meeting vessel is red, as it is a potential danger to us. An **AIS target alert dialog** has just popped up.

There is a lot of information about the vessels that transmit AIS signals.



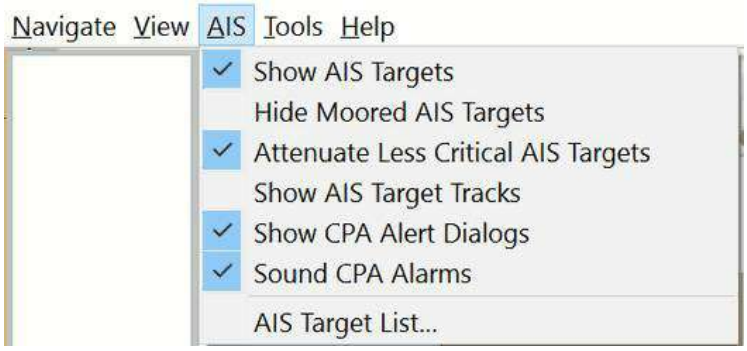
The cursor is on top of the the meeting vessel on a SW course. As we have not yet received full information, which can take a while, we don't get the name but an id number, called the MMSI number, instead. Exactly what is shown in the yellow pop-up is configured in the AIS tabs Rollover heading.

This vessel is identified by name, and has a green color, as it does not represent any danger to our navigation.

AIS Operating Controls

The Menubar-AIS and Toolbar-AIS provide useful operating controls of key AIS parameters which may need to be adjusted during use.

MenuBar> AIS Dropdown



To turn on the **Menubar** use **Options> User Interface> Show Menubar** \

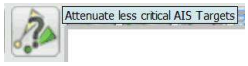
- *Show AIS Targets*
- *Hide Suppress anchored/moored targets*
- *Attenuate less critical AIS targets*
- *Show AIS Target Tracks*
- *Show CPA Alert Dialogs*
- *Sound CPA Alarms*
- *AIS Target List*

These **Menubar > AIS Dropdown** controls work together for quick access:

- Show AIS Targets=Options > Ships > AIS Targets > Display: Show AIS
- Hide Moored AIS Targets=Options > Ships > AIS Targets > Display: Suppress Anchored/Moored Targets…
- Attenuate Less Critical AIS Targets.. [Exception, see below]
- Show AIS Target tracks=Options > Ships > AIS Targets > Display: Show Target Tracks Length (min)
- Show CPA Alerts=Options > Ships > AIS Targets > CPA/TCPA Alerts: Show CPA/TCPA Alert Dialogs
- Sound CPA Alarms=Options > Ships > AIS Targets > CPA/TCPA Alerts: Play sound to CPA/TCPA Alerts…

NOTE: **Options > Ships > AIS Targets > Display**: Check **Attenuate Less Critical AIS Targets** to enable it. Also when "Attenuate.." is unavailable, the Toolbar AIS Icon click rotation drops the selection for **Attenuate all AIS targets**.

Toolbar > AIS



Toolbar AIS Icon Message (Clickable Rotation to change settings. Read the pause message.)

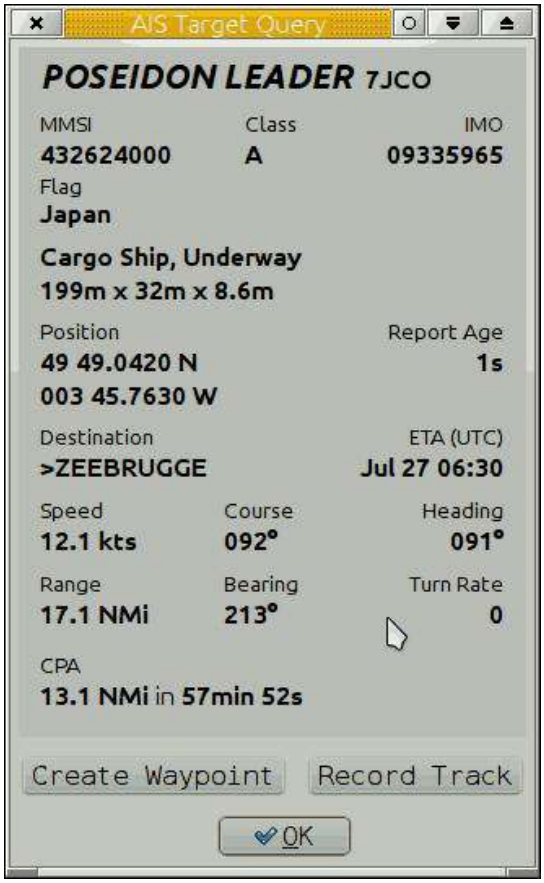
- Attenuate Less Critical AIS Targets (if enabled under Options > Ships > AIS)
- Hide AIS Targets
- Show all AIS Targets
- Attenuate all AIS Targets (dropped in rotation if unchecked under Options > Ships > AIS Targets)

AIS Target Query

What is an MMSI number? Maritime Mobile Service Identifier (MMSI) is a number identifying a ship in communication. MMSI consists of nine digits. All VHF units using Digital Selective Call (DSC), are programmed with the vessels MMSI. The same applies for AIS and EPIRBs.

What is an IMO Number? "International Maritime Organization[176] **(IMO) numbers** are a unique reference for ships and for registered ship owners and management companies.

They were introduced under the SOLAS Convention to improve maritime safety and security and to reduce maritime fraud. For ships, the IMO number remains linked to the hull for its lifetime, regardless of a change in name, flag, or owner." From Wikipedia[177]



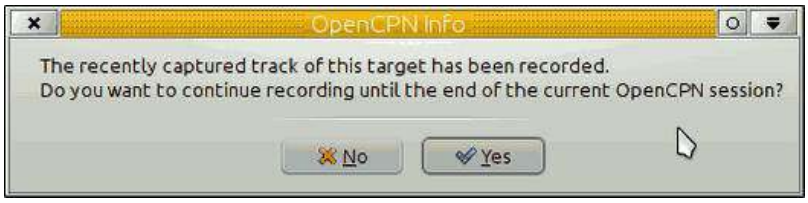
Instead of just hovering the cursor on an AIS object, **double click**, and the dialog above pops up. A lot of relevant information is displayed. **CPA**, **Closest Point of Approach**, to Ownship is 12.7 miles in 12 min 57s. More information about the target itself, is available on Internet address: MarineTraffic[178] http://www.marinetraffic.com/ais/shipdetails.aspx?mmsi="MMSI number here"[179],

in this case: http://www.marinetraffic.com/ais/shipdetails.aspx?mmsi=233150000[180]

Buttons in the Target Query Dialog

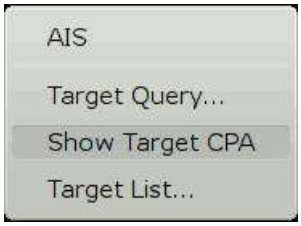
Create Waypoint drops a mark at the targets current position.

Record Track/ Stop Recording Pressing the **Record Track** button brings up a new dialog.



The recently recorded track of the "Poseidon Leader" will appear in the Route & Mark managers track tab on a line starting with "AIS Poseidon Leader…".

If the **Yes** button is pressed, the Target Query Dialog button **Record Track** changes to **Stop Recording**. All tracks recorded will behave just like any other track.



Right-clicking an AIS target brings up a dialog focused on **AIS**.

Aids to Navigation AtoN

More and more aids to navigation are equipped with an AIS transmitter, and show up as a target in OpenCPN like this

Note the word "Real", that says that this is an object that exists in reality.

Here we have an AIS transmitter on a floating W Cardinal Mark. This is of course real and the buoy is on position. If the buoy is off position, for some reason, the Aton icon becomes red.

There are also Virtual AtoNs marked with their own icon.

Virtual AtoNs are used to quickly make mariners aware of things like new wrecks, uncharted hazards and floating debris. They are normally used for a short duration until replaced by real aids or charted, removed or dispersed. Virtual AtoNs are also used for information. For example, the position of the Italian Maritime Rescue Coordinating Center. Note the word “Virtual” in the dialog.

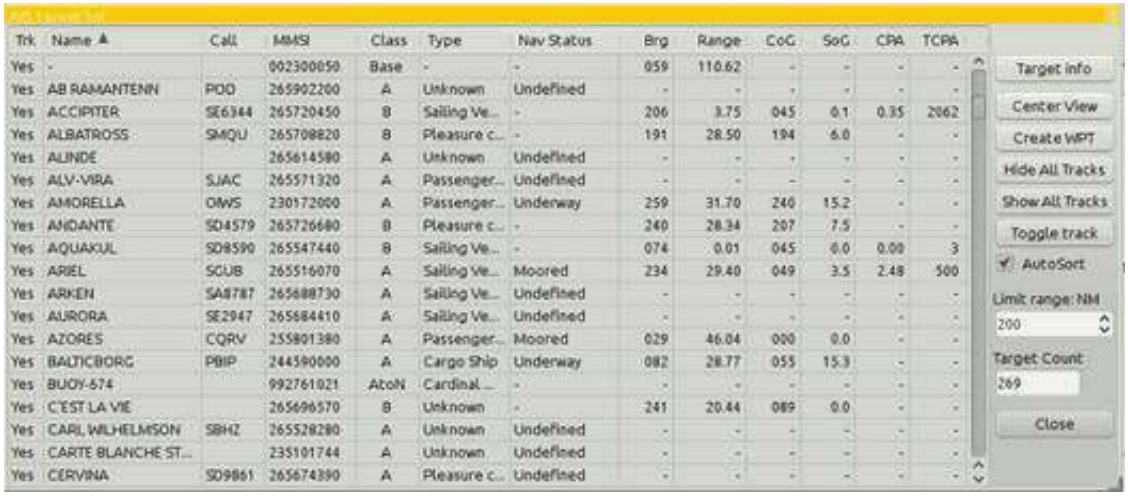
Note: OpenCPN handles the situation where MMSI is set to 0 (zero). This can occur with an incorrectly configured AtoN. Nevertheless, all available information is shown.

AIS Update Rate

How often is the AIS information updated from each target? The required update rates from an AIS target transmitter is shown below.

		Class A	Class B
Static Data		6min	6min
Dynamic Data	< 3kn moored	3min	
	upto 2kn	10s	3min
	> 2kn		30s
	< 14kn (turning)	10s (3.33s)	
	< 23kn (turning)	6s (2s)	
	> 23kn	2s	

AIS Target List



Another way to present the AIS information. The AIS target list is available through the right click menu.

Sorting targets

Click on the header in a column to sort according to this criteria. For example, clicking “Range” sorts the targets with the nearest target on top. Click one more time to get the target, furthest away on top. There is an “autosort” checkbox. When checked, auto sort is on. May be unchecked/rechecked any time. The autosort checkbox is automatically unchecked when target count exceeds 1000. However, it may be rechecked directly by the user, even if the target count is exceeded, and will stay checked.

Active Search And Rescue Target (**SART**) and Digital Selective Calling (**DSC**) distress

targets, will always stay at the top of the list, even when sorting.

AIS targets with Lat > +/-85 deg will show brg “unavailable”. OpenCPN is not suited for Polar Navigation. * **Target Info** button: Click on a target to highlight it and then click the button to display the information dialog.

- **Center View** button: Highlight a target an click this button and the screen will center on the target.
- **Create WPT**. Drop a waypoint at the current position of the target.
- **Hide All Tracks** If tracking is on in Options → Ships → Ais Targets, all tracks will disappear from the screen. Read more furher down this page.
- **Show All Tracks** Will reverse the previous option, and show all available tracks. If Options → Ships → Ais Targets is off, tracking will start for all targets.
- **Toggle Track** Reverse the tracking status.

The **Trk** column in the list indicates current tracking status for each target.

- **AutoSort** See “Sorting Targets” above, for an explanation of this box.
- **Limit Range**: The list will only show targets with a range less than, or equal to this value.
- **Target Count:** Total number of AIS targets.

MMSIname.csv File

This file is a simple list with two columns, MMSI Number and Vessel Name. It is saved in your User file (Windows: *C:\ProgramData\Opencpn*) near the **opencpn.ini** file. It is used to provide Vessel names that frequent your area because the vessel name is not sent or available all the time.

Static data including vessel name, call sign, dimensions, etc., are sent once every six minutes. The MMSINAME.CSV exists to provide names for vessels sending AIS messages while your system has yet to receive the static data.

MMSI numbers and names are added at the end of the file and not updated. Multiple entries can happen and may be caused by confusing configuration of the AIS transponders. Users experiencing performance issues can delete the MMSINAME.CSV file, when it had become too large. A new csv file will be created on receipt of the next MMSI.

AIS Transponder and Ownship

OpenCPN does NOT show **Ownship** (i.e. AIVDO message) as an AIS target or in the target list. AIVDO is processed only in the main navigation thread. *The only true way to monitor the output of a transponder, is with a separate AIS receiver.* Earlier releases did show ownship, but this was a bug, simply an illusion. The earlier presence of AIVDO (ownship) information in the data stream, really only indicated that the transponder was turned on and received GPS signals.

AIS data port

Select your AIS input port in the Connection Tab. The AIS button in the ToolBar, appears different according to the following conditions.

The AIS toolbar tool cycles with each mouse click as follows: (hover for next control action)

- AIS show all targets (normal, default)
- AIS Scale non-critical targets. (Provided it has been enabled under Options > Ships > AIS Tab)
- AIS Hide all targets
- and back to AIS Show All targets.

Also please refer to **AIS Operating Controls** above, under **Toolbar > AIS Icon** which shows how to change key AIS settings by pausing the mouse on the AIS Icon to view the popup message indicating how the AIS controls will change with the next click on the icon. These controls rotate or cycle with each click.

 AIS Alive. The default AIS button. This icon appears as soon as an AIS port is active in the tool-box. It is also the normal state with an AIS receiver working and with no targets of interest.

 AIS Alive and Activity, a small green circle will illuminate in the lower right corner of the Ais buton. If there is at least one AIS message every 4 seconds, the light will remain illuminated.

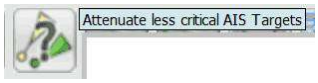
 AIS Suppressed. This icon indicates only that target suppression is activated in the AIS tab in the ToolBox. Referring to the picture above there are two sort of suppression:

- Suppress display of all moored/anchored targets, max speed specified in dialog.
- Suppress Alerts for moored/anchored targets.

This icon will be over-ridden with the AIS alarm button if an alarm is, or becomes, active according to the AIS tab alarms settings in the toolbox.

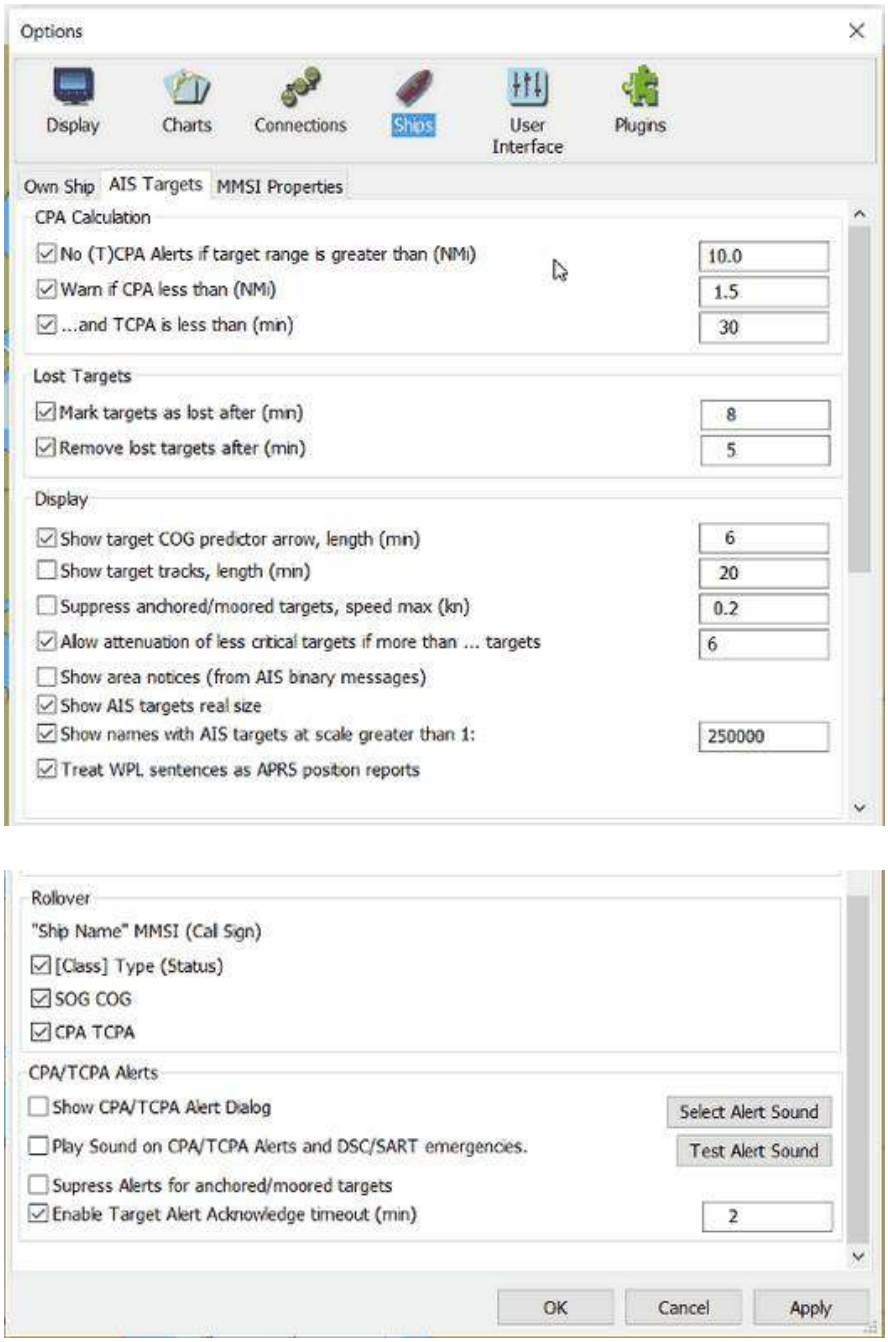
 AIS Alarm. A target exist that raises the alarm as defined in the AIS tab in the ToolBox. It is the three settings “CPA Calculations”, that rules if and when an alarm is raised.

 AIS Disabled. No targets, if available, are shown on the screen. This button toggles with the other buttons. For example, if the AIS alarm button is visible, click the button and it will change to the “AIS Disabled” button, and all targets, alarms etc, disappears from the display. Click again and the original button and AIS display comes back.



Attenuate less critical Targets

ToolBox AIS Tab



This tab controls the behavior of many things in the AIS display. There are no “best” settings. It all depend on where you are, what kind of navigation you are into and what kind of vessel you are on. It is your responsibility to evaluate this.

CPA calculation

Rules for when the Closest Point of Approach- CPA (when two vessels are nearest each other) and the Time For Closest Point of Approach (TCPA) is calculated, and when warnings are activated. There are three tick boxes, which can be activated with user set values.

No CPA Calculation if target range is greater than (NMi)

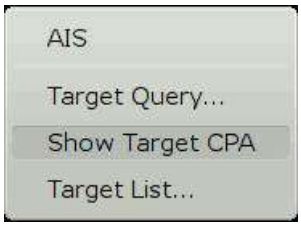
If the vessel is far away it is less interesting to calculate CPA. In a busy waterway this could cut down on clutter and processing speed if a reasonable value is set.

Warn if CPA is less than(NMI)

Similar arguments to No 1. This controls when a warning for minimum CPA distance is given. A warning can be both on the screen and a sound. The CPA is shown on the screen when a warning is active.

..and TCPA is less than (min)

This Box can only be activated if the previous box is active. If the minimum CPA is far in the future, it's not so interesting. If it's hours away, both vessels have probably changed speed and course in the meantime. Set TCPA to a reasonable value value depending on circumstances. A lower value if negotiating a busy waterway. A higher value when offshore. Many factors plays a role here. If you need to get off watch crew up on deck for a manuver, take this into account, for example. Do you find that you get to many useless alarms? Consider lowering this value and/or the CPA value. If a target is within the distance set in #1 and without an active warning, theCPA can be shown anyway through right-clicking on the target.



Show Target CPA

Show Target CPA toggles with **Hide Target CPA**

In Target CPA Details, a few more tricks are available.

Lost Targets

Rules for how lost targets should be handled on the display.

Mark Target as lost after (min)

Target is regarded as lost if no transmission are received for the number of minutes set here, the target will change on the display and have a black bar across.

Remove lost targets after (min)

The lost target will be removed from the display after the number of minutes set here.

Display

If and how a vessels course and speed should be displayed and if stationary vessels should be on the screen.

Show target COG predictor arrow, length (min)

An arrow will be shown in front of the vessel representing it's COG (Course Over Ground). The length of this arrow and the dot at the end of it represents the calculated position in the number of minutes set here. Set easily calculated values. If a vessel approaches you doing 15 kts and the time is set to 6 minutes, the dot will be 1.5 nautical miles ahead of the vessel.

The width of the “Target COG predictor arrow” can be adjusted in the opencpn.ini configuration file. Find the line below and adjust the value.

```
AISCOGPredictorWidth=3
Warning: Don't edit to the opencpn.ini (opencpn.conf) file when OpenCPN is
running.
```

To track or not to track?

This choice below boils down to two basic scenarios.

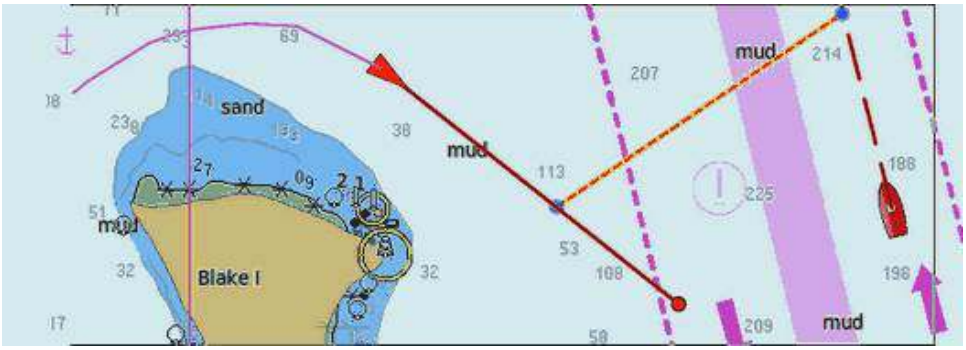
- All targets will be tracked, with the option of turning off tracks for selected targets.
- No targets will be tracked, with the option of starting to track selected targets

The Target List **Trk** column indicates current tracking status of each target. There is more about tracks in the section “AIS Target List” above.

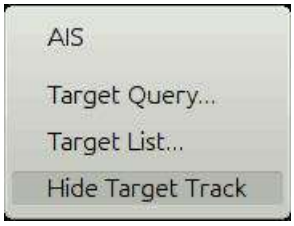
Show target tracks, length (min)

This is the basic setting that can be refined in the “AIS Target list”. With this box ticked targets are tracked even if they are not displayed. Start out with this option ticked, if you hesitate. Come back and fine tune the settings later on, if necessary.

A track will be shown behind a target. This helps to judge the target vessels intentions.



When “Show target tracks” is ticked, the context sensitive AIS menu changes to include the toggle option “Hide Target Track - Show Target Track”.



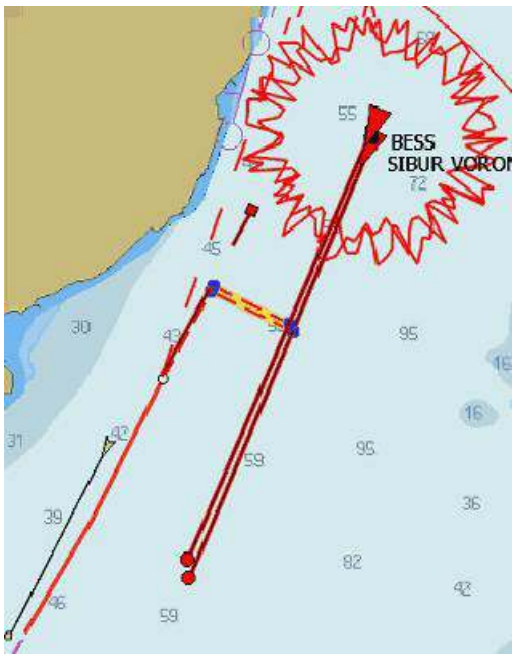
When “Show target tracks” is NOT ticked, the context sensitive AIS menu changes to include the toggle option “Show Target Track - Hide Target Track”. A big difference, in this case, is that OpenCPN has no record of the track. The tracking will start from the moment “Show Target Track” is clicked.

Suppress anchored/moored targets

“Suppress anchored/moored targets, speed max (kn)” A target  will not be displayed if the speed is less than the value set. There are two exceptions to this rule, “Aids to Navigation (AtoN)” and “Vessels Not Under Command”. The rule is aimed at catching anchored or moored vessels. The “Navigational Status” is set by the ships and may not be correct. Be aware that the COG arrow will not be shown for any target with a COG less than this value, hence it's important to enter a very low value.

Attenuation of less critical targets

“Allow attenuation of less critical targets if more than …targets [number]” If checked AND selected under “Menubar-AIS” or “Toolbar-AIS” then at least [number] of targets will be displayed normally. If unchecked then all AIS targets are displayed normally and this option is greyed out and unavailable.



Note smaller attenuated green ship on lower left.

“Attenuation of Less Critical Targets” will declutter the display without removing AIS targets from the display by reducing the size of less critical targets. Less critical targets are determined with a weighted rules filter. The important targets remain unchanged, including display of the ships name. Less critical targets are reduced in size and do not display ship name, to reduce clutter on the chart.

Details for Attenuation of Less Critical Targets

The “importance” of a target depends on:

- **Speed** of the target. Faster targets are more important (max speed acknowledged is hard coded at 12 knots).
- **CPA**. The closer a target will come the more important it is.
- **TCPA**. If the time to 'collision' is small the target is more important.
- **Distance to the target**. Far away is less important.
- **Size of target**. Larger targets are more important.
- **Class B targets don't transmit ships size** and is set to 0(zero).

For each parameter above a factor is calculated. The highest value of this factor depends on the value in the config file. All these values are then added, which gives each target a 'weight'.

From all AIS targets the top [number, say 10] targets which are most important, are displayed at full scale. Only [number, say 10] important targets are displayed, depending of the value in **Options > Ships > AIS > Display: “Allow attenuation of less critical targets if more than …targets [number]“**. The weighted importance is frequently calculated and as long as a target remains in the top [number, say 10], it will be displayed normally.

The less critical targets are still displayed, but at reduced size. The size of the less critical targets can be adjusted with the

```
[AISScaledSizeMinimal=50]
```

setting in the config file, where 50 stands for 50%. Scaled down targets don't have names, no nav status symbols, and no heading line.

Show Area Notices(from AIS binary messages).

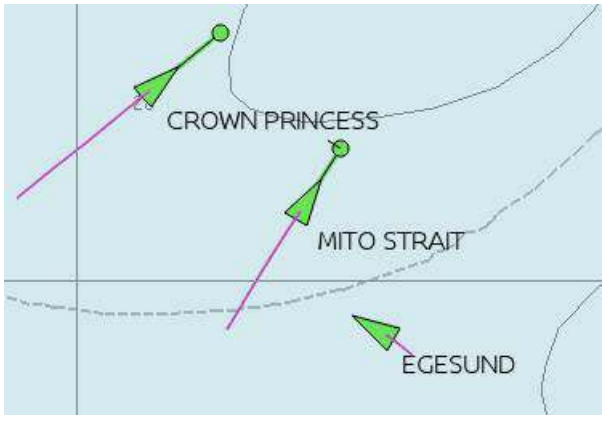
More about Area Messages here.

Show AIS targets real size

Zooming in on a target will eventually show a rectangle using the real size , if available. The picture below also shows how differences in course and heading are treated.

Show names with AIS targets at scale greater than 1:

[select value] With this box activated…..this is what you get!



Note that this setting also controls if a numerical value will be displayed alongside a tidal current arrow.

Treat WPL sentences as APRS position reports

APRS (Automatic Packet Reporting System) is utilized by HAM radio operators around the world.The NMEA WPL sentence is shorthand for for “waypoint location”. If the box is checked,a WPL sentence will be assumed to be an AIS-like APRS target. Enable it on the AIS tab in the Toolbox if you have it disabled. WPL Sentences have the same functionality as AIS or radar targets (track recording, creating a permanent waypoint on current position etc.)

Rollover

Tick the boxes for the kind of information shown when hovering with the cursor over a target. This is what you get with all the settings ticked.

CPA/TCPA Alerts and DSC/SART Emergencies

When an alert is triggered, a jagged circle in red is drawn around the target that set off the alarm. Additional events can be set here, drawing more attention to the alarm. For practical navigation, make sure your alarm sound is set.

Show CPA/TCPA Alert Dialog

Shows an alert dialog on the screen with target information when an alarm is triggered. This setting only applies to AIS CPA/TCPA alerts. A DSC/SART emergency will always generate a dialog.

Play Sound on CPA/TCPA Alert Dialog

and DSC/SART emergencies. Sounds an alarm when an alarm is triggered.

Supress alerts for anchored/moored targets

Don't show alarms for anchored and moored targets.

Select Alert Sound

Select an alarm that suits you, instead of the installed default sound. This alarm will also be used if an anchor watch is set. Due to copyright issues, only a few sound files are included. The default location for these files are ”/usr/share/opencpn/sounds/” on Linux and typically C:\Program Files\OpenCPN\sounds on Windows XP. Users can add their own generic “.wav”

sound files. These files can be in any suitable place in the file-system.

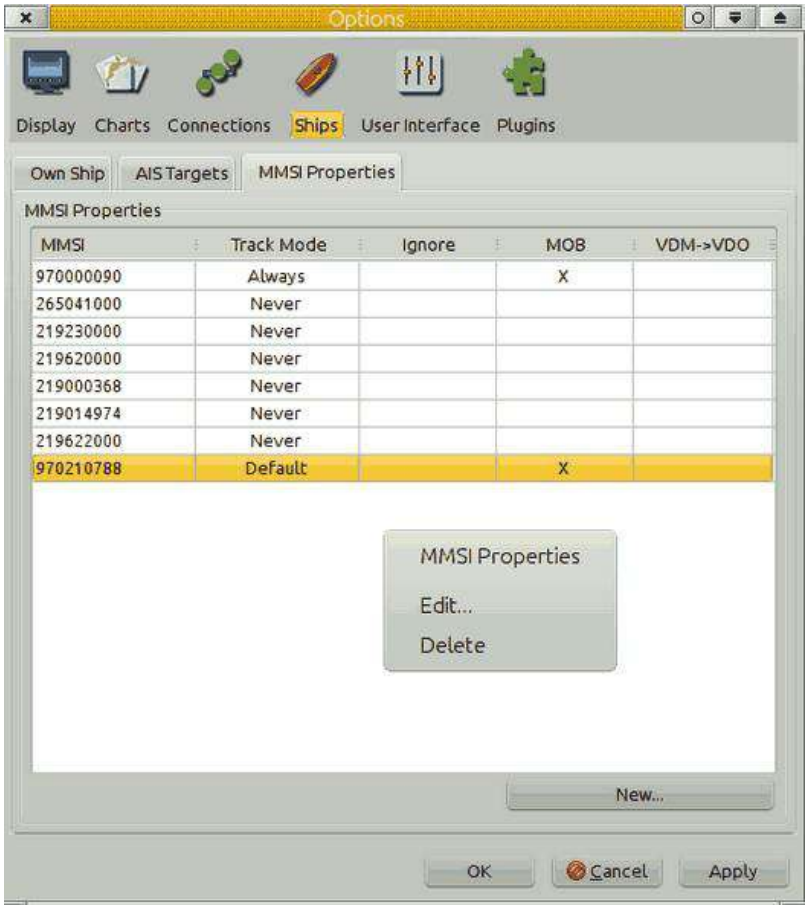
Test Alert Sound

Test the selected sound and make sure this important feature is working.

Enable Target Alert Acknowledge timeout

Once a target alert is acknowledged, wait the set number of minutes before the alert comes up again (if still applicable).

Toolbox MMSI Tab



Read all about this tab here MMSI Properties

When exactly is an alarm activated?

An alert is set off if your boat is approaching the CPA, the blue dot on the extension of the course line, and the previously discussed set of conditions are met. Once the distance to the CPA increases, this happens when the involved vessels has passed each other, the alarm stops, even if the other conditions still apply.

One user noticed an alert every few seconds, yet the target was still green. The explanation is: Variation between alert status and ship icon color is due to rapid changes in target course/speed. The target color can change from red to green while the alert dialog is showing. This may happen so fast that the red icon is not actually seen. OpenCPN does not automatically cancel the alert dialog in this case, in order to not mask information.

Types of Transponders recognized by OpenCPN

- Class A
- Class B
- APRS Automatic Packet Reporting System Targets
- ARPA Automatic Radar Plotting Aid Tagets[181]
- ATON Aid to Navigation, both “Virtual” and “Real”.
- BASE Base Station
- DSC Digital Selective Calling Targets
- GPSG_BUDDY GpsGate Buddy Targets
- SAR Aircraft Aircraft participating in Search and Rescue.
- SART Search and Rescue Transponder Targets

MMSIname File

OpenCPN Remembers the names of seen and fully identified target. The names are cached internally and help identify targets quicker on next start. Targets not yet fully identified, where the name comes from the cache, are displayed in lime green. See example below. The AIS name caching can be turned off in the opencpn.ini/opencpn.config file by adding a line like this.

```
[Settings]
EnableAISNameCache=0
```

The name of the file where the list of previous MMSI and ship names are stored is “mmsitoname.csv” in case you would like to clear it. This file is in the same folder as your configuration file (Click the ? icon in the toolbar to see the location, it is platform dependent).

MOB SART Alerts

For MOB SART information see SART

Automatic Identification System

For a general introduction to **AIS**, Automatic Identification System[182] is a good place to start, also AIVDM/AIVDO protocol decoding[183] by Eric S. Raymond

AIS transceivers automatically broadcast information, such as their position, speed, and navigational status, at regular intervals via a VHF transmitter built into the transceiver. The information originates from the ship's navigational sensors or is programmed. when installing the equipment (call sign, ship name, etc).

The signals are received by AIS transceivers fitted on other ships or on land based systems. The received information can be displayed on a screen or chart plotter, showing the other vessels' positions. Data is transmitted via a tracking system which makes use of a Self-Organized Time Division Multiple Access (SOTDMA).

AIS Standard Types of Devices

Class A Vessel-mounted AIS transceiver (transmit and receive) which operates using SOTDMA (maintains a timeslot memory map, preannounced timeslot reservations, prioritized transmissions). Class A is self organizing, as each transmission claims a timeslot for the next transmission. If there is no free timeslot available the AIS claims the timeslot of another vessel that has the largest distance. There are 4500 timeslots per minute available, so it must be really crowded to run out of timeslots. Class A transmits at 12.5 watts, with a default transmit rate every few seconds. Class A receives all types of AIS messages.

Class B Vessel-mounted AIS transceiver (transmit and receive) which operates using either carrier-sense time-division multiple-access (CSTDMA) or SOTDMA; For Lighter commercial and leisure markets. CSTDMA transceivers listen to the slot map immediately prior to transmitting and seek a slot where the 'noise' in the slot is the same or similar to background noise, where the slot is not being used by another AIS device. Class B transmits at 2 watts, with a default transmit rate is normally every 30 seconds, but this can be varied by speed or base stations, requires integrated GPS. Class B receives all types of AIS messages. Class B works differently; it is not self organizing at all. Class B is listening. As soon as this AIS device recognizes a time slot without a transmission it will transmit. In theory it is possible that all Class B timeslots are occupied and that a free timeslot is not availabble, or that multiple Class B's jump try to jump into the same slot. In very crowded areas, it could be wise to lower your AIS antenna. This will stop you from receiving distant transmitters and your own AIS will 'think' it is seeing a free slot where a weak signal is available. This will make your (stronger) signal available to nearby receivers.

Base Station Shore-based AIS transceiver (transmit and receive) which operates using SOTDMA. Base stations have a complex set of features and functions which in the AIS standard are able to control the AIS system and all devices operating therein. Ability to interrogate individual transceivers for status reports and or transmit frequency changes.

ATON Aids to Navigation Shore or buoy-based transceiver (transmit and receive) which operates using fixed-access time-division multiple-access (FATDMA). Designed to collect and transmit data related to sea and weather conditions as well as relay AIS messages to extend network coverage.

SART Search and rescue transceiver Specialist AIS device created as an emergency distress beacon which operates using pre-announce time-division multiple-access (PATDMA), or a “modified SOTDMA”. The device randomly selects a slot to transmit and will transmit a burst of eight messages per minute to maximize the probability of success. A SART transmits a special message format recognised by other AIS devices up to a maximum

of five miles. A SART is designed for periodic use and only in emergencies, due to stress put on the slot map.

RF Characteristics

AIS uses the globally allocated Marine Band channels 87 & 88. AIS uses the high side of the duplex from two VHF radio “channels” (87B) and (88B)

- Channel A 161.975 MHz (87B)
- Channel B 162.025 MHz (88B)

The simplex channels 87A and 88A use a lower frequency so they are not affected by this allocation and can still be used as designated for the maritime mobile frequency plan.

Most AIS transmissions are composed of bursts of several messages. In these cases, between messages, the AIS transmitter must change channel.

AIS Target Quick Graphic References

Note that AIS targets reporting position unavailable will be rendered in grey colour.

Ais_Icon	Informaton	Ais_Icon	Information
	An active AIS SART and is a **distress** call equal to a **“Mayday”**transmission. More about AIS SART.		The V-shape stern indicates a Class B target. Tugboats and pilot boats very often carry Class B transponders. These are often designed specifically for small commercial boats, fishing boats and pleasure crafts.
	Icon displayed when **testing** an AIS-SART device.		Targets is complying with the Euro AIS[184] Inland specification.
	Aircraft participating in Search and Rescue.		This vessel has the “Inland Blue Flag” set, it's a part of the European, Inland AIS standard. The “Blue Flag” signal, commonly seen on inland waters, indicates that the vessel requests a “stbd-stbd” passage or crossing. This Blue Signal is manually switched on/off, by the target.
	Potential Danger.		Aton, Aid to Navigation, for example a Lighthouse or a Buoy with an AIS transmitter.
	No Danger. Not Identified (Voyage data not received)		Aton, Aid to Navigation, that is off it's suposed position. For example a buoy equiped with AIS that has come adrift.
	No Danger. Not Identified		Virtual Aton, Virtual Aid to Navigation, not a real marker. Can be useful for a range of situations. A new

wreck, is one example. Further explanations.[185]

No Danger. Identified

Virtual Aton, off position. Actually seen in the wild, but may be a user config error.

Lost Target

AIS Base Station

Ship which has lost fix - position unavailable. Displayed at the last known position.

The following tagets only displays if DSC messages, GpsGate mesages, Radar or APRS messages are mixed in to the incomming AIS stream, by using, for example a multiplexer. More on the following pages.

Vessel not under command.

DSC Station. Only the DSC message received. The position contains only degrees and minutes of Latitude and Longitude.

Vessel restricted in ability to manoeuvre.

DSC Station. DSC **and** DSE messages received. The DSE message contains the missing decimals of minutes of Latitude and Longitude. The result is a much more accurate position.

Vessel constrained by draft.

DSC Station transmitting a **distress** signal. Treat this as a **“Mayday”** call.

Vessel aground.

GpsGate Buddy target.

Vessel engaged in fishing.

ARPA Target

High Speed- and Wing In Ground- crafts. This includes Hydrofoils, Hovercrafts and low flying crafts utilising the ground effect.

APRS Target

Anchored or moored. Displayed when the transmitted “Navigation status” is “at anchor” or “Moored”. There is no guarantee that this status is correct, as it is set manually on the transmitting ship…

…illustrated by this ship. Note the black line on the yellow circle. This indicates that the vessel is turning to port (left), also illustrated by the lag in the display update. ROT - Rate Of Turn is available in the “Ais Target Query” dialog, through the right click menu.

SART

The US FCC has recently approved transmissions by AIS SART devices. These devices were originally designed for SOLAS class ships as an alternative to radar SARTs for carriage on life boats, but the efficiency of design has encouraged applications down to man-over-board devices.

Search And Rescue Transponders (SART) or PLB transmitting AIS messages are now available on the market. In an emergency situation the position will be displayed as an AIS target in OpenCPN. AIS SART can be a device on a vessel, in a life raft or a personal Man Over Board (MOB) device. MMSI always begins with 97.

Any AIS SART Activation

Note: Unknown SART. When the MMSI Number is not entered into the MMSI List

This section includes "Unknown" SART, **SART Alerts** which **Do NOT** have **MMSI numbers** entered into the **MMSI List** as MOB. Listed MMSI SART Alerts also have this type of alert. The common notice or alert is that the icon below marks an **emergency**.


SART icon, **distress** target display. **This is a "Mayday".**

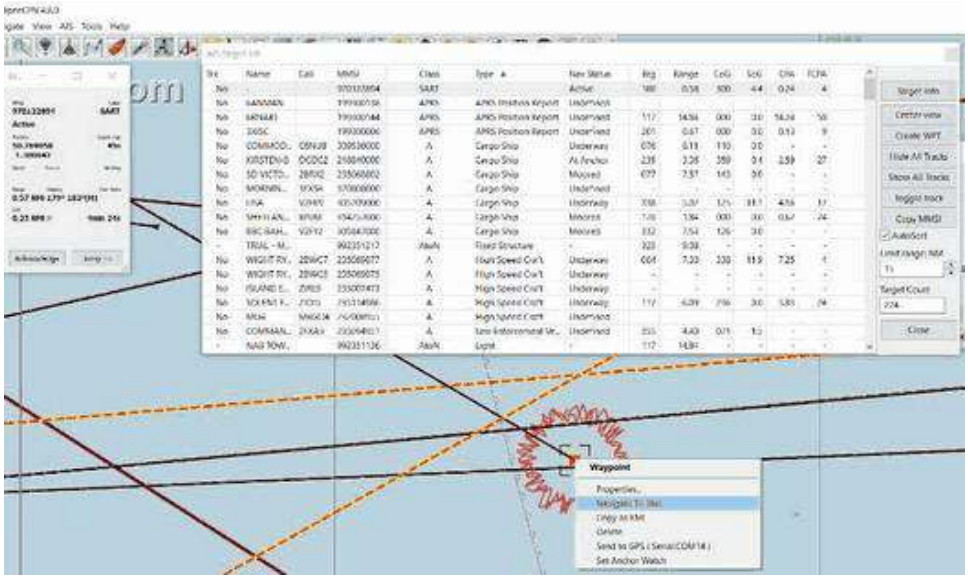
In OpenCPN a distress signal sent by a SART, triggers a visual alert (red explosion bubble) and a warning sound (if activated in the ToolBox–>AIS Tab).

Jump to Target

Then Manually Create & Activate Route.

There is no **Automatic creation of a Route** to the SART for **MMSI numbers** *not* entered into the **MMSI List**.

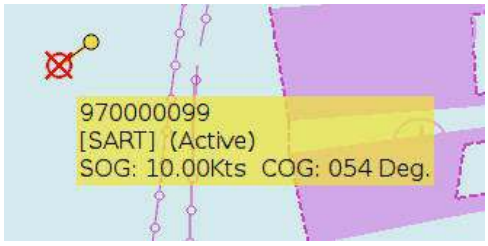
Currently the easiest way to create a Route from Ship to SART is to pick **Jump to Target** from **Target Info** and then **Right Click** on the SART Alert Icon and pick **Navigate to this** which will create and set the **Route Active**.



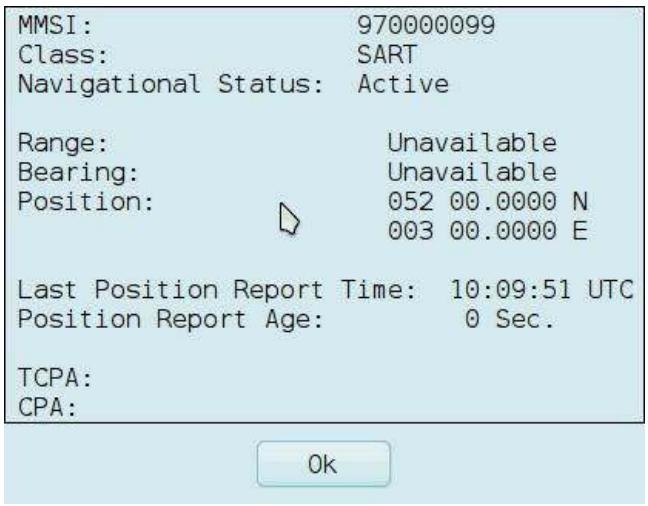
We would like to see “Navigate to this” as a Right Click in the AIS Target List.

Alert is Acknowledged

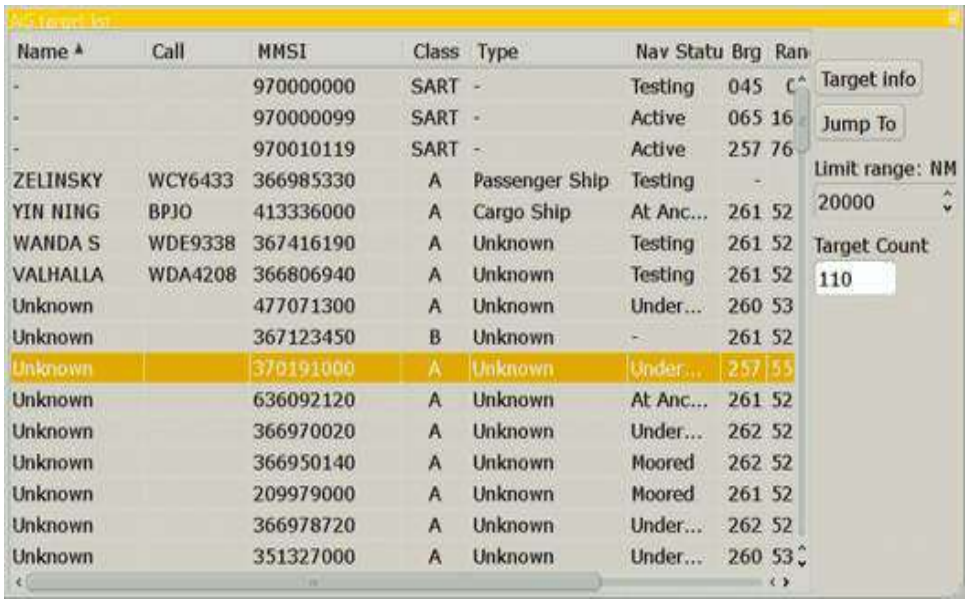
Once the alert is ***Acknowledged***, the target behaves as any other AIS target. In the picture below the cursor is over the target. The SART target will persist on screen for 18 minutes after the last transmission irrespective of other settings for AIS. **SART alerts always have priority over DSC and CPA alerts.**



And here is an AIS target query.



AIS SART messages and DSC distress calls are always found at the top of the AIS target list.



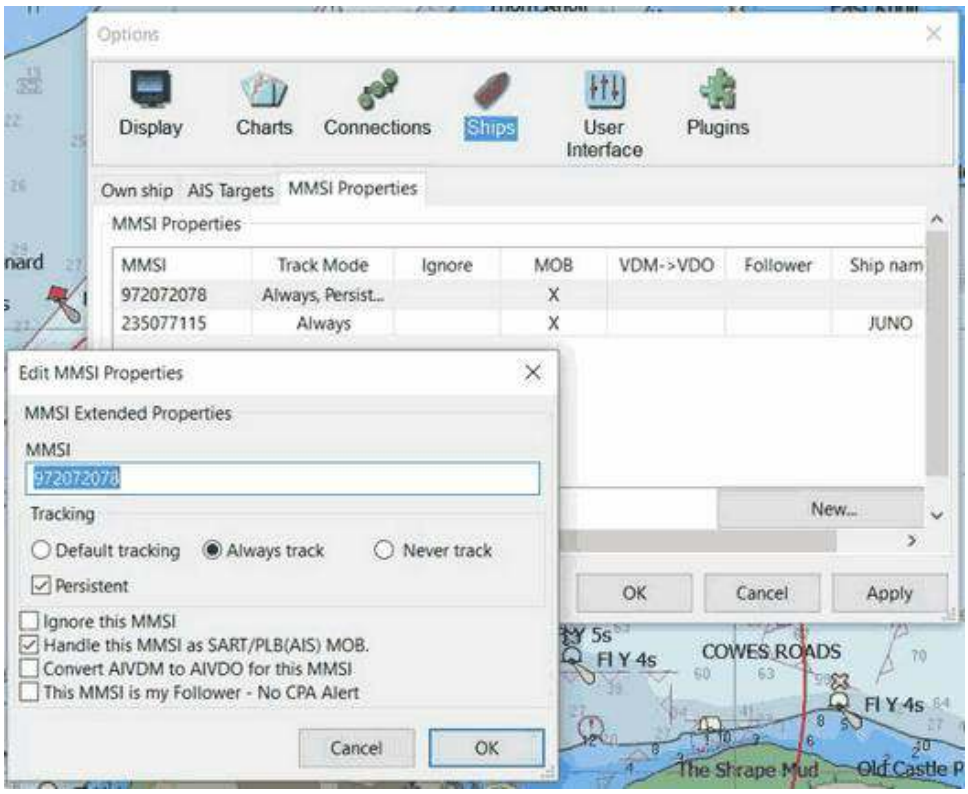
Automatic SART-MOB Activation for your Crew

Note: Enter Crew Member AIS-SART-PLB MMSI Numbers into the MMSI List

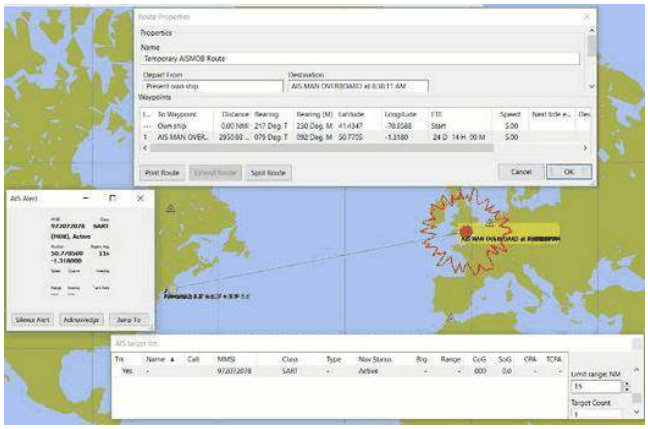
If you and your crew have AIS Sart PLB personal locator beacons, transmitting AIS emergency messages, and the MMSI number of each device is entered in *Options → Ships → MMSI Properties → New*, OpenCPN (from version 4.0) will automatically work as a *man overboard tracking device*.

Read more in *Man OverBoard*.

In particular, each Crew Member's MMSI must be properly recorded and set up for "Automatic MOB Activation" in *Options > Charts > Ship > MMSI list*.



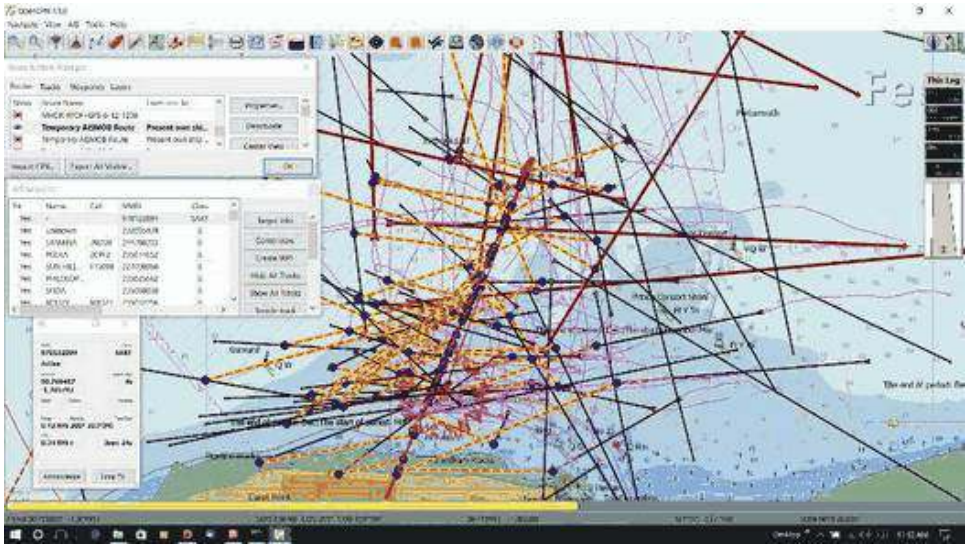
AIS Sart for MMSI Crew "Temporary MOB Route" Shows



When the AIS-Sart occurs and becomes “Active” (showing up at the top of the AIS Target List), there is a new heavy blue “Temporary MOB Route” created from the Ship to the SART, that is not “Activated” yet. Also the Active SART has a red explosion bubble around it and the heavy blue “temporary MOB route” is automatically inserted into the Route Manager along with a MOB waypoint.

AIS Sart "Temporary MOB Route" is Activated

When the automatically created “Temporary MOB Route” (shown as a heavy blue line), is activated by a Right Click, or in Route Manager, the “Active Route Console” Window appears on the right side of the screen and the route is from Ship to MOB.



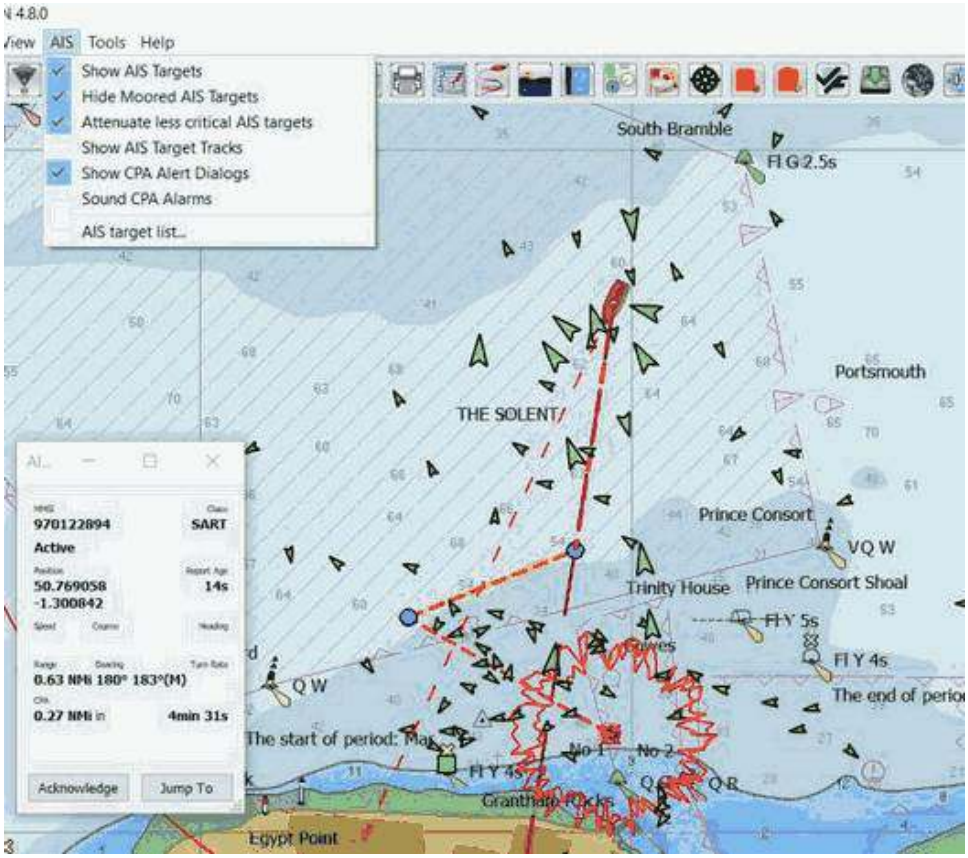
This is an intense situation with heavy AIS traffic, shown with normal AIS settings. There are ways to reduce the clutter:

From from *Menubar* > *AIS* > *Dropdown*

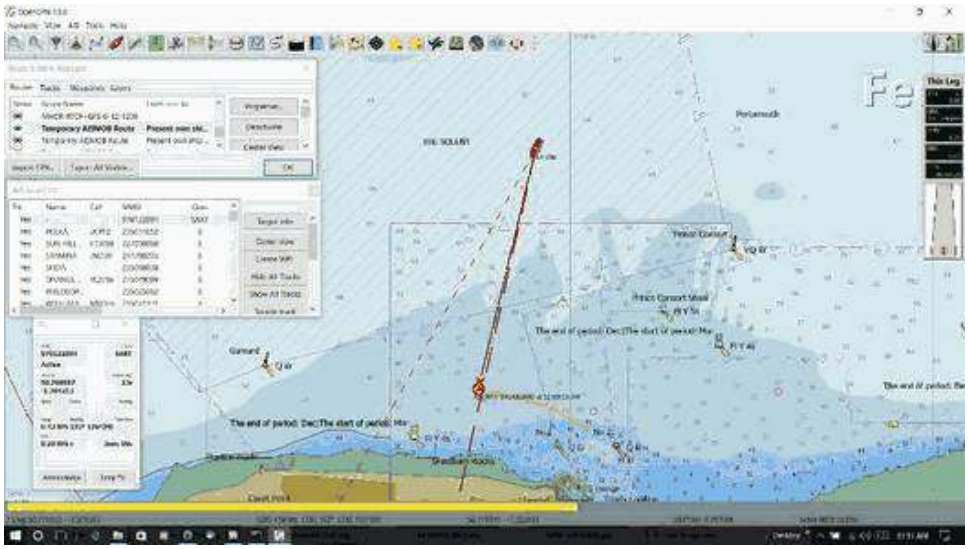
- Turn on “Attenuate less critical targets”
- Uncheck “Show AIS Target Tracks”
- Uncheck “Show CPA Alert Dialogues”

From Options > Ships > AIS Targets

- Under “Display” Uncheck “Show Target COG predictor arrow”
- Under “CPA Calculation” to Uncheck “Warn if CPA is less than (NMi)”



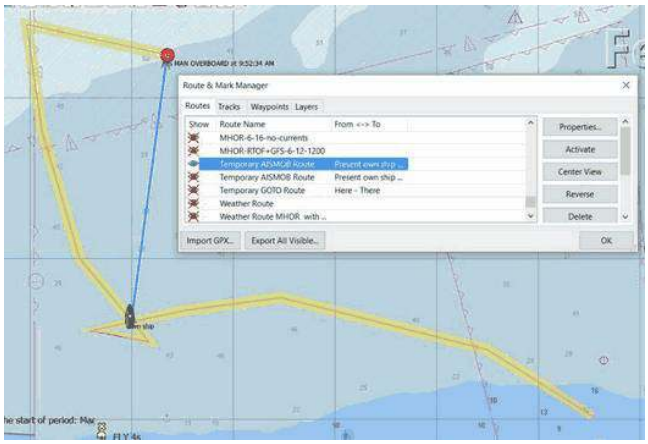
The final step, “Show Targets” set to Off from *Menubar* > *AIS* > *Show Targets*:



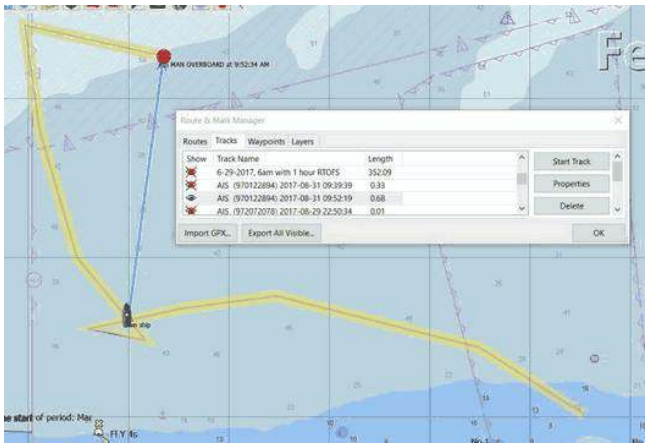
After MMSI Crew member SART is deactivated (18 minutes)

After any Crew member SART MOB (MMSI entered into MMSI List) has occurred and is completed, there is an 18 minute period during which the MOB continues to show (typical). Then after that there will be continue to be artifacts left in the “Route Manager” which is very good, because they provide a backup to continue the search. Each screen shows a different artifact.

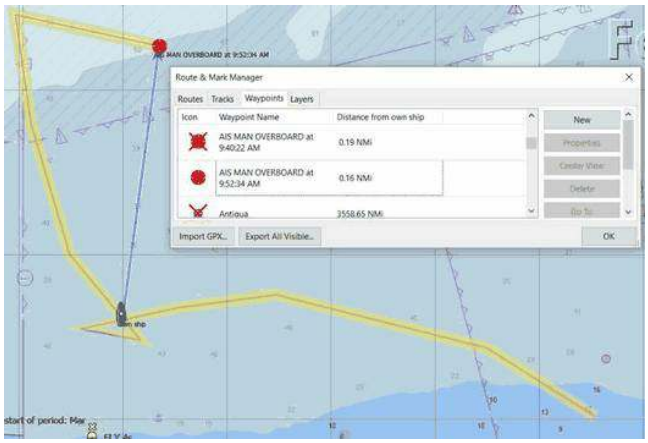
Temporary MOB Route



MOB Track



MOB Waypoints - Most recent MOB Waypoint (the earlier ones are disabled automatically).



Disable or ignore a SART Alarm

When an Alert is active:

- Find the Alert's MMSI number in the AIS Target List.

- Add a “New” MMSI number in Options → Ships → MMSI.
- Edit the Options → Ships → MMSI Properties to “ignore” this target.
- Close the Options Dialog.
- “Acknowledge” the SART alert one more time.
- No further alerts should be seen or heard.
- If you restart OCPN, you will never get alerts for this target again.

To simulate a SART Alarm run Sart Alarm Nmea File[186] in VDR player.

Testing Ais-Sart-Mob with a Real SART event recording

There is an even better dry VDR file test provided by contributor [Firebar] which is a realtime recording which has Ship's position and several AIS-Sart-Mob signals from **MMSI # 970122894** which will give you an very good idea of the operation. Download this file below, unzip and run it with VDRplayer[187] after making the proper TCP connection in Opencpn. Also make sure you enter the MMSI number into the MMSI list providing the correct settings. Then when AIS-Sart-Mob alert occurs, right-click the blue Temporary MOB route and set it “active”. For instructions on use of VDRplayer on Github[188] and Adding a Network Connection

The screenshot illustrations above[189] were done with this file. When the MOB has moved and there is a new automatic route created, the old route is deactivated automatically..

- Test file AIS-sart-mob-Firebar-Real.zip[190]
- Cruiser Forum Discussion AIS Man Overboard Behavior[191]

Testing One SART message

With the MMSI entered and set as an MOB device, when a SART message is received an MOB alarm is activated and a single MOB waypoint is generated. No further ones are generated regardless of whether the alert is acknowledged or not. With two SART activations within a few seconds of each other at exactly the same position one MOB waypoint is generated. With a drifting MOB the result may a little different.

- Test file: SART-Test-One-Activation[192]
- Cruiser Forum Discussion: One AIS SART message[193]

Testing AIS-Sart-Mob without AIS-PLB Device (dry test using VDR files)

The two lines representing the SART going off are: >
!AIVDM,1,1,,A,»O2TSdlt:1@E=@,2*51

!AIVDM,1,1,,A,1>O2TSf000OquoPM3AG000000000,2*3B

Sart-Test.txt[194] Please unzip the compressed file. Run this Nmea0183 file with VDRplayer to simulate an AIS-SART-MOB event after setting up the MMSI number as described below.

First set up the AIS-MOB MMSI in the Options > Ship > MMSI Tab as if it were a Crew

Member's MOB device, as shown below:

- MMSI# 972072078
- Always Track
- Persistant
- Handle this MMSI as SART/PLB(AIS) MOB

Then run the test file above with VDRplayer[195]. If you do have it set up you'll get a single SART distress call and a new Temporary MOB Route will be automatically set from the Ship location to the MOB. If you do not have it set up correctly, you'll probably get 2 alerts for the SART in the course of the file.

Using the Test Button for a AIS-SART-MOB-PLB device

It is possible to use the “Test Function” to test a SART, to make sure it works. If the AIS-MOB-PLB has a testing function that can be activated, there is a test mode which uses a different icon. (We would very much like a VDR recording of this to provide an download dry test.)

Icon displayed when **testing** an AIS-SART device.

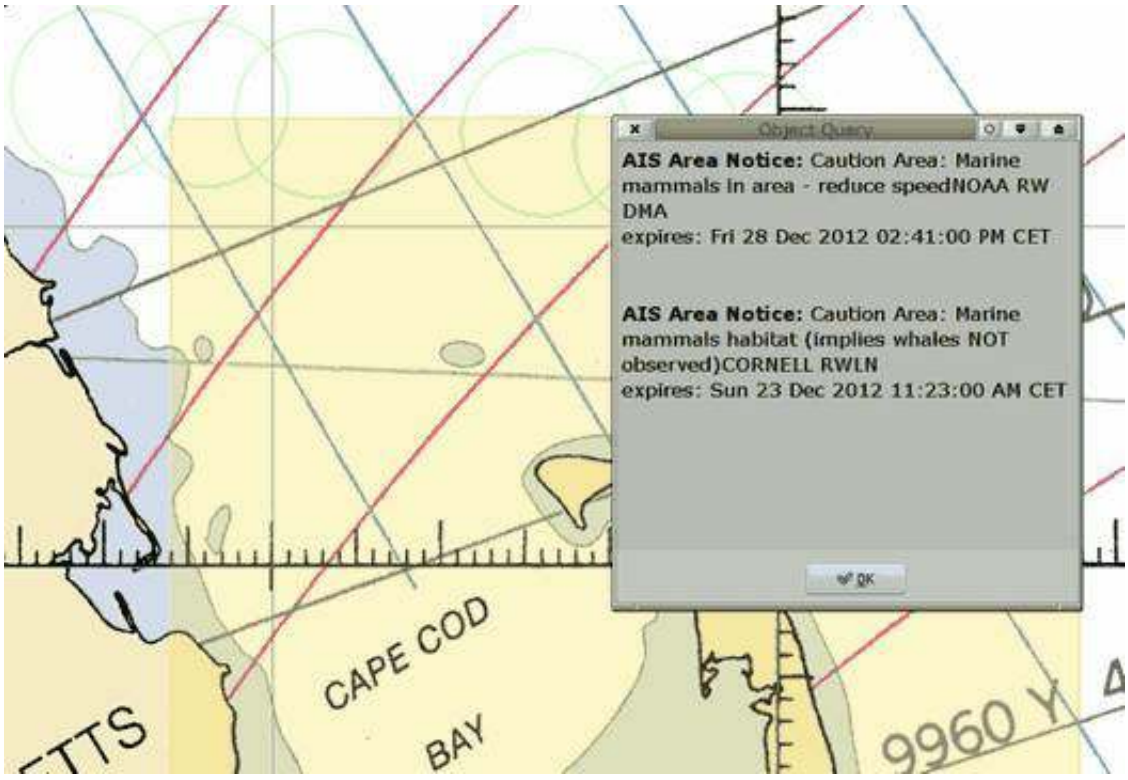
Area Messages

To display the messages, tick the Options → Ships → AIS Targets → Show area notices(from AIS binary messages).

Many countries around the maritime world are testing the AIS binary messages. Expect a lot of development in this area.

In OpenCPN, this is very much a work in progress, the areas were only added April 2012 and the messages in December 2012.

Areas and the messages included for each area, are available. In the US, Cape Cod is transmitting experimental Right Whale information. For testing, copy vislab-ccom.unh.edu/ais/notices.aivdm[196] into a text file and point the VDR (Voyage Data Recording) plugin to this file. These messages are updated quite often.

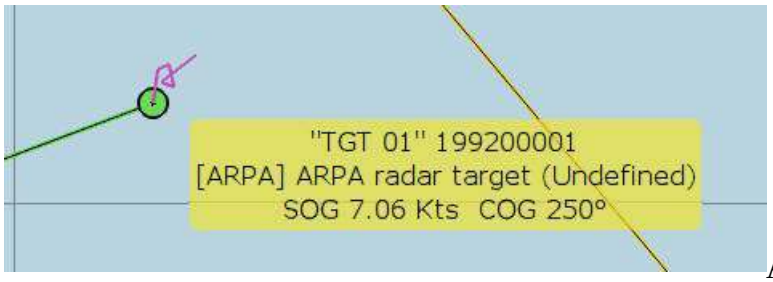


The area messages are found as the first entries in a normal object query for vectorcharts. The easiest way to display this dialog is to just double click in an area. The screen picture above shows that this works for RNC:s (raster charts) as well as ENC:s (vector charts). The first notice above is for the yellow tinted rectangular area while he second notice is for one of the circles outlined in green.

An overview of available massages compiled by IALA. IALA has agreed to maintain a collection of regional applications for the AIS Application Specific Messages that are in use. The intent is to provide an overview to all interested parties of what currently exists. **The overview of available messages is available here**.[197]**

Radar Targets

3.3 Beta feature.
Some radars are able to create NMEA radar sentences from observed targets.
The ARPA targets, except for the way the data is acquired, are treated exactly as if they were AIS, including timeouts.



Arpa Target


Arpa Target


Arpa Target


Arpa Target

Implementation details: https://github.com/nohal/OpenCPN/wiki/ARPA-targets-tracking-implementation[198]
Discussion: http://www.cruisersforum.com/forums/f134/radar-nmea-messages-104048.html#post1239386[199]

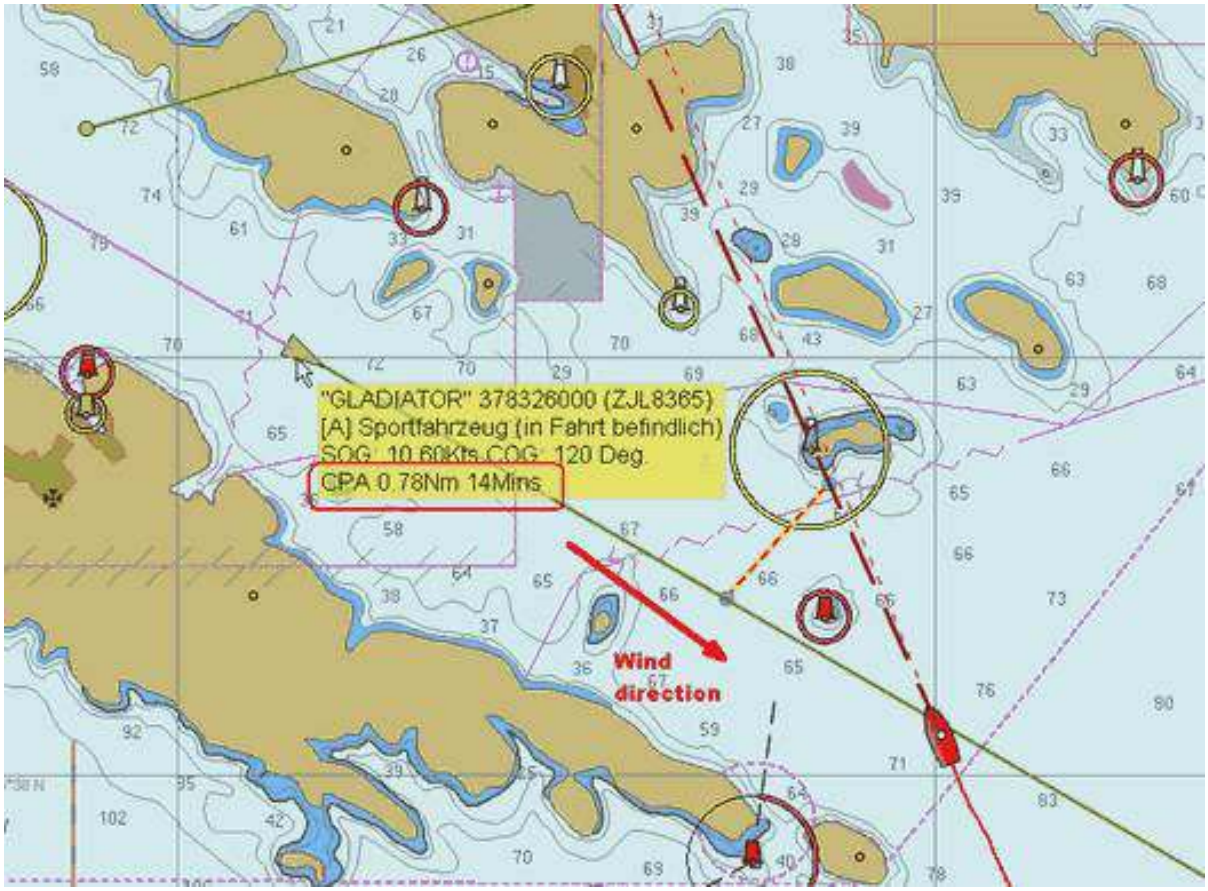
Target CPA Details

OpenCPN displays warnings about targets CPA & TCPA according to the setup in the AIS tab. But it's also possible to show CPA & TCPA for any target, that is no immediate danger, but where internal CPA calculation is still done, to assist in the decision making.

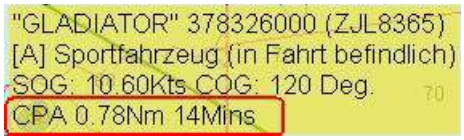
The AIS rollover window shows the CPA and TCPA of a target :

But it doesn't tell us **where we and the target are at CPA**, and if the target passes in front of us or behind us (i.e. should we speed up or slow down ?).

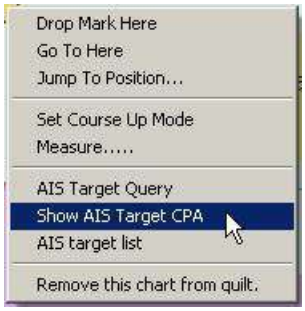
See the following (real) example: We are sailing hard on the wind, while a vessel is approaching us, more or less from the wind direction. A CPA of 0.78 miles is normally safe, but there is this island in our way, meaning we had to tack towards the vessel, and it is still 14 minutes to go …



What will happen with our CPA after the tack ? Have we already passed each other or do we get closer when tacking just in front of the island ? The answer to these questions is a context sensitive menu for AIS targets. Move the mouse over the target, and when you see the CPA / TCPA info in the rollover window,

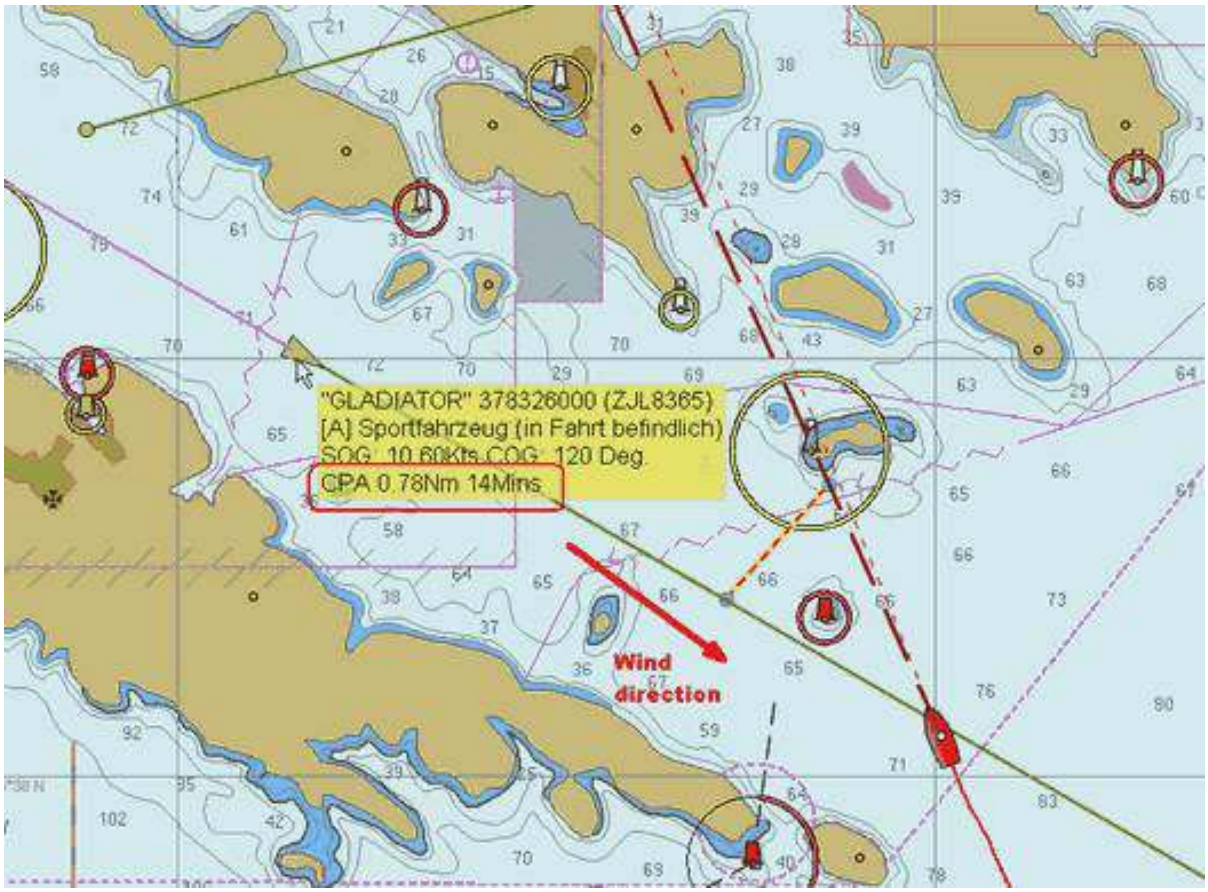


you can right click and select “Show AIS Target CPA”.



The function is only available when we have a “valid CPA”, i.e. when the rollover shows CPA and TCPA (it uses the internal CPA calculation).

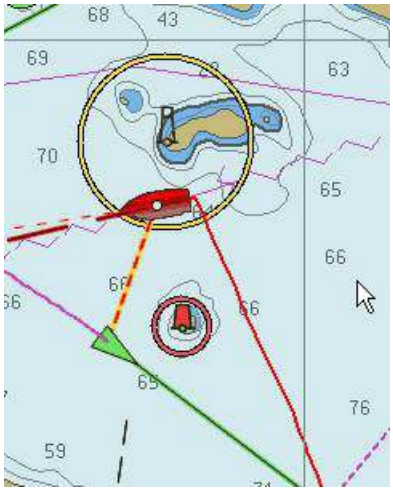
It simply shows the “CPA line” which is used in case of a CPA alert :



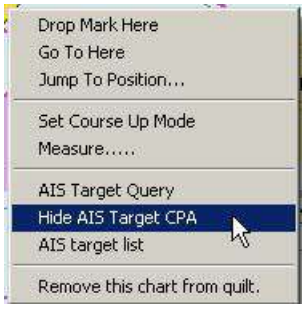
Showing the CPA-line as in the screen-shot above, makes life much easier. Nothing to worry about …

At CPA … • we will be just in front of the island, exactly at our tacking position and • she'll already be behind us (CPA line points backwards from our CPA position) The CPA line is constantly updated, so you can follow the situation.

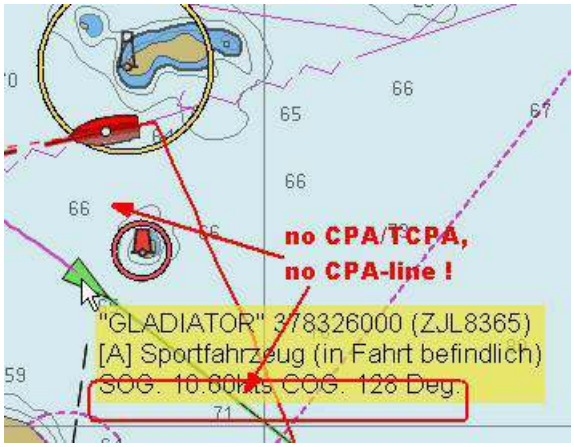
This is, what it looked like directly after our tack



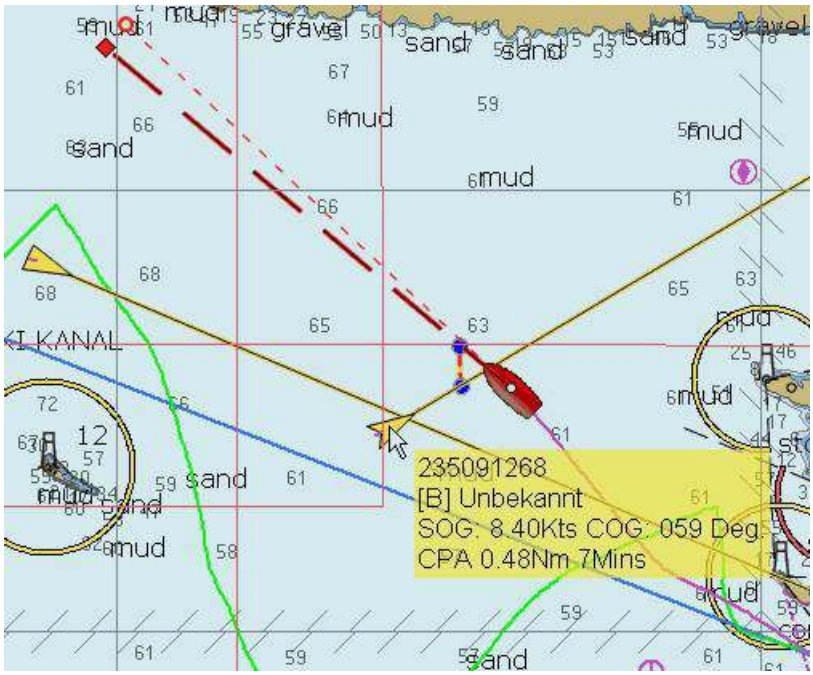
To get rid of the CPA line for a specific target, right-click on the target and select “Hide AIS Target CPA”.



As already mentioned, the CPA line is shown only, when there is a valid CPA. A minute later, we don't have a CPA anymore for the target –> the CPA line isn't drawn anymore !.

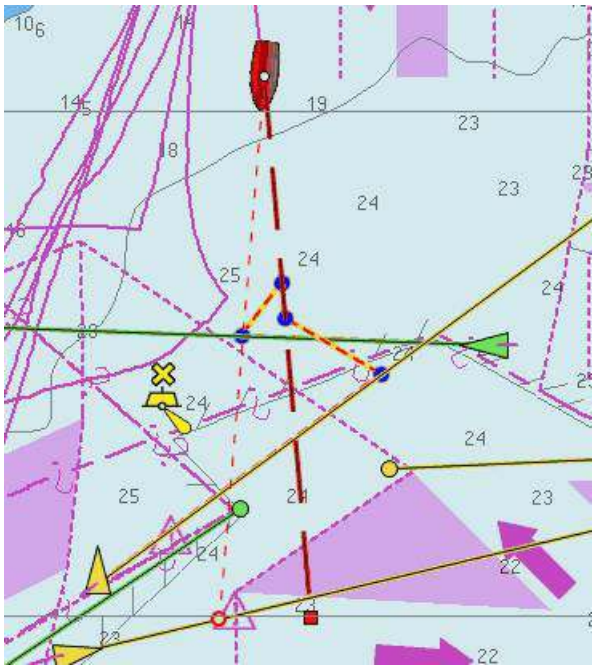


Another example :



He'll pass behind us, so “full steam ahead !”

Monitoring several targets You can also monitor more than one target in parallel. Simply right-click on a second target and “Show AIS target CPA line” Situation could be : What happens to a second target if I get out of the way of the first one ?



DSC or Buddy via AIS.

If DSC or GPSGate Buddy-messages are available in an incoming NMEA 0183 data stream, OpenCPN will show them with their own icons, and they will show in the “AIS Target list”. They are not a part of AIS, but are displayed the same way, for convenience.

DSC is used on all new VHF set (or should be!). More on Wikipedia.[200] To use this feature, check that your VHF set outputs NMEA 0183, in a way that can be connected to OpenCPN.

GPSGate is a commercial **GPS tracking and sharing [201]**service.[202] GPSGate Buddy Tracking is **part of that service**.[203]**

Make sure that Options–> AIS Targets –>“Play Sound on CPA/TCPA Alerts” box is ticked, otherwise the alarm sound (see below) will not be heard.

If OpenCPN receives a DSC Distress call, an alarm will be triggered, both visually and by sound.

A VHF/DSC distress call is treated in the same way as an AIS/SART call. Both should be treated as MAYDAY calls.

Two different types of alerts. DSC Distress alert, coming from a specific vessel, presumably by crew activating a switch on the transponder. These are occasionally seen as false alerts, for testing. For the second type look under AIS SART section. SART, which is a SearchAndRescueTransponder. The MMSI starts with 97….. and will have Class: SART. This might be from a PLB (and PLB-AIS) on man overboard, for instance. PLB AIS devices are under the AIS SART type.

Quick Reference


DSC Station. Only the DSC message received. The position contains only degrees and

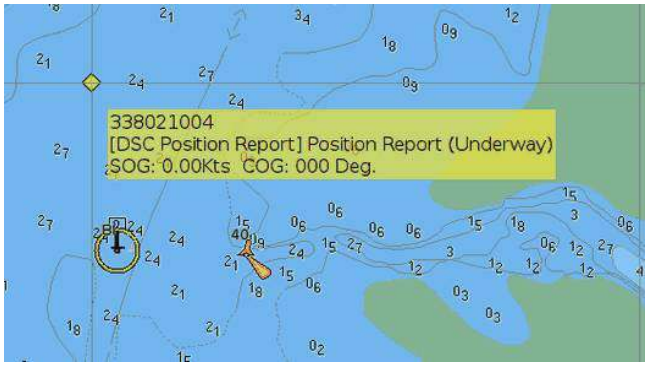
minutes of Latitude and Longitude.

 DSC Station. DSC **and** DSE messages received. The DSE message contains the missing decimals of minutes of Latitude and Longitude. The result is a much more accurate position.

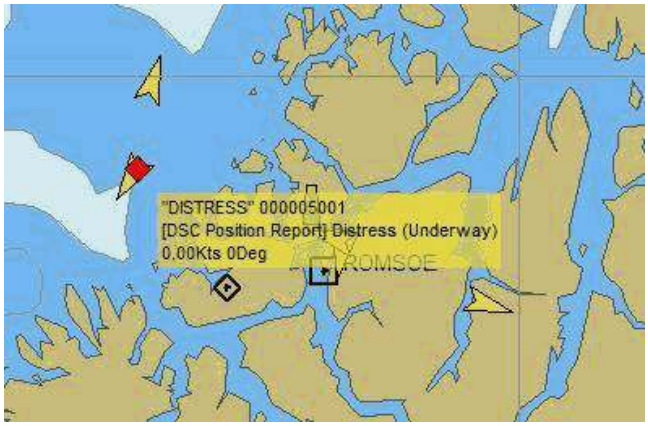
 DSC Station transmitting a **distress** signal. **This is a "Mayday".**

 GpsGate Buddy target.

A normal DSC target, is someone using a dsc-capable VHF

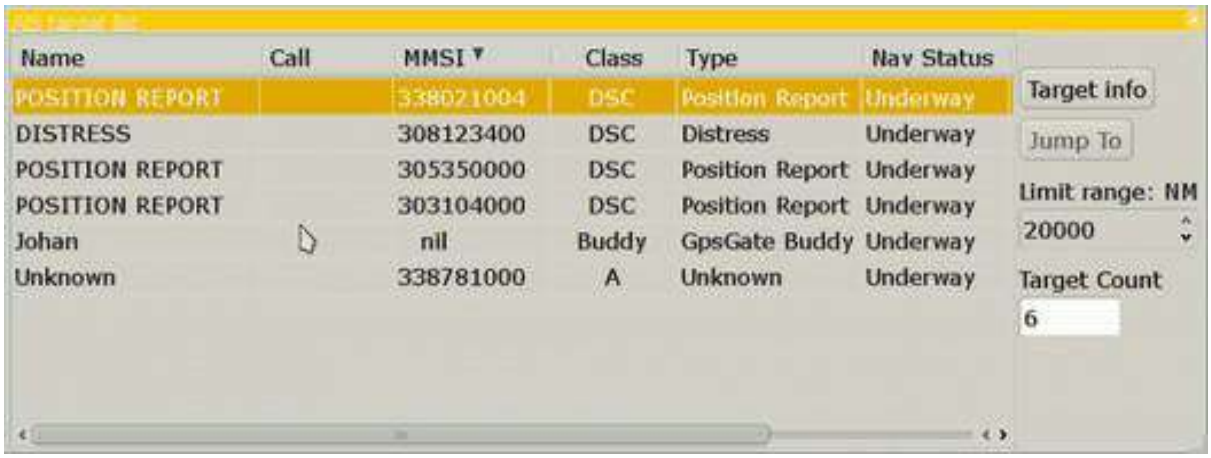


Distress message via DSC, Digital selective Calling, from an unidentified AIS target.

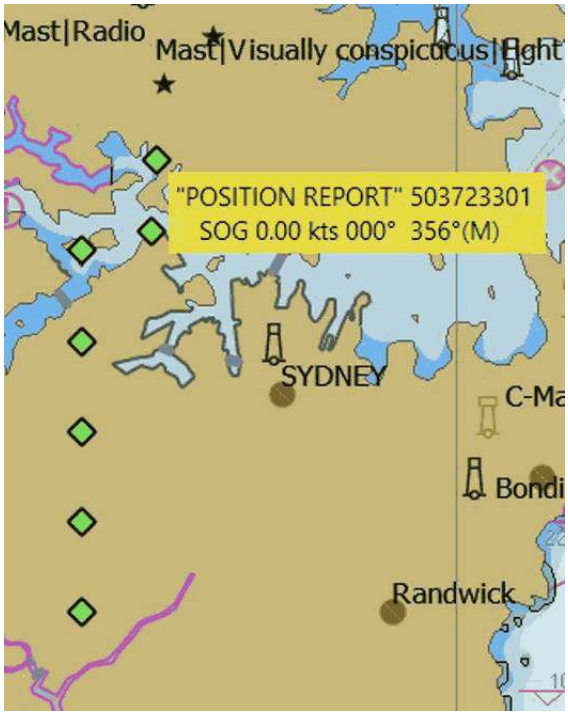


A green Buddy target on an island.

The AIS Target List View



Seven Green DSC Position Report Instances, Position displayed in yellow hover box



AtoN

Aids to Navigation

Shows all possible AtoN's. From top, Real or Synthetic and Virtual

Real or Synthetic AtoN

AIS aids to navigation – Real or Synthetic

Real or synthetic AIS aids to navigation (AtoN) shall be presented as a diamond with crossed lines centred at the reported position of the AtoN. The crossed lines shall be not more than 2 mm in length and the sides of the diamond shall be not more than 6 mm in length.

The diamond and crossed lines shall be drawn using a thin solid line style.

The basic colour for an "off position" AIS AtoN is red.

The basic colour for an "on position" AIS AtoN is as used for the AtoN symbols.

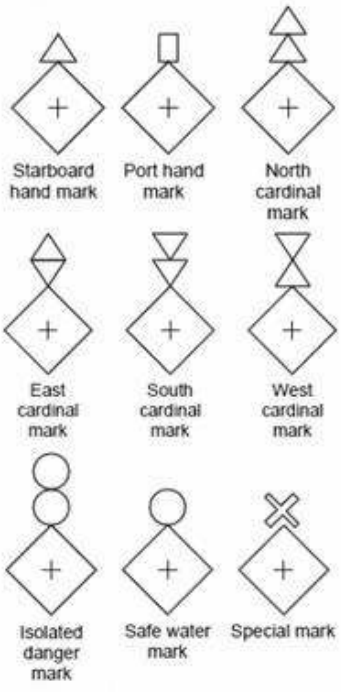
AIS AtoN may be drawn indicating the purpose of the AtoN. Purpose symbol shall be drawn using a thin solid line style and shall be the same basic colour as the AIS AtoN symbol.

AIS AtoN may be labelled. Alphanumeric text used to label an AIS AtoN shall be the same basic colour as the AIS AtoN symbol.

Real or Synthetic AIS AtoN:

Basic shape (SN243)

Examples of Real or synthetic AIS AtoN



(IALA dictionary, topmarks)

Virtual AtoN

AIS aids to navigation - Virtual

Virtual AIS aids to navigation (AtoN) shall be presented as a diamond with crossed lines centred at the reported position of the AtoN. The crossed lines shall be not more than 2 mm in length and the sides of the diamond shall be not more than 6 mm in length.

The diamond shall be drawn using a thin dashed line style. The crossed lines shall be drawn using a thin solid line style.

The basic colour for a Virtual AIS AtoN is as used for the AtoN symbols.

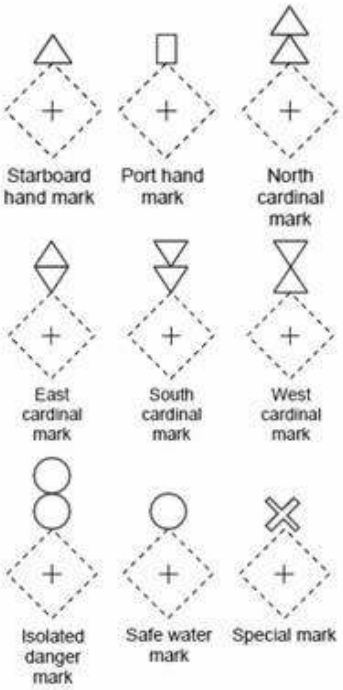
AIS AtoN may be drawn indicating the purpose of the AtoN. Purpose symbol shall be drawn using a thin solid line style and shall be the same basic colour as the AIS AtoN symbol.

AIS AtoN may be labelled. Alphanumeric text used to label an AIS ATON shall be the same basic colour as the AIS AtoN symbol.

Virtual AIS AtoN:

Basic shape

Examples of Virtual AIS AtoN



(IALA dictionary, topmarks)

AtoN in Practice

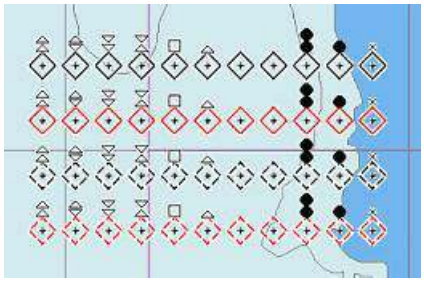
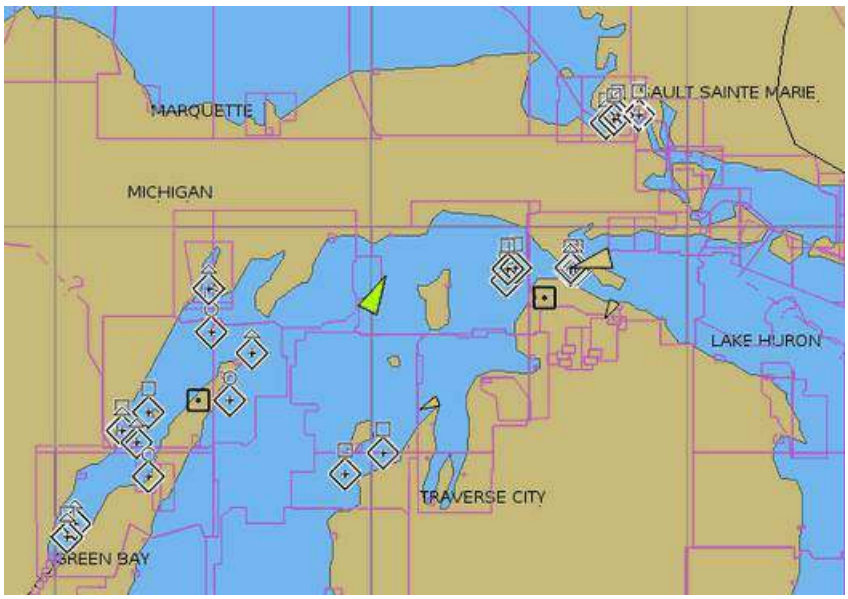
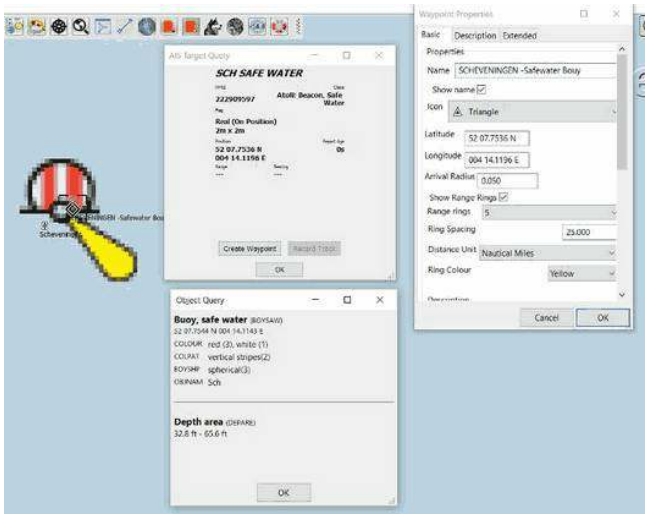


Chart with Aton



AtoN Safewater



Tides and Currents

Notes

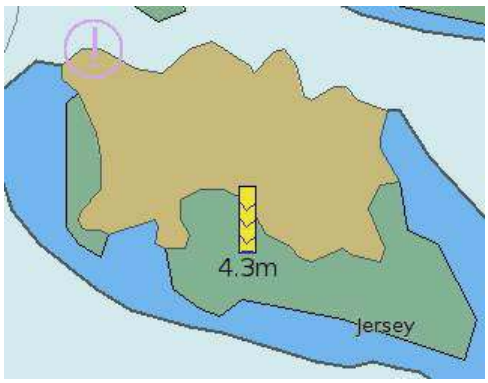
- Tide and Current predictions are not available for all areas.
- OpenCPN comes with a built in tidal data file, but can use any legacy IDX or binary tcd file. Multiple tidal files can be used at the same time. More about this further down this page.
- As with all predictions, the displayed values are calculated using mathematical models and actual tides and currents will vary.
- Variations from the predicted tide may be caused by weather (offshore wind and high barometric pressure) and can vary easily by 15 minutes and 1 foot. In some remote areas (north) the period of observation used for the calculation may be relatively short, thus causing the value of the predictions to be less accurate. Predictions are predictions!

Enable Tides and Currents Display

- Click the toolbar button  to see **tide** stations.
- Select  to see **current** stations.
- **<u>Important:</u> tide and currents will not be displayed unless these toolbar buttons are selected.**

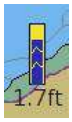
Displaying Tides

- Available tide stations will show on the chart as green graphs with a “T” logo:
- The “T” becomes a a yellow and blue vertical bar when the scale is greater than 1:500.000

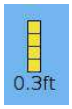


The vertical bar contains a lot of information at a glance.

The tidal rise is 2.5m above the chart datum. The blue part is “water”. The “V” inside he bar indicates that the tide is decreasing towards Low Water.



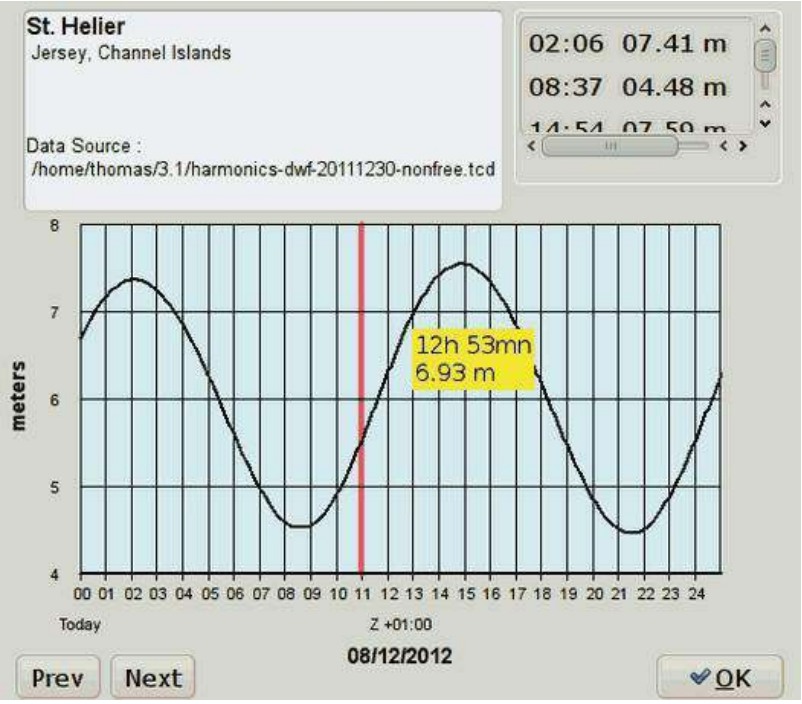
Here, the tide is rising towards High Water.



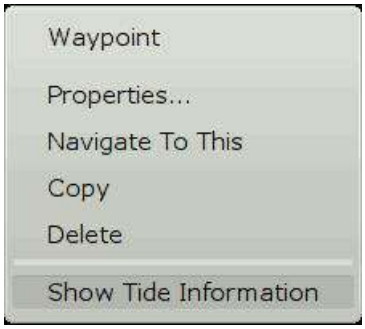
Low Water looks like this.

High Water Looks like this.

Right click the middle of either icon to see the tidal graph:



If a waypoint, route or a track is, or passes, on top of a tidal icon, a right-click will show a context menu for those features. To see the tidal graph, press “Show Tide Information” at the bottom of the menu.



The Tidal Dialog gives the name of the station as well as the the name of the Data Source file. This is important when you have multiple sources covering the same area. Time and height for HW and LW is displayed in the upper right part.

The Yellow box, with the tidal rise and time, follows the cursor when hovering over the dialog. The time axis at the bottom displays the time, in this case he timezone is “Z +01:00”, which is the same as one hour ahead (east) of UTC, that used to be called GMT.

In North America it is common to use a three or four letter acronym for timezones.

UNITED STATES TIME ZONE CODES	UTC OFFSET	
AST	ATLANTIC STANDARD TIME	UTC - 4
EST	EASTERN STANDARD TIME	UTC - 5
EDT	EASTERN DAYLIGHT TIME	UTC - 4
CST	CENTRAL STANDARD TIME	UTC - 6

CDT	CENTRAL DAYLIGHT TIME	UTC - 5
MST	MOUNTAIN STANDARD TIME	UTC - 7
MDT	MOUNTAIN DAYLIGHT TIME	UTC - 6
PST	PACIFIC STANDARD TIME	UTC - 8
PDT	PACIFIC DAYLIGHT TIME	UTC - 7
AKST	ALASKA TIME	UTC - 9
AKDT	ALASKA DAYLIGHT TIME	UTC - 8
HAST	HAWAII-ALEUTIAN STANDARD TIME	UTC - 10
HADT	HAWAII-ALEUTIAN DAYLIGHT TIME	UTC - 9
SST	SAMOA STANDARD TIME	UTC - 11
SDT	SAMOA DAYLIGHT TIME	UTC - 10
CHST	CHAMORRO STANDARD TIME	UTC +10

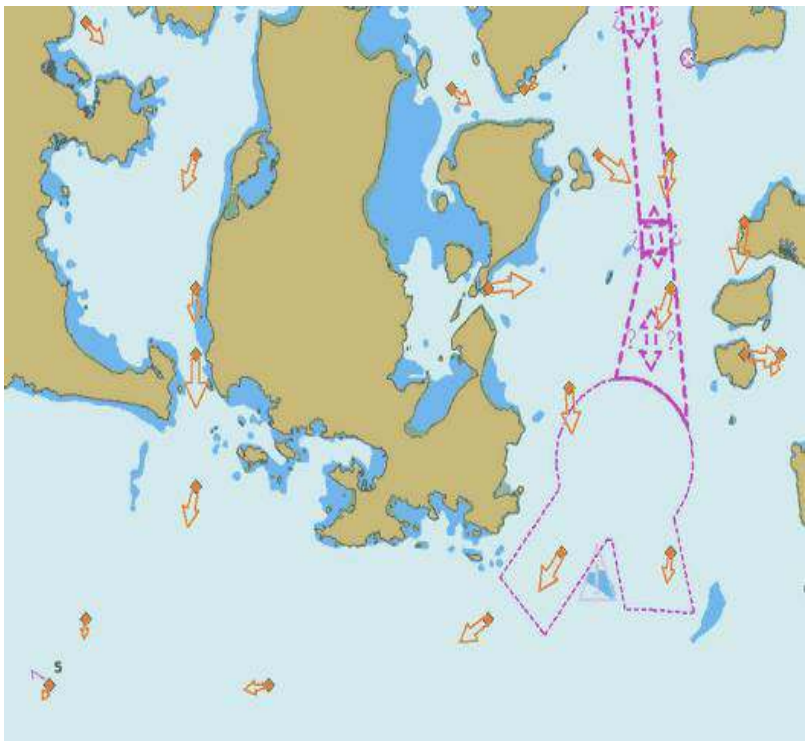
Displaying Currents

Available current stations will show on the chart as orange diamonds, when zooming in arrows will appear pointing in the direction of the set. Note that “current” here is short for “Tidal Current”, and is the same as the UK term “Tidal Stream”.

Master current stations are shown like this


in all scales. No direction is associated with these stations but they can be queried, trough a

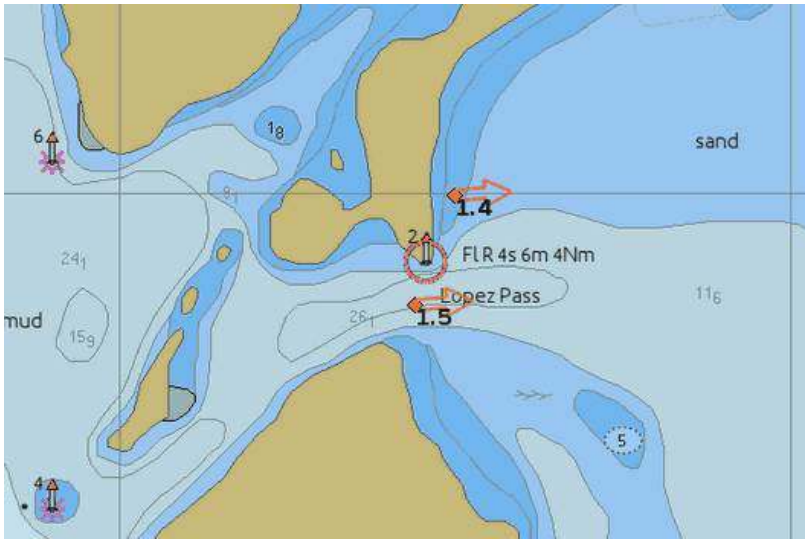
right click, for the magnitude of the current.



Arrow indicates current **direction** and **strength** - the bigger the arrow, the more current.

The size of the arrows can be customized by users in the **opencpn.ini** (opencpn.conf) file.

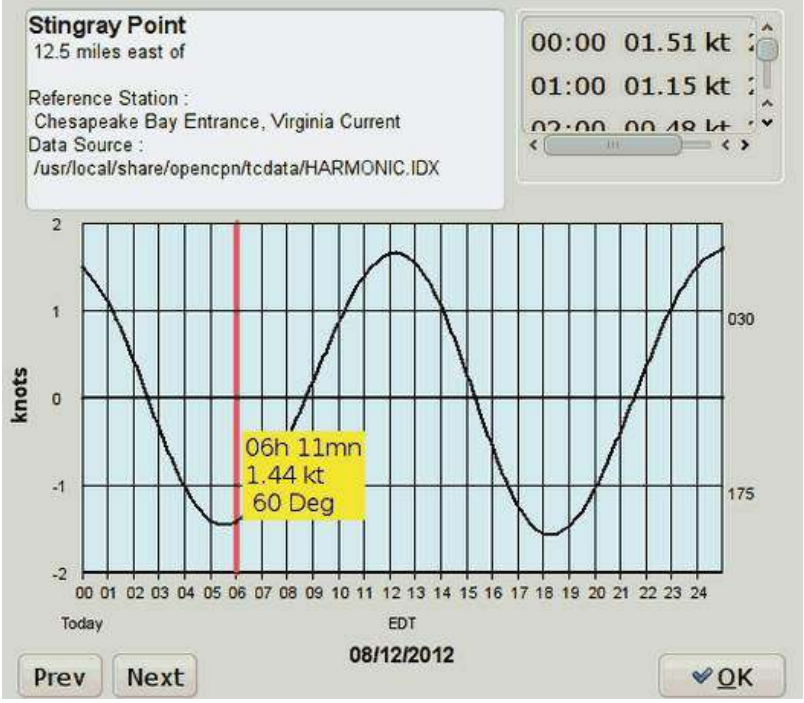
In the **[Settings/Others]** section you can set the option **CurrentArrowScale** to a positive number representing a percentage scaling factor of the current arrows. The values bellow 100 mean the arrows will be smaller than now, the values above 100 will cause them to be bigger.



A numerical value can be displayed next to the arrow.

To do this go to **Options → Ships → AIS Targets** and tick the box "**Show names with AIS targets at a scale grater than 1:**", and **set a scale**. When zoomed in to a scale greater than this, the current will also be displayed with a number

Right click the orange box to see current graph:



If a waypoint, route or a track is, or passes, on top of a current icon, a rightclick will show a context menu for those features. To see the current graph, press “Show Current Information” at the bottom of the menu.

The Yellow box, with time,speed and direction, follows the cursor when hovering over the dialog.

Note that OpenCPN can only display “Reversing Currents” found in restricted waterways, such as rivers and straits.

The general case with “Rotary Tidal Currents”, can not be displayed with this interface, but are available for some areas as Grib files. More here

Grib Weather Plugin

Using alternative data sets

OpenCPN supports two tidal file formats. **Xtides .tcd** file format as well as the default **.IDX** type. The latter consits of a pair of files called **HARMONIC** and **HARMONIC.IDX**, in a directory.

The default, **IDX dataset** for tides and currents is limited, mainly for copyright reasons.

[http://www.flaterco.com/xtide/]][204], a well known free software tidal aplication (GPL license), maintains regularly updated .tcd files for US. Updated files are normally published in December each year. These are presently the only area with, up to date freely available, tidal data. The latest updates are available from the Xtide site, http://www.flaterco.com[205] and ftp://ftp.flaterco.com/xtide/[206]. The “non-free” dataset, including UK and the

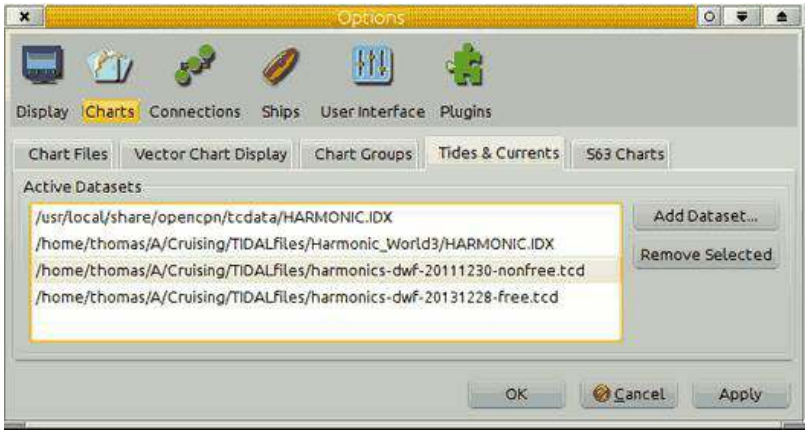
Netherlands, is no longer updated. The last update was published 2011.

Please note that OpenCPN differs from **XTide** results, in very small amounts, usually a few minutes, regarding the times of slack water. This is due to the older algorithm used in OpenCPN compared to the most modern **XTides** implementation of subordinate station time offset calculation

There is currently has a problem when multiple **.tcd** files are loaded. The reference station may be incorrectly identified. In practical navigation only one **.tcd** file is needed at any given time, depending on which side of the Atlantic you are navigating.

A number of different datasets are available on the Internet, with vastly greater coverage. Some of these datasets are quite old, and they also contains glitches and errors, many of which have been corrected in the OpenCPN default dataset.

In many areas there are no free alternatives, and OpenCPN makes it possible to switch between data sets and even using them at the same time. If two stations are located on exactly the same position, only one will be visible……



Go to **Options → Charts → Tides & Currents**. Press "**Add Dataset**.." to add another dataset.

Tidal files can be located anywhere on your file system, but it will pay off to be organized. The first entry above shows the default location for the built in datafile on Linux. On windows a typical location is "**C:\Program Files\OpenCPN\tcdata**".

Edit Harmonic File

Refer to this thread in Cruiser Forum Opencpn Harmonic Files[207]

If you edit and break a harmonic file and copyright, don't post it. It is possibble to add/modify Harmonics data. First get the latest version, might be V10, and then add a line for the new location into the section of that country into the file HARMONIC.IDX. The data fields of the new line are explained somewhere in the file HARMONIC.IDX itself:

```
# &Hmin Hmpy Hoff Lmin Lmpy Loff StaID (tzname) RefFileNum RefName
```

The # sign marks a line as comment only.

Route & Mark Manager

The Route & Mark Manager  lists routes, tracks, waypoints, and layers that are currently loaded into OpenCPN. It allows you to view and modify those navigation objects and their components. The Route & Mark Manager has tabs for

- *Routes*
- *Tracks*
- *Waypoints*
- *Layers*

Getting Around

Persistence

Navigation objects in OpenCPN, except for “Temporary layers”, are persistent between OpenCPN sessions. Navigation Data Backup discusses data persistence more fully.

Show/Hide Eye

You can toggle the visibility of active objects by clicking the “eye”  to the left of the object name on each line. For waypoints the eye is replaced by the icon shown on the chart for the waypoint. A red X across the “eye” (or waypoint icon) means that the object is invisible.

Sort by Columns

Objects can be sorted by their column header in the Route & Mark Manager. For example, clicking “Route Name” will cause the routes below to be sorted alphabetically. Clicking again reverses the order.

Selection by Ctl - Left-click

You can select multiple objects in the Routes, Tracks, or Waypoints tabs by holding down the CTRL key and left-clicking the objects or by holding the SHIFT key and selecting the first and last object of a group.

Properties by Double Click

Double-clicking on a route, track, or waypoint brings up its Properties dialog. It's a shortcut for selecting the object and clicking the Properties button.

Export & Import GPX Files

You can export and import routes, tracks, waypoints, and layers using the GPX transfer format. This lets you save your routes and marks to external files so you can have more than the active ones - for example, to do route planning or archive existing data.

- GPX format is supported by a wide variety of programs.
- You can have as many external files as you wish, there are no limits on the number of eternal files.
- Use this for passage planning by saving multiple possible routes for a passage.
- Export routes and tracks for historical-log purposes.
- Prepare layers as an aid to navigation en route.
- Note that waypoints that are already in an included Layer, even a non-visible Layer, will not be imported. There is no warning that these waypoints have not been imported.
- For more information see Technical: Routes, Waypoints, Navobjects, Gpx and Guid[208]

Keeping a lot of active routes in OpenCPN makes for a cluttered chart display. It also slows the program and makes it use more system resources. Imagine a word processor where every document you ever created was displayed unless you made it invisible. The “Export selected” and “Import GPX” buttons work like the “Save” and “Load” options in most programs. Just as you wouldn't save all your word processing documents in a single giant file, it's not efficient to export all your navigation objects into a single file.

It is more efficient to export each route or track to a separate file. Click on the object, click on the “Export selected” button, name the file, and navigate to the folder in which you want it saved. If you save each route and track in its own file you can import them individually. There is more discussion of a strategy for creating routes at Create Route.

The “Export All Visible” button is useful for making a quick backup copy of all your navigation objects but the resulting file is cumbersome to work with. It is also useful for creating a GPX file that is to be loaded as a layer. Read more at Layers.

Routes

A route is a set of two or more points you wish to visit in a given sequence. Route points can be defined as the route is created or they can be previously defined waypoints or route points. For more information about creating routes read Create Route.

- The route points have exactly the same properties as the isolated waypoints, but does not show in the waypoint tab, to avoid clutter. To create a route that uses real waypoints, create them first and join them with the route tool.

Click the "eye"

 to the far left on the line with the route to toggle if the route is displayed or hidden on the chart. A small dialog let you choose if existing marks included in a route will also become invisible. When a route is turned visible, all the shared waypoints are also made visible. Once a route is deleted, such a mark will go back to be a “normal” waypoint.

To Sort routes

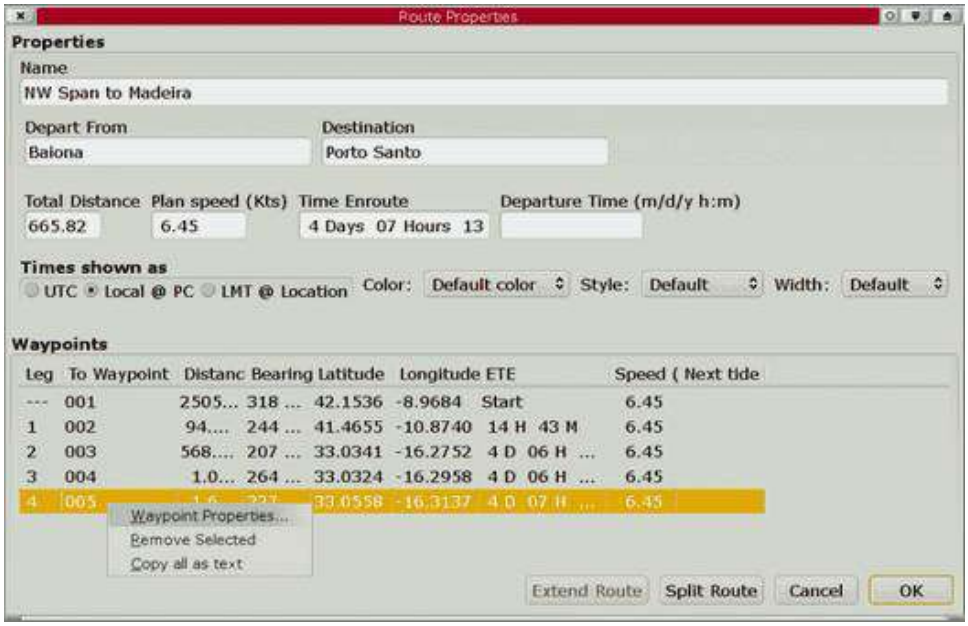
Click “Route Name” or “To”

To Filter routes

Use the filter.

Properties

This button brings up a new dialog with settings that can be changed for each route.



Wpt is right-clicked

A new dialog has popped up. The waypoint properties can be reached and edited. For example, change the default name, “005” in this case, to something more appropriate. Read more in the Extended Marks section. The waypoint can also be deleted. The last entry, “Copy all as text” copies all Route Properties for pasting into a text or Spreadsheet document.

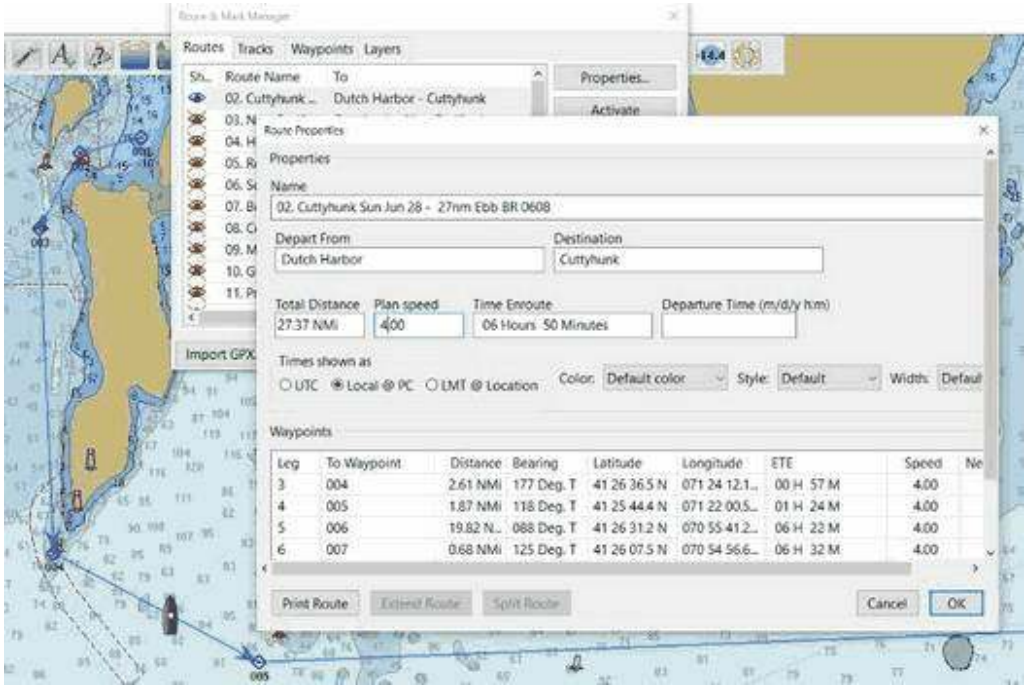
```
Route Properties
Name  NW Span to Madeira
Depart From  Baiona
Destination Porto Santo
Total Distance  665.82
Speed (Kts) 6.45
Time Enroute  4 Days 07 Hours 13 Minutes

Leg To Waypoint  Distance  Bearing Latitude Longitude  ETE Speed (Kts) Next tide event
--- 001  2505.67 NM  318 Deg. T 42.1536  -8.9684  Start  6.45
1  002  94.99 NM  244 Deg. T 41.4655  -10.8740  14 H 43 M 6.45
2  003  568.12 NM 207 Deg. T 33.0341  -16.2752  4 D 06 H 48 M  6.45
3  004  1.04 NM  264 Deg. T 33.0324  -16.2958  4 D 06 H 58 M  6.45
4  005  1.67 NM  327 Deg. T 33.0558  -16.3137  4 D 07 H 13 M  6.45
```

Plan Speed

The overall planned speed for the route. The speed for each leg can be set by going to the waypoint Properties → Description tab for the waypoint that starts the leg, and write in the speed. For example “ VMG=9.7”. [Unfortunately this approach presently excludes writing descriptions for the waypoint. One or the other, be warned!] The Plan Speed value is persistent and will be used for further routes, unless changed. The default value is 6.0 knots.

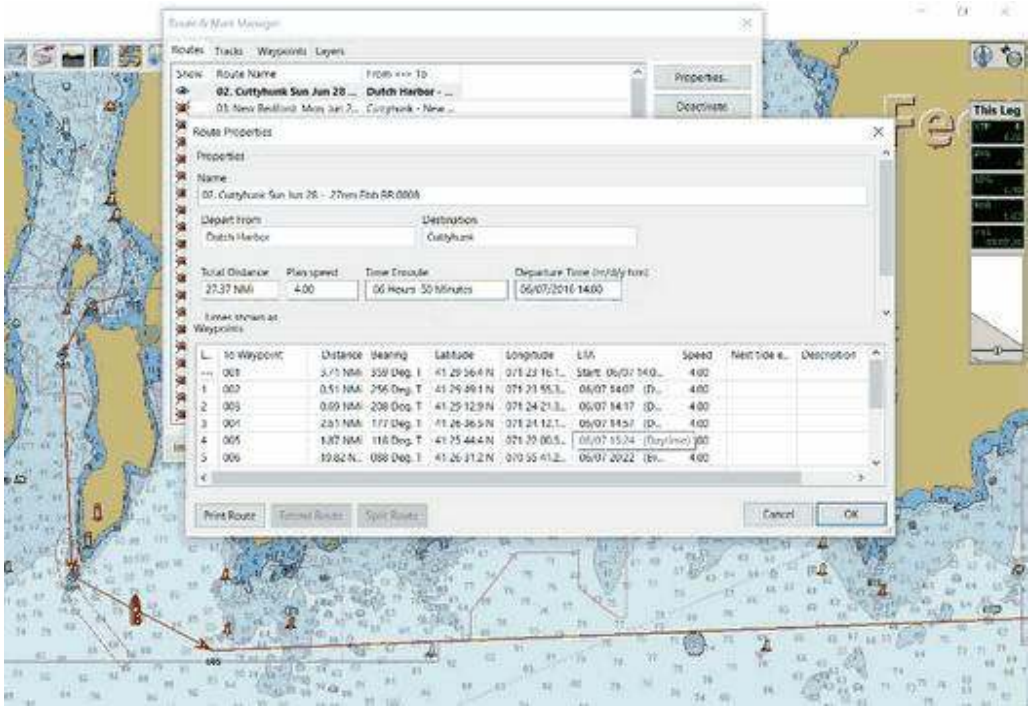
Departure Time

For Planning: With no departure time the ETE (Estimated Time En route) is calculated. Route is Inactive and normal calculation is ETE. The ETE will be calculated from the First Waypoint of the Route.



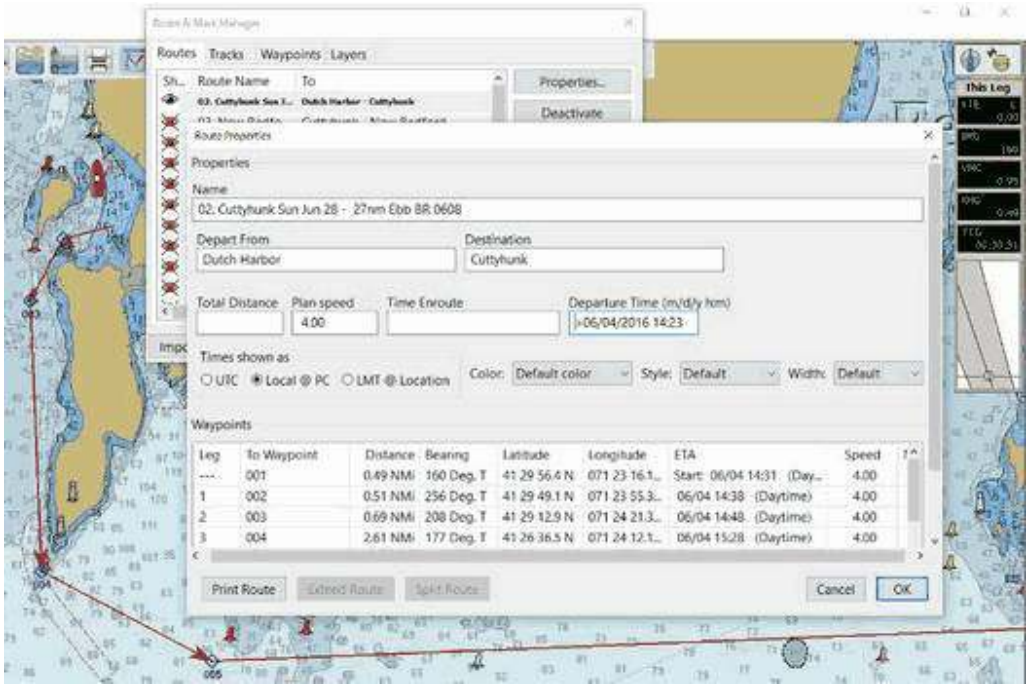
ETA for Planning - Date & Time

- Route can be Inactive or Active.
- Enter a Departure Date and Time eg: 06/07/2014 14:00 and the ETA will be calculated.
- Make sure to press “Enter-Return” after entering a departure time. This guarantees that the entered time is used in calculations.
- The ETA will be calculated from OwnShip to the first Waypoint of the Route and then for each waypoint.
- Note the Active Waypoint Console.



ETA Planning - Now

- Route can be Inactive or Active with first WP active.
- To enter the present time, enter ">" (meaning: "Now") in the departure time box. This works provided "Time shown as" → Local@PC is selected.
- Press "Enter" and all the times in the "ETA" column will change.
- ">" differs from entering the same time manually, say "06/04/2016 14:23".
- Distance from Ownship to first Waypoint (active) will be shown with ETA's for all waypoints in the route. Calculates departure Now from the current boat position, including the distance to the first waypoint of the route Use prior to leaving harbour, *all calculations pass through the very first WP of the route* and ETA is calculated from the boat position through the *first waypoint* and then to the end of the route.
- Note the Active Waypoint Console.



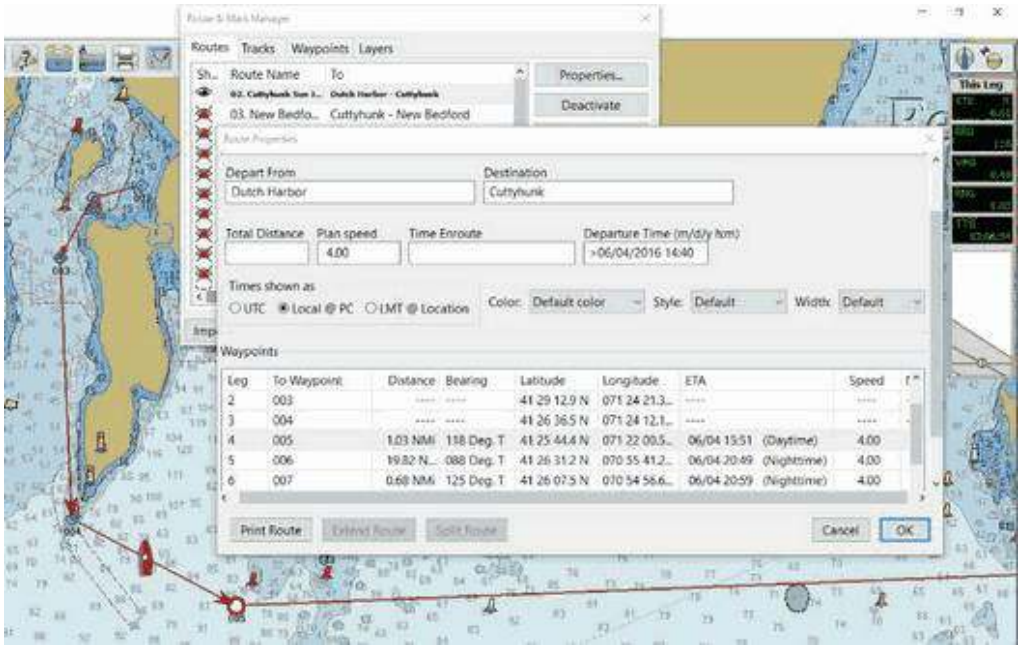
ETA Planning - Now from Intermediate WP

If the Route is Active and an intermediate Waypoint is Active, say WP5, then "- ">" - issued at 14:00 on 06/04/2016 - calculates departure "Now" from the current boat position, including the distance to the currently "active waypoint" of the route. Waypoints before the active waypoint are left empty.

ETA - During Passage

1. Set Route "Active" Route & time shown as "Local@PC".
2. If you are simulating this condition you may need to right click on the next WP and pick "Active".
3. On an ocean passage, after a week of sailing, calculate ETA to the following WP.
4. Set the route as "active" & next WP as "active".
5. Then, when entering ">"="now" as Departure Time, all the ETAs are from your real position TO THE NEXT WP, not to the beginning of the route.

6. The ETA to the active waypoint is from Ownship to the WP. Note the Active Waypoint Console.



Time UTC is a new name for GMT. LMT is a local mean time based on the present longitude. For Local Zone Time one can also enter the keyword **"Now"**.

Color Set the displayed color of the track or keep the default.

Style Solid, dashes, dots, a combination or keep the default.

Width Set the width of the track or keep or keep the default. Marking a line with the leg number and the destination Waypoint in the Properties Dialog also marks the Waypoint on the chart with a blue square.

The lower part of the Route properties dialog now has

Print Route

Print Route button. It is possible to first select what features to print before being sent to the normal print routine.

Extend Route

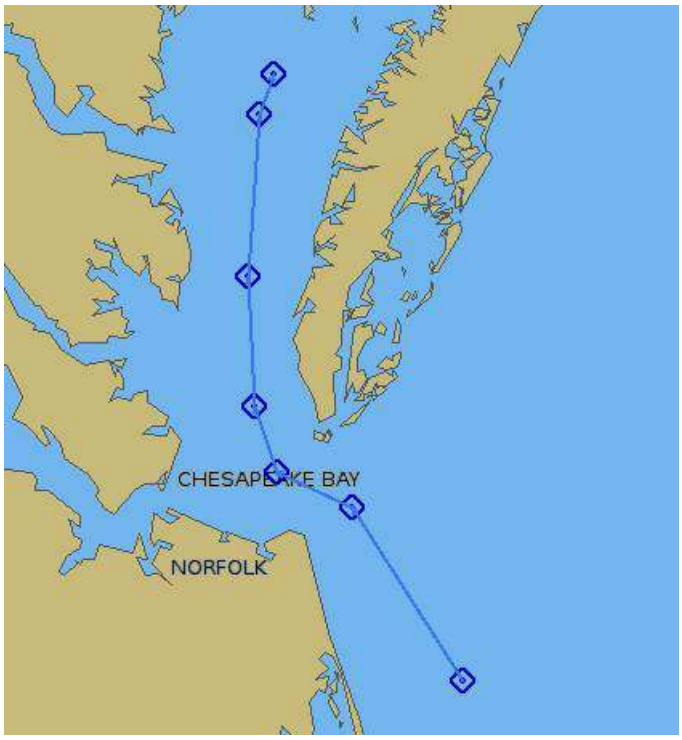
Extending is possible only when it is obvious, what should be joined with the current route (current=visible in the Dialog).

- Eligible are all visible route points shared with, or lying nearby to the current route's endpoint. If there is exactly 1 such point, then it is considered obvious, and the Extend button is enabled. If there are more, some should be hidden before proceeding, until just 1 remains.
- Routes are extended forward, based on the geographic location, next route point must be very near, as when mouse-extending the route. If the next route point is to far away for extending, just create the joining leg and extend twice.

Split Route

For splitting, the split point is selected as the row in the listing. The point-of-split becomes part of both new routes (shared) or tracks (cloned). Original route-track is deleted.

- Here is a basic example of first splitting then extending. The test route is shown below *



- **Split Test_A** In the Route Managers property dialog for the route we have selected a waypoint where we would like to split the route. The “Split Test” Route now consists of two parts, that has been renamed. *

- Next we extend the first leg “Split Test_A” with the second leg “Split Test_B”. This extended route is now named “Split Test_B_plus.

Activate-Deactivate

Activates-Deactivates a route marked in the left part of the window.

Zoom to

Zooms in on a route marked in the left part of the window.

Reverse

Reverses a selected route. It's possible to cancel the reverse operation through a confirmation dialog. *

Delete

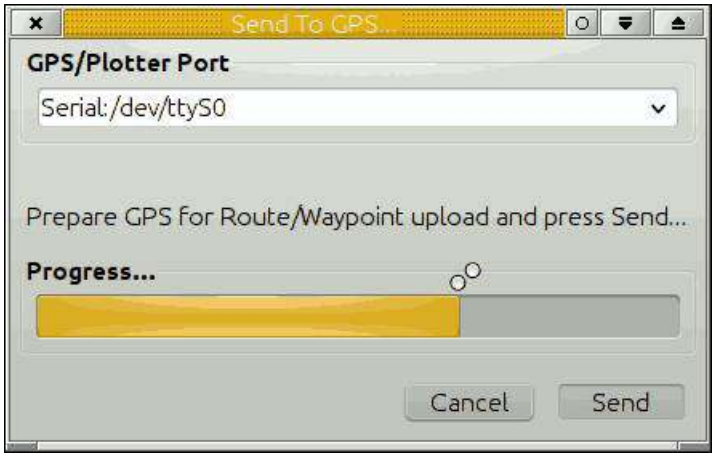
Deletes selected route or track. Use the Shift key to mark multiple routes for deletion. This also work in the other Route manager tabs.

Export Route

Save the route on your computer for later use (import)

Send to GPS

Send the Route to your GPS. Pressing the button activates a dialog were an output port is selected. This port does not have to be listed in “Connections” as it is an independent feature. This choice also appears in the right click menu for routes and waypoints. For **Garmin Users**, make sure that the ToolBox → GPS → ”Use Garmin GRMN-GRMN (Host) mode for Waypoint and Route uploads” box is ticked. The reason for this is that Garmin units cannot accept route uploads via NMEA0183. This is a “design feature” of all Garmin receivers.



Delete All

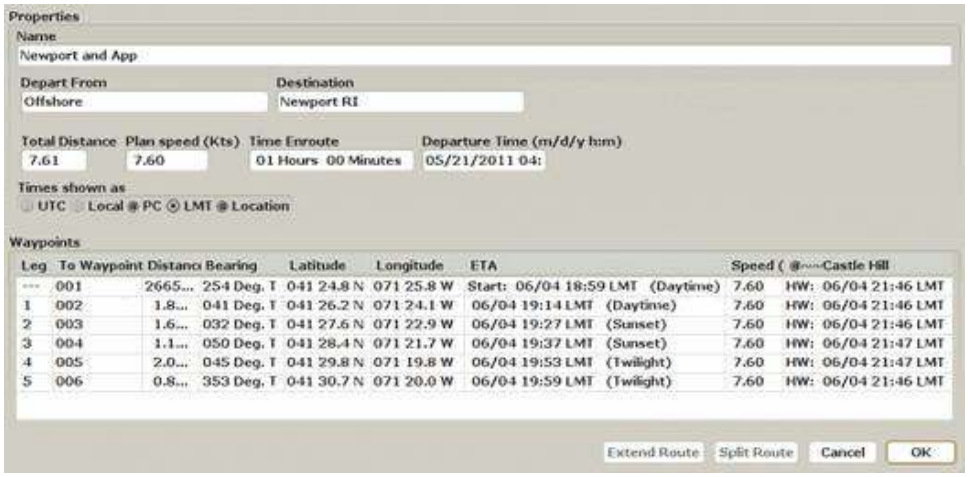
Be careful. If you **know** you have saved the routes on your computer and are able to import the again, this is a simple way to clear the screen from routes. Better be safe than sorry, so save before deleting, if you want to be able to use the routes again.

Import

Import one or more previously saved Routes, or Routes from other gpx compatible applications. It is possible to select and import multiple routes. The default waypoint icon bitmap is a circle. This kicks in if the icon in the imported gpx-file is not recognized.

Export All Visible

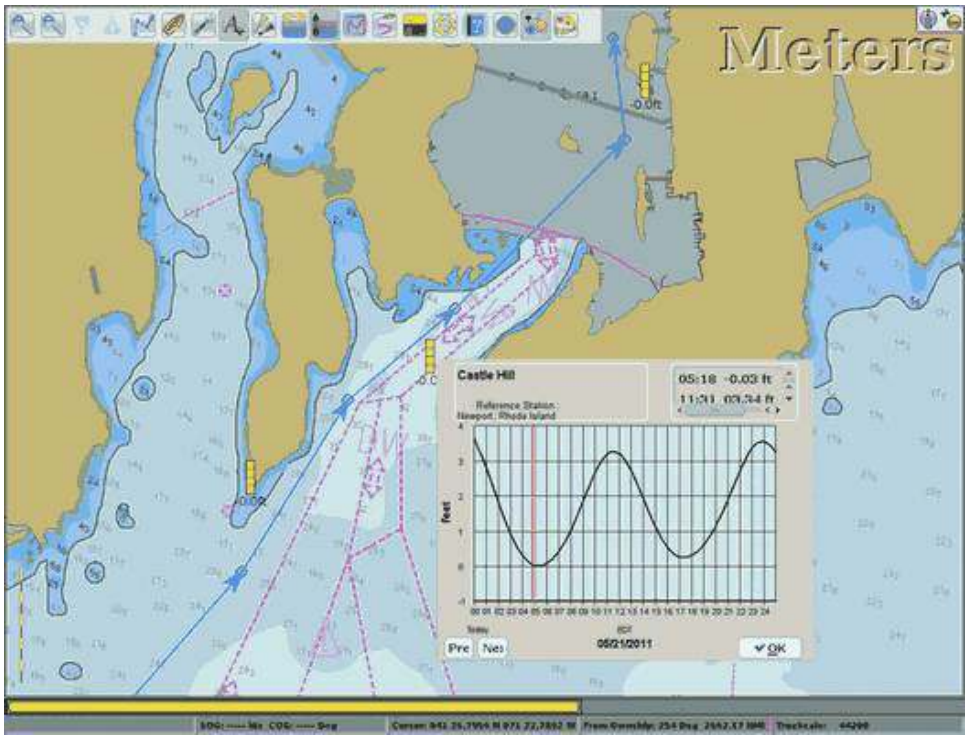
Saves all visible routes, waypoints and layers, in one gpx file. This is done through a normal file saving dialog.

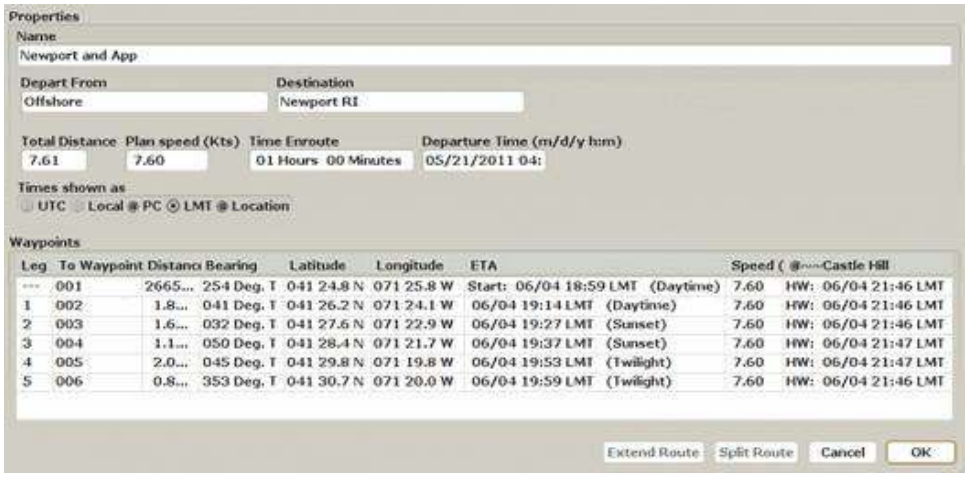


Tidal Column - Use and activation

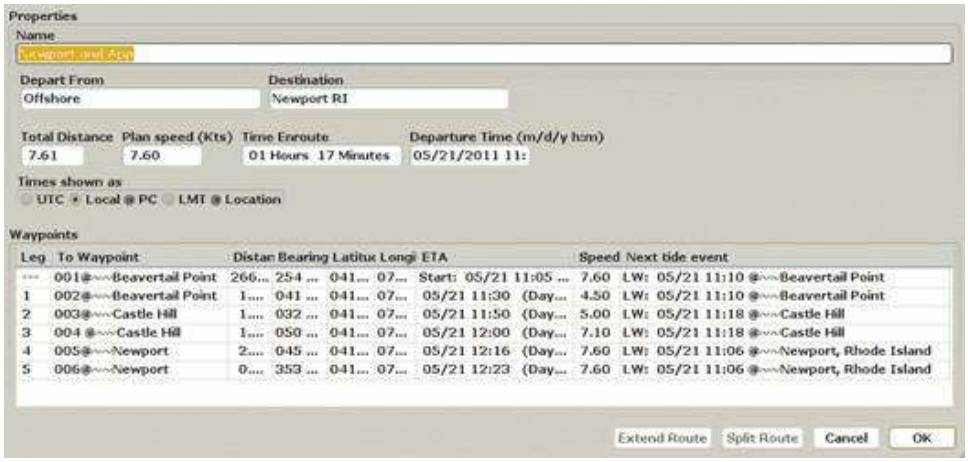
To Show tidal heights in the column, open the “Tidal Height Curve Dialog” for an individual tidal station so that it is shown on the screen as below. The tidal situation for this station will be tabulated along all route points in the route properties dialog.

- It is essential to enter a departure time and a planned speed.
- Once “Enter” is pressed the tidal column will show the nearest High or Low water considering the ETA at each waypoint.

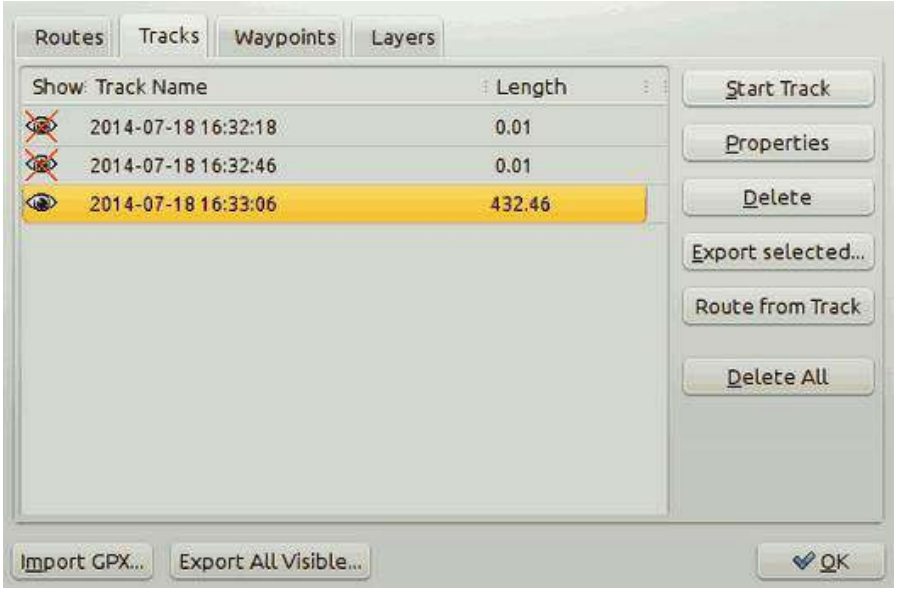




- If no tide dialog for any station is open and a waypoints name contains the string @~~ <name>, for example “@~~York Spit Light”, then the tide report for the closest station with matching name is shown in the tide column for this waypoint. The most appropriate tidal station for each waypoint can thus be selected.
- When entering a departure time the ETA, Expected Time of Arrival will be shown, instead of ETE, Expected Time En-route.
- The individual waypoints “Description” field can contain the setting of planned speed specific just to the next route leg (e.g. “VMG=4.5;”) and-or the specification of Estimated Time of Departure from this waypoint (e.g. “ ETD=2/14/2011 12:00;”), allowing for planning extended stopovers. Time can be specified as UT, LMT or local zone time at the PC (default).



Tracks



Make sure that you have read all about Automatic Daily tracks and track Highlighting in the Documentation on the Own Ship.

Eye

The visibility of tracks is controlled by clicking the “eye” on each line.

Sorting

Tracks can be sorted by clicking the column headers. Tracks are extended backward, based on the time-stamp sequence, a track is selected, which ends as the latest one before the start of current track. Tracks are extended as a single segment if they share the extending point. If they have no common point a new “empty” segment, with no visible track, is added.

Joining

Joining two tracks (i.e. extending a track) results in just track one remaining. It may look like two tracks but the Route Manager treats it as a single track.

Merge Selected Tracks

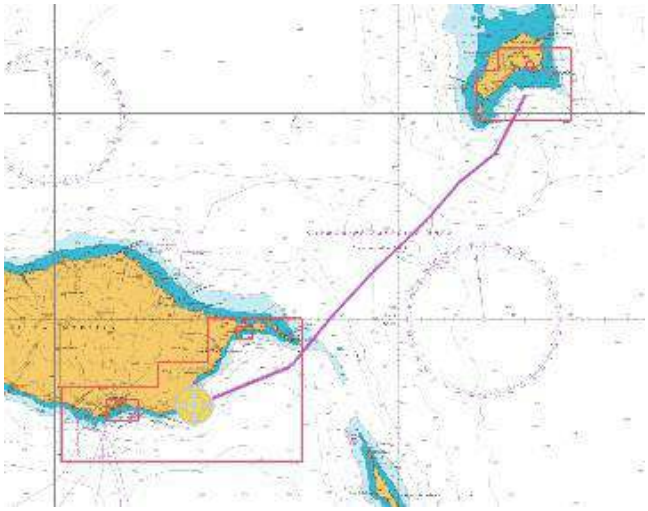
An alternative to “Extend Track” where two separate tracks are joined. The difference is that Merged tracks are visibly joined by straight track-lines. Read on for instructions on merging tracks.

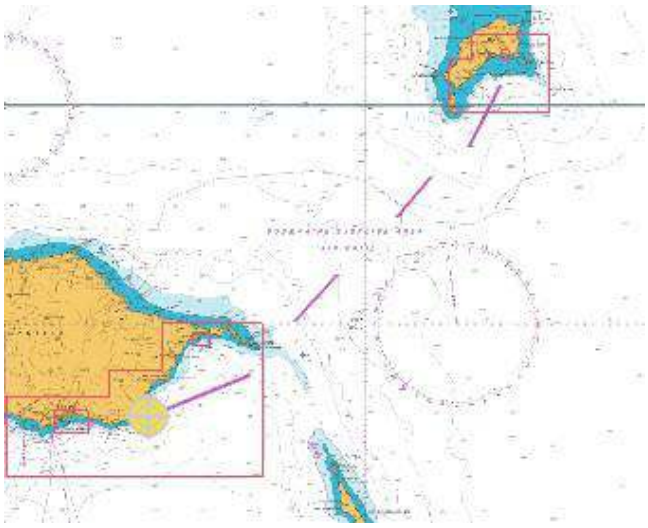
- If you have ever hit the Track icon by mistake, or closed down OpenCPN in the middle of a passage, you know that it's very frustrating to have a voyage split up in a number of different tracks that are not joined together. This can be fixed.
- Just select any number of tracks in the Track tab of the Route Manager window, right click the mouse to bring up the context menu, and choose to “Merge Selected Tracks”. The selected tracks will be merged in chronological order, with the track properties (name, color etc) of the resulting track keeping those of the earliest track in the

selection.

Copy as text

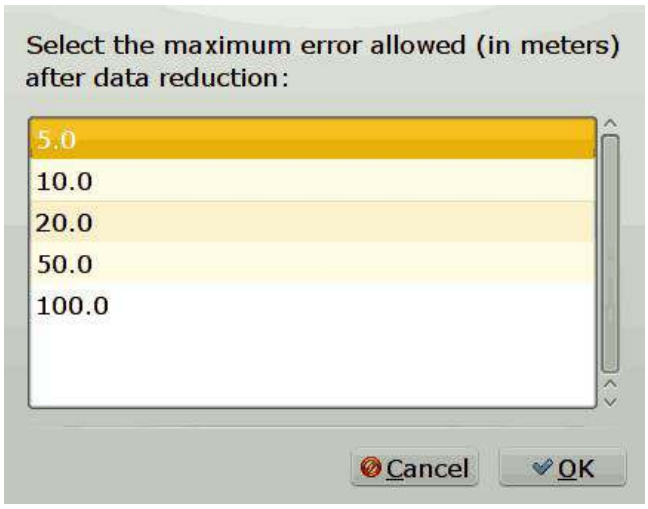
Copies the track name, unless it's the default time stamp, and the track distance. The result of clicking the merge button.

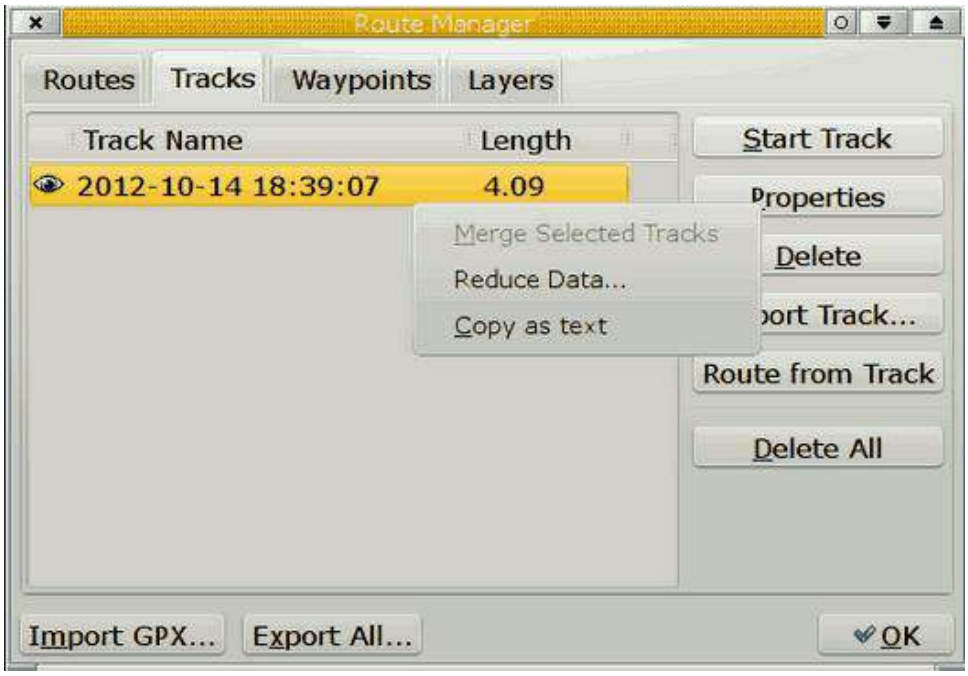




Reduce Track Data

- Do you have have massive amounts of tracks and finds them bogging down OpenCPN? This feature is for you!
- It is available from the context menu in the Track Manager. Right click on an existing track, and then click “Reduce Data…” .
- Pick one of the options, it reduces the amount of points in an existing track while maintaining the specified maximum error between the original track and the reduced track. Testing on an old OpenCPN track or an imported track, with an error setting of 10 or 20 meters tracks, will, in many cases, reduce the size to less than half and one can't really see the difference.
- Tracks made with the new intelligent dynamic tracking available in OpenCPN will not reduce much, unless a large error is tolerated.

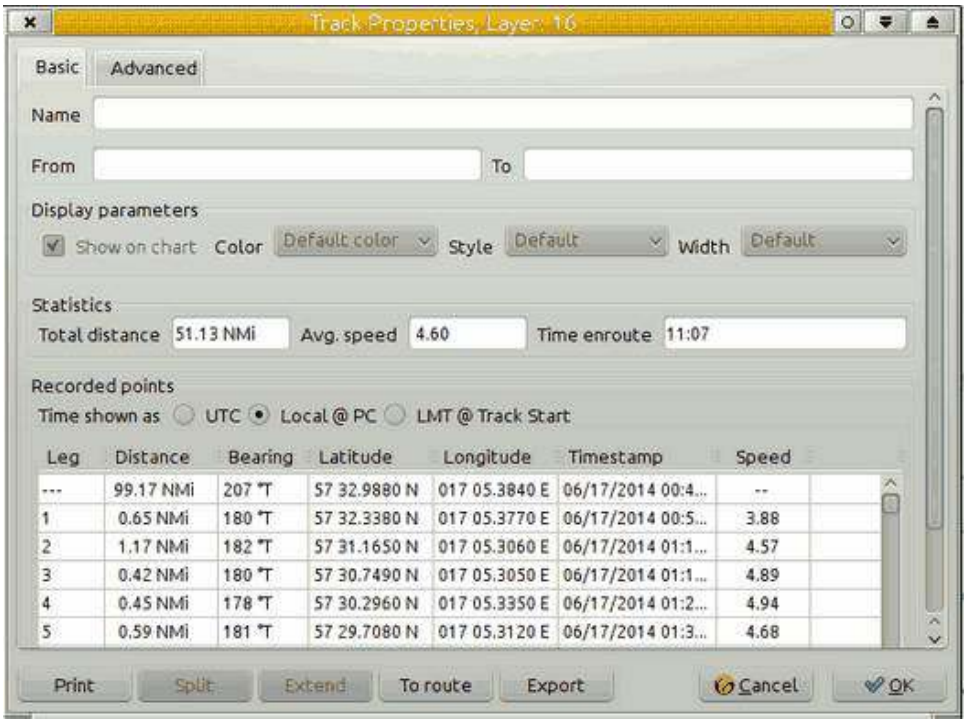


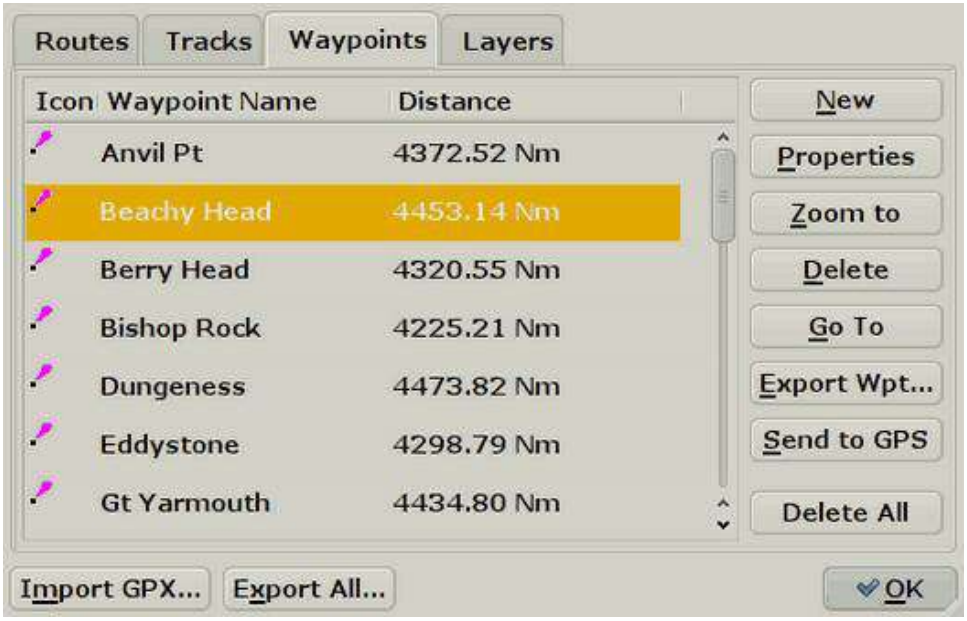


Track Properties

The track properties dialog is similar to the route properties dialog above. There are some obvious differences as a track describes something that took place in the past and a route is planning for the future. Track properties also has an **Advanced** tab that works similar to the Extended Marks dialog.

Waypoints





- Control the visibility of each waypoint by clicking the waypoint icon to the left on each line. Sort the waypoints by clicking the column headers. * **New.** Create a new waypoint. This brings up the waypoints properties dialog. The default position is set to the current position of “Own Ship”.

- **Properties.** All about the dialog in Extended Marks
- **Zoom to** centers the chart display on the waypoint.
- **Go To**. Makes an instant route from present position to the mark and activates the route. A similar instant route is created by right clicking and selecting “Go To Here” without first creating a mark. This instant route will be listed in the Route Tab.
- **Export Wpt** and **Send to GPS** buttons behaves similar to corresponding buttons for Routes.
- **Delete All**, does **not** delete any **Man Over Board** marks. All other marks are deleted.
- Use the Shift key to mark multiple waypoints for deletion. This also work in the other Route manager tabs.

- Refer to Route & Mark Manager
- Refer to Layers
- Refer to Layers Library
- Refer to AtoN
- Refer to Using Routes

FAQ

Is there a way to change the WP 'Icon' in a route?

http://www.cruisersforum.com/forums/f134/change-route-wp-icon-192133.html[209]

To change a single WP icon of a route go to the properties window with a right click on the WP icon. To Globally change a Route's WP Icons is not possible because the icon Diamond is hard coded in the source. However it is possible to change globally the WP icon for normal WPs, the triangle. To do that search a line with “DefaultWPIcon=…” in opencpn.ini.

Also see Use your own Icons

Navigation Data Backup (Navobj.xml)

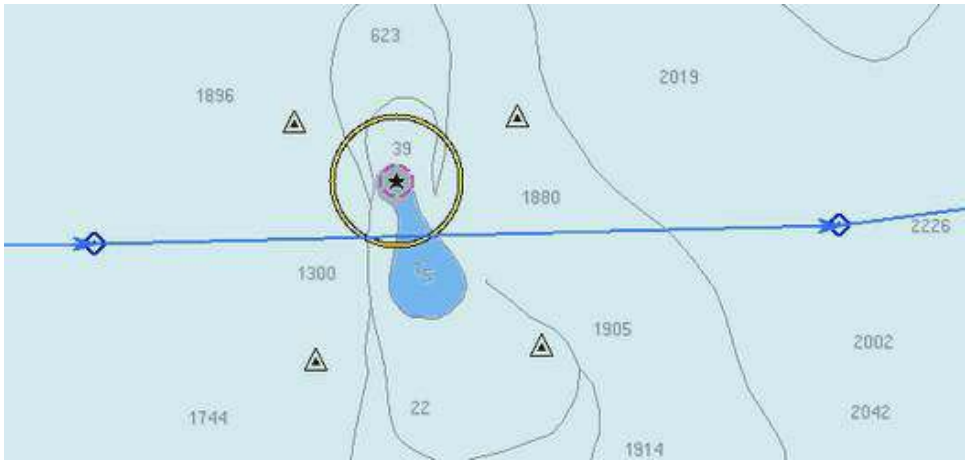
- Where are Routes, Tracks and Waypoints Stored?
- I lost my route, is there a backup?
- Can I find a missing track?

See Navobj

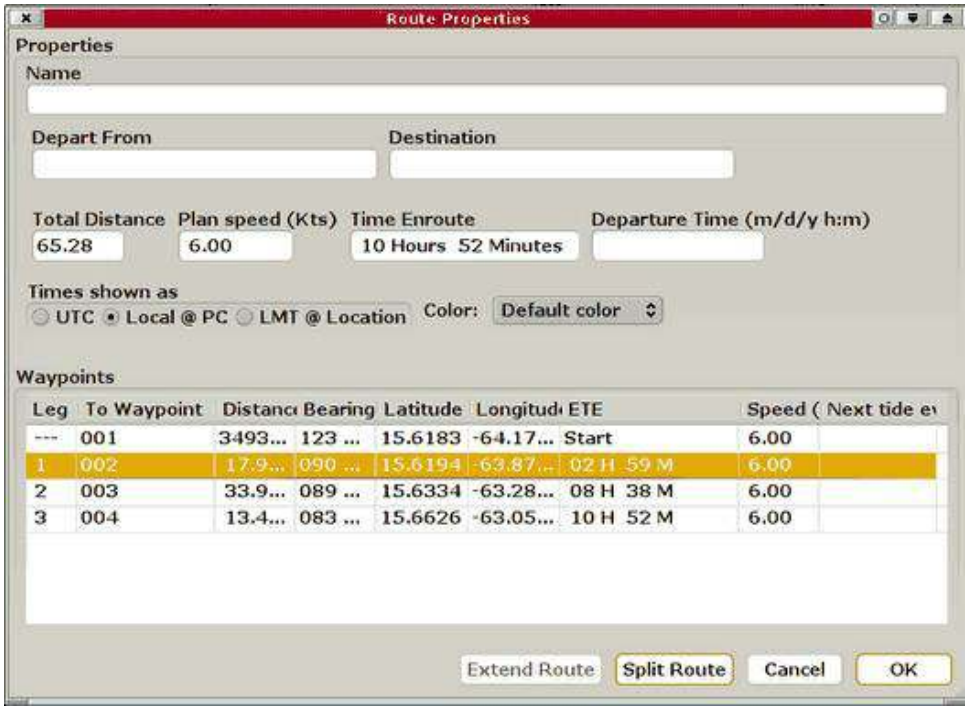
Using Routes

To include existing waypoints in a route

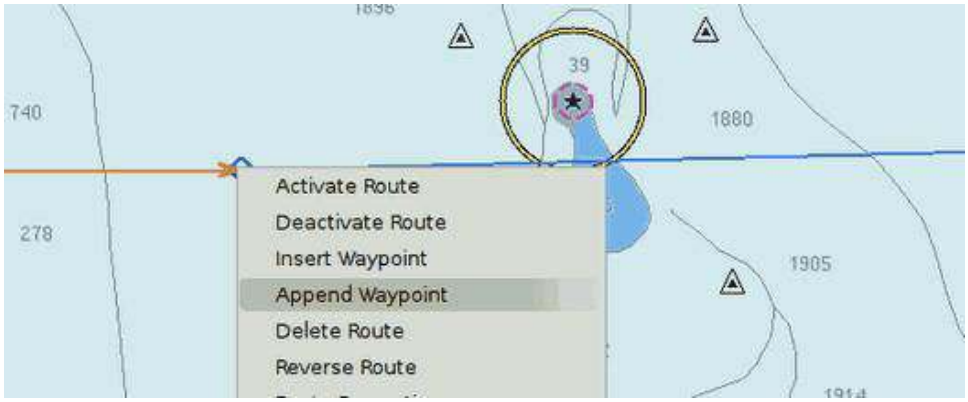
How to use split and extend - an example.



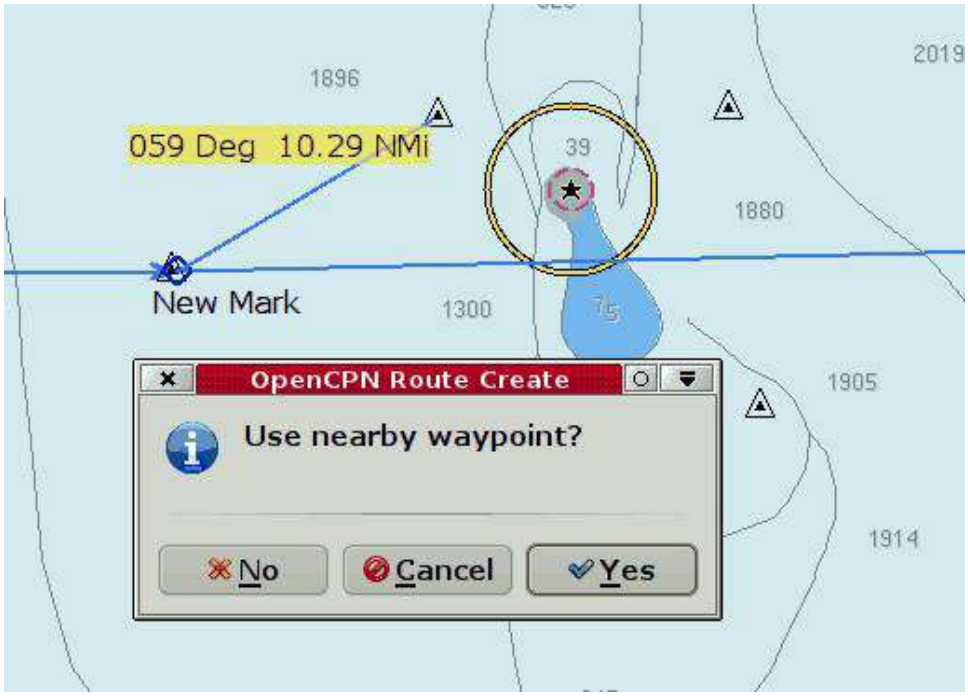
Hm…a bit of a miss in the planning. An islet with a shallow bank extending southward on our route. We put two marks north of the obstruction and would like to include these in our route.



The waypoint west of the islet is #2. We mark this in “Route Properties”, from the right-click menu. The Button “Split Route” is highlighted, meaning it is available to use. This is exactly what we want to do, so we click the button and split the route at wpt #2.

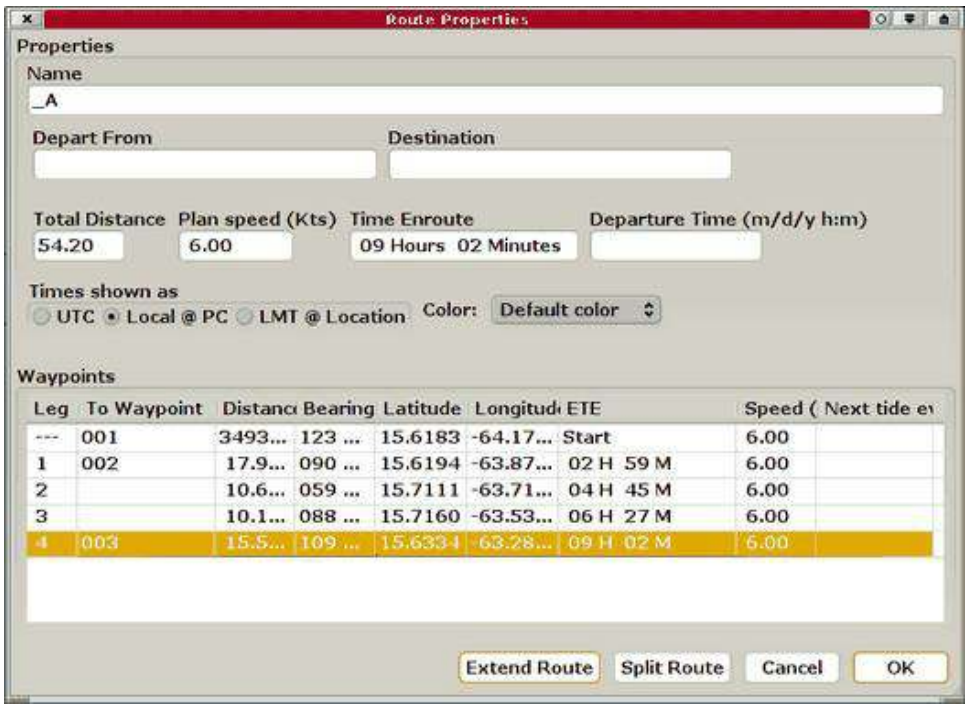


Right click at #2 and choose “Append Waypoint”,

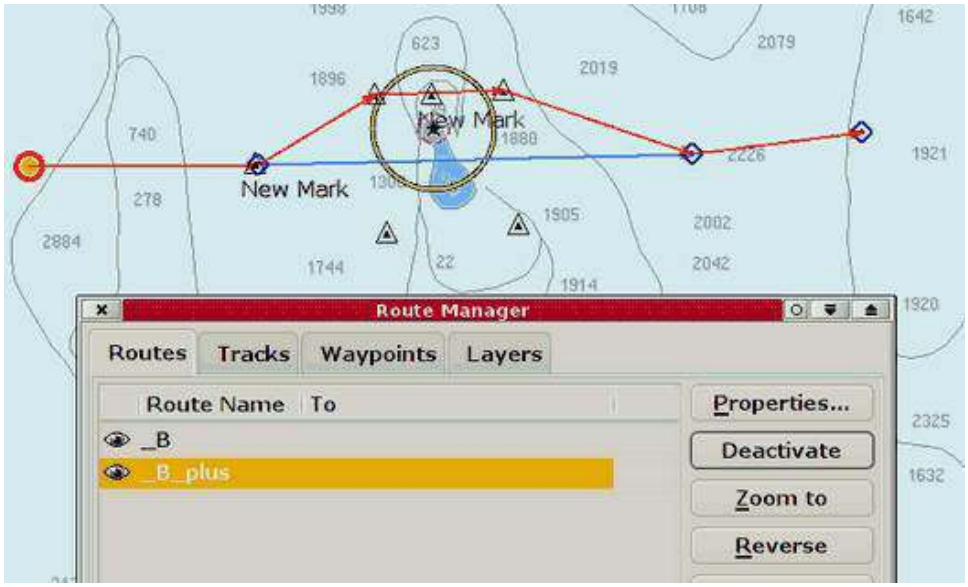


Move the cursor to the first triangle, and answer yes to “Use nearby waypoint?”.
Then move the cursor to the second triangle , and answer yes to “Use nearby waypoint?”.
Same thing for the original wpt to the east of the islet.

Click “Activate Route” to see that this extension worked.

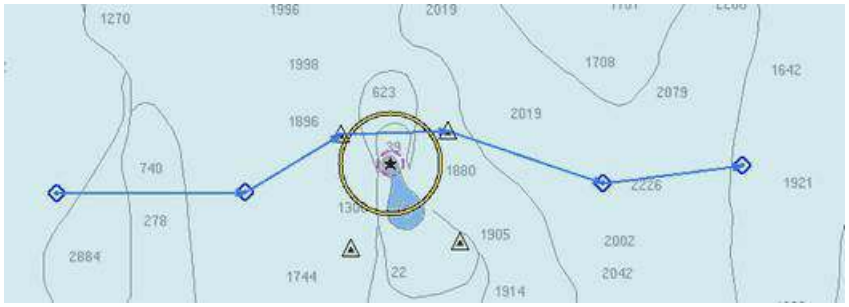


Once again mark “Route Properties” in the right-click dialog. #3 is the last wpt in our “new” temporary route. The “Extend Route” button is highlighted, so we click it.



Open the Route Manager to view the result. Notice the naming of the routes. _B_plus is active. What remains is to delete route _B and to rename _B_plus to a suitable name, for example the name of your original route.

Deleting route _B.



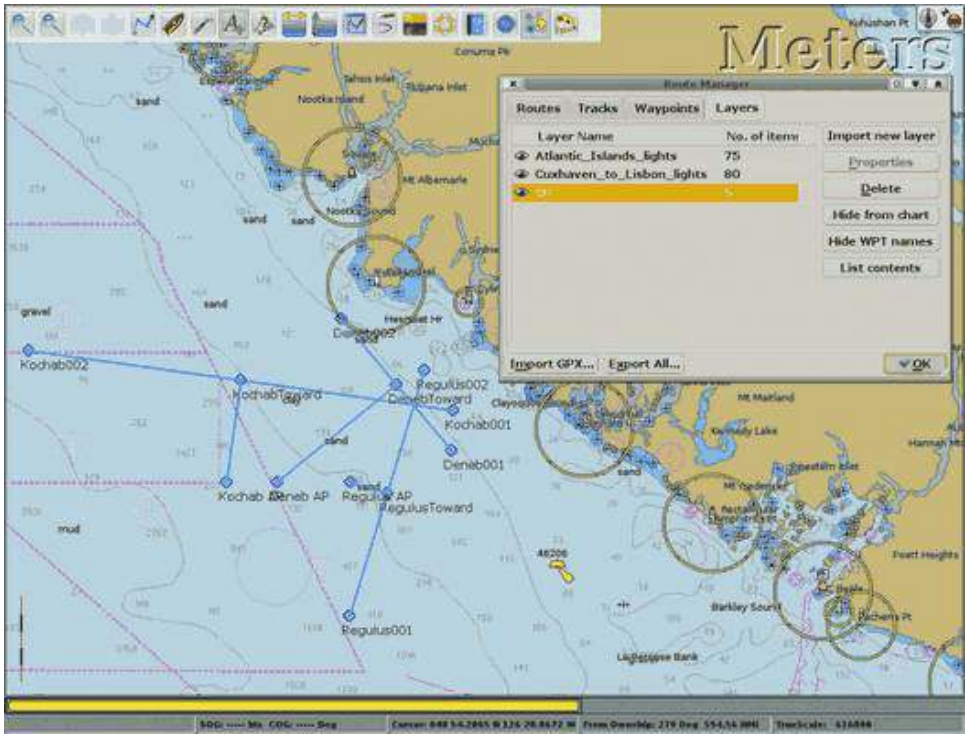
And here is the finally adjusted route.

This was just an exercise…..in real life, it would be easier to just move the existing waypoints in the route, to avoid the Islet.

Layers

- Layers are one or more routes, tracks or waypoints that have been saved together into a single gpx file.
- A layer is persistent and protected from changes.
- A waypoint in a gpx file for example, can be imported either as a “waypoint” or as a layer. The difference is that when imported as a layer it cannot be changed or deleted.
- Layers may be imported "temporarily" or "permanently".

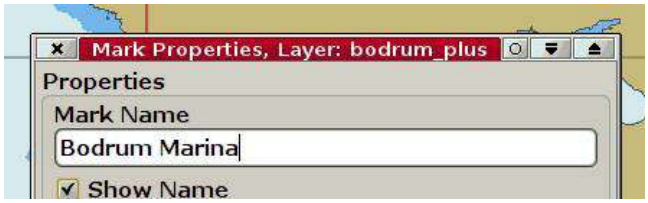
The Route Managers Layer Tab



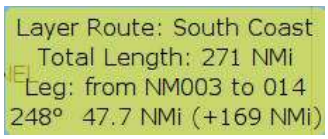
- Layers are useful for many things. It can for example be used to update charts with new navigation marks and dangers as per Notices to Mariners, and to add Radio Call-In Points or to build a database of lights and locations, that will be visible on chart regardless of current scale. See the first picture above, where French and UK forecast areas are good examples of Layers. In the second picture, a very good celestial fix, plotted with a gpx script has been saved as a layer.
- More advanced uses could, for example, be an interactive cruising guide using the possibility to embed links in waypoint descriptions.

When is a feature a part of a Layer?

- Layers are immutable, permanent, nothing can be changed. This could make them confusing, unless you are aware of the fact that they are layers!
- To see if a waypoint, route or track, is a part of a layer, right-click the object. If it is part of a layer, the context sensitive menu will say so. Alternatively, open properties and check the top of the dialog. If part of a layer, the layer's name is printed. As always, double clicking on an object directly brings up the properties dialog,



- A route belonging to a layer is also identified as such, by just hovering with the cursor above the route.



- A Route belonging to a layer also has the option “Activate”. It can thus be used, but still, no changes can be made. A much more flexible option, would be to import the route layer file as a normal gpx file.

Layer Directory for Automatic Loading of Permanent Layers

- Layers can be created in OpenCPN and saved as a gpx file, or be created offline

manually or by scripts, for example.

- Layers that are saved in a directory called “layers” (created by the user) in the same location as your config “opencpn.ini ” file are automatically loaded on start of OpenCPN. These layers are known as “Permanent Layers”.
- The layers that are saved to this directory will be listed in the Route Managers Layers Tab on start up. The first time they will all be visible. Adjust visibility by clicking on the “eye” in the first column. This setting will be remembered. Have a look at the first picture on this page!
- The easiest way to find this directory is to go to the  - button in the ToolBar and look all the way down in the first tab (About).
  - In Windows create the directory: *C:\ProgramData\opencpn**layers***
  - In Linux create the directory: ***/home/$USER/.opencpn/layers***
- On Mac OS X, the location is “/Users/“username”/Library/Preferences/Layers”. Note that “Library” is a hidden directory in “Lion”. For Mac OS there are two “Library” directories, do not use the one for the system.
- Any subdirectories in the layers directory are also loaded.
- Layers worth keeping could be kept in the mentioned “layers” directory and visibility during a session can be handled through “Hide from Chart” or “Show on Chart” buttons. New layers, gpx files, can easily be added in a subdirectory of it's own.
- A few restrictions apply to layer marks. A layer mark cannot be used to set anchor watch on. If right-click-selecting co-located objects, priority is given to non-layer objects.

The Route Managers Layer Tab.

- **Temporary layer**: Any gpx file can be imported as a layer. This can be used for developing layers, or for import from a user defined directory with predefined layers, as necessary. Layers imported this way will be saved when closing down the computer, they are persistent. More permanent layers should be kept in the “layers” directory, as described above.
- **Delete:** Unloads the layer, but doesn't of course touch the originally imported gpx file. A progress bar will appear when deleting large layers. It is not possible to stop the deletion, once started. For size restrictions, see below.
- **Hide from Chart** or **Show on Chart** Controls if the marked layer is visible. The same thing can be achieved by clicking the “eye” to the left of the layers name. A red X across the eye marks a hidden layer. See picture above. These settings are persistent, they will be remembered after a restart.
- **Hide WPT Names** Shows a visible layer without waypoint names. This helps to un-clutter layers, when zoomed out.
- **List contents** or **Delist Contents** Listing is this context means showing the individual points in the layer as waypoints in the “Waypoints Tab”
- **Import GPX..** and **Export All..Warning** these buttons has nothing to do with Layers. They work as if you are in an other tab. For import use “Import New Layers”. For export, create layers as described above.
- **Export All Visible**.. exports all visible layers, routes and waypoints to a gpx file. Use this button to create new layers, for example. Just save the gpxfile in the right place, described above. Note that “visible” in this context is the opposite to a layer, route or waypoint being “hidden”. This means that objects not visible on the screen, may be included.
- A progress bar will appear when exporting large layers. It is not possible to stop the

deletion, once started. For size restrictions, see below.
- If a layer includes extended marks, linked to pictures, for example, the pictures will not be exported, only the links to the pictures. To “export” the whole layer to another computer, copy all the pictures separately. Adjust all the links in the gpx file, to the new computer, by doing a “search and replace” in a text editor on the new computer.

Size Limits for the Layer feature.

- OpenCPN is not suited to handle very large permanent layer files. Exporting and deleting such layers bogs down the program. With older hardware or limited available memory, even these recommendations may be to optimistic.
- OpenCPN 4.0 has refined the track and layer logic to improve performance with large tracks. See next paragraph.
- Newly developed static layers by argus.survice.com[210] show that OpenCPN has problems with very large layers consisting of waypoints named after the depth at the position. With 10,000 + posistions it's necessary to consider some rules when using OpenCPN. If you disregard these rules, expect bad performance.
- Deactivating OpenGL may improve the performance somewhat.
- Always load the files as a temporary layer, zoomed in on your local area. Never load when zoomed out. Why? Zoomed out OpenCPN has to handle all wpts at the same time when zooming/panning. Zoomed in it just a handful of wpts at the same time.
- An alternative is to load a file when zoomed in on an other area. This goes quick. Then promptly make the layer invisible. Only make the layer visible when zoomed in on the actual area.
- Never zoom out with these files loaded, unless you make the layer invisible first. There is no point in this anyway as all you will see is a lot of black “smear”.

More on creating layers and saving data.

- Export and Import of GPX files
- Have a look at *Navigation Data Backup*

Where to find ready made Layers?

- A few samples are available in Layers Library on the OpenCPN.org.

Great Circle Sailing

Very few cruising boats need to use Great Circles, but it's certainly an important consideration for commercial vessels across the North Atlantic and North Pacific.

The advantage of a great circle is obvious, the shorter distance. The disadvantages, depending on latitude, could be quite a few. Colder weather, stronger winds, higher seas and perhaps even icebergs. The great circle is just one factor in the decision making, when planning a route, the weather is likely to be the deciding factor in most cases.

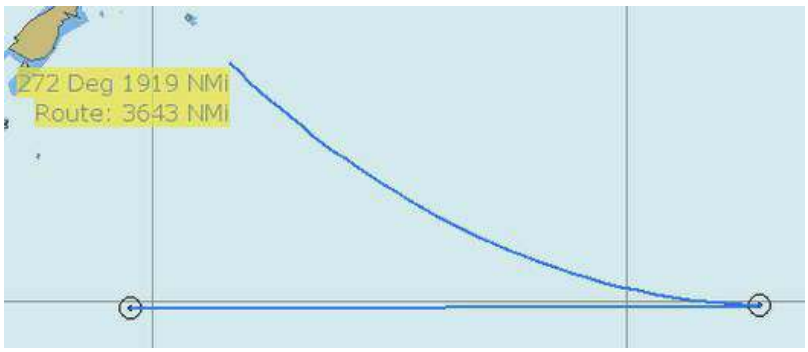
OpenCPN has a builtin Great Circle tool as well as a Great Circle plugin.

The built in Great Circle tool.

The “Measure” tool in the right-click menu and the “Create Route” button on the ToolBar switches seamlessly to a great circle mode when asked to do long distance tasks. This mainly happens when using these tools in some east-west direction and far away from the equator. The mode kicks in when the difference between the normal, rhumb line and the great circle becomes larger than two nautical miles. This will be some 0.2% to 0.5% of the total distance, depending on latitude and direction. When this happens a clear curve towards the pole will appear.

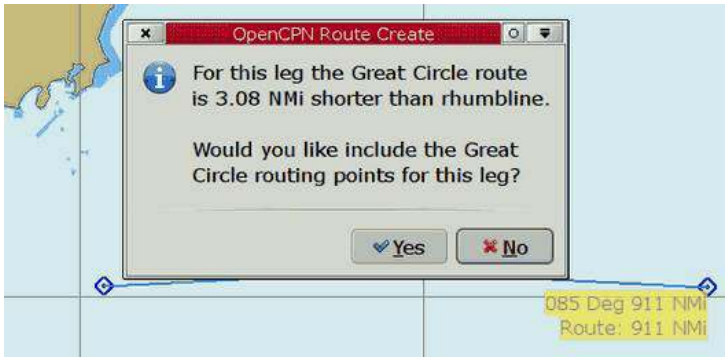
 The Measure Tool

Testing the measure tool for Manila to San Francisco (approximately). For a good illustration to Great circles, find a second point that is opposite the first, on the other side of the globe, and just move around slightly.



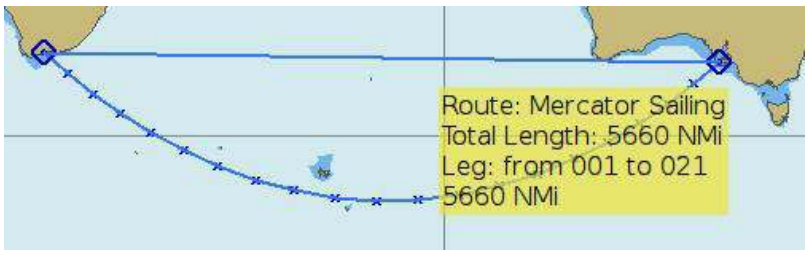
Once the first leg in measuring is done, it's plotted as a rhumb-line, to keep things simple. The active leg is still displayed as a great circle, if long enough. The distance displayed is the combined great circle distances.

 The “Create Route” Tool



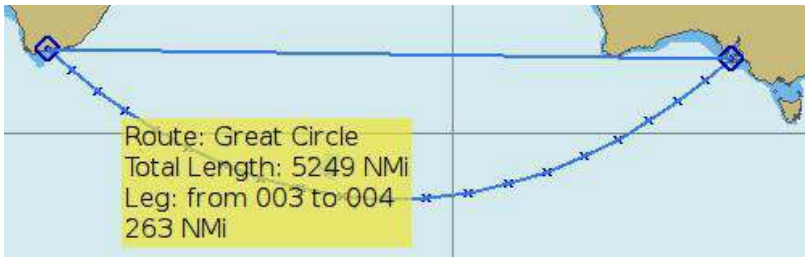
If you answer no to the above question, OpenCPN will use a traditional rhumb line for the leg. Answering yes, will kick the great circle option into action and a number of intermediate waypoints will be created. There will be at least 3 waypoints. The exact number of waypoints is calculated by OpenCPN and is appropriate for most cases.

The created route is now available in the RouteManager dialog, as a normal route.

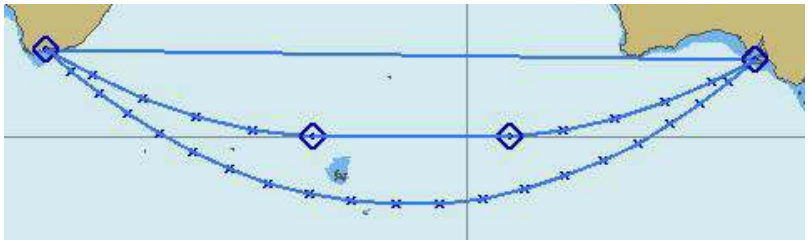


As a real example let us look at a route from Mossel Baai, South Africa, to the western

entrance to Investigator Strait, South Australia. The rhumb line is 5660 nautilcal miles, and the great circle, as approximated by the created route is 5249 miles. The “real” great circle is some 15 miles shorter.



Composite Saling



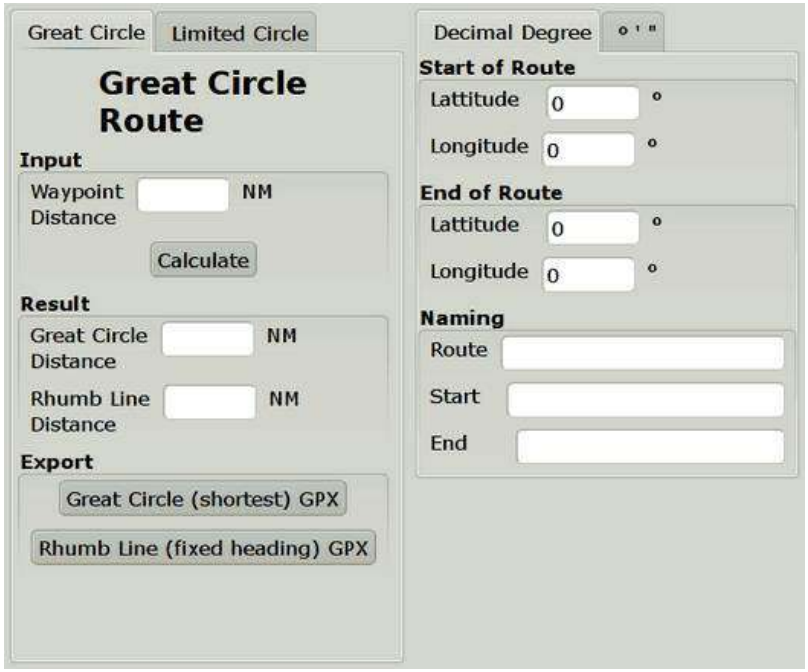
Composite sailing is a great circle sailing with a maximum allowed latitude. OpenCPN has no such built-in option, but it's easy to create.

Above is the same route as before designed for composite sailing, not going further south than 45° S latitude. Start a route at Mossel Baai extend it until 45° S becomes a tangent to the visible great circle. End the route.

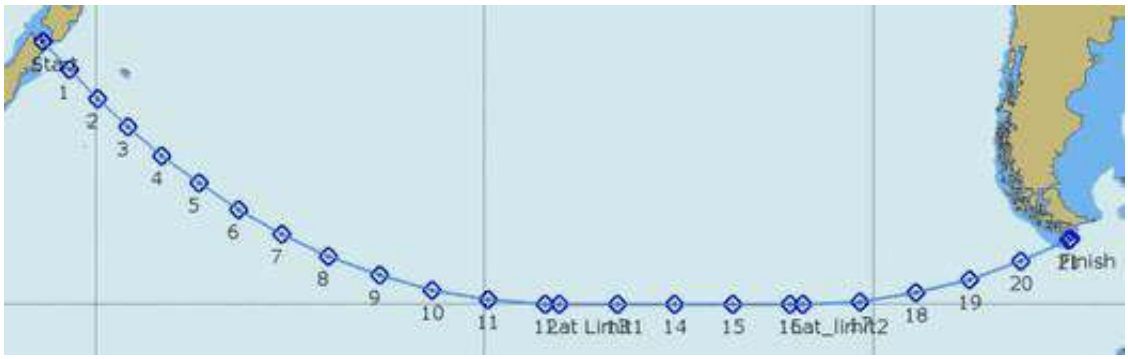
Do the same thing, starting with the destination and going backwards. Create a rhumb line route, using the two points along 45° S. The three routes together form the composite route. The total distance of the composite route is 5293 Nautical Miles.

Route Plugin

“Salty Paws” route plugin handles much more than great circles, introduced here.



The plugin has a few features not present in the built-in tool. It can calculate a composite route, and the distance between the waypoints can be set by the user. The end result, however, is a “gpx” file that is exported, and then imported into OpenCPN via the Route Manager.



A great circle from Cook Strait to Cape Horn limited by 60° S

Weather-Routing

Users have the choice between using qtVlm or the Weather Routing Plugin.

It is recommended that you use the weather routing plugin as it is now stable and qtVlm is no longer free software (source code is not available).

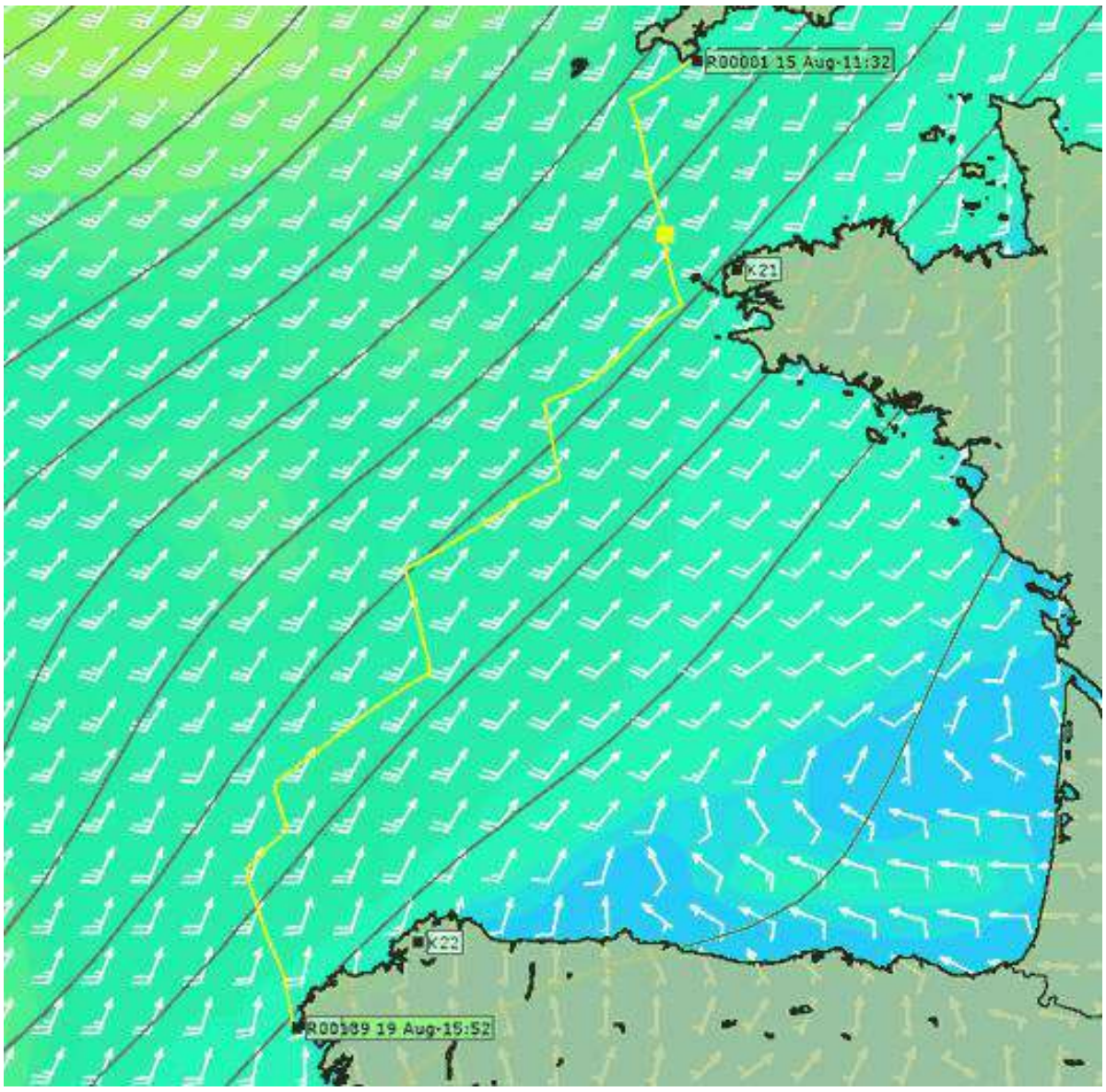
Routing with an older version of qtVlm is described here.

OpenCPN can import optimized routes from the Free and OpenSource QtVlm program. Make yourself familiar with QtVlm if you intend to use it, as many things are done differently from OpenCPN.

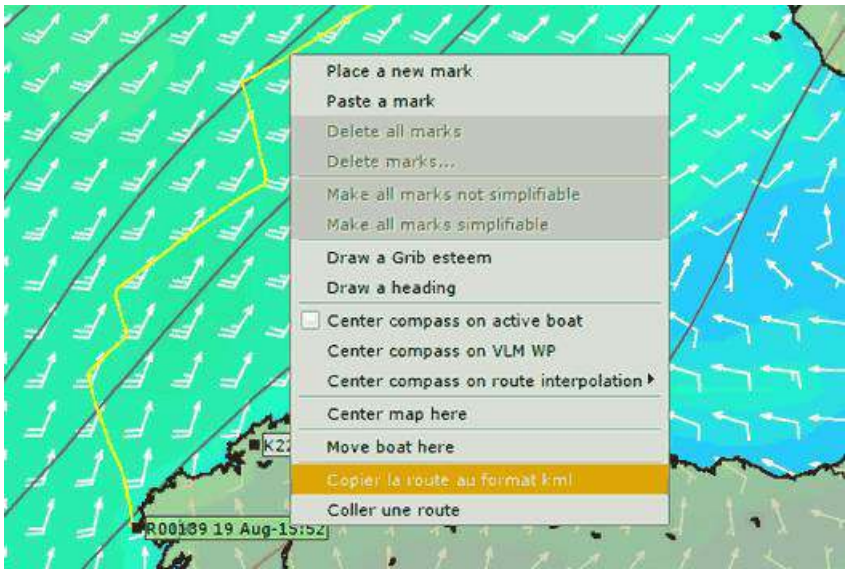
QtVlm Documentation and Installation[211]
QtVlm Thread on OpenCpn Cruiser's Forum[212]
OpenCPN and QtVlm Summary of Route Transfer, see below

Before going any further, make sure you really **understand grib files**, what they are and their limitations. A good place to start is Franks Singletons pages.[213]

Let's look at an example of importing an optimized route from QtVlm. It's a situation most of us try to avoid. Going across the Bay of Biscay with an active Atlantic Low just west of the British Isles.
The busy, time constrained, delivery skipper intend to find the best route from Lizard Point to Cape Finisterre. He has entered into QtVlm, the constraint, to route away from more than 30 kts headwinds. Below is the QtVlm optimized route based on the latest available grib file. Note that QtVlm doesn't know anything about tidal streams, currents local squalls nor about the state of the crew etc. These are more reasons why the final route always is the responsibility of the skipper.



Right-click on the route and export in the kml format.



Open OpenCPN. Right-click and “Paste Route”

This looks a bit ugly, and both the route and all waypoint have been exported. We want something better!

One alternative is to let QtVlm (Edit Route) “Simplify” the route before copying.

Another alternative is to first use the “Paste Track” option.

Note that this is no true track, it's just another way of exporting a route, possible due to the KML format. A track describes where we have been in the past, while routing is planning for the future. Importing the track gives a “light-weight” overview of the suggested route. Read more about the Grib Weather Plugin.

Next open OpenCPNs Route Manager Track Tab and press “Route from Track”.

Much better. We now have a track with a route on top. Right-click and delete the track. Next, it is smart to display the same gribfile used by QtVlm in OpenCPN, using the Grib Plugin.

All this looks impressive, but it's still based on a grib file. So it's still based on a computer prognosis, with no human input. All other reservations connected with gribs, still apply. An on board calibrated barometer is a good way to check what confidence can put on a grib forecast. Read more about the Grib Weather Plugin.

A reasonable polar diagram is essential as well. Producing one is standard procedure on racing boats, but not that common on cruising boats. Cruising specific factors, such as “comfort” also plays a part in a cruisers true performance capabilities.

Summary of Route transfer process.

Using OpenCPNand qtVlm in “Real Boat Mode”
QtVlm English Documentation and Download is here[214].

Copy Routes

OpenCPN to QtVlm

- OpenCPN Right click on the route, pick “Copy as KML”, Pick “KML with extended waypoint data (qtVlm)”
- QtVlm Right click on the Ocean, pick “Paste a Route” or Hit “CTRL-V”

QtVlm to OpenCPN

- QtVlm Right click on the route, pick “Copy Route xxx”
- OpenCPN Right click on the Ocean, pick “Paste Route”

Copy Tracks

OpenCPN to QtVlm

- OpenCPNRight click on the Track, pick “Copy as KML” Open Text Editor, Paste into new txt, save as .KML .
- QtVlm Pick “Routes- Imports Routes - In Ortho mode - browse to the directory, Pick the *.kml file.
- Note If all of the Track (now route) does not show up, current Grib data is not long enough.
- Note: Route Manager “Route from Track” selection, then simply copy the route.
- Note: Route Manager also provides Export Track as Gpx, however qtVlm does not support *.gpx format.

QtVlm to O

- QtVlm There are no tracks in qtVlm, just copy the route.

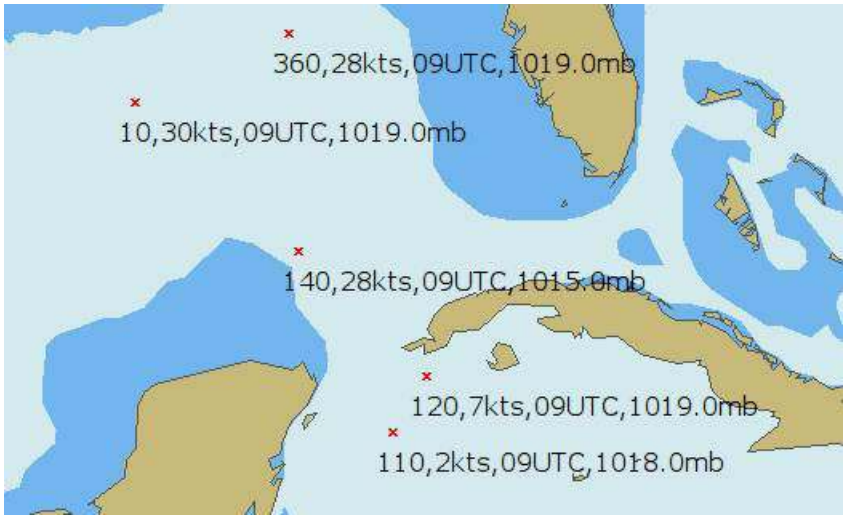
Using GPS in OpenCPN and qtVLM at the same time

Linux only:
Connect to your Gps using GPSD in OpenCPN.
Then issue this command:
$gpspipe -r | socat - PTY,link=/tmp/gpsout,raw
Now use ”/tmp/gpsout“ as the serial port name in QtVlm.

Planning Data

The examples shown on this page are all suitable for import as layers, as that will prevent any waypoint from being moved by mistake.

Need to see some offshore weather observations?



NOAAs NDBC site[215] gives access to a lot of offshore observations from buoys and ships worldwide.

To easily visualize all this data the “ShipWxRep” script transform a limited set of all the available data into gpx waypoints. The format, as seen above is “wind direction, wind speed, time for observation, and air pressure”. This can be helpful when evaluating the accuracy of grib files, even though the best tool in this respect probably is a calibrated digital barometer.

Plotting Miami Tropical Forecast Advisories.

If you only have access to low bandwidth Internet, this script is a way to quickly plot the contents of, for example, an email containing the forecast advisory. In any case, it is a good idea to have the forecast track of a tropical system available where you normally do your navigation and planning.

Download the gpx scripts here[216]. The old great circle script is included. For some help run each script without arguments.

Ship Track

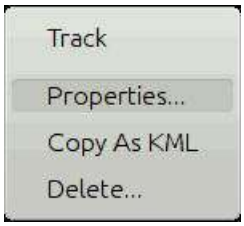
 Track off

 Track on

Toggling the track icon turns tracking on and off. When tracking is on, the button hasa green background. Tracking means that a record is kept of the vessels position as it proceeds. A trail is left behind the vessel on the chart display.

Tracking is persistent. If you shut down OpenCPN with tracking active, tracking will be activated automatically next time you start. Note however that tracking on start up is delayed until a GPS position is available. This action avoids large nonsense jumps in the beginning of the new track. The way the track is recorded can be set in Options → Ships → Ownship. A full explanation is available in Own Ship

Recorded tracks can be imported, exported and managed using the Route & Mark Manager. When right clicking on a track you can select Track Properties from the context menu, and a new dialog pops up. Normally it looks like this:

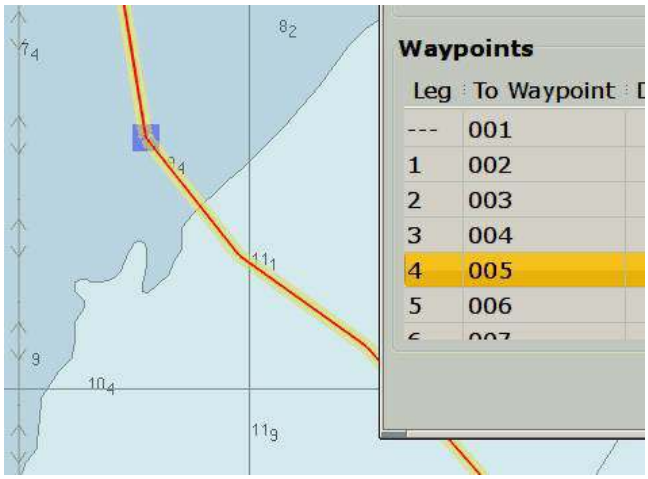


But if the track is a layer or part of a layer, you will see this instead:

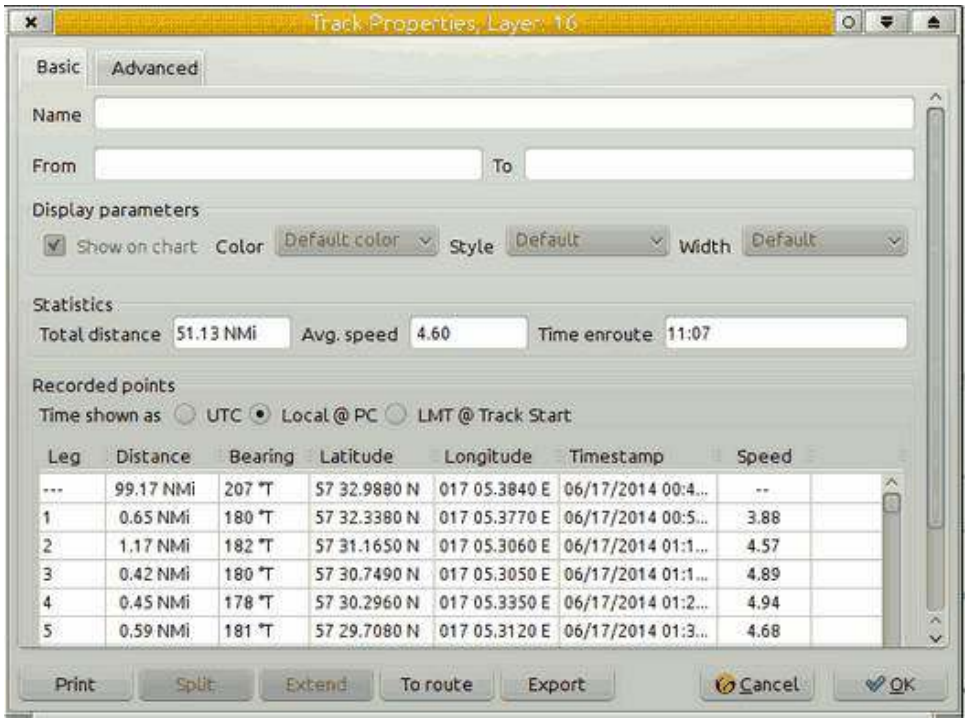
A layer cannot be changed easily, and a lot of what follows does not apply to Layer Tracks. Read more about Layers.

The properties dialog can also be reached through the Route Manager. A record of all the

track point will be listed. On the screen dump below the tracking precision is set to “Medium”. The Waypoints, track points really, appears at irregular times, due to the smart tracking. Only trackpoints that contribute to the track are recorded. In other words, a change in the track occurs at every recorded trackpoint. Click anywhere on a line in the list of track points, to mark the line and a blue square will mark the position on the track.



From the right click menu the Delete track option is available as well. To prevent mistakes a confirmation dialog pops up. For more about Tracks read about the Route Managers Track Tab in Route & Mark Manager.



There are many options for how a track will be shown and what time to use. The **Advanced** tab, where you can document the track and include links, works similar to Extended Marks.

As a backup, a logbook entry is made every half hour in the OpenCPN log file. The format is similar to this:

14:30:00 CEST: LOGBOOK: 2011-06-28 12:30:00 UTC DR Lat 44.43657 Lon -65.17280

Help?

Please Jump to the Getting Started page where Help is located.

About OpenCPN
Help with search
How can I find the OpenCPN.Log File ?
How can I find the Opencpn.ini File
Click on the link above.
Please do not put any content on this page. Put it on Getting Started

Man Overboard

Man Over Board, MOB, can be handled **manually,** by pressing a button on the screen, or hit a shortcut key sequence.
Mob can also be handled **automatically**, or semi-automatically, provided that the crew is equipped with the right gear.

In any case …receiving a signal from an AIS SART or PLB will always generate an on screen alert, and sound a warning if this is set up. Read more about ***AIS SART*** .

MOB Activated Manually

Drop a Man Over Board Marker at your present position by pressing

*** Man Over Board Button**  on the ToolBar. This button will always be furthest to the right among the buttons, for ease of finding.
or hit theKeys
***Ctrl + Space bar**.

A mark, looking like the button is instantly created - the MOB mark.
The MOB mark will be called “MAN OVERBOARD at + time-stamp”

A temporary route, **from** a point 1 mile ahead on the current COG, and **to** the MOB mark is created and activated. On the screen, a course and bearing to the MOB mark will be displayed. This temporary triangular mark is labeled “1.0 NM along COG”.

If COG, course over ground, is not available, no route is created but the MOB position is marked. This can happen if no GPS is connected, if the GPS signal is (temporary) unavailable or if the speed is so low that the GPS doesn't calculate COG.

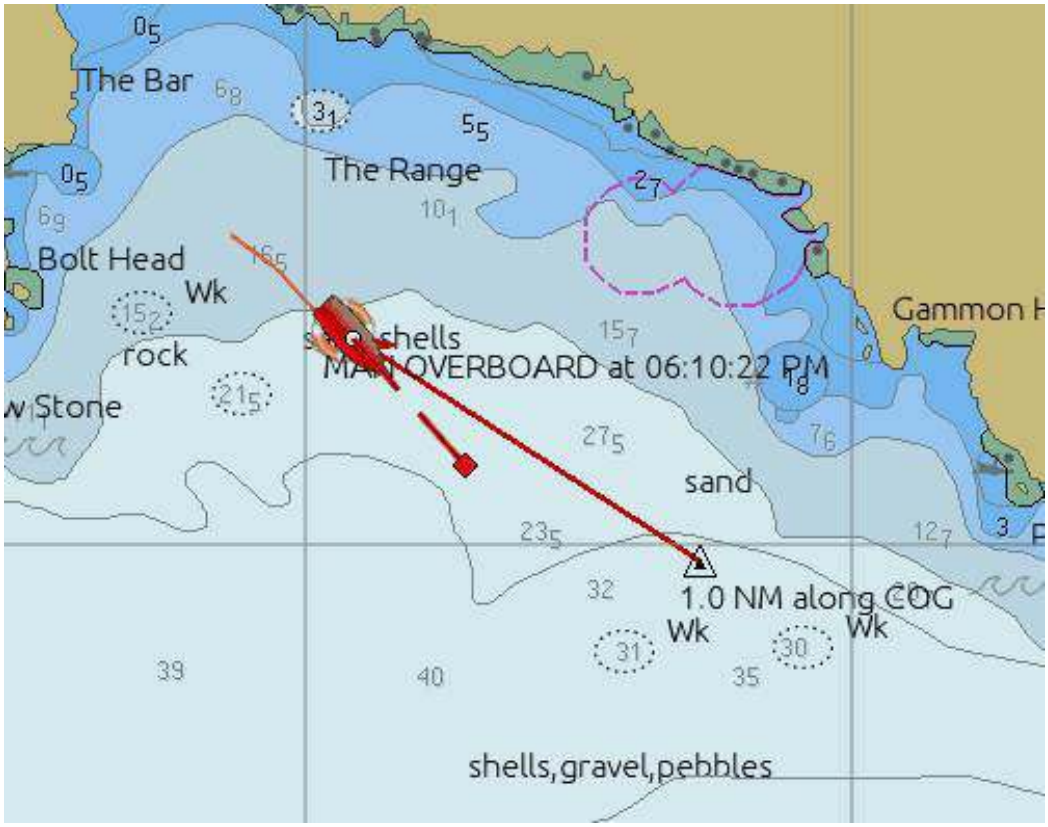
The MOB mark is persistent
If OpenCPN is shut down OpenCPN by mistake, and you have to restart, the MOB mark will still be there.

To delete a MOB
The temporary route can be deleted, through the right-click menu, but no action of the user with the mouse or keyboard will move or delete the MOB mark, except for a right click → Mark/Wpt Properties and **select a different icon**, and then delete the mark (ex mob mark) from the right click menu, or through the Route Manager. A MOB mark is not included in “Delete All” in the Route Manager, to avoid mistakes. The mark has to be selected alone and then “Deleted”.

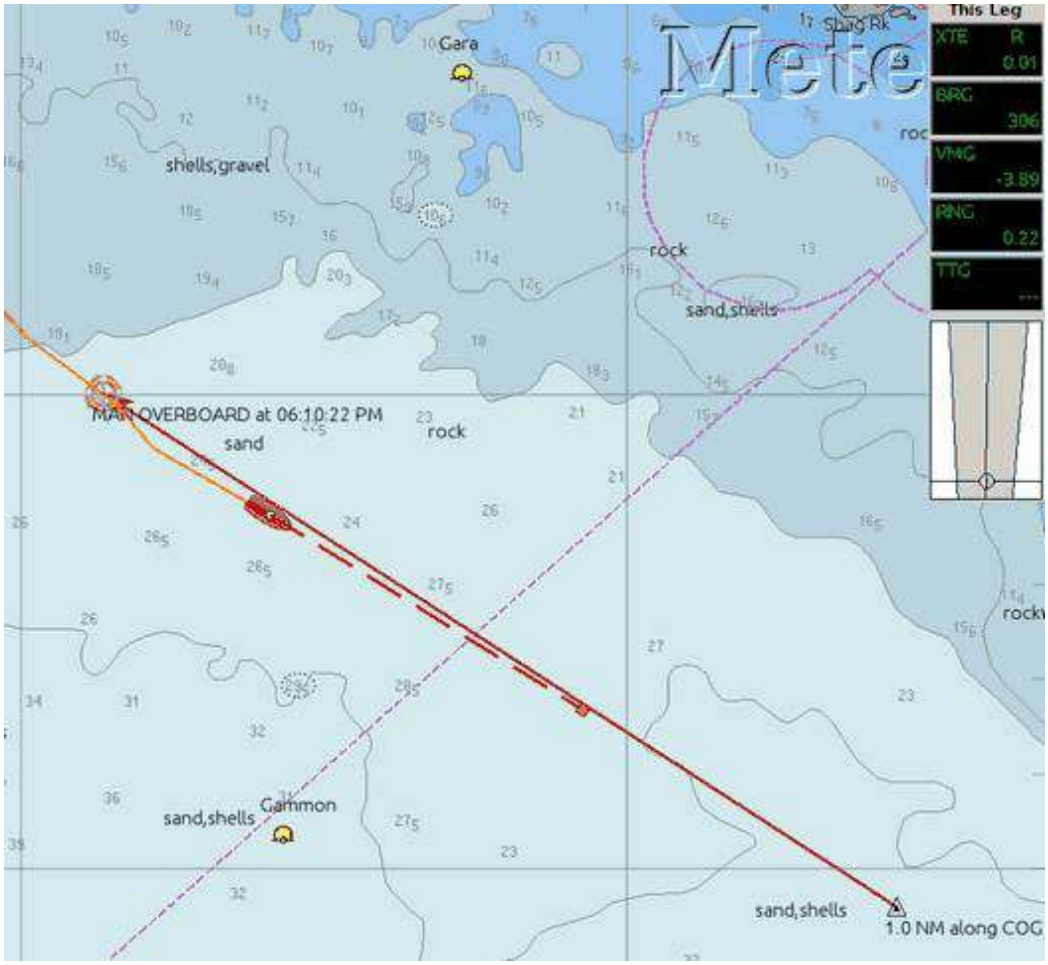
Multiple MOB marks can be deployed, and multiple temporary routes will be created. The active route will always be associated with the last dropped MOB mark.

Be very careful when using this capability in waters with strong tide or current.
The person overboard will **not** be at the position of the MOB mark for long. Both Own Boat and the person in the water will move with the current, but OpenCPN knows nothing about this.

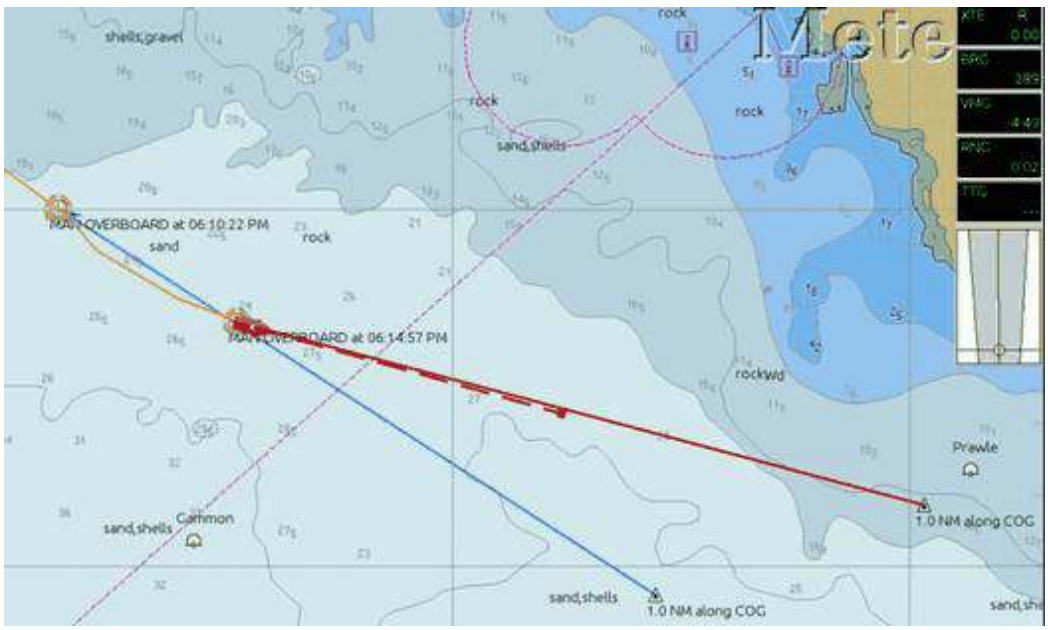
The MOB mark has just been dropped



Own Boat has moved on and the MOB mark is 0.22 miles in bearing 306 degrees.
One option in this situation is to drag the triangle to the Own Boats position.

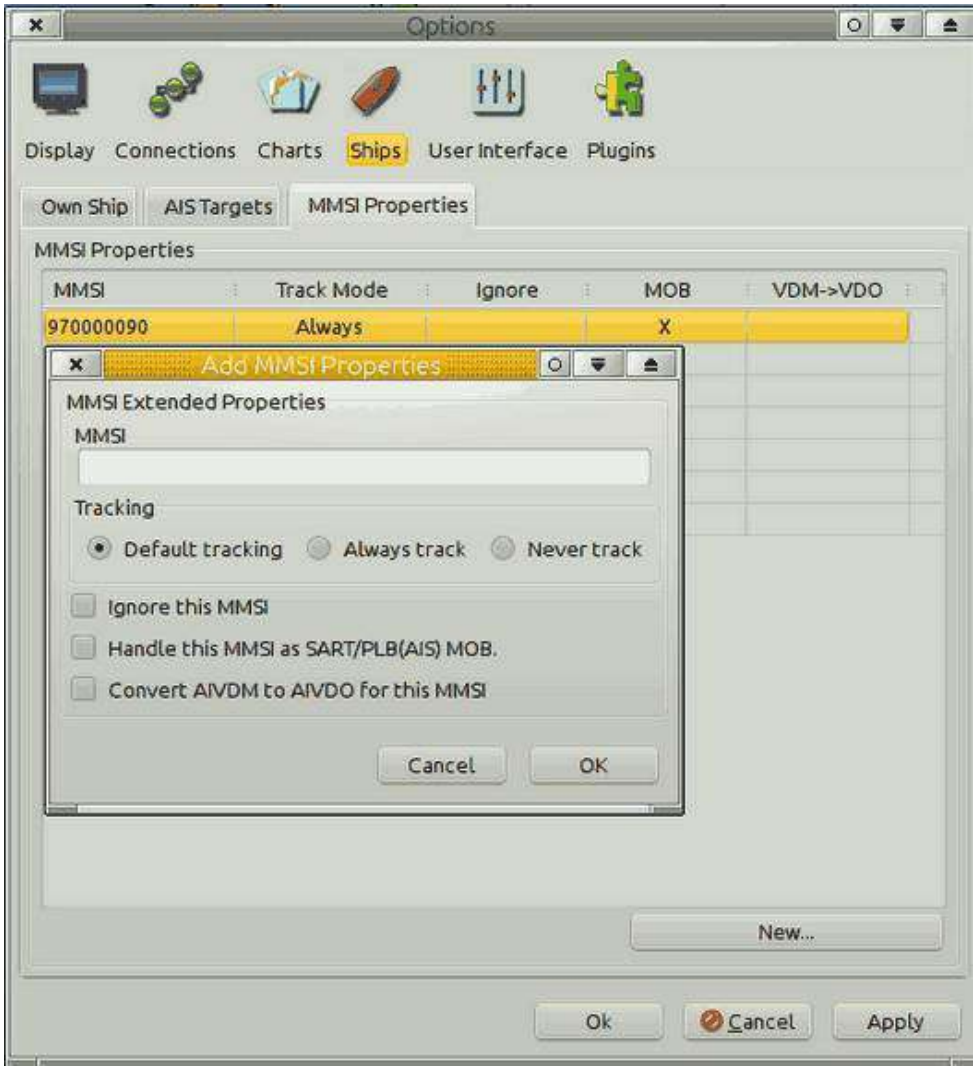


A second MOB mark is dropped.



MOB activated automatically.

This works if each person onboard has a personal “AIS-SART” or “PLB(AIS)” and carry them at all times.
The transponder must also be activated, either manually by the MOB or automatically.
OpenCPN should be set to treat the MMSI of the crew devices as MOB events.
Do this by going to Options → Ships → MMSI Properties → New and enter the MMSI number of a device.



Mark “Always track” and “Handle this MMSI as SART/PLB(AIS) MOB”, and press OK. Do the same thing for each AIS emergency device on board. They should now all appear in the list at the “MMSI Properties” tab.

Next set up Options → Ships → Ais Targets → “Play Sound on CPA/TCPA and DSC/SART emergencies” including “Select Alert Sound”.

With this setup a MOB will generate an alarm and OpenCPN will start a MOB event as described above under “MOB activated manually”.

Otherwise.....

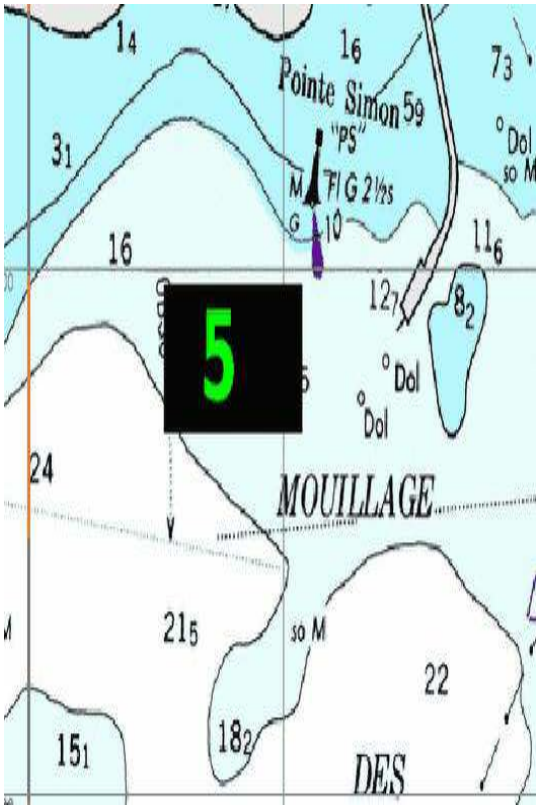
An active SART or PLB(AIS) will generate an emergency alarm (if this is set up) and an on screen alert, even if the MMSI is not entered into OpenCPN as above. Read more about AIS AIS SART.

Night Navigation

Dimming the whole screen for Nighttime Navigation.

Use the F6 key for dimming and SHIFT + F6 to reverse the dimming.
This is not connected to a chart feature, and dims the whole display, not just OpenCPN.
“CTRL + G” cycles through (monochromatic) green, red and normal screen. The color change applies to the whole screen as well.
“Ctrl + G” may not work on some Windows systems, depending upon the graphics driver implemented.

When pressing F6 the word “MAX” appears on the screen in the NW part. Press again and the screen gets a bit dimmer and “MAX” is replaced by a “9” and so on.



“Print Screen” refuses to catch the dimming!!

Mac OS X users can easily adjust the screen brightness with the F1 and F2 keys.

Change Color Scheme

This Button  has 4 levels corresponding to standard US raster charts built in levels. You

can cycle through the levels also by pressing the F5 key.
These represent the Default level, the Daylight level, the Dawn or Dusk level, and finally the Night level.

Often there is no difference between the Default level and the Daylight level.

The way this button works differs between different categories of charts.

S57 Vector Charts and the CM93 ver2 charts.

All charts display the Dawn/Dusk and Night levels. This means that there is no change when the button is first pressed, but further pressing brings up a Dusk and then a Night palette.

US Raster Charts

These are generally coded with all the levels. The Daylight level has slightly sharper colors for better daylight viewing.

Other Raster Charts

Most other raster charts just contains a standard palette, and pressing the Button has no effect other than dimming part of OpenCPN, except for the chart display.
The Brazilian Raster Charts include a Dusk and Night palette, but the colors displayed are not what one would expect.
Charts converted with the help of tiff2bsb or imgkap, normally only contain the default color scheme.

Plugin Link

Please click this transition

Link to Plugins

Link to Developer Beta Plugins

Dev Beta Plugins[217]

MENUBAR

Navigate View AIS Tools Help

The Menu Bar is a good aid to find features and shortcuts, and works best if you already is a bit familiar with OpenCPN. This page contains links that explains the different features.

The Menu Bar, when visible, is situated just under the Title Bar and above the default position of the Tool Bar. See Below. It contains access to features, as well as help with available shortcuts, also called hot keys.

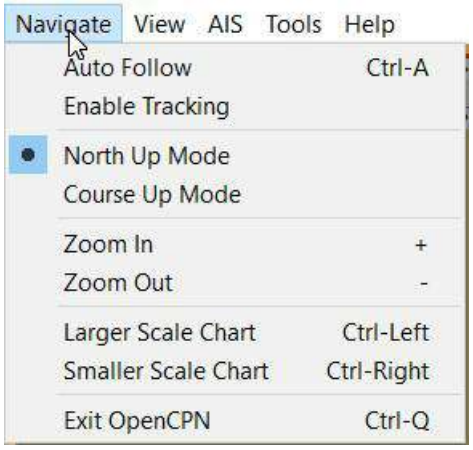
The Menu Bar can be activated in two ways.
It can be on all the time by ticking Options→User Interface → Show Menu Bar.
If this choice is not on, the Menu Bar can be shown temporarily by using the hot-key **"Alt"**.
As soon as the screen is used, for example by panning or double clicking for an Object Query, the Menu Bar disappears.

As seen above the Menubar consists of five entries.

Navigate View AIS Tools Help

Shortcut Keys When a menubar item is visible, the characters shown on the right of the items are "hints" to remind user of the shortcut key to use when the menu is closed. While the menu is open, this key may be inactive. The key to use is the first character of the item itself. This may be platform dependent.
Alt + underlined letter, opens the concerned sub-menu. **Alt+N** will open "Navigate". The exact behavior is platform dependent. For example **Alt+A** will open the Ais menu on Windows. Linux requires **Alt** and then **Alt+A**.

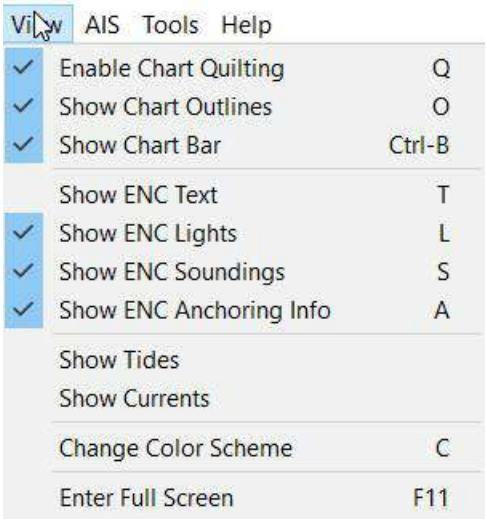
Navigate



Navigate View AIS Tools Help

Auto Follow
Display Orientation - North up
Ship Track - Enable Tracking
Display Orientation - North up
Display Orientation - Course up
Zoom In
Zoom Out
Scaling Charts - Larger Scale
Scaling Charts - Smaller Scale
Exit OpenCPN Shortcut Ctrl+Q

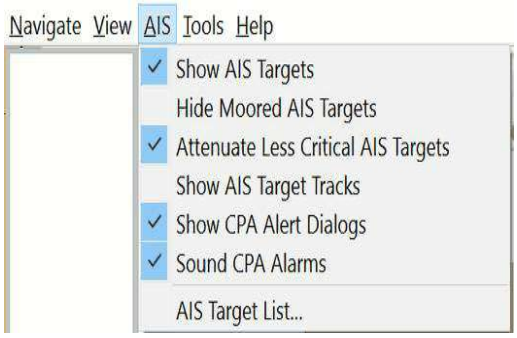
View



Navigate View AIS Tools Help

Enable Chart Quilting
Options Setting - Show Chart Outlines
Chart Status Bar - Show Chart Bar
Vector Display Tab - Show ENC Text
Vector Display Tab - Show ENC Lights
Vector Display Tab - Show ENC Soundings
Vector Display Tab - Show ENC Anchoring Info
Tides and Currents - Show Tides
Tides and Currents - Show Currents
Night Navigation - Change Color Scheme
Enter Full Screen F12

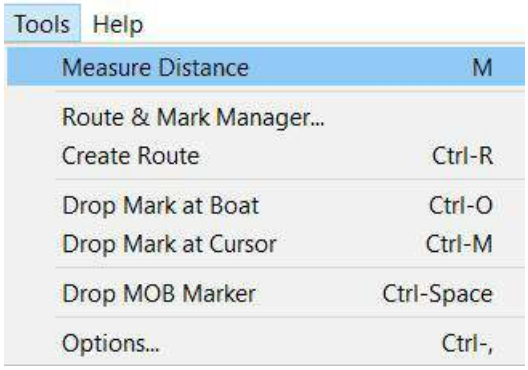
AIS



Navigate View AIS Tools Help

Show AIS Targets
Hide Suppress anchored/moored targets
Attenuate less critical AIS targets
Show AIS Target Tracks
Show CPA Alert Dialogs
Sound CPA Alarms
AIS Target List

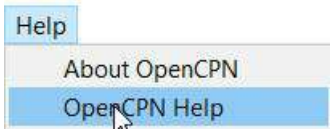
Tools



Navigate View AIS Tools Help

Right Click on a Mark Menu
Route & Mark Manager
Create Route
Drop Mark at Boat
Drop Mark at Cursor
Drop MOB Marker
Options

Help



Navigate View AIS Tools Help

About Opencpn
Help

PLUGINS

Please select one of the following Pages:

Install and Enable Plugins General Information about plugins
Included Plugins in OpenCPN
Plugin Messaging between ODraw , Watchdog and Weather_routing.
Download Page[218] for all version 4.2 & 4.4 plugins that are regarded as stable.

Developers need your help testing! **Developer Beta Plugins[219]**

To create an ~~PDFNS>opencpn:opencpn_user_manual:plugins|Offline External Plugins Manual~~ (does not work yet.)

Plugin Categories

Included
Dashboard
World Magnetic
Grib Weather
Chart Downloader Tab

AIS/Radar
AIS Radar Display
Garmin Radar Overlay
BR24 Radar Overlay

- FAQ Radar
- Traditional Plotting Methods
- Debugging Radar

AIS Rtlsdr Usb

Charts
NV Charts
S63 Vector Charts
BSB4 Charts
oeSENC
Fugawi Charts
VfKaps - VentureFather
RotationCtrl
Chartscale
Object Search

Projections

Logs
Logbook
Find-It
VDR
NMEA Converter
oBabel (Beta)[220]

Navigation[221]
Squiddio
GoogleEarth
Celestial Navigation
Route Great Circle
DR Dead Reckoning
oTCurrent
GE2KAP Companion Software
WMM (Included)
TideFinder (Beta)[222]

Safety
Ocpn_Draw
Watchdog
SAR[223]

Sailing
Tactics
Sweep Plot
Polar

Weather
Weatherfax
IACfleet
Climatology
Weather Routing

Utility
Statusbar
Calculator
Launcher
Debugger
Pypilot Autopilot
Survey (Beta)[224]

Click on the link above.

Plugin Authors Credit

The diversity and range of the OpenCPN Plugins is quite remarkable. Users should appreciate the time these authors spent to create this resource. Plugins have been developed for some

time now. There is a very healthy collaboration, so that at times it is truly impossible to determine “whose” plugin it is, and since this is one of the major strengths of Open Source we will not attribute. However it should be noted that there are a number of authors who are quite prolific. As the authors come to mind they will be noted below. If you are one of the authors and your name does not appear, please advise.

Programmers

Sean Depagnier, Dave Register, Jean Pierre Pitzef, Dave Cowell, Dirk Smits, Jon Gough, Mike Rossiter, Salty Paws, Transmitter Dan, Peter Tulp, Konni, Hakan, Wally Schulpen, Kees Verruijt, Douwe Fokkema, Dave Deller and there are more.

Testers

Many thanks to those who spent many hours helping the authors of these plugins test and debug.

Install and Enable

The core OpenCPN tries to keep features to a minimum so that it is lean, mean and easy to use. Features can still be added through the plugin infrastructure.

The release of OpenCPN 4.2 upgrades the user framework for Plugins to a newer version, which means it is not binary compatible with the previous releases and all Plugins for Windows and Linux must be rebuilt for compatibility.

These newly rebuilt plugins will not work with older versions of OpenCPN.

OpenCPN has four default plugins pre-installed:

Grib Weather
Dashboard
WMM Plugin
Chart Downloader

Download Plugins

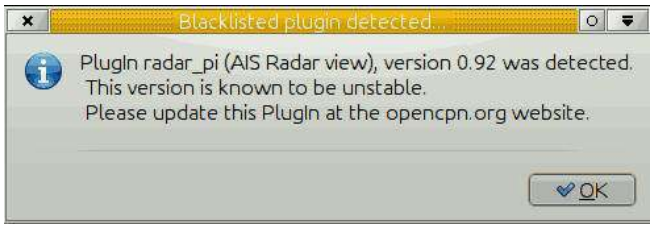
Many more plugins are available. See below.
Go to the dedicated page for downloading plugins: PlugIns[225]
Currently there are about 20 different plugins available for download.
For a complete list of plugins read the recent posts in this forum thread[226].

Plugin Versions

The release of OpenCPN 4.2 upgrades the user frameworks for Plugins to a newer version, which means it is not binary compatible with the previous releases and all Plugins for Windows and Linux must be rebuilt for compatibility. It is expected that this Plugin interface will remain stable for some time so Plugins will work across different (future) versions of OpenCPN.

Blacklisted Plugins

Plugins or versions of plugins known to be problematic can be Blacklisted.



A dialog pops up for 5 seconds when starting OpenCPN, if a blacklisted plugin is detected. This will happen even if the plugin is not enabled. A number of plugins are blacklisted. They are, mainly, old problematic versions of plugins. There is always a newer version of a blacklisted plugin, or, in worst case scenario, one will soon be released.

Installing a Plugin

For **Linux**, place the downloaded “pluginxx.so” in {prefix}/lib/opencpn, which means /usr/lib/opencpn for a standard installation, using the provided packages. If you are compiling yourself {prefix} may be “/usr/local” instead of “/usr”. Check “opencpn.log” if necessary.

For **Windows** the downloaded file is usually an executable “.exe” installation file. Click on the file and follow the instructions. If the file is a “_.dll” place the downloaded “pluginxx.dll” in a “plugins” sub folder of your OpenCPN installation folder. A common location is C:\Program Files\OpenCPN\plugins.

Once the plugin is in the right directory, restart OpenCPN and proceed to enabling the plugin.

For **Mac** the plugin will come as a pkg file. Double-click the pkg file and follow the install instructions.

This will place the plugin files in the proper locations.

Enabling a Plugin

Plugins are made available by clicking on the plugin in the Options→Plugins Tab. Once this is done, an “Enable” button appears. Pressing this button activates the plugin icon in the ToolBar and changes the the default “grayed out” text to black in the list. Not all plugins have an icon when active. For most plugins there is a “Preferences” Button for configuration.

When a plugin is disabled in the Options→Plugin tab, the plugin Icon disappears from the ToolBar.

The Plugin Icon works as a toggle switch for the plugin. Pressing the Grib Icon, for example, activates the Grib plugin. Pressing one more time deactivates it.

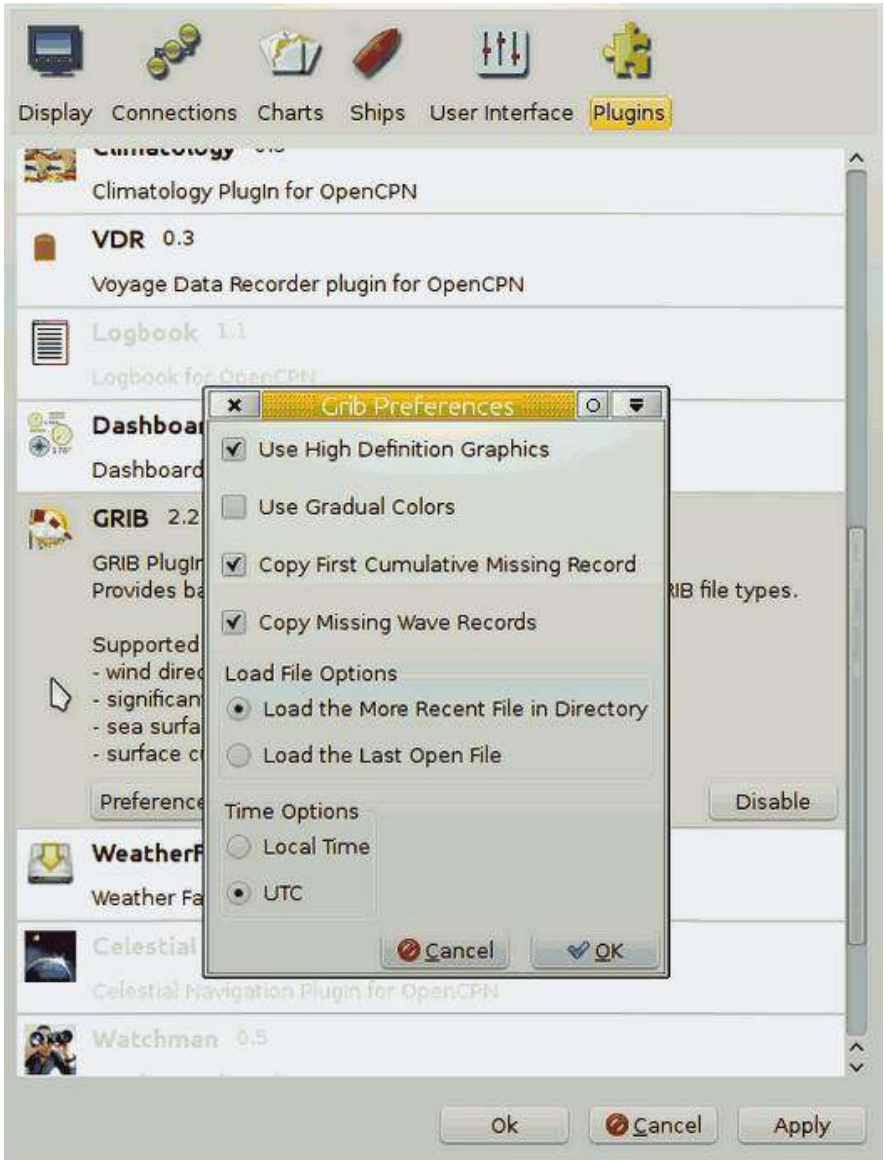
The WMM Icon uses a new feature, by displaying the magnetic variation, at the position of OwnShip in the button itself.

Re-Enable a Plugin after a Plugin Update

Version 4.2 has implemented automatic reload of updated PlugIns by visiting the **Options→Plugins** screen.

Presumably the plugins are rescanned and loaded.

Previously, after a plugin was Disabled, the program had to be shut down and reopened for the full change of Opencpn status to occur. This is no longer necessary, simply go to the Option→Plugins screen and all plugins will be reloaded.



Problems with Plugins

If you run into problems with plugins, first check what the opencpn.log file says.

For each plugin you will find lines similar to:

```
    08:59:25 CEST: PlugInManager searching for PlugIns in location
/usr/lib/opencpn\\
08:59:25 CEST: PlugInManager: Loading PlugIn:
/usr/lib/opencpn/libweather_routing_pi.so\\
08:59:25 CEST: /usr/lib/opencpn/libweather_routing_pi.so\\
API Version detected: 110\\
PlugIn Version detected: 101
```

This example is from Linux.

On Windows systems the location of the log file will be displayed when you click “Help” (the ? mark icon) on the toolbar. Alternatively, to find the “opencpn.log” on your system read OpenCPN Installation.

Install Linux Plugins

After releasing OpenCPN 4.0, the plugins are being migrated to the official OpenCPN PPA repository.

Ubuntu / Debian

To configure the your system to use the official repository, follow the instructions at Ubuntu PPA

After adding the repository, you can use the Software Center to install the OpenCPN plugins as any other software package or use the command line tools

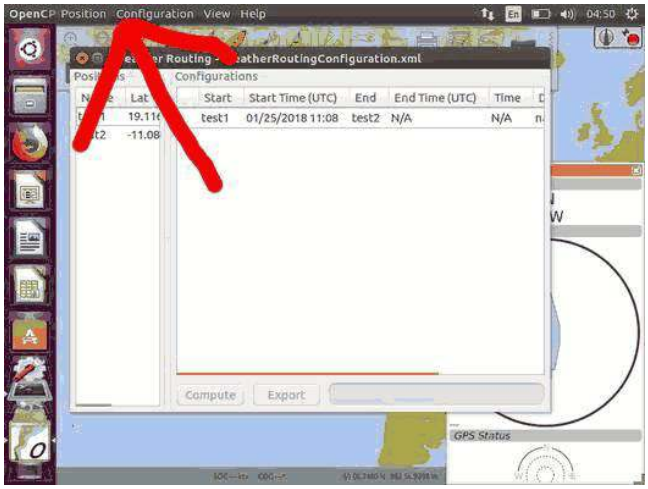
sudo apt-get update
sudo apt-get install opencpn-plugin<PLUGIN_NAME>

where **<PLUGIN_NAME>** is the name of the plugin. For example, to install the WMM plugin, the complete commad will be:

sudo apt-get install opencpn-plugin-wmm

Note about Ubuntu Unity menus locations

On the popular Ubuntu distribution using the Unity desktop environment, the menus are not part of the application windows, but always displayed on the top of the screen.



All the menus shown as part of windows in this manual should appear there, as shown on the attached screenshot of the WR window active. Note: KDE does not have this problem.

This default behaviour can be easily changed in 14.04 and newer as described in Ubuntu desktop moving application menus back into application windows[227].

Note about MAC OS menu locations

The situation is similar to Ubuntu above.

Note for the users who previously installed the plugin packages manually

Unfortunately, the new packages conflict with the plugins downloaded originally from opencpn.org. To resolve the conflict, either uninstall the plugin before using the version from the PPA or open the Terminal and use the following command to install a plugin:

sudo apt-get -o Dpkg::Options::="–force-overwrite" install opencpn-plugin-<PLUGIN_NAME>

where **<PLUGIN_NAME>** is the name of the plugin, for example to install the Weatherfax plugin, the complete command will be:

sudo apt-get -o Dpkg::Options::="–force-overwrite" install opencpn-plugin-weatherfax

Fedora / CentOS

yum install opencpn-plugin-<PLUGIN_NAME>

Plugin Messaging

Between ODraw, Watchdog and Weather_routing.

OpenCPn Draw and Watchdog

User aspects

First of all, we should see OD and WD as separate plugins. In OD you can draw geo-referenced objects (lines, points, straight lined areas and circles). WD knows when and how to sound alarms.

In OD, a graphical indication (crosshatching or shading) may be added to areas, to indicate whether these are intended to avoid (crosshatched inside) or to stay within (crosshatched outside), or whatever other meaning you want to give to those graphical indications.

In WD you can select whether (certain types of) alarms should react only for areas that are flagged (in OD) as to avoid or to stay within, or for all areas. On top of that, in WD you can indicate whether this should be done only for areas labeled in OD as active, or inactive, or both.

The WD Boundary Alarm has 4 different types:

1. Alarm when approaching an area from outside (based on distance);
2. Alarm when approaching an area from outside (based on time);
3. Alarm to indicate whether your boat is inside or outside an area (Inclusion Alarm, another type of anchor alarm);
4. Alarm to indicate whether AIS objects are present in an area.

For the first two alarms the WD uses the same terms for the boundary that OD does as well as allowing a check for the state of the boundary. The third alarm only looks at a specific boundary which is identified by the boundaries GUID. The fourth alarm specifies a boundary to check if an AIS target is inside it.

Beside the 4 types of Boundary Alarms mentioned above, WD has the following alarm functionality:

1. Alarm when approaching coastlines (Landfall Alarm; 2 types: time and distance)
2. Alarm when NMEA-data stream stops (NMEA Alarm)
3. Deadman Alarm
4. Alarm when distance to reference position exceeds a set value (Anchor Alarm)
5. Alarm when course over ground deviates more than set (Course Alarm; 3 types: only port deviation, only starboard deviation or a general deviation);
6. Alarms when speed deviates more then set (Speed Alarm; two types: overspeed for more than set maximum, and underspeed for less than set minimum).

In total there are 14 different types of alarms.

Technical aspects

WD and OD are independent plugins. OD knows about drawing geo-referenced objects, WD knows how to sound alarms. Now the two can work together by passing and receiving messages, in this case JSON messages (basically a text string of elements and values).

For the alarms, when WD needs boundary information, WD asks OD, via a message, whether a Lat/Lon is inside a boundary. WD can add further requirements asking for boundaries in a particular state and a particular type. Both the state and type are the same as what OD uses, i.e. Active/Inactive and Exclusion/Inclusion/Neither, or the inclusive "Any" (meaning any type and/or any state, not being as selective).

In OD the boundaries checked are both an OD Boundary and an OD Boundary Point with range rings showing. Boundaries and Boundary Point Range Rings are both considered boundaries. The type of boundary applies to both, but the state (active/inactive) currently only applies to Boundaries, not Boundary Points. This is because there is currently no state for a Boundary Point. This may change in future updates to the plugins for consistency.

When OD completes its check of Lat/Lon inside boundaries it replies with a single message containing the first boundary that the Lat/Lon is inside AND which matches the type and state requested. The response message contains the Name, Description, GUID, Type and State of the boundary found.

WD uses the returned message to decide whether to sound the alarm and uses some of the information in the messages that are then displayed to the user, i.e. a change in text in the watchdog window and a message box, if requested.

Messaging in OCPN is synchronous, broadcast such that every plugin that registers for messages and the main program, OpenCPN, will receive every message sent. All processing of messages is synchronous, i.e. each plugin has to process each message completely and return to OCPN (the controller) before the next plugin can process the message. For the WD/OD message stream WD sends a message to OD, OD processes the message and sends a response message to WD, WD mainline processes the response message and stores the information, then returns control to OD which then returns control to WD at the point that WD created the first message. Now WD can process the saved information from OD, and the controller, OpenCPN can process the next message.

OD messages can be used by any plugin and OCPN itself to obtain information. For the OD messaging there is a "structure" for the content of the message, specifying the source requester, the type of message (Request/Response), the message i.e. FindPointInAnyBoundary, the message id (may contain an identifier for the source requester) and then the message contents, i.e. Lat, Lon, Type, etc.

So a request looks like:

Source: "WATCHDOG_PI"
Type: "Request"
Msg: "FindPointInAnyBoundary"
MsgId: "distance"
lat: 54.0001
lon: -30.1001
BoundaryType: "Exclusion"
BoundaryState: "Active"

This message is then given a “destination”, in this case “OCPN_DRAW_PI”, when the call to the OCPN messaging process is made.

The response will look like:

Source: “OCPN_DRAW_PI”
Type: “Response”
Msg: “FindPointInAnyBoundary”
MsgId: “distance”
GUID: “62ec7520-b58f-4087-b077-ae1c581dfec1”
lat: 54.0001
lon: -30.1001
Name: “Rocks”
Description: “Good fishing”
Found: false
BoundaryObjectType: “Boundary”
BoundaryType: “Exclusion”

This message is then given a destination of the originator, in the case above “WATCHDOG_PI”, when the call to the OCPN messaging process is made. The “destination” is used so that each recipient of the broadcast message can easily check if the message is meant for it. There is no filtering provided by OCPN messaging on this value.

Using this construct there are validation checks to make sure messages are valid to process. If they are not valid there will be error messages entered into the opencpn.log file with relevant information.

Currently this message construct is used by OD, WD, WR and the AIS processing in OCPN when it broadcasts AIS information to OCPN and the plugins. In some cases there is no response message expected, i.e. AIS just sends messages, but in others the response is important.

OD is not concerned where the message came from or why, it will just respond to message requests with what is found from inspection of OD objects. WD just wants to know if it should sound an alarm or not, so it sends message requests to OD to determine certain conditions. WR just wants to know if the current Lat/Lon is valid for further processing or not, so it sends message requests to OD to determine certain conditions. AIS just provides information on each target it is dealing with.

Now the check frequency in the WD alarm screen determines how often to check for a Lat/Lon being in a boundary. One other item which should be mentioned, is that for each boundary check based on time there are up to 11 Lat/Lon messages sent to OD, for each distance check there are up to 163 Lat/Lon messages to OD. Therefore the amount of this message traffic is something to watch. Please note that a JSON message does not have a “structure” per se, the message consists of element/value pairs written as delimited strings. The elements can occur in any order. So “structure” in the sense used in this document really refers to required elements.

Included

These are the Plugins included with the standard download.

Install and Enable Plugins
General Information about plugins.

Plugins included in OpenCPN

Dashboard Plugin
Plugin to display navigation data. Included in the OpenCPN installation.

Grib Weather Plugin
Plugin to display Grib weather data files. Included in the OpenCPN installation.

WMM Plugin
A plugin to display the magnetic variation, based on the World Magnetic Model.

Chart Downloader
Manager for chart downloads.

Dashboard

The Dashboard plugin is able to show quite a few instruments. **The Dashboard plugin is an Internal Plugin, always distributed with OpenCPN, no separate download is required.**

If the data is available to OpenCPN in the NMEA0183 data stream the different instruments will display relevant data; but the plugin won't tell what is available. It is assumed that the user knows what is connected. It is of course possible to activate all instruments and see what works.

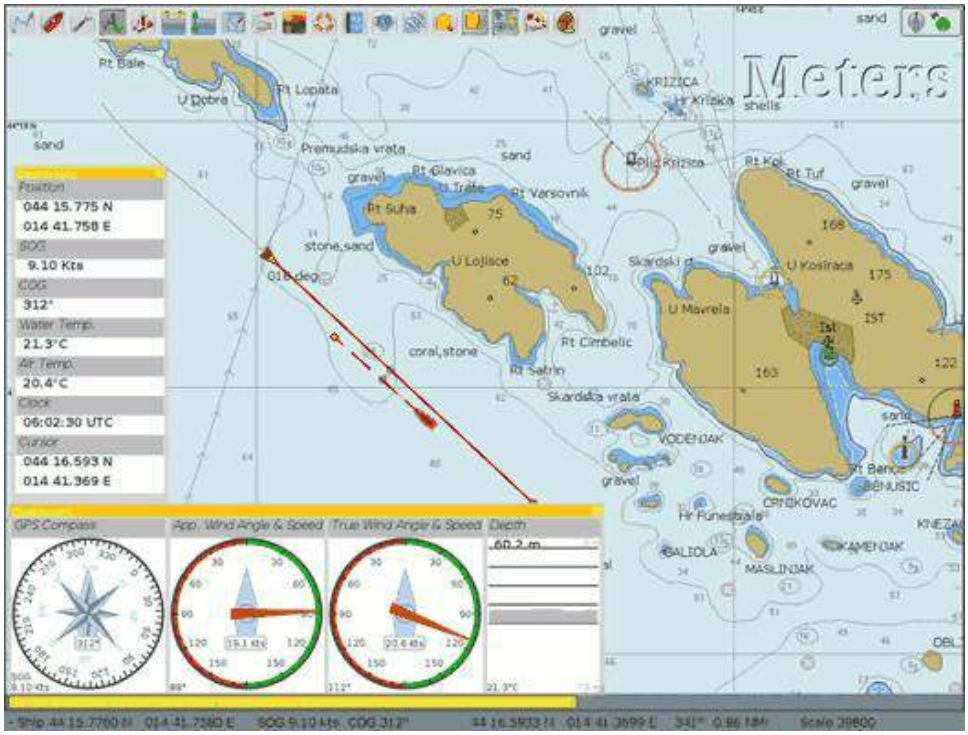
Links

Source: Opencpn Internal Plugin[228]
Forum: Forum Discussion thread[229]

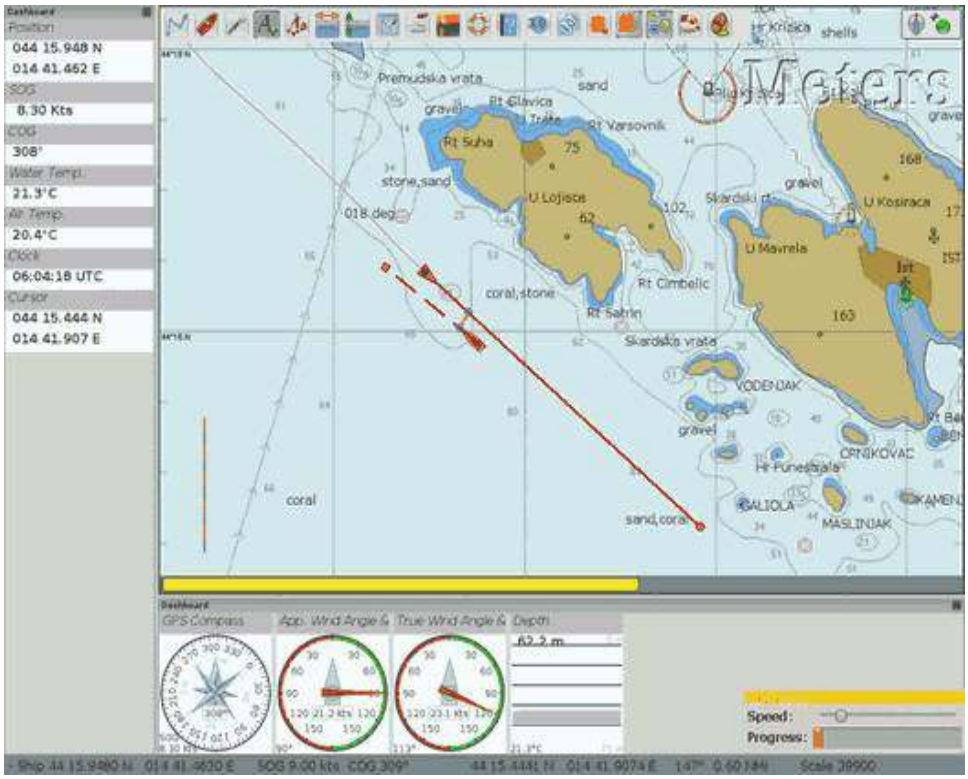
The Dashboard in action

There are two Dashboards, one vertical and one horizontal.

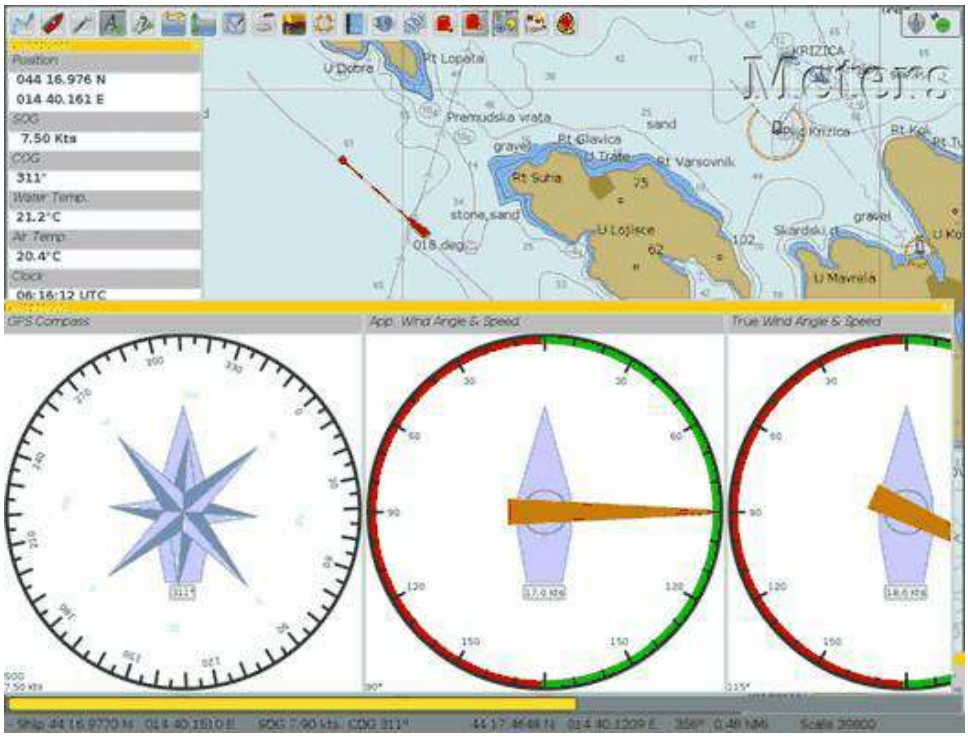
Grab the top Caption bar with the cursor and drag the Dashboard as far as possible to the right or left. Let go the cursor, and the Dashboard will dock, the chart display will adjust, no part of the chart will be hidden. Horizontal Dashboards can in a similar way be docked top or bottom. This process is reversible. Just grab the Dashboard dialog bar with the cursor, an pull towards the middle of the screen, and the Dashboard will become floating.



The same Dashboards docked left and bottom.

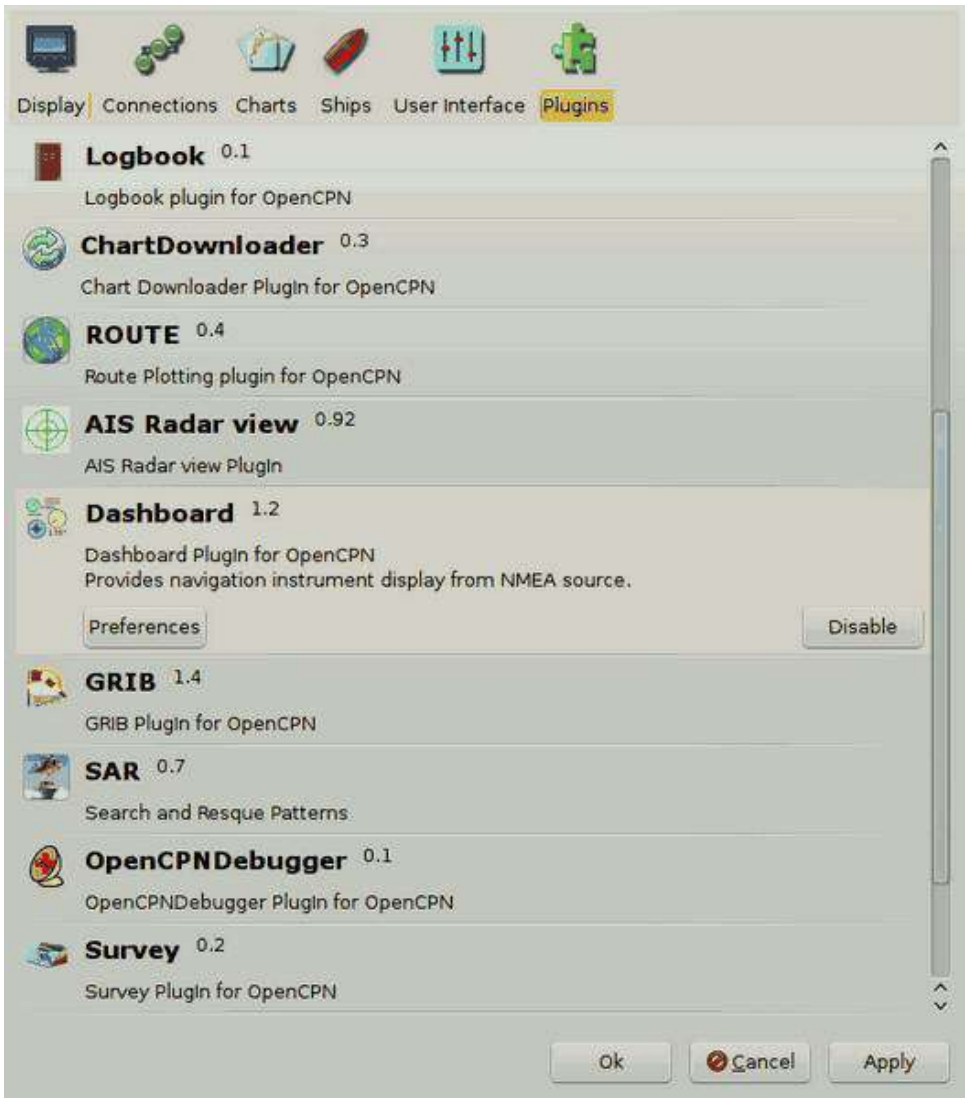


There is a grab handle in the SE corner of each Dashboard. Use it to resize each dialog. The graphics will change size, but not the text, which is handled separately. See further down.



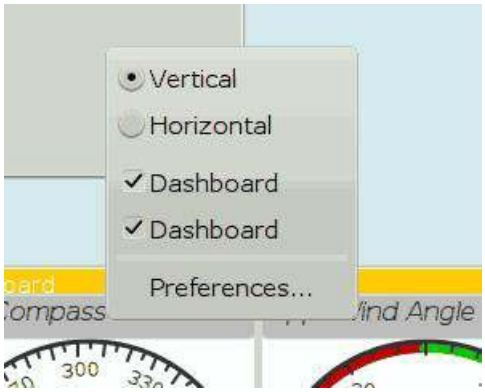
The Dashboard Tab

Once the Dashboard plugin is activated in the plugin tab, the Dashboard Icon will be available in the ToolBar and will work as an on/off toggle. The Preference button works exactly the same as described under “Dashboard Settings” below.



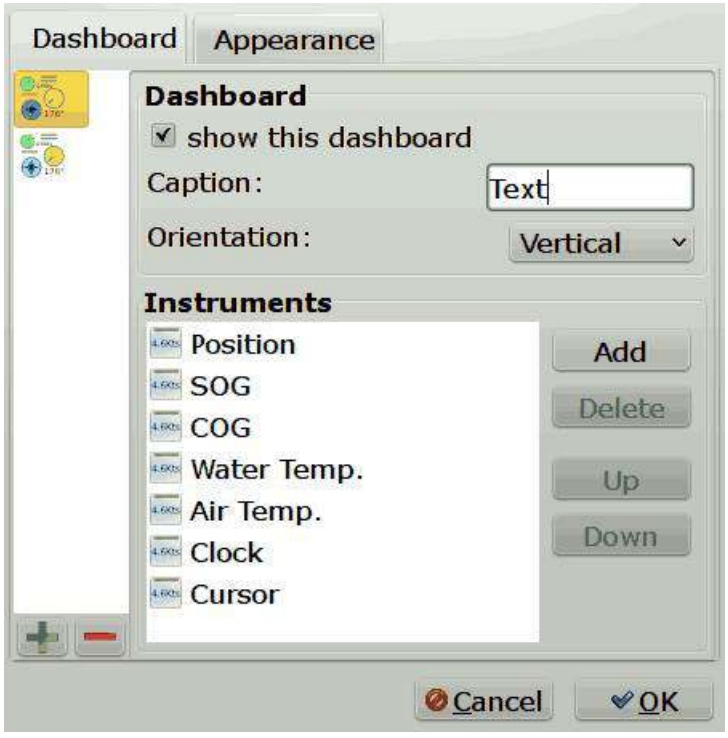
The “Enable” Button activates the plugin and shows the icon in the ToolBar. Once enabled, the “Disable” Button is displayed, as show above. If you press the “Preference” Button the Dashboard preferences dialog becomes available.

Dashboard settings



Right click anywhere in a Dashboard and a few options are displayed, in a small dialog. Above we have clicked on the vertical Dashboard. Make this Dashboard horizontal by clicking the “Horizontal” radio button. Stop displaying it by un-ticking the box in front of the first “Dashboard” line. Get it back by right clicking on the other Dashboard and tick the same box again.

Preferences



The Dashboard Tab

The Icons in the narrow pane to the left, represents the available instances. Click on an instance and the configured instruments shows in the “Instruments” pane.

“+” and “-“ Add or delete a Dashboard instance. Note, that an active Dashboard can not be deleted as the ”-” will be grayed out. Configure a new instance by “Add”-ing instruments in the “Instrument” pane.

Show this Dashboard If ticked just that Dashboard is shown. Toggling the icon displays all Dashboards.

Caption changes the name of the DashBoard from the default “Dashboard” to the Caption value. Due to a wxWidgets bug, this change is not instant, and requires docking the Dashboard or restarting OpenCPN, to work.

Orientation A dash board can be either Vertical or Horizontal. Vertical can be docked left or right, Horizontal can be docked top or bottom.

The “Instruments” pane. Shows the Instruments that are “active”, that will show up in that particular Dashboard .The instruments are selected with the buttons to the right.

Add. This button brings up the “Add Instrument” dialog where the available instruments can be highlighted and added to the Instruments Window.

40 Instruments Available

Position (text)
SOG (text) -Speed Over Ground
Speedometer (dial)
COG(text) - Course Over Ground
GPS Compass(dial)
STW(text) Speed Through Water
True HDG(text) Heading
Apparent WindAngle & Speed(dial) See MWV[230]
App. Wind speed(text)
App. Wind speed(dial)
True Wind Angle & Speed(dial)
Depth(text)[1]
Depth(dial)[1]
Water Temp(text)
VMG(text)- Velocity Made Good to a waypoint
VMG(dial)

Rudder Angle(text)
Rudder Angle(dial)
GPS in view(text)- the number of satellites detected[2]
GPS status(dial)[2]
Cursor, shows the position of the cursor.
Clock, showing UTC from the NMEA stream, in most cases this is the gps time.
Sunrise/Sunset
Moon phase
Air Temp
App. Wind angle
True Wind angle
True Wind direction
True Wind Speed
True Wind Direction and speed
Magnetic Hdg
True Compass
Wind History
Trip Log
Sum Log
Barometric Pressure (dial)
Barometric Pressure (text) MVW Example[231]
Barometric History
From Ownship. Shows the vector from Ownship to the cursor.
Magnetic COG[2]

1. The DPT sentence is used, and transducer offset will be added to depth value, if available.
2. Linux note: GPS satellite info is not available if using gpsd. The same informations is however available through the “xgps” command.

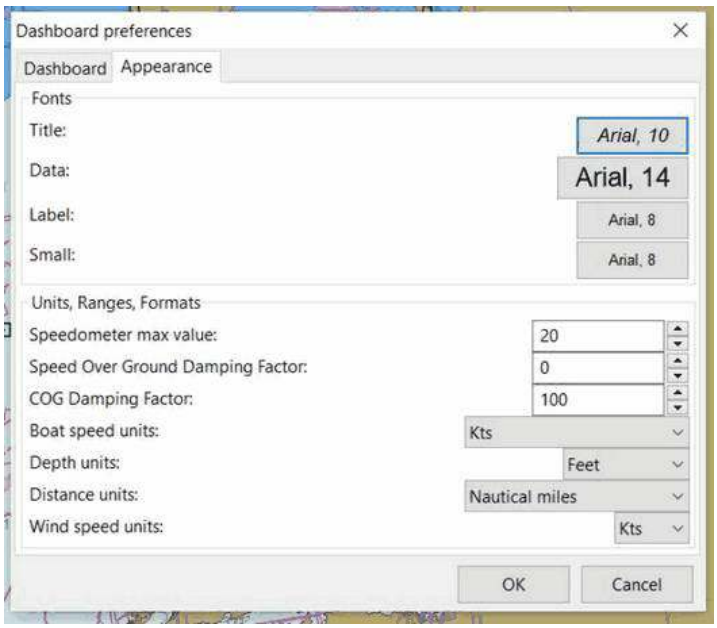
Delete

Highlight an entry in the Instrument Window to delete it.

Up / Down

Highlight an entry in the Instrument Window and change the order between the selected instruments. This order will also be the order between the instruments in the Dashboard dialog.

The Appearance Tab



Use this tab to set fonts.

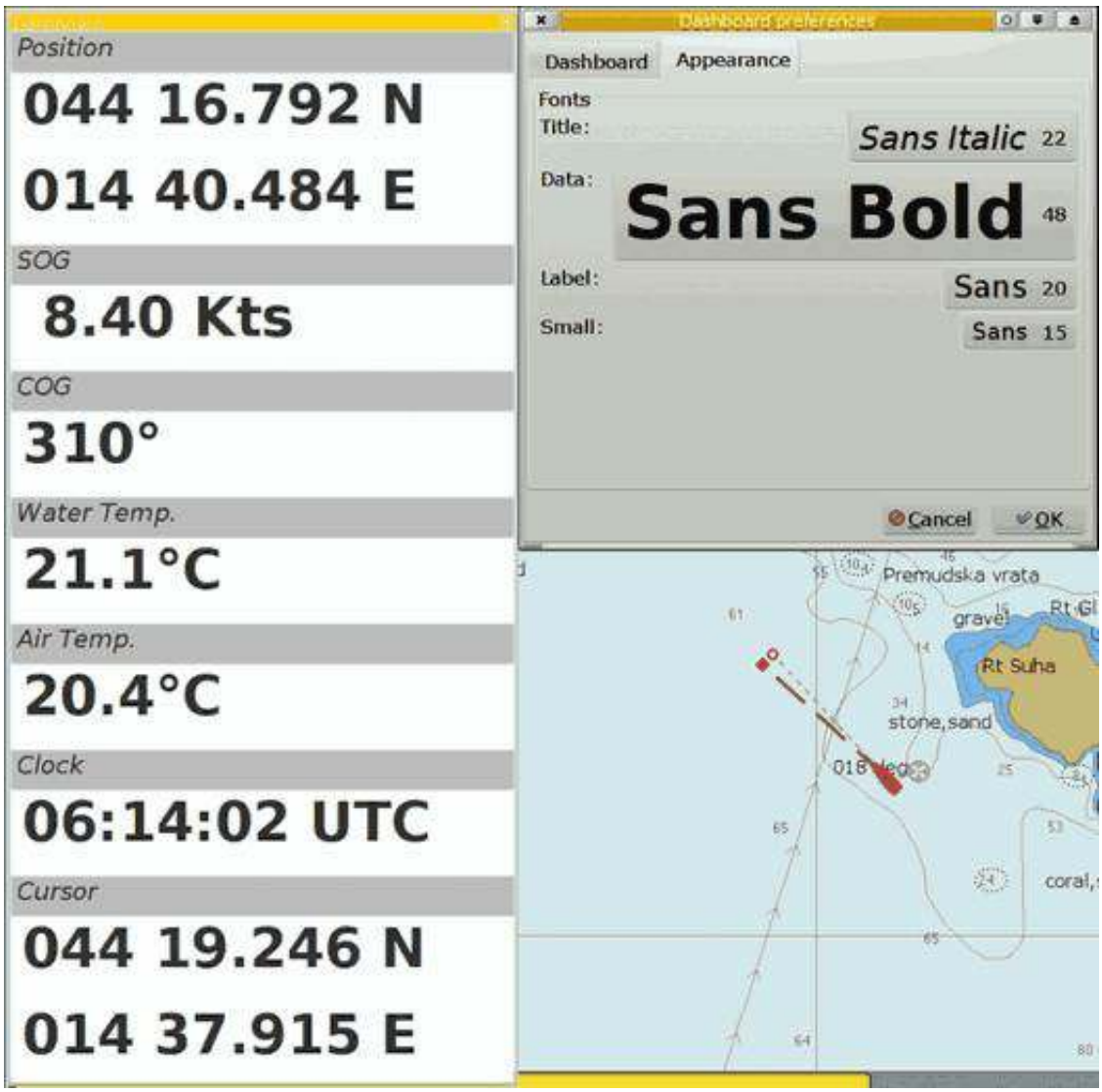
Note: Depth Transducer Offset is in units of meters regardless of the chosen display units.

Dampen SOG and COG (IR Filter)

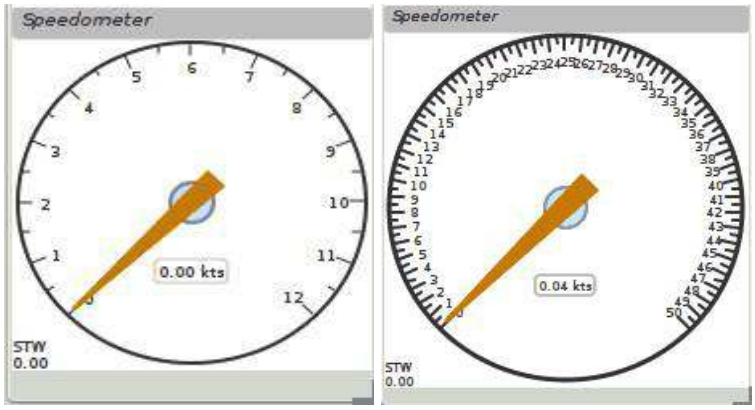
There are 2 parameters in the Dashboard→Preferences→Appearance dialog for damping of SOG and COG. A value of 1 means no filtering. Higher values mean ever slower response of the instrument. The max filter value is 100 which is pretty slow. This filter works almost exactly like a mechanical filter that uses an oil damped indicator dial. It will respond gradually to a change in course or speed. A typical filter value of 10 seems to work pretty well.

Units Selection

Select these parameters as suits your use. These controls together enable the user to adjust the view of the dashboard to suit individual needs.



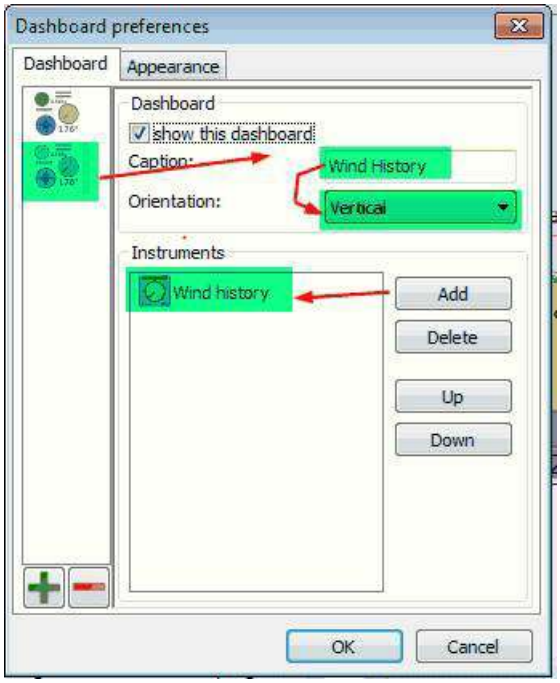
Units Ranges and Formats Set the units to use, and the range of the speed dial.



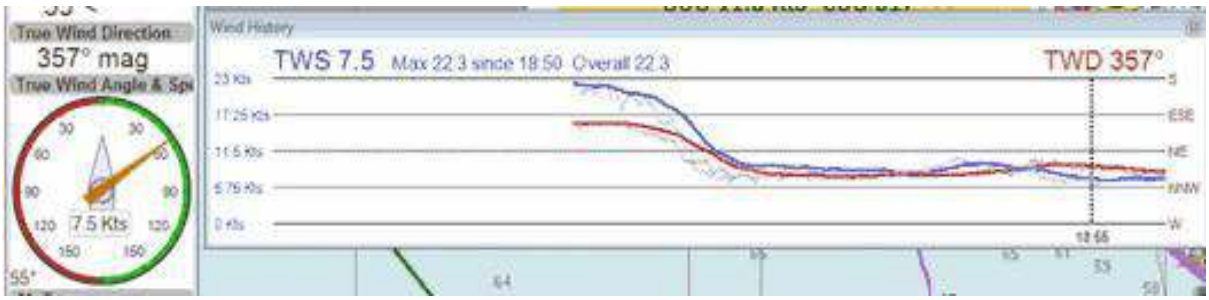
Wind History

The Wind History Instrument needs some further explanations.

The "wind history" instrument is meant to be run as a standalone (vertical) instrument.
Just define a separate dashboard and add it as the only instrument.



You can resize the Instrument with the mouse.



In real conditions, it monitors around 40 min of wind direction (red), as well as wind speed (blue), showing a vertical time line every 5 min (the example screen shot is a full-speed VDR replay).

The text on the top shows the current values, as it is displayed in the standard instruments (blue = wind speed data, TWS=True Wind Speed, red = direction, TWD = True Wind Direction).

Here is an explanation of the text line, left side (see screen shot):
TWS 7.5: true Wind Speed currently 7.5 kts
Max 22.3 kts since 18:50: this is the max Wind speed in the visible graphs, i.e. the last ~40 mins
Overall 22.3: the max wind speed since OpenCPN was started.

Right side above: TWD 357 degrees: True wind direction currently 357 degrees

The thin red/blue curves are the real direction/speed values, the thicker curves are smoothed

values. Makes it easier to see trends.

There is some logic included : The instruments zooms automatically as much as possible, always trying to show the whole visible curve;
Wind speed curve:
if your max (visible) wind speed is 10 kts, then your scale is from 0…11 kts (rounded upwards to the next full knot).
In the screen shot we had a mx of 22.3kts –> scale is 0…23 kts.
Wind direction:
The instrument scale shows +/- 90 degrees of the currently visible data values, but is limited to a total of 360 degrees.
If the wind is shifting through North (from 350, 355, 359, 002, 010, …) we're shifting the curve as well, meaning that there is NO vertical jump in the data from 360 degrees –> 0 degrees, and we do NOT loose all the continuity in the smoothed curves !

If you should happen to have more than a full 360 degrees cycle of wind direction in the recorded data (if you sail through a couple of dust devils), I limited the max scale to 360 degrees, meaning that the curve will run out of the visible area on bottom or on top of the instrument.

Please note that you don't have to have the instrument “open” all the time. Once activated as initially described, you can close it, and simply reopen it on demand. You don't loose the curves, the instrument continues to collect the data. To make it visible again simply right click on an existing standard-dashboard, and click the “Wind History” Dashboard.

Night time Mode

In Windows, Night, F5, mode. The title bar on the floating dashboard window is a bit glaring (this mode is controlled by windows by way of a theme and is not possible to change from an application) . Dock the Dashboard into “docked mode” it will be less glaring. The best solution is to simply “dock” the dashboard window at night, either left or right. This brings the window decorations back under OCPN control, and we recently added logic to dim it in this mode.

Dashboard Time

The dashboard plugin contains 3 instruments capable of displaying the time according to the preference of the user.

1. GPS clock - Unmodified time provided by the GPS unit, if available. This value is UTC.
2. Local GPS clock - Time from the GPS clock corrected by user defined timezone offset (see bellow)

3. Local CPU clock - Local clock obtained from operating system

On the appearance tab of the Dashboard preferences there is a setting for “Local offset from UTC”. The default is 00:00. When the 00:00 is selected th Local GPS clock will display time in the time zone of the computer running OpenCPN. If that is not what you want then you can selected any other offset in 30 minute increments up to +/- 12 hours. The offset will be added to the GPS UTC time and the local computer time zone will be ignored.

Sunrise - Sunset

Sunrise/sunset are computed based on the date and lat/long from the GPS NMEA input data. They are not computed from the CPU clock or the ship's position. So unless you have a GPS connected then the times of sunrise/sunset are probably not going to be right. It has always been thus.

Barometer MWV - XDR,MTA,MDA

NMEAconverter_pi may help 1. Prepare Barometer Sensor Output for Dashboard

WMM

The “**World Magnetic Model PlugIn** for OpenCPN” implements the NOAA World Magnetic Model.
More information:
http://www.ngdc.noaa.gov/geomag/WMM/DoDWMM.shtml[232] The bundled WMM2010 model expires on December 31, 2014.
After then, if a new version of the plugin is not released in time, you will have to get a new WMM.COF from NOAA and place it in the location you can find in the OpenCPN logfile.

The WMM plugin is an Internal Plugin, always distributed with OpenCPN, no separate download is required.

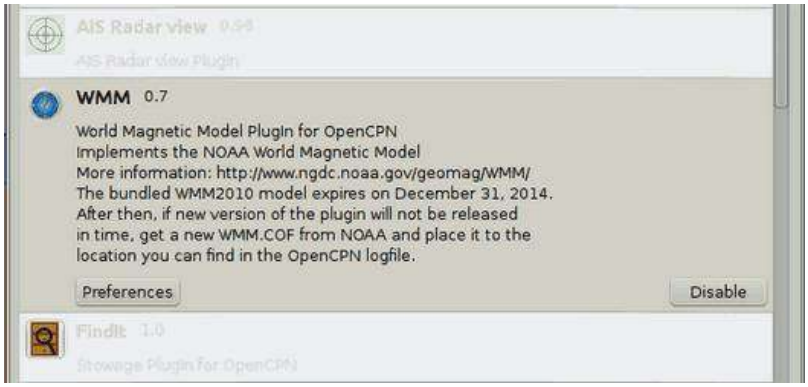
Links

Source: Opencpn Internal Plugin[233]
Forum: World Magnetic Model Plugin (WMM) Thread[234]
Forum: WMM Thread[235]

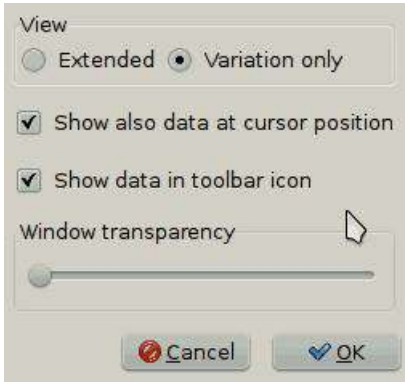
A Quick-Start Guide.

This plugin is all about the value of the magnetic variation. The value at your boat position, at the position of the cursor, and the rest of the world.

Download and install the plugin. Go to Options–>Plugins. Press the “Enable” button.

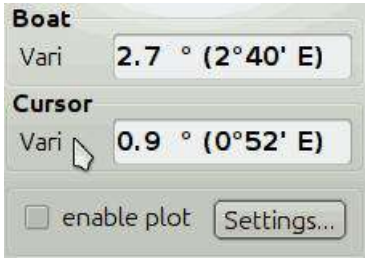


Then press the Preference button, and copy the settings below.



Press OK twice. The WMM icon will now be found in your ToolBar. The numbers in the button is the variation at your position.

Press the Toolbar Button and the small dialog below will appear on the screen. The first value is the same as in the button, the variation at your boat (gps) position. The second value is the variation at the position of the cursor.



That is all you need to know to get started, and for most of your daily use. Need more details? Read on!

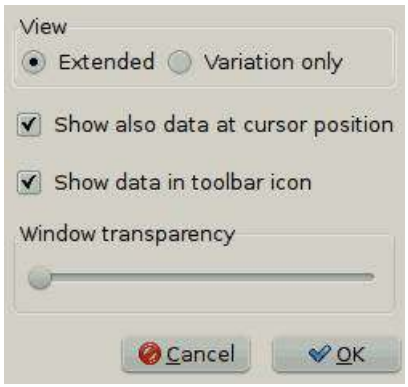
The Details

World Magnetic Model Plotting allows users to cross reference the magnetic deviation values printed on many raster charts.

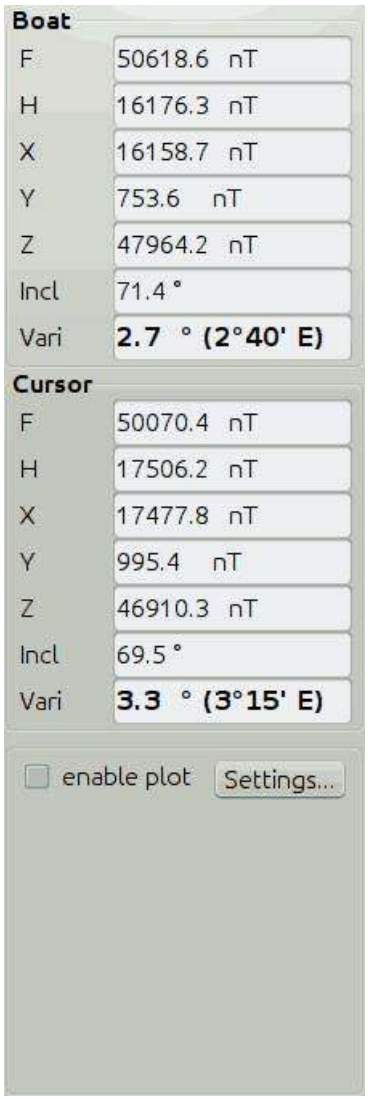
Variation is the angle between true and magnetic north.
Inclination is the vertical angle of the magnetic field.
A compass is adjusted for the inclination in the intended sales region. If you buy a compass in Europe; it will not be level in Australia, for example.
Field Strength is the magnetic field in nano tesla from 20000 to 66000.
Currently the total field strength is shown, with no immediate practical use. Hopefully this will change to show the horizontal component in the future, that has an impact on whether the compass works or not, near the magnetical poles.

The plotted lines are similar to a topographic map. The space between them can be adjusted; more space takes less time to calculate.

The Step size and Pole accuracy sliders allow a trade off for speed vs computation time.



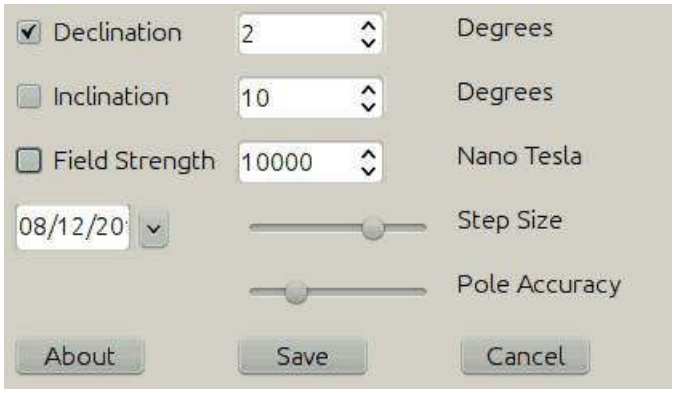
With the extended Radio-button, this dialog will show on the screen



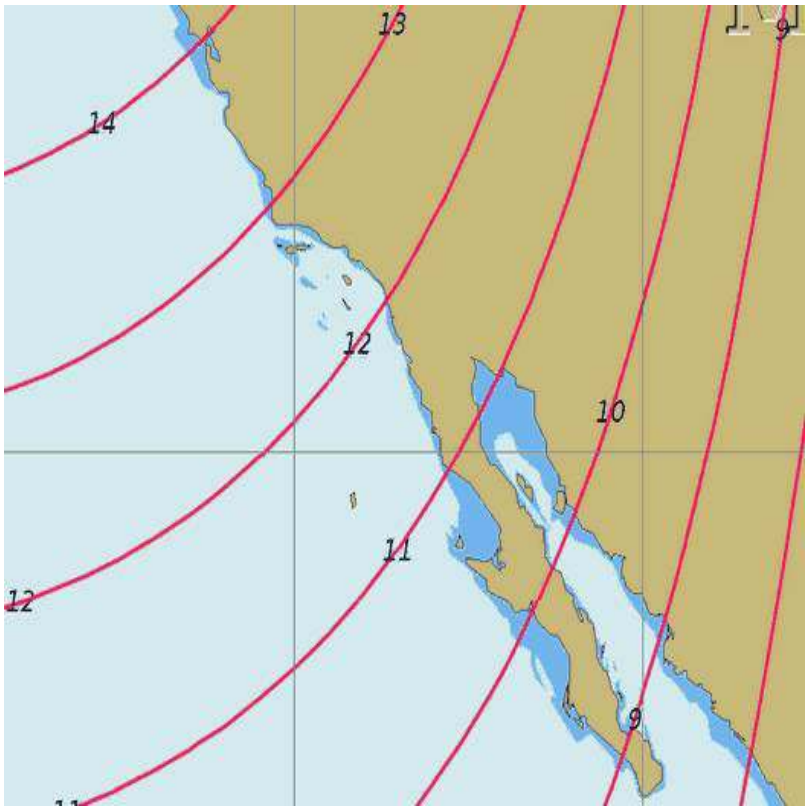
F - Total Intensity of the geomagnetic field
H - Horizontal Intensity of the geomagnetic field
X - North Component of the geomagnetic field
Y - East Component of the geomagnetic field

Z - Vertical Component of the geomagnetic field
I (DIP) - Geomagnetic Inclination
D (DEC) - Geomagnetic Declination (Magnetic Variation)

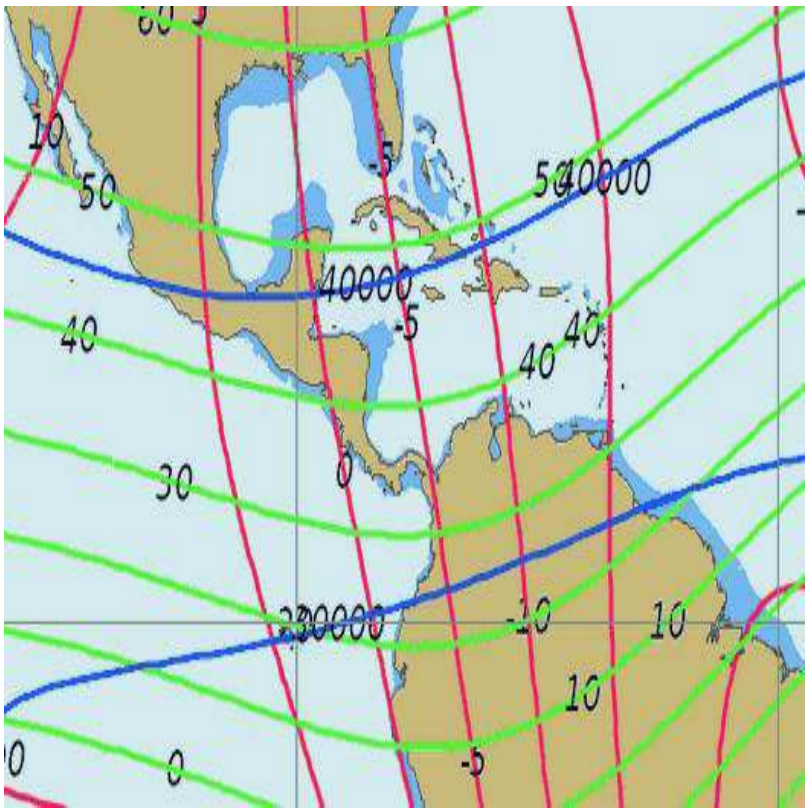
Click “Settings” and adjust the display of the graphical plot.



Show variation only.



Or all options together.


10
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Grib Weather

OpenCPN has a grib weather file viewer plugin, aimed at being useful while under way.
The grib plugin is an Internal Plugin, always distributed with OpenCPN, no separate download is required.

Links

Source: Opencpn Internal Plugin[236]
Forum: Grib Weather Forum[237]

What is a grib file?

If you are not familiar with grib weather files, make sure you understand the basics, before you start to use them. **It is essential to understand the limitations of weather forecasts that are distributed in the grib format.**
It is also worth pointing out that gribs are **not** reliable near tropical systems.
Send a blank mail to GribWarning@saildocs.com. Read the mail you get back carefully.
To get started with gribs and to find sources for downloads, check Franks-Weather[238].
A very good, up to date book, is “Modern Marine Weather, second edition” by David Burch, with a thorough treatment of the subject.
A few files including lectures on tropical weather and gribs are available here[239].

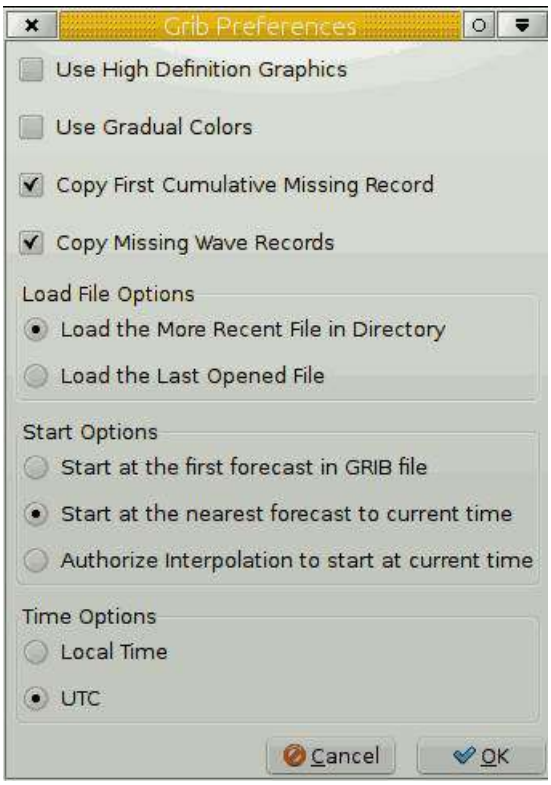
Types of Grib files.

OpenCPN can read both the original gribfile format, known as Grib1, as well as the new Grib2 format, with the .grb2 or .grib2 file-extension.

Get started

To display grib files as an overlay on your normal charts you have to first activate the grib icon 

Go to  find the plugin tab. Click on the Grib plugin, then the “Enable” button. The “Preferences” Button brings up a small dialog. The settings in this dialog rarely needs changing after the initial setup.



Grib Preference

Use High Definition Graphics. The setting only concerns the barbed wind arrows.Tick the "Use High Definition Graphics" box, unless you are on old hardware. Not ticking the "High Definition Graphics" box can help to speed up the grib display on a slow computer.
Use Gradual Colors. This setting applies to all colored overlay maps. On many installations the difference in rendering is very small. The overlay maps built in color variation plays a part.
Copy First Cumulative Missing Record. This is about rainfall and cloud cover records . As these records are "cumulative" the first one does not exist in files from zyGrib and Saildocs. With this parameter unchecked, there will be neither rainfall and nor cloud cover displayed for the first date/time of the file. Ticking the box fixes the problem.
Copy Missing Wave Records. This only concerns wave records from zyGrib delivers files from two models ; FNMOC (WW3-…) for waves and GFS for all other parameters. These two forecast models does not have the same time spacing. For some dates/times, the wave data do not exist.This parameter allows this missing data to be reconstructed and avoiding the overlay (if set) to flicker.

Load File Options

Load the More Recent File in Directory. Loads the newest file in the grib directory on start.
Load the Last Open File. Loads the grib file used last time.

Start options

Start at the first forecast in GRIB file

Start at the nearest forecast to current time
Authorize interpolation to start at current time.

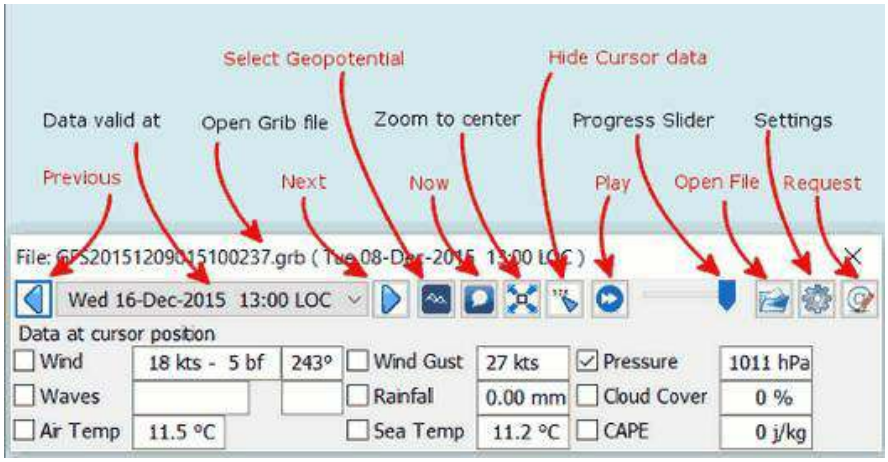
Time Options

Local Time
UTC

The Grib Display Controls

The Standard Display Control

To start the Grib plugin press the  button in the tool-bar. The “GRIB Display Control” then pops up.



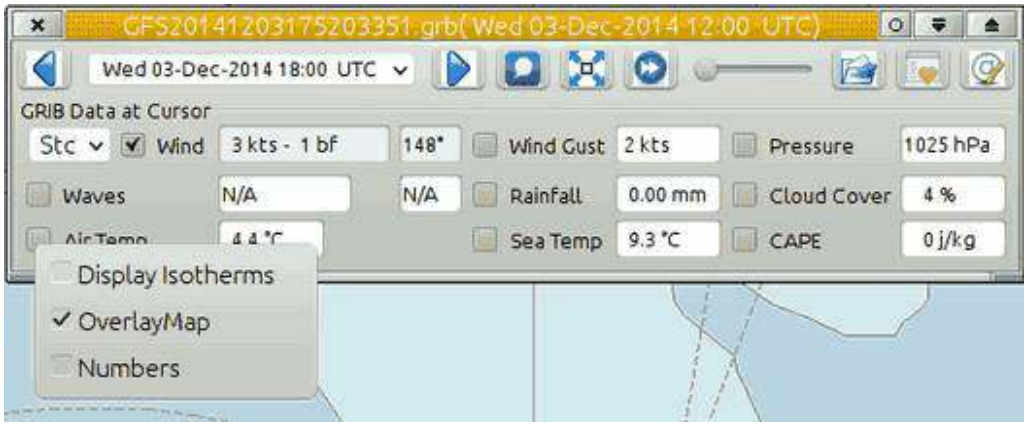
Hide Data at Cursor

This is a smart and compact dialog. For a quick start press the “Open File” button and navigate to your grib file directory and press the file to be displayed.
Previous/Next Go to the previous or the next record in the gribfile. This corresponds to the time “interval” chosen when the grib file was downloaded.
Data valid at The time of validity for all grib data on screen.
Open Grib file The name of the grib file in use.
Now Displays the record, nearest in time to “now” according to the Start option you have selected: (“Start at the nearest forecast to current time” or “Authorize interpolation to start at current time”).
Select Geopotential Height If grib data for geopotential height is available, selection will be between Std, 500.
Zoom to Center This button will home in on the loaded area that the loaded grib file covers.
Play Goes through all records in turn, with the animation speed controlled in the “Grib

Settings" dialog.
Hide Cursor Data Hides Grib which normally appears in the data windows. Data windows are hidden.
Progress Slider Just to the right of the "Play" button is a slider that is just another way of going through the grip records.
Open File Activates the operating systems standard file selector dialog to select a grib file. The plugin remembers the directory of this grib. This is used next time you start OpenCPN and activates the Grib plugin. See settings in the "Grib Preferences" dialog above.
Settings is where to control how the different grib data will be displayed. See more below.
Request Download grib files via email. More below.
GRIB Data at Cursor. This is where the "smart" part kicks in.
Only entries for the data contained in the active grib file will be displayed. For example, if there is no wave data in the current grib file, there will be no signs of wave data at all. In the case above, where the the wave data is N/A, the grib file includes wave data, but not for the area where the cursor is. Compare with the picture below, where the grib only contains current data.
The tick boxes next to each data entry, are used to activate the data-display on the screen. Exactly what will be shown is controlled in the "Grib Settings" dialog, which is reached by pressing the "Settings" button.
Don't activate to many display features at the same time. The display quickly becomes very cluttered.

The "GRIB Display Control" loaded with a grib file only containing current data.

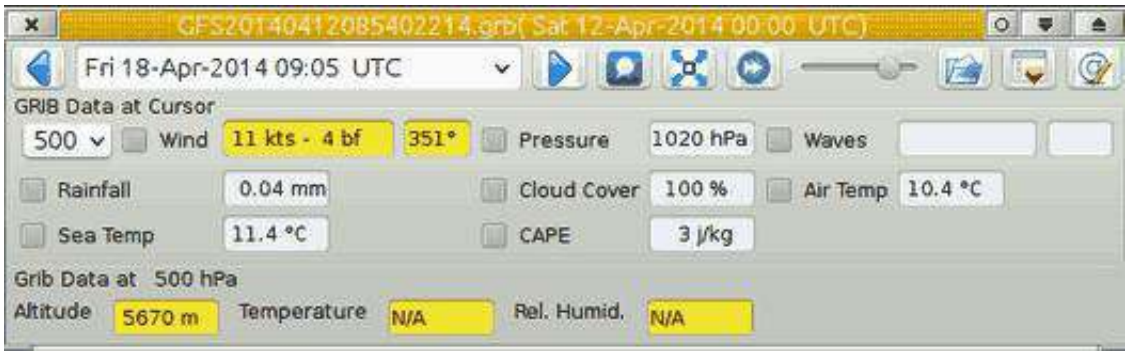
Advanced GRIB Data at Cursor. The display options for all the data shown, can be reached by right.clicking on the little squares where the "ticks" are shown. For the meaning of all these options, read on.



Right-clicking the "Air Temp" option square.

The Advanced Display Control

The plugin has an advanced mode were altitude data can be displayed. This mode requires some more knowledge than plain gribs.
A good start is to read **"Mariner's Guide to the 500--Millibar Chart"[240].**
If a grib file includes altitude data, the control will automatically include more options. See below.



If the dialog looks normal except for an extra selection box under “GRIB Data at Cursor”, like this,

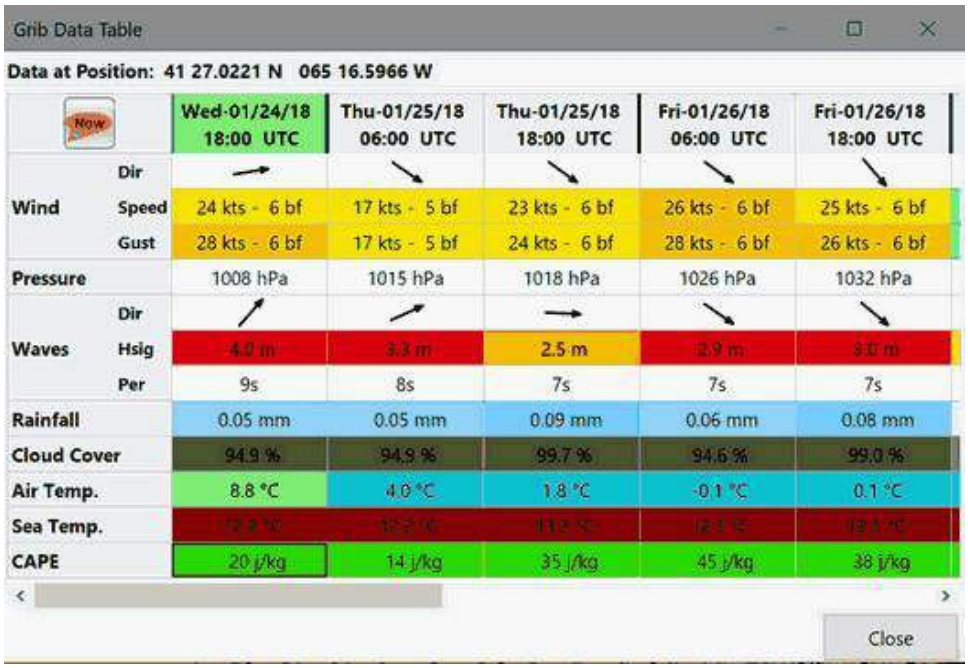
then the grib file contains altitude data. Selecting one of the altitudes, for example 500, changes the dialog to what you see above.
The advanced data are displayed against a yellow background.
Wind. These are the wind data valid for the selected altitude level.
Grib Data at 500 hPa. The values at the selected level.

Weather Tables

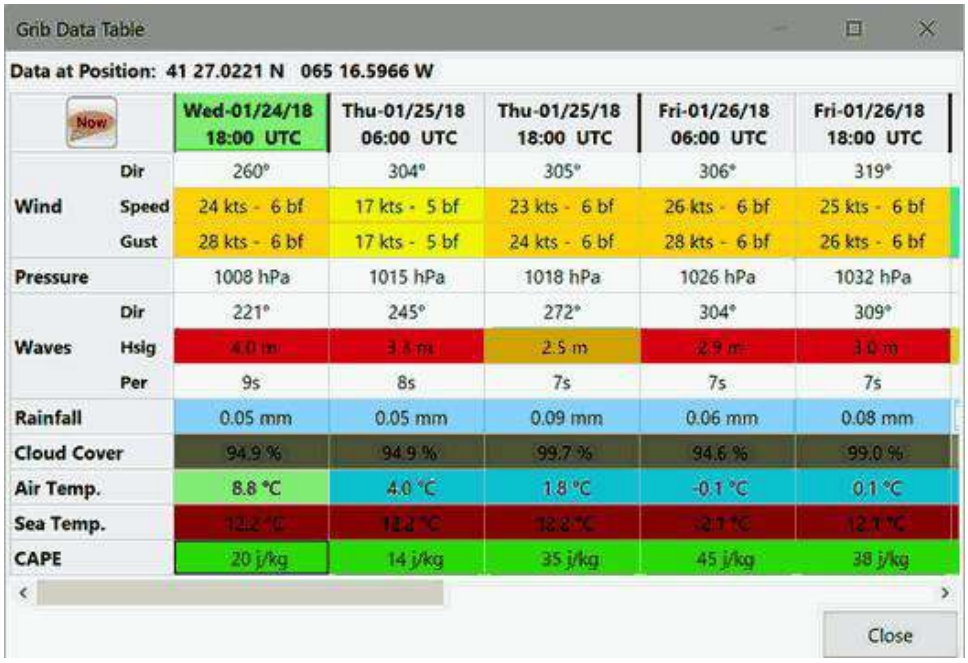
Once a grib file is loaded in the current session, the “Weather table” appears in the right click menu.

Click the entry, and a Weather Table, valid at the cursor point, pops up. All available data in

the current grib file, for the whole time span, are shown.



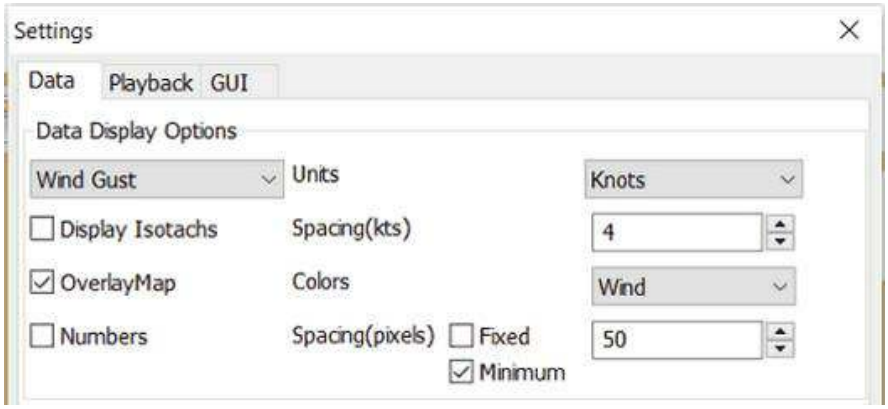
NOTE: To change the Wind & Wave Arrows to Degrees, just hit the **Dir** switch.



Settings

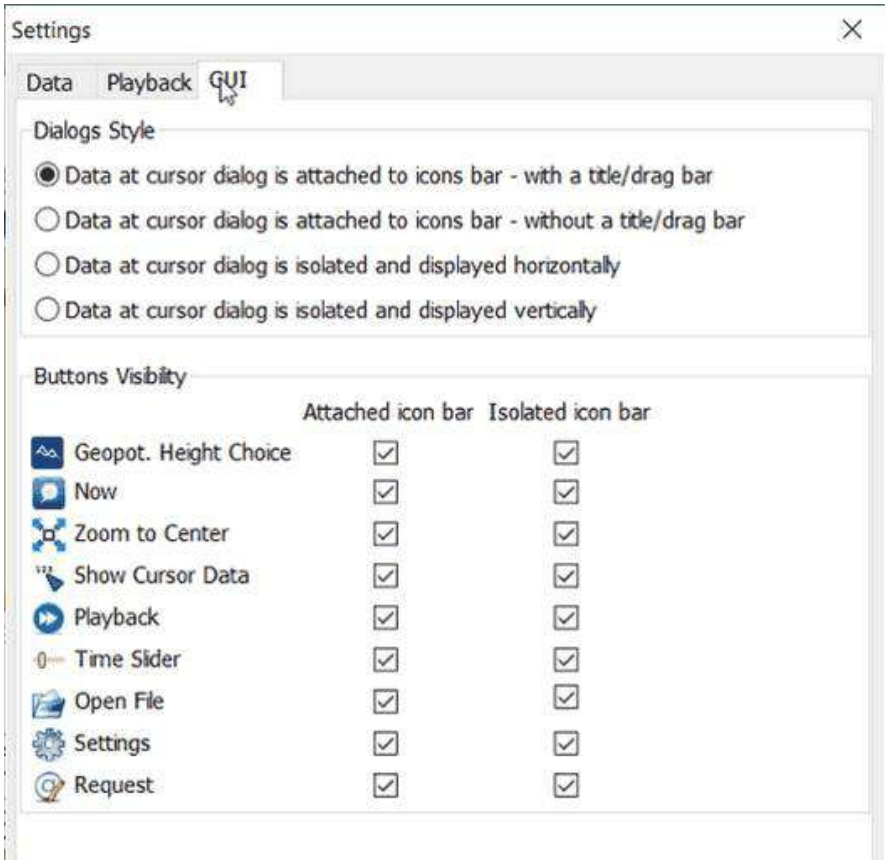
…controls how the grib files are displayed on the screen, and units used in the Grib Display control. Things like overlay colors, animation time interval and speed and much more. The basic dialog looks like this.

Typical DATA TAB

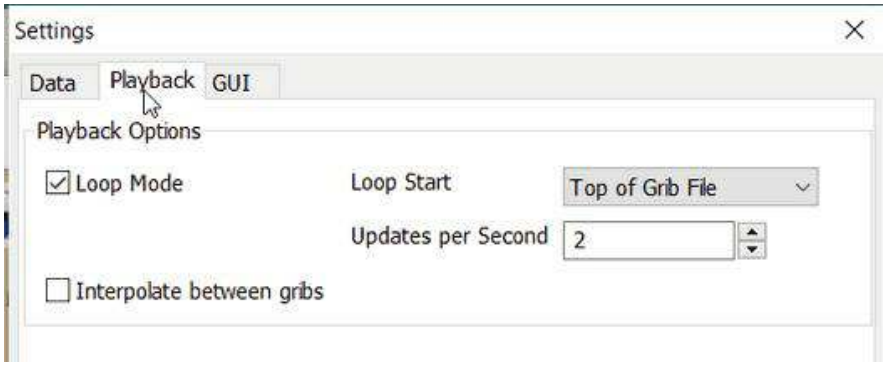


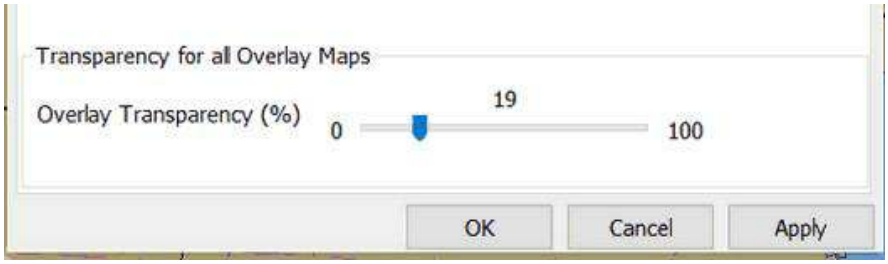
Note the Fixed or Minimum Spacing (pixels) selection. This is a typical setting.

Typical GUI TAB



Typical PLAYBACK TAB

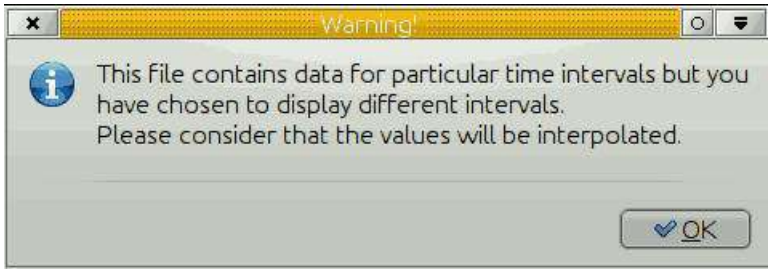




Playback

The Loop Mode controls what happens when “Play” is pressed in the Grib Display Control.

Loop Mode. Sets the “Play” function into a loop mode. Otherwise, playback will stop when reaching the end of the file.
Loop Start. Were to start the loop. The option “Current time forecast” makes sure that only data now or in the future are shown
Updates per Second. Controls the speed of “play”.
Loop Start. The loop can start either at the start of the grib file or from the current time forecast.
Interpolate between gribs. If you select this option, you will be able to choose your own time interval, but you have to consider that it can decrease data accuracy. To remind you, this info will pop up.

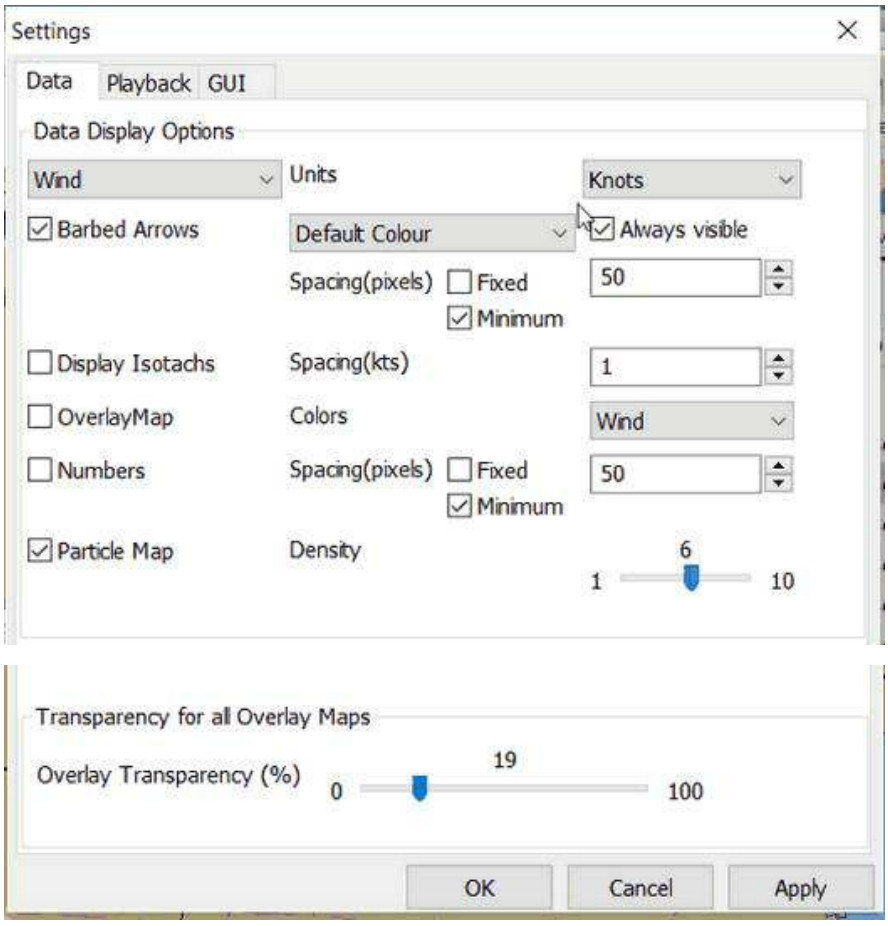


Time Interval. This is the time interval used for interpolation. The entry is only visible if “Interpolate between gribs” is ticked. This is connected tho the chosen time interval when requesting a grib file.

Display

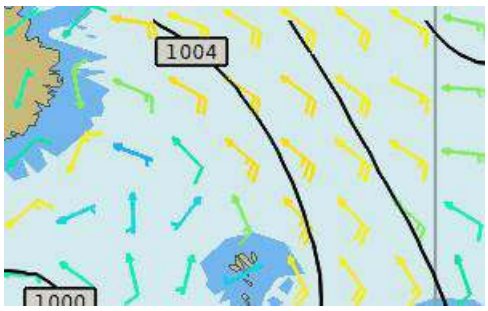
The lower part of the Grib Settings Dialog, under the Display heading is really 10 different controls. The controls are activated by the choosing one of the items in the selection menu below.

Many of the entries are repeated, so let's first have a closer look at the the most important one, the Wind. Entries on the same line are connected.

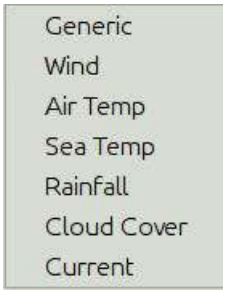


Units refers to the choice of units for the selected record.
For wind speed the choices are.

Barbed Arrows Display the traditional barbed arrows, showing wind direction and wind speed.
Range refers to the distance between displayed arrows (not working 3.3.1117).
Default Color/Controlled Colors Default is dark brown while “Controlled” varies from blue for very light winds to red for very strong winds.

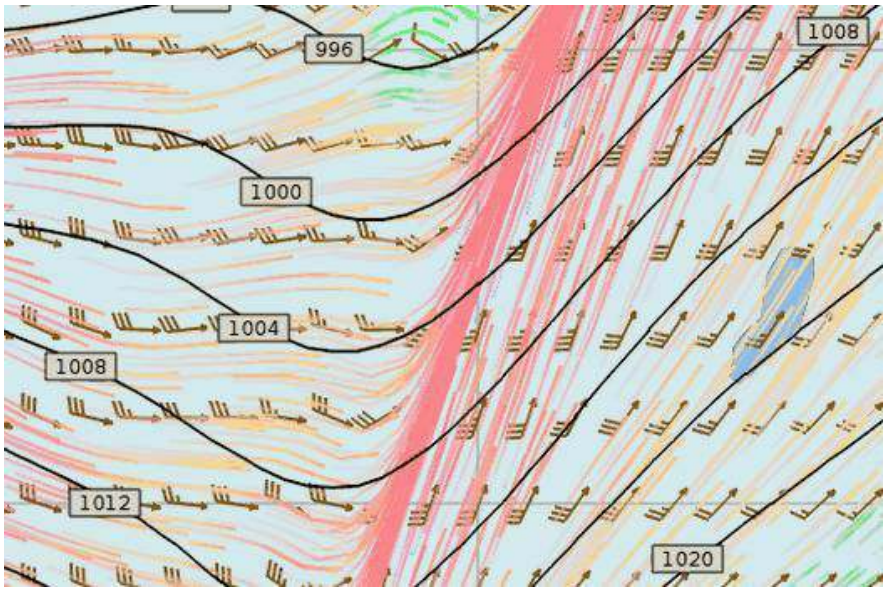


Always visible This option only exists for “Wind” and “Pressure”. When ticked the object is shown regardless of what is ticked in the “Settings Control”. The idea is to be able to Show wind and/or pressure at the same time as other options. Use with Rainfall, for example, to help identifying fronts.
Display Isotachs shows contour lines connecting points with the same wind speed.
Spacing controls which wind speed Isotachs will be shown. Use knots for units and 10 for spacing and isotach contours will be shown at 10 kts, 20kts and so on.
OverlayMap Depending on your system capability,if you use “Accelerated Graphics (OpenGL)” (see General Options/Display/Advanced), the overlay will be visible at all scales. But if you don't, the overlay will only be visible at small scales. A small yellow pop up at the bottom left of the screen will inform you. Zoom out to a scale of 1:13 millions, or smaller to see them.
Colors is another selection menu containing pre-set color schemes. The idea is to use the scheme with the same name as the control, but this is just a hint, nothing more.



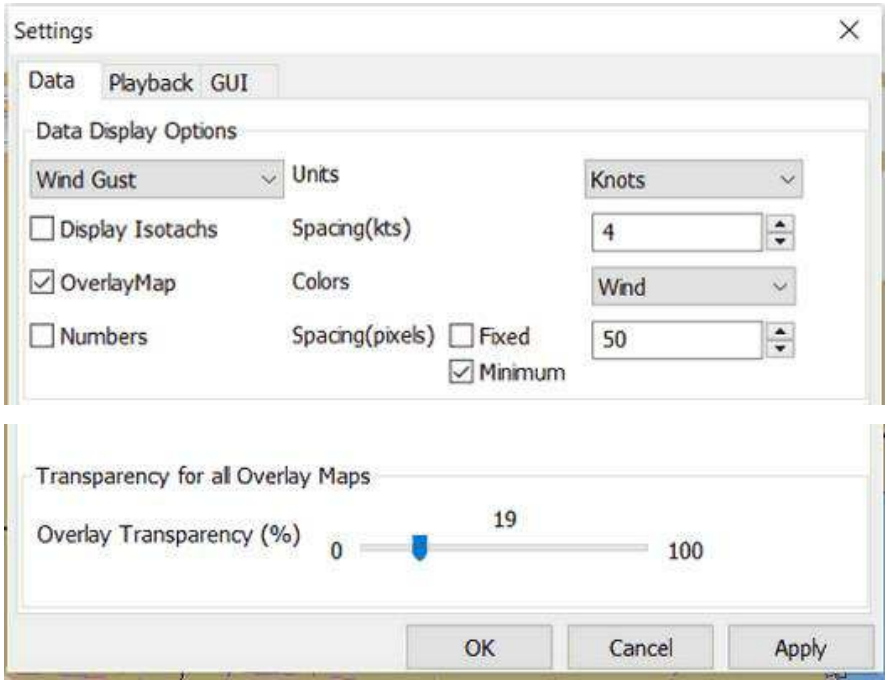
Numbers shows the wind speed in small square boxes. **Minimum Spacing** refers to the spacing between these boxes.
Particle Map is a kind of animation of the wind field. It is created by letting “particles”, or dots, move in the wind direction and leave a trail. The trail is colored after the wind strength, and each particle has a limited “life span”.
The **Density** slider creates particle trails that are shorter but closer together with increased value, which is the same as further to the right. The particle Map below clearly shows a

convergence zone with stronger winds (red). This is probably a cold front.
Performance Warning: Note that high density Particle Maps on Low Powered Machines and Large Files may slow your machine to a crawl. First test on small files.

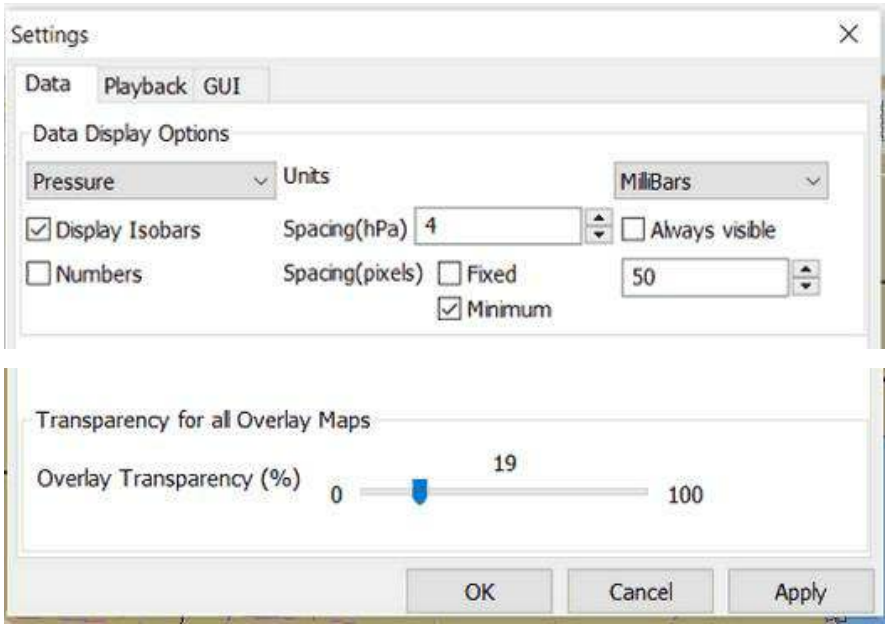


Overlay Transparency works as expected.

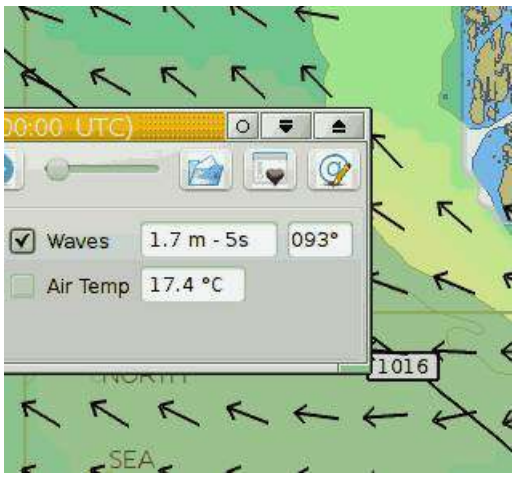
All the controls for Wind Gust, Rainfall and Cloud Cover, have similar entries; only the units differ.

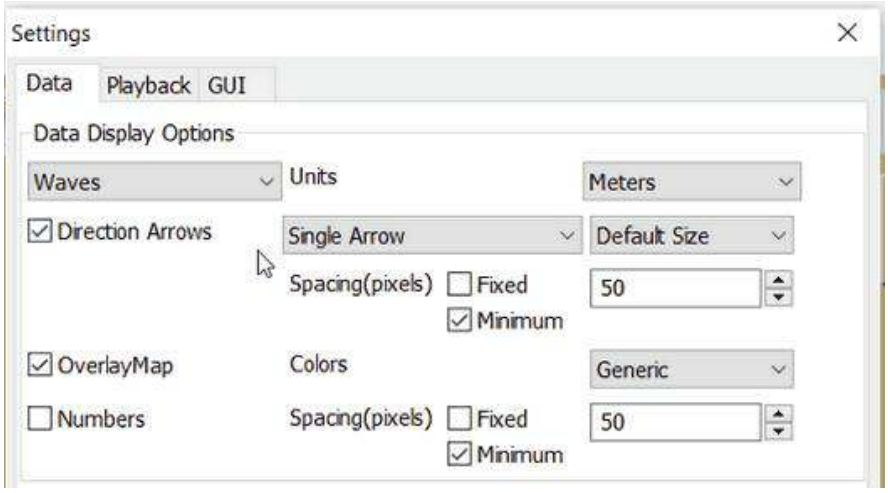


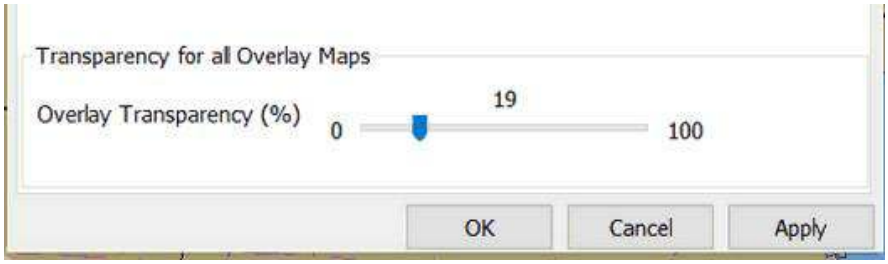
The pressure display has no overlays, only the options of isobars and numbers. Overlay Transparency is redundant.



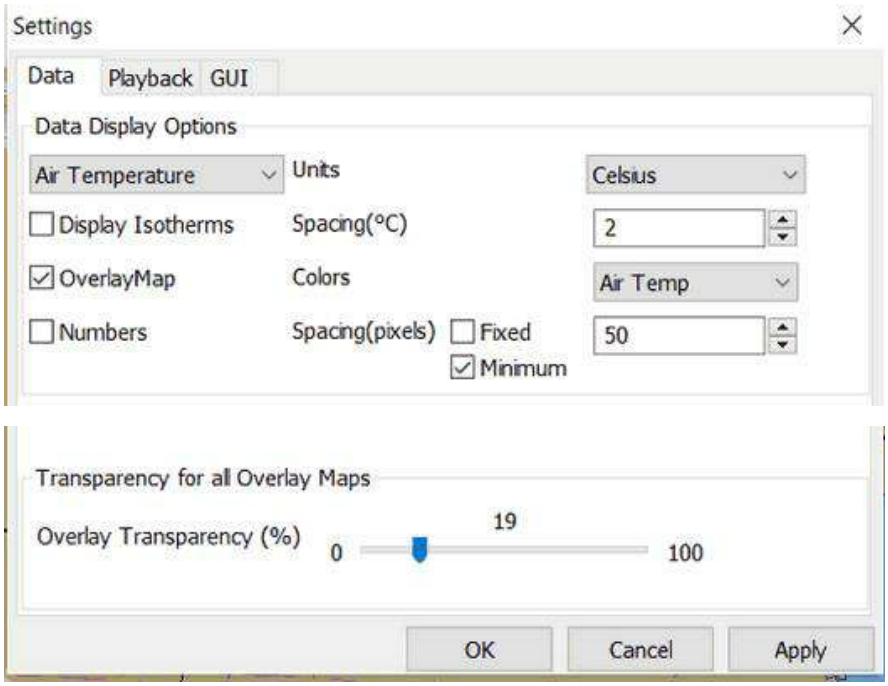
Waves and Current have a more or less similar display. A Particle Map is available for currents. See the descripion above for wind Particle Maps. Once again different units.
There is a choice between three different display arrows shown in two sizes.
If wave height, direction and wave period is present in the grib file it will be displayed in the Display Control like this:



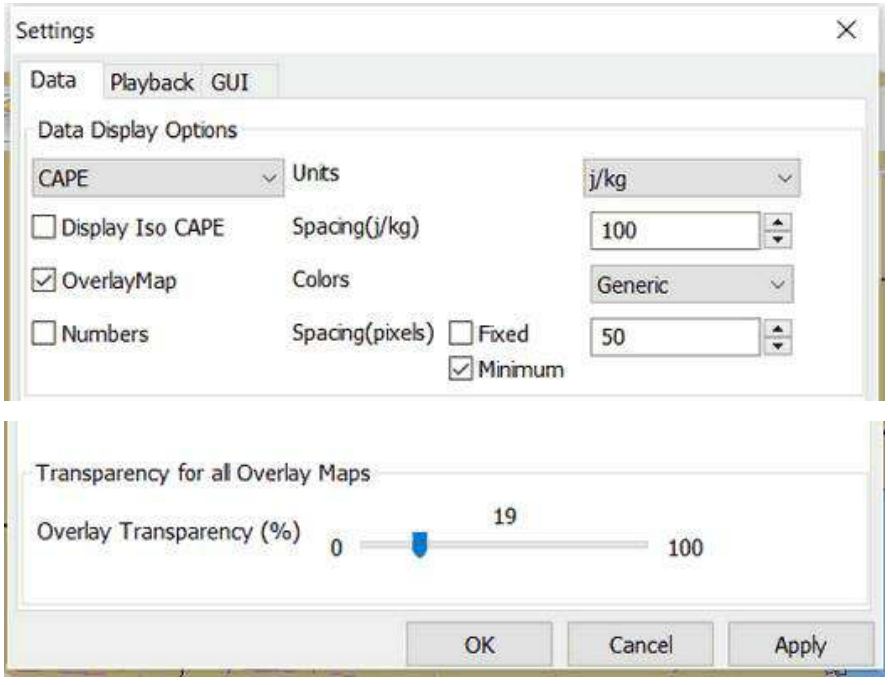




Air Temperature and Sea Temperature looks the same.



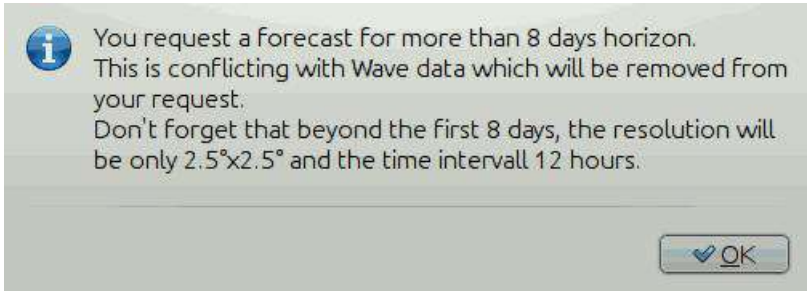
Convective Available Potential Energy (CAPE) has these settings



Altitude and Relative Humidity have a simple one choice entry.

The Grib-file Request Button

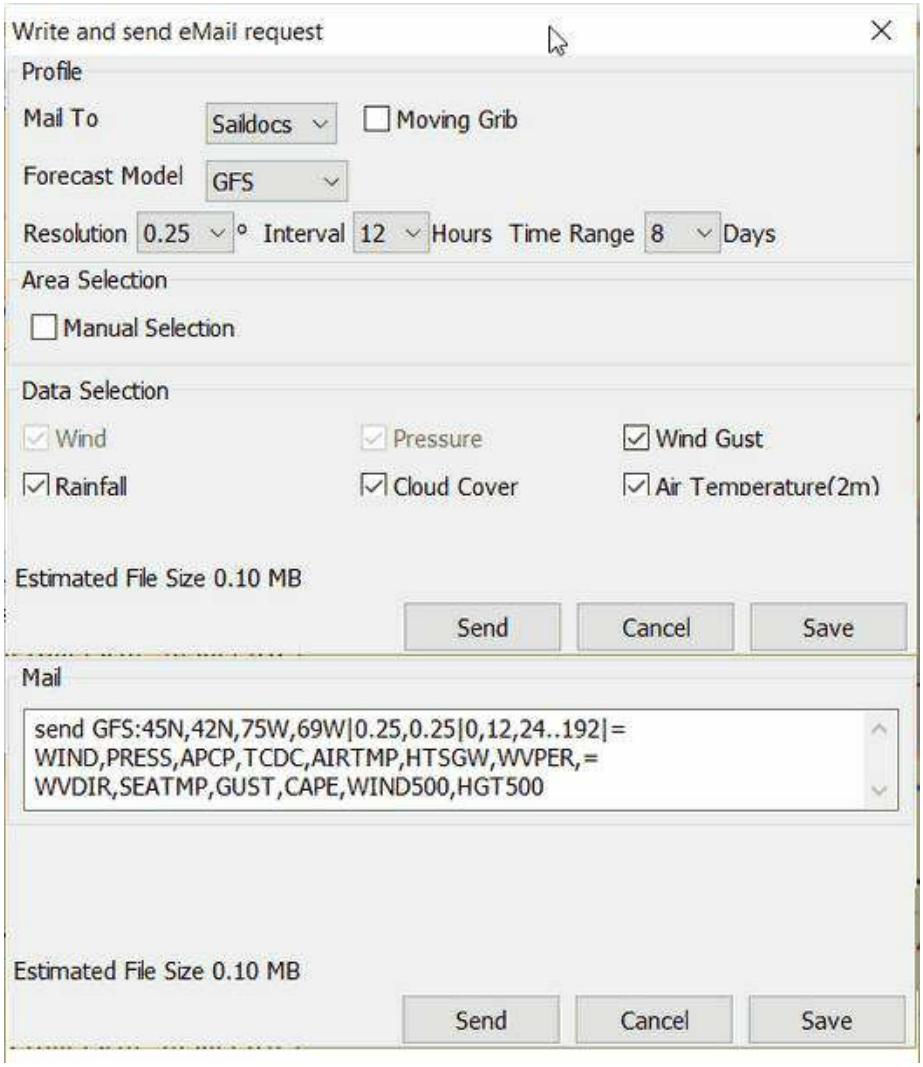
- Grib files can be requested directly from the plugin. The request is in the form of an email to SailDocs or ZyGrib. The requested grib file is also delivered via email as an attachment.
- The area for which data is requested defaults to the area visible on the screen, but the request area can be selected by other means as well. See more below.
- It's possible to request gribs from 4 different Grib prediction models when using Saildocs GFS, COAMPS, RTOFS and indirectly WW3. When you request “Waves” in GFS, Saildocs merge wavedata from WW3 into the delivered grib.
- The ZyGrib option can only deliver GFS gribs, which is the “standard” model for gribs.
- RTOFS gribs only contains current and water temperature data.
- COAMPS delivers wind and pressure with a higher resolution than GFS
- The minimum times between grib records are 3h for GFS and 6h for COAMPS & RTOFS.
- GFS can be requested for 8 days ahead. An extended GFS request up to 16 days ahead is possible. This warning will pop up.



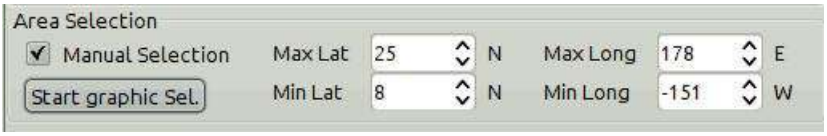
The same value for COAMPS is 3 days and RTOFS 6 days.

There are two layouts of this dialog, depending on whether it is a request to SaiDocs or to ZyGrib. Some alternatives are only available from SailDocs, and some are only available from zyGrib. Alternatives not available are grayed out.

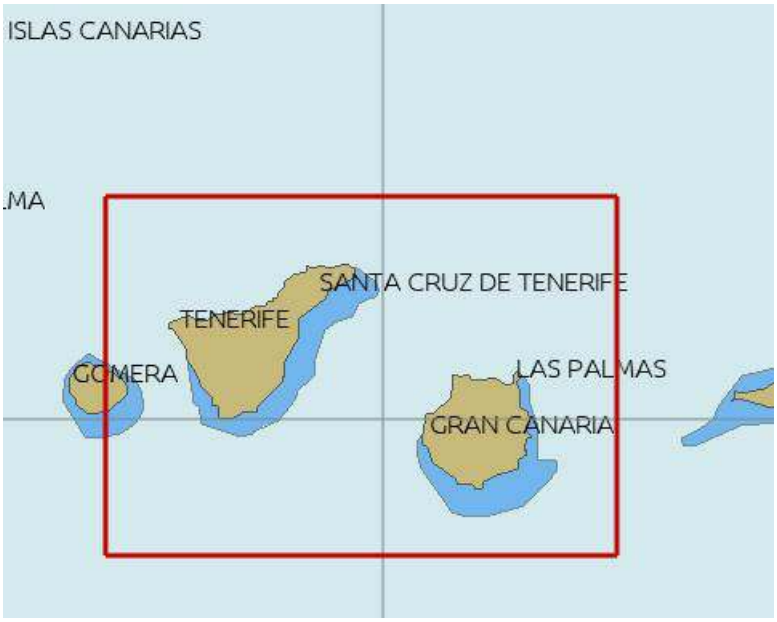
SailDocs Request Form



Compose the request by picking parameters and data. Not all data are available for all choices of parameters.
For example, in the picture above “Wind Gusts” and “Current” are grayed out, as the are not available with GFS from SailDocs.
When selecting **“Moving Grib”** the dialog expands and makes it possible to choose a speed and course. The selected grib forecast area will move, using these values, for each grib interval. The idea behind this is to minimize the download while still covering a longer passage.
Moving grib files are incompatible with interpolation, so if a “moving file” is detected a warning is displayed. Interpolation, if set is deactivated, but only for moving file, the settings as such, are not modified.
Resolution The choices are 0.5, 1.0 or 2.0. A recent upgrade to gribs makes it possible to download even 0.25° resolution. This is not yet an alternative in the plugin and requires editing the email manually before sending. In the picture above …|0.5,0.5|… should instead look like …|0.25,0.25|…
The default geographical coverage of the requested grib file is the area you can see on the screen. A manual Selection Mode is also available.
When the **Area Selection** → Manual Selection box is ticked the dialog expands



Choose the limiting Latitude and Longitude for the grib-file manually or press “Start graphic Sel.” button.



Press the left mouse-button and draw a rectangle around the required area.

When selecting **“Pressure Altitude”** and the GFS forecast model, the dialog expands and makes it possible to choose forecasts for different altitude levels. The SailDocs dialog only supports the 500 mb altitude, while zyGrib suports all options.
When you are ready press ***“Send”***.
This message will show in the “Mail” window instead of the “send” request:

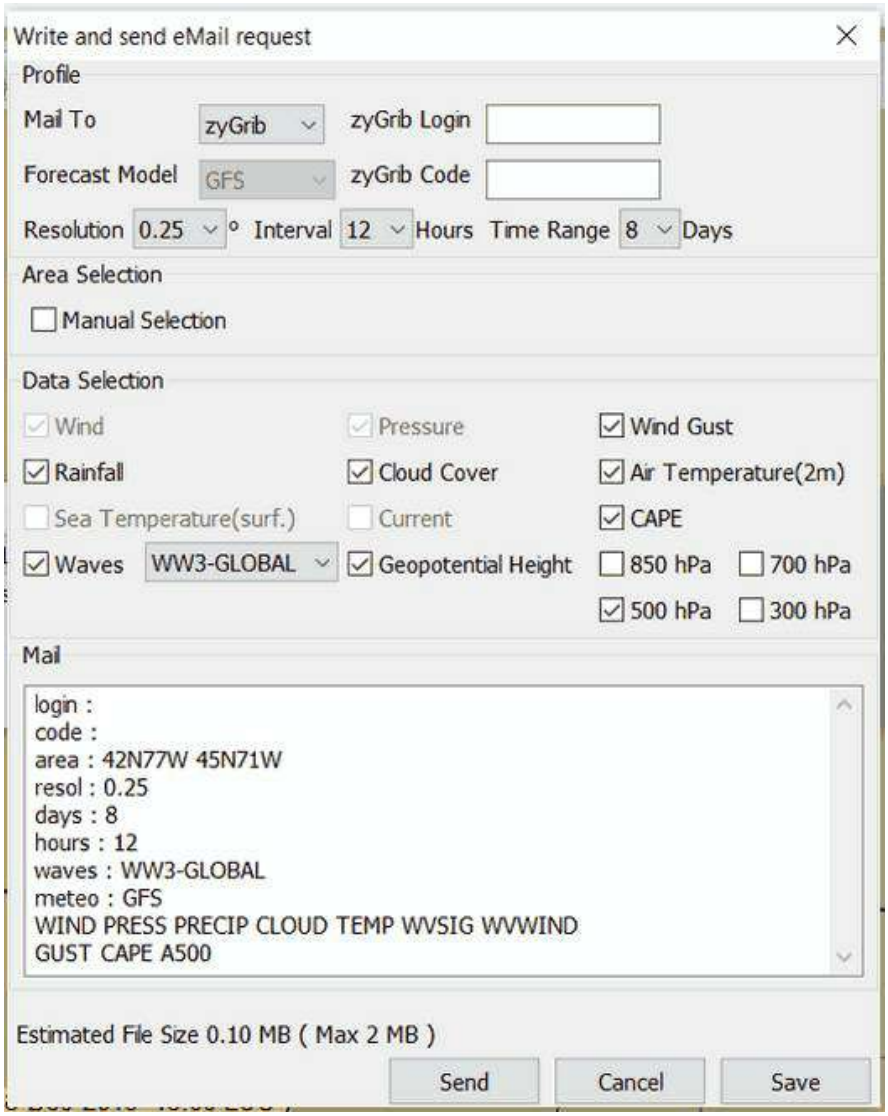
```
   Your request is ready. An email is prepared in your email environment.
You have just to verify and send it...
Save or Cancel to finish...or Continue...
```

As stated, a mail is composed for you and ready to send with your normal mailing program. This is the standard way of getting a new grib in Windows and Linux. (Mac ??)

To get a grib, just press ***“Send”***, and wait for a return mail.

zyGrib Request Form

Note that the Login is longer the first page of the website. The URL for the login is http://www.zygrib.org/index.php?page=gribauto[241] This is where you login to recieve the special code that allows download for two months.



Configuration of Default Email Server

If after hitting “Send”, the “Mail” window shows this message, instead of the “send” request:

```
 Request can't be sent. Please verify your email system parameters.
You should also have a look at your log file.
Save or Cancel to finish...
```

Configuration of the user's default Mail Server for the particular Operating System is required.

There is an advanced alternative for Mac OSX, Linux (and BSD). Install and configure a mail server. Instructions are on the Grib Weather Mail Servers Page. Following these instructions to enable the mail server will enable automatic transmission of a grib request to SailDocs.

After installing and configuring a mail server, there is one more step. Open “opencpn.conf” and add the line below. As always, do not run OpenCPN when editing opencpn.conf.

```
   [PlugIns/GRIB]\\
SendMailMethod=1
```

Setting “SendMailMethod” to “0” restores the default.

ZyGrib Server Registration

When ZyGrib is selected as the download server, there are User and Code fields that can be completed. This requires subscription or registration to the ZyGrib Forum.

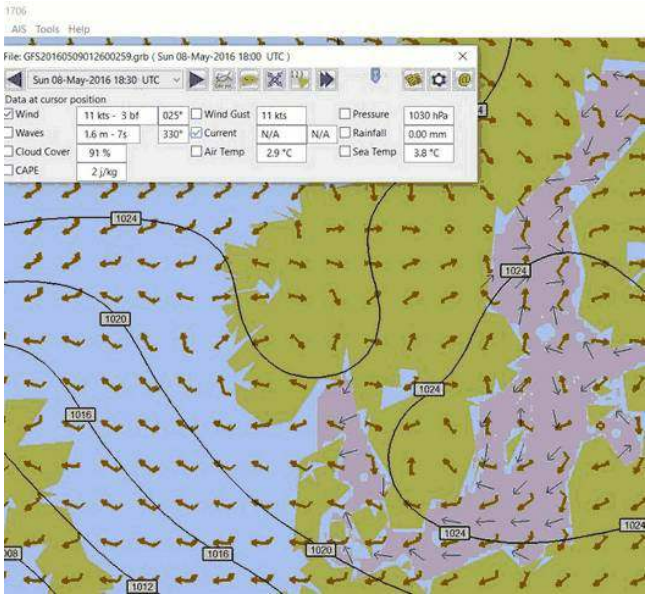
ZyGrib allows registration to the zyGrib forum and permits use of the user/password to obtain a two month code for registered zyGrib downloads. Limitations: Maximum 16 emails per user and per 24 hours. Maximum size of 4 MB per grib file.

- Request by Internet[242]
- Gribs by Email[243]
- Code Generator[244]
- Forum[245]

Load two Grib Files Concurrently (Wind + Current)

Combine separate Saildocs GFS Wind + RTOFS Current grib files. (Note: Only applies to OpenCPN v4.2.x and forward)
Using Windows, Click on the “Open a File” to browse grib file.

1. Highlight two grib files (Ctrl and pick the two files with a mouse left click.)
2. The pick Open and the two grib files will be opened.
3. Both grib files will be used by Weather_routing.
4. In grib_pi settings I always use the “Current” “Proportional Arrow”
5. Refer to Weather_Routing_pi: Two Grib Files (Wind + Current)



More to know

There are many aspects to the use of grib files which lead to the use of other companion programs or plugins.

- ZyGrib[246] is a free and open-source software (FOSS) dedicated grib viewer. Grib files can be downloaded by ZyGrib and then opened in OpenCPN.
- Weather-Routing tools use Grib_pi and Grib data to create optimized routing based on boat performance files.
- Weather Routing Plugin OpenCPN has an excellent weather_routing plugin which works in concert with grib_pi and climatology_pi concurrently, so that grib files are extended by Climatology's monthly averages for planning long voyages.
- QtVlm[247], is another FOSS weather routing program, combines a grib file with boat polar data, and produces an optimized route.

These are very good tools to use in routing decisions, but they all have the same limitations as all grib-data.

Grib File Notes & WARNINGS

(These notes are from the SailDocs Grib Server)

This grib file is extracted from a computer forecast model. While such computer data can provide useful guidance for general wind flow, there are limitations which must be understood.

What you are receiving is a weather prediction generated by a computer run by NOAA/NCEP (GFS, WW3 models) or the US Navy (comaps, nogaps) and downloaded and processed by Saildocs (a service of Sailmail).

The network is complex, and any computer network is subject to hardware and software failures or human error which can effect accuracy or availability of data.

1. In particular, if our servers were not able to download a current data file then the grib-file may be based on old data. The file information is shown above and also contained in the file itself. Also remember that grib data is not reviewed by forecasters before being made available.
2. You are getting a small part of the raw model data that the forecasters themselves use when writing a forecast, and it is your responsibility to make sure that the data is consistent with your local conditions and with the professionally-generated forecasts (e.g. text bulletins and weather-fax charts).
3. Grib data also has limitations along shore, where local effects often dominate and may not be adequately modeled.
4. In addition these models cannot provide adequate prediction for
    - tropical systems,
    - frontal activity or convergence zones.
    - For example, while global models can provide useful data on the likely track of hurricanes, they grossly underestimate the strength of hurricanes because of their small size compared to the model grid.
5. For hurricane/cyclone forecasts, carefully monitor the appropriate warning messages and do not rely on grib data from any source.

Grib data can provide useful guidance not available elsewhere. Understand the limitations and use the data carefully. Grib data should be considered supplemental to other forecasts, and not be relied upon in lieu of professionally-generated charts or forecasts.

Mail Servers

Warning!

This is an Advanced subject, that is not necessary for running the grib plugin.
Do not try these setups unless you are familiar with your operating system, comfortable with handling the command line interface and editing configuration files.
Do not expect these instructions to work without some customization.

This page contains detailed instructions on how to set up mailservers to automatically send grib request mails to Sail Docs.
“Ptizef” & “rgleason” have compiled the instructions for **Windows/Thunderbird**
“Ptizef” has compiled the instructions for **Linux/SSMTP.**
“Cagney” has compiled the instructions for **Linux/Exim4**.
“CarCode” has compiled the instructions for **Mac OS X/PostFix** .

Windows MAPI Mail Server Setup

The plugin's email request depends on the user's selection of the default MAPI email program which is dependent on the Operating System conventions. Linux, Windows and Mac are all different. If the plugin does not find a default MAPI program, an appropriate message will show in the plugin menu:

```
 Request can't be sent. Please verify your email system parameters.
You should also have a look at your log file.
Save or Cancel to finish...
```

and there will be an error message in the opencpn.log similar to:

```
 10:55:47 PM: MAIL Error: Failed to logon to MAPI using a shared session,
Error:3
```

To fix this problem use a google search, and find links such as Fix CLS Send, MAPI or Runtime Error in Email[248]

Windows 10 or 8.1 and Thunderbird

For example, if you use Thunderbird exclusively with Win10 or Win8.1, this should fix the problem

```
 Start > Control Panel > Default Programs > Set your Default Programs,  Then
pick Thunderbird.
```

Windows Vista or XP and Thunderbird

- **Outside OpenCPN** there is nothing more to do except to ensure that there is a mail system (mine is thunderbird) correctly configured and set as “main” on the device.

also verify if the mapi32.dll is present in c:/windows/system32 (or equivalent for 64b) (otherwise an error message will be the result).

- **Inside OpenCPN**, there is nothing to do; the sender mail address can be entered, but will not be used. Just don't forget to enter the zyGRIB login and password.

When clicking on “send” button :
if the “main” mail system is not open, OpenCPN opens it and the waiting messages are received.
remark : if there are many waiting messages, it could take a while. That is why it would be better to create a specific address for this purpose.
Then a new mail page is opened with all mail elements already written thus ready to be sent.

Linux

Using SSMTP

How to install and configure sSMTP:

- 1) Install the ssmtp package.
If another MTA is already installed, you may be asked to uninstall it before installing ssmtp.

Once it's done you can test it by typing this command:
“whereis sendmail”

The answer should be something like “/usr/sbin/sendmail”.

Use that answer in the next command:
“ls -la /usr/sbin/sendmail”

If everything is OK you should get this answer:
“/usr/sbin/sendmail → ssmtp”
showing that Sendmail function is now connected to ssmtp.

- 2) Now there are two files to set:

the first file : /etc/ssmtp/ssmtp.conf (with root rights)

The typical setting should be:

root=postmaster
AuthUser=yourlogin to your ISP access
AuthPass=yourpasseword to your ISP access
mailhub=yourISPserveurname.yourdomain (for example smtp.orange.fr)
rewriteDomain=yourdomain
FromLineOverride=YES
hostname= the full host-name (normally automatically entered, but if not you can type the command : “hostname” to get it)

For ISP requiring a TLS connection , it could be necessary to add the line UseTLS=YES or

UseSTARTTLS=YES

the second file : /etc/ssmtp/revaliases (with root rights)

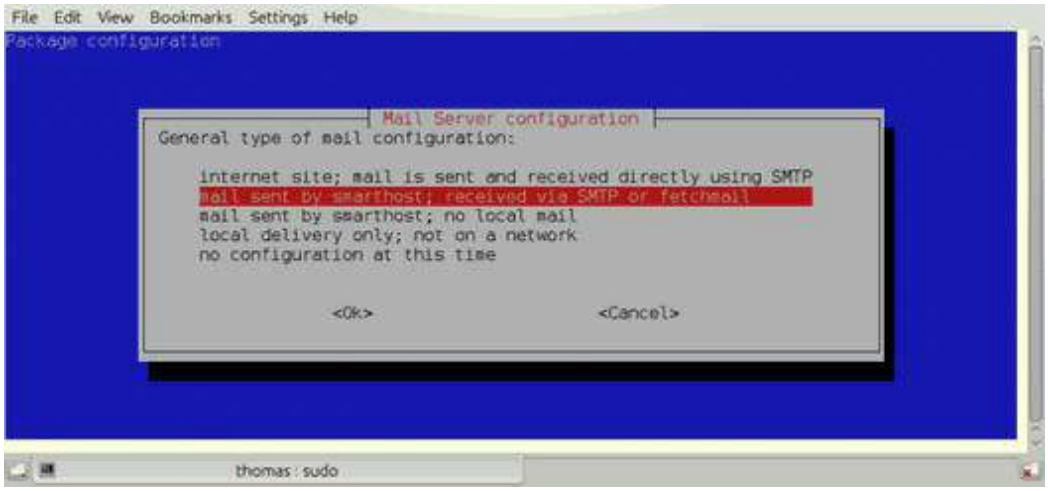
Enter this line.
root:yourlogin@yourdomain:yourISPserveurname.yourdomain:port

The default port was 25 but now many ISP refuse it and use 587. If you have a mail system, you will find the right value in
it.sudo dpkg-reconfigure exim4-config
Sendmail/Postfix install for Mac
- Inside OpenCPN :You must enter the sender address : your entire mail address, the one you will use to send mails and receive answers

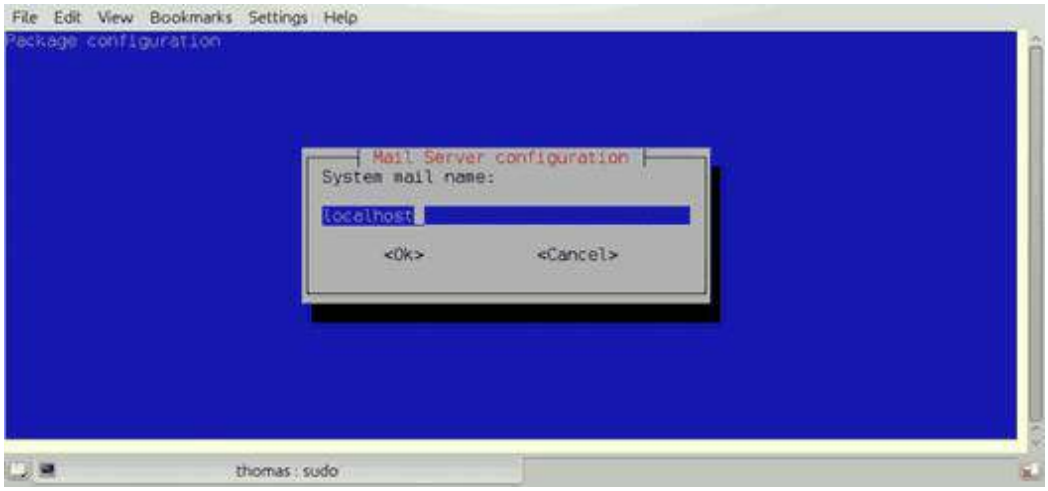
When you click on the “send” button, the mail is directly sent. You can find the log here : /var/log/mail.log

Using Exim4

First install Exim4
$sudo apt-get install exim4
then configure it (again).
$sudo dpkg-reconfigure exim4-config
This is a very simple setup where exim is just used to forward mail to the ISP:s smtp server. Local system mail is also available.

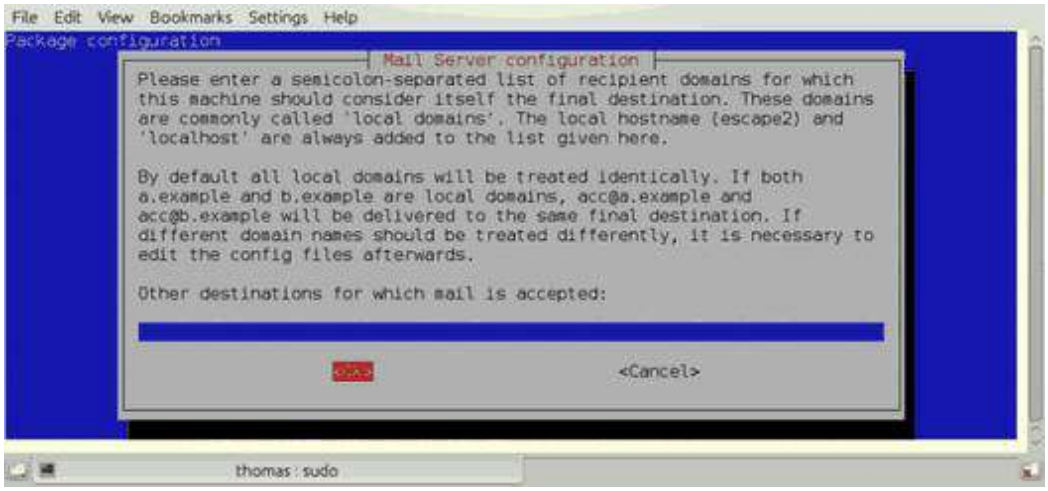


It's important to use the choice above.

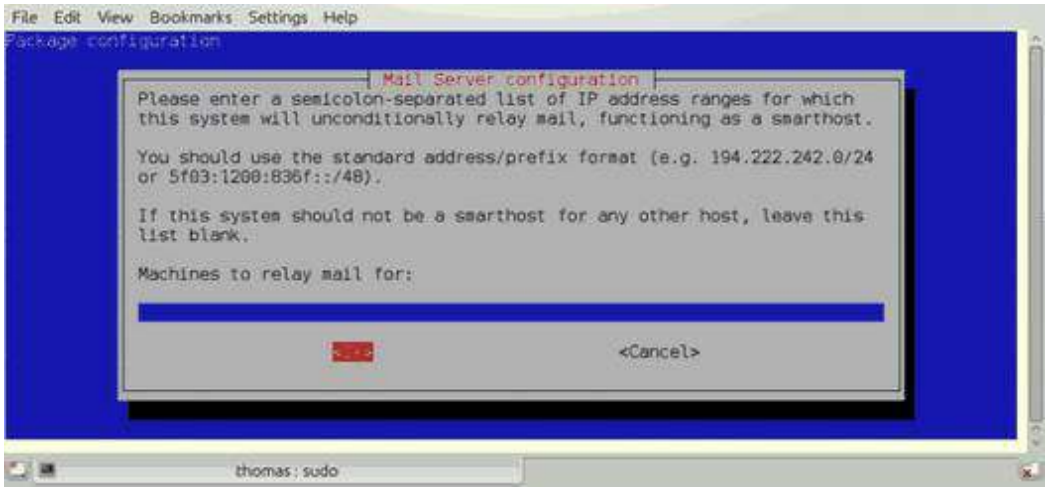


I just use “localhost”.

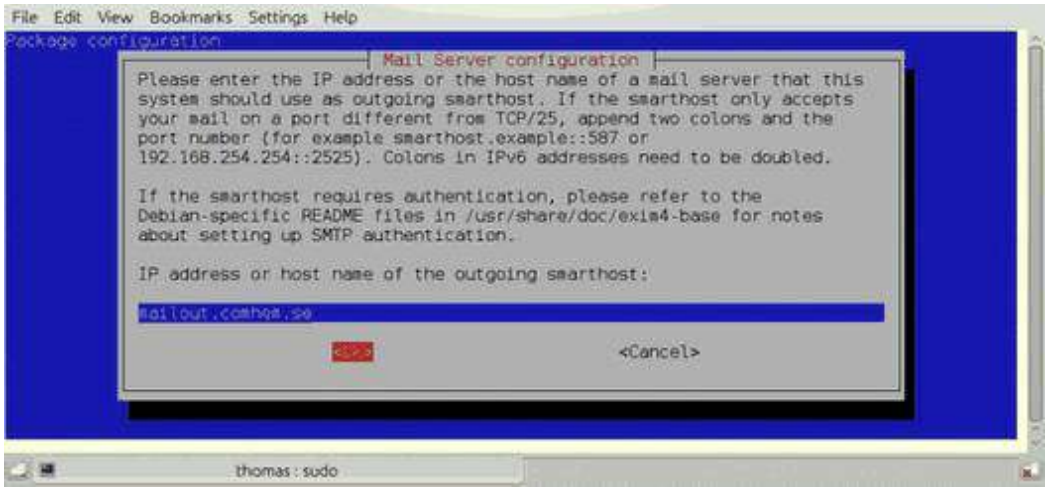
We have no incoming connections.



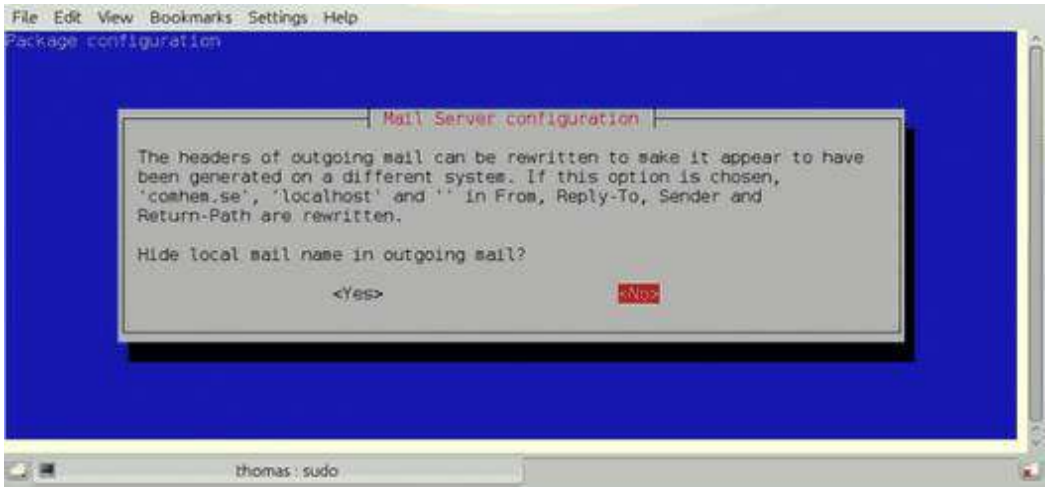
We are not using this.



We are not using this.

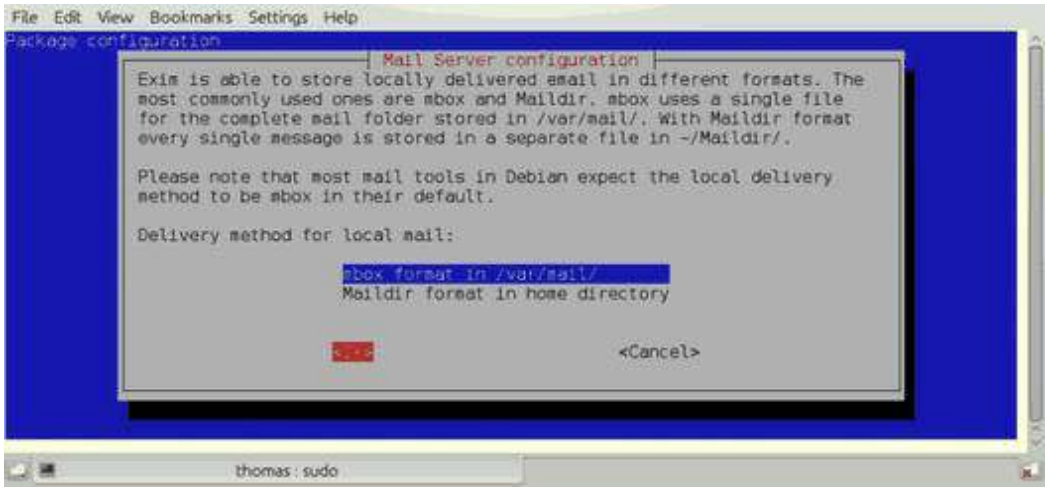


This is important. It must point to your Internet Service Providers SMTP server.

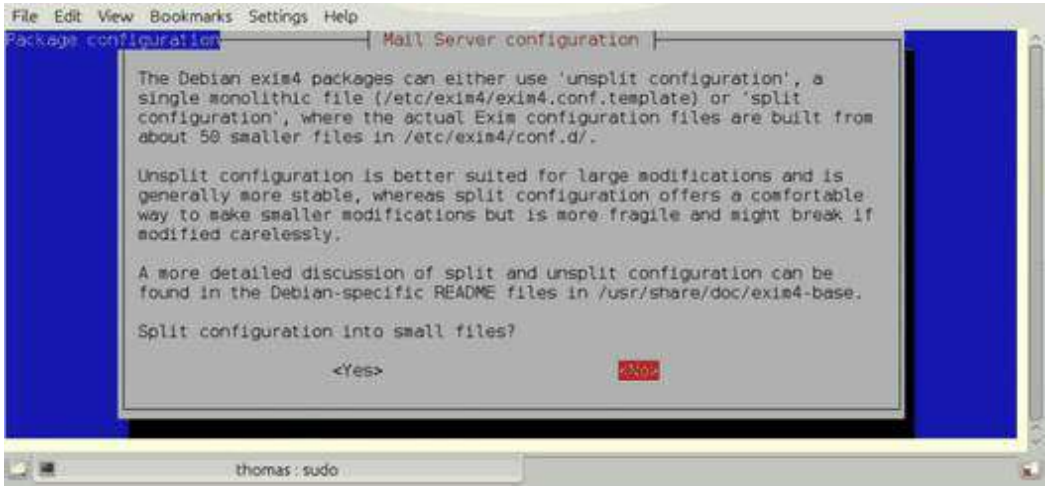


Your choice!

RTFM and make up your mind. Not a big deal for this simple setup.



RTFM.



Your Choice, but no point in splitting this simple setup.

Edit /etc/exim4/passwd.client so it contains your username and password to your ISP:s mail server.

```
# password file used when the local exim is authenticating to a
```

remote_PARATABLE_INS_# host as a client._PARATABLE_INS_#_PARATABLE_INS_# **see exim4_passwd_client(5) for more documentation**_PARATABLE_INS_#_PARATABLE_INS_# Example:_PARATABLE_INS_### target.mail.server.example:login:password_PARATABLE_INS_# for OpenCPN you can use *:login:password_PARATABLE_INS_*:fakexyz123:madeupXYZ123

(Re)start Exim4
$ /etc/init.d/exim4 {start|stop|restart|reload|status|what|force-stop}
Start testing

Mac OS X

Using Sendmail/Postfix

It is not so easy to install this on a Mac since you will need some experience with terminal using. The example below uses an googlemail account and nano as editor:

Step 1
Type in terminal these 6 lines one after another with return:
sudo mkdir -p /Library/Server/Mail/Data/spool

sudo gzip /usr/share/man/man1/{postalias.1,postcat.1,postconf.1,postdrop.1,postf ix.1,postkick.1,postlock.1,postlog.1,postmap.1,pos tmulti.1,postqueue.1,postsuper.1,sendmail.1}

sudo gzip /usr/share/man/man5/{access.5,aliases.5,bounce.5,canonical.5,cidr_tabl e.5,generic.5,header_checks.5,ldap_table.5,master. 5,mysql_table.5,nisplus_table.5,pcre_table.5,pgsql _table.5,postconf.5,postfix-wrapper.5,regexp_table.5,relocated.5,tcp_table.5,t ransport.5,virtual.5}

sudo gzip /usr/share/man/man8/{anvil.8,bounce.8,cleanup.8,discard.8,error.8,flus h.8,local.8,master.8,oqmgr.8,pickup.8,pipe.8,proxy map.8,qmgr.8,qmqpd.8,scache.8,showq.8,smtp.8,smtpd .8,spawn.8,tlsmgr.8,trivial-rewrite.8,verify.8,virtual.8}

sudo /usr/sbin/postfix set-permissions

sudo chmod 700 /Library/Server/Mail/Data/mta

Step 2
Type in terminal another command to start the nano editor with this file:
sudo nano /etc/postfix/sasl_passwd

Type into the nano editor:
smtp.googlemail.com:587 YourAccountname@googlemail.com:YourPassword

Substitute YourAccountname and YourPassword with your data.
Save the file in nano with Ctrl-O and exit with Ctrl-X.

Step 3
Publicate the new file in terminal with this command:
sudo postmap /etc/postfix/sasl_passwd

Step 4
You have to edit the main config file and add at the end the following lines with this command in Terminal:
sudo nano /etc/postfix/main.cf

This to add:
# Minimum Postfix-specific configurations.
mydomain_fallback = localhost
mail_owner = _postfix
setgid_group = _postdrop
relayhost=smtp.googlemail.com:587

# Enable SASL authentication in the Postfix SMTP client.
smtp_sasl_auth_enable=yes
smtp_sasl_password_maps=hash:/etc/postfix/sasl_passwd
smtp_sasl_security_options=

# Enable Transport Layer Security (TLS), i.e. SSL.
smtp_use_tls=yes
smtp_tls_security_level=encrypt
tls_random_source=dev:/dev/urandom

Save the file and exit nano as in step 2.

Step 5
Now you can start postfix in terminal with:
sudo postfix start

If an error occurs correct main.cf and start again with:
sudo postfix reload

Step 6
Now you can test your work in terminal with:
date | mail -s test YourAccountname@googlemail.com[249]

Done.
Supplemental
If you want to have started sendmail/postfix each time you start you start your machine you can add these lines to the launch daemon:

<key>RunAtLoad</key>
<true/>

Do this with this command in terminal:
sudo nano /System/Library/LaunchDaemons/org.postfix.master.plist

After that this file should look like this:
<?xml version=“1.0” encoding=“UTF-8”?>
<!DOCTYPE plist PUBLIC "-//Apple Computer//DTD PLIST 1.0//EN"
"http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version=“1.0”>
<dict>
<key>Label«/key>
<string>org.postfix.master</string>
<key>Program</key>
<string>/usr/libexec/postfix/master</string>
<key>ProgramArguments</key>
<array>
<string>master</string>
<string>-e</string>
<string>60</string>
</array>
<key>QueueDirectories</key>
<array>
<string>/var/spool/postfix/maildrop</string>
</array>
<key>AbandonProcessGroup</key>
<true/>
<key>OnDemand/lt;/key>
<true/>
<key>RunAtLoad</key>
<true/>
</dict>
</plist>

Instead of googlemail in this example you may use any other mail server.

Chart Downloader

The grib plugin is an Internal Plugin, always distributed with OpenCPN, no separate download is required.

Please Go to the Chart Downloader documentation on this page: Chart Downloader Tab

Click on the link above.
Please do not put any content on this page.

AIS/Radar

Radar Overlay Plugins:

Overlay the Radar picture of Garmin or Navico on OpenCPN

Garmin Radar
The GRadar plugin works with modern Garmin (Ethernet capable) radar scanners only.

BR24/3G/4G Radar
The Navico broadband plugin will work with a Simrad, Lowrance or B&G broadband scanner. All three models – BR24, 3G and 4G – are supported with multiple screens. Version 2.1 is a major upgrade.

Radar Debugging
Assistance in debugging Navico connections.

AIS Plugins

AIS Radar
Implements a radar-like display for AIS targets. See Other Plugins. [250]Simple plugin no documentation.

RtlSdr USB AIS
Use a low-cost USB DVB-T (digital TV) receiver to receive AIS messages from ships.

AIS Radar View

This document is about AIS Radar View plugin (Ais-radar)

- What and Why
- Installation
- Standard Actions
- Operation
- Remarks

Links

- Source: Github Repository - Nohal branch "Packaging"[251]
- Source Original:Original Github Repository[252]
- Forum: AIS Radar Plugin[253]

What and Why

A. **What does AIS Radar-pi do**

AIS RADAR is a plugin that allows you to display AIS targets in the way ships are displayed on a radar screen.

Note: Do not confuse this with the additional supplements that overlap the Ship's radar screen on the OpenCPN screen.

B. **Why should I want it?**

If you want a simple screen, showing only the AIS targets, AIS Radar can be just what you are looking for.

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Installation

Note: In this section the instructions are specifically for AIS Radar-pi, but there is a dedicated page in the manual with information about Downloading, Installing and Enabling Plugins in general. That dedicated page can be found here: Plugins - Install and Enable.

AIS-Radar-pi can be downloaded from http://www.opencpn.org/index.html[254]

Click “**Downloads**”

Click “**Plugins for OpenCPN 4.2 & 4.4**”

Look for “**AIS Radar View**”“

B. How to install the plug-in

Make sure you choose the file that is compatible with your computersystem. In this manual we presume it's Windows, so we choose the **Windows setup-package**.
Download the file (double-click).

We assume you know where to find the files you download from the Internet (if you don't: quit now and read the manual of your computer before doing anything else with it .

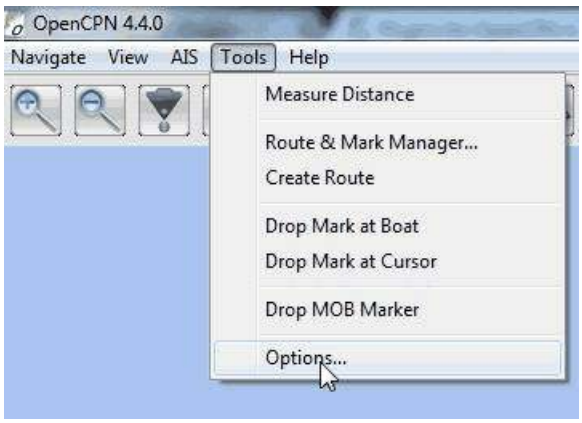
Double-click the downloaded file and follow the set-up instructions.

That's it. But before you can actually **use** the plug-in, you first have to **enable** that plug-in in OpenCPN.

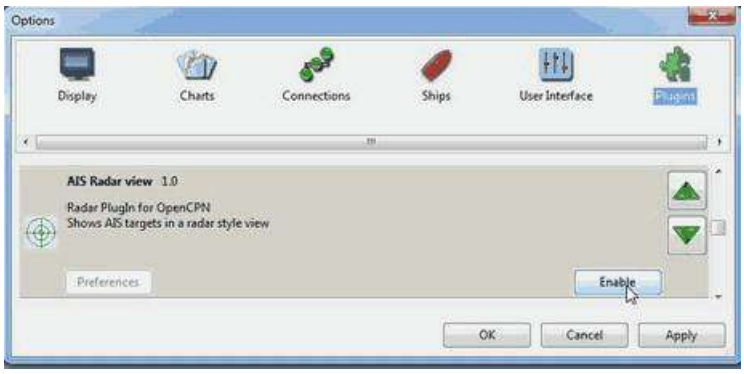
Enabling the plug-in in OpenCPN

Open (or restart) OpenCPN.

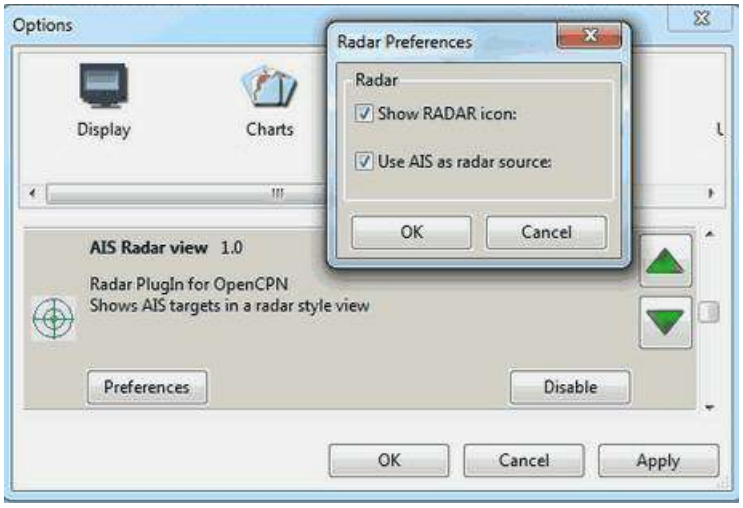
Click **Tools-Options-Plugins**



Scroll down untill you see the AIS Radar-pi.



Click "**Enable**" and then "**Preferences**".



The list of preferences is simple:

- Show RADAR icon
  - This box toggles displaying the icon in the OpenCPN icon bar.

- Use AIS as Radar Source.
  - Ticking this box will allow AIS Radar View to use the information from your AIS receiver (make sure your AIS receiver is set up in OpenCPN in “Tools”-“Options”-“Connections”).

Click “**OK**”.

Now the AIS Radar icon should appear somewhere in your OpenCPN Toolbar.

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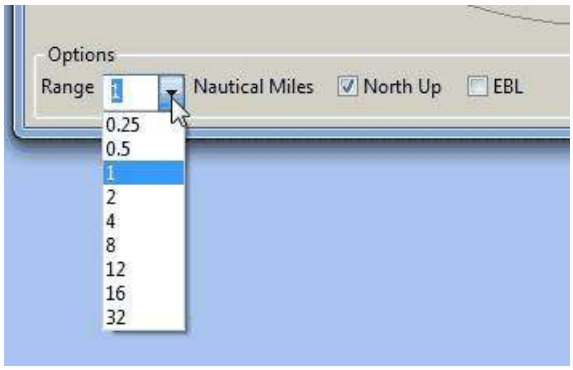
Standard actions

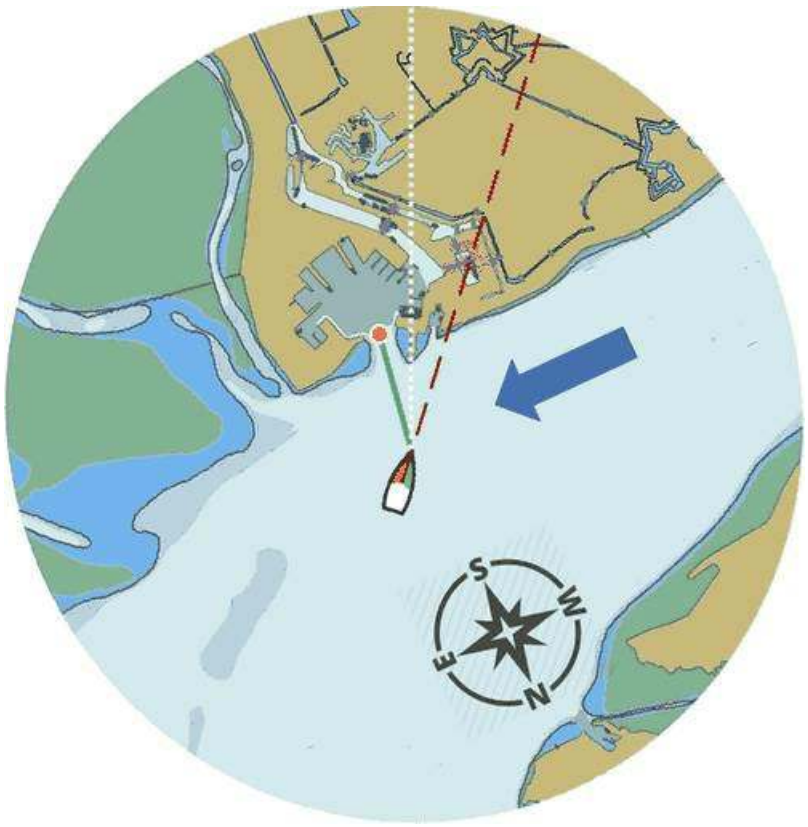
When you click the AIS Radar-pi icon, you will see a radar-screen like representation of the AIS-targets around you.
They are represented by triangular ship-icons. Yellow if not fully recognized yet, green when fully recognized.

When your own ship has not just an AIS-receiver, but an AIS **transponder** (and **sends** AIS signals), you will see such an icon in the centre of the screen. That's you.

On the bottom of the screen you can set some options. You can set different ranges in AIS Radar. From 0.25 nm to 32 nm.



You can also choose “North Up” (when it's not selected, the view will be “Course Up”) and you can select “EBL” (“Electronic Bearing Line”).



With EBL selected, a mouse-click on the AIS Radar screen will give you a bearing in degrees. That bearing is always in degrees relative to North, not relative to your course.

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Operation

Two operating modes are possible:

- **North**-up,
- **COG** up, or “Course Up”.

You can select “North Up” on the bottom of the screen.
If you select “North Up”, you will see the text “North Up” in the right hand top corner of the AIS Radar Screen.
If you do **not** select “North Up”, AIS Radar Screen will operate in “**COG** up” mode and you will see the text “Course Up” in the right hand top corner of the AIS Radar Screen.

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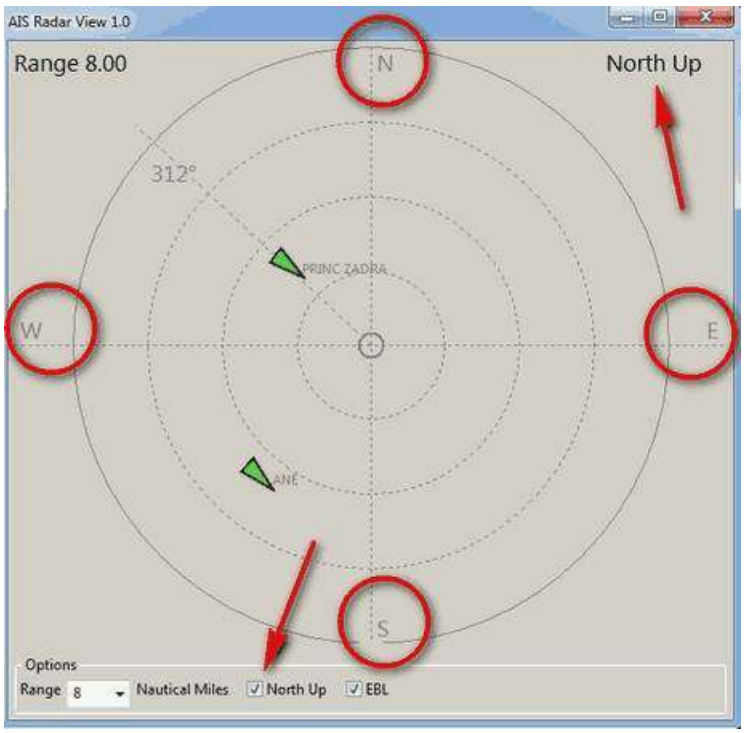
Mode "North up"



"North Up" is selected. You will see the text "North Up" in the right hand top corner of the AIS Radar Screen.

Also you will see the letters "**N**", "**E**", "**S**" and "**W**". They indicate North, East, South and West.

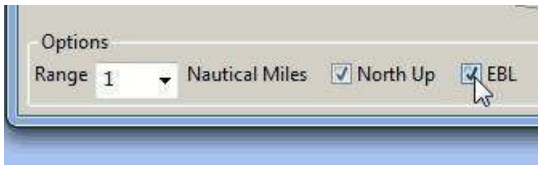
The range is set to 8 nautical miles.
The **center** of the screen, where the vertical and the horizontal axes cross, **is your own position**.

All vessels with an AIS transmitter, Class A or B, within the chosen distance, will be displayed on the screen ("AIS-targets") and their positions will be updated as they (and/or you) move.

There is no ship-icon in the middle. That is because in this example you are only receiving AIS-signals and not sending them.
If you would be transmitting AIS-signals, you would see a ship-icon (us) in the middle of the screen. If your boat does **not** send AIS-signals but you **do** see a ship-icon in the middle of the screen, you have rammed another ship! (**maybe you should have set a Watchdog-alarm?**)

Note: the AIS Radar relies not only on the other ships sending AIS-signals, but also on your equipment receiving those signals!

"**EBL**" (Electronic Bearing Line) is also selected.



In the top left quadrant of the screen you see an AIS Target. It is the *"Princ Zadra"* coming

from the North West. By putting the mouse-cursor on that ship and clicking, the EBL will tell you the true bearing of that ship from your position. In this case that true bearing is 312 degrees. It's true, believe us.

Any target that:

- moves **towards** the center of the screen is a boat that can “potentially”, collide with the boat of the user.
- moves **away** from the center of the screen, is a boat that presents no risk of collision with the boat of the user.

Mode "Course Up" ("COG up")

If you do not select “North Up”, AIS Radar Screen will operate in “COG up” mode and you will see the text “Course Up” in the right hand top corner of the AIS Radar Screen.

The next screenshot is the same situation as described in the part ” Mode “North up”, but now in “Course Up” mode.

Note that the numerical value displayed at the top of the vertical axis gives your COG. In this case that numerical value is 306 degrees. That means you are heading North West.

Also note that on the screen the *“Princ Zadra”* (which is coming from the North West) is now coming almost straight “down” towards you.
Theoretically, in “COG up” the targets directly in front of your ship should be permanently oriented towards the top of the screen. BUT, also note that with each variation of your own COG, the entire screen rotates either in one direction or the other. It's movements are non-existent if you follow a constant heading.

Any target that:

- moves **towards** the center of the screen is a boat that can “potentially”, collide with the boat of the user.
- moves **away** from the center of the screen, is a boat that presents no risk of collision with the boat of the user.

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Remarks

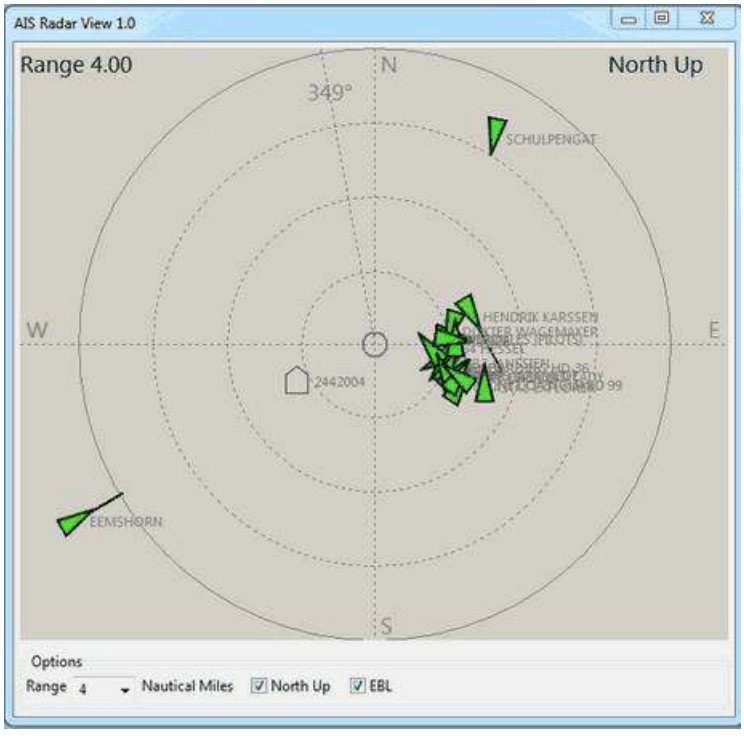
Keep in mind that the plugin has advantages but also some things to be aware of. The big advantage of AIS Radar is that it is not very complex. But keep in mind that the information on the screen is sometimes less than the information you will get in the “normal” AIS Target Information on the main screen of OpenCPN.

We will illustrate that with a few screenshots of a ship approaching us from our port quarter.

It's a ship called “*Eemshorn*”.

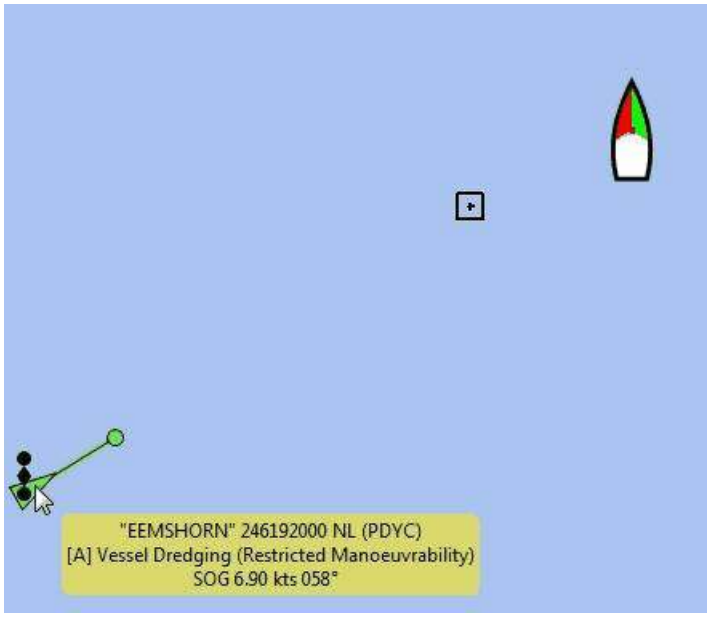
Looking at the AIS Radar screen you might think she is just an ordinary ship like any other ship.

This is the info on the **AIS Radar** screen.



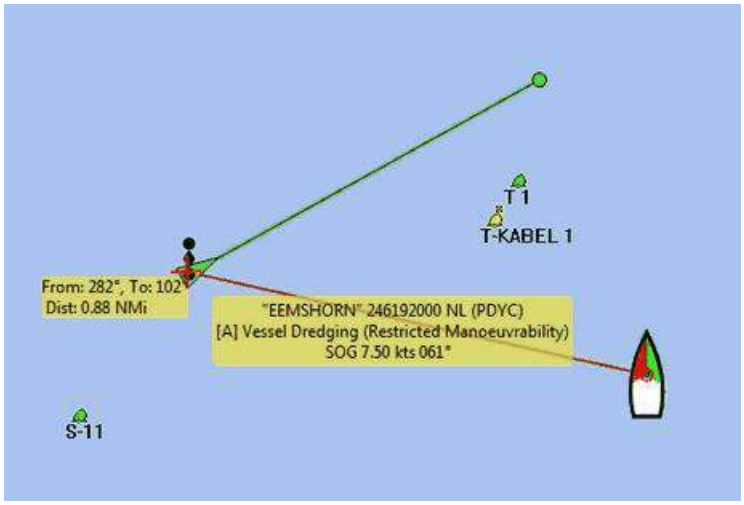
But the AIS Target Information on the main screen of OpenCPN would give you some important additional information. In this case that she is a dredger and restricted in her manoeuverability.

This is the info on the **OpenCPN** screen.



And instead of the EBL in AIS Radar you could use an EBL made with the plugin OpenCPN DRAW (ODraw).

This is the info on the OpenCPN-screen with an **EBL made with ODraw**.



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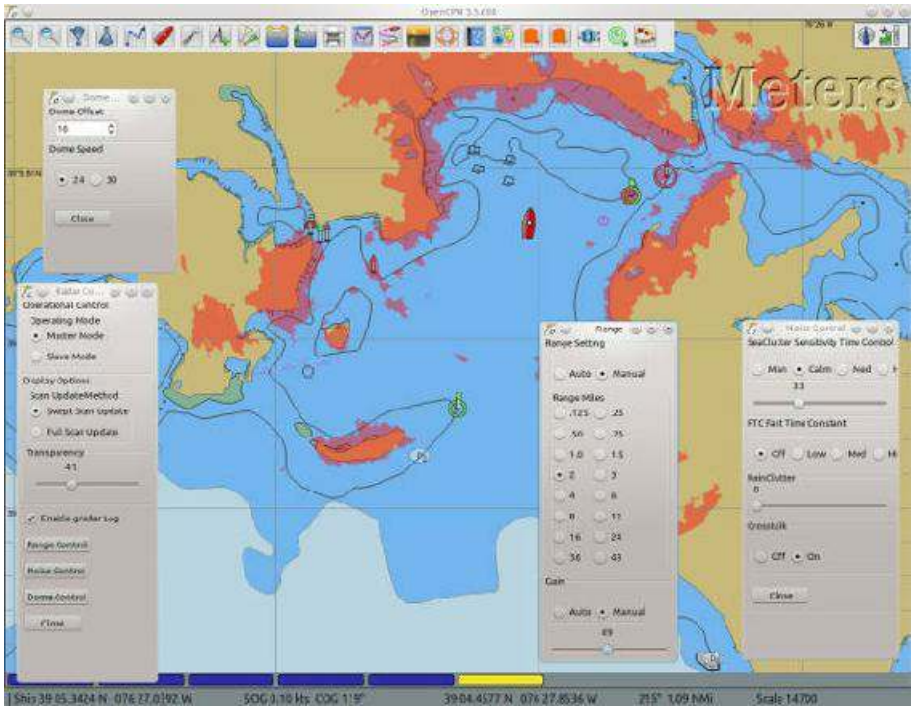
Garmin Radar

The GRadar plugin works with modern Garmin (Ethernet capable) radar scanners only.

The chart plotter is a combination of a Gps and electronic charts. If Gps works as expected and, a bigger if, the chart is correct, then everything is fine. Add a radar to the mix, with an independent picture of targets, including land, buoys and other vessels, and compare the two. That is what this plugin does. It overlays the radar-picture on the chart plotter. If both agree, the navigator can be more confident that his navigation is correct. On the other hand, if the pictures disagree, there is one more thing to sort out.

To use this plugin the user must be familiar with both OpenCPN and radars. Without a sound knowledge in radar picture interpretation, the plugin will seem a bit confusing.



Links

Gradar_pi

- Source: Github Repository Gradar_pi[255]
- Download: https://opencpn.org/OpenCPN/plugins/gradar.html[256]
- Forum: Garmin OpenCPN Radar Overlay Plugin[257]

GXradar_pi

- Source: Github Repository GXradar_pi[258]
- Download: https://opencpn.org/OpenCPN/plugins/gXradar.html[259]
- Forum: Garmin XHD Radar Overlay Plugin[260]

Newest Development

- Source: Github Repository- Beta Navionics/Halo/Garmin/GarminHx Radars[261]

Hardware

The Garmin Radar PlugIn for OpenCPN requires a specific hardware interface in order to allow the OpenCPN application to access the Ethernet data captured and broadcast by the radar scanner.

There are three interconnect scenarios possible, depending upon whether the installation includes an existing Garmin chartplotter, and the operational mode desired.
Interface Type 0: OpenCPN Slave Mode, using existing Garmin chartplotter.
Interface Type 1: OpenCPN Master Mode, using existing Garmin chartplotter.
Interface Type 2: OpenCPN Master Mode, no chartplotter.

Complete Installation Instructions

Download and read the complete **Installation Instructions**: GRadarDoc.pdf[262]

Installing the plugin

Follow the instructions on the Install and Enable page.

Enable GRadar plugin

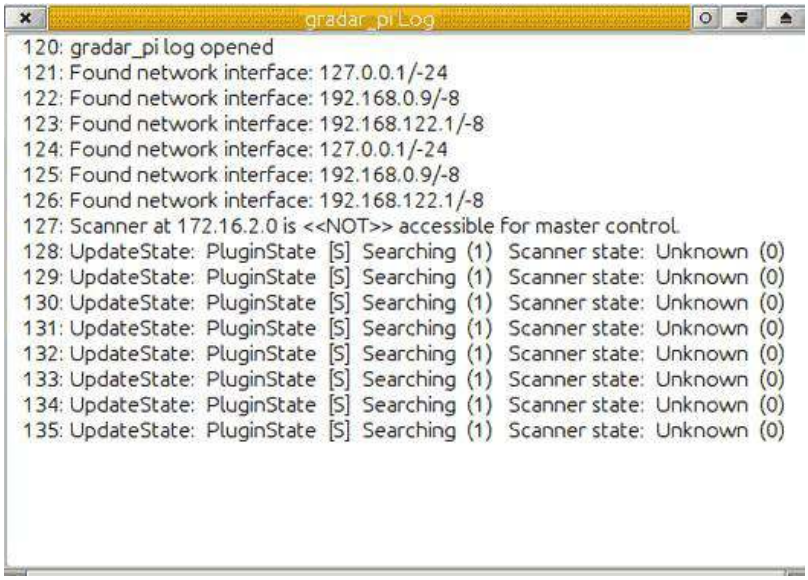
Once installed enable the plugin in Options → Plugins. The Preference button does not work. For GRadar Settings, read on.

When enabled the GRadar icon appears in the toolbar. The icon is an on/off switch and has two states indicting if the the plugin is working or not:

Off	On
	

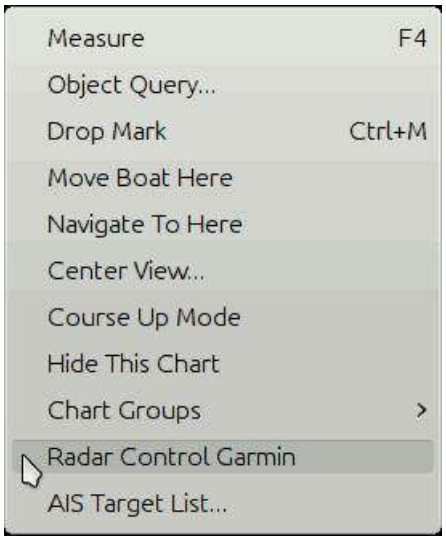
As soon as the plugin is enabled there will also be a separate log window. This is how it looks

when no radar is connected.

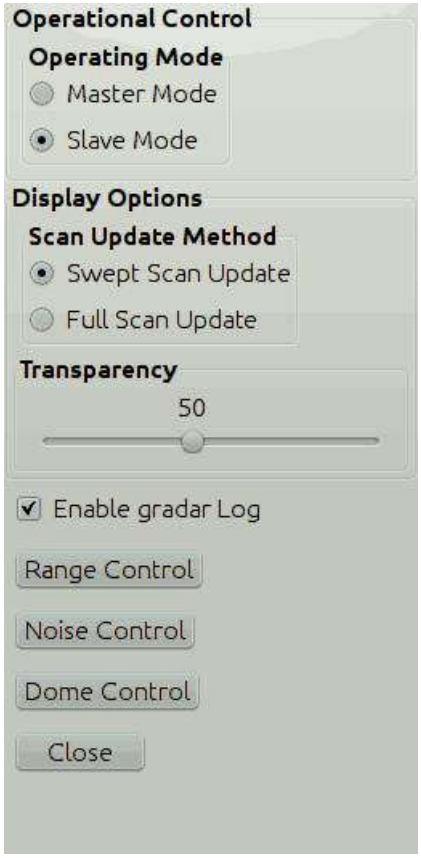


Using GRadar

Rightclick to get to the GRadar Settings.

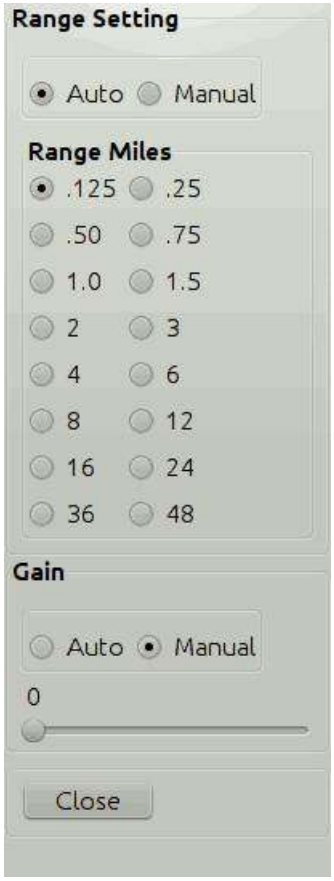


Operational Control



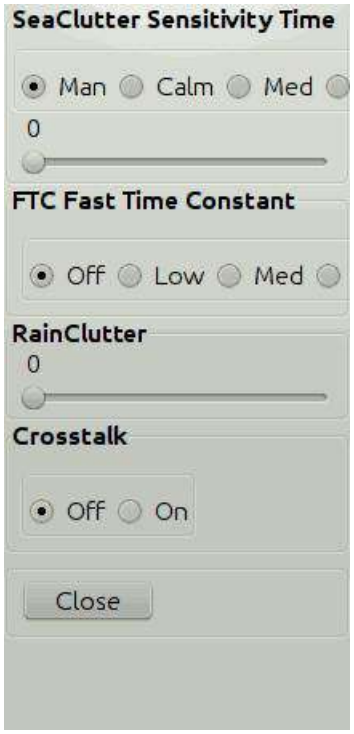
Describe all the options.

Range Control



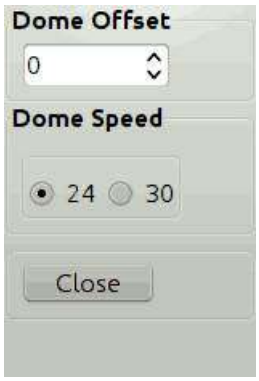
Describe all the options.

Noise Control



Describe all the options.

Dome Control



Describe all the options.

More .....

NMEA ARPA Radar Targets

Certain radars transmits targets in NMEA sentences. OpenCPN can display these targets in a similar fashion as normal AIS targets. Read more: Radar Targets
Is this a good thing combined with GRadar or does it just clutter the display……??

Gradar_pi Troubleshooting Documentation -v13

HelmsMatt got everyone thinking on this!!

Thanks to all for your dedication and input.

We have made a tiny bit of progress and have documented all the test steps and results of your setting suggestions. In summary, we found that we had the v12 version of gradar plug-in installed and when we installed the v13, the message “Successfully added to multicast group 239.254.2.0” started appearing. We disabled the “tunnels” and simplified the ipconfig. Disabled Windows Firewall, Wireless adapter, and virus protection. Verified that Radar was powered on before starting OpenCPN and IP settings were exactly like Chuck's. Still the Radar button in OpenCPN will not go green.

Here are the details of the steps taken and results: 1. Disabled Windows Firewall 2. Disabled Wireless adaptor 3. Checked OpenCPN plug-ins and realized that we still had the v12 installed. 4. Copied the v13 dll into plug-ins and deleted the v12 dll 5. Verified Radar and GPS are powered up 5. Started OpenCPN and saw that log now contains “Successfully added to multicast group 239.254.2.0” 6. Tried clicking on Radar button but indicator stays red. 7. Here is log: 0: Found network interface: 172.16.1.1/16 1: Found network interface: 127.0.0.1/8 2: Scanner at 172.16.2.0 is accessible. 3: Successfully added to multicast group 239.254.2.0 4: UpdateState: PluginState [M] Searching (1) Scanner state: Unknown (0) 5: Heading: 265 6: Heading: 0 7: Heading: 264 8: Heading: 0

8. Disabled tunnel adaptors using CMD as administrator: netsh int teredo set state disabled netsh int isatap set state disabled

9. Rebooted 10.Below is results of ipconfig /all showing that only the Ethernet adaptor is running 11. Verified that Local Area Connections only has “IP version 4” checked 12. Verified that IP version 4 properties are statically set to: IP address: 172.16.1.1 Subnet mask: 255.255.240.0 Default gateway: 172.16.1.100 13. Verified that Windows Firewall is OFF 14. Verified that Micro Trend Internet Security & Virus Protection is OFF 15. Radar powered on. Started OpenCPN. 16. Log results are the same as above. Radar button does not turn green.

C:\Users\Cindy>ipconfig /all

Windows IP Configuration

Host Name . . . . . : Cindy-ASUS Primary Dns Suffix . . . . . : Node Type . . . . . : Broadcast IP Routing Enabled. . . . . : No WINS Proxy Enabled. . . . . : No

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . : Description . . . . . : Atheros AR8151 PCI-E Gigabit Ethernet Con troller (NDIS 6.20) Physical Address. . . . . : C8-60-00-52-01-F4 DHCP Enabled. . . . . : Yes Autoconfiguration Enabled . . . . : Yes IPv4 Address. . . . . : 172.16.1.1(Preferred) Subnet Mask . . . . . : 255.255.240.0 Default Gateway . . . . . : NetBIOS over Tcpip. . . . . : Enabled

See this forum thread for more troubleshooting.
http://www.cruisersforum.com/forums/f134/opencpn-radar-overlay-plugin-79081-23.html#post1415816[263]

Try cycling the power to reboot the scanner. Make sure its in Master mode before you Hit the Radar Button

---

OK, now this has become a puzzle requiring a solution. You seem to not be receiving any data from the scanner at all.

Cindy: Get wireshark

Wireshark · Download

Install and run wireshark with the scanner switched on, and OCPN inactive (not running). The scanner sends multicast status reporting continuously while powered up, with or without the OCPN PlugIn. gradar monitors these multicasts to determine the scanner status as reported in the log.

You should see something like the attached screen.

bdcat

BR24 Radar

OpenCPN radar plugin for Navico Broadband Radars

(BR24, 3G, 4G models)

BR24radar_pi is a plugin for OpenCPN[264] that allows full integration of Navico Simrad, Lowrance or B&G broadband radars. It supports all broadband radomes – BR24, 3G and 4G.

The latest plugin version available is 2.1 which requires Opencpn 4.4.0 or later. The plugin requires also accelerated graphics OpenGL mode. It does not work without OpenGL, and never will. This means that a computer with good and fast OpenGL drivers is recommended.

by Kees Verruijt

Note: A new plugin version 3.0 is available on Github canboat BR24radar_pi releases link below. Since that version needs a OpenCPN update to be fully useable on Windows it's not yet available on the OpenCPN plugins download page. An OpenCPN patch is though available on the same Github release page. This wiki is therefor still mainly valid for plugin version 2.1.

BASIC OPERATION
HARDWARE INSTALLATION
SOFTWARE REQUIREMENTS

Links

- Binary releases: https://github.com/canboat/BR24radar_pi/releases[265]
- Binary releases: OpenCPN Download Navico Radar Plugin[266]
- Source Github BR24radar_pi[267]
- Wiki(not up to date):BR24radar Wiki[268]
- Manual: BR24radar Manual[269]
- Source: Github Repository- Beta Navionics/Halo/Garmin/GarminHx Radars[270]
- Forum: Navico Radar Plugin v3.0 Released[271]
- Forum: OpenCPN Radar overlay plugin[272]

The plugin can be operated as the only control station for your scanner, as it allows access to all setup operations such as antenna direction correction and antenna height, as well as cooperate in a multi-station setup – whether multiple OpenCPN installations or one or more Navico MFDs/plotters. In fact using a mixed setup is what 2 out of 3 developers use, and recommend (our laptops and tablets don't work nearly as well outside as the dedicated plotters.)

With the 4G model it supports dual range (“two radar”) mode, where both radars can be operated individually (transmit state, gain & other settings, guard zones, etc.) Compared to the plotters the only functionality missing is MARPA but it has better _target trails_ support than the plotters and comparable _guard zone_ support. It supports two guard zones per radar

as well as two _Electronic Bearing Lines_ (EBL) and Variable Range Markers (VRM) per radar.

1. Hardware installation
2. Software Installation
3. Basic operation
4. Target trails
5. Cursor, EBL and VRM
6. Guard zones
7. Timed transmit

Credits

The plugin was initially developed by Dave Cowell who took Dave Register's Garmin plugin and modified it to work with the BR24. Over the years code was contributed by @Hakansv, @douwefokkema, @seandepagnier, @nohal, @chucksk, and @canboat.

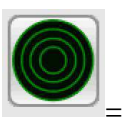
BASIC OPERATION

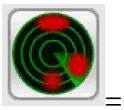
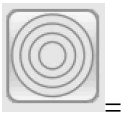
The toolbar button
The context menu
The main menu
Full main control menu when transmitting
Adjust menu
Advanced menu
Preferences
View menu
Guard Zone
Timed Transmit
EBL/VRM

HARDWARE INSTALLATION
SOFTWARE REQUIREMENTS
Installation trouble shooting
FAQ Frequently Asked Questions
Traditional Radar Plotting Methods

The toolbar button

The toolbar button shows the state of the radar:

 = Radar not detected  = Radar standby

 = Radar transmitting  = Radar windows hidden

The action taken when clicking the icon depends on the current state:

- When radar overlay is enabled but the control menu is not shown it shows the control menu.
- Otherwise it toggles the radar windows and overlay off (hidden) or on (shown).

Hiding all radar windows and overlay is useful if you are sailing into a highly complex situation where you want full view of the chart display and not have the distraction of radar windows and paints over your charts. The radar keeps its current settings (it keeps transmitting if this was on) until you un-hide (show) it again.

The context menu

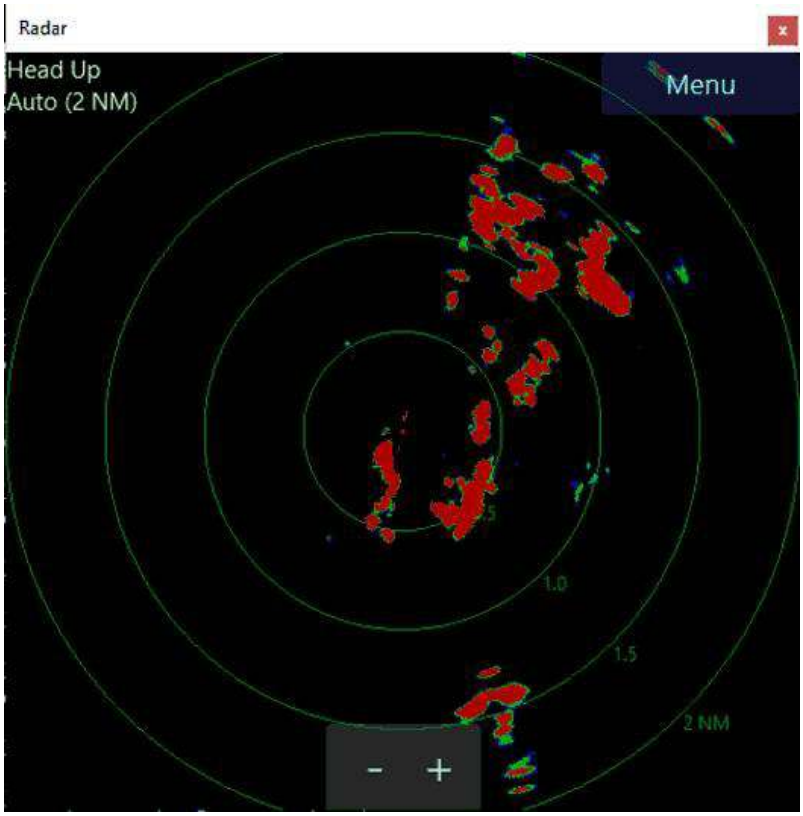
There are also two entries in the OpenCPN control menu for the radar plugin. The context menu is usually accessed by clicking the right mouse button on the chart window.

These are:

- Hide radar/Show radar
- Radar control

… Hide or Show radar should be self-explanatory. If chart overlay is enabled the *Radar control…* button will show the control menu for that radar only. If chart overlay is disabled it will show the control menu(s) for one or two radars.

The PPI window(s)



Either one or two classic radar displays, known as Position Plot Indicators (PPI) by professionals, can be shown. You can hide these if so desired (which makes sense only if you enabled the overlay over the chart). You can resize, move or dock them into the chart display. To close them you use the default OS button on the top of the window. To dock them, drag them to the side or bottom of the chart window and wait for a colored rectangle to be drawn over the chart.

The author likes to use two radar ranges with the windows docked on the right side of the display, one above the other. But just try it out to see what you like best.

The PPI window has a *Menu* button that accesses the control menu. If you moved the PPI window since the last time you accessed the control menu the menu will come up immediately above the Menu button on the PPI window.

The control menu

Every radar (again, in the case of a 4G you can have two) has its own *control menu*. If radar overlay is enabled and you have hidden the control menu of the radar assigned to radar overlay, press the toolbar icon to access the control menu. If all else fails you can access this using the context menu on the chart display (_Right mouse button > Radar control …_) The control menu only shows those options which are functional for the particular state of the radar, and has various sub-menus.

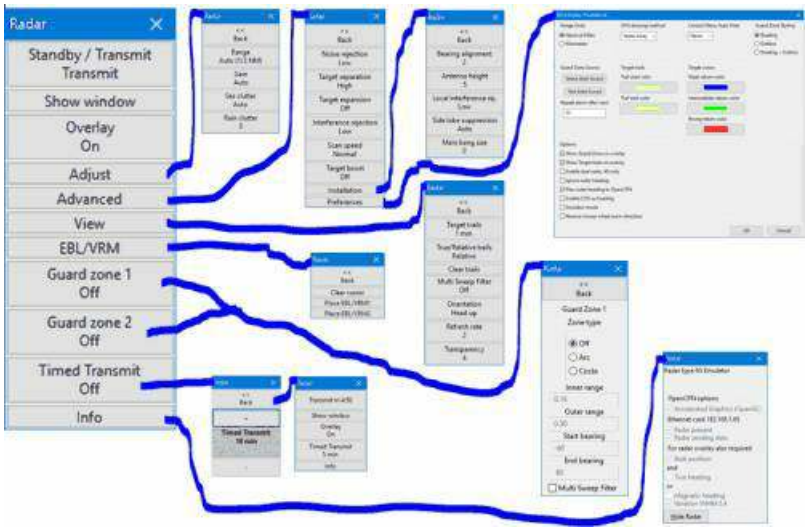
The main menu

When the radar is not transmitting the menu looks like this:

Button	Possible Values	Purpose
Standby/Transmit/Standby	Standby, Transmit	Toggle radar Transmit state
Show/Hide Window	Show window(s), Hide window(s), Show other window	Show or hide the PPI windows
Overlay	Off, On, Radar A, Radar B	Toggles radar overlay over chart
Timed Transmit	Off, mins	Chooses time that radar is in standby and then automatically transmits again
Info		Show information dialog

Full main control menu when transmitting

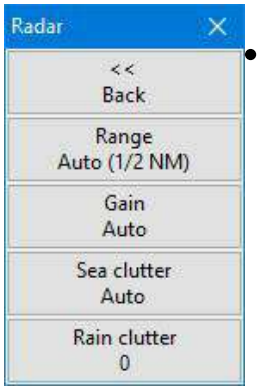
When the radar is transmitting the menu looks like this:
Most control menu text will change value according to actual status. Some are buttons for further settings. Click a button to change the menu for additional settings. The picture shows how each button calls for detailed menus.



Button	Possible Values	Purpose
Standby/Transmit	Standby, Transmit	Toggle radar Transmit state
Show Window	Show window(s), Hide window(s), Show other window	Show or hide the PPI window(s)
Overlay	Off, On, Radar A, Radar B	Toggles radar overlay over chart
Adjust	Adjust	Change menu to adjust range, gain and clutter
Advanced	Advanced	Change menu to advanced preferences
View	View	Change menu to adjust appearance preferences
EBL/VRM		Set/Reset EBM and WRM in PPI window(s)
Guard zone 1	Arc/Circle-On/Off	Change menu to adjust guard zone 1
Guard zone 2	Arc/Circle-On/Off	Change menu to adjust guard zone 2
Timed Transmit	Off / xx mins	Change menu to set timed transmit
Info and Enable		Show connection and other info

Adjust menu

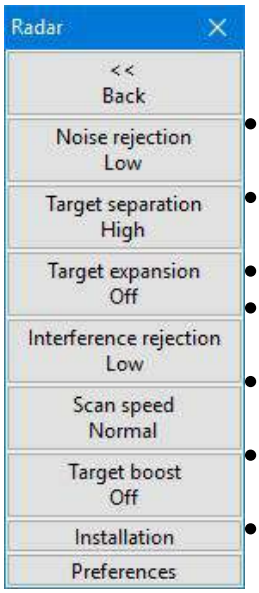
- **Back** Return to previous menu.
- **Range** Set Auto and the range is adjusted to cover the chart screen and will change according to OCPN zoom level. Or set a manual range.
- **Gain** Set Auto and the radar built-in method will adjust to “best” performance. Or adjust manually.
- **Sea clutter** Set Auto and the radar built-in method will adjust to “best” performance. Or



adjust manually.

- **Rain clutter** Adjust manually to a suitable level when needed. A zero value is for normal use. When heavy rain clutters the screen increase the value to best performance. A to high value may also filter out important targets.

Advanced menu



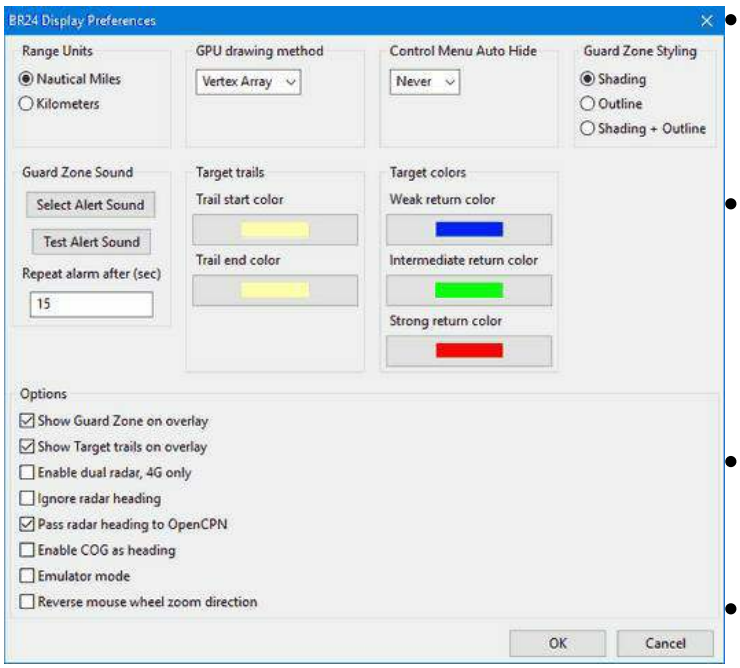
Most of these menu items are buttons opening an adjustment box where a click on “+” or “-” will adjust the value.

- **Noise rejection** Off-Low-High. Filter out noise what's not rain or sea clutter.
- **Target separation** Off-Low-Medium-High. Let the radar try to distinguish between targets
- **Target expansion** Off-On. Let the radar expand targets.
- **Interference rejection** Off-Low-Medium-High. Suppress interference from other broadband (close) radars.
- **Scan speed** Normal-Fast. Set the rotation speed of the radar scanner for example to follow high speed targets.
- **Target boost** Off-Low-High. Let the radar make targets bigger - more “blobs” for each echo.
- **Installation** Set installation preferences like heading offset and radar hight above water surface.
- **Preferences** While radar is transmitting the preferences menu can be reached here from the control menu. The other patch is from OCPN Tools > Options > Plugins > BR24 Radar > Preferences.

Preferences

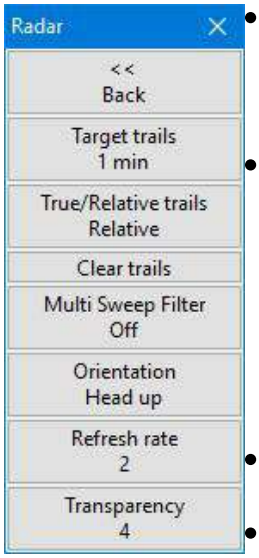
Options

- **Show Guard Zone on overlay**: When set guard zones are drawn over the charts. Otherwise only in the PPI window. Styled as of the upper right settings.
- **Show Target trails on overlay**: When set trails are drawn over the charts. Otherwise only in the PPI window. Fill colors as of the upper settings.
- **Enable Dual radars**: If a 4G radar type is connected two PPI windows can be shown. Each view will then get its own control menu.
- **Ignore radar heading**: In case a compass heading is connected to both OCPN and the radar this option sets which of them the plugin will use.



- **Pass radar heading to OpenCPN**: In the case the radar has a compass heading connected that signal will be passed from the plugin to OpenCPN if set.
- **Enable COG as heading**: In the case no compass heading is available the GPS course over ground, COG, can exceptionally be used. The radar view will often be misdirected and can lead to insecure misinterpretations.
- **Emulator mode**: A tool to test the function of the plugin. A dummy radar image will be shown. Many control menus are not functional.
- **Reverse mouse wheel zoom direction**: Reverse the wheel zoom function in the PPI window(s).

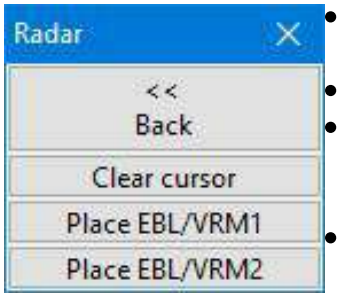
View menu



- **Target trails** Click to open an edit box to increase/decrease the trails length in time. Increase down to “Off” will switch trails off. The color of the trails can be set in preferences where also options for where to show trails, PPI/chart overlay, are present.
- **True/Relative trails** Click to toggle between True/Relative. True will obviously show trails from positions where the target has been. Relative will show target movements relative your own ship during the stated time; A target in front you at the same speed and heading will though get no trail. If you are running faster the trail will show a target moving towards yourself. Also static targets like marks and shore will get a trail since relative your ship they are moving opposite your heading. Try it! Sometimes it's very informative, sometimes disturbing.
- **Clear trails** Click the button to immediately clear all trails. If trails are not set to “Off” all trails will restart.
- **Multi sweep filter** Click the button to toggle between Off/On. When “On” a guard zone alarm will not be detected until several radar sweeps have seen a target at the same position. Can be useful where waves are high. But use it with care! The filter can also make small targets not alarming.
- **Orientation** Click the button to toggle between Head up/North up in the PPI window. For chart overlay OCPN's own settings are valid also for the radar picture.
- **Refresh rate** Click to open an edit box to increase/decrease the refresh rate. I high value will increase screen update time for the radar picture. Fast targets will be shown without interruptions. A high level will use significant more CPU. Two is default.
- **Transparency** Click to open an edit box to increase/decrease the radar overlay

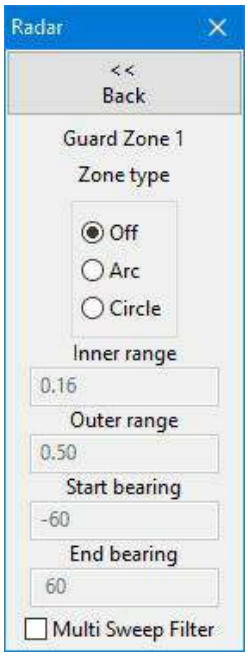
transparency. A low value will cover what's on the chart, a very high value is hardly visible. Five is default.

EBL/VRM



- To set EBLs in a PPI window you first click a cursor mark to point out an angle from centrum for the line.
- **Clear cursor** is used to clear any cursor mark in the window.
- **Place/Clear EBL/WRM 1** When this button is clicked a line will be drawn from centrum and trough your cursor mark. When drawn the button will change so you clear the line when desired.
- **Place/Clear EBL/WRM 2** Equal functions but for the second EBL/WRM. Before setting the second line you have to make a new cursor mark for the that line.

Guard zone



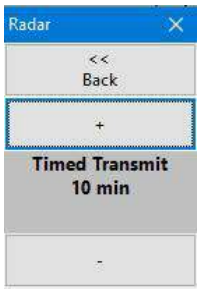
Guard zone 1 / 2 You can use two guard zone simultaneously and independent of each others. Guard zone menu 1 and 2 are used to set properties for each of them. Both menus are equal. Each zone is indicated on the chart overlay and/or in the PPI window. The style can be outlined and/or shaded. Once a guard alert is activated by a target inside a zone an alert box is shown and the alert sound will play. Zone style and sound to play are all set in Preferences.
Once a guard zone alert is active the alert box is shown. In the message box it's indicated which zone is alarming and the strength of the target echo. The alarm is sounding repeatably and a count down timer will indicate next alarm. The alarm sound can be silenced by the **Confirm** or **Close** buttons. The close button will also hide the alert box. Both confirm and close actions are valid for one target. If another target appears inside a zone but at another range and bearing as earlier confirmed a new alert will occur.

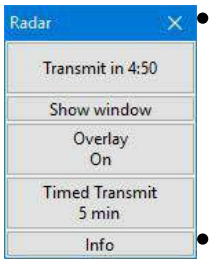
- **Zone type** The guard can be “Off” or on and shaped as an arc or a circle.
- **Inner range** Enter the distance from own ship where the zone shall start. Range units are set in Preferences.
- **Outer range** Enter the range from own ship where the zone shall end.
- **Start and End bearing** If the zone is set to a circle these settings are grayed out. For an

arc enter start and end bearings. Zero is own ships heading. Negative values can be used so one method to cover 40 degrees on each side in front of the boat is to set start to -40 and end to 40. (Start at 320 and end at 40 will do as well.)

- **Multi sweep filter** Click to set the filter described in detail in View menu.

Timed transmit





- **Timed transmit** can be used to repeatably pause the radar transmission for a chosen time. Use the "+" / "-" buttons to change the time in five minutes steps. Decreasing to "Off" will deactivate the function. Guard zone(s) to monitor during transmit periods has to be set before the timed transmit function is activated.
- **Back** Once a time is set the function will initiate when the "back" button is clicked. The function will start with a transmit cycle.
- **Function** While Timed Transmit is pausing the control menu will inform it's status. The count down timer show remaining time till transmission. Expired timer will start the radar for two minutes and then return to a new pause. During transmit a count down timer indicates remaining time to next pause.
- **Timed transmit reset** The timed function will reset if:
  - A guard zone alert is detected during the transmit period.
  - A user mouse click on either the timer count down button or
  - A click on the Timed transmit button and decrease the timer value to "Off".

Advanced: To change default transmit time after the pause change "BR24Radar/RunTimeOnIdle=120" in OpenCPN

Fix Me! This is trying to make a new page I think it is not going anywhere. [[#configuration_file|configuration file.]]

HARDWARE INSTALLATION

RI10/11
Shared setup with a Navico MFD
Installation_with_only_a_Scanner
Choosing an Ethernet switch
WiFi
Radar Interface (RI10) to Chartplotter
Radar Interface (RI10) to Radar Scanner

BASIC OPERATION
SOFTWARE REQUIREMENTS

The Navico radars are very easy to use with OpenCPN. All you need is a wired Ethernet connection.

Read your Navico/Simrad/Lowrance BR24/3G/4G installation manual for schematic pictures corresponding to below descriptions. Also power connections and patch cable pin outs, when needed, are well described in the manuals.

You can add as many computers as desired, the system will allow operation from all connected MFDs (plotters) and computers.

RI10/11

In all installation packages (except Lowrance 3G USA) the scanner also ships with a small black box – either a RI10 with NMEA 2000 input or a RI11 with NMEA 0183. It uses the data from the heading sensor on the NMEA network to add this to the radar data.

- The Navico plotters require heading input to the RI-10/11 for MARPA operation.
- The plugin uses this heading as the “best” source of heading for radar overlay.

This box also helps isolating the system electrically, and will improve protection of the computer from damage in case of electrical storms (lightning.)

Shared setup with a Navico MFD

If you already have a Navico MFD installed the installation consists of:

- Installing an Ethernet switch, or a WiFi router with a built in Ethernet switch. You need a wired port for each device – the radar, the MFD(s) and the computer running OpenCPN.
- Connect all devices to the switch.

In all cases you will need at least one RJ45 to Navico radar connector cable. The cheapest solution is to cut Navico Ethernet cables with two yellow connectors at both ends, and crimp a RJ45 connector onto both halves. Or get a standard Ethernet patch cable. So for the most common case where you have a single MFD connected to a radar scanner:

- Cut the Ethernet cable between MFD and scanner and crimp on two RJ45 connectors.
- OR - Get another Ethernet patch cable, preferable shielded, STP. (Cat5 or Cat6 will both work.)
- Insert these into a switch.
- Connect the computer to the switch as well.

Alternative to cutting into the Radar Ethernet Cable, see wifi below.

Installation with only a scanner.

If your scanner came with a RI10:

- Cut the supplied Navico ethernet cable in half or get another Ethernet patch cable as of above paragraph.

- Crimp on a RJ45 connector.
- Insert the RJ45 connector into the computer's Ethernet port or a standard Ethernet switch and the other side into the RI10.

Install the scanner as detailed in the Navico installation instructions. *The same instruction also contains RJ45 cable pin out scheme.*

If you bought a USA Lowrance 3G scanner:

- Insert the RJ45 connector from the radar scanner into a standard 100 Mbit switch. _or_
- Cut the supplied Navico conversion cable that has a RJ45 female connector and a yellow Navico connector in half, and replace the yellow connector with a RJ45 connector.

We recommend *always using a 100 Mbit switch in this setup* to provide some electrical isolation between the scanner and the computer. We don't know whether the connection between the radar and the RI10 uses the four other wires for some non-Ethernet purposes, so some damage may occur if you insert the radar cable directly into your computer.

Choosing an Ethernet switch

If you are going to use a switch you may as well use a Gigabit switch. The scanner has a 100 Mbit interface, but a Gigabit switch will use slightly less power than a 100 MBit switch. You should probably also use one that has a 12V input which can be powered directly from the 12V house battery (or a DC/DC converter if you have a 24 V house battery bank.)

The author uses a 5 port Netgear GS105 which according to Netgear: *Both GS105 and GS108 support the latest Energy E cient Ethernet (IEEE 802.3az) standard, which reduces energy consumption when there is light traffic on an active port or when there is no link or no activity detected. It can further save energy when a short cable (<100m) is used. Energy savings lead directly to cost savings in operation.*

Note: make sure you get the _metal cased_ GS105/GS108 that uses 12 V input. There are now also other models with a plastic case that have a 5 V input, which requires an extra DC/DC converter.

WiFi

The _multicast_ transmission system used by the scanner means that transmission over WiFi must happen at the lowest rate that any device connected to the WiFi network is capable of. For 802.11b and g this rate is 1 Mbit/s. Since the radar data is ~ 1 Mbit/s as well this means it does not work well at all. The solution is to either:

- Modify the base rate to be higher. This reduces the maximum range of your WiFi network for all devices.
- Get a faster WiFi network, for example 802.11a or 802.1ac (5 GHz). This has a much faster base rate (6 Mbit/s). Unfortunately, most WiFi routers do not allow you to change the base rate. If yours is Linux based and uses 'hostapd' you can edit the following section in 'hostapd.conf'. The example disables basic rates 10 and 20 (= 1 and 2 Mbit/s):

 # Basic rate set configuration

 # List of rates (in 100 kbps) that are included in the basic rate set.
 # If this item is not included, usually reasonable default set is used.
#basic_rates=10 20
#basic_rates=10 20 55 110
#basic_rates=55 110
#basic_rates=60 120 240

B&G or Simrad Go-Free Wifi

One alternative to cutting into the Ethernet Cable See Cruiser Forum Post by EJS in Navico Radar Thread[273] He enabled multicast and made sure he had no slow devices affecting the data stream.

- I am using a GoFree WiFi to transmit halo radar data to a PC running openCPN quite successfully. It has not been slow at all (No missing radar spokes with both ranges running) after I enabled the multicast mode in the GoFree router. Based on the info in the advanced set-up guide from Simrad, multicast is disabled by default to keep the radar data from clogging the GoFree bandwidth in case you have many devices using the router. Since the radar data is really what I want, I enabled multicast and the radar data passes through at high speed. I have also made sure there are no slow WiFi devices on the net as the router defaults to the slowest transmission rate of any connected device.

- My GoFree is hardwired to the radar control box, and hardwired to the chart plotter, but is wireless to the OpenCPN PC (Windows 10, 802.11N) The usual connection is to hardwire directly from the radar box to the chartplotter, but the GoFree passes the traffic correctly (as it should) I can control the radar from either the PC or the chartplotter. The display changes on both displays when I make a change on either one. I see no reason the set-up shouldn't work with the other Simrad radars and other Wifi Routers as long as multicast can be enabled.

For additional IP connection help see: Radar Debugging

Radar Interface (RI10) to Chartplotter

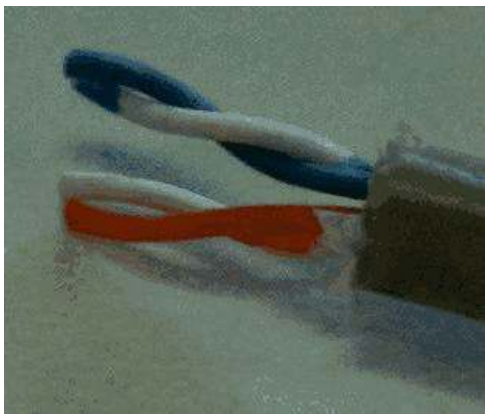
Cables and RJ45 Ethernet Pinouts

This Ethernet cable runs from the RI10 Radar Interface to the back of the Chartplotter. This cable is cut and wired with new RJ45 Connectors for a Ethernet Switch or Wifi Router.

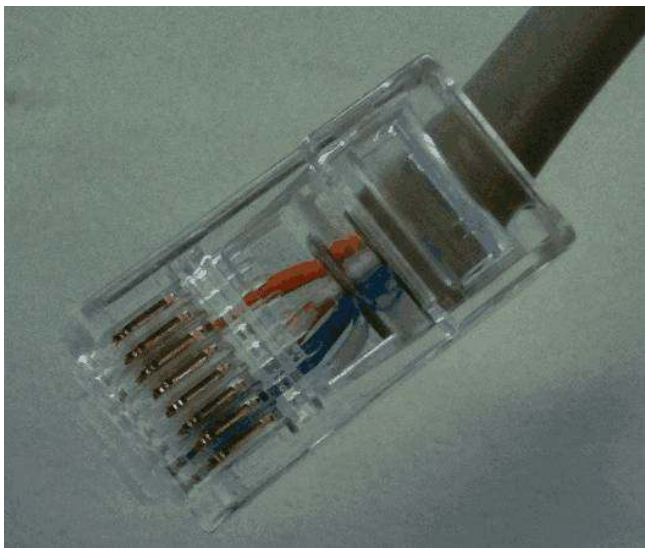
Normally you may use either T568A or T568B pinout[274]

and http://pinouts.ru/NetworkCables/Ethernet10BaseTStraightThru_pinout.shtml[275]

The RJ45 has 8 pins, but for normal use is 4 enough. Simrad has 4 wires: Blue, blue/white, orange, orange/white. Hakan has advised to use the T568B connection.



B&G Typical 4 Wire Cable



B&G Typical RJ45 Connection of the 4 Ethernet Wires

It is actually neither T568A or T568B standard. With the clip pointed away & the main wire coming from the right. Pin numbering in accord with the T568 documentation. **You should check your RJ45 connector wiring carefully.**

```
  Not Used ------ Pin 8  |
Not Used ------ Pin 7  |
Orange -------- Pin 6  |
Not Used ------ Pin 5  |========== Main Cable
Not Used ------ Pin 4  |
OrangeWhite --- Pin 3  |
Blue ---------- Pin 2  |
BlueWhite ----- Pin 1  |
```

T568 Standard Connections

See the T568B connection[276]

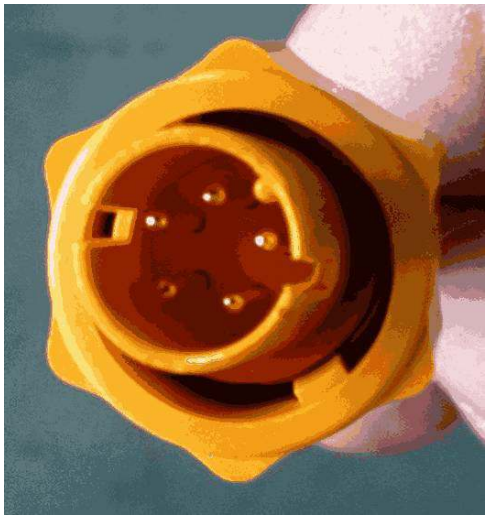
See the T568A Connection[277]

B&G Typical Ethernet Cabling Chart with numbers.

Ethernet cables

Part Number	Description
000-0127-56	Adapter cable: Ethernet Yellow male to RJ45 female 2 m (6.5 ft)
000-0127-51	Ethernet cable yellow 5 Pin 2 m (6.5 ft)
000-0127-29	Ethernet cable yellow 5 Pin 4.5 m (15 ft)
000-0127-30	Ethernet cable yellow 5 Pin 7.7 m (25 ft)
000-0127-37	Ethernet cable yellow 5 Pin 15.2 m (50 ft)

With these Typical Round 5 Pin Male Cable Ends

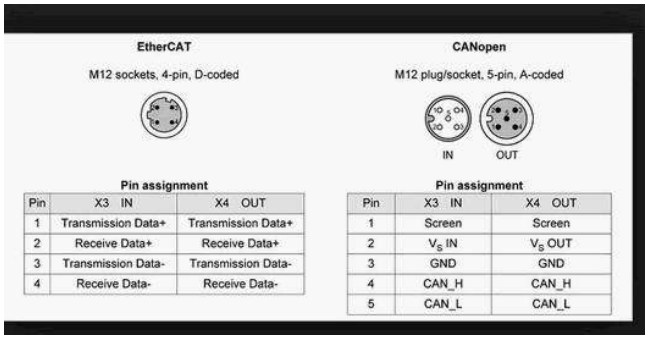


B&G 000-0127-51 Ethernet cable 6.5' (various lengths are available) with two Round 5-pin Male Cable Ends. **This Ethernet cable runs from the RI10 Radar Interface to the back of the Chartplotter.** This is cut and wired with new RJ45 Connectors for a Ethernet Switch or Wifi Router.

B&G 000-0127-56 Ethernet Round 5-Pin Male to RJ45 Cable -Instead of cutting the cable.

B&G GoFree Wifi Female Ethernet Connectors (B&G Chartplotters with Nmea2000 use same connectors)

Comparison of B&G EtherCAN and Canbus



EtherCAT

M12 sockets, 4-pin, D-coded

Pin assignment

Pin	X3 IN	X4 OUT
1	Transmission Data+	Transmission Data+
2	Receive Data+	Receive Data+
3	Transmission Data-	Transmission Data-
4	Receive Data-	Receive Data-

CANopen

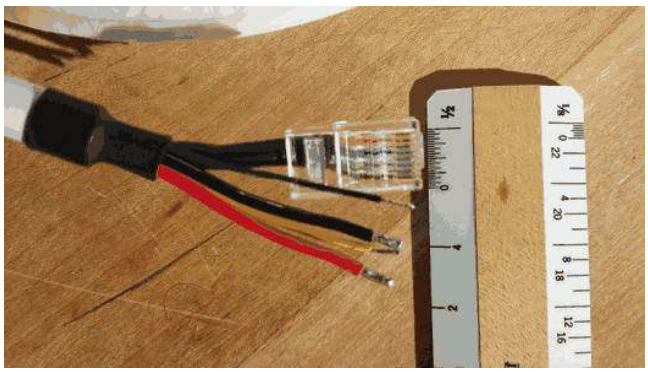
M12 plug/socket, 5-pin, A-coded

IN OUT

Pin assignment

Pin	X3 IN	X4 OUT
1	Screen	Screen
2	V_S IN	V_S OUT
3	GND	GND
4	CAN_H	CAN_H
5	CAN_L	CAN_L

Radar Interface (RI10) to Radar Scanner



B&G Broadband Radar 3G / 4G Install Guide[278]

B&G RJ45 Ethernet Connection (See above) Note that this connection uses all 8 Wires but we do not know which T568 Standard! You will have to inspect your Radar Cable's ethernet connector to determine the pin outs. Also refer to page 12 & 13 of the Radar Installation

```
 8 Brown -------|
7 White/Brown -|
6 Green -------|
5 White/Blue --| ============= Ethernet wire
4 Blue --------|
3 White/Green--|
2 Orange-------|
1 White/Orange-|
```

Then there are additional wires exclusive of the Ethernet RJ45 connection.

- Thin Black = Shield
- Heavier Black = Neutral
- Thin Yellow = Turns on and off Radar
- Heavier Red = Positive Power

If you need to cut the Radar Cable for some reason, for example to remove it in the winter, you can fashion a watertight box with a 4 wire strip connector and (2)RJ45's with a straight RJ45 Connector. You will also need to determine how you want to turn on the Radar, via the yellow wire (from the Chartplotter or independently or when the Radar has power? There are instructions in the manual.) Also there are Amphenol MRJ Rugged RJ45 Connectors[279] available with matching terminals.

The scanner interconnection Diagram and pinouts are on page 34, but you are unlikely to need them.

SOFTWARE REQUIREMENTS

Network Setup
Installing the plugin
Enabling the plugin

BASIC OPERATION
HARDWARE INSTALLATION
Trouble shooting if below not works

The plugin requires the following software requirements:

- OpenCPN 4.2 or higher installed. Generally the latest production release is recommended, at the time of writing this is OpenCPN 4.4.
- Firewall disabled or with exceptions enabled for opencpn.exe.
- OpenGL mode enabled in OpenCPN. The frequent screen updates produced by a radar make traditional window calls impractical.

Network setup

The scanner and the displays communicate using a system called _multicast_. This has the advantage that the data only needs to be sent once, and is received by all displays. Uniquely, it also means that there is no issue with Ethernet addresses. _Any ethernet address is acceptable._ A disadvantage is that it can be hard to setup a firewall rule as you don't just “open” a particular port. The simplest solution is to allow `opencpn.exe` full access to the network for both receive and transmit.

Installing the plugin

Download the latest production version and run the installation package.

- Microsoft Windows and macOS releases are available from the [release page on this site](https://github.com/canboat/BR24radar_pi/releases[280]).
- Linux (apt): see the [standard instructions](http://opencpn.org/ocpn/download[281]) for installing OpenCPN on Linux. The plugin package name is 'opencpn-plugin-br24radar'.

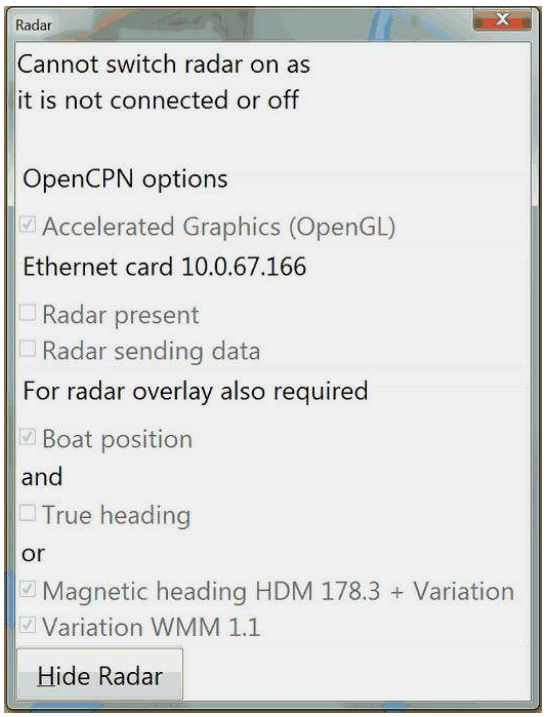
Enabling the plugin

- Start OpenCPN
- Go to Options > Plugins > BR24radar. Click **Enable**.
- Close the options dialog. You now have a new icon in the toolbar.

If the radar has not been detected yet it will show as:

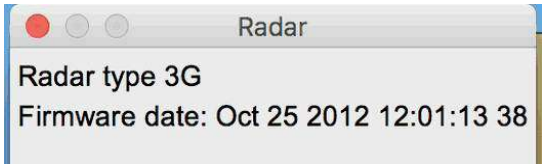
and if the radar has been detected it will show:

There is also an information window that shows whether the scanner has been detected, and whether there is a valid heading input:



If a condition is not satisfied this dialog will open automatically. You can also open it using the control menu (see next page.) As you can see the Info dialog shows whether you have OpenGL mode enabled.

It also shows whether radar presence has been detected, and its IP address. Until it has it will cycle through all Ethernet cards at the rate of one card every two seconds. In the image above the scanner has not been seen yet and it is listening on the card with IP address 10.0.67.166.



In the above image the radar type and firmware release date are shown, this shows that the radar has been detected successfully.

For **North Up** display and radar overlay you must have a heading sensor attached, either via the RI10/11 (preferred) or via NMEA0183 input to OpenCPN directly. If you use a magnetic sensor the variation is also required, but that is easy to do by enabling the WMM plugin.

For radar overlay you must have a boat position via GNSS input to OpenCPN. The most common is a GPS sensor sending NMEA0183 data.

By customer demand it has been made possible to use Course Over Ground as the heading input, but we think this is such a bad idea that we have not enabled it by default. Go to the __Options > Plugins > BR24radar > Preferences page to enable it. Please don't enable it and then complain that the overlay is out when you are going slowly or are docked.

Traditional Radar

Traditional Radar Plotting Methods

How to use PIL Good Parallel Index Line Video link[282]

How to plot for Collision Avoidance Collision Avoidance Plotting Part1 of 3 Video Link[283]

FAQ Radar

Which Radars work with Opencpn? What is best?

The following radar scanners are supported by plugins for OCPN version 4.8.4:

- Garmin HD
- Garmin xHD
- Navico BR24 (All Navico are also sold as: Lowrance, Simrad, B&G)
- Navico 3G
- Navico 4G

For direct download to OCPN 4.8.4 see:
https://opencpn.org/OpenCPN/info/downloadplugins.html[284] And for wikis:
https://opencpn.org/wiki/dokuwiki/doku.php?
id=opencpn:opencpn_user_manual:plugins:ais_radar[285]

There's ongoing development for a new radar plugin combining more types into one plugin; called radar_pi. This plugin can so far be used for all listed above except Garmin HD. Navico Halo is also supported but not thoroughly tested. (As far as is known)

Found here: Radar_pi[286]

and can be built for both O 4.8.4 and O 4.99.0(Alfa for O 5.0 beta)

What type and maker is the best is of course up to each and everyone. I'm using radar_pi and Navico 3G and find it very good. Not less with the (M)ARPA function. The difference between 3G and 4G was not enough for the prize difference for me and the 20 NM range is good enough. Many opinions and configurations.

Another user has Navico 3G plugs straight into network port and working flawlessly with OCPN. If you choose this option depending on the “Branding” Lowrance, B&G, Simrad some are shipped with interface boxes and or interface cables. You do not need any of these if your intention is to connect directly to a PC running OCPN. Knowing this may save you some money.

The 3G radar plugin doesn't seem to work.

- Setup: Radar ⇐= ethernet =⇒ Netgear FS105 Switch ⇐= ethernet =⇒ windows 10 laptop
- Message: “Cannot switch radar on as it is either not connected or is not off.”
- Suggestion: ENABLE OpenGL is required.
- [] Accelerated Graphics (OpenGL) [must be checked!]

How can I connect the Radar's Ethernet to my USB port?

- See the plugin documentation and
- See thread[287]

How are AIS and Marpa Calculated?

The plugin calculates AIS and Marpa completely autonomously.

1. AIS uses SOG, COG & GPS.
2. Marpa uses GPS location + time for own boat position. Heading for own boat heading in order to rotate the radar image relative to the boat. From this it computes relative distance and heading to a target and from that the true direction and position of all targets. The results are true speed and course of the target.
3. All calculations are in a message including position, course, speed, a ID number and target status(Acquiring/Active/Lost) transferred to OCPN as a $RATTM message. In OCPN this is evaluated by the AIS_Decoder function to a ARPA symbol.

=== I would like to have a better understanding how Marpa works with with collision avoidance, when the BR24_pi plugin only uuses/displays SOG and COG, when course through water or relative vector, is needed to calculate CPA and TCPA based on movements relative together, not on ground based movements. —

1. ARPA target movements are calculated based on the differences in GPS target locations over the various sweeps (spokes) of the radar.

This results in true target positions and speed.

1. OpenCPN handles these as AIS targets and calculates CPA and TCPA.
2. From CPA and TCPA the skipper knows if there is a danger or not.
3. When action is needed to avoid the danger he has to rely on relative observations of the danger to decide on what to do. For this he can use the relative radar picture with relative trails. He does not need to know speed through water as he already knows that there is a dangerous situation.
4. Using the relative picture he has to decide on the action to take. Once he has taken an action, he can use the new CPA and TCPA to judge if the action was sufficiently effective.
5. But on top of this, a radar image with trails relative to the water movement would help of course in the decision making. We don't have these (yet).

I thought that the option "Show relative target trails" will show the movements relative to me? So i´ll get the Information about the relative movement on the chartoverlay too (as target trail).

1. Yes. Relative trails will show you the movement of targets relative to you.
2. Relative trails are better shown and interpreted in the PPI (radar only) window.
3. It seems not logical to show relative trails on the chart overlay, which maps relative trails of a target on a true position and shows where the target has never been. We are now considering changing “Show relative trails to “Show True Trails” for the Chart Overlay, so that the target has indeed been in every location of the trail.

Should the Heading source connected via the Interface box or just connect it directly with the Ethernet RJ45 connection on the Opencpn computer? Which is better?

- Doesn't matter much. Both way are used. And the course update frequency is not that

crucial for normal sailing speed. I use my compass unit to feed OCPN at 1 Hz. Others are using a faster transfer via Navico I-box.
- Send heading to the radar via the interface box so that heading is available in each spoke

correctly synchronised with when the radar generated the image. In practice the difference isn't that big.

- Tupia reports, My radar is plugged directly into the RJ45 port on the computer and it has not had any problems. Uses the heading from fluxgate compass over NMEA. When setting up you need to accurately determine the offset angle while the boat is completely stationary and you have multiple identifiable targets.

Can we test the marpa function here in the garden at home? (no marine traffic). Have just tested the normal radar functions.

- You can set a MARPA on a stationary target for test. Set a guard zone where just one or two blobs are present and check “ARPA On” or right click near a blob and “Acquire ARPA target”.

Debugging

Navico Broadband Radar Debugging

What to do if it does not work

Of course you updated to the newest version first?
Recent versions show this message dialog if not all conditions to show a radar image are met:

No boat position

Check your GPS interface and/or NMEA inputs.

No heading

No compass data found. Check the NMEA inputs for HDT, HDM or HDG sentences. HDT is preferred. If none are available COG is used if the boat is travelling, but this is very bad for the overlay. Get a compass!

No radar present

Is the system connected to the radar, either directly or via switch? Does the IP address of the network device show up in the “ZeroConf” line?

If the radar does not transmit radar data but it is detected then the “Radar present” line will get a checkmark and the text will change to “Radar IP <ip-addr>”. Check that this is the correct IP address. If the system does not show the IP address of the ethernet device that is on the same network as your radar, check your ethernet configuration.

If the radar transmits data the dialog will change to the controls dialog, but the log file will still show the information such as IP address.

Everything looks OK but still no picture

If you get the normal radar control dialog and the little 'light' in the radar button shows green, but you still do not get a picture, you can use the radar *emulator*.

The emulator was created for debugging during development, but it can be used to check that your OpenGL driver is compatible and whether your system performs well enough. It uses (almost) the same code path as the normal UDP reception of radar data, but 'invents' an artificial radar image in 'standalone' mode.

In the preferences dialog (*Options* > *Plugins* > *BR24Radar* > *Preferences*) choose *Display Option* for *Radar display* as *Emulator* and close the preferences and options dialogs. You should now see a picture like this, even if you have fulfilled none of the overlay requirements:

Firewall

Most issues so far that we have been asked to look in to were related to a *firewall* preventing the plugin to access the network at will, especially for Microsoft Windows users. Please try again with your firewall switched off completely. If it works without the firewall, just add a rule in the firewall that allows *opencpn.exe* full access. Most consumer grade firewalls do not allow sufficient control over multicast settings.

Multiple ethernet devices

The Navico radar continuously sends out its status, and it tries to locate such a message. Since the plugin doesn't know which ethernet device it should use it loops over the list of active devices until it receives such a status message, and then uses that device until it looses the connection, at which point it starts searching again.

This algorithm has been developed for the situation where a radar may be on one ethernet device (a USB Ethernet dongle) one moment and a different ethernet device (a Thunderbolt Ethernet converter attached to a docking station) the next moment. This is useful as it allows you to keep OpenCPN running for days at a time without restarting, and it will still be able to use the radar when the tablet is docked or wired to the network, without stopping OpenCPN when using the tablet in a wireless fashion.

Although the software tries to detect automatically which ethernet device the radar is using there are still situations where this breaks. In particular this will matter most when the OS requires the plugin to set the proper IP address on the multicast output data and the plugin chooses the wrong IP address. This will surface as a situation where the radar is detected but it cannot be turned on.

The following situations are examples of such setups:

- When you have a bridged network over two devices and it accidentally binds to one of the underlying devices (which, because of Murphy, will be the wrong one). This should only occur when the underlying device has an IPv4 address which (because it is bridged) it should not have. The plugin should use the bridge device only.
- When you have a virtual ethernet device that passes the multicast data from the radar on to the plugin but does not pass multicast send data from the plugin to the radar.
- When you have both a wired and a wireless network connected to the radar network.

To see if this is the case please check the list of ethernet devices using ipconfig / ifconfig (command line) or GUI control panel (MS Win), network manager (Linux) / System preferences (OS X). Disable all devices except for the one that the radar is connected to. If it works now, enable the other devices one by one and restart OpenCPN after each attempt. Once you locate the network that is interfering, determine whether it has a correct IPv4 address. It should be on a different network as that of the ethernet device where the radar is connected to.

Note that devices that have *no* IPv4 address (not even a self-assigned one) or have a *loopback* address (starts with 127) will never interfere and do not need to be disabled.

Verbose logging to file

Use the following to increase the amount of logging to the opencpn.log file:

1. Click on the question mark in the button bar and note where the ini file (and log file) are kept.
2. Stop OpenCPN.
3. Edit the ini file and change the *VerboseLog* in the [Plugins/BR24radar] section to a number higher than 0. Values from 1 to 4 are different. At level 4 your file will grow very quickly!
4. Start OpenCPN.
5. Start the radar (or attempt to do so.)
6. Stop OpenCPN.
7. Check the content of the logfile. You may also be asked to upload this file to a location that it can be examined.

⇒Back to BR24 Hardware installation

Rtlsdr USB

For AIS vhf and more on tv tuner usb dongle

Use a low cost USB DVB-T (Digital TV) receiver for AIS messages from Ships. Various dongles are supported, the r820-t works the best and is also the cheapest (typically $8 US)

Links

- Sources: Github Repository[288]
- Download: Website Download[289]
- Forum: Rtlsdr Plugin[290]

Notes for Mac RTLSDR

https://github.com/nohal/OpenCPN/wiki/RTL-SDR-AIS-on-macOS[291]

Hardware Setup:

You must use a proper vhf antenna, not the one included with the dongle. I cut the antenna coax included with the dongle, and spliced it to the vhf coax. You must solder both inner and outer (shield) connections.

Software Setup:

Linux

You must now compile rtl-sdr from source:

```
git clone git://git.osmocom.org/rtl-sdr.git
mkdir build
cd build
cmake ..
sudo make install
```

Next, you must have either aisdecoder or gnuradio (with gr-ais).

For aisdecoder:

```
wget
http://www.aishub.net/downloads/
aisdecoder
.
tar
.
gz tar zxvf aisdecoder.tar.gz
cd aisdecoder
mkdir build
cd build
cmake ..
sudo make install
```

For gnuradio with gr-ais: <not completed>

Windows

You must run the program zadig to install the driver available here http://zadig.akeo.ie/[292] The default settings should be fine.

The receiver program (rtl_fm) and decoder (aisdecoder) are included as pre-built binaries, so from here, install the plugin setup package. So far I have no pre-built packages for gnuradio on windows, but this would be useful if provided. If there are issues it may be helpful to install the sdrsharp program to determine if the dongle is receiving data at all.

All Platforms

It should be possible (from the preferences dialog) to calibrate the dongle with the Auto Calibrate button:

From what I can tell so far, the error correction range is +- 128 (my two dongles use values of 35 and 50) and must be within 5 for aisdecoder and 15-20 for gnuradio. When the value is more accurate, more ais messages are received as well.

From here, install the plugin package, or build from source and install. This works best in an area with a lot of ais traffic. Once calibrated, ships should appear on the chart.

Links

Software Defined Radio by Tom Dove[293]

RTL-SDR Tutorial Cheap AIS Ship Tracking[294]

dAISy AIS Reciever Alternative[295]

Charts

Chart Downloader (Plugin Included in Program download)
Download, install and keep up to date the navigational charts provided by various free governmental sources worldwide directly from within OpenCPN's Toolbox. Supports both the raster and vector charts for the US waters provided by the NOAA, official raster navigational charts published by Argentina, Brasil and New Zealand (covering also huge areas of the Pacific ocean) as well as electronic charts of the inland waterways of the USA and more than a dozen European Union countries.

S63 Vector Charts (O Charts)
A plugin that makes it possible to display standard commercial charts.
This plugin has a totally different display format and is integrated in the main program.
See O-Charts[296] S-63 Vector charts for OpenCPN which has a link to VAR Chartworld for ENC charts.[297]

oeSENC Charts (O Charts)
A Plugin for Vector charts licensed from official bodies for OpenCPN, especially for users in Europe, but noot limited to. This is an encrypted format with its own plug-in, the oeSENC plug-in. Special and exclusive for OCPN Derived from S-57, but already in an easy to digest format for OCPN (ocpn encrypted SENC). These charts are distributed through O-Charts[298] at very competitive prices for vector charts of this quality. Germany, Belgium, the Netherlands, the British Isles, France, Iceland, Norway, Sweden, Crotia are available. Other destinations like Italy, Denmark or Australia will follow.

Fugawi Charts
Fugawi.com[299] is a portal offering raster charts from different editors in a common uniform format.
Chart sets from sources like for example NV, Delius-Klasing, Solteknik, BlueLatitude or Explorer Charts and others are found here under one roof.
The FugawiChart-PlugIn gives access to these charts.

NV Charts
The NVC charts are purchased only from the German publisher NV Verlag This plugin runs NVC Charts[300].

BSB4 Charts
A plugin which makes it possible to use MAPTEC encrypted BSB4 charts for which encryption certificates have been purchased and registered on the computer running OpenCPN.

vfKaps -VentureFather Satellite Kap Charts
A plugin which makes it easy to create google earth, bing and nokia kap files. In some areas of the world a satellite chart is more accurate than even the official chart. This plugin allows satellite charts from Google, Bing or Nokia to be downloaded via the VentureFarther server.

Interface Tools

RotationCtrl
Controls to rotate the charts in various ways. North up, South up, Course up, Heading up, Route up, Wind up, Tilt down, Tilt up. Rotate CCW, Rotate CW.

Chartscale
Slider to change the chartscale. Useful utility.

Object Search
Allows search of named objects on S-57 and CM93 vector charts.

Projections
Utility to project the charts in many alternative projections configured by the user. Right-click shows “Projections” with user selection for Mercator, Orthographic, Polar, Stereographic, Genomonic, ane Equirectangular. These projections may be useful for a more accurate interpretation of navigational data. Mercator is especially skewed at high lattitudes. Requires opengl.

Chart Sources

VisitMyHarbor[301]
Has charts for UK, Ireland, Near Contenant, Iberia. VisitmyHarbor[302]

Other Sources
See OpenCPN User Manual for other Chart Sources[303].

NV Charts

- This plugin on works for Windows. Nv Charts for all platforms is available through the Fugawi plugin.
- On your PC, the download and installation plugin can be made before or after the installation of the charts.

Links

Source: Github Repository NVC_pi[304]
Download: NVC_pi Download[305]
Forum:NVcharts Forum[306]
Website: NV_Verlag[307] or through Fugawi website

Get charts from NV-Verlag:

The NVC charts are purchased only from the German publisher NV Verlag.

- On this website: **NV_Verlag[308]**

- This website is multilingual. See at the top right on the homepage of the site the icons to change the language.

The charts in this editor ribs cover the following:

For Europe area :	**Other areas:**
North Sea	Caribbean
Baltic Sea	East USA coast
English Channel	
Atlantic Coast	
Balearic Islands	

- Editor's note:
  - In case of malfunction, particularly on Windows 8.1 and Windows 10, do not hesitate to contact NV-Verlag, using their website contact form.
  - Experience shows that this chart editor is responsive and helps resolve many problems.
  - The installation procedure of the charts is independent of OpenCPN
  - It is possible to install the charts on two different computers,
  - Free software charts display comes with charts. But it is “light” a product.

- Nautical charts are automatically installed in a specific folder proposed by the installer.

    - But it is possible to choose the installation folder of charts as you wish.
    - Other data, OpenCPN does not support, will install automatically in a prescribed folder.

- You can buy a “dongle” on which a facility is possible.
    - In this case, by moving the dongle, it is possible to use the charts on other computers.

Installation charts procedure:

- For installation you must:
    - have a CD-ROM, provided by the publisher, which contains:
        - the installation software
        - charts.
    - or having proceeded to download:
        - the installation software,
        - charts.

- If you have a dongle, install the dongle into a USB port on your PC
- Note Well:
    - This dongle does not appear in the list of equipment on the PC when using the Windows Explorer.
    - Since the dongle can be used on another PC, the location of the charts in your PC is not listed on the dongle. Therefore, the name of the folder where the charts are placed does not matter.
    - The charts will not be installed on the dongle.
    - One of the two work permits nautical charts will be listed on the dongle.

- If you do not have a dongle, one of two installation permissions will be written on your PC.
- In any case, it is best to have a good internet connection to complete the installation.
- In the absence of internet access, there is a special procedure for installing.

- Run the installation software,
- Follow the instructions that appear on the screen knowing that sometimes to be patient.

Download and install the plugin:

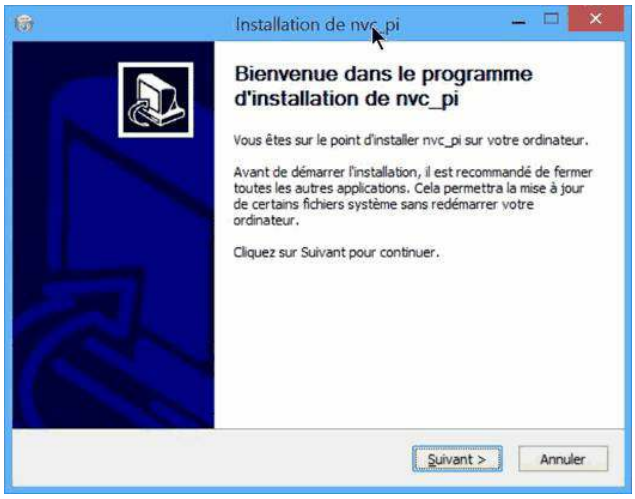
The latest version is available here:

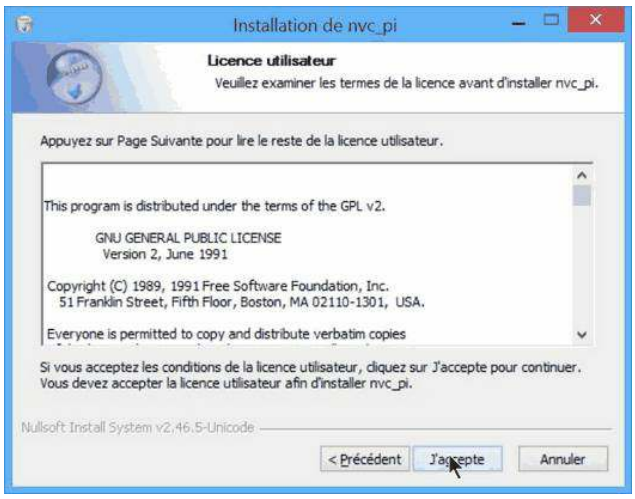
Download Plugin[309]

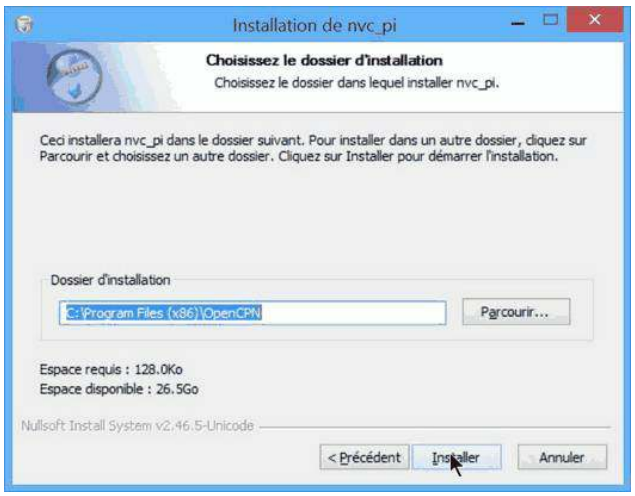
- Save the file to your PC.

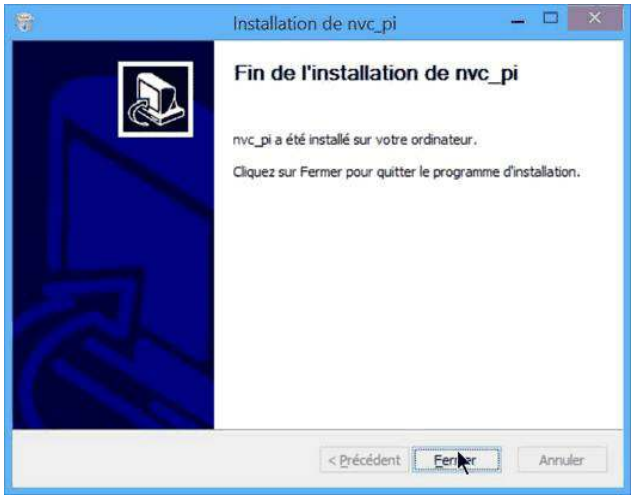
- This plug-in only works with windows
  - XP SP3/Vista/7/8.1/10

- After downloading the file, depending on the settings selected on your PC, click or double click it.
- For installation steps. Allow the installation to do.









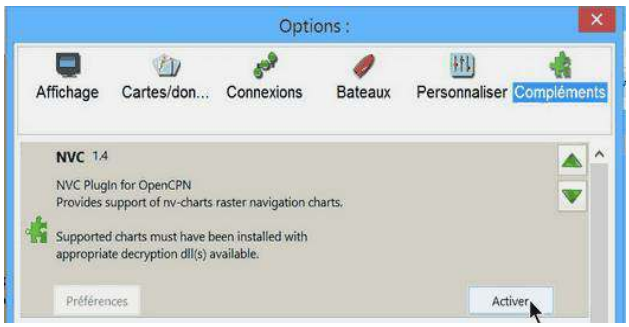
The installation will be done automatically in the “plugins” folder of the installation OpenCPN.

- Nota Bene :
  - Once the installation done, the executable file which was used to carry, can be deleted from the PC.

Activation / De-activation of the plugin:

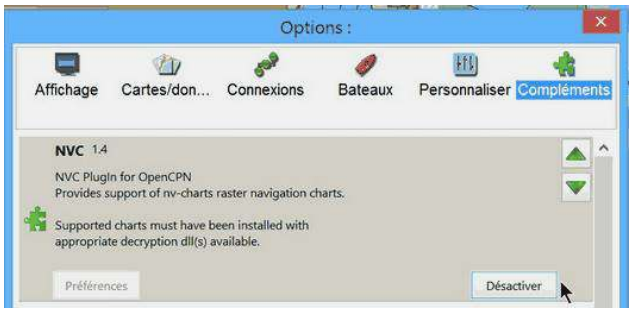
- After installing OpenCPN the icon bar at the top of the screen, has no additional icon.
  - Lack of visual information makes it impossible to know whether the plug-in “NVC-Chart” is on.

Activation :



- Commissioning Tool “NVC-Chart”:
  - Go to the “Toolbox”, “Plugins” tab,
  - Click the “NVC-Chart” icon,
  - Click the “Activate” button,
  - Confirm with “Ok” or “Apply”.

Deactivate:



Go to the “Toolbox”, “PluginsIns” tab,

- Click the “NVC-Chart” icon,
- Click the “De-activate” button,
- Confirm with “Ok” or “Apply”.

Manual:

- Cases where the charts were installed directly on the computer with the access code.
  - OpenCPN automatically recognizes their presence.
  - The operating procedure is the same as with other charts. Just declare the directory charts in the “Maps” tab of the “Toolbox”

- Cases where the charts were installed on the computer and where the access code is on a dongle.
  - You must insert the dongle into a USB port on the computer before launching OpenCPN.
  - After that, the operating procedure is similar to that of other charts. Just declare the directory charts in the “Charts” tab of the “Options”.
  - Each access to the charts, the dongle is red illuminated during the update of the database.

(see pictures below)

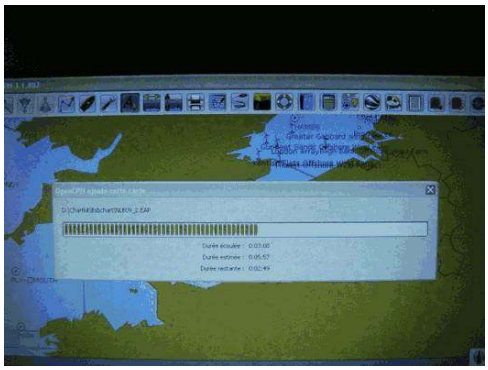
- If you use a dongle and if the dongle is removed, access to nautical charts is stoped.
  - It is useless to put the dongle to try to regain access to nautical charts.
  - We must restart the access procedure:
    - close OpenCPN
    - return the dongle
    - restart OpenCPN

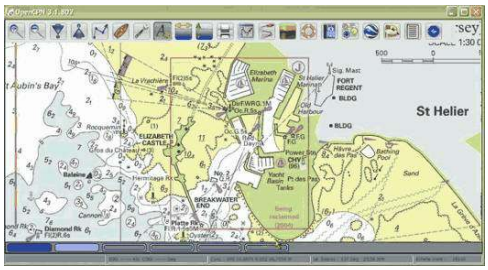
Retrieve Charts Previously Purchased.

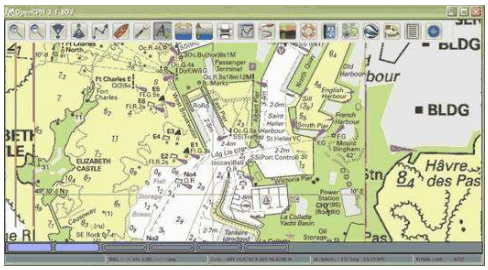
To retrieve the charts I purchased earlier NVcharts directed me to this website: NV-Chart Download[310]

There you can find the charts you purchased and you want to download by year of release. I found the Windward Islands kit but couldn't find the Leeward Islands kit.

Enter the charts you need to download and click on the download button. The charts will be downloaded as an exe file. Run the exe file and enter your serial numbers, name and email and then it will install the charts. They recommend saving them in C:Chartkit/BSB. That's where I installed and then pointed Opencpn to that subdirectory and everything works well.







S63 Vector Charts

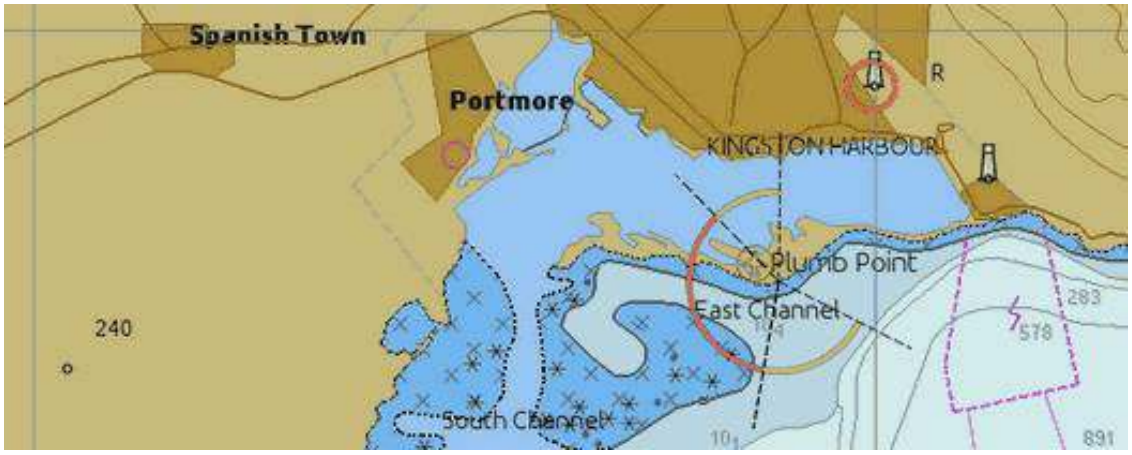


Chart showing Part of Jamaica, from the IHO S63 test suite.

Links

Source: Github Repository[311]
Website: S-63 O-charts.org[312]
Download: S63_pi Download[313]
Forum: S-63 Charts Plugin Released[314]

Goal

This Plugin supports use of S63 encrypted Charts and dramatically expands OpenCPN's range of charts available.
These charts are quite reasonably priced….S-63 is the encrypted distribution format for S-57 vector charts. Today, hydrographical offices all over the world are producing their official vector charts in the S-57 format. Distribution is done under the S-63 standard.

To use the encrypted charts, you must get a license for your particular machine (called Permit), make sure to visit

http://o-charts.org/[315]

for more information and to get the permits.

S63 is an encrypted version of S57 vector charts, and is the standard format for almost all, officially published, vector charts in today's world. As a matter of fact, only NOAA and the East Asia Hydrographic Commission (EAHC), publishes free unencrypted S57 charts nowadays.

These, S57 and S63 charts, are the current state of the art charts. The quality of the charts are the best vector charts available. They are always kept up to date. No other vector chart are in the same league.

There are, however also some drawbacks. Many popular cruising areas are very poorly covered as the focus is on the needs for commercial shipping. One example is he Bahamas area. Another problem is the relatively high price. When licensing consider the licensing period. Your charts will be available still after expiring just without weekly updates.

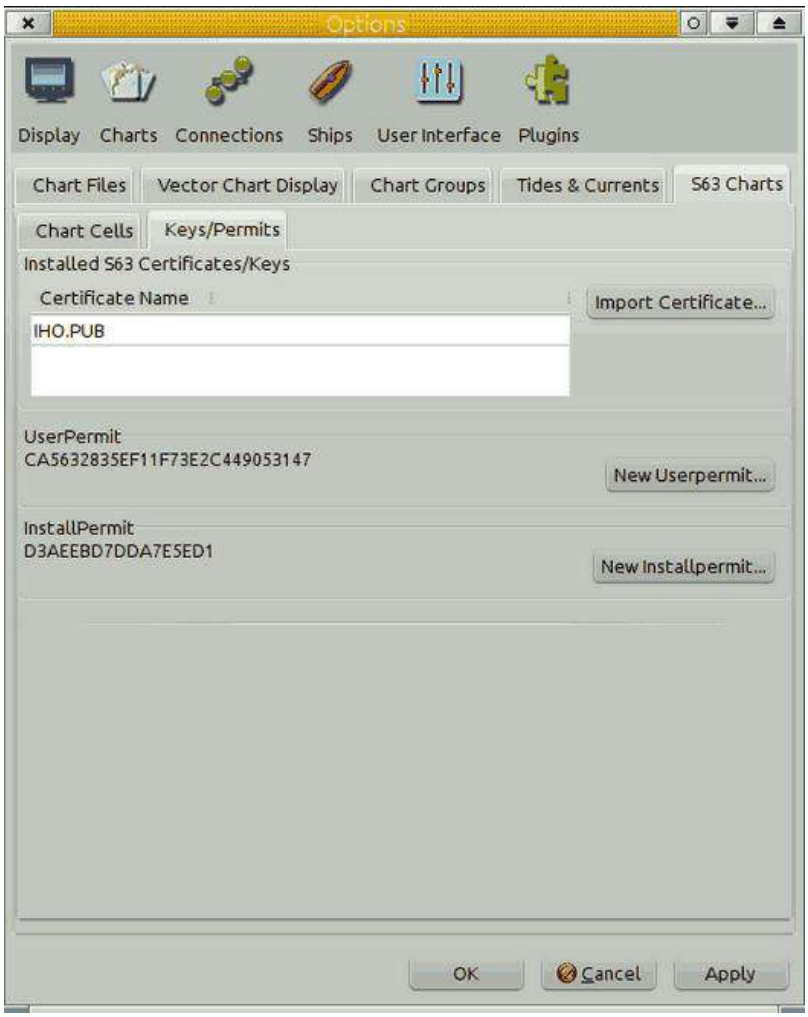
OpenCPN handles these commercial, non free, charts through an open source plugin, that in the background connects to a “black box” helper application. An external entity, ***http://o-charts.org[316]***, handles the encrypted and commercial aspects of the S-63 plug-ins for OpenCPN.

Get Started

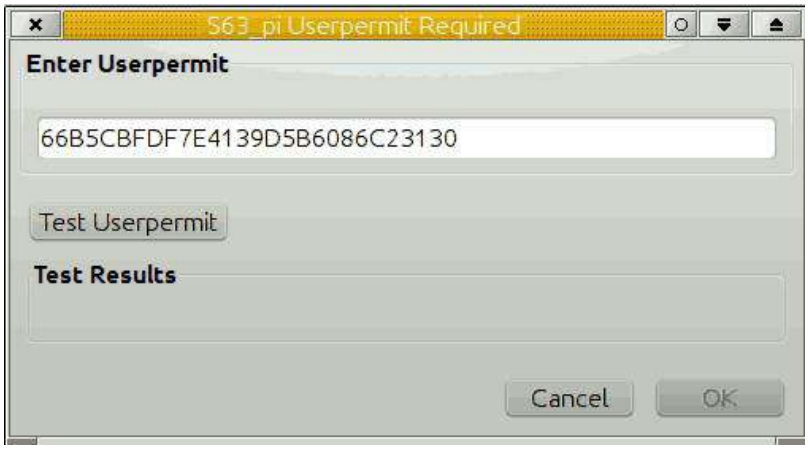
- Download the plugin for your operating system the official OpenCPN download page.
- Also download and read the informative Documentation from ***http://o-charts.org/downloads.html[317]***. Really!!
- Install the plugin the way you normally install programs on your operating system. The S-63 plug-in gets enabled at installation.
- Check that your Options → Charts shows a new “S63 Charts” tab, as in the pictures below.
- At the S-63 Keys/Permit tab you can create a *system identifier file* which “fingerprints” your individual system - a file you will need for the InstallPermit. Try this on your system before licensing charts to ensure that a fingerprint can be created for you.
- Now go to the O-charts shop to get your “User Permit” and “Install Permit”. Use these to license your chart selection.
- Detailed instructions are available on ***o-charts.org[318]***

Loading the Charts

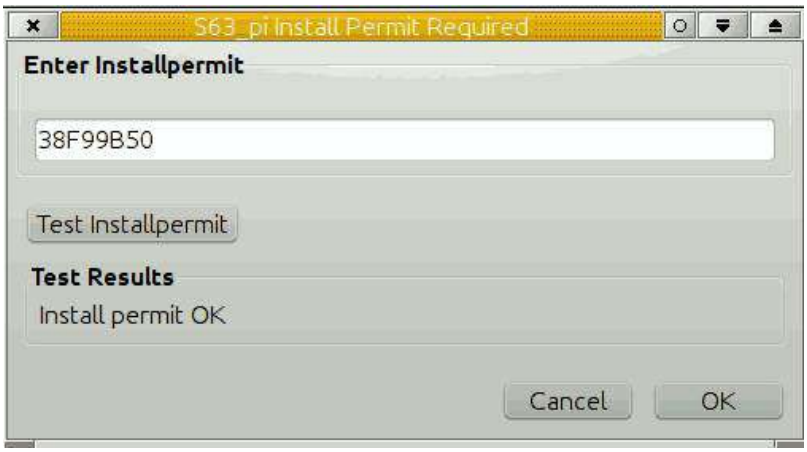
The Keys/Permits tab.



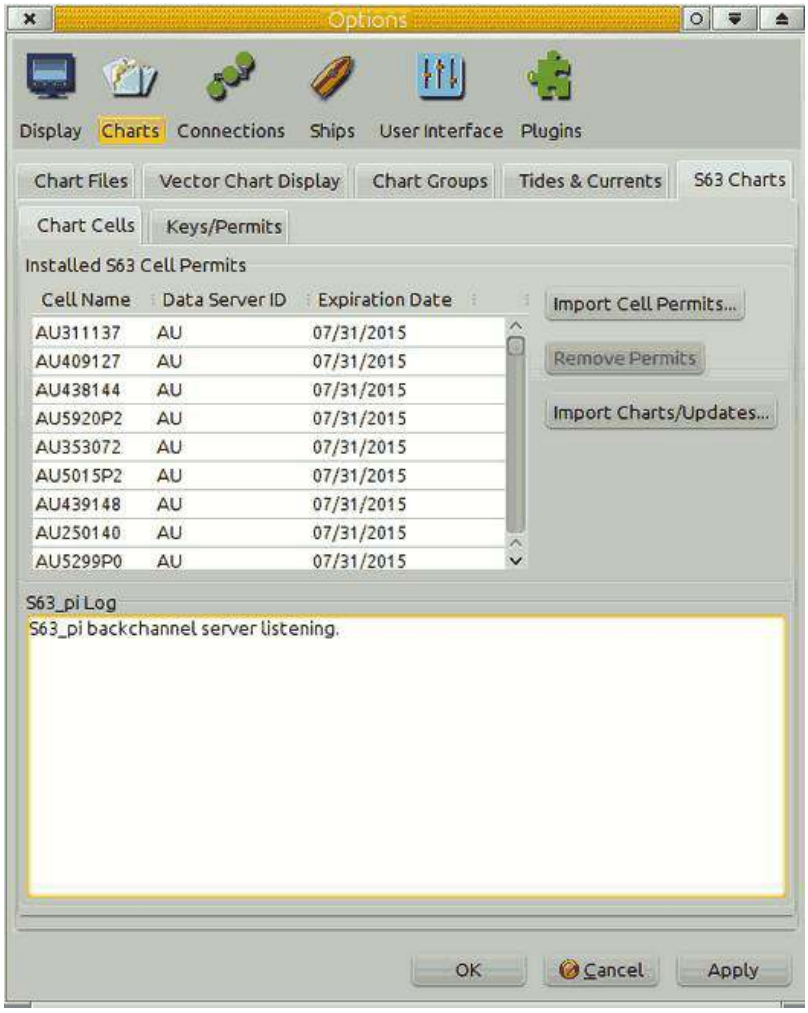
- **Certificate Name** This should already be present after a sucessfull plugin installation.
- If it's missing press the “Import Certificate…” button and import the file IHO.PUB. To find the location of this, file press the  button in the toolbar. Find the “Config file location” at the bottom of the “About” tab.
- Go to the same directory as the config file, and then to the s63 → s63_certificates directory, where you will find IHO.PUB.
- **UserPermit**



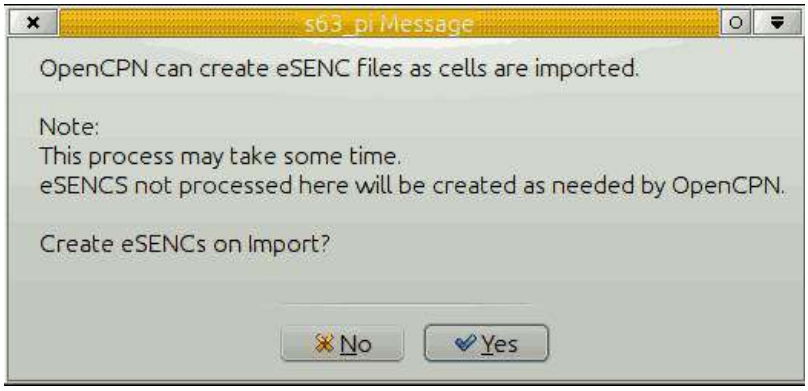
- Enter your new Userpermit from O-charts and test it. The permit above is from IHO's test suit and is not valid in real life.
- **New InstallPermit**



- Enter your new Installpermit from O-charts and test it.
- OpenCPN is now setup for S63 charts. Lincense your charts or use the test set. See instructions below.
- Download and uncompress your files.
- Install Cell Permits by using the button “Import Cell Permits…” to find the file PERMIT.TXT.
- Import the downloaded charts by pressing “Import Charts/Updates..” and find the folder “ENC_ROOT”



- This dialog will pop up. I you answer “No”, the SENC creation will happen when you first try to use the chart.



Testing

Download

http://www.iho.int/iho_pubs/standard/S-64/ENC_Test_Data_Sets/ENC_TDS_S-63_Encrypted/ENC3.1.1_TDS_S-63_Encrypted.zip[319]

You may exercise the S64 Test set using the following special permits:
<code> User Permit: 66B5CBFDF7E4139D5B6086C23130
Install Permit: 38F99B50 <\code>

Perhaps the best to start with is:

IHO S-64 [S-63 TDS v1.2]/8 Data Exchange Media/Test 8b/PERMIT.TXT

BSB4 Charts

Links

Source: Github Source[320]
Download: BSB4_pi Download[321]
Forum: BSB4 Chart Plugin Thread[322]

Goal

Provides Windows support only, for BSB Version 4 Raster charts, a format used by many hydrographic authorities throughout the world. BSB4 charts are raster charts, manufactured according to a standard developed by MAPTEC. The BSB4 plug-in enables OpenCPN to open and read the encrypted charts correctly provided that the charts have been purchased, registered and the plugin is installed properly. Supported charts must have been installed with appropriate encryption certificates in place. This plug-in only works with Windows.

There are several sources of charts:

- Charts published by the company MAPTEC,
- Charts published by theCanadian Hydrographics Service[323] (CHS)[324]
- Legacy charts produced by the Australian Hydrographic Service[325].

The chart installation procedure is independent of OpenCPN. At the time this plugin was first published the creator of the plugin posted on www.cruisersforum[326] as follows:

- This plugin supports Windows only.
- The BSB4 charts will be available only on the computer where they were successfully first installed and registered by the original end user.
- The plug-in makes no attempt to understand or “crack” the encryption algorithms. The DLL interface is treated as an opaque portal to read the decrypted files. The plug-in acts as a “wrapper” to make the charts visible.
- The BSB4 PlugIn won't be distributed as open source.

It will be a binary-only DLL, looking just like all other PlugIns at run-time.

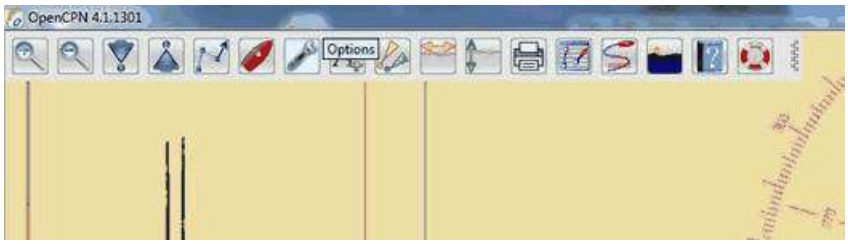
- Please take careful notes of the 2nd point above. If a user somehow “acquires” a copy of an encrypted BSB4 chart folio, it won't be useable with this plugin.

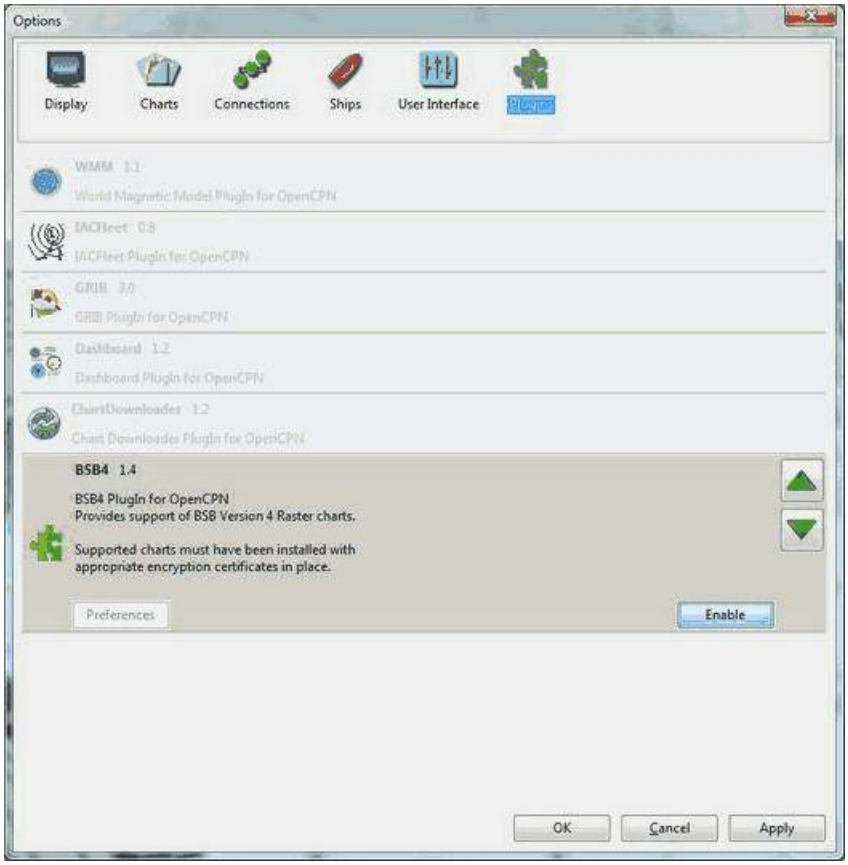
In summary, the plug-in will only work for registered charts on the computer where they were first installed and registered. The plug-in is NOT a means to obtain free charts.

The downloaded file is an installer which will place a DLL in the “plugins” folder of the OpenCPN installation. The installer will attempt to place it in the correct location but if your directory structure is “non-standard” the plug-in may not end up in the correct location. On a standard installation the plug-in folder will be C:\Program Files (x86)\OpenCPN\plugins\ If you have a non-standard installation then it will be up to you to ensure that the BSB4 plug-in

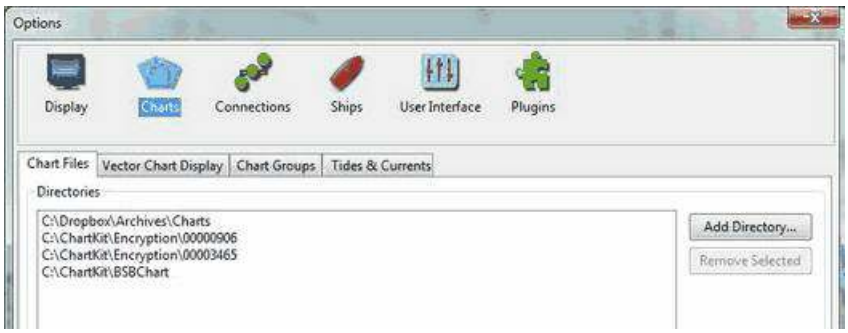
(bsb4_pi.dll) appears in the correct folder - just copy it into the right location if it doesn't get there by itself.

Once the plug-in DLL is in the correct plug-ins folder it will appear in the options/plugins menu when you start OpenCPN. You will need to navigate to Options (the wrench menu item), select the plug-ins tab, find the BSB4 plug-in and click “enable” in order to use the plug-in.





With the plug-in successfully installed in the OpenCPN plug-ins directory and enabled there is one further step necessary to view your encrypted charts.



From the Options menu, select the Charts tab.

Then add the appropriate directory(ies) where your encryption certificates are located, followed by the directory(ies) where the encrypted charts are located.

The screenshot above is from a successful installation. Your directory structure will no doubt be completely different but the same principles apply.

In the example above, the non-encrypted charts are located on Dropbox.

Then there are two separate encryption directories followed by the directory which contains the encrypted charts.

To recap the process, the following are the steps necessary to install and use the BSB4 plug-in:

1. Purchase and install encrypted BSB4 charts on the same computer that will run OpenCPN with the BSB4 plug-in
2. Download and run the BSB4 plug-in installer
3. Ensure that the plug-in DLL has in fact been created in the appropriate plug-in folder. If not, copy the DLL to the required location.
4. Start the OpenCPN software and enable the BSB4 plug-in
5. Add the appropriate encryption and chart directories to the OpenCPN chart locator.

Typically if you follow all the steps the charts will immediately be visible at this point. On occasion however they will not immediately appear and you may need to exit the OpenCPN software, closing it completely and then reopening it. At that point the encrypted charts should be visible.

oeSENC Charts

OpenCPN Vector Charts

OCPN Vector Charts are licensed and sourced from chart providers like Hydrographic Offices. These - non free - charts give OCPN access to up-to-date and proven charts for areas where those are not available for free.

Different from S-63 or genuine S-57 charts (US), these are not *"Official Charts"* in the context of "*carriage requirements"*, as they are not issued or certified by official bodies. Even if the content is the same.

The charts are delivered in an encrypted format optimized for OpenCPN called oeSENC and are requiring the corresponding oeSENC plug-in. They appear like all the other vector charts in S-57 format and can be quilted and managed identically.

In the case of charts licensed from the Australian AHS the charts are called oeEVC due to legal reasons. The oeSENC plug-in will handle these files same as the oeSENCs.

Same as in the case of the S-63 plug-in, the operational part is managed by an outside entity, o-charts.org. The charts are available at its web shop.

Links

Source: Github source[327]
Download: oeSenc_pi Download[328]
Website: o-charts Vector Charts for Opencpn[329]
Forum: oeSenc CF Thread[330]

Windows / Mac / Linux

- requires to be online! For offline install of oeSENC charts see further below..

1. Download and install the oeSENC plugin[331] (only for OpenCPN 4.6 version and above). If you have already the oeSENC plugin installed, update to the latest version.

For the online procedure described here version 2.0 or later of the plug-in is required.

2. Go to OpenCPN, *Options → Plugins → oeSENC* and enable it.

3. Go to o-charts shop[332] and license the chart sets you are interested in. Remember your access data to o-charts shop (email and password), you will need them later.

4. Go to OpenCPN, *Options → Charts → oeSENC charts* tab and press *Refresh Chart List*.

5. Login with your o-charts shop access data.

6. If you have previously requested charts, you will get a list of System Names. Select the System Name that corresponds to your computer.

If not, you have to provide a new System Name to identify your system. 3 characters minimum and 15 maximum. Only lowercase letters and numbers allowed. No symbols or spaces.

7. Follow on screen instructions to assign and download on your computer the charts sets you licensed on the o-charts shop.

Android

1. Install OpenCPN 1.0.13, or above, for Android 4.2, or above, from the Play Store[333].

2. Install oeSENC plugin for OpenCPN from the Play Store[334] to be sure your device is compatible.

3. Go to o-charts shop[335] and license the chart sets you are interested in.

4. Back to OpenCPN, *Options → Charts → oeSENC charts → Add/update oeSENC chart sets* and login with your o-charts access data.

5. Follow on screen instructions to assign and download on your device the charts sets you licensed on the o-charts shop.

Updates

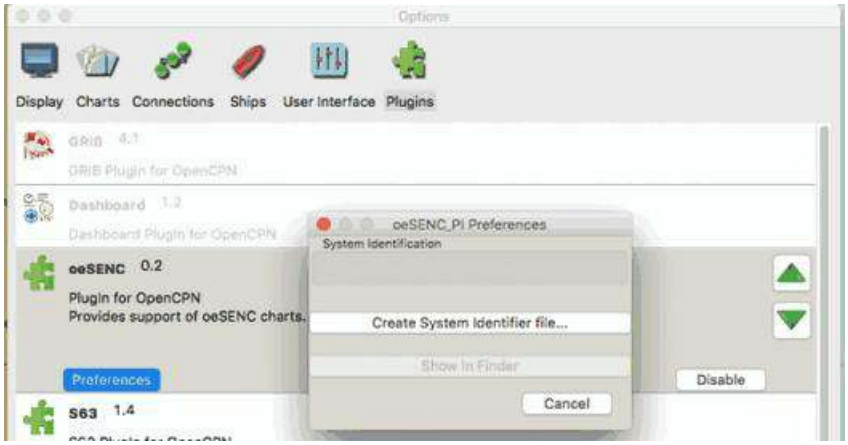
You should visit *Options → Charts → oeSENC charts* from time to time to see if a new update is available. DE, FR and NO chart sets are updated weekly. UK, BE, NL, IS, HR and ES chart sets are updated quarterly.

Offline Installation of oeSENC charts

For target systems without connection to Internet you will create the System Identifier file at the target system, take it to a site with Internet access and request and download the chart set for the target system. Copy the received file onto some portable device and copy it onto the target system.

The steps in detail:

Install the plug-in, enable it at **Options | plug-ins** and create your system identifier file from "**Preferences**" The plug-in will report the path to the file. For Windows and macOS systems a copy is created directly on the desktop.



At the shop at

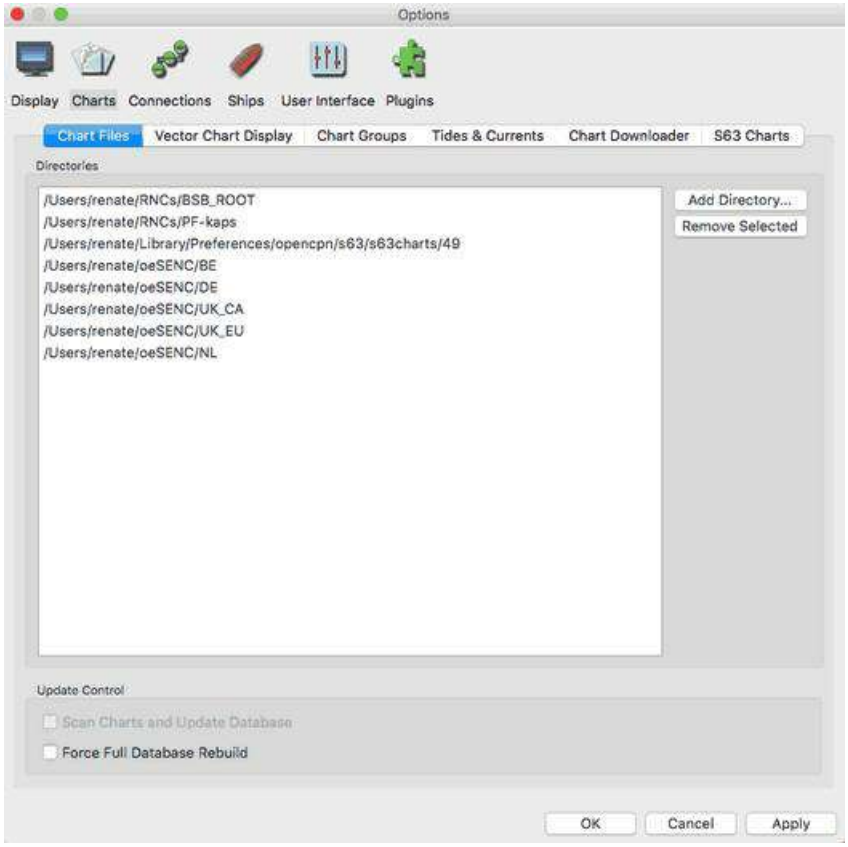
http://o-charts.org[336]
- Select the chart set you want to license.

1. Upload your SystemIdentifierFile - it is used to encode the charts for a specific system - and finish the purchase.
2. You will receive an e-mail with the download path and your license key.
3. Depending on the workload of the production system this can take some time.

Download the packet

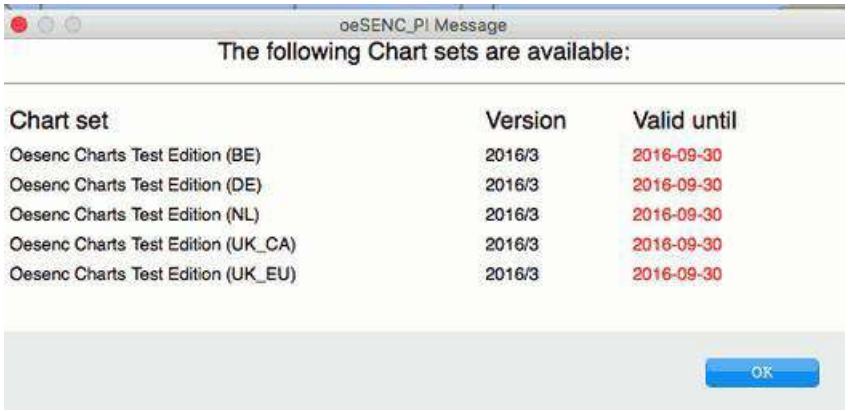
1. Unzip it to a directory of your choice.
2. Add an entry to the source chart directories pointing to the directory of the chart set.
3. Apply.

The downloaded set contains a text file with information about the set, the license key, the EULA and the chart “blob” itself.



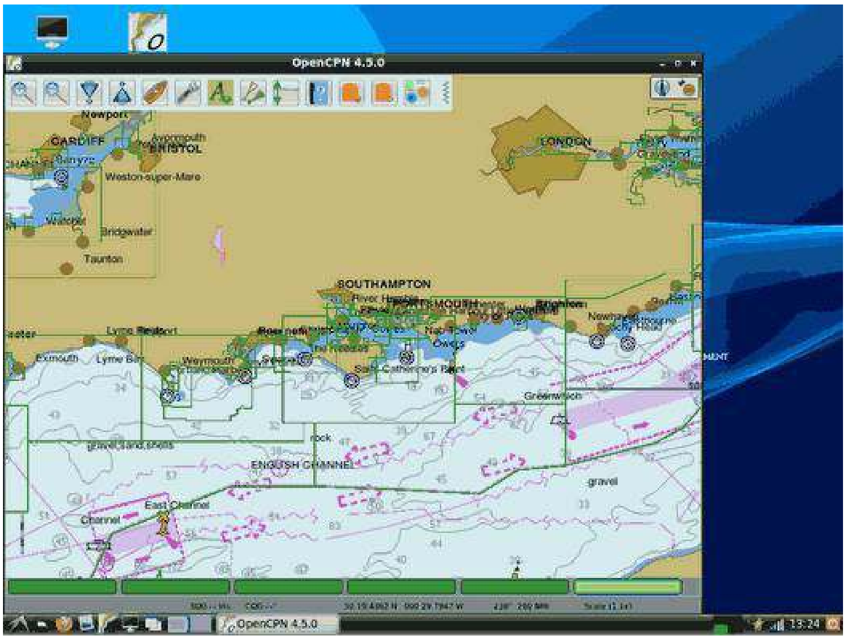
Each Use

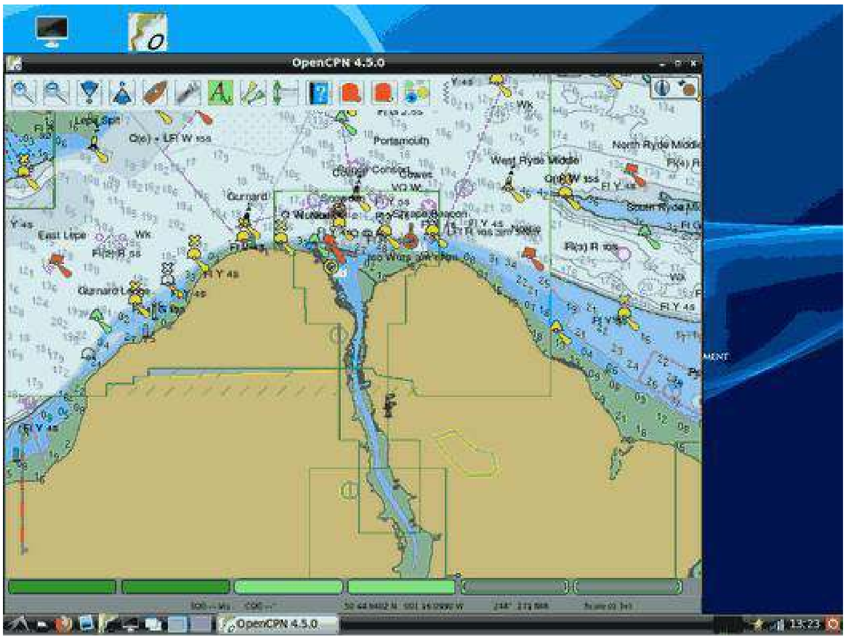
Each time you will use the charts from the set, a pop-up will inform you about the licensing period of the charts and you will have to accept the terms of use. These are requirements from our licensors.

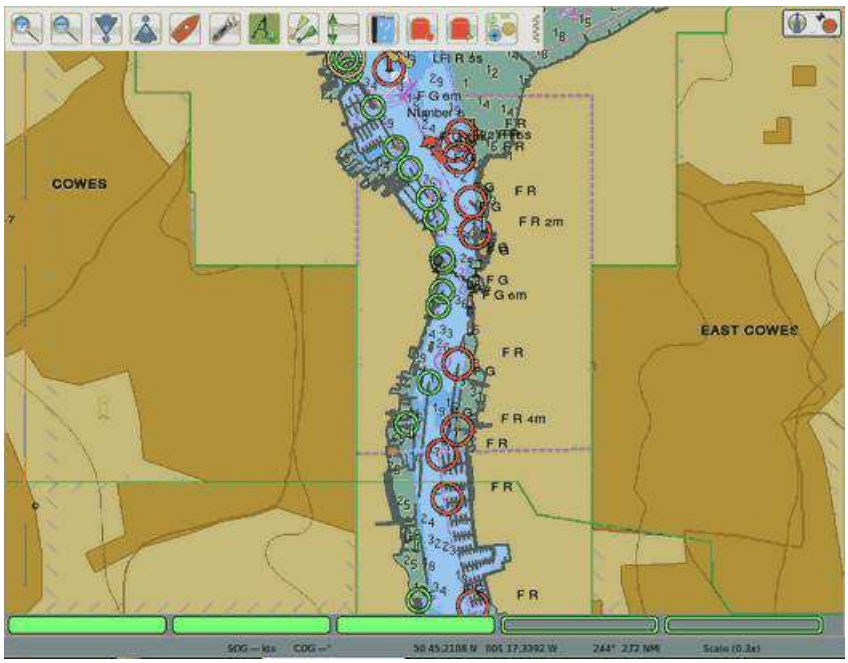


One additional license for back-up purposes is included and can be generating by the user when required.

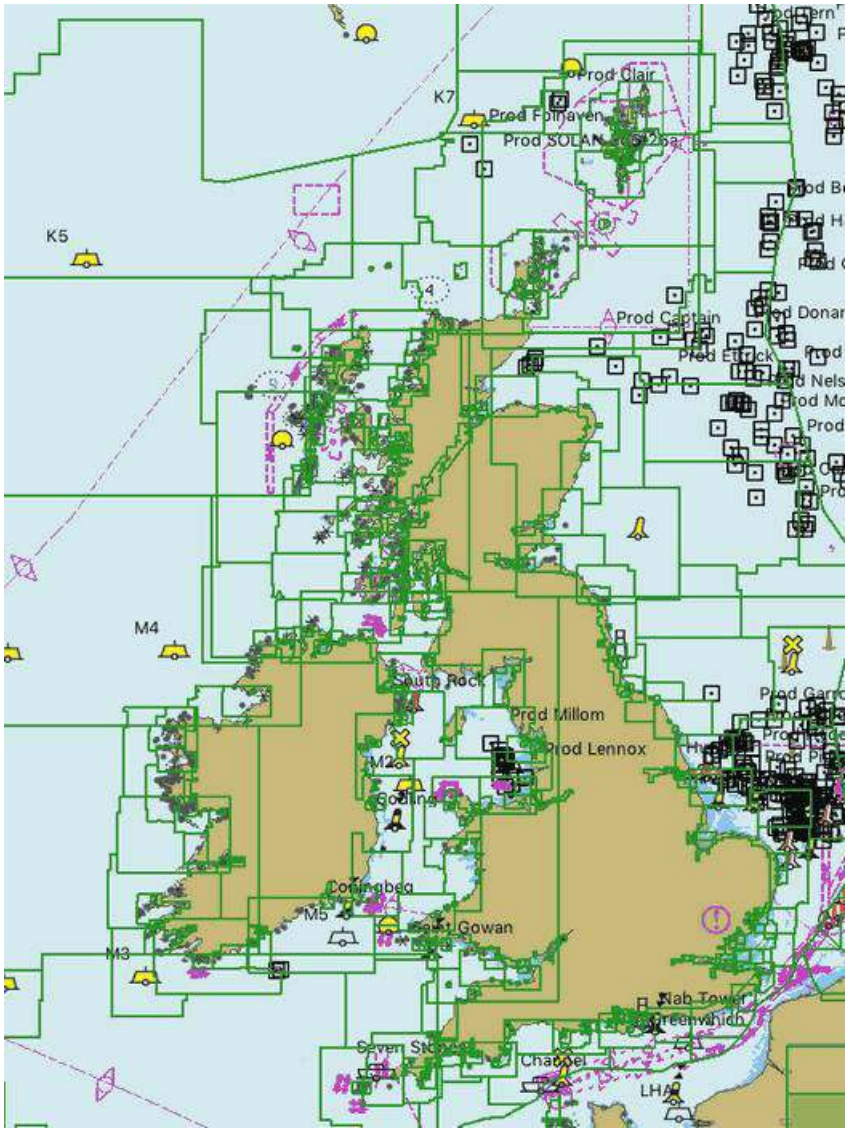
Chart Examples

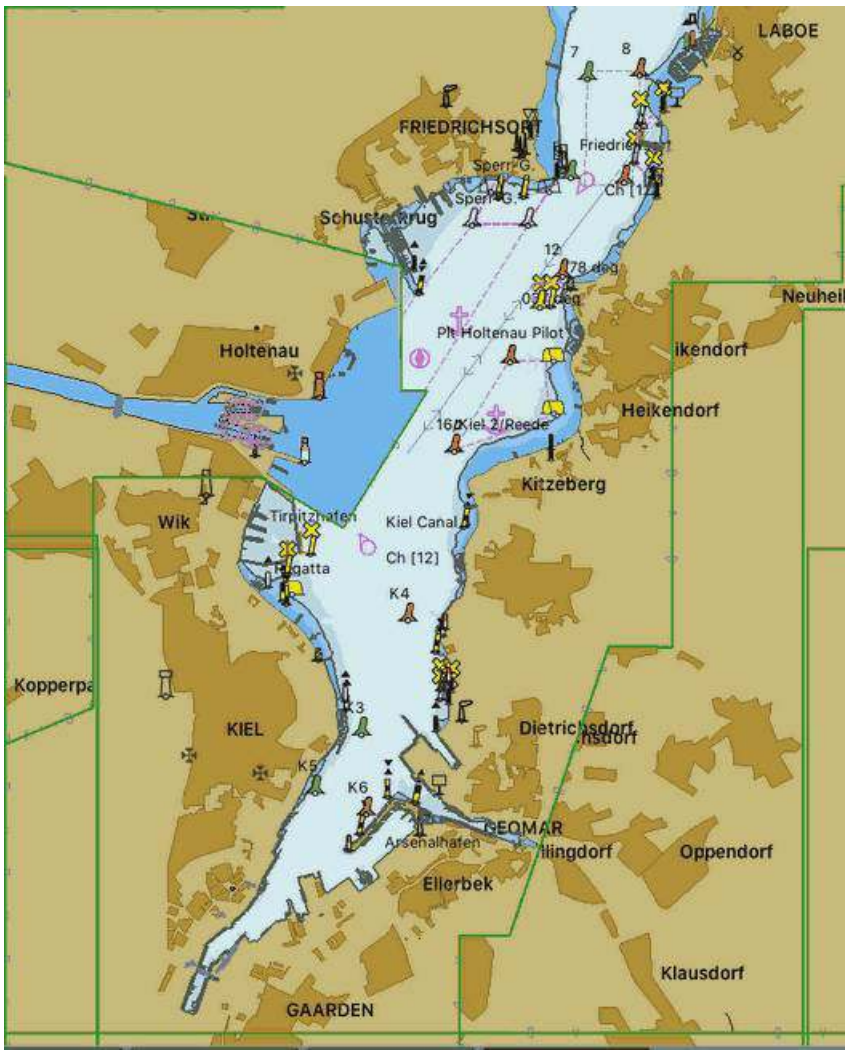

OpenCPN 4.5.0
Newport
CARDIFF
BRISTOL
Weston-super-Mare
Bridgwater
Taunton
LONDON
SOUTHAMPTON
ENGLISH CHANNEL
gravel
East Channel
OpenCPN 4.5.0
13:24


OpenCPN 4.5.0
Portsmouth
West Ryde Middle
North Ryde Middle
East Lepe
Gurnard
OpenCPN 4.5.0
13:23


COWES
EAST COWES
Number 3
F R
F R 2m
F G
F G 6m
F R 4m


Meters


K7
Prod Clair
Prod Foinaven
Prod SOLAN
K5
Prod Captain
M4
South Rock
Prod Millom
Prod Lennox
M2
Goodwin
M5
Gowan
M3
Nab Tower
Greenwhich
Seven Stones
Channel
LHA



Windows / Mac / Linux

- requires to be online! For offline install of oeSENC charts see further below..

1. Download and install the oeSENC plugin[337] (only for OpenCPN 4.6 version and above). If you have already the oeSENC plugin installed, update to the latest version.

For the online procedure described here version 2.0 or later of the plug-in is required.

2. Go to OpenCPN, *Options → Plugins → oeSENC* and enable it.

3. Go to o-charts shop[338] and license the chart sets you are interested in. Remember your access data to o-charts shop (email and password), you will need them later.

4. Go to OpenCPN, *Options → Charts → oeSENC charts* tab and press *Refresh Chart List*.

5. Login with your o-charts shop access data.

6. If you have previously requested charts, you will get a list of System Names. Select the System Name that corresponds to your computer.

If not, you have to provide a new System Name to identify your system. 3 characters minimum and 15 maximum. Only lowercase letters and numbers allowed. No symbols or spaces.

7. Follow on screen instructions to assign and download on your computer the charts sets you licensed on the o-charts shop.

Android

1. Install OpenCPN 1.0.13, or above, for Android 4.2, or above, from the Play Store[339].

2. Install oeSENC plugin for OpenCPN from the Play Store[340] to be sure your device is compatible.

3. Go to o-charts shop[341] and license the chart sets you are interested in.

4. Back to OpenCPN, *Options → Charts → oeSENC charts → Add/update oeSENC chart sets* and login with your o-charts access data.

5. Follow on screen instructions to assign and download on your device the charts sets you licensed on the o-charts shop.

Updates

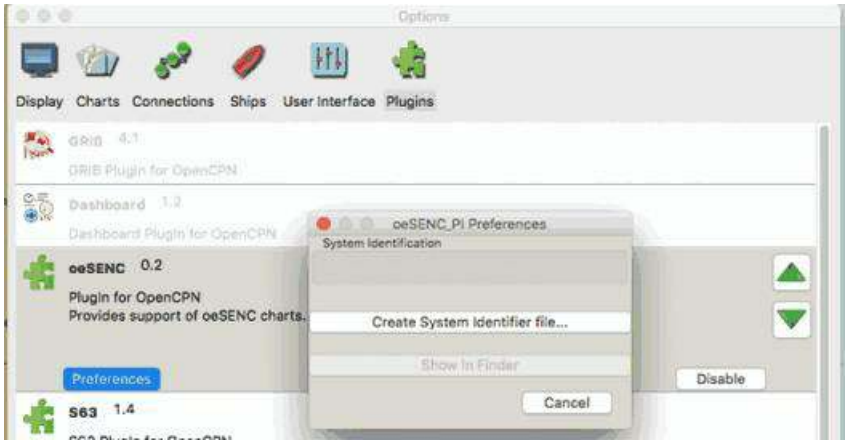
You should visit *Options → Charts → oeSENC charts* from time to time to see if a new update is available. DE, FR and NO chart sets are updated weekly. UK, BE, NL, IS, HR and ES chart sets are updated quarterly.

Offline Installation of oeSENC charts

For target systems without connection to Internet you will create the System Identifier file at the target system, take it to a site with Internet access and request and download the chart set for the target system. Copy the received file onto some portable device and copy it onto the target system.

The steps in detail:

Install the plug-in, enable it at **Options | plug-ins** and create your system identifier file from "**Preferences**" The plug-in will report the path to the file. For Windows and macOS systems a copy is created directly on the desktop.



At the shop at

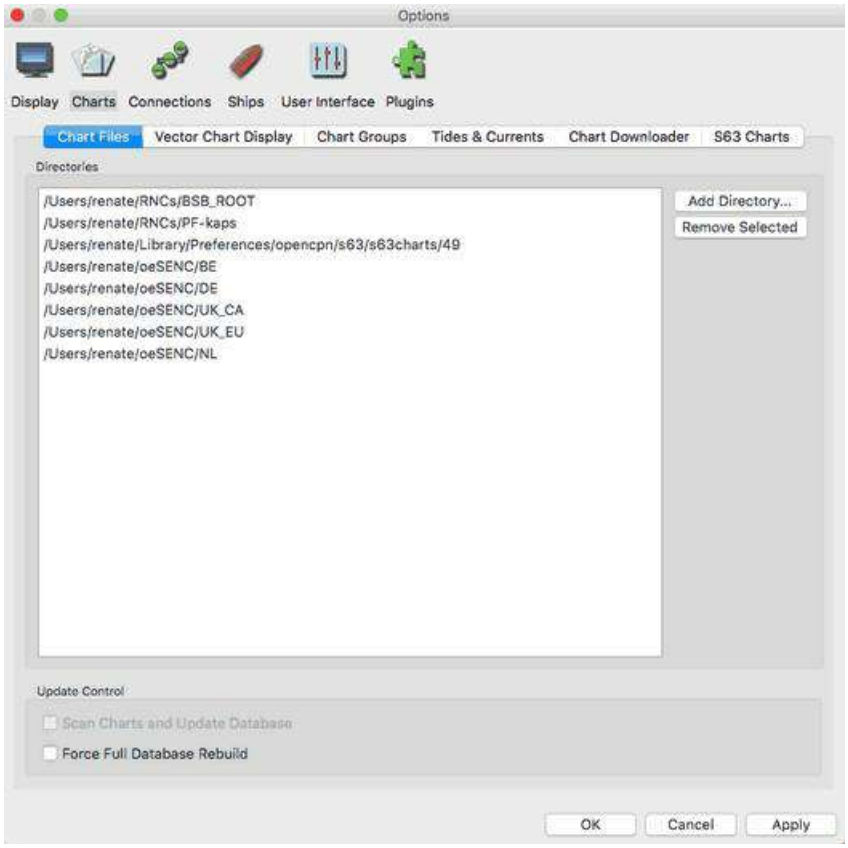
http://o-charts.org[342]

1. Select the chart set you want to license.
2. Upload your SystemIdentifierFile - it is used to encode the charts for a specific system - and finish the purchase.
3. You will receive an e-mail with the download path and your license key.
4. Depending on the workload of the production system this can take some time.

Download the packet

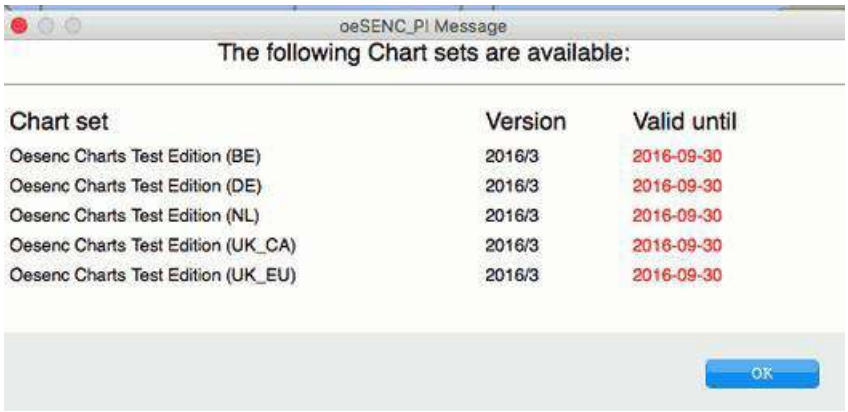
1. Unzip it to a directory of your choice.
2. Add an entry to the source chart directories pointing to the directory of the chart set.
3. Apply.

The downloaded set contains a text file with information about the set, the license key, the EULA and the chart “blob” itself.



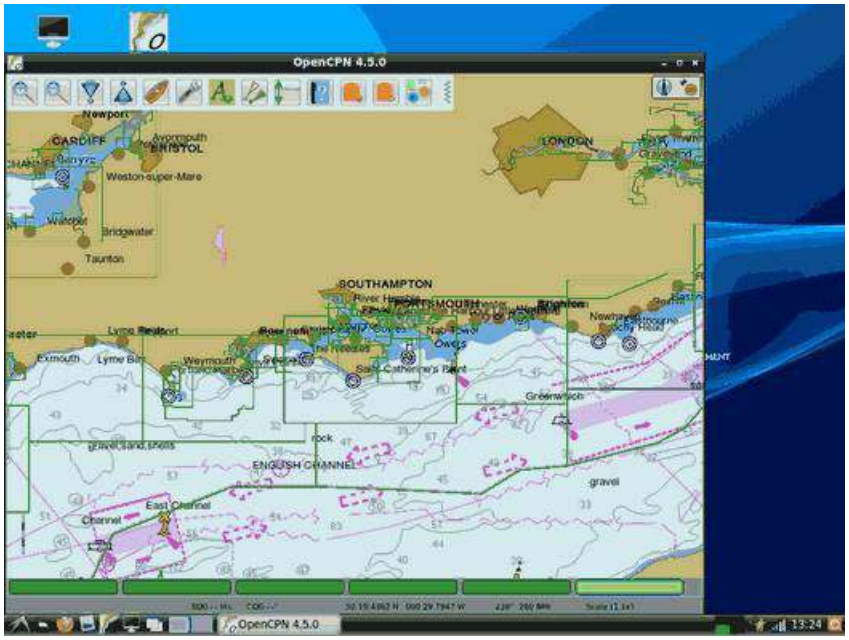
Each Use

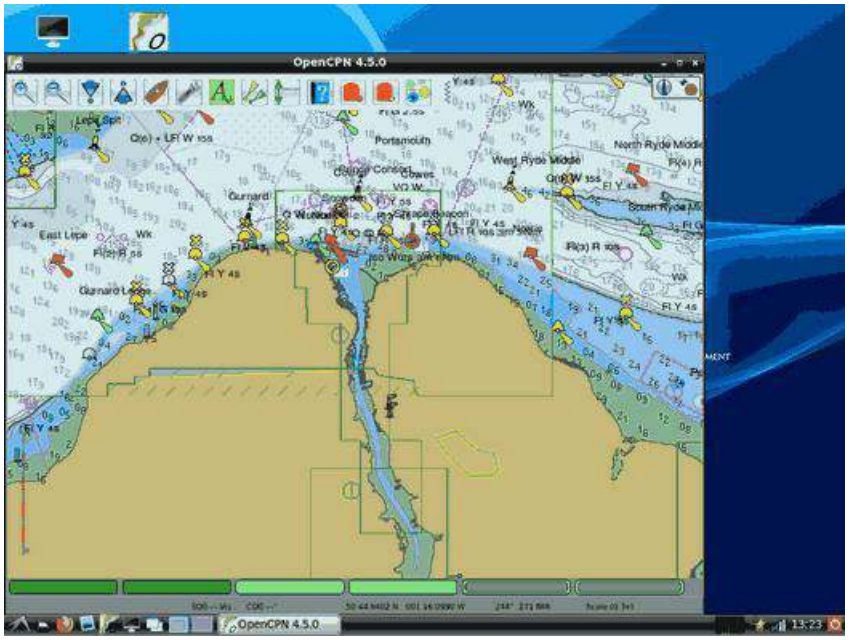
Each time you will use the charts from the set, a pop-up will inform you about the licensing period of the charts and you will have to accept the terms of use. These are requirements from our licensors.

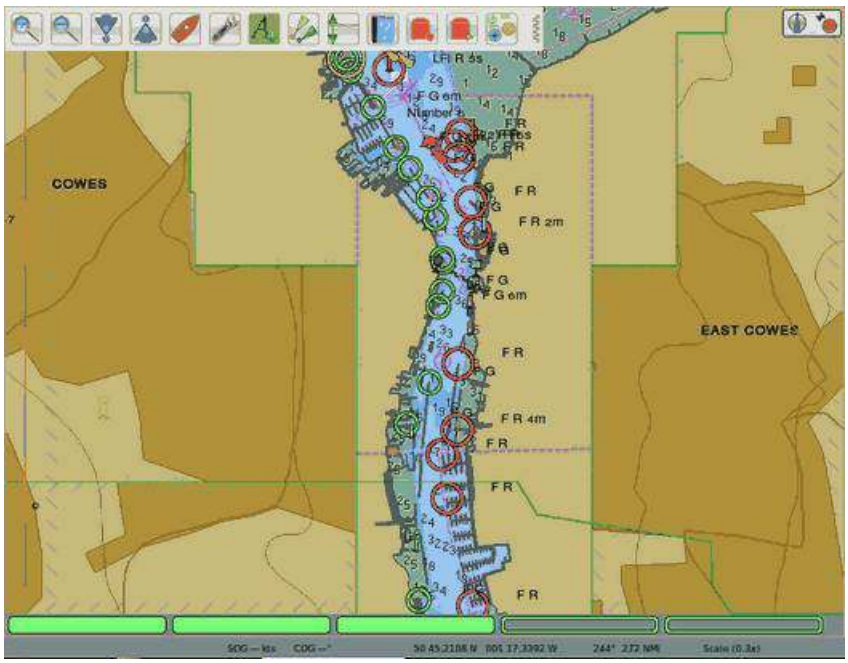


One additional license for back-up purposes is included and can be generating by the user when required.

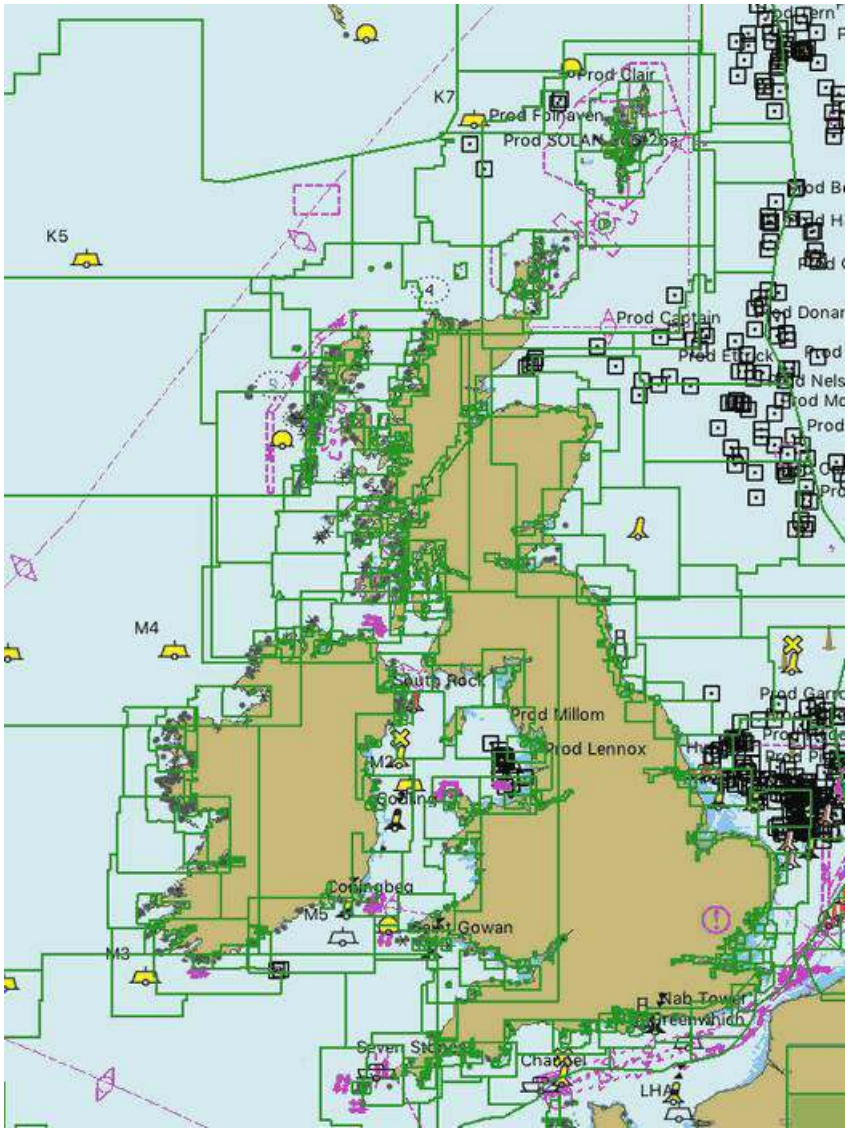
Chart Examples

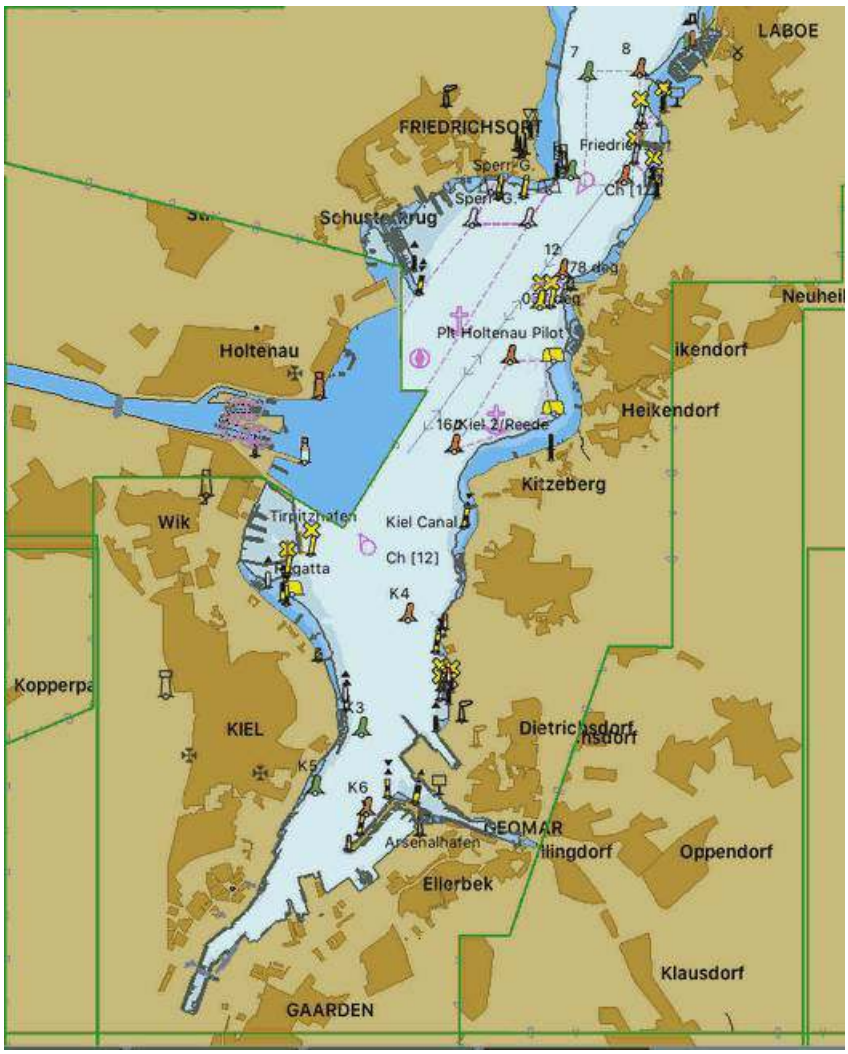

OpenCPN 4.5.0
Newport
CARDIFF
Avonmouth
BRISTOL
Weston-super-Mare
Bridgwater
Taunton
LONDON
SOUTHAMPTON
Exmouth
Lyme Bay
Weymouth
Owers
Greenwich
rock
gravel, sand, shells
ENGLISH CHANNEL
gravel
East Channel
Channel
OpenCPN 4.5.0
13:24


OpenCPN 4.5.0
Portsmouth
Gurnard
East Lepe
Wk
West Ryde Middle
North Ryde Middle
South Ryde
OpenCPN 4.5.0
13:23


COWES
EAST COWES
F R
F R 2m
F G
F G 6m
F R 4m


Meters


K7
Prod Clair
Prod Foinaven
Prod SOLAN
K5
4
Prod Captain
M4
South Rock
Prod Millom
Prod Lennox
M2
Goeling
M5
M3
Nab Tower
Greenwhich
Seven Stones
Channel
LHA


LABOE
FRIEDRICHSORT
Schusterkrug
Holtenau
Pil. Holtenau Pilot
Kiel 2/Reede
Heikendorf
Kitzeberg
Wik
Tirpitzhafen
Kiel Canal
Ch [12]
K4
KIEL
K5
K6
3
Dietrichsdorf
GEOMAR
Arsenalhafen
Oppendorf
Ellerbek
Klausdorf
GAARDEN

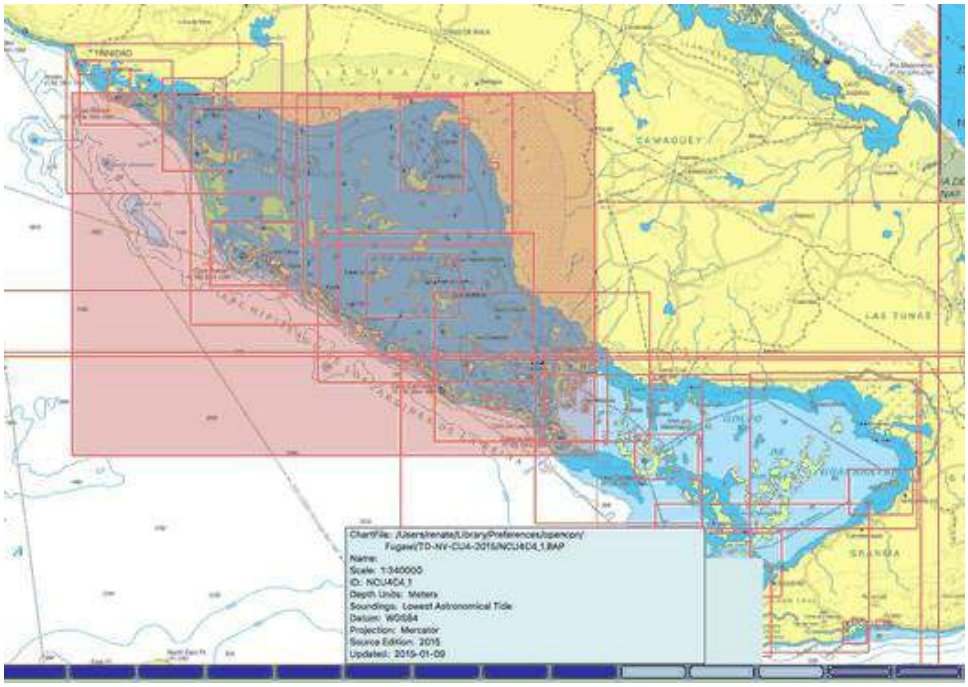
Fugawi Charts

The Fugawi Charts plug-in gives access to license the broad raster chart portfolio offered by Fugawi for all platforms supported by OpenCPN.
You will find here charts from editors like NV, Delius-Klasing, Solteknik, BlueLatitude, Explorer charts and more

Links

Source: Github Repository[343]
Download: Website Download[344]
Forum: Fugawi Thread[345]
Website: https://fugawi.com[346]

Windows / Mac / Linux



NOTE: *The following requires online internet access!*

1. Download and install the FugawiCharts[347] plugin (only for OpenCPN 4.8.4 version and above). If you have already the Fugawi plugin installed, update to the latest version.

2. Go to OpenCPN, *Options* → *Plugins* → *Fugawi Charts* and enable it.

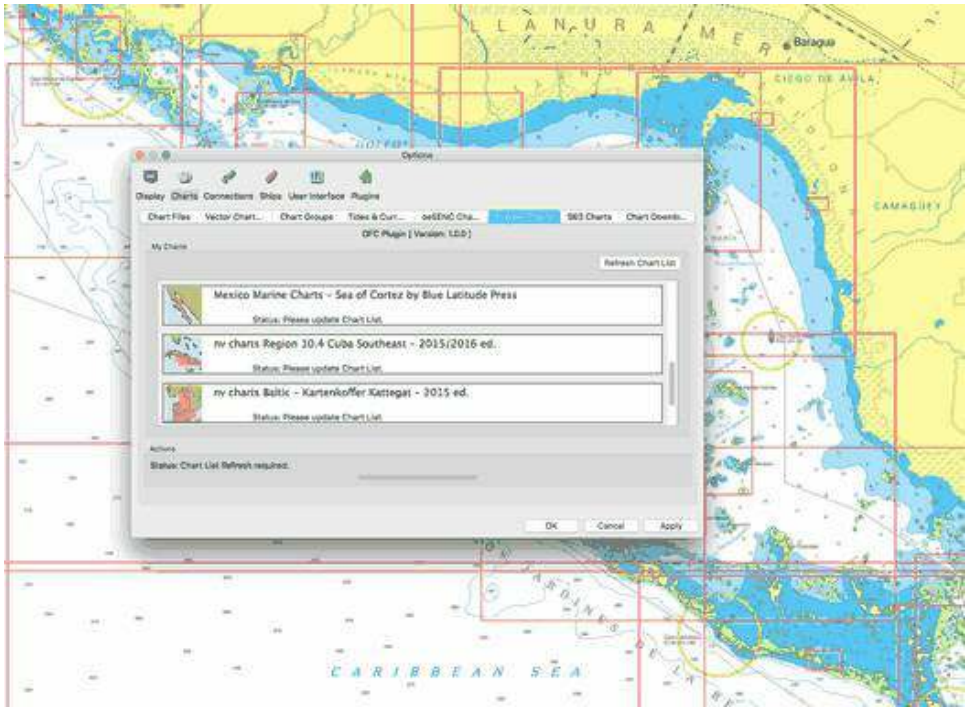
3. At Fugawi.com[348] license the chart sets you are interested in. Remember your access data to the Fugawi shop (email and password), you will need them later.

4. Go back to OpenCPN, *Options* → *Charts* → *Fugawi charts* tab and press *Refresh Chart*

List.

5. Login with your Fugawi shop access data.

6. You will see the list of chart sets you have licensed. Select the chart set you want to work with by clicking on it. Assign it to your system, download and install as guided by the plug-in.



- You will find List of OpenCPN Fugawi Charts[349]
- You will find additional information in the form of Fugawi.com FAQs[350]

Vfkaps Charts

VentureFarther Satellite Charts

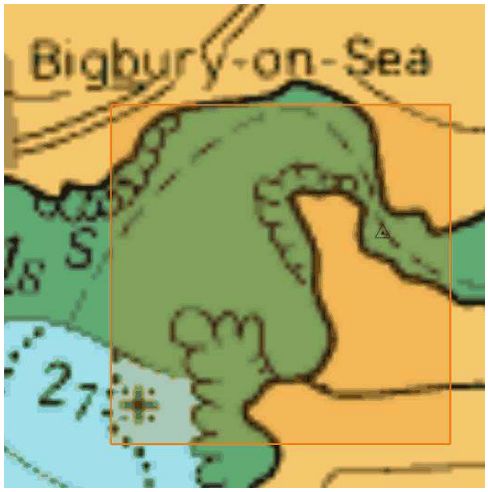
Links

- Source: Github Repository[351]
- Releases: Github Releases Download[352]
- Download: Download Webpage[353]
- Website: VentureFarther.com[354]
- Forum:Venturefarther Satellite Charts - Vfkaps Plugin[355]
- Forum: Yachting & Boating World Forum - Google earth KAP chart creation plugin for Opencpn[356]

1. What and Why

In some areas of the world a satellite chart is more accurate than even the official chart. This plugin allows satellite charts from Google, Bing or Nokia to be downloaded via the VentureFarther server (http://venturefarther.com) [357]

Even in well charted areas such as the UK the satellite chart will often be more accurate than the official UKHO chart. As an example a waypoint was made on the chart for the River Avon, Devon, UK.



An extreme example but the satellite chart shows where you could have ended up if you had followed the navigation chart!

2. Install

You will need to register with VentureFarther and obtain your API key here[358]

Please read the 'Credits' page on the VentureFarther website. 1 Credit is used for each single satellite chart download. Making a 'Multi-Chart' download will use 9 credits, because it consists of 9 satellite charts. Credits can be earned by submitting cruising information or you may choose to purchase an annual subsciption.

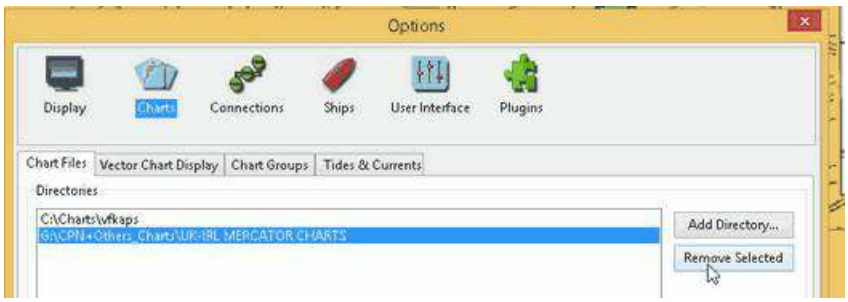
Download the plugin installer and run the installer .exe file from here (Windows):

https://github.com/Rasbats/vfkaps_pi/releases[359]

On Linux download the DEB package and install this.

Important ... Using encrypted charts while using the plugin

If one of your 'normal' navigational chart directories contains encrypted charts, such as those from VisitMyHarbour[360] you will find that any satellite charts you create are deleted as soon as OpenCPN is closed. To avoid this you will need to remove the encrypted chart directory.



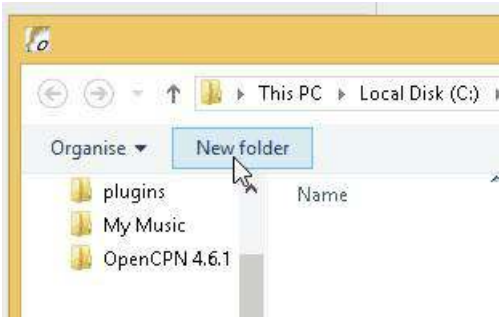
Close OpenCPN and restart. Make your satellite charts. You can then close OpenCPN. VisitMyHarbour (VMH) charts are activated … 'I agree'. Start OpenCPN and add your VMH chart directory. You then have both satellite charts and VMH charts on the same screen. You will be able to create more satellite charts in this state but they will be deleted as soon as

OpenCPN closes.

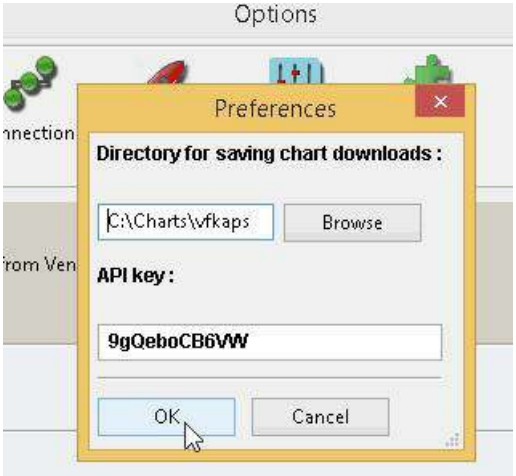
3. Standard actions

Open the toolbox and enable 'vfkaps'. Open 'Preferences'.

Select/create the directory where you want to save your satellite charts.

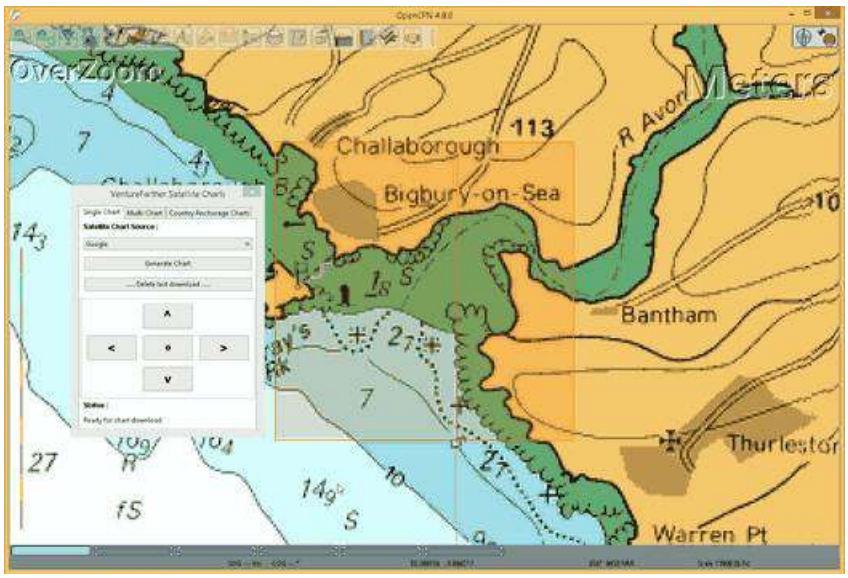


Enter your VentureFarther API key.



Apply/Ok and on the toolbar you will find the vfkaps icon.

Start the vfkaps plugin.



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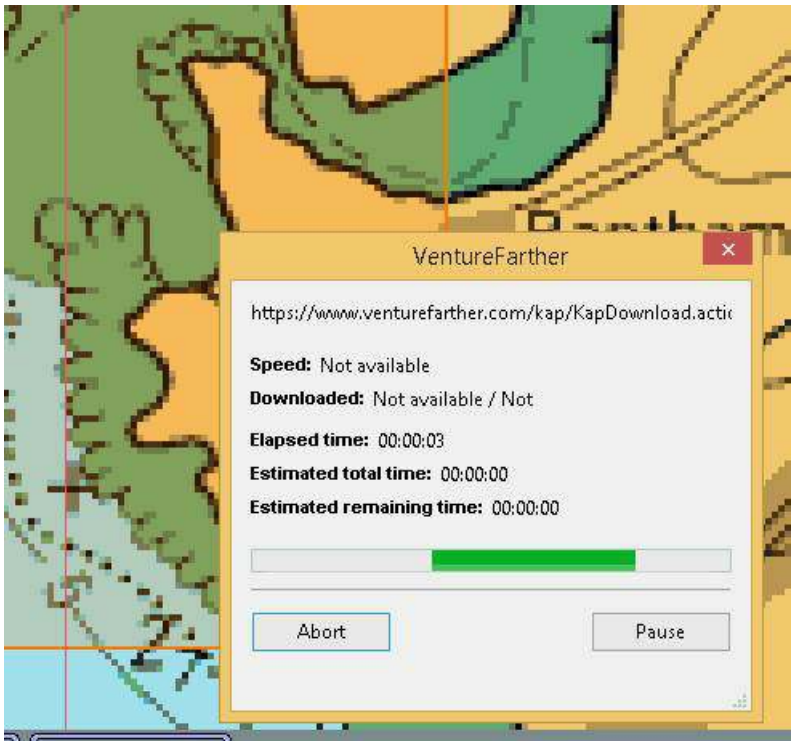

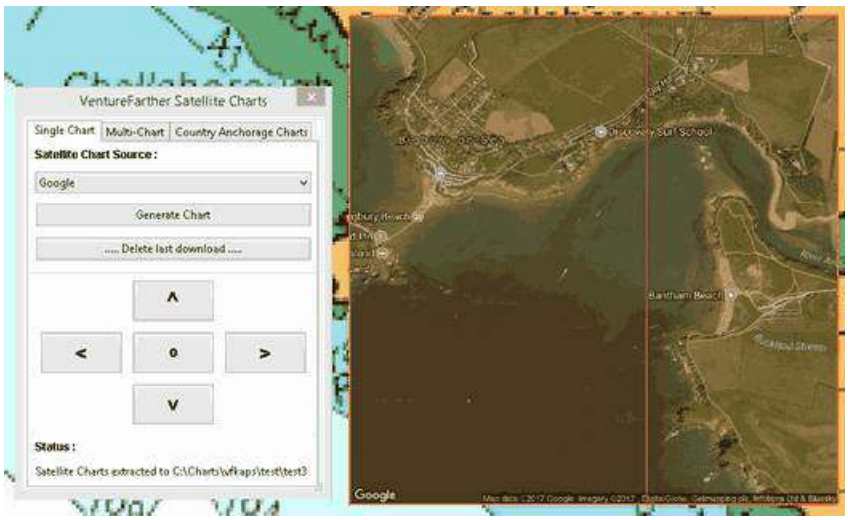

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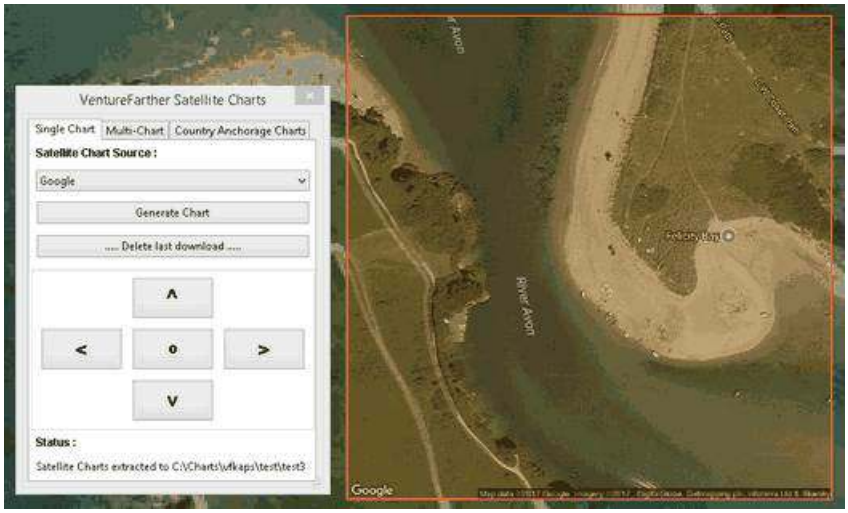

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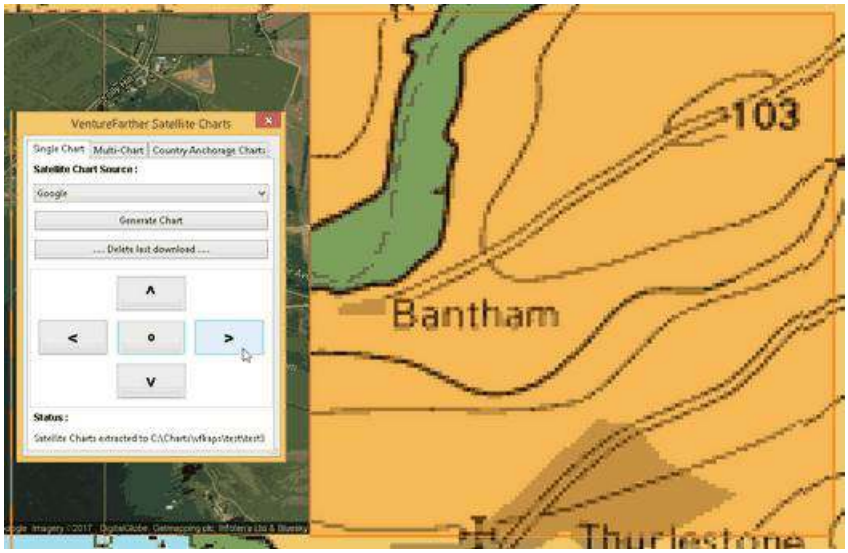

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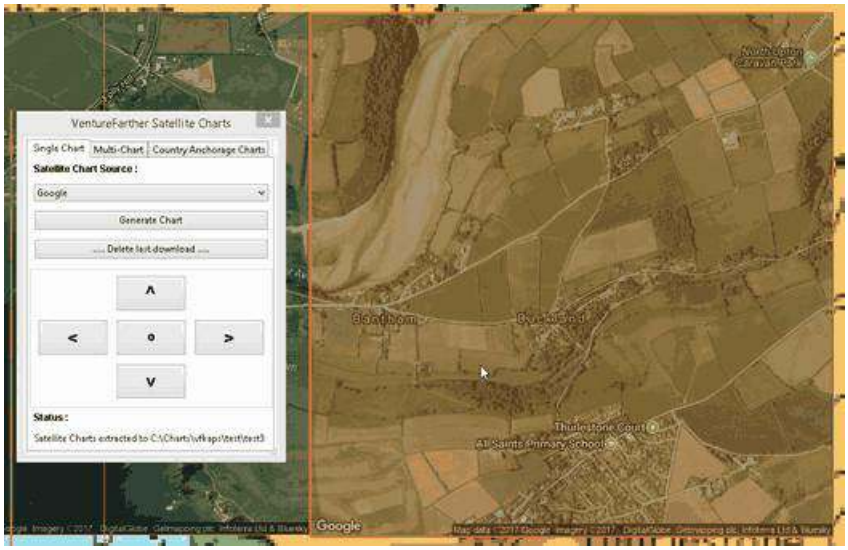

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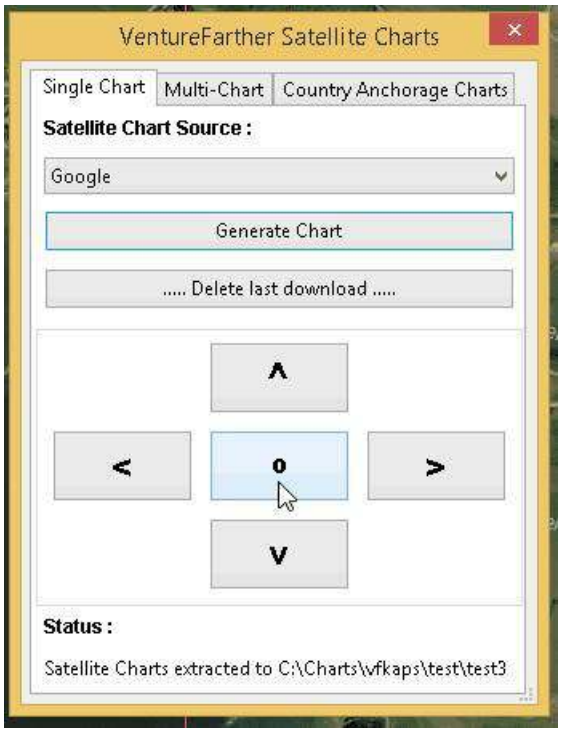

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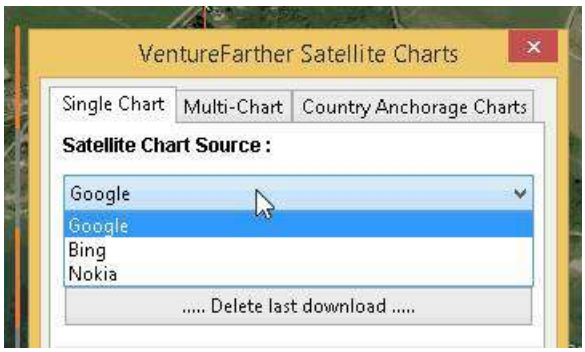

[This shows how to delete files from the last download]

Format of the satellite chart

Country_VF_latitude_longitude (degrees, decimal minutes)

United_Kingdom_VF50_16.794_N_3_52.806_W.kap

4. Options / Warnings / Ideas

Sharing anchorage information

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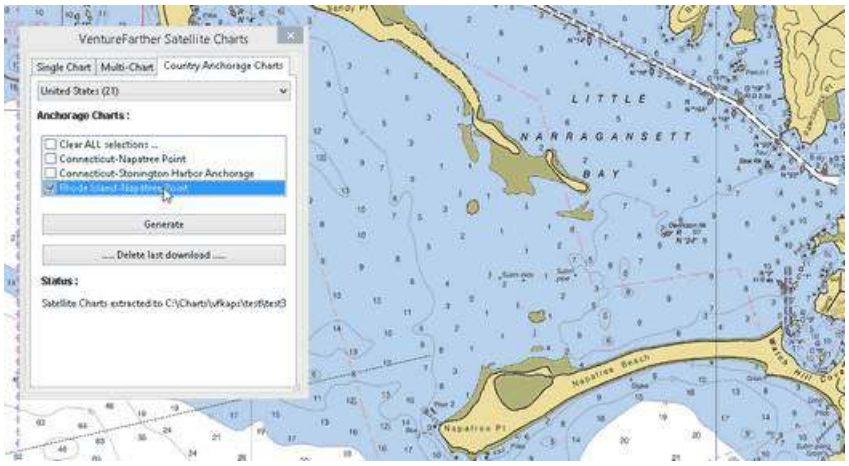

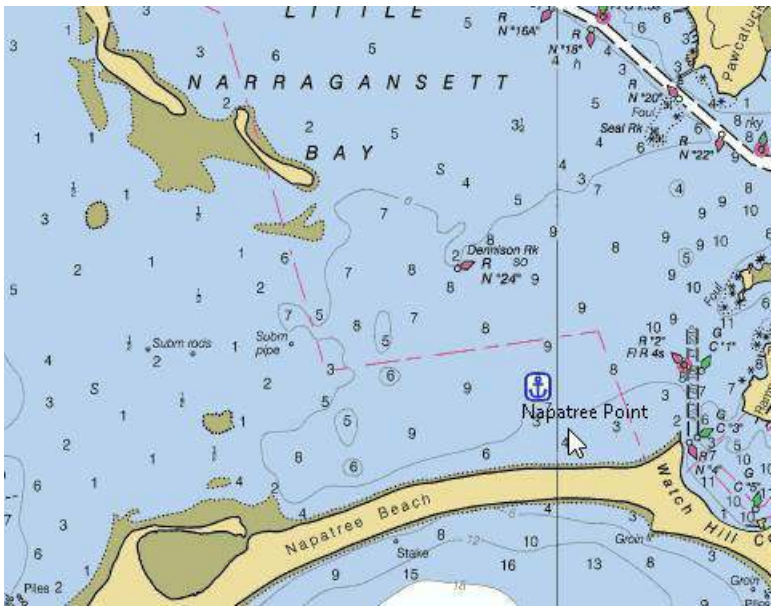

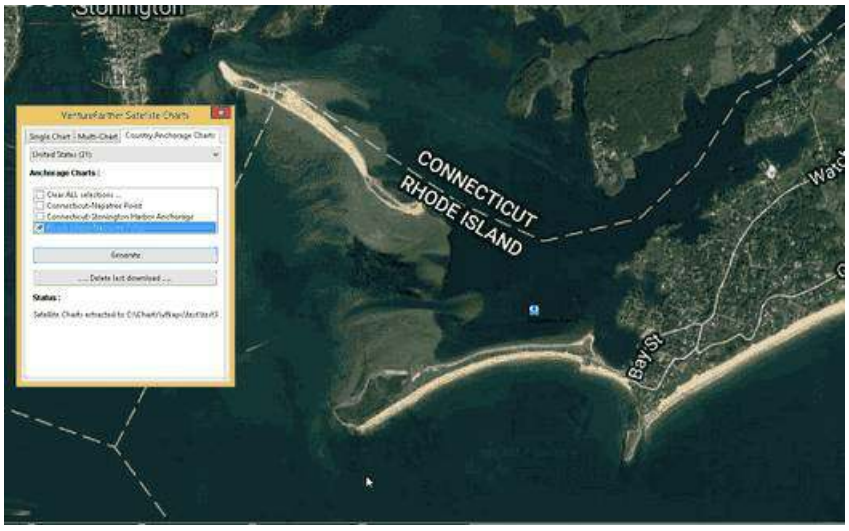

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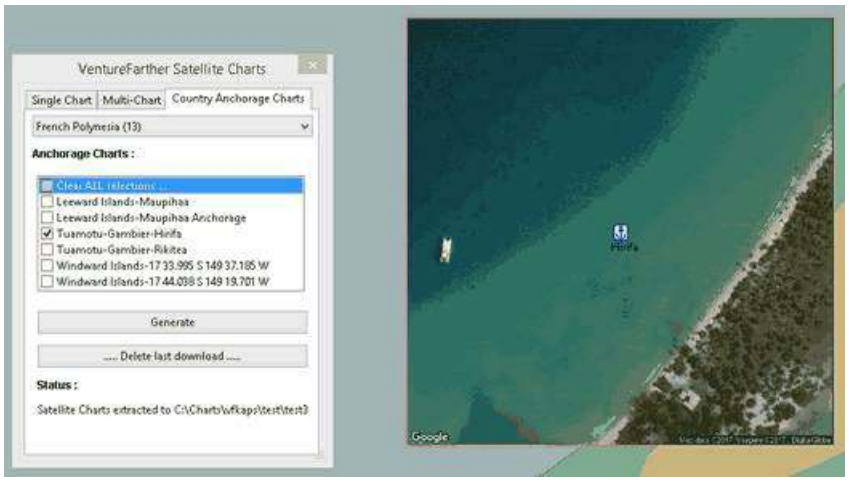
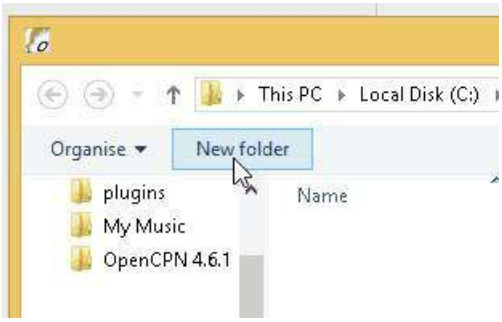


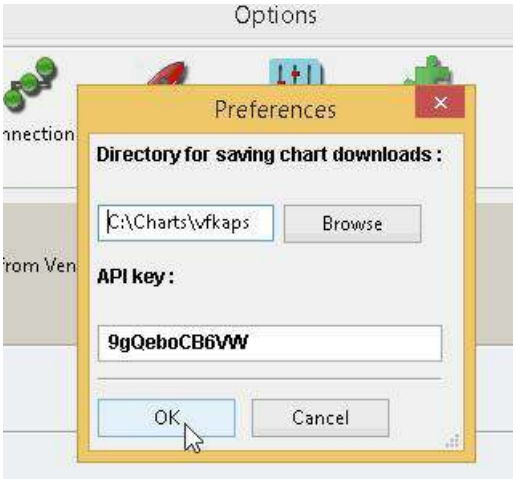
3. Standard actions

Open the toolbox and enable 'vfkaps'. Open 'Preferences'.

Select/create the directory where you want to save your satellite charts.

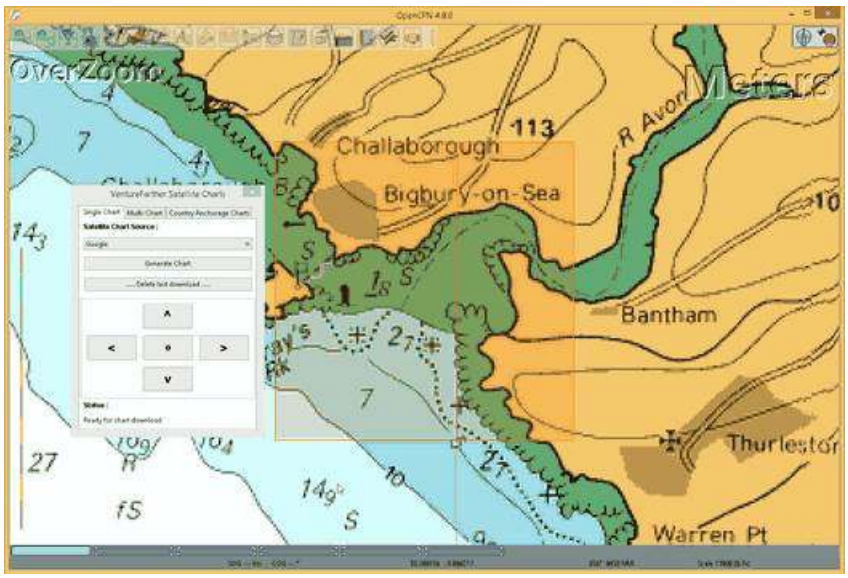


Enter your VentureFarther API key.



Apply/Ok and on the toolbar you will find the vfkaps icon.

Start the vfkaps plugin.



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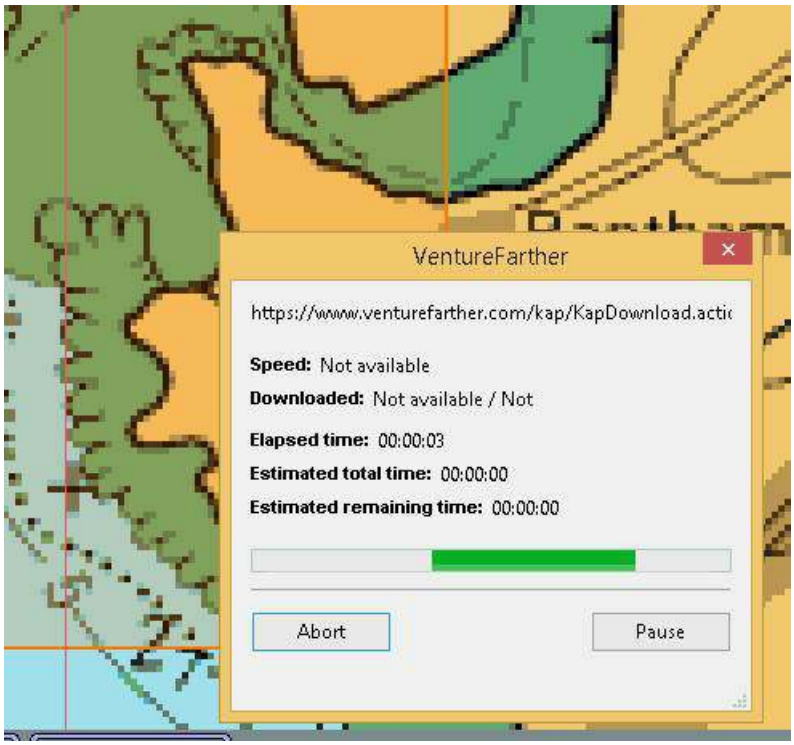

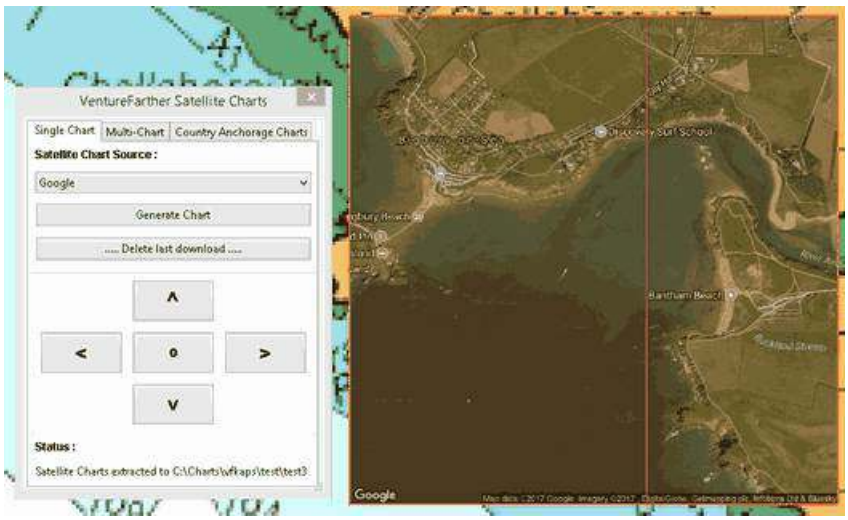

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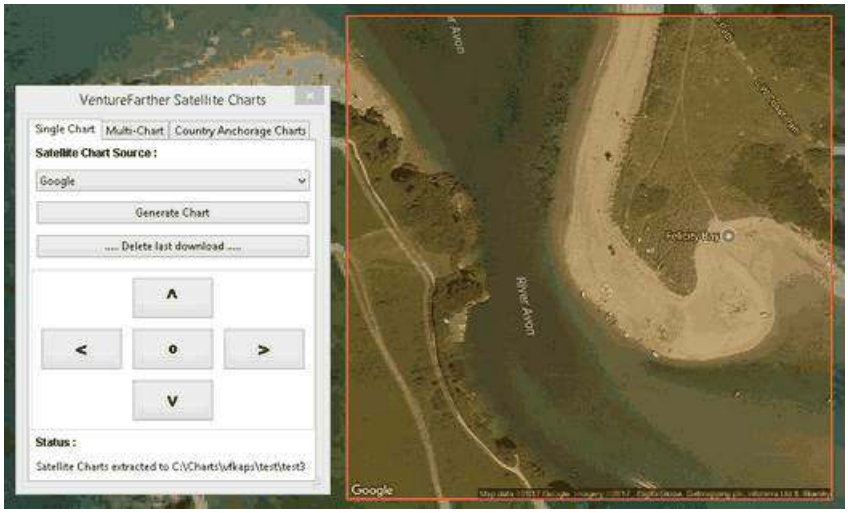

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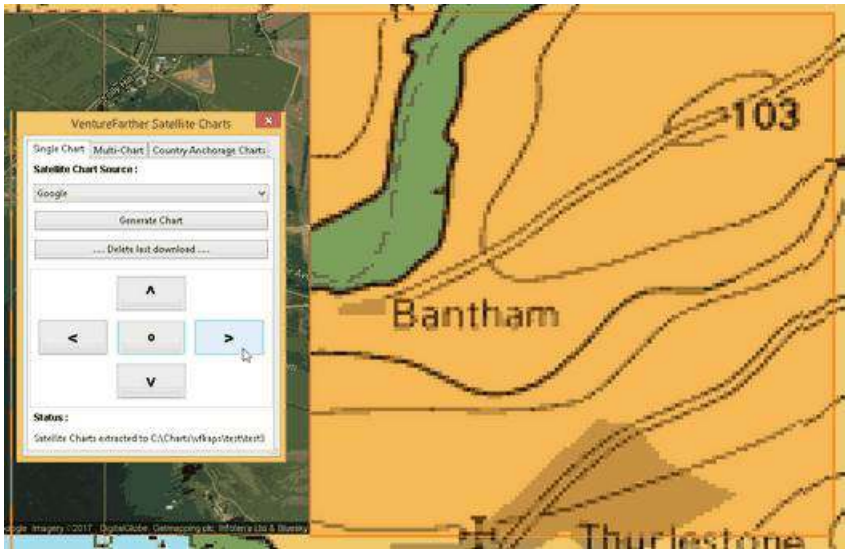

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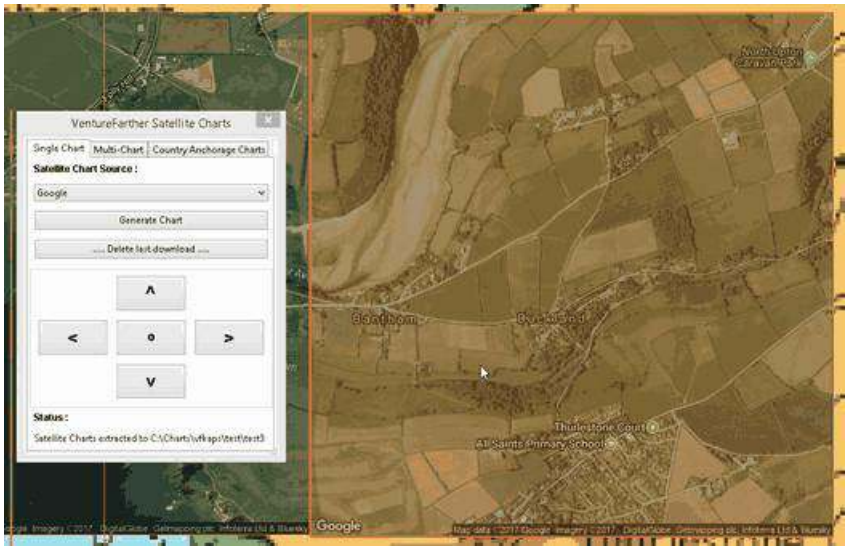

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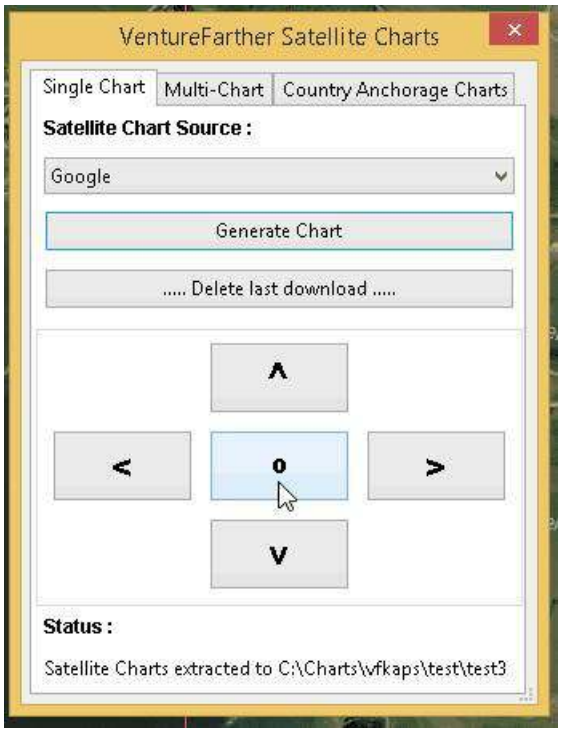

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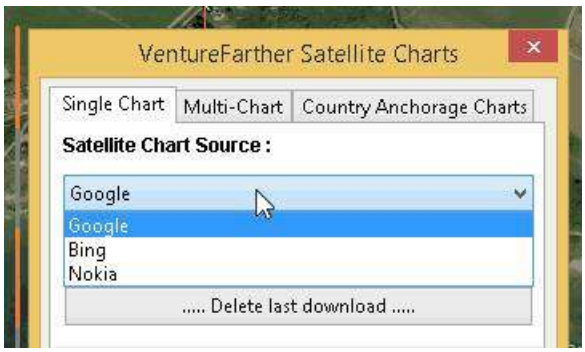

[opencpn:opencpn_user_manual:plugins:charts:vfkaps#deleting_the_last_chart_download|Thi shows how to delete files from the last download]]

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Country_VF_latitude_longitude (degrees, decimal minutes)

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4. Options / Warnings / Ideas

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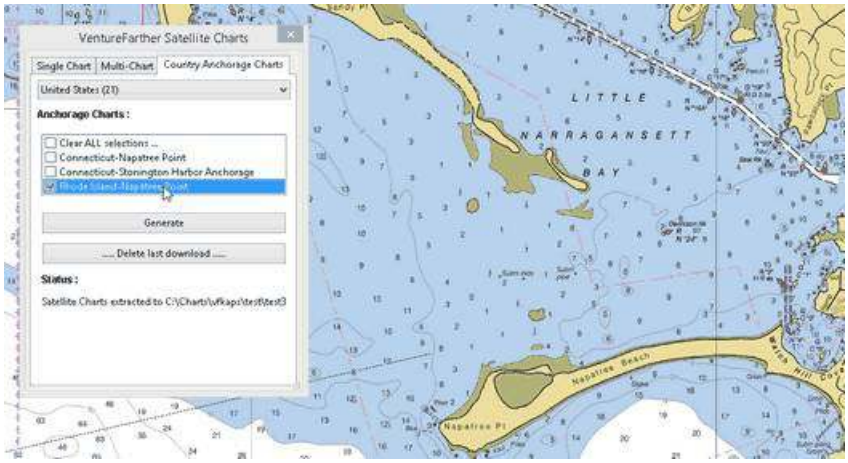
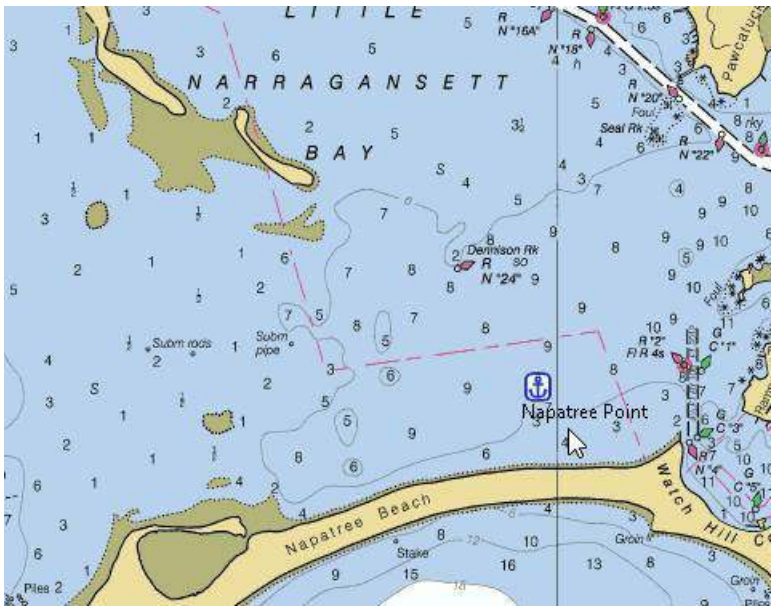
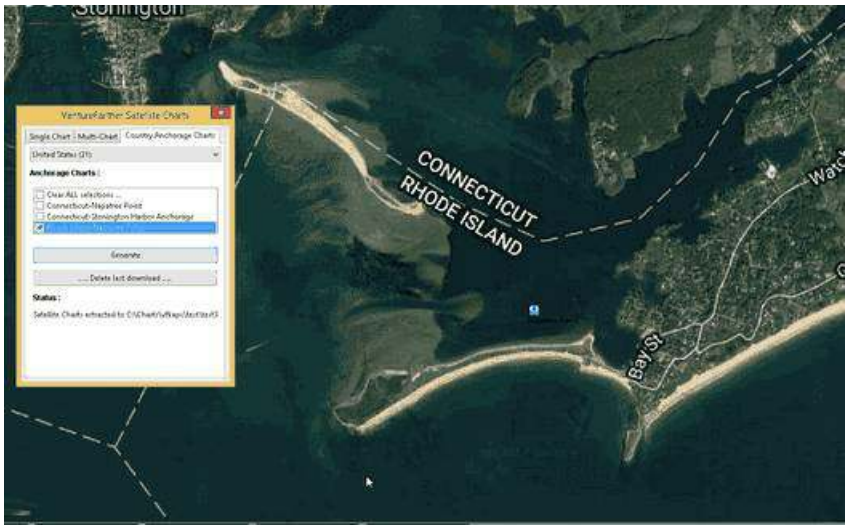
Using this tab generates a list of countries for which users have contributed an anchorage. Select the anchorage area of interest. 'Generate' will create the satellite chart and place a waypoint icon near the anchorage. **The normal warnings apply about using the best information available to determine the safety of the anchorage you have chosen.**







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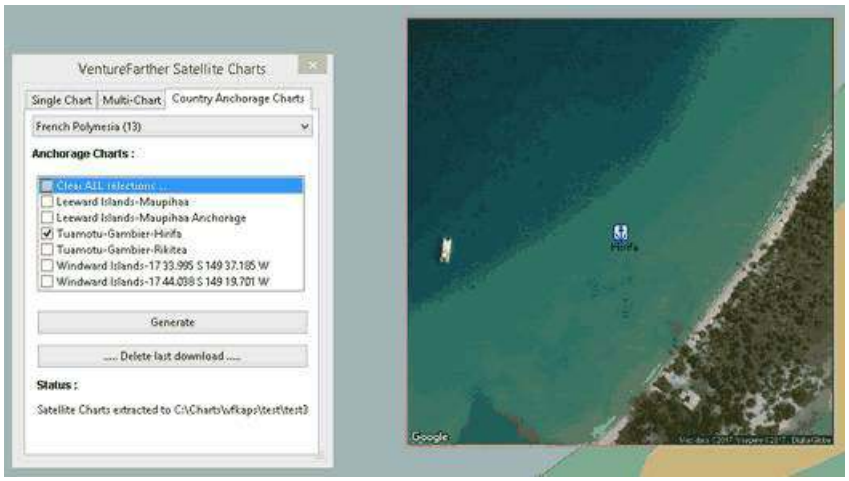
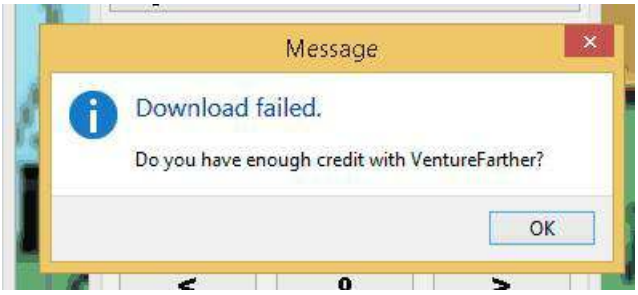


Insufficient credit with VentureFarther

If you have run out of credit with VentureFarther you will get a warning notice.



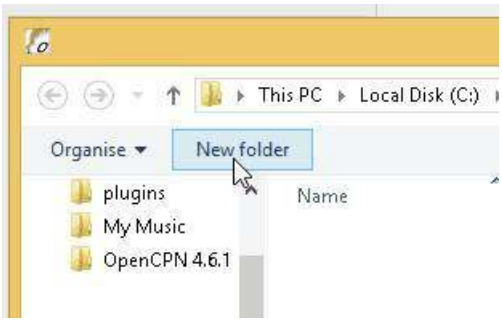
You will need to increase your credit with VentureFarther by making a contribution to the data on that website. You may wish to purchase an annual subscription.

Chart directory has been deleted

If you have deleted the directory where you have been saving the charts you will get a warning.

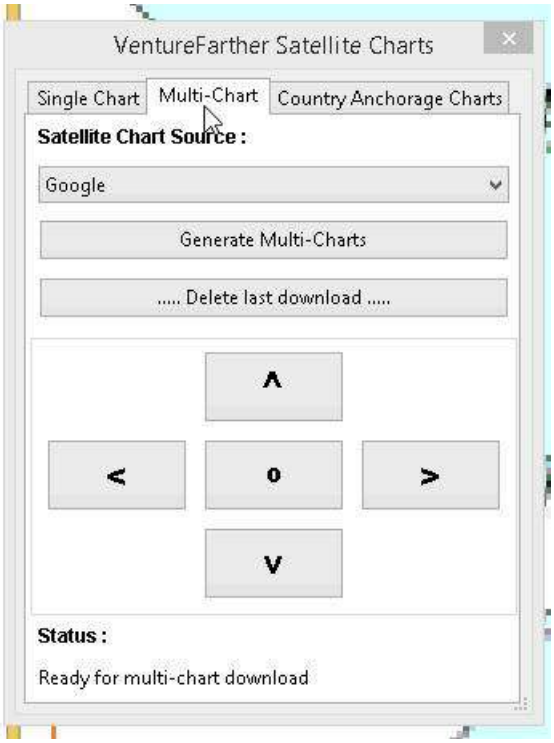
{{opencpn:manual:plugins:vfkaps:9b.vf.jpg?nolink&}}

You will need to go back to preferences and select/create a new directory.



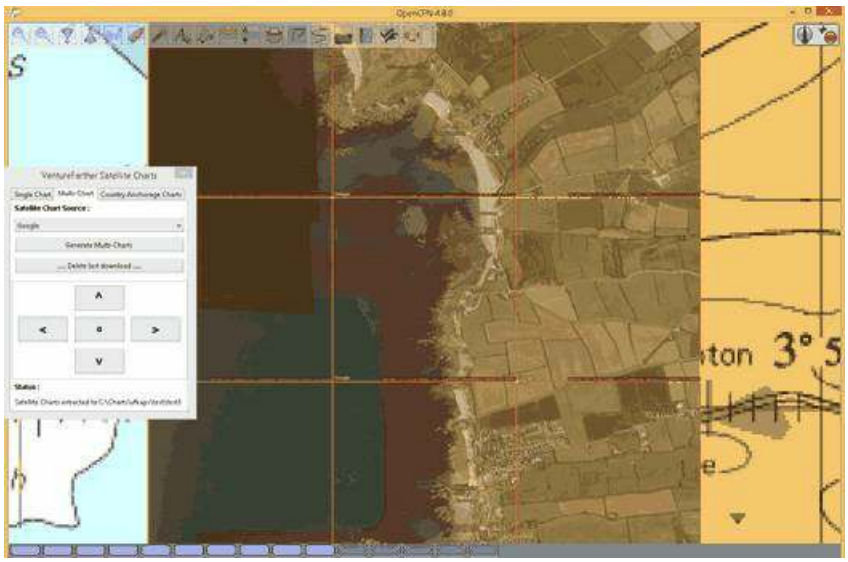
Tiling satellite charts

This is carried out by using the 'Multi-Chart' tab.



Use the direction arrows to select the centre of the 9 charts that will be downloaded.

Be prepared for a large download, that can take several seconds.



Surrounding charts at very small scale

Single chart downloads at very small scale is possible. You will not be able to download the surrounding charts using 'Fetch surrouding charts'.

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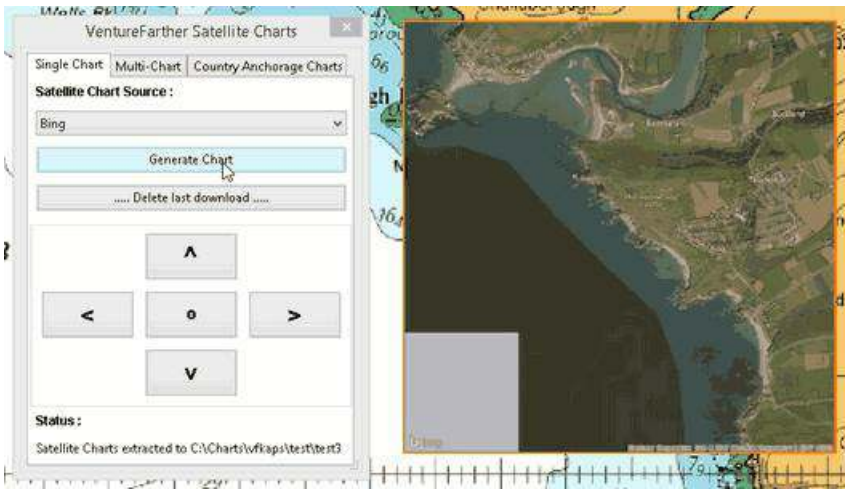
This option is useful if you want to compare the satellite chart of the same area from different providers.



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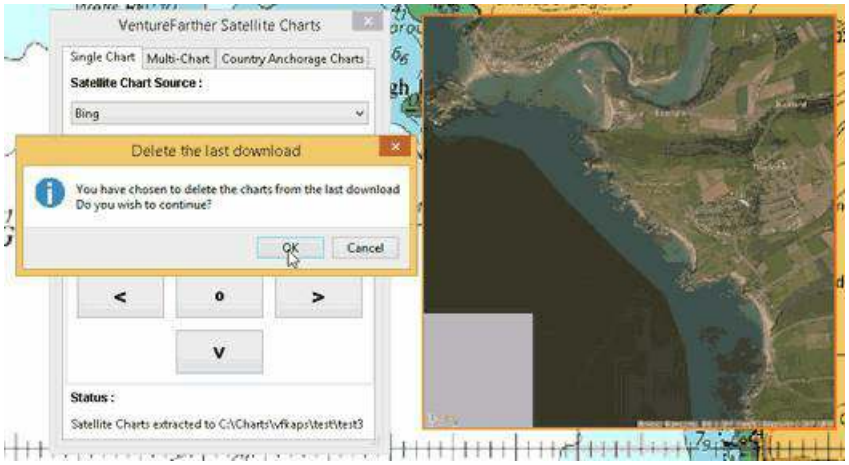

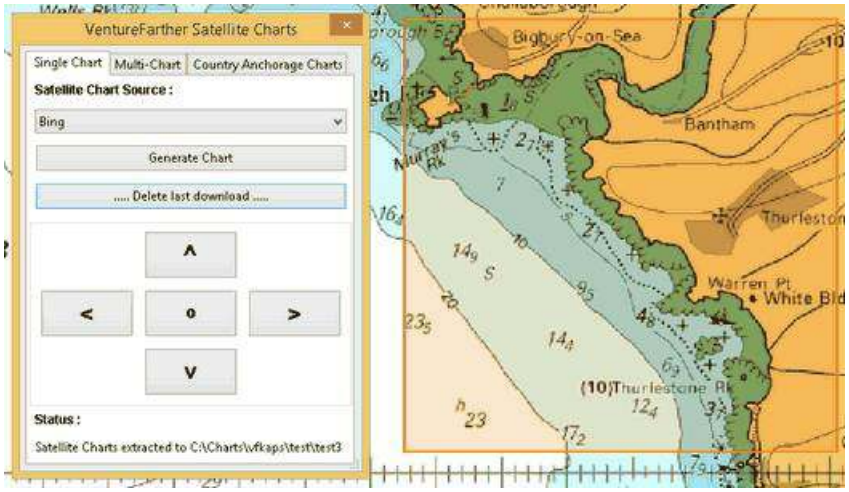

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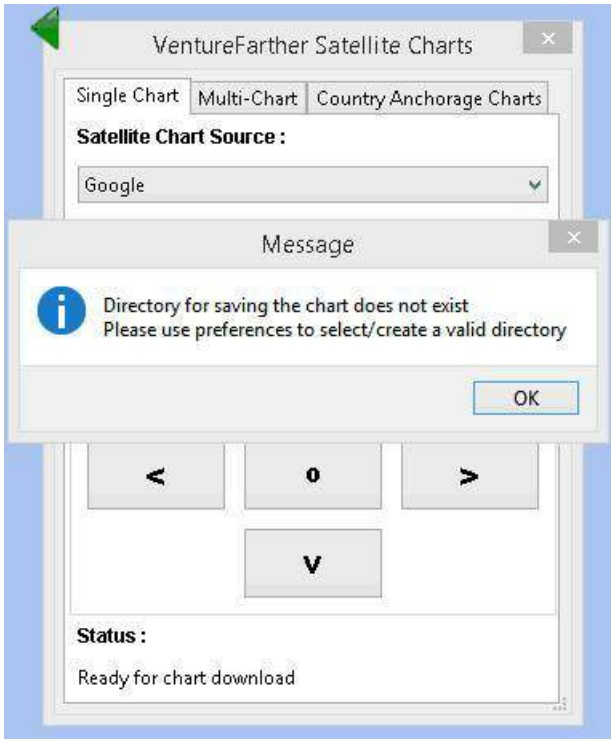

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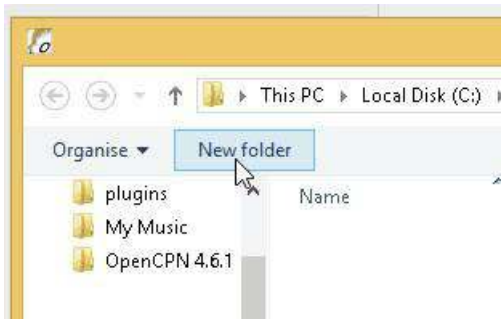

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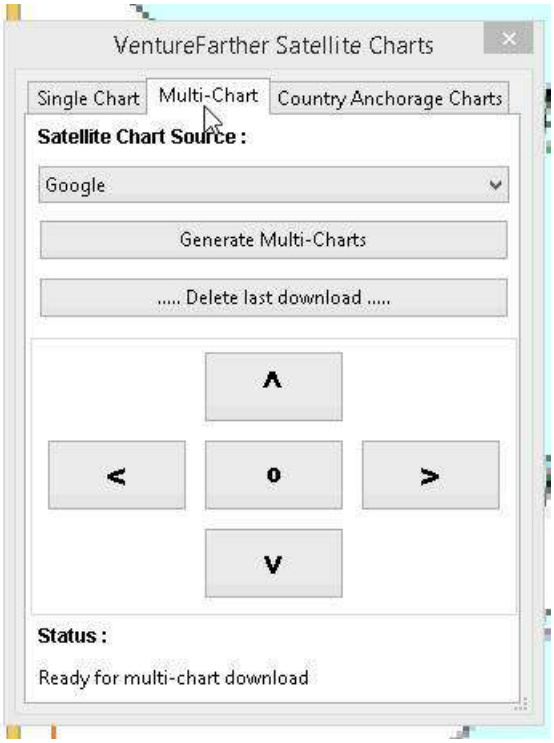

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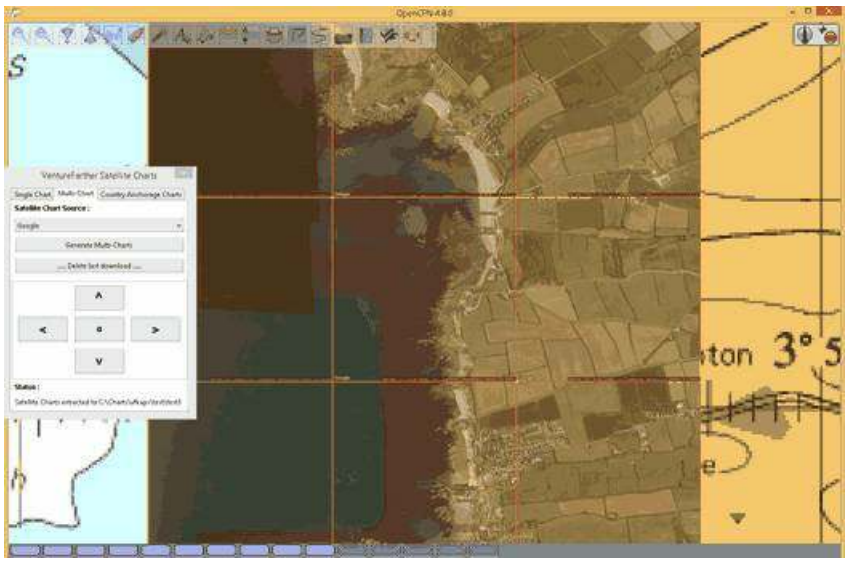

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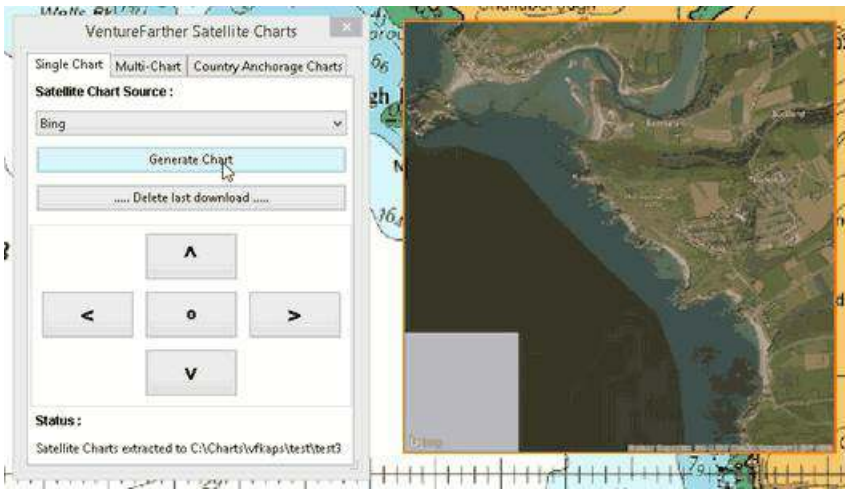

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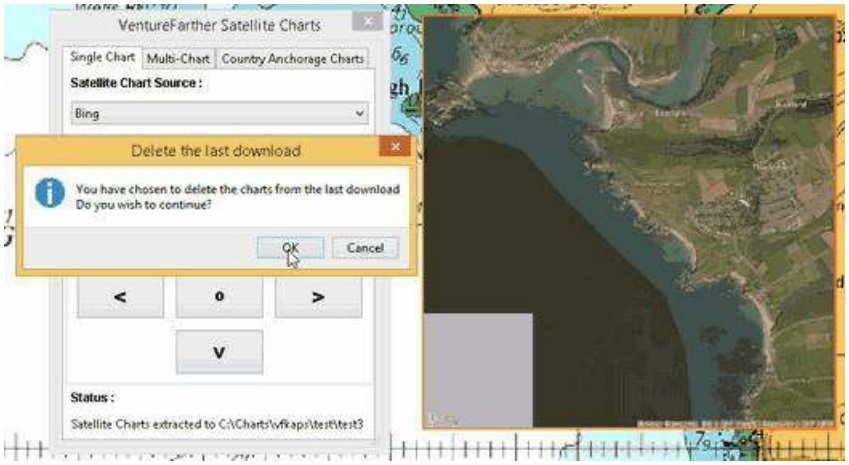
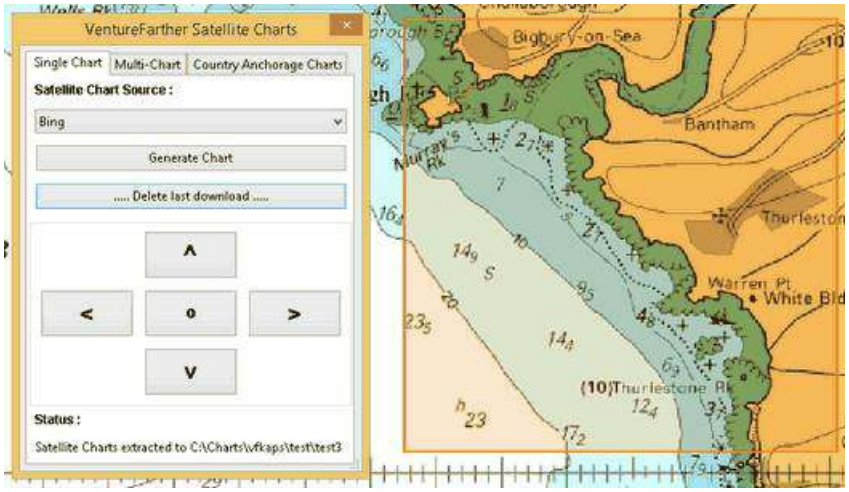




Rotation Control

This document is about Rotation Control-plugin (Rotation-pi)

Links

- Source: https://github.com/seandepagnier/rotationctrl_pi[361]
- Download: https://opencpn.org/OpenCPN/plugins/chartrotation.html[362]
- Forum: http://www.cruisersforum.com/forums/f134/rotationctrl-plugin-144542.html[363]

***Important Note**:*
This plugin is an early testing release.
You may encounter some bugs in this plug-in.
See "Remarks", part B and C.

- What and Why
  - A. What can Rotation-pi do
  - B. Why can Rotation-pi be useful
- Installation
  - A. Where to get Rotation-pi
  - B. How to install Rotation-pi
- Standard Actions
- Remarks
  - A. Why (or why not) "North up"?
  - B. Strange behavior of ENC-text
  - C. Strange interaction with Google Earth
  - D. Notes on possible performance-issues

1. What and Why

A. What can Rotation-pi do

The plugin allows the user to control the way the chart is shown on the the computer-screen.

You can rotate the chart manually (clockwise, counterclockwise) and in the following manners:

- **North** up (the top of the chart corresponds to the direction of true North).

- **South** up (the top of the chart corresponds to the direction of true South).
- **Course** up (the top of the chart points corresponds to the direction you are actually goïng (Course over Ground).
- **Heading** up (the top of the chart corresponds to the direction you are steering).
- **Route** up (the top of the chart corresponds to the waypoint that is activated as “navigate to”.
- **Wind** up (the top of the chart corresponds to the direction the wind is coming from).

The plugin gets the necessary information in the following manners:

- about “**North**“and “**South**”: from the information in your **digital charts**.
- about your **course**: from your **GPS**.
- about your **heading**: from your **(electronic) compass** that outputs NMEA-data to OpenCPN.
- about your **route**: from **OpenCPN** (when you have activated a route).
- about the **wind**: from your **wind sensor** that outputs NMEA-data to OpenCPN.

B. Why can Rotation-pi be useful

Normally the representation of a chart is “North up”.

That means Top is “North”, Right hand side is “East”, Bottom is “South” and Left hand side is “West”.

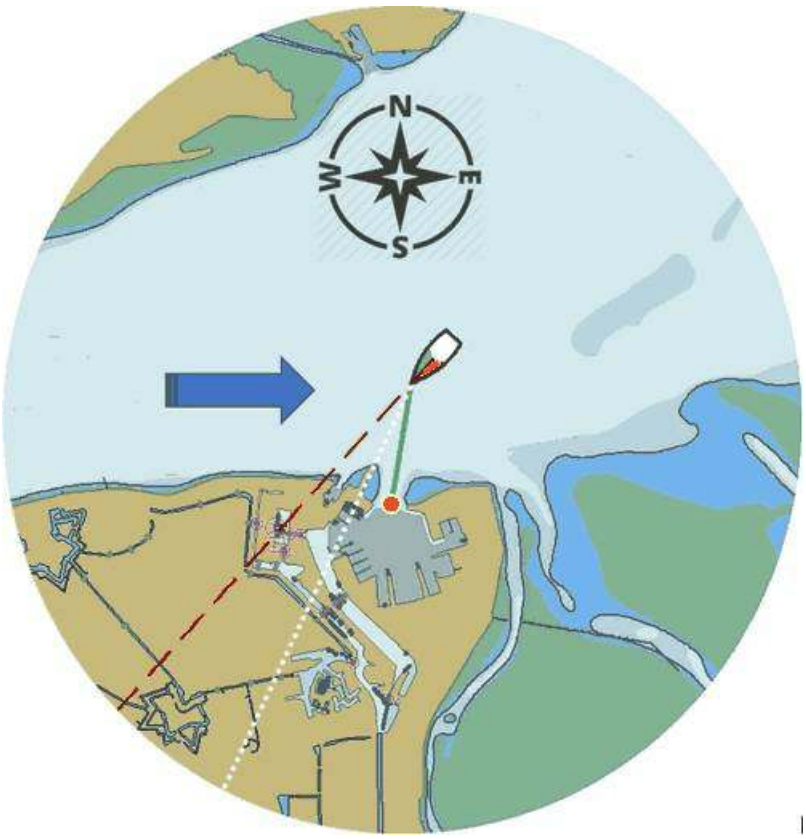
But maybe you prefer to have the top of the chart corresponding to “South”.

Or to have the top of the chart corresponding to:

- your present course (to where you are really going to)
- or heading (to the direction your bow is pointing to)
- or route (to where you are supposed to go)
- or the wind-direction (the direction to avoid facing while throwing up or peeing).

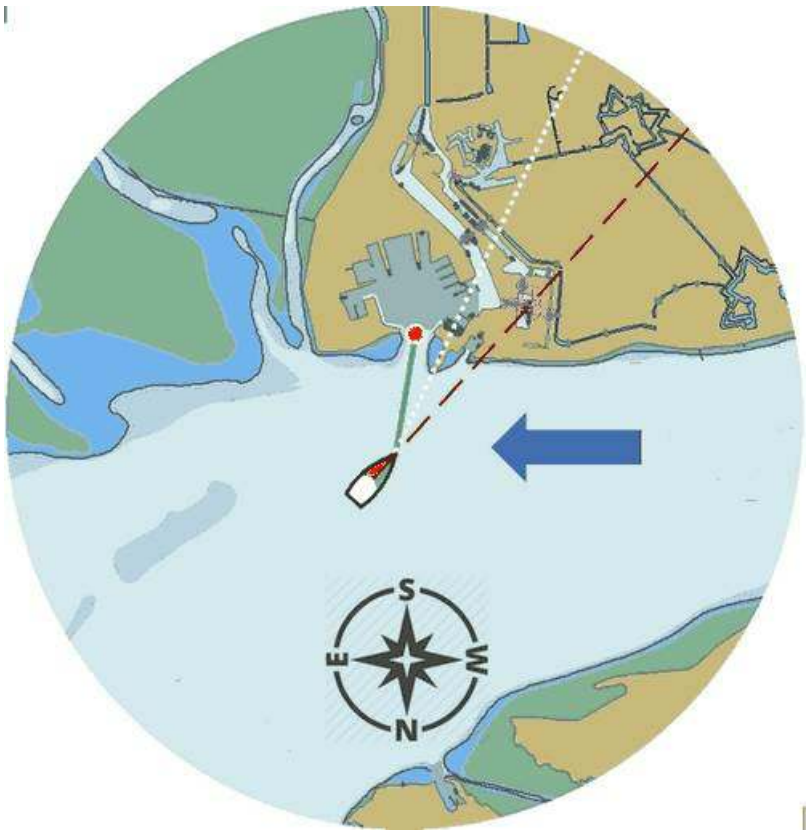
Examples:

This sailing vessel is inward bound. The representation is “North up”.

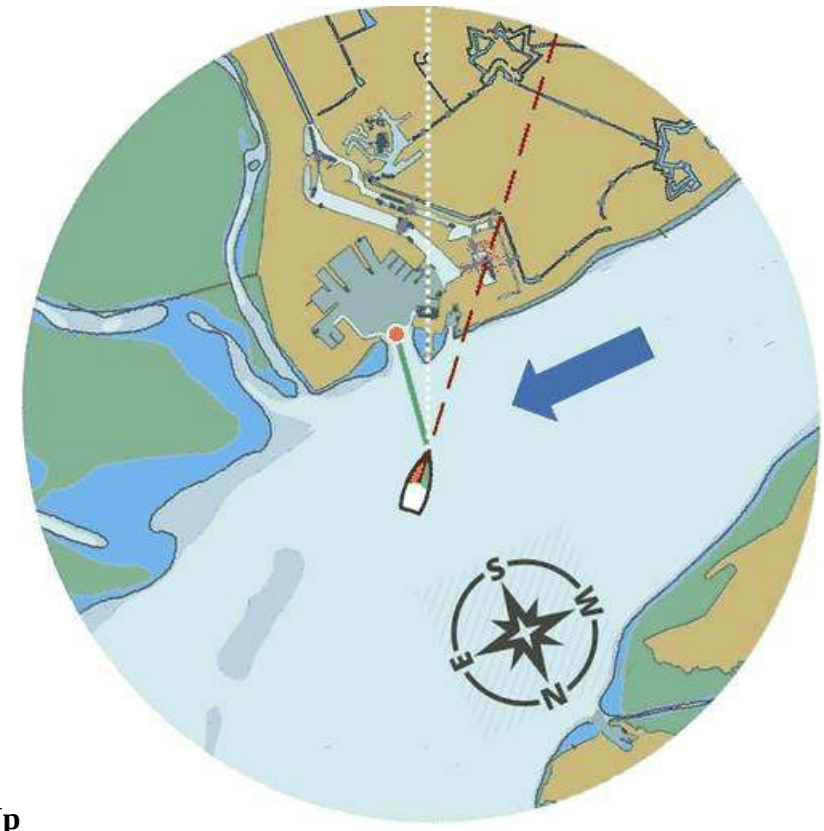


- The **wind** (blue arrow) is from the **West**.
- The ship's **heading** is the **red dashed** line.
- The ships **course** (over the ground) is the **white dotted** line.
- The ships **route** (next active waypoint) is the red dot at the end of the **green line** (and don't worry, she's just about to turn to port).

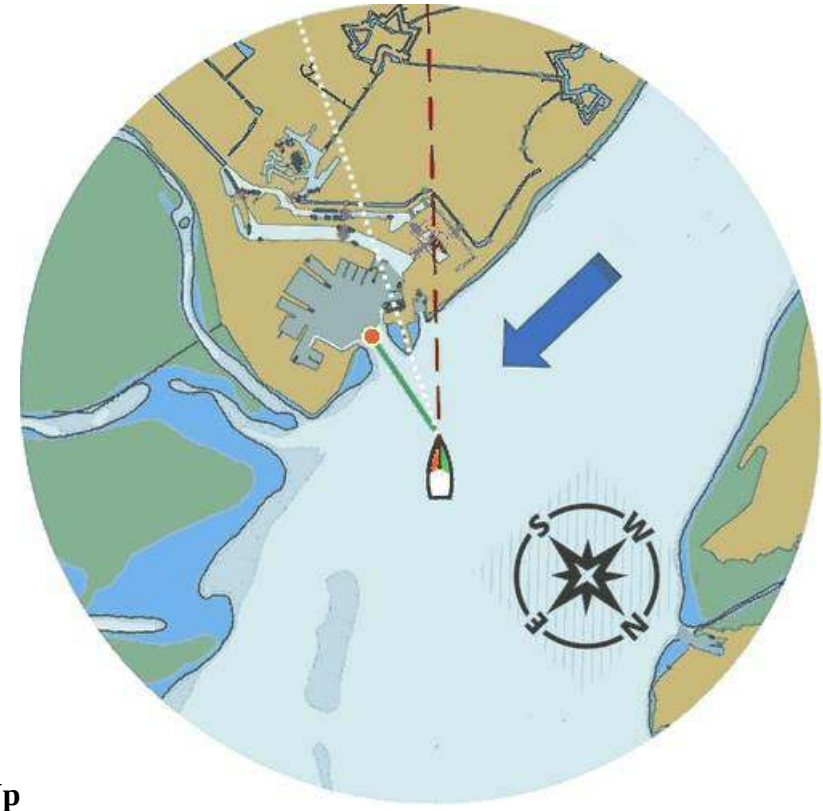
The next illustrations show you the differences. Note the rotation of the coastline.



South Up

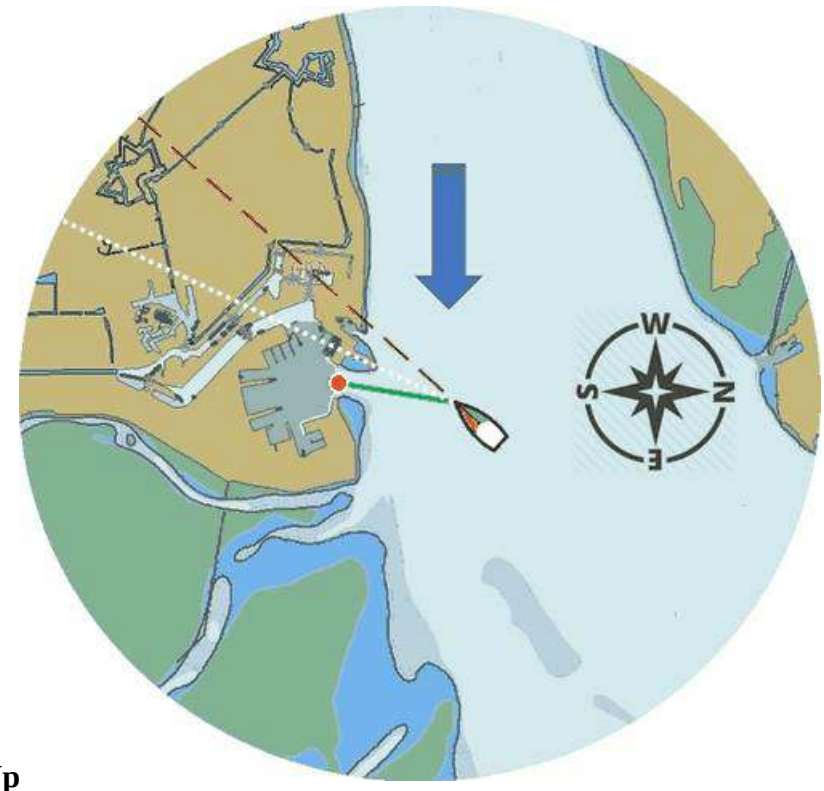


Course Up



Heading Up

Route Up



Wind Up

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2. Installation

A. Where to get Rotation-pi

Rotation-pi can be downloaded from
https://opencpn.org/OpenCPN/info/downloadplugins.html[364]

B. How to install Rotation-pi

Make sure you choose the file that is compatible to your computersystem.
In this manual we presume it's Windows, so we choose the Windows setup-package.

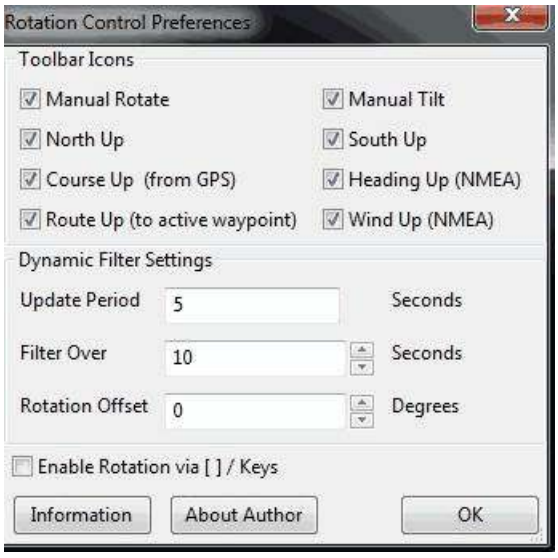
Download the file (double-click). Double-click the downloaded file (with “rotationctrl_pi” in the name and ”.exe” as extension) and follow the set-up instructions.
That's it.

Open (or restart) OpenCPN.
Click **Tools-Options-Plugins**
Scroll down until you see the Rotation-pi.

Click “**enable**”.

The Rotation-pi icons should appear in your Toolbar.

Additionally you can set the **Preferences**.



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3. Standard Actions

What are basic (standard) actions you have to do to make Rotation-pi work.
Simple: just click the button of your choice to activate the desired rotation.

Note: the buttons for “Manual Tilt” (the red buttons) do not seem to work yet!
To go back to the normal representation (“North up”) click the “North up”-button.

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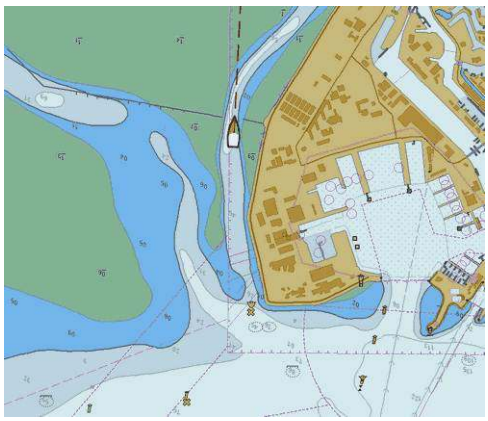
4. Remarks

A. Why (or why not) "North up"?

This is the “normal” representation (“**North** up”).

We are sailing in a narrow channel in a southerly direction.
On the chart, the coast is on the **left** side of the boat-icon.

But for the helmsman on board the coast is on his **right** hand (starboard) side.
For someone who has a clear visual image of the chart “in his head”, this should not be a problem.
But other people may find it a bit confusing.

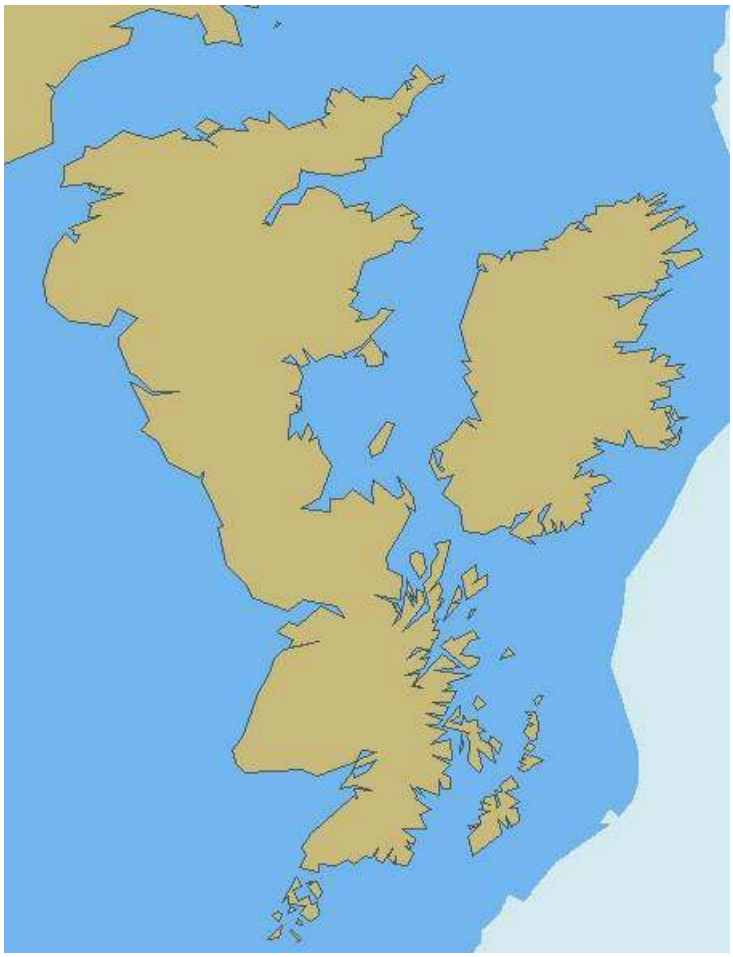


This is the same situation, but now with “**Heading** up”.

In this presentation-mode the chart shows the coast on the same side (right hand) as it is seen from the helmsman's position.
That sounds logical.

But for those of us who have “the chart in their head” it can be confusing.
(because the brain may say *“Hey skipper! It's your boat that is moving and turning, not the coast!”*)

Let's face it: when thinking of the UK and Ireland,is this what you have in mind?



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B. Notes on possible strange behavior of ENC-text

When using ENC-charts (vector-charts) you might experience some weird behavior when using any other mode than “North up”.

This is “**North** up”

Note the ENC-text for the names and numbers of the buoys and the indication “Wk” on the wreck-symbols.

And a few seconds later, but now with “**Heading** up”.

Note the icons for the buoys are not “upright” anymore, but also rotated (and with “South up” they would be completely upside down).

But more disturbing is that the ENC text for the names and numbers of the buoys has disappeared (as has the text “Wk” on the wreck-symbols).
And other ENC-text might be placed in the wrong positions.

This “missing text-bug” can occur because in this example a ENC (a vector chart) is used.
It can occur with all representations that are not “North up”.

Note: This does not seem to occur to all ENC's, but it **can** occur.
It can not happen while using a raster chart (on a raster chart you will not lose the text, but the text will be rotated the same way as the rest of the information on that chart).

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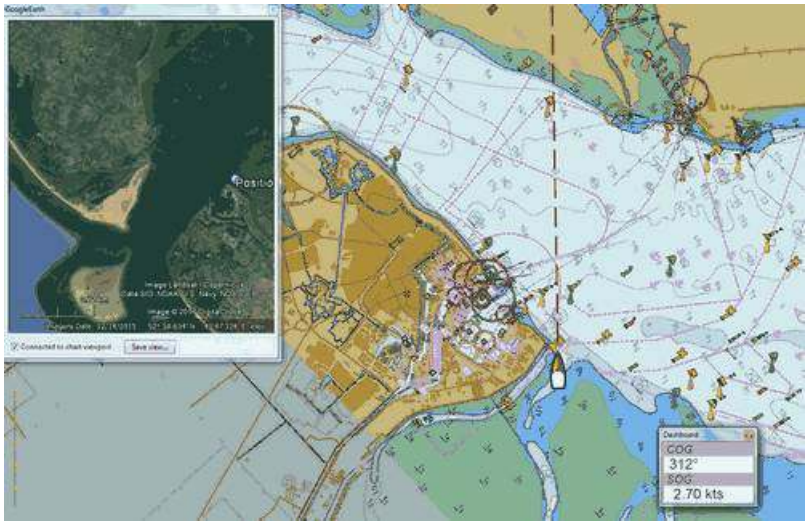
C. Notes on strange interaction with Google Earth

When used in conjunction with the Google Earth-plugin, something strange happens. In any representation-mode other than “North-up” or “South-up”, the picture in the Google Earth-window rotates ***opposite*** to the rotation of the main screen (the chart).
In other words, if the main charts rotates clockwise, the Google Earth-window rotates counter-clockwise and vice versa.



True, it does make navigation more interesting, but nevertheless should be considered a bug in this plug-in.

D. Notes on possible performance-issues

When you alter course, something happens on your OpenCPN screen. In normal mode (“North up”) OpenCPN rotates your ship's icon. But in modes “Heading up”, “Course up” and “Route up”, you want OpenCPN to rotate the world. That takes a lot more than just rotating that ship-icon. On less powerful systems it might cause the system to respond slower than desired (or it might cause other problems).

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ChartScale

Links

- Source: https://github.com/seandepagnier/chartscale_pi[365]
- Downloads: https://opencpn.org/OpenCPN/plugins/chartscale.html[366]
- Forum: http://www.cruisersforum.com/forums/f134/chartscale-plugin-201340.html[367]

This document is about ChartScale-plugin (Chartscale-pi)

- What and Why
- * A. What can chartscale-pi do
- * B. Why can chartscale-pi be useful
- Installation
- * A. Where to get this plugin
- * B. How to install this plugin
- Standard Actions

1. What and Why

A. What can Chartscale-pi do

The plugin allows the user to zoom in and out by means of a slider.

B. Why can Chartscale-pi be useful

Normally you use the (+) and (-) buttons or the scroll-wheel of your mouse for zooning in and out. But maybe you prefer tou use a slider. The position of the slider (far left, far right or somewhere in between) gives you a direct indication of the zoom-status.

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2. Installation

A. Where to get this plugin

The github repository is:

https://github.com/seandepagnier/chartscale_pi[368]

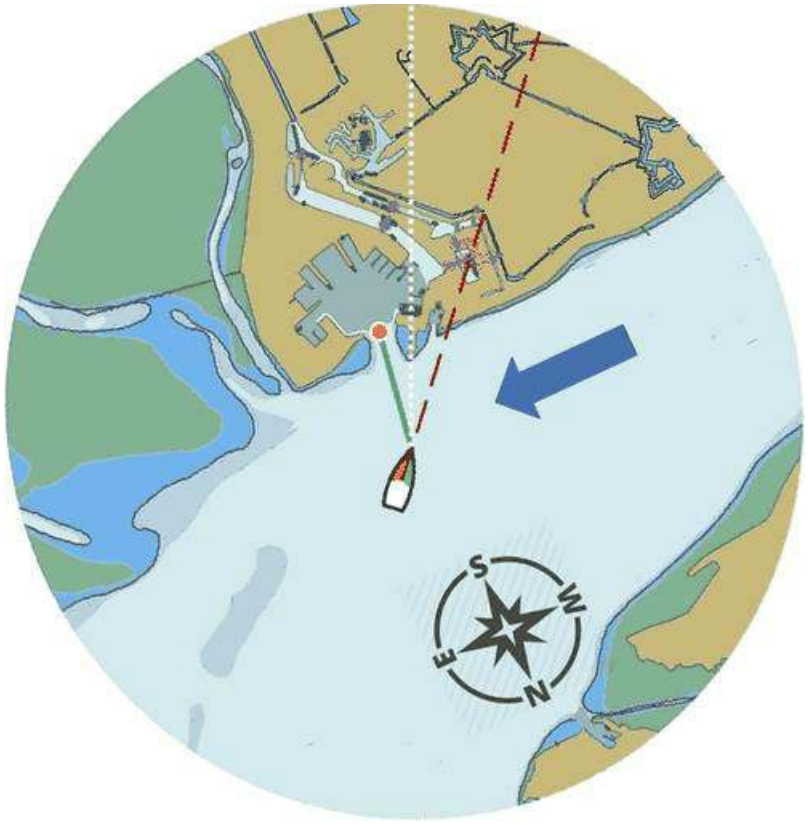
ChartScale-pi for Windows can be downloaded from this location:
[https://github.com/rgleason/chartscale_pi/releases[369]|Chartscale Executable]]
Click on the most recent to download.

B. How to install this plugin

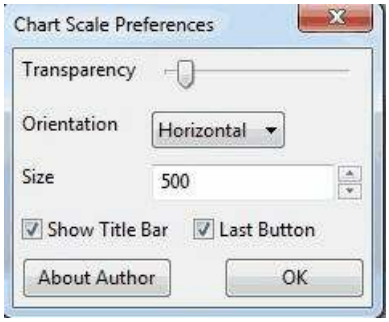
Double-click the downloaded file (with “chartscale_pi” in the name and “.exe” as extension) and follow the set-up instructions.
That's it.

Open (or restart) OpenCPN.
Click **Tools-Options-Plugins**
Scroll down until you see the ChartScale-pi.

Click “**Enable**” to enable the plugin and then “**Preferences**” to set your preferences (should be self-explanatory).



Click “**OK**” in the Chart Scale Preferences window

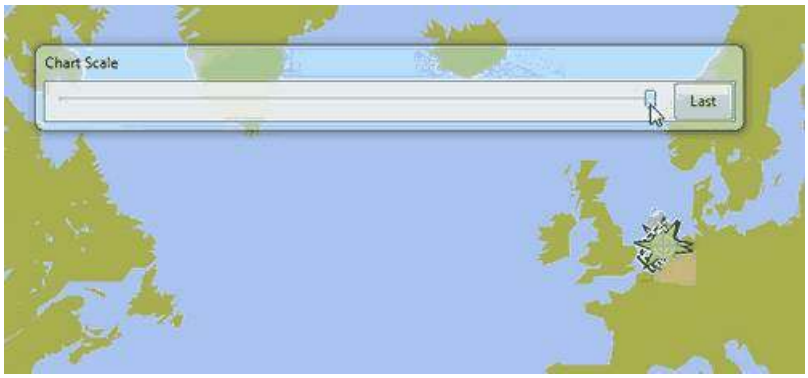


and then “**OK**” in the Plugins-window.

Now the Chart Scale slider should appear on your screen.

In this example the slider-button is to the far left. That means “zoom in as far as possible”.

And in this example the slider-button is to the far right. That means “zoom out as far as possible”.



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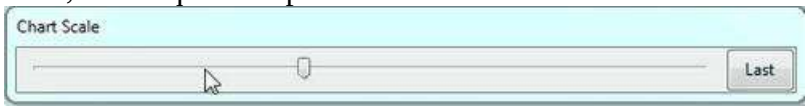
3. Standard Actions

What are basic (standard) actions you have to do to make ChartScale-pi work.

Well, that is quite simple. Click on the slider-bar. Click left of the slider-button to zoom in…



And click right of the slider-button to zoom out.

Click “Last” to zoom back to the zoom-factor that was last used.

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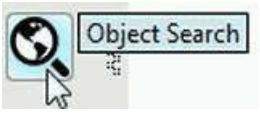
Object Search

Allows search of named objects on S-57 and CM93 vector charts.

Links

- Source: Github[370]
- Download: Chart Object Search[371]
- Forum: ObjSearch_pi Thread[372]
-

This document is about Object Search plugin (Search-pi) 

1. What and Why
2. Installation
3. Standard Actions
4. Examples
5. Frequently Asked Questions

What and Why

A. **What does Search-pi do**

Object Search is a plugin that allows you to find charted items:

1. you did not know exist
2. you did know exist, but did not know the position of.

Note: Object Search is for searching charted objects in **VECTOR** charts only.

B. **Why should I want it?**

Well… the answer is simple: You might want to know the position of a certain charted object (duh…).
Charted objects can be buoys or other navigational aids, bridges, locks, land-area's etc.

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A. **What does Search-pi not do**

Read S-63 and oeSENC licensed and encrypted charts. The plugin cannot deal with the encrypted chart objects.

Installation

Note: In this section the instructions are specifically for Search-pi, but there is a dedicated page in the manual with information about Downloading, Installing and Enabling Plugins in general. That dedicated page can be found here: Plugins - Install and Enable.

Search-pi can be downloaded from http://www.opencpn.org/index.html[373]

Click "**Downloads**"

Click "**Plugins for OpenCPN 4.2 & 4.4**"

Scroll down to the "**Chart Support**"-section and click "**Chart Object Search**"

B. How to install the plug-in

Make sure you choose the file that is compatible with your computersystem. In this manual we presume it's Windows, so we choose the **Windows setup-package**.
Download the file (double-click).

We assume you know where to find the files you download from the Internet (if you don't: quit now and read the manual of your computer before doing anything else with it).

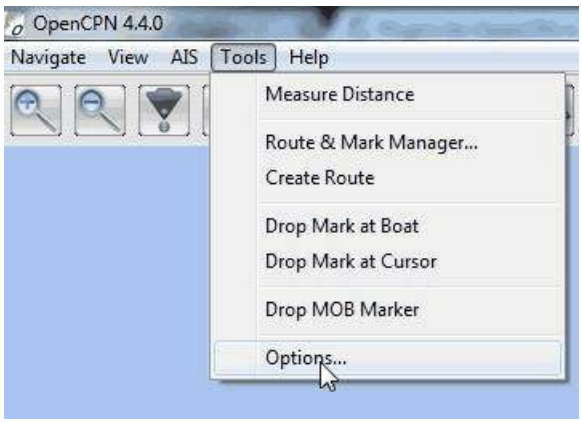
Double-click the downloaded file and follow the set-up instructions.

That's it. But before you can actually **use** the plug-in, you first have to **enable** that plug-in in OpenCPN.

Enabling the plug-in OpenCPN

Open (or restart) OpenCPN.

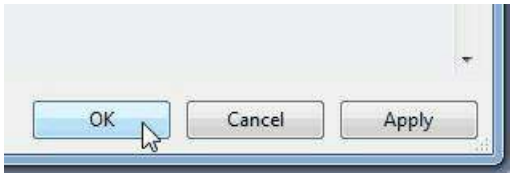
Click **Tools-Options-Plugins**



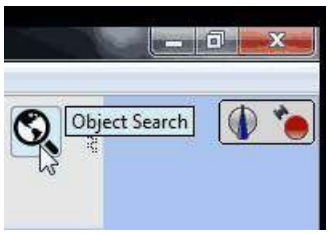
Scroll down untill you see the Object Search-pi.

Click "**Enable**".

Click "**OK**".



Now the Object Search-pi icon (it looks like a looking glass) should appear somewhere in your OpenCPN Toolbar.



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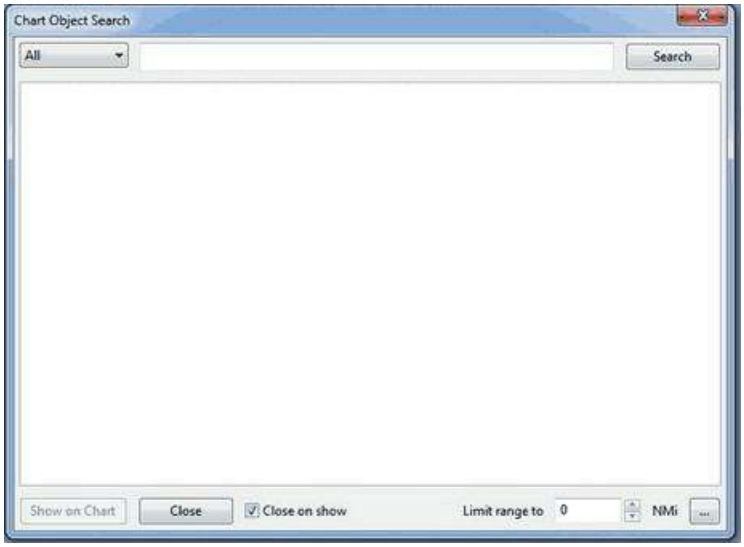
Standard actions

When you click the Object Search-pi icon, this menu will open.

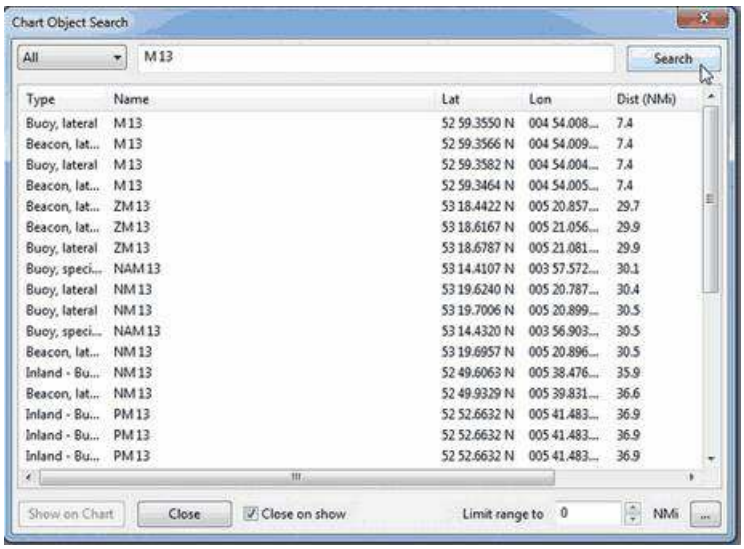


Let's presume we want to search for a charted object with the name "**M 13**".

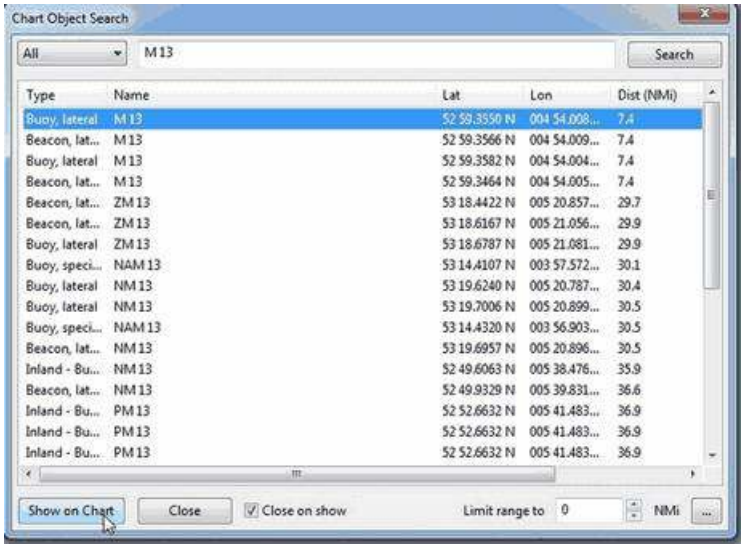
Why? Well, for example because you are sailing in Dutch waters.
After visiting the National Lifeboat Museum in Den Helder (the gateway to the Dutch Waddensea) you plan a trip from Den Helder to the small fishing harbour of Den Oever, some 10 miles east of Den Helder.
You are warned to stay well clear of the shallows directly south-east of buoy M 13.

OK, now you know there is a buoy M 13 somewhere between Den Helder and Den Oever.
But you want to know where exactly that buoy is.
So you use Object Search to find "M 13" for you.

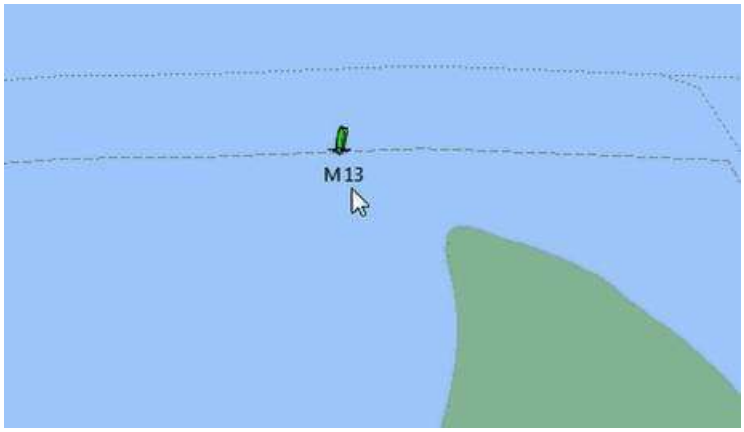
Insert the text you want to search for and click "**Search**".



Click one of the Results and click "**Show on chart**".



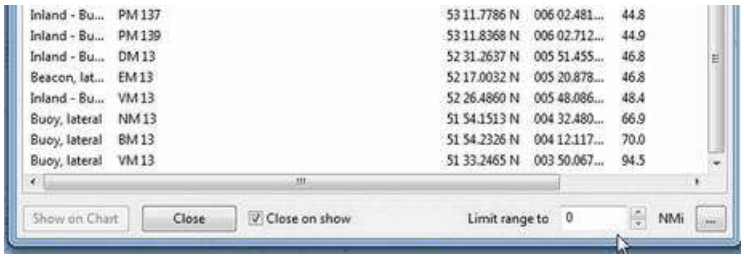
Zoom in and there is your buoy "M 13". And directly south-east of it that dreaded spit.



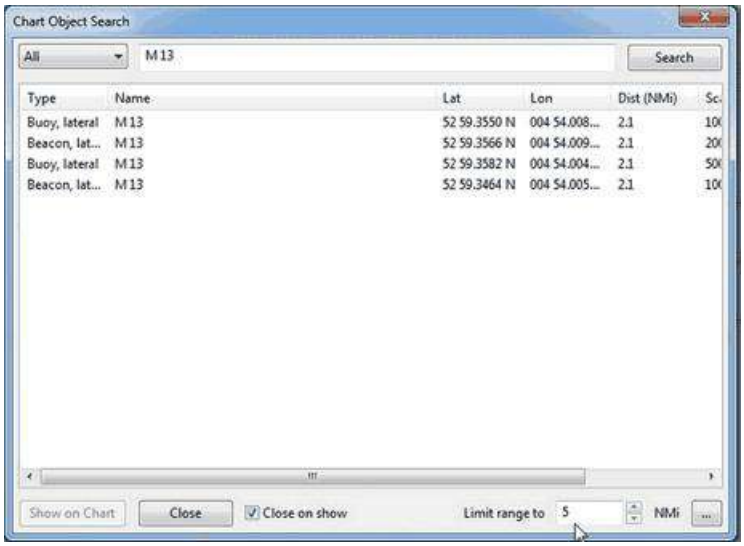
Now as you can see, there are quite a few items in your "Results".

You can narrow the list of results down by adjusting the field "**Limit range to**".

"**0**" means "**No Limit**" and will give the longest list of results.
There is even an item "VM 13" 94.5 miles away. That is not necessary and can be confusing.



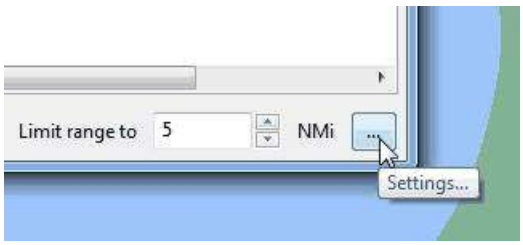
Let's say in this example we expect the buoy M 13 to be within 5 miles from our boat's position.
Therefore we have set a limit of 5 Nmi.
("**5**" means "**Search in a range of 5 Nautical Miles from the boat's position**").
That will narrow the list of results down considerably.

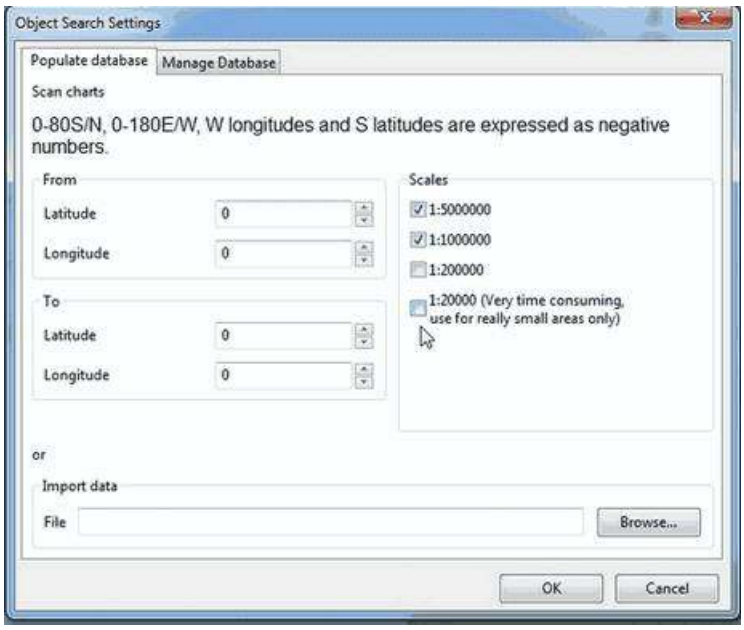


And that is better manageable.
Just four hits (and all four of them are about the buoy we are searching).

Note: it's obvious that if you set too small a limit (and the object you search is not within that limit) Object Search will not be able to find it!

You can also adjust the settings via (you guessed it…) "Settings".





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Examples

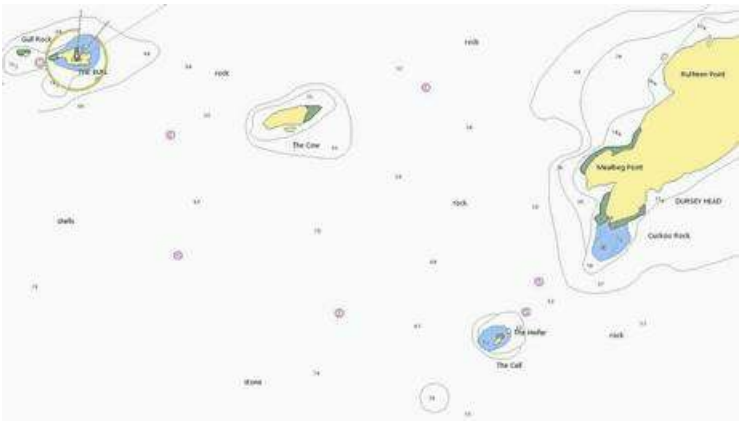
The first example is already given in the previous section. In that example you want to look-up an object that should be on your chart, you just don't know it's exact position.

But here's another example (OK, maybe a bit silly…):

You are on a sailing trip on the South-West coast of Ireland. You have made it to Baltmore, County Cork, and are sitting in a bar, enjoying the local brew. The next leg of the trip will involve rounding Dursey Head. You mention that to one of the locals and he replies with "***Oh, but then you should watch out for the bull!***". His mate says "***Oh no, never mind the bull, you can see that from miles away. The heifer and her calf are far far more dangerous!***". Now this gives you an uneasy feeling. What the heck are they talking about? Why should a heifer be more dangerous than a bull? And a heifer and her calf? How's that possible? (a heifer is a young cow before she has had her first calf). And besides: it's a sailing trip, not a bloody hike through the fields!
You are wondering what the ingrediënts of that local beer are, but before you can inquire further, the two locals leave the pub and you are left behind in utter confusion.

When you are back on board of you ship, you start OpenCPN to run Object Search. Type in the "search" field "**heifer**" and click "**search**".
This might be the result:

Click : “**show on chart**” and zoom in….



Ah… so that's why the “heifer” and the “calf” are more dangerous than the “bull”.
“The Bull” island (top left) has a lighthouse and the “Heifer” and “Calf” rocks south-east of The Bull and just off Dursey Head are a lot smaller and therefore less easily seen (and avoided by sailors like you).

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Frequently Asked Questions

(nothing yet).

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Projections

Links

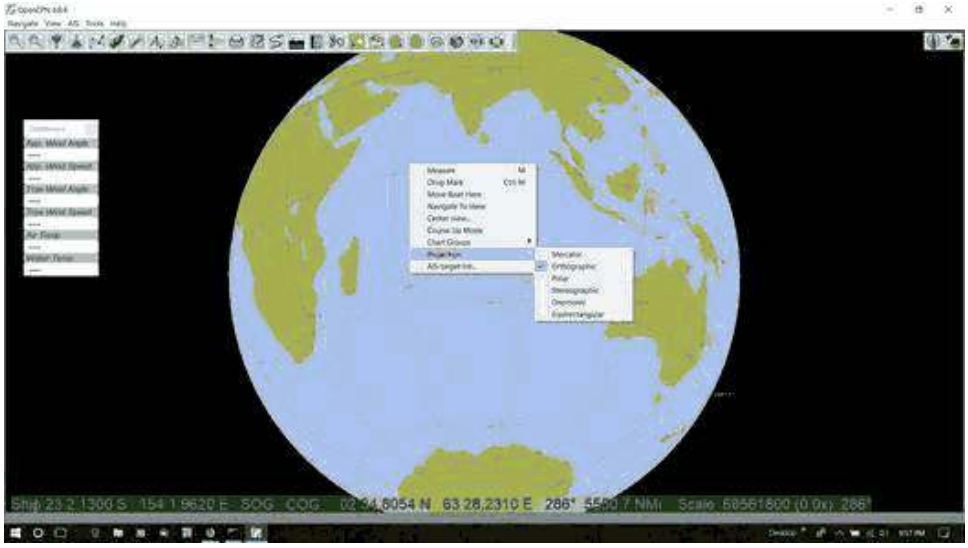
- Source: https://github.com/seandepagnier/projections_pi[374]
- Downloads: https://opencpn.org/OpenCPN/plugins/projections.html[375]
- Forum: Projections_pi Thread[376]
- YouTube: Projections[377]

How to set the Projection

Right click anywhere on the chart and pick the Projection from the list available.

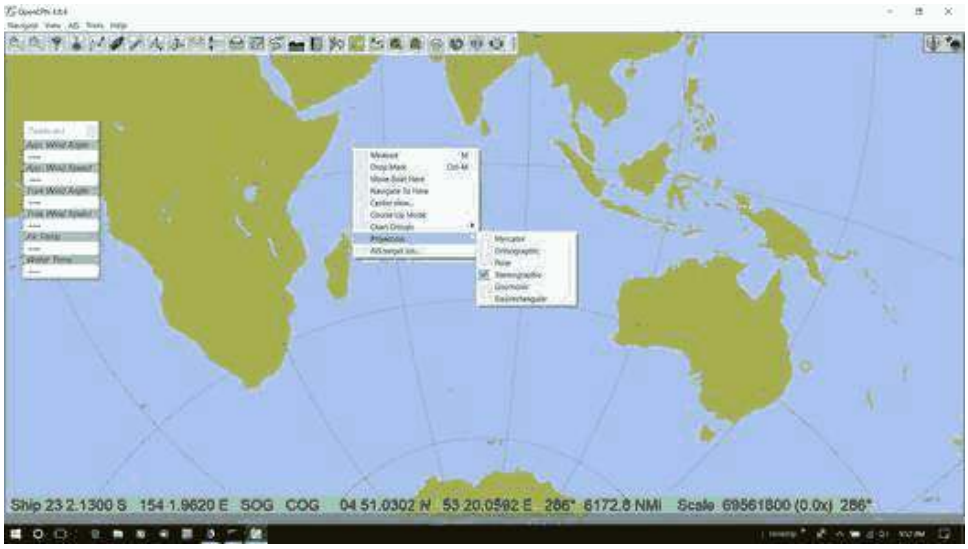
Mercator Projection

Orthographic Projection



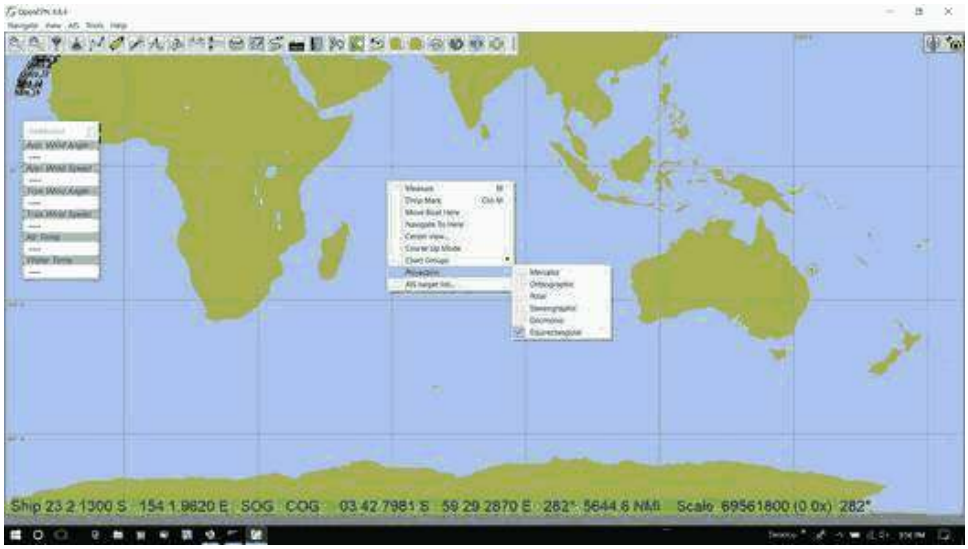
Polar Projection

Stereogrphic Projection



Gnomonic Projection

Equirectangular Projection



Logs

Logbook
Plugin for creating and maintaining many types of logs for your boat.

Find-It
A stowage Manager

VDR Voyage Data Recorder.
Plugin to record and play NMEA data files. Allows simulation of AIS. See vdrPlus (Beta) [378]

NMEA Converter
Useful plugin to convert incoming NMEA Sentences

oBabel (Beta)[379]
Uses GPSBabel to transfer waypoints and routes to a Garmin chartplotter

Logbook

Links

- Source: Github Repository - Peter Tulp maintains the plugin[380]
- Source: Github Repository - Delatbabel[381]
- Releases: Github Releases[382]
- Download: Website Download[383]
- Forum: LogbookKonni CF Thread[384]

1. What and Why

The Logbook plugin is useful for creating and maintaining many types of logs for your boat.

The plugin is now maintained by Del, Konnibe has been unable to continue development due to ill health.

2. Install

See Install and Enable page for installing this plugin.

3. Standard actions

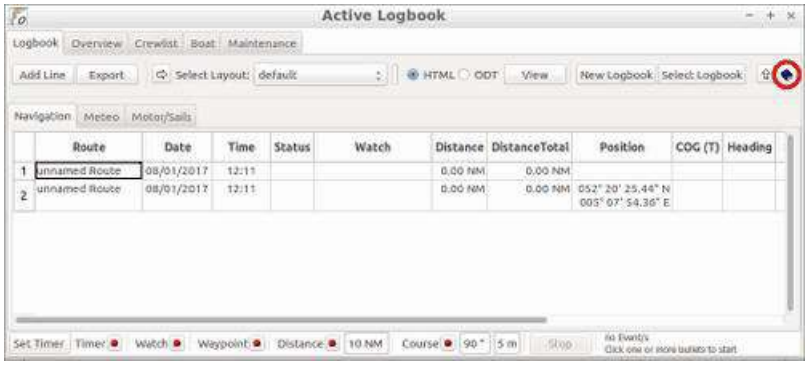
An additional Layouts zip file is needed for the first install and should be downloaded through the official download page.

After downloading and installing the plugin, you can install the initial layouts.

- Start OpenCPN
- Select Options from the toolbar  and go to the Plugins tab.
- Select the Logbook plugin
- Click the Preferences button
- In the dialog click “Install” below the label “Install Layouts”
- In the file dialog select the file 'LogbookKonni_Layouts.zip'

Note that the layouts are customisable by the user and can be distributed to and shared with other OpenCPN logbook users. If you have developed a useful custom layout for your logbook then please feel free to send us details.

The logbook plugin contains an extensive help file which can be accessed by clicking on the little blue book when the logbook plugin is started. See RED circle in below picture.



4. Options

Setting preferences for the logbook is done in the Logbook Preferences dialog. You can get to this from the main OpenCPN Options  window, go to the Plugins tab, select the Logbook plugin and click “Preferences”

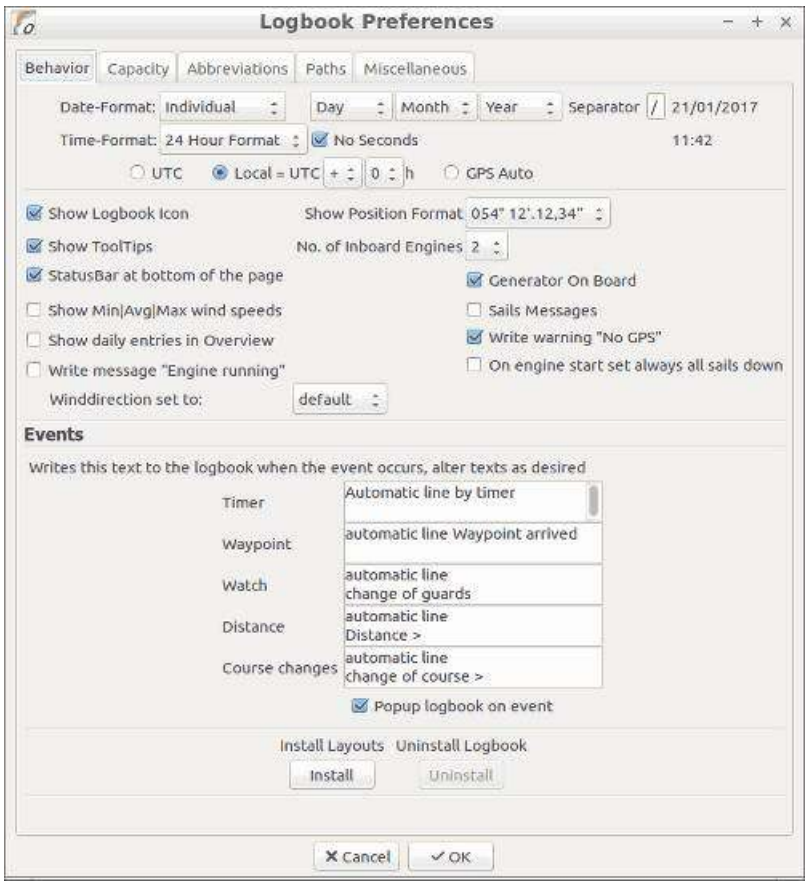
5. Use with GE2KAP

On GE2KAP[385] website, select “Downloads” in the Menubar.

C2GPXKML - V4.0.2 New July. 31, 2015 Converts GPX, KML, SRW, Maxsea and Ozi formats. Supports Konni logbook plugin csv to combine track and logbook data.

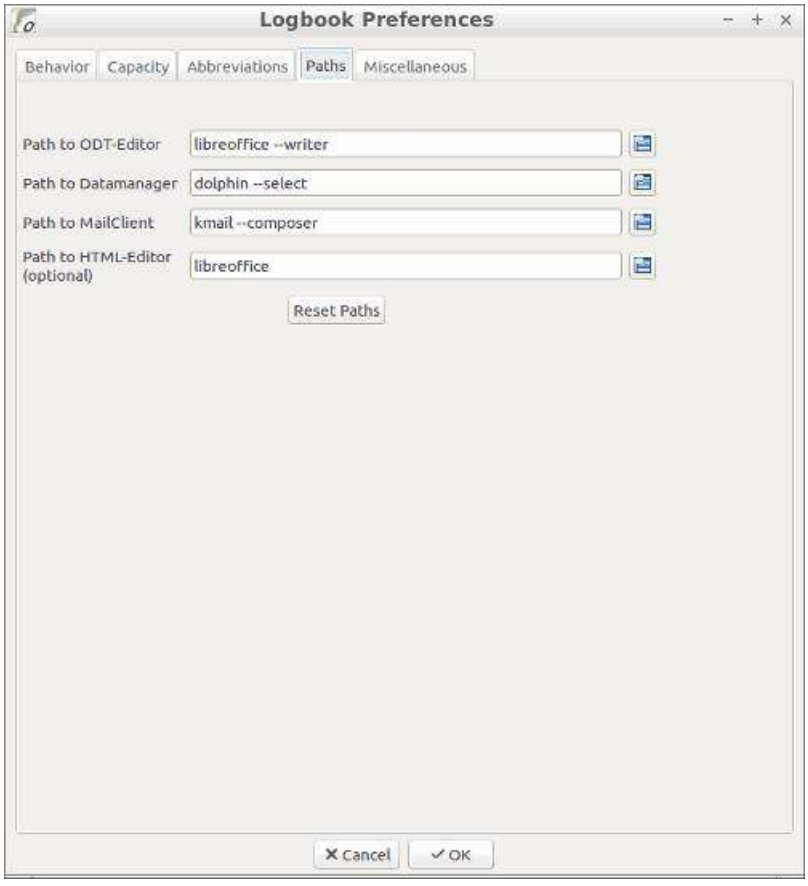
Preference Pages

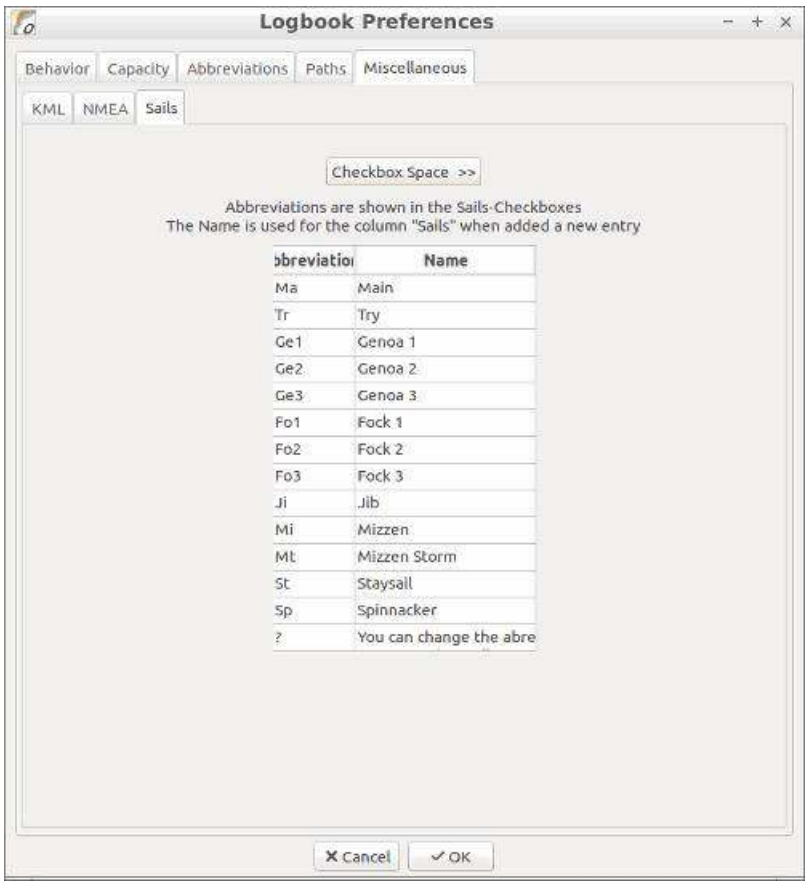
Here are the preference pages for Logbook. In the Help file (see above) all the fields are explained in detail.


Logbook Preferences
Behavior
Capacity
Abbreviations
Paths
Miscellaneous
Date-Format: Individual
Day
Month
Year
Separator
/
21/01/2017
Time-Format: 24 Hour Format
No Seconds
11:42
UTC
Local = UTC
+
0
h
GPS Auto
Show Logbook Icon
Show Position Format
054° 12'.12,34"
Show ToolTips
No. of Inboard Engines
2
StatusBar at bottom of the page
Generator On Board
Show Min|Avg|Max wind speeds
Sails Messages
Show daily entries in Overview
Write warning "No GPS"
Write message "Engine running"
On engine start set always all sails down
Winddirection set to:
default
Events
Writes this text to the logbook when the event occurs, alter texts as desired
Timer
Automatic line by timer
Waypoint
automatic line Waypoint arrived
Watch
automatic line
change of guards
Distance
automatic line
Distance >
Course changes
automatic line
change of course >
Popup logbook on event
Install Layouts
Uninstall Logbook
Install
Uninstall
Cancel
OK


Logbook Preferences
Behavior
Capacity
Abbreviations
Paths
Miscellaneous
Only used when you enter 1/2, 1/4 ... in a total-field, or to calculate the watermaker
Water
Tank
0 gal
Watermaker
0 gal/h
Fuel
Tank
0 gal
Battery
Bank #1
0 Ah
Bank #2
0 Ah
Cancel
OK


Logbook Preferences
Behavior
Capacity
Abbreviations
Paths
Miscellaneous
Navigation
Degrees
°
Minutes
'
Seconds
"
Distance
NM
Speed
kts
Show Depth in
Meter
Meter
m
Show Wave/Swell in
Meter
Feet
ft
Heading
True
Fathom
fth
Weather
Barometer
mb
Windspeed
kts
m/s
km/h
Temperature
F
Fuel/Water
Capacity
gal
Motor Hours
h
Ampere
A
Engine
E
PropShaft
S
Revolutions
RPM
Maintenance
Day(s)
day(s)
Week(s)
week(s
Month
month
If GPS off use for manual entry
Windspeed
kts
Direction
True
Cancel
OK


Logbook Preferences
Behavior
Capacity
Abbreviations
Paths
Miscellaneous
Path to ODT-Editor
libreoffice --writer
Path to Datamanager
dolphin --select
Path to MailClient
kmail --composer
Path to HTML-Editor (optional)
libreoffice
Reset Paths
Cancel
OK



Download Manual in PDF or Doc

For those who would like the Logbook Manual in a separate format from the plugin, here are two downloads:

Logbook 1.2 Help.pdf[386]

Logbook 1.2 Help.doc[387]

Logbook Help in Conversion document[388]

Find-It

Links

- Source: Github Repository[389]
- Source: Github Releases[390]
- Download: Website Download[391]
- Forum: Findit CF Thread[392]

1. What and Why

This Plugin is a stowage manager.

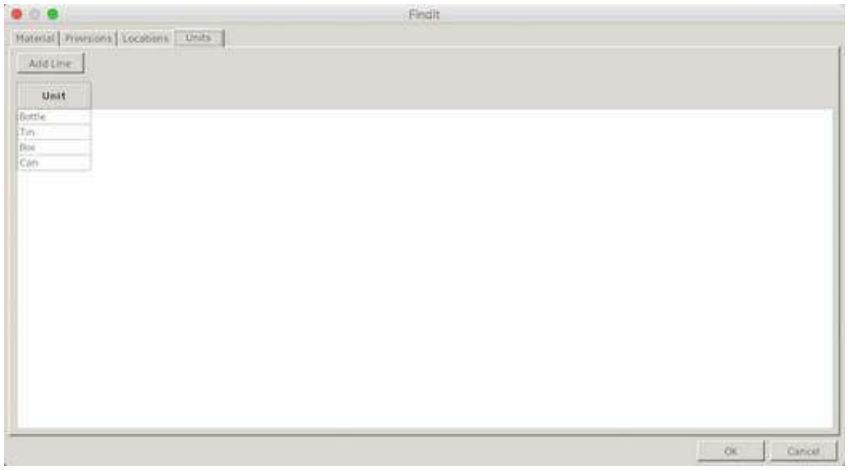
The plugin can work alone or in conjunction with the LogbookKonni plugin. If the LogbookKonni plugin is present and enabled and the Buy it button is pressed the items in the Material or Provisions page marked Buy will be transferred to the LogbookKonni page Maintenance/BuyParts.

2. Install

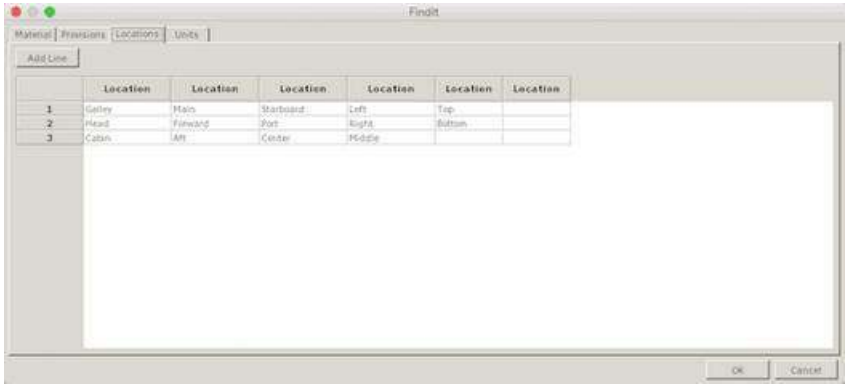
See Install and Enable page for installing this plugin.

3. Standard actions

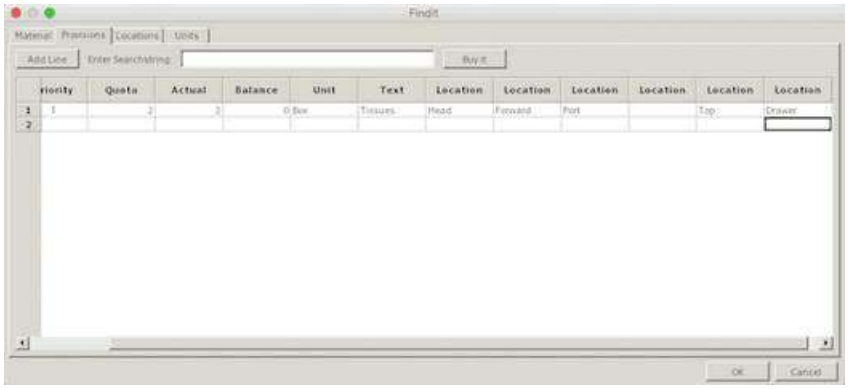
First you have to define the Units, e.g. Bottle, Can, Tin, Box etc.



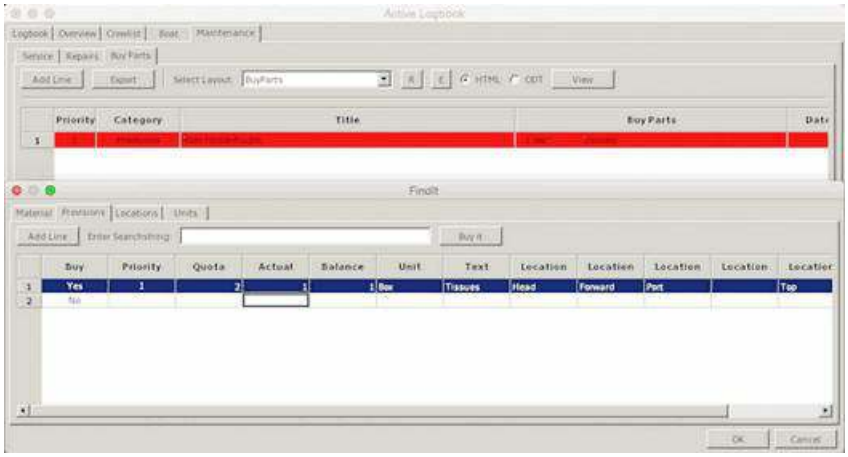
Then you have to create the possible locations in the boat. These Locations are user definable and depend on the possible locations on board. The locations below are just for demo purposes.



Now you can create Material or Provisions with the units and locations defined previously.



If the **Actual** count will be below the **Quota**, the **Balance** will be positive and the **Buy** indicator will be set to **Yes**. Clicking on the **Buy it** button will transfer the **Yes** marked lines to the **LogbookKonni** plugin in the **Maintenance/BuyParts** section. Depending on the **Priority** it will be marked in different colors.



4. Options


FindIt Options
Show FindIt Icon
If Value of Column "Balance" = 0, set Value to
blank
"0"
If Value of Column "Buy" = No, set Value to
blank
"No"
Use last row values as default for new row
Yes
No
OK
Cancel

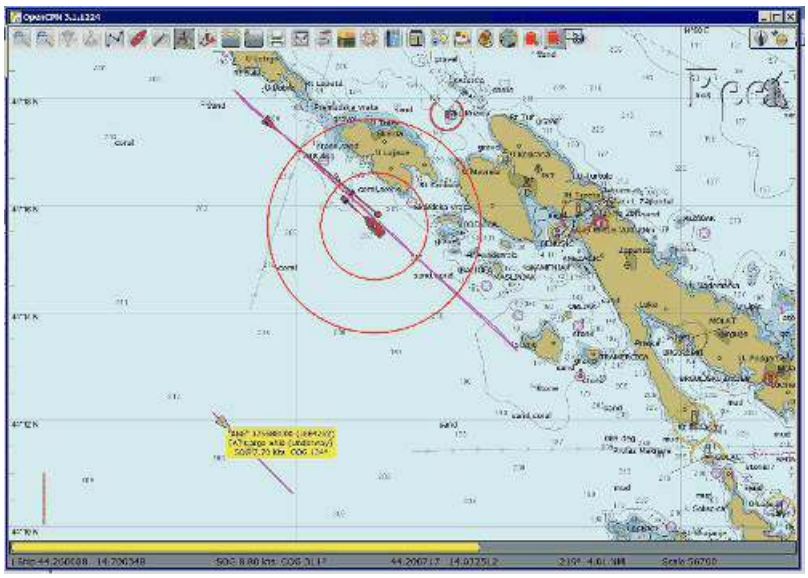
VDR

Voyage Data Recorder

Use Voyage Data Recorder to record and play NMEA files.

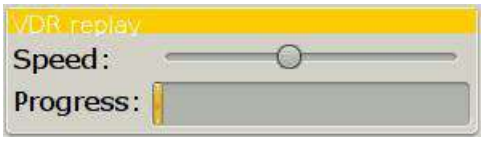
Links

- Source: Github Nohal Repository, use Packaging Branch[393]
- Source: Github Seth-dart Original Repository[394]
- Download: Website Download[395]
- Forum: VDR Plugin Thread[396]



- Use VDR for AIS Simulation - Run VDR to play AIS NMEA files. Or… use the VDR plugin to record your passages and replay them later! The VDR is also great for testing NMEA sentences, the Dashboard and new OpenCPN features. These are just a few examples, of how to use this versatile plugin.
- When VDR is activated in ToolBar → Options → Plugins → VDR, two Buttons appears in the ToolBar

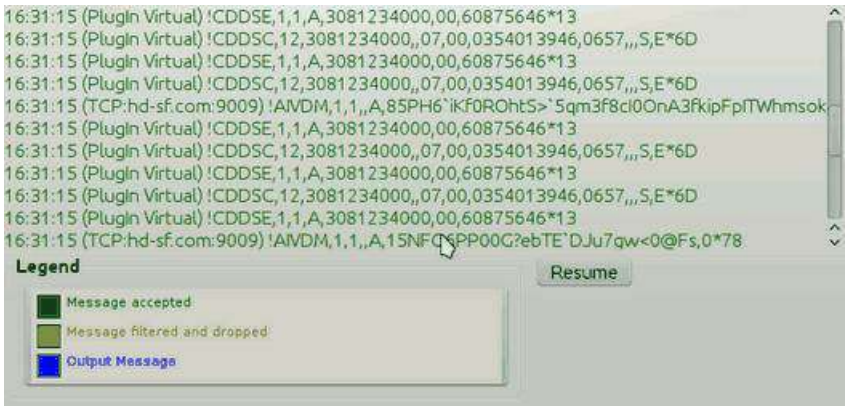
- The left button is for recording, and leads to a “Choose file” dialog to select the file to record to. A file with a .txtfile extension works well.
- The right button is for playing an existing file, and also leads to a dialog where the file must be selected. Once selected VDR starts to play the file,the smalldialog below shows on the screen.

- 

- You can control the speed with the upper slider. Far left is slow, natural speed, while moving the slider to the far right equals fast forwarding. Please note that the setting under options/ships/calculate SOG will impact which SOG values are shown when playing fast forwarding.
- The lower part of the dialog shows the progress.
- When recording, the VDR plugin includes all NMEA data available on the internal bus in OpenCPN. Even data not recognized or used by OpenCPN will be recorded. Everything (almost) in the ToolBar → Connections → NMEA debug window will be included.
- In other words. The VDR records everything from all ports and does not participate in the downstream multiplexer filter or priority scheme. That way, a VDR recording may be played back, experimenting with various filters and priorities if desired.
- If you are playing a file with the VDR at the same time, even that data will be included. So it is possible to play and record at the same time!

Want to play ?

- To get started, download this file[397]. Save and un-zip and you have a .txt file. The file is ready to play.
- If you can't find the boat, have a look in the Adriatic or just press the “Auto Follow”, or press F2. The view will now center on the action.

See 

- The VDR shows up as “PlugIn Virtual” in the NMEA Debug Window.

FAQ

Why is my SOG way off and showing 60-70 knots in the Dashboard, when I playback a file?

Uncheck “Calculate SOG” option in Preferences. See Playback from recorded file[398]

NMEAconverter

Links

- Source: https://github.com/RooieDirk/NmeaConverter_pi[399]
- Release: RooieDirk Release TAB[400]
- Download: Website Download[401]
- Forum: http://www.cruisersforum.com/forums/f134/new-plugin-nmeaconvertor-145073.html[402]

NMEA Converter can convert incoming NMEA Sentences

Be aware you need at least some knowledge of NMEA Sentences

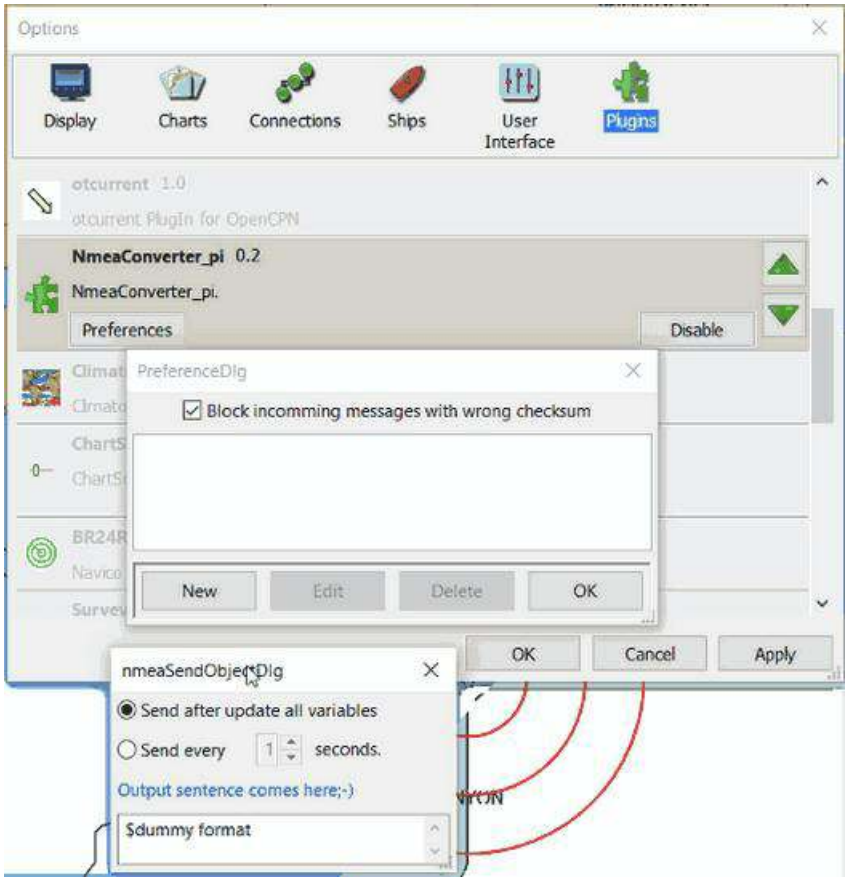
For Reference from the Nmea Sentences Page

- DBT - Depth Below Transducer
- DPT - Depth of Water
- GGA - Global Positioning System Fix Data
- GLL - Geographic Position - Latitude/Longitude HDG Heading - Deviation & Variation
- HDM - Heading - Magnetic
- HDT - Heading - True
- MTA - Air Temperature (obsolete)

- MDA - Meteorological Composite (obsolete) Use XDR transducer instead.
- MTW - Mean Temperature of Water
- VLW - Distance Traveled through Water
- MWD - Wind Direction & Speed
- MWV - Wind Speed and Angle
- RMC - Recommended Minimum Navigation Information
- RSA - Rudder Sensor Angle
- VHW - Water speed and heading
- VTG - Track made good and Ground speed
- VWR - Relative Wind Speed and Angle
- VWT - True Windspeed and Angle (obsolete)
- XDR - Transducer Values
- ZDA -Time & Date - UTC, day, month, year and local time zone
- AIVDO - Automatic Information System (AIS) position reports from own vessel

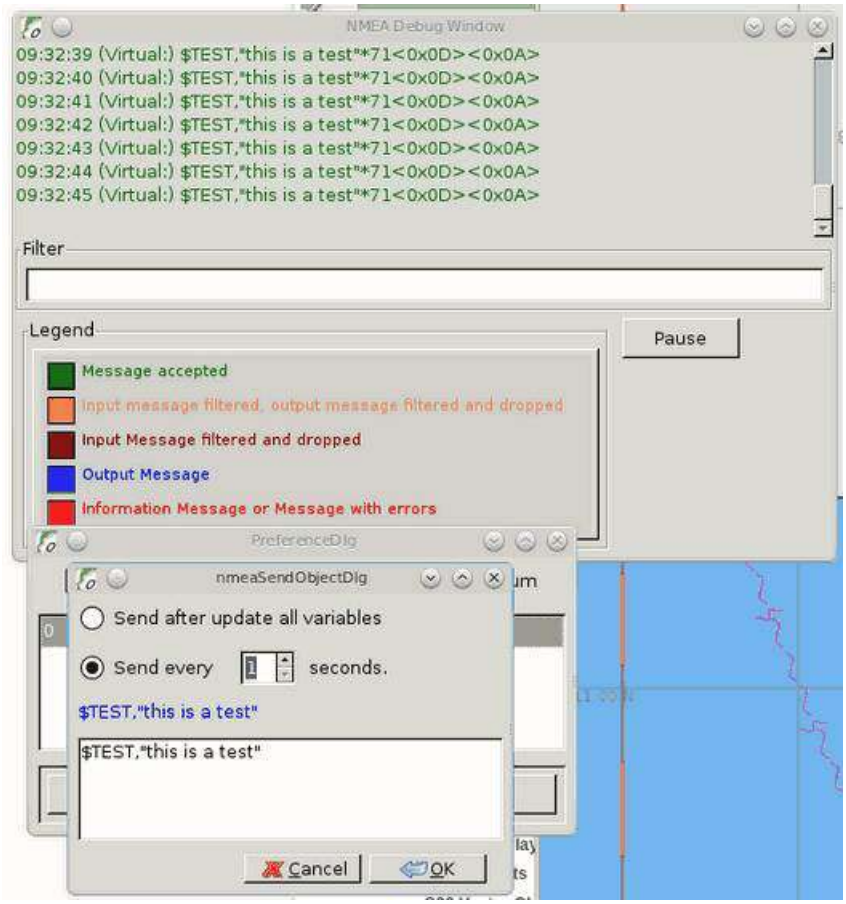
Install the plugin in accord with the Install and Enable Instructions.

Then open the Preference Dialog to set your conversions.



If you see something like above please enlarge the nmeaSendObjectDlg window so it will show some buttons.

1. First Test



This is a completely useless sentence that is sent every second to OpenCPN. Check also the nmeadebug window in the picture above, and note that a checksum is added to the sentence. It is easy to change this one into something like:

$GPRMC,085437,A,5324.3052,N,00611.5704,E,3.3,68.9,070614,0.3,E,A

Just enter this line into the NmeaConverter > Preference > New > Edit box and Save it. No VDR file is needed. That will fake a GPS position into OpenCPN, but still not very usefull.

2. Use incoming data to send a different NMEA sentence.

The real power of this plugin is that you can change the data of the sent sentence by cherry picking from incoming sentences. The reason I wrote this plugin was I wanted Dashboard to show the air temperature. To get the data, Dashboard needs a $xxMTA sentence, however I had a Airmar PB200 unit that is sending $xxMDA sentences.

An example: We have from the windset,

MDA- Meterological (Obsolete)

$WIMDA,30.1,I,1.0,B,11.3,C,,,,,,,18.6,T,18.5,M,5.8,N,3.0,M*27

and want: MDA- Air temperature

$xxMTA,11.3,C*<Checksum>

Note that the data needed is in fields 5 and 6 of the MDA sentence. (11.3 degrees Celcius)

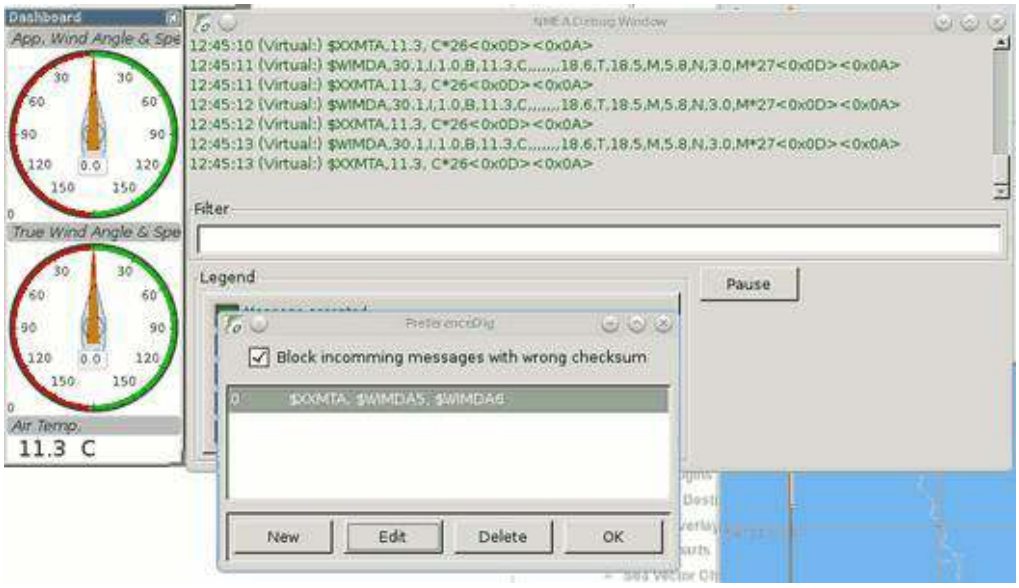
Setting the format to

$XXMTA, $WIMDA5, $WIMDA6

will give an output sentence:

$XXMTA, 11.3, C*26

Where **$WIMDA5** is replaced by the 5th field of the $WIMDA sentence. etc.



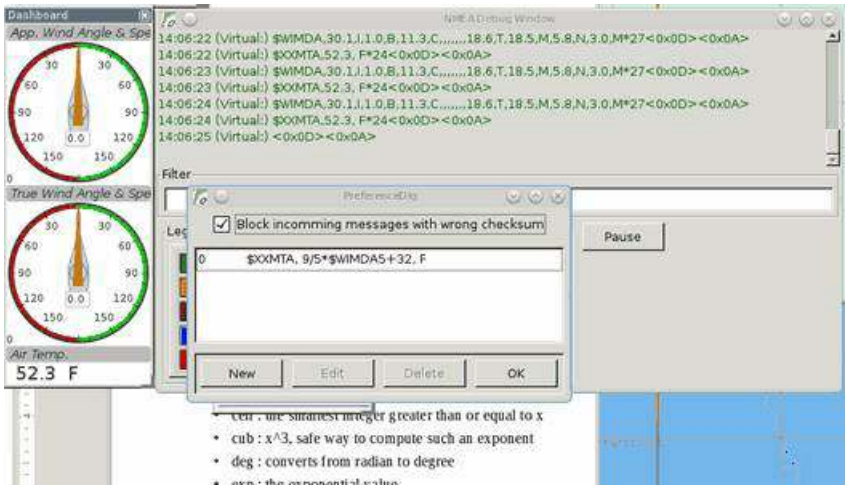
As seen above, the $XXMTA sentece is sent each time a $WIMDA sentence is received and read by Dashboard.

For testing use VDR_pi or VDRplayer and run WIMDA+OCMDA.txt from this zip[403]

3. Do math-Convert units, e.g. Centigrade to Fahrenheit

But what if I was living in the US and prefered the reading to be in degrees Fahrenheit? Just change the format to:

$XXMTA, 9/5*$WIMDA5 + 32, F



The value is recalculated and displayed as degrees Fahrenheit.

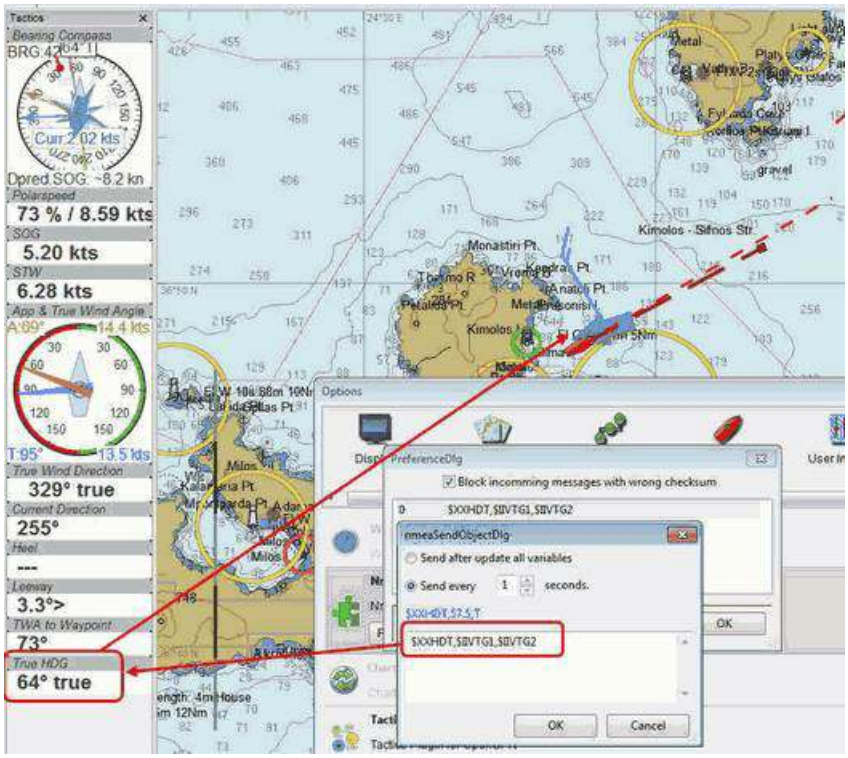
Use the same file for testing use VDR_pi or VDRplayer and run WIMDA+OCMDA.txt from this zip[404]

4. Force True Heading to COG

In NMEAconverter create a HDG (compass) sentence from your COG. Possible use when the autopilot is old and does not receive heading (true or magnetic).

Note: Since computation of the drift and surface current requires HDG, it is understood that while using Tactics_pi value for Current speed and direction will not be useful. All you will see is the speed difference between SOG and STW, which would force Current to be the vector component normal to the keel. That means the “current” display will always be directly from bow or stern, in other words the component of the current along the centerline of the boat, assuming your STW(speed through water) is calibrated correctly.

See CF Tactics_pi Post #22[405].



The nmea file being run by VDR_pi is vdr2 - copie.xls[406]

Tactics_pi and in particular, NMEAconverter_pi is using

```
$XXHDT,$IIVTG1,$IIVTG2
```

Remember that setting HDT to COG will give you no drift angle at all (except maybe a small portion via the manual heel input), so you will not see any real current I suggest to set a fixed heel angle to 0 (see screenshot above), to avoid side effects with manual heel input at very low speeds and small speed differences between SOG and STW.

5. Calculate True Wind from Apparent Wind

Known

Boat Speed ground (kts) = SOG
Apparent wind speed (degrees) = AWS
Apparent wind angle (degrees) = AWA

MWV - Wind Speed and Angle - Input

$–MWV,x.x,a,x.x,a*hh<CR><LF>

Field Number:

1. Wind Angle, 0 to 360 degrees
2. Reference, R = Relative, T = True
3. Wind Speed
4. Wind Speed Units, K/M/N

5. Status, A = Data Valid
6. Checksum

RMA - Recommended Minimum Navigation Information - Input

$–RMA,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>

Field Number:

1. Blink Warning
2. Latitude
3. N or S
4. Longitude
5. E or W
6. Time Difference A, uS
7. Time Difference B, uS
8. Speed Over Ground, Knots
9. Track Made Good, degrees true
10. Magnetic Variation, degrees
11. E or W
12. Checksum

MWV - Wind Speed and Angle - Output TW in Knots

$–MWV,x.x,T,x.x,K*hh<CR><LF>

Field Number:

1. Wind Angle, 0 to 360 degrees
2. Reference, R = Relative, T = True
3. Wind Speed
4. Wind Speed Units, K/M/N
5. Status, A = Data Valid
6. Checksum

Nmea0183 from http://www.catb.org/gpsd/NMEA.html[407]

Calculations Needed:

x =AWS*sin(AWA*3.14159265/180)
y =(x/tan(AWA*3.14159265/180)) - SOG
TWS (True Wind Speed) =x/sin(TWA*3.14159265/180)
TWA (True Wind Angle) =atan(x/y)*180/3.14159265
*Formula from http://www.bethandevans.com/calculators.htm[408]

The formula now needs to be completed:
$XXMWV,

TWS and TWA

(From zzz, see zzz's Cruiser Forum Post[409]

```
$XXMWV,$WIMWV1+acos((sqr($WIMWV3)+sqr($GPRMC7)+sqr($WIMWV3)-2*$GPRMC7*$WIMWV3*(
sqr($GPRMC7))/(2*sqrt(sqr($GPRMC7)+sqr($WIMWV3)-2*$GPRMC7*cos($WIMWV1*3.141592(
```

1. $s were missing in the previous version
2. Changed wind speed unit from K to N
3. Deleted spaces after commas.
4. In terms of sog vs. stw, as pointed out, in most cases, diff is negligible I believe.
5. One thing about stw is that the sensor cannot capture the movement of a vessel due to tide (as high as 5 knots!).
6. For my purpose, gps is good enough.

Observations by Rhythm Doctor:

One needs to be careful with this calculation. There are at least two different syntaxes for the reporting of relative wind angle. The older VWR and VWT sentences for relative and true wind are not recommended for new devices, but there are many older devices and SeaTalk converters that still use them (specifically, my own instruments). The sentences look like this (with II talker ID in this example):

$IIVWR,084.0,R,10.4,N,5.4,M,19.3,K
$IIVWT,084.0,R,10.4,N,5.4,M,19.3,K

1 084.0 Wind Angle 0 - 180
2 R Right of vessel heading (L = Left)
3 10.4 Wind Speed
4 N Wind Speed units Knots
5 5.4 Wind Speed
6 M Wind Speed units Metres per second
7 19.3 Wind Speed
9 K Wind Speed units Km/Hr

Newer devices use the preferred MWV sentence structure that looks like this (with II talker ID in this case):

$IIMWV,084.0,R,10.4,N,A
$IIMWV,084.0,T,10.4,N,A

1 084.0 Wind Angle 0 - 359
2 R Relative (T = True)
3 10.4 Wind Speed
4 N Wind Speed units Knots (K = KPH, M = MPH)
5 A Status (A= Valid)

Note that VWR/VWT and MWV work totally differently: VWR provides wind angles from 0-180 with an additional parameter of L or R, while MWV provides wind angles from 0-359 with no L or R. Converting your obsolete VWR sentence to the more modern MWV sentence would seem to be impossible without a conditional if() statement, which appears to not be supported (since I was unable to get it to work).

Here is the sentence that works best for me for converting VWR (relative/apparent wind) to VWT (true wind). Using the wildcard (instead of II, GP, or WI sender IDs) allows testing with others' VWR sentences, including Paul Elliot's test nmea files:

```
$XXVWT,90-deg(atan(($??VWR3*cos(rad($??VWR1))-$??RMC7)/$??VWR3*sin(rad($??
VWR1)))),$??VWR2,sqrt(sqr($??VWR3*sin(rad($??VWR1)))+sqr($??VWR3*cos(rad($??
VWR1))-$??RMC7)),$??VWR4,,,,
```

Note that there is an invisible <return> character at the end of this sentence (after the four commas). In my testing, things don't work right without it. I recommend that you include it if you copy/paste this formula into the config dialog.

Transmitter Dan advises:

It is possible to replace the sender ID (GP or WI) with ?? which means any sender ID will be accepted. Using the wildcard will allow Paul Elliot's test nmea file to work with the nmeaconverter formula, using Seatalk - vYacht dialect:

```
$XXMWV,90-deg(atan(($??MWV3*cos(rad($??MWV1))-$GPRMC7)/$??MWV3*sin(rad($??
MWV1)))),T,sqrt(sqr($??MWV3*sin (rad($??MWV1)))+sqr($??MWV3*cos(rad($??MWV1))-
$GPRMC7)),N,A
```

Edit: In above formula's 3.14159265 might be replaced by “pi”, and 3.14159265/180 can also be written as “deg”.

Paul Elliot's Test Files[410]

7. Prepare Barometer Sensor Output for Dashboard

Aim

The BMP180 pressure sensor output from Raspberry Pi/OpenPlotter uses the sentence $OSXDR. This cannot be read by Dashboard. BMP180 Output Units are Bars i.e 1000 times the reading needed for display - mBar/hectoPascal. Any error in the output cannot be corrected. This formula creates an $xxMDA (deprecated) or $xxXDR sentence that can be used by Dashboard.

Conversion

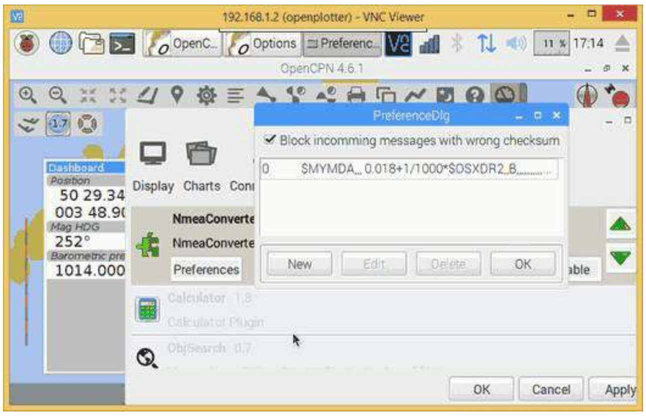
$MYXDR,P, 0.018 + 1/1000 * $OSXDR2,B,Barometer

Deprecated: $MYMDA, , ,0.018 +1/1000*$OSXDR2,,B,,,,,,,,,,,,,,M

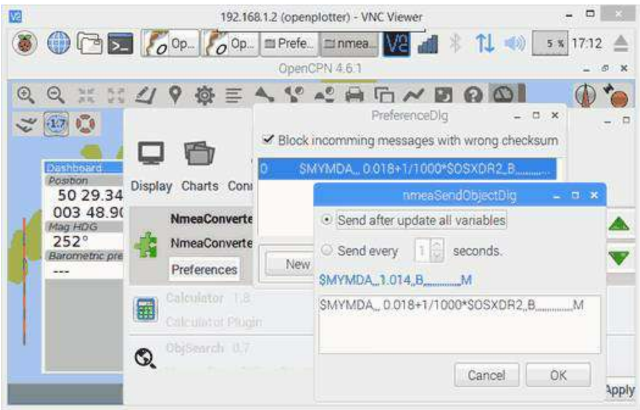
(0.018 is an error correction and also adjusts the barometer pressure for a sea level reading)

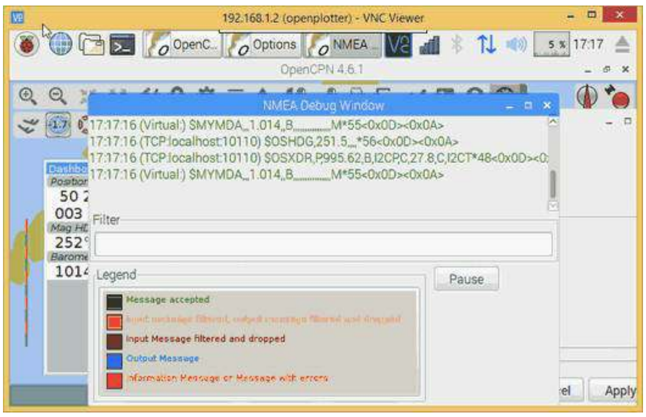
Applying the settings

Found it necessary to tick the 'block incomming (sic) messages with wrong checksum' box when editing the sentence.



When editing the sentence; starting a variable with '.' or '$' causes OpenCPN to freeze. Variables are being read by the plugin all the time and these characters are not recognised. Workaround is to type '0.' and then the number. Also 'OSXDR2' and then add the '$' in front, '$OSXDR2'.





8. Use Wildcards

Now it is possible to use wildcards in the identifiers. So you could make it talkerid independent by using something similar to

```
.....$??XXX3....
```

and whatever character on the ? position will cause a hit.

Even more important, you might use it for special transducers sending the something like

```
$OWXDR,H,....or $OWXDR,C....
```

sentence.

Note that field 1 is part of the identifier. As the comma is the nmea separator, you can not use it as an identifier string, but by using a wildcard it works.

For example

```
....$OWXDR?H2... or $??XDR?H2....
```

will work.

9. Contribute your Formulas & Conversions

If you have an useful format formula please feel free to add it here.

Another future possibility is to do a comparison lookup of a boat"s Polar data and send a special NMEA sentence of the comparative result to the Dashboard using a special dedicated performance instrument, for example.

Calculations Supported

For calculations the following functions are suported:

Normal functions

abs : the absolute value, it removes the sign
ceil : the smallest integer greater than or equal to x
cub : x^3, safe way to compute such an exponent
deg : converts from radian to degree
exp : the exponential value
hvi : Heaviside's function, =0 if x<0, =1 if x>=0
int : the largest integer less than or equal to x
inv : inverts, 1/x
floor : not supported, see int
ln : the neperian logarithm
lnep : see ln
log : the logarithm base 10
rad : converts from degree to radian
sgn : the sign, -1 or +1. Zero returns +1.
sqr : x^2, safe way to compute such an exponent
sqrt : the root square
pi : 3.14159265
deg : 3.14159265/180

Trigonometric functions

acos : the secant (inverse of cosine)
acsh : the inverse of the hyperbolic cosine
asin : the cosecant (inverse of sine)
asnh : the inverse of the hyperbolic sine
atan : the cotangent (inverse of tangent)
atnh : the inverse of the hyperbolic tangent
cos : the cosine
cosh : the hyperbolic cosine
sin : the sine
sinc : the cardinal sine (radian)
sinh : the hyperbolic sine
tan : the tangent
tanh : the hyperbolic tangent

This makes it possible to do spreadsheet-like calculations. And as in a spreadsheet the trigonometric functions use radians.

In beta at this moment:

- An extra checkbox to allow for calculation in degrees instead of radians.
- “E” bug is fixed.
- “pi” instead of 3.14159265
- “deg” instead of 3.14159265/180

Navigation

sQuiddio
Global user-sourced and user-maintained repository of sailing destinations (marinas, anchorages, yacht clubs, docks, fuel stations etc.) available as waypoints in OpenCPN through a plugin.

Google Earth
Links a Google Earth satellite image to the area of chart being explored.

Celestial Navigation
Plugin to record Sextant Sights and show Circles of Position to obtain a Fix

Great Circle Route
A short introduction to to the Great Circle part of the Route Plugin. Route Plotting, Great Circle routes, Limited Circle Routes and Rhumb lines.

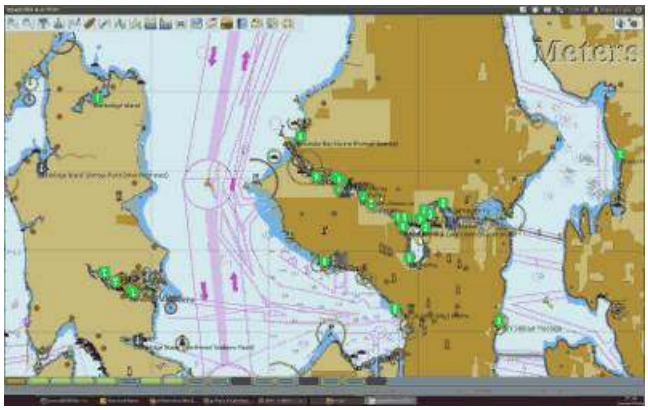
DR Dead Reckoning
Add DR positions to a GPX file exported from OpenCPN

oTCurrent
Display tidal current arrows for times other than the present

GE2KAP
Use GE2Kap to create Kap files which can be overlaid on Charts. (Companion software, not a plugin)

sQuiddio

Find thousands of destinations right in your Opencpn chart



Links

- Website: **sQuiddio.io[411]**
- Source:Github Repository[412]
- Release: Github Release[413]
- Download: Website Download[414]
- Forum: sQuiddio CF Thread[415]

…makes its global user-sourced and user-maintained repository of sailing destinations (marinas, anchorages, yacht clubs, docks, fuel stations etc.) available as waypoints in OpenCPN* through a plugin.

The waypoint Properties box shows basic information about the Destination, such as the Destination's average user rating, address and phone number (where available) and a link to the Destination's page on sQuiddio.

These instructions are correct:

In OpenCPN, go to the Options → Plugins and enable the sQuiddio plugin (no settings are required).

To view destinations in an area:

Right-click on the area of the chart for which you want to view available Destinations.

Select*Download local sQuiddio destinations*from the contextual menu.

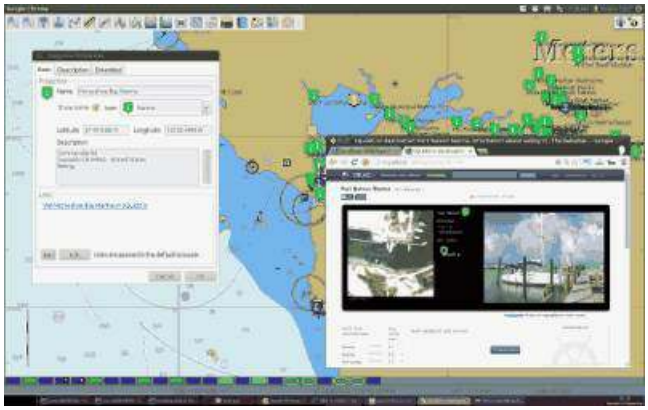
For a touch device (e.g.Android), a right-click action is generated by a so-called “long touch”. Touch and hold the screen point until a context menu appears. Select the desired action.

Note: Not all phones generate an application context menu by touching the device “menu”

button. Depends on the Android version and device mfg. The general method is “long touch” on the chart canvas. Should work on all devices.

* OpenCPN version 3.3 or greater required

Share your seafaring knowledge with others

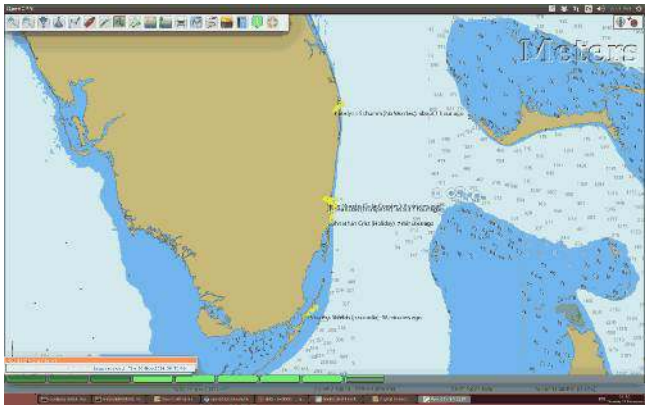


By following the link in the waypoint, registered sQuidd.io users can post comments about the Destination, as well as rate the Destination on attributes such as beauty, service and quality of wi-fi access (where applicable).

Can't find your favorite anchorage or marina? Report new destinations not yet available in the database.

Follow your cruising friends on your OpenCPN Chart

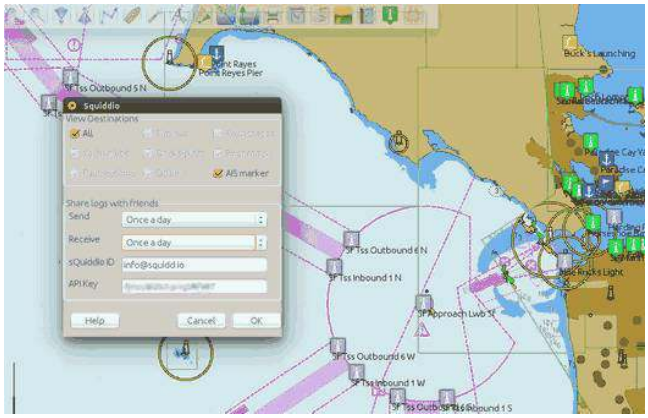
(version 0.4 or greater)



Share your position, SOG and COG with boats in your sQuiddio follow list [416], and display their current position and heading on your OpenCPN charts

View AIS Aids to Navigation (ATON) on your OpenCPN Chart

(version 0.5 or greater)



Plan your cruise ahead by locating AIS ATONs[417] along your itinerary, before they come into your AIS range.

Use of the plugin is free of charge. (Free registration[418] is required for certain functions).

Installing the plugin

- Look for the sQuidd.io icon in the *Plugins for OpenCPN 3.3 and later* section of the plugins download page[419].
- Select the architecture and platform of your choice, download and install the relevant installation package.
- After successful installation, the plug in should be available in the Plugins tab of your OpenCpn Options dialog box.

Using the plugin:

- In OpenCPN, go to the Options → Plugins and enable the sQuiddio plugin (no settings are required).
- To view destinations in an area:
  - Right-click on the area of the chart for which you want to view available Destinations.
  - Select *Download local sQuiddio destinations* from the contextual menu.
- To view additional information about the Destination, and a link to the sQuiddio Destination page, right click on Destination's waypoint, and select Properties.
- The waypoint dialog box includes a link to the Destination page on sQuidd.io. If you have an Internet connection, click the link and your browser should soon display the Destination's page on sQuidd.io.

- You can hide all Destinations for an area from the charts by right-clicking on the chart and selecting *Hide local sQuiddio Destinations* from the contextual menu. You can make the destinations visible again (without downloading them anew) by selecting the *Show sQiddio destinations*.
- To submit a new destination, position your cursor on the new Destination's exact location in the OpenCPN chart, right-click and select *Report a Destination at this location* from the contextual menu. (Note: you must have a free user account to report new Destinations.)

About sQuidd.io

sQuidd.io is a service designed and developed by boaters for boaters.

We love the sea and believe that the best way to enjoy and protect this wonderful gift of Mother Nature is to facilitate the sharing of information among boaters. This is why most of the content you find on our site is generated by other users. We encourage you to contribute your seafaring knowledge to sQuidd.io by creating destinations, rating your favorite ones and by providing information and feedback. Thanks to users like you, squidd.io is quickly becoming the most complete, comprehensive and up-to date source of cruising information in the world.

FAQ About the Website

Are there Destination reviews, or just "star" ratings?

Most of the info on the destination page is user-editable by clicking on the green “edit” link. The edit page has a Google map which can be used to adjust the exact location of the destination, and three tabs, that allow you to specify some basic info about the destination (phone number, email address etc), write and intro paragraph, or add a number of keyword-value pairs that provide additional information. All this updates the Destination page once the edits are saved.

User reviews are entered in the form of user comments in the Media Feed, at the bottom of the page.

Are there data fields for things like dockage or mooring rates, approach depths, VHF channel, available services, nearby facilities, fuel prices, etc?

Yes. That's what the above keyword-value pairs are for. With this approach, you have an unlimited number of potential attributes to define the destination. Just type anything you wish, e.g. “Toll Free Number” as a keyword, then the enter the corresponding value. There is a type-ahead filler in the keyword field that shows commonly used keywords (e.g. Guest Berths for a Marina, or holding for an anchorage), but you can enter what you want. Again, all these are shown on the Destination page

Also, what's with all the flikr photos and links?

Photos are one of the objects that can be posted to the Media Feed, in addition to comments and reviews, since they are a great way to provide a visual dimension to the destination page. Users can upload their photos. In absence of user-supplied photos, we have pre-populated the media feeds of many destinations with photos from the public domain or services like Panoramio (discontinued) or Flickr based on lat/lon coordinates. As users add their own, the new ones will replace the old ones

There is also a mechanism to provide photos and comments through social media (see the link at the bottom)

More info in the website FAQ

FAQ Destinations[420]POI, Share, Check in/out, Twitter & Instagram, Photos

FAQ Stay Connected[421] Share position with friends on a follow list. Spot, Cell, GeoSMS, Satphone, email

FAQ OpenCPN[422] Plugin, API, POI, add POI, Log Sharing, Position.

GoogleEarth

****Windows ONLY****

Installation

Windows: Use the latest installer here[423].

Links

- Source: Github Repository[424]
- Download: Website Download[425]
- Forum: GoggleEarth Thread[426]

Documentation

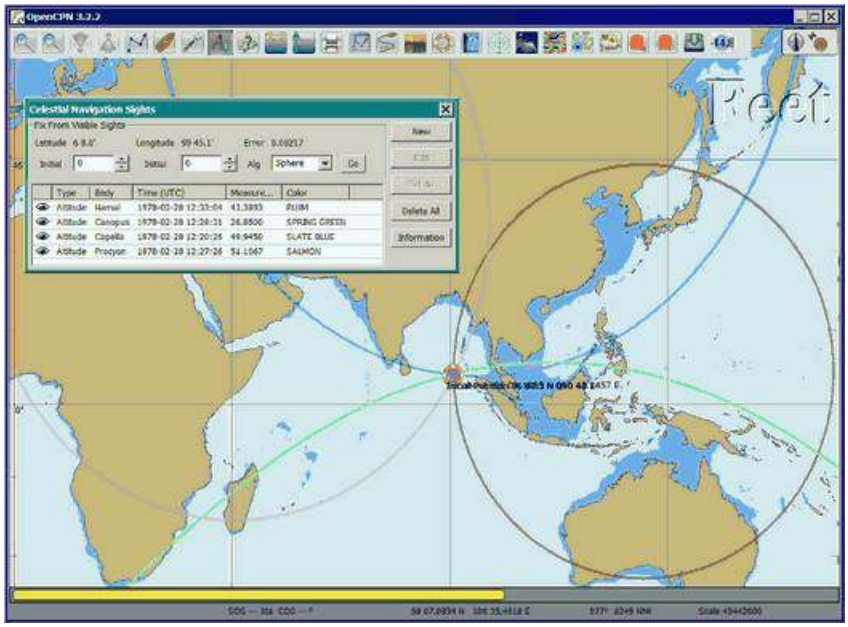
Celestial Navigation

Plugin to record Sextant Sights and show Circles of Position to obtain a Fix

Celestial navigation support makes it possible to establish your position when other means are not available. Also, users may find this plugin, which is still under development, useful for cross checking their position fixes obtained in other ways, or to to better visualize a celestial fix. You find the forum thread here:

Links

- Source: Github Repository[427]
- Releases: Github Windows Releases[428]
- Download: https://opencpn.org/OpenCPN/plugins/celestialnav.html[429]
- Forum: Celestial Navigation Plugin Redux[430]



Types of Observations

Currently 3 types of observations are, more or less, supported:

1. **Altitude** (sextant measurement) – Measure the angle between the horizon and a heavenly body, and enter the required data in the plugin. Each measurement results in a Circle of Position on the sphere (COP, or Circle of Equal Altitude). Two or more observations result in intersecting COP's from which a position fix can be obtained.
2. **Azimuth** (compass measurement) – Measure the azimuth (bearing) of a heavenly body. This method is hopelessly inaccurate, especially on a small boat in high seas. However, it is interesting for demonstration purposes, and possibly - with accurate digital

compasses - it may be a viable navigation method in the future.

3. **Lunar distance** (sextant measurement) – Measure the angle between two heavenly bodies. The computer then attempts to determine clock error from this measurement, and the system time may be corrected.

Process

1. Obtaining Sights with Sextant

Standard practice in navy and merchant navy with regard to celestial positioning is as follows (assuming no artificial horizon is available on the sextant):

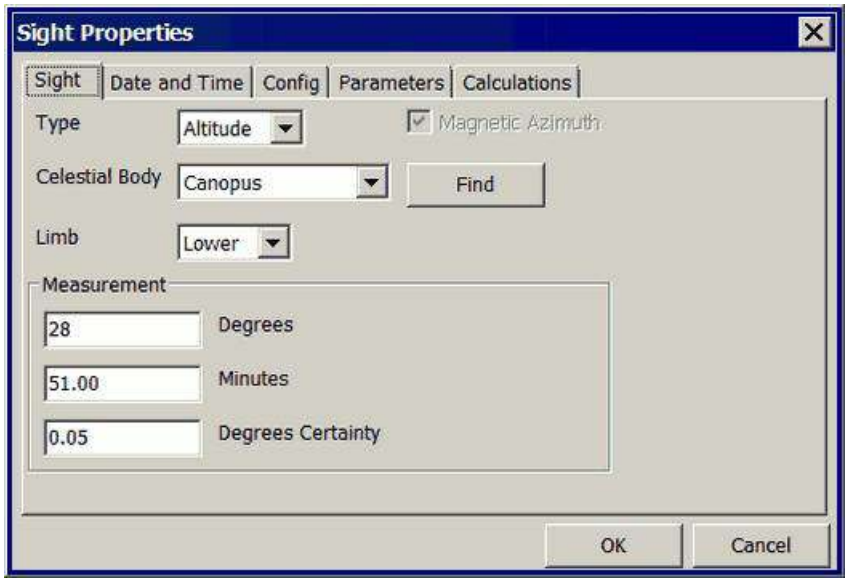
1. During morning nautical twilight (about 15 minutes): if possible take 6 star/planet observations.
2. In the morning at about 09:00LT: take a Sun's observation (later to be shifted to noon-time).
3. At local noon: take a Sun's observation (traditionally only direct latitude calculation from sun at meridian passage). Construct a fix for noon from both sun observations.
4. During evening nautical twilight (about 15 minutes): if possible take 6 star/planet observations.
5. Use the Moon for an observation in above practice when situation permits.

Many books have been written about the art and science of celestial positioning (see below).

This is the document containing the test data used for the example below: Example worksheet[431] (4 star observations).

2. Sight Properties - Sight Tab - Enter Star Data

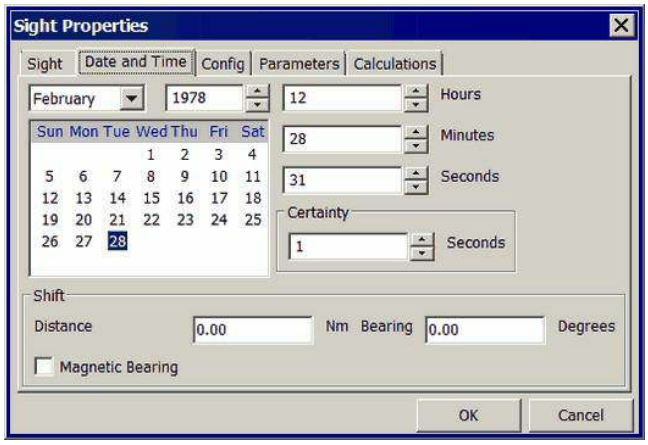
Enter Type (Altitude, Azimuth, Lunar), Celestial Body, Limb, Measurement and Degrees of Certainty. Degrees of Certainty is the accuracy the navigator assumes for the observation. A larger value results in a larger line width for the Circle of Position on the chart.



3. Sight Properties - Date and Time Tab

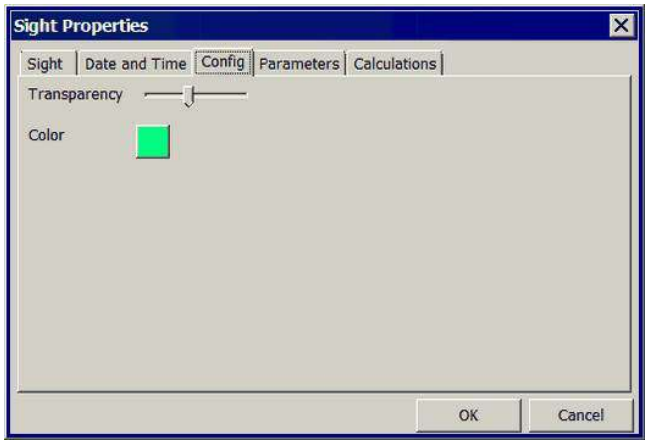
Enter Date (based on GMT/UT) and Time in GMT/UT, Certainty and Shift. Note that entering a shift removes the calculated numerical fix. This is due to the computation method used, which presently does not allow to shift COP's. However, a position fix can be established by visually observing the COP's (which are graphically shifted) on the chart.

The date and time is populated using current computer time and time zone (verify your computer's time), to match the Greenwich UTC Date & Time. Times for sights are entered in UTC. Sights are likely taken extemporaneously with time details, unique exact time for each sight must be entered separately, overriding the computer time & date.



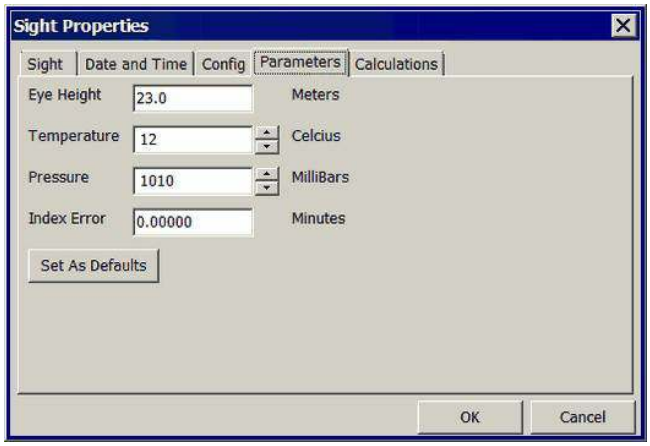
4. Sight Properties - Config Tab - Display Characteristics

Enter Transparency and Color you wish to use for the COP.



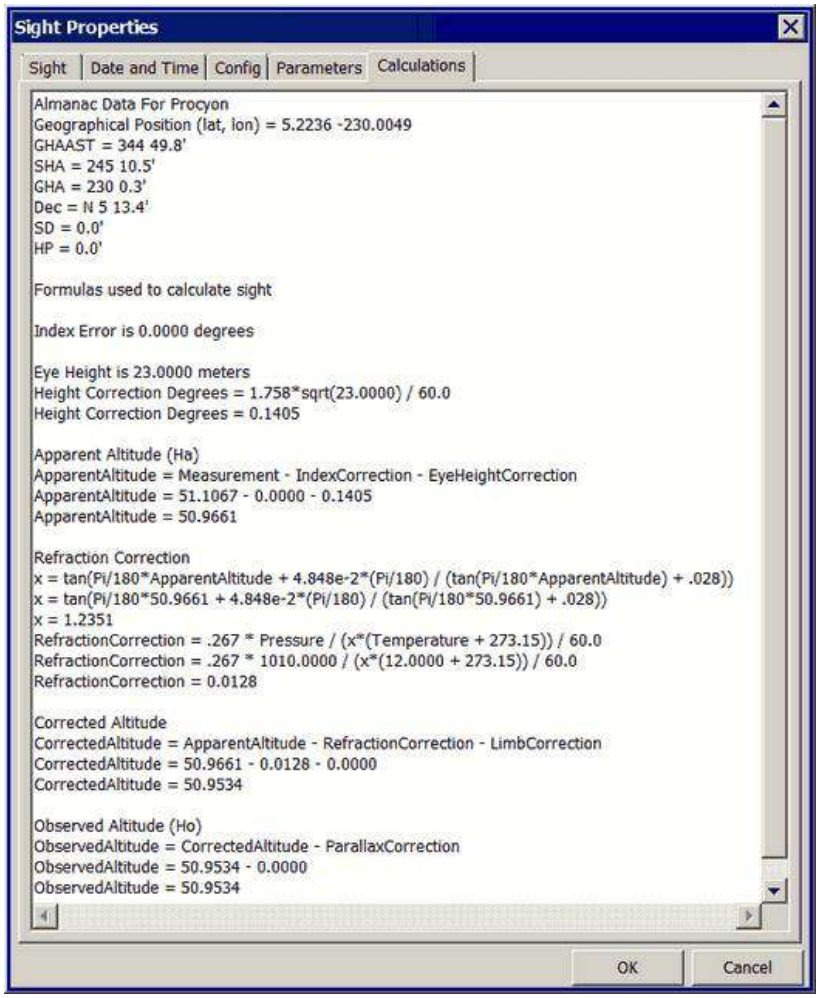
5. Sight Properties - Parameters Tab

Enter Eye Height, Temperature, Pressure and Index Error.



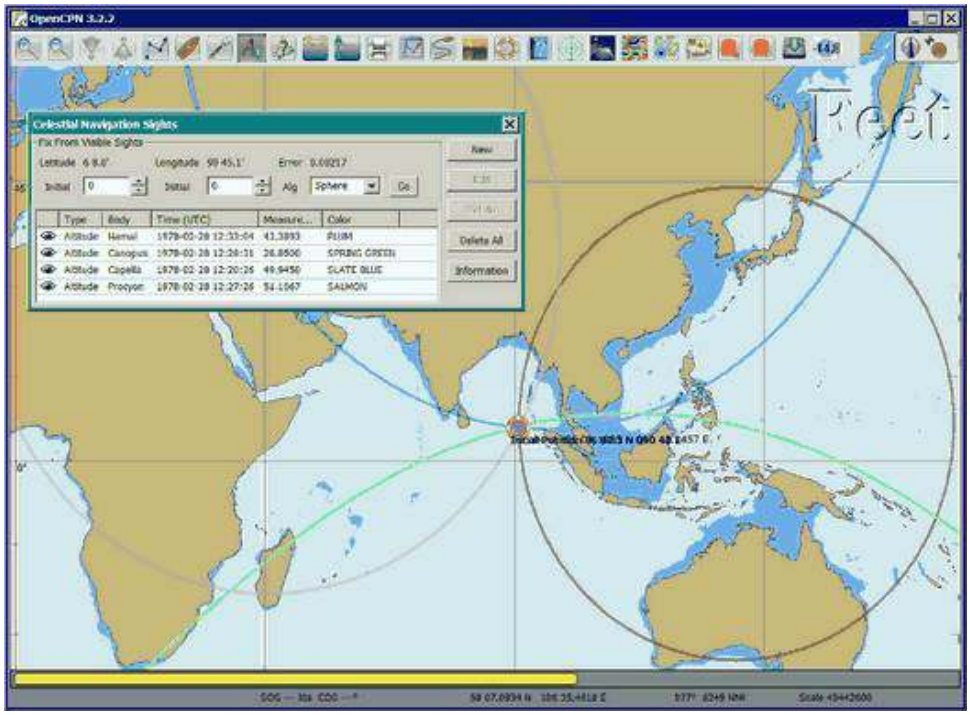
6. Sight Properties - Calculations Tab

Showing the input figures and some calculated results for the observation. Together with the calculated numerical position fix showed in the main window of the plugin, this can be used for comparison with results that are obtained by other calculation methods (traditional manual method using logarithms, traditional or direct computation methods as mentioned in Nautical Almanac, shortened methods using e.g. US Pub. 229[432] or US Pub. 249[433], other computer applications).



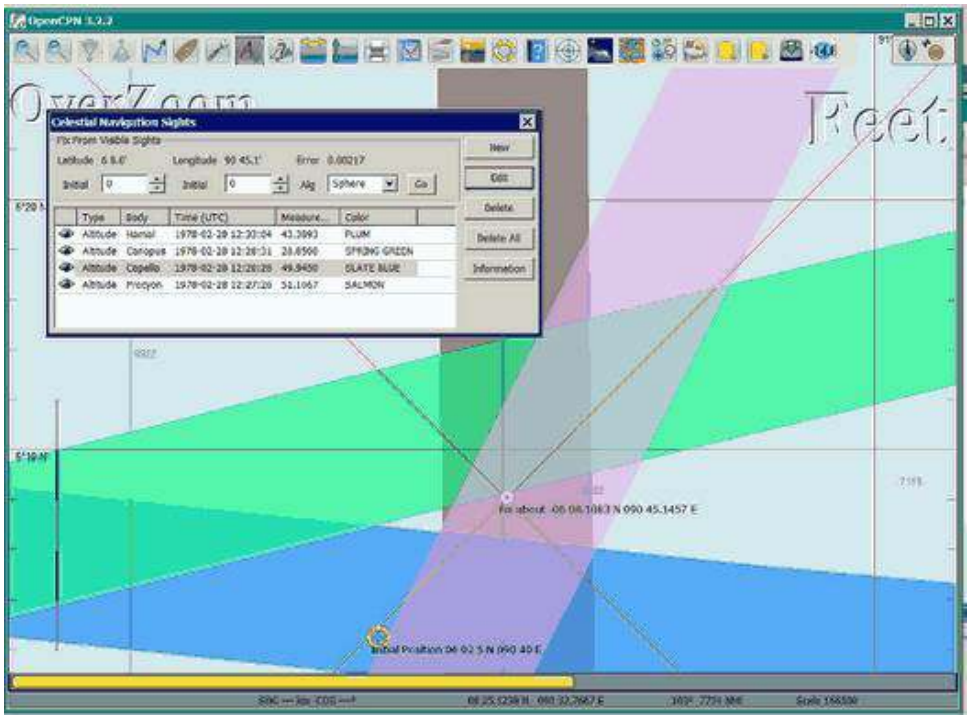
7. Celestial Navigation Sights - Circles of Position and Sights

A Circle of Position (COP) indicates all the positions on earth where a navigator may observe the same altitude of a heavenly body at a certain time. Using traditional methods, only the part of a COP the navigator is interested in is used, and replaced by a tangent line (LOP).



8. Four Circles of Position (showing DR position as MOB and fix as Waypoint)

The MOB icon shows the initial DR position entered. The red circle indicates the intersection of the crossing red lines, the calculated position fix. Hover cursor over the crossing, right click and place a mark. If required, visually adjust this to get best latitude and longitude of the fix. In Sight Properties - Sight Tab, Degrees Certainty was set to 0.05.



Methodology

General Traditional Theory

A general, but very clear text on celestial positioning is available in the PDF file on the web site of Henning Umland:

- A Short Guide to Celestial Navigation (pdf 5mb)[434]

Many thanks to Henning Umland for this concise text. Naturally, also the information provided by the Nautical Almanac and Bowditch is of interest (see 'Links').

Plugin Computation Methods

The plugin is still under development and the computation methods used are innovative and based on vector, matrix and least squares methods. The author, Sean d'Epagnier, uses this innovative method to directly calculate a fix position. Only he knows the background and details.

General information on direct computation methods can be found on pages 277 to 285 of the Nautical Almanac 1994 (see 'Links') and in the following articles:

- New Computational Methods for Solving Problems of the Astronomical Vessel Position (pdf 1.7mb)[435]
- The Direct Fix of Latitude and Longitude from two observed Altitudes (pdf 1mb)[436]
- Genetic Algorithm for Solving Celestial Navigation Problems (pdf 435kb)[437]

Presently, the plugin is not capable of advancing COP's to a common time. When a shift is entered, the calculated numerical position on the main window disappears. In this case, the

fix can only be established by visual examination of the graphics on the screen (see also 3. Sight Properties - Date and Time Tab, and 8. Four Circles of Position) and a fix time cannot be established.

Accuracy of Data

- Celestial Navigation Data for Assumed Position and Time- Navy[438]
- Astronomical Software Ephemeris[439]

Comparison of Plugin Astronomical Data and Nautical Almanac Data

The data and formulae contained in the Nautical Almanac form a standard in itself. The plugin utilizes astronomical data from VOP87d (for the planets and indirectly for the sun), ELP2000/82 (for the moon) and contains Right Ascension (RA; star's SHA = 360° - star's RA) and Declination (Dec) data for the selected stars.

During development of the plugin, the calculated (intermediate) correction values for dip, refraction, horizontal parallax, parallax in altitude and semi diameter, as well as the calculated position fix, should be compared to values that result from other computation methods.

The astronomical data used in the plugin is more accurate than data taken from the Nautical Almanac. However, for navigation purposes the differences are generally not important. With regard to altitude reductions, so far test data indicates that the differences found in calculated observed altitude (Ho) are small. Measurement and reading errors made by the navigator will be larger. Using the present version, calculated fix positions can still differ from those calculated with traditional methods.

Accuracy of Plugin Astronomical Data

The plugin astronomical data are from Jean Meeus' Astronomical Algorithms Wikapedia[440] Sourceforge[441].

- Planetary positions are based upon a truncated version of Bretagnon and Francou's VSOP87[442] theory Wikipedia VSOP[443] . The estimated maximum error in the heliocentric longitude is several arc-seconds. Geocentric positions are accurate to within a few arc-seconds.
- Lunar positions are calculated using a truncated version of the lunar theory ELP-2000/82 of Chapront-Touzé and Chapront[444]. The estimated maximum error in the geocentric longitude is about 10 arc-seconds.

Accuracy of Data in the Printed Nautical Almanac

The largest error that can occur in GHA and declination of any body other than the Sun or Moon is less than 0.2'; it may reach 0.25' for the Sun and 0.3' for that of the Moon. In practice it may be expected that only one third of the values of GHA and declination will have errors larger than 0.05', and less than one tenth will have errors larger than 0.1'.

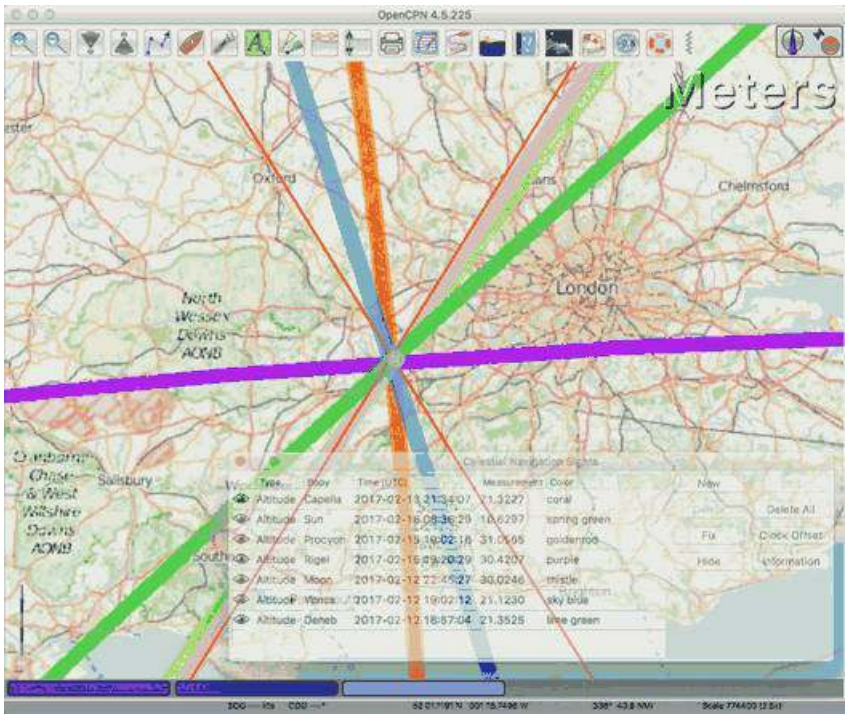
The errors in the altitude corrections are nominally in the same order (*but the actual values of*

dip and refraction at low altitudes may differ considerably in extreme atmospheric conditions).

Depending on the type of sextant, the reading accuracy of the sextant can be 0.2', 0.1' or 10“. Measurement and reading errors made by the navigator will be larger.

Calculation & Accuracy Improvements to Plugin 2/26/2017

by ***Povl Abrahamsen***, 2/26/2017



While the existing plugin worked well with sun, moon, and planet sights, it was not treating stars correctly. This update adds corrections for star sights.

1. It uses updated star positions from the SIMBAD Astronomical Database (http://simbad.u-strasbg.fr/simbad/[445])
2. Positions are corrected for proper motion and parallax.
3. Positions are corrected for frame bias, precession, and nutation.

See: Githb Pull Request #9[446]

New files:

- transform_star.cpp has been written by me, using equations from the US Naval Observatory Circular No. 179 (http://aa.usno.navy.mil/publications/docs/Circular_179.pdf[447])
- epv00.cpp comes from the SOFA library (http://www.iausofa.org/[448]), with a wrapper function written by Povl Abrahamsen.

Also we would like to acknowledge the use of the SOFA function and library.
See “Article: Earth Rotation and Equatorial Coordinates” below for general information

about the error.

Abbreviations

Some abbreviations of terms are given in the list hereunder. Not all of these abbreviations conform to a standard.

AP- Assumed Position- where you are *or think you are* based on Latitude and Longitude.

COP- Circle of Position (Circle of Equal Altitude)

Dec- Declination- the angle in degrees of a celestial body above or below the celestial equator. It's analogous to latitude on earth.

DR- Dead Reckoning Position (from *Deduced Reckoning)*

HA- Hour Angle

GP- Geographical Position of a heavenly body. It has two components; declination and GHA. *Dec,* or declination, mentioned above, is analogous to latitude on earth. In Western longitudes a heavenly body's GHA equals the longitude of the GP. In Eastern longitudes the GP equals 360° *minus* GHA. If at a given point in time you were at the GP of a celestial body it would be directly over your head- your zenith.

GMT/UT- Greenwich Mean Time and Universal Time. For celestial navigation work all observations are recorded in time and date based on Greenwich, England. GMT is also known as “UT”.

GHA- *Greenwich Hour Angle*- the angular distance in degrees between Greenwich (0°) and a celestial object. GHA is always measured West of Greenwich.

LHA- *Local Hour Angle*- the horizontal angular distance in degrees between the Ap (Assumed position) and a celestial object. It is always measured West from the Ap. to the celestial object.

LOP- Line of Position

MPP- Most Probable Position

RA- Right Ascension (star's SHA = 360^{o} *minus* the star's RA)

SHA- Sidereal Hour Angle

D-R-I-P-S

- **Dip** of the Horizon (function of eye height)
- **R**- Refraction (function of Ha, temperature and pressure)
- **IE**- Index Error (= + or *minus* Index Error of sextant)
- **PA**- Parallax in Altitude (function of HP and Ha)
- **SD**- Semi-Diameter. One half of the angular width of the Sun or Moon.

HP- Horizontal Parallax

Hs- Sextant Altitude- the initial, uncorrected, sextant measurement from the horizon to a celestial body. Also known as *Height of sextant.*

Ha- Apparent Altitude= Hs *minus* Dip +or *minus* IC (Index Correction) Also known as *Apparent Height.*

Ho- Observed Altitude- final corrected sextant angular measurement. Also known as *Height observed.*

Hc- Computed Altitude. Also known as *Height computed.*

Int- Intercept (=Ho + or *minus* Hc) Always subtract the smaller figure from the larger.

Z- Azimuth. Horizontal angle in degrees between True North and the celestial body.

Resources

Article: Genetic Algorithm for Solving Celestial Navigation Fix Problems

by Ming-Cheng Tsou, Ph.D., National Kaohsiung Marine University, Taiwan POLISH MARITIME RESEARCH 3(75) 2012 Vol 19; pp. 53-59 10.2478/v10012-012-0031-5

- 122939.celnavalg tsau.pdf[449]

ABSTRACT
In this work, we employ a genetic algorithm, from the field of artificial intelligence, due to its superior search ability that mimics the natural process of biological evolution. Unique encodings and genetic operators designed in this study, in combination with the fix principle of celestial circles of equal altitude in celestial navigation, allow the rapid and direct attainment of accurate optimum vessel position. Test results indicate that this method has more flexibility, and avoids tedious and complicated computation and graphical procedures.

Article: The Direct Fix of Latitude and Longitude from Two Observed Altitudes

by Stanley W. Gery
Neptune Power Squadron, Huntington, New York, Received April 1996, Revised December 1996

- v44n1-2.pdf[450]

ABSTRACT
This work presents a direct method for obtaining the latitude and longitude of an observer from the observed altitudes of two celestial bodies. No assumed position or dead-reckoned position or plotting is required. Starting with the Greenwich hour angles, declinations, and observed altitudes of each pair, the latitude and longitude of the two points from which the

observations must have been made are directly computed. The algorithm is presented in the paper, along with its derivation. Two different, inexpensive, programmable pocket electronic calculators were programmed to execute the algorithm, and they do it in under 30 s. The algorithm was also programmed to run on a personal computer to examine the effect of the precision of the calculations on the error in the results. The findings show that the use of eight decimal places in the trigonometric computations provides acceptable results.

Article: New Computational Methods for Solving Problems of the Astronomical Vessel Position

by Tien-Pen Hsu (1), Chih-Li Chen (2) and Jiang-Ren Chang (3)

(1) Institute of Civil Engineering, National Taiwan University
(2) Institute of Merchant Marine, National Taiwan Ocean University
(3) Institute of Systems Engineering and Naval Architecture, National Taiwan Ocean University; E-mail: cjr@mail.ntou.edu.tw[451]
THE JOURNAL OF NAVIGATION (2005), 58, 315–335. The Royal Institute of Navigation, doi: 10.1017/S0373463305003188, Printed in the United Kingdom

- JON 58(2) 315-335.pdf[452]

ABSTRACT
In this paper, a simplified and direct computation method formulated by the fixed coordinate system and relative meridian concept in conjunction with vector algebra is developed to deal with the classical problems of celestial navigation. It is found that the proposed approach, the Simultaneous Equal-altitude Equation Method (SEEM), can directly calculate the Astronomical Vessel Position (AVP) without an additional graphical procedure. The SEEM is not only simpler than the matrix method but is also more straightforward than the Spherical Triangle Method (STM). Due to tedious computation procedures existing in the commonly used methods for determining the AVP, a set of optimal computation procedures for the STM is also suggested. In addition, aimed at drawbacks of the intercept method, an improved approach with a new computation procedure is also presented to plot the celestial line of position without the intercept. The improved approach with iteration scheme is used to solve the AVP and validate the SEEM successfully. Methods of solving AVP problems are also discussed in detail. Finally, a benchmark example is included to demonstrate these proposed methods.

Article: Use of Rotation Matrices to Plot a Circle of Equal Altitude

by A. Ruiz
Industrial engineer, Navigational Algorithms
Journal of Maritime Research, Vol. VIII. No. 3, pp.51-58, 2011

- Download Rotation Matrices (pdf 3mb)[453]

ABSTRACT
A direct method for obtaining the points of a circle of equal altitude using the vector analysis as an alternative to the spherical trigonometry is presented, and a solution where celestial navigation and Global Navigation Satellite Systems are complementary and coexist is

proposed.

Article: Determining the Position and Motion of a Vessel from Celestial Observations

by George H. Kaplan, U.S. Naval Observatory

- Determine Position & Motion of a Vessel (pdf)[454]
- See also Other Articles by George Kaplan[455]

ABSTRACT
Although many mathematical approaches to the celestial fix problem have been published, all of them fundamentally assume a stationary observer. Since this situation seldom occurs in practice, methods have been developed that effectively remove the observer's motion from the problem before a fix is determined. As an alternative, this paper presents a development of celestial navigation that incorporates a moving observer as part of its basic construction. This development allows recovery of the information on the vessel's course and speed contained in the observations. Thus, it provides the means for determining, from a suitable ensemble of celestial observations, the values of all four parameters describing a vessel's rhumb-line track across the earth: latitude and longitude at a specified time, course, and speed. In many cases, this technique will result in better fixes than traditional methods.

Article: Vector Solution for the Intersection of two Circles of Equal Altitude

by Andrés Ruiz González Navigational Algorithms[456] San Sebastián. second website: Navigational Algorithms[457]

- Vector Solution for the Intersection of two Circles of Equal Altitude (pdf 70kb)[458]
- Vector Solution for the Intersection of two Circles of Equal Altitude[459]

ABSTRACT
A direct method for obtaining the two possible positions derived from two sights using the vector analysis instead the spherical trigonometry is presented. The geometry of the circle of equal altitude and of the two body fixes is analyzed, and then the vector equation for simultaneous sights is constructed. Also the running fix problem is treated. Finally the C++ source code for the algorithm is provided in an easy implementation, susceptible for being translated to other common programming language

Article: Earth Rotation and Equatorial Coordinates

Rick Fisher August 2010

- https://www.cv.nrao.edu/~rfisher/Ephemerides/earth_rot.html[460]

Abstract
“By the standards of modern astrometry, the earth is quite a wobbly platform from which to observe the sky. The earth's rotation rate is not uniform, its axis of rotation is not fixed in

space, and even its shape and relative positions of its surface locations are not fixed. For the purposes of pointing a telescope to one-arcsecond accuracy, we need not worry about shape and surface feature changes, but changes in the orientation of the earth's rotation axis are very important. ”

Discusses small errors in measurements and standards due to perturbations of the earth.
2/28/2017

Article:Coordinates, Time and the Sky

Coordinate Systems for Direction
John Thorstensen, Department of Physics and Astronomy, Dartmouth College, Hanover, NH 03755

- Coordinates, Time and the Sky[461]

This subject is fundamental to anyone who looks at the heavens; it is aesthetically and mathematically beautiful, and rich in history…

Book: A Short Guide to Celestial Navigation

- http://www.celnav.de/page2.htm[462]

Revised October 1st, 2011, First Published May 20th, 1997

Book: The Sextant Handbook

International Marine
ISBN 0-07-005219-0

- Amazon web site: The Sextant Handbook, Adjustment, Repair, Use and History - 2nd Edition[463]

The Sextant Handbook is dedicated to the premise that electronic navigation devices, while too convenient to disregard, are too vulnerable to rely on exclusively. The book is designed to make beginner and expert alike conversant with this most beautiful and and functional of the navigator's tools.

Online: Vanderbuilt AstroNavigation Course

Vanderbuilt AstorNavigation Online Course[464] https://my.vanderbilt.edu/astronav/
Supplemental Page[465]

This free and open to the public, online course is made possible by The Blended & Online Learning Design (BOLD) Fellows Program and is hosted by Vanderbilt University. The BOLD Fellows program allows graduate student-faculty teams to create course materials in STEM subject areas rooted in good course design principles which benefit from the online content delivery.

This course serves to address the lack of widely-available instruction in astronavigation. Specifically targeted here are the steps of performing a sight reduction to obtain a terrestrial position using this technique. These steps are explicitly illustrated after a brief overview provides a solid context for their relevance. Difficult concepts such as plotting on a navigational chart and the complexities of using of navigational publications should be better served through this online content delivery.

Content created by: David D. Caudel, PhD. Candidate, Physics, Vanderbilt University

Other Celestial Links

- TheNauticalAlmanac[466] An extensive source for celestial navigation. Nautical Almanac PDF'S and other tools.
- Bowditch 2002[467] (Organized for easy Chapter download)
- Cool Celestial Navigation Links[468] (on the web site of Henning Umland)
- Nautical Almanac 1994.pdf[469] (large download of 140 Mb from the web site of Reed Navigation)
- Navigational Algorithms[470] (web site of Andres Ruiz)
- Papers on Advanced Navigation[471] (web site of Andres Ruiz)
- Supplementary celestial software on OpenCPN web site[472] (by Andres Ruiz)
- Erik's Nautical Web Pages[473] (web site of Erik de Man)
- Online Study of Celestial Navigation[474] (e-learning via web site of Seasources.net)
- Backbearing Astronavigation[475]
- NavList[476]
- Bowditch 1995[477] (but also other, historical, navigation books online)
- American Practical Navigator[478] Complete=35m also convenient separate chapters.
- UKHO Future of Celestial Navigation[479]
- Future of Celestial Navigation[480] (pdf; ***also points out the vulnerability of GPS***)

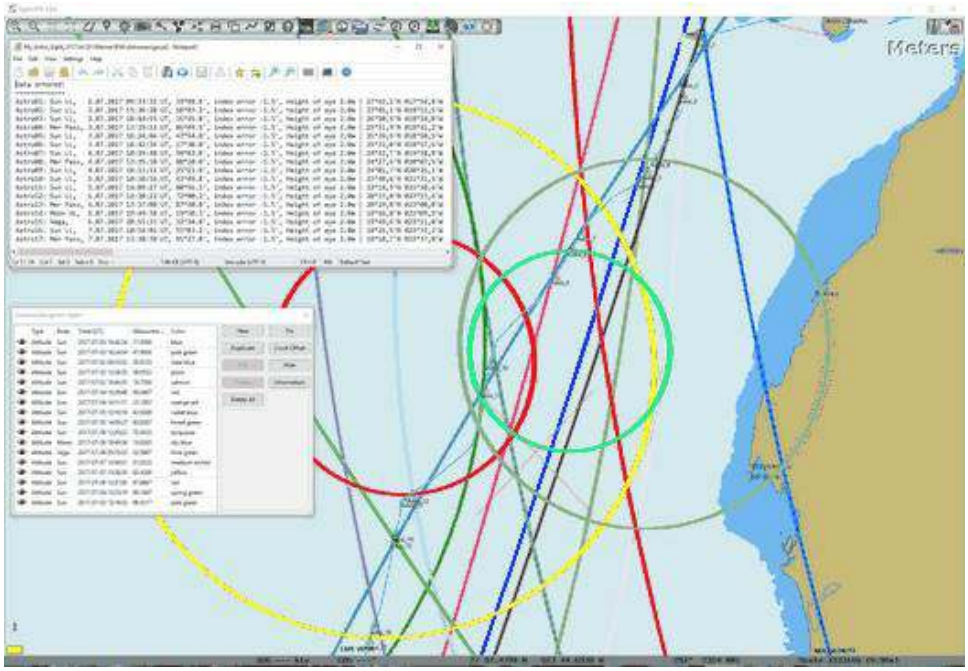
- Celestial Navigation in the Navy[481]
- Interactive Spreadsheets[482]

Test Data: Examples

- Example worksheet[483] (observation of 4 stars for fix calculation)
- Alternative worksheet[484] (observation of Sun, Moon, Venus and Polaris for altitude reduction only)
- Celestial Navigation[485] (Problem, solution with Andres program, import GPX into Opencpn. by Andres Ruiz)

We should thank Sean who has advanced the work of others admirably, and NAV for his technical review of the plugin, his knowledge, and his generous assistance in preparing this documentation. Rick.

Kubek's Sights to test Accuracy of the Plugin



Sights.xml File[486]

My Astro Sight 2017[487]

Track with Sighting Waypoints[488]

Please remove ".doc" and "my_astro_" from "my_astro_sights.xml" and place in your programdata/opencpn/plugins/celestial_navigation/ directory. Also please remove ".doc" from "my_astro_sight_2017.txt.doc".

Kubek's Notes

'Mer Pass' is Meridian passages of the Sun (LL) or The Noon Sight (RYA Astronavigation Chapter 5).

All my sights are NOT in the same time so you need to do “running fix” (maybe somebody can improve this plugin to have build in drawing “running fix”). For all 17 sights, I first calculated on paper during passage using Sight Reduction Tables + Almanac for 2017 and to compere it, I do it again using Long Term Almanac 2000-2050 - Kolbe (which is great). Lastly I put my sight into plugin to check it and it looks OK. Same as my paper work (except Mer Pass).

What I would like to see as an option to this plugin is “Meridian passage of the Sun”. I used those sight as Sun LL in the plugin but it is NOT as precise as could be (Astro17 - I have on the paper 18°10'N [on GPS it was 18°10,6'N] - plugin draw circle in 18°12.9'N - the reason is that time of the 'Mer Pass' of the Sun is very difficult to measure precisely).

Testing: Armchair testing of Celestial Navigation

A Simplified Example

NOTE: The menu selection **Sight Highlighted > Edit > Sight > FIND** is used to help find the Altitude, Azimuth or the celestial bodies, and currently does not calculate any of the Parameter corrections. Indeed, these calculations would have to be the mathmatical reverse of those found in the file sightdialog.cpp (Lines 151-159) and would have to be done in reverse order. The reason this is important, is if you use this armchair method, the circles of position will not be exact, so your fix will not be as accurate as if you actually take a sight.

We are going to use the all the same times and locations for the sights. Everything that can be set the same will be.

Simplification: Parameters that are always the same:

- Clock Offset =0
- Time: Boston Time (UTC-5): Oct 10, 2017, 13:00 so UTC 10/10/17 18:00
- DR Shift: Distance=0 Bearing=0
- Parameters: Eye height=2.0 m Temp 10 c, Pressure=1010, Index Error 0 min
- Latitude: 42.35, Longitude to -71.1

What is different:

- Using “Find” and Altitude set for the Star and enter the Lat/Long above:
- Star - Altitude Entered
- Alkaid 79.501993
- Kochab 58.133196
- Arcturus 66.507224
- Sun 36.888867

I suppose I should go up to the rooftop to use my sextant and learn how to take sights again. But that is not the purpose here. We want to check Celestial_Navigation_pi. So this an armchair method that I think may be ok using the “Find” Button. (Short Answer: I think the problem was the default setting of “Clock Offset: -10000 seconds”! This should be set at

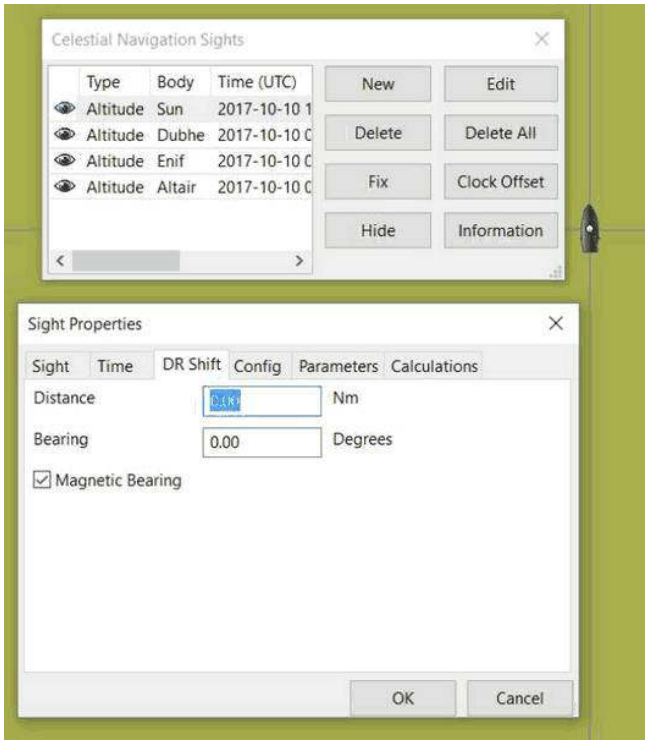
default=0 IMHO)

Here is a sample test sight.xml.doc[489] file that you can use if you would like. Remove the ".doc" please. You can rename your own sights.xml file for reuse later, and load this one…. for Windows Users this file is in *C:\ProgramData\opencpn\plugins\celestial_navigation*.

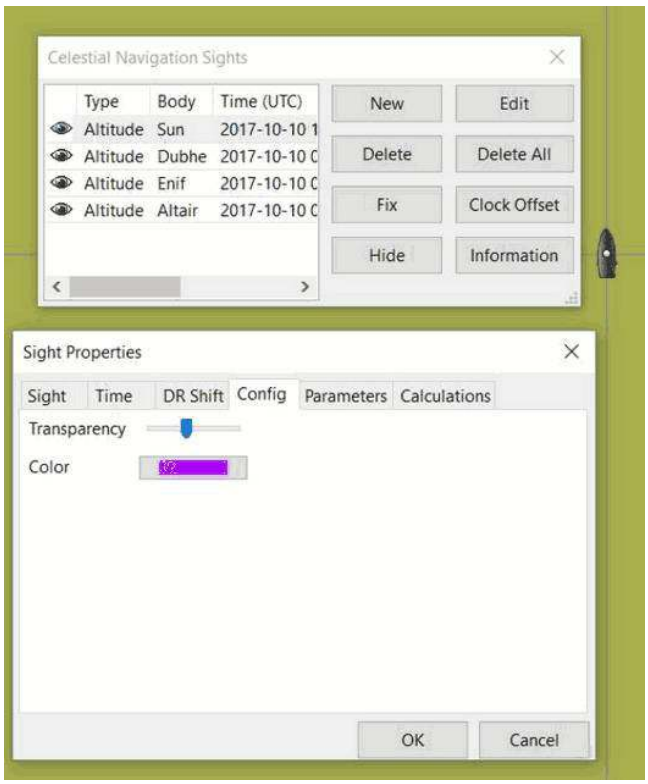
Process

1. In OpenCPN with Celestial_Navigation_pi "Enabled", first **Locate the Boat**!
2. The **Own Boat** location is used for the Sight > "Find" function. "**Find**" will be used to get '*altitude*' or '*azimuth*' for a given *celestial body*, at *the boat's location or a location you entered* at a *UTC time*.
3. Right Click, Drop a waypoint and then Right click on WP, pick Properties set lat 42.35 long -71.10 Boston,Ma
4. Try to Right-click "**Move the boat**" to the exact location of the waypoint. (I would really appreciate a Right-click "Move to lat\long" feature.
5. **Clock Offset** Button. Check that Clock Offset = "0" 6. In Cel_Nav Pick "**New**"

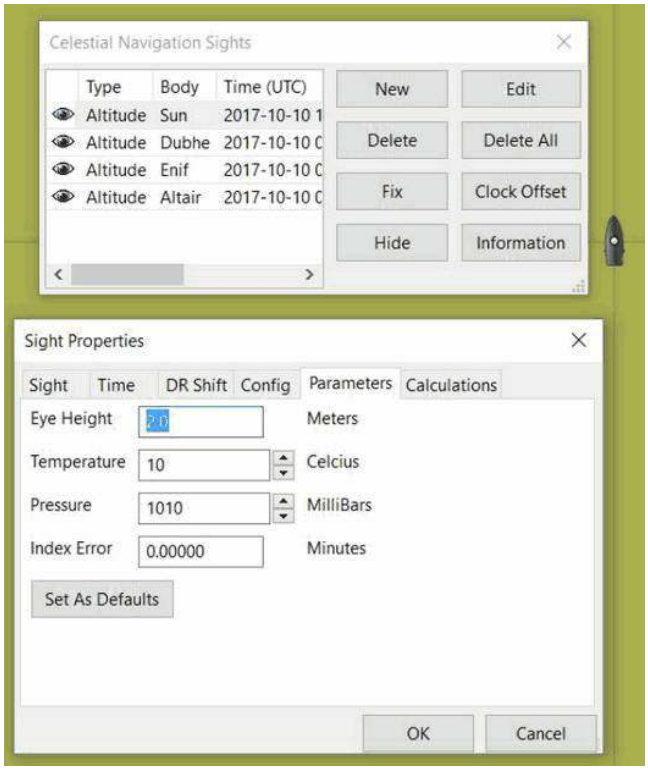
7. Time Tab: Boston Time (UTC-5): Oct 10, 2017, 13:00 so UTC 10/10/17 18:00



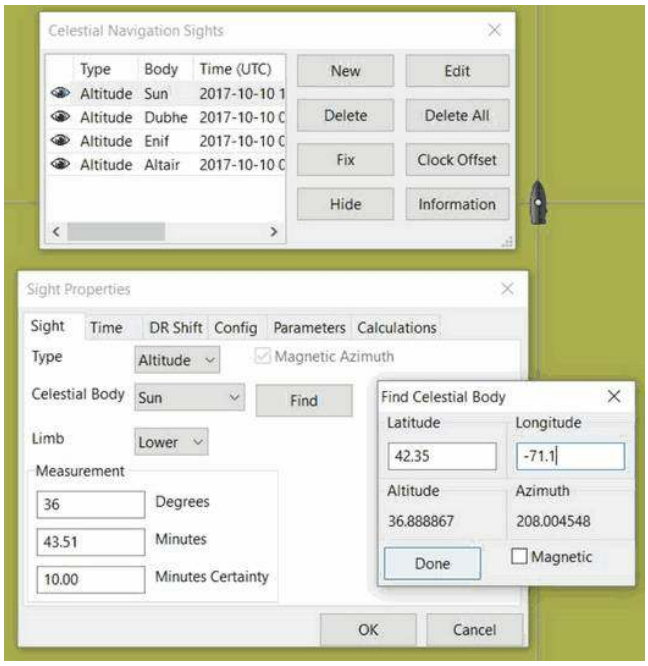
8. DR Shift: Distance=0 Bearing=0



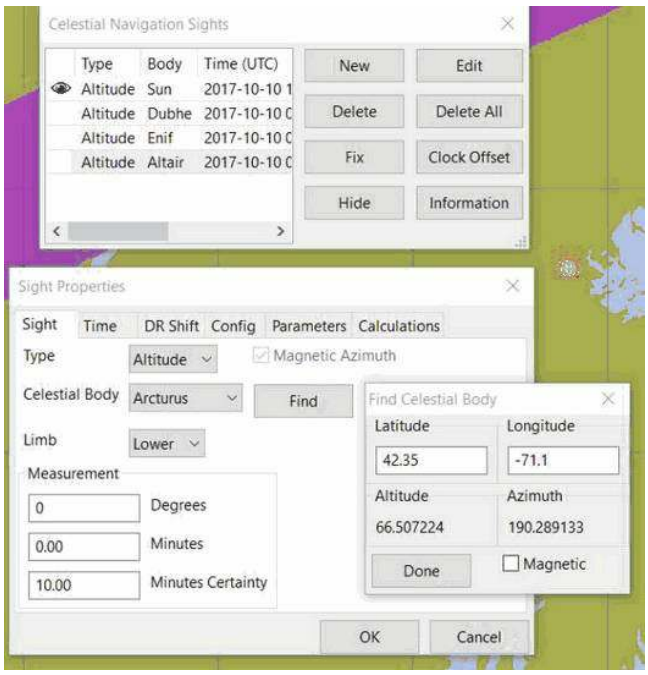
9. Config; Set color wanted.



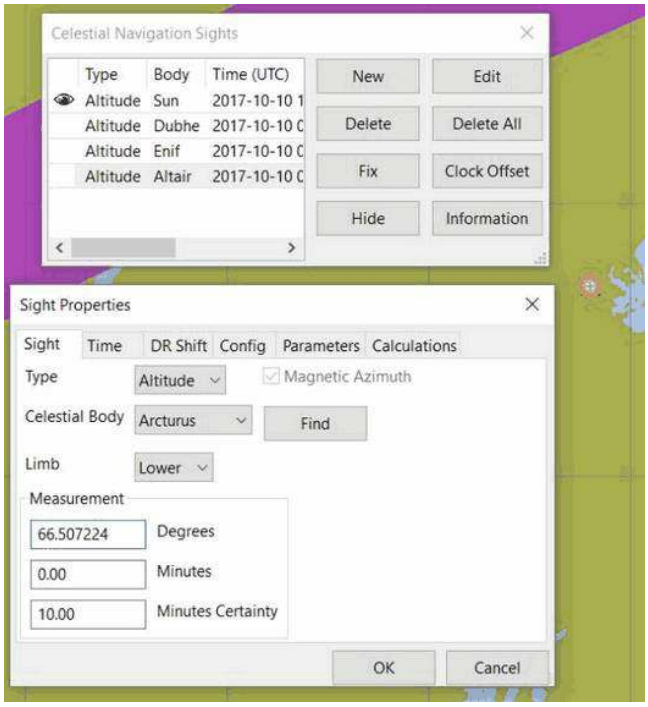
10. Parameters; Eye height=2.0 meters; Temp 10 c.; Pressure=1010; Index Error 0 min. Click Set as Defaults.



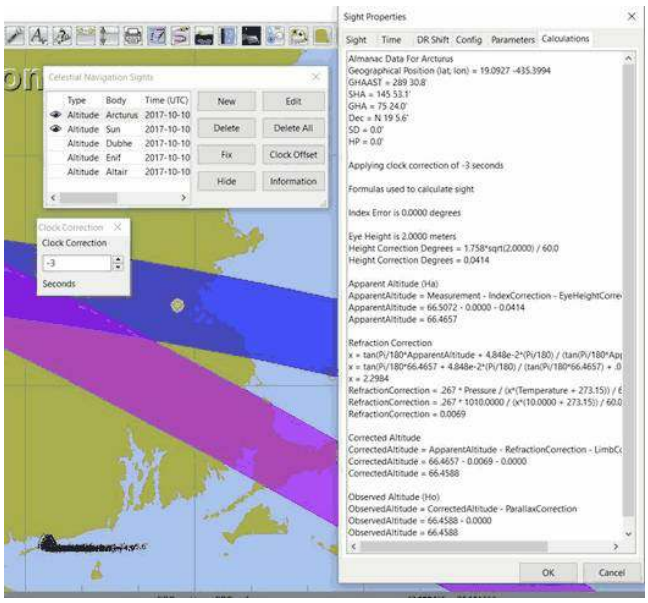
11. **Sight Tab**: Type=Altitude; **Celestial Body=Sun**; Limb=Lower; then pick "**Find**"
12. Make sure to change Latitude: 42.35, Longitude to -71.1 (Would very much like to Right Click > Move Boat Lat/Long!)
13. Read Altitude of Sun on 10/10/17 UTC 1800 = 36.888867, Select "Done"
14. Enter "**Degrees**" 36.888867, make the Minutes 0. Hit **OK**.



16. **Sight Tab**:Then enter another Type= Altitude **Celestial Body=Arcturus** Limb=Lower, check that the Time, DR Shift, Config are the same. Hit Find.
17. Enter Lat=42.35 Long=-71.1 See Altitude of Arcturus UTC 10/10/17 18000 is 66.507224 Hit **Done**.

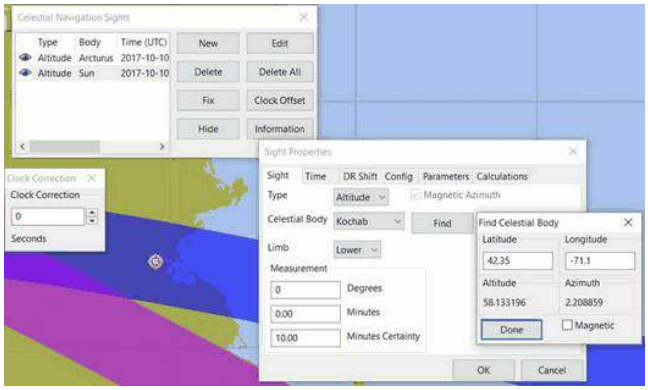


18. Enter Degrees=66.507224, make Minutes=0. Hit **OK**.

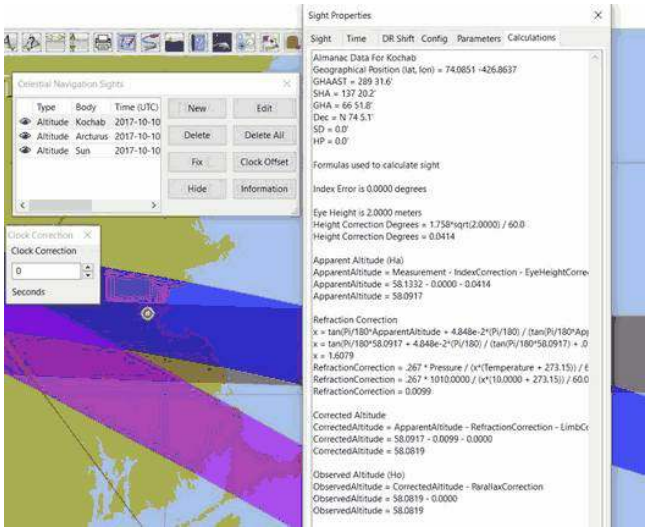


15. Arcturus Calculation Page (Printable)

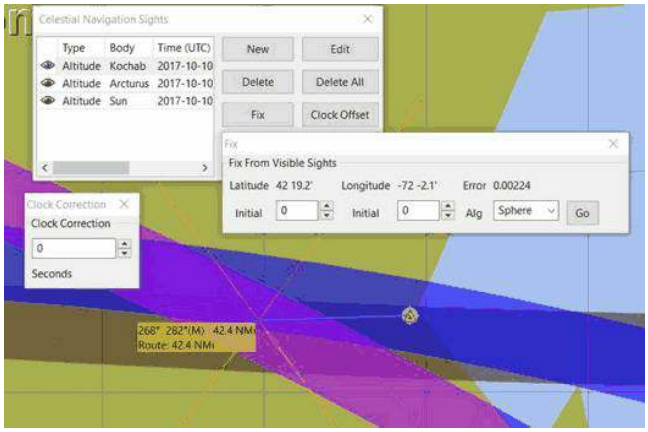
19. Found *"**Clock Offset**"= -10000 or something*, set it at "0" then screwed around for awhile checking other things. *Sights changed position, better…* **This was definitely a problem from earlier!**



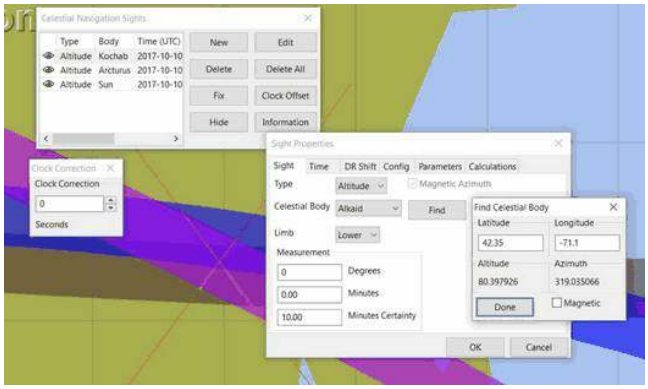
20. **Sight Tab**:Then enter another Type= Altitude **Celestial Body=Kochab** Limb=Lower, check that the Time, DR Shift, Config are the same. Hit Find.
21. Enter Lat=42.35 Long=-71.1 See Altitude of Kochab UTC 10/10/17 18000 is 58.133196 Hit **Done**.



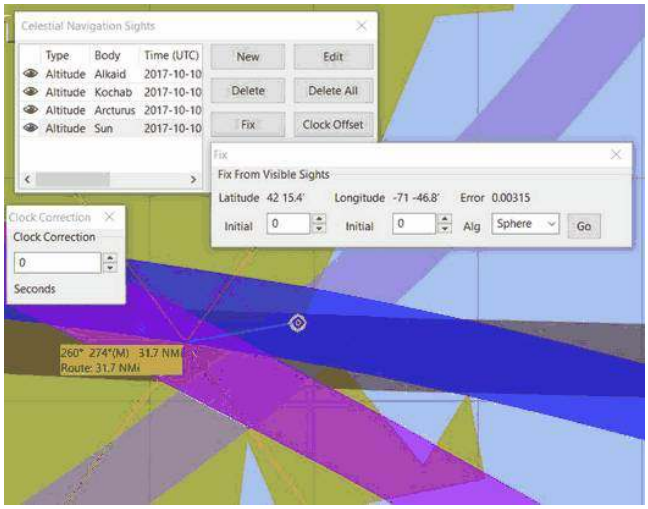
22. Enter Degrees=58.133196, make Minutes=0. Hit **OK**.



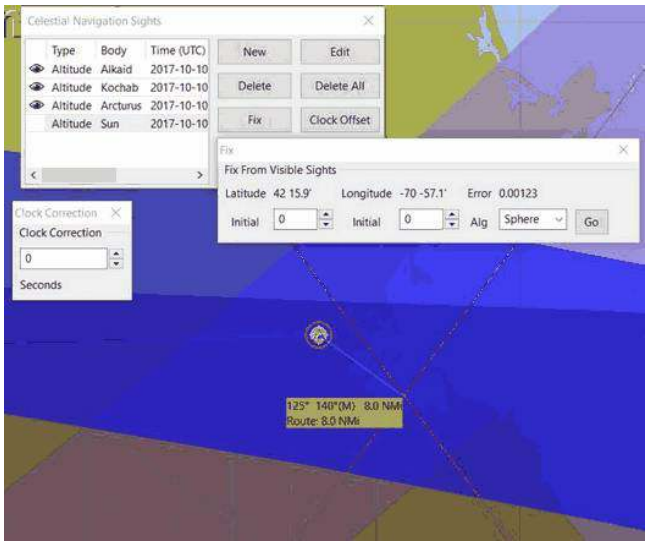
23. **Fix** Then find Fix. The fix is 41 nm off. To many circles east to west.



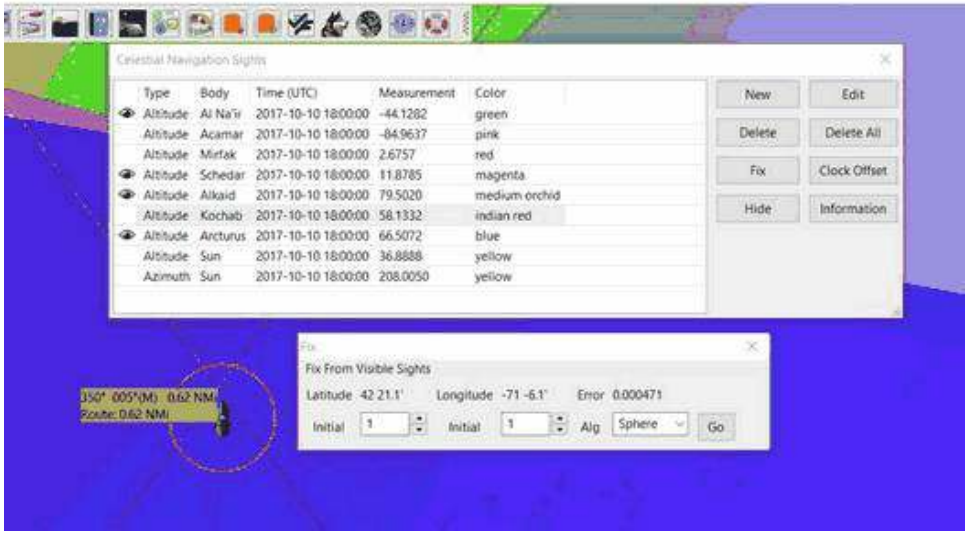
24. **Sight Tab**:Pick “New” and set **Celestial Body=Alkiaid**. Check all Tabs set correctly. Pick “**Find**“
25. Enter Lat=42.35 Long=-71.1 See Altitude of Alkaid UTC 10/10/17 18000 is 79.501993 Hit **Done**.



26. **Fix** Hit Fix new red X draw and it is 31 nm away. Better.
27 **Turn off the Sun** as it is the worst sighting compared to the other 3 by clicking on the "eye". Better.



28. **Fix** Hit Fix and new red X drawn and it is **8nm away**.



Associated Sights.xml File -take .rick2.doc off please[490]

29. Later added more sights and selected the 4 best ones and hit **Fix** and got about .6nm away.

NOTE: The altitude & azimuth given with the “FIND” button is without the Parameter's Tab corrections, so it will not be as accurate as an actual Sight.

Great Circle Route

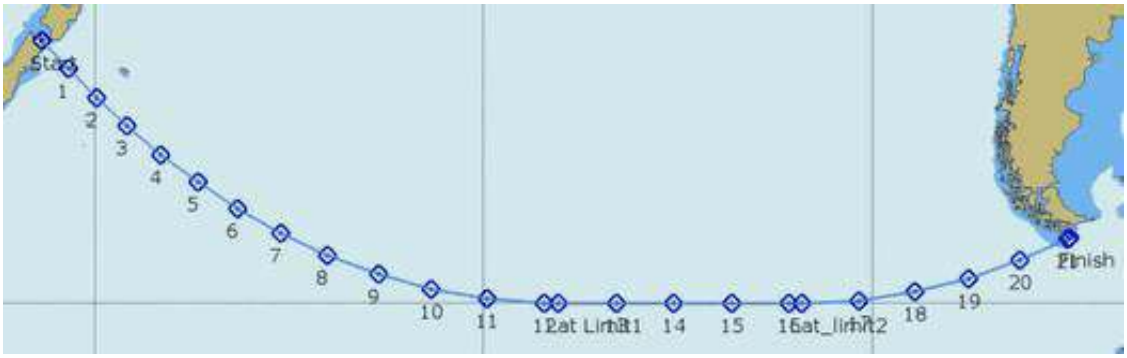
Links

- Source: Github Repository[491]
- Download: Download Page[492]
- Cruiser's Forum: Route_pi Discussion Thread[493]

Route Plugin

“Salty Paws” route plugin handles much more than Great circles, introduced here.

The plugin has a few features not present in the built-in tool. It can calculate a composite route, and the distance between the waypoints can be set by the user. The end result, however, is a “gpx” file that is exported, and then imported into OpenCPN via the Route Manager.



A Great-circle from Cook Strait to Cape Horn limited by 60° S

Dead Reckoning

Add DR positions to a route by means of editing a gpx file, which has been exported from 'Route Manager'.

Installation

Windows: Use the latest .dll here[494]. Remove the .pdf extension.

Links

- Source: Gihub Repository[495]
- Releases: Github Releases[496]
- Downloads: Website Download[497]
- Forum: Cruiser's Forum Dead Reckoning thread[498]
- Forum: DR plugin splitting up gpx routefiles[499]

Definition

In navigation, dead reckoning or dead-reckoning (also ded for deduced reckoning or **DR**) is the process of calculating one's current **position** by using a previously determined **position**, or fix, and advancing that **position** based upon known or estimated speeds over elapsed time and course.

1. What and Why

The DR plugin is a means of adding DR positions to a route. Because the plugin cannot access 'Route Manager' directly it works by editing a gpx file, which has been exported from 'Route Manager'.

DR speed and the time between the DR positions can be changed before the DR gpx is finally created.

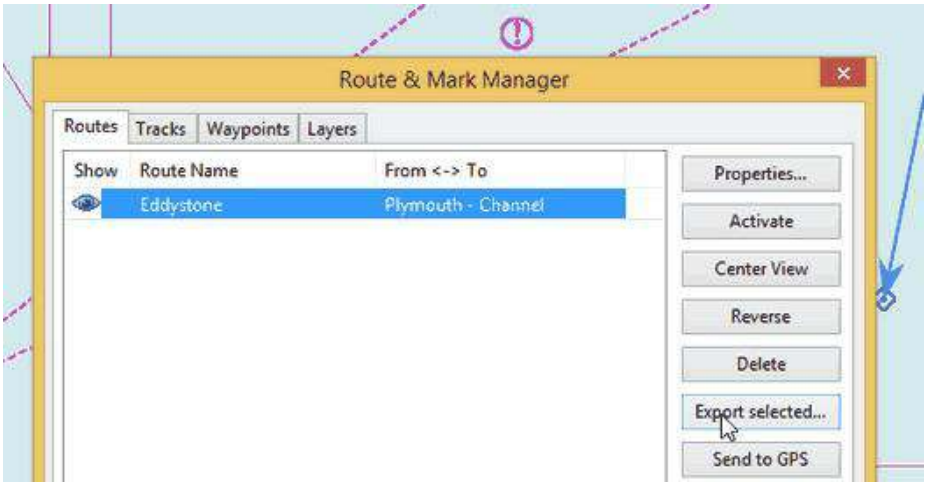
This plugin is a temporary solution to the problem of creating DR positions. The **Draw plugin** now allows the creation of DR positions for course legs.

2. Install

Copy 'DR_pi.dll' to the plugins folder. Start OpenCPN. Tools/Options and select 'Enable' for the DR entry.

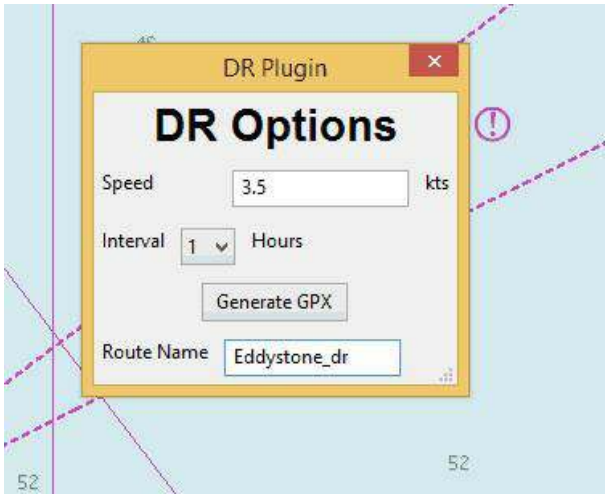
3. Standard actions

Save the route which you want to add DR positions to by using 'Route Manager'. Make a note of the folder where this original route file can be found.



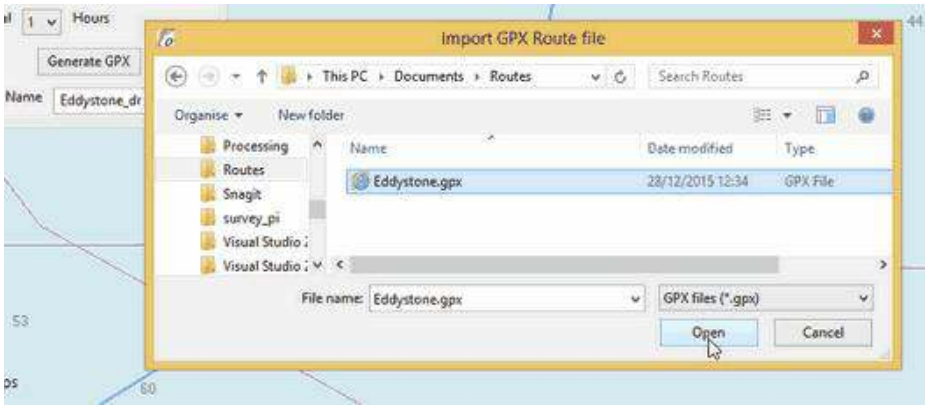
Start DR:

The main page of the plugin appears:



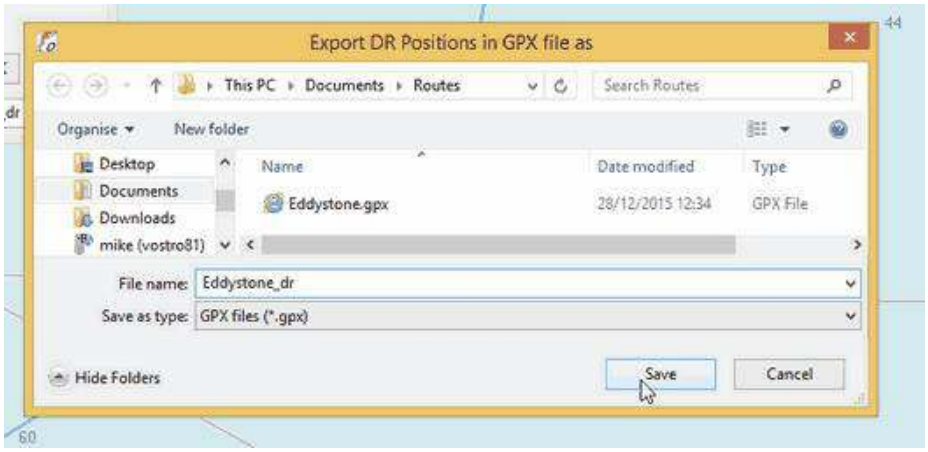
The DR speed and interval between DR positions have been added. The DR route name is entered in the bottom box.

The process of creating the DR route is started by pressing 'Generate GPX'. A file dialog box appears.



Select the route GPX file where DR positions will be added.

Immediately after selecting this file a new file dialog box appears.

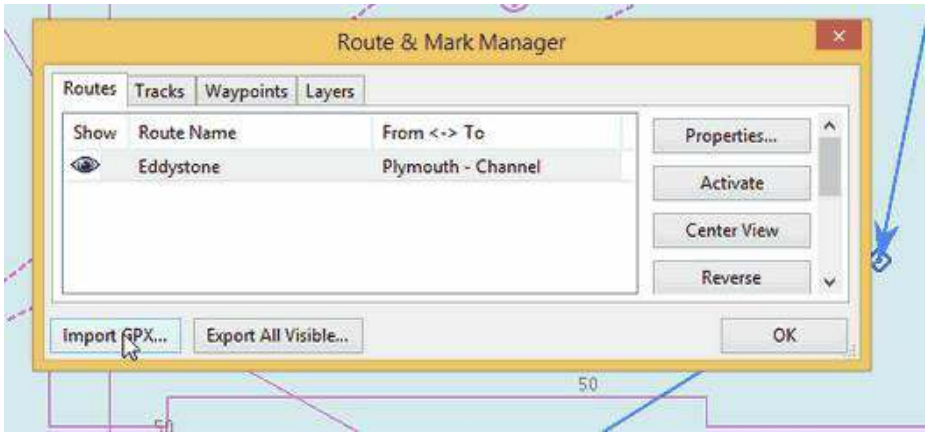


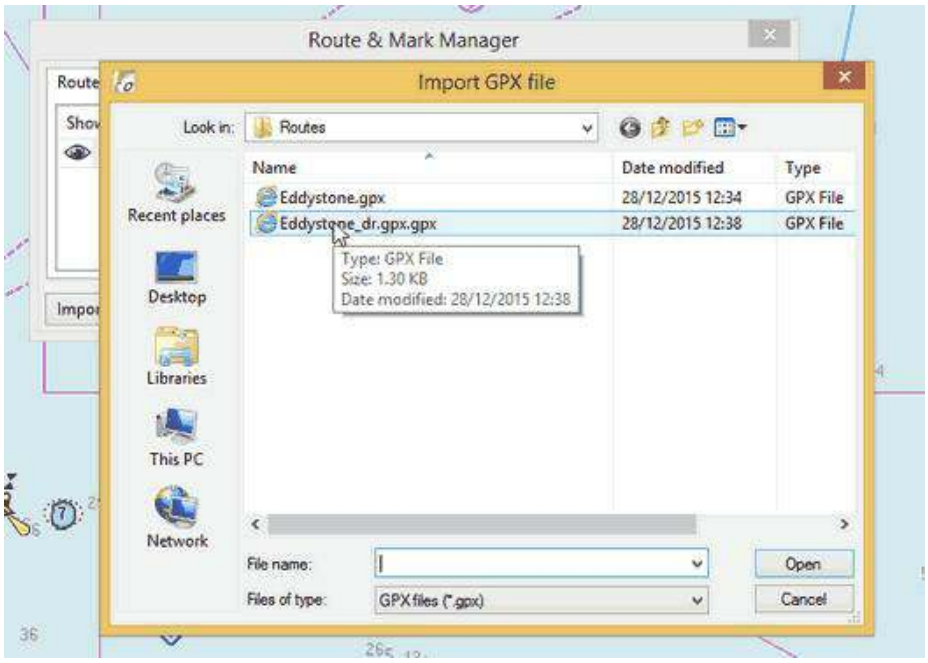
After pressing 'Save' the route_dr gpx file is created in the folder you have chosen. If the

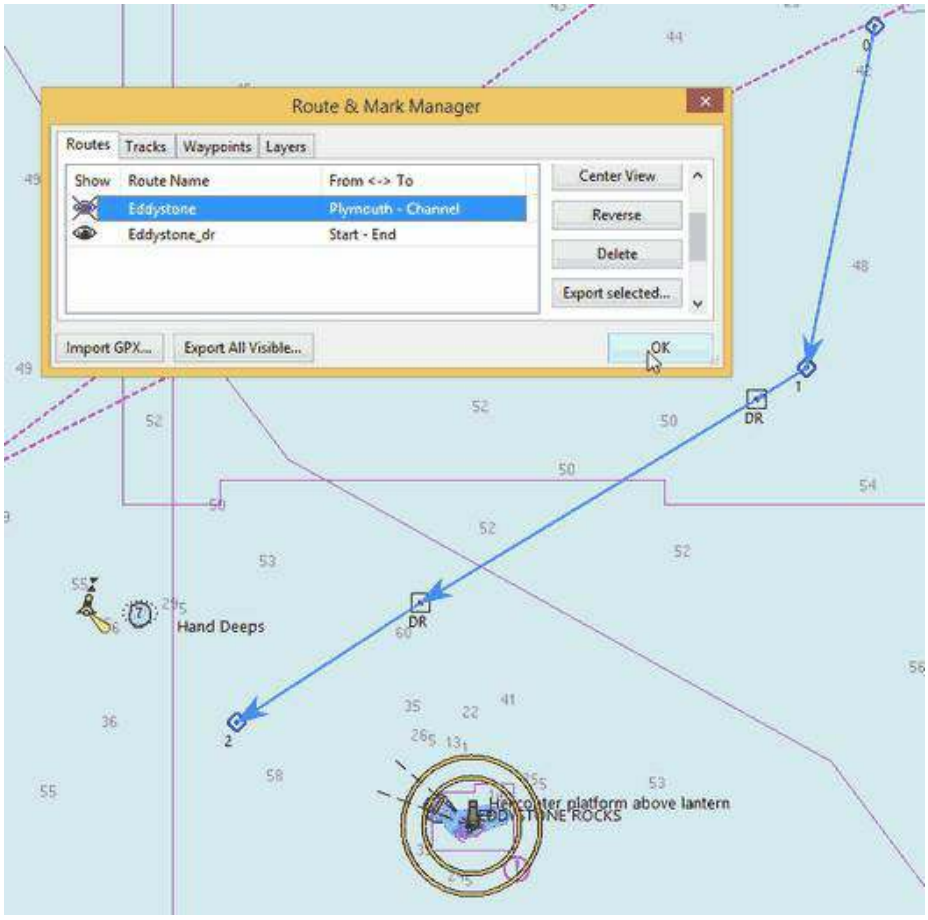
original file is not needed you can use the same file name and the original file will be over-written.

The plugin can now be closed.

Using 'Route Manager' import the DR gpx:







The DR route is now available. To avoid confusion the original route can be hidden by using the 'Eye' symbol.

oTCurrent

Links

- Source: Github Repository[500]
- Download: Website Download[501]
- Forum: oTCurrent Thread[502]

1. What and Why

The OpenCPN standard installation has tidal current data for the USA. Using the program 'Show Currents' icon a set of arrows for the tidal current are displayed and also the rate of the current. These arrows are in a single colour. No value for direction is shown.

oTCurrent allows the selection of a different date/time for the tidal current prediction. Also, using the 'Next' and 'Previous' buttons the user can 'step through' the time of the prediction. Direction and rate can both be shown.

IMPORTANT: The times selected/shown use the same time zone as your computer. The tidal current displayed should be checked against official publications.

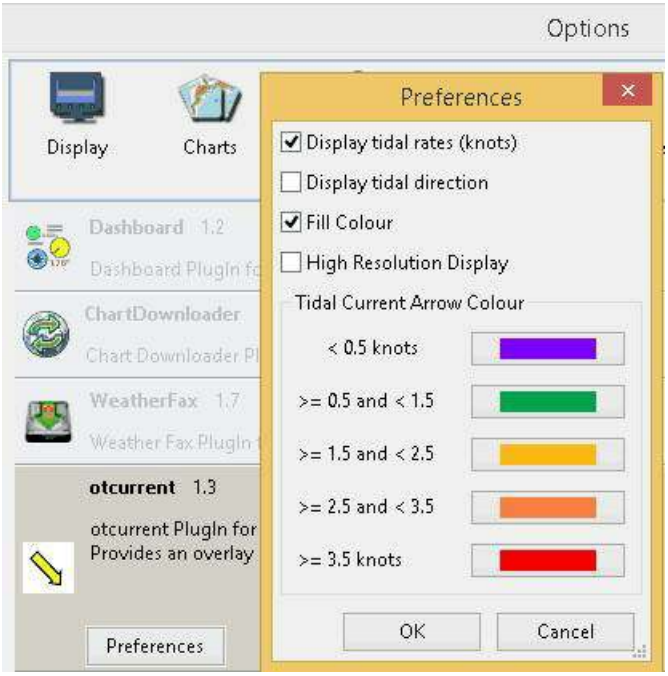
2. Install

The Windows installer ishere[503].

The plugin assumes that you are using the 'HARMONIC.IDX' file installed in the 'tcdata' folder of your setup. The plugin is not able to work with 'tcd' files. If you are using a different 'HARMONIC.IDX' you can select the folder where this file is located.

3. Standard actions

Enable the plugin by using Tools/Options and pressing the Enable button.

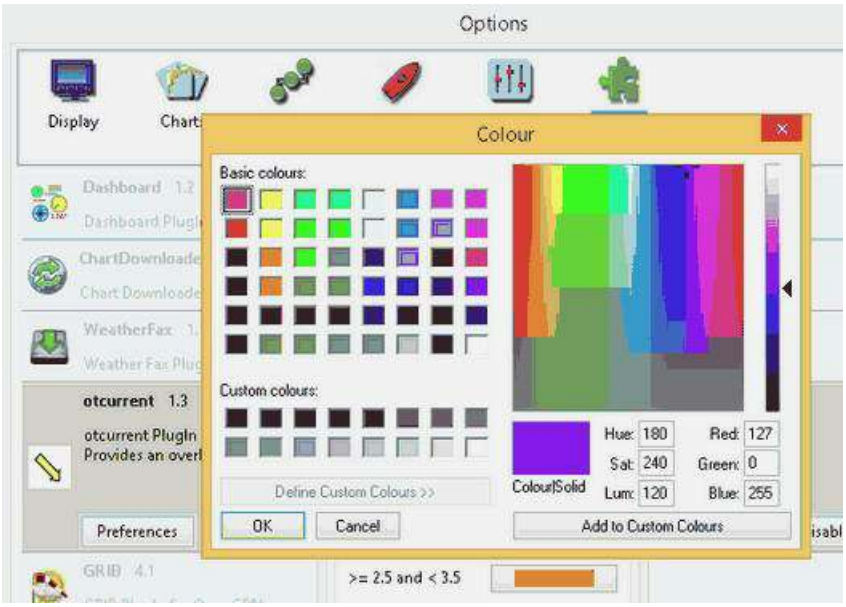


While the 'Options' screen is open user preferences can be set. The user can decide whether text values of rate and direction are shown against the tidal arrows. Arrows can be 'solid fill' or 'outline'. 'Fill Colour' makes the arrows 'solid fill'.

The color of the arrows can be changed.

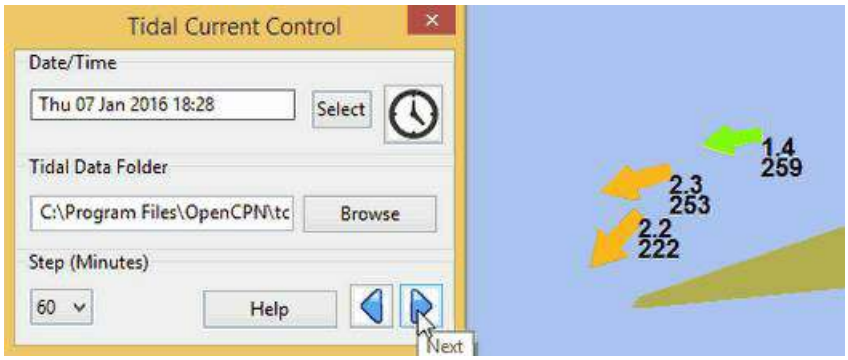
For users with a high resolution display there is an option to adjust the plugin dialog to match those displays.

These selections are saved in the Config file.

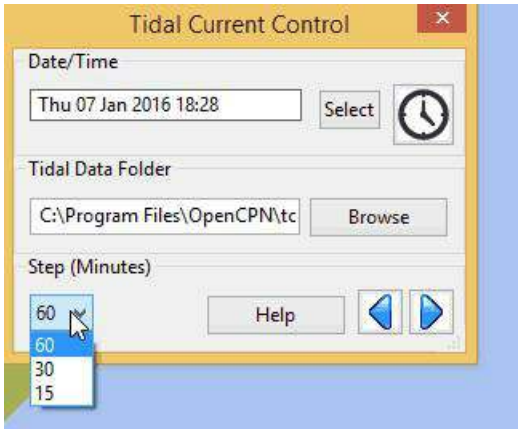


After enabling the plugin and pressing 'Apply' the oTCurrent icon appears on the toolbar.

Press the icon to start seeing tidal arrows. Unlike the arrows displayed by the standard OpenCPN program you will need to be zoomed in, to a scale greater than 1:50000.

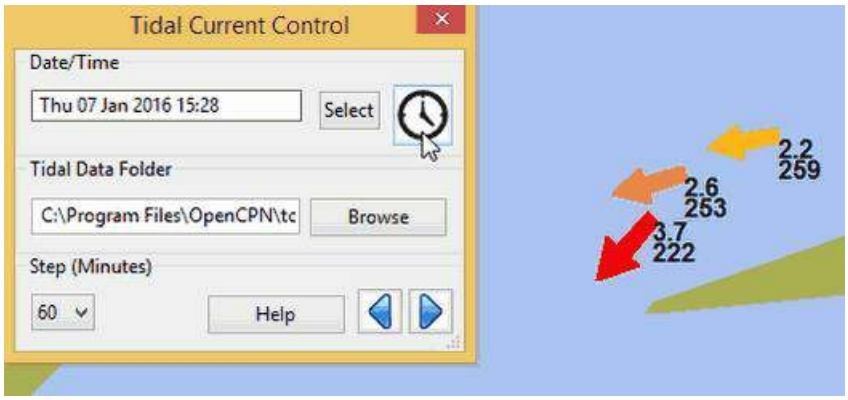


Pressing 'Next' steps the time ahead by the interval set in the 'Step' box.

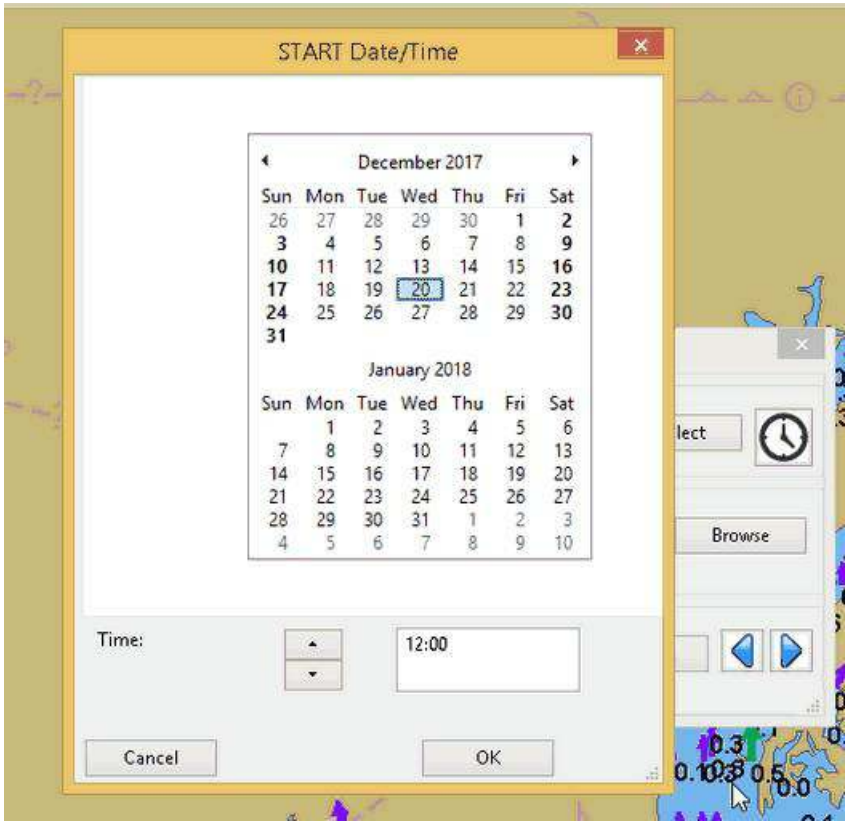


Pressing 'Previous' steps the time back by this interval.

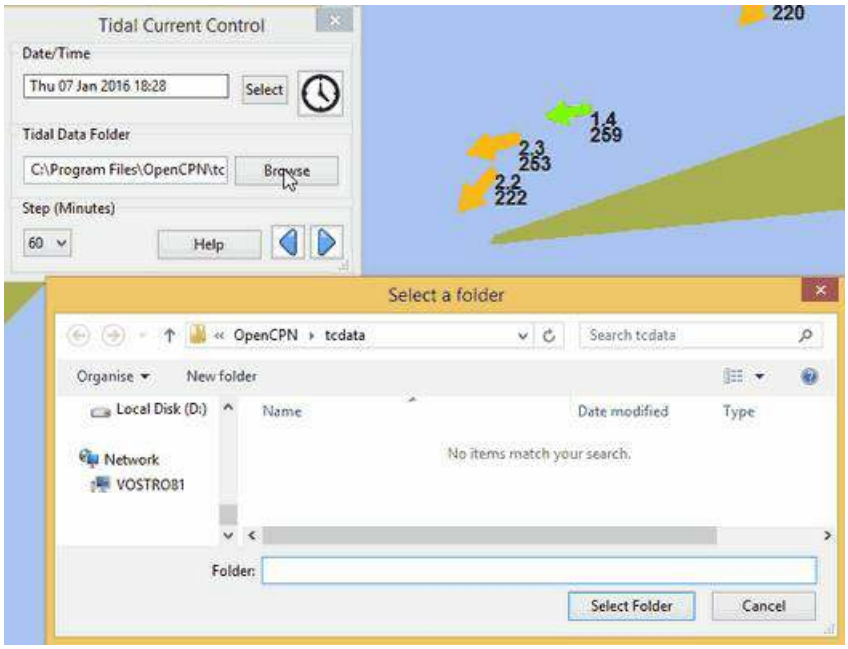
The 'Now' (Clock) button shows the tidal current for the present time.



Dates in the future can be chosen, using the 'Select' button.



If you have a 'Harmonic.idx' file on your computer, other than the one installed as part of the standard OpenCPN installation, this file can be selected with the 'Browse' button.



4. Options

Return to 'Tools/Options/Preferences' if you wish to change whether text is displayed for direction or rate. Also to change the color used for a range of speed. For high resolution

displays there is an option to improve the plugin dialog for those displays.

5. FAQ

No arrows are shown. How do I show them?
Is the chart zoomed in to a sufficiently large scale? Are you using a 'Harmonic.idx' file?

My sailing area is Europe. Can tidal currents (streams) be displayed?
Unofficial 'Harmonic.idx' files are available for some European waters.

For Linux users: If you are using V10 please rename HARMONIC.idx as HARMONIC.IDX. Without this change you will not see any arrows or current information with the plugin.

GE2KAP

Links

Source: Not available.

- Download: GE2KAP http://gdayii.ca/index.php[504]
- Website: GE2KAP http://gdayii.ca/index.php[505]
- Instruction: Make charts on Google Earth with GE2Kap[506]
- Instruction: Running ge2kap on linux and mac[507]
- Forum: GoogleEarth to bsb-kap[508]

See this website ***GE2KAP http://gdayii.ca/index.php[509]***
How create Google Earth(GE) Kap files and overlay them on OpenCPN Charts
by Phil Higgins (Note: Not a plugin, but companion software, like fine wine…)

English Help File -Index.html[510]

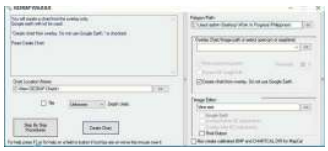
Recently updated & simplified Tutorials for GE2KAP[511]

Installation

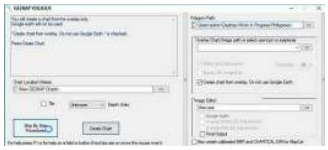
On gdayii.ca GE2KAP[512] website, select “Downloads” in the website Menubar and find the “GE2KAP” download. Download and and uncompress the zip file and install. Some zip files require a password to unzip which is: **phiggins**

Refer to the English Help File -Index.html[513] also located in the download. EG: From the GE2KAP installation folder “file:C:/GE2KAP/GE2KAP.V26.0.0.0/Help/English/index.html” The **index.html** will provide instructions.

- The **README** is a file in the GE2KAP program folder that, when opened launches the built-in HELP discussion with your computer's browser. It's quicker to access the HELP from the first pane of the GE2KAP program by pressing F1.
- The '**Tutorial**' is named '**Step by Step Procedure**' and is accessed by clicking on the box with that label on the first pane of the GE2KAP program or by use of F1 key. Lots of procedures described and they can also be narrated by Windows.



Opening Menu GE2KAP



Step by Step Procedures (Tutorial)

Step by Step - Overview

Overview Details

Click on one of the links below to download the file.

1. Some zip file require a password to unzip which is: phiggins
2. Be sure to read the **README** file.
3. **GE2KAP.V26.0.0.0** - Aug. 25, 2017 Creates charts from GE and chart images and SasPlanet. Can overlay opencpn chart and chart images including GeoTiff, Support for Google Earth Pro V7.3.0.
4. **GERoute** - V2.0.0 New Nov. 17, 2014 Follows a route to load the Google earth cache.
5. **C2GPXKML** - V4.0.2 New July. 31, 2015 Converts GPX, KML, SRW, Maxsea and Ozi formats. Supports Konni logbook plugin csv to combine track and logbook data.
6. **AISTTM** - V2.0.0 New Nov. 17,2014 Converts AIS/NMEA into TTM messages for non-AIS radars. Can be used as an AIS/NMEA simulator.
7. **Fix_GE_API** - V4 Aug 23,2015 04, Fixes the Google Earth API

From the Tutorial, Contents of Install Package

1. **GE2KAP.exe** The program to execute **GE2KAP.rex**. At first start, it will also run **Check.rex** to check if all the prerequisites are installed.
2. **Install_Plugin.exe** The program to install the OpenCPN plugin **ge2kap_pi.dll** for GE2KAP. Do not run this program by itself. The first time you run GE2KAP.exe, if the plugin is not installed or its the wrong version, this program will be invoked to install the plugin. It can be run again by running **Check.rex**.
3. **GE2KAP.rex** The GE2KAP program. This is what you run.
4. **GE2KAPFuncs.dll** A dll with functions used by GE2KAP. It must be in the same directory as **GE2KAP.rex**.

5. **View.xxx** A program used to view the chart produced. It must be in the same directory as **GE2KAP.rex**. It will be copied into **View.exe** the first time GE2KAP runs.
6. English.mo/….mo Language files for the various languages supported. They must be in the same directory as **GE2KAP.rex**.
7. **Help** directory Help directory. It must be in the same directory as GE2KAP.rex.
8. **ge2kap_pi.dll** This is the GE2KAP plugin for OpenCPN. It needs to be copied into the opencpn\plugins directory which is usually *C:\Program Files\opencpn\plugins* or *C:\Program Files (x86)\opencpn\plugins*.
    a. Then rename it to **ge2kap_pi.dll**.
    b. After copying, start OpenCPN and enable the plugin Options..Plugins..ge2kap Click Enable then OK.
9. **Check.rex** checks that all prerequisites are installed, including the ge2kap_pi plugin.
10. More in the Tutorial

Use of ooREX Language

Paul Higgins uses the ooRexx language in creating GE2KAP. For GE2KAP to run it needs the ooRexx interpreter installed on the machine (Paul used to work for IBM). GE2KAP intallation checks if ooRexx has been downloaded and installed and if not, you are prompted to do so.

ooRexx is an interpreter language. That means the human readable source code is not compiled to machine code to an executable and this executable is started but the ooRexx code is given to the interpreter which translate it to machine code during startup. That is nice for small programs and test them on the fly.

Description & Process

Here is a reasonable technique for putting charts into OpenCPN with a minimum number of steps and/or geeky user interfaces. It does involve using GE2KAP, which you can find ***Chart Conversion[514]*** complete with downloading instructions.

GE2KAP is a great program. I've used it a bunch of times to get imagery in OpenCPN to show me where rocks, shorelines, etc. really are. But beware! Even at high magnification (say, 1000 feet view) rocks and submerged objects may not be visible. Fortunately, we maintain a good lookout and narrowly avoided learning this lesson the hard way!

If you have a chart that you believe is accurate, for example, from a cruising guide. The instructions below allow you to display it correctly in OpenCPN. The process for overlaying a chartlet in OpenCPN using Google Earth and GE2KAP is actually quite straightforward.

1. Get an image of the chartlet. In the case of a cruising guide, take a photo of the page. Be sure the camera lens is directly above the center of the chart and the camera is parallel to the chart surface.
2. Use Photoshop or GIMP to crop and refine the image. Adjust brighteness and increase its contrast, to make the final OpenCPN display more readable. Save the image in a temporary directory or desktop. Any format – .jpg, .jpg .bmp.
3. Go to Google Earth and locate the general area where you want the chartlet to show.

Scale the screen image to roughly coincide with the chartlet boundaries – no need to be precise. Go to View/Reset and reset both Tilt and Compass.

4. Select the **Add Image** Overlay tool on the GE toolbar. (Looks like two rectangles slightly offset from each other. If there is no toolbar, go to View and select Toolbar from the pull-down menu.) You will get a dialog window. Give the chart a name (e.g. localname_PM for a chart from Pacific Mexico) and browse to where you've saved the image. Don't hit OK. (If you do, you can get back to the dialog screen by checking Sidebar under View, right-clicking the overlay name in the sidebar and selecting Properties.)
5. In the dialog window, Slide the Transparency control back and forth to get a level that allows you to align the chartlet image with the GE image. Grab any corner to scale the chartlet to the GE image, and grab the center to move it into position. (Hint: Use the corners rather than the cross-hair in the center. Align one corner and then the opposite one. Keep working it until you get it right.)
6. Select a transparency level high up on the scale toward Opaque. If you make the chartlet too transparent you won't be able to read things like depths and waypoint names; if you make it too opaque it will appear in OpenCPN with a black border around it, interrupting the flow of the other chart features. Now click OK. Go to View in the taskbar and unselect everything, to give you a clean image.
7. Open **GE2KAP** and create a chart exactly as you would have done for a GE image without the chartlet overlay (in other words, just use the left side of the interface, ignoring everything on the right). Note where GE2KAP files the chart in your directory structure (in my case, C:\GE2KAP\GE2KAP.V10.0.6.2\Charts).
8. Open **OpenCPN**, select Tools (image of a wrench)/Charts. If the directory you saved your chart to is already listed, select it and click *Remove Selected*. Now click *Add Directory …* Browse to the directory where you saved the chart, click *Open*, then in the chart dialog window click **OK**.“ . Your new chart should now appear where it is supposed to be on the OpenCPN chart.

Good luck!

Yacht Zen Simple Guide to Installing and Using GE2KAP

Simple Guide to Installing and using GE2KAP[515]

Yachtvalhalla Guides

Terry advises, I've not updated my tutorial/briefing Create GE2KAP Overlay (Rev12) PDF[516] since the 'Step-by-Step Procedures' have been incorporated into the program as shown above.

Since using the SAS Planet program with GE2KAP has many advantages, I've also written a guide for using the programs together, GE2KAP2SASP DOCX[517]

Also GE2KAP can be used to correct Raster Charts See Correct Charts[518]

Jon Hocking's KAP File Page

Jon Hocking's Kap File Page[519] GE and OpenCPN[520] GE and KAP files[521]

SAS.Planet

Also using SAS Planetdownload link: SAS Planet1[522]

GE2KAP can create a chart from the ***SasPlanet[523]*** dislayed map.

GE2KAP -Google Earth & Sas.planet

GE2KAP - Creates .KAP charts from Google Earth ***gdayii.ca Downloads[524]*** Password to decompress archive: “phiggins”

GERoute - Follows a route to load the Google Earth cache.

C2GPXKML - Converts navigation routes and tracks to different formats, including Logbook!

Safety

Watchdog
Alarms including AIS, links and communicates with oDraw.

Ocpn_Draw
Drawing tools, Boundaries, EBL and VRM, link to Watchdog for keep in and keep out alarms.

SAR
Creates Search and Rescue patterns with desired parameters. See this **SAR[525]** link for Rescue patterns

Watchdog

Watchdog Update (1.2.000) Complete Documentation overhaul, especially the “Boundary Alarm” section.

Links

- Source: https://github.com/seandepagnier/watchdog_pi/releases[526]
- Releases: Windows Watchdog_pi Installer[527]
- Forum: CF Watchdog Thread[528]

What is Watchdog (WD) Plugin?

Watchdog Plugin is a plugin for OpenCPN. This plugin is developed by Sean D'Epagnier and implements various configurable alarms alerting the user about the changing conditions round the boat. Watchdog also implements a Deadman-alarm and an improved anchor alarm. Watchdog communicates with another very useful plug-in, called **OpenCPN oDraw Plugin**. That plugin is a tool to draw points, lines and shapes within OpenCPN. These points, lines and shapes can be used in navigation, for instance to show electronic bearing lines (EBL), variable range markers (VRM), specific points (boundary-points) and specific areas (boundaries). The oDraw-plugin can also be used to create a special type of boundary, called a Guard Zone. These features of the oDraw-plugin can be used in Watchdog. Watchdog can be set up to alert you when your own ship either enters (or gets too close to) or leaves (or gets too far away from) one or more of these boundaries. Watchdog can also be set up to alert you when another ship (AIS-target) enters a boundary.

Watchdog will be referred to as **“WD-pi”** or **“WD”.**
OpenCPN Draw Plugin will be referred to as **“Draw-pi”** or **“OD”**.

Note: the plugin originally started life as “Watch**man**” but was later renamed to “Watch**dog**”. The original name “Watchman” might still pop-up in some screens and menu's.
WD-pi requires Opencpn version 4.1.xxx or newer.

* Contents:

- Installation
- What does Watchdog do?
- In what situations can Watchdog warn me?
- How does Watchdog alert me?
- Standard actions: Setting up a Watchdog Alarm
- Standard actions: Setting up the Alarm Actions
- Landfall Alarm

- Boundary Alarm (Time, Distance, AIS Guard Zone & Inclusion)
  - Boundaries and Guard Zones
  - Setting up a GPS course crosses boundary in < ... minutes Alarm (Boundary Time)
  - Setting up a GPS fix is ... nm from boundary Alarm (Boundary Distance)
  - AIS Guard Zone Alarm & Inclusion Alarm
  - Setting up a Boundary AIS Guard Zone Alarm
  - Setting up an Inclusion Alarm
  - Combination of Boundary Guard Zone Alarm & Boundary Inclusion Alarm
- Dynamic Guard Zones
- Anchor Alarm&
- Course Alarm
- Speed Alarm
- Deadman Alarm
- NMEA Data Alarm (GPS & AIS)
- Email to yourself

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Installation

A. Where to get WD-pi

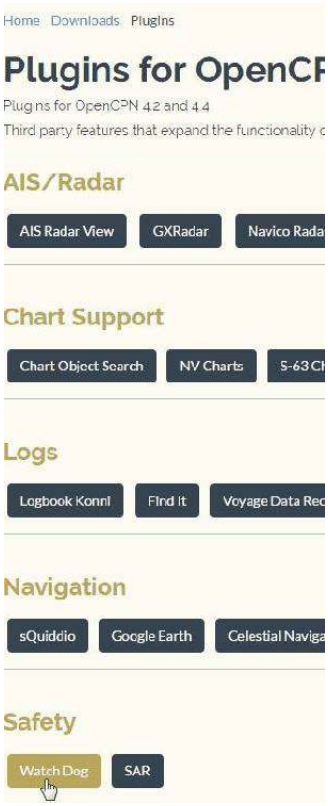
Note: In this section the instructions are specifically for WD-pi, but there is a dedicated page in the manual with information about Downloading, Installing and Enabling Plugins in general. That dedicated page can be found here: Plugins - Install and Enable.

WD-pi can be downloaded from http://www.opencpn.org/index.html[529]

Click "**Downloads**"

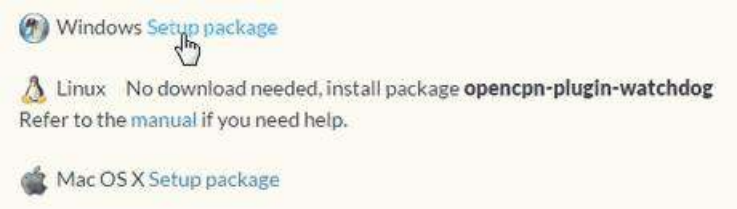
Click "**Plugins for OpenCPN 4.2 & 4.4**"

Scroll down to the "**Safety**"-section and click "**WatchDog**"



Make sure you choose the file that is compatible with your computersystem.
In this manual we presume it's Windows, so we choose the **Windows setup-package**.

Download the file (double-click).



B. How to install WD-pi

We assume you know where to find the files you download from the Internet (if you don't: quit now and read the manual of your computer before doing anything else with it).

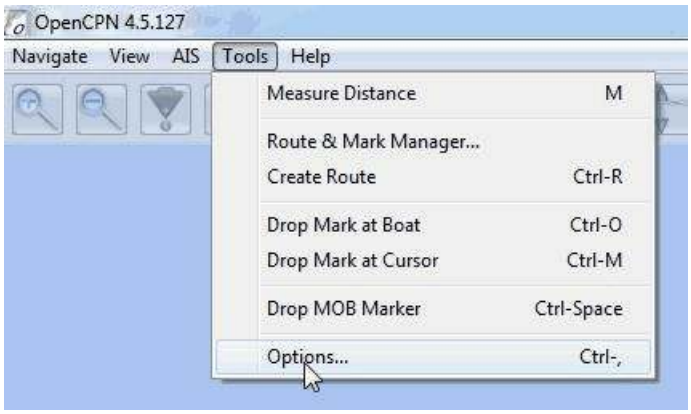
Double-click the downloaded file (with “watchdog_pi” in the name and “.exe” as extension) and follow the set-up instructions.

That's it. But before you can actually **use** WD-pi, you first have to **enable** that plug-in in OpenCPN.

Enabling WD-pi in OpenCPN

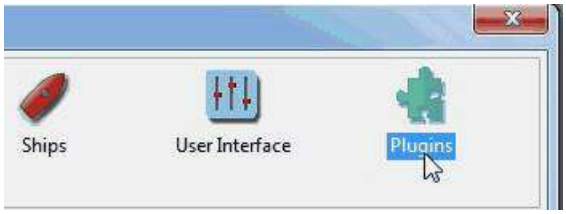
Open (or restart) OpenCPN.

Click **Tools-Options-**. via the Menubar…



or directly by clicking the “wrench”-icon

and then **Plugins**



Scroll down untill you see the WD-pi and click “**Enable**”.

Now the WD-pi icon (it's a picture of the head of a dog, a Husky to be precise) should appear somewhere in your OpenCPN Toolbar.
Now Watchdog can be used in OpenCPN

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What does Watchdog do?

Watchdog warns you -in a couple of specific situations- when you want to be warned.

In what situations can Watchdog warn me?

Watchdog has (in the version stated in the top of this document) the following types of alarms:

- Landfall Alarm
- Boundary Alarm (including “Guard Zone” Alarm)
- Anchor Alarm
- Course Alarm
- Speed Alarm
- Deadman Alarm
- NMEA Data Alarm

How does Watchdog alert me?

Does it bark?

Yes, that is possible. But maybe you want to choose something else.

You can set an alert in the form of a text-message that pops up on your screen …. (and yes, in that pop-up screen there's still evidence of the original name Watch*man*..)

A text-message is rather useless if you are not looking at your display. As the Deadman alarm is supposed to prevent you from falling asleep (or to wake you up if you did) the only logical kind of alert for “Deadman” is some form of (loud and bloody annoying!) noise.

So Watchdog also enables you to set an acoustic alarm.

You can use any sound you like, as long as it is a **“.wav” file.**

Examples:
If you want to brush up on your Morse-code, you can set Morse-code YYY (Yankee = “My anchor is dragging”) as sound for anchorwatch-alarm and Morse-code UUU (Uniform = “You are running into danger”) as the sound for Boundary and Land-fall-alarm. You can generate these sounds yourself dead-simple on the website Morse Code Translator[530]. Just

type whatever you want, adjust pitch and speed to your liking and save as .wav files in /OpenCPN/sounds).

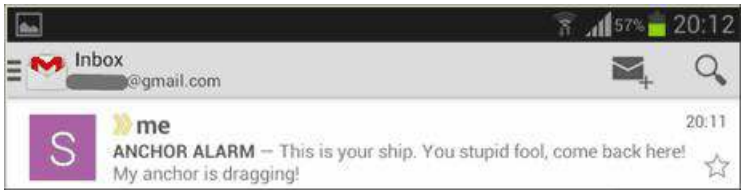
If your only reaction to hearing the beeps of Morse code is “Ah, the pizza in the microwave is ready!” then maybe a more direct approach suits you better. Like for instance a computer that actually says “**Warning! Boundary!**” when the Boundary-alarm sounds and “**Warning! Anchor!**” when your anchor is dragging.

And if you really want a Watchdog that barks, well….. then find yourself a wav-file of a barking dog (not recommended though; if you are anchored in an idyllic harbour it might start every dog in the surrounding to join in).

Apart from pop-up screens and all kinds of sounds, you can also let Watchdog execute a **computer command.** That can be any computer command. To name just a few options: Start a pdf-document with pre-defined messages in “Seaspeak” or any other language you need to have a conversation with the skipper of that monstrosity that is about to collide with you.

Or imagine your boat anchored in the bay and you sitting ashore in the pub…..

And hey, on our mobile phone we receive an email from a loved-one!



How this email-trick is done, is explained in “**Email to yourself**” at the end of this manual.

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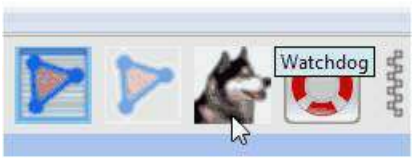
Standard actions: Setting up a Watchdog Alarm

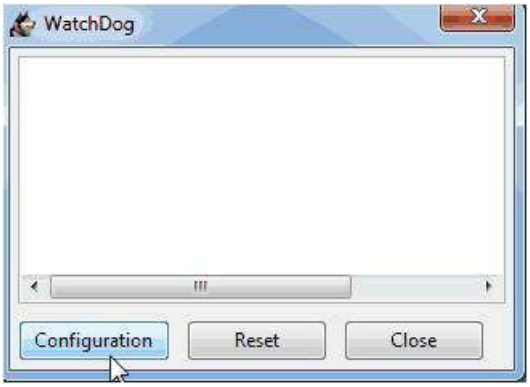
Once you have Watchdog installed and in your OpenCPN Toolbar, follow these 4 initial steps to set up a new Watchdog Alarm:

Step 1. Click “**Watchdog**” in the OpenCPN Toolbar

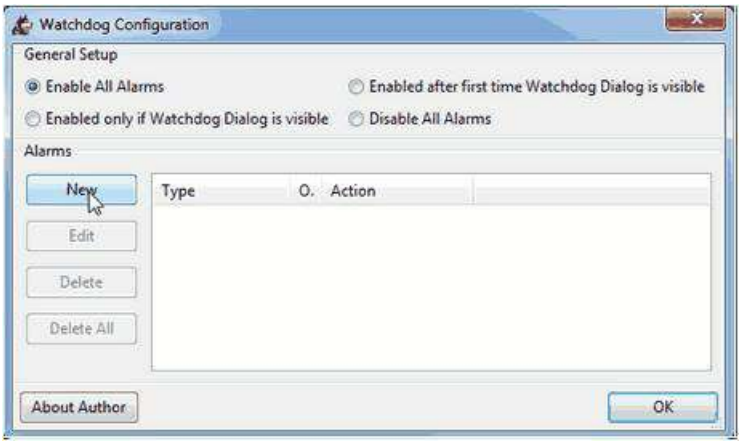


Step 2. The “Watchdog Window” opens. It will show all the alarms you have set (in this

example none is set yet). Click "**Configuration**"

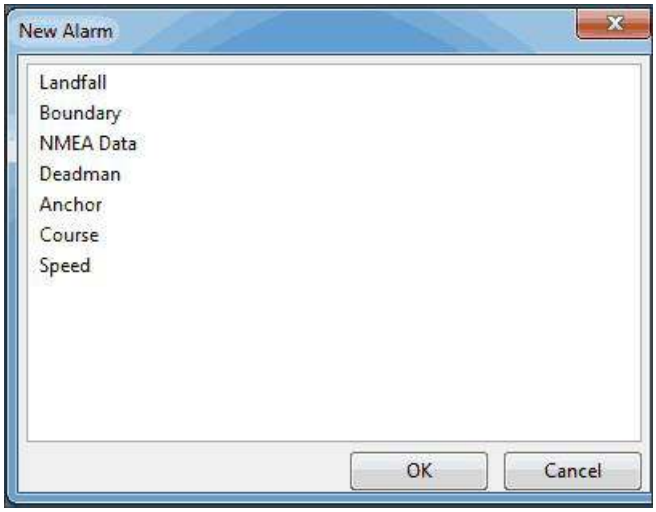


Step 3. The "Watchdog Configuration Window" opens. Click "**New**"



Step 4. The "New Alarm Window" opens. It shows the various types of alarms.

(The next steps involve clicking the desired alarm and clicking "**OK**")

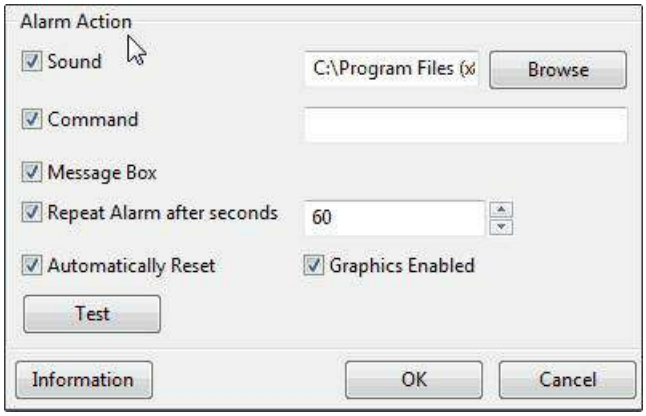


NOTE: These 4 initial steps are the same for each alarm. In the rest of this tutorial these steps will not be repeated but will be referred to as "set up a new Watchdog-alarm".

Standard actions: Setting up the Alarm Actions

When setting up a new Watchdog-alarm, you will come across the "**Edit Alarm**" window.

In that window there is a part that is specific for that type of alarm, but there is also a part that is the same for every type of alarm. It is the "**Alarm Action**" part.



In this part you can tell Watchdog what you want it to do. A brief explanation:

Sound
Alert you by playing the soundfile (.wav-file) you have entered (use the "**Browse**" button to point WD to that file).

Command
Execute a computer command (type the command in the box next to "command").

Message Box
Show a pop-up Textbox with "ALARM".

Repeat Alarm after seconds
Gives the opportunity to order WD to repeat the alarm after a set time (in this example that time is set to "60 seconds").

Automatically Reset
Means that when the alarm is triggered, the alarm will be reset to await the next "cause for alarm".

Graphics Enabled
Means that WD will show you something on screen, relating to the alarm. For instance the radius of the anchor-alarm you have set.

Test
Means that you can test if the alarm works yes or no.

Information
Means that … well, try that button for yourself and you'll see.

If you do not understand the function of the buttons "**OK**" and/or "**Cancel**": sell your computer!

First the various types of alarms are briefly explained. After that each type of alarm is explained in (a bit) more detail.

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Landfall Alarm -in short

Landfall Alarm is meant to alert you when you are nearing land. Not very usefull when you are only sailing withing a couple of miles from your marina but more aimed at the bigger trips involving vast stretches of water. Columbus would have liked it. The more extensive description of the alarm is here: LANDFALL ALARM.

Boundary Alarm -in short

See also **Plugin Messaging between ODraw, Watchdog and Weather_routing.**

Boundary Alarm is meant to alert you when the position of a ship relative to a boundary (or to a boundary of a specific type) is not what you want it to be.
For instance when you are about to sail into a so-called “restricted area”.

The manual for Boundary Alarm is a bit more complex than the other sections. That is because:

- there can be **different types of boundaries** (made with the plugin **O-DRAW**) and
- there can be **different types of boundary-alarms** (made with **WATCHDOG**).

With Watchdog you can make these 4 different types of boundary-alarms:

1. **GPS course**-alarm warns you when your **course and speed** will make you cross the perimeter (border) of a boundary in less than the specified **time**.
   In this manual this type of alarm is also referred to as “Boundary-time”.
2. **GPS fix**-alarm warns you when your **position** from the perimeter (border) of a boundary is less than the given **distance**.
   In this manual this type of alarm is also referred to as “Boundary-distance”.
3. **Inclusion**-alarm warns you when **you** are **outside** a given boundary.
4. AIS **Guard Zone**-alarm warns you when **other ships** are **inside** a given boundary.

Boundary-alarms of the type **GPS course**, **GPS fix** and **Inclusion** are related to the position (and speed and course) of your own ship and are fed by the data from your **GPS** receiver.

Note: The name “**Inclusion Alarm**” might be a bit confusing because “inclusion” means “beïng inside”. And in this case “inside a boundary”. But the “Inclusion Alarm” is not meant to alarm you when you get *inside* a boundary, on the contrary. It is meant to alarm you when you get *outside* the boundary.
In earlier versions of Watchdog this alarm was called “Anchor Watch Boundary GUID”. But as Watchdog also has a dedicated “Anchor Watch” alarm, the name was changed into “Inclusion” Alarm.
To avoid “inclusion-confusion” , just keep in mind that the “Inclusion Alarm” is keeping

an eye on you to make sure you stay “included” in the boundary.“

A Boundary alarm of the type AIS **Guard Zone** is triggered by the data from other ships, as received by your **AIS** receiver.

The difference with the “normal” AIS alarm (warn me when a ship comes within a given distance from “own ship”) is that the Watchdog Boundary Guard Zone alarm gets triggered when a ship enters a specific area (like for instance the entrance to that secluded spot you thought to have for just you and your spouse/friend/secretary/…).

The more extensive description of the alarm is here: BOUNDARY ALARM.

Note: in Watchdog you can set a “Guard Zone” alarm but in O-Draw you can also create a “Guard Zone”.
A Guard Zone in O-Draw is a special kind of area that is not static, but moves with your own ship.
The more extensive description is here: DYNAMIC GUARD ZONES.

Anchor Alarm -in short

Anchor Alarm is meant to alert you when your position changes more than a specific distance from a certain position (in short: when your anchor is dragging).

The more extensive description of the alarm is here: ANCHOR ALARM.

Course Alarm -in short

Course Alarm is (of course) meant to alert you when you get off course. The problem with getting off course is that you might end up somewhere where you do not want to be (see “Boundary Alarm”).

The more extensive description of the alarm is here: COURSE ALARM.

Speed Alarm -in short

Speed Alarm is meant to alert you when you are going slower than a certain set speed (**Underspeed**) or when you are going faster than a certain set speed (**Overspeed**).

If you go too slow, you might run out of beer before you reach your destination. If you go too fast, your lovely sailing trip might end too soon in some lousy marina.

The more extensive description of the alarm is here: SPEED ALARM.

Deadman Alarm -in short

Deadman Alarm is meant to alert you (or your crew) when the program suspects you to have fallen asleep, jumped overboard or simply passed away. In other words: when after a given amount of time the program still has not experienced any input whatsoever from anyone. The object is of course to be sure there is still someone on board keeping watch and able to take

all the necessary actions. The Deadman alarm stops as soon as any user action is taken, for instance a movement of the cursor (mouse).

The more extensive description of the alarm is here: DEADMAN ALARM.

NMEA Data Alarm -in short

NMEA Data Alarm is meant to alert you when OpenCPN loses NMEA-input. NMEA-data is information the program receives from various instruments. Most well-known NMEA-data is from GPS receivers and AIS receivers. NMEA Data Alarm is crucial if you want to rely on anything that has something to do with either your position, course and speed or the position, course and speed of other ships! In short: if you lose your NMEA input, you lose a very important part of the CPN-bit of OpenCPN!

The more extensive description of the alarm is here: NMEA DATA ALARM.

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LANDFALL ALARM

Landfall-alarm is meant to alert you when you get within a set distance from land.

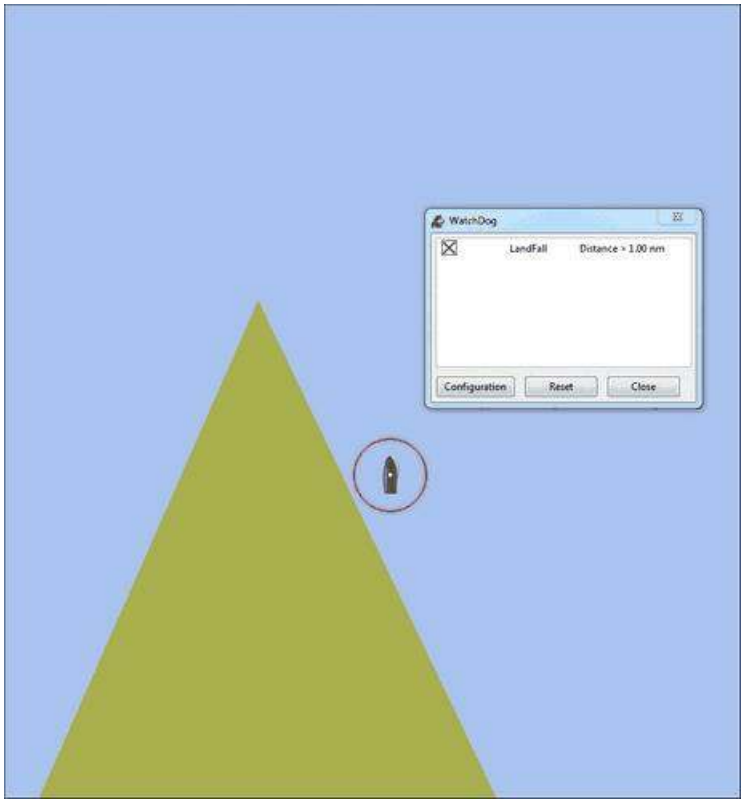
For most sailors the usefulness of such an alert is obvious.

“**Hoorah and up she rises!**” More info: go to ”MAIB[531]“ and search for “Lysblink Seaways”.

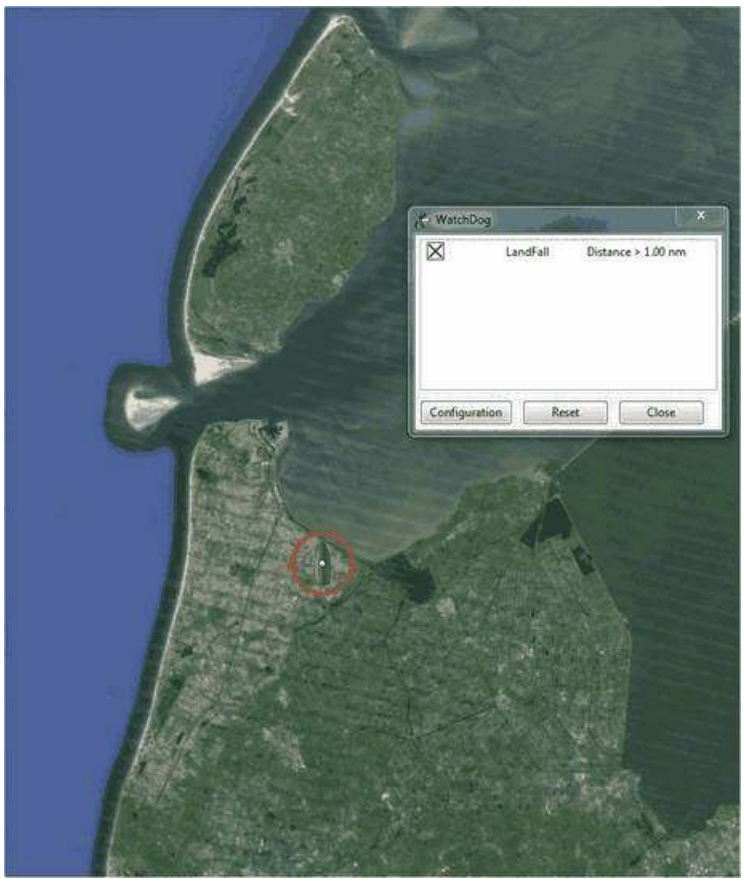
Important: the alarm operates in relation to the coastline as it is programmed into your vector charts! OpenCPN comes with a worldwide background map, displayed if no charts are available for an area.

Note: these two screenshots illustrate that the coastline in that basic background map can be quite different from the real thing!

Looking at this basic coastline chart WD will assume we are not close enough to the coastline to trigger the Landfall alarm. So, WD stays quiet.

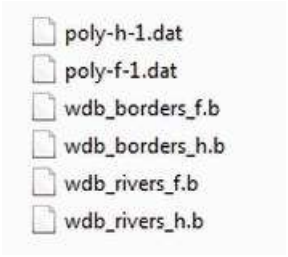


When he really should have barked!



Therefore it would be advisable to use **the most detailed GSHHS High Resolution Background Map** which is 224 mb when unzipped and can be downloaded via the chapter Charts-Chart Sources of the OpenCPN User Manual.

Unzip the file and make sure these 6 files

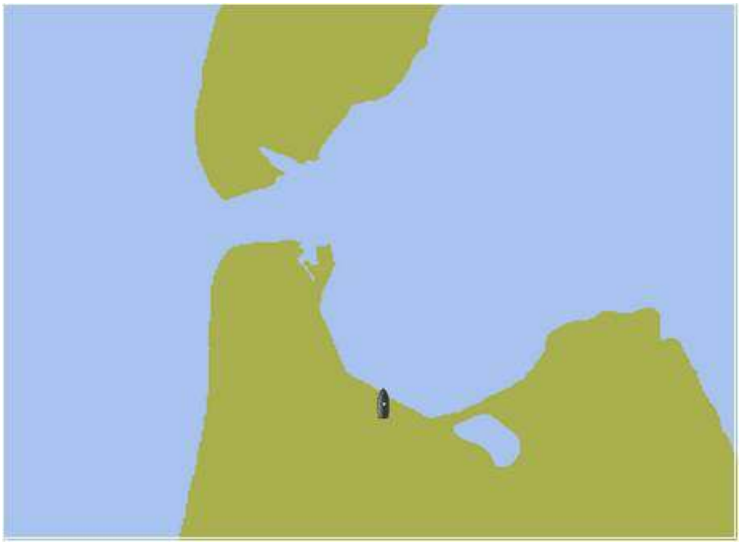


are placed in a folder called **gshhs**.

Put that folder gshhs in the directory where OpenCPN is installed (in Windows probably “C:>Program Files (x86)>OpenCPN”).

Restart OpenCPN.

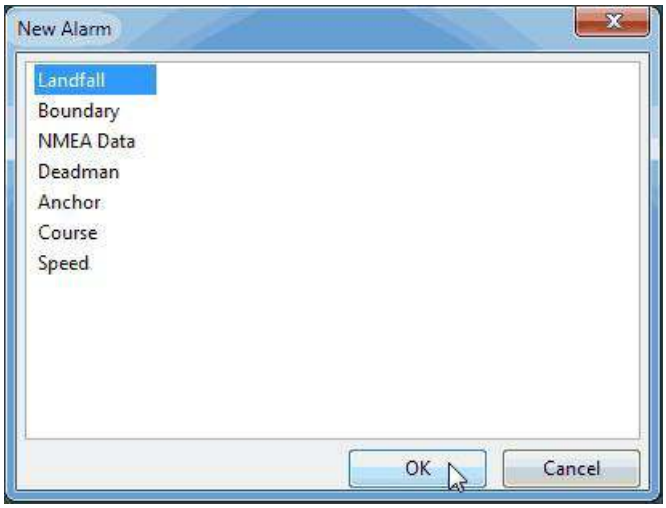
Now that's more like it!



Stay on the safe side and set landfall-alarm for a distance well offshore. Landfall-alarm is not meant for close-quarters navigation.

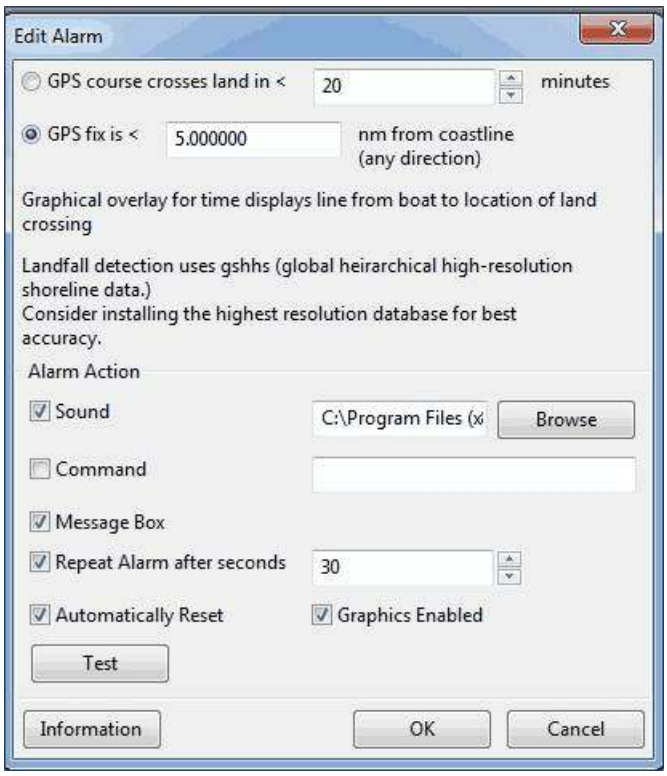
Setting the Landfall-alarm is explained step-by-step by these screenshots.

Set up a new Watchdog-alarm and pick “Landfall”.

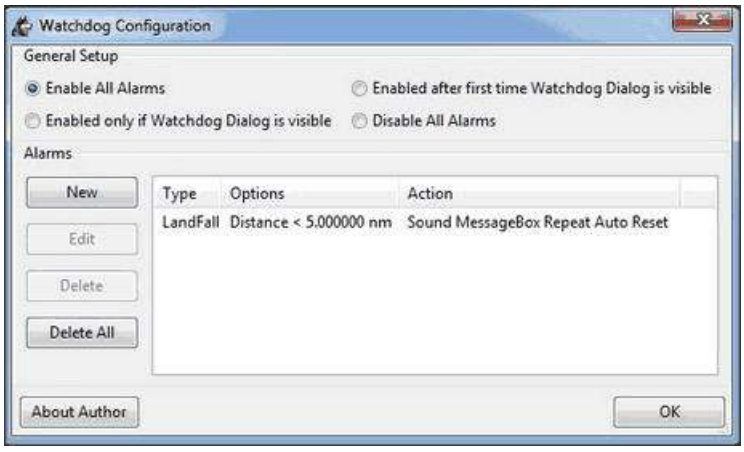


Click “OK”. The “Edit Alarm” window pops up. In the Edit Alarm window you can choose between “GPS course crosses land in less than … minutes” or “GPS fix is less than …. nm from coastline”.

Here we've chosen “GPS fix is less than 5 nm from coastline”. Tick the rest of the boxes and click “OK”.

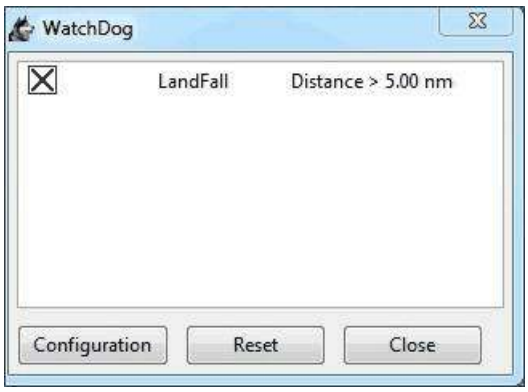


The Watchdog Configuration window shows the alarm.



Now your Landfall alarm is ready to be used.

Just make sure the “Alarm On/Alarm Off” box is ticked (set).



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BOUNDARY ALARM

Watchdog communicates with another very useful plug-in, called **"OpenCPN ODraw Plugin"**. That plugin is a tool to draw geo-referenced points, lines and shapes within OpenCPN. These points, lines and shapes can be used in navigation, for instance to show specific points or areas (Boundaries), electronic bearing lines (EBL) and variable range markers (VRM). **Watchdog** will be referred to as "WD-pi" or "WD". **OpenCPN Draw Plugin** will be referred to as "O-Draw", "Draw-pi" or "OD".

This section of the Watchdog-manual is a bit more complex than the other sections. That is because of the fact that:

With **O-DRAW** you can make 4 different **types** of **boundary**.

1. Boundary-type "**inclusion**"
2. Boundary-type "**exclusion**"
3. Boundary-type "**neither**"
   and also a special kind of boundary:
4. **Guard Zone**

and

With **WATCHDOG** you can make 4 different **types** of Boundary-**alarms**.

1. **GPS course** crosses boundary in less than … minutes
2. **GPS fix** is less than … nautical miles from boundary
3. **Inclusion Alarm**, Boundary GUID …..
4. **AIS Guard Zone**, Boundary GUID …..

As a result, there can be several combinations of boundary type and boundary alarm. Before we continue, an explanation of these 4 different types of alarms is necessary.

1. **GPS course**-alarm warns you when your **course and speed** will make you cross the perimeter (border) of a boundary in less than the specified **time**.
   In this manual this type of alarm is also referred to as "Boundary-time".

2. **GPS fix**-alarm warns you when your **position** from the perimeter (border) of a boundary is less than the given **distance**.
   In this manual this type of alarm is also referred to as “Boundary-distance”.
3. **Inclusion**-alarm warns you when **you** are **outside** a given boundary (a bit like “Anchor Alarm”).
4. AIS **Guard Zone**-alarm warns you when **other ships** are **inside** a given boundary.

WD and OD are independent plugins but the two can work together by passing and receiving messages.

For the alarms, when WD needs boundary information, WD asks OD, via a message, whether a Lat/Lon is inside a boundary. WD can add further requirements asking for boundaries in a particular state and a particular type. Both the state and type are the same as what OD uses, i.e. Active/Inactive and Exclusion/Inclusion/Neither, or the inclusive “Any” (meaning any type and/or any state, not being as selective).

In this section we'll give examples of all four of these alarms. But first something about..

Boundaries and Guard Zones

To fully benefit from the capabilities of the WD Boundary Alarms, you have to understand the “Boundaries” made by OD. Therefore, prior to explaining the **Watchdog** Boundary Alarms, we first have to side-step a little bit to **Draw-pi** and give an explanation of these Boundaries (for a full explanation, see the chapter OCPN Draw in the manual).

You can create Boundaries in **Draw-pi** (not Watchdog) by clicking “**Create Boundary**” and Guard-Zones by clicking “**Create Guard Zone**”. It's all explained in the Draw-pi section of this manual.

Boundary Types
In the “Boundary Properties” tab (this is still in **Draw-pi**) you can assign a “Boundary Type” to each Boundary or Boundary Point (BP). You can choose “**Exclusion**”, “**Inclusion**” or “**Neither**”

Note: **In WD you can set the alarm for every kind of boundary**. So, you can set alarms that get triggered when you get in (or too close to) a boundary of the type “Exclusion” but

you can also set alarms that get triggered when you get in (or too close to) a boundary of the type “Inclusion” or a boundary that is of the type “Neither”.

The most logical thing to do though, is to use as a rule that each Boundary Type is meant to give you a specific type of message. We advise you to use “Inclusion” boundaries as “OK to get in”, “Exclusion” boundaries as “not OK to get in” and “Neither” boundaries as boundaries that are just good to be aware of. The type of message each boundary type would send to you, would then be something like this:

Boundary Type **Exclusion** says: *“Don’t you come near me (and “inside me” is an absolute NoNo!)”*. **KEEP BOAT OUT.**
Boundary Type **Inclusion** says: *“Stay with me, please”*. **KEEP BOAT INSIDE.**
Boundary Type **Neither** says: *“Hey, I don’t care where you are, but I think you should know I exist”*.

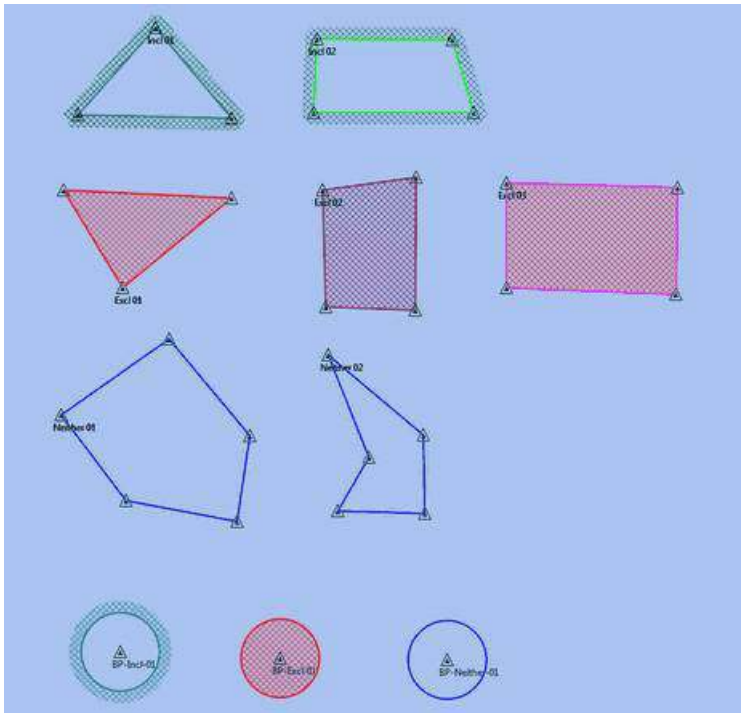
Each Boundary Type is graphically represented in a specific way.

- **Exclusion:** a hatched pattern **inside** the area.
- **Inclusion:** a hatched zone on the **outside** of the boundary.
- **Neither: no** hatch (just a line).

You can give boundaries any shape, size and color you like, but colorwise it might seem logical to use something reddish (“danger”) for boundaries of the type “exclusion” and something greenish (“safe”) for boundaries of the type “inclusion”.

In this screenshot we show you the different types of boundaries.

- Top row: two boundaries of the type “inclusion”
- Second row: three boundaries of the type “exclusion”
- Third row: two boundaries of the type “neither”
- Fourth row: three boundary points. From left to right, “inclusion”, “exclusion”and “neither”.



OK, now you know what types of boundaries there are.

Let's see how we can set up the different types of Watchdog-boundary-alarms.

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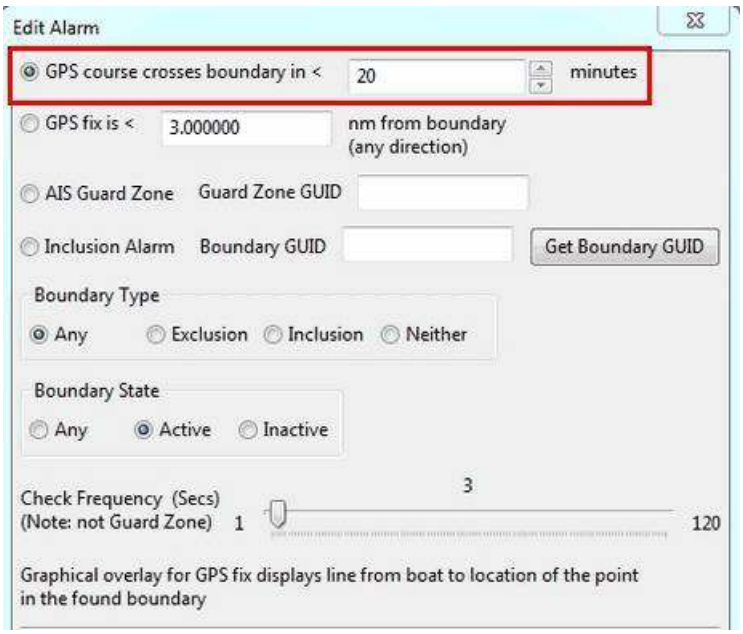
Setting up a "GPS COURSE CROSSES BOUNDARY IN < ....MINUTES" ALARM

Set up a new Watchdog-alarm and pick "**Boundary**".

Select **"GPS course crosses boundary in < …. minutes"**

Edit the alarm so that the alarm will be triggered when your course and speed wil bring you in less than (your choice) minutes to a boundary.
You can set the time between 0 and 1000 minutes. 0 minutes is quite useless and 1000 minutes (more than 16 hours) is maybe a bit much.

In this example we have used 20 minutes.



In the Watchdog "**Edit Alarm**" window, you can select "**Boundary Type**" and "**Boundary State**".

In this example "**Any**" and "**Active**" are ticked.
The result is that the alarm will look at **all active** boundaries, no matter what the type is.

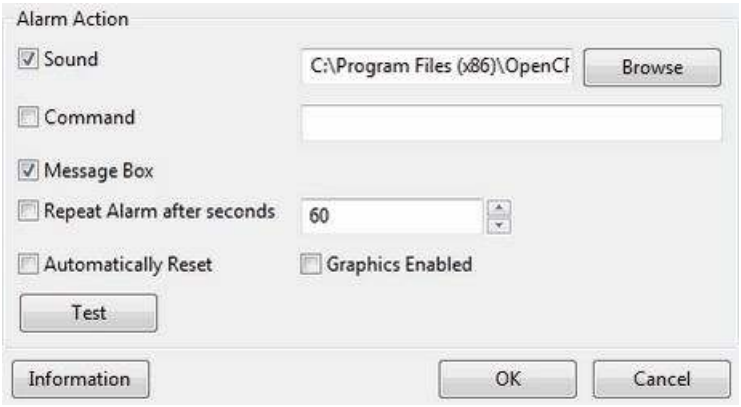
When it comes to the **type** of the boundary:
If you want the alarm to react to **any** boundary, no matter what the type is, select "**Any**".
If you want the alarm to react **only** to boundaries of the type "**Exclusion**", select "**Exclusion**".
If you want the alarm to react **only** to boundaries of the type "**Inclusion**", select "**Inclusion**".
If you want the alarm to react **only** to boundaries of the type "**Neither**", select "**Neither**".

When it comes to the **state** of the boundary:
If you want the alarm to react to **any** boundary, no matter what the state is, select "**Any**".
If you want the alarm to react **only** to **active** boundaries, select "**Active**".
If you want the alarm to react **only** to **inactive** boundaries, select "**Inactive**".

Note: as from WD version 1.9025 the "Edit Alarm" window for Boundary alarm also shows a slider to allow the user to select the frequency of checking.

It defaults to 3 seconds (the current Watchdog default), but can be set from 1 to 120 seconds. The longer the check the better for low powered machines.

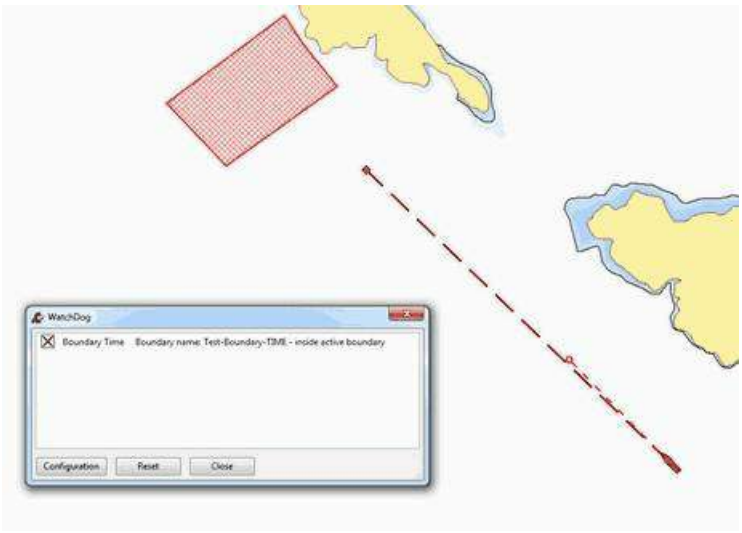
Don't forget to set the **Alarm Actions** ("Sound", "Message Box" etc. as described in "Standard actions: Setting up the Alarm Actions").



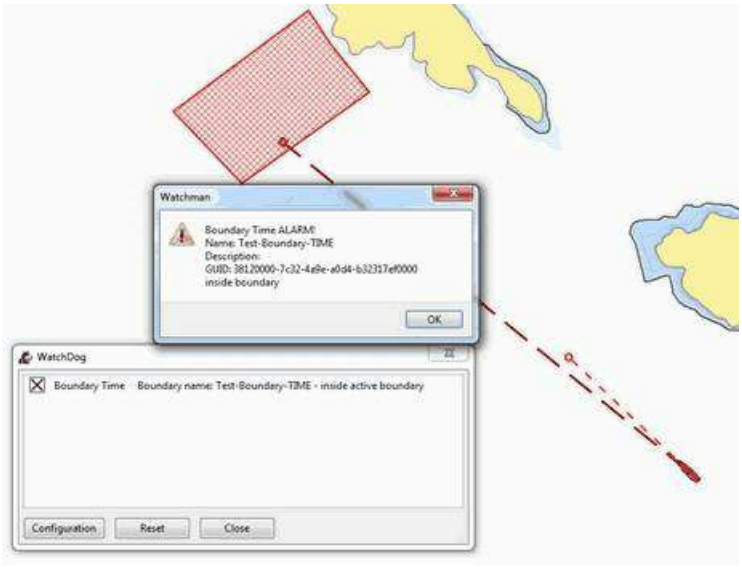
Click "**OK**".

To illustrate the working of the alarm, in this example we have set the COG Predictor Length to 20 minutes (via Options-Ships-Own Ship-Display Options).

As long as we are more than 20 minutes away from a boundary, Watchdog will remain silent.



But as soon as we are less than 20 minutes away from a boundary, the alarm will be triggered.



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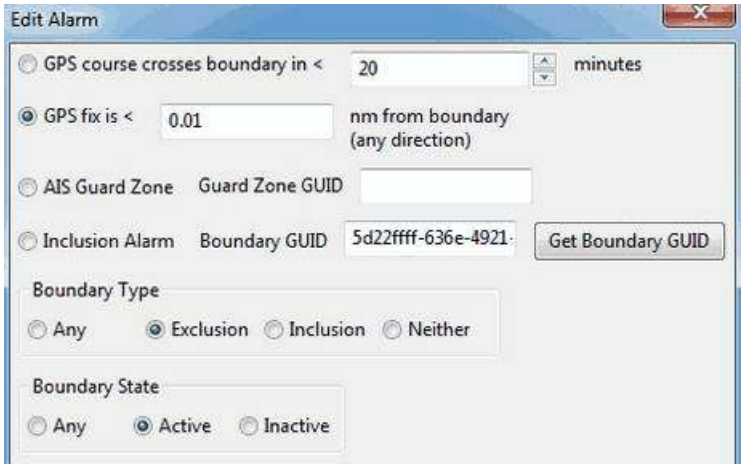
Setting up a "GPS FIX IS < …… NM FROM BOUNDARY" ALARM

Set up a new Watchdog-alarm and pick "**Boundary**".

Select **"GPS fix is < …..nm from boundary"**

Edit the alarm so that the alarm will be triggered when the GPS fix indicates that the boat is less than the minimum distance from a boundary.
Note: if you enter a distance of "**0**", the alarm will **not** work, because Watchdog cannot understand "**a distance of less than 0 nm**" (and to be honest, neither can we…).

In this example we have chosen 0.01 nm (18,5 meters) to a boundary ("GPS fix is < 0.01 nm from boundary).



Note: In this example we have a **boundary of the type "exclusion"** (a hatch-pattern on the

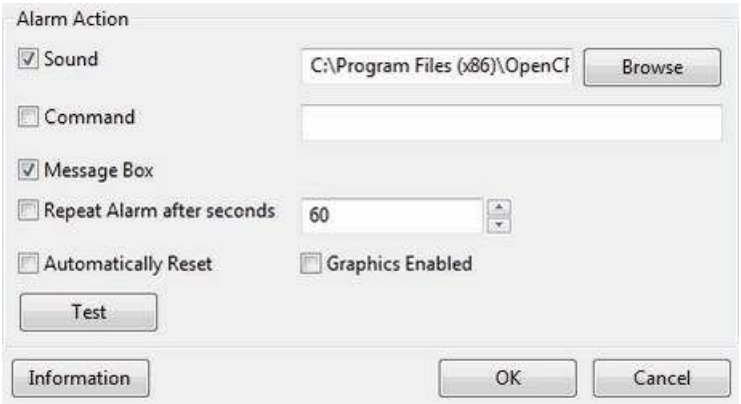
inside).

In the Watchdog "**Edit Alarm**" window, you can select "**Boundary Type**" and "**Boundary State**".

In this example "**Exclusion**" and "**Active**" are ticked.
The result is that the alarm will **only** look at boundaries of the type "Exclusion" and of the state "Active".

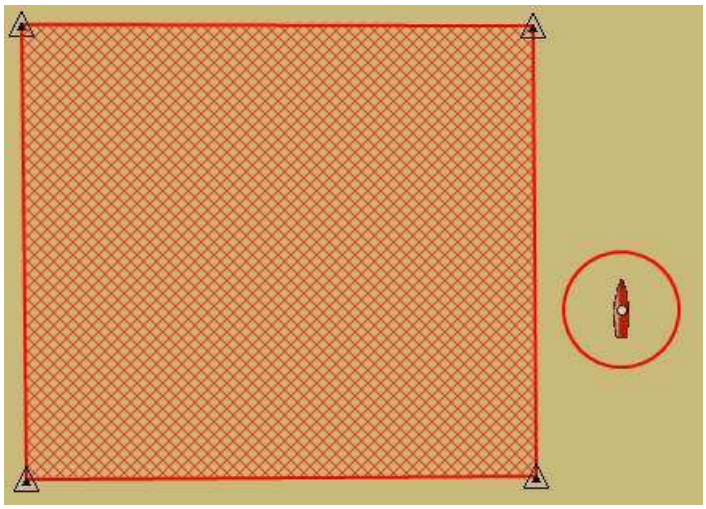
(See also the previous section ("Setting up a GPS course crosses boundary in < …. minutes") for the effects of ticking the different "Boundary Type" and "Boundary State"-buttons).

Don't forget to set the **Alarm Action** and click **OK**.

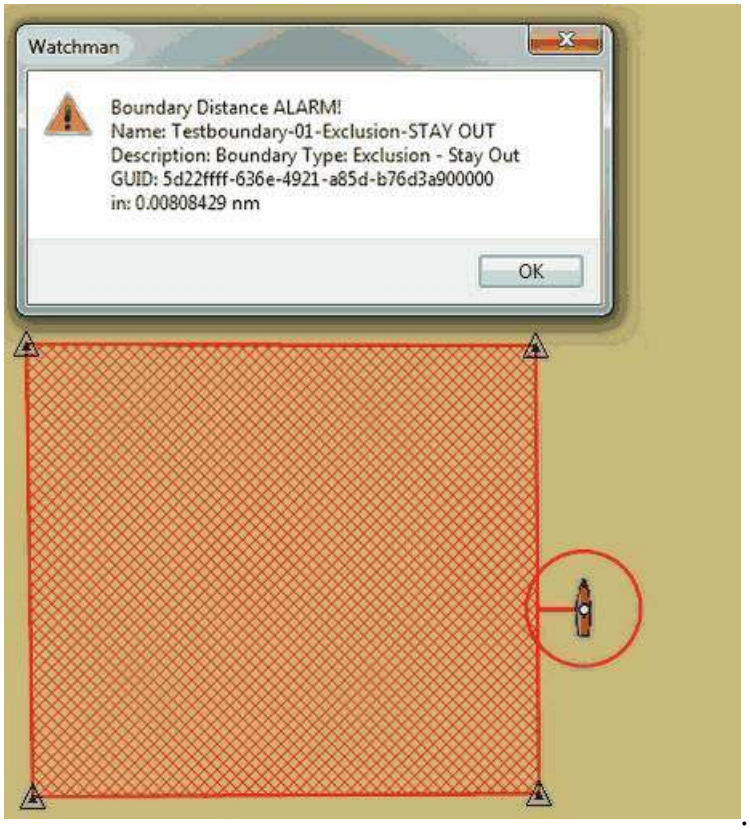


Now lets see if it works….

As long as the distance to a boundary is more than 0.01 nm, the alarm remains silent.



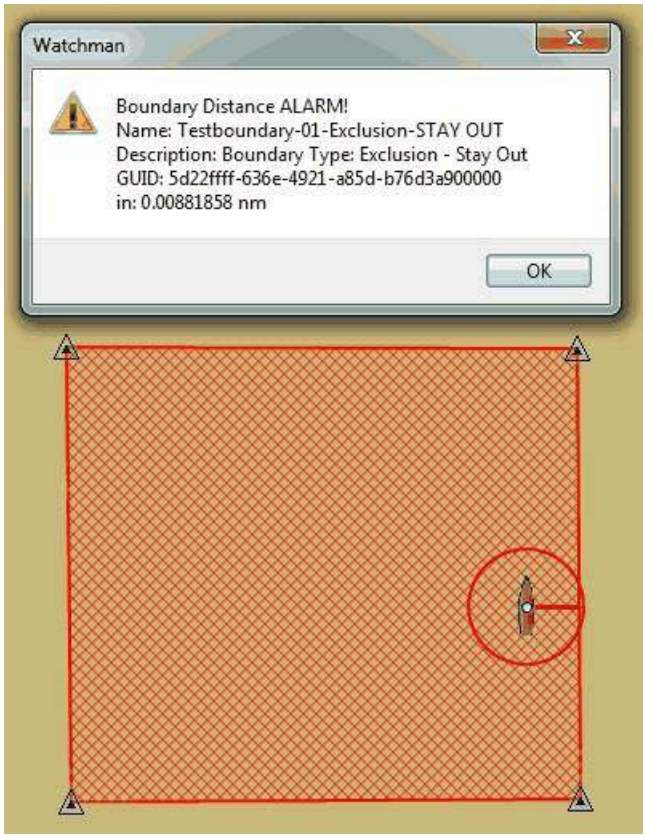
But as soon as we get within a distance of 0.01 nm of a boundary, the alarm is triggered
The alarm will also show the name and description of the boundary you are getting too close to.
For this example that name is "Testboundary-01-Exclusion-STAY OUT".



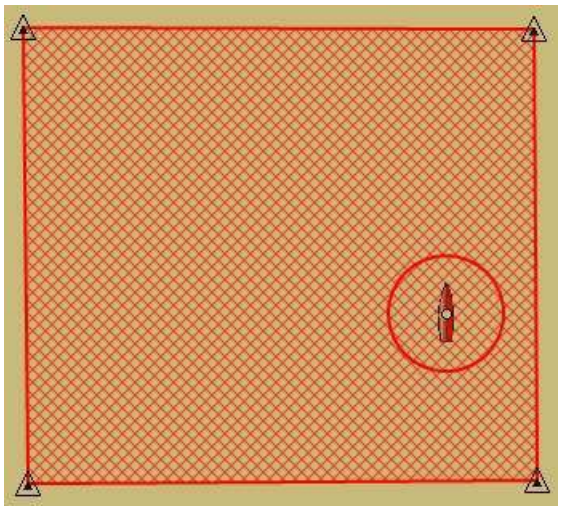
.

This goes also for the inner side of the boundary.

Closer than 0.01 nm from the boundary perimeter? Alarm.



More than 0.01 nm from the perimeter?
The alarm stops.



Watchdog did warn you, but if you still decide to go on, she (yes, Watchdog is a bitch….) will assume that you know what you are doing.

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"AIS GUARD ZONE" ALARM & "INCLUSION" ALARM

A Boundary alarm of the type "**Inclusion Alarm**" is meant to alert you when your own ship gets outside a specific boundary.
The alarm is related to the position of **your own ship** and is fed by the NMEA-data from your **GPS** receiver.

A Boundary alarm of the type "**Guard Zone**" is meant to alert you when one or more other ships are inside a specific boundary.
"Guard Zone" is related to the position of **other ships** and is fed by the NMEA-data from your **AIS** receiver.
"Guard Zone" will also be shortened to "**GZ**".

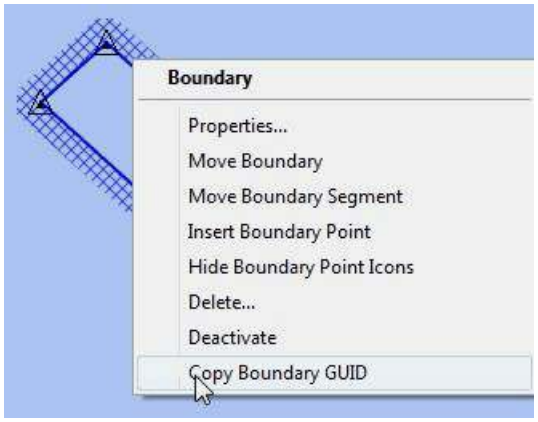
NOTE: "other ships" are only ships that actually transmit AIS data and whose AIS-data are actually received by your AIS receiver!
Ships that do not transmit AIS-data (or AIS-data your AIS receiver does not receive) are not "seen" by WD!

Keep this in mind, especially as you might encounter ships that **should** send out AIS-signals, **but don't do so** because their transmitter is switched off on purpose (like fishing vessels that want to keep their favourite fishing tracks hidden from others!)

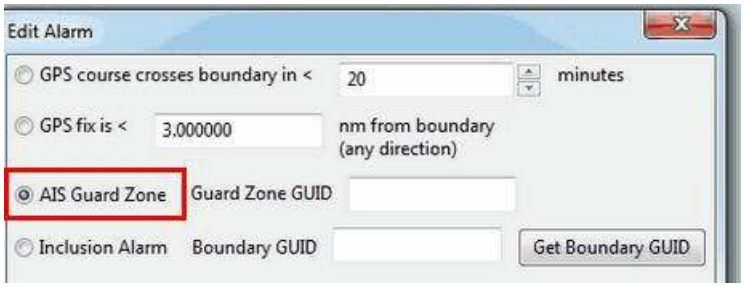
GUID's

To let Watchdog know what specific boundary it has to guard, you have to specify the "**GUID**" of that boundary.

GUID stands for “globally unique identifier” and is a unique reference number used as an identifier in computer software.
GUIDs are displayed as 32 hexadecimal digits with groups separated by hyphens.
Example: 2a980000-5098-4787-ac4f-e05b47e7ffff
To enter the GUID of a Boundary or BP in WD, you place your mouse-cursor on a boundary, do a right-mouseclick and copy the GUID. Then, in the Watchdog Edit Alarm-window, you can paste the GUID in the field Boundary GUID or Guard Zone GUID.



Make sure you do “Copy GUID” **before** editing the Watchdog Alarm.



Alternatively, when the “own ship” icon is within the boundary, you can click “**Get Boundary GUID**”.

Note: this method does not always work. In such cases: use the “copy-paste” method.

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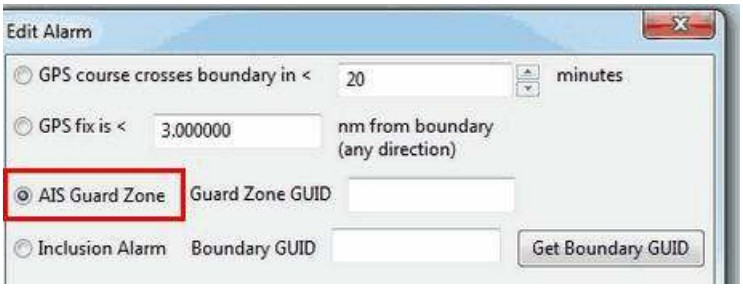
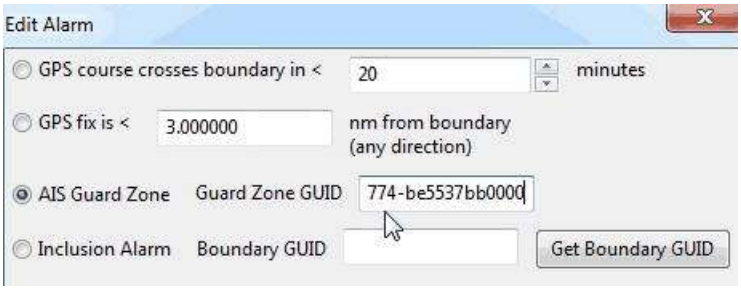
Setting up a Boundary AIS Guard Zone Alarm

Set up a new Watchdog-alarm and pick “**Boundary**”.

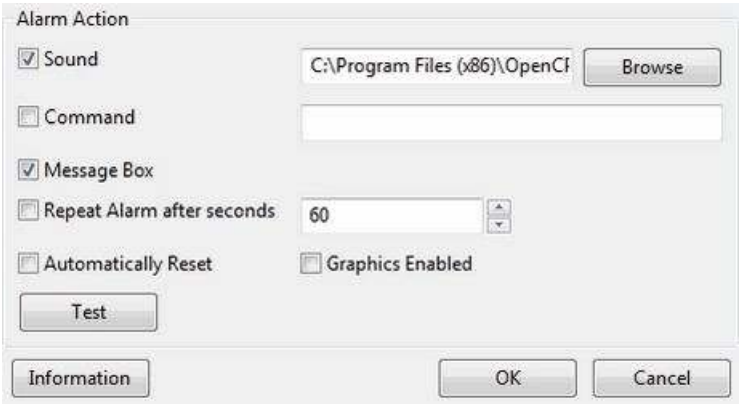
Select “**AIS Guard Zone**”



Edit the alarm so that the alarm will be coupled to the boundary you want to be guarded.



Don't forget to set the **Alarm Action** and click **OK**.

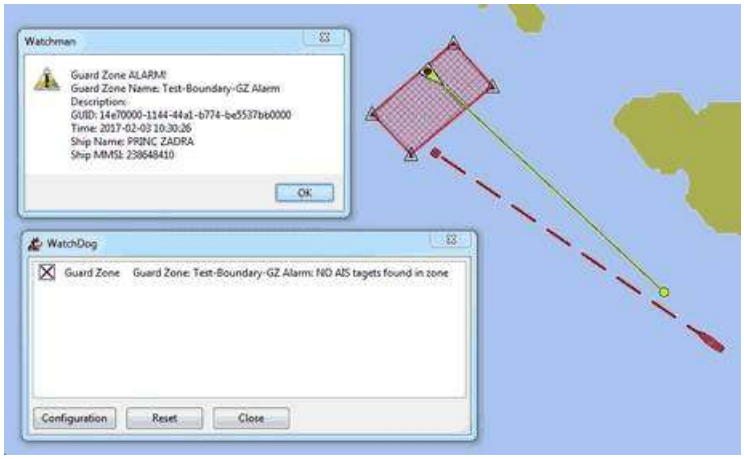


Now lets see if it works….

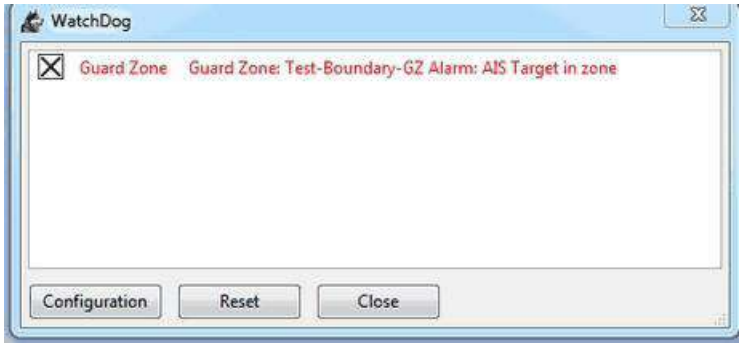
As soon as the feed from your AIS receiver shows that an AIS-target (= “another ship”) enters the specified Guard Zone Boundary, the alarm gets triggered.

The other ship (green icon) is not (yet) in the Guard Zone Boundary: alarm not triggered (yet).

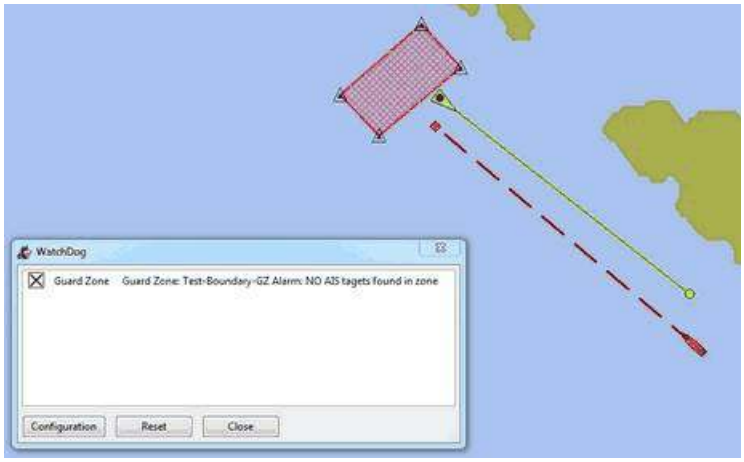
The ship enters the Guard Zone Boundary: Guard Zone Alarm is triggered (and shows ships name and MMSI-number).



And the text in the Watchdog window turns **red** and says "**AIS Target in zone**"



As soon as the ship leaves the Guard Zone Boundary: Alarm is not triggered anymore.
The text in the Watchdog Window turns back to black and says "**No AIS targets found in zone**".



The Boundary AIS Guard Zone Alarm works!

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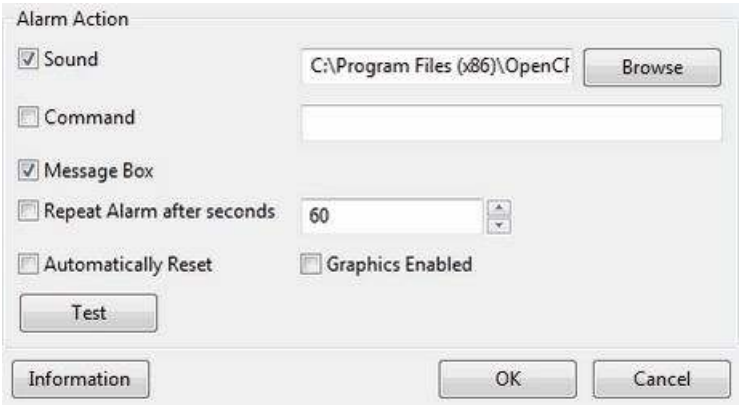
Setting up an Inclusion Alarm

Setting up a Boundary Inclusion Alarm is similar to setting up a Boundary Guard Zone alarm. But instead of “Guard Zone” you click “Inclusion Alarm” and you put the GUID of the “Inclusion Alarm” Boundary in the field next to “Boundary GUID”.

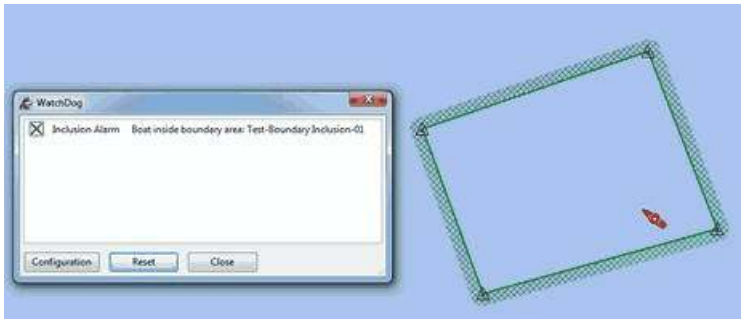
Set up a new Watchdog-alarm and pick “**Boundary**”.
Select “**Inclusion Alarm**”
Edit the alarm so that the alarm will be coupled to the boundary you want to “stay inside” of.
In this example it is a boundary with GUID 6372ffff-7f0e-4a64-9e6c-dfd303620000

Don't forget to set the **Alarm Action** and click **OK**.

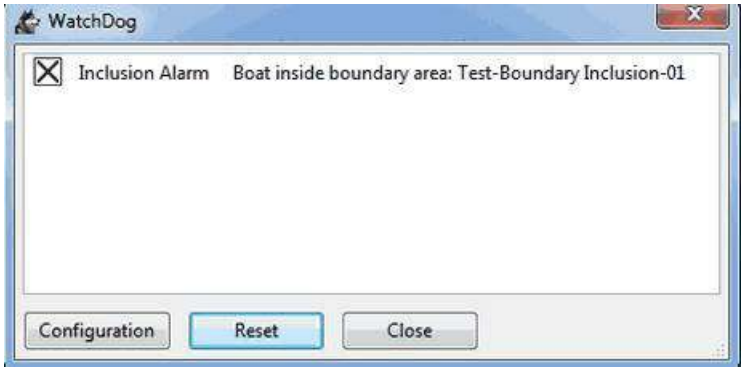


Now lets see if it works….

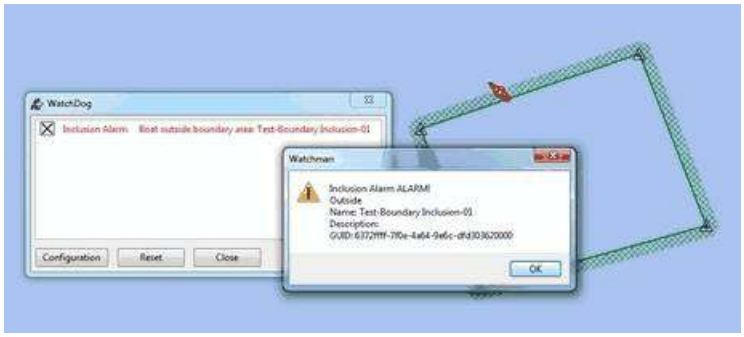
The own ship is inside the boundary. Watchdog watches over you and wants you to stay "included".
Well, in this case everything is just fine. Watchdog stays silent.



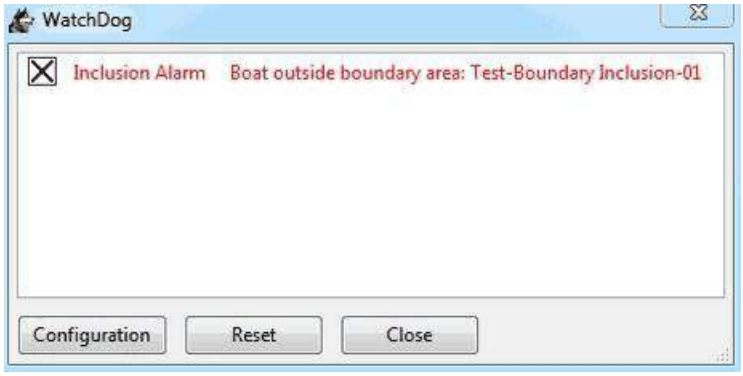
The text in the Watchdog window stays black.



But as soon as our ship leaves the boundary, Watchdog alerts us!



And the text in the Watchdog window turns red.



The “Boundary Inclusion” alarm works!

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Combination of Boundary Guard Zone Alarm and Boundary Inclusion Alarm.

It is possible to assign a Boundary Guard Zone Alarm and a Boundary Inclusion Alarm to one and the same boundary.
That means that you can let Watchdog alert you:

- when another ship enters your “safe” anchoring area

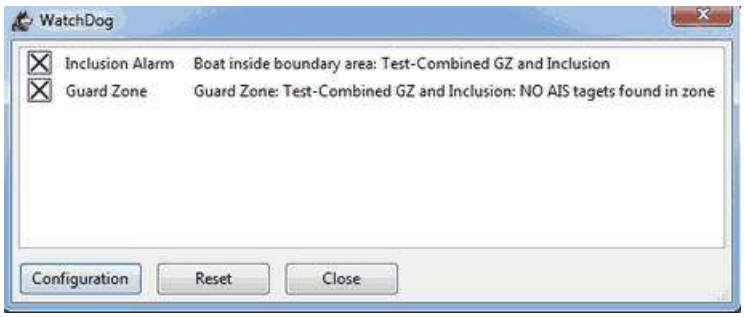
and

- when you are drifting out of that area.

To achieve this, you use in the Boundary Guard Zone Alarm the same GUID as in the Boundary Inclusion Alarm.

You can activate one of the two alarms, both of them or none of them.

In this screenshot both alarms are activated.



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DYNAMIC GUARD ZONES

The plugin "**Draw**" was invaluable to begin with, but got even better when it was updated with the possibility to draw a Guard Zone **that moves with our own ship!** These Guard Zones differ from normal Boundaries. Not only do they move with your own ship, but they can also be set up to rotate with the ships heading or with the ship's course over the ground. Let's call them "**Dynamic Guard Zones**".

As oDraw works hand in glove with WATCHDOG, these new features in oDraw also affect the way WATCHDOG can be used.

Here are some examples. In these examples "Guard Zone" is shortened to "GZ".

Let's assume that our ship has a blind spot. A blind spot is an area around the ship that cannot be directly observed by the helms(wo)man. In this example the blind spot is on the port side and extends from 70 to 90 degrees. But we want to be alerted if any ship (AIS-target that is) enters that blind spot. We can set up Watchdog to do that for us.

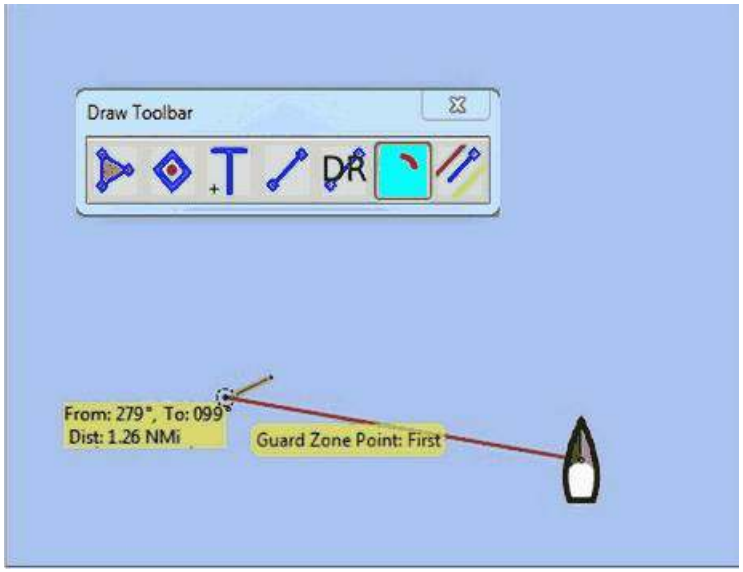
This is how we do that.

First we set up a GZ.

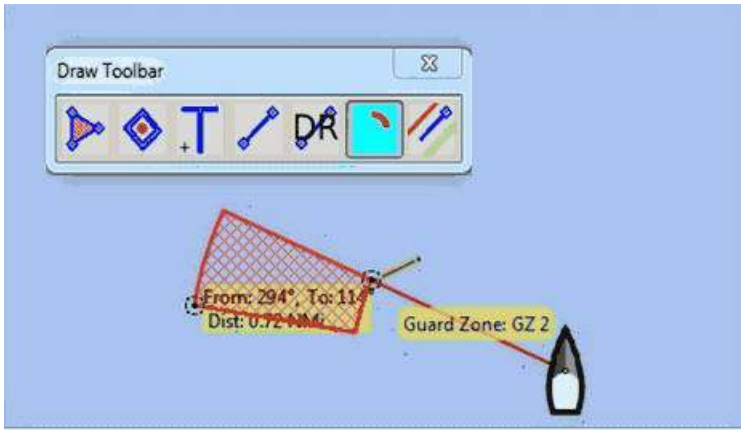
Open the Draw Toolbar

Click "Create GZ"

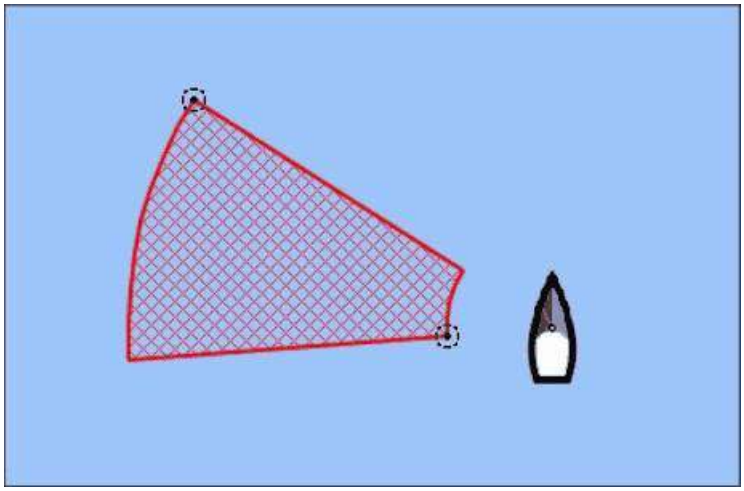
Set the first point of the GZ roughly abeam on the port side.



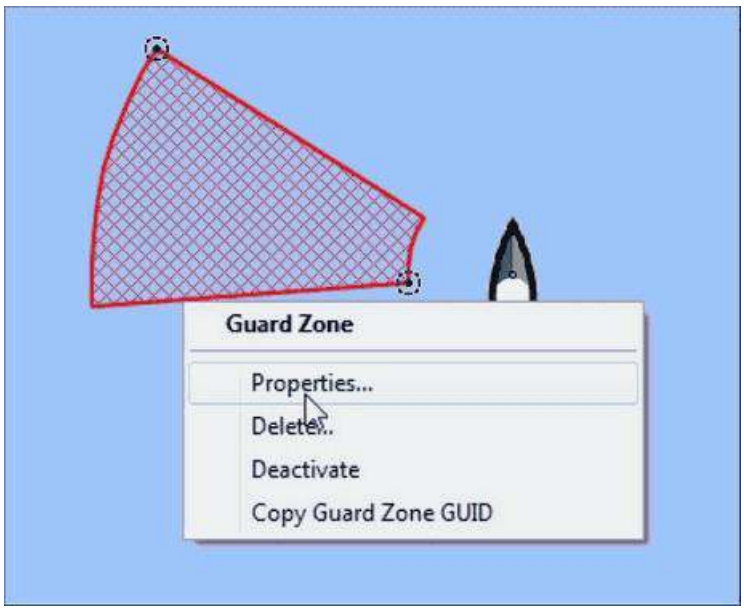
Set the second point a bit above and to the right of the first point (clockwise).



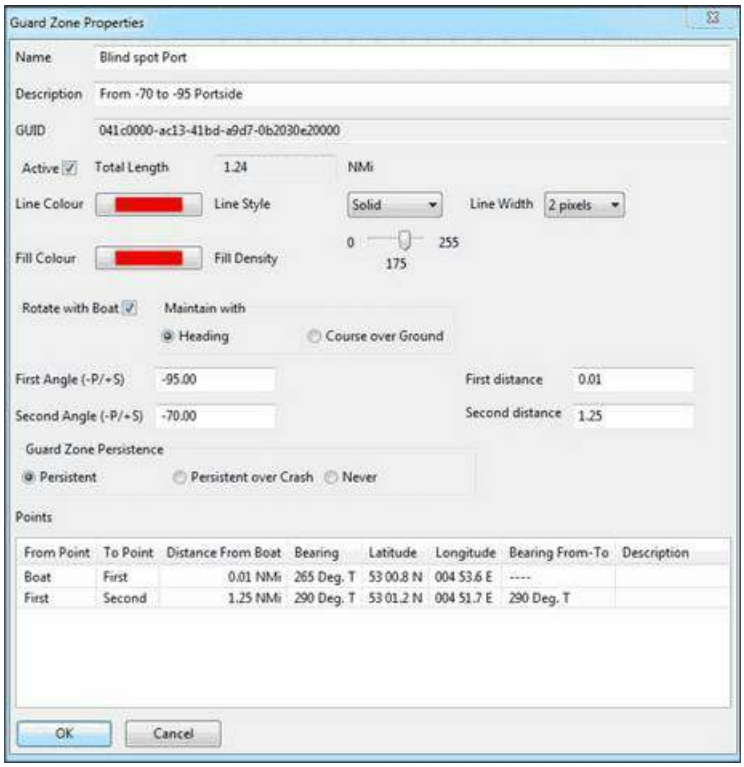
The result is some kind of wedge-shaped GZ.



Now you should fine-tune that GZ. Click on the GZ and open the “Properties” tab.



Give your GZ a recognizable name and description. Choose the Colours and Line Width you prefer and fill in the required angles and distances. See the example.



Note: the **first** distance is the distance **closest** to the boat. Make sure this distance is bigger than 0. In this example the first distance is set to 0.01 NMi or 18.52 meters. The **second** distance is the **greatest** distance from the boat. In this example that distance is set to 1.25 NMi.

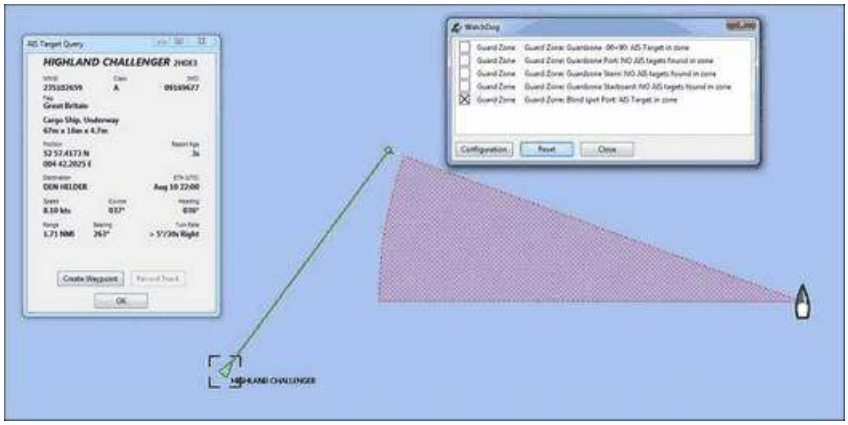
As the blind spot extends from 70 to 90 degrees portside, we set the first angle to -95 (- is port, + is starboard) and the second angle to -70. The result is a wedge-shaped GZ that starts at 0.01 NMi, extends to 1.25 NMi and covers 15 degrees.

Make sure you put a checkmark at “Rotate with Boat”!!

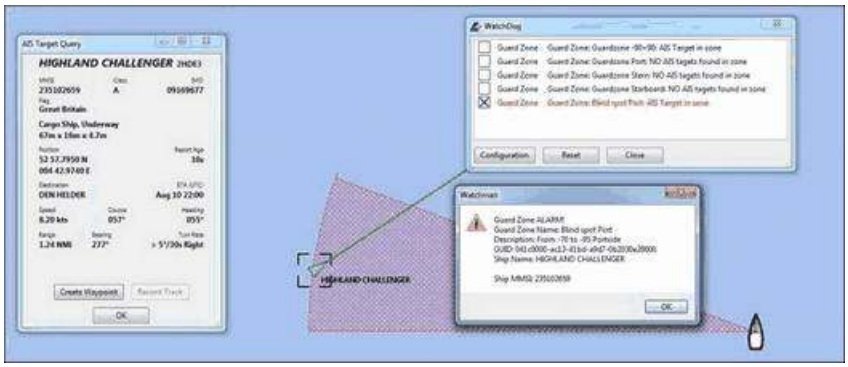
The next step is to set up a Watchdog Guard Zone Alarm for that GZ. **The steps to do that are described earlier in this manual.**

Now we'll put it to the test.

The *Highland Challenger* is closing in on our portside.

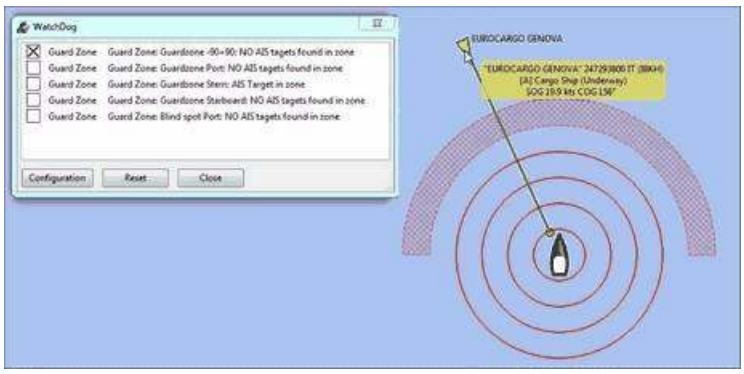


but as soon as she challenges our “slice of pie”, Watchdog starts to alert us!

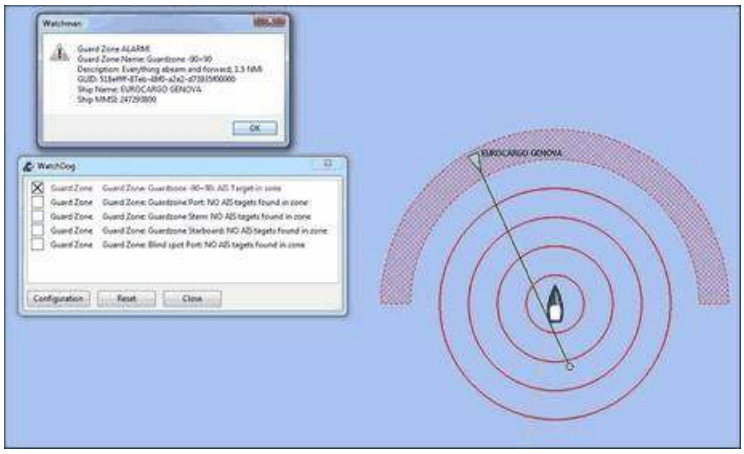


Some other examples:

A GZ that extends from 90 degrees Port to 90 degrees starboard.
The outer perimeter is 1.50 NMi, the inner perimeter is 1.25 NMi. The four range rings around our own ship are set 0.25 NMi apart. *Eurocargo Genova* is approaching on our port bow. Still more than 1.5 miles away, but she's a big one and doing almost 20 knots.

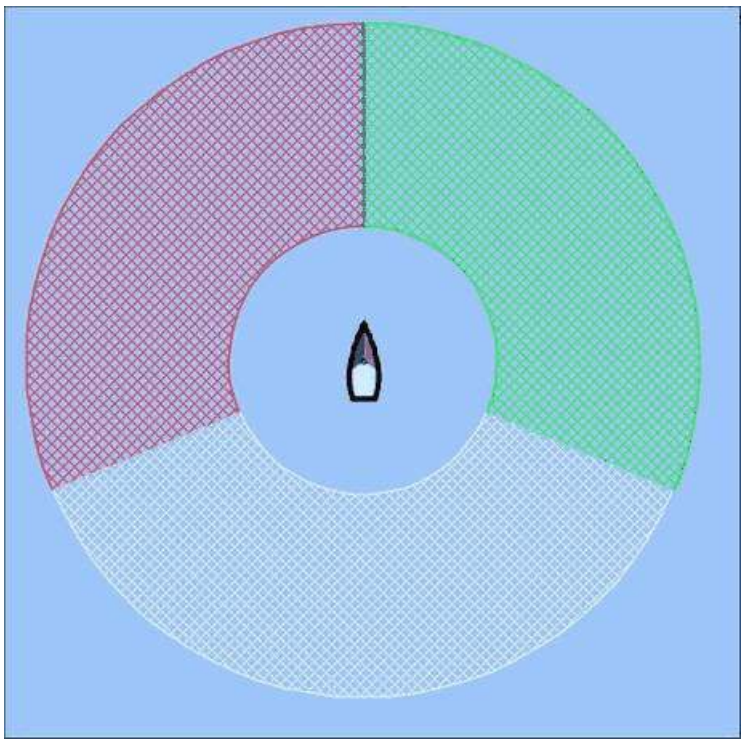


Luckily we've set up our GZ alarm.



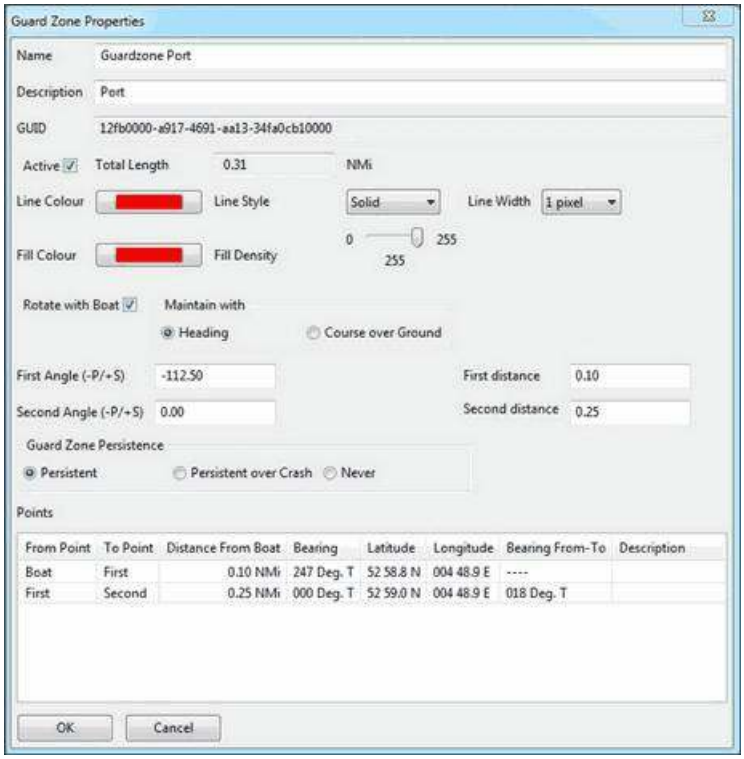
A “Tri-colour” GZ.

Here we have three GZ's around the ship. One (red) covering the 112.5 degree arc that coincides with the port navigation light, one (green) covering the 112.5 degree arc that coincides with the starboard navigation light and one (white) covering the 135 degree arc that coincides with the stern light. As all of these GZ's are set up to rotate with the ship's heading, they could be used to see at one glance whether another ship is in your red, green or white sector (also handy to remind some of us that “starboard is green and port is red”…..).

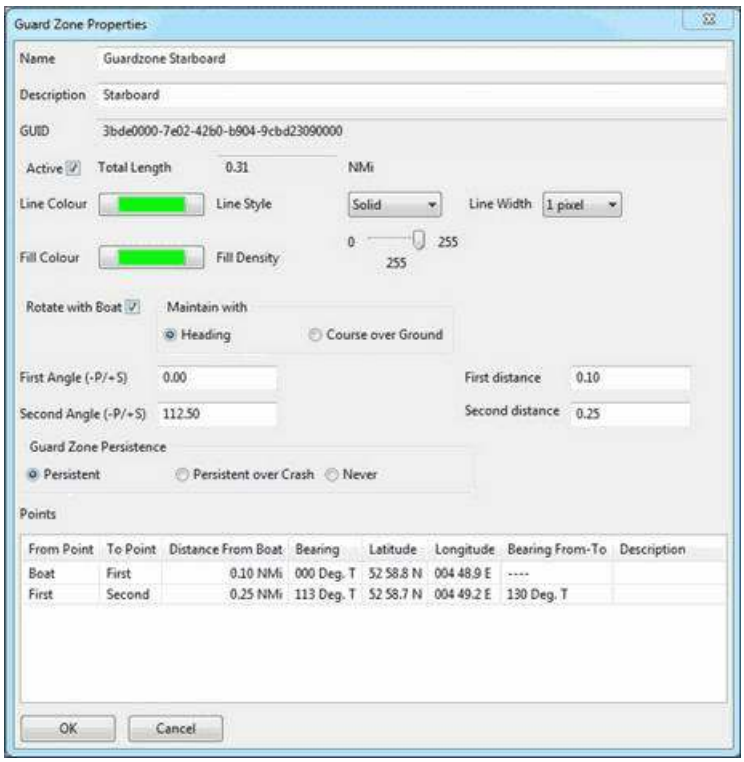


In this example the sectors range from 0.10 to 0.25 Nmi from our ship. This is how these three GZ's (Guardzone Port, Guardzone Starboard and Guardzone Stern) are set up:

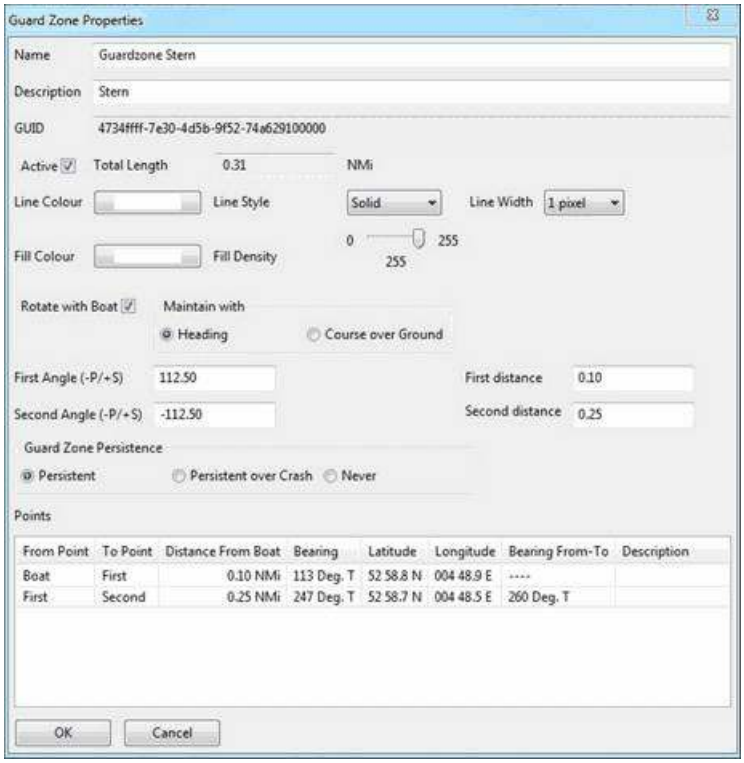
The red sector:



The green sector:

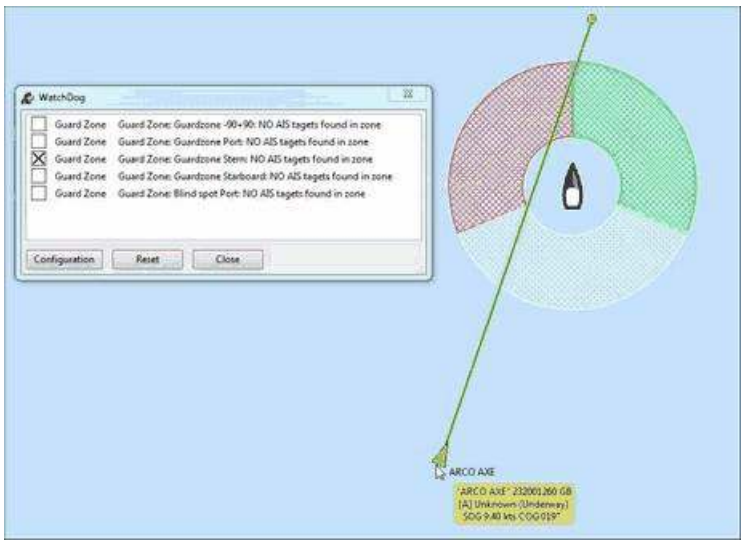


The white sector:

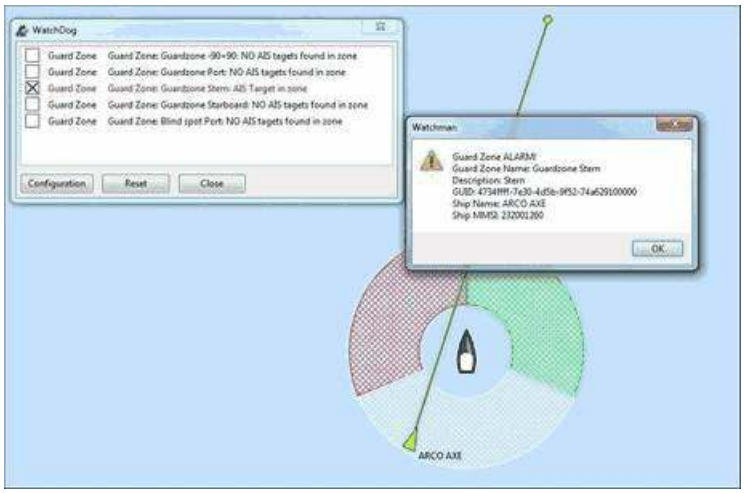


Note that the white sector is set by defining the first angle as 112.50 and the second angle as -112.50 this covers an arc of 135 degrees (360 - 225).

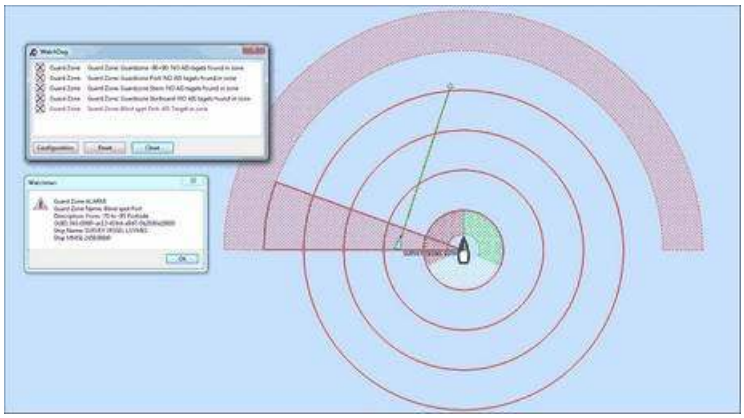
Arco Axe is sneaking up on us. GZ “Stern” is activated.



We really don't want *Arco Axe* (or any other axe for that matter….) to hit us in the behind but before she can become a pain in the ass, Watchdog spots her and alerts us.



You can set up multiple Dynamic Guard Zones and set the alarms for one, some or all of these zones.



(Dynamic) Guard Zone Alarms are in some ways similar to the “AIS Collision Alarm” you can set in OpenCPN (Options-Ships-AIS Targets-CPA Calculation). But they are more

versatile.

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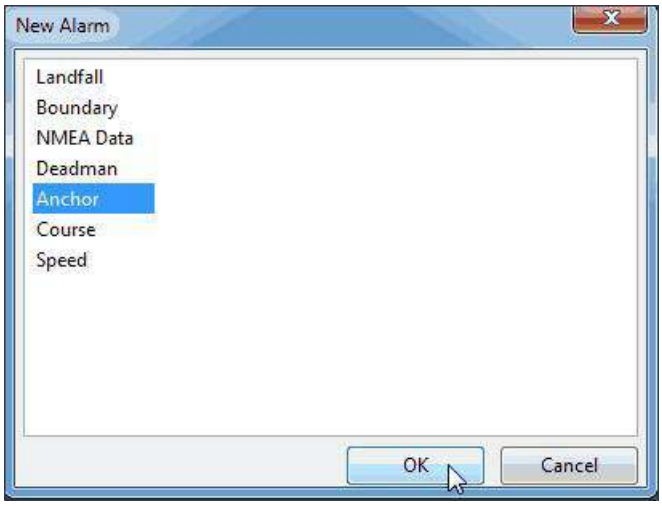
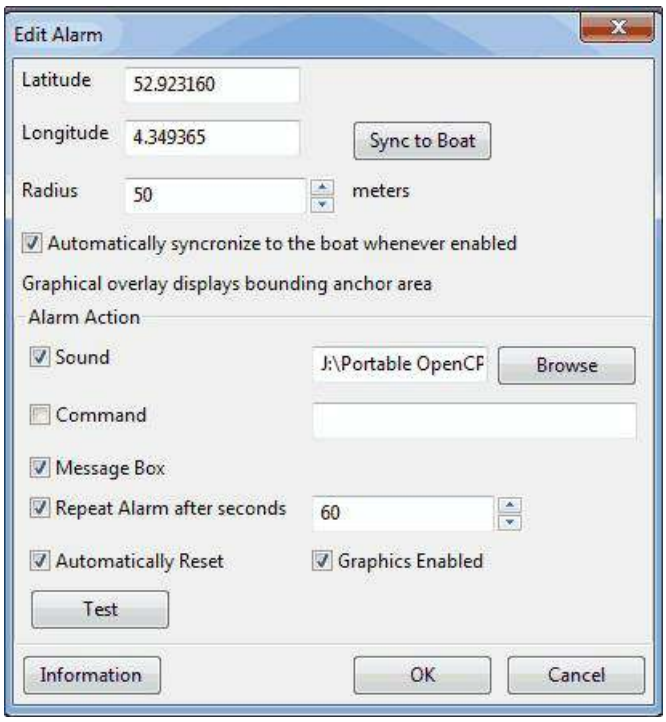
ANCHOR ALARM

The Anchor Alarm does not belong to the catgory “Boundary” as it is not related to a boundary. The Anchor Alarm is related to a specific position.

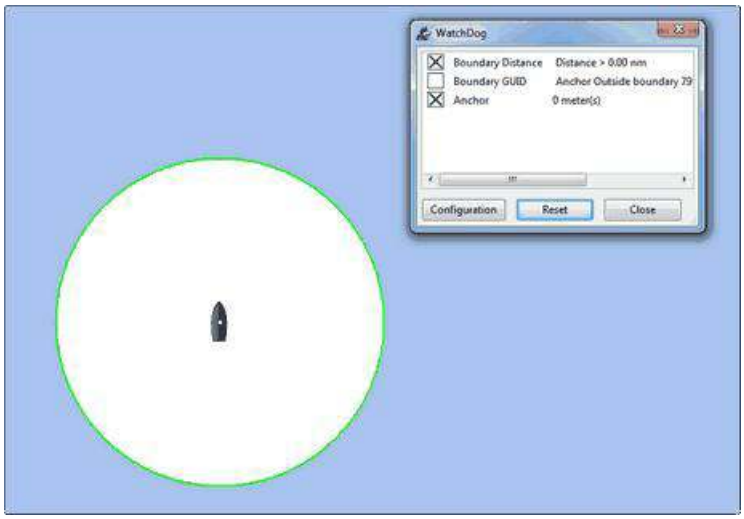
The pictures are self-explaining (or at least supposed to be).Set up a new watchdog alarm and pick “Anchor”



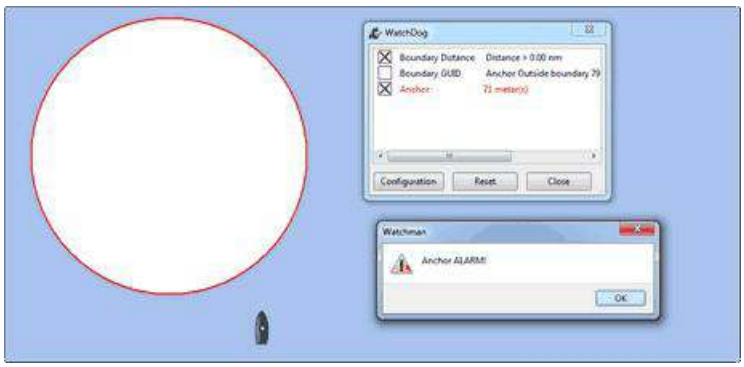
In the “Edit Alarm” window, the latitude and longitude (Lat and Lon) of your ship wil be shown (or to be precise: the Lat and Lon of the “your ship” cursor, so make sure you have a GPS fix!).



Radius can be set to whatever you like but “0 meters” will of course result in an unwanted amount of alarms. In this example radius is set to 50 meters. Click “OK”. Then the alarm is enabled and the boat is within the radius of 50 meters from the specified position, the alarm is not triggered and the circle showing that radius has a green edge.



Moving the boat more than the pre-set radius (in this case 50 meters), triggers the alarm. The green edge turns red. The text in the WD window turns red and shows the distance from the specified position.



To Stop False Alarms (Hints):

1. Set the Anchor Alert at the same time and place as the Anchor! - As close as possible.
2. Set the radius a little larger.
3. Make sure you have set the anchor properly so it is not dragging and there is adequate scope.
4. Anchor out of kelp in good holding ground.
5. Change your anchor location, shallower or deeper, different bottom.
6. Check your GPS NMEA data stream to see if the GPS signal is reasonably constant.

To check your GPS Data Stream
In the NMEA debug window, do you see changes in the GPS receiver position reported by RMC or GLL messages? You can save this stream as a file using the VDR plugin and inspect it with a Text Editor. Make sure there is no change in position reported by GPS receiver. Look at the RMC lines. The lat and lon fields are constant. EG: “3348.0358” and “15116.9019”. You will need to watch these values for a longer time to see change. Of course, if you cycle the power on the GPS receiver, you may see a change, particularly if the receiver selects a different set of satellites to calculate the position. When this happens, by the way, it is a reminder of the essential limit of GPS positional accuracy. You are getting 3 digits of precision, implying around 6 feet of accuracy. But consumer-grade GPS is generally not repeatably accurate to 6 ft.

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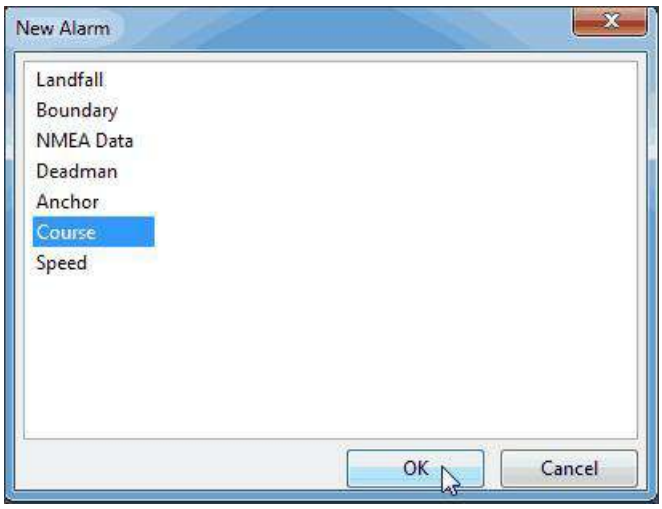
COURSE ALARM

Course Alarm is (of course) meant to alert you when you get off course. The problem with getting off course is that you might end up somewhere where you do not want to be.

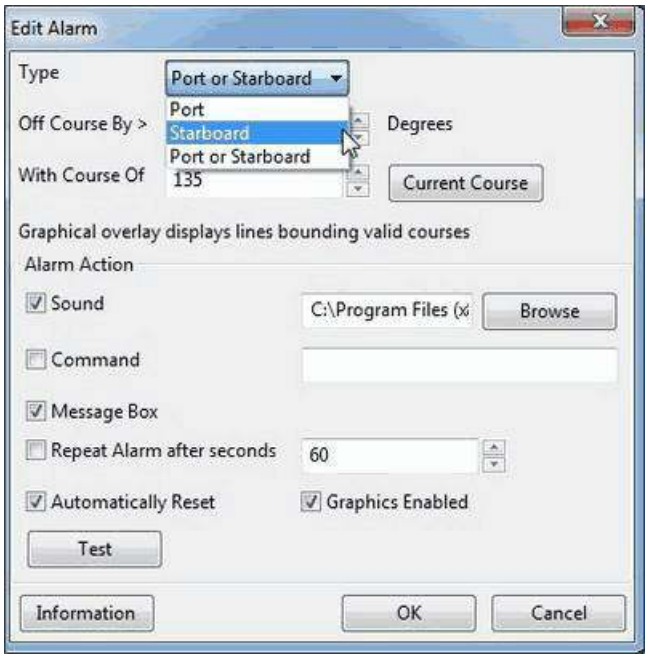
Setting the Course-alarm is explained step-by-step by these screenshots.

Set up a new watchdog alarm and pick “Course”



You can set the alarm for, for “Port” only, for “Starboard” only or for “Port or Starboard”.

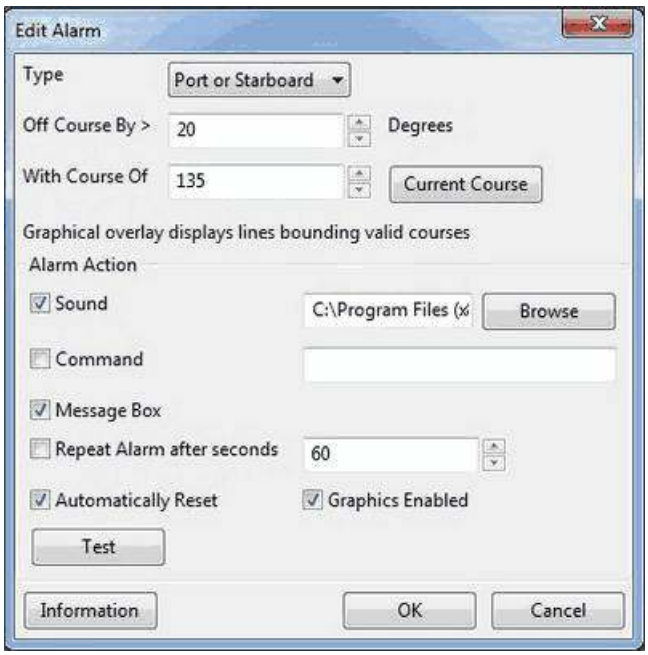
Choose “Port” if you only want to be alarmed when you go too far to port. Choose “Starboard” if you only want to be alarmed when you go too far to starboard. Choose “Port or Starboard” if you want to be alarmed when you go either too far to port or too far to starboard.



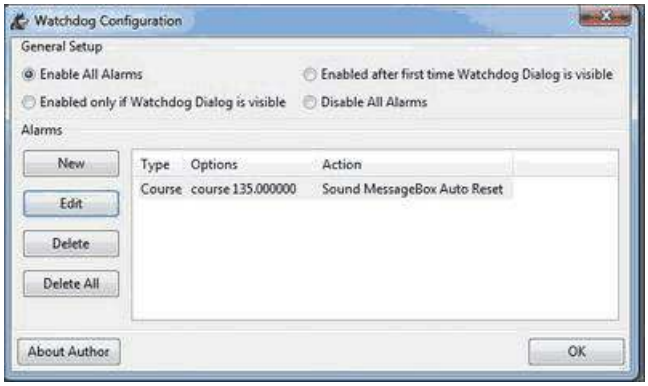
Choose how many degrees you want as margin before the alarm is triggered. You can specify the desired course either manually (enter the desired course yourself) or by clicking “Current Course”. In that case Watchdog enters your present COG, as received from your GPS.

In this example Watchdog will start barking when you wander more than 20 degrees to port or more than 20 degrees to starboard from a course of 135 degrees.

After you are finished editing the alarm, click “OK”.



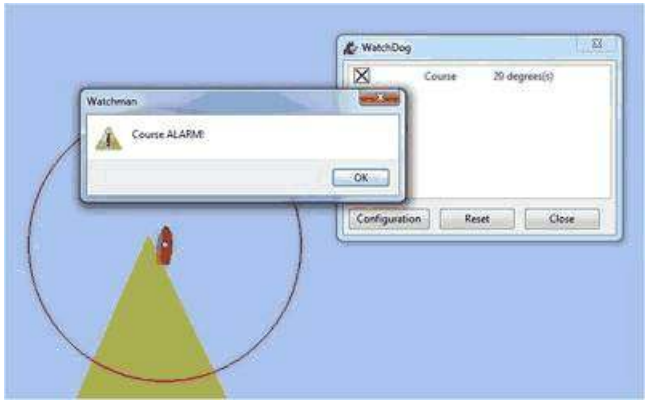
The “Course Alarm” shows up in the Watchdog Configuration window. Click “OK”.



Watchdog shows your COG (in this example 168 degrees).

Tick the checkbox (if it isn't ticked yet). Watchdog “Course Alarm” is now activated and wil alert you if your course is not between 115 and 155 degrees (135 plus or minus 20 degrees).

In the screenshot below the course is somewhere around 005 degrees. As that is (way) off course, the alarm is triggered.



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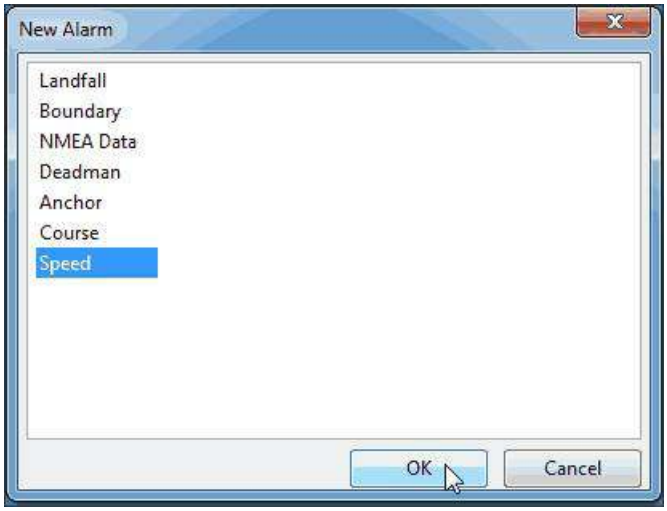
SPEED ALARM

Speed-alarm is meant to alert you when your SOG gets below (Underspeed) or above (Overspeed) a specific speed. You can set a limit. That limit is the speed, in knots, you don't want to get below or above.

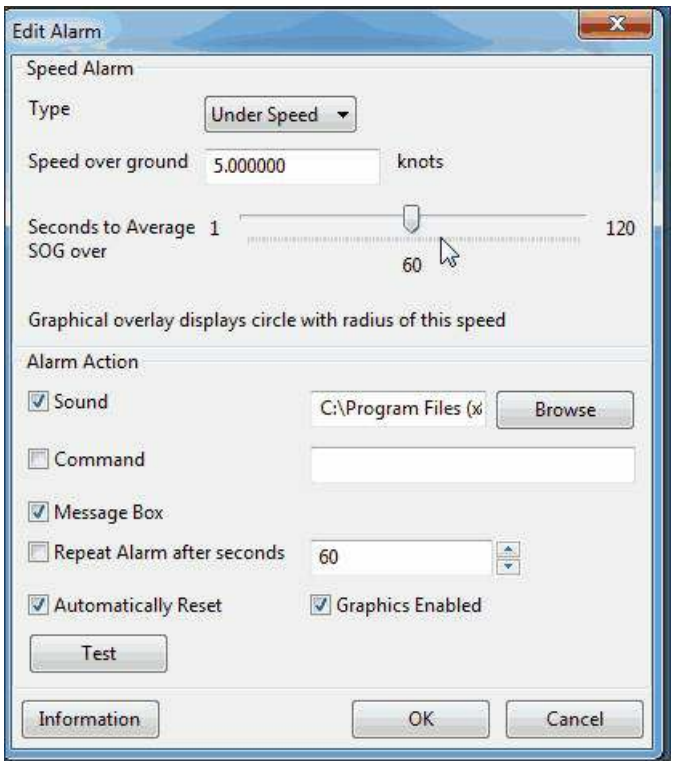
Setting the Speed-alarm is explained step-by-step by these screenshots.

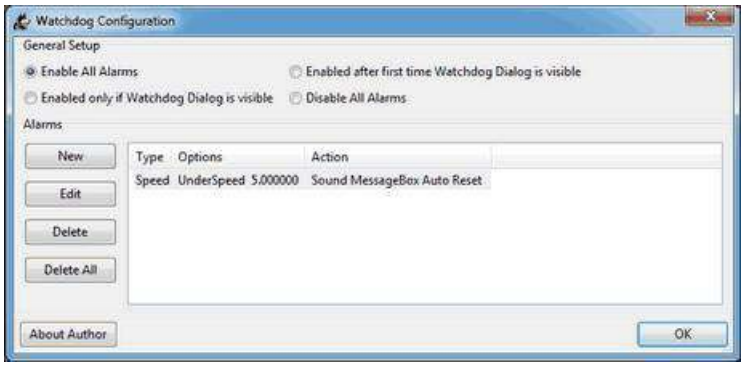
Set up a new watchdog alarm and pick “Speed”



In this example the alarm is set for “Underspeed” and the limit is set to 5 knots. In other words: you want to have an alarm as soon as your speed drops below those 5 knots. But If you are riding bigger waves, your speed can increase momentarily when you surf from the wavetop and decrease momentarily when you have to go “uphill” again. In such cases the Speed Alarm might get triggered with every wave. To prevent that, you can set Watchdog to **average** your speed. You can set a slider from 1 second to 120 seconds.

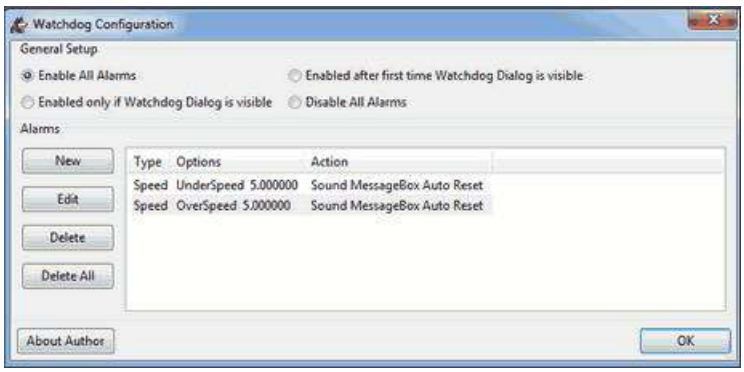
In this example the slider is set to 60 seconds. Now Watchdog will only trigger the alarm when your **average speed, measured over a period of 60 seconds**, will be below 5 knots.



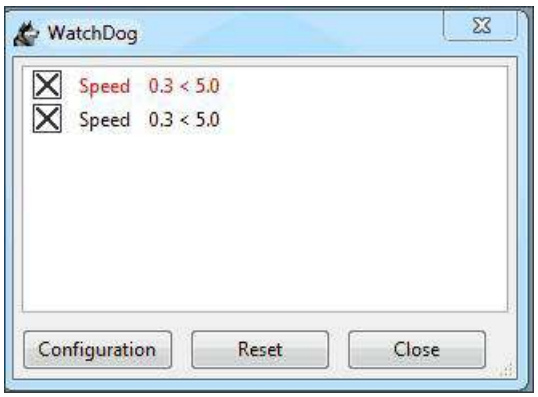


In this example the boat's average speed over 60 seconds was 0.6 knots and the limit was set to 5.0 knots. Watchdog shows you "**0.6 < 5.0**" (0.6 is less than 5.0).

Here we have set **two** speed-alarms. One for **Underspeed** and one for **Overspeed**.



In this screenshot the limit was still 5.0 knots, but the boat's average speed over 60 seconds was 0.3 knots. The “Underspeed” alarm was triggered and the text turned red. The “Overspeed” alarm did not get triggered and that text remained black.



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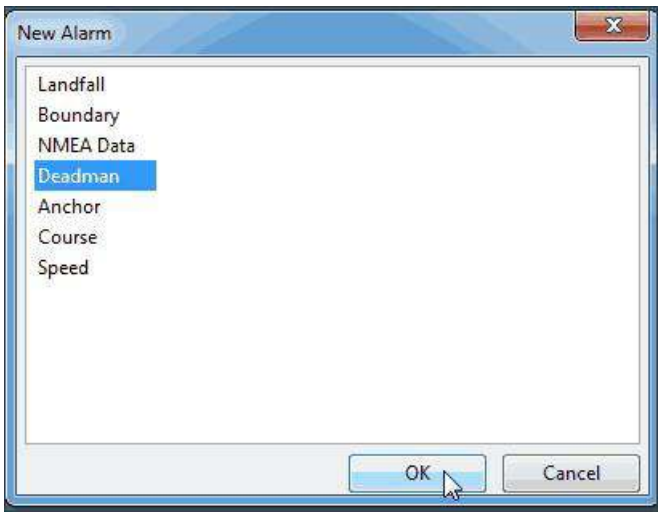
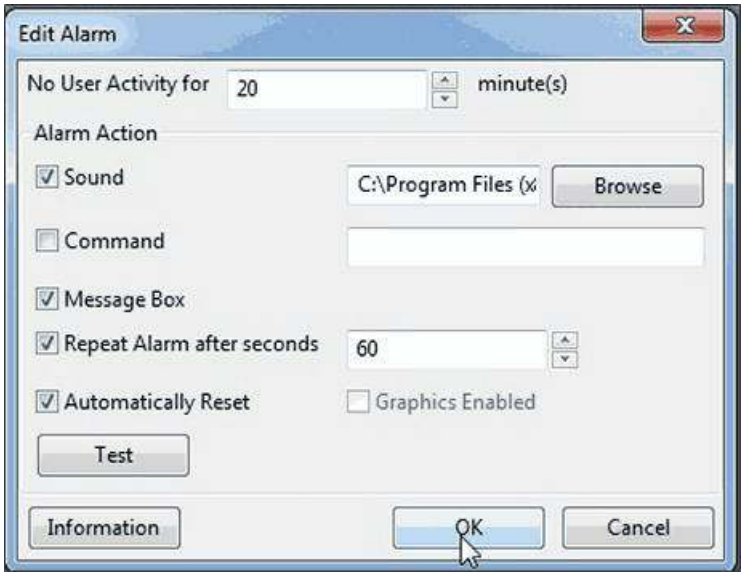
DEADMAN ALARM

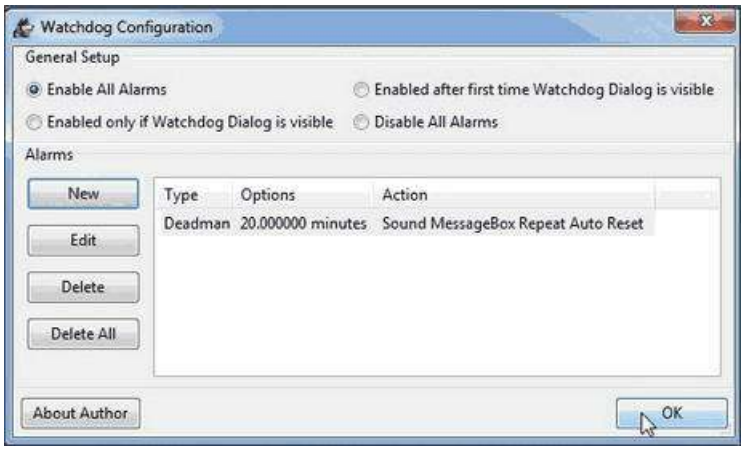
Deadman Alarm is meant to alert you (or your crew) when the program suspects you to have fallen asleep, jumped overboard or simply passed away. In other words: when after a given amount of time the program still has not experienced any user input whatsoever. The object is of course to be sure there is still someone on board keeping watch and able to take all the necessary actions. The Deadman alarm stops as soon as any action is taken, for instance a movement of the cursor (mouse). As the Deadman alarm is supposed to prevent you from falling asleep (or to wake you up if you did) the only logical kind of alert for “Deadman” is some form of (**loud and bloody annoying**!) sound.

Setting the Deadman-alarm is explained step-by-step by these screenshots.

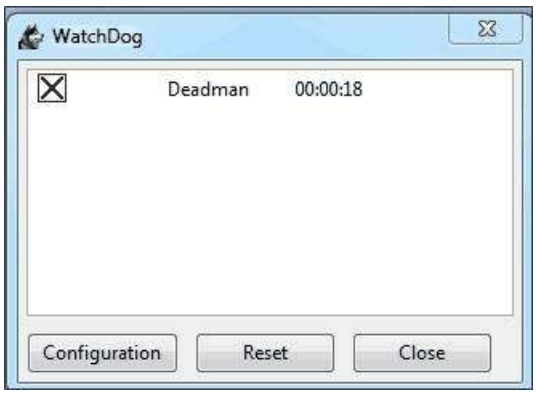
Set up a new watchdog alarm and pick “Deadman”







Once set, the clock starts ticking.



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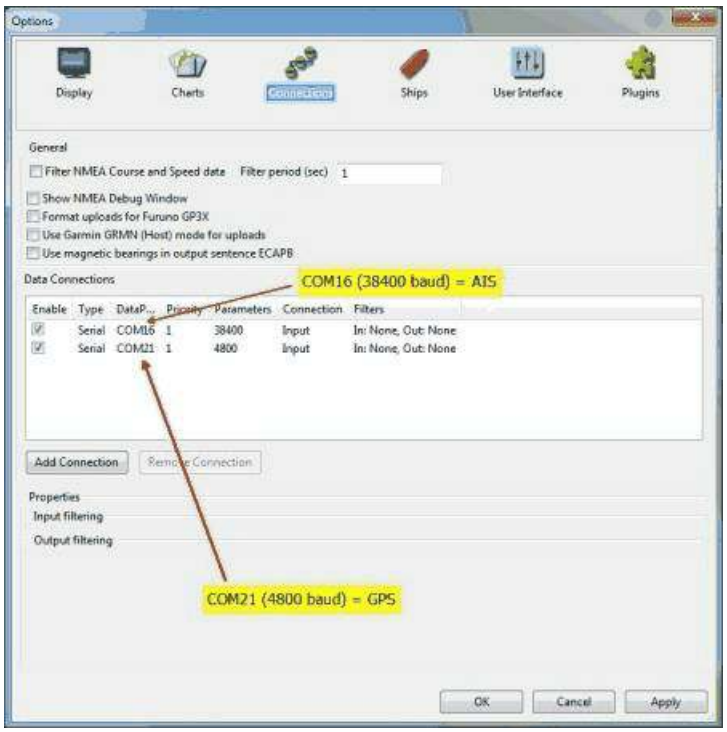
NMEA DATA ALARM

In Watchdog you can set NMEA-data-alarms. NMEA stands for National Marine Electronics Association. NMEA data consists of sentences, the first word of which, called a data type, defines the interpretation of the rest of the sentence. Each Data type would have its own unique interpretation and is defined in the NMEA standard. Examples of devices that communicate via NMEA-data with your computer are your GPS receiver and your AIS receiver.

In this picture there is a set-up with a GPS receiver and a AIS receiver connected to OpenCPN. Here the GPS is on COM21 and the AIS on COM16.



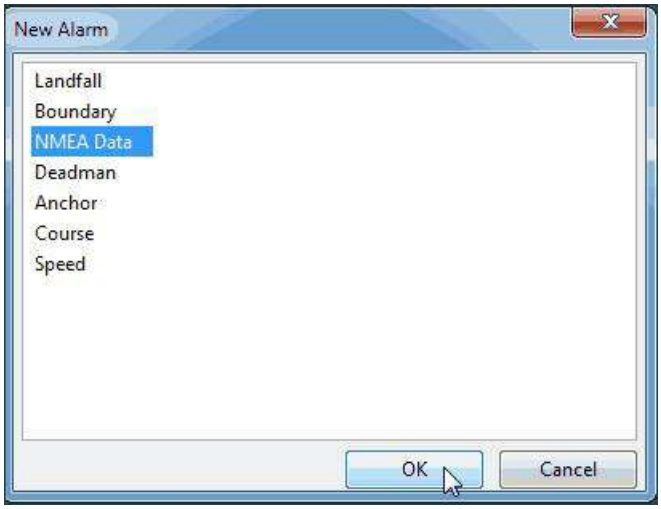
NMEA and your position.

For a chart-plotting program like OpenCPN the most important type of NMEA data is the data defining your position on this globe. These data are provided by your GPS receiver. Without receiving these GPS data, the program won't know what your actual position is anymore (and there is a fair chance you might not know it either). **When, for whatever reason, the flow of NMEA-data from your GPS to OpenCPN stops, that will have major effects on the whole idea of the CPN bit** (chartplotting and navigation) **of OpenCPN!**. Your boat might sail into a Boundary Area you want to stay out of, but the boundary alarm won't be triggered. The same goes for Anchor Alarm. If you drag your anchor but your GPS has gone on the blink, the alarm won't be triggered. In short: it's important to know when you lose your GPS fix. The GPS data are received in a data type beginning with "**$**" and the letters "**GP**". The most important NMEA sentences include the GGA which provides the current Fix data, the RMC which provides the minimum GPS sentences information, and the GSA which provides the Satellite status data.

So, if OpenCPN receives **$GPGGA**, that means it receives a fix from your GPS.

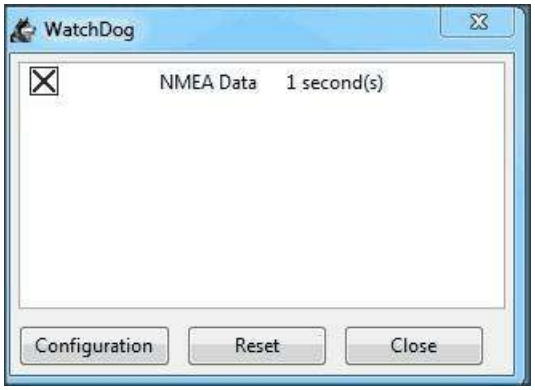
Setting up a Watchdog-NMEA-alarm (GPS)
Let's set up a Watchdog-NMEA-alarm that warns us when for some reason the GPS fix is lost for more than 10 seconds.

Set up a new watchdog alarm, choose "NMEA Data" and click "OK"



Standard "$GPGGA" is set. Set timer to "at least every 10 seconds" and tick the other boxes as per the screenshot below. Click "OK"

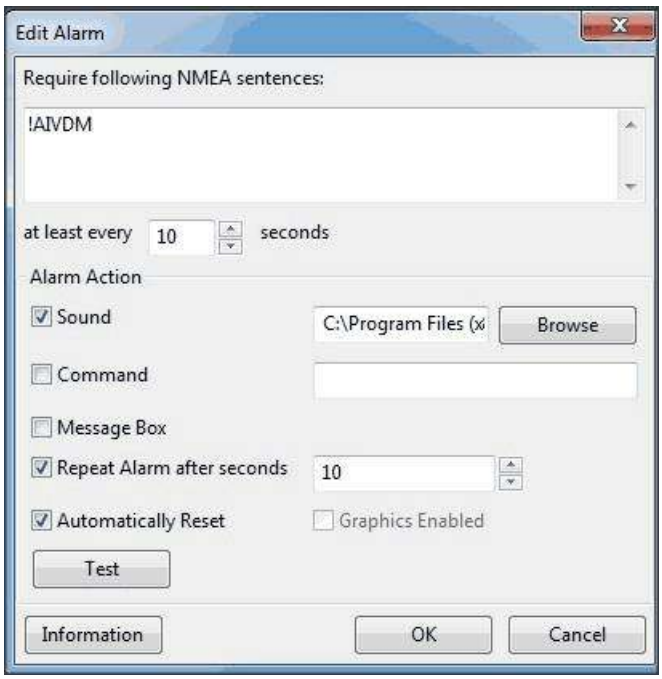
Now you have your NMEA-alarm set. It will be triggered 10 seconds after OpenCPN stops receiving GGA-sentences.



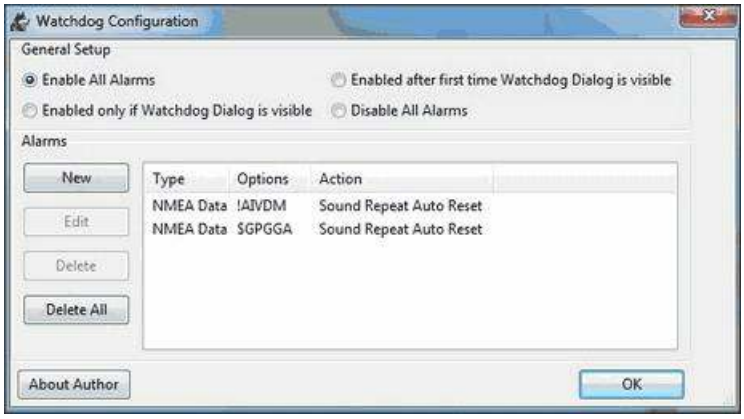
NMEA and the position of other ships
NMEA-data can not only show you where you are, they can also show where other ships are, what their name, callsign, SOG and COG are etc. Nice to know if you want to meet up (a rendezvous) or if you are afraid one of them might get a bit too close for comfort (a collision). These kind of data are received via an AIS receiver.

Multiple NMEA alarms
You can set a separate alarm for the loss of AIS data. It works the same as the GPS alarm but AIS data (from other ships) always begin with !AIVDM (don't forget the exclamation-mark).

Setting up a Watchdog-NMEA-alarm (GPS)
You can add a new NMEA-alarm (see the previous steps) but now you fill in **!AIVDM**

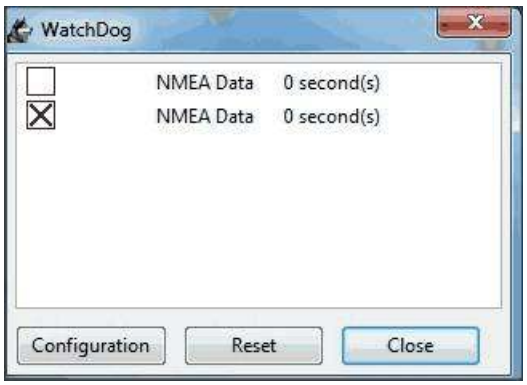


The result is two NMEA Data-alarms (one for GPS fix and one for AIS-data)



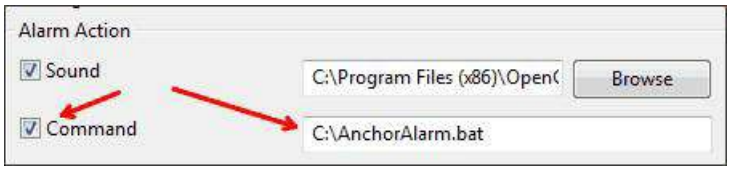
The upper NMEA Data alarm is the AIS-alarm. The lower NMEA Data alarm is the GPS alarm.

Each alarm can be switched on or off.



EMAIL TO YOURSELF

You can order Watchdog to execute a computer command. Let's say that we want Watchdog to send us an email in case our anchor drags. We have stored that command in a file we made and called **AnchorAlarm.bat**. In this example that file is stored in the root of our computer (C:\) but of course you can put in anywhere, as long as you tell Watchdog where to find it.



Sending emails from the command prompt can be done with a small tool called “Send-It-Quiet”. More info: http://commandlinesendmail.blogspot.nl/[532]

Example of the file AnchorAlarm.bat (in this example Send-It-Quiet is installed in E:\Tools\senditquiet\senditquiet)

Lets say:

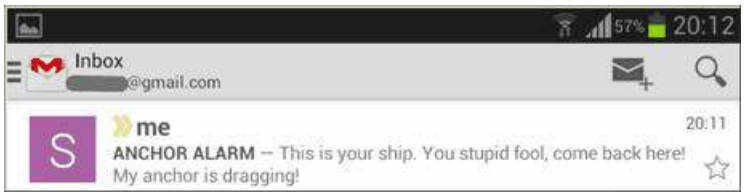
1. You are Blackbeard
2. Your emailadress is **blackbeard@gmail.com**
3. Your Gmail username is **blackbeard**
4. Your Gmail password is **1loveGold2**.

You want the program to send an email to yourself with the subject **ANCHOR ALARM** and the message **This is your ship. You stupid fool, come back here! My anchor is dragging!**

The batchfile would then be:

E:\Tools\senditquiet\senditquiet\senditquiet.exe -s smtp.gmail.com -port 587 -u **blackbeard@gmail.com** -protocol ssl -p **1loveGold2** -f **blackbeard@gmail.com** -t **blackbeard@gmail.com** -subject “**ANCHOR ALARM**” -body “**This is your ship. You stupid fool, come back here! My anchor is dragging!**”

The result when the anchor alarm gets triggered…



Note Of course this only works when you can actually email from the computer OpenCPN is installed on! This example is tested on a Windows 7 PC with Internet connection and a Gmail-account.

If, after reading all of the above, you still wonder why Watchdog could be of any use for navigation, we strongly advise you to sell your boat.

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Ocpn_Draw

Developer: Jon Gough

Links

- Source: https://github.com/jongough/ocpn_draw_pi[533]
- Releases: Github Releases[534]
- Download: Website Download[535]
- Forum: Ocpn_Draw Thread[536]

Summary

The Ocpn_Draw Plugin (OD) is designed to allow users to place objects/items on the OpenCPN interface and have these georeferenced. This allows the objects/items to move with the chart and have a defined Latitude and Longitude. There are two basic types of object/item that can be used:

- Points
- Paths

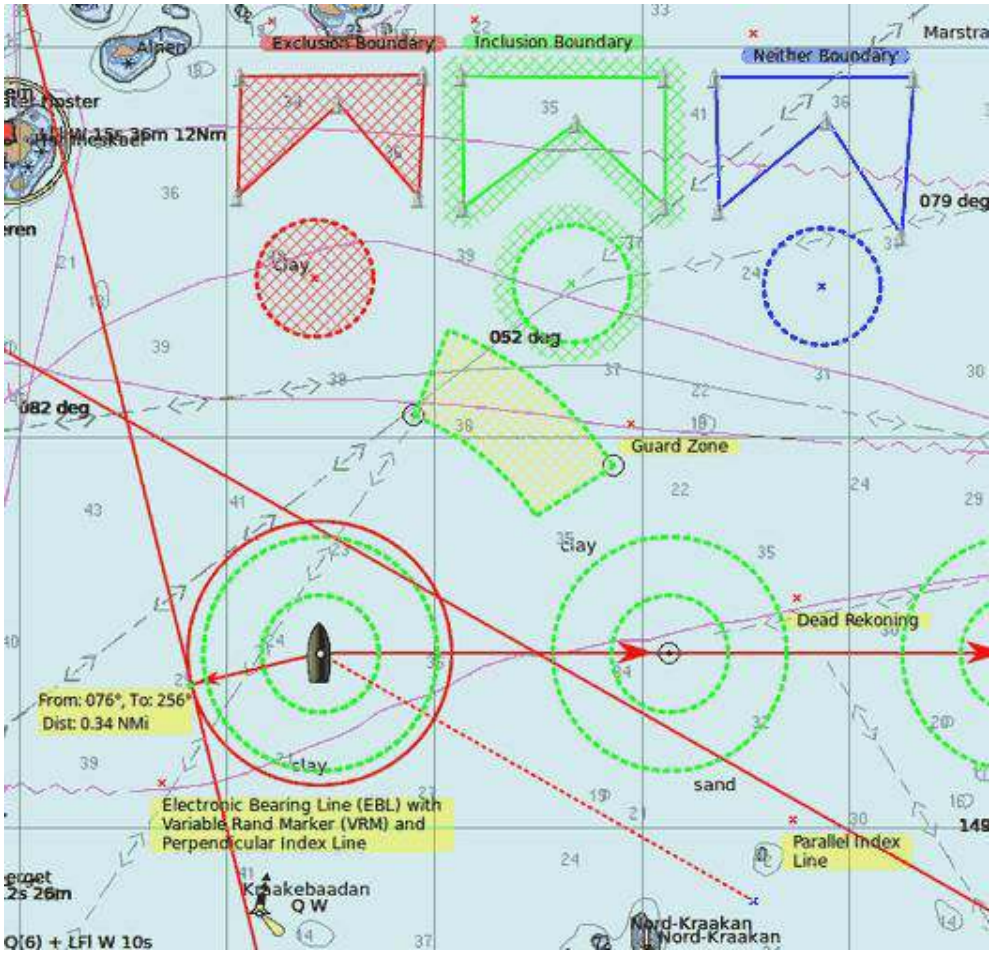
Points are very similar to Waypoints and mark locations on the chart. Paths join two or more points together and draw a line between them. Currently these Points exist:

- Boundary Point
- Text Point
- Electronic Bearing Line (EBL) Point
- Dead Reckoning (DR) Point
- Guard Zone (GZ) Point

These Points are used to construct special types of Paths:

- Boundary
- Electronic Bearing Line (EBL)
- Dead Reckoning (DR)
- Guard Zone (GZ)
- Parallel Index Line (PIL)

The example screen shot below shows an example of each type of Point and Path.



One user's Feature Request:

“When Piloting the Range and Bearing of prominent bouys, chart features can be temporarily important as is the balance of the traffic. AIS proves the real time value of plotting these dynamic elements. Additionally, this point is reinforced where (Cursor) Range and Bearing is shown in places like the Dashboard or Status Bar. However, when piloting in unfamiliar waters it is useful to maintain an awareness of multiple landmarks. Much of the dead reckoning situational awareness in the absence of AIS targets is from Range and Bearing info, especially at night or in low visibility. A big benefit with respect to maintenance of situation awareness on deck. These range and bearing datapoints might be recorded/timestamped when arriving at designated DR waypoints as well. Range/Bearing Also, Useful when estimating arrival at a layline, given a known tacking angle and current heading”

His Comment after learning of ODraw:

“Thanks for the redirect. ODraw_PI works great for my purposes. We should definitely CLOSE this request….”

WatchDog Alarms

Ocpn_Draw_pi (OD) provides a graphics companion to Watchdog_pi (WD) Alarms. OD is used as a graphics tool to create Boundary Graphics and Boundary Point Graphics. WD will

then create “Boundary Alarms” using the Boundary Graphics created by OD. The alarms that WD can create are (GPS proximity, GPS course & time, Anchor, AIS) depending on the alarm type WD may require a particular Boundary GUID or the alarm may apply to all boundaries that are displayed. The WD alarm types are separate and distinct from the OD graphics types (inclusive, exclusive, neither). OD knows nothing about the WD plugin, it just responds with information about specific Lat/Lon combinations. WD can use the graphic type that OD has to help filter which boundaries to look for. So if you have a large number of boundaries of mixed 'types' it would probably help if you selected the type of boundary to look for rather than use the default 'Any'.

ODraw and WatchDog interactions

See Plugin Messaging between ODraw , Watchdog and Weather_routing. A simple way to visualise the interactions between ODraw Boundaries and WatchDog boundaries alarms is laid out in this chart.

	WD	All	Exlusion	Inclusion	Neither
OD					
Exclusion Grid inside		Ring	Ring	No alert	No alert
Inclusion Grid outside		Ring	No alert	Ring	No alert
Neither No grid		Ring	No alert	No alert	Ring

The chart shows which OD Boundary objects will cause a WD alarm to ring. If the WD alarm is set to Exclusion, the alarm will ring, go off, if an Exclusion boundary is found within the alarm area, i.e. time or distance. However, no other type of boundary will cause the alarm to go off. So when you setup the alarms you need to check the above matrix to ensure you will get the alarm when you want it.

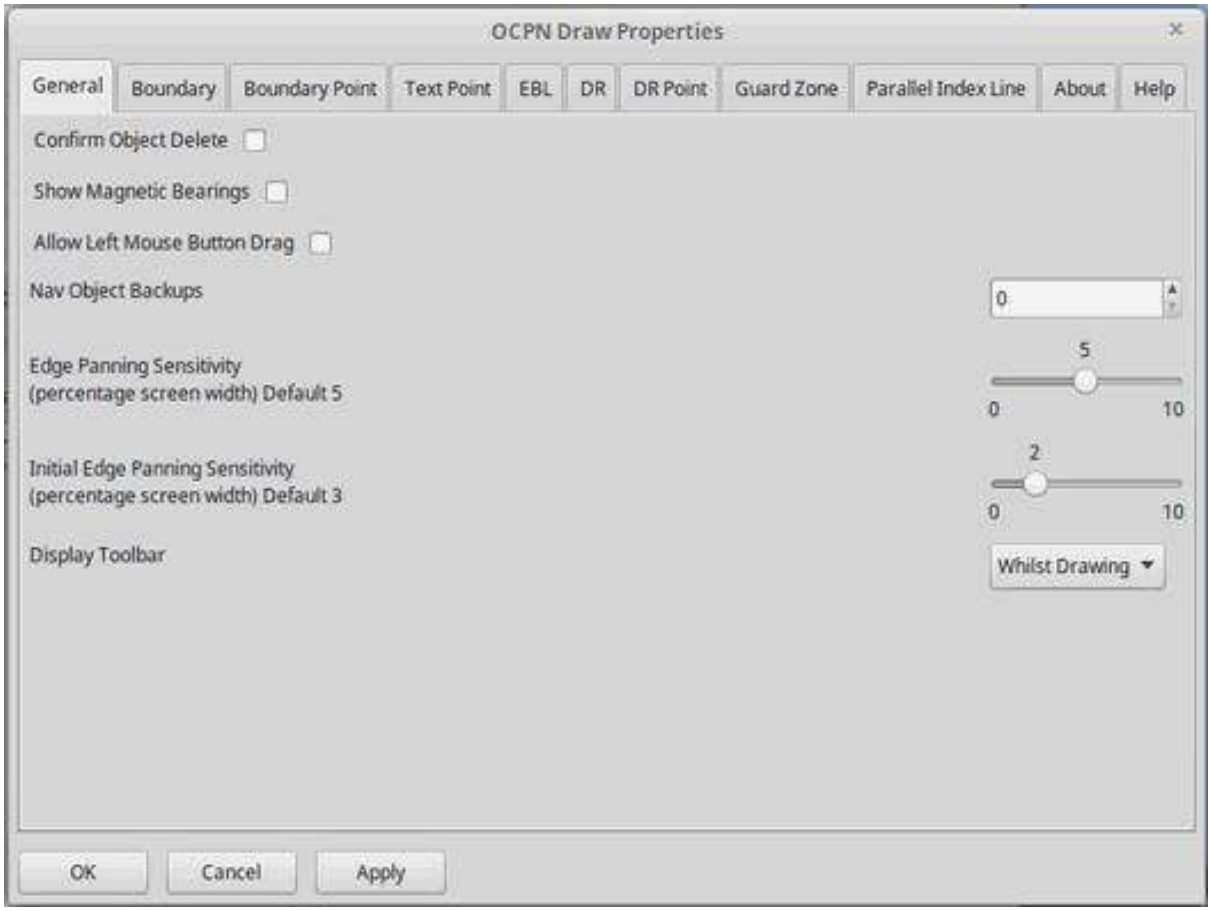
Installation

This plugin requires at least version of Opencpn 4.4.xxx
Download the plugin from the Plugin Downloads section of opencpn.org

Settings

Settings > Plugin > Ocpn_Draw > Preferences
Under Preferences the Tabs are General, Boundary, Boundary Point, Text Point, Path, EBL, DR, DR Point, Guard Zone, Parallel Index Line, About and Help where various settings are selected. Generally the defaults should give a reasonable starting point. However, all the defaults that are used can be changed from here.

General



Confirm Object Delete

This setting determines whether a dialog box will be shown asking for conformation about deleting any objects. With it checked you will be asked to confirm all deletes, with it unchecked you will be able to delete any object without being asked for confirmation. If you do delete an object by mistake and you have 'Nav Object Backups' set to more than 0, you will be able to use one of those backups to restore your objects.

Show Magnetic Bearings

If this is checked and there is a magnetic variation available then this will be applied to all angles that are used within the plugin. If it is checked and there is no magnetic variation available it will assume a '0' variation.

Allow Left Mouse Button Drag

This setting allows dragging objects by placing the mouse over the object, pressing and holding the left mouse button and dragging the object to the desired location.

If this setting is off you will need to right click on the object to get the popup menu and select move from that. Then you can press and hold the left mouse button and drag the object.

A word of warning from user Redog: If “Allow Left Mouse Button Drag” is checked it is very easy to move your entire boundary or zone to a new location, thus changing all

coordinates of waypoints you may have painstakingly entered. If you only intend to move 1 waypoint leave unchecked and use right click and move waypoint. If you intend to move entire zone check this option, it is a brilliant concept and very useful.

Nav Object Backups

This setting determines how many backups to keep of the navigation objects file. The location of the files can be found in the opencpn.log file. Each time OpenCPN stops a new copy of the navigation obj file will be created. The latest file is called 'ODnavobj.xml'.

Edge Panning Sensitivity

This is the percentage of the screen size distance from the edge that will cause the screen to pan when using the drawing tools. The bigger this number the further from the edge of the screen your pointer will be when the screen starts panning.

Initial Edge Panning Sensitivity

This is the same as above, but is used after a drawing tool is picked but before the first object is created. This is supplied so that the screen does not start panning if you move your pointer off of the toll bar near the edge of the screen.

Display Toolbar

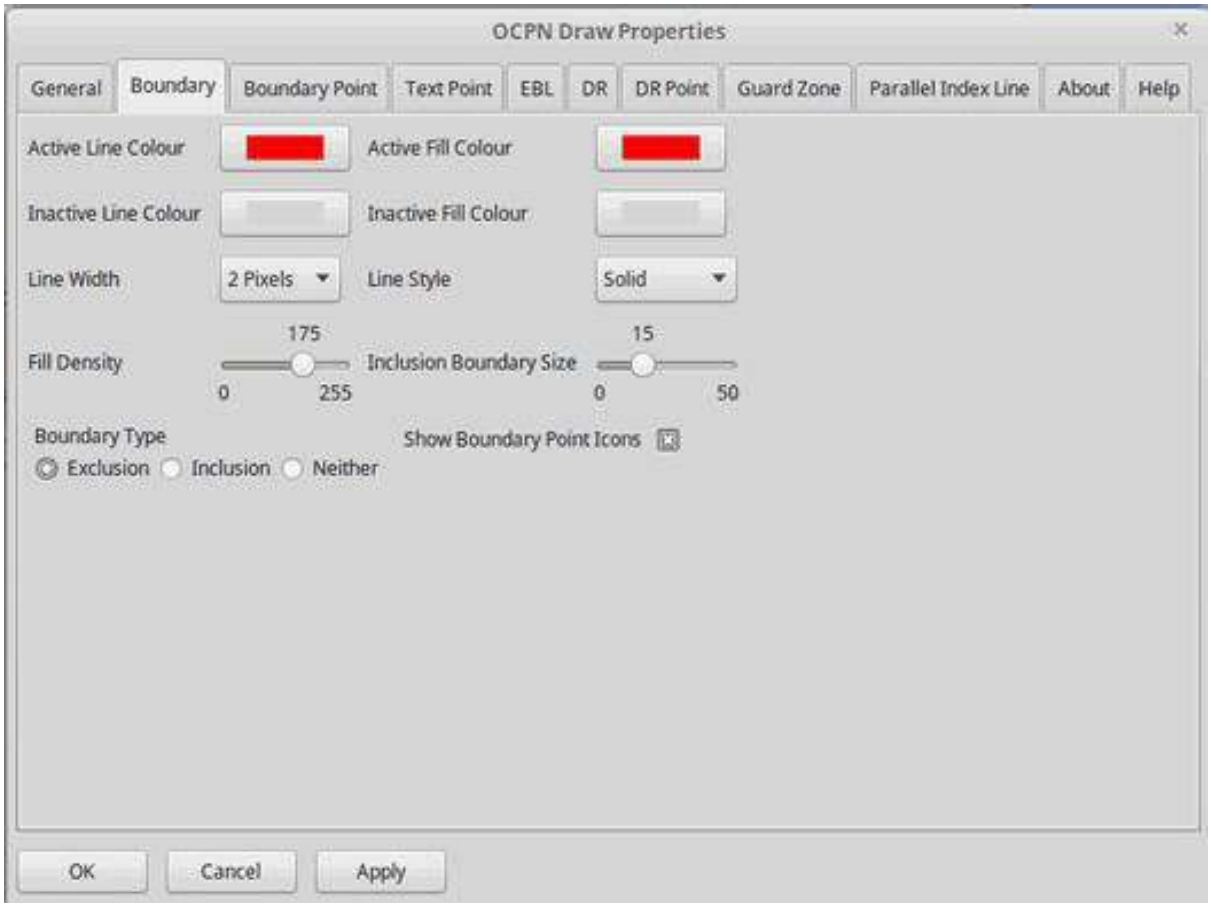
The plugin allows you to use two graphical methods of selecting the tool you wish to draw with:

1. The main Toolbar and the right mouse click
2. The Draw Toolbar

This setting determines if the tool bar is display and has three settings

1. Never - the toolbar is not displayed
2. Whilst Drawing - the toolbar is displayed whilst a drawing tool is active
3. Always - the toolbar will display all the time irrerspective of whether you are using the plugin.

Boundary



Active Line Color

This is the color of an active Boundary Line
Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Active Fill Color

This is the default color to use for any active Boundary fill hash. When selected a standard, platform dependent, color picker will be presented. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive Line Color

This is the color of an inactive Boundary Line.
Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive Fill Color

This is the default color to use for any inactive Boundary fill hash. When selected a standard, platform dependent, color picker will be presented. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Line Width

This is the width of the Boundary Line in pixels. It can be a value between 1 and 10 pixels.

Line Style

This defines how the Boundary Line is drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash
- Dot Dash

Some of these may not display well on your screen depending on the resolution you are using. It is known that when using high resolution screens, i.e. 3800×1900 the difference between the line types may be difficult to see.

Fill Density

This allows the setting of how transparent the fill hash is. A value of 0 means that it is fully transparent and a value of 255 is that it is fully opaque. The term density is used as it seemed clearer, i.e. low density - you can see through it, high density - you cannot see through it.

Boundary Inclusion Size

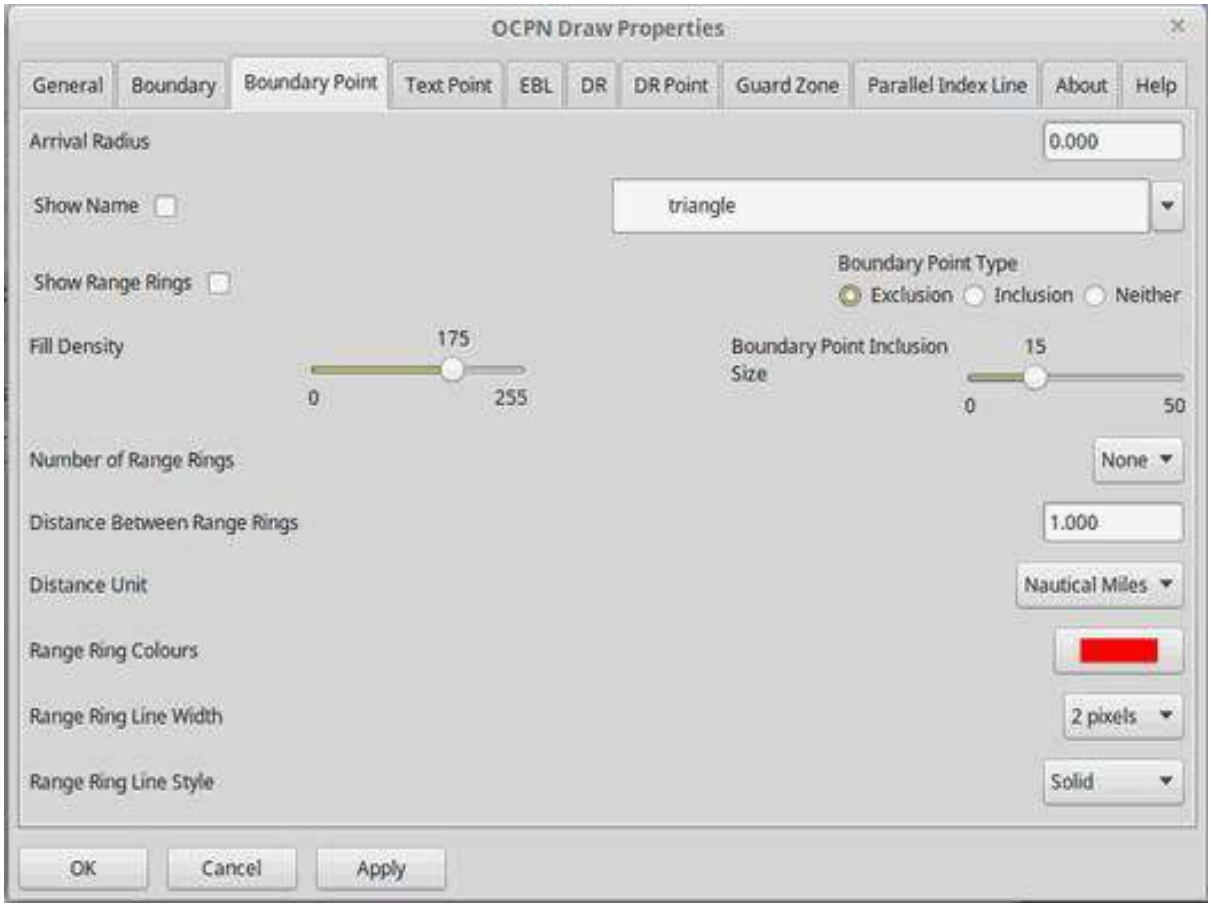
This defines, in pixels, how wide the hash is around the outside Boundary Line when the Boundary is of type 'Inclusion'.

Boundary Type

This radio button selection sets the default type for all Boundary. Points.

- Exclusion - fill the inside of the Boundary with a hash.
- Inclusion - surround the Boundary with a nominated size hash
- Neither - just draw the Boundary Line with no hash

Boundary Point



Arrival Radius

This is not really relevant to a Boundary Point at the moment, but may become useful if other items/capabilities are added

Show Name

This is the default setting for showing the Boundary Point name. Currently Boundary Points are created with the name empty/blank so nothing displays.

Icon

This is the default icon to use for all Boundary Points. There is a set of OpenCPN icons that can be used as well as user defined icons. The method of adding user defined icons is documented in the main OpenCPN manual

Show Range Rings

Boundary Points can have range rings associated with them. To show the rings by default this setting needs to be checked.

Boundary Point Type

This radio button selection sets the default type for all Boundary Points.

- Exclusion - fill the inside range rings with a hash.
- Inclusion - surround the largest range ring with a nominated size hash
- Neither - just draw the range rings but there is no hash

Fill Density

This allows the setting of how transparent the fill hash is. A value of 0 means that it is fully transparent and a value of 255 is that it is fully opaque. The term density is used as it seemed clearer, i.e. low density - you can see through it, high density - you cannot see through it.

Boundary Point Inclusion Size

This defines, in pixels, how wide the hash is around the outside Boundary Point Range Ring when the Boundary Point is of type 'Inclusion'.

Number of Range Rings

This defines the number of range rings to show if they are selected to be shown. If Zero is selected, then there will be no range ring shown.

Distance Between Range Rings

This is the gap between sucessive range rings. The measurement this is using is defined in the Distance Unit' setting

Distance Unit

The unit of measurement to use for the range rings gap. It can be:

- Nautical Miles
- Kilometers

Range Ring colors

This is the default color to use for any Boundary Point Range Ring. When selected a standard, platform dependant, color picker will be presented. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Range Ring Line Width

This is the width of the range rings when drawn in pixels. It can be a value between 1 and 10 pixels.

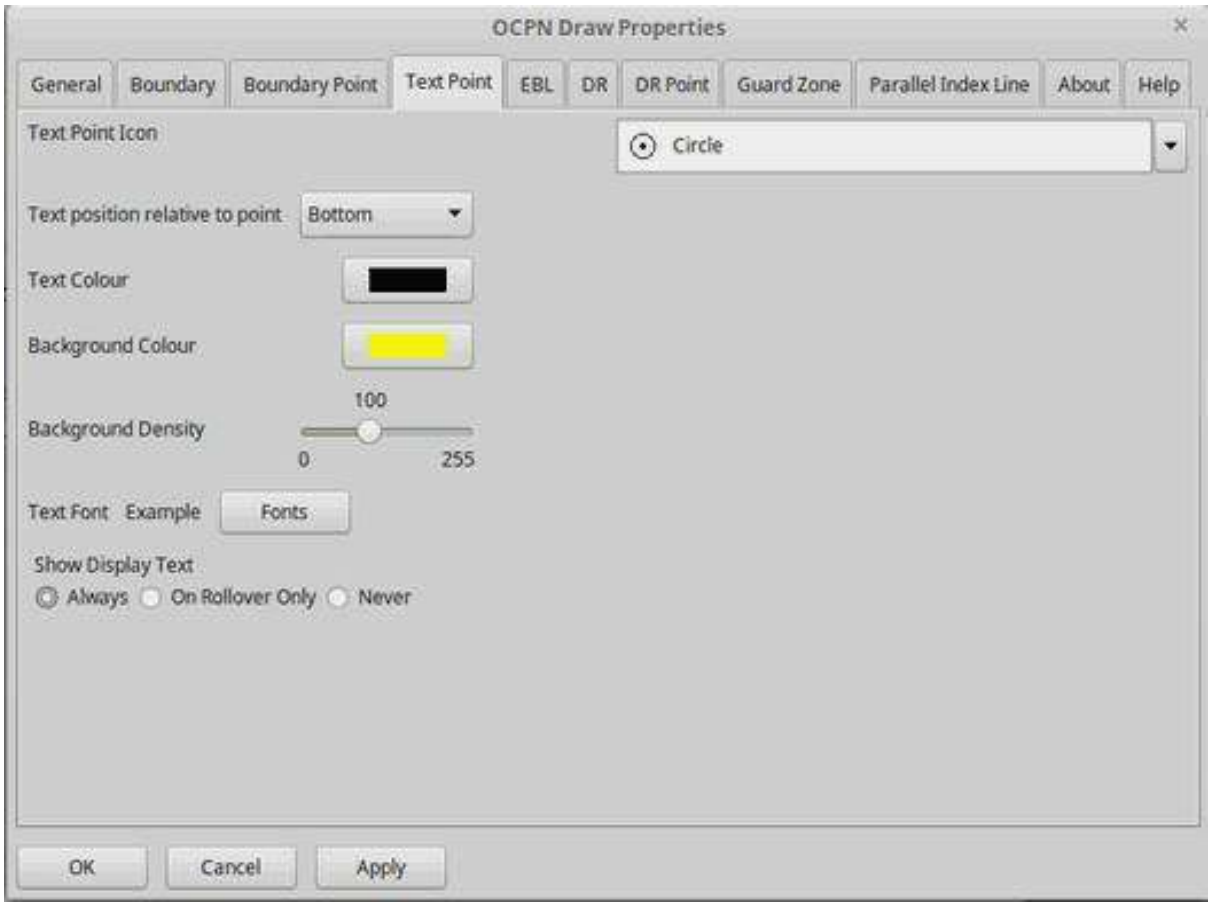
Range Ring Line Style

This defines how the Range Rings are drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash
- Dot Dash

Some of these may not display well on your screen depending on the resolution you are using. It is known that when using high resolution screens, i.e. 3800×1900 the difference between the line types may be difficult to see.

Text Point



Text Point Icon

This is the default icon to use for all Text Points. There is a set of OpenCPN icons that can be used as well as user defined icons. The method of adding user defined icons is documented in the main OpenCPN manual.

Text Position

This selects where the text is positioned relative to the location of the Text Point. If you show an Icon it will be easier to see and interact with the text on the screen. If you do not use an Icon it may be easier to use the Path Manager to get to the Text Point.

There are 7 different locations:

- Top
- Top center
- Bottom
- Bottom center
- center
- Right
- Left

Text color

This is the color that the default Display Text will have. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Background color

When a Text Point displays text it will have a colored background to help it stand out from the underlying chart. This is the default color of the background box. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Background Density

This allows the setting of how transparent the background color. A value of 0 means that it is fully transparent and a value of 255 is that it is fully opaque. The term density is used as it seemed clearer, i.e. low density–you can see through it, high density–you cannot see through it. The default density is 100.

Text Font

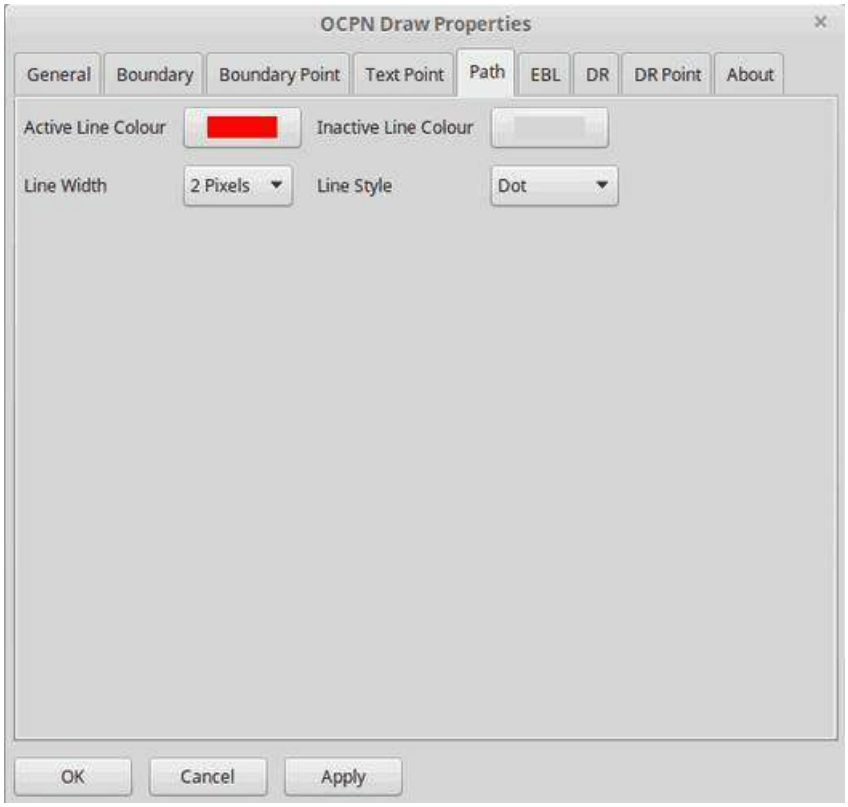
This is the default font to be used for the 'Display Text'. The 'Fonts' button will allow picking of any font that is installed on the system. You can pick the Family, Style and Size of the font. This is presented by a platform specific font picker. The current font that will be used is shown by the work 'Example' which will be drawn using the font selected.

Show Display Text

This is the default for when the Display Text of a Text Point is shown.

- Always - Display text is always shown
- On Rollover Only - The text will be displayed when the mouse pointer rolls over the Text Point. This is to try and help declutter the screen if there are many objects being concurrently displayed.
- Never - The display text is not displayed

Path (this item is currently hidden)



Active Line color

This is the color of an active generic Path if there is no specific type. Currently this is not used as there are no unspecified Path types in use. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive Line color

This is the color of an inactive generic Path if there is no specific type. Currently this is not used as there are no unspecified Path types in use. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Line Width

This is the width of the Path Line in pixels. It can be a value between 1 and 10 pixels.

Line Style

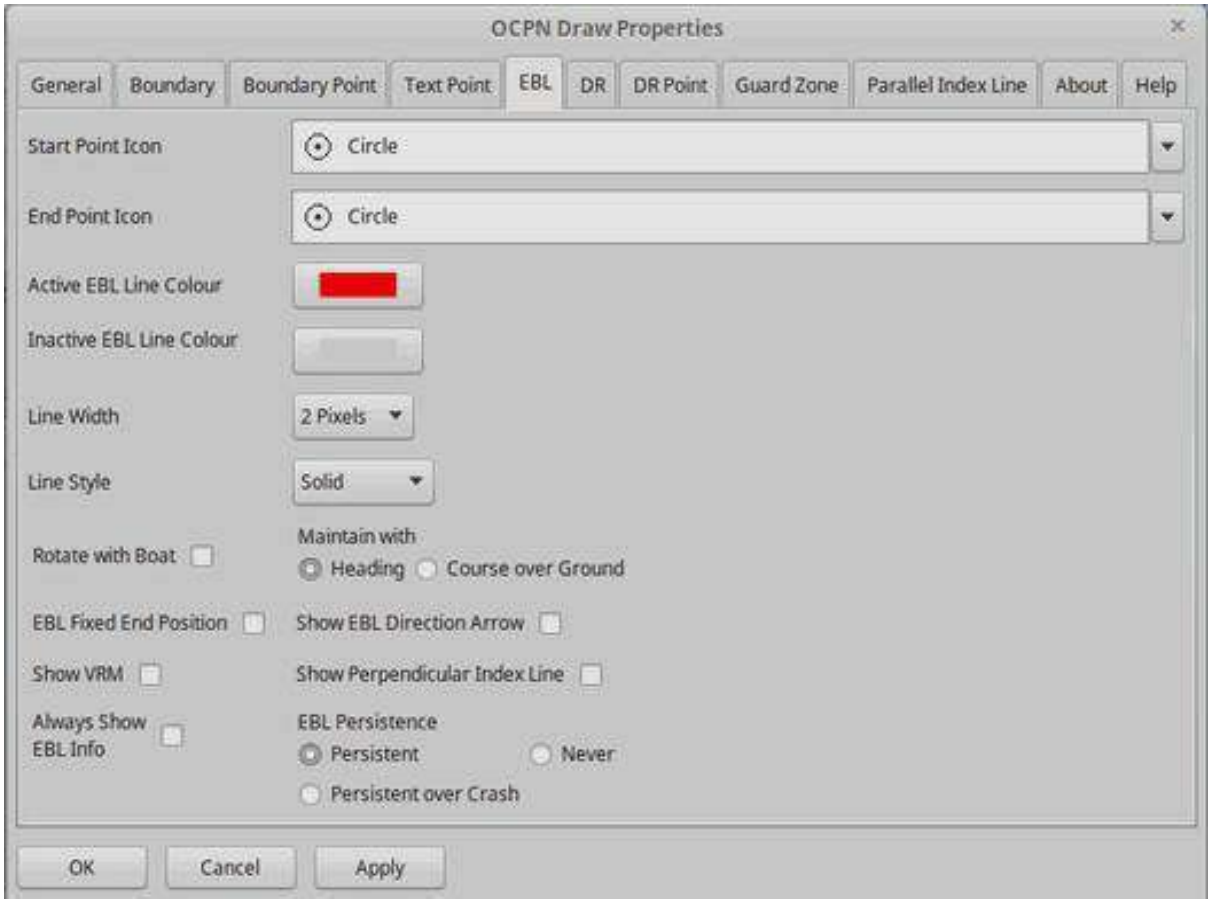
This defines how the Path Line is drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash

- Dot Dash

Some of these may not display well on your screen depending on the resolution you are using. It is known that when using high resolution screens, i.e. 3800×1900 the difference between the line types may be difficult to see.

Electronic Bearing Line (EBL)



Start Point Icon

This is the default icon to use for the start point of an EBL. There is a set of OpenCPN icons that can be used as well as user defined icons. The method of adding user defined icons is documented in the main OpenCPN manual.

End Point Icon

This is the default icon to use for the end point of an EBL. There is a set of OpenCPN icons that can be used as well as user defined icons. The method of adding user defined icons is documented in the main OpenCPN manual.

Active EBL Line color

This is the color of an active EBL. Selection is by a platform specific color picker. This will

allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive EBL Line color

This is the color of an inactive EBL. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Line Width

This is the width of the EBL in pixels. It can be a value between 1 and 10 pixels.

Line Style

This defines how the EBL is drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash
- Dot Dash

EBL Fixed End Position

This the default for all EBLs. This fixes the End Point of an EBL such that when the boat moves the end point does not. If this is left uncheck the end point of the EBL will move with the boat so the EBL always has the same length and bearing.

Show EBL Direction Arrow

This is the default for all EBLs. If checked a direction arrow will be displayed on the EBL at or near the end point. This helps show the direction of the EBL.

Show VRM

This draws a Variable Range Marker (Ring) centered on the start point and sized to go through the end point.

Show Perpendicular Index Line

This shows a line drawn perpendicular to the end of the EBL. The line uses the same attributes as are applied to the EBL itself.

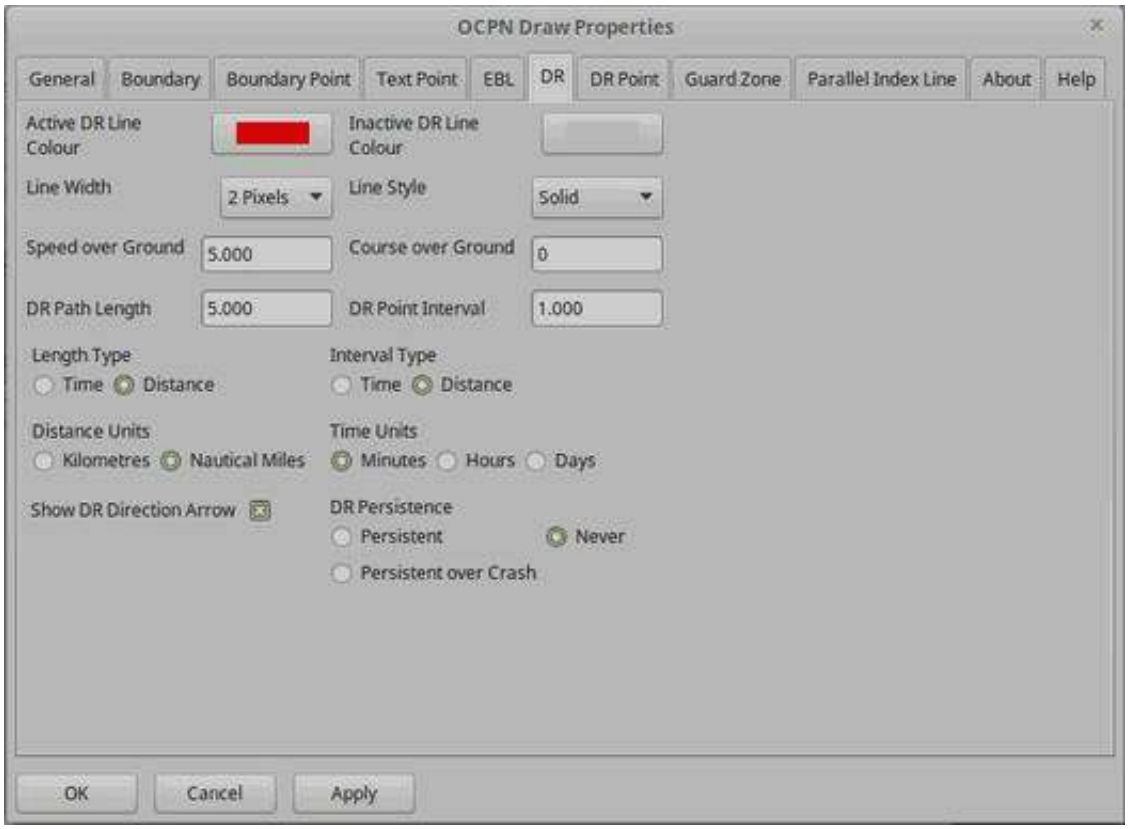
EBL Persistence

The EBLs that are created can be:

- Persistent - will persist over a restart of OpenCPN
- Persistent over Crash - will not persist over a normal restart of OpenCPN, but will be

persistent over a crash of OpenCPN
- Never - the EBL will only be temporary and will not be displayed again when OpenCPN is restarted.

Dead Reckoning (DR)



Active DR Line color

This is the color of an active DR Line Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive DR Line color

This is the color of an inactive DR Line. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Line Width

This is the width of the DR line in pixels. It can be a value between 1 and 10 pixels.

Line Style

This defines how the DR line is drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash
- Dot Dash

Speed over Ground

This is the default speed over the ground to use when calculating the DR line.

Course over Ground

This is the default course over ground to use. The type, True or Magnetic, is determined by the setting in the General tab.

DR Path Length

This is the default length of the DR line.

DR Point Interval

This is the default interval to place points along the DR path.

Length Type

This is the default length type to be used, either Time or Distance.

Interval Type

This is the default interval between placing points, either Time or Distance.

Distance Units

This is the default distance units to use, either Kilometers or Nautical Miles

Time Units

This is the default time units to use, one of Minutes, Hours or Days

DR Persistence

The DR lines that are created can be:

- Persistent - will persist over a restart of OpenCPN
- Persistent over Crash - will not persist over a normal restart of OpenCPN, but will persist over a crash of OpenCPN
- Never - the DR line will only be temporary and will not be displayed again when OpenCPN is restarted.

Dead Reckoning Point (DR Point)

Fix Me! This image seems to be missing {{plugins:beta_plugins:plugins_under_development:od_prop_-_dr_point_properties.jpg}}

DR Point Icon

This is the default icon to use for the all points of a Dead Reckoning line. There is a set of OpenCPN icons that can be used as well as user defined icons. The method of adding user defined icons is documented in the main OpenCPN manual.

Show Range Rings

Boundary Points can have range rings associated with them. To show the rings by default this setting needs to be checked.

Number of Range Rings

This defines the number of range rings to show if they are selected to be shown. If Zero is selected, then there will be no range ring shown.

Distance Between Range Rings

This is the gap between successive range rings. The measurement this is using is defined in the 'Distance Unit' setting

Distance Unit

The unit of measurement to use for the range rings gap. It can be:

- Nautical Miles
- Kilometers

Range Ring colors

This is the default color to use for any DR Point Range Ring. When selected a standard, platform dependant, color picker will be presented. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Range Ring Line Width

This is the width of the range rings when drawn in pixels. It can be a value between 1 and 10 pixels.

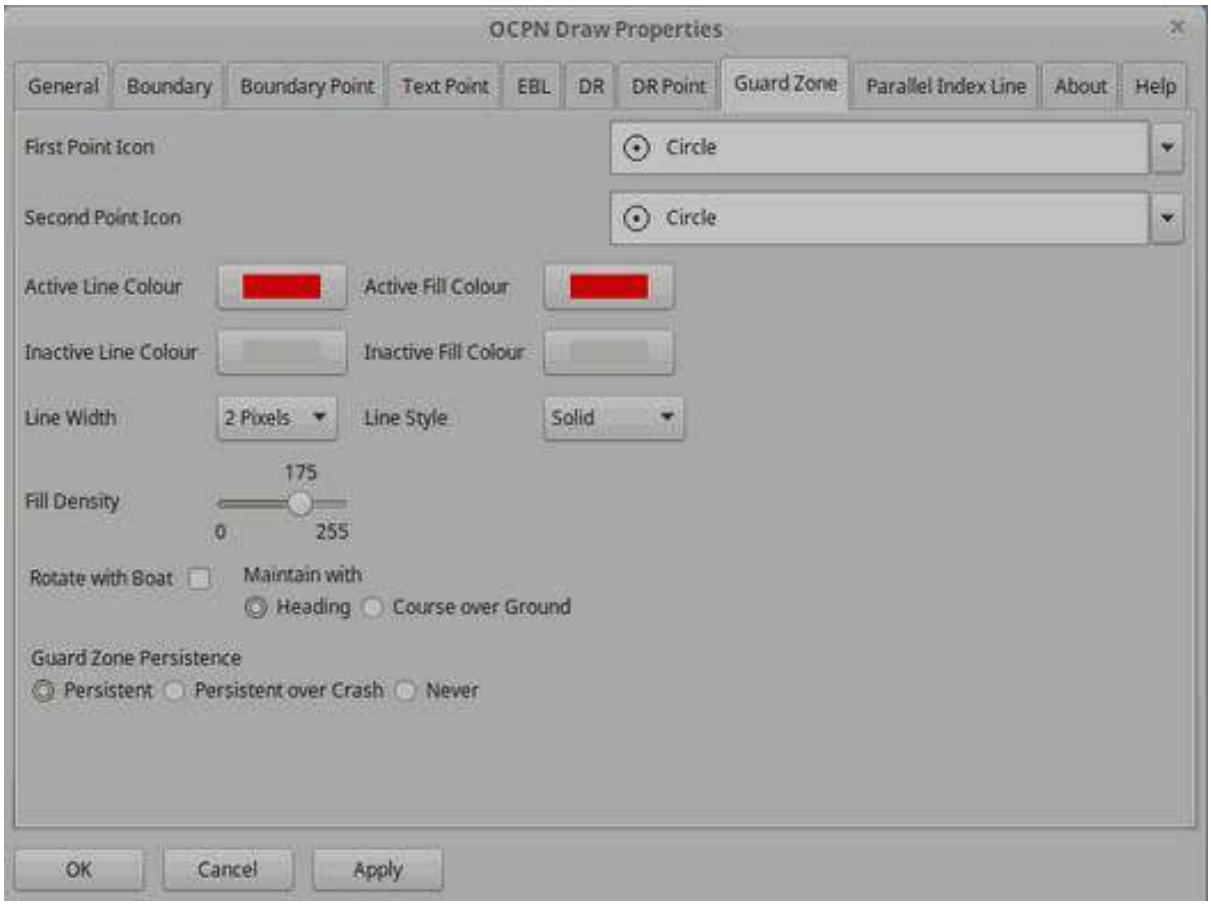
Range Ring Line Style

This defines how the Range Rings are drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash
- Dot Dash

Some of these may not display well on your screen depending on the resolution you are using. It is known that when using high resolution screens, i.e. 3800×1900 the difference between the line types may be difficult to see.

Guard Zone



First Point Icon

This is the default icon to use for the first point placed when creating a Guard Zone (GZ). There is a set of OpenCPN icons that can be used as well as user defined icons.

The method of adding user defined icons is documented in the main OpenCPN manual.

Second Point Icon

This is the default icon to use for the second point placed when creating a Guard Zone (GZ). There is a set of OpenCPN icons that can be used as well as user defined icons. The method of adding user defined icons is documented in the main OpenCPN manual.

The method of adding user defined icons is documented in the main OpenCPN manual.

Active Line Color

This is the color of an active Boundary Line
Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Active Fill Color

This is the default color to use for any active Boundary fill hash. When selected a standard, platform dependent, color picker will be presented. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive Line Color

This is the color of an inactive Boundary Line.
Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive Fill Color

This is the default color to use for any inactive Boundary fill hash. When selected a standard, platform dependent, color picker will be presented. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Line Width

This is the width of the Boundary Line in pixels. It can be a value between 1 and 10 pixels.

Line Style

This defines how the Boundary Line is drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash
- Dot Dash

Some of these may not display well on your screen depending on the resolution you are using. It is known that when using high resolution screens, i.e. 3800×1900 the difference between the line types may be difficult to see.

Fill Density

This allows the setting of how transparent the fill hash is. A value of 0 means that it is fully transparent and a value of 255 is that it is fully opaque. The term density is used as it seemed

clearer, i.e. low density - you can see through it, high density - you cannot see through it.

Rotate with Boat

This locks the GZ to either the heading the course over ground of the boat. If this is unset then the GZ will move with the boat but will be at a fixed direction from the boat irrespective of its course or heading.

Maintain with

This setting works with the 'Rotate with Boat' specifying whether to use the current heading or the course over ground.

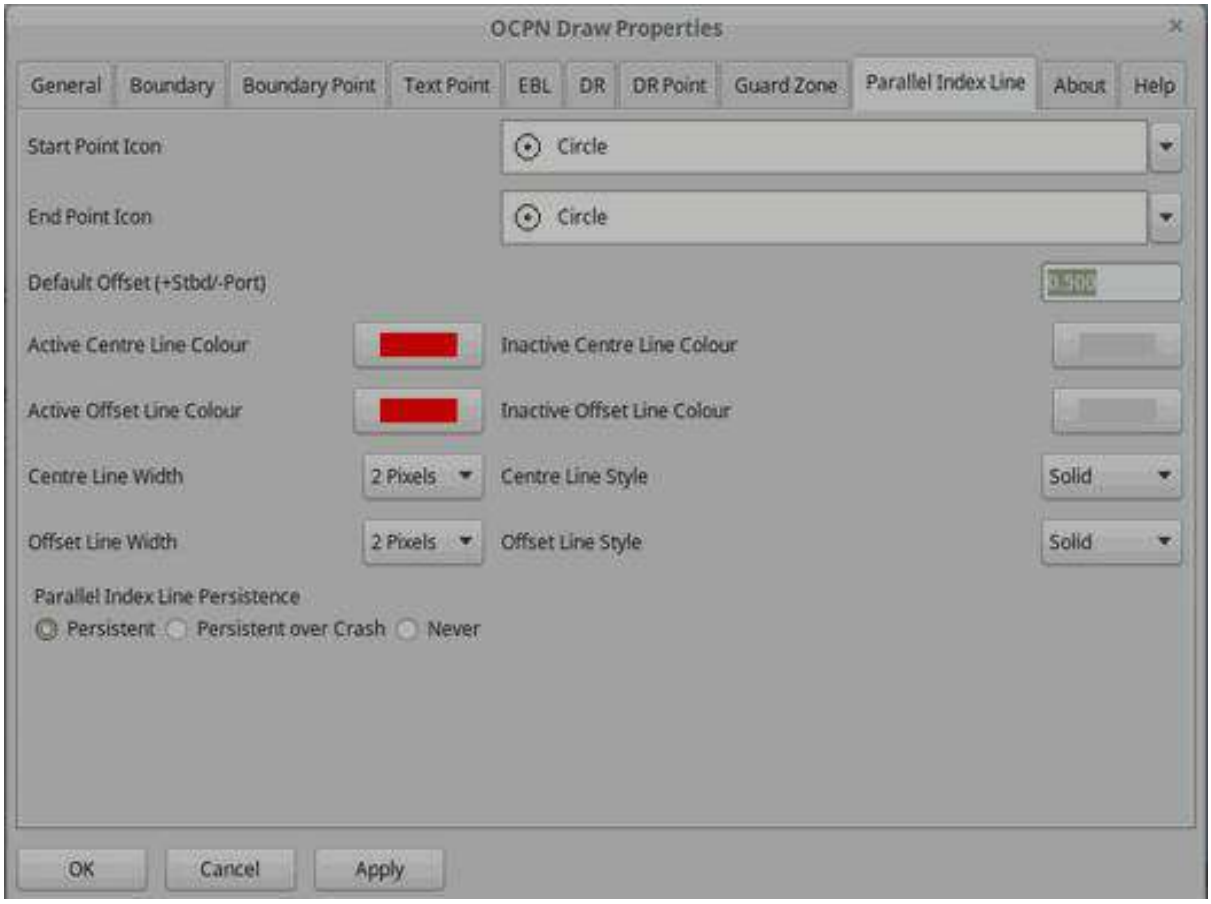
This defines, in pixels, how wide the hash is around the outside Boundary Line when the Boundary is of type 'Inclusion'.

Guard Zone Persistence

The GZs that are created can be:

- Persistent - will persist over a restart of OpenCPN
- Persistent over Crash - will not persist over a normal restart of OpenCPN, but will be persistent over a crash of OpenCPN
- Never - the GZ will only be temporary and will not be displayed again when OpenCPN is restarted.

Parallel Index Line



Start Point Icon

This is the default icon to use for the start point of an PIL. There is a set of OpenCPN icons that can be used as well as user defined icons. The method of adding user defined icons is documented in the main OpenCPN manual.

End Point Icon

This is the default icon to use for the end point of an PIL. There is a set of OpenCPN icons that can be used as well as user defined icons. The method of adding user defined icons is documented in the main OpenCPN manual.

Default Offset (+Stbd/-Port)

This is the default offset that the PIL takes from the centre line.

Active Centre Line color

This is the color of an active PIL centre line. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive Centre Line color

This is the color of an inactive PIL centre line. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Active Offset Line color

This is the color of an active PIL offset line. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Inactive Offset Line color

This is the color of an inactive PIL offset line. Selection is by a platform specific color picker. This will allow the color to be any RGB (Red, Green, Blue) color that is supported by the platform.

Centre Line Width

This is the width of the PIL centre line in pixels. It can be a value between 1 and 10 pixels.

Centre Line Style

This defines how the PIL centre line is drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash
- Dot Dash

Offset Line Width

This is the width of the PIL offset line in pixels. It can be a value between 1 and 10 pixels.

Offset Line Style

This defines how the PIL offset line is drawn. It can be one of the following:

- Solid
- Dot
- Long Dash
- Short Dash
- Dot Dash

Line Style

This defines how the EBL is drawn. It can be one of the following:

- Solid

- Dot
- Long Dash
- Short Dash
-

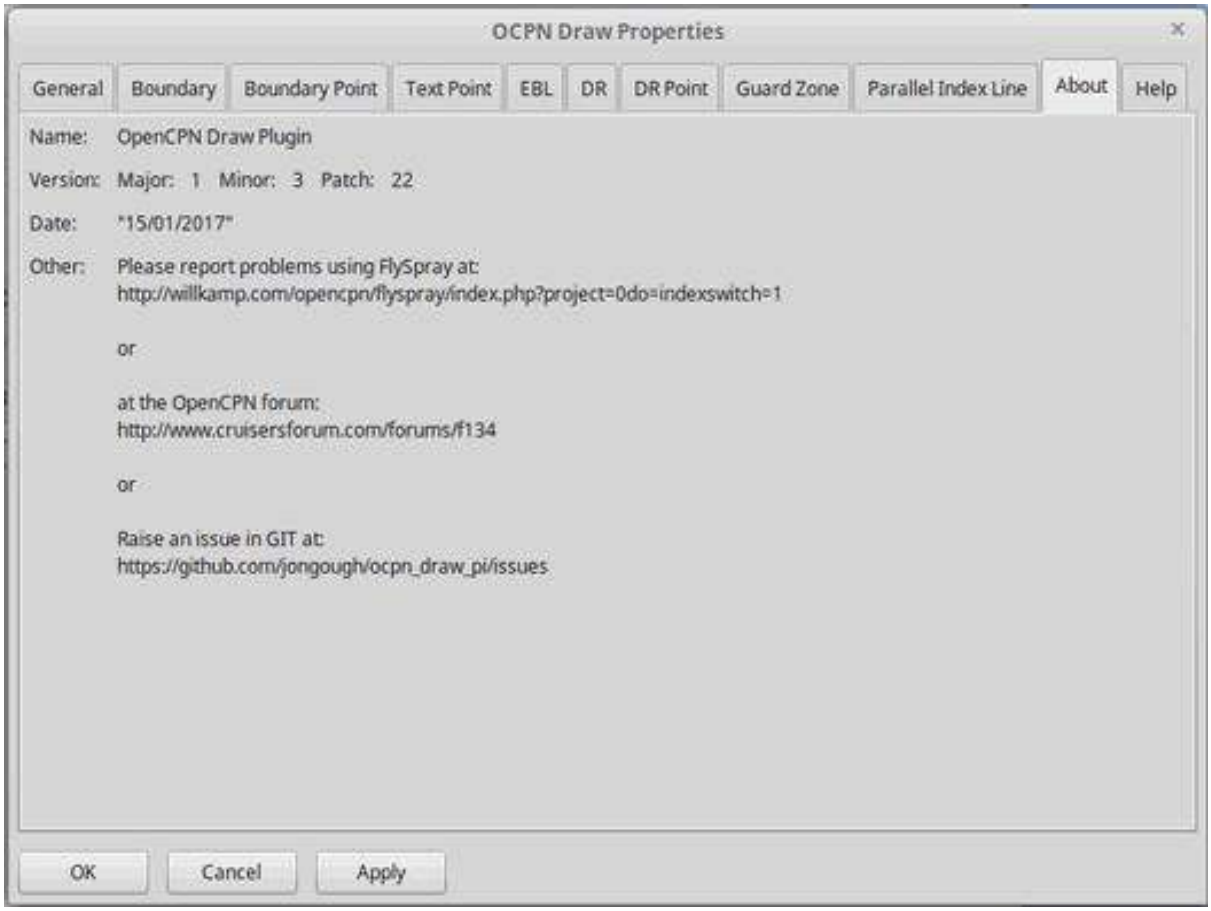
Dot Dash

Parallel Index Line Persistence

The EPILs that are created can be:

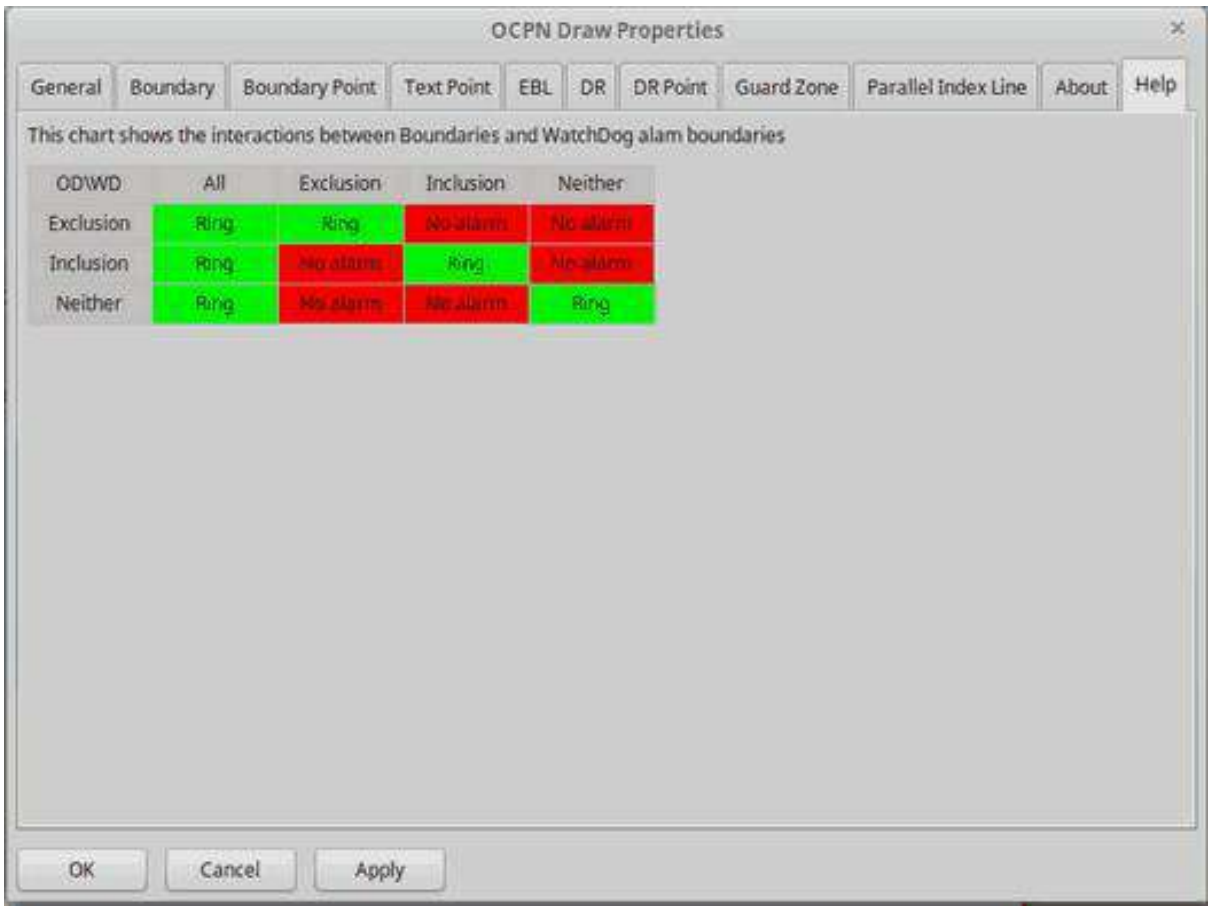
- Persistent - will persist over a restart of OpenCPN
- Persistent over Crash - will not persist over a normal restart of OpenCPN, but will be persistent over a crash of OpenCPN
- Never - the PIL will only be temporary and will not be displayed again when OpenCPN is restarted.

About



This page provides useful information in the event you have problems with the Plug In. Please provide the version number and the patch number with any reported incident. You should also provide the version number of OpenCPN as this will help identify where the issue may be.

Help



This page provides information on the interaction of this plugin with the Watchdog plugin. This shows when alarms should ring for various boundary types.

Interface at the Icon Toolbar

Fix Me! Orphanchecker found issues with links here. There was a lot of jibberish in the link. Found these images with a search. Don't know if they are right.

Draw Create (right icon)

The plugin has an interesting interface with two icons as shown above for ***Draw Manager*** and ***Draw Create*** . The right icon ***Draw Create*** is dynamic and will show a different icon depending on which drawing object type has been selected. Click on the right icon and a floating ***Draw Toolbar*** appears containing ***Draw Tools*** , with the last one used selected by

default (appears depressed). Select the ***Drawing Tool*** needed. 

Fix Me! Same thing here.
[[:opencpn:developer_manual:plugins:beta_plugins:plugins_under_development:od_toolbar.jp
id=opencpn:developer_manual:plugins:beta_plugins:plugins_under_development:odraw1.3_p
{{:plugins:beta_plugins:plugins_under_development:od_toolbar.jpg?nolink&309x81}}]] The above ***Draw Tools*** are for *Boundary*, then *Boundary Points*, *Text points*, *EBL*, DR, Guard Zone, and Parallel Index Line in that order. The Drawing Objects that are available are as follows:

- Boundary
- Boundary points
- Text points
- Electronic Bearing Lines (EBL) & Variable Range Marker (VRM)
- Dead Reckoning
- Guard Zone (GZ)
- Parallel Index Line (PIL)

Try drawing several of each type to learn how they work and what they create. You can select the next tool in sequence by right clicking the mouse prior to starting to draw. Once a left mouse click has been done the right click will terminate the 'create' drawing. You can also stop the 'create' mode by hitting 'Esc', left mouse clicking the selected tool in the main toolbar or by left mouse clicking on the close icon in the 'Draw Toolbar'. It sounds complicated, but you will find one of the methods should meet your normal usage requirements.

Each tool has a cursor icon:

- Boundary: Pencil
- Boundary Point: Red Cross
- Text Point: 'I' icon
- EBL: Red Cross and a line joining the cursor to the boat
- DR: Red Cross
- GZ: Pencil
- PIL: Red Cross

The DR tool does not draw based on the current cursor position, it brings up a dialog box that allows you to enter the DR information.

When you left mouse click 'OK' the DR line will be drawn based on the information you have entered. The information that is first displayed is the default information entered into the properties panel or the current information available to OpenCPN, i.e. SOG and COG.

Draw Manager (left icon)

The left Icon is for the ***Draw Manager*** which gives the user control over each of the *Drawing objects* that have been created from the **Draw Toolbar**. From the ***Drawing Manager*** menu

Path & Point Manager Tabs for *Paths, Ocpn Points, Layers* become available, and selected Drawing Objects can be *Shown, Hidden, Deactivated, Centered, Deleted, Exported, Delete All, and Export All.* Additionally a drawing object's ***Properties*** can be accessed and changed. First select one or more ***Drawing Objects*** under a given ***Tab*** . Then select the desired ***Action*** on the right. For example: Select all ***Drawing Objects*** under ***Paths Tab*** , then select ***Delete*** . This will remove all of the ***Drawing Objects*** under ***Path Tab*** . Of course the quick alternative is to select ***Delete All*** . ***Properties, Deactivate and Center View*** are greyed out when more than one object is selected.

Drawing Manager > Layers

Drawing Objects imported into Layers are static and non editable. Use Layers in the same way as the Route and Waypoint manager does, i.e. Temporary Layers. It will bring in boundaries and points and show or hide them as required. You can load more than one layer file into the same layer, just select more than one file in the file manager popup and they will load into the same layer. To use Layers and move Drawing Objects into a temporary user created Layer, select them, Export Selected and then from the Layer Tab Import.

Edit Mode for Draw Objects

First, to get out of the creative draw mode, click on the Draw Button or hit escape. Then in the drawing hover over the object you wish to modify until a square yellow descriptor appears, then right click. The popup menu's first line will identify the type of drawing object you have selected. Then there will be a action pick list, dependent on the object, such as Properties, Move.., Insert.. Deactivate.. Delete. Some drawing objects are made of several parts, (Boundary, Boundary Points, EBL & VRM, GZ and PIL) so it makes a difference where you hover and the condition of the object.
1. To select a Boundary, hover over the edges. To select a boundary point hover over it.
2. To select an EBL hover over the ends or the shaft, depending on whether the EBL is centered on a boat or lat/long the right click actions will be different. The popup menu list selections should be self explanatory.

When you have right clicked and selected an action, for example to move a boundary, text point or boundary point, the point will be highlighted with a yellow dot. Complete the move by dragging and releasing. For editing any characteristics such as color, line thickness, font, etc, use 'Properties', but if you just want to move a point select 'Move'. To move a point you will need to right click and select move. Having selected move you will then need to put the cursor over the selected object, push and hold the left mouse button and drag the object to where you want it. When you let go of the left mouse button the cursor (what ever it was showing before) should revert to the standard pointer and the 'move' process is terminated. If you want to move the object again, you will have to right click again to get the popup and repeat the process.

Edit Mode for Draw Object Properties

There are multiple ways to access an object's ***Properties*** .

- In ***Path & Point Manager*** double click on a Drawing Object, ***Properties*** will appear.
- In the Drawing hover over the Drawing Object, right click and pick ***Properties*** .

- In the Drawing hover over the Drawing Object, double left click, ***Properties*** will appear.

It is also possible to drill down into an object if it is multi-part, i.e. get a Boundary properties dialog displayed then right click or double click any line showing a Boundary point and the properties for that point will be displayed.

Constrained moves

When moving an object you can move it in any direction just by holding the left hand mouse button down and dragging. If you want to constrain the movement to horizontal or vertical you need to use the Ctrl key to only allow vertical movement or the Shift key to only allow horizontal movement. If you release the key whilst dragging the constraint is removed. You can press and hold one of the two keys at any time during the movement, the constraint only applies when the key is held down. Additionally, when used with EBL pressing Ctrl + Shift at the same time, will constrain the angle value and allow movement along the angle. This will also work when perpendicular line is checked.

Whole Boundary moves

A boundary can be moved as a single object or a single line of the boundary can be moved. The default action is to move the whole boundary, but you can select 'Move Boundary Segment' from the right mouse button popup menu.

Boundary merges

If you have two or more boundaries you can select these and merge the boundaries together. This is accomplished by hold the Ctrl key down then left mouse clicking on the boundaries you want to merge. Each boundary selected will flicker showing it has been selected. If you then right click on a boundary you will be presented with a merge popup. This will allow you to merge and keep the current boundaries, this draws a bounding boundary around the selected boundaries. If you select merge and delete you will draw a bounding box around the boundaries then the original boundaries will be deleted. There is no undo, so care needs to be taken.

Available Drawing tools

This section will describe in more detail the drawing tools that are available with this Plug In.

Boundary

This allows drawing of a closed path joining all points that of the path. The smallest Boundary has two points, but normal Boundaries will have three (triangle) or more points. There is no limit to the number of points, or the size of the Boundary. When drawing points that have already been placed will be connected togther with the path line. A rubber band line will be drawn that follows the cursor. The boundary fill may appear incomplete or strange at this point. However, when the final point is place and the create process is finished it will correct itself and display the boundary fill correctly.

If a point is placed in the wrong location carry on laying the other points. When you have finished the create process you can then edit the boundary and 'Move', 'Delete' or 'Add' more points to the boundary. If the whole boundary is in the wrong location it can be moved as a whole from the right mouse click menu.

The types of boundary you can draw, which can be easily changed after creation if it is wrong, are:

- Exclusion - The interior of the boundary will have a cross hatch pattern of the selected color. The type of boundary reported to other plugins, such as Watchdog, will be of type 'Exclusion'.
- Inclusion - A user defined width cross hatch pattern will be drawn around the outside of the boundary in the selected color. The type of boundary reported to other plugins, such as Watchdog, will be of type 'Inclusion'.
- Neither - The boundary will be drawn as a line with no interior or exterior fill. The type of boundary reported to other plugins, such as Watchdog, will be of type 'Neither'.
- Please Note that these Types (exclusion, inclusion, neither) are Graphical only, and WatchDog does not use them in setting its internal alarms. We recommend that these graphic types be used appropriately to conform with the type of alarm that will be set from within WatchDog, however they will have NO EFFECT on the WD alarm type.

The type of boundary may change what other plugins do with the information, or how it is displayed. If using the Watchdog plugin and you set the boundary anchor watch the alarm will go off if you move outside of the boundary. If you are motoring/sailing and you have a proximity boundary watch set then the alarm will go off if you get closer than the specified distance. The first type of boundary should be an 'Inclusion' boundary and the second should be an 'Exclusion' boundary.

Note: A Boundary is a line joining two or more Boundary Points together. As such, each Boundary Point can have the same capabilities as individual Boundary Points.

Boundary Point

This allows the placing of individual points on the chart. They are very similar to 'Marks' that can be dropped by OpenCPN. However, they have the capability of being 'Exclusion', 'Inclusion' and 'Neither' boundary points. This is demonstrated when **Range Rings are Displayed**.

- Exclusion - The interior of the boundary point, from the biggest range ring, will have a cross hatch pattern of the selected color. The type of boundary point reported to other plugins, such as Watchdog, will be of type 'Exclusion'.
- Inclusion - A user defined width cross hatch pattern will be drawn around the outside of the largest range ring of the boundary point in the selected color. The type of boundary point reported to other plugins, such as Watchdog, will be of type 'Inclusion'.
- Neither - The boundary range rings will be drawn as a line with no interior or exterior fill. The type of boundary point reported to other plugins, such as Watchdog, will be of type 'Neither'.
- Please Note that these Types (exclusion, inclusion, neither) are Graphical only, and WatchDog does not use them in setting its internal alarms. We recommend that these graphic types be used appropriately to conform with the type of alarm that will be set

from within WatchDog, however they will have NO EFFECT on the WD alarm type.

Boundary Points continue to be placed on the chart until the drawing create mode is terminated. This allows the placing of as many points with single mouse left clicks as the user wishes.

Text Point

This allows the placing of individual Text Points on the chart. They appear very similar to Boundary Points, but they allow the displaying of multi-line text in the desired font. They can have range rings, but these cannot be filled.

The text top left corner of the text is the reference point. There are 7 provided locations:

- Top - which puts the text over the top of the point aligned to the left edge of the icon with the bottom just clear of the icon
- Top center - which puts the text over the top of the point with the center of the text aligned to the center of the icon
- Bottom - which puts the top edge just underneath the point aligned to the left edge of the icon. If you displace the point name the text should drop enough to show it
- Bottom center - which puts the text underneath the point with the center of the text aligned to the center of the icon
- center - which puts the text horizontal and vertical center over the icon.
- Right - which puts the top edge aligned with the top of the icon, the left hand edge of the text just clear of the right hand side of the icon
- Left - which puts the top edge aligned with the top of the icon, the text to the left of the icon with the right hand end of the text box just clear of the icon

The amount the box edge is offset is controlled by 8 settings in the opencpn ini/conf file. You will find them called:
DefaultTextTopOffsetX, DefaultTextTopOffsetY
DefaultTextBottomOffsetX, DefaultTextBottomOffsetY
DefaultTextRightOffsetX, DefaultTextRightOffsetY
DefaultTextLeftOffsetX, DefaultTextLeftOffsetY

These are not in any dialog box as they are very unlikely to be modified.

Changing the font in the properties box does not apply the font until the OK button is pressed on the properties box. The word 'Example' should change to show you the font selected. I will look and see if I can make the background box a little bigger. The information for the size of the box is obtained from the system depending on the font used, so I may have to make that an attribute of either the font (may be difficult) or of the point itself. Changing the font in the properties box does not apply the font until the OK button is pressed on the properties box. The word 'Example' should change to show you the font selected.

When a Text Point is created the 'natural' scale at which it is created is stored. This is then used to determine what to show when scaling to larger scales. Currently at twice the natural scale the text gets hidden and at 8x the natural scale the text box gets hidden. This is currently hard coded.

To display text for the Text Point you will need to open the properties for the Text Point and

fill in the 'Display Text' tab. This is simple text and does not allow individual formatting of different parts of the text. You can pick the font and the font metrics to use for all the text associated with one text point.

EBL

The EBL always starts attached to the boat with the far end of the line being placed by left clicking the chart. The default action for the end point is set in the main properties dialog. The end point can either be fixed to a Latitude and Longitude or move along with the boat. This allows the EBL to show the boat moving against a fixed point, i.e. passing a reef, or to show other objects moving relative to the boat, i.e. when the boat can tack to get around a bouy.

The EBL can be detached from the boat to allow placing of the start point where the user left clicks. The EBL can also then have the start point centerd on the boat but not move or re-attached to the boat.

Variable Range Markers (VRM's) can be displayed as part of the EBL, by checking a box on the EBL properties (or set the default on the OD properties) and a range ring will be drawn based on the start point. If the end point of the EBL is moved the range ring will move with that point. This allows easily setting up of safety rings around a boat. The plugin provides additional information when moving the end point of an EBL/VRM

End Points A & B of an EBL can be in several states:
1. Associated with Boat position (boat lat long) - Moving with the boat.
2. Associated with a fixed position (lat long) - Not Moving with the boat.
3. When offset Point B is associated with Boat position (lat long) it moves relative to the boat position and stays at the same angle.

Right click selections for EBL are
1. When the EBL start point is attached to the boat… Pick a new start point.
2. When the EBL start point is not on the boat.. Center on moving boat or Center on Lat/Lon (not fixed to the boat)

This flexibilty is useful for DR to have “Fixed” EBL markers.

The default color is the same as for a 'Boundary Point' and it will draw 1 range ring. If you want to change that then you will need to get to the start point properties (double click the EBL and double click the first point), or if the first point is clearly visible, just go to its properties (right click the point and select properties) and you can change the number of rings, the colors (you cannot fill them at the moment).

The VRM color, by default is set to the same as the EBL, but once you change the VRM color to be different from the EBL then it will stay this way, unless you select the match option in the right click menu.

There are two ways of changing the VRM color:

1. Under properties for the EBL with the VRM showing. Change the EBL color and the VRM color will also change.
2. Under properties for the EBL with the VRM showing get the properties of the

'boat'/'start' point and change the color.

It may seem strange at first to use an EBL to give you the VRM, but it makes the coding/logic easier and allowed building on the 'path/point' concept that is at the heart of this plugin. From a user perspective it should make selecting the VRM easier so that it can be dragged to the size required as there is a well defined point that can be selected. This is particularly true if you have many VRM's at one time.

It is not necessary to loop through the *preferences* to enable the VRM for one EBL–the settings pop-up double clicking the EBL has all the necessary entries.

Reverse bearing has been added to the rollover popup for EBLs.

The main properties dialog in the general tab sets whether to use magnetic bearings or true. If magnetic is used then if you have the World Magnetic Model installed the variation will be used from that plugin. If not you will, currently, need to set 'UserMagVariation=0.00' in the ocpn_draw_pi section of the config file (there is no setting in the properties dialog for this yet). There is, currently, no way to get at the value set in the opencpn mainline properties that will work on all platforms which may require another plugin-api change to enable this to be made available.

DR

This draws a Dead Reckoning line with multiple points along it starting at the boats current location. As mentioned above, this tool does not use the mouse click to draw on the chart, rather it uses it to display a dialog box where the DR information can be entered. When the 'OK' button is clicked the DR will be created and drawn on the chart. At this point the line can be modified by changing the points that make it up. However, this may make the DR line not reflect what you expect as neither the time/distance between points is maintained, nor is the COG/SOG. So the DR line at that point becomes more of a line with possibly little meaning in the context of DR.

Guard Zone (GZ)

This draws a segment of a torus or doughnut. The centre is the boat and the angle and size is determined from the two points that are used to describe the GZ. When the GZ tool is selected the cursor will change to a pencil and a line will join it to the centre of the boat. When the left mouse button is clicked the first point of the GZ is dropped. Now when the mouse pointer is moved an angular segment of a torus is drawn, the size of which is determined based on where the mouse cursor is. The second point is dropped when the left mouse button is clicked. This completes the drawing of the GZ which will now be the default colour and filled in with a hatch of the default colour.

Parallel Index Line (PIL)

Annex to IMO res.A893(21)-Guidelines For Voyage Planning. Section 4- Appraisal

- “Additional information which should be marked on the charts include: ….. Parallel index lines should also be drawn where appropriate.”

Annex to IMO res.A893(21)-Guidelines For Voyage Planning. Section 6- Monitoring, point (j)

- “Radar can be used to advantage in monitoring the position of the vessel by the use of parallel indexing, which is a simple and most effective way of continuously monitoring that a vessel is maintaining its track in restricted coastal waters. Parallel indexing can be used in any situation where a radar-conspicuous navigation mark is available and it is practicable to monitor continuously the vessel’s position relative to such an object. It also serves as a valuable check on the vessel’s progress when using an electronic chart.”

This allows drawing a line which offset from a centre line by a specified amount. This offset line will move with the boat and can either rotate with the boat or stay at a specified angle. Drawing a PIL is the same as drawing an EBL. The index line only shows up when the centre line has been drawn.

Each PIL centre line can have multiple offset lines. To create more than the first line right click the centre PIL line and select 'Add Index Line'. A new index line will be drawn based on the default settings.

End Points A & B of an PIL can be in several states:
1. Associated with Boat position (boat lat long) - Moving with the boat.
2. Associated with a fixed position (lat long) - Not Moving with the boat.
3. When offset Point B is associated with Boat position (lat long) it moves relative to the boat position and stays at the same angle.

Right click selections for PILL are
1. When the EBL start point is attached to the boat… Pick a new start point.
2. When the EBL start point is not on the boat.. Center on moving boat or Center on Lat/Lon (not fixed to the boat)

The offset line has its own properties box which can be accessed by either right clicking the offset line or by double left clicking the offset line.

Each offset line can be moved using either left drag (if enabled) or right clicking the line and selecting move.

How to use PIL Good Parallel Index Line video link[537]

How to plot for Collision Avoidance Collision Avoidance Plotting Part1 of 3[538]

Properties dialogs

All objects that have been drawn have a properties dialog associated with them to allow changing of the objects attributes.

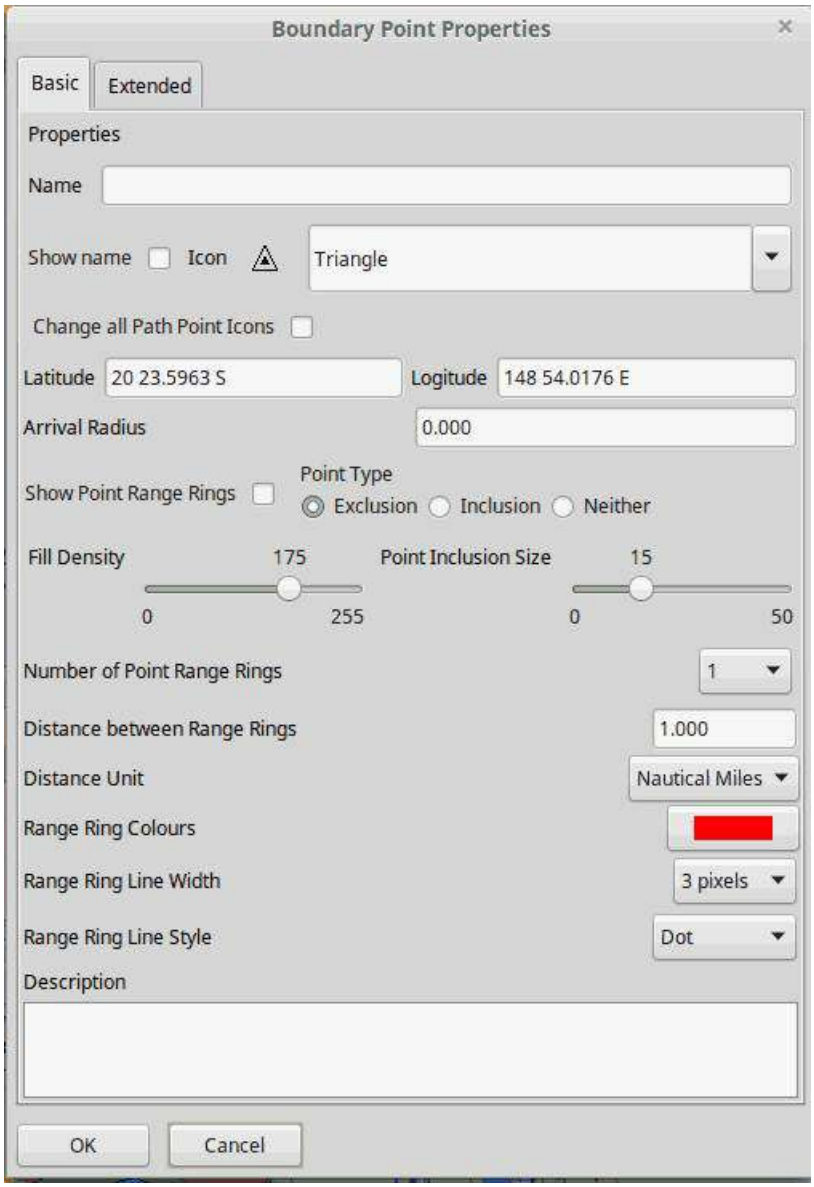
Boundary Properties

You can display the point properties by either double left mouse clicking on the particular line you want in the Points list or by right mouse clicking on the line, once it has been selected, and selecting 'Boundary Point Properties' from the popup menu. If you want to

remove a particular point then left click the line to select it. Then right mouse click on the point and select 'Remove Selected' from the popup menu.

Boundary Point Properties

Basic



These are the properties for the selected Boundary Point. Any changes here will be made to the selected Boundary Point and, if the 'OK' button is clicked, will be preserved over a restart.

Extended

This allows you to stop displaying the Boundary Point on the screen and change the GUID if you want. You will need to click 'OK' to save the changes.

Text Point Properties

Basic

This tab controls the text that is displayed for the Text Point. Any changes here will be made to the selected Text Point and, if the 'OK' button is clicked, will be preserved over a restart.

Extended

This is the same as for a Boundary Point

You can display the point properties by either double left mouse clicking on the particular line you want in the Points list or by right mouse clicking on the line, once it has been selected, and selecting 'EBL Point Properties' from the popup menu.

If you want to remove a particular point then left click the line to select it then right mouse click on the point and select 'Remove Selected' from the popup menu.

EBL Point

Basic

These are the properties for the selected EBL Point. Any changes here will be made to the selected EBL Point and, if the 'OK' button is clicked, will be preserved over a restart.

Extended

This is the same as for a Boundary Point.

DR Properties

These are the properties for the selected DR Point. Any changes here will be made to the selected DR Point and, if the 'OK' button is clicked, will be preserved over a restart.

Extended

This is the same as for a Boundary Point

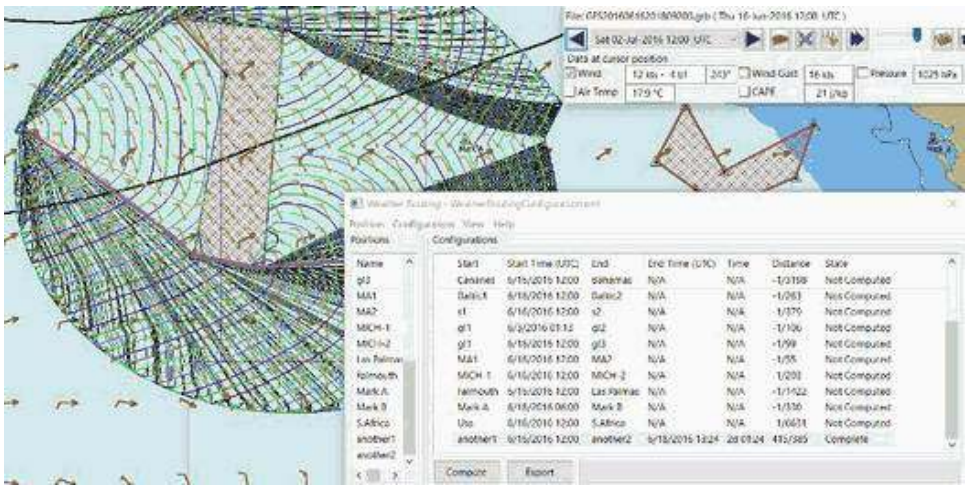
>Possible Future Improvements:

Match
It might be nice to have a way to “match” a text entity which is a way of copying all the font, color, background color and transparency information. To clone the properties of an object and not necessarily the object itself. So, the idea is to copy some of the attributes, colour, text, icon from one point to another, but leaving the lat, lon, GUID, name? remember the “the change all icons for boundaries” you have implemented already.

Copy and paste Lat/lon point
Code for copying a point (text, boundary, etc.) exists already, there just isn't a way to execute it, i.e. it needs new menu item to allow the creating of a point based on the current point.

Examples

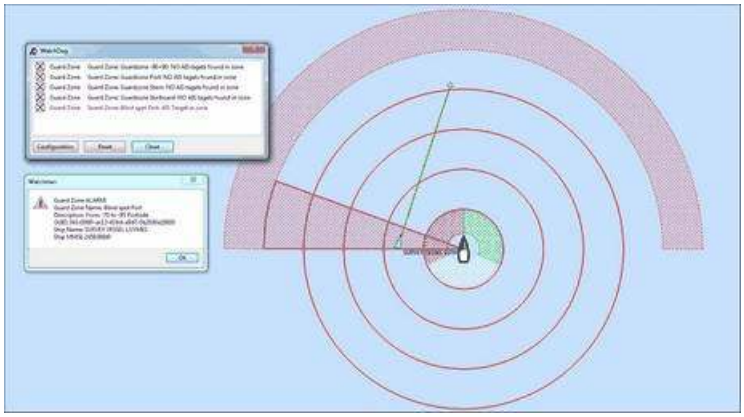
Weather_Routing_pi



Red hatched Boundary created with Ocpn_Draw and used in Weather Routing Configuration > Options > Basic Tab > Check “Detect Boundary”

WatchDog_pi

You can set up multiple Dynamic Guard Zones and set the alarms for one, some or all of these zones.



(Dynamic) Guard Zone Alarms are in some ways similar to the “AIS Collision Alarm” you can set in OpenCPN (Options-Ships-AIS Targets-CPA Calculation). But they are more versatile.

Croatia Anchorages Script

Jobe39 has created a Simple Python File to convert gpx file from http://www.anchoragesincroatia.net/p/map-download.html[539] for the OpenCPN draw plugin.

See Github repository[540]

Also see Feature Request - Import GPX files for anchorages in croatia #386[541] for information about the process.

FAQ

Why can't EBL lat/long be copied or changed?

The EBL is really defined as a length and direction from a starting point, the default being the boat. The ODPoints that are used are to enable moving the end points to a user selected location, which really translates into a length and direction. If you fix the end point, i.e. it does not move with the boat (a check box is available for this in the properties) then the end point lat/lon is stable and does not change, this allows the user to then input the lat/lon they wish. If they then allow the end point to move, uncheck the check box, it will use the new lat/lon as the starting point for the EBL.

Copying the lat/lon of a moving point would probably not give you the answer you were hoping for. As the end point changes as the boat moves and rotates, the real life probability of getting the lat/lon you thought you would is unlikely. The way of showing that the lat/lon is changing is by making these fields read only, i.e. you cannot interact with them in any way, so there is no way to get the event for copying them. This is a restriction on the current implementation of wxWidgets.

SAR

Links

- Source: https://github.com/SaltyPaws/SAR_pi[542]
- Forum: Website Download[543]
- Download: Website Download[544]

SAR-plugin (SAR = Search And Rescue)

This document is about SAR-plugin (SAR-pi). The plugin is developed by SaltyPaws, based on the (external) software “SAR Search patterns” by Andres Ruiz González.

This document is by no means meant to replace official SAR-manuals like the IAMSAR (International Aeronautical and Maritime Search and Rescue) Manual.

The sole purpose of this document is to explain SAR-pi so that you can use that plugin in OpenCPN.

- **What and Why**
  - What does SAR-pi do?
  - Why should I want it?
- **First things first, choose the right search-pattern**
- **Terminology**
- **On-scene coordination**
- **Initiation of search**
- **On-board preparation**
- **Installation**
  - Downloading

    - Installing
    - Enabling
- **Search Patterns**
- **Standard Actions**
    - Top half of the window
    - Bottom half of the window
    - How to use the SAR-pattern in OpenCPN
- **Operation**
    - SAR: Trackline (Parallel Search)
        - Parallel Search with 2 ships
    - SAR: Expanding Square
    - SAR: Sector Search
    - SAR: Oil Rig
- **Survival times**

What and Why

What does SAR-pi do?

SAR is a plugin that can generate different types of Search and Rescue-patterns directly from within OpenCPN.
You can save these patterns as GPX-files.

These GPX-files can then be loaded in OpenCPN and used as routes to follow in order to perform an efficiënt search and rescue-operation.

Note: In this document “Search And Rescue will be shortened to “**SAR**”.

Why should I want it?

When a SAR-operation is necessary, there is absolutely no time to lose.

It can be a fellow sailor who is in distress, or a loved-one who fell overboard during a dark and rough night.

It is very important that your search operation is as efficiënt as possible. Meaning that -with the required speed-, you cover a maximum of the search-area in a minimum of time. In order to achieve that, it is best to follow certain patterns. These search-patterns have proven to give the best results for certain conditions.

When the need arises, you can start thinking about making a search pattern. And then you have to actually lay out that pattern as a track or route to follow. But that will take you some time and it requires clear thinking. And especially in those situations “clear thinking” is challenged by a lot of other worries on your mind.

Let SAR-pi do the work for you!

Note: in most circumstances SAR-operations are coördinated by the Coast Guard or other professional search and rescue-organisations. These operations are coordinated and executed by highly trained specialists and follow specific rules and procedures.

This manual is meant primarily for situations where you are all on your own and you are the first (or only) ship in the vicinity.

First things first, choose the right search-pattern.

There is no time to lose, so choose a search pattern that is best suited for the situation.

In short:

Choose Parallel track search:

- **to search a large area when the location of the search object is uncertain.**

Choose Expanding Square Search:

- **when the location of the search object is known within relatively close limits;**
- when searching for **persons in the water or other search objects with little or no leeway**.

(but keep in mind: this procedure is **less suited to be used simultaneously by multiple vessels)**

Choose Sector search:

- **when the position of the search object is accurately known and the search area is small.**

(but keep in mind: this procedure is **less suited to be used simultaneously by multiple vessels)**

Choose Oil Rig Pattern:

- when you want to search just **one quadrant relative to a fixed position**.

Terminology

Nobody is eager to get involved in a situation that necessitates a SAR-operation. Not as the object that has to be found and not as a vessel that participates in the SAR-operation. But if you do, you will have to understand that one of the keys to a successful operation is coordination and the avoidance of miscommunication. That involves understanding some specific terms and abbreviations.

- **SRU**: Search and Rescue Unit (for instance: your ship).
- **Search Area**: the area most likely to contain the search object.
- **Datum**: the Datum is the most probable location of a search object, corrected for movement over time (drift).
  So that's the place we would normally begin our search.
- **Search Leg**: a Search Leg is the long leg of a parallel search pattern.

- **Cross Leg**: a Cross Leg is a connection between two search legs of a parallel search pattern.
- **Sweep Width**:the distance an SRU should be able to detect the search object on either side of the leg.
  Sweep Width will be affected by the height of the observer and the weather-conditions. A clear day and calm sea will give a larger Sweep Width than a stormy night.
- **Leg Spacing**: the distance between two parallel Search Legs.
  That distance should be no more than 2x Sweep Width.
- **RCC: Rescue coordination centre**. A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.The RCC normally assigns a **SMC**.
- **SMC: SAR Mission Coordinator**. The official temporarily assigned to coordinate response to an actual or apparent distress situation. The SMC can assign an **OSC**.
- **OSC: On-scene coordinator**. A person designated to coordinate search and rescue operations within a specified area.
- **CSP: Commence Search Point**. Point, normally specified by the SMC, where a SRU is to begin its search pattern.

On-scene coordination

When two or more SRU's are working together on the same mission, one person on scene may be needed to coordinate the activities of all participating SRU's.

The person in charge of the first SRU to arrive at the scene will normally assume the OSC function until the SMC arranges for that person to be relieved.

The OSC is normally a person in charge of a:

- ship or aircraft participating in a search, or
- nearby facility in a position to handle OSC duties.

Initiation of search

- **When a SRU arrives on-scene in advance of the others, it should proceed directly to datum and commence an expanding square search**.
- If possible, **datum may be marked by putting over a liferaft or other floating marker with a leeway similar to that of the search object, as a check on the drift**.
- This can then be used as a datum marker throughout the search.
- As other SRU's arrive, the OSC should select one of the search patterns, as appropriate, and allocate search sub-areas to individual SRU's.
- In good visibility and with sufficient SRU's, the OSC may let the first SRU continue its expanding square search while the others conduct a parallel track search through the same area.

In restricted visibility, or if sufficient SRU's are not available, it will probably be better to have the first SRU break off the expanding square search and be available for initiation of a parallel track search.

On-board preparation

Search patterns are for the “S”-part of SAR. But let's not forget the “R”-part (after all, that “R”-part is the one and only reason for the “S”-part). So prepare yourself to do what has to be done once the search proves succesful. That will probably be:

- assisting distressed craft and/or
- recovering people from survival-craft or from the water.

Be aware of drift!

Precise search pattern navigation using high-precision methods such as GPS-systems will produce good patterns relative to the ocean bottom, **but not relative to the drifting search object**. This could allow the search object to drift out of the search area. **Therefor the currents and other forces affecting the search object's drift during the search should be taken into careful consideration**. If a smoke float or other highly visible, expendable object is available, it should be deployed at datum and the pattern should be performed relative to it.

Be aware of the risks involved!

Vessels proceeding to assist should assess the risks they may encounter on scene, including the risks such as those associated with leaking cargo, etc. Information should be sought as necessary from the distressed craft and/or from the RCC or, if no RCC is involved, the OSC.

Now you're ready to read on….

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Installation

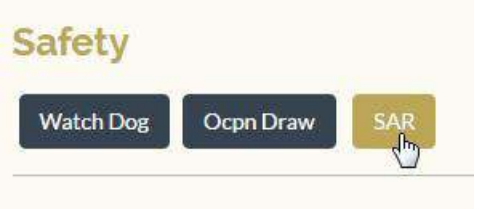
Note: In this section the instructions are specifically for SAR-pi, but there is a dedicated page in the manual with information about Downloading, Installing and Enabling Plugins in general. That dedicated page can be found here: Plugins-Install and Enable.[545]

Downloading

SAR-pi can be downloaded from http://www.opencpn.org/index.html[546]

Click “**Downloads**”

Click “**Plugins for OpenCPN 4.2 & 4.4**” Look for “**SAR**””



Installing

How to install the plug-in.

Make sure you choose the file that is compatible with your computersystem. In this manual we presume it's Windows, so we choose the Windows setup-package. Download the file (double-click). We assume you know where to find the files you download from the Internet (if you don't: quit now and read the manual of your computer before doing anything else with it). Double-click the downloaded file and follow the set-up instructions. That's it. But before you can actually use the plug-in, you first have to enable that plug-in in OpenCPN.

Enabling

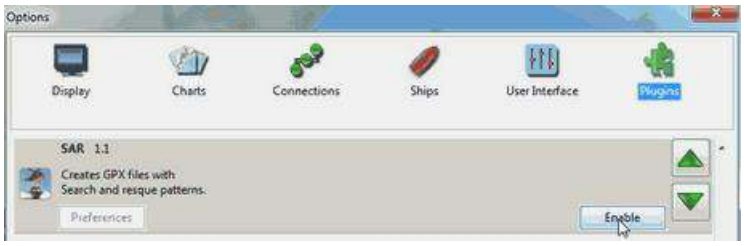
Enabling the plug-in in OpenCPN.

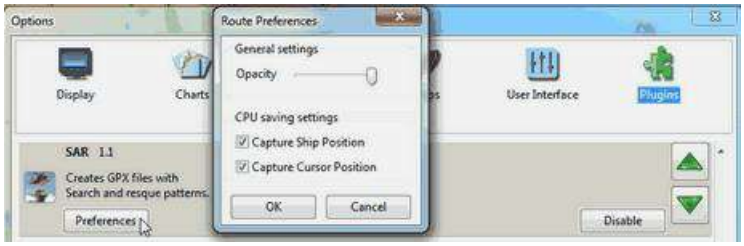
Open (or restart) OpenCPN.

Click **Tools-Options-Plugins**.

Scroll down untill you see the **SAR**-pi.

Click "**Enable**" and then "**Preferences"**.



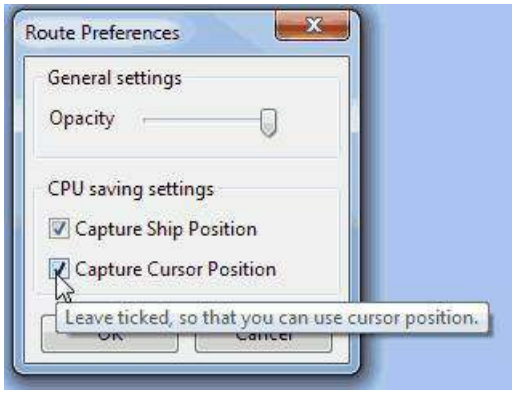


Preferences

The list of preferences is simple:

- A slider to set "Opacity"
- A tick-box to toggle "Capture Ship Position"
- A tick-box to toggle "Capture Cursor Position"

It's best to leave both checkboxes ticked, so that SAR-pi can use your ship's position or your cursor's position as a starting-point for the SAR-patterns.



Click “OK” to exit the “Route Preferences” screen and then “OK” to exit the “Options” screen.

Now the SAR-pi icon should appear somewhere in your OpenCPN Toolbar.

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Search Patterns

The ability to quickly deploy efficient search and rescue patterns is relevant since no matter how developed our means of transportation may get, the possibility of an emergency arising due to an accident or other reasons can never be ruled out. Specific SAR patterns have been worked out to deal with maritime emergencies. These various search and rescue patterns will be explained below.

Types of Search and Rescue Patterns

SAR-pi can generate 4 different types of SAR-patterns. They are:

- “SAR: Trackline” (**Parallel** Search),
- “SAR: **Expanding Square**”
- “SAR: **Sector** Search”
- “SAR: **Oil Rig Pattern**”.

In the section “**Operation**” we will explain the patterns in some more detail.

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Standard actions

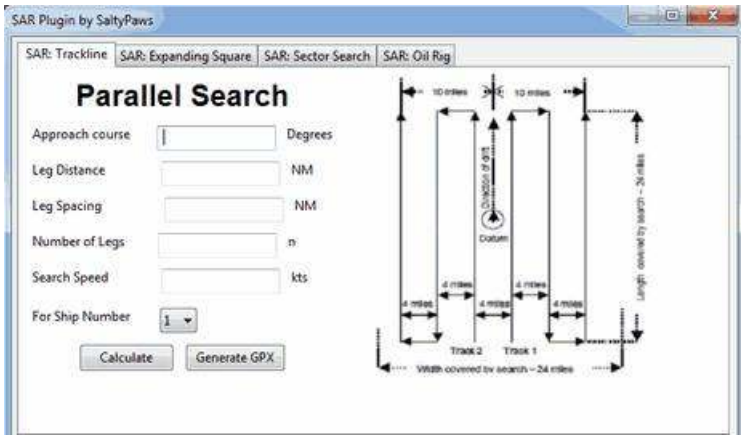
Click the **SAR-icon** in the Toolbar

Choose the desired search pattern. In this example: SAR: Trackline.

The plugin has a window with two sections: the top half and the bottom half.

Top half of the window

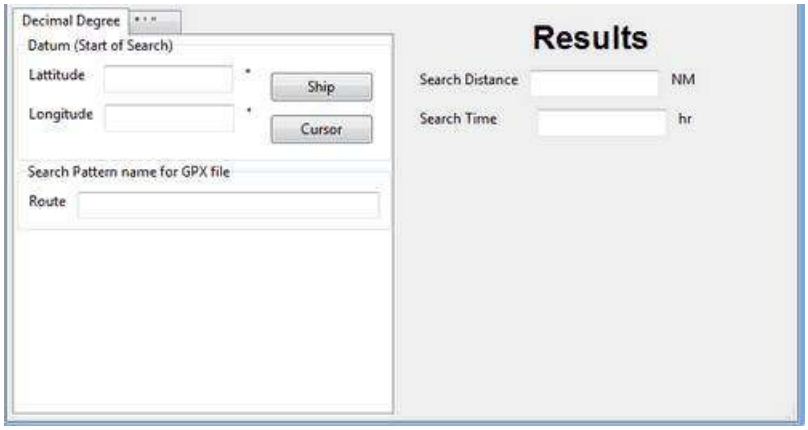
Here you can set the type of search-pattern. In this screenshot a pattern of the type “Parallel Search” (“Trackline”) is chosen.



In each search pattern you can enter several parameters, for instance the search speed. They will be explained in more detail in the specific section for each type of pattern There are also buttons to calculate the distance and time of the search pattern and to generate a GPX-file for that pattern.

But before you generate the GPX-file, go to the bottom half of the window.

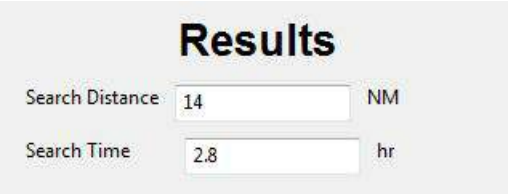
Bottom half of the window



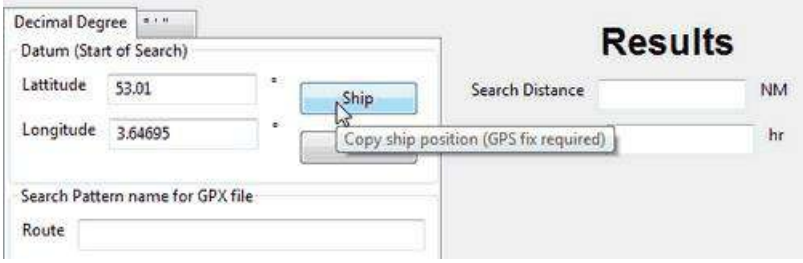
The **bottom half of the window** is for entering the start-position of the search pattern and for showing the results (the distance of the calculated search pattern and the time it will take to

complete that pattern). You can also enter a name for the search-pattern (Route).

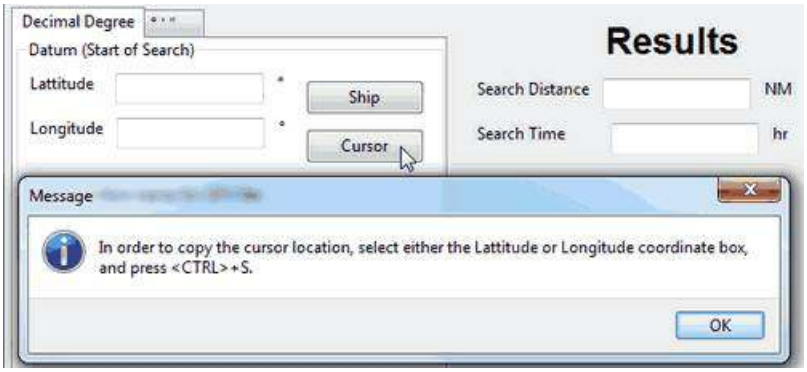
When the parameters for the search-pattern are entered, you click "**Calculate**" and find out that (in this example) the pattern will cover 14 NM and will take 2.8 hours to complete.



If you want the search pattern to start at your **ship's** position, you go to the bottom half of the window and click "Ship".



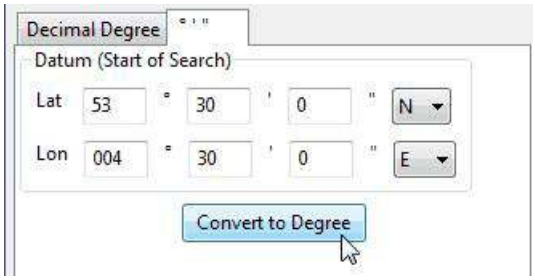
You can also use the position of your **cursor** on the screen. For instance when you are still some distance away from the area where the search has to take place. A message will pop up to tell you to select either the Lattitude or the Longitude coordinate field and press Ctrl+S.



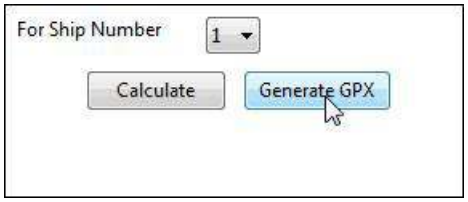
A third option is to enter latitude and longitude of the starting position by hand.

For example: you hear a MAYDAY of a ship that is sinking in position 53 degrees 30" North / 004 degrees 30" East.

Fill in 53, 30, 004, 30 and click "Convert to degree".



Now click “Generate GPX”.



We save the file in a map where we can easily find it. For instance in a map “SAR”.

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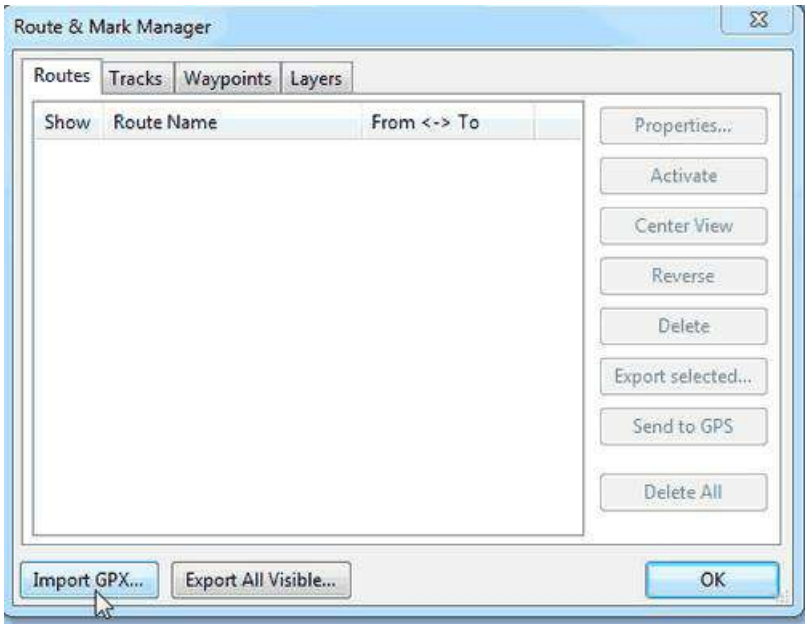
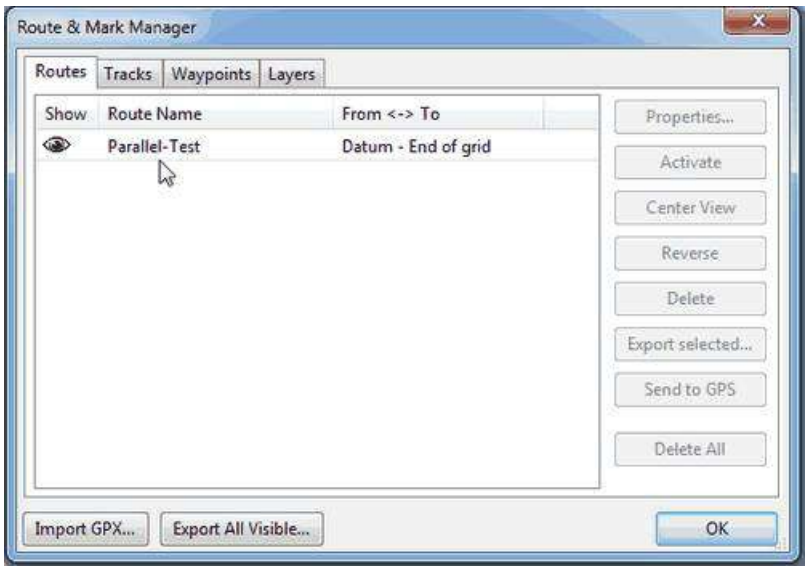
How to use the SAR-pattern in OpenCPN

Go in the OpenCPN Toolbar to “Route & Mark Manager” and import the GPX-file as a route.



The search pattern will show up as a new route. Make sure it is “visible” (the “eye” should be open).



The standard actions can be summed up as:

1. Choose the desired search pattern “SAR: Trackline” (Parallel Search), “SAR: Expanding Square”, “SAR: Sector Search” or “SAR: Oil Rig”.
2. Enter the parameters.
3. Click “Calculate” to find out how long the search track will be in nautical miles and how long it will take you to complete that search.
4. Click “Generate GPX” to generate a GPX-file of the search pattern.
5. Open “Route and Mark Manager”
6. In the “Route” tab, Click “Import GPX”
7. Find the GPX-file you just generated and click “OK”.
8. The search pattern will appear on your screen and can be used as a route.

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Operation

"SAR: Trackline" (Parallel Search)

Keywords:

- LARGE AREA
- POSITION OF SEARCH OBJECT APPROXIMATE
- UNIFORM COVERAGE DESIRED
- SEARCH LEGS PARALLEL

Parallel Search:

- is used to search a **large area when survivor location is uncertain**.
- is usually used when a large search area must be divided into sub-areas for assignment to individual SRU's on-scene at the same time.
- has search legs with their longest side oriented true north or, when drift has to be considered, oriented in the direction of the drift line.

- can be undertaken with one or more vessels (preferably with at least two ships).

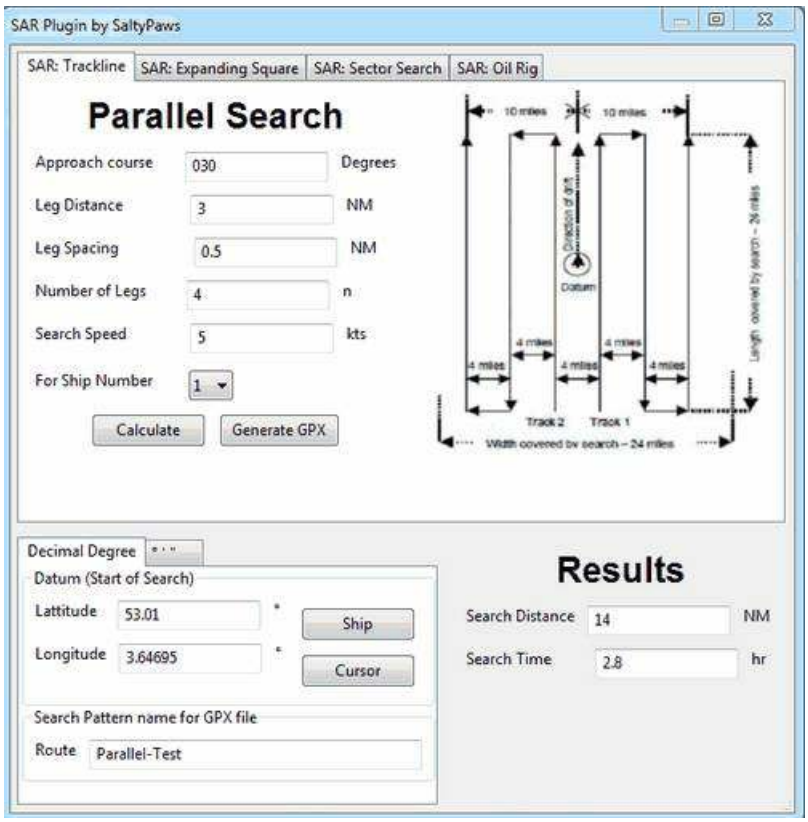
Risk with restricted visibility

A parallel track search in restricted visibility poses problems because of the following considerations:

- desirability of reducing the interval between SRU's as much as possible consistent with safety resulting loss of search area coverage;
- potential risk of collision

Setting up a "Trackline (Parallel Search)"-pattern.

Click the SAR-icon in the Toolbar Choose the desired search pattern. In this case: SAR: Trackline.



Now we have to enter the parameters (“TAB” will bring you to the next field). In this example we have set up a Parallel Search pattern for ship number 1 with the parameters as described in the previous screenshot.

That is:

- Approach Course = 030 degrees
- Leg Distance = 3 NM
- Leg Spacing = 0.5 NM
- Number of Legs = 4
- Search Speed = 5 knots

“Approach course”

The Approach course is the direction you want the “legs” to point. Normally this will be the direction of the drift or, if no drift has to be taken into account, true north. In the following example we have entered 030 degrees (roughly Nort-East).

“Leg distance”

This is the length in nautical miles of each leg.

“Leg spacing”

This is the distance in nautical miles between two (parallel) legs.

Note: when the lookout is positioned high above the water, for instance in a crow's nest, the lookout has a better view and can see object further away than when he would be positioned low above the water. In such cases the distance between the legs can be greater than when the lookout is low above the water. See also the explanation of “Sweep Width”.

“Number of legs”

This the number of legs you want to use in the search pattern. The higher the number, the more legs and the longer the search pattern.

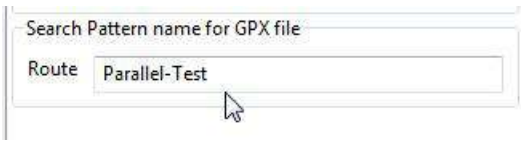
“Search speed”

This is the speed of the searching ship. **Note**: the higher the speed, the greater the distance you can cover in a given time. But high speed might also result in a bigger risk of passing the position of the searched object without noticing that object.

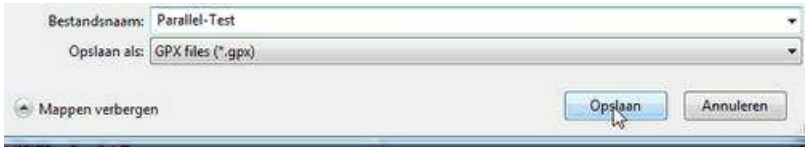
“For ship number”

You can set a search pattern for 1 ship or for two ships. If you choose “1”, the search pattern will be for ship number 1. If you choose “2”, the search pattern will be for ship number 2. It will have the same starting position (Datum) as the search pattern of ship number 1, but the pattern will be positioned on the opposite side.

We use the position of our cursor as the starting point (as described under “Standard Actions”) and we enter a name for the patter. In this example: Parallel-Test.

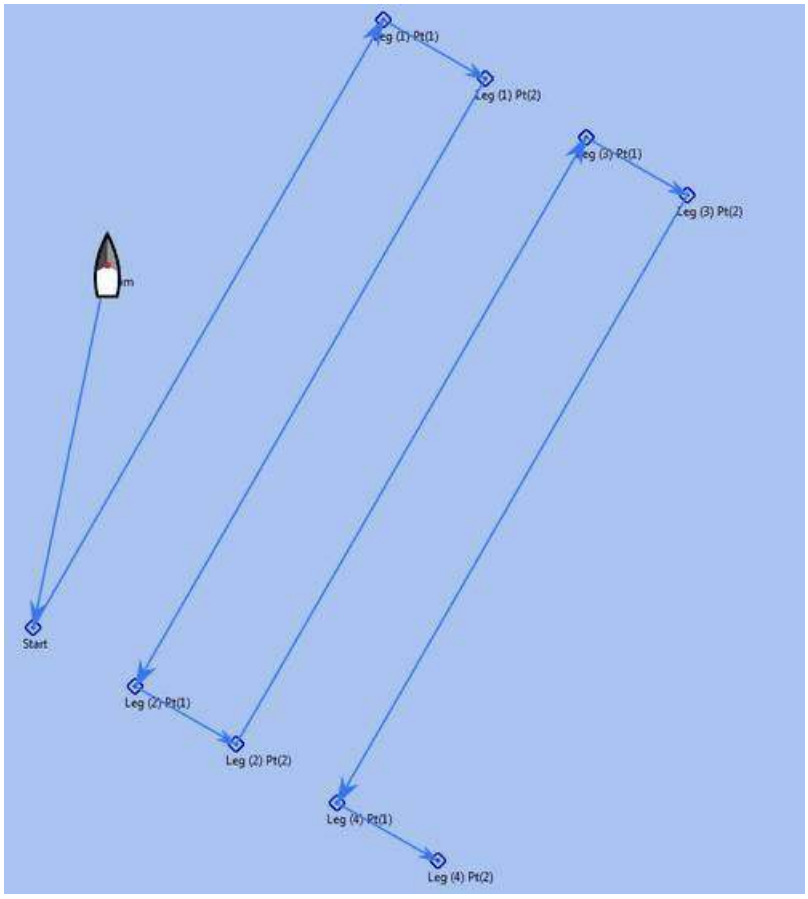


Back in the top half of the window we click “**Generate GPX**” and save the GPX-file (as described under “Standard Actions”).



Note: for some reason the system saves the GPX-file with a double gpx-extension.

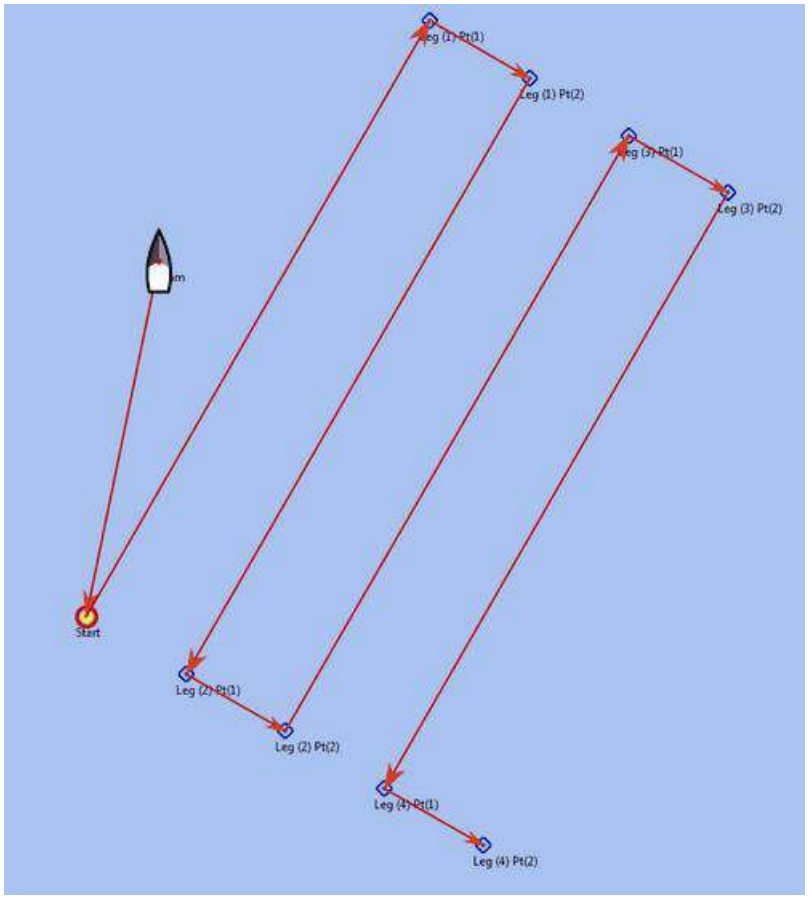
In OpenCPN we open the GPX-file as a route (as described under “Standard Actions”) and this is the result.



The pattern has 4 legs, 0.5 nm apart from each other and the first leg is orientated in the direction 030.

Activate the route and start your SAR-operation!

Note: in these screenshots the “own ship”-icon is pointing upwards (away from the starting-point). In real live it would mean you would have to turn over port to proceed to go “back” to the starting point.



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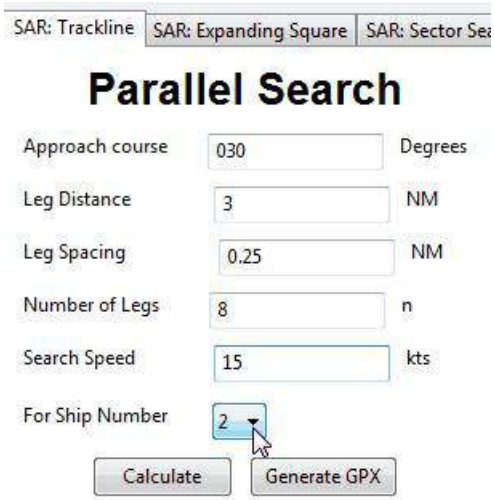
Parallel Search with 2 ships.

If there are two ships participating in the search, you can repeat the proces for “ship number 2”. That second pattern can use other parameters than the pattern for ship number 1. In the following example we assume the “mothership” launches her (faster) RIB.

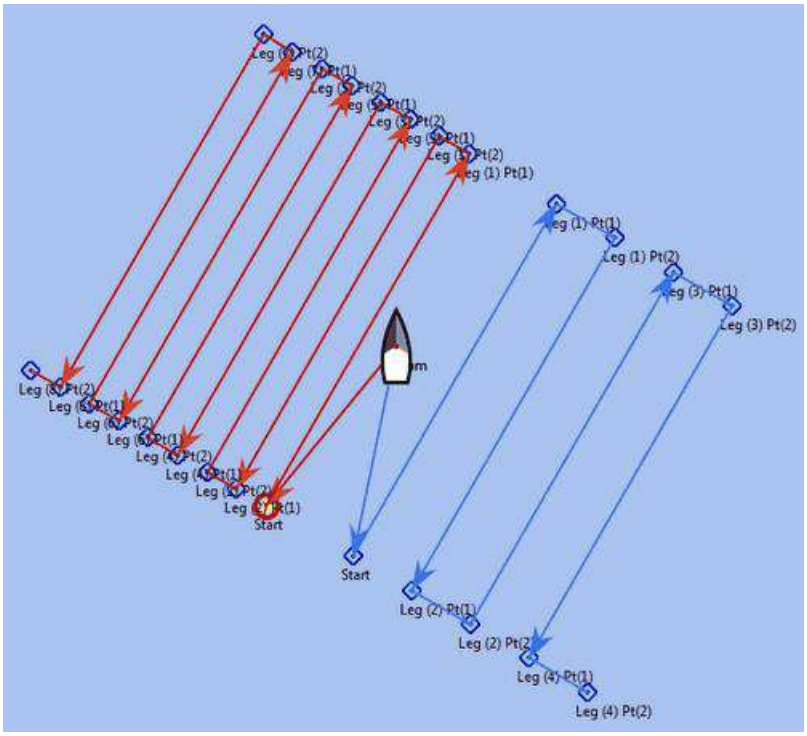


Let us assume that ship number 2 is a RIB that can easily cruise at 15 knots. We set that as

the Search Speed. And as that ship is faster, she can cover a larger area in the same amount of time. So we can afford to set the Leg Spacing to a shorter distance. Say 0.25 NM. And we can double the Number of Legs to 8.

Repeat the process of creating the GPX-file, saving it and opening it as a route in OpenCPN.

This is the result with both of the GPX-files loaded. The search-pattern for ship number 2 is on the opposite side of the starting-position.



Note: Suppose there are two ships. One is the relatively big and slow but comfortable mother-ship with her well-equipped navigational area (and of course OpenCPN plus SAR-plugin). The other ship is the small and fast but very uncomfortable RIB that's speeding towards the search-area. Now it is possible to generate the SAR-patterns in the relative comfort of the mother-ship (or even from a shore-based station) and then send the generated GPX-file(s) via email to one or more other ships. Like that RIB. There that GPX-file can be received (and used!) on a mobile phone that has OpenCPN for Android!

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"SAR: Expanding Square"

Keywords:

- SMALL AREA
- FIRST SEARCH LEG IS EITHER DIRECTION OF DRIFT OR TRUE NORTH
- ALL TURNS ARE 90º TO THE RIGHT
- TRACK SPACING DETERMINES 1ST AND 2ND LEG THEN ADD ONE TRACK SPACING EVERY OTHER LEG

Starting at the probable location of the target, the search vessels expand outward in concentric squares.

This pattern is the most effective pattern **when the location of the search object is known within relatively close limits**.

The commence search point is always the datum position.

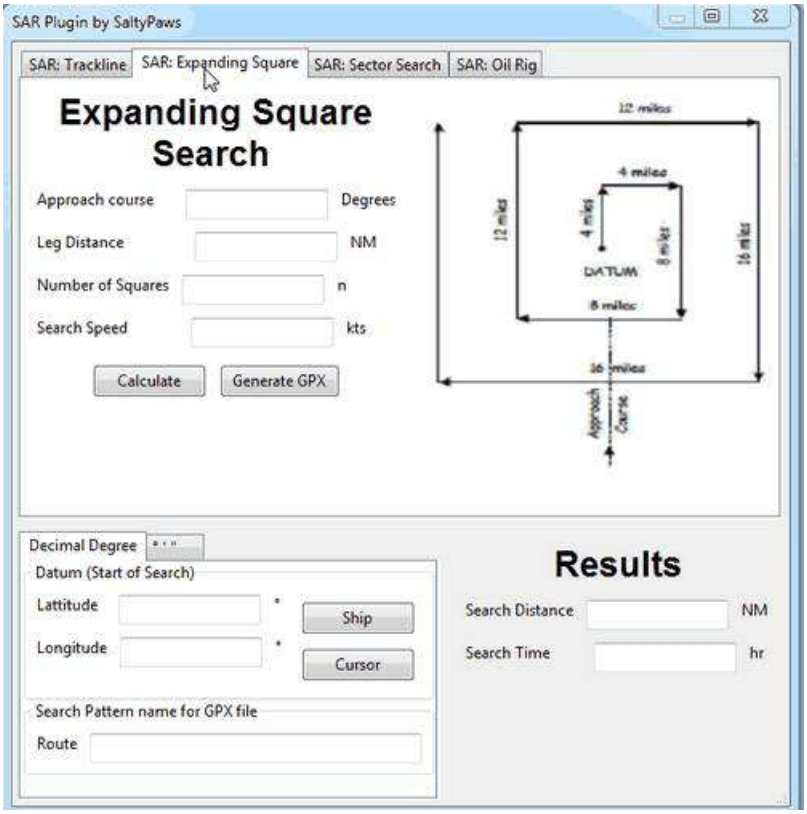
Expanding square search is often appropriate for vessels or small boats to use when searching for **persons in the water or other search objects with little or no leeway**.

Due to the small area involved, this procedure is **less suited to be used simultaneously by multiplevessels**. Accurate navigation is required; the first leg is usually oriented directly into the wind to minimize navigational errors.

Setting up a "Expanding Square" search pattern.

Click the SAR-icon in the Toolbar Choose the desired search pattern. In this case: SAR: Expanding Square.

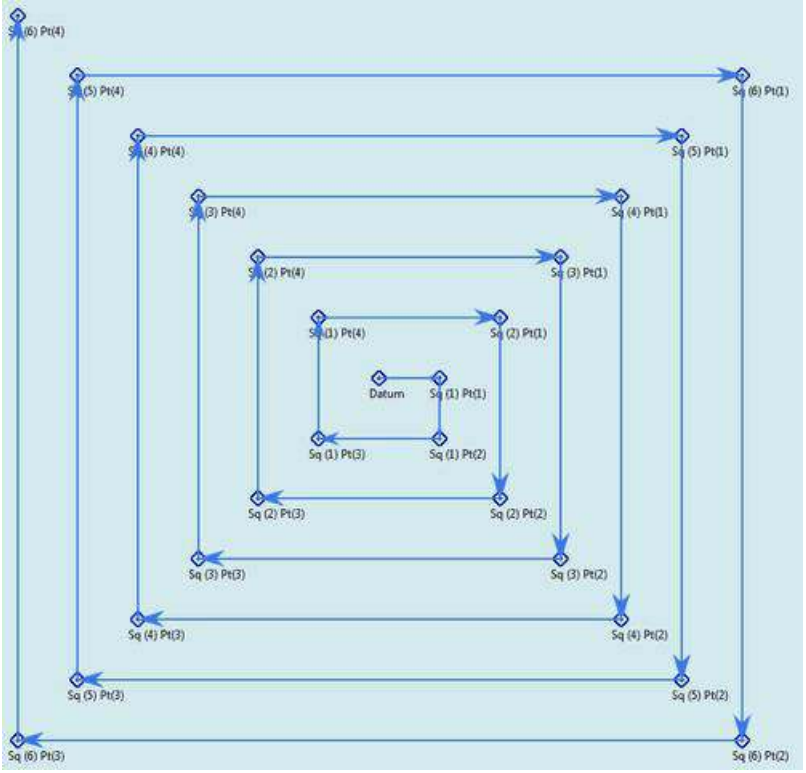
The parameter-window shows these fields:



The approach-course should be set in the direction of the drift, or else to 000 (true North). The rest should be easy to understand, so we will not explain this further. Example: (insert screenshot sar_exp_sq_02a.jpg)

Following the steps described in “Standard Actions” will give a result that looks like this:

(insert screenshot sar_exp_sq_02b.jpg)



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"SAR: Sector Search"

Keywords:

- RELIABLE POSITION OF SEARCH OBJECT
- SMALL SEARCH AREA
- DATUM AT CENTER
- STARTS AND ENDS AT DATUM
- ALL TURNS ARE 120º TO THE RIGHT
- 1ST LEG IN DIRECTION OF DRIFT

The sector search is employed when the position of the lost ship or lost body is known accurately and the search has to be carried over a small area, say with each leg a length of no more than 2 to 5 NM. It is normally carried out in the area where the casualty or the object has been sighted.

The search pattern will always start from the datum point. This pattern gives a very high probability of detection close to the datum point and spreads the search over the probable area quickly. With a man overboard, the ship returns immediately to the datum or, if the search target is once sighted and then lost, the ship heads for the datum.

All turns are 120 degrees to starboard. Upon completion of the search pattern, re-orient the pattern 30 degrees to the right and research a new pattern (see the dashed lines). This procedure can be repeated three or four times until either the victim is found or the search has

been called off.

The advantage of this pattern is that the search vessels cross the datum a number of times. The first step is to determine the drift and carry out the operations in that direction (first leg in the direction of the drift).

A suitable marker (for example, a smoke float or a radio beacon) may be dropped at the datum position and used as a reference or navigational aid marking the centre of the pattern.

An aircraft and a vessel may be used together to perform independent sector searches of the same area.

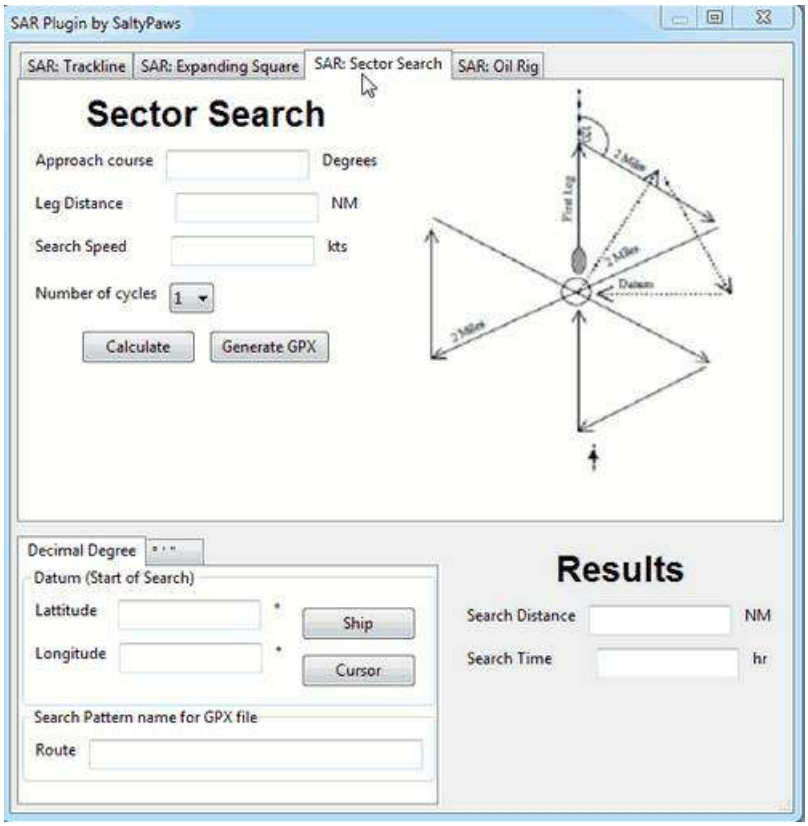
NOTE: Due to the small area involved and the fact that the search vessels cross the datum a number of times, this procedure is less suited to be used simultaneously by (a lot of) multiple vessels.

Setting up a "Sector Search" pattern.

Click the SAR-icon in the Toolbar

Choose the desired search pattern. In this case: **SAR: Sector Search**

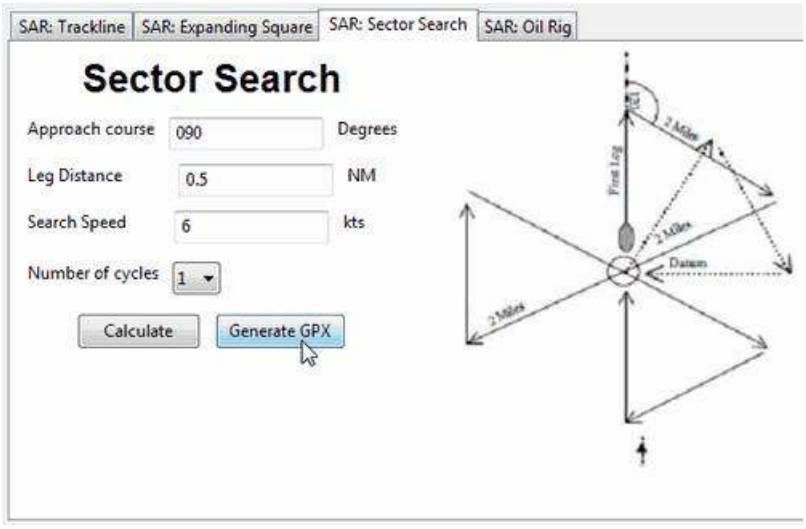
The parameter-window shows these fields:



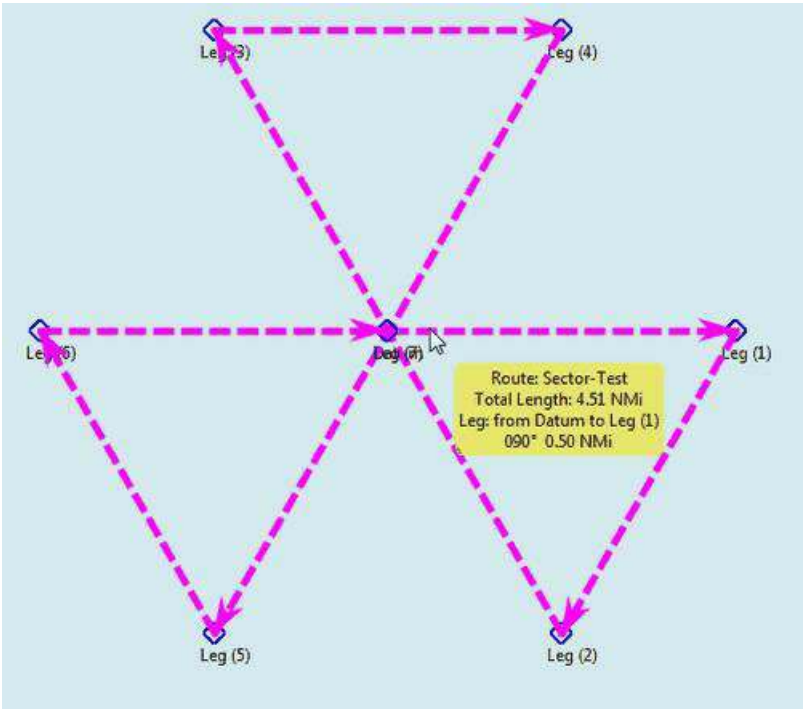
The approach-course should be set in the direction of the drift, or else to 000 (true North).

The rest should be easy to understand, so we will not explain this further.

Example:



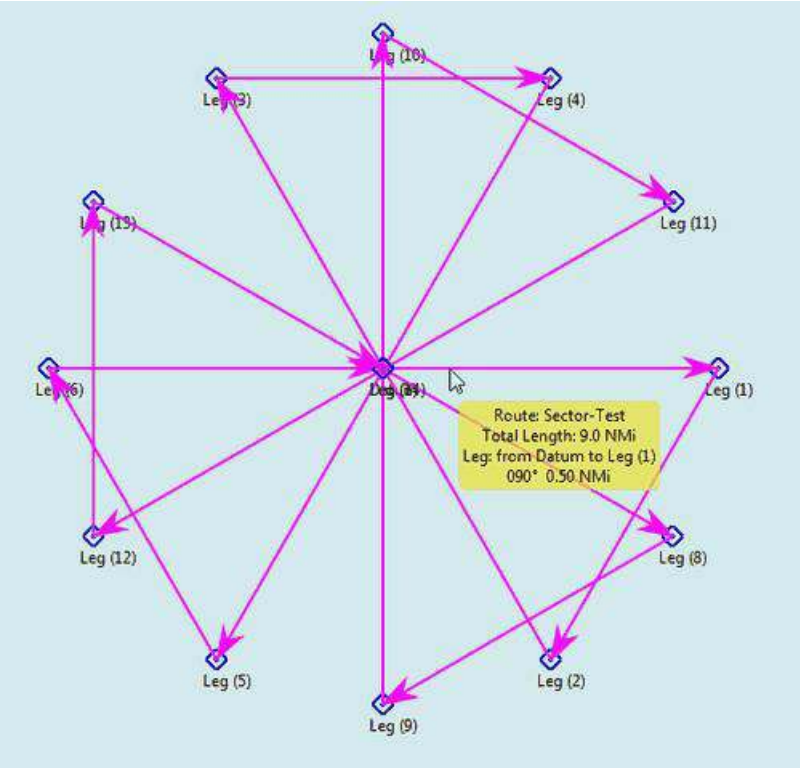
Following the steps described in “Standard Actions” will give a result that looks like this:



Note: the search-patterns are loaded as “routes”. And as with any route, you can adapt the appearance of that route (colour, style and width).

In this case we have chosen “Magenta” as colour and “short dash” as style.

Repeat the process for a second cycle and the result will be this:



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"SAR: Oil Rig"

Keywords:

- FROM STATIONARY OBJECT
- ONE OF FOUR QUADRANTS

In the so-called “oil rig pattern”, the search sectors are placed into four quadrants.

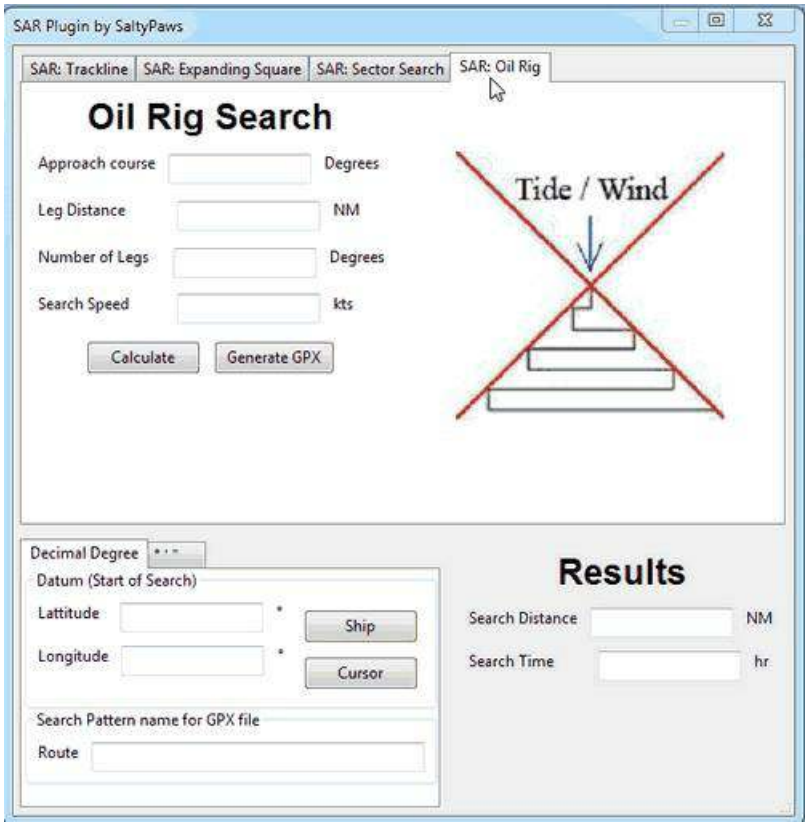
This pattern is meant to be used when someone has fallen from a stationary object (like an oil rig is, or at least is supposed to be) and the search-area is confined to one quadrant.

Setting up a "Oil Rig"-search pattern.

Click the SAR-icon in the Toolbar

Choose the desired search pattern. In this case: **SAR: Oil Rig**

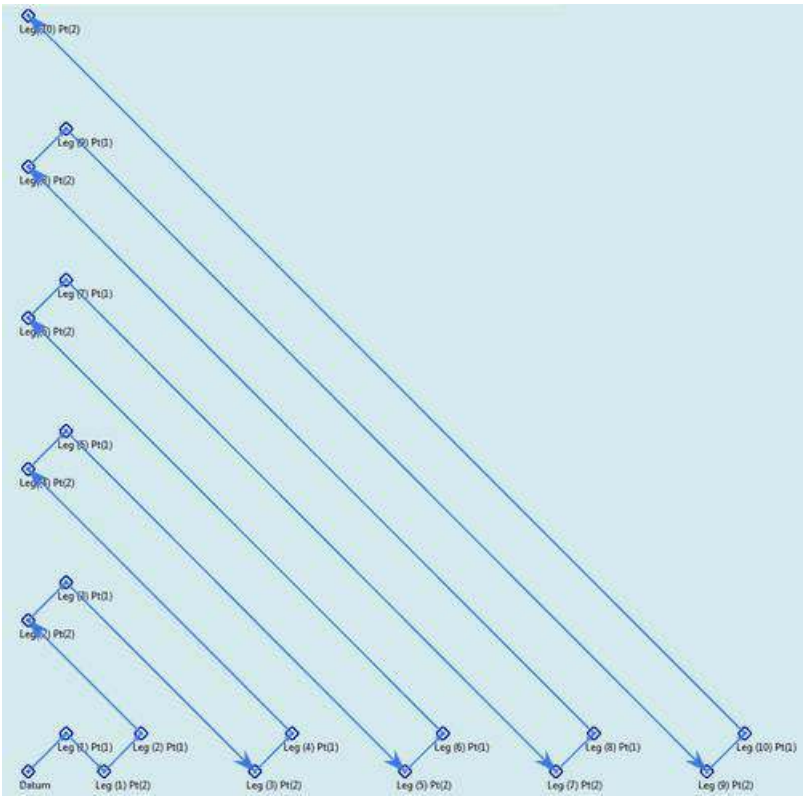
The parameter-window shows these fields:



Example:

Note: the field “Number of Legs” is followed by “Degrees”. That word should not be there. Forget it.

Following the steps described in “Standard Actions” (and with these parameters) will give a result that looks like this:



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Survival Times in the Water

This table gives you an estimate of survival times in various water temperatures. This table is only a guideline to emphasize the need for fast action and not a means of setting an arbitrary limit on the search effort.

Water temperature		Survival time (Average duration)
Centigrade	Fahrenheit	
Less than 2°	Less than 34°	Less than 45 minutes
2° to 4°	34° to 40°	Less than 90 minutes
4° to 10°	40° to 50°	Less than 3 hours
10° to 15°	50° to 59°	Less than 6 hours
15° to 20°	59° to 69°	Less than 12 hours
Greater than 20°	Greater than 70°	Indefinite (depends on physical condition)

End of the SAR-pi manual.

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Weather

IACfleet
IAC Fleet Code visualizes the encoded data issued as part of the weather bulletins. The IAC Fleet Code provides size effective encoded synoptic charts for several areas of the world, especially useful with slow and limited connection to the Internet. Coverage areas:

- South Pacific weather issued by Fiji Meteorologica Service in Nadi and available from Saildocs
- Weather over Brazil and adjacent parts of Pacific and Atlantic oceans, including direct download of the data from the Internet
- Weather analysis and 24 hour forecast for North Atlantic and Europe issued by NOAA, including direct download of the data from the Internet.

Weatherfax
Read weather fax encoded data as audio or image and Overlay on top of charts.

Weather Routing
Establish an estimate of optimal weather routing using Grib Plugin and Climatology. Establish “Boundaries” using Ocpn_draw.

Climatology
Manage and view monthly gridded climate data.

Grib Weather (Included Plugin)
Plugin to display Grib weather data files. Included in the OpenCPN installation.

IACfleet

Links

- Source: https://github.com/nohal/iacfleet_pi[547]
- Download: Website Download[548]
- Forum: Iac Fleetcode Thread[549]

Documentation

We need a volunteer Editor to complete this Wiki manual!

Weather Routing Pi

Links

- Source: https://github.com/seandepagnier/weather_routing_pi[550]
- Downloads: https://opencpn.org/OpenCPN/plugins/weatherroute.html[551]
- Forum: http://www.cruisersforum.com/forums/f134/weather-routing-100060.html[552]

Purpose of Weather Routing (WR)

This plugin creates optimized weather routes based on:

- Grib_pi plugin using downloaded predictive grib files (grb, grb2) with wind, wave & current data
- Climatology_pi plugin using built in NOAA 30 year data, averaged by month with wind, wave and current data
- [opencpn:opencpn_user_manual:charts:chart_sources#high_resolution_background_map High Resolution Background]] Install using the Chartdownloader. Required to improve routing with “Detect Land” checked.

The plugin also requires Boat performance data (polar data) developed from:

- Boat Instrument data created while sailing in non-current conditions. See
  - Polar_pi
  - VDR_pi
  - VDRplayer Manual[553]javascript:%20indexmenu_18973814515a5cc87ac6b23.o(80);
  - Polauto (Windows)[554]
- Velocity Prediction Programs using physical measurements of the boat.
- Additionally there are many Polar Data files available in the Weather_routing Plugin.
- You may find a starter polar file for your boat (EG: C:\Program Files (x86)\OpenCPN 4.8.0\plugins\weather_routing_pi\data\polars)

Note: Boat performance data should be in a format compatible with weather_routing_pi. The plugin will convert the file to a format it can use (fixing certain minor variations and irregularities) or declare it unusable.

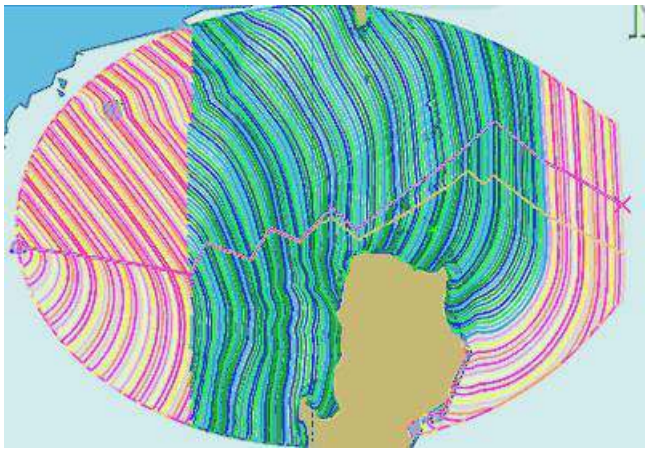
Note: Grib data is predictive data, and as such it will be subject to change. Generally data past 3-4 days it is unreliable, and the longest grib available is 16 days (with a larger time interval between data points). For longer voyages, Climatology_pi data can be used as an alternative data source to extend the routing calculations.

What is Weather Routing useful for?

- Trip or voyage planning.
- Determining good weather windows for starting the trip.
- Calculate multiple routes at the same time.
- Highlight and step through multiple “completed' routes at the same time.
- Approximation of better routes dependent on goals and constraints set.
- Adjust the Wind Speed as a percentage, which helps to set realistic goals.
- Avoidance of predicted high winds (hurricanes & typhoons), areas of light winds, large waves, etc.
- Show possible sail changes and % crossover.
- Summary metro chart of the voyage that shows the weather visually.
- Number of tacks, % upwind/downwind, etc. to determine how difficult the voyage will be.
- Estimate trip total time, distance, average speed to help determine the stores needed.
- Useful for crew members planning airline tickets, but only as a rough estimate.
- Remember that it is only as good as predictive and average data!

What does Weather Routing look like?

Weather Routing: Calculation of the fastest/safest route from a starting point to an ending point given the current national weather forecasts, available wind data, current oceanic currents , the performance of your vessel, and comfort criteria (storms, wind, waves, etc.) More about Optimum Weather Route[555]



Wind Data Source Alternatives, mix and match

When the weather route is displayed, **Grib** and **Climatology** calculations use different *color schemes*. In the route below:

1. **Route**: Thick magenta line from the start “triangle” to the finish “X”.
2. **Cursor Route**: Thin yellow line that follows the cursor around. This is the optimal route to the cursor.
3. **Data at Cursor**: In **Grib_pi** Menu - Wind speed at Cursor is very useful for diagnostics along a problematic route.
4. **Left**: Beginning of passage using only **Climatology** data because the boat is outside the **Grib** area.
5. **Middle**: Computation is based on **Grib** data with Cyan and Blue Isochrones.

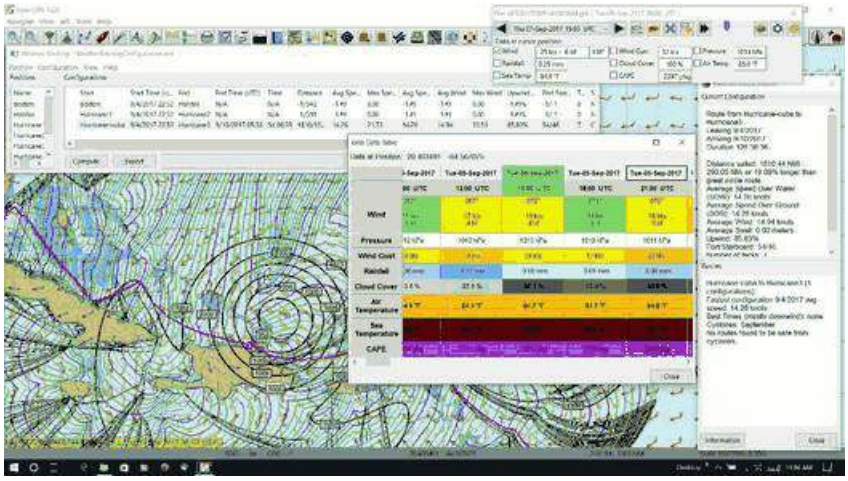
6. **Right**: End of the passage, the **Grib** data does not cover this time so again **Climatology** data is used.
7. **Isochrones** While calculating a Weather Routing the plugin will calculate the location of the boat for a given time interval (eg: 1 hr, 4hr, 6 hr or 12hr). An isochrone represents how far the boat will sail in a given direction, based on the weather and boat conditions, for each successive time interval. Isochrones are like contour lines around the starting point. Think of them as showing an intermediate destination, and the calculated distance traveled.
8. **Small Triangle**: Start point defined by the "Weather Routing Position" selected in the "Configuration".
9. **Small X**: End point defined by the "Weather Routing Position" selected in the "Configuration".
10. **Small Squares**: Not shown here are the small squares on the route, where there has been a **sail/polar file** change.
11. **Small round circle** on the route is the calculated **Boat location** for that time frame.
12. Step through the Grib file frame by frame To understand the Routing better.
13. If the transition from grib to climatology is not uniform, then the climatology data is not as reliable in that situation.

Terminology

Reference to Common Terms used in this Manual.

Summary

1. Use the **Grib Plugin** and recently downloaded grib files for completing grib predictive routing (1-8 days).
2. Use the **Climatology Plugin** to find and plan long term cruising routes, (most useful in prevailing winds areas).
3. Use both Grib and Climatology data, to allow the routing to be extended past the time/date range of the grib file, which uses Climatology data to extend the Routing based on NOAA "average" or "most likely" data.
4. Use both Grib and Climatology to use "tidal current data" if the grib does not contain it, or to use climatology to avoid areas of cyclones.



Example: Routing from Cuba to Puerto Rico through Hurricane Irma. Showing Grib_pi

“Weather Data” (Right Click on Chart) and Weather_routing View > Report & View > Plot.

Cleanup of Prior Installation

Generally we recommend that the plugin and configuration artifacts should be completely removed before installation of the new version, in order to allow the intended initialization files to be copied from the System files ProgramFiles (x86) folders to User Files ProgramData. The plugin expects a clean environment before initializing and copying the appropriate files into the user directories. You must “Clean” your opencpn files of all weather_routing files and folders or the initialization that is required will not occur. For windows users, from:

1. C:\Program Files (x86)\OpenCPN 4.8.0 —> Run Uninstall Weather_routing.exe as administrator.
2. C:\ProgramData\opencpn —> Open opencpn.ini in Notepad++ and remove all lines for weather_routing and weatherrouting, including the order of plugins “weatherrouting” reference.
3. C:\ProgramData\opencpn\plugins —> Remove the Weather_routing directory.

Download and Installation

Download Page: Linux, Windows, Mac[556]

Make sure you choose the file that is compatible with your computer system.
In this manual we presume it's Windows, so we choose the **Windows setup-package**.

We assume you know where to find the files you download from the Internet (if you don't: quit now and read the manual of your computer before doing anything else with it).

Double-click the downloaded file (with “weather_routing_pi” in the name and ”.exe“ as extension) and follow the set-up instructions. If you are doing parallel installs of OpenCPN make sure the plugin goes into the proper version of OpenCPN!

That's it. But before you can actually **use** Weather_Routing_pi, you first have to Enable the plug-in in OpenCPN.

Grib_pi plugin is included with OpenCPN, but you will need to install Climatology_pi plugin if you wish to use that type of data.

Enable OpenGL

You need to activate OpenGL in order to have the route display on top of the grib layer!

Source Code

https://github.com/seandepagnier/weather_routing_pi[557]

Cruisers Forum Thread

Weather Routing[558]

Standard Actions

Goal

Weather_routing is remarkably flexible, but with that comes complexity. New users must not dive in changing settings without understanding what they are doing or how it affects "**Computation**".

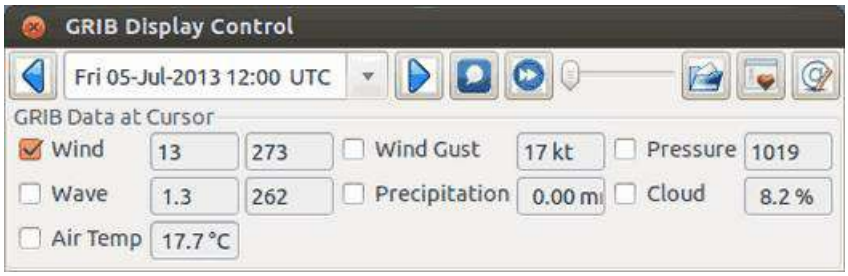
1. Generally the "**Reset**" settings are the most reliable settings available and after hitting "**Reset**" most of the settings can be left alone.
2. However there are definitely some settings the user must set manually in order to get any results!
3. The goal here is to make your first routing compute properly and "**Complete**".

Please follow this tutorial carefully and you will succeed the first time. Once you get familiar with the interface and have had successes, learn all the features gradually, changing and adjusting one setting at a time.

1.Setup Grib_pi Data

Grib_pi is installed with OpenCPN. Learn how to use it and download a fresh Grib file with wind, current & waves.

- Initially the grib area should be larger than the area between start and finish by at least two time intervals,
- Should be for more days than expected (refine this later).
- Set the grib at the **starting time** and then move it *one or two time intervals forward*, later with more experience you may set the Grib data and time at what you want.

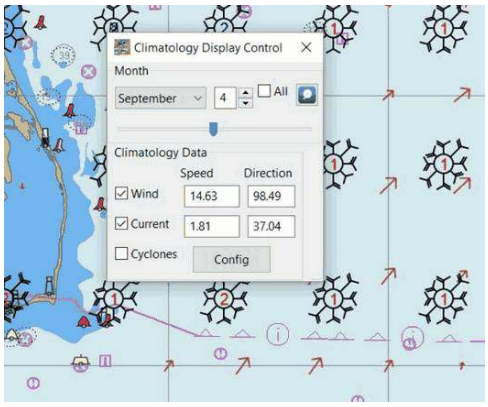


2. Setup Climatology_pi Data

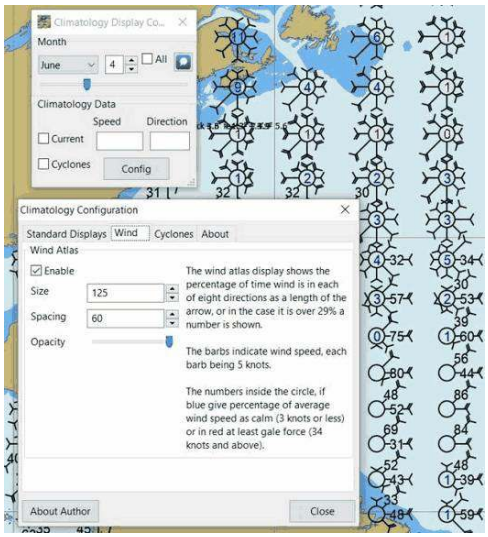
Climatology_pi should be installed as directed.

- Enable Climatology_pi. Learn how to use it.

- When Climatology_pi is **Enabled** under *Options* > *Plugins* , the "**Weather_routing Configuration**" - *Data Source* - **Climatology Dropdown Menu** (*Disable, Cumulative Map, Cumulative Calms, Most Likely, Average*) will become accessible for selection.
- The **Weather_Routing Plugin** will access *Climatology data* automatically once these settings are selected.



Climatology NOAA 30 year average Wind and Current data in September near Cape Lookout



Climatology Configuration of Wind Roses (Size=100 and Spacing=50 is good too.)

3. Install GSHHS High Resolution Background

Download and install to improve routing with "Detect Land" checked.

- GSHHS High Resolution Background

If you are working with Land Interface a lot, this is not optional! Best to install it.

4. Weather Routing Setup

Four Transatlantic Configurations that will Compute using Climatology Wind Data

Confirm that the Weather_Routing Plugin has been installed.

Files & Pathnames

It is important that you use this configuration for Windows (Linux use comparable User accessible directories):

1. Main Path for support files: *C:\ProgramData\opencpn\plugins\weather_routing*
2. WeatherRoutingConfiguration.xml: *C:\ProgramData\opencpn\plugins\weather_routing*
3. Polar Files (.pol,.txt,.csv): *C:\ProgramData\opencpn\plugins\weather_routing\polars*
4. Boat.Xml Files: *C:\ProgramData\opencpn\plugins\weather_routing\boat*

(Note the weather_routing installation may not create these files in the correct location, and may put them under *C:\Program Files (x86)\opencpn\plugins\weather_routing/data*. If this is the case, just download the Weather Routing Setup files below and install as shown above.

Weather Route setup for MacOS and for inclusion in the Weather Routing wiki.

Run some Weather Routing Routes

1. Start Climatology_pi, although it will start automatically if called.
2. Start Grib_pi (normally used, but not necessary with the default “Configurations” which use Climatology.
3. Set the Grib Date has been already set in the default configurations.
4. Then open Weather_routing_pi.
5. Confirm the “Boat section” path is correct as shown above in the Pathname list.
6. Confirm the “Polar” path is correct as shown above in the Pathname list.
7. In the menu you should find 5 configurations for transatlantic routes.
8. Pick a route and then select “Compute from the bottom of the menu.
9. Check that the isobars and route is drawn.
10. Try “Computing” the other routes, noticing how the settings have been changed, and what files are being used.
11. Once you are pretty confident about this, go to the next step, which is to create your own configurations.

Computation of 4 Routes

There are 4 Weather Routings in “**Weather-Routing-Setup**” that should **Complete** using the wind data from Climatology.

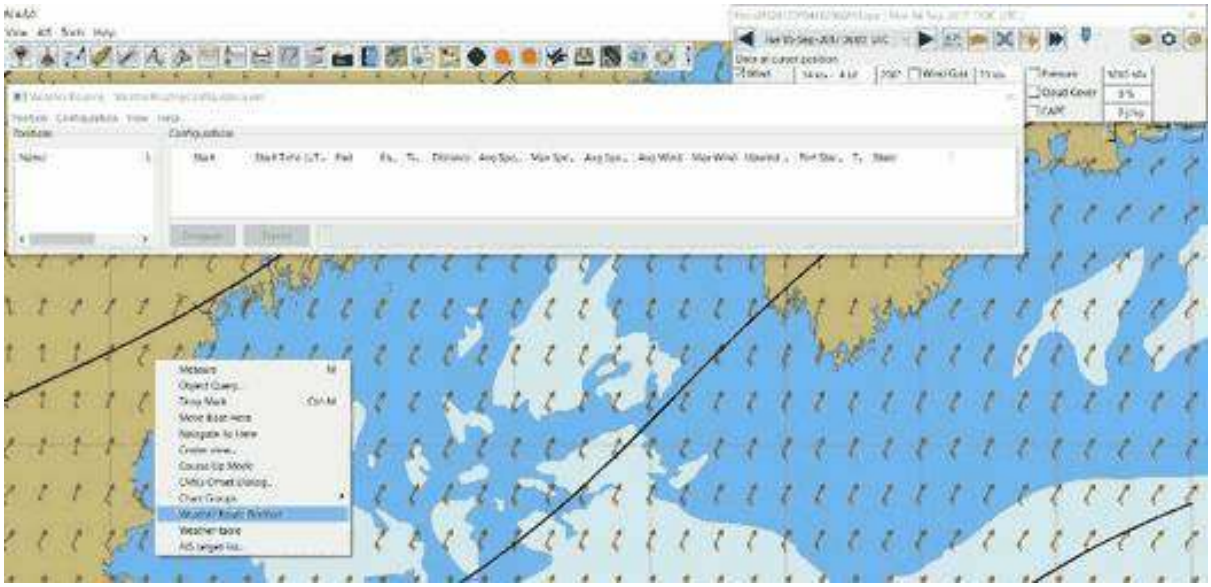
5. WR Not a substitute for sound judgment & realistic goals

You must *Configure* weather_routing to match your *sound judgment* and *realistic goals*. You are in control, use your own judgement when you review the results. **This cannot be emphasized enough.** Weather_Routing_pi is just a tool in your hands, you are in control.

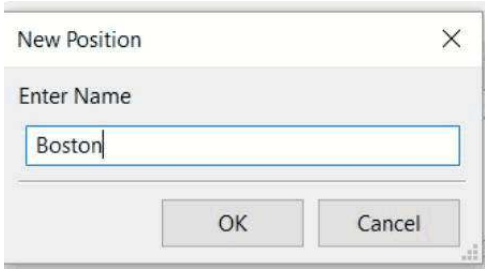
6. WeatherRoutingConfiguration.XML Menu

If the plugin is downloaded and installed, with default settings unchanged (or “Reset All” is used), the plugin should create an optimized weather routing with just a few specific additional settings and “computation”.

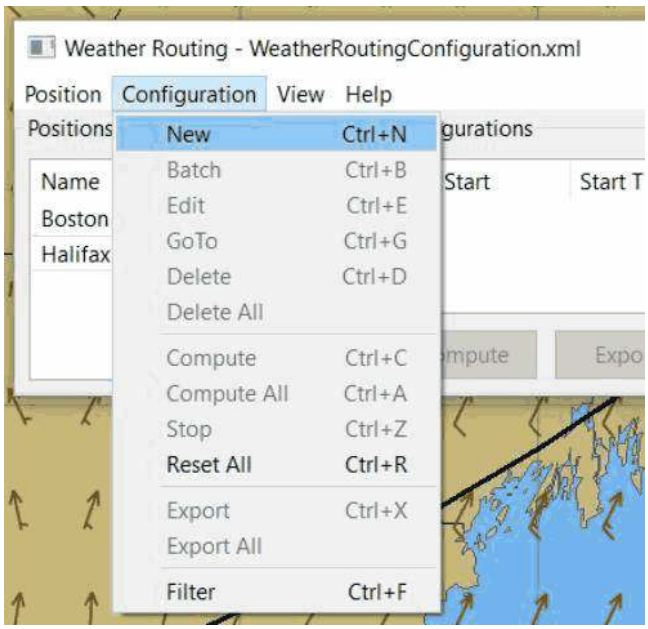
- Complete Setup Grib_pi Data and Setup Climatology_pi Data as described above.
- Start by clicking on the Toolbar Weather_routing plugin Icon to open the Weather_routing_Configuration Menu.
- WR WeatherRoutingConfiguration.xml Menu



- Define two **Weather Route Positions** on the chart within the “grib area”. Hover the mouse at a selected location, *Right Click,* and then pick “**Weather Route Position**” from the popup menu. Make a “**Boston**” and a “**Halifax**” Weather Route Position.

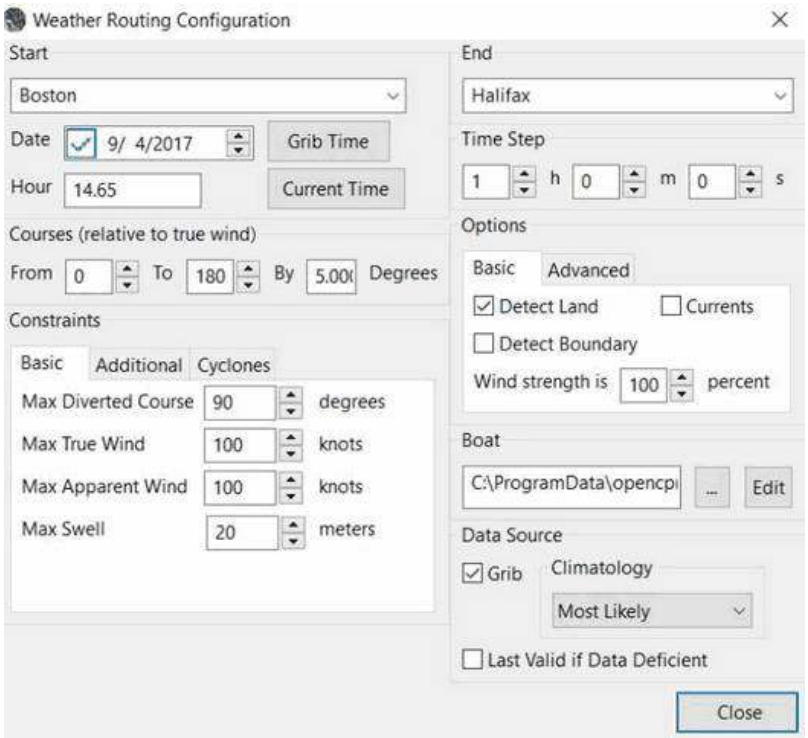


- In the *WR WeatherRoutingConfiguration.xml* menu select **Configuration***New*. *The Weather Routing Configuration* Menu will appear with “Start”=Boston and “End”=Halifax.



7. Weather Routing Configuration Menu

- Scan the setting to check that they are as shown in the image.
- Check **Start** and **End** selections. If not correct, select these WP Positions from the respective dropdowns.



- **Set Start Date & Time**. If you have set start date & time in Grib_pi as described above.
- From the *Weather Routing Configuration Menu* click **Grib Time** to set the Start Date/Time used by the "Configuration" for the routing. The **Grib Time** used will be the

current frame used and visible in Grib_pi. There are other ways to do this, but use this way to start.

8. WR Configuration > Boat.xml Menu - Edit

Weather_routing_pi uses *[Boat].xml* files to store multiple *[Polar].pol, *.csv or *.txt* filenames which are used with the Current "*Configuration*". Also the *[Boat].xml* file can be *"Save as Boat"* to another boat filename such as *Boat-Test.xml* or *[Your-Boat-Medium-Wind-Heavy-Sea-Clean-Bottom].xml*.

Many new users have have trouble "Completing" Weather Route Configurations due to *Polar:Fail* messages, which is often because the single polar they have used only has TWS from 6-20 knots and does not span the entire true wind speed range of the particular grib file being used.

To help new users when starting out, we will create a **Boat-test.xml** file that references three "polar-xx-xxx-x-xx.pol" files which cover a full TWS (True Wind Speed) range of 0-60 knots. The Weather_routing Configuration will utilize the best polar information from the multiple polar files in **Boat-test.xml** after computing the "Sail/Polar Crossover" calculations between the different polar files being used.

3 Boat.xml zipped files[559] unzip to *C:\ProgramData\opencpn\plugins\weather_routing\boat* which are preconfigured files that should work with the Polar and WeatherRoutingConfiguration.XML file downloads. These files are the same as **Weather_Routing_Setup[560]** above.

- Boat.XML
- Boat-test.XML
- Boat-Test-Power.XML

Later on, after some successful weather routings, users are encouraged to create separate boat performance *[polar].pol* files for:

- Sets of Sails Used (Sail Changes, First & Second Reefs)
- Sea conditions (Waves - Rough, Chop, Height, Period)
- Boat load (Race Light, Cruising, Heavy)

- Boat bottom condition (Smooth, Grass, Barnacles, Loaded)

Example of useful Polars for your boat:

1. LW-light wind (0-5 knots) Sail set #1
2. MW-medium wind (5-18 knots) Sail set #2
3. HW-heavy wind (18-24 knots) Sail set #3
4. SW-storm wind (24-32 knots) Sail set #4
5. GW-gail wind (32-60 knots) Hove to, Drogue.
6. LW-lightwind-Power (0-3 knots) Polluting Internal Combustion Engine

Using the sails normally used for each type of wind, such that the full range of True Wind Speed (TWS) is represented (0-60 knots).

NOTE: These files can be inspected and edited with a text editor such as Notepad++ or they can more easily be edited using the *Polar section* **Edit** Menu and the two Tabs **Grid** and **Dimensions**. Learn how they are formatted (particularly *.pol) as this will assist you in creating useful polars for your boat.

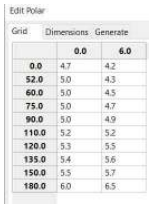
Polar Files for Learning (User Friendly)

Polars-Pol.zip[561]

Please Download, unzip and copy the six *.pol files listed below into your data\polars directory. For Windows use: *C:\ProgramData\opencpn\plugins\weather_routing\data\polars* These files are the same as **Weather_Routing_Setup[562]** above.

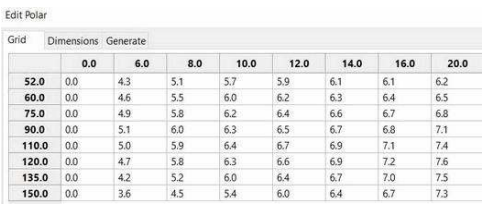
Three Stepped Range TWS Files used together (use either Sail or Power for TWS-0-6)

1. TWS-0-6-Power.pol (power for light winds)
2. TWS-0-6.pol (sail)
3. TWS-0-20.pol
4. TWS-20-60.pol


Edit Polar

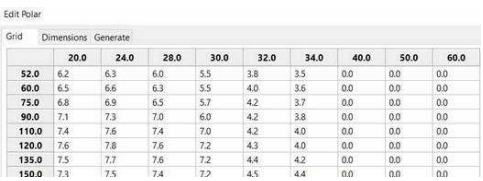
Grid Dimensions Generate

	0.0	6.0
0.0	4.7	4.2
52.0	5.0	4.3
60.0	5.0	4.5
75.0	5.0	4.7
90.0	5.0	4.9
110.0	5.2	5.2
120.0	5.3	5.5
135.0	5.4	5.6
150.0	5.5	5.7
180.0	6.0	6.5


Edit Polar

Grid Dimensions Generate

	0.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
52.0	0.0	4.3	5.1	5.7	5.9	6.1	6.1	6.2
60.0	0.0	4.6	5.5	6.0	6.2	6.3	6.4	6.5
75.0	0.0	4.9	5.8	6.2	6.4	6.6	6.7	6.8
90.0	0.0	5.1	6.0	6.3	6.5	6.7	6.8	7.1
110.0	0.0	5.0	5.9	6.4	6.7	6.9	7.1	7.4
120.0	0.0	4.7	5.8	6.3	6.6	6.9	7.2	7.6
135.0	0.0	4.2	5.2	6.0	6.4	6.7	7.0	7.5
150.0	0.0	3.6	4.5	5.4	6.0	6.4	6.7	7.3

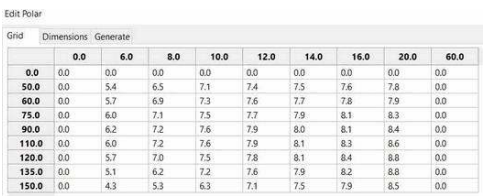

Edit Polar

Grid Dimensions Generate

	20.0	24.0	28.0	30.0	32.0	34.0	40.0	50.0	60.0
52.0	6.2	6.3	6.0	5.5	3.8	3.5	0.0	0.0	0.0
60.0	6.5	6.6	6.3	5.5	4.0	3.6	0.0	0.0	0.0
75.0	6.8	6.9	6.5	5.7	4.2	3.7	0.0	0.0	0.0
90.0	7.1	7.3	7.0	6.0	4.2	3.8	0.0	0.0	0.0
110.0	7.4	7.6	7.4	7.0	4.2	4.0	0.0	0.0	0.0
120.0	7.6	7.8	7.6	7.2	4.3	4.0	0.0	0.0	0.0
135.0	7.5	7.7	7.6	7.2	4.4	4.2	0.0	0.0	0.0
150.0	7.3	7.5	7.4	7.2	4.5	4.4	0.0	0.0	0.0

Single File with Full Range TWS 0-60 knots

1. Test-TWS-0-20+60.pol


Edit Polar

Grid Dimensions Generate

	0.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	60.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.0	0.0	5.4	6.5	7.1	7.4	7.5	7.6	7.8	0.0
60.0	0.0	5.7	6.9	7.3	7.6	7.7	7.8	7.9	0.0
75.0	0.0	6.0	7.1	7.5	7.7	7.9	8.1	8.3	0.0
90.0	0.0	6.2	7.2	7.6	7.9	8.0	8.1	8.4	0.0
110.0	0.0	6.0	7.2	7.6	7.9	8.1	8.3	8.6	0.0
120.0	0.0	5.7	7.0	7.5	7.8	8.1	8.4	8.8	0.0
135.0	0.0	5.1	6.2	7.2	7.6	7.9	8.2	8.8	0.0
150.0	0.0	4.3	5.3	6.3	7.1	7.5	7.9	8.5	0.0

[Boat].xml files are normally located here for Windows:
C:\ProgramData\opencpn\plugins\weather_routing

In **Boat.xml Menu** *Edit* please **Add** these files

1. TWS-0-6-Power.pol (use power in light winds)
2. TWS-0-20.pol
3. TWS-20-60.pol

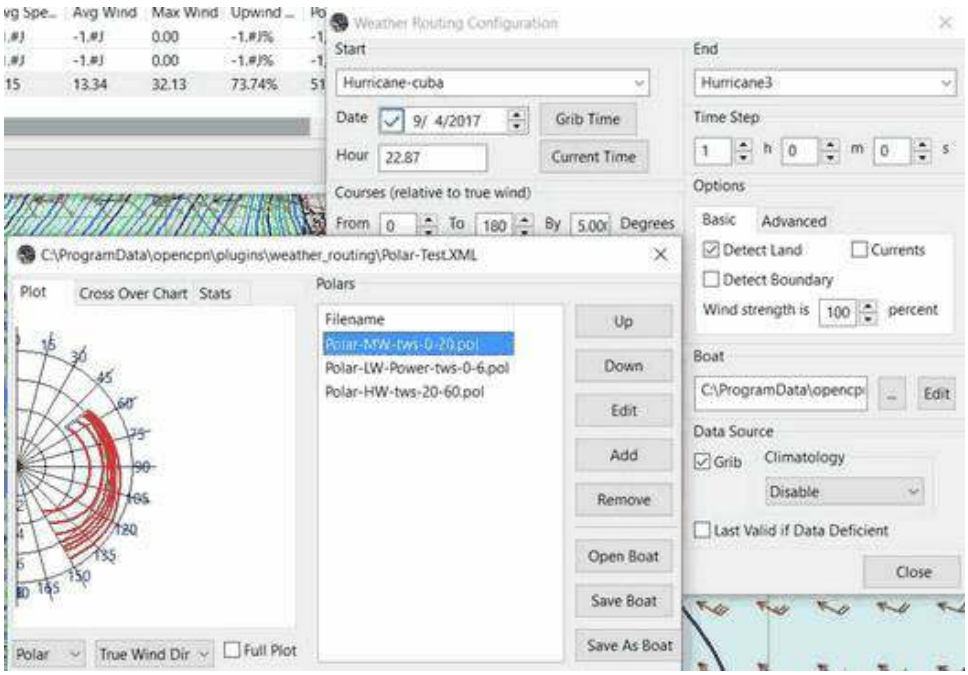
Use of these three files will cover a wide wind range from 0-60 knots (with 0-6 under power). If you just want to use one file for TWS 0-60 knots use Test-TWS-0-20+60.pol.

Once the three files have been added, next pick **Save as Boat** then type **Boat-Test** and "Save" to create and save "Boat-Test.xml"

Now when **Computing** "new" **Configurations** first check the configuration by selecting **Boat-Test.xml** at the Boat section "…." just ahead of "Edit" in the "Configuration" Menu. Once that completes properly, then create a "Boat.xml" file for your boat with reference to your normal boat polars and use that.

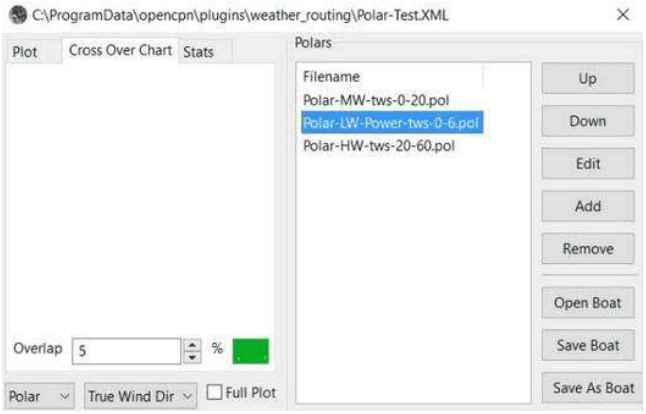
Plot Tab

Shows the highlighted polar file graphically as a familiar polar diagram. Note that the dropdown menus at the bottom provide different useful ways of viewing the boat performance data.



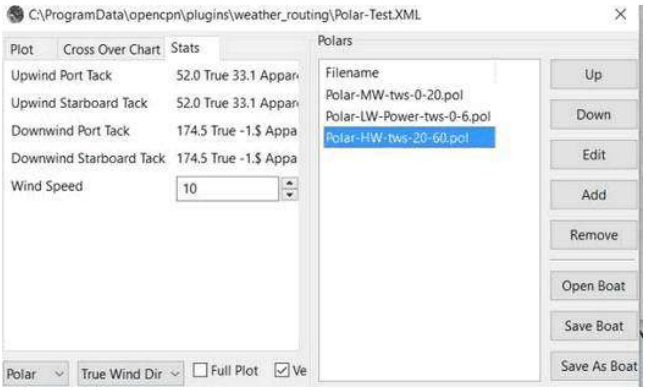
Cross over Chart Tab

Shows the Sail/Polar Cross over calculations.



Stats Tab

Shows target speeds.

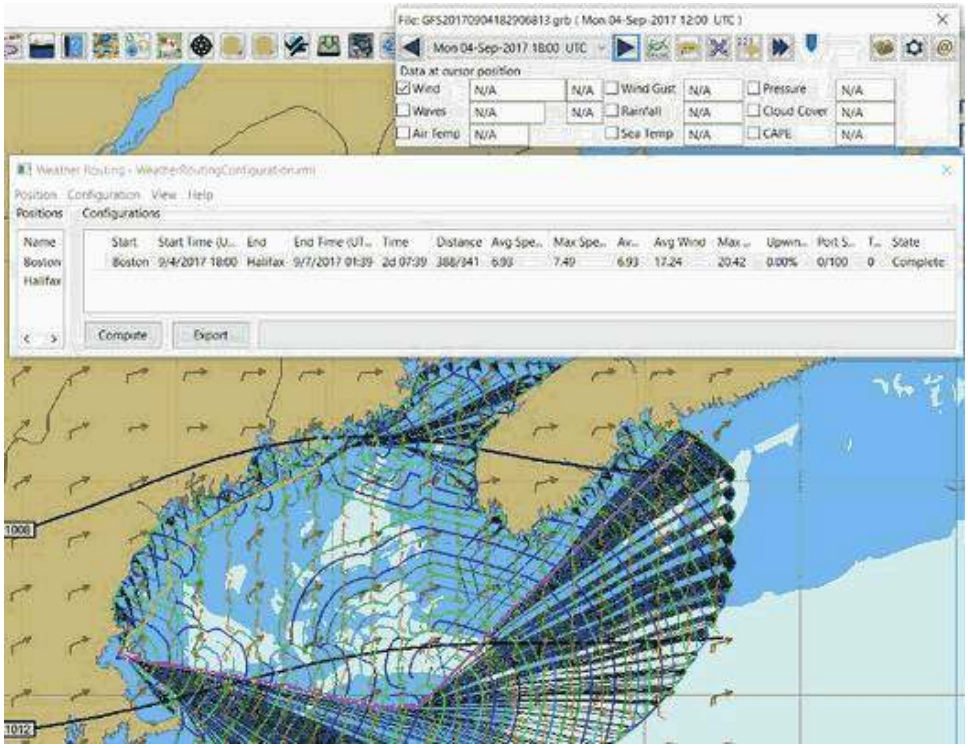


Complete Setting up "Boat" Performance & Polars

- Weather_routing_pi will use this data to calculate the most favorable route.
- Later you can find a Boat Polar file that is closer to your boat.
- Click **Save Boat** to close the menu and save the **[Boat]/Polar-Test.xml** file.
- Then "**Close**" **Weather Routing Configuration** Menu.

9. Compute "Configuration" in WeatherRoutingConfiguration.xml Menu

- In the *WR WeatherRoutingConfiguration.xml* menu, highlight the *Configuration* you've created and select **Compute**.
- Now new isochrones will be created and a weather routing from Boston to Halifax will be "**completed**".



10. Messages in Configuration Window

In the Configuration Menu after “Compute”, a message will show to the right of the Configuration.

“Complete” affirms that the computations completed. “Fail” indicates they did not and that some setup parameter may be out of range. The failure messages have been made to be more descriptive to help.

If your polar doesn't include boat speeds:

1. Above a windspeed that the grib tries to use, it will fail to route.
2. Below a windspeed that the grib tries to use, it will fail to route.

There are many reasons a **Computation** cannot complete, or fail. The computation is dependent on:

1. Wind Data (grib_pi or climatology_pi) - Start & End data/time of the file, interval downloaded.
2. Boat Polar File - Correct format, with a wind range that matches the grib data.
3. Time Interval Issues - Sometimes a 1/2hr or 1hr interval will yield a better route than 3hr or 3hr. Sometimes that is the difference between “Completion” and “Fail”.
4. Max Diverted Route - Normal setting is 100 degrees, which speeds up calculations, but with longer time intervals, you may have to set this on something like 140-160 degrees to complete the routing, particularly when the Finish is near land with Islands and Peninsulas around.
5. Configuration settings which must be made to be compatible with the data to Complete:
    a. Interval Issues - Too long a calculation interval for the distance between start and end.

b. Land Detail - Detect land is checked and the High Resolution GSHHS Shoreline is not installed.
c. Land Interface Issues - Routing near land is complex, if there is a failure at the interface with land zoom in and look at the Isobars. Sometimes they are not calculated for all locations due to the complexity of the land (limited by too many iterations). In that case try making a new Weather Routing Position nearby where there are isobars shown.
d. Max Diverted Course - When “Polar:Fail” or “Polar:No Data” occurs near the “finish” using large Time Intervals (4hr - 24hr). Zoom in and look at the route, isochrones, finish, and land. If the route is almost completed to “Finish” (with land, islands and peninsulas around) try changing Max Diverted Course from 100 degrees to 150 degrees and run it again. It will probably complete.

Different Time Intervals - Everything Else is the same.

Beginners should first try a simple route, with starting point and end point, 5 degree steps, and possibly a 3 hour time interval until they see it is working. The time interval depends on the speed of the boat and distance traveled, grib file downloaded.

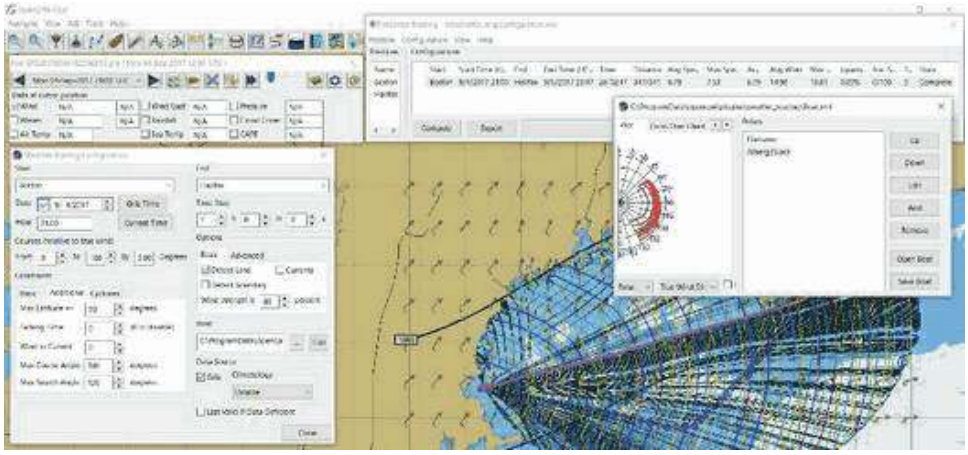
1. If the Configuration was completing **Computation** earlier and you changed a setting, check that first.
2. If a Configuration fails, another thing to try is **Reset All**, and go through the setup sequence above, again.
3. If “Polar:Failed” try increasing or reducing the *Weather Routing Configuration***Wind Strength %** (50%, 150%) because the Polar File may not have the required winds specified. The grib file may have periods of very high winds or very low winds which are not covered by the polar diagram wind range.
4. Then try using different data, either change the grib start date, moving it forward, or try using only Climatology Data, or change the Polar File to something else, or add multiple polar files, just to get the Configuration working.

11. Configuration - Edit

Provides setup flexibility for various factors:

1. Start location, date and time. End location.
2. Step duration for isochrones in hours and minutes (12 hours for long routes, 1 hour for shorter)
3. For Time Step I generally start larger and once things are working, go smaller, the distance governs what the tme step is.
4. Divide the time expected to sail the course into 10 and use that number for the Time Step. Then adjust as needed.
5. Degree Steps (5 degree steps is faster than 1 degree steps). Generally leave Courses (relative to true wind) alone, From 0 to 180 by 5 degrees is fine.
6. Boat Performance based on editing boat specifications or based on a polar data file.
7. Set constraints on various factors such as max wind, swell, waves, latitude, max diverted course etc…
8. Start Grib_pi and/or Climatology_pi
9. Set Grib_pi to the date and time you want to use.
10. Then go to the Weather_routing Config menu and pick “Grib Time”

11. Set options like detect land, currents, inverted regiions, anchoring.
12. Routes can be Edited (created, selected, renamed, reset and exported.)



12. View

Settings

To eliminate the black lines of all Alternate Routes, in Settings you can set the alternate route thickness to zero.

Statistics

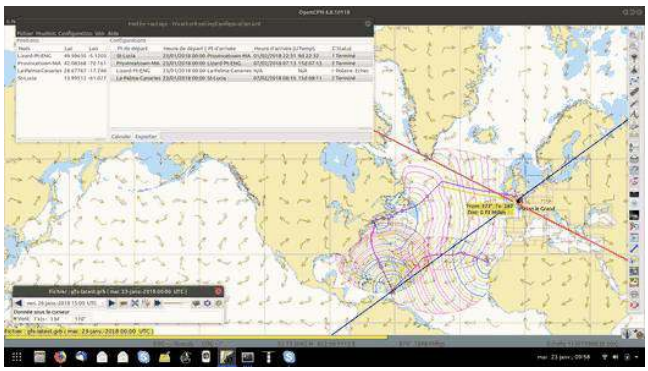
Report

Plot

Cursor Position

13. Use with Grib_pi

Boat position (round circle) is when stepping through the grib file (assuming you use a grib file and not climatology of course).



Moreover, if multiple routes are computed and shown (selected), when stepping through the

grib the boat position is shown simultaneously on each route.

that: when you step through the grib you will see the boat position at that current grib time (not “the multipier of the two time intervals”). This can be right on an isochrone or between two isochrones (if grib interval is smaller than wxrte time interval).

14. Use with Climatology

15. Use with Route Manager

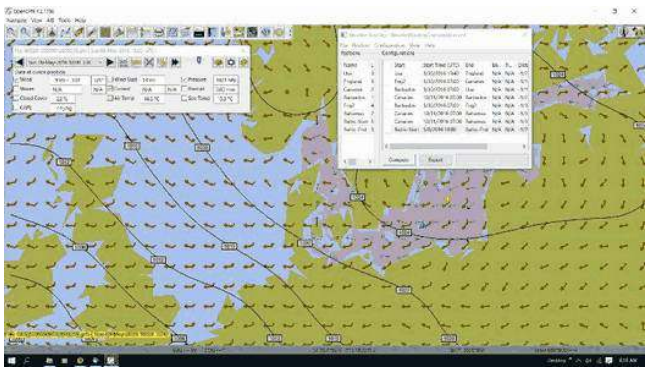
The **Route Manager** can be used for listing the weather route. *Right click* a weather route and pick “*Properties*”. Also a Weather Routing can be Exported to a gpx file or saved to a Route in Route Manager.

16. Other Uses

In addition to “Standard actions” Weather_Routing_pi will work with other **Plugins**

Two Grib Files (Wind + Current)

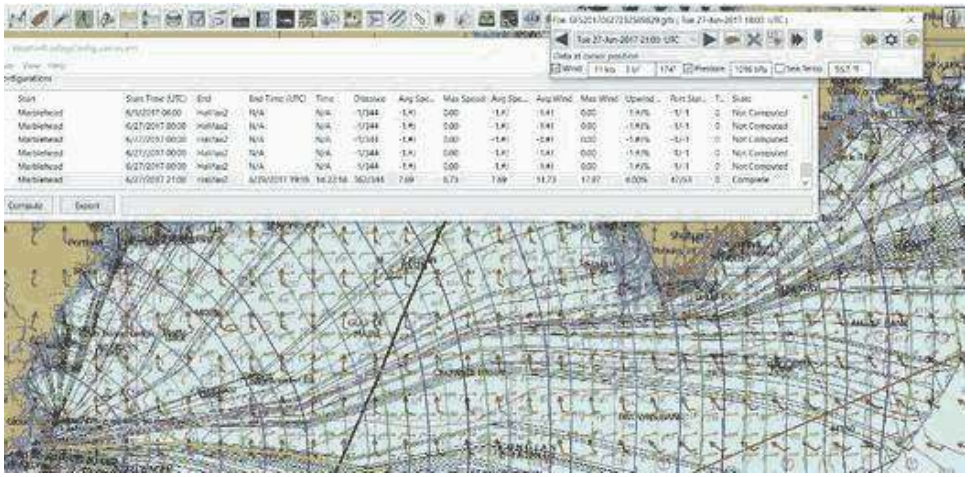
Weather Routing will use two grib files that are loaded by Grib_pi. This is useful when you have downloaded a GFS Wind and Pressure Grib, and an RTOFS Current Grib of similar time period and resolution. First Load two Grib Files Concurrently (Wind + Current)[563] in Grib_pi. Then in WR Configuration check the Currents box.



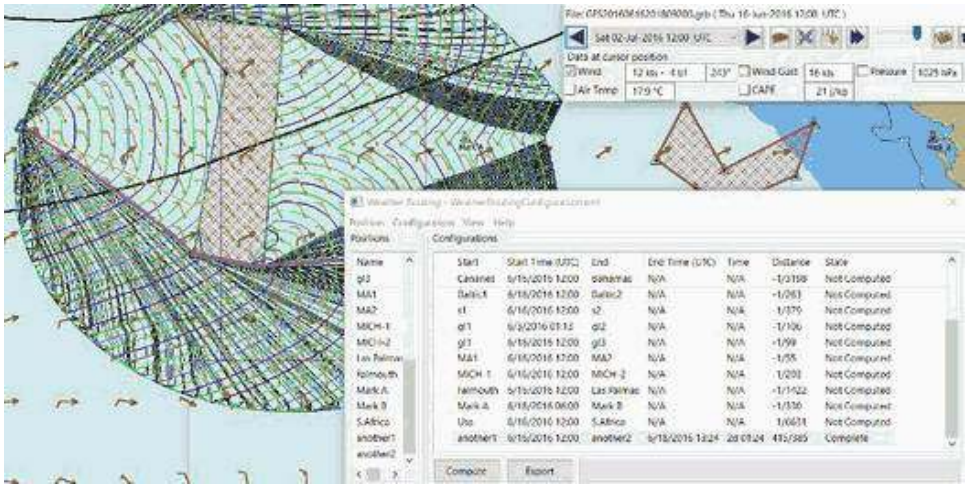
In this Baltic Sea example there is an underlying current file with black arrows and the area of the grib is shown in light read. The wind + pressure grib is shown with brown arrows with feathers.

Ocpn_Draw_pi (Boundary with guid)

Create Boundaries recognized by Weather_Routing_pi. Useful for guiding routing.



Red hatched Boundary along the Nova Scotia coast was created in Ocpn_Draw and used in weather_routing, to prevent routing in that area.



Red hatched Boundary created with Ocpn_Draw and used in Weather Routing Configuration > Options > Basic Tab > Check “Detect Boundary”

Watchdog_pi Alarms

(anchor, boundary, speed, course, deadman, NMEA etc.)

Set various parameters (range in meters, degrees, time in seconds or minutes, speed etc.)

FAQ

This section is meant to deal with various questions that might arise when using the pi. Example: (Why) Can(‘t) I? Answer:

Why does the "Computation" of a "Configuration" always fail with the message "Polar:Fail"? It is very frustrating.

1. See CF Thread Polar:Fail[564]
2.

What can I do about "Polar:Fail"?

1. Add other polars to the boat file to cover those wind speeds.
2. Increase or Decrease the Interval, try 1 hr to 8hr. This does make a difference, and sometimes an alternate optimal route will appear.
3. Reduce Wind to 50% or 25%.
4. Increase Wind to 110% or 125%.
5. Use Boat.XML or Boat-Test.xml with TWS 0-60 knots.(original file, unchanged)
6. Use a different set of Polars.
7. Find the high or low wind area and times, then change the route accordingly.
8. Try a different grib file from another time with in the same area.
9. Zoom into where it fails and look. Near land can cause problems.
10. Try making a slightly new Destination point if it fails just short.

I can't seem to get this to complete a weather routing, what is wrong?

1. Undo the most recent changes you have made if you had it was working recently.
2. When this happens go back to basics, Reset to default settings. See the CF Post[565] about this and refer to the default list in this manual above. Or download the **Weather_Routing_Setup[566]** above, install it again and start over.

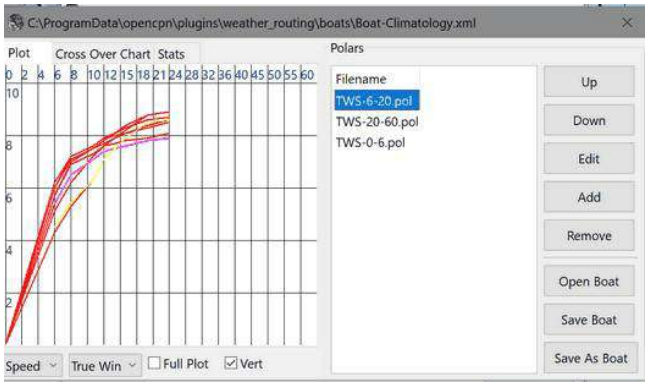
=== Routings, with climatology only, seem to be missing voyage data, such as duration, time of start and finish…. If we are using a specific date and time for the start, why is this happening? ===

It is most likely that the routing did not reach the destination. -Understand that the routing ends if destination is inside two isochrones, which is likely what you have, but remember between these two isochrones the boat can only move in straight lines and if there's land in the way, the destination could be unreachable. Islands and Harbors are very prone to this kind of issue.

Try a new destination (or start) well outside of the harbor. This issue occurs at both the start and the finish when the routing is tends to be near land with islands, harbors and complex shorelines, or try shortening the interval.

Edit Boat > Plot Tab What is the difference between the faint yellow line and the magenta line?

1. These are the optimum upwind and downwind lines for best velocity made good. The colors show up best with the left dropdown set on “Speed” rather than “Plot”



Weather_Routing Time Intervals and Grib Data Time Intervals

When you step through the grib you will see the boat position at that current grib time. This can be right on an isochrone or between two isochrones (if grib interval is smaller than wxrte time interval).

Grib data Time Interval: Available in 3,6 and 12 hour intervals. Weather_Routing Time Interval: Often set to a smaller interval, say 3 or 1 hour intervals. But sometimes to complete to the destination the interval has to be set considerably smaller, say 10 minutes. Weather_routing will then interpolate the Grib file interval down to 10 minutes. When you try to step through the grib file to understand the conditions on the routing, you will jump across the interpolated isochrones. This is determined by the weatherrouting time interval.

For example: From the WeatherRoutingConfiguration results the arrival time is 21:33, for a departure at 12:00. This means a duration of 9 hours, or three grib intervals of 3 hours. Consistent with the 3 steps in grib controller (3 hour time intervals). If you have weather_routing time interval set to 10 minutes, the boat will skip over 18 isochrones for each step of the grib controller.

How do I eliminate all black alternate routes?

View > Settings “Alternates for all isochrones” is unchecked and there are still black alternate routes showing. How do I eliminate them? Set alternate route thickness to “0” on the View > Settings menu.

How can I edit or move an existing WR Position?

Create a new position with the same name to replace it. There is then a prompt to overwrite the old location. This works from the context menu on the chart also.

Supplemental Hardware and Software

- Polar tools - Polar_pi, Polauto (Windows) (See above)
- Voyage Recordings to create polars: Use Opencpn VDR_pi RPI3 or Yacht Devices Voyage Recorder
- Yacht Devices using Excel: Case: How to plot a polar diagram for a yacht using data collected by Voyage Recorder[pdf[567]]

Warnings

Warning about Data

Weather_routing is only as good as the data provided by the Grib plugin and the Climatology plugin.

1. **Grib plugin**: Depends on recent download grib files from Noaa and other sources. Downloaded Grib predicitions can change significantly over several days. The longer the grib prediction is, the less reliable the grib can be.
2. **Climatology plugin**: Can be used for analyzing long crusing routes through various seasons and constraints, but does not take into account the current weather conditions which often vary significantly from the 30 year average, especially outside of prevailing wind areas.
3. These planning tools may be helpful, but should be taken with a healthy “grain of salt” as any good sailor (who looks out to the horizon) should know.

Warning about Weather Routes

The weather routes created may not consider or “see” normal navigation considerations and issues, therefore every route should be checked very carefully for navigation markers, shallow depths, bad currents, rocks, land and other obstacles and hazards.

Developer Notes regarding Packaging for Configuration of the Installation files

Stelian wrote:

In fact, the paths in WeatherRoutingConfig.xml and the boat XML files need to be there, because they tell the plugin where to find the corresponding boat/polar files. And since there might be several boat or polar names with the same name (but located in different folders), the paths need to tell which one is to be used.

However, there is one exception to this: at the packaging time, we don't know where the files will be installed - we know we want to put these in the user directory (ProgramData), but this path is dynamic, it depends on the user name (in case of multiuser systems). For example, on Linux, it might be /home/stelian/.opencpn/plugins/… or /home/rick!

So what we've done is to change the code to allow the config file to use name without the path. The plugin, when it tries to open the file and if there is no path before, will automatically append the user directory path.

This is why the xml files containing the default configuration need to have only the filenames and not the paths inside.

Moreover, the files can contain the path to the contours. This path, once again, is dependent on the user. So we've just removed the CrossOverContours from the boat xml files, and made sure that the plugin will regenerate the contours upon start.

For the date problems, well, we simply noticed in the XML file that the dates were in

mm/dd/yy format, so I've just modified them to yyyy-mm-dd, (if you had saved the files using the current version of the plugin this should have been done automatically).

There was an hour issue too, the file had 09:00 (local time I suppose), I put 00:00:00 instead, I don't think it matters much anyway for such long routes.

I also renamed a boat.XML file to .xml (notice case), it's more standard that way (I know that windows doesn't care much, but on the other systems the conventions are quite strong).

Notes

New dialog to display which sail plan is at the cursor in View→Cursor Position. Alternately it might be interesting to have a display option to color the route map the same as the cross-over chart. There is a box on the route to show each sail change.

Author

Weather_routing_pi is written by Sean D`Epagnier programmer excellente. Sean's Website[568]

Information Tab

Weather Routing Plugin for OpenCPN

Introduction

The Weather Routing Plugin is designed to compute iteratively positions the boat could possibly make at a certain time. By merging the results of many calculations, it is possible to form a map determining routes to any given location within the map.

Quick Start

First, load the grib file used for routing using the grib plugin. Next, open the Weather Routing plugin from the main toolbar and right click the map and Select “Weather Route Position” at the starting location. Repeat this step for the destination. Now, in the Weather Routing window from the Configuration menu (next to File) Select “New”. From here you must configure your vessel correctly in the boat dialog; add a polar to specify how the boat sails. When ready, select “Compute” from the Configuration menu to compute the weather route.

Background

Integration with the grib plugin allows for knowledge of weather conditions. The climatology plugin can also provide a source of data for longer voyages, but be warned that using the climatology data, especially in variable wind areas is unlikely to give realistic results. Using climatology for currents is more useful and can be used with grib wind data when grib current

data is not available.

For example, in the case where data is valid from both sources, grib will always be choosen. If current data is available from climatology, and only wind from grib, then the grib wind is used with the climatology current.

The grib time selected on the timeline at the time the computation is started can be syncronized. From there, the grib timeline data is accessed as the computation proceeds. Once a computation is completed, the course and position of the boat as it sails along the computed route can be viewed during grib playback.

Wind data is required; if no Current or Swell data is available, they are assumed to be zero.

Configuration Options

- Time Step Time to sail before considering a course or sail change. This is the difference in time between the isochrons on the map. Small time-steps are needed to navigate through narrow channels and give a more accurate result. Generally the route's computed time becomes faster with smaller time steps as it can find a more optimal route with more variation, however it will take longer to calculate (generally four times longer for half the time step).
- Grib Enable using current grib from grib plugin.
- Climatology
  - Disable Do not allow climatology to be used.
  - Currents Only Use climatology for currents, but never wind.
  - Cumulative Map Pretend the wind comes from all of the directions in the wind atlas for the percentage of time based on the atlas. For this mode to work optimally, you should sail at all angles from 0 to 360, and enable “optimize tacking”. This will allow the program to assume you will tack as needed in intervals shorter than the isochrons to take advantage of wind shifts.
  - Cumulative - Calms Like Cumulative Map, except the boat also drifts without sailing during calms.
  - Most Likely Use the interpolated most likely wind data from the wind atlas, with the most likely wind speed.
  - Average Use wind vector average for wind direction, and wind magnitude average for wind speed. This is the fastest to compute, but not very realistic (it may be close in prevailing conditions).
- Last Valid Wind Data if Deficient Continue to navigate on last valid wind data even if there is no more valid wind data in the area/time. Currents will be assumed to be zero if data is deficient. Cases with deficient data include navigating outside the space or time of the grib file without climatology data, or into an area also not covered by climatology.
- Wind Strength Percentage Multiply wind strength from data source by this percentage to allow computation of possible “what if” scenarios of greater or lesser wind strength.
- Integrator Newton's method is default and fastest, but doesn't take into account changes in wind/current along each step. Rutta Kunge (4th order) is much more accurate taking 4 samples, but a lot slower. Generally Newton's method with a smaller time step is recommended for more accuracy.
- Detect Land Use GSHHS coastline data to avoid sailing through land. This check is quite slow and should be optimized in the future. It is recommended to upgrade to the high resolution background map available here.

- Optimize Tacking Boat may sail on all courses 0-360, even directly upwind and it is assumed that the captain performs tacking at the optimal angles to closely approximate the generated weather route for upwind and downwind. Tacks will not be visible in the generated route. This may allow navigation in tighter areas, or otherwise better results without decreasing the time step.
- Inverted Regions This is relatively rare, but in some cases it may be possible to reach a location from two different routes (imagine either side of an island) which is further away from the destination before the destination can be reached. At this point, the algorithm must invert and work inwards on this inverted region (rather than outwards) to possibly reach the destination. This case can occur when routing around islands, or occasionally when routing near a high pressure system. Normally this should be disabled, and extra computations are avoided. NOTE: this mode has bugs
- Anchoring In some cases, it may be preferable to anchor (assuming it isn't too deep) rather than continue to navigate if there is a contrary current which is swifter than the boat can travel. This allows the route to reach the destination sooner by sitting in place until the current abades.
- Max Diverted Course Maximum course error to continue toward destination. Not all possible courses will be considered and therefore the most optimal route may not be found. This usually (but not in all cases) is obvious when the optimal route is sometimes near the edge of the graph. Using a reasonable value can greatly speeds the rate of computation.
- Max Course Angle Like Max Diverted Course, except the search range is based from the starting position to the destination. Normally should be set to 180.
- Max Search Angle This specifies how much the boat course can change between propagations. A value of 180 gives the maximum flexibility of boat movement, but increases the computation time. A minimum of 90 is usually needed for tacking, a value of 120 is recommended with strong currents. Smaller values (60 or less) can give very fast results, but should be used with care, as if the other settings are not appropriate, an inaccurate graph will result. For example, if tacking is needed at any time, then in this case, all courses (0-360) must be specified as degree steps and “optimize tacking” should be enabled.
- Max True Wind Knots Do not navigate in areas with more true wind than this value.
- Max Apparent Wind Knots Do not navigate in areas with more apparent wind than this value. This should be set to a high value (ie: 100) if not used to avoid extra calculations.
- Max Swell Meters Do not attempt to navigate in areas with more wave average height than this value.
- Max Latitude Do not navigate above (or below in the southern hemisphere) this latitude.
- Max # of Tacks Does not attempt to tack more than this number of times. Currently it tacks as much as it likes initially, then stops tacking at the limit, therefore if a very low number or an even/odd mis-match is given, a very sub-optimal track may be produced. For this reason a value of -1 (unlimited tacks) is recomended
- Tacking Time Penalty for course change from one tack to the other in seconds. This is normally irrelevant for ocean passages, but could be useful for routes in tight quarters Setting to 0 avoids extra calculations.
- Wind VS Current When wind opposes current rough seas can be produced. This constraint takes the dot product of the current and wind vectors, and if the result exceeds this value, navigation in this area is avoided. For example, a value of 60 would avoid 30 knots of wind opposing a 2 knot current as well as 20 knots of wind opposing a 3 knot current. Higher values allow for rougher conditions; the special value 0 (default) allows any conditions.

- Avoid Cyclone Tracks Uses climatology cyclone tracks to avoid routings which cross historic cyclones. The settings in the climatology configuration for windspeed, pressure elnino etc are used, so only visible tracks are considered.
- Courses (relative to true wind) A list of courses to attempt sailing. Excluding certain values can force the route to explicity show tacks/jibes. Another option is to remove all upwind values to find a course which is always running off the wind (even if it is much longer.) Good results typically have a course every 3-5 degrees; more steps takes longer computation time.

Failures

If the route failes to complete there are various reasons why displayed in the status column of that configuration.

- Grib Grib data not available at the needed time step. This is different from being outside of the grib area.
- Climatology Can only occur if trying to avoid climatology cyclone data and the data isn't available.
- Polar Occurs when there is no polar defined for the conditions.
- No Data Occurs when navigating in an area where there exists no wind data.

It is also possible to fail with none of the above specified. In this case it is likely due to the configuration settings being too restrictive.

It is possible to be restricted by constraints in one area, not have data in another area and have undefined polar data elsewhere, and changing any of the three allows for a successful route. For this reason the cause of failure may be unclear. Batch Mode

Once a weather route is successfully computed, it is possible to determine the best time to leave. To do this, many configurations must be generated each with a different start time. Starting by selecting a single configuration with the earliest starting time. From the configuration menu, select batch (ctrl+b) From here, enter the number of days/hours to generate spans. Using decimal values for hours is allowed (ie: 0.5 for half-hour) Once generate is selected, many configurations should appear. Now, “Compute All (ctrl+a)” can be selected from the configurations menu. A total progress bar can be seen under the configurations. Finally a report describing the routes is available from the View menu. Boat

The boat dialog displays the polar plot of the boat's speed vs true wind direction as well as showing other details. An xml file specifies the boat parameters and each sail plan. Two file types of polars are supported; CSV (same as qtVlm) and xml parameters which describe how to compute the polar.

Plot tab

specifies the parameters for the plot displayed.

- Polar Typical polar diagram showing boat speeds at a given wind speed.
- Speed Plot boat speed across all wind speeds at a given wind angle.

The tracking displays give data based on the mouse position over the plot.

Crossover tab

Shows the relationship of the polars and which one is used for each condition.

Statistics

Displays miscellaneous statistics about the boat.

Settings

The following is a list of the default **Configuration** Constraints and Options. Use this list to check your settings if you are having trouble.

Constraints

If you are having trouble, set the Configuration to these defaults or select Configuration > “Reset All”:

Basic

1. Max Diverted Course 76 degrees
2. Max True Wind 100 knots
3. Max Apparent Wind 100 knots
4. Max Swell 20 meters - Ordered List Item

Additional

1. Max Latitude 90 degrees
2. Tacking Time 0 (disabled)
3. Wind vs Current 0 (disabled) Factor for waves and hobby horsing
4. Max Course Angle 180 degrees
5. Max Search Angle 120 degrees

Cyclones

- Avoid Crossing Cyclone Tracks Unchecked
- within X months X days 1 month 0 days

Options

- Time step 1 hour 0 min 0 sec

Basic

1. Detect Land Checked (when first starting, uncheck it)
2. Detect Boundary Unchecked
3. Use Currents Unchecked
4. Wind Strength is 100 percent

Advanced

1. Inverted Regions Unchecked
2. Anchoring Unchecked
3. Integrator Newton

Boat

1. Data Source
    - First use a freshly downloaded grib of the entire route area (a little larger than then route), making sure that it is for a big enough time interval. Then set the Grib_pi at least one frame later than the start time.
2. Grib Unchecked
    - You will need to check this.
3. Climatology Disabled
    - You can leave this disabled when you are starting. You can run routes using Climatology alone, or you can use the 30 year Noaa data averages to extend calculations for a long trip both at the start and finish. There will be an indicator on the preferred route when the data source changes.
4. Last Valid if Data Deficient
    - Unchecked If your grib file is not long enough checking this can help.

Irma Examples

Five Configurations that will Compute

Confirm that the Weather_Routing Plugin has been installed.

Files & Pathnames

It is important that you use this configuration for Windows (Linux use comparable User accessible directories):

1. Main Path for support files: *C:\ProgramData\opencpn\plugins\weather_routing*
2. WeatherRoutingConfiguration.xml: *C:\ProgramData\opencpn\plugins\weather_routing*
3. Polar Files (.pol,.txt,.csv): *C:\ProgramData\opencpn\plugins\weather_routing\polars*
4. Boat.Xml Files: *C:\ProgramData\opencpn\plugins\weather_routing\boat*
5. Grib-Sample File: *C:\ProgramData\opencpn\plugins\weather_routing\grib-sample*

(Note the weather_routing installation may not create these files in the correct location, and may put them under *C:\Program Files (x86)\opencpn\plugins\weather_routing/data*. If this is the case, just download the Weather Routing Setup files below and install as shown above.

Weather Routing Setup Files

Download and Unzip files and directories to
C:\ProgramData\opencpn\plugins\weather_routing

Weather Routing Setup[569]

Unzip and install files & directories into *C:\ProgramData\opencpn\plugins\weather_routing* to follow the locations above. These files will provide you with sample files to help learn how to weather_route.

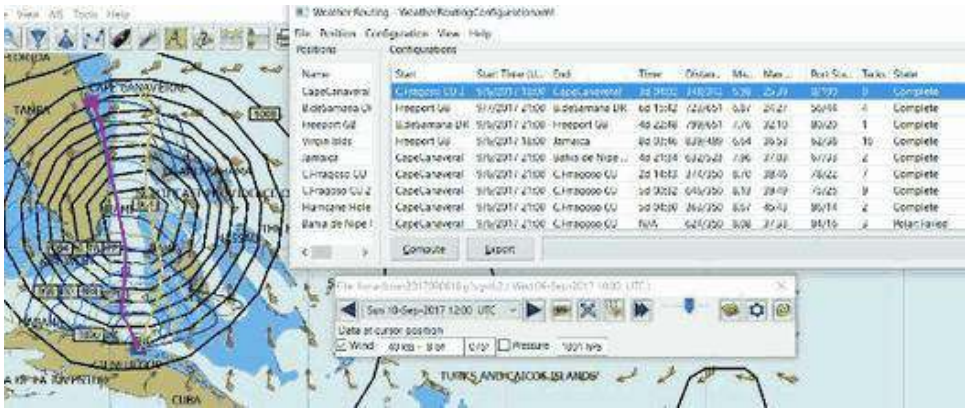
Run some Weather Routing Routes

1. Start Climatology_pi, although it will start automatically if called.
2. Start Grib_pi and open the Irma-Jose-2017090618.gfs.grib2 file located in *C:\ProgramData\opencpn\plugins\weather_routing\grib-sample* or just copy it to your normal grib file location.
3. Set the Grib Date to Wed, Sept 6 2017, UTC 21:00 and get the screen centered on the grib.
4. Then open Weather_routing_pi, you may be pointing at the wrong directory, so Pick "*File > Open*" and browse to *C:\ProgramData\opencpn\plugins\weather_routing* and then select and open "*WeatherRoutingConfiguration.xml*".
5. Confirm the "Boat section" path is correct as shown above in the Pathname list.
6. Confirm the "Polar" path is correct as shown above in the Pathname list.
7. In the menu you should find 5 configurations for routes in the Caribbean.
8. Pick a route and then select "Compute from the bottom of the menu.

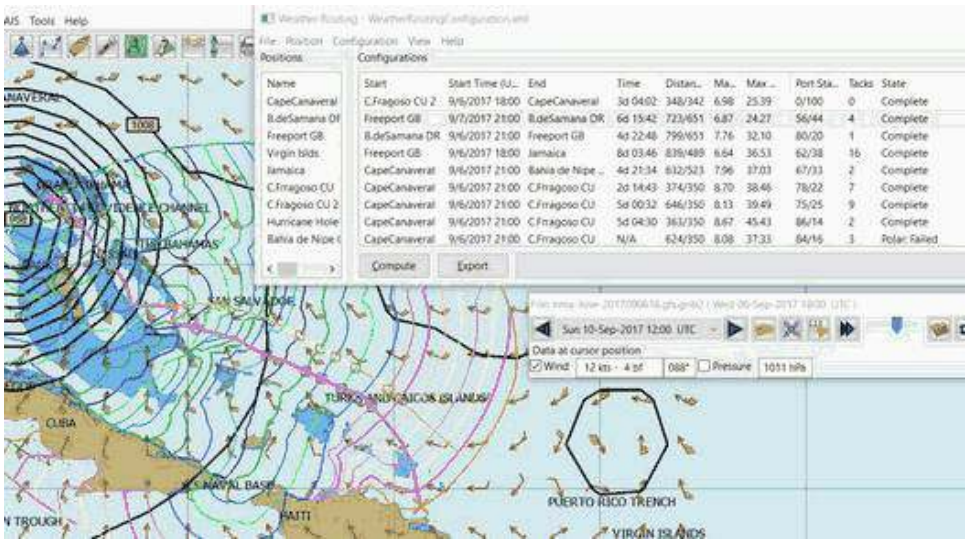
9. Check that the isobars and route is drawn. Then step through the Grib_pi changing the time to see where the boat is located and how the wind changes.
10. Try “Computing” the other routes, noticing how the settings have been changed, and what files are being used.
11. Once you are pretty confident about this, go to the next step, which is to create your own configurations.

Computation of 5 Routes

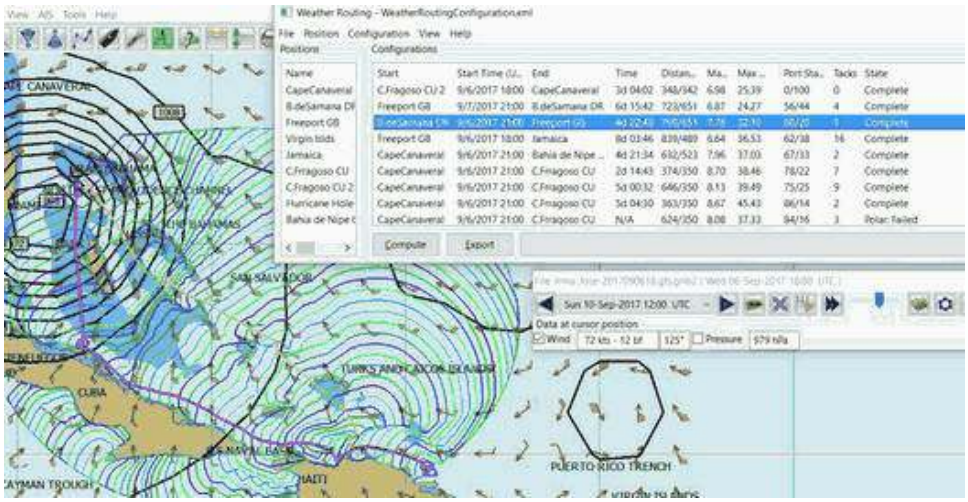
These are 5 Weather Routings in “**Weather-Routing-Setup**” that should **Complete** when using the small grib file for hurricane Irma. Weather_routing would not normally be used for this, however in emergency situations it could be used to develop “avoidance” measures by setting “conservative” maximum wind speeds in your polar files. These routings below do find circuitous “avoidance” routes based upon their Polar File values, but the values could be made more “conservative”. **The purpose of these examples is to illustrate the dependence of “Completed” routings on a number of values and constraints, to heighten the user's awareness of those values.** When a routing *Fails*, the user needs to learn and understand what values need to be adjusted. Adjustment of *Time Interval* is just one of the settings to be considered in **Weather Route Configuration**.



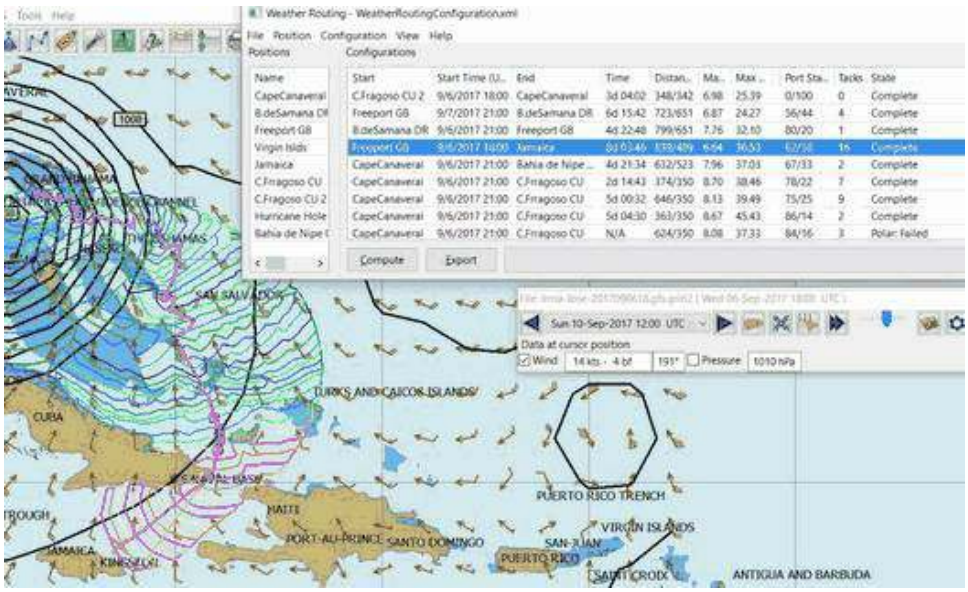
First Routing Default Settings - 4 hr Interval



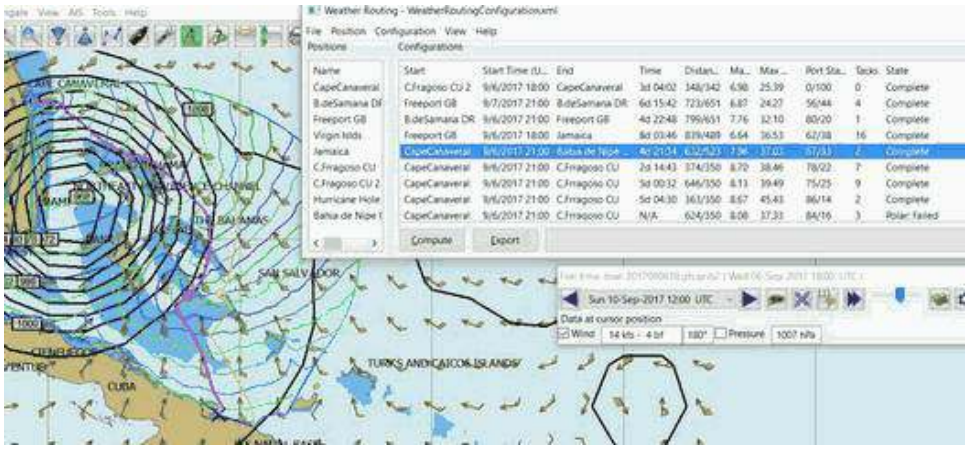
Second Routing Default Settings - 5 hr Interval



Third Routing Default Settings - 2 hr Interval



Fourth Routing Default Settings - 3 hr Interval

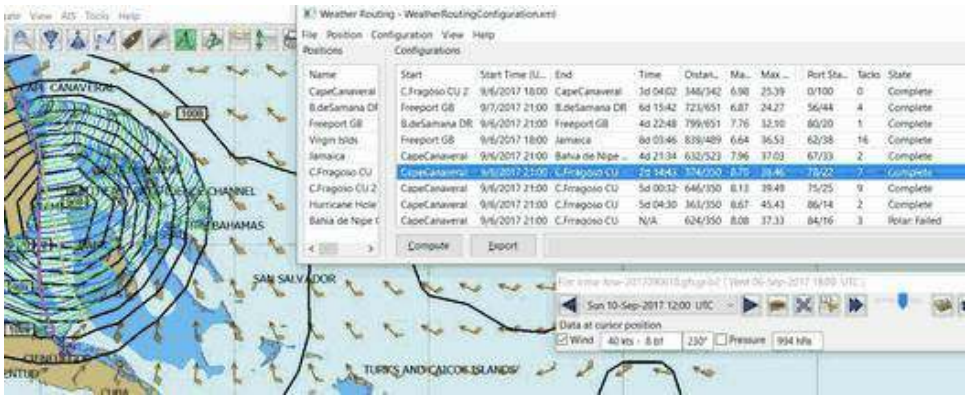


Fifth Routing Default Settings - 4 hr Interval

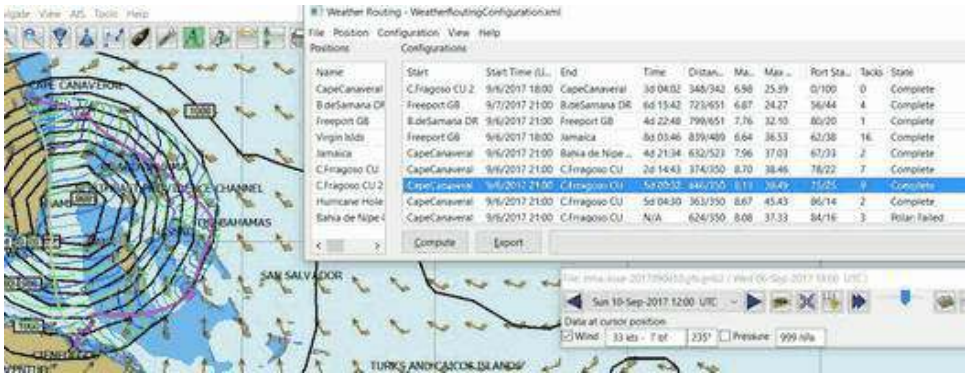
Computation of Routes from Cape Canaveral with different Intervals

These routes are also in "**Weather-Routing-Setup**" and illustrate how different Time Intervals may interact with Land causing **Failures** depending on the configuration of the Finish point with land masses. Notice that **Cape Canaveral 4 & 5** (4 & 5 hour Time Intervals) both **Failed**. Changing to a smaller Time Interval is likely to help **Complete** and so is changing the Default **Max Diverted Course** from 100 to 150 degrees, both of which will require more computation. The other alternative is to use a different Weather Routing Position for the Finish, which is further away from the interfering land masses.

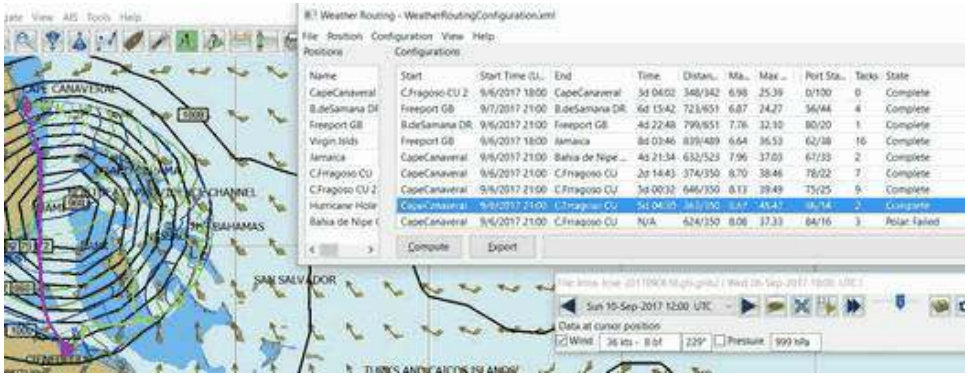
The *optimum weather route* that is computed changes with the *Time Interval* due to interaction with *Land mass* at the edges of the *Wind data*. Choosing Finish points that are clear from **Land Masses**, Smaller **Time Intervals** and greater **Max Diverted Course** will generally help in these cases. The very different routes taken with each time interval all result in Trip times of 5days-1/2hr to 5days-4-1/2hrs which are quite small differences given the divergent routes. In planning your trips you may want to take advantage of these alternatives which are shown with use of different **Time Intervals**, depending on your goals.



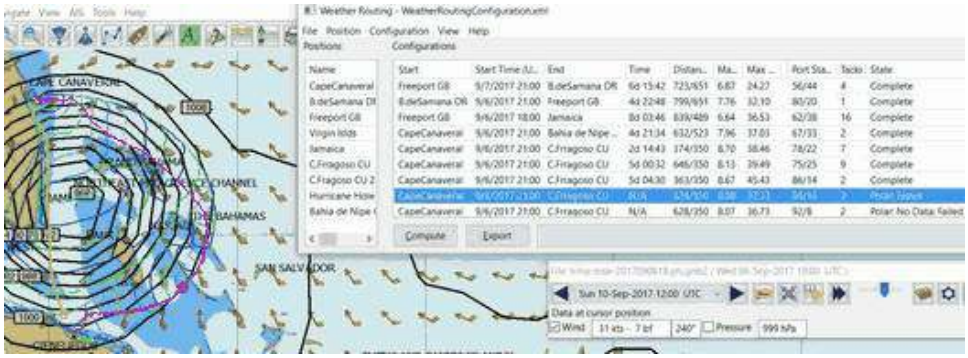
From Cape Canaveral 1- 1hr Interval



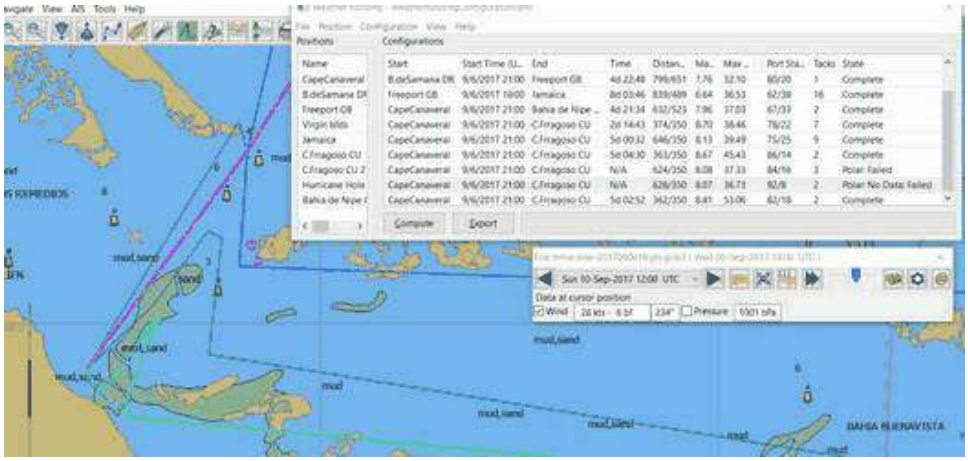
From Cape Canaveral 2- 2hr Interval



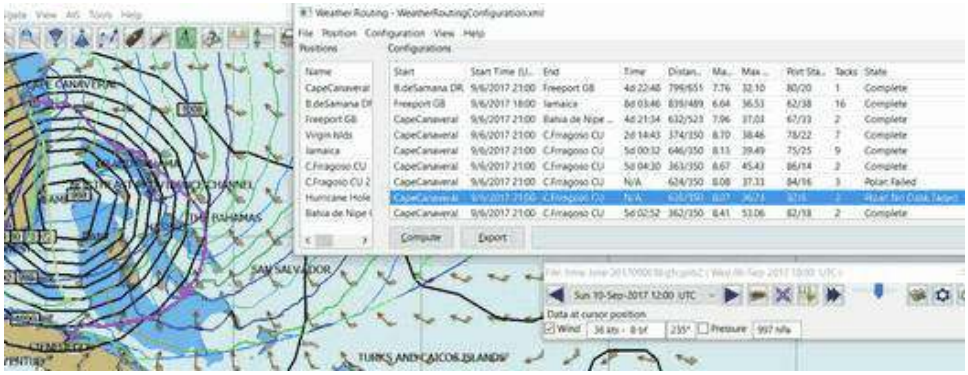
From Cape Canaveral 3- 3hr Interval



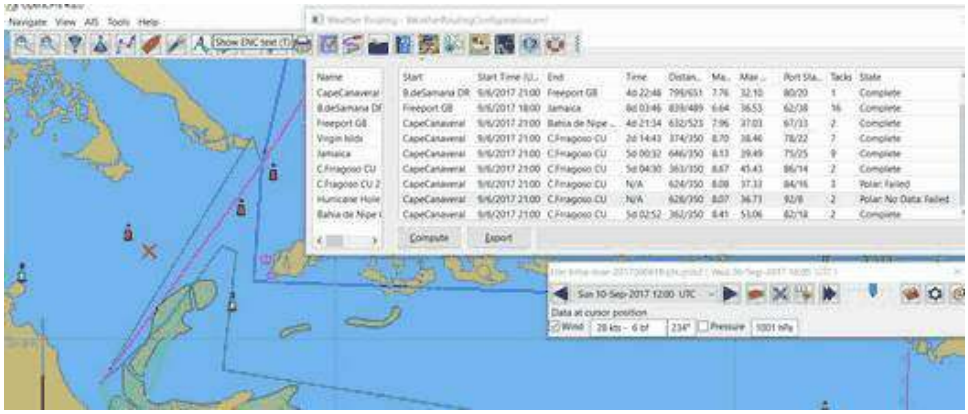
From Cape Canaveral 4- 4hr Interval **Polar:Failed**



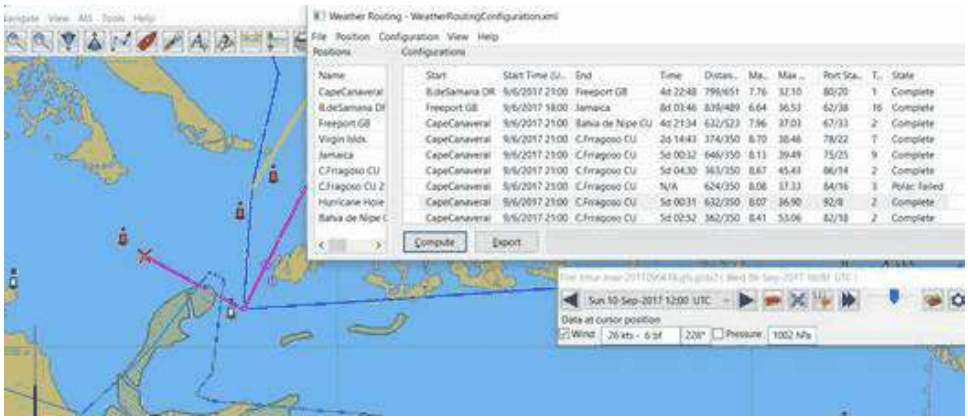
From Cape Canaveral 4- 4hr Interval **Polar: Failed** Zoomed



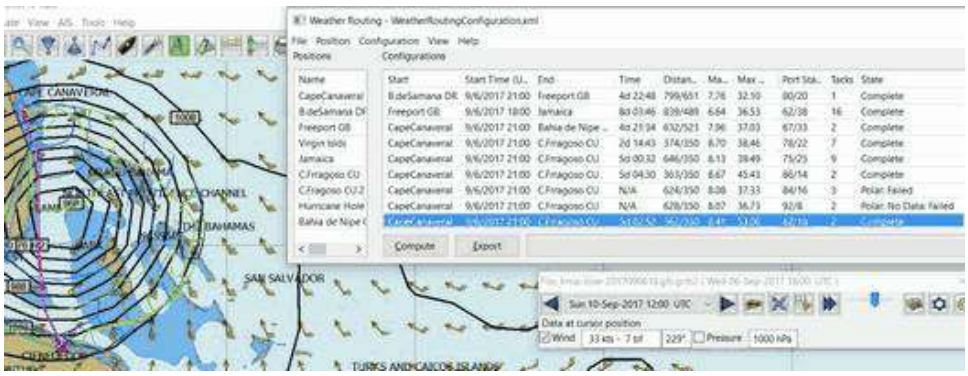
From Cape Canaveral - 5 hr Interval **Polar: Failed**



From Cape Canaveral - 5 hr Interval **Polar:No Data Failed** Zoomed



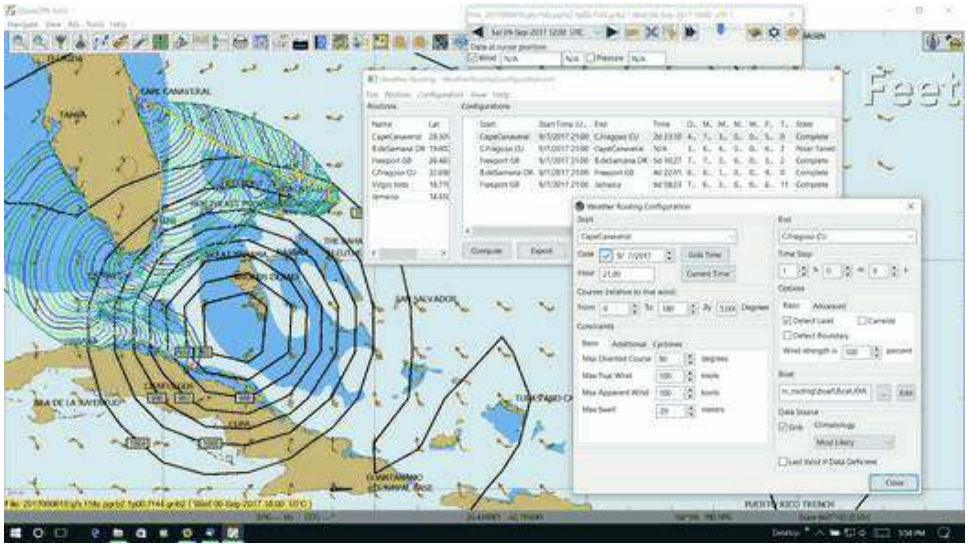
From Cape Canaveral - 5 hr Interval Fail Zoomed (Changed MaxDiv=150) **Complete**



From Cape Canaveral - 6 hr Interval - On Default (MaxDiv=100) **Complete**

When there is a Compute *Failure* try to understand why. Zoom in to where the routing is failing, to see and determine that the *Time Interval* or *Destination Point* is not right or too close at the complex land - sea interface. Then change the *Time Interval* or move the *Destination Point* further out to sea where the routing calculations can be made more easily. This is just one configuration consideration, there are others.

Here is a good example of “Avoidance Routing” around Irma. The polars could be made more conservative (and should be), and the routing will probably “fail” which would be a warning that a better “weather window” is needed. **Time to prepare for the hurricane rather than running weather-routings!**.



5. WR Not a substitute for sound judgment & realistic goals

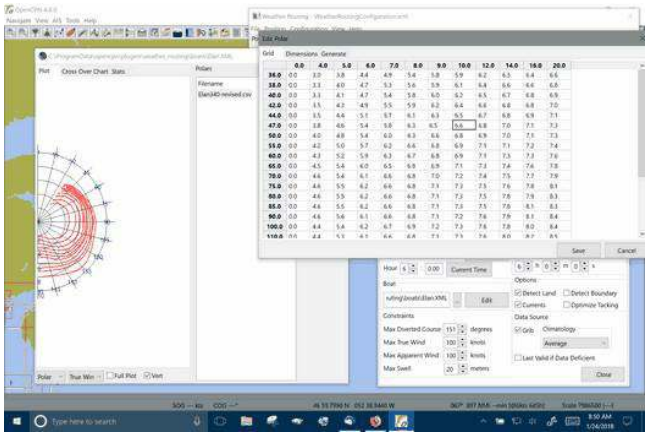
Why try to route into Irma? **You** must *Configure* weather_routing to match your *sound judgment* and *realistic goals*. You are in control, use your own judgement when you review the results. **This cannot be emphasized enough.** Weather_Routing_pi is just a tool in your hands, you are in control.

File Conversion

Polar File Conversion

Opencpn weather_routing_pi and the required polar format

The plugin has a useful **Edit** mode for polars under *WeatherRouting Configuration* > *Boat* > *Edit*, then highlight the polar and Select **Edit**. The *Dimension Tab* enables adding and deleting columns and rows.



Changing the anomalous value 4.7 to 6.6 for a smoother curve at 47 degrees and 10 knots TWS.

The weather_routing_pi plugin references several files located in *c:/ProgramData/opencpn/plugins/weather_routing*.

To see where these files are set in the plugin, select a route or make a new one. Pick *Configuration –> Edit*. Then pick *Boat* > *Edit* a tabbed dialogue box will open.

Plot Details Tab has *Open, Save and Save as* buttons. This is the pointer to the <boat>.xml file which contains the boat characteristics, it is initially set to “boat.xml”. After you have gone through all the tabs and set the boat's Lwl, Loa, Displacement, etc. you should “Save as” using your boat's name. Then “open” that file each time weather_routing needs those settings.

Initially under <Configuration > Edit > Boat Edit > Plot Details [tab] the file referenced is “boat.xml”. Make sure you have a file “boat.xml” in your opencpn data directory, if you are having troubles, download a boat.xml file and “load” it.

The second file is under <Configuration > Edit > Boat Edit > Polar [tab] and this is an optional polar file “<boat>.csv”. “Polar File” Tab shows the path of the Polar file being used, if one exists, otherwise the program has builtin VPP calculation using the boats characteristics which have been entered, which is in effect when the path shows as “<computed>”.

If you have prepared a polar file in the Opencpn format for your boat, you can load it into the

plugin from this tab, and after you “Save” from the “Plot Details” tab, the pathname willl be remembered [note the pathname in the sample <boat>.XML file below].

Sometimes the plugin is picky about these files. If it is close the plugin and opencpn and reopen, to reset it. Then try again. The two sample files are shown below. They are paired. If you load the XML file the referenced polar file will be loaded if it is in the path and the correct format.

Shannon38-opencpn-roundtrip.XML [This is the <boat>.XML file]
<?xml version=“1.0” encoding=“utf-8” ?>
<OCPNWeatherRoutingBoat version=“0.9” creator=“Opencpn Weather Routing plugin”>
<BoatCharacteristics displacement_tons=“21” lwl_ft=“34” loa_ft=“38” beam_ft=“11” />
<BoatDrag frictional_drag=“0.0170” wake_drag=“0.9500” />
<Plan Name=“Initial Plan” computed=“0”
csvFileName=“*C:\ProgramData\opencpn\Shannon38-opencpn.CSV*” />
</OCPNWeatherRoutingBoat>

Shannon38-opencpn.CSV [This is the <boat polar>.csv file.]
twa/tws;6;8;10;12;14;16;20
0;0.00;0.00;0.00;0.00;0.00;0.00;0.00
30;0.00;0.00;0.00;0.00;0.00;0.00;0.00
40;2.80;4.10;4.40;4.70;4.90;5.00;5.10
45;4.00;4.90;5.20;5.50;5.70;5.80;5.90
52;4.50;5.40;6.10;6.40;6.60;6.70;6.80
60;5.00;6.00;6.50;6.70;6.80;6.90;7.00
75;5.50;6.40;6.80;7.00;7.20;7.30;7.40
90;5.70;6.60;7.00;7.30;7.50;7.60;7.70
110;5.80;6.70;7.10;7.40;7.60;7.70;7.90
120;5.50;6.50;7.00;7.30;7.60;7.90;8.20
135;4.80;6.00;6.60;7.00;7.40;7.70;8.30
150;4.00;5.00;5.90;6.50;6.90;7.30;7.90
165;3.70;4.80;5.20;6.20;6.60;6.90;7.50
180;3.30;4.20;4.70;5.90;6.30;6.60;7.20

qtVLM Polar Format
http://wiki.virtual-loup-de-mer.org/index.php/QtVlm_Polar_Diagram[570]
Extension of the file name. Csv
Separator ';' (semicolon)
Double-entry table

- The first cell always contains 'TWA \ TWS'
- The first line lists the wind forces. Vlm does not go beyond 60 knots of wind.

Beginning of each line gives the look, then each value corresponding to the shape and strength of the wind (column heading).

The digital data of the polar use a decimal point, 'that is the point.' An integer (no point ended) is valid. Whites are valid (value = 0.0) but discouraged. Thank you for being explicit.

Text file format is UNIX ie lines that are terminated by LF (Line Feed) and not CR (Carriage Return) and LF. A good text editor windows (PsPad or Notepad + +) knows rerecord this

format.

TWA\TWS;0;2;4;6;8;10;12;14;16;18;20;22;24;26;28;30;32;34;36;38;40;42;44;46;48;50;52;5
0;0.000;0.000;0.000;0.000;0.000;0.000;0.000;0.000;0.000;0.000;0.000;0.000;0.000;0.0
5;0.000;0.210;0.420;0.630;0.800;0.860;0.920;0.940;0.950;0.970;0.980;0.980;0.990;0.950;0.8

Maxsea Polar Format (same as Adrena, or SailGrib WR) http://www.sailgrib.com/wr-user-guide[571]

The first row defines the True Wind Speed.
The first column defines the True Wind Angle.
In the example, the theoretical hull speed for various wind velocities and wind angles is in the cells.
Modify the True Wind Speed values in the first row. The example below uses 10 and 30 Kts.
Enter these values in the first row and delete the other columns.

In an Excel spreadsheet TWA 10 15 20 25
30 2.0 5.4 7.2 7.9
90 4.7 9.5 11.5 12.8
150 2.9 7.4 10.5 13.0

http://www.sailingperformance.com/Products.html[572]
Expedition http://www.expeditionmarine.com/index.html[573]
Isler http://www.islersailing.com/new_page_3.htm[574]
BLUR Boats and Polars http://www.blur.se/boats/[575]

Bluewater Racing, and Expedition Polar file format
http://www.bluewaterracing.com/bluewater.htm#_Toc343740589[576]

Quote:
A polar file is a sequence of lines. Each line describes the curve for one windspeed, *ws*. Optionally, the first line may begin with the string “pol”, in which case it is treated as a comment line. This klunky format is not my idea; it is for compatibility with *Expedition* and other software tools, and because it loads easily into spreadsheet tools such as *Excel*.

Each curve is described on one line of the text file by a windspeed, followed by a sequence of pairs of True Wind Angle and boatspeed. (TWA in degrees, BSP in knots) eg:

10 30 0 45 6 90 8.1 160 7 180 5
15 30 0 40 8 90 12 150 10 165 9 170 5

This gives two curves, one for windspeed 10, one for windspeed 15. Different curves may have different TWA points, and different numbers of points. The line for windspeed 10 specifies a boatspeed of zero knots at a true wind angle of 30 degrees, a boatspeed of six knots at TWA 45, 8.1 knots at 90, seven knots at 160 degrees, and five knots at 180 degrees.

There can be a zero windspeed curve with non-zero boatspeed, i.e., “when the wind is gone, the motor's on.”

Rules for the data in polar files:

1. One windspeed curve per line.

2. There must be a least 3 points per curve.
3. There must be at least one non-zero windspeed curve.
4. The minimum TWA is zero, and the maximum is 180.
5. The 2nd smallest TWA in a line is the best VMG upwind angle for that windspeed. The 2nd largest TWA is the best VMG downwind angle for that
6. The first TWA should be less than any 2nd TWA in any curve. Ideally, zero.
7. The last TWA should be greater than any 2nd-to-last TWA in any curve. Ideally, 180

If these rules are broken, the behavior of the program is undetermined.

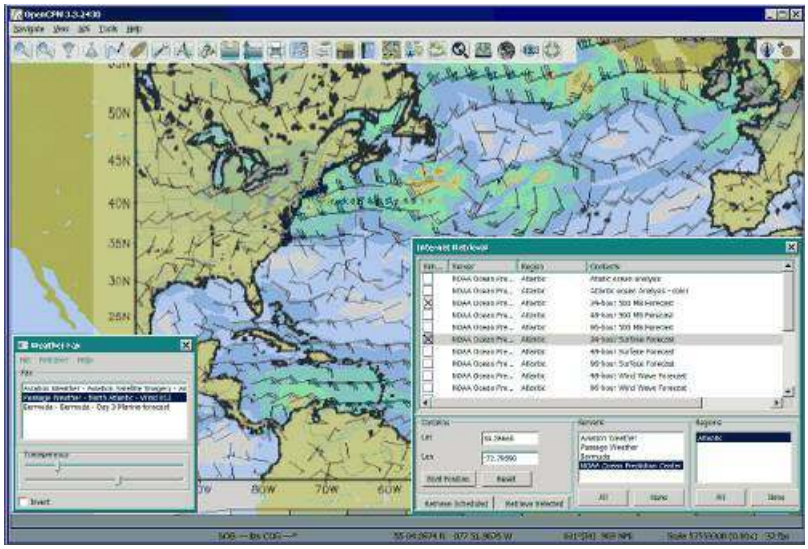
Example
2 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
4 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
6 24 28 32 36 40 44 48 52 4.5 56 60 5 64 68 72 76 5.5 80 84 88 92 5.7 96 100 104 108 112 5.8 116 120 5.5 124 128 132 136 4.8 140 144 148 152 4 156 160 164 168 172 176 180
8 24 28 32 36 40 44 48 52 5.4 56 60 6 64 68 72 76 6.4 80 84 88 92 6.6 96 100 104 108 112 6.7 116 120 6.5 124 128 132 136 6 140 144 148 152 5 156 160 164 168 172 176 180
10 24 28 32 36 40 44 48 52 6.1 56 60 6.5 64 68 72 76 6.8 80 84 88 92 7 96 100 104 108 112 7.1 116 120 7 124 128 132 136 6.6 140 144 148 152 5.9 156 160 164 168 172 176 180
12 24 28 32 36 40 44 48 52 6.4 56 60 6.7 64 68 72 76 7 80 84 88 92 7.3 96 100 104 108 112 7.4 116 120 7.3 124 128 132 136 7 140 144 148 152 6.5 156 160 164 168 172 176 180
14 24 28 32 36 40 44 48 52 6.8 56 60 6.8 64 68 72 76 7.2 80 84 88 92 7.5 96 100 104 108 112 7.6 116 120 7.6 124 128 132 136 7.4 140 144 148 152 6.9 156 160 164 168 172 176 180
16 24 28 32 36 40 44 48 52 6.7 56 60 6.9 64 68 72 76 7.3 80 84 88 92 7.6 96 100 104 108 112 7.7 116 120 7.9 124 128 132 136 7.7 140 144 148 152 7.3 156 160 164 168 172 176 180
18 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
20 24 28 32 36 40 44 48 52 6.7 56 60 7 64 68 72 76 7.4 80 84 88 92 7.7 96 100 104 108 112 7.9 116 120 8.2 124 128 132 136 8.3 140 144 148 152 7.9 156 160 164 168 172 176 180
22 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
24 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
26 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
28 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
30 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
32 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
34 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180
36 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180

Other Information and Alternatives for Weather_Routing Refer to this link in the wiki Weather Routing

Weatherfax

Weatherfax

Retrieves internet image files, reads image files or decodes audio and then Overlays the image on top of charts.



Links

- Source: https://github.com/seandepagnier/weatherfax_pi[577]
- Release: Windows Releases[578]
- Download: https://opencpn.org/OpenCPN/plugins/weatherfax.html[579]
- Forum: http://www.cruisersforum.com/forums/f134/weatherfax-97533.html[580]

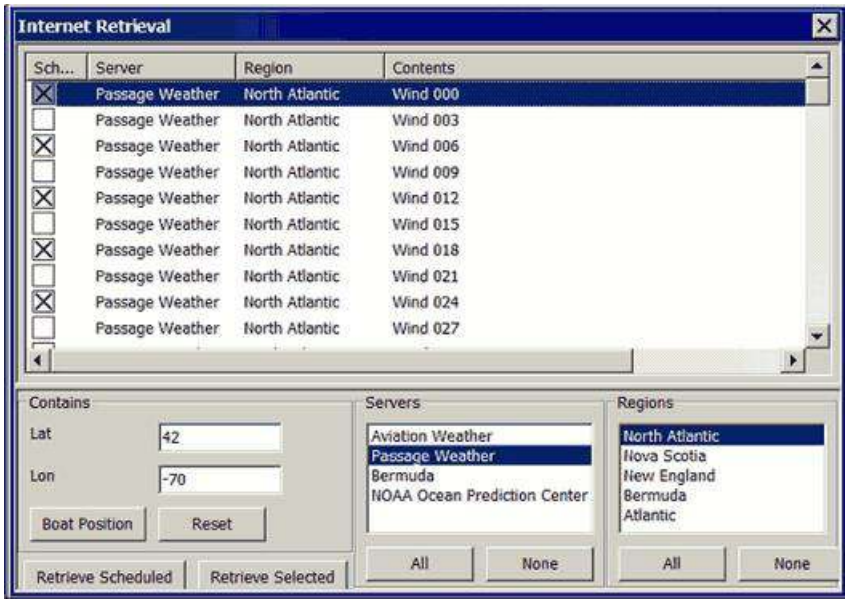
Preparation

Install Weatherfax Plugin. Enable it in the Settings > Plugin Tab. Then open it and explore the top menus.

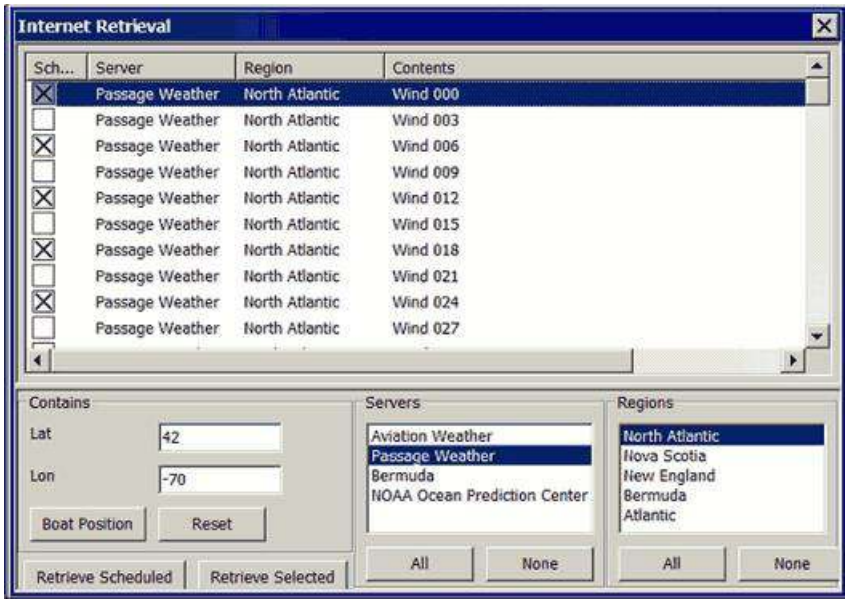
With an internet connection it is quite easy to select the “HF Radio Schedules” to select and set alarms for use with a reciever, or to select the Internet Schedules and then retrieve Weatherfaxes via the Internet and overlay on the chart. Audio Capture requires a connection.

Retrieve Weatherfax Image files with an internet connection

If you have an internet connection, first Retrieve > All > HF Radio Schedules.
Then Retrieve > Internet > Select NOAA > Select Boston (for example) > Select 24hr 500mb Forecast
The Weatherfax image file will download and be overlaid directly onto a chart.

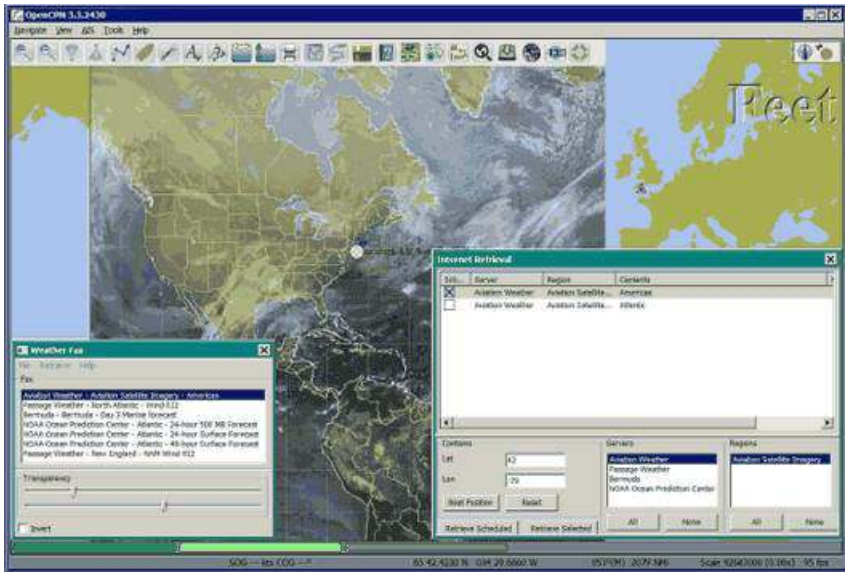


Lat 42 Long -70 –> Servers: Noaa —> Regions: Atlantic —→ Select Contents —→ Retrieve

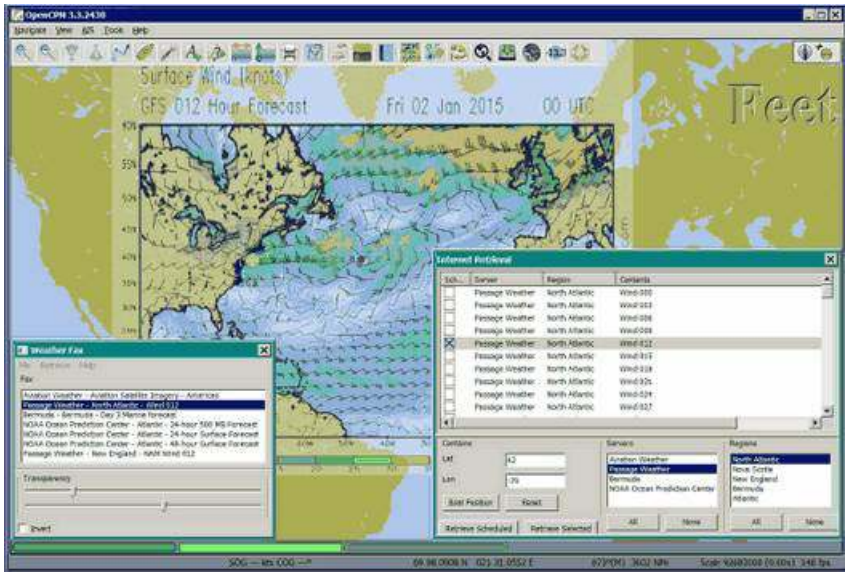


Lat 42 Long -70 –> Servers: Passage —> Regions: N. Atlantic —→ Select Contents —→ Retrieve

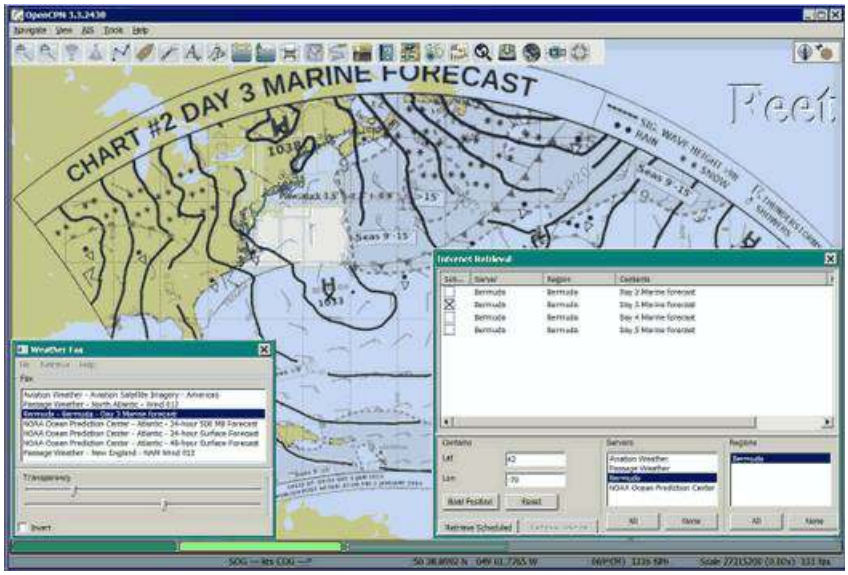
The plugin data directory contains an WeatherFaxInternetRetrieval.xml file that has database for meterological sites. The “Internet Retrieval” Option uses this schedule. It is a wonderful planning tool for cruises or passagemaking. There are several options, but first Select “Internet” to retrieve HF Radio Schedules via the internet. Then Select “NOAA” Under “Servers” you will see “Stations” fill up. Then select “Boston” and the Internet Retrieval choices are automatically listed in the menu area. Select several faxes and pick “Retrieve Scheduled” or “Retrieve Selected”.



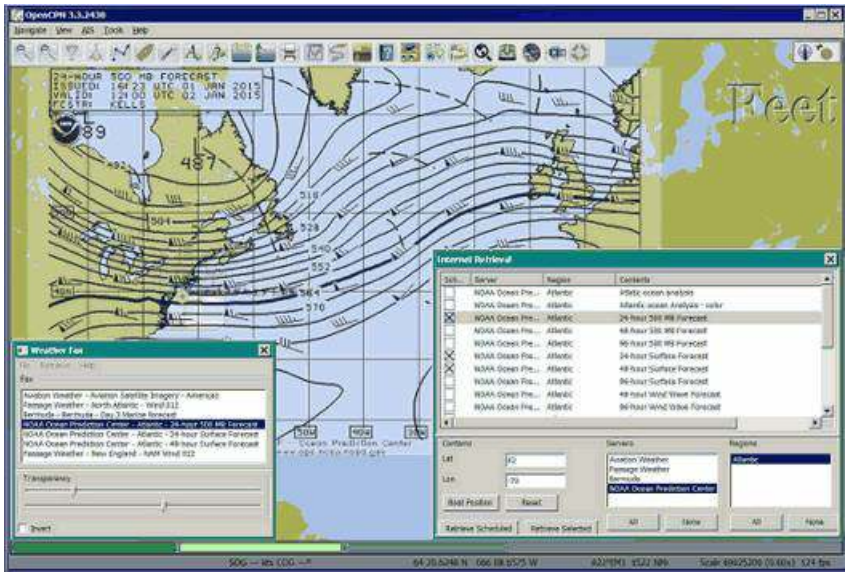
Aviation Americas Forecast retrieved via the internet.



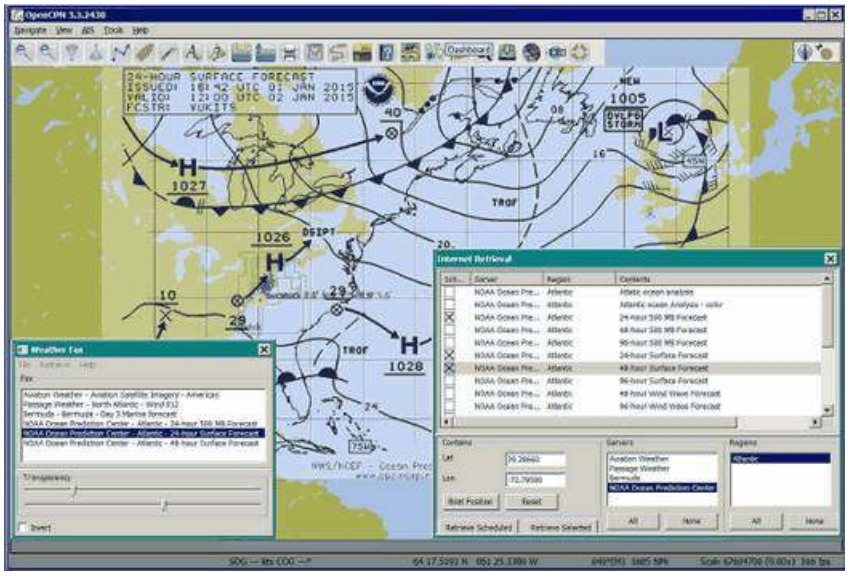
Passage Weather Atlantic 012 Wind via internet.



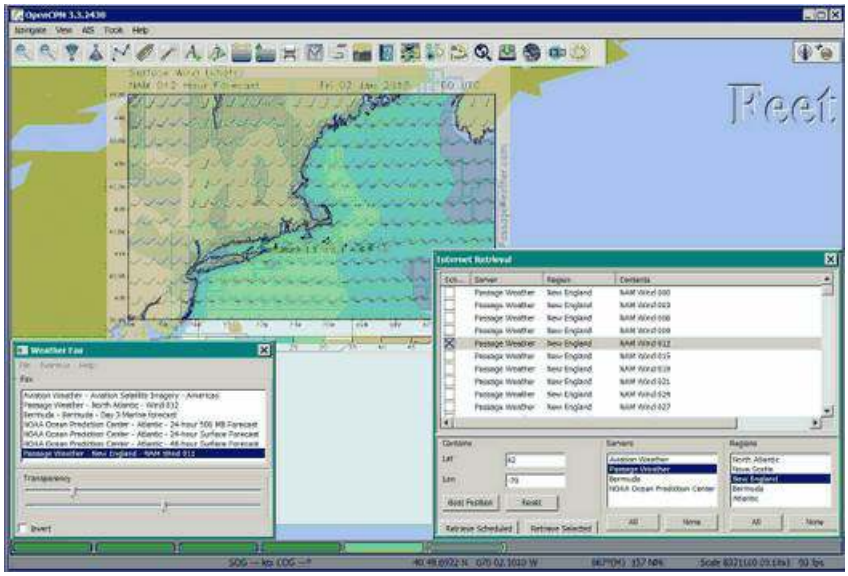
Bermuda 3 day via internet.



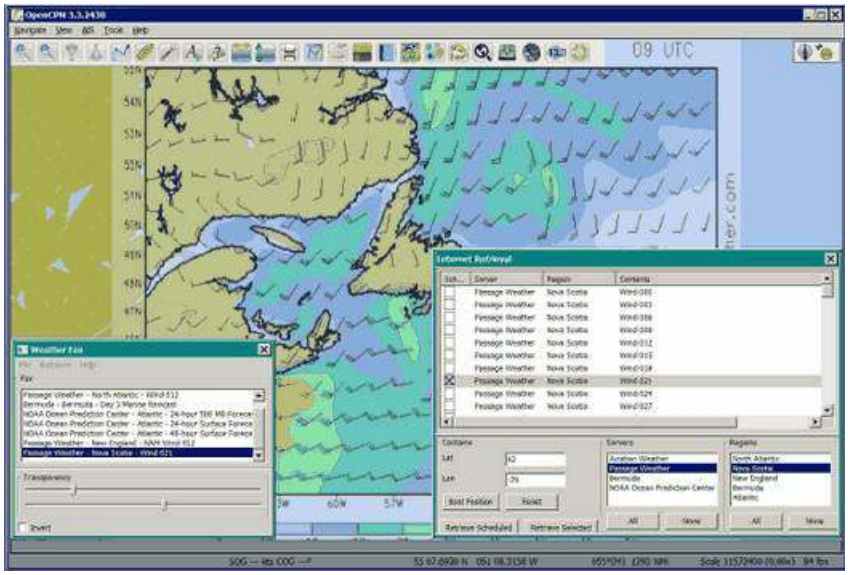
NOAA Atlantic 24hr 500mb via internet.



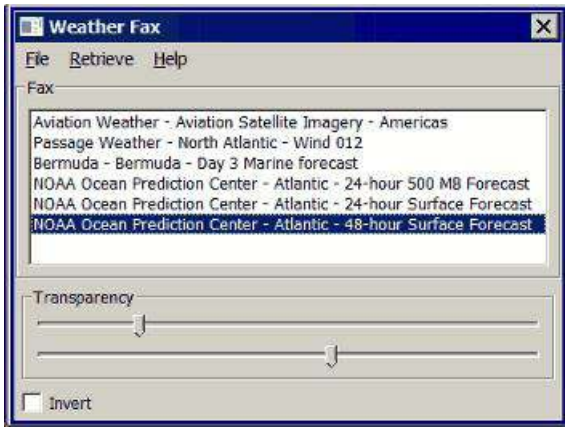
NOAA Atlantic 24hr Surface via internet.



Passage Weather New England Wind 012



Passage Weather Nova Scotia Wind 021



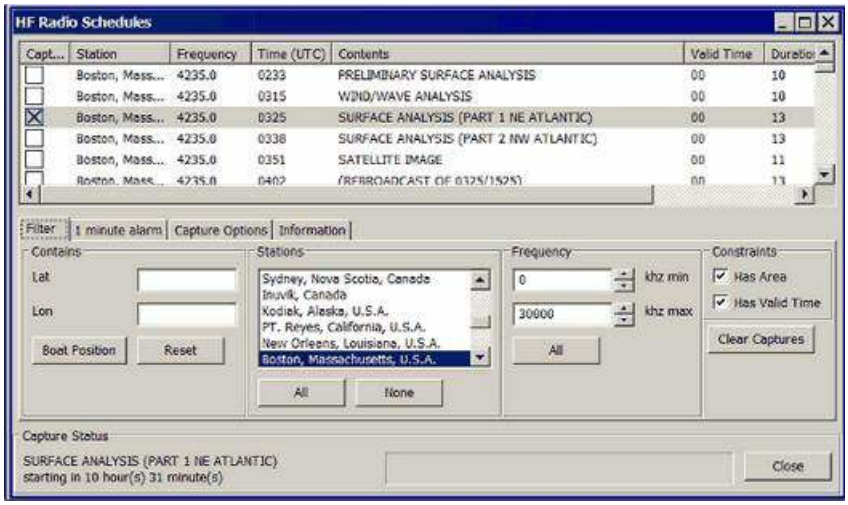
List of Weatherfaxes downloaded. Highlighted one shows overlaid on charts.

The weatherfax will be overlayed generally in the proper location provided the weather service has not changed their fax formats. (The user can modify the associated WeatherFaxInternetRetrieval.xml file appropriately to add or modify the actions.) Users should please post changes to this file to the Weatherfax Thread for the next release.

HF Radio Weather Faxes

The plugin has a builtin database (WeatherFaxSchedules.xml) for HF Radio Weather Service Fax transmissions, which when used properly can automatically alert the user and begin decoding these faxes.

Retrieve > RF Radio Schedule Menu on the Filter Tab.



Retrieve > RF Radio Schedule Menu on the 1 minute Alarm Tab.

Retrieve > RF Radio Schedule Menu on the Capture Options Tab.

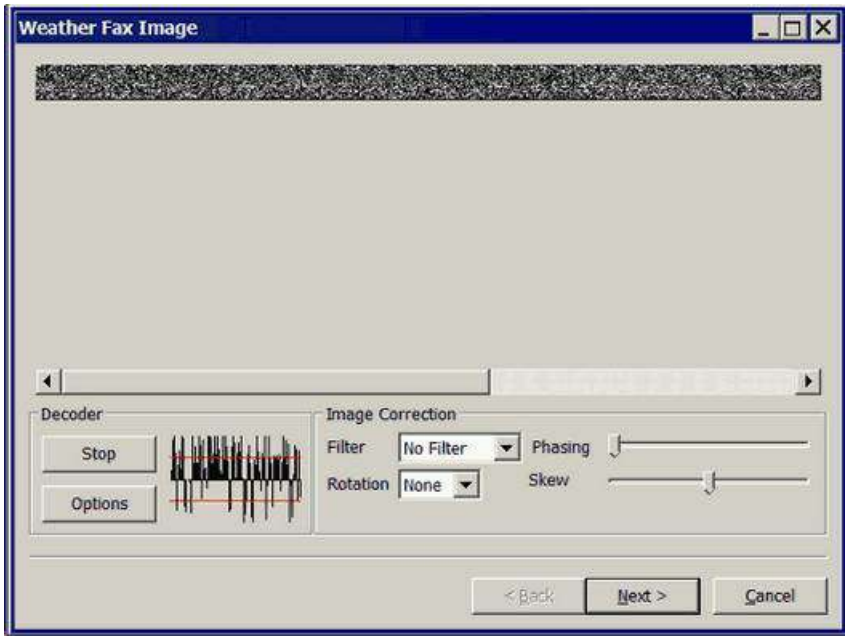
Retrieve > RF Radio Schedule Menu on the Information Tab.

Decoding Sound via SSB

Select Retrieve → Audio Capture (Ctrl+A)

A line from the SSB radio to the audio input of the sound card should be attached, and the radio tuned to the appropriate frequency (1.9khz below listed frequency and SSB mode) The SSB BFO must be adjusted correctly.

Retrieve > Audio Capture shown while recieving

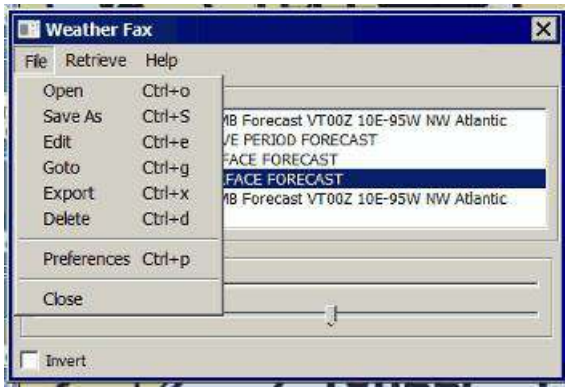


The images decoded can then be calibrated and overlayed on charts. The resulting image can be exported to a chart, so the plugin also works as a general purpose conversion tool to make charts from images.

Weatherfax Image Wizard

Working with Files

The plugin can read and open numerous common image files, and audio files, and can save Kap files. The next step in development is to have it read Kap for ease of use with respect to coordinates being recorded and reused.



Some Sources of Image files

Here are some examples of the gif, png, tif weatherfax files that can be used:

- NOAA Marine Radio Forecast Charts[581]
- NOAA Boston Radio Forecast -Atlantic[582]

- Preliminary Surface Analysis[583]
- 00Z-12Z Surface Analysis Atlantic -Part 1 [584]
- 00Z-12Z Surface Analysis Atlantic -Part 2[585]
- 48 hr Surface Analysis Atlantic[586]
- 96 hr Surface Analysis Atlantic[587]
- Atlantic[588]
- 24 hr 500mb Atlantic[589]
- NOAA Ocean Prediction Center -Atlantic[590]
- UK Atlantic Forecasts[591]
- Northwood N.Atlantic Latest Data[592]

How to use Weatherfax files and the Image Wizard:

- Save the files in a new directory on your hard drive in the same directory as your Charts. (I called the directory FaxWx).
- Open the Plugin and a fax file and use the Weatherfax Image Wizard
- From OpenCPN select the Weatherfax Icon, a window pops up.
- Select Open and browse to the FaxWx directory and select a fax file.
- Open the file.

Objective:

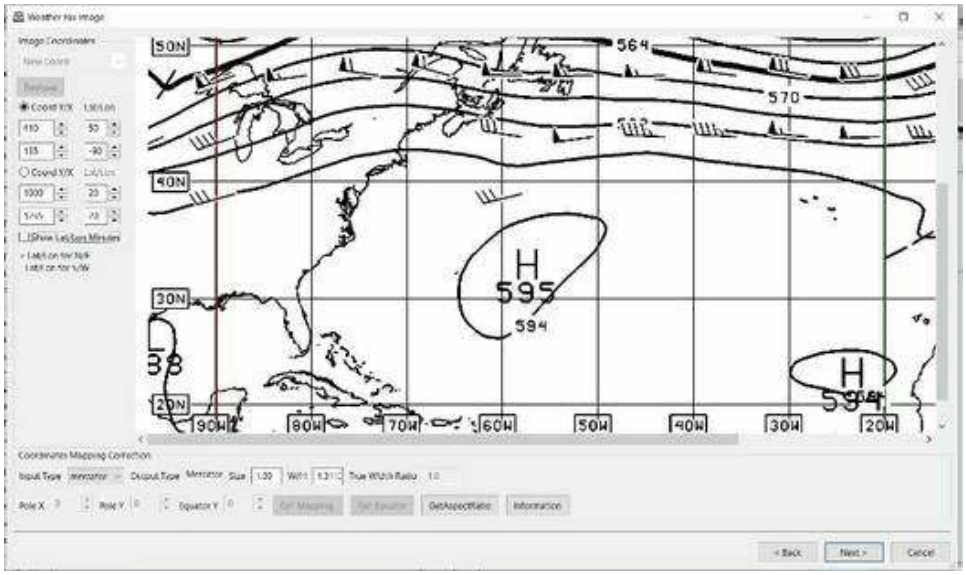
The objective is to set the x/y coordinates and lat/long properly so that the image will map directly over the proper area on the charts/globe. The Image Wizard allows user control over the necessary settings in a step by step process which ends in a successful chart overlay or not, depending on the skill of the user. If it does not work properly the first time, simply try it again. There are two basic types of projections the wizard can handle.

Mercator Projections

If the fax is a Mercator projection (orthogonal, not polar), click through the next screen that comes up and at the second screen set the coordinates and lat/long properly. (Screenshots will be added later) and click on through to see the fax overlaid on the charts.

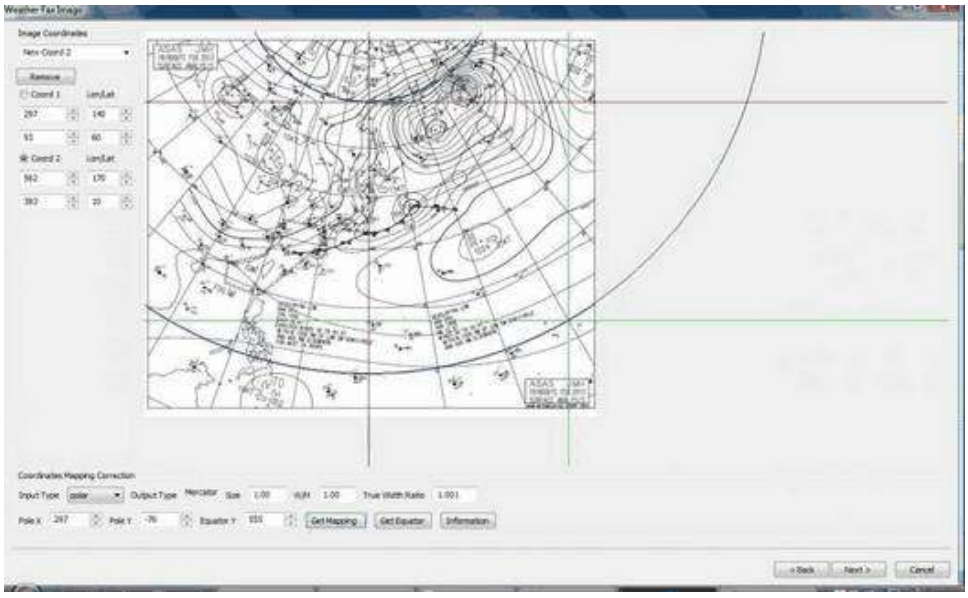
Note: It is very difficult to test for poor coordinate and lat/long input, so it is best to have your lat long correct, otherwise strange things may happen with the overlay in Opencpn.

I first use a separate image viewer with the selected fax image, to zoom in and to write down the Lat/long and coordinates that I will be using. If you plan to export to a chart file then you should select “Get Aspect Ratio”



Polar Projections

There are other techniques used to modify a Polar fax onto a Mercator projection chart which are reviewed on the forum and will be more fully described later. Review the posts following this Cruiser's Forum Post in the Weatherfax Thread[593] in the Forums.



***Coordinate* 1** (Red) -Select a high latitude which must also lie on the vertical meridian running through the pole (N or S)
Coordinate 2 (Blue) - Select an opposing corner (either side) with lower latitude. Then hit Get Map, the Blue circles should follow the latitudes of respective coords. Adjust the left/right location with the PoleX value and adjust the circle radius with the PoleY value. Set the True Width Ratio value to 1.0.

From here, it should be possible to click “get mapping”

True width Ratio - Adjusts the width of the blue circles (a fraction like .8 makes the circles

wider, and 1.2 makes them narrower). Adjust the true width ratio such that the blue circles align with the associated latitude lines, otherwise the “Apply” transformation will not render straight lat/long lines or will fail.

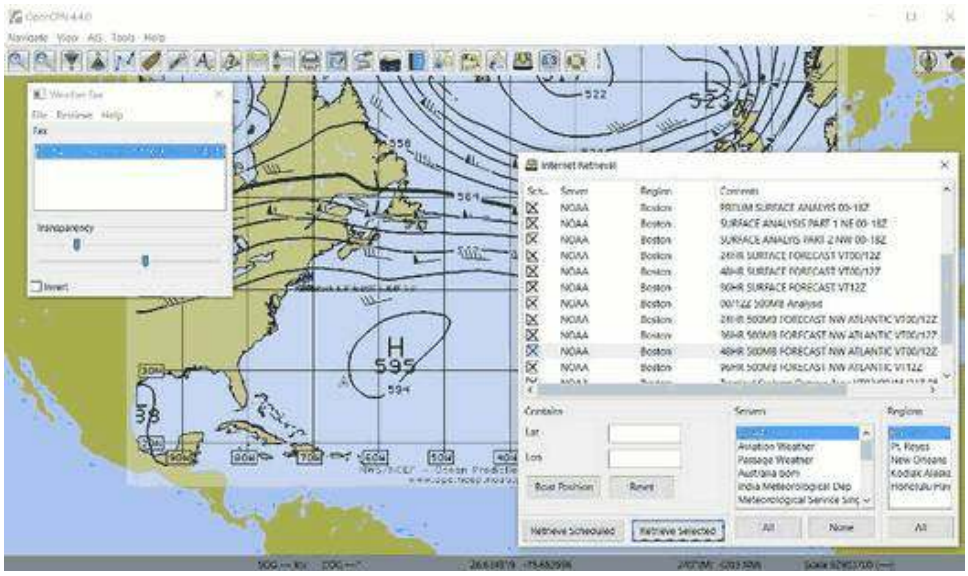
Pole X **-** Moves the center of the blue circles left and right. The blue circles should be centered on the vertical meridian which goes through the pole.

Pole Y **-** Moves the center of the blue circles up and down. The blue circles should be centered on the pole. Hit get mapping to see how this is working, because the blue rings change in width, and sometime the ring closest to the pole flips if the value is too far out of whack.

Equator Y **-** This does not appear to do much when you change the value, more about this value later.

If you are starting fresh with a Polar, and the blue rings are too wide after hitting Get Mapping, first check the lat/long entered and reset coords to be sure they are hit, then Hit 'get mapping again' then adjust the “True width ratio” so the blue rings align with the latitude lines. Once that is done don't hit “Get Mapping” again, hit “Apply” the lines should be straight and orthogonal.

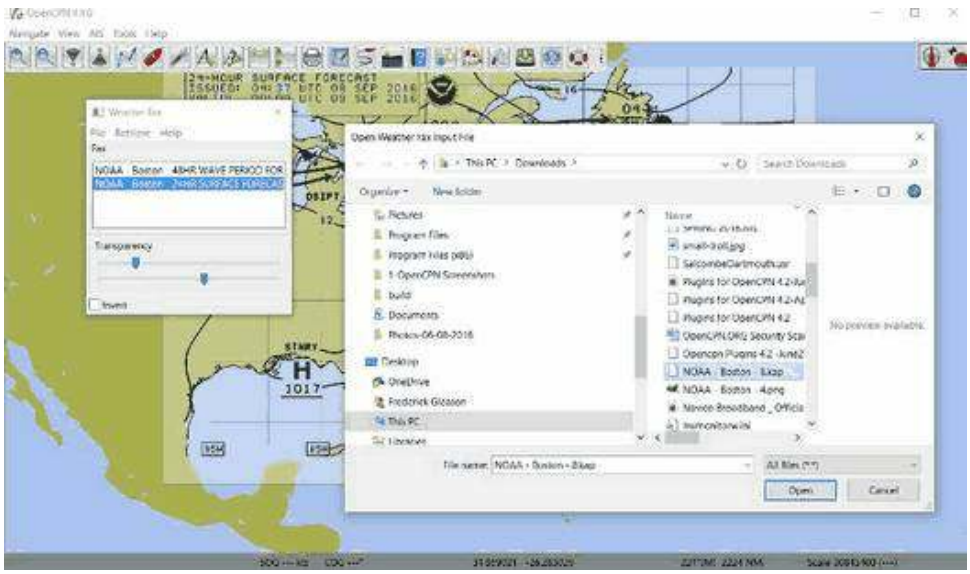
Here is an example of a WxFax overlay in Opencpn



File Export as KAP, File Open KAP

File Export as KAP

Image files that are downloaded and overlaid onto charts with specific coordinates, can now be saved as Kap files that save long/lat and coordinates with the file.



File Open KAP (Next Improvement)

Hopefully the plugin will also be made to read Kap files so that they can be automatically overlaid on charts without having to use the WeatherFax Image Wizard.

Thanks to Sean for a great Plugin!

Climatology

Links

- Source: https://github.com/seandepagnier/climatology_pi[594]
- Download: https://opencpn.org/OpenCPN/plugins/climatology.html[595]
- Forum: http://www.cruisersforum.com/forums/f134/climatology-102281.html[596]
- Forum: Climatology DataBase Thread[597]
- YouTube Sean: Climatology[598]

Climatology Plugin

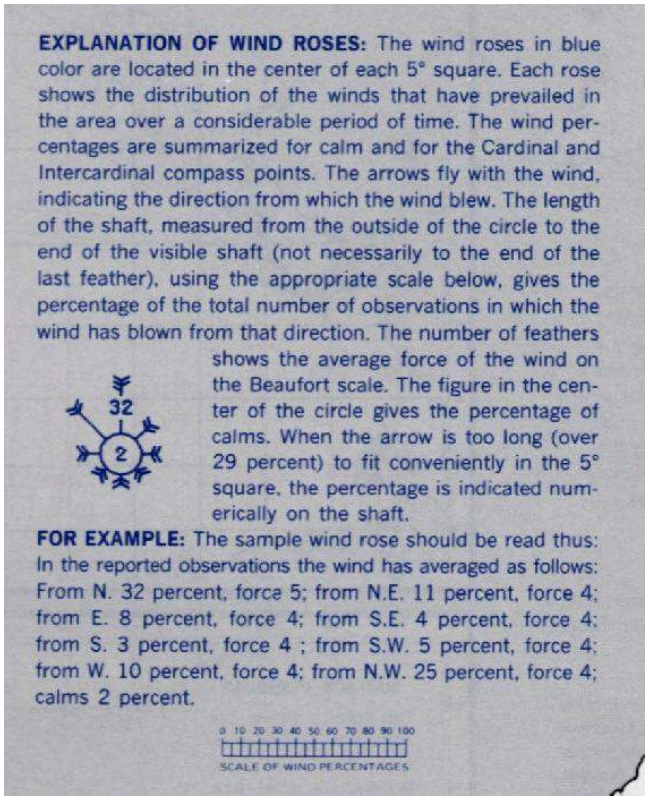
Intended to aid in planning sailing voyages, to help visualize weather patterns, and to integrate with weather routing plugin to compute optimal sailing routes. Weather_routing plugin will use Climatology to make long voyaging routes. This plugin goes well beyond what a Pilot chart provides.

Manage and view monthly gridded Climate data compiled from various sources. Satellite weather data from the last 30 years is averaged, then represented using only useful bits, then compressed to produce a much smaller database used by the plugin.

Climatology provides monthly data for Wind, Currents, Sea Level Pressure, Sea Temperature, Air Temperature, Cloud Cover, Precipitation, Relative Humidity, Lightning, Sea Depth, and Cyclones.

July Wind with Current overlay. (Click for enlarged view)

The wind atlas time shows the percentage of time the wind is in each of eight directions as a length of the arrow or in the case it is over 29% of the time a number is shown. The barbs indicate wind speed, each barb being 5 knots. The numbers inside the circle, if blue give the percentage of average speed as calm (3 knots or less) or in red at least gale force (above 34 knots and above).



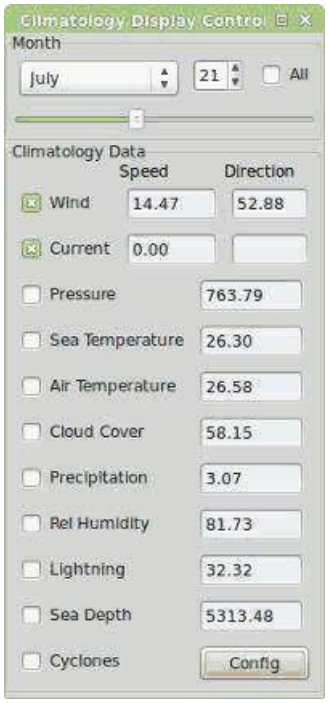
EXPLANATION OF WIND ROSES: The wind roses in blue color are located in the center of each 5° square. Each rose shows the distribution of the winds that have prevailed in the area over a considerable period of time. The wind percentages are summarized for calm and for the Cardinal and Intercardinal compass points. The arrows fly with the wind, indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle to the end of the visible shaft (not necessarily to the end of the last feather), using the appropriate scale below, gives the percentage of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long (over 29 percent) to fit conveniently in the 5° square, the percentage is indicated numerically on the shaft.

FOR EXAMPLE: The sample wind rose should be read thus: In the reported observations the wind has averaged as follows: From N. 32 percent, force 5; from N.E. 11 percent, force 4; from E. 8 percent, force 4; from S.E. 4 percent, force 4; from S. 3 percent, force 4 ; from S.W. 5 percent, force 4; from W. 10 percent, force 4; from N.W. 25 percent, force 4; calms 2 percent.

Weather_routing plugin uses Climatology Data

Weather_routing_pi can utilize the 30 year wind averages and current date from Climatology_pi. This is a unique and useful application. For more information see Weather_routing_pi.

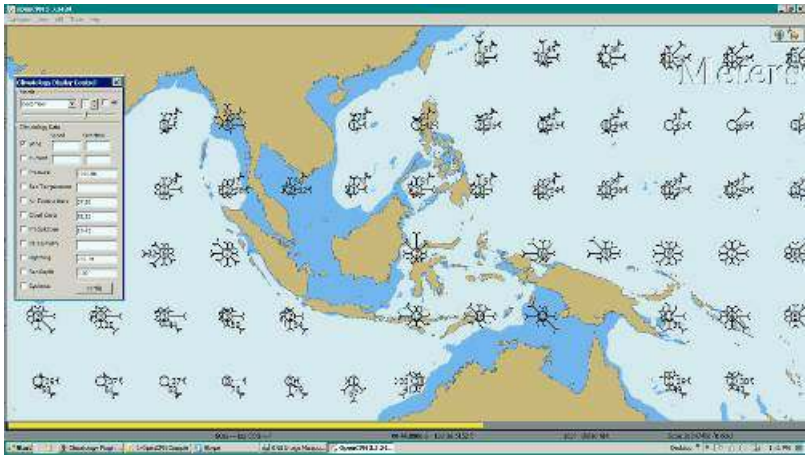
Climatology Data types



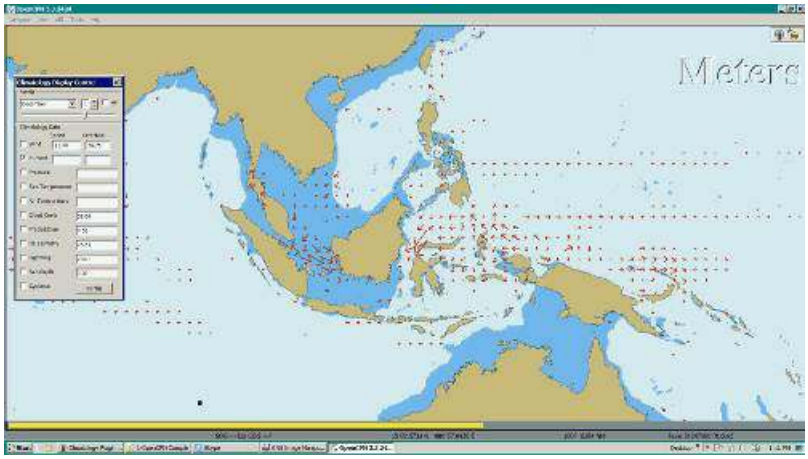
Climatology Data Types with Display Options
Climatology has a number of Data Types. The display characteristics of each data type are controlled from the “Config” menu which first requires selection of the particular data type from a dropbox. Amoungst the display controls for each datatype are Enable/Disable, and to show the data as a “Overlay” which requires that OpenGL be enabled under Option > Display > Advanced. The display options have been configured already for general use provided OpenGL is checked and should require no special configuration effort to be useful, however as users become familiar with the plugin, they may wish to change a setting for their type of use (such as if they do not have OpenGL checked.)

The table below shows four data types that are normally shown in vector format and do not require that Overlay be checked, the other data types can also be configured to not require that Overlay be checked if OpenGL is not operational. Click for an englarged view.

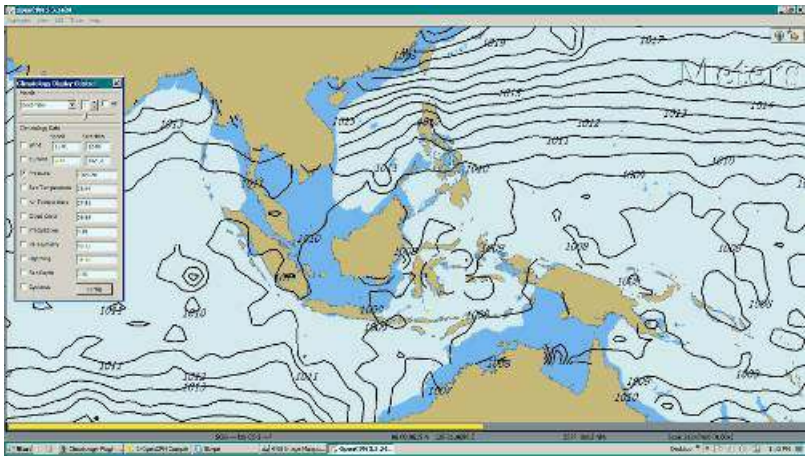
Normal Vector Data Types
(Opengl not required) - Malaysia

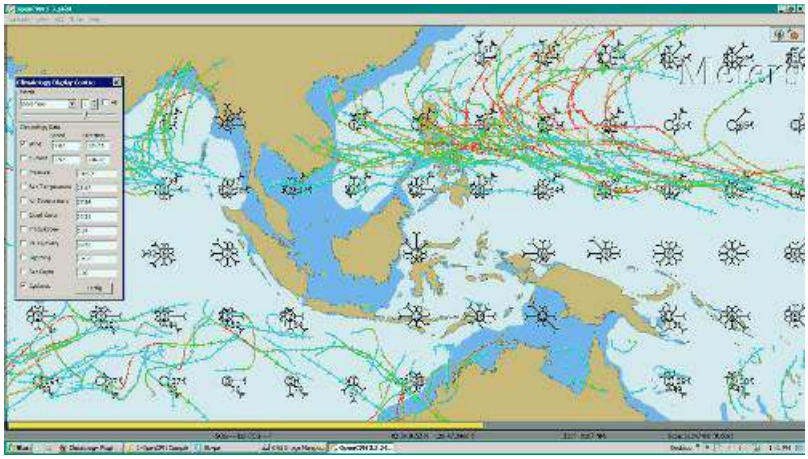


Wind - December



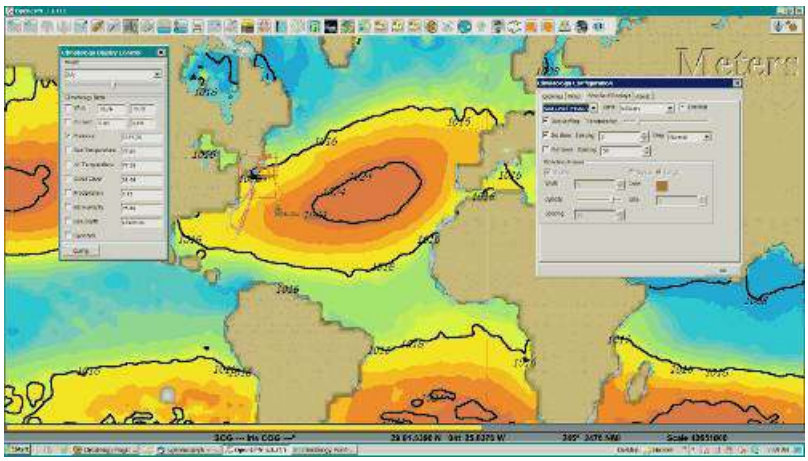
Current - December


Pressure - December

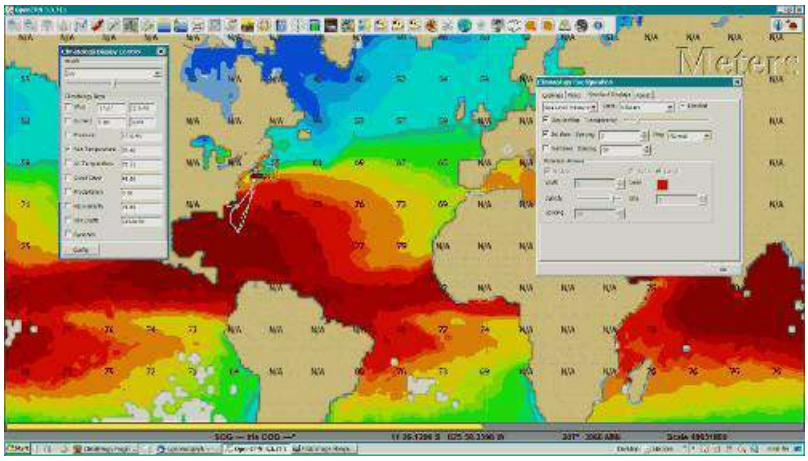

Cyclones - December

The table below shows data types which are normally shown with Overlay checked and OpenGL turned on, however they can be configured to show vector data when Opengl is off, by unchecking “Overlay” for each data type and configuring a few of the display settings. Click for enlarged view.

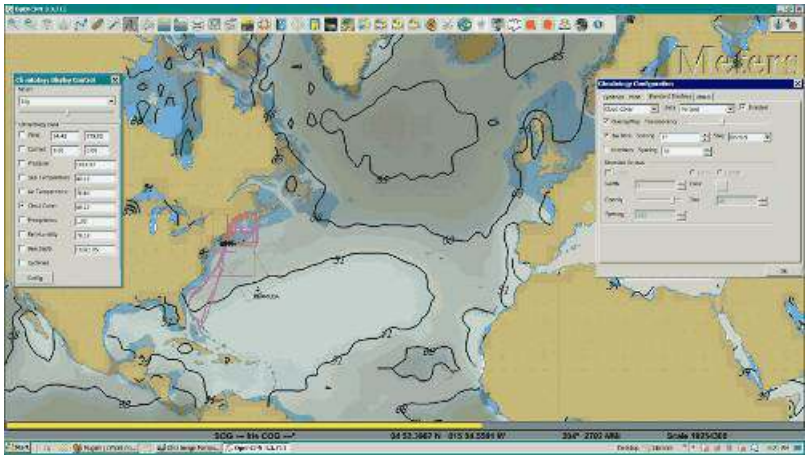
Normal Overlay Data Types
(requires Opengl) - Atlantic



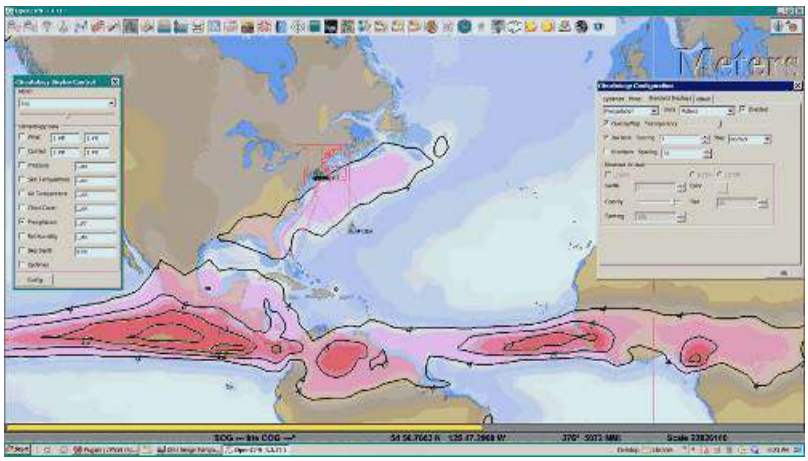
Pressure



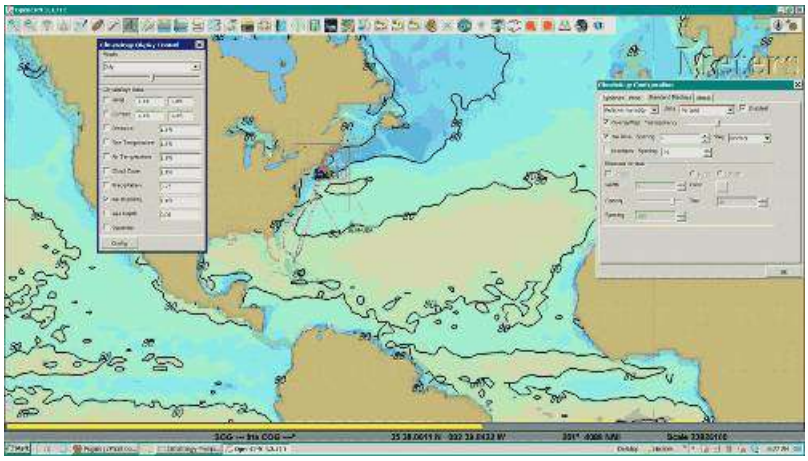
Sea Temperature - July



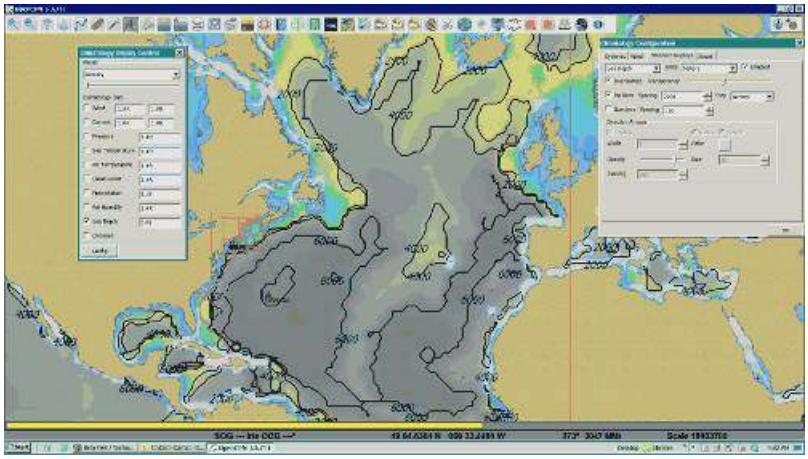
Cloud Cover



Precipitation



Relative Humidity

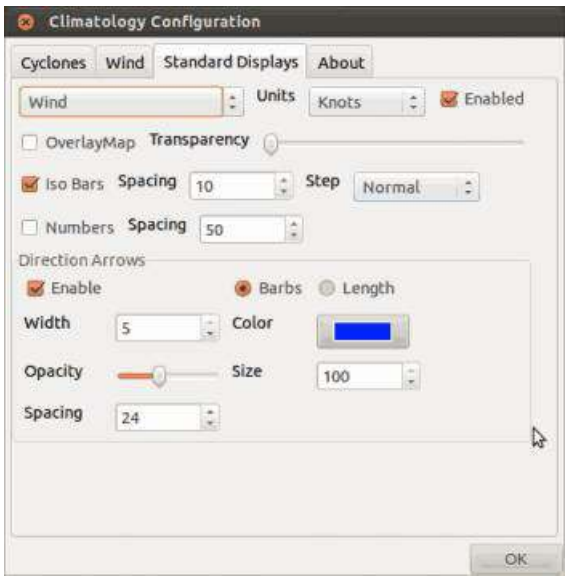


Sea Depth

Note: The Data-Types in the table above can be configured by the user to show data if Opengl is not turned on by selecting “Config”, selecting the appropriate data type from the Drop Down window, and unchecking “Overlay” and then selecting “Numbers”.

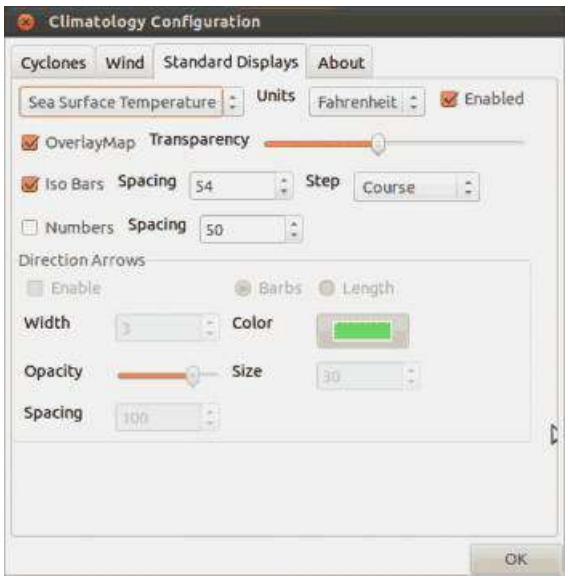
Configuration

Config > Standard Tab > Wind dropdown



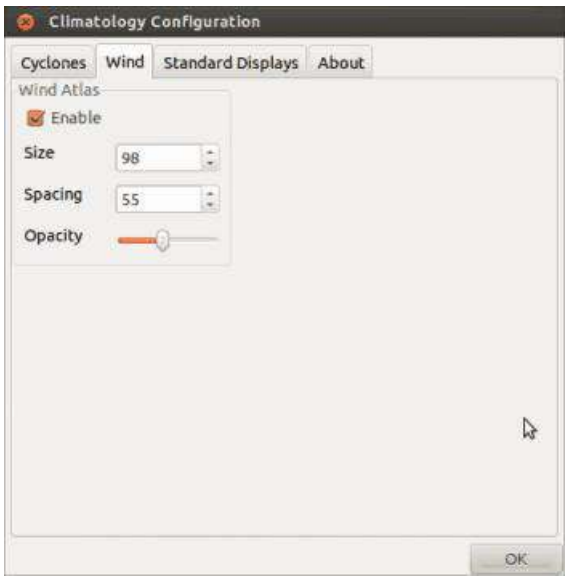
Config > Standard Tab > Current dropdown

Config > Standard Tab > SeaSurfaceTemperature dropdown



Config > Standard Tab > SeaLevelPressure dropdown

Config > Wind Tab



Config > Cyclones Tab

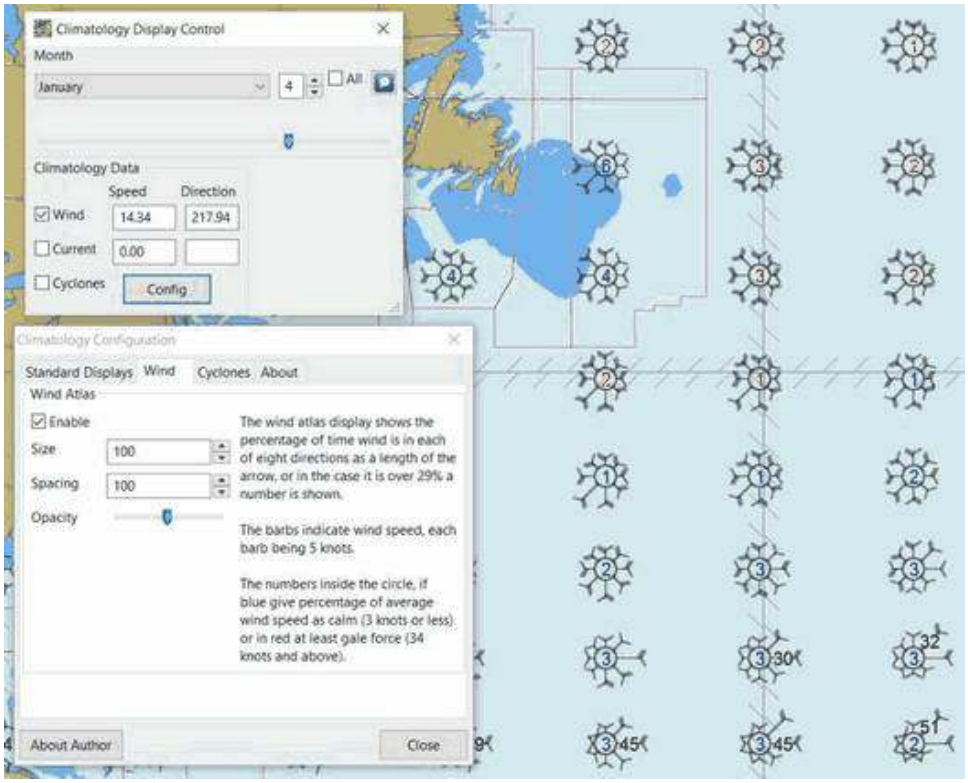
Installation of the Plugin
The plugin works with OpenCPN 3.2 and newer and is available for download from opencpn.org/ocpn/downloadplugins[599].

1. Windows: Download and run installer
2. Linux: dpkg -i <package_name>.deb or rpm -i <package_name>.rpm or cd /usr; sudo tar xavf <package_name>

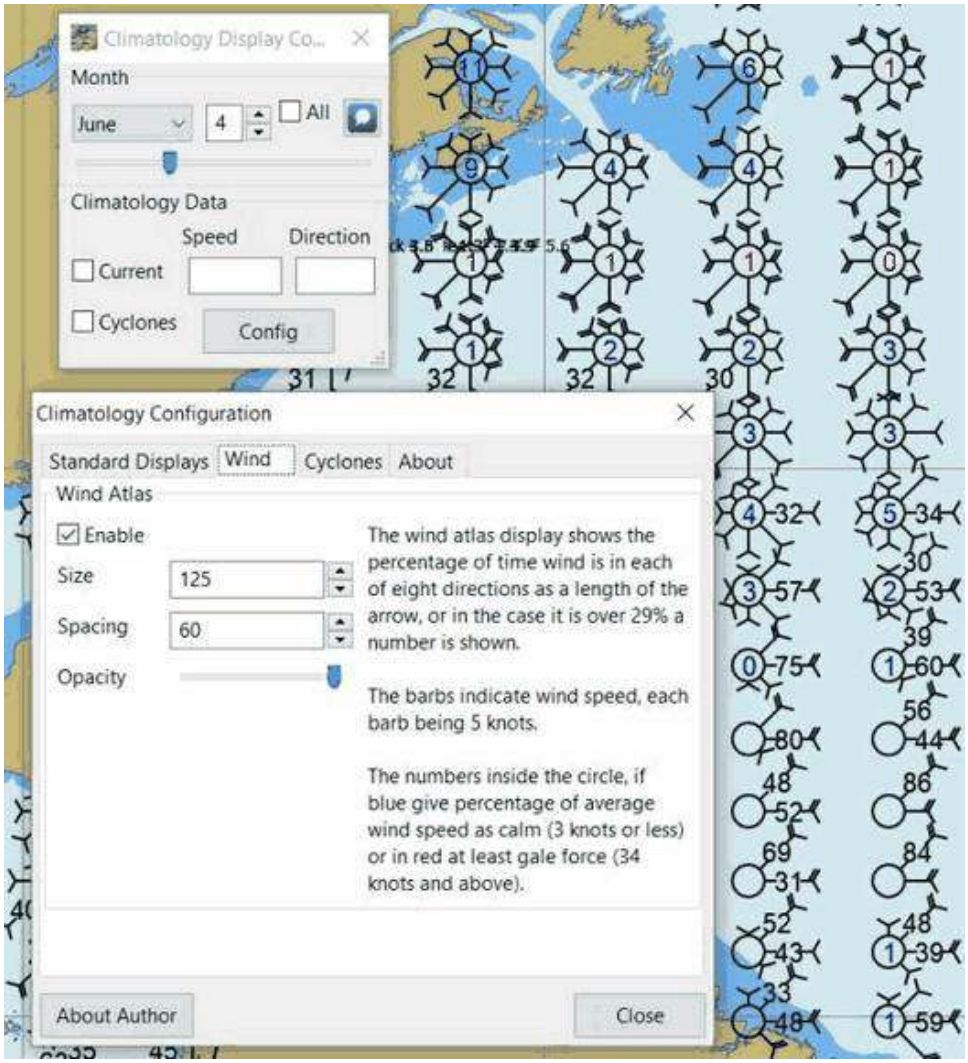
You must also get the data files, the plugin will inform you where to install them.

FAQ

How do I set the Wind Rose settings so that they work right? Set the two settings somewhere around Size:100 and Spacing:100 or Size:125 and Spacing:60.



Wind set at Size:100 and Spacing:100



Wind set at Size:125 and Spacing:60 (Size:140 and Spacing:100 also might work)

Warning about use of Data:

Weather_routing is only as good as the data provided by the Grib plugin and the Climatology plugin.

1. **Climatology plugin:** Depends on a separate set of files that must be downloaded, extracted and placed in the proper directory. Climatology data is generally averaged since the 1980's depending on data type and sources available (for example, Wind data is averaged 6 hr data since 1987). The entire source data set is over 180 gb, however after averaging and compression it becomes about 7mb. There are various macro factors which affect weather over a given season which should be considered, including El Nino, Gulf stream, etc. Climatology has averaged these effects.
2. These planning tools may be helpful, but should be taken with a healthy “grain of salt” as any good sailor (who looks out to the horizon) should know. -Rick Gleason

About the Author

The Climatology Plugin was written by Sean Depagnier who has written many Opencpn plugins. There is a strong likelihood you have already used one of his plugins. The plugin is over 1000 lines of code written with care and skill. Sean has a voyage fund and would appreciate any contribution large or small, please see the Donate button under the Configuration > About Tab. -Thank you Sean for this excellent plugin!

Sailing

Tactics
Dashboard for racing, Target speed, VMG, Current, etc.

Sweep Plot
Provides a historical plot of Speed (SOG) above Course (COG) for sailors.

Polar
Read, modify and export Polars

Polar

Create your own Polar Files from Instruments

Links

- Source: https://github.com/ptulp/polar_pi[600]
- Download:https://opencpn.org/OpenCPN/plugins/polar.html[601]
- Forum: CF Polar_pi Thread[602]

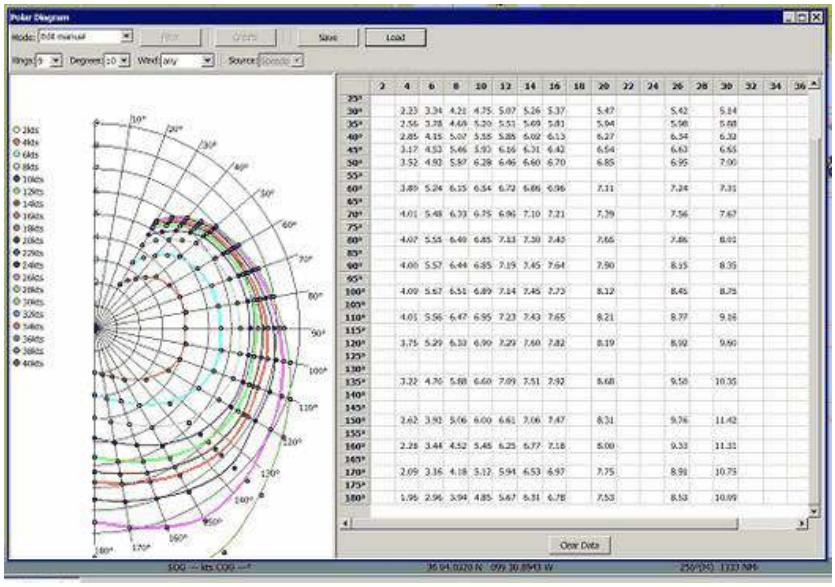
1. What and Why

This plugin can be used to Create, Load, View, Edit and Save polars.

2. Install

See Install and Enable page for installing this plugin.

3. Standard actions



At this moment the polar plugin has 4 modes of operation:

- Data from logbooks: This mode will read from all logbooks found in the logbook/data directory and if found enough data points it will create a Polar from this.
- Data from NMEA: This mode will read data from the NMEA stream and create a Polar from this data.
- Data from VDR File: This mode will read a given VDR file and will using the NMEA

messages in there to create a Polar.
- Edit Manual: This mode allows the user to create a Polar manually.

It is possible to switch between modes. For instance edit manually a Polar and then switch to Data from NMEA and Start Record. This will add and update the data for the polar.

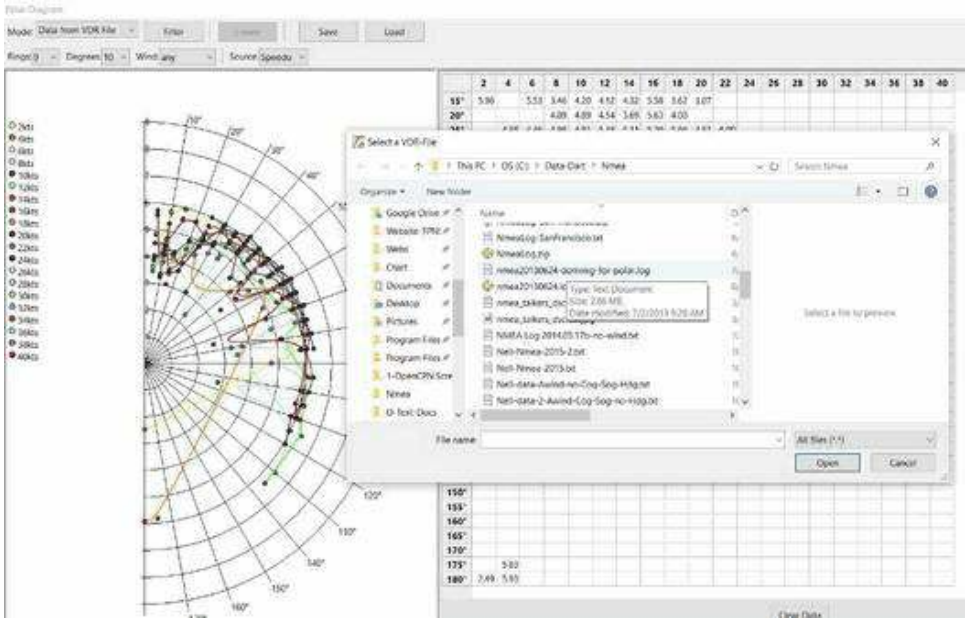
The data will be collected in 5 degree wind directions and 2 knots of windspeed and saves this information. The plugin will also interpolate middle steps, eg 6 and 7 degree will be added to the 5 degree step and 8 and 9 will be added to 10 degree step. The windspeed is divided by 2, so column 2 knots hold the speeds from 2 till 3.99 and column 4 knots will hold the speeds 4 till 5.99. etc up to 40 knots.

If reading in other polar files it tries to fill in the wind direction in 5 degree steps and 2 knots of wind like the input from NMEA. It will use the same sampling as above.

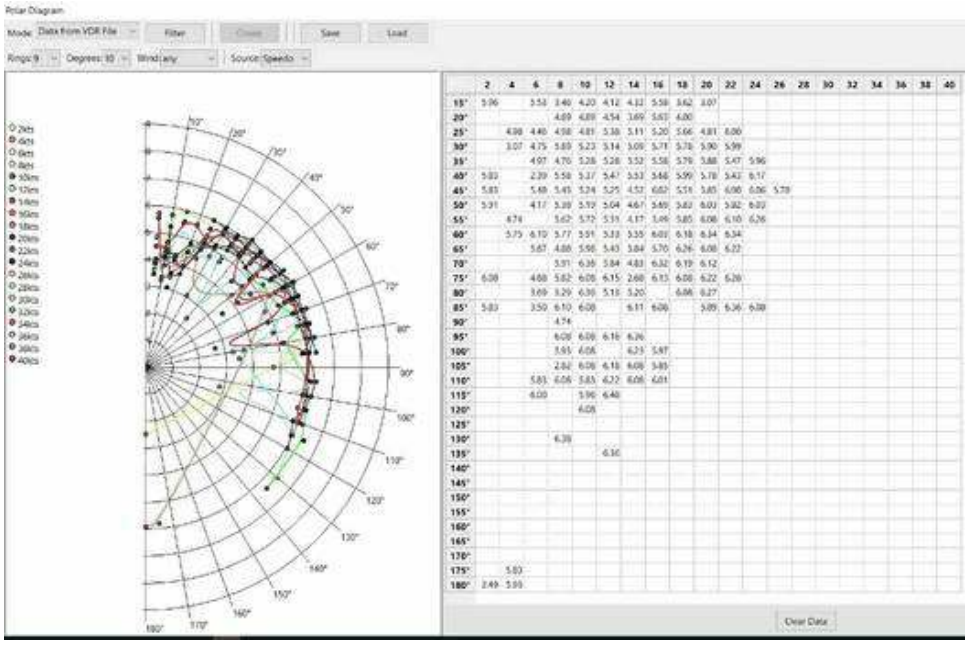
Polar can read badly formatted polar files with lines of all zeros and can save the file out with the zeros removed.

4. Create your own Polar File

1. Confirm that your Wind and BSP/STW instruments are properly calibrated and that the nmea0183 data stream is working properly with full sentences and good checksum. Confirm that you can record the data.
2. Record Nmea0183 data while sailing in various wind conditions, at a wide range of wind angles, with the same set of sails trimmed properly, preferably with a clean bottom, average weight in the boat, and no current. Make several of these recordings for different sets of sails and reefing.
3. Using Polar_pi load one of the files.



Load Nmea0183 Recorded Data file



Open Nmea0183 Recorded Data file

1. Edit the file. You will want to normalize the data and make it regular, by eye.

1. Save the file with a new name, using some version of [Boat-Sails-Conditions].pol
2. Now you can use it in Weather_routing as one of your Polar files. Note that in Weather__routing you can load multiple polar files such as:
   a. Very light wind under power
   b. Light to medium wind under mainsail and genoa
   c. Heavy wind under mainsail and jib, etc.

This plugin does an excellent job of building and preparing polars for use in weather_routing.

5. Options

6. Windows Alternative

Polauto is a fully featured alternative created by by Patrick Tierclin another sailing Frenchman.

- Polauto (Windows)[603]

Plots

Plugin for improving sail trim and maintaining course

Links

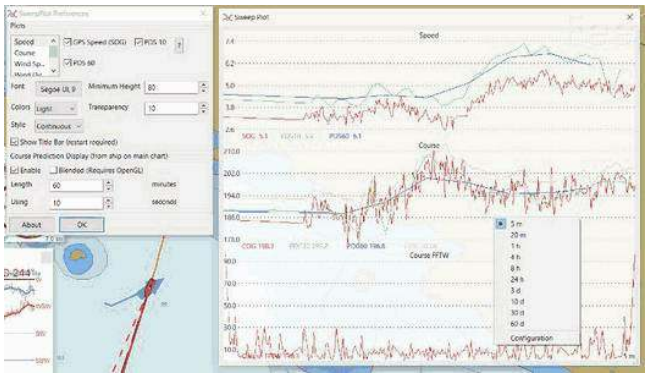
- Source: https://github.com/seandepagnier/plots_pi[604]
- Download: https://opencpn.org/OpenCPN/plugins/sweepplot.html[605]
- Forum: CF Plots_pi Thread[606]
- YouTube Sean: Plots Plugin[607]

Plots Plugin has been improved again, and provides Historical data in a format useful for sailing, using a large selection of Data Types (Speed, Course, Wind True & Apparent, etc). It is the best tool for showing historical data in OpenCPN.

The plugin is designed to monitor speed and course to make the changes to sail sweep obvious. It may be used to better understand the sailing characteristics of a particular sailing vessel, or for fine tuning to give optimal results.

For example, tightening a vang, adjusting the the traveler or the jib may produce such a slight change that it is difficult to gauge the result. This plugin can make gps speed feedback visible.

The predictor line allows setting the sample time for smoother prediction than the builtin predictor. This is especially useful when traveling relatively slowly in areas with large waves.



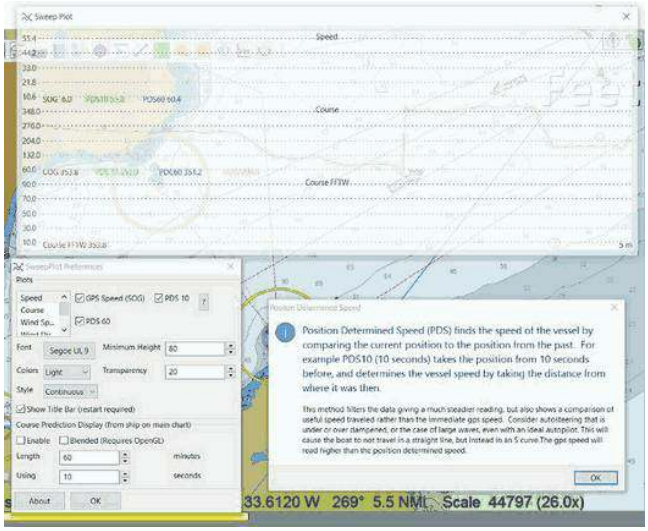
The top histogram is the Speed Screen which offers Speed, PDS10 (Position Determined Speed = 10 seconds) and PDS 60 (60 seconds.)

PDS

Position Determined Speed PDS finds the speed of the vessel by comparing current position to the position from the past. For example PDS10 (10 seconds) takes the position 10 seconds before and determines the vessel speed by taking the distance from where it was then.

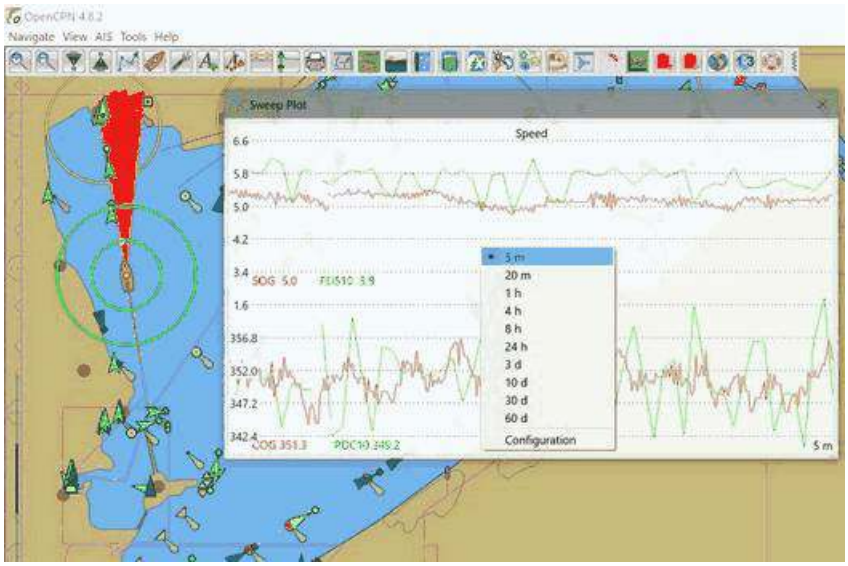
This method filters the data, giving a much steadier reading, but also shows a comparison of

useful speed traveled rather than the immediate GPS speed. Consider autosteering that is over or under dampened, or the case of large waves, even with an ideal autopilot. This will cause the boat to not travel in a straight line, but in a S curve. The GPS speed with read higher than the PDS position determined speed.



Configuration

While running the plugin right-click on the plugin screen to bring up the Configuration Menu.



While using the plugin you an right-click to change various settings on the fly.

Time Frame to Display Select a time frame for the Display from 5 minutes to 60 days.

Transparency The value 1 is fully opaque. The value 100% is fully transparent. Do not use this value, the plugin will be lost and the Transparency setting can only be changed from the Sweepplot setting in the opencpn.ini file. Look for

```
[Settings/Plots]
```

```
PlotTransparency=7
```

in order to reset the transparency to something that can be seen.

NOTE: Changes in Transparency value do not show until the PI Toolbar button is toggled.

This is one of Sean's plugins.

Tactics

Links

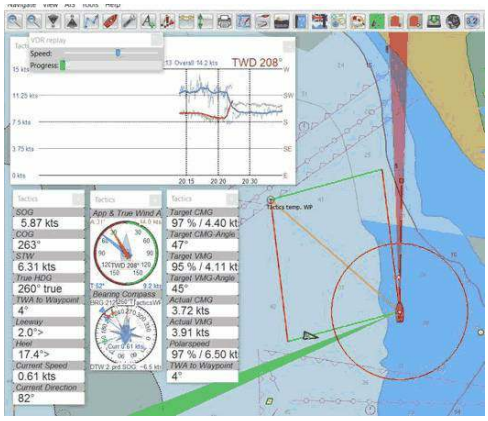
- Source: https://github.com/tom-r/tactics_pi[608]
- Download: https://opencpn.org/OpenCPN/plugins/tactics.html[609]
- Forum: Tactics plugin thread[610]

Windows Download

OpenCPN Beta File Thingie 2.5.7[611] rguser rgpass Go to Tactics directory and download the latest. Also some sample VDR files to play.

tactics_pi a performance enhancement to dashboard_pi

Rev 1.0



References:

- Yacht Performance Analysis with Computers[612]
- How Ockam Calculates things[613]
- http://www.orc.org/rules/Speed%20Guide%20Explanation.pdf\Speed Guide

Calculation[614]

1. Introduction

Everything started with the question : "Do we make it around the corner of that island when we tack now and sail the same apparent wind angle on the other tack ?"

Disclaimer :

This is still alpha code (not even beta), and you should not use it for live – real sailing.
I will not be liable for any harm, damage or whatever strange things happen if you use this plugin and rely on its data.

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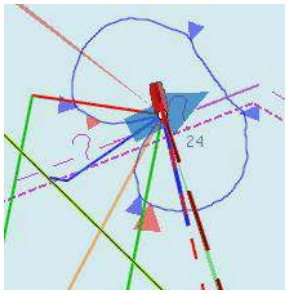
1.1 What tactics_pi can do :

To sail Target-VMG / Target-CMG angle, simply steer the blue HDT pointer on one of the Target-VMG / - CMG markers.

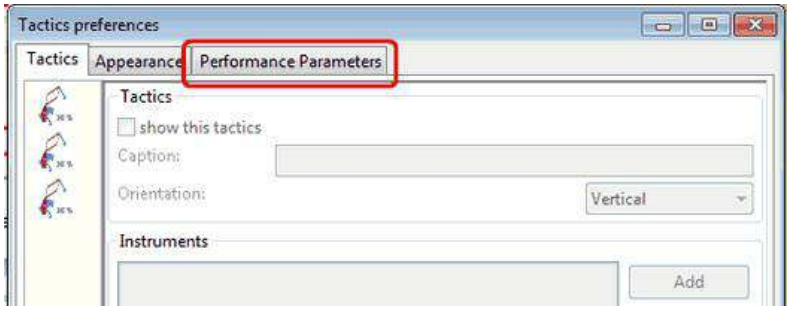
As you can see here, there may be 2 red CMG markers, the **preferred one has the biggersize** !



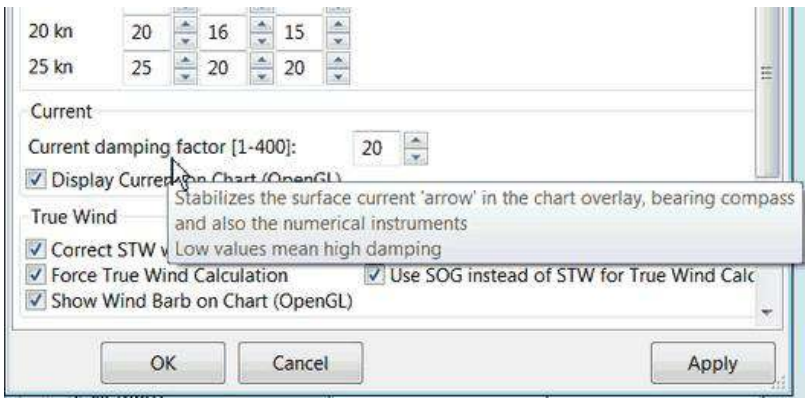
1. Calculate true wind data : TWA, TWD, TWS from true heading (HDT), speed through water (STW) and app. Wind speed (AWS), with optional correction by heel-angle. Calculation is enabled via a preference setting and disables available true wind data from the bus throughout the tactics_pi plugin.
2. Calculate the “leeway”, the boat drift based on heel. A common formula is used for that purpose.
3. Calculate the surface sea current and display it as single instruments (current speed/direction) as part of the “Bearing compass” or as overlay on the chart (semi transparent). The routines take boat heel and leeway into account. If you don't have a heel sensor, there is a simply workaround, see below. Current display on the chart can be disabled by a preference setting.
4. Calculate and display the boat laylines for the current tack, and the same TWA on the other tack. Sea current is taken into account, if available ! Laylines may be toggled on/off. Adjustable length and max. width (triangle, with one corner at the boat) of the boat laylines. The layline width reflects the boat's yawing (COG changes over time).
5. Load a polar file and calculate/display performance data, like actual VMG (velocity made good up-/downwind), Target-VMG, Target-TWA (the opt. TWA up-/downwind), CMG (course made good towards a waypoint), Target-CMG (opt. CMG angle and speed), polar speed (the speed you should be able to sail at current TWA/TWS based on your polar),…
6. Display the actual polar as overlay on the chart, including markers for Target-VMG/CMG angles. Just adopt your course and place your heading pointer on one of the markers, and you sail Target-VMG/CMG based on your polar …
7. Set a (one !) temporary tactics waypoint and display the laylines to the mark, based on a Target-TWA calculation, while taking your polar into account.

8. It has a “dial instruments” called “Bearing compass”. Boat true heading (HDT) points “up”, it shows the boat laylines as well, the surface current, a pointer to the waypoint (either set manually as the temporary Tactics waypoint or read from a NMEA RMB sentence), needles for AWA and TWA, markers for the Target-VMG/CMG angles.
9. It has a “Polar compass” instrument, graphically displaying the actual polar ring and markers for Bearing to WP, Target-VMG angles and Target-CMG angles.
10. It has an “Average Wind” instrument with an adjustable averaging time, which displays graphically the average wind and its deviations to port / starboard
11. It can create specific NMEA performance records with the purpose to export them to the displays of your instruments. You can now e.g. calculate the polar target speed in the plugin and send it to your instrument display outside in the cockpit. Currently only available for NKE, but may be enhanced in the future.
12. There are various settings, which I grouped in a separate tab. To access the preferences screen, right mouse click on the tactics_pi window, then select “*Preferences …*”

You'll find all seetings in a separate tab “*Performance Parameters*” :



There are so-called ToolTips available for almost all of the preferences. Just hover the mouse over one of the prefs:



1.2 Prerequisites :

Required

- You will need to activate **OpenGL**, if you want to use the chart overlay functions.
- **SOG, COG** from the GPS
- Preferably **True Heading** from an electronic compass.
- if not available, magnetic heading will do, as long as you have magnetic

variance available (either from the GPS RMC sentence or from the wmm_pi plugin)

- **Boat speed through water** from a log / “paddlewheel” sensor
- **Apparent wind angle** and **apparent wind speed**
- **Heel sensor** which supplies your boat heel angle to **O**as XDR sentence

If not available, there's a workaround with manual input

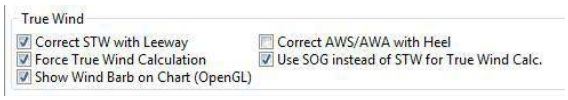
- You need a polar file of your boat to use all polar based performance calculations
- **Calibrate AWA, Compass HDG/HDT, STW (Speed through water), and AWS (apparent wind speed) as good as possible.**
- Especially the compass heading calibration tends to be neglected. But this is vital for a proper surface current calculation. All I can say is : sh*** in – sh*** out …

See also the Terminology at the very end for explanation of terms

2. Basic functions work without a polar file

2.1 Calculate true wind data

The plugin can calculate true wind data (TWA, TWS, TWD) but keeps the calculated data inside the plugin (it does not broadcast it to O)! True wind calculation is done silently if you don’t have TWA, TWS, TWD available in your NMEA stream. Furthermore you can force the true wind calculation in the plugin by a preference setting. If the tick “*Force True Wind Calculation*” is set.



- It does not matter if TWA, TWS and TWD are already available on the system or not. Calculation is done in the plugin then. It does calculate TWA, TWS and TWD.
- This is e.g. useful, if you have a heel sensor, which is not integrated in your instrument bus. You can use the corrections then to get more accurate true wind data.
- Input is AWA, AWS, STW, and for TWD also true heading HDT.

If you don't have HDT on your system bus (but only HDG), you can use **wmm_pi**.

- **wmm_pi** supplies the magnetic variation and if running is taken into account to calculate HDT from HDG

If you have a heel sensor in your system, and its data is available in O, you can use two corrections.

Correct STW with Leeway:

The plugin can calculate your leeway (drift angle) based on on your heel sensor (see below). That means your boat is possibly moving sideways, which adds an error to the True Wind calculation. Standard instruments normally do not take this effect into account, as far as I know. NKE does this correction in its regatta processor only, but not on their normal instruments.

Correct AWS/AWA with Heel:

This option corrects your AWS and AWA data by the heel angle. **Use this option with great care !.** Manufacturers normally already do correct this, if you have a heel sensor integrated in your instrument bus. O will simply receive the already corrected data for AWS / AWA then. The result would be wrong data ! I implemented this option for those sailors using an external (or DIY) heel sensor, which is not recognized by their instrument system. You'll get a warning popup as soon as you set the tick.

Use SOG instead of STW for True Wind Calc:

Replaces STW (Speed through water, the “log”) with SOG (from the GPS) in the internal true wind calculation. The idea is simply to have a fallback for the true wind calculation in case your log fails and also to eliminate side effects on the calculation by surface current.

2.2 Calculate “Leeway”

Leeway describes the drift of the boat due to the force of the wind. Leeway is the basic input for the surface current calculation described later on. Input for the leeway calculation is your heel angle. Normally you'd say : the more you heel, the more you drift . But that's only part of the truth. Other significant inputs are boat speed and the shape of your hull…

A widely (NKE, B&G,…) used formula calculates the leeway with 3 input values : heel, boat speed (STW), and hullshape-factor.

- Leeway = hullshape-factor*heel/(STW*STW)

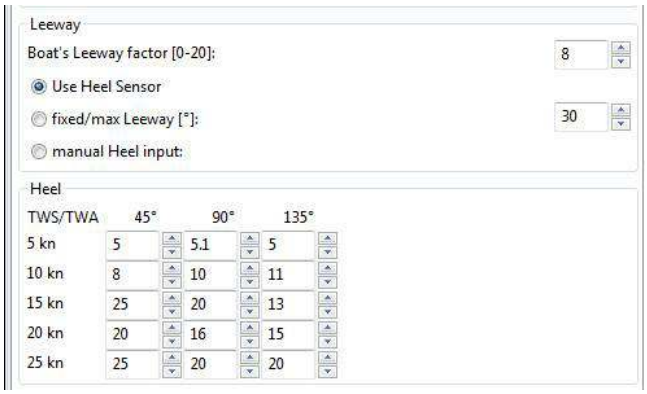
To make this work, you have to estimate the hullshape-factor.

The attribute in the preferences is called “*Boat's Leeway factor [0..20]:”*

- The input range is 0…20, 10 is a good value to start with.

If you don't have a heel sensor on board, you can either set a fixed value (e.g. 0 when motoring without sails), or try to set up a very simple “heel polar”.

Heel polar:



The idea is that almost every magnetic compass installed in the cockpits has a scale, where you can read the degrees of heel.

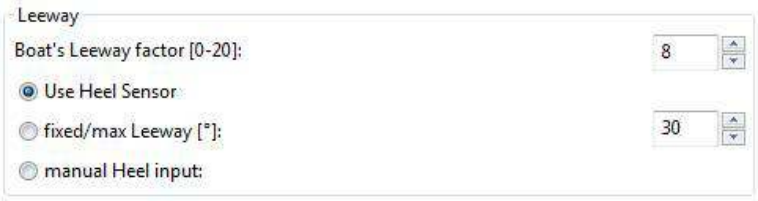
Then simply compare the O instruments display, for TWA and TWS, read the values from the scale and put it into the small table above.

Please be sure to read **True Wind Angle** and **True Wind Speed** and not apparent wind angle and speed !!!

I tried it on my own boat, comparing the heel polar values with those of my sensor. It works astonishingly well.

Even if you use the heel-polar, you have to estimate the *"Boat's Leeway factor [0..20]:"*

You have 3 choices for heel input, depending on where you set the radio button in the preferences. You can switch the radio buttons forth and back while sailing to compare the results, no problem



The attribute "fixed/max Leeway [°]:" is dual purpose:

1. The given value is always taken into account as maximum possible Leeway value.In the screenshot below, I set it to 30°. If your heel polar or calculation with the formula above outputs values >30°, the program takes 30°.
2. If you set the radio button here, the routines always take 30°, no matter what your sensor calculates or your heel-polar would tell you.

2.3 Calculate the surface current

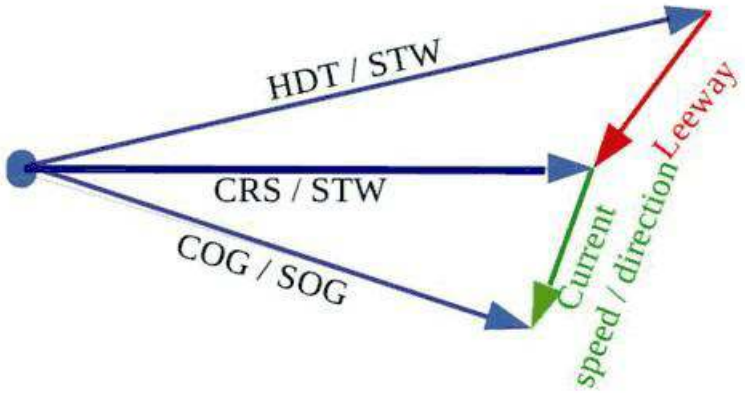
If you compare your HDT and COG vectors in O (the 2 forward vectors on the chart at your boat), the difference between both is a mixture between Leeway (the boat's drift) and surface

current. Once we can determine Leeway, the rest is surface current.

The surface current calculation is simply a triangle calculation with vectors.

- Always seen from the current position, the first vector is HDT (degrees) / STW (length).
- As your boat drifts with the wind, the second vector is “course through water” (CRS, degrees) and STW (length)
- “course through water” is actually HDT with applied leeway.

The resulting vector between CRS/STW and COG/SOG is the surface current.



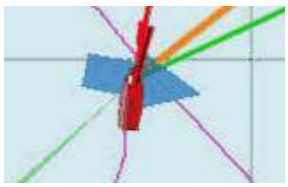
To calculate the current, you need as input HDT, STW, Leeway, COG and SOG and your GPS latitude / longitude.

In the preferences you can set 2 options for the current :

- the damping factor : the lower the values are the more filtering is applied, and the reading gets more stable. On the other hand, it starts lagging a bit.
- The **lower** the value, the more damping is applied. Actually I'm experimenting in the range of 0.001 to 0.025. Keep this value at the lower end, the start to increase, until it gets unstable.

2.3.1 Activation of the current display

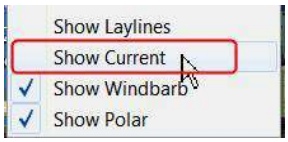
You can show a semi transparent blue current symbol underneath your boat, showing the surface current direction.



To activate the current display on the chart by default, upon program start, navigate to the Preferences dialogue and set the tick "*Display Current on Chart (OpenGL)*". The preference is only setting the default.

While navigating in OpenCPN, you can turn the current overlay display on / off as you like.

Just right-click on any Tactics_pi instrument and select "*Show *C*urrent*". This toggles the display on/off.



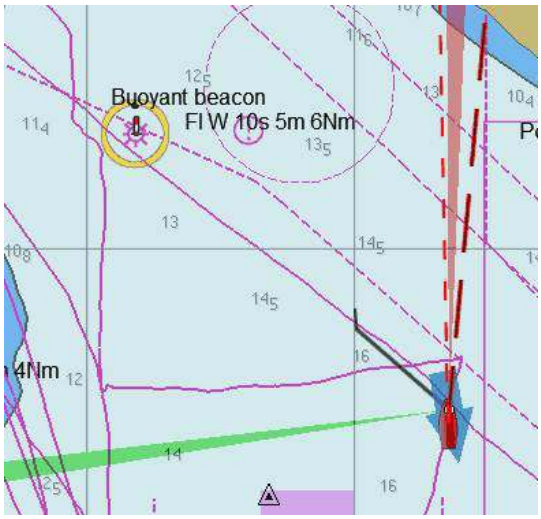
2.4 Calculate and display the boat laylines

You can show the boat laylines on the chart. They refer to COG.

The colours mean

- red = wind from port
- green = wind from starboard.

The width is defined by the yawing of your boat, the more you yaw, the wider they get



The second layline (green in this example) simply shows you where you would get on the other tack / gybe when you sail the same TWA after the tack. **Leeway and current are taken into accountfor the calculation of the second layline.** In the preferences, you can set

the following options :

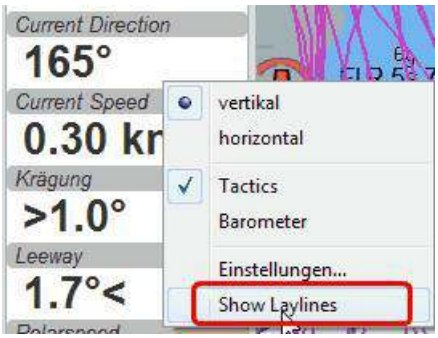
The *Layline width damping factor* is the rate how fast the layline width reacts on COG changes.

It's done with exponential smoothing, the smaller the factor, the higher the damping rate.

You can define the length of the laylines on the chart, as well as a minimum and maximum width.

If you don't like the yawing effect simply set min and max both to 1 or 2 degrees.

To toggle the layline display on the chart on/off, right-click on the tactics_pi main window and select "*Show laylines*"



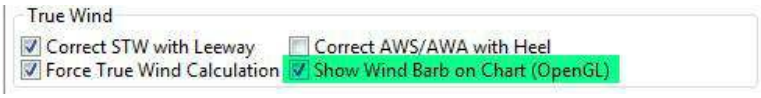
2.5 Show wind barbs

You can also show a wind barb at the boat position, showing you direction and speed (feather length) in 5 kt steps

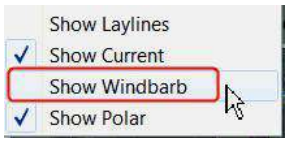
2.5.1 Activation of Wind barb display

To activate the wind barb display on the chart by default, upon program start, navigate to the Preferences dialogue and set the tick "*Display Wind Barb on Chart (OpenGL)*". The

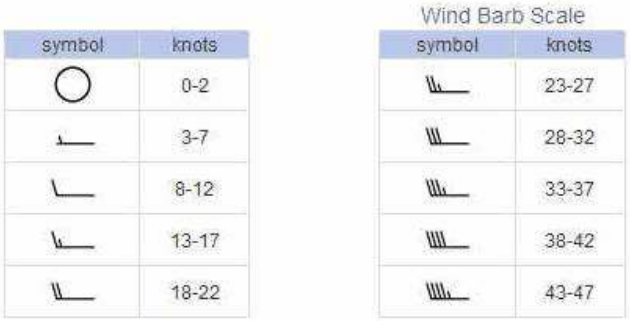
preference is only setting the default.



While navigating in OpenCPN, you can turn the wind barb overlay display on / off as you like. Just right-click on any Tactics_pi instrument and select "**Show Windbarb**". This toggles the display on/off.



I took the basic code for the wind barbs from the tack and laylines plugin, but had to adopt the transit from one barb to the next level. Furthermore it to show the barbs up to 47 knots correctly now (it ends at 30 kts in the original code)



This is the currently implemented wind barb scale (0-2kts has no feather at all) :

2.6 Instruments :

2.6.1 Current Direction and Current Speed :

Current direction means "current sets into …"

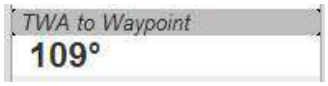
2.6.2 Heel :

In this example we heel to **starboard** !

2.6.3 Leeway :

Boat drifts 0.5° **to starboard** due to heel

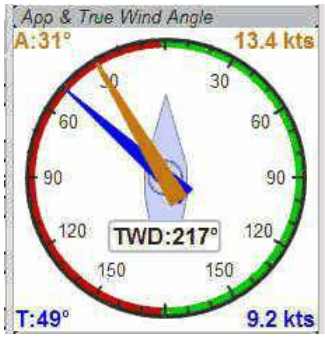
2.6.4 TWA to Waypoint



It's meant to do a quick check of the TWA on the (new) tack prior to sailing the tack/gybe maneuver.
Either place a WP in the GPS(NMEA–> RMB) or simply drop the TacticsWP on the new course line.

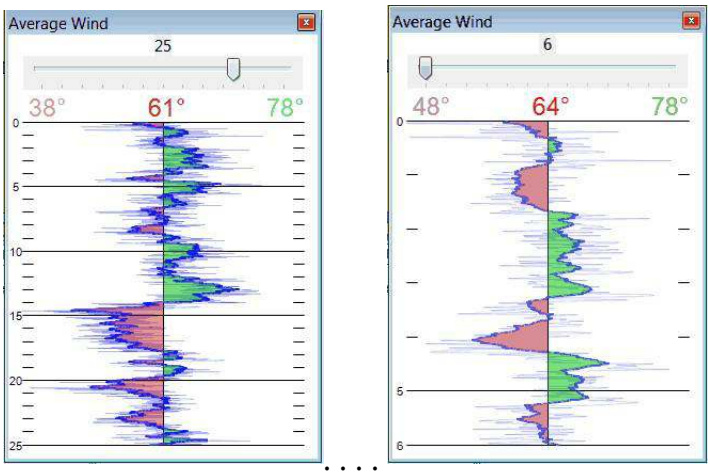
As with the other functions, the “Tactics temp.WP” overrules the RMB coming in from a GPS.
It should give you an idea which gennaker/spi or sail to select on the next tack.

2.6.5 “App.& True Wind Angle” dial instrument with TWD display



I added the TWD to the dial instrument; this saves some space on the screen for an extra instrument

2.6.6 Average Wind Instrument



I created a new graphical instrument which shows the average wind and its deviations to both sides.

The curve is centered on the average wind, green means the wind is on starboard of the actual average wind, red means it blows more from port.

You can adjust the averaging time in steps of 1 [min] between 6 and 30 mins.

The **red** number in the center is the average wind direction, **left** and **right** is the min and max (unfiltered) wind angles to either side.

The very thin lines are the unfiltered wind direction input from the instruments.

To adjust the time average, just pull the slider left / right.

The vertical scale is [minutes], short dashes every minute, full horizontal line every 5 minutes.

The instrument has its own timer, so it's independent of the connection speed.

The idea is:

if you sail in puffy, changing winds, that you see graphically when the wind changes to the other side. In theory, you should tack, as soon as the wind veers away and crosses the average wind direction …

As you can see in the examples above there are definitely cycles, where the wind changes direction.

3. Performance functions which need a polar file

3.1 Load a polar file

You can load a polar file from the preferences screen

Click on the load button and select a polar file.

The format is the same that polar_pi uses (or better: used last summer). I took the basic code from there, to keep the plugins consistent. This is also the reason why I did not spend time in displaying the polar again. You can use polar_pi instead.

When loading the polar, it is written to a 2 dimensional static array with 181 lines for each TWA degree (0…180°) and 61 rows (0…60) for each knot of windspeed. It's a simple lookup table for the latter use, with the purpose to reduce the processor load and increase access speed in normal use.

Loading Procedure :

1. The whole array is prefilled with NAN values.
2. The values from the polar file are placed at their corresponding spots in the array
3. The missing data in between given values (= not NAN) is then filled with average values.

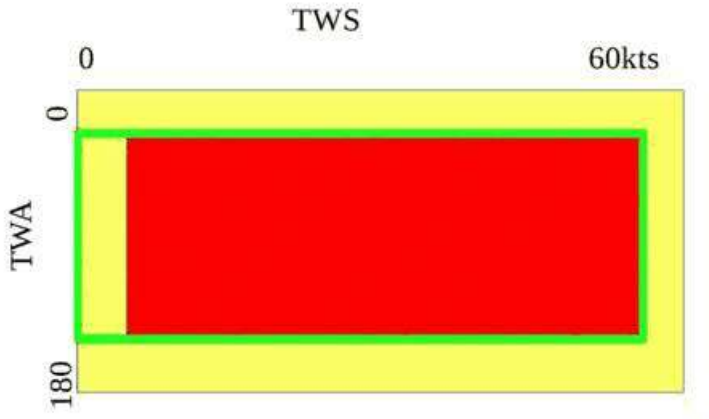
Please note :

- **Only polars with TWA / TWS / STW, and TWS/STW in knots make sense**
- **I do not extrapolate polars beyond their outside limits.** If you run in a 30kt wind, and your polar ends at 25 kts, then the performance instruments will give you a “no polar data” text. I suggest that you turn polar_pi / vdr_pi on at that point and record your data 😃

The only exception of the extrapolation is the range between the 0 kts windspeed and the first given value.

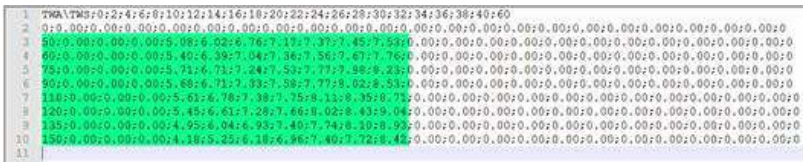
I do simple averaging here.

In other words : if **yellow** is the whole polar from TWS 0-60 kts and TWA 0-180°prefilled with NAN, and **red** is your polar data, you will get the **green** square filled with data.

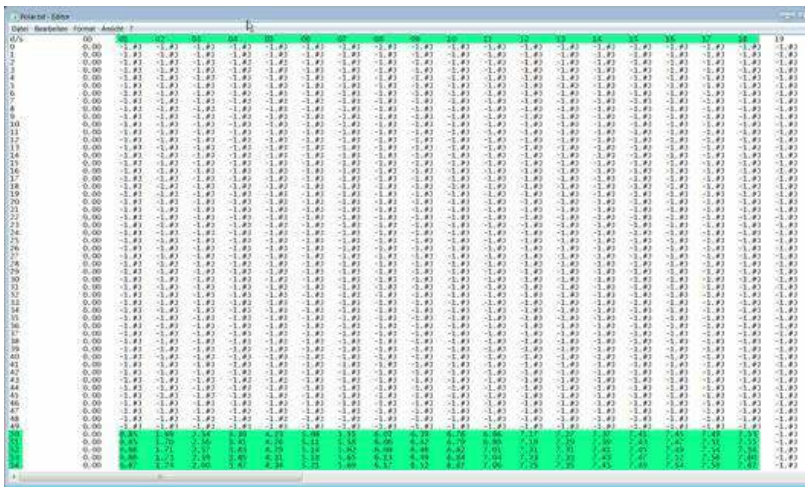


See the ini file chapter, how you can read out the array as a text file (see key PolarLookupTableOutputFile=…).

Here is an example of a polar file starting at 50° TWA



And this is the corresponding lookup table dumped to a file using the ini key PolarLookupTableOutputFile



True wind speed values are averaged now. True wind angle is still rounded to the next full knot. For testing I implemented full averaging of TWS &TWA as well , but live comparisons didn't show improvement. I think this is a good compromise to average TWS only, as I'm pretty sure that TWA won't be more accurate than one knot, due tu upwash issues, position and accuracy of the wind vane, compass accuracy, etc.

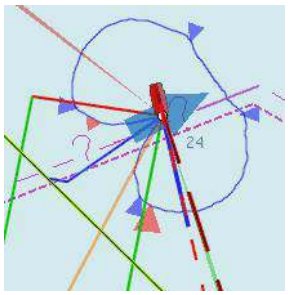
3.2 Display polar on chart

You can display the polar as overlay on the chart.. The size of the different polar “rings” is normalized, they all have the same size. Nevertheless, the plugin always shows the current / correct polar ring. The polar orientation is related to the true wind direction, and it shows blue markers for the Target-VMG angles up- and downwind, and red markers for the Target-CMG angles (if you have an active NMEA-RMB-sentence or a Tactics_pi waypoint set).

There’s also a small blue HDT line diplayed. I decided to add an additional marker for Hdt, because I found it easier than always remembering which of the 2 red default markers is Heading and which one is Course over ground …

To sail Target-VMG / Target-CMG angle, simply steer the blue HDT pointer on one of the Target-VMG / - CMG markers.

As you can see here, there may be 2 red CMG markers, the **preferred one has the biggersize** !

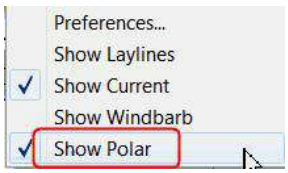


3.3 Activation of the polar display on the chart

To activate the polar display on the chart by default, upon program start, navigate to the Preferences dialogue and set the tick “*Show polar on chart (OpenGL)*”. The preference is only setting the default.

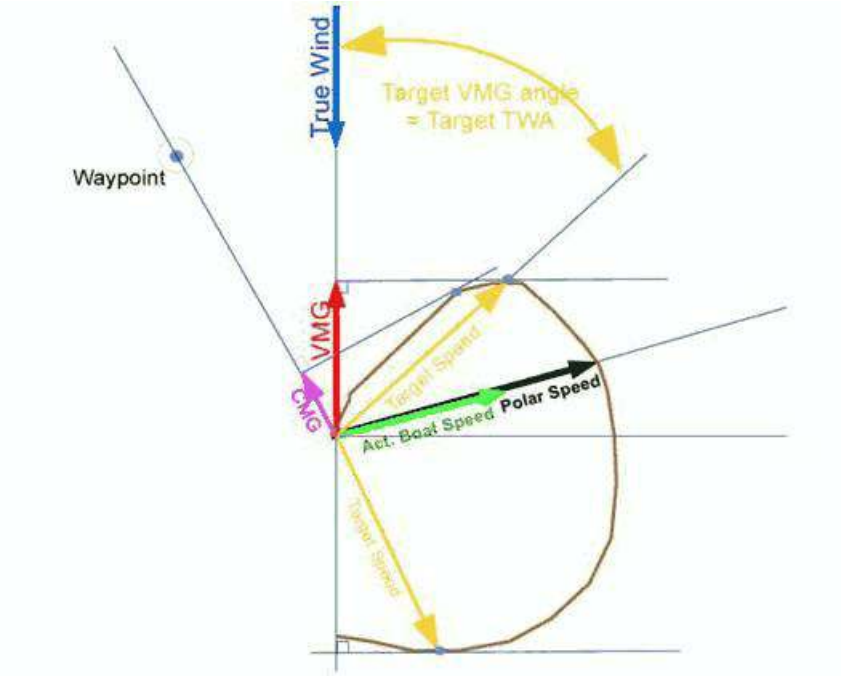
While navigating in OpenCPN, you can turn the polar overlay display on / off as you like.

Just right-click on any Tactics_pi instrument and select “*Show Polar*”. This toggles the display on/off.



3.4 Performance data

various performance data is available as text instruments. See the following chart for reference on the different terms in relation to a polar curve



For some of the instruments I split the display in a % value for your current speed in relation of the polar data value as 100%.

In this example, we're currently doing (only) 51%, of what the polar has stored as optimum value. According to the polar we should be able to do 11.95 knots.

The reason to do so was simply that the data belongs together anyway and so to save space on the screen

3.5 Instruments which need a polar

3.5.1 Polarspeed :

This is simply the reference of what speed we should be able to sail based on our current TWA / TWS values. The % value is the reference to STW.

This is **actual boat speed** versus **polar speed** in the drawing above.

Values below 100% mean, where slower than the polar says, above 100% mean where faster than the polar (we should run vdr_pi now to record the data)

Useful in crosswind / reaching conditions without a waypoint

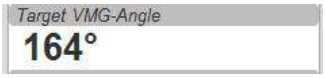
It shows the optimum speed for the given wind conditions.

3.5.2 Actual VMG :

Is the “Velocity made good” refering to the wind direction. The means we're moving with 6,27 kts into wind direction. Also works when we sail downwind (then it's off the wind)

VMG = STW * cosine (True Wind Angle)

3.5.3 Target VMG-Angle :



Also known as **Target TWA**;this is the optimum TWA (True Wind Angle) when sailing upwind or downwind for a given wind speed, based on your polar data. **Very useful when sailing up-/downwind** without a waypoint.

The program simply searches the polar with a given TWS for the optimum TWA up-/downwind. It's defined as the tangens on the polar.

3.5.4 Target VMG :

Also known as “target boat speed” (**target speed** in the diagram above)

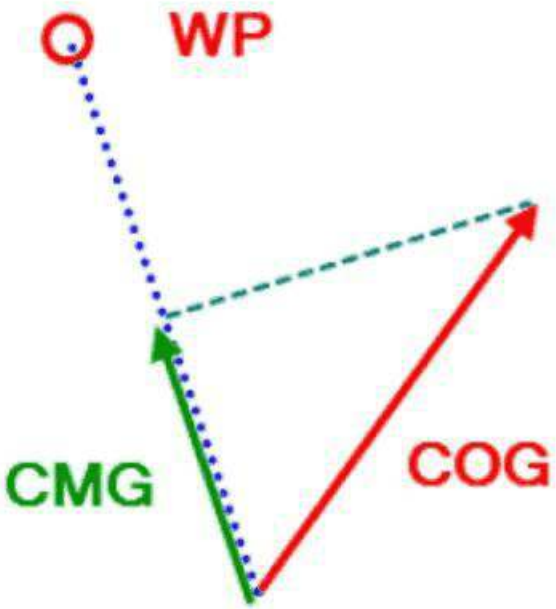
This is the reference to the Target VMG-Angle. In our example it means :

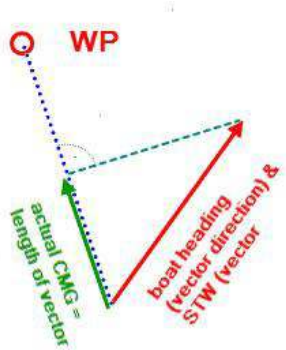
If we would sail with 164° TWA (from ex. above), then we could make 11.95 knots

according polar), but currently we're doing only 51% of that.

3.5.5 Actual CMG:

Actual **C**ourse **M**ade **G**ood = aka VMC; the component of your boat speed towards a waypoint. We're moving with 8.36 knots towards a waypoint





CMG = STW * cosine (Heading - Marks bearing)

Quite valuable on reaching courses towards a waypoint.

3.5.6 Target CMG Angle :

Optimum angle to sail fastest to a waypoint, based on your polar data (Like VMG, but not up-/downwind but towards a waypoint).

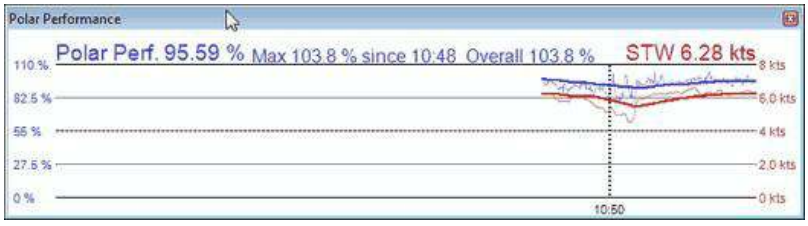
3.5.7 Target CMG :

Same as *Target VMG*, but towards a waypoint. Means : "If we would sail 130° (Target CMG Angle, from ex. Above), we would move towards the waypoint with 11.98 knots, but currently we're only doing 64% of that.

Comment : Calculation is verified, but it doesn't tell you (yet) if you're on the correct tack

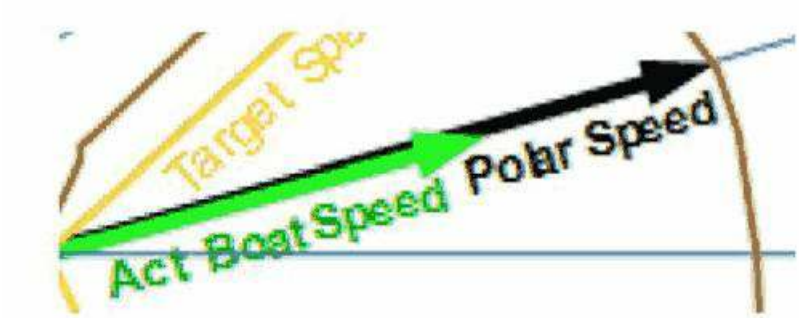
3.5.8 Polar Performance

– sail trimming aid –



A new graphical instrument like Wind-History or Baro-History.

It simply plots the **STW** (speed through water) as percentage of the **polar speed** data (=100%) for the actual true wind speed TWS and true wind angle TWA. It is this comparison in the polar chart above, plotted as %



The idea is a simple sail trimming aid, as the percentage value is quite stable in comparison to the real speed values. And TWA / TWS is constantly adjusted while reading the polar data.

Message : as long as the filtered curve points upwards your trim adjustments were right, if it points down, you're sailing worse than before …

Comment : Still needs probably adjustments with the damping factor, # of points plotted, etc.

3.5.9 Bearing compass

Nice dial instrument, inspired by NKEs tactics page, which I called *Bearing Compass*.

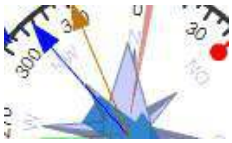
UP- direction is HDT, in this example (356°T)

Surface Current:

We see the blue surface current arrow based on boat heading (HDT) and the current speed “Curr: 0.68 kn”

Needles for TWA and AWA :

Furthermore we have the blue, thin arrow, which is TWA on boat axis. It also shows the TWD on the degree scale (315°) and the AWA arrow in orange/yellow (standard dashboard colour)



Laylines :

You see the red/green laylines, which are based on COG. As with the laylines on the chart,

the second layline shows you where you end up sailing **the same TWA on the other tack.**

Leeway and current are taken into account.

Use the second layline together with the waypoint marker described below.

Please note : the calculation is based on TWA. Especially when sailing downwind with a gennaker, your apparent wind angle depends very much on the speed of the boat. As soon as the gennaker start working aerodynamically, it’ll speed up the boat and your AWA will show lower values (points more foreward). If you gybe now, your boat speed will drop, and although sailing the same TWA, your app. wind angle will be higher than before. You will have to bring you boat back up to speed to see the same AWA than before the tack.

This can be tricky when you’re close to a buoy and don’t have much space/time to speed up your boat again.

Target VMG Angle indicator :

The blue triangle outside the degree scale is the Target-VMG Angle (Target TWA)

Simply adopt your course to place your blue TWA-arrow on the Target-VMG pointer, and you sail optimum (polar based) speed up-/or downwind.

Waypoint marker :

If a waypoint is active, either by a NMEA-RMB sentence from your GPS or the temporary tactics WP which you can place on the chart, you will see the WP as a red dot.

The manually placed tactics WP overrules a parallel available RMB sentence

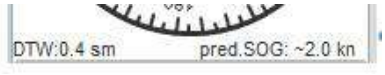
Change your course and place it under the layline (the red one in this example) and you will directly bump into it.

Or use the second layline to determine when it is time to tack towards the waypoint and when you will make it around the WP (the red dot should be outside the second layline then)

Additional data :

The top 2 corners show the bearing to the WP and the name of the WP (See screenshot above).

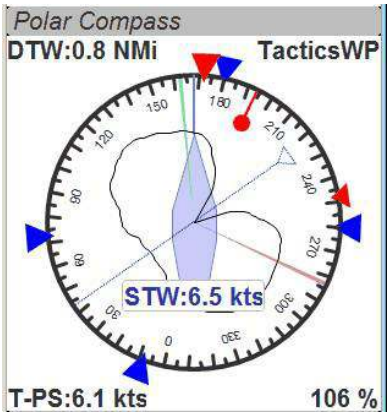
The lower 2 corners give you



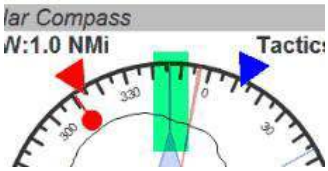
DTW = the distance to the WP and predicted speed over ground on the other tack, **assuming that you sail the same TWA** on the other tack. This simply drops out of the surface current calculation …

3.5.10 Polar Compass

I derived this instrument from Bearing Compass. Once you loaded a polar, it shows you the actual polar ring. The size of the ring is normalized (always the same size).



The polar is rotated with the TWD, which is shown as thin blue line here. In this example True Wind Direction is ~226°, the wind is blowing from port aft. Please note the vertical True Heading line, highlighted in green here :



The 4 blue markers (triangles) are showing the Target-VMG-Angles up- and downwind. They are based on the actual polar ring and are moving with the with the polar.

The red maker(s) (triangles) are the Target-CMG Angles towards a Waypoint. They are only shown if you have an active Waypoint set (via NMEA-RMB or the ‘temp. TacticsWP’).

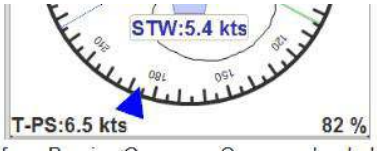
The red dot inside the compass shows the bearing to the waypoint.

In contrary to **Bearing Compass**, the VMG/CMG markers are shown in conjunction with the polar and are rotating with the polar/true wind angle.

To sail optimum VMG- or CMG-Angle, change your course in a way that **the boats heading line** (green markup above) **points on one of the markers**.

Top left and right data fields show

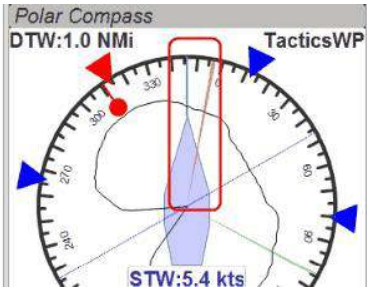
- DTW = Distance to Waypoint
- Waypoint name (here : TacticsWP)
- The centered data is STW = Speed Through Water



The 2 bottom fields are

- T-PS : Target-PolarSpeed on the left
- PolarSpeed-% = the percentage of you actual STW compared to the Target-PolarSpeed.

Furthermore you see the laylines which are based on CoG.



In this example, there is a angle btw. the HDT line and the layline, so we have a significant drift !

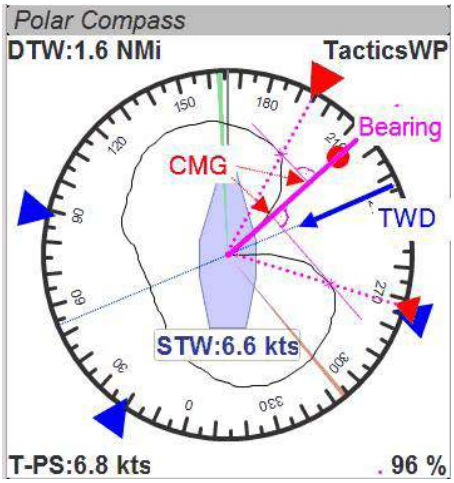
There may be 2 red CMG pointers, based on Bearing and True Wind direction. Generally one of them is preferred, because you approach the WP faster. The preferred one has a bigger size !!!

For those who are interested in the theory of CMG calculation, see the following example with the markups below:

We have TWD, shown with the bluearrow. The polar is rotated with TWD.

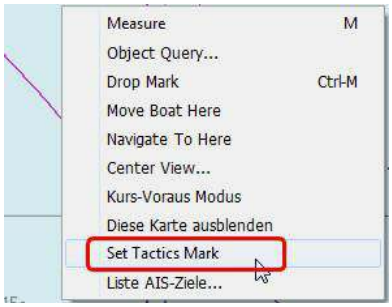
Next we have the bearing to our WP, see the solid purple line “Bearing”.

From this solid purple bearing line, we have to find the tangens on the polar curve to both sides. The tangens is – in relation to the purple bearing line – the highest point of the polar curve. Graphically one draws perpendicular lines from the purple bearing line to either side until it just touches the polar curve. The length on the purple bearing line, measured from the 0-point of the polar, to the perpendicular intersections (marked CMG) corresponds to the Target CMG speed.

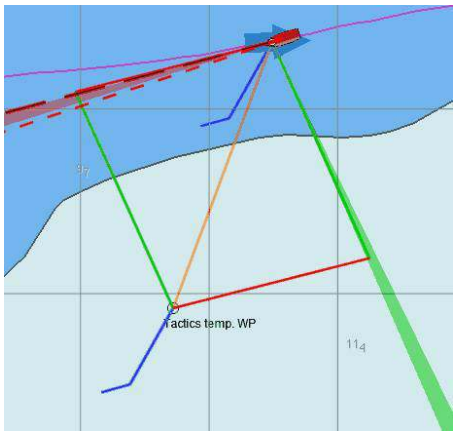


3.6 Temporary waypoint and Target-TWA laylines

You can right-click on any place in the chart and drop a temporary waypoint (exactly one).



As soon as you activate the layline display, the plugin will do a Target-TWA calculation to that WP, based on the current TWD and your boat polar. Surface current is taken into account.

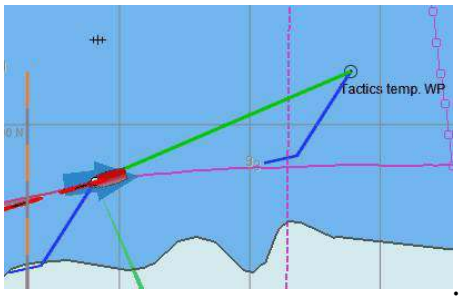


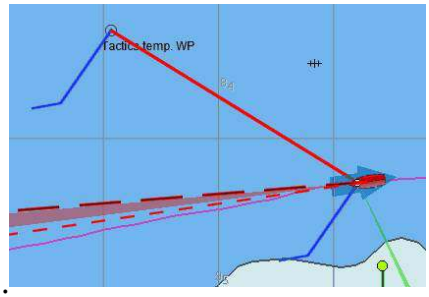
1. You can delete that waypoint as any other WP. Select it with right click and choose "*Delete*".
2. You can drag the waypoint on the chart, it behaves like a normal waypoint.

3. Depending on your settings in ***O*** you may have to open the WP properties to drag.
4. Currently it takes the Target-VMG (Target-TWA) angle up-/downwind and applies it to our boat as well as to the mark (Tactics temp. WP).
5. If there is a line intersection, it chops off the lines at the intersection, et voilà …. Colours green and red are again the wind directions green = wind from starboard, red = wind from port

Additionally

1. I do a polar based calculation to see if the direct course would be faster compared to the Target-VMG calculation.





In that case you'll get a red or green line directly to the waypoint. Colour depends on the side the wind is blowing from. Wind from port → red, wind from starboard → green As you can see here I'm placing a wind barb also on the tactics waypoint.

Please note :

1. In contrast to weather routing, I'm explicitly not using grib files here for current/wind info.
2. The “Temp. Tactics Waypoint” is meant for a quick, near run around a buoy, cape of an island, etc. using the live wind data we currently experience and the momentary surface current.
3. Just drop a mark on the chart and off you go. Delete it, drop it somewhere else, and boom, off you go again. Maximum one tack/gybe not more.

3.7 NKE style NMEA Performance Records and export to the instruments

NKE supports the upload of specific performance data to their instrument bus, which can be shown in their displays then. These records are polar based and unless you’re using their (quite expensive) regatta processor, this gives us an easy way to display e.g. the “Target Polar Speed” outside in the cockpit on the standard instrument displays.

- Due to the lack of information on other manufacturers capabilities, I implemented this for the NKE system right now.
- Be aware that OpenCPN can only import/export NMEA183 right now, but not NMEA2000 or SeaTalk.

The following 5 records are implemented :

Speed and performance target

```
$PNKEP,01,x.x,N,x.x,K*hh<CR><LF>
|      \ target speed in km/h
\ target speed in knots
```

Course on next tack

```
$PNKEP,02,x.x*hh<CR><LF>
\ Course (COG) on other tack from 0 to 359°
```

Opt. VMG angle and performance up and downwind

```
$PNKEP,03,x.x,x.x,x.x*hh<CR><LF>
|   |    \ performance downwind from 0 to 99%
\   \ performance upwind from 0 to 99%
\ opt. VMG angle 0 à 359°
```

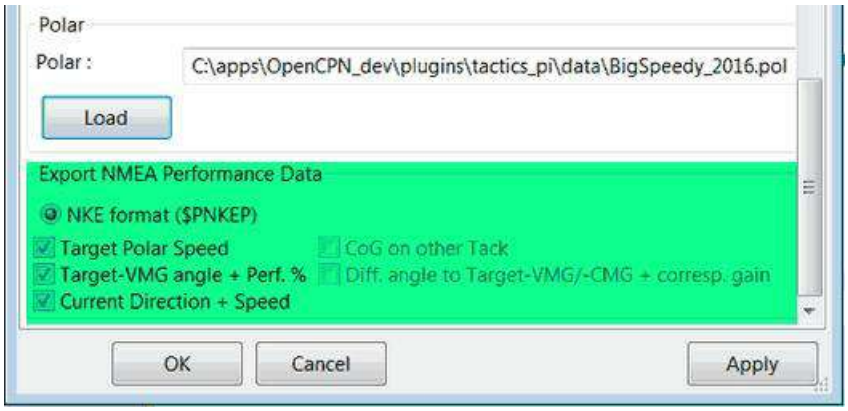
Angles to optimise CMG and VMG and corresponding gain (available but to be verified)

```
$PNKEP,04,x.x,x.x,x.x,x.x*hh<CR><LF>
|   |   |    \ Gain VMG from 0 to 999%
\   \   \ Angle to optimise VMG from 0 to 359°
\   \ Gain CMG from 0 to 999%
\ Angle to optimise CMG from 0 to 359°
```

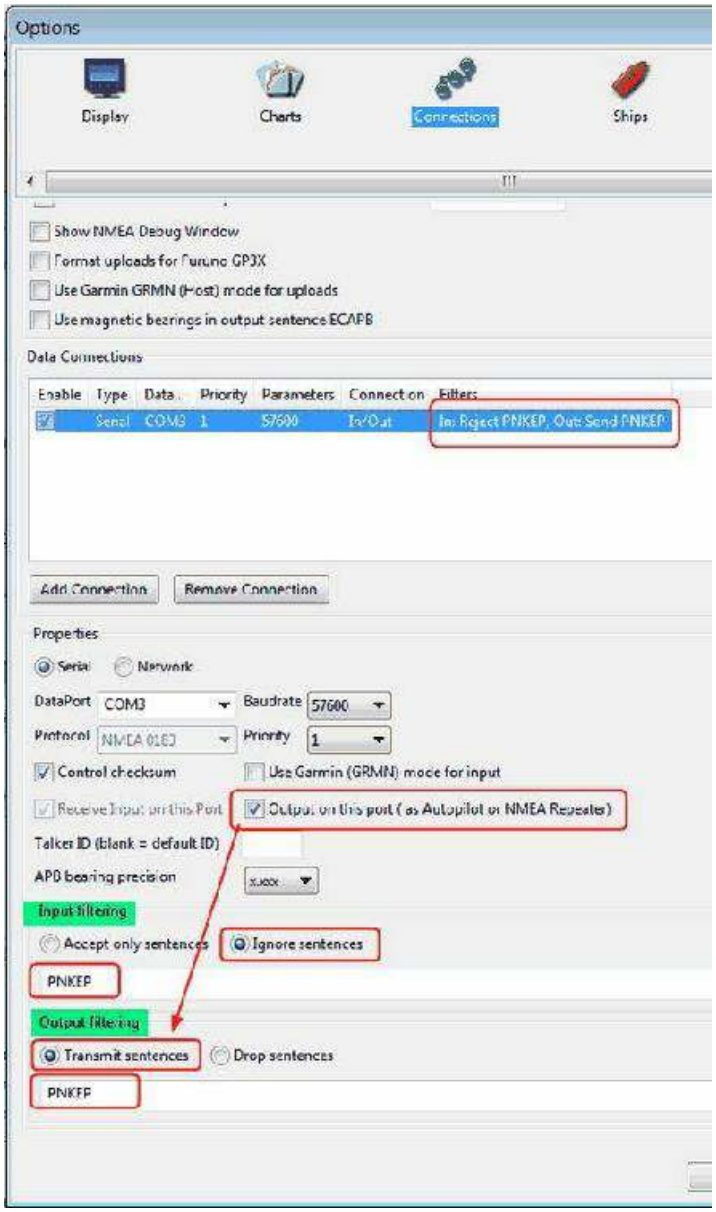
Direction and speed of sea current

```
$PNKEP,05,x.x,x.x,N,x.x,K*hh<CR><LF>
|    \     \current speed in km/h
\    \ current speed in knots
\ current direction from 0 à 359°
```

There is a new tab now in the Preferences where you can define up to 5 performance NMEA183 records to be created.



These 5 NMEA183-records all begin with $PNKEP and are created on the fly using the data calculated in the plugin and are sent to OpenCPNs NMEA stream. To send the records to your instruments, you have to define an outgoing connection in you Interface connections, e.g. like this :



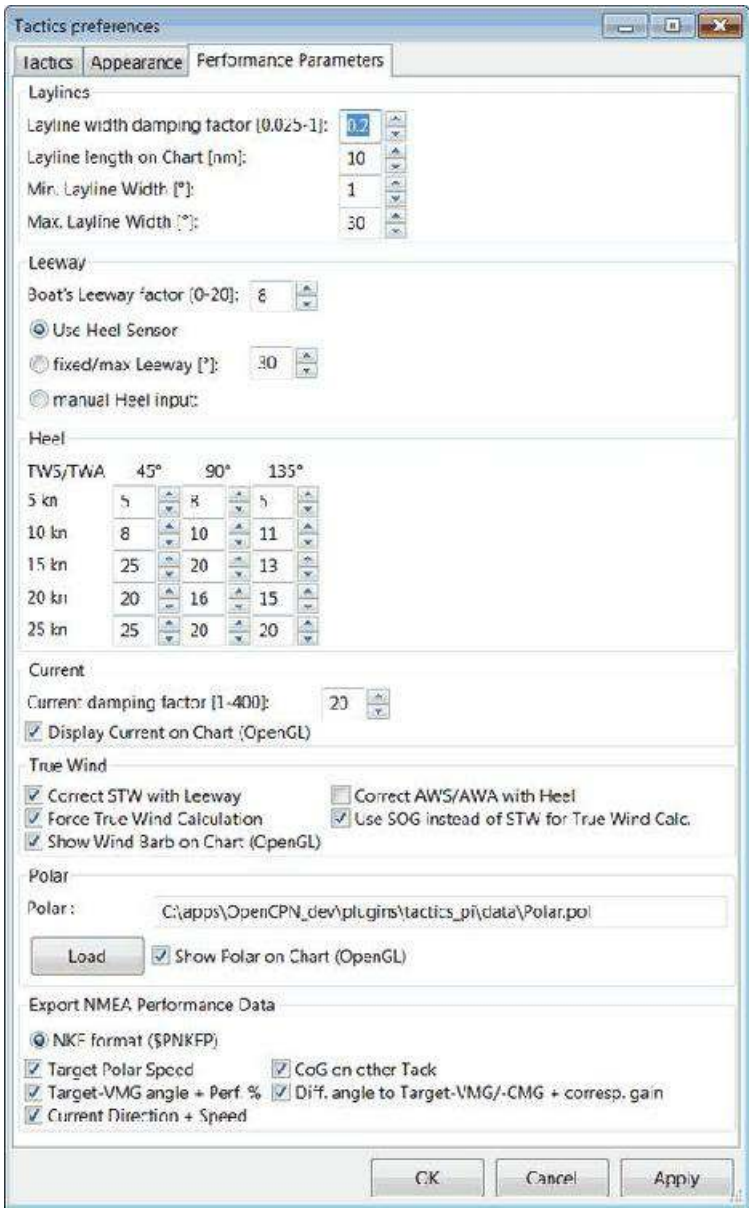
- Set an output filter as shown above, filtering for **PNKEP**.
- After set up, you should see records beginning whith $PNKEP, in your NMEA debug window.

NKE exports the $PNKEP sentences as soon as they're available on the topline bus.
Normally they're calculated in their regatta processor and then exported to the PC.

- Therefore **ignore** all incoming $PNKEP sentences !
  Click on *Input filtering* (see screenshot above), select *Ignore sentences* and add PNKEP.
- Don't forget to re-init your NMEA data stream ***in your instruments***, to make sure the new records are accepted.

3.8 Settings in the INI file

I added a complete tab “Performance parameters” with all the settings



- The ***Apply*** button set the global variables which are used for the preferences directly, without closing the pref’s window.
- All parameters are written to the opencpn.ini file using the standard “dashboard” functionality, i.e. when closing tactics_pi itself.
- I’ll add a “Save” button here, which directly writes to the ini file.

You'll find all keys under section [PlugIns/Tactics] and subsequent sections starting with [PlugIns/Tactics/…]
The basic setup is inherited from dashboard_pi, I did not change any of the “original dashboard” keys, but added some

Relevant are :

```
**[PlugIns/Tactics]**…
* CurrentDampingFactor=0.003
```

```
* MinLaylineWidth=2
* MaxLaylineWidth=30
* LaylineWidthDampingFactor=0.2
* ShowCurrentOnChart=1
* LaylineLenghtonChart=5
**[PlugIns/Tactics/BearingCompass]**
* DampingDeltaCoG=0.4
* MinLaylineDegrees=2
* MaxLaylineDegrees=30
**[PlugIns/Tactics/Performance]**
* PolarFile=C:\\apps\\OpenCPN
4.1.925\\plugins\\weather_routing_pi\\data\\polars\\Aki950routage.pol
* PolarLookupTableOutputFile=C:\\temp\\Polar.txt
* BoatLeewayFactor=8
* fixedLeeway=30
* UseHeelSensor=1
* UseFixedLeeway=0
* UseManHeelInput=0
* UseSOGforTWCalc=1
* Heel_5kn_45Degree=5
* Heel_5kn_90Degree=5
* Heel_5kn_135Degree=10
* Heel_10kn_45Degree=8
* Heel_10kn_90Degree=10
* Heel_10kn_135Degree=11
* Heel_15kn_45Degree=25
* Heel_15kn_90Degree=20
* Heel_15kn_135Degree=13
* Heel_20kn_45Degree=20
* Heel_20kn_90Degree=16
* Heel_20kn_135Degree=15
* Heel_25kn_45Degree=25
* Heel_25kn_90Degree=20
* Heel_25kn_135Degree=20
* UseSOGforTWCalc=1
* ExpPolarSpeed=1
* ExpCourseOtherTack=0
* ExpTargetVMG=1
* ExpVMG_CMG_Diff_Gain=0
* ExpCurrent
```

I think they are selfexplaining, if you compare the settings with the preferences screenshot above.

- All damping factors are “alpha” from the standard exponential smoothing formula, except CurrentDampingFactorwhere I'm using double exponential smoothing at the moment.
- They should range between something above 0 and 1, the smaller the number, the higher the damping, 1 means no filtering at all

Recommendation :

1. Use CurrentDampingFactorwith low values, like 0.03 to get a stable reading
2. One interesting key, which is not available in the preferences screen is PolarLookupTableOutputFile
3. As explained earlier, the polar file is loaded into an array. When you set this key, you can dump that array to a (tab delimited) text file, which can be read e.g. with notepad++.
4. As mentioned earlier, this array is prefilled with NAN values, NANs are reflected in the file as “-1.#J”.

5. If you want to see/check that, just add that key manually under section **[PlugIns/Tactics/Performance]**

Make sure the path exists and the given file is writeable. There's no safety checks implemented here, so use at your own risk.

There are more keys and sections for tactics_pi but all others came with dashboard_pi and were not touched by me.

3.9 Restrictions/known issues at the time being :

Wind barb display on chart ends at 47 knots. Any windspeed higher than that is displayed as "45 knots". With more than 47 kts, I'm personally not really interested anymore in a correct wind barb display …

4. Terminology

Term	Description
AWA	**A**pparent **W**ind **A**ngle; the relative wind angle measured by your wind sensor, related to the boat axis(0°…180°)
AWS	**A**pparent **W**ind **S**peed; the relative speed of the wind measured by your wind sensor
CMG	**C**ourse **M**ade **G**ood; the speed approaching a waypoint
COG	**C**ourse **O**ver **G**round; generally supplied by the GPS
HDG	Magnetic heading of your compass; **not** compensated with magnetic variation
HDT	True heading of your compass. "True" means compensated with magnetic variation
Heel	The angular degrees how your boat is heeled (leaning) sideways due to any force from outside (wave, wind, water ballast on one side of the boat, swing keel etc….)
CRS	Course through water; HDT + Leeway, but without currents
Leeway	The drift of your boat based on the wind. As soon as the wind is blowing it implies a force on your boat, the boat starts drifting. Leeway is NOT including any drift due to surface currents! That's actually the challenge
SOG	**S**peed **O**ver **G**round; generally supplied by the GPS
STW	**S**peed **T**hrough **W**ater; the info that is returned by your "paddlewheel" sensor
Target CMG	The optimum speed / angle towards a waypoint; aka VMC
Target VMG	The optimum speed / angle up- or downwind with reference to the true wind direction (without a waypoint)
	True **W**ind **A**ngle; the angle of the true wind relative

TWA	to the boat axis (0°…180°). The unit then gives you the direction as “>”=port, “<”=starboard
TWD	**T**rue **W**ind **D**irection; true wind direction related to the compass rose (0°..359°)
TWS	**T**rue **W**ind **S**peed; the speed of the wind in the atmosphere
VMC	**V**elocity **M**ade on **C**ourse; same as CMG
VMG	**V**elocity **M**ade **G**ood; the speed up-downwind with reference to true wind direction

5. Appendix

5.1 How to align/check your magnetic compass with O

- Swing your compass as described by the manufacturer
- Connect your GPS to O to get a stable position
- Make sure you have true heading available (use wmm_pi, in case you don't get the mag. variation from the GPS)
- Directly in O, set your heading predictor to a high value, e.g. 10 miles
- Put the mouse onto the (thin HDT) preditor line towards the end of the line (the long line reduces the error)
- Simply compare now true heading with the status line or the “From Ownship” display…
- Then adjust your compass (in this case : -1°)

That's it…

6. History

Rev	Date	Remark
1.0	24.05.2016	Initial release
1.1	24.05.2016	Corrected description of true wind calculation
1.2	25.05.2016	Wind barbs corrected; steps corrected and enhanced up to 45kts
1.3	07.06.2016	“TWA to Waypoint” instrument implemented Laylines-to-waypoint reworked, documentation updated
0.4	11.06.2016	Changed Rev from 1.4 to 0.4 to keep the plugin version inline with the doc version
0.5	14.06.2016	Preferences with scrollbar, internal icons updated Added TWD to the “App. & True Wind Angle” dial instrument;
0.6	27.06.2016	Option added to use SOG instead of STW for true wind calculation code cleanup “Apply” button added to the preferences Polarspeed, Target-VMG, Target-CMG, Target-CMG Angle instruments corrected for user speed settings

0.7	04.07.2016	Added STW to Polar Performance instrument as second graph Minor corrections
0.7.3	16.07.2016	User settings for wind / boat speed implemented Watchdog for RMB implemented to recognize the loss of waypoint data in “Bearing Compass” and “TWA to Waypoint” instruments Usage of default plugin svg icons for “journeyman” styles picture added for CMG Correction of TWD calculation
0.8	06.11.2016	NKE style NMEA performance records implemented Prefs enhanced to select which performance records to be created.
0.9	04.12.2016	Completion of $PNKEP records TWS averaging when accessing polar data
1.0	07.01.2017	Polar compass Average Wind Instrument Polar overlay on chart Right-click menu to activate/deactivate chart overlays CMG calculation rework CMG markers in different sizes Watchdogs for TWS, TWD, AWS Tooltips in Preferences Bug fixes Index in documentation

7. Tactics FAQ

Why bother with Speedo Paddlewheels?

Here is a good discussion[615]

Other

Other Useful 3rd Party Plugins

These plugins are available at the Opencpn Download location or at various github repositories to be compiled. They generally work for Windows and Linux, and some are available for MAC. There are no page links for these plugins yet.

We need volunteers to write a brief paragraph about each of these plugins.

Statusbar
This plugin replaces the built-in status with a more configurable one that is easier to read. For best results, you should disable the built-in toolbar on the User Interface tab in the Toolbox and set the Y position of the plugin toolbar to at least the pixel size of the font selected in the plugin preferences.

Calculator
Light weight yet powerful calculator plugin for OpenCPN which includes functions to solve nautical questions.

Launcher
Allows user to define several buttons to launch external commands. Targets touch screen devices.

Debugger
Shows plugin API messages. For developers to help troubleshoot problems with NMEA data streams.

Pypilot Autopilot
Provides an OpencCPN interface to the free software autopilot pypilot.

Survey (Beta)[616]
To survey and record the depth.

StatusBar

Alternative to the Standard Status bar at the bottom.

Links

- Source: https://github.com/seandepagnier/statusbar_pi[617]
- Download: https://opencpn.org/OpenCPN/plugins/statusbar.html[618]
- Forum: CF Statusbar_pi Thread[619]
- YouTube: Statusbar[620]

1. What and Why

What can StatusBar do?

Shows Dashboard and Nmea Data at the bottom of the screen in various formats.

Why is StatusBar useful?

Informs the skipper of conditions that are useful in navigation. StatusBar plugin replaces builtin statusbar. The builtin status bar (disable from the User Interface tab) can be very difficult to read.

The statusbar plugin improves on some of these difficulties. It is best used with OpenGL enabled (requires some basic OpenGL extensions).

2. Installation

A. Where to get this plugin:

Github: https://github.com/seandepagnier/statusbar_pi[621]

Available on the Downloads Page:
https://opencpn.org/OpenCPN/info/downloadplugins.html[622]

B. How to install the plugin:

1. Double-click the downloaded file (with “statusbar_pi” in the name and “.exe” as extension) and follow the set-up instructions.
2. Open (or restart) OpenCPN.
3. Click **Tools-Options-Plugins**
4. Scroll down until you see the StatusBar-pi.
5. Click “**Enable**” to enable the plugin and then hit “**Apply**”.
6. Use “**Preferences**” to set your preferences (should be self-explanatory). Then “**Apply**.

7. Then close **Options** and the data should appear at the bottom of the screen.

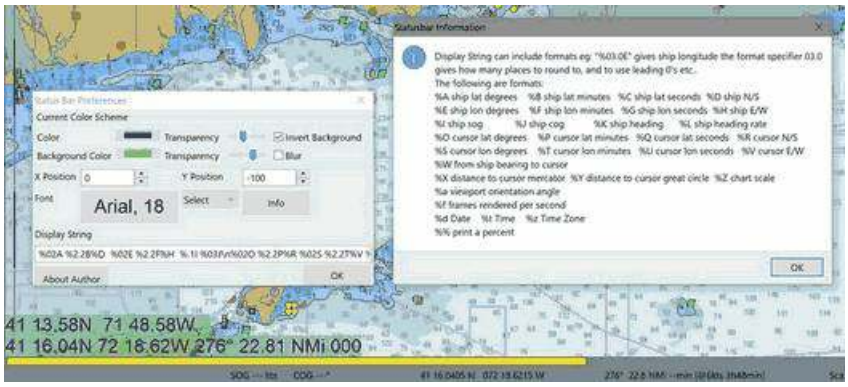
C. How to disable the OpenCPN lower Status bar.

1. Settings > User Interface.
2. Uncheck “Show Status Bar”.

D. Where is the Cruiser's Forum Discussion?:

CF Statusbar_pi thread[623]

3. Standard Actions



Preferences Menu

Display String

Display of data is controlled in the Preferences menu in the Display String area. Below is the default Display String entered under Preferences. This area is edited to display the information you would like shown on the screen.

```
%02A %2.2B%D  %02E %2.2F%H  %.1I %03J\n%02O %2.2P%R %02S %2.2T%V %03W %.2X
%03.a
```

The formatting and values available to the user are listed below under **Info**

Fonts, Color and Transparency

Under preferences the user can select font, font color and size as well as transparency.

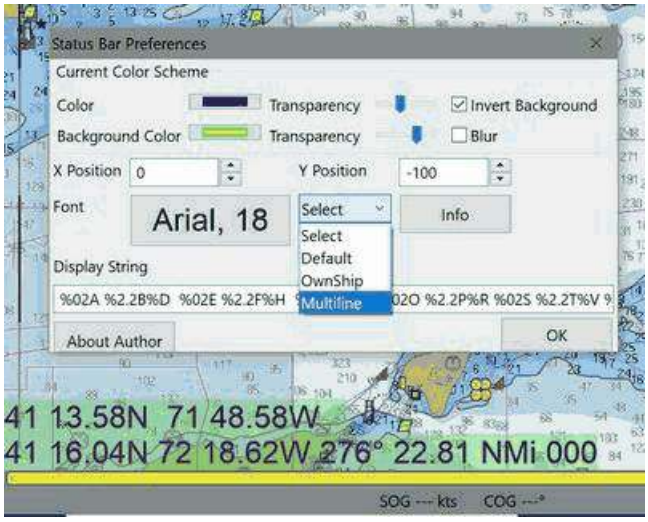
Select Dropdown

Used to control the Appearance of the data. There are three **Select** string types which can be picked from the dropdown: **Default**, **Ownship**, **Multiline**

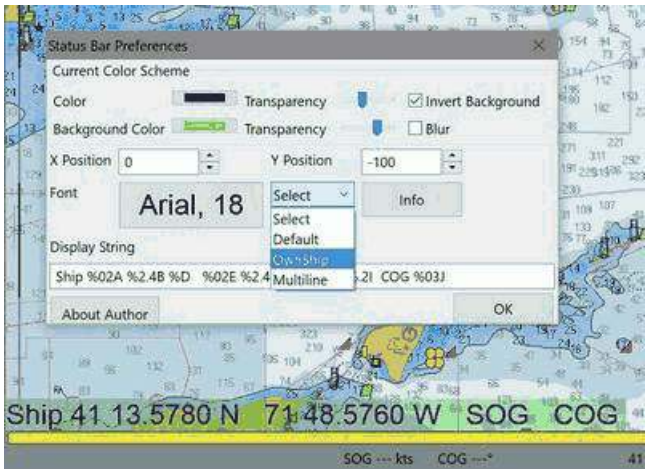
```
wxString DefaultString = _T("Ship %02A %2.4B %D   %02E %2.4F %H   SOG %.2I
COG %03J
```

```
%02O %2.4P %R   %02S %2.4T %V   %03W  %.1X    Scale %Z");
wxString OwnshipString = _T("Ship %02A %2.4B %D   %02E %2.4F %H   SOG %.2I
COG %03J");
wxString MultilineString = _T("%02A %2.2B%D  %02E %2.2F%H  %.1I %03J
\n%02O %2.2P%R %02S %2.2T%V %03W %.2X %03.a");
```

Select Dropdown - Default



Select Dropdown - Multiline



Select Dropdown - Ownship

Info Button

The button **Info** displays a popup window with the Code key. The allowed Display strings can include the following formats:

For example:

```
"%03.0E\"  Gives ship longitude.
The format specifier 03.0 gives how many places to round to, and to use
leading 0's etc.
```

The following are the specifier formats:

%A ship lat degrees
%B ship lat minutes
%C ship lat seconds
%D ship North/South
%E ship lon degrees
%F ship lon minutes
%G ship lon seconds
%H ship East/West
%I ship sog
%J ship cog
%K ship heading
%L ship heading rate or ship turn rate (degrees/second)
%O cursor lat degrees
%P cursor lat minutes
%Q cursor lat seconds
%R cursor North/South
%S cursor lon degrees
%T cursor lon minutes
%U cursor lon seconds
%V cursor East/West
%W from ship bearing to cursor
%X distance to cursor mercator
%Y distance to cursor great circle
%Z chart scale
%a viewport orientation angle
%f frames rendered per second
%d Date
%t Time
%z Time Zone
%% print a percent

Sean D'Epagnier is the author of this plugin. His website is http://seandepagnier.users.sourceforge.net/[624] where you will find a “Donate” button.

Calculator

Links

This plugin is available for Linux and Windows.

- Source SaltyPaws: Github Calculator Plugin[625]
- Source Rasbats (with windows): Github Calculator muparser Windows fix[626]
- Release: Linux and Windows release[627]
- Download: https://opencpn.org/OpenCPN/plugins/calculator.html[628]
- Forum: CF Calculator_pi Thread[629]
- Forum: Plugin-calculator[630]
- Forum: Plugin calculator windows version[631]

Goals

This is a light weight yet powerful calculator plugin for OpenCPN which includes functions to solve nautical questions.

- Would you like to know your hull speed?
- Increase of draft due to heel.
- More functions can be added by the author.

Key features are:

- Storing results in variables
- Shows historic calculations
- Full complement of nautical functions
- Screen footprint can be optimized & minimized as required

Adding formulas is easy. If your favorite nautical equation is missing, please let me know your equation via flyspray, and I will add it.

Requirements

```
OpenCPN 4.2.0 and above.
Linux or Windows
```

Use

The calculator plugin allows you to carry out all nautical calculations, without having to leave the OpenCPN environment. The scientific calculator is capable of working with, and retaining variables.

* When starting the plugin for the first time, go to  to find the plugin tab. Click on the calculator plugin, then the “Enable” button.

- Back in the OpenCPN menu the calculator icon  brings up the calculator.
- 

- Tick the “Help” tickbox to bring up a comprehensive help screen. Unticking the help button brings you back to the calculator only interface and resizes the menu to the original size.
- Enter calculations in the box and press enter or “Calculate” for evaluation. Press the up or down button, to retrieve historic input and results (max 30).

Help

Type help in the calculator to get these instructions.

Examples

Examples of expressions that work in the calculator are: *(comments are in brackets, some results depend on other example calculations)*:

Hull speed:

- LWL=48 *(water line length in feet)*
- vhull=1.34*LWL^(1/2) *(hull speed in knots)*

Conversions:

- ftm=0.3048 *(feet to meters)*
- km_to_nm=0.539957 *(Kilometers to nautical Mile)*
- ftm*LWL *(waterline length in meters)*

Distance to horizon

- R=6378.1*1000 *(Radius of the earth in m)*
- H=2.5 *(Height of the eye above sea-level in m)*
- d = R * acos(R/(R + h)) *(Distance to horizon in m)*
- ans*km_to_nm *(Distance to horizon in nm)*

Distance to lighthouse

- H1=200 *(height of lighthouse in m)*
- d1 = R*acos(R/(R + H1)) *(Distance to horizon in m)*
- distance=d1+d *(visibility range of lighthouse in m)*

Useful Notes

- **Ans** is the result of the previous calculation
- **Variables** can be defined (e.g. myvariable=10/8*cos(dtr*90) or yourvariable=Ans)
- % modulus - Divides the value of one expression by the value of another, and returns the remainder.
- ! factorial
- Sign Returns .-1 for negative numbers and 1 for positive numbers
- Factorial Variables: Pi, e
- dtr is the conversion factor from degrees to radians

Built-in functions

The following table gives an overview of the functions supported by the default implementation. It lists the function names, the number of arguments and a brief description.

Name	Argc.	Explanation
TRIGONOMETRY		default entry use radians e.g. sin(dtr*90) to calculate in degrees
sin	1	sine function
cos	1	cosine function
tan	1	tangens function
asin	1	arcus sine function
acos	1	arcus cosine function
atan	1	arcus tangens function
sinh	1	hyperbolic sine function
cosh	1	hyperbolic cosine
tanh	1	hyperbolic tangens function
asinh	1	hyperbolic arcus sine function
acosh	1	hyperbolic arcus tangens function
atanh	1	hyperbolic arcur tangens function
LOGARITHMIC		
log2	1	logarithm to the base 2
log10	1	logarithm to the base 10
log	1	logarithm to the base 10
ln	1	logarithm to base e (2.71828…)
OTHER		
exp	1	e raised to the power of x
sqrt	1	square root of a value
sign	1	sign function -1 if x<0; 1 if x>0
rint	1	round to nearest integer
abs	1	absolute value
min	var.	min of all arguments
max	var.	max of all arguments
sum	var.	sum of all arguments
avg	var.	mean value of all arguments

Built-in binary operators

The following table lists the default binary operators supported by the parser.

Operator	Meaning	Priority
=	assignment	-1
&&	logical and	1
||	logical or	2
⇐	less or equal	4
>=	greater or equal	4
!=	not equal	4
==	equal	4
>	greater than	4
<	less than	4
+	addition	5
-	subtraction	5
*	multiplication	6
/	division	6
^	raise x to the power of y	7
^	use ^(1/2) for square root	7

* The assignment operator is special since it changes one of its arguments and can only by applied to variables.

Other operators

MuParser

muParser has built in support for the *if.. then.. else* operator. It uses lazy evaluation in order to make sure only the necessary branch of the expression is evaluated.

Operator	Meaning
?:	if then else operator

Variables:

pi, e	well known
ans	the result of the previous calculation
dtr	conversion factor from degrees to radians
Define variables	e.g. myvariable=10/8*cos(dtr*90) or yourvariable=ans
clear	removes results in the history and leaves defined variables in tact

User Interface:

Type these commands in the command window:

history	Toggle the history panel
showhelp	Show/Hide the Help button
showcalculate	Show/Hide the Calculate button
showhistory	Show/Hide the history toggle
help	show the help menu

Settings/Plugins/Preferences:

- Show/Hide Calculate
- Help and History toggle buttons
- History Settings: max Results -this is the number of results that will be stored in the history pull down. The history pulldown will contain five times this value.
- Log to opencpn: Enable/Disable logging of results to opencpn logfile.

Other:

- Error handling supported
- MuParser has been compiled with C++ Double for internal precision.

Compiling

You have to be able to compile OpenCPN itself - Get the info atDevolpers Manual[632]

- git clone https://github.com/SaltyPaws/Calc_pi_muparser.git[633]

Build out of OpenCPN branch!

in folder calculator_pi

- mkdir build
- cd build
- cmake ..
- make
- sudo make installf

After using wxformbuilder to modify the interface, use degreefix.sh, to facilitate the windows build. When updating the Excel file with formulas and conversions, convert to cpp code by running the supplied perl script

Changes to version 1.6

- Added Willson Fetch Equation
- Added wind speed to Beaufort equation
- Changed to MuParser math interface
- Added History pulldown box, improved history box behaviour
- Added reporting modes (1000 separator, SI prefixes, accuracy)

- Added function button in OpenCPN toolbar, with option to switch off from plugin settings
- Minor tweaks and fixes

SaltyPaws aka Walbert Schulpen

Support for Diagrams

I believe the plugin supports small jpg & png images for the purpose of better visualization. What is needed to implement this system is some diagrams and more knowledge about the plugin. Rgleason

Early Executables

Earlier compiled library files can be downloaded/uploaded here.
https://sourceforge.net/projects/opencpnplugins/[634]

License

The plugin is licensed under the terms of GPL v2 or, at your will, later. The MuParser files are by Ingo Berg and is open source. For full licence, please see the muparser source files.

Launcher

Launch external programs from within Opencpn.

Links

- Source: https://github.com/nohal/launcher_pi[635]
- Download: https://opencpn.org/OpenCPN/plugins/launcher.html[636]
- Forum: CF Launcher_pI Thread[637]

This document is about Launcher plugin (Launcher-pi) 

1. What and Why
2. Installation
3. Standard Actions
4. Examples
5. Frequently Asked Questions

What and Why

A. What does Launcher-pi do

The plugin allows the user to define several buttons to launch external commands.
It is primarily targetting touchscreen devices but can also be used with a mouse.

External commands are all the commands you can give to your computer. They are not to be confused with the internal commands you use in OpenCPN itself (you cannot use Launcher-pi for such internal commands).

B. Why can Launcher-pi be useful

You can use a button in Launcher-pi (while you keep running OpenCPN) to do something else with your computer than just running OpenCPN.

You could for instance:

Open a document with information you find usefull. That can be anything. The manual of your ship's engine, your favourite recipes for that freshly caught mackerel (or, if you did not catch anything, the book “Fishing for Dummies”), a document with all the facts of interests of the ports you pass, pilotage information, you name it.

When you have access to the Internet you could use Launcher to **open a specific website**. For instance the OpenCPN-website, the Cruisers Forum, Marine-Traffic (AIS) etc. etc.

In “**Standard actions**” we will show some examples.

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Installation

A. Where to get Launcher-pi

Note: In this section the instructions are specifically for Launcher-pi, but there is a dedicated page in the manual with information about Downloading, Installing and Enabling Plugins in general. That dedicated page can be found here: Plugins - Install and Enable.

Launcher-pi can be downloaded from http://www.opencpn.org/index.html[638]

Click “**Downloads**”

Click “**Plugins for OpenCPN 4.2 & 4.4**”

Scroll down to the “**Other**”-section and click “**Launcher**“

B. How to install the plug-in

Make sure you choose the file that is compatible with your computersystem. In this manual we presume it's Windows, so we choose the **Windows setup-package**.
Download the file (double-click).

B. How to install Launcher-pi

We assume you know where to find the files you download from the Internet
(if you don't: quit now and read the manual of your computer before doing anything else with it).

Double-click the downloaded file (with “launcher_pi” in the name and ”.exe” as extension)

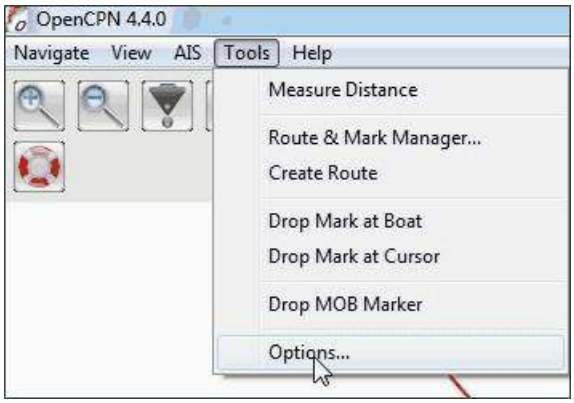
and follow the set-up instructions.

That's it. But before you can actually **use** Launcher-pi, you first have to **enable** that plug-in in OpenCPN.

Enabling Launcher-pi in OpenCPN

Open (or restart) OpenCPN.

Click **Tools-Options-**.



and then **Plugins**

Scroll down untill you see the Launcher-pi.

Click "**Enable**".

Now the Launcher-pi icon (it looks like an old fashioned ship's wheel) should appear somewhere in your OpenCPN Toolbar.

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Standard actions

What are basic (standard) actions you have to do to make Launcher-pi work.

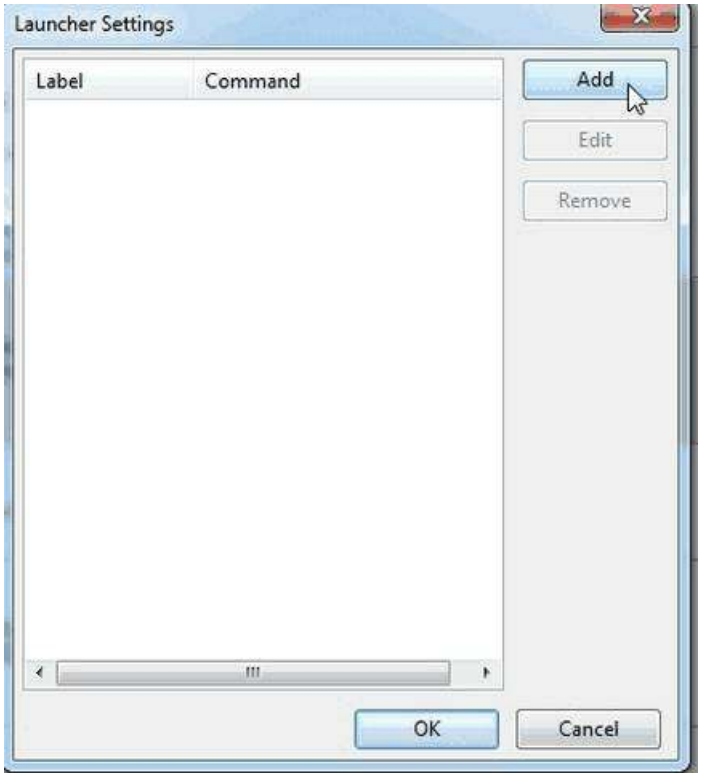
Edit Launcher

Click “**Tools**” - “**Options**” - “**Plugins**” as described before.

Scroll down to “Launcher” and click “**Preferences**”.

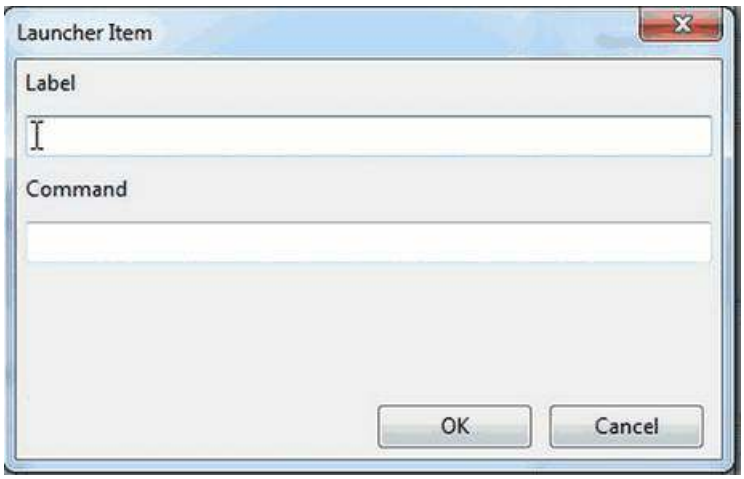
Clicking “Preferences” will open the menu “**Launcher Settings**”.

In the menu “Launcher Settings”, Click “**Add**”.



Clicking “Add” will open the menu “**Launcher Item**”.

In this menu “Launcher Item” you will have to give Launcher some information.
You want a button in Launcher-pi to launch a program for you, so you will have to tell Launcher-pi:
1. What **label** you want on that **button** and
2. Where Launcher-pi can find the **command** to launch that specific **program**.



EXAMPLE:
you want a button to launch a specific **document** (let us assume it is a user manual of your ship) that is made with the program **Microsoft WORD**.
You can find the path and file-name to run WORD by a right-hand mouse-click on the icon (shortcut) for that program.
Choose "**Properties**" and copy the text that is in the field "**target**".

Let us assume that:
The **path** and **file** to execute that **program** is "**C:\Program Files\Microsoft Office 15\root\office15\WINWORD.EXE**".

The **file** (document) you want to open is called "**Manual_of_my_ship.docx**" and stored in a **directory C:\MyShip\Manuals**.

IMPORTANT:
If the pathname\filename consist of several words **separated with a blank space**, change that by removing those blank spaces or by replacing them by **underscores**. Example: **"C:\My ship\Manuals"** should be renamed to **"C:\Myship\Manuals"** or **"C:\My_ship\Manuals"** and "**Manual of my ship.docx**" should be renamed to "**Manual_of_my_ship.docx**".

So to assign a button in Launcher to launch that specific WORD-document, you will have to feed Launcher the following information:

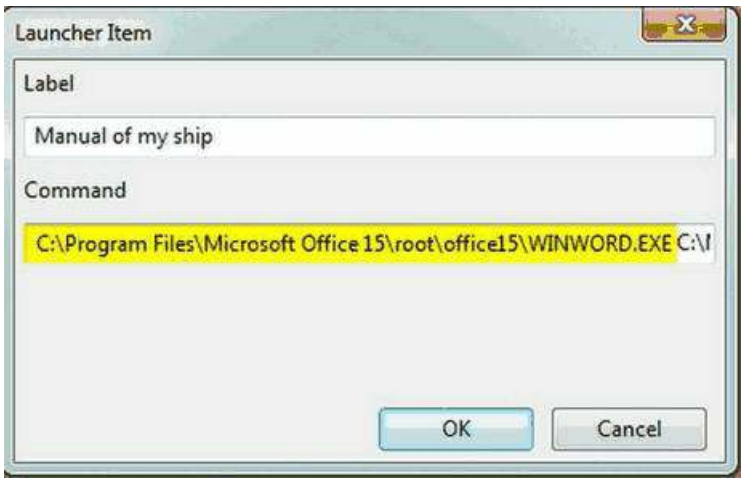
1. The **label** you want for the button.
In this case: "**Manual of my ship**".

2. The **path and program-file** .
In this case: "**C:\Program Files\Microsoft Office 15\root\office15\WINWORD.EXE**".

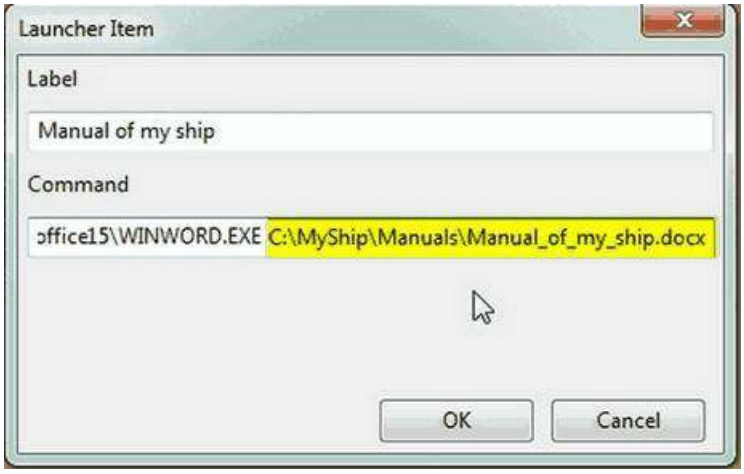
3. The **path and specific file** to open with that program.
In this case: "**C:\MyShip\Manuals\Manual_of_my_ship.docx**".

This is how you do that:

Insert the **label** Manual of my ship
Insert the **command** C:\Program Files\Microsoft Office 15\root\office15\WINWORD.EXE

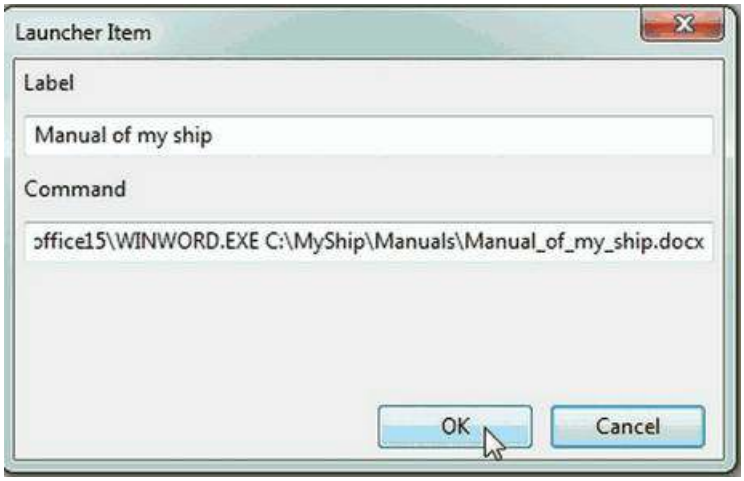


IMPORTANT: **Leave one space after "exe"** and add the **path and name of the file** you want to open.
In this case: **C:\MyShip\Manuals\Manual_of_my_ship.docx**

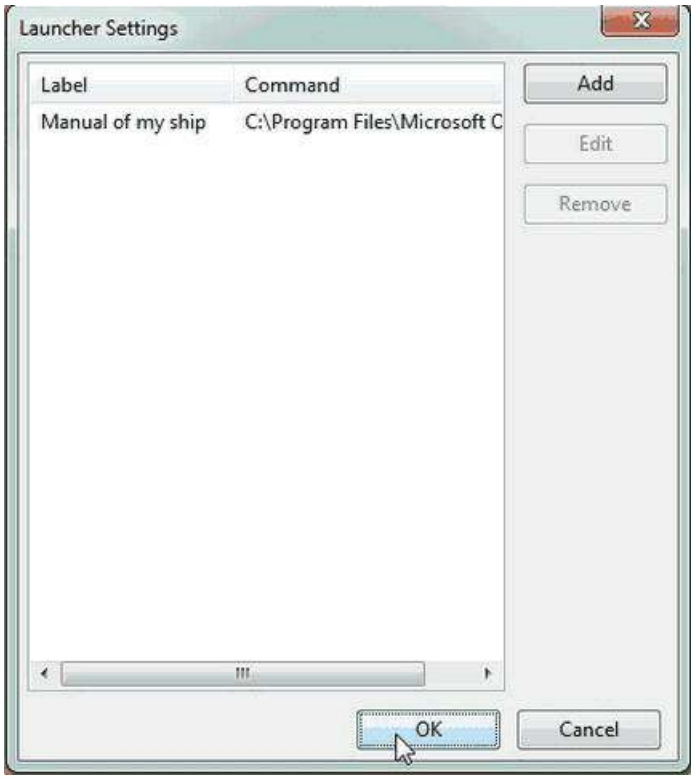


The text in the field "command" should read **C:\Program Files\Microsoft Office 15\root\office15\WINWORD.EXE C:\MyShip\Manuals\Manual_of_my_ship.docx**

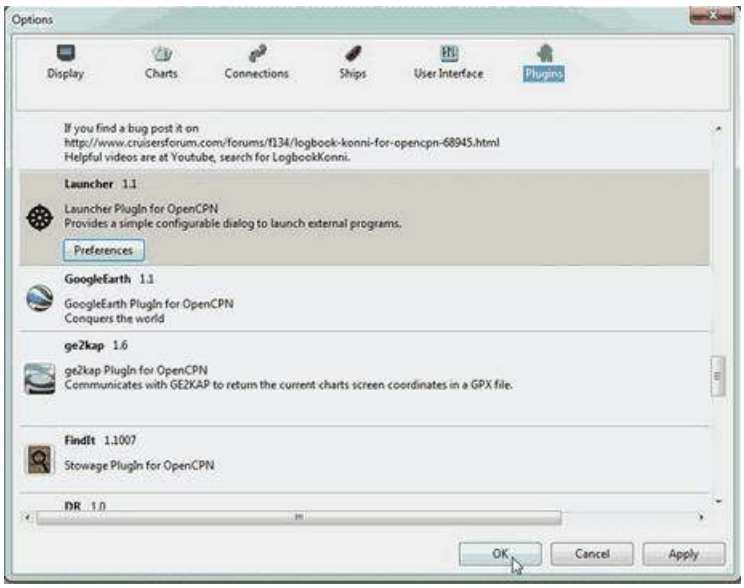
Click "**OK**" to save the Launcher item.



Click “**OK**” to save the Launcher settings.



Click “**OK**” to exit the “options”-menu and return to the main screen of OpenCPN.

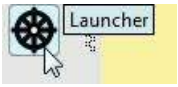


Now you can execute the command via Launcher-pi.

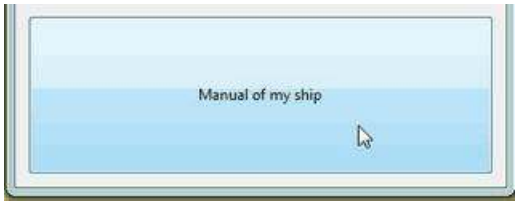
Executing a command via Launcher-pi

To execute the command via Launcher-pi in OpenCPN, do this:

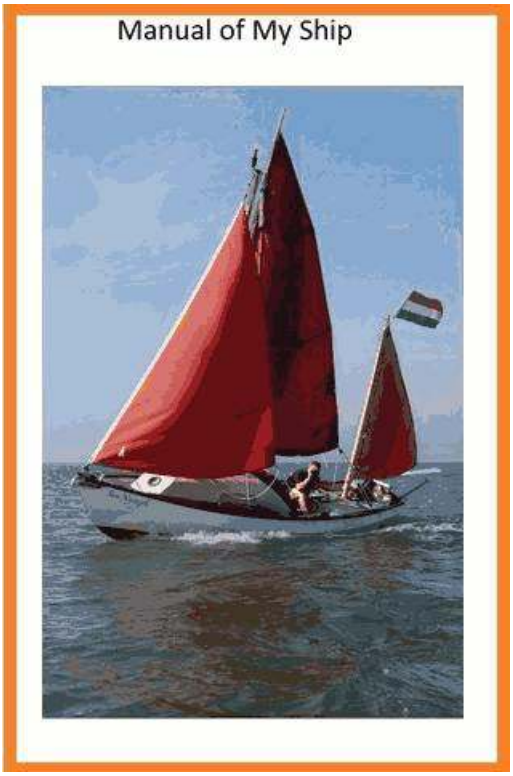
Click on the **Launcher-pi icon** in the toolbar.



Click the button with the label “**Manual of my ship**”



The WORD-document should open.



Note: of course this WORD-document can only be opened if you actually have the program WORD on your computer in the given directory (C:\Program Files\Microsoft Office 15\root\office15\WINWORD.EXE) and if you actually do have a document called “Manual_of_my_ship.docx” in the given directory (C:\MyShip\Manuals\).

You can repeat this process of adding Launcher items. With every new assignment you will see the number of buttons growing.

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Examples

Launcher 1.1 Variables

Launcher 1.1 has some nice new functionality Readme in github main repository

##Variable substitution

You can use several variables in your commands which will be replaced with the actual values at the moment of command invocation

Variable	Meaning
———	——-
%BOAT_LAT%	Boat Latitude
%BOAT_LON%	Boat longitude
%BOAT_SOG%	Boat SOG
%BOAT_COG%	Boat COG
%BOAT_VAR%	Magnetic variation
%BOAT_FIXTIME%	The timestamp of the past fix (seconds since 01/01/1970 UTC)
%BOAT_NSATS%	Number of satelites “visible” during the last fix

We need some examples for use of these new features.

VDRplayer

Launcher can be used to start various nmea VDR files to test plugins. See VDRplayer as Nmea Server[639]

Websites

In this example we show how to make a Launcher item to launch a website (in this case the website of the Dutch Coastguard, which is www.kustwacht.nl[640]) with Google Chrome.

To do so, you first have to find and copy the command to launch the program Google Chrome.

That should be something like **C:\Program Files (x86)\Google\Chrome\Application\chrome.exe**.

You can find the path and file-name to run Chrome by a right-hand mouse-click on the icon (shortcut) for that program, choose “**Properties**” and select (all) the text in the field “**Target**”. Click “**copy**”.

Go to **OpenCPN**.

Edit Launcher.

1. Click **Tools-Plugins-Launcher-Preferences**
2. Click **Add**
3. Insert the **label** (Dutch Coastguard)
4. Insert (paste) the **command** C:\Program Files (x86)\Google\Chrome\Application\chrome.exe

5. leave one space after “exe” and add the **adress of the website** (in this case: www.kustwacht.nl[641])

The text in the field “command”should read:

C:\Program Files (x86)\Google\Chrome\Application\chrome.exe www.kustwacht.nl[642]

Click “**OK**” to save the Launcher item.

Click “**OK**” to save the Launcher settings.

Click “**OK**” to exit the “options”-menu and return to the main screen of OpenCPN.

Execute the command via Launcher-pi in OpenCPN as described before.

Click on the **Launcher-pi icon** in the toolbar.

Click the button with the label “**Dutch Coastguard**” to open the website.

One other example you might find useful.

When you are sailing in US waters you might want to consult one of the “United States Coast Pilots”.

These pilots are published by the NOAA and can be downloaded (free of charge) from https://www.nauticalcharts.noaa.gov/nsd/cpdownload.htm[643]

There are several volumes. In this example we have downloaded “US Coast Pilot nr. 2 (Atlantic Coast: Cape Cod, MA to Sandy Hook, NJ), 207 (46th) Edition”.

It is a PDF-document. So if your computer has a program that can read PDF-files, you can read that document on your computer-screen.
And with Launcher, you can launch that document directly from within OpenCPN.
You just have to add a button for it in “Launcher”.

This is what you do:
Download the document and save it on your computer.
Let's say you save the document as “**Pilot_2_Cape_Cod_to_Sandy Hook.pdf**” in a directory “**C:\Nautical\US_Coast_Pilots**” (remember the importance of avoiding spaces between the words in the path- and filename, use underscores instead!)

In OpenCPN, edit Launcher as described before:
click “**Tools**” - “**Options**” - “**Plugins**”.
Scroll down to “Launcher” (make sure the plugin is “Enabled”)
Click “**Preferences**“
Click “**Add**“

In the field “**Label**”: enter the name you want to give to the button.
In this case for instance “US Pilot 2-Cape Cod to Sandy Hook”.

In the field “**Command**”: enter the path and filename of the program you use to open PDF-

files.
If you use Adobe Reader it might be something like this:“C:\Program Files (x86)\Adobe\Reader 11.0\Reader\AcroRd32.exe”.
If you use an alternative PDF-reader, like the freeware PDFXchange Editor, it might be something like this: “C:\Program Files\Tracker Software\PDF Editor\PDFXEdit.exe”.
Leave a space and enter the path and filename of the document you want that program to open.
In this case that would be: “**C:\Nautical\US_Coast_Pilots\Pilot_2-Cape_Cod_to_Sandy_Hook.pdf**”.

Click “**OK**” to save the Launcher item.

Click “**OK**” to save the Launcher settings.

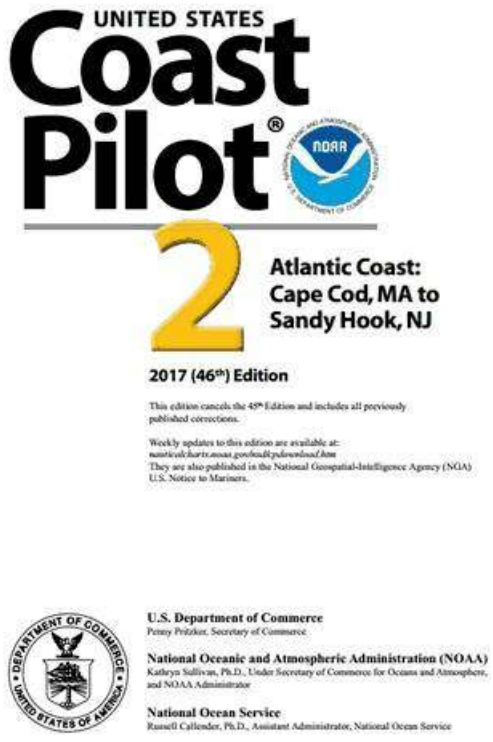
Click “**OK**” to exit the “options”-menu and return to the main screen of OpenCPN.

Execute the command via Launcher-pi in OpenCPN as described before.

Click on the **Launcher-pi icon** in the toolbar.

You should see the button that corresponds with the US Coast Pilot nr. 2.

Click that button and the file will open.



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Frequently Asked Questions

Q: Can I run **internal** OpenCPN-commands with Launcher?
A: **No**. Launcher is only meant for **external** commands.

Q: I have edited Launcher to execute a command, but it doesn't work. **What did I do wrong?**
A: **We don't know**. There's a lot you might have done wrong.
But **check the correct pathnames\filenames**. If the pathname\filename consist of several words **separated with a blank space**, change that by removing those blank spaces or by replacing them by **underscores**. Example: **“C:\My ship\Manuals”** should be renamed to **“C:\Myship\Manuals”** or **“C:\My_ship\Manuals”**.

Q: Can I use Launcher to shut down my computer?
A: **Yes**. It is possible.
Here's an example how to do it in Windows 7 Home Edition 64 bit.
Add a new launcher item.
Type in the field under “label” the text “Shut down after 10 seconds”
Type in the field under “Command” the text
shutdown -s -t 10 -c “I quit. You've got the helm”
This should shut down your computer 10 seconds after launching that item.
Of course you can alter the text “I quit. You've got the helm” in anything you like.
Just don't forget to put that text between quotation marks (”).
Note: Windows 7 **Pro** 64-bit might not accept the ”-s” parameter from Launcher. Try ”/s“ instead.

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Debugger

Debugger for the OpenCPN plugin API

Links

- Source: Github Repository[644]
- Releases: Github Releases[645]
- Download: Website Download[646]
- Forum: Debugger CF Thread[647]

Documentation

We need a volunteer Editor to write this wiki manual!

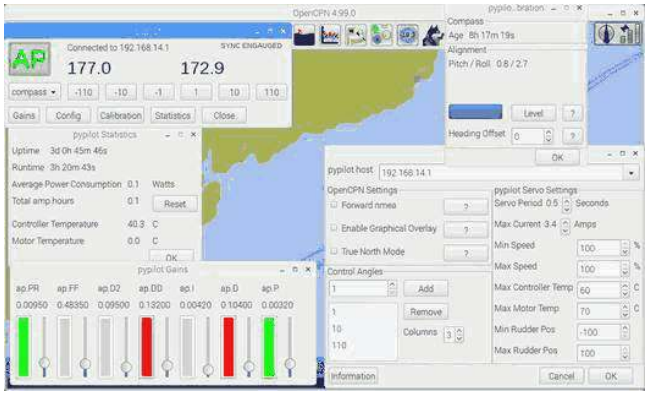
Pypilot Autopilot

The pypilot plugin provides an interface to the free software autopilot pypilot. Control, configure and calibrate the autopilot from OpenCPN.

The pypilot_pi interface plugin will work with any operating system running opencpn (Linux, Windows, MacOS, Android are available). The pypilot_pi interface plugin is separate and distinct from autopilot_route_pi.

The pypilot server that pypilot_pi connects to, so far typically runs on raspberry pi, but it can work on orange pi or potentially other systems as well.

Note: OpenCPN can communicate with pypilot server already via nmea to receive compass heading, and to autopilot, and this plugin is not strictly required. The plugin allows for configuration and tuning of the autopilot in ways not possible through basic nmea0183 messaging. The plugin also allows for graphical overlays of the autopilot settings directly onto the chart.



OpenCPN Plugin for Pypilot Autopilots An OpenSource Marine Autopilot.

Tested pypilot on a trimaran sailing 15 knots, and it is working.

- Video: Pypilot on Princess Mia[648] The autopilot route plugin capable of steering under sail in harbors
- Website[649] (Hardware and Software)
- Github[650] (Python & C++)
- Hardware[651]

PyPilot Forums

- Pypilot Cruiser's Forum Thread[652]
- Cruiser's Forum Autopilot - Open Source[653]
- Cruiser's Forum Free Autopilot Discussion[654]
- PyPilot OpenMarine Forum[655]

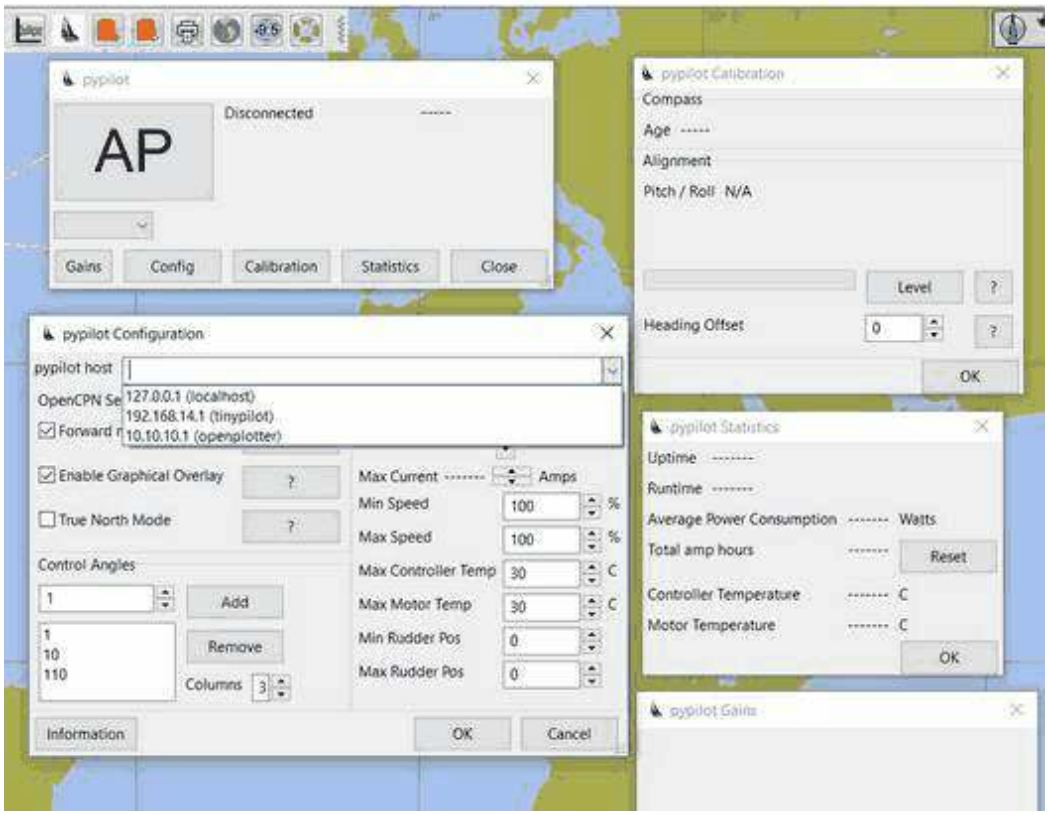
- PyPilot with Arduboat Discussion[656]

Sean D'Epagnier's PyPilot AutoPilot[657] using raspberry zero-W or orange,

- Controller[658],
- IMU[659] with
- Optional user interface LCD and keypad[660], gps and weather sensors.

Pypilot Webapp[661] if using tinypilot, creates a webserver which provides remote autopilot control through a browser. Trimaran test used rtlsdr IR remote for control. It can use any tv remote, also buttons, or gui program through openplotter.

This Autopilot uses modified and improved versions of SignalK and RTMUlib2. More details are available in the Wiki[662] and README[663]



Shop for Sean D'Epagnier's PyPilot Integrated Hardware:

- PyPilot Autopilot[664]
- Motor Controller[665]
- Sensors[666]
- Sensor - mpu9255 9DOF inertial sensors for raspberry pi[667]
- Weather Sensors - Wind and Barometric Pressure[668]
- Weather Sensors - Wind and Barometric Pressure with Display[669]
- The wind sensor uses this Davis Wind instrument[670]

Tindie Store[671]

Pypilot is free software like Opencpn and it is fully supported by opencpn, and is better

supported than any autopilot. It has 2 specialized opencpn plugins designed for it. For the cost of a raspberry pi, some $4 sensors, and a motor controller you can build, or buy for $75 and just use a windshield wiper motor and a belt to the wheel, or if you have a tiller:

See https://youtu.be/ZaLBRRelT-M[672]

Survey

This is a Beta Plugin found in the Development Book here[673]

Advanced Features

- Anchor Watch
- Automatic Anchor Mark
- Extended Marks
- Route to Autopilot
- Command Line
- Navigation Data Backup
- Configuration File
- OpenGL
- Network Repeater
- Nmea Sentences
- Portable OpenCPN
- Low Powered Systems
- Layers Library
- User Icons
- Maximize Screen Display
- Portable OpenCPN V2

InlandECDIS

European Inland Waters ECDIS & AIS

For the inland waters of Europe there are some special regulations in force. Vessels over 20m in length should have an Inland AIS and an inland ECDIS. (Since Jan 2017 compulsory in Germany, with the rest of europe to follow). OpenCPN from version 4.6 and higher has a special mode to comply with the rules for Inland ECDIS version 2.3 in information mode.

Under *Options* > *User Interface* there is a checkbox *Use settings for Inland ECDIS*. When checked OpenCPN will:

- Startup in 'Dusk' mode. (To prevent blinding if startup at night)
- Startup with the 'Standard' layers visible.
- Hide several toolbar buttons that are of no use for inland waters and charts. Toolbar can still be changed, but changes are not saved. At startup the same minimum toolbar will be shown.
- An extra toolbar with buttons for switching layers and pre defined zoom levels will popup.
- AIS targets that have no compass connected for heading information will be shown as octogram.
- The blue-paddle for starboard to starboard meetings has now the compulsory form. (a blue square with white border) If the blue-paddle information is available but the paddle is not set only a white line is drawn.

Remember that you only comply with regulations if OpenCPN is in **inlandECDIS mode**, using the most recent inland ENC charts, no other programs are running on the computer and the computer screen is readable from the cunning position.

Additional Information

The Inland Waterways ECDIS checkbox changes the User Interface and AIS to the requirements of the EU Inland Waterways (CCNR)[674].

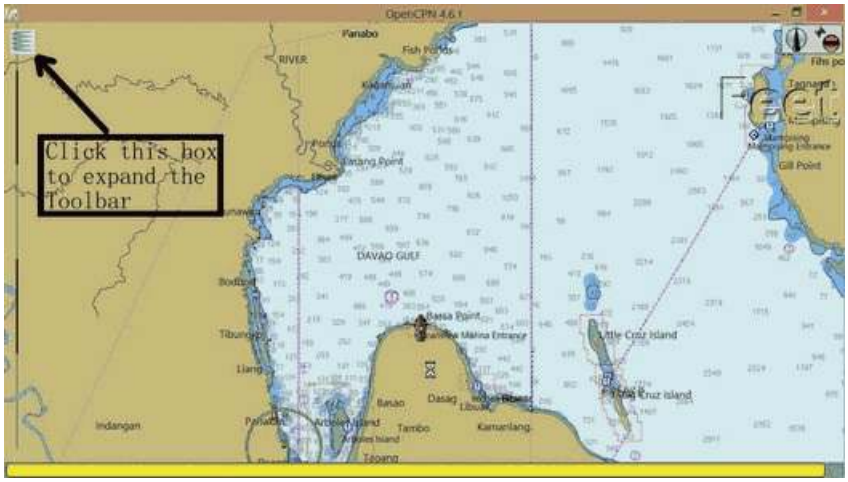
Also please refer to INTERNATIONAL STANDARD FOR RACKING AND TRACING ON INLAND WATERWAYS[675] Word Document for more information.

Note that if your User Interface is acting unexpectedly, not saving settings, and opening in night mode, this checkbox may have been selected inadvertently. See FAQ - Why aren't my settings saved?

Maximize Screen Display

The default display is shown here:

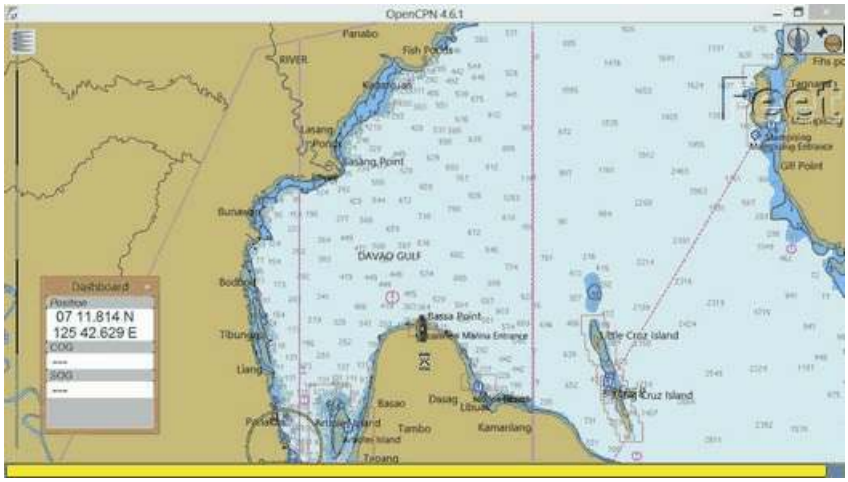
The display can be maximized to this.



Gone are the **Menu Bar** (at the top), the **Status Bar** (at the bottom) and the **Toolbar**.

Loss of the **Toolbar**? Not really … just click on the **icon** in the upper left corner to display the **Toolbar** for a specified time.

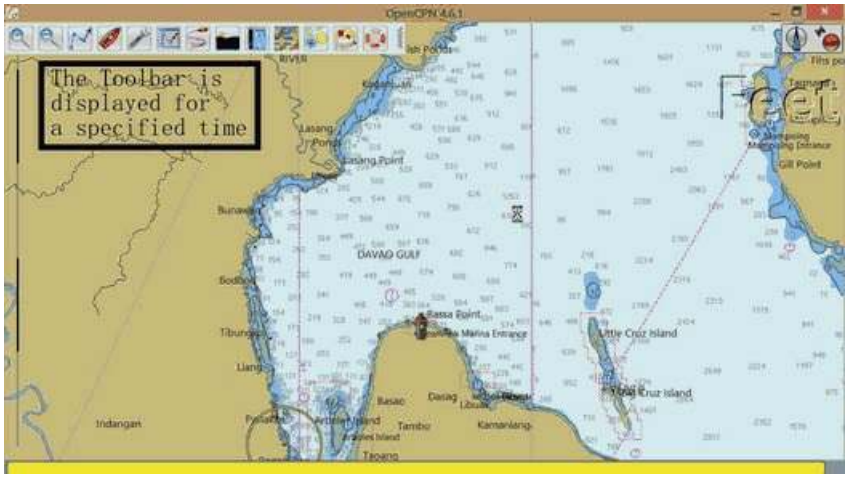
And the **location, COG and SOG** that are displayed in the **Status Bar** can be displayed on the **Dashboard** plugin.

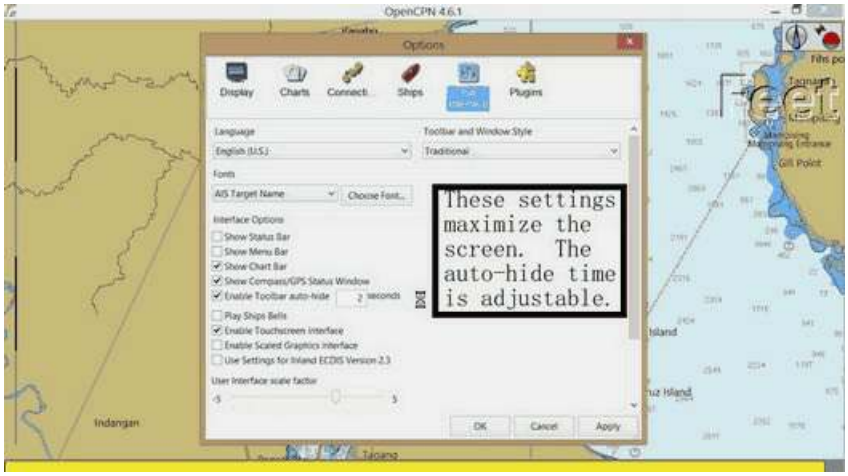


SETTINGS

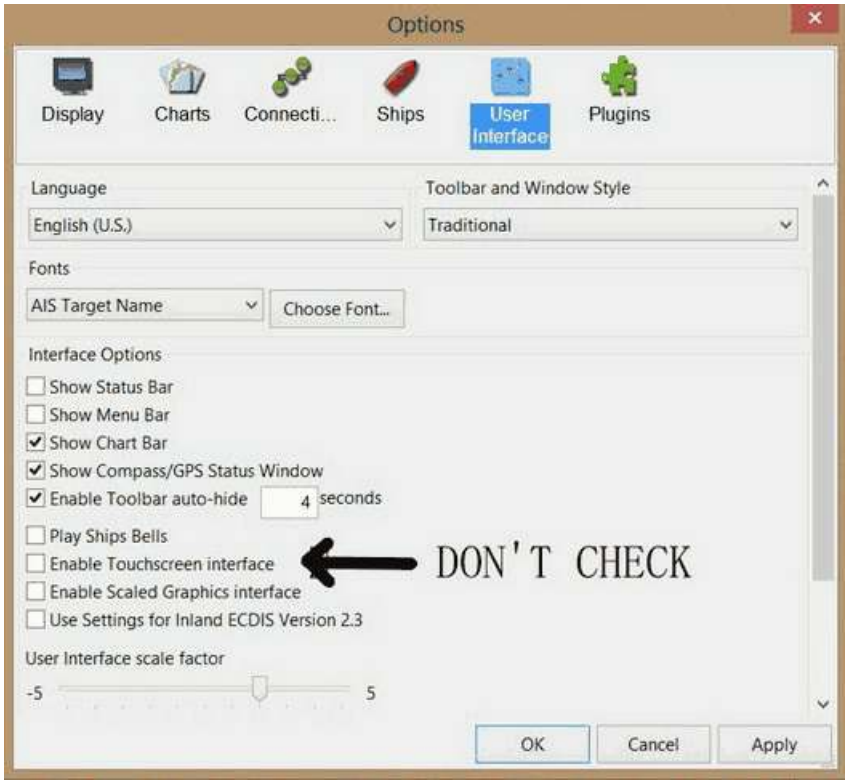
The settings to maximize the display are on **Options/User Interface** page.

I prefer to increase the **Toolbar auto-hide** time to 4 sec ILO the default of 2 sec.





CAUTION: Do not check the 'Enable Touchscreen interface'. A bug In **OpenCPN 4.6.1** will cause the chart 'piano keys' to sometimes turn black.

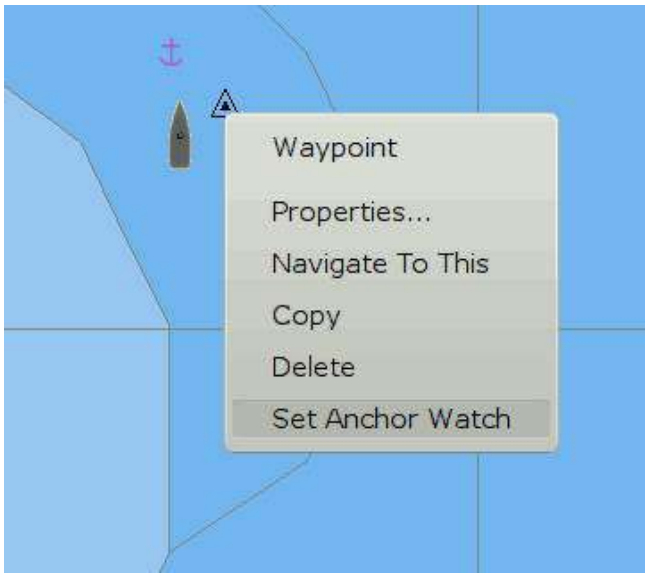


Terry Sargent 14 May 2017

Anchor Watch

Anchor watch can be set on any mark that you have created with OpenCPN, except for a mark that belongs to a layer, as long as the boat is within 1 nautical mile of this mark. This means that the Anchor watch items, on the right click menu, will only be visible if your boat is within 1 nautical miles of a mark. If the boat is closer than 5 m to the mark the anchor watch can't be set either.

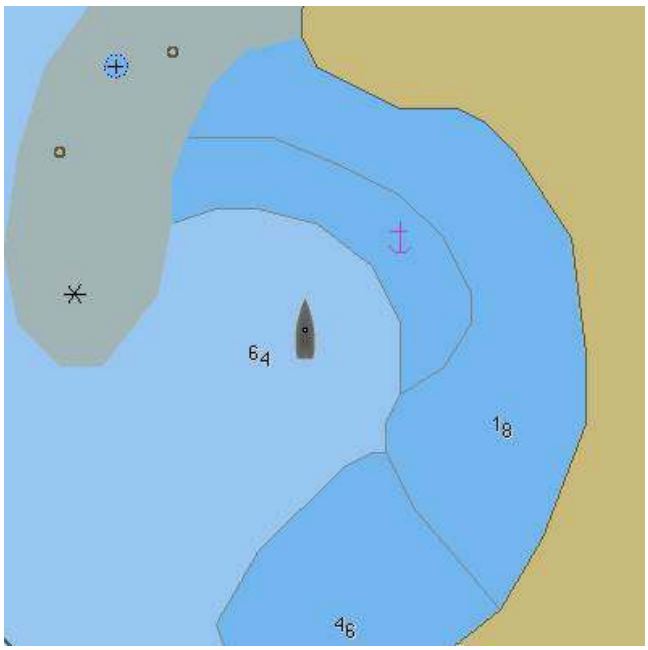
A maximum of two marks can have anchor watch set at the same time. Get around the restriction with a mark in a layer, by creating a new mark nearby.



This feature can be used in other situations than just anchoring, but keeping an eye on your anchor, and making sure it isn't dragging, is the main purpose.

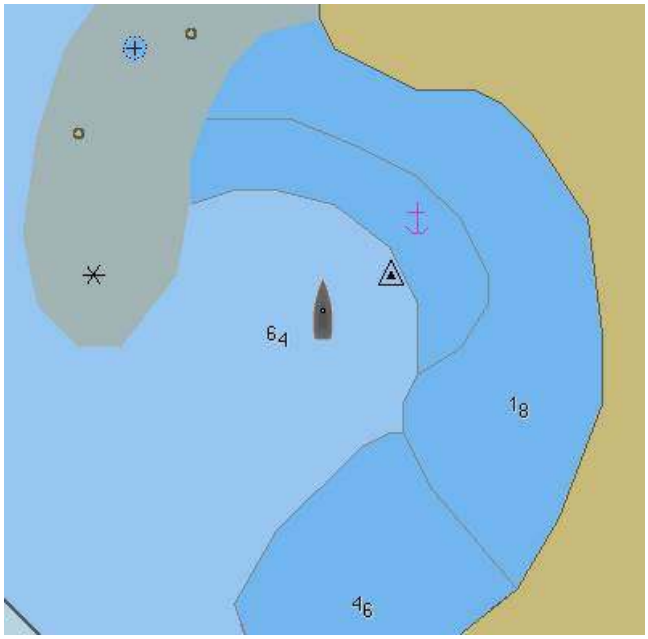
Basic usage

To learn how it works let's make a dry run to a nice trade wind anchorage.



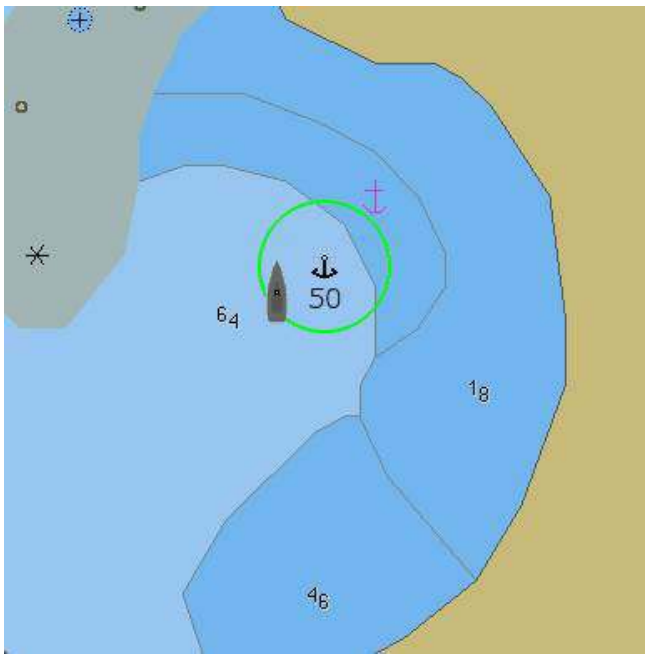
After circling around and exploring the bay, we know where we want to drop our anchor.

At the chosen spot we drop the anchor, at the same time we right click on the “Own Boat Icon” and press “drop Mark Here”.



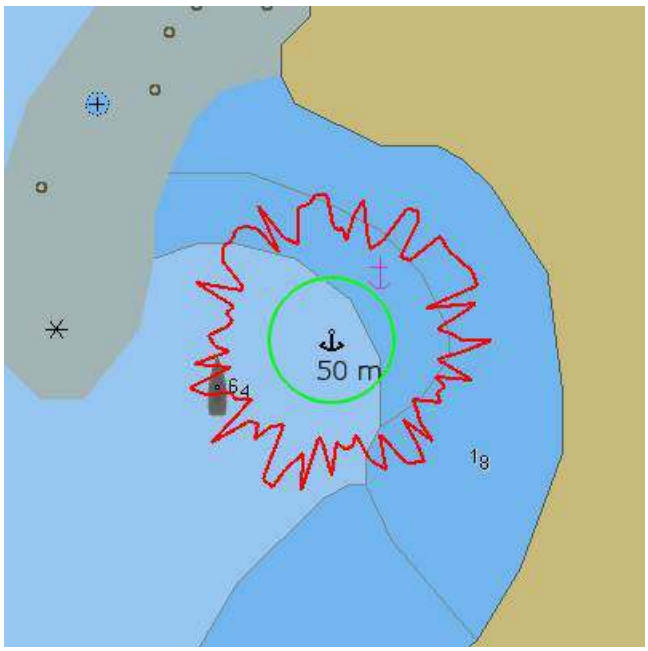
The wind, ENE at 15 kts let us drift back until we are satisfied with our scope. A burst in reverse convinces us that the anchor is set, later confirmed by a leisurely snorkeling over the anchor. Time to sort out the anchor watch

Right click on the mark and press “Set Anchor Watch”. The name of the mark changes to 50, and a green circle appears with a radius of 50 meters.

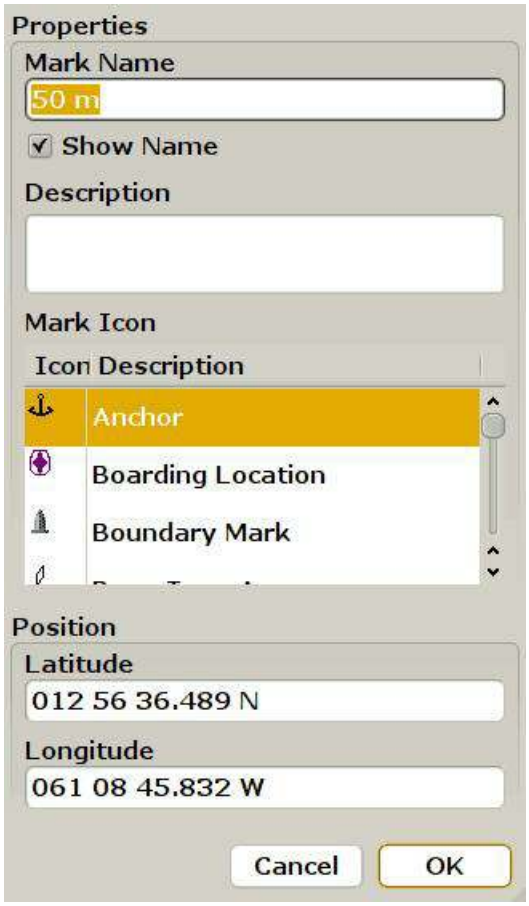


The anchor watch is now active, with a default max distance of 50m from the mark, and an alarm will be set off if the boat for some reason exits the circle. If “Play sound on CPA/TCPA Alerts” is set in the AIS ToolBox Tab, the same audio alarm is activated together with the visual alarm on the screen. To deactivate the anchor watch, right click on the mark and select “Clear Anchor Watch”.

If you are more than 50 m from the anchor when activating the watch this happens..

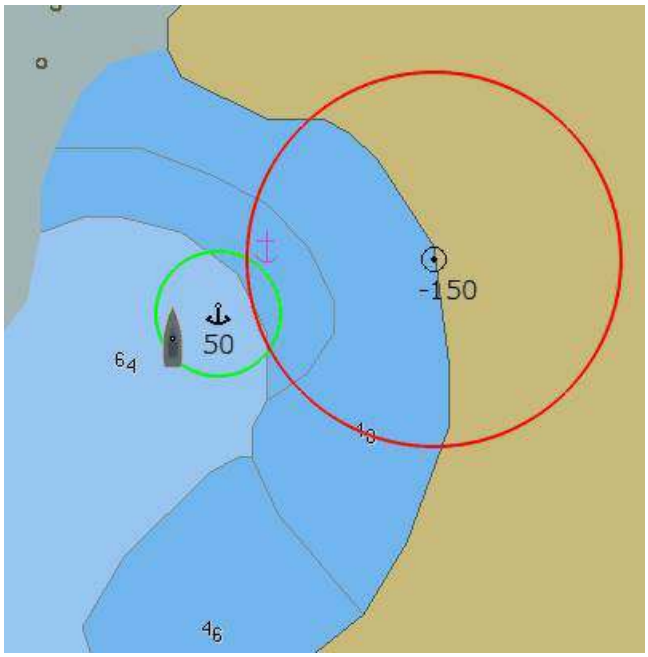


Sort this out by open the Mark/WP Properties Dialog.

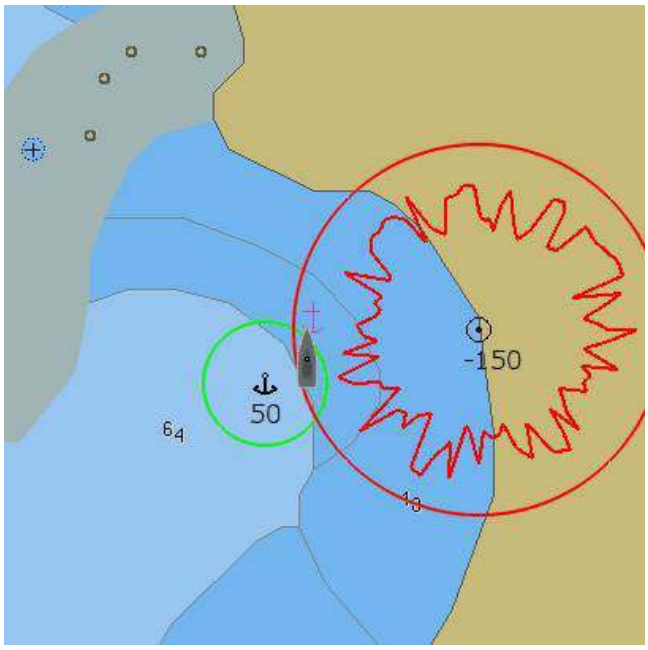


Change the name from “50 m” to a name that is relevant to the amount of chain and/or rode that you use, for example “75”. Change the icon to, if you like. Pressing OK should stop the alarm.

To get protection from the wind and a bit of northerly swell, we have really anchored to close to the beach. To keep an eye on this potential danger we set another mark on the beach.



This time we change the “Mark Name” to -150, this means that if the boat comes within 150 meters of this mark, the alarm is set off. Green circle, OK to be inside. Red circle OK to be outside.



An hour later, after a heavy squall passed, the wind goes light and fluky. The boat drifts towards the beach and the anchor alarm sounds and comes up on our computer screen.

The alarm sound is the same as the AIS warning sound and is set in the ToolBox under the AIS tab.

Alternatives and Settings

A mark at the position of ownship, can also be created by hitting “Enter” or “Spacebar”. “Ctrl + M” creates a mark at the position of the cursor. The anchor watch can now be set as demonstrated above with the default alarm distance being applied.

A way to easily drop a mark, exactly at your current position, is to hit “Ctrl + Space”. This is the “Man Over Board” shortcut. Right click and go to properties. Change the name to a suitable alarm distance and pick a different icon. Set the Anchor Watch.

The picture is an illustration to what happens if you use the MOB keystroke, and then just activate the Anchor Watch. As the mark is already named, the default watch distance doesn't work. The green circle is the 5 m default minimum distance. The alarm goes off, of course.

* The Anchor Watch only works with an active gps. If the gps signal is lost, the alarm will be set off. Both the default Anchor Watch Radius and Max distance from mark can be changed by editing the configuration file, opencpn.ini on Windows and opencpn.config on Linux.

- Close down OpenCPN and open the configuration file in a text editor.
- Find the section that starts with “[Settings] ”.
- Create two new lines, looking, for example like this.
- AnchorWatchDefault=45 (default is 50 m)
- AnchorWatchMax=2500 (default is 1852 m)
- Enter your own preferences, 45 & 2500 are just for illustration.

Route to Autopilot

Send a Route to the Autopilot, the basics

If an autopilot is connected to an output port, as defined in the Options → Connections tab, and a route is active, OpenCPN sends NMEA RMB, RMC, and APB sentences to the A/P.

Read more in Options > Connections *Sending an Active Route to an Autopilot* in *Options > Data Connections* (at the bottom) for more information about connections and testing.

Note that a ***Connections Output Port*** must be configured to send ECRMB, ECRMC and ECAPB NMEA sentences to the Auto Pilot.

Also read about the *Activate Route & Active Route Console* and *Active Route Console Window - Showing Active Leg Data*in *Marks and Routes* towards the bottom.

It is essential to have turned on an ***Active Route*** in order to send waypoints to the Autopilot.

Waypoint Advance

OpenCPN automatically shifts to the next waypoint in the route using an arrival radius of 0.05 miles (= 92.6 m) by default. This value can be changed in *Options → Ships → Own Ship*. The arrival radius can be adjusted in each waypoint properties dialog as well.

This works fine in the general case. The A/P is watching the NMEA stream. It sees a new destination lat/lon, and new heading to steer, and then asks the user for confirmation to make the turn. Raytheon/Autohelm works this way.

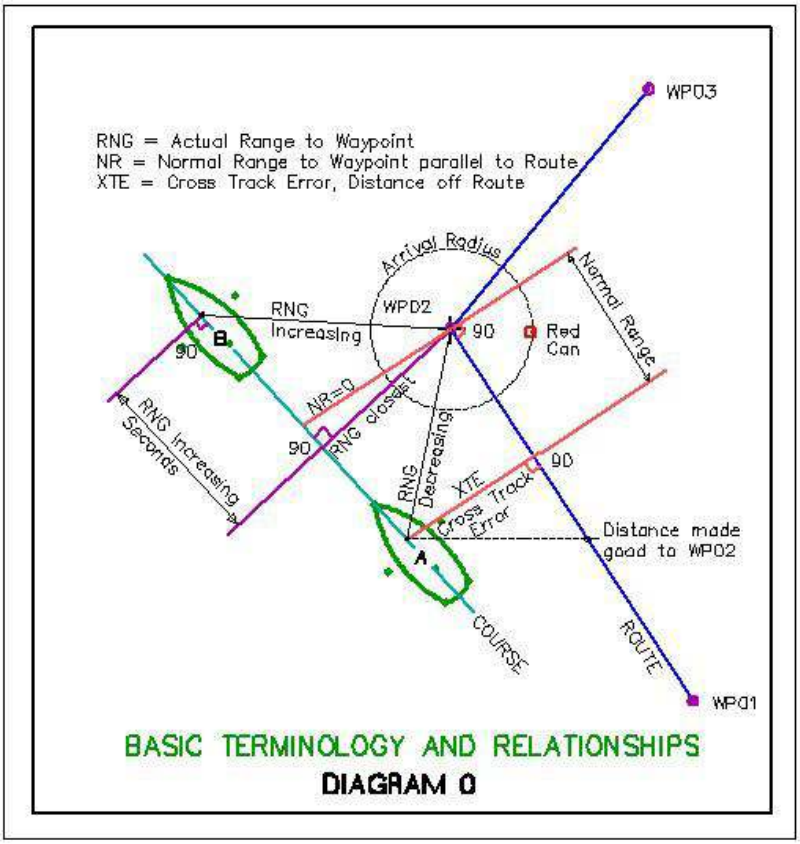
Simulation & Testing - Short description

To create outgoing ECxxx messages make a (left click menu) "**Navigate to here**" to a arbitrary point. You may need to filter outgoing sentences on the network connection to only send "EC" (and filter out the same on the incoming side to avoid feedback) so you don't receive them and then send duplicates. The information is scattered so use your browser to search for "autopilot".

Autopilots and Routes, the details.

Please read *Advance route waypoint on arrival only*first. Here is a detailed discussion of Options → Ships → OwnShip → **Advance route waypoint on arrival only.** With an **Active Route**, in the **Active Route Console** "This Leg" is visible near the upper right corner of the screen in the console:

RNG (actual range) Distance to the next waypoint.
NR (normal range) Distance from destination waypoint to a line orthagonal (right angles) to the current route segment which passes through ownship. When shown in the Console window, NR is after RNG.



There are two general conditions:
1.**RNG=NR** On course with no cross track error (XTE=0)
2. **RNG>NR** Off course (sailing perhaps) with cross track error (XTE>0)
When the difference is greater than 10% both values are shown in “RNG”

The “normal” range is the second number shown. 1.88 in this case.

Four Different Conditions

Waypoint Advance is the normal default OR **Advance Waypoint upon Arrival only** when selected in Options.

The four diagrams below represent four different conditions:

1. Waypoint AdvanceRNG = NR and XTE=0 (Boat is on the route)
2. Waypoint Advance RNG > NR and XTE>0 (Boat is off the route), console shows both RNG and NR and NR x 1.1 > RNG.

3. Advance Waypoint on Arrival only when when RNG=NR and XTE=0 and NR<Arrival Radius
4. Advance Waypoint on Arrival only when RNG >1.1 x NR and XTE>0

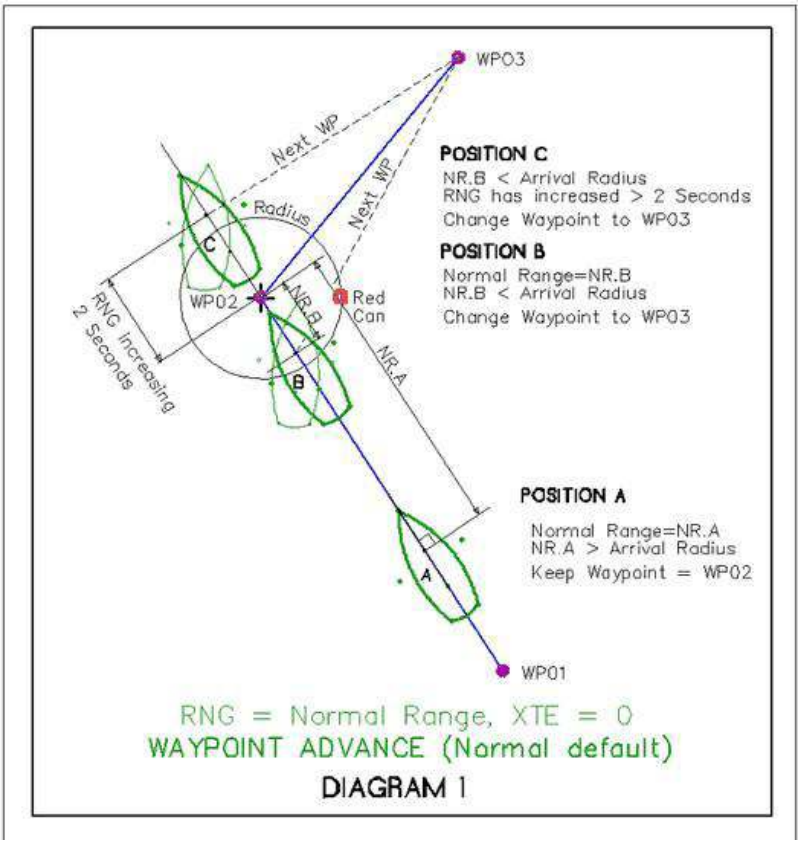
1. Waypoint Advance when RNG=NR and XTE=0 (or near 0)

Under Waypoint Advance mode (the normal default) when

- RNG (Range) = NR (Normal Range)
- XTE=0 or near 0

when following a Route OpenCPN normally decides to advance to the next waypoint if *at least one* of the following two conditions apply.

- **NR** (normal range) is less than the declared Arrival Radius. ***OR***
- **RNG** (actual range) is increasing for 2 seconds. Ownship is moving away from the target waypoint, and has been for more than two seconds.



2. Waypoint Advance when RNG 10%>NR and XTE>0

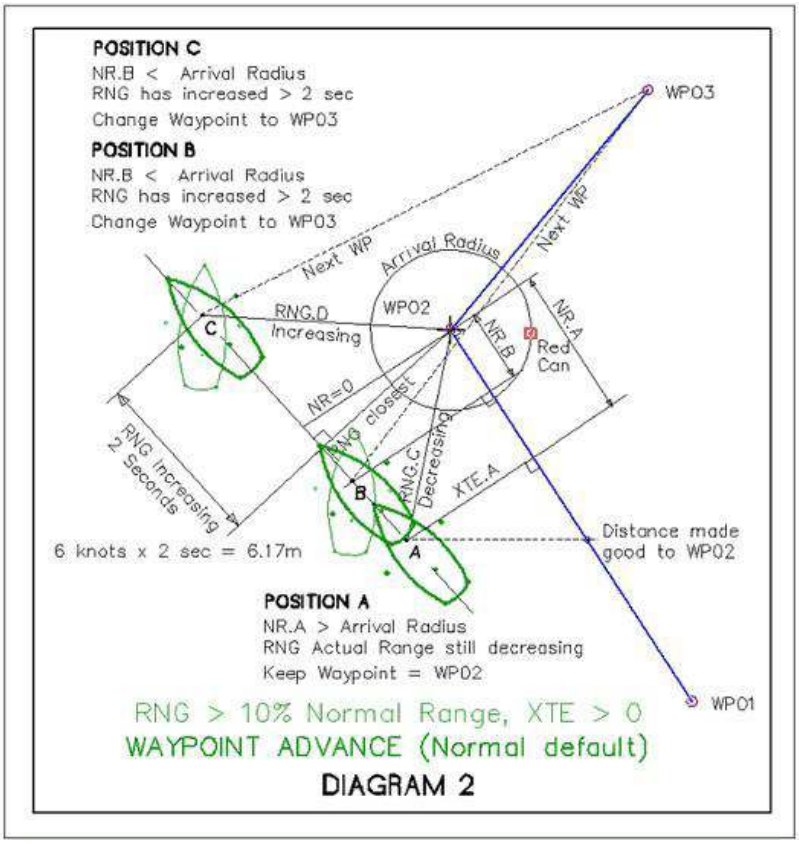
Under Waypoint Advance mode (the normal default) when

- Range (RNG) is 10% > Normal Range (NR)
- XTE >0

when following a Route OpenCPN normally decides to advance to the next waypoint if *at*

least one of the following two conditions apply.

- **NR** (normal range) is less than the declared Arrival Radius. ***AND***
- **RNG** has increased for more than 2 seconds.



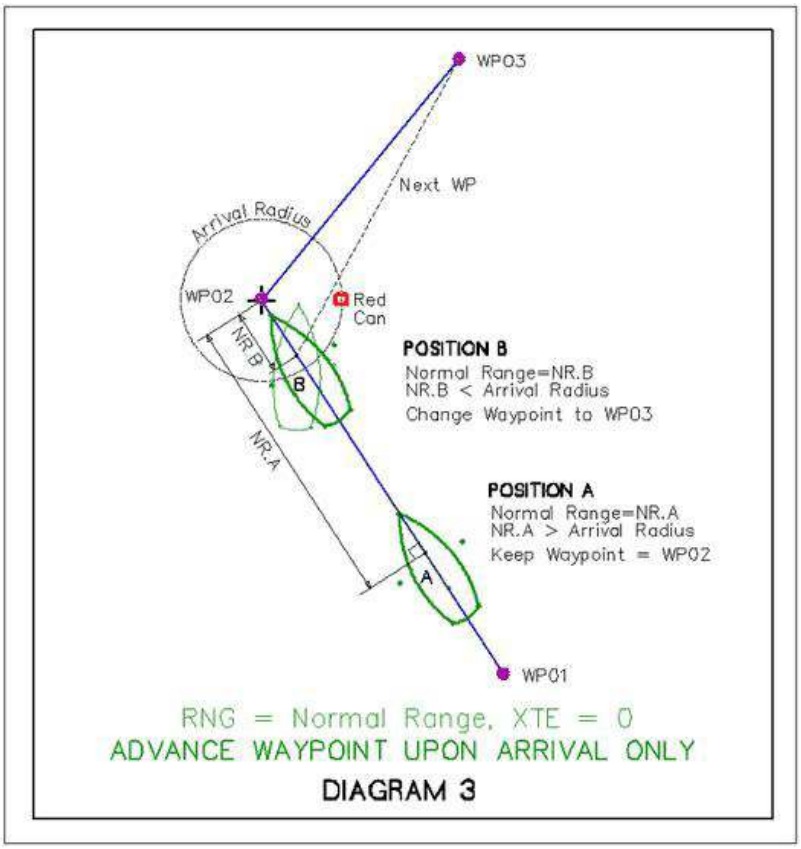
3. Advance Waypoint on Arrival Only when RNG=NR and XTE=0

With **Advance Route Waypoint on arrival only** checked and activated, when

- Range (RNG) = Normal Range (NR)
- XTE=0 or near 0

when following a Route, OpenCPN **only** advances the route to the next waypoint when

- **NR<Arrival Radius**. The second condition for XTE is ignored.



4. Advance Waypoint on Arrival Only when RNG >1.1 x NR and XTE>0

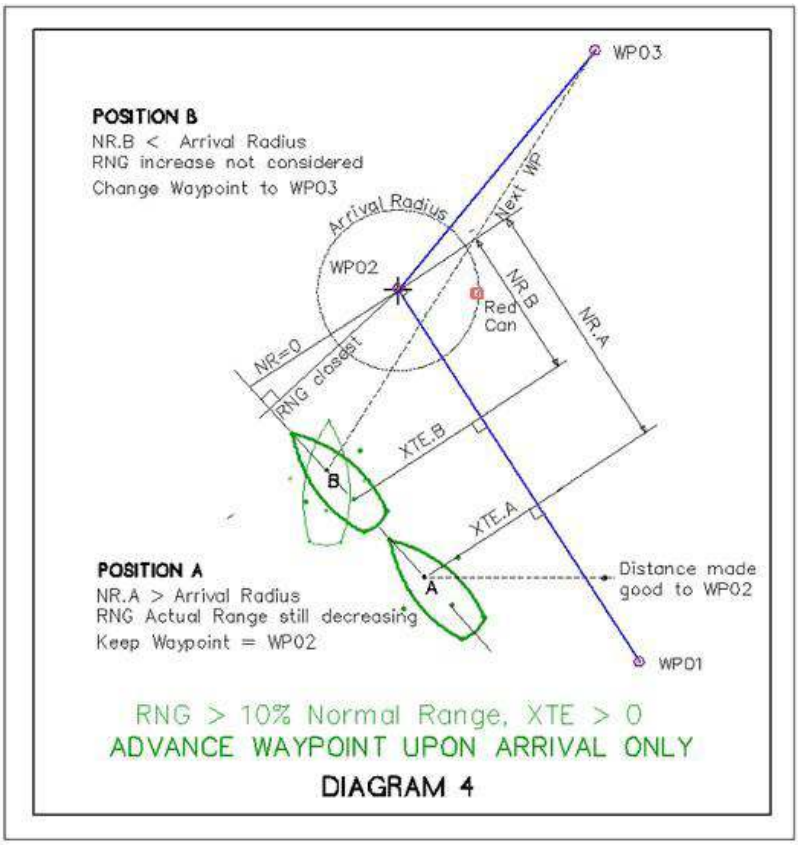
With **Advance Route Waypoint on arrival only** checked and activated, when

- Range (RNG) is 10% > Normal Range (NR)
- XTE>0

when following a Route, OpenCPN **only** advances the route to the next waypoint when

- NR < Arrival Radius
- Range increase is not considered.

[Editor's Diagram Correction: Boat B location Normal Range should be shown at the arrival radus with boat starting the turn!]



When to use Advance Waypoint upon Arrival only

Advance Waypoint upon arrival only (option) is useful when sailing and you can't lay the next mark and are forced to tack to reach it. It allows a ship to move away from waypoint without automatically advancing to next waypoint.
Note: Waypoint Advance (normal default) is dependent on NR < Arrival Radius OR RNG increasing more than 2 seconds, so what this option does is overide that second condition.

Advance Waypoint upon arrival only (option) ensures that the current waypoint remains active
1. NR<Arrival Radius is reached **OR**
2. A line just inside of the Arrival Radius which is also “normal” or perpendicular to the marked route is reached. In this case there is a cross track error.

On the other hand….
Waypoint Advance (normal defualt) helps you if you really want to cut a corner by a large distance, in such a way that the “normal range” will never be less than (Arrival radius). The second condition, RNG increases for > 2 seconds, willl automatically advance the route to the next waypoint in this case.

Automatic Anchor Mark

Automatic Anchor Mark. This is what it does. If the following are ALL true:

1. In “Cruising” mode, meaning that speed has at some point exceeded 3.0 kts.
2. Current speed is less than 0.5 kts.
3. OpenCPN has been up at least 30 minutes
4. OpenCPN is exiting normally
5. There is no anchor watch set on an “anchor…” icon mark.
6. Any “Anchorage - icon” waypoint within 0.25 NM of current GPS location is deleted.

Then, OpenCPN will drop a waypoint at the current location, with the name - “Anchorage created on [Date Stamp]”.

Thus waypoints are automatically created for known good anchorages as you shut down the computer. The 0.25 NM condition prevents clogging up frequently visited anchorages with closely spaced waypoints. The other conditions help to prevent spurious waypoints.

To use this feature find opencpn.conf or opencpn.ini as it is called in windows. Search for a line like this:

```
AutoAnchorDrop=0
```

and change the value from “0” to “1”.

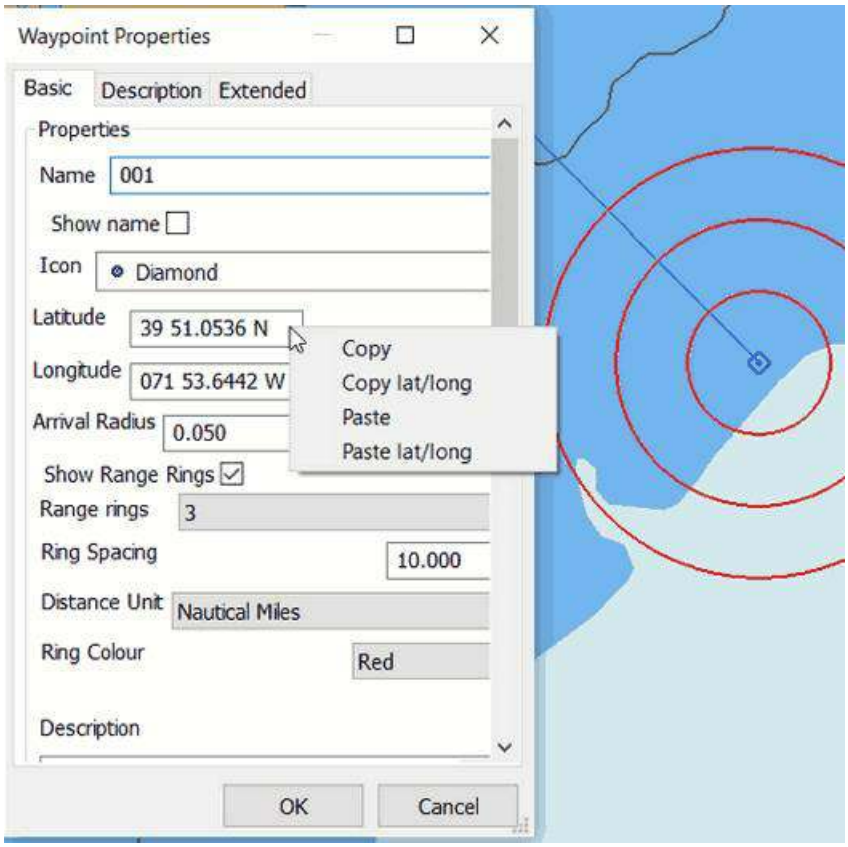
Also see Configuration File

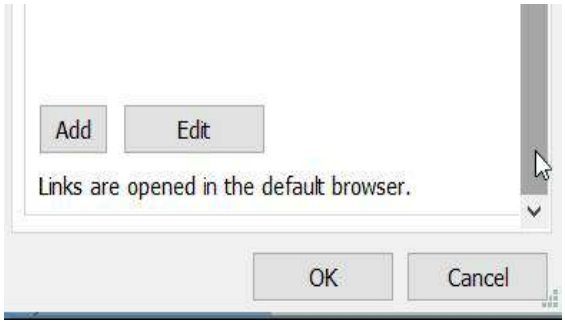
Extended Marks

For the basics of marks see this page: *Marks and Routes*

The properties of Extended marks described on this page expands the use of marks.
It is now possible, for example, to make a interactive Cruising Pilot.
An extended mark is sometimes called a **POI**, a point of interest.

The “Mark/WP Properties” looks like this for a default mark.

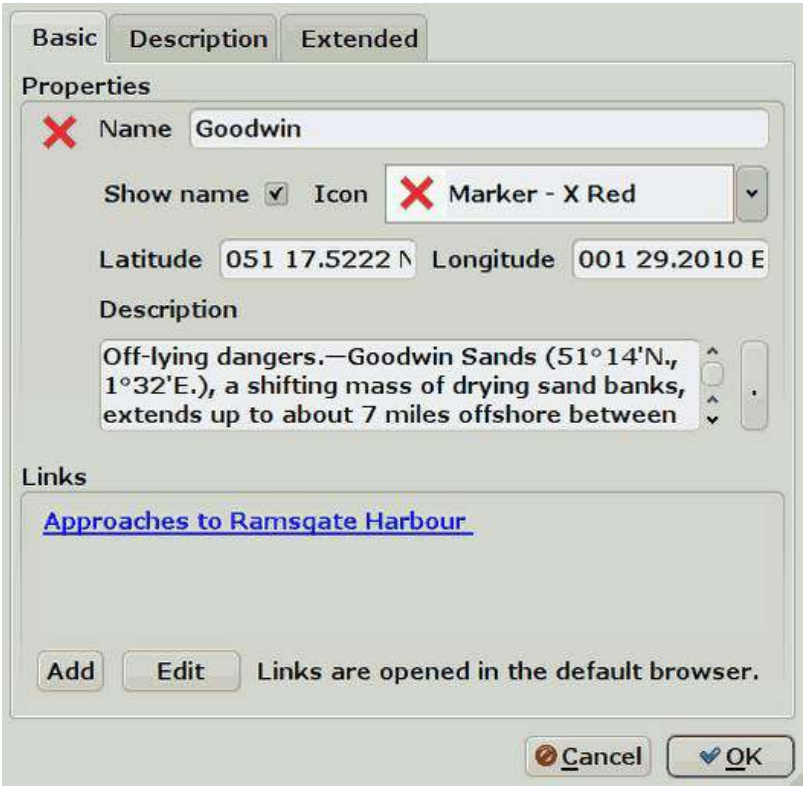


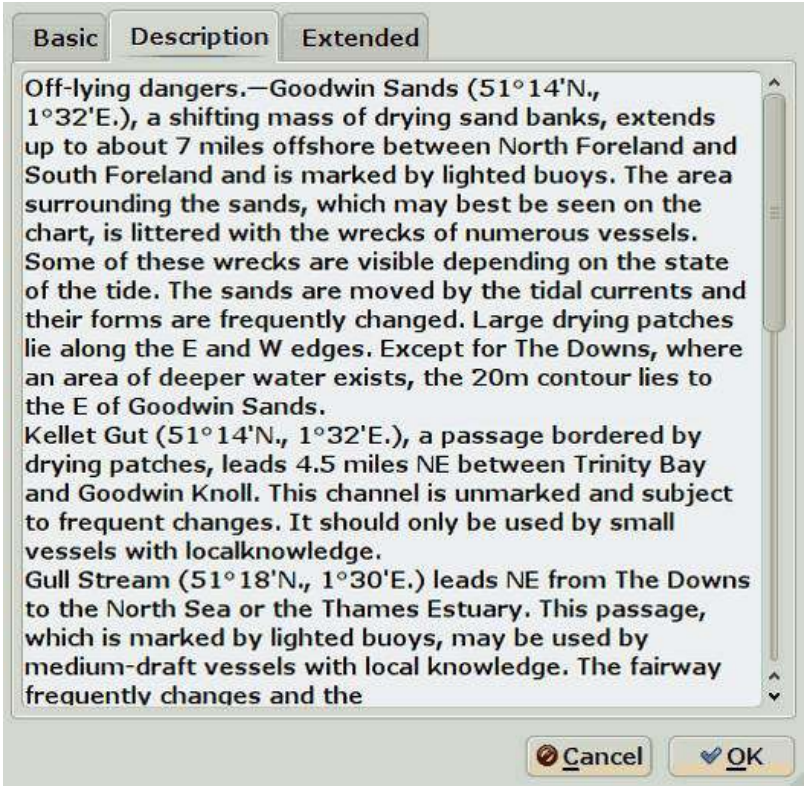


The dialog is available by double-clicking the mark, in the right-click menu or through the Route Manager.

The Basic tab

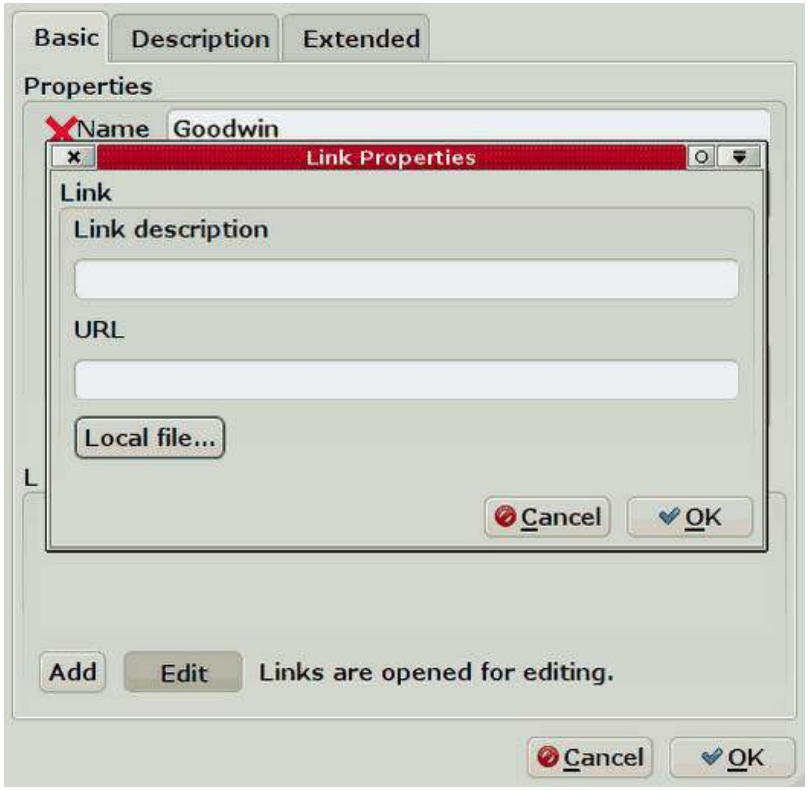
- **Name**: Give the mark a suitable name. This will be visible on the chart, but can be hidden by un-ticking the **Show Name** box.
- **Icon**: Change the default icon for the mark. Only the “Name” will be displayed if selecting the “Empty” icon.
- **The position of the mark**: You can drag the mark with the mouse to the desired position or enter the correct **Latitude** and **Longitude** in these fields.
- Right clicking anywhere in the latitude or longitude display gives you the sub dialog shown above. Latitude and longitude can be copied separately or together. A copied lat/long will be available in the paste buffer, and will be displayed if you activate the “Jump to position…” dialog. It is also possible to paste a position. A Paste will try to be smart about parsing the format, and accepts a lot of different syntaxes. Even the GPX **<wpt lat=“0.00” long=“0.00”>** should work.
- **Arrival Radius** Read more in Options Setting , where the default is set. The arrival radius can also be set individually for each waypoint.
- **Range Rings** Show range rings, number of rings, ring spacing, units and color.
- **Description**: Enter anything about the mark. Long descriptions can be read easier by switching to the **Description Tab**. See examples below.





Links: Marks can, as an option, have embedded links to the Internet or the the local computer. These are either opened in the default browser or through the default application, for example for pictures or pdf files. For security reasons, the links does not work for launching other programs.

Create a link by pressing **Add**. Give the link a good description in the new dialog. Enter an Internet address in **URL** or find a local file through the button **Local File..**

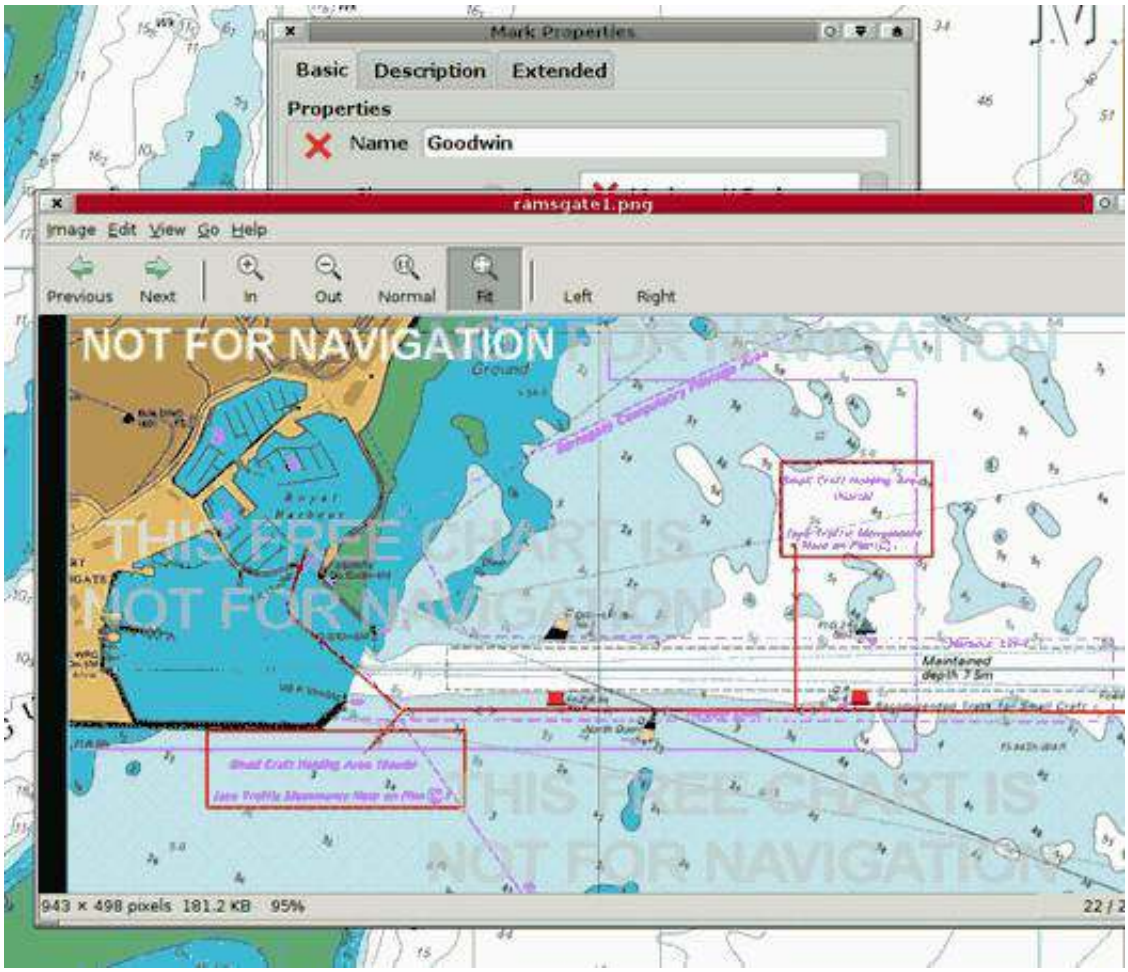


The new link will appear under **Links**. Add more links as required.

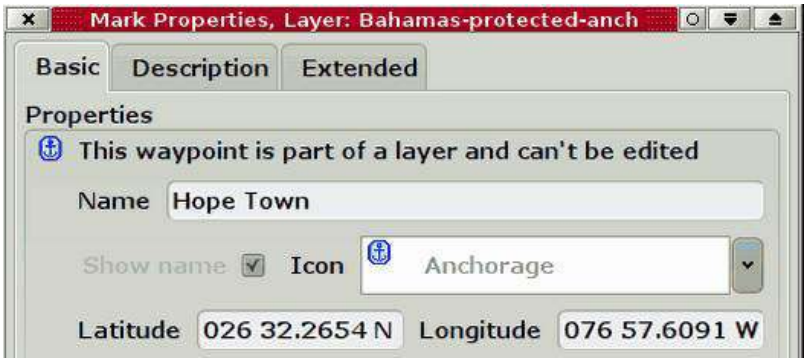
Edit links by pressing the “Edit” button. The description will change from “Links are opened in the default browser.” to “ Links are opened for editing” when the button is pressed. The color of the “Edit” button gets a grayer shade when it is pressed down. Press once more to release the button. Press once - the button is down. Press again - the button is released and goes up.

Right-click an existing link for a related action menu.

In the illustrated case, the link was to a local JPG picture, that opens in the default program associated with the jpg extension.



If the mark belongs to a Layer, it can't be changed. A warning about this appears above the name of the mark



The Description Tab

This is simply an expanded view of the Description box in the Basic tab.

The Extended Tab

Show on Chart: Untick this box, and the mark will not show on the chart. To make it visible again, use the Route Managers Waypoint Tab. Click the “Icon” column, to the far left, on the line with the waypoint.
GUID is a unique identifier for the mark.

Command Line

OpenCPN has a minimal command line interface (CLI)

- Windows Usage : opencpn.exe [/h] [/p] [/fullscreen] [/no_opengl] [/rebuild_gl_raster_cache] [/parse_all_enc] [/unit_test_1 <num>]
- Linux Usage: opencpn [-h] [-p] [-fullscreen] [-no_opengl] [-rebuild_gl_raster_cache] [-parse_all_enc] [-unit_test_1 <num>]

The options:

[/h] Show usage syntax. Linux also accepts [–help]

[/p] The portable option is explained here → Portable OpenCPN

[/fullscreen] Starts OpenCPN in FullScreen mode.

[/no_opengl] A total switch-off of OpenGL, in a more thorough way than in “Options”. Read more in OpenGL .

[/rebuild_gl_raster_cache] Rebuild OpenGL raster cache on start. Read more in Options Setting

[/parse_all_enc] Convert all S-57 charts to OpenCPN's internal format on start.

[/unit_test_1 <num>] Display a slideshow of <num> charts and then exit. Zero or negative <num> specifies no limit. This command test cycles through all possible charts in the currently loaded chart database, adjusting the viewport to show the loaded chart automatically. The value of this test is clear: it provide an unattended stress test of OpenCPN, It is most fun to watch in quilt mode….. The test runs until all charts in the database have been visited once. A side-effect of this switch is that it can be used to process a set of ENC charts into SENC files. The first, time consuming processing of ENC charts, can this way be done unattended.

For Windows

When using a .bat file to launch OpenCPN, you may type this MSDOS line :

```
START /REALTIME C:"\Program Files"\OpenCPN/opencpn
```

Where:

START : MSDOS Command
/REALTIME : gives the highest priority to the program
C:"\program Files"\OpenCPN/opencpn : pathway where OpenCPN's Executable is downloaded
(specific to each windows version)

Navigation Data Backup

Saving sessions

- The *navobj.xml.[1..x]* takes care of your session data backup. This means that when you start OpenCPN it “remembers” the state of your last session.
- A rotating backup of navobjects is automatically created on every program run. OpenCPN keeps backups of the last 5 runs. This can be changed.
- Change the number of navobject backups. In the *opencpn.ini/opencpn.config* file you can find a Configuration Setting to control the number of backups kept, defaulting to **KeepNavobjBackups=5.** This value can be changed using a text editor.
- The backups are then stored in files navobj.xml.[1..x] (in the same directory as the ini file) where .1 is always the newest backup and the oldest is removed on the next program run. The file that will be loaded on next start is called navobj.xml.
- The backups are only rotated if the *navobj.xml* file has changed since the last backup was created. This prevents overwriting good backups with a broken version, more than once.
- Note that the *navobj.xml* files reside in a folder that is hidden by default by Windows. More information is available here: OpenCPN Installation.
- To load an old backup, exit the program. Find the backup you want to use. Rename it *navobj.xml*. Start OpenCPN!
- The *navobj.xml.[1..x]* files are **gpx** files and it is also possible to **directly import** them back into OpenCPN. Press the “Import GPX” button in the Route Manager.

Upgrading OpenCPN

- Navobjects are not lost during a normal upgrade to a newer version.

If trouble strikes...

- You have useful automatic rolling backups of *navobj.xml*, as described above.
- **Copy them somewhere safe** before you run OpenCPN again, as they are automatically rolled over, and you lose the oldest one for each invocation of OpenCPN.
- **Rename the “best” one** as *navobj.xml*, and the contents will be automatically used by OCPN.
- The OpenCPN logfile also serves as a backup through the “LOGBOOK:” entries.
- These can be used to reconstruct a GPX track. A windows utility for hat purpose is available here: https://github.com/nohal/LogBookExtractor/downloads[676]

Saving waypoints, routes, tracks and layers for future use.

- For a more permanent backup solution, to keep routes, waypoints and tracks etc, that you may need in the future, consider saving the data by using *Route & Mark Manager* or use *Layers*
- **Be organized.** Create a dedicated directory, for example GPX_Routes, to save files

worth keeping. Be careful to name all files in a manner so the content is obvious, without having to import the file into OpenCPN.

- **Export button** Each tab in the Route Manager (except the Layer Tab) has a button “Export……”. Use this to export one Waypoint, one Route or one Track at a time. Multiple selection is possible in this version of OpenCPN (and several previous versions).
- **To Create a layer**, a collection of waypoints, routes and tracks by making the features to be included in the layer visible. Everything else should be deleted or hidden. Every object that is visible on the screen when maximum zoomed out, will be included, not just what is visible on the screen for the moment. When you are ready, use the “Export all visible” button to create the layer gpx file.
- **To Change an existing Layer** start with creating a backup of the existing gpx file, containing the layer, by copying it to a safe place. Make sure that no navigational objects are visible, that you don't want in the new version of the layer. Then use the Route Managers “Import GPX..” and load the layer to be edited. Perform your changes to the layer and press “Export All Visible…”, and save. If you made a backup, just overwrite the original file. Otherwise give the changed Layer a new name.
- **Use your saved files** by importing them back into OpenCPN. Press the “Import GPX” button in the Route Manager. Layers can be set up to load autmatically on starting OpenCPN. Read more in *Layers*

Configuration File

- **Always exit OpenCPN** before editing the configuration file.
- Edit the file with a text editor, and save your changes.
- Restart OpenCPN.

Some of the user settings available through the config file.

APB bearing precision setting is set in the *Toolbar > Options > Connections* settings page for connections that have outgoing messages. The precision is applied to:

- CrossTrackErrorMagnitude
- BearingOriginToDestination
- BearingPresentPositionToDestination
- HeadingToSteer

This change was made as some auto pilots are limited in the precision they can accept in the APB message. All other messages and internally the precision is not changed. There is no change to the XTE message as that was not requested at the time. Setting added in OpenCPN Version 4.2.0

```
[Settings]  .....
NMEAAPBPrecision=3
```

Ais name caching can be turned off in the *opencpn.ini/opencpn.config* file by adding a line like this.

```
[Settings] .....
EnableAISNameCache=0
```

Crash reporting for Windows icon be enabled by editing the opencpn.ini file. Add the line below to enable the crash-report. Sett the value to “0” to disable it.

```
[Settings] .....
EmailCrashReport=1
```

Rotating the canvas, is unsupported but possible…..

```
[Settings] ....
EnableRotateKeys=1
```

Enables

- **[** = Rotate chart left. **]** = Rotate chart right.
- **Alt + [** = Rotate chart left in fine steps.
- **Alt +]** = Rotate chart right in fine steps.
- \ = Reset rotation
- Some keyboards have to use **AltGR +]**, etc.

Also an Alternative, see the RotateCtrl_pi plugin which has Toolbar buttons.

Graphic memory, If you have a lot of graphic memory, or very little, try to add the following to your config (ini on windows) file:

```
[Settings] .....
GPUMemorySize=nnn
```

where nnn is graphics card memory size, in MBytes. 256 MBytes is the default.

Application memory limit target. Try to limit the total memory used by OCPN to the specified value, approximately. Specify this mode by:

```
[Settings] ......
MEMCacheLimit=xxx
```

Open chart limit. This is the default mode under Linux, and the default value is 20 open charts at any one time. Modify this limit by the following:

```
[Settings]  ....
NCacheLimit=yy
```

Display a horizontal scalebar instead of the default vertical.

```
[Settings]   .....
UseSimplifiedScalebar=1
```

Width of the COG Predictor can be adjusted in the *opencpn.ini* configuration file. Find the line below and adjust the value.

```
[Settings]  ....
OwnshipCOGPredictorWidth=3
```

Maximum Waypoint Name Length

```
[Settings] ....
MaxWaypointNameLength=6
```

Allow the use of setting MaxWaypointNameLength in opencpn.ini to enable sending longer than 6 character waypoint names to GPS

Number of Navobject Backups In the *opencpn.ini or opencpn.config* file you can find a configuration setting to control the **number of backups kept**, defaulting to KeepNavobjBackups=5. This value can be changed using a text editor.

```
[Settings] ...
KeepNavobjBackups=5
```

AnchorWatch Both the default Anchor Watch Radius and Max distance from mark can be changed by editing the configuration file

```
[Settings] ....
AnchorWatchDefault=45
AnchorWatchMax=2500
```

Enter your own preferences, 45 & 2500 are just for illustration, defaults are 50 and 1852 respectively.

Automatic Anchor Mark Search for a line like this:

```
[Settings] .....
AutoAnchorDrop=0
```

and change the value from “0” to “1”.

Using all four processors

```
[Settings] .....
NCPUCount=4
```

GPS timeout

```
[Settings] ....
GPSDogTimeout=6
```

OCPN must get a valid position report (e.g. RMC, GLL, etc) every six seconds (default) or else the ownship icon will go grey, and many other functions will stop working. Adjustment to the defaut value may be necessary on, for example, a very busy network.

If you are a developer: **Debug statements** can be added to produce a lot of output when problems arises in certain areas. More in Troubleshooting.[677]

OpenGL

What is OpenGL? An Overview

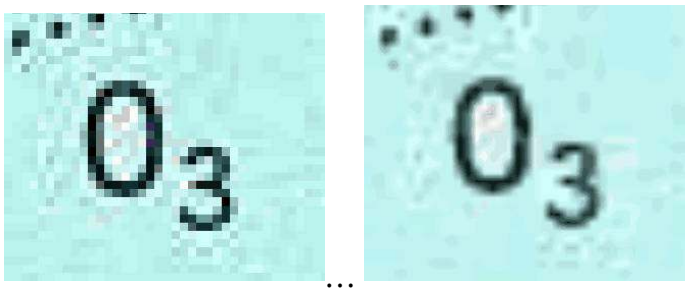
OpenGL is an open standard, cross platform, advanced graphic library. It uses the graphic cards processor (GPU) and memory, to speed up applications. With OpenCPN a user with a typical modern graphic card will have an enhanced experience. Much faster and smoother zooming and panning as well as clearer and sharper chart rendering.

In OpenCPN, OpenGL is a choice; however. the old graphic engine is still there. OpenGL will not work for everyone. Performance may not be improved with embedded graphics chips, often found in older laptops and netbooks.

Microsoft has gone from *support* to *hostility* towards OpenGL. There is currently a lot of trouble in Windows for all OpenGL applications, not just OpenCPN. OpenCPN has been forced to disable a handful of OpenGL features for all *Intel OpenGL graphics drivers on Windows*, for example.

Mac OS X has full supports for OpenGL.

For Linux the situation is slightly different. Linux supports OpenGL, as it generally tends to support open standards. The user is however dependent on a driver from the graphic cards maker, and their support for OpenGL. This may change with projects like nouveau[678], a free driver for nVidias cards.



Without OpenGL and With OpenGL

Heavy over zooming reveals some of the secrets behind OpenGL

Why introduce OpenGL in OpenCPN?

The main reasons are:

- Better performance, leveraging modern PC graphics cards that are ubiquitous and powerful.
- Better “eye candy”, such as smooth zoom and pan, with little impact on responsiveness.
- Future cross-platform support (e.g Android/IOS)
- Some features depends on OpenGL, such as horizontal text and numbers on skewed (course up) vectorcharts.

Is OpenGL a good choice for everyone?

OpenCPNs performance with OpenGL is highly dependent upon your graphics hardware and drivers.

- On some systems using Intel HD Graphics adapters, especially running 64bit editions of Windows 7, OpenCPN gets killed due to errors in the display adapter drivers. You may try to get updated drivers or as a workaround, on Windows run **OpenCPN - no OpenGL** from *Start* menu. On all the platforms, you can use the **-no_opengl** Command Line switch while starting the program to run it with OpenGL disabled.
- Some graphics chip sets (e.g.intel 945G) have rather poor OpenGL driver support, so that we cannot fully utilize the hardware acceleration potential of these systems.
- nVidia graphics, even very old cards, seem to perform very well.
- Performance may not be improved with embedded graphics chips as often found in older laptops and netbooks.
- There is a lot of trouble with OpenGL on Vista and W7. Microsoft implemented a new screen compositing model for Vista and later, which “broke” many OpenGL apps
- Conclusion:Using OpenGL with OpenCPN will be a significant upgrade for some users of OpenCPN, but OpenGL may not be “better” for everyone's OCPN application.
- So, user's choice. If OpenGL works better for you, then use it. If not, the old DC based graphics render system is still in place.

Start using OpenGL

- Find the latest driver for your graphic card. The driver that came with your operating system, is not likely to be the best. Start looking at your graphic card makers home page.
- Go to the *ToolBox→Settings* and tick the two boxes *“Use Accelerated Graphics(OpenGL)”* and *“Enable Smooth Panning/Zooming”*. Read all the details in the Options Setting > Display Tab.

Other tricks

If you have a lot of graphic memory, or very little, try to add the following to your config (.ini on windows) file:

```
  [Settings] ....
GPUMemorySize=nnn
```

where nnn is graphics card memory size, in MBytes. 256 MBytes is the default.

Supplementary Software to test Graphics Adapter Opengl compatibility

Troubles in OpenGL mode?**

- Make sure the proper updated drivers for your graphics card.
- Earlier Intel HP Graphics, chips do not offer full OpenGL support. This is where the opengl issues tend to occur.
- One good option is to get a newer graphics board that supports OpenGL fully. (I would

suggest Nvidia, but there will be various opions about that.)
- Another option is to try adjusting the OpenCPN OpenGL settings, unchecking all the advanced features and testing.
- Then if there are still difficulties, running this software may show exactly what the problem is.

This free adapter testing software is for various operating systems, including Windows 32bit and 64bit.

GLview: OpenGL Extensions Viewer[679] http://www.realtech-vr.com/glview/[680]

This software tool tests your graphics card capabilities and makes a report log. It is useful in tracking down particular problems with OpenGL on a given system. The Developers can then help determine what is wrong.

However when other software like GoogleEarth works OK with OpenGL on, then there are possibly other reasons why OpenCPN fails, related to the Opencpn OpenGL implimentation. There are many, many graphics cards and they have differing capabilities and sometimes the Opencpn opengl implimentation has to be adjusted for a particular card.

Network Repeater

From Gilletarom's website some excellent information on Networking
http://www.plaisance-pratique.com/OpenCPN-Networking-repeater-to[681]

Opencpn network/RJ45 (Ethernet) cable

The means :

1. OpenCPN, know IP of the server PC, has an RJ45 (Ethernet) cable or Wifi on both, PC
2. Has set both networked PCs, cable or Wifi
3. OpenCPN on the PC server

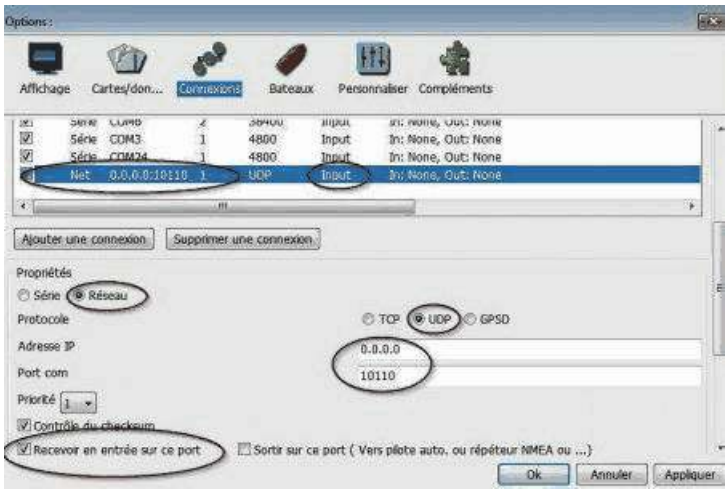
Setting OpenCPN on the PC server

- Setting Options
  - connections
    - add Connection
- Set as follows by putting your IP address followed by : xx
  - Properties ⇒ “Network”
  - Protocol ⇒ “UDP”
  - Adress ⇒ your IP address followed by : “.x.x”
  - Data Port com “10110”
  - Output on this port “OK”
- Set “Apply” and then “OK”

Setting OpenCPN on PC Receiver

- Setting Options
  - connections
    - add Connection
- Set as follows by putting only this IP address, for UDP protocol : 0.0.0.0
  - Properties ⇒ “Network”

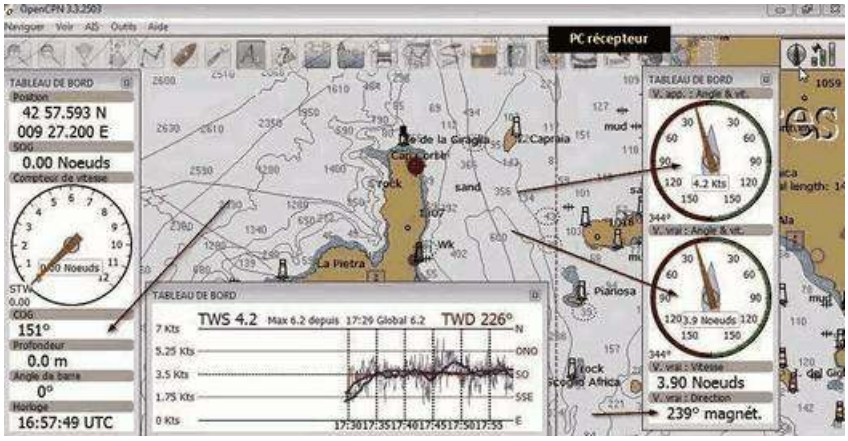
- Protocol ⇒ “UDP”
- Adress ⇒ “0.0.0.0”
- Data Port com “10110”
- Receive Input on this port “OK”
- Set “Apply” and then “OK ”



Networking

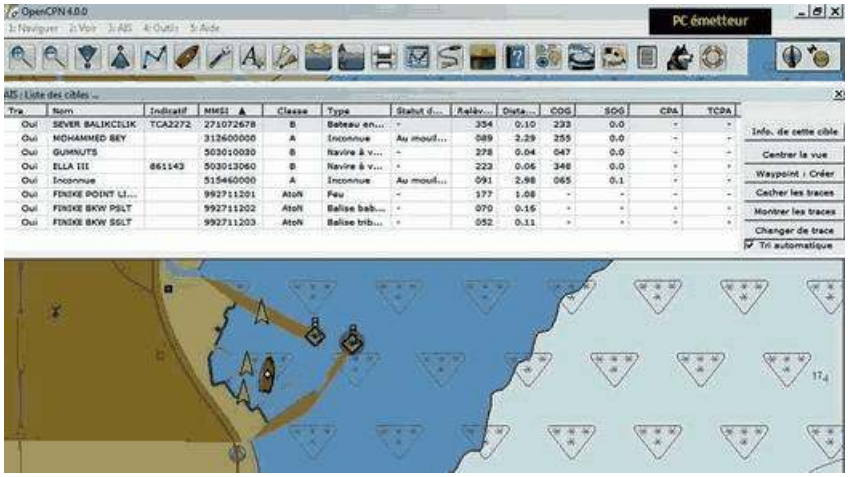
On the server PC On the PC Receiver

..

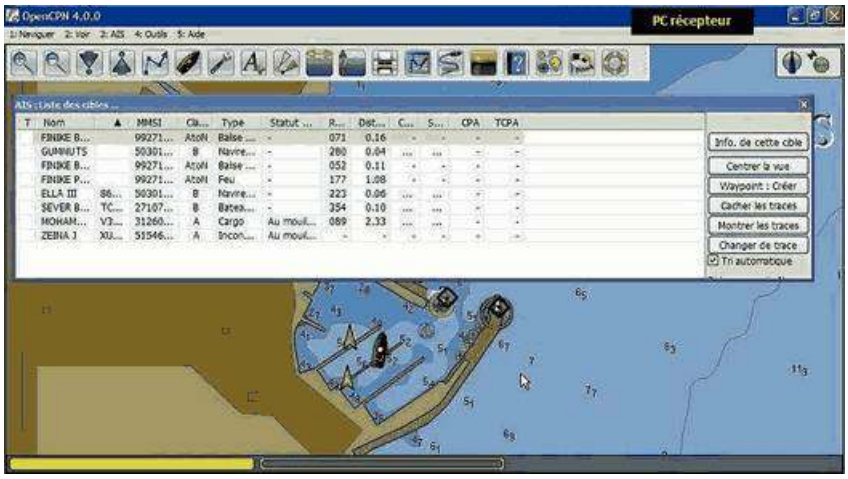


For this example, all the NMEA data from the GPS and display of AIS data

**On the server PC On the PC Receiver

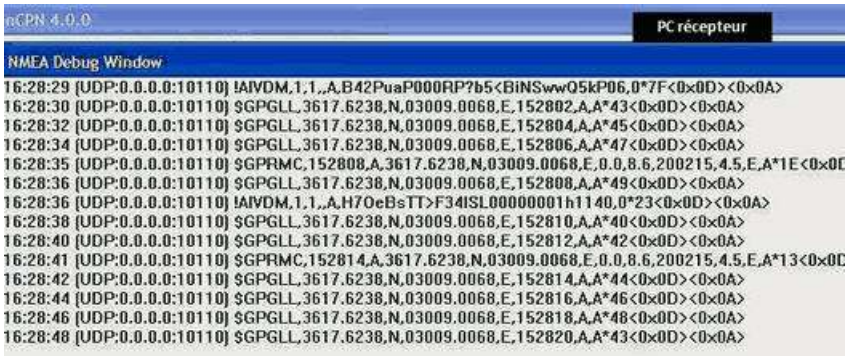


..



- The emission readings and receiving NMEA sentences, under the AIS receptions.
- We see that every sentence received by the transmitter is immediately re-shipped by outgoing connection

..



NMEA information goes through the RJ45 cable or WiFi and are received on the other PC.

With this application you can have a PC inside and another type tablet outdoors

For more information on OpenCPN Wifi Networking, OpenCPN WiFi network between XP, W7 and W8 tablet, Creation of a network using a batch file see Pratiques et Techniques de la Plaisance[682]

NMEA 0183 Sentences

For a comprehensive explanation of the NMEA 0183 protocol please read

NMEA Revealed by Eric S. Raymond[683]

Please note the 2008 Obsolete Nmea Sentences list in the Eric Raymond document.

- NMEA MTK Online Checksum Calculator[684]
- NMEA Online Checksum Calculator[685]
- Github NMEA Checksum code[686]
- NMEA in Supplementary Software[687]
-

Other References

- Explanation of NMEA sentences as used in GPS receivers[688]
- NMEA 0183 Sentences Not Recommended for New Designs, Approved by the NMEA 0183 Standard Committee as of October 1, 2008[689]

Note: OpenCPN does not use or recognize NMEA 2000

OpenCPN Core Program:

Recognized NMEA0183 Sentences

HDM - Heading, Magnetic

1. Heading Degrees, magnetic
2. M = magnetic

HDG - Magnetic heading, deviation, variation

1. Magnetic Sensor heading in degrees
2. Magnetic Deviation, degrees
3. Magnetic Deviation direction, E = Easterly, W = Westerly
4. Magnetic Variation degrees
5. Magnetic Variation direction, E = Easterly, W = Westerly

If HDG message also contains the variation and E/W flags then O will use that. If not then it will look in RMC message for a variation. If nothing there it will use WMM plugin unless user has selected the variation manually in options.

HDT - Heading, True

1. Heading Degrees, true
2. T = True

RMB - Recommended Minimum Navigation Information

To be sent by a navigation receiver when a destination waypoint is active.

```
''
14
1 2   3 4    5    6       7 8        9 10  11  12  13|  15
| |   | |    |    |       | |        | |   |   |   | |   |
$--RMB,A,x.x,a,c--c,c--c,llll.ll,a,yyyyy.yy,a,x.x,x.x,x.x,A,m,*hh<CR><LF>''
```

Field Number:

1. Status, A= Active, V = Void
2. Cross Track error - nautical miles
3. Direction to Steer, Left or Right
4. TO Waypoint ID
5. FROM Waypoint ID
6. Destination Waypoint Latitude
7. N or S
8. Destination Waypoint Longitude
9. E or W
10. Range to destination in nautical miles
11. Bearing to destination in degrees True
12. Destination closing velocity in knots
13. Arrival Status, A = Arrival Circle Entered
14. FAA mode indicator (NMEA 2.3 and later)

RMC -Recommended Minimum Navigation Information

1. Time (UTC)
2. Status, V = Navigation receiver warning
3. Latitude
4. N or S
5. Longitude
6. E or W
7. Speed over ground, knots
8. Track Made Good, degrees true
9. Date, ddmmyy
10. Magnetic variation, degrees
11. E or W

xxWPL - Waypoint Location

Used to send routes and waypoints up to a GPS receiver. OpenCPN does not process these sentences as input.

1. Latitude
2. N or S (North or South)
3. Longitude
4. E or W (East or West)
5. Waypoint Name

xxRTE - Routes

Used to send routes and waypoints up to a GPS receiver.OpenCPN does not process these sentences as input.

1. Total number of messages being transmitted
2. Message Number
3. Message Mode
    a. c = complete route, all waypoints
    b. w = working route, the waypoint you just left, the waypoint you're heading to, then all the rest
4. Waypoint ID
5. More Waypoints

GGA - Global Positioning System Fix Data

1. Universal Time Coordinated (UTC)
2. Latitude
3. Longitude
4. GPS Quality Indicator
5. Number of satellites in view, 00 - 12
6. Horizontal Dilution of Precision (HDOP)
7. Antenna altitude above/below mean-sea-level (geoid)
8. Units of antenna altitude, meters
9. Geoidal separation, the vertical difference between the WGS-84 elipsoid and the geoid
10. Units of geoidal separation, meters
11. Age of differential GPS data, time in seconds since last SC104
12. Differential reference station ID, 0000-102

- **GLL - Geographic Position, Latitude / Longitude**

1. Latitude
2. N or S (North or South)
3. Longitude
4. E or W (East or West)
5. Time (UTC)
6. Status A - Data Valid, V - Data Invalid

GSV - Satellites in view

1. Number of sentences for full data / sentence 1 of 2
2. Number of satellites in view
3. Satellite PRN number
4. Elevation, degrees
5. Azimuth, degrees
6. SNR - higher is better / for up to 4 satellites per sentence

VTG - Track Made Good and Ground Speed

1. Track Degrees
2. T = True
3. Track Degrees
4. M = Magnetic
5. Speed Knots
6. N = Knots
7. Speed Kilometers Per Hour
8. K = Kilometers Per Hour

GPwpl - Waypoint Data

Only when there is an active route (this is sometimes bidirectional).

APB - Autopilot Sentence "B"

This is a fixed form of the APA sentence with some ambiguities removed.

```
 Note: Some autopilots, Robertson in particular, misinterpret "bearing from
origin to destination" as "bearing from present position to destination". This
is likely due to the difference between the APB sentence and the APA sentence.
for the APA sentence this would be the correct thing to do for the data in the
same field. APA only differs from APB in this one field and APA leaves off the
last two fields where this distinction is clearly spelled out. This will
result in poor performance if the boat is sufficiently off-course that the two
bearings are different.
```

Field Number:

1. Status V = LORAN-C Blink or SNR warning V = general warning flag or other navigation systems when a reliable fix is not available
2. Status V = Loran-C Cycle Lock warning flag A = OK or not used
3. Cross Track Error Magnitude
4. Direction to steer, L or R
5. Cross Track Units, N = Nautical Miles
6. Status A = Arrival Circle Entered
7. Status A = Perpendicular passed at waypoint
8. Bearing origin to destination
9. M = Magnetic, T = True
10. Destination Waypoint ID
11. Bearing, present position to Destination
12. M = Magnetic, T = True
13. Heading to steer to destination waypoint
14. M = Magnetic, T = True

XTE - Measured cross track error

Measured cross track error is a part of the RMB message, for compatibility with some older equipment designed to work with Loran.

1. Cross track error, measured
2. General warning flag V = warning

3. (Loran-C Blink or SNR warning)
4. Not used for GPS (Loran-C cycle lock flag)
5. Cross track error distance
6. L - Steer left to correct error (or R for right)
7. N- Distance units - Nautical miles

AIVDM - Automatic Information System (AIS)

Position reports from other vessels

1. Time (UTC)
2. MMSI Number
3. Latitude
4. Longitude
5. Speed Knots
6. Heading
7. Course over Ground
8. Rate of turn
9. Navigation status

AIVDO - Automatic Information System (AIS)

Position reports from own vessel

1. Latitude
2. Longitude
3. Speed over ground
4. Course over ground
5. MMSI, navigational status, ship type, call sign, destination, sizes (in AIS target list)

xxTTM

Tracked Target Message

1. Target Number (0-99)
2. Target Distance
3. Bearing from own ship
4. Bearing Units
5. Target Speed
6. Target Course
7. Course Units
8. Distance of closest-point-of-approach
9. Time until closest-point-of-approach “-” means increasing
10. “-” means increasing
11. Target name
12. Target Status
13. Reference Target

xxTLL

Target Latitude and Longitude

1. Target Number (not used/ignored)
2. Latitude
3. Longitude
4. Name
5. Status
6. Reference Target (not used/ignored)

xxOSD

Own Ship Data

1. Heading, degrees true
2. Status, A = Data Valid
3. Vessel Course, degrees True
4. Course Reference
5. Vessel Speed
6. Speed Reference
7. Vessel Set, degrees True
8. Vessel drift (speed)
9. Speed Units

FPROS

GPSGate Buddy Position Update.

1. Latitude
2. Hemisphere N/S
3. Longitude
4. Hemisphere E/W
5. Altitude in meters above sea level
6. Speed over ground in knots
7. Heading over ground in degrees
8. Date
9. Time UTC
10. Name of buddy this position info belongs to.

- **CDDSC - Digital Selective Calling Information**
- **CDDSE - Extended Digital Selective Calling Information, including a more accurate position.**

For more details on how OpenCPN interprets all recognized sentences, look at the “AIS_DecoderA.cpp” file in the source code. For the Dashboard plugin, look at the different files in the “nmea0183” directory.

Dashboard Plugin recognized NMEA 0183 sentences

- **DBT** - Depth Below Transducer
- **DPT** - Depth of Water
- **GGA** - Global Positioning System Fix Data
- **GLL** - Geographic Position - Latitude/Longitude HDG Heading - Deviation & Variation
- **HDM** - Heading - Magnetic
- **HDT** - Heading - True
- **MTA** - Air Temperature (obsolete)
- **MDA** - Meteorological Composite (obsolete) -see below
- **MTW** - Mean Temperature of Water
- **VLW** - Distance Traveled through Water
- **MWD** - Wind Direction & Speed
- **MWV** - Wind Speed and Angle
- **RMC** - Recommended Minimum Navigation Information
- **RSA** - Rudder Sensor Angle
- **VHW** - Water speed and heading
- **VTG** - Track made good and Ground speed
- **VWR** - Relative Wind Speed and Angle
- **VWT** - True Windspeed and Angle (obsolete)
- **XDR** - Transducer Values - see below

MDA

Meteorological Composite (obsolete) This message is obsolete and NMEA recommends to use XDR transducer messages instead.
However, old instruments might still sending this message.
OpenCPN reads the second value “Barometric pressure, bars”, but only if the number provided is between 0.8 and 1.1
All other values are ignored.

```
''
$--
MDA,x.x,I,**x.x,B**,x.x,C,x.x,C,x.x,x.x,x.x,C,x.x,T,x.x,M,x.x,N,x.x,M*hh<CR>
<LF> \\
|   |        |   |    |   |    |   |    |   |    | \\
|   |        |   |    |   |    |   |    |   |    Wind speed, meters/second \\
|   |        |   |    |   |    |   |    |        Wind speed, knots \\
|   |        |   |    |   |    |   |    Wind direction, degrees Magnetic
\\
|   |        |   |    |   |    |        Wind direction, degrees True \\
|   |        |   |    |   |    Dew point, degrees C \\
|   |        |   |    |    Absolute humidity, percent \\
|   |        |   |    Relative humidity, percent \\
|   |        |        Water temperature, degrees C \\
|   |        Air temperature, degrees C \\
|      **//Barometric pressure, bars// ** \\
Barometric pressure, inches of mercury''
```

XDR

Transducer Values

```
            1 2   3 4       n
|   |   |   |       | \\
*  $--XDR,a,x.x,a,c--c, ..... *hh<CR><LF> \\
```

- Field Number:
- 1) Transducer Type
- 2) Measurement Data
- 3) Units of measurement
- 4) Name of transducer
- x) More of the same
- n) Checksum

- Example:
- $IIXDR,C,19.52,C,TempAir*19
- $IIXDR,P,1.02481,B,Barometer*29

- Currently, OpenCPN recognizes the following transducers:

```
Measured Value | Transducer Type | Measured Data   | Unit of measure |
Transducer Name
-------------------------------------------------------------------------------
------------------------
barometric     | "P" pressure    | 0.8..1.1 or 800..1100           | "B" bar
| "Barometer"
air temperature| "C" temperature |   2 decimals                    | "C"
celsius     | "TempAir" or "ENV_OUTAIR_T"
pitch          | "A" angle       |-180..0 nose down 0..180 nose up | "D"
degrees     | "PTCH"
rolling        | "A" angle       |-180..0 L         0..180 R       | "D"
degrees     | "ROLL"
water temp     | "C" temperature |   2 decimals                    | "C"
celsius     | "ENV_WATER_T"
-------------------------------------------------------------------------------
-----------------------
```

- **ZDA -Time & Date - UTC, day, month, year and local time zone**
- **AIVDO - Automatic Information System (AIS) position reports from own vessel**

See details for AIVDO above in list.

NMEA version 2.3.added a mode indicator to many sentences to indicate what
kind of fix the receiver has. The value can be one of
A=autonomous
D=differential
E=Estimated
N=not valid,
S=Simulator.
Sometimes there can even be a null value as well.
The A and D are the only vales that will indicate an Active and reliable Sentence.
This mode character has been added to the end of RMC, RMB, VTG, and GLL sentences.
Optionally, to some others as well, including the BWC and XTE sentences.

Portable OpenCPN V2

How to create a portable OpenCPN program on a USB memory stick, including the split-screen configuration

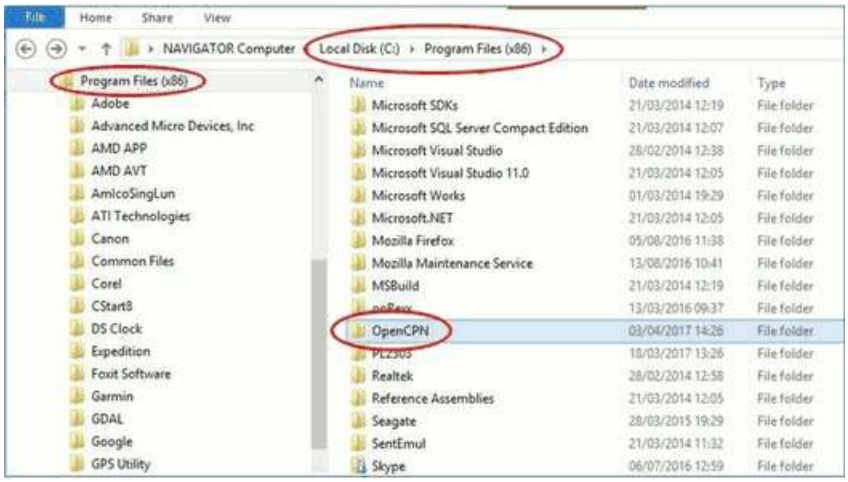
The Help files in the OpenCPN program are out-of-date with the latest release 4.6.1. I will describe the method I have found to create a folder containing the necessary files and folders that can be copied to a USB memory stick (flash drive) and used directly with a Windows based computer.

1.

Create a folder on the Desktop (or any convenient place) titled "**Portable OpenCPN**". The necessary files and sub-folders will be placed in this folder. It's the one that, when done, can be copied to a memory stick for portable use.

1.

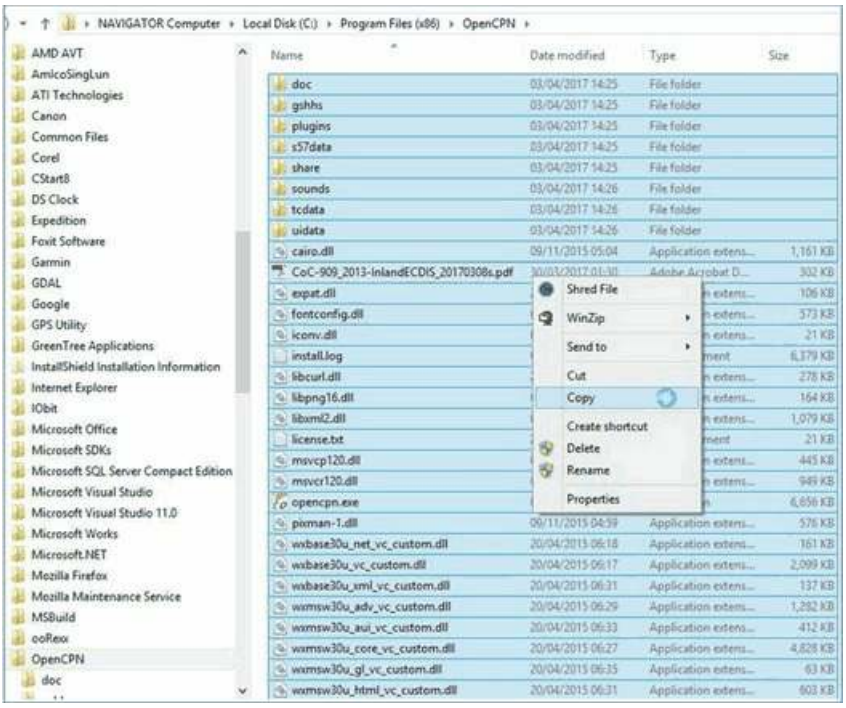
On the C:\ drive locate the **OpenCPN** folder under **Program Files (x86)**



1.

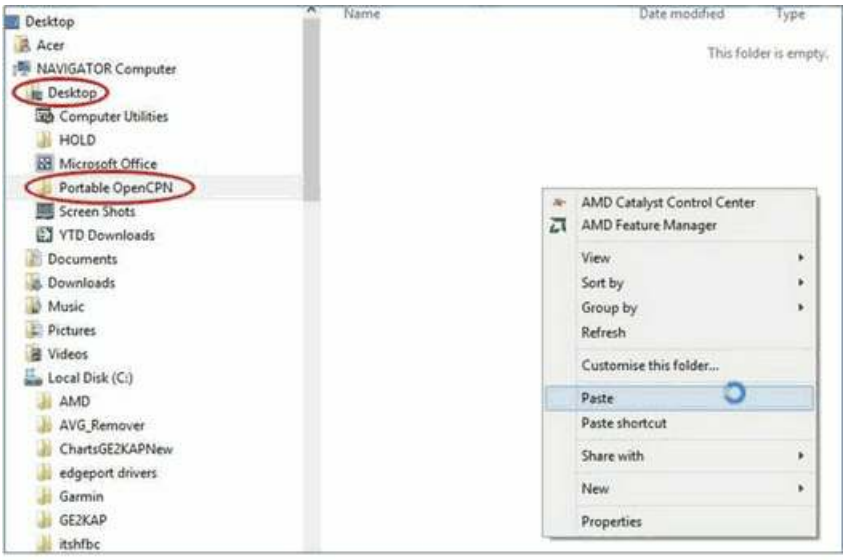
Open this folder (right-click and select Open or double left-click). **Select** all files and folders

(**CTL-A**) then right-click and select **Copy** to place these files and folders on the clipboard.



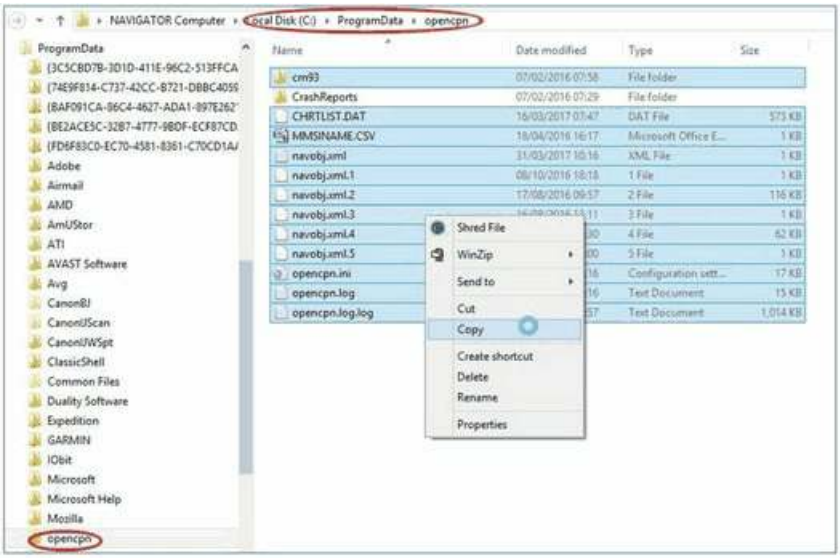
1.

Navigate back to the **Desktop**, open the **Portable OpenCPN** folder, right-click on the empty screen and select **Paste**.



1.

On the C:\ drive, locate the **opencpn folder** under the **Program Data** folder. (**NOTE**: The **Program Data** folder is a hidden file and must be selected to be shown (It's a selection on **Control Panel/Folder Options**)). Open this folder, select all the files except **Crash Reports** and **Copy** to the clipboard.



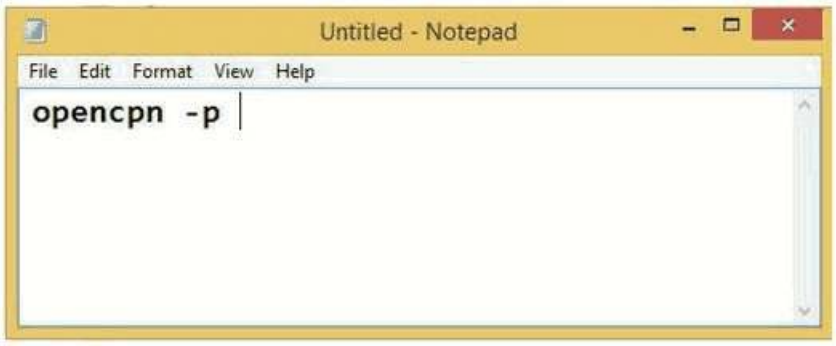
1.

As before, return to the **Portable OpenCPN** folder on the **Desktop** and **Paste** these files and folders into that folder.

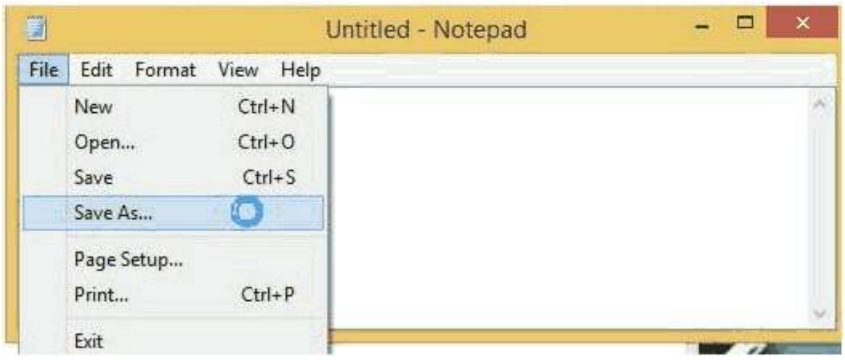
1.

To enable the program to run from the memory stick it is necessary to use a '**batch**' file for launching. The batch file is created by any text editor but saved with a **'.bat'** suffix, not a **.txt** suffix..

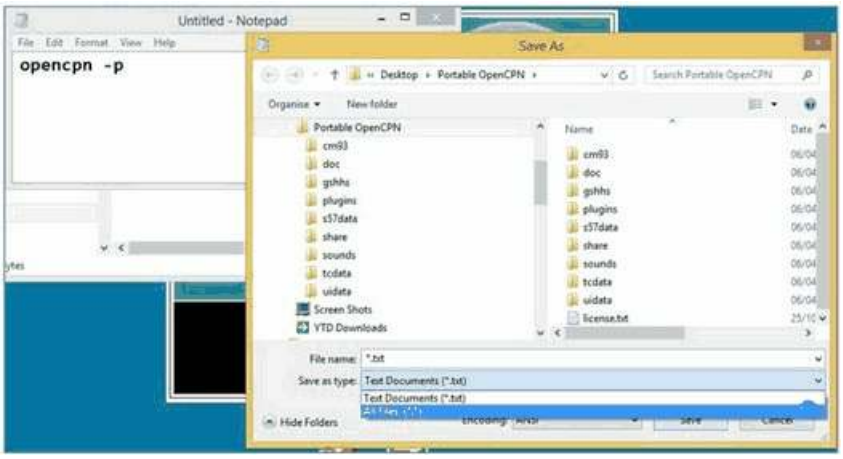
I've used **Notepad** to add the words as shown.



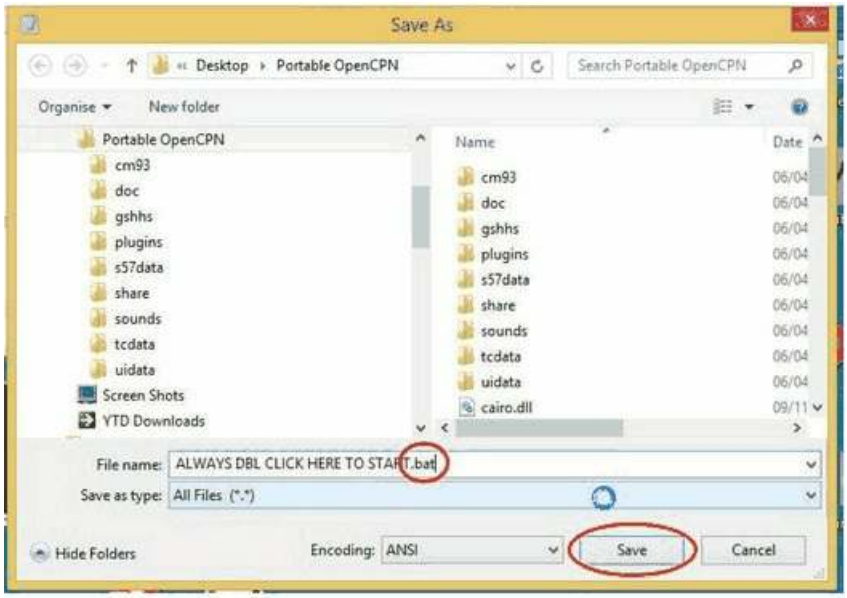
Select **File/Save As…**



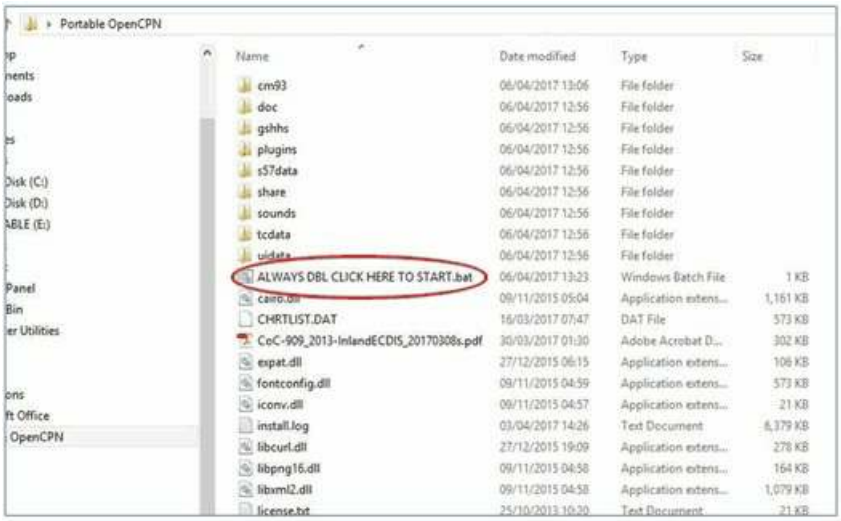
On the **Save As** screen select from the elevator **Áll Files (*.*)** Otherwiseit wants to save it as a **.txt** file.



On the next screen I have entered the name **ÁLWAYS DBL CLICK HERE TO START.bat** Note the suffix **.bat**. Now click on **Save.** The name for this file is up to you. If the name starts with the letter ‘’**A**’’ then it will be visible at the top of the files and under the folders when the folder is open.

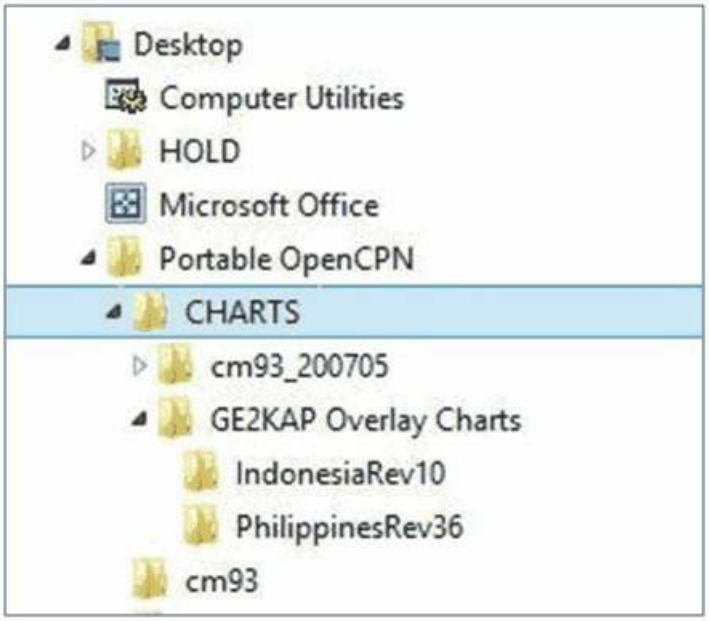


… and save it with a click in the **Portable OpenCPN** folder on the **Desktop**.



1.

So far we have loaded the basic **OpenCPN** program on the memory stick but it will need charts and other items to be useful. Here I have created a '**CHARTS**' folder under the **Portable OpenCPN** folder. From my host computer I have copied the charts as shown: the **cm93** vector charts from 2007 (the best for the SEAsia waters) and my collection of **.kap Overlay Charts** for **Indonesia** and the **Philippines** that were created with the **GE2KAP** program.

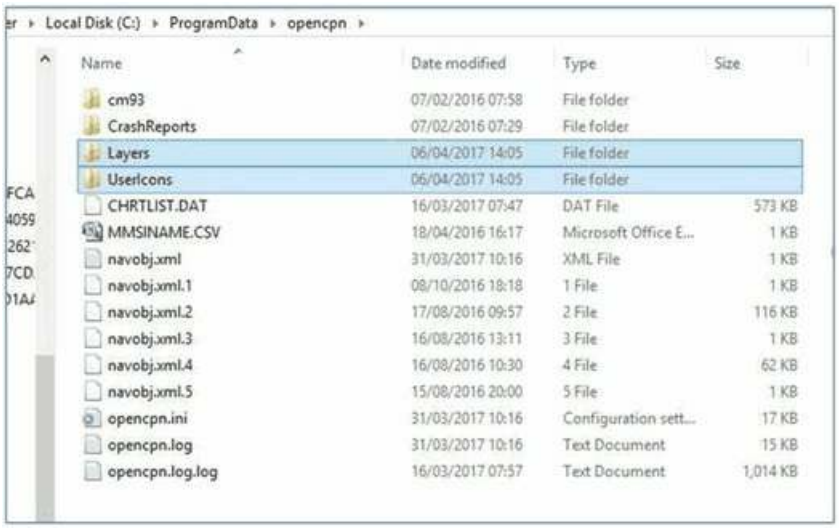


1.

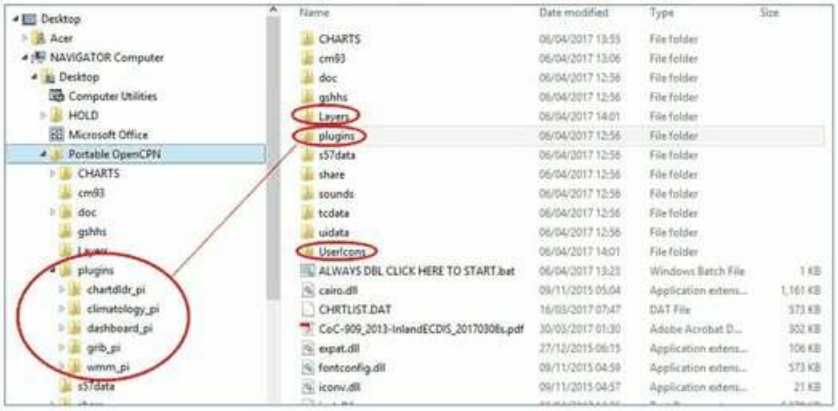
Other items I find useful I have copied from my host computer.

The **Layers** and **User icons** folders are located in the **Program Data/opencpn** folder. These are copied and pasted into the **Portable OpenCPN** folder. Placing a **Layers** folder here allows the contents to be displayed or hidden with one click in the **Route & Mark Manager** within the **OpenCPN** program. The **UserIcons** folder contains additional icons from those in

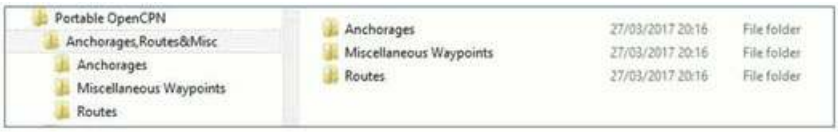
the default installation when describing marks you create in the program. These are available from the **OpenCPN Downloads** page on the internet.



I have **plugins** on my host computer that are in addition to the default ones that come with the **OpenCPN** program. To have these in the portable version I have copied them from my host computer into the **plugins** folder in the **Portable CPN** folder.

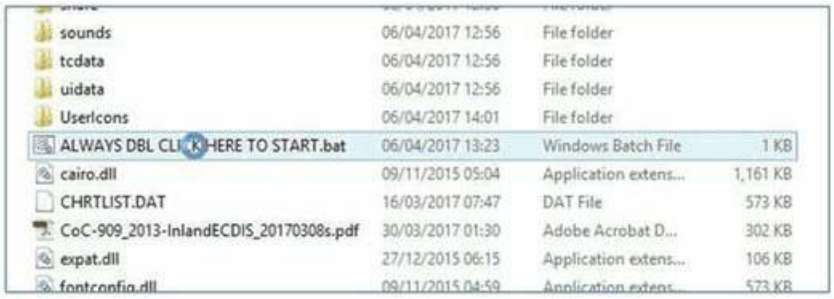


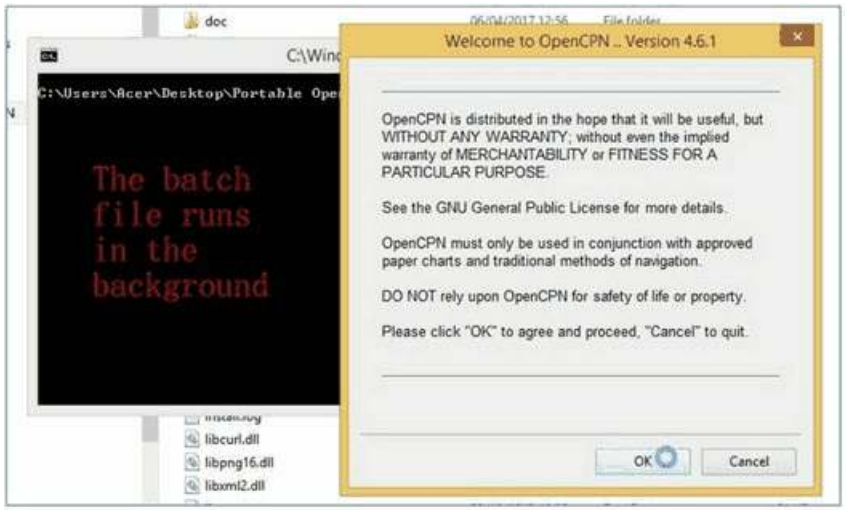
Other information on my host computer that I want copied over are **Anchorages, Routes and Miscellaneous** Waypoints. These are shown here.



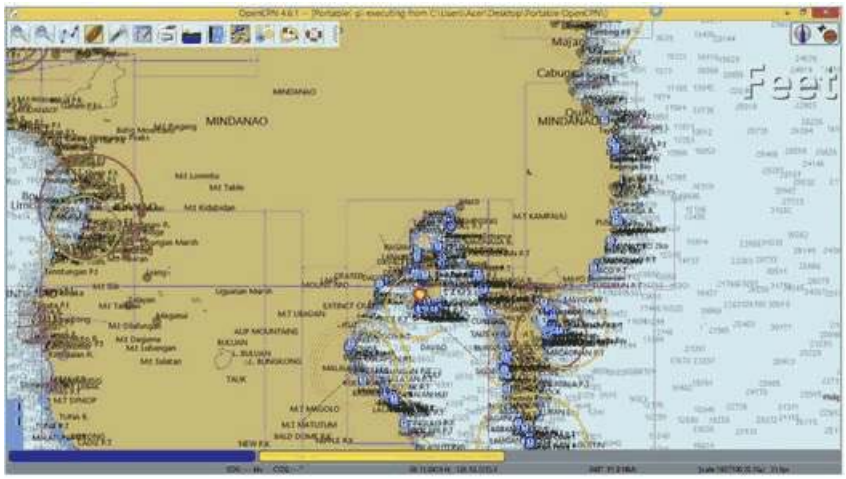
1.

Let’s run the program! Double-click on the batch file.





The batch file launches (it will stay running in the background) and the first welcome screen of the **OpenCPN program**. Click on **OK** and …..

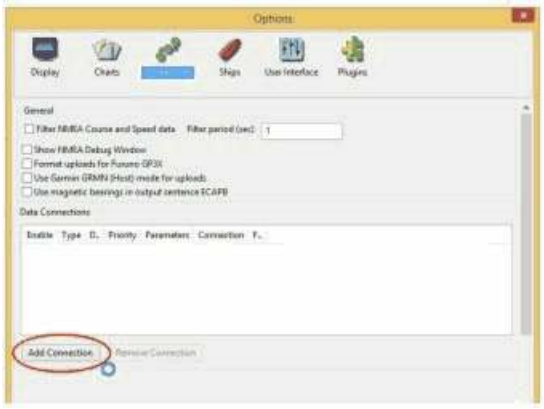


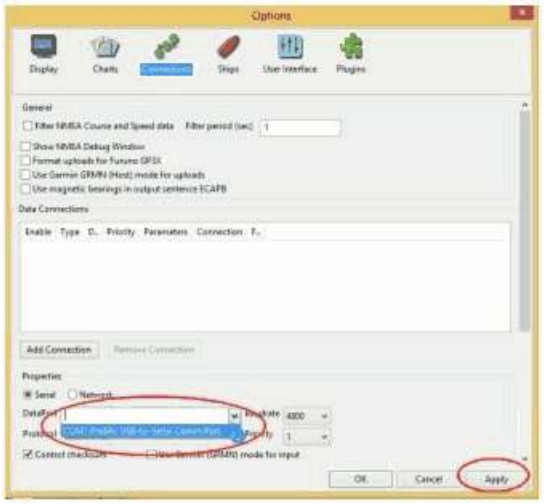
GPS CONNECTIONS

1.

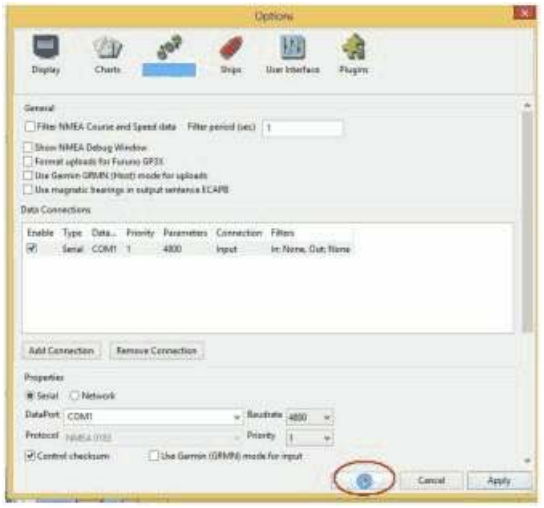
For 'Stand alone' mode. (The program is run from the memory stick but uses a GPS signal available on the host computer) This mode requires that a **GPS** signal be available, usually on some **COM** port. Assume such is the case where a **USB GPS** has been connected to the host computer and the signal is available on the **COM1** serial port.

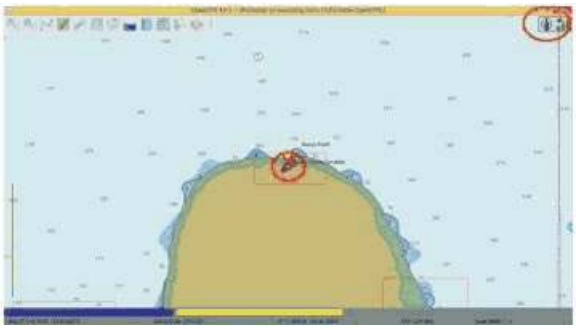
Go to **Options/Connections** and click on **Ádd Connection**’ Click on the ‘’**elevator**’’ to display the host computer **COM** port then click on ‘’**Apply**’.’





This screen appears .. click on ‘’OK’’ The display shows the GPS input is active by the green bars in the UR and the boat icon is now red color.





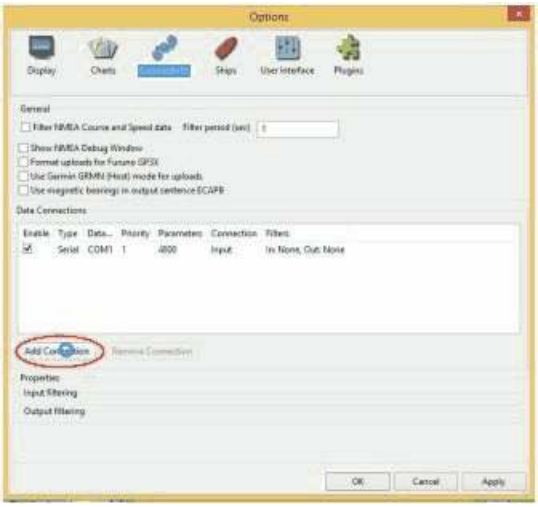
1.

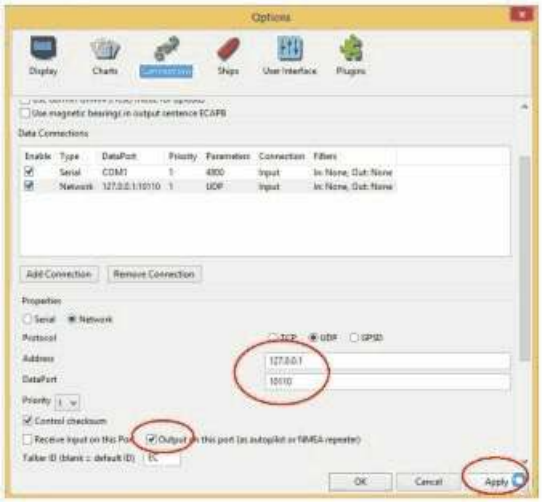
For ‘Split-screen’mode. (The program is run from the host computer and also from the portable configuration) This configuration gives **two** displays of the **OpenCPN** program on the screen. This allows a **close-up** view and a **zoomed-out** view simultaneously. To do this the **OpenCPN** program is run from the host computer and the second display for the split-screen is run from a portable configuration. (The portable configuration can be on a memory stick or resident on the host computer). The problem to overcome is that running the **OpenCPN** program from the host computer, using a COM port, denies that COM port from any other use, i.e. it cannot also be used for the portable configuration. The solution is to output the GPS signal from the host computer on a local UDP network and receive the signal on the portable configuration from the UDP network instead of a COM port.

The settings we will use are: ***Host computer - UDP IP 127.0.0.1, Port 10110, output Portable configuration – UDP IP 0.0.0.0, Port 10110, input***

On **the host computer**, go to **Options/Connections**. Click on ‘’**Add Connection**””. Click on ‘’**Network**’’, check the‘’UDP’’ button, insert numbers as shown, check the

“”**Output** ..”” box and click on “”**Apply**””.

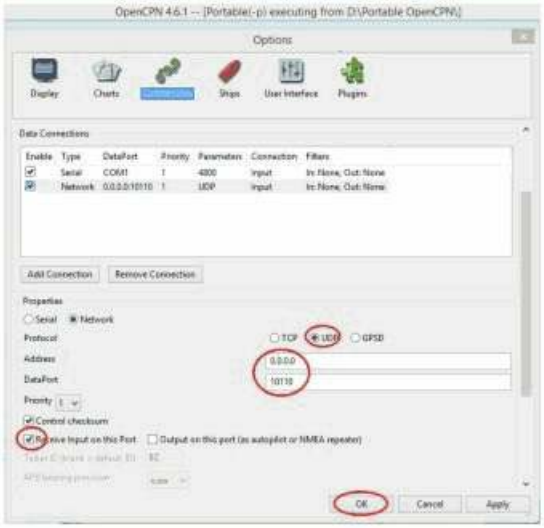




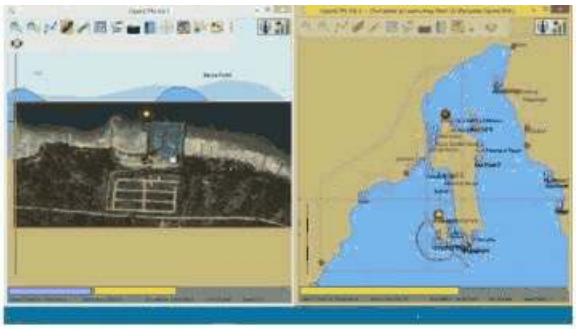
You ‘may’ see this screen appear:

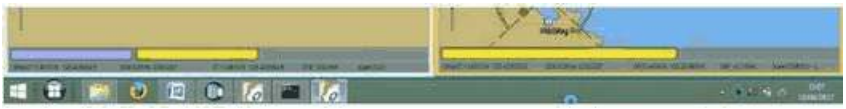
Check and uncheck the boxes as shown and click on ‘’Allow access’’

Launch the **portable OpenCPN** program. Repeat as above to establish these settings: Click on ‘’OK’’.



Now display both programs and move the edges to show a split-screen display. Note that the GPS data is present on both screens.





HINT: ***When moving the edges of the two screens down, do not go into the 'taskbar 'area, though it may be hidden. Avoiding this area will keep the screen configurations in the same split-screen mode when next re-launching the programs.***

VOILA!

See, that wasn't so hard was it? If you have problems or need help I am just an email away. Email: yachties(that symbol)yahoo.com[690]

Terry

18 April 2017

Portable OpenCPN

An updated version for OpenCPN 4.6.1 is also available

The OpenCPN portable option allows the program to run from an USB stick, or run independent from, and parallel to a normal installation.

Using Windows, it is not possible to run concurrent instances of OpenCPN, unless using the portable option.

- You can start the regular OpenCPN and a portable version later. The other way around will not work.
- You can run multiple portable instances at the same time. It makes sense to run these from different folders, to avoid possible data corruption.

To differ between various instances of the program, the titlebar on portable versions looks like this.

It is thus possible to run multiple portable instances and identify each version.

To create a portable Windows version

1. Create a new directory dedicated to the portable OpenCPN.
2. In a separate window, navigate to C:\Program Files (x86)\OpenCPN (on 64-bit systems) or C:\Program Files\OpenCPN (on 32-bit systems), and copy (don't move) the following data directories (with containing files) into this new directory:
    - doc/
    - plugins/
    - s57data/
    - share/
    - sounds/
    - tcdata/
    - uidata/
    - wvsdata/ (only for OpenCPN 3.2.0 and earlier)
3. From the same OpenCPN folder, copy the following files into the new directory:
    - crashrpt_lang.ini
    - CrashRpt1401.dll
    - CrashSender1401.exe
    - license.txt
    - OpenCPN.exe (of course)
    - Eight wxWidgets dlls beginning with the name “wxbase” (This needs an expert's attention)
4. Now navigate to C:\Windows\SysWOW64 (on 64-bit systems) or C:\Windows\System32 (on 32-bit systems) and copy the following files into the new directory:

    - msvcp100.dll
    - msvcr100.dll
5. If running Windows, create MSDOS batch file “opencpn portable.bat” (or other name of user choice) containing the one line:

```
<code>
opencpn -p
</code>
```

This file must be in the new directory. If you want your batch file to be in a different directory, you must edit the batch file to include “cd” commands to navigate into the new directory before the line containing the “opencpn -p” command.

To run OpenCPN portably within this directory, simply execute the “opencpn portable” batch file. There may be a way to build a click-able shortcut to OpenCPN, with the -p option specified in the shortcut. But I could not figure it out. Windows insists upon a drive letter in the command line of the shortcut, which would defeat the whole purpose of portability.Thus, the batch file….

If the charts are also in the current dir, then the entire installation is “portable”, meaning there are no hard-coded drive letter dependencies, and all write activities occur in the current dir only.

This setup works very well from a USB stick.

Additional Notes for OpenCPN v4.1.xx and 4.2

Use these files they are more current

- msvcp120.dll ←-better than msvcp100.dll
- msvcr120.dll ←-better than msvcr100.dll
- libcurl.dll ←-needed for chartdownloader and other features.
- 16 wxWidgets ←-Files in main directory, rather than the 8 mentioned, best to copy all.
- zlib1.dll ←-Also best to copy zlib1.dll

For a higher running priority see: *Command Line*

A Linux version

On Linux, a similar functionality exists. The 32 and 64 bits issue is similar.

32 bits version can be made to work on a 64 bits Linux by installing *ia32-libs* or *multiarch* support packages. The opposite way, a 64 bit version on a 32 bit system, will not work.

Copy the opencpn executable binary and the data directories mentioned above to a local directory.

In that directory, do:

```
$ ./opencpn -p
```

This will cause all user data files to be created and used from within that local directory. This

can be useful for side-by-side testing…

Low Powered Systems

This is an advanced subject.
Beginners need only bother, if they have a system with very low resources and if the system feels very sluggish. The background is that OpenCPN, quite aggressively uses memory, to speed up the application, this can backfire in certain situations….

There is a simple memory management scheme, for use with systems that has limited resources.
Two modes are available, only one of which can be active at any given time.
The modes must be specified in the "opencpn.conf" file, called "opencpn.ini" in Windows and Mac.

1. Application memory limit target. Try to limit the total memory used by OCPN to the specified value, approximately. Specify this mode by:

```
[Settings]....
MEMCacheLimit=xxx
```

Where xxx is memory use target in Mbytes. Overrides NCacheLimit below.

2. Open chart limit. This is the default mode under Linux, and the default value is 20 open charts at any one time.

Modify this limit by the following:

```
[Settings] ....
NCacheLimit=yy
```

Where yy is the maximum number of simultaneously open charts.

- If you do not enter any memory management specification in the config file, the following defaults apply:
- Linux systems has a soft memory limit at 50% of available RAM. Open chart limit is 20 charts.
- Windows and Mac…Application memory limit target is used. Target limit is 50% of available physical RAM, up to a maximum of 1 gigabyte.

Settings for increased speed.

Texture Settings

In *Options→Display-Advanced Tab* activate "Disable Full Screen Quilting" to start with.

Use OpenGL if your hardware is up to it. If you are using OpenGL on a low-spec machine, you will have better performance if you

1. Disable texture caching, or\
2. Pre-build the texture cache in a region of interest. That is, move the boat to say Dover. Then do *Options→Advanced>(OpenGL)Options→Build Texture Cache*. You do not

need to wait the entire time, which may be hours for a large chart set. “Skip” out when the distance reported is 100 miles or so.

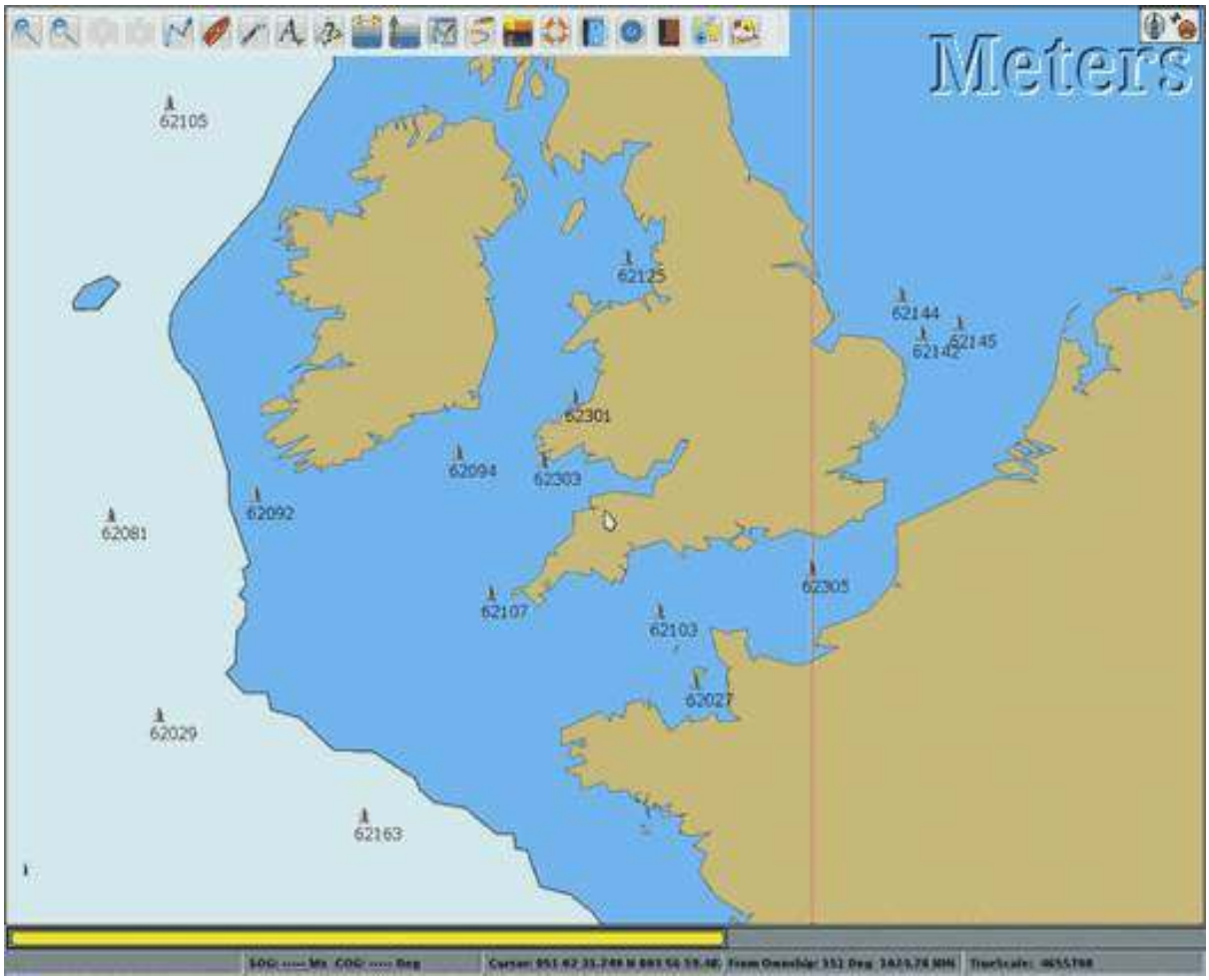
Eventually, after steady use, your texture cache will be filled automatically in the background, and performance will increase steadily.

Layers Library

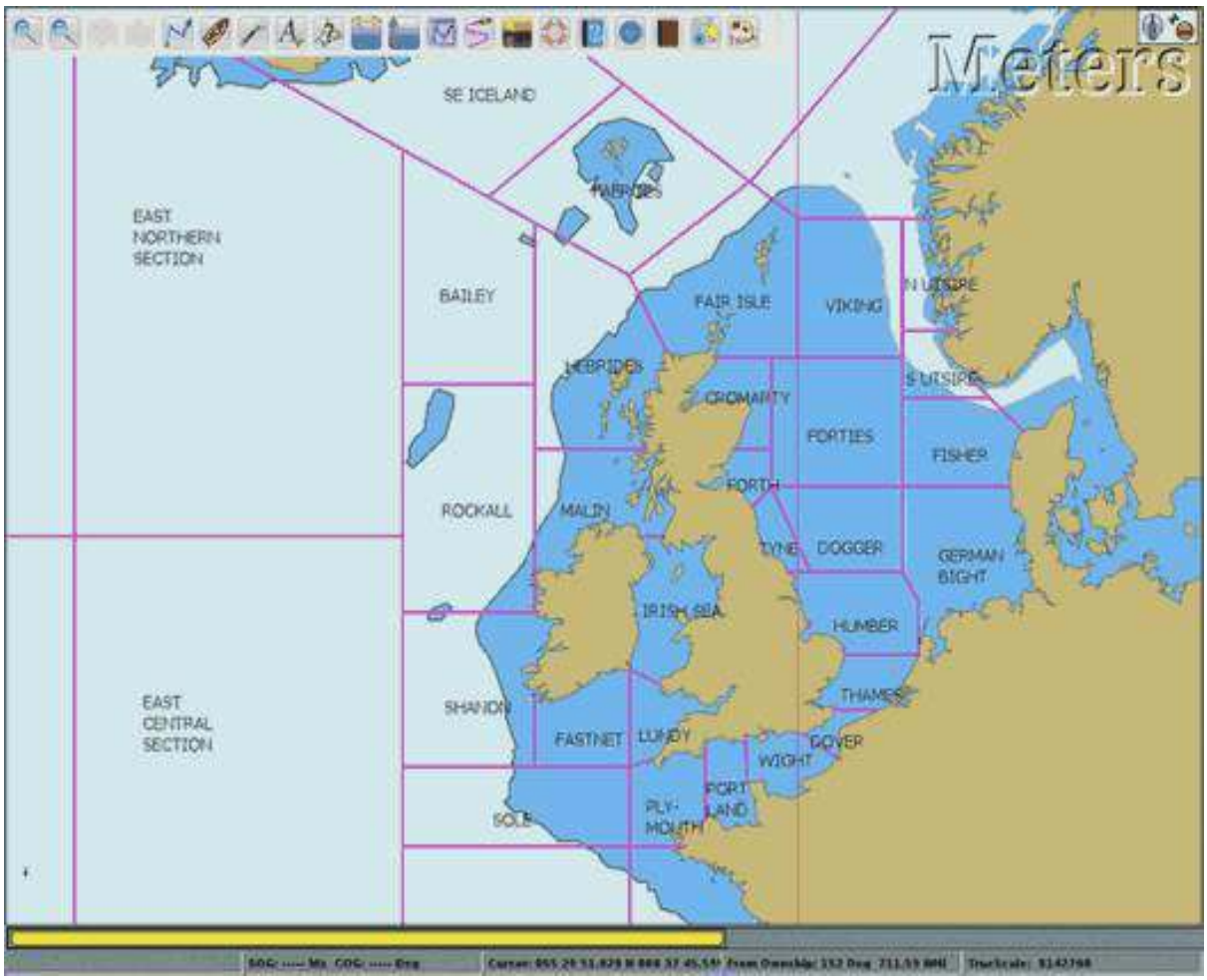
Layers are explained in the manual, read refer to

- Layers
- Route & Mark Manager

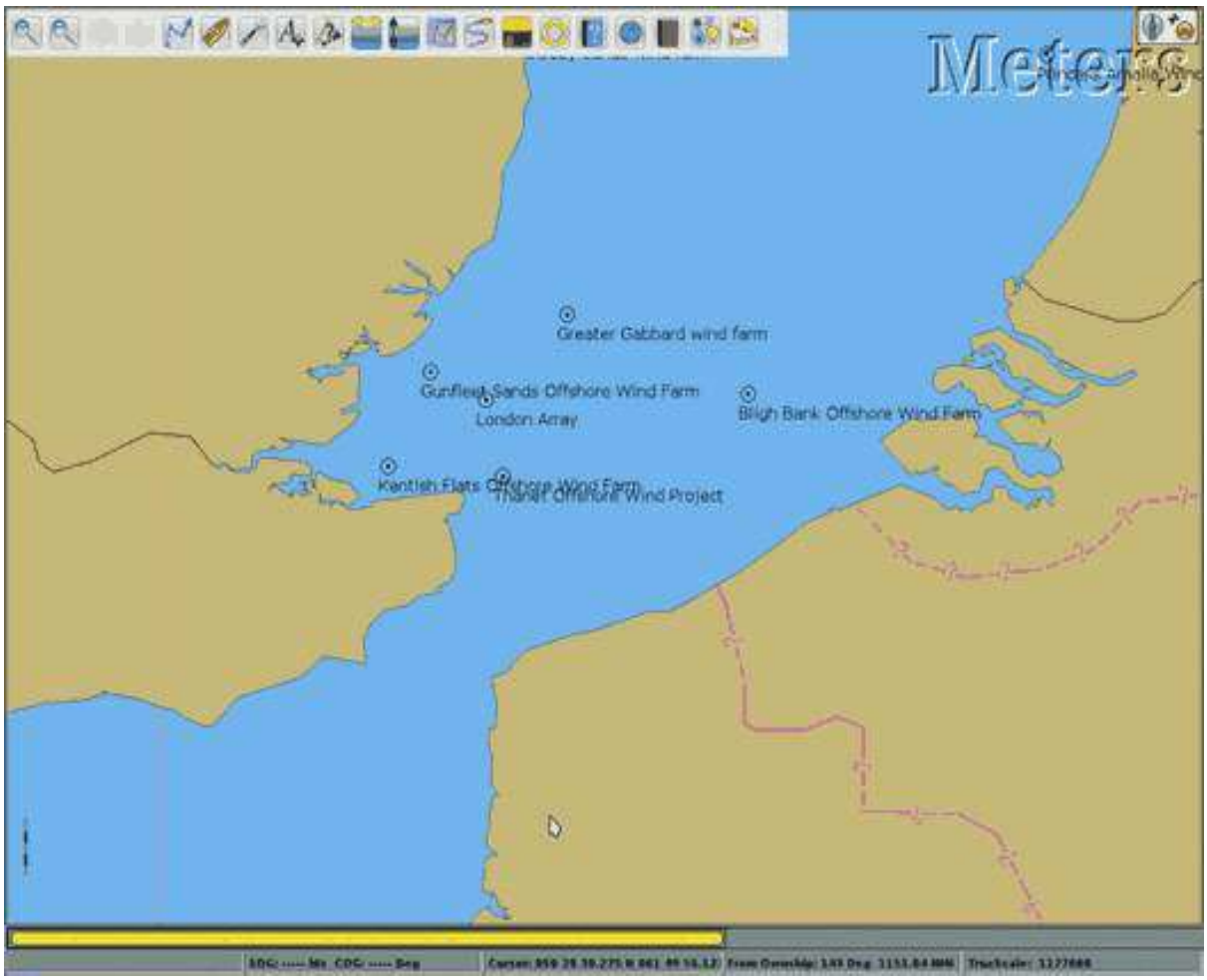
Some examples to start the library and the discussion.



Noaa buoy position layer based on a script that parsed the NOAA data. gpx file bouy_pos.7z[691]



UK Met Office forecast areas made manually with tracks and waypoints. gpx file Uk_fcst-areas.7z[692]



Some offshore wind farm areas. A kml file converted with gpsbabel.gpx file NEUoffshore_windfarms.7z[693]
Much more on this site www.justmagic.com/GM-GE.html[694]
Note that far from all kmz/kml are suitable for conversion. gpx file WEEZ.7z[695]

Chart Corrections

Timezone boundaries, one track per timezone[696]

Navigation marks, lights and AIS beacons.

AIS Beacons British Isles & French West Coast[697]
List of Lights.7z[698]

Offshore Wind Farms

Windfarms - windfarms.7z[699]
Windfarms 2 - neuoffshore_windfarms.7z[700]

Platforms

Platforms.7z[701]

Traffic Separations

TSS zones.7z[702]

Weather related

NOAA wx-buoy positions[703]
UK forecast areas[704]
French Atlantic forecast areas[705]
Worldwide forecasts[706]

Wrecks

Some Wrecks varia.7z[707]

Exclusive Economic Zones

Africa and West Asia.[708]
Antarctica[709]
Australia[710]
Canada[711]
Central America[712]
Dutch Overseas Territories[713]
Europe Northern Part[714]
Europe Southern Part[715]
France North Atlantic area[716]
France Mediterranean area[717]
France Overseas Territories[718]
Norwegian Overseas Territory[719]
Pacific Islands[720]
Russia[721]
South America[722]
South and East Asia[723]
UK and Channel Islands[724]
UK Overseas Territories[725]
USA including Overseas Territories[726]

- Refer to Route & Mark Manager
- Refer to Layers
- Refer to Layers Library

User Icons

A user can install his or her own icons to use with marks and "own ship".

The procedure goes like this:

1. Create a directory called “UserIcons” in the same place that holds your opencpn.ini(config) file.
In MSW this is the same folder that holds the log file. Easiest way to find this is to go to the  - button in the ToolBar and look all the way down in the first tab (About).
In Linux create the directory: */home/$USER/.opencpn/UserIcons*.

2. Add png icon files to this directory. Legacy **.xpm** iconfiles also works They can be any size. The name of the icon file becomes the name of the new waypoint icon. These new icons will appear on the Waypoint Properties dialog, and can be assigned to any waypoint. They can also be assigned in **GPX** Import files.

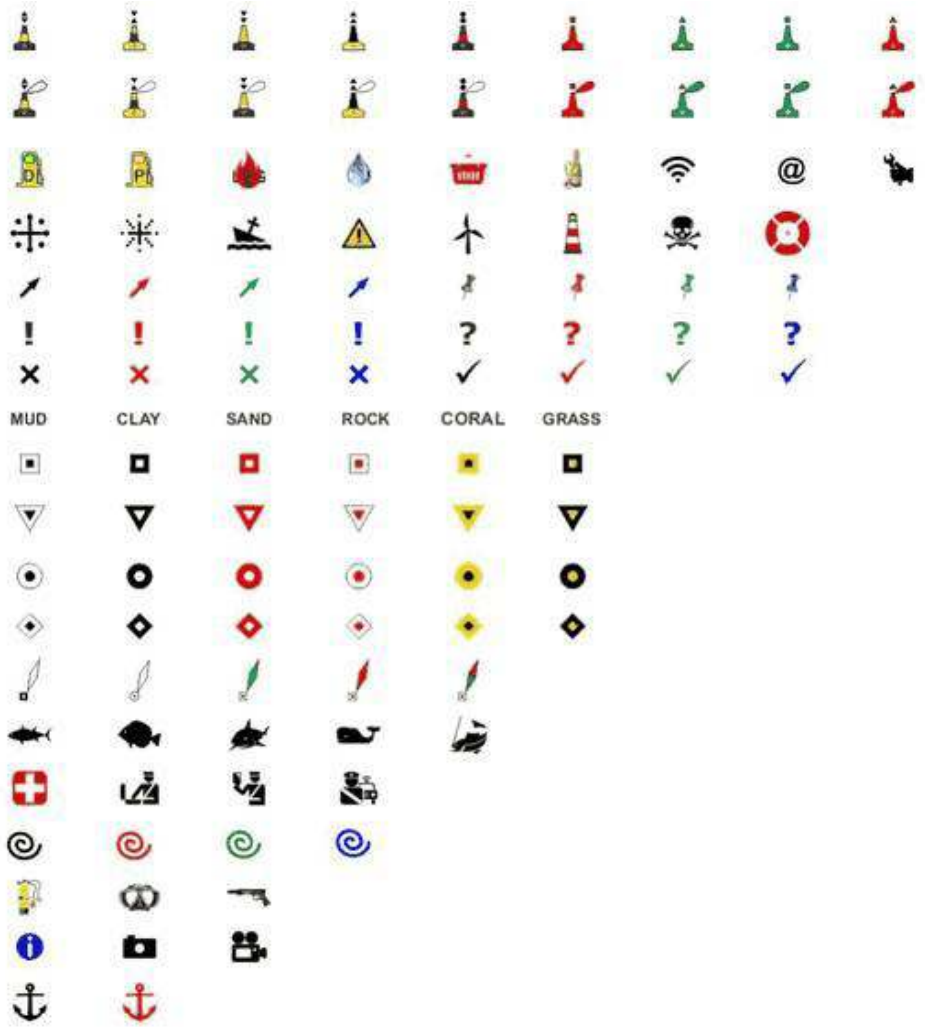
3.To replace the default own ship icon  , just put a file *ownship.xpm* or *ownship.jpg* in the UserIcons directory, described above.

4 For color-blinds and others, there is a yellow version  available. Use the link to “bigdumboat” below or the different alternatives from S/V Revelations. Before using any yellow OwnShip icons, consider the special meaning of this color for the OwnShip Icon in OpenCPN. Read more here *"GPS Setup and Status"*

Icons contributed by users of OpenCPN

Download by clicking on the links below.

General Icons by S/V Revelations



Download icons by "S/V Revelations[727]

Own ship Icons by "S/V Revelations"

Download OpenCPN-Ownship-Icons by S/V Revelations[728]

[729]
Icons by "glwyn380" glywn380.zip[730]
Icons by "Nohal" nohal.zip[731]
Icons by "sredna" usericons.zip[732]
Icons by "Surveyor" surveyors-usericons.7z[733]

Terminology

List of Definitions and Terminology

Definitions related to direction and speed as given in Bowditch 2002

Vector, n. Any quantity, such as a force, velocity, or acceleration, which has both magnitude and direction, as opposed to a SCALAR which has magnitude only. Such a quantity may be represented geometrically by an arrow of length proportional to its magnitude, pointing in the given direction. [Dutch: vector]

Velocity, n. A vector quantity equal to speed in a given direction. [Dutch: snelheid (in een bepaalde richting)]

North, n. The primary reference direction relative to the earth; the direction indicated by 000° in any system other than relative. True north is the direction of the north geographical pole; magnetic north the direction north as determined by the earth's magnetic compass; grid north an arbitrary reference direction used with grid navigation. [Dutch: noord, noorden, N]

True North, The direction of the north geographical pole; the reference direction for measurement of true directions. [Dutch: ware noorden, Nw]

Variation, n. 1. The angle between the magnetic and geographic meridians at any place, expressed in degrees and minutes east or west to indicate the direction of magnetic north from true north. The angle between magnetic and grid meridians is called GRID MAGNETIC ANGLE, GRID VARIATION, or GRIVATION. Called MAGNETIC VARIATION when a distinction is needed to prevent possible ambiguity. [Dutch: variatie, var]

Magnetic North. The direction indicated by the north seeking pole of a freely suspended magnetic needle, influenced only by the earth's magnetic field. [Dutch: magnetische noorden, Nm]

Deviation. , n. 1. The angle between the magnetic meridian and the axis of a compass card, expressed in degrees east or west to indicate the direction in which the northern end of the compass card is offset from magnetic north. **Deviation** is caused by disturbing magnetic influences in the immediate vicinity of the compass. Semicircular deviation changes sign (E or W) approximately each 180° change of heading; quadrantal deviation changes sign approximately each 90° change of heading; constant deviation is the same on any heading. Deviation of a magnetic compass after adjustment or compensation is RESIDUAL DEVIATION. Called MAGNETIC DEVIATION when a distinction is needed to prevent possible ambiguity. [Dutch: deviatie, dev]

Compass North. The direction north as indicated by a magnetic compass; the reference direction for measurement of compass directions. [Dutch: kompasnoorden, Nk]

NOTE:
Variation is the same as **Declination** See NOAA Geomagnetism[734] and Wikipedia[735] "Declination" (magnetic affects of the world) should not be confused with "Deviation"

(magnetic effects of the ship). That is the reason we are using the word **Variation exclusively**, as Bowditch does, for clarity and lack of confusion.

Nautical Acronyms

Definitions
The definitions below are for those terms commonly used in instrument systems and navigation. The abbreviations shown are those more commonly used and may vary from one manufacturer to another. The definitions likewise may vary.

Route (RT)- A route is a predefined path or passage from one point to another. Routes generally use a series of Marks or Waypoints at each course change. Waypoiints are Location Markers with specific Longitude and Latitude. The Route Legs between the Waypoints each have a specific Course and Distance.

Waypoint (WPT) - A waypoint marks a specific location, coordinates, or Latitude and Longitude, often determined by GPS. A Waypoint could be considered the ending point of a Leg.

Isochrones - While calculating a Weather Routing the plugin will calculate the location of the boat for a given time interval (eg: 1 hr, 4hr, 6 hr or 12hr) and an isochrone represents how far the boat willl sail in a given direction, based on the weather and boat conditions, for each successive time interval. Isochrones are like contour lines around the starting point. Think of them as showing an intermediate destination, and the calculated distancee traveled.

Apparent Wind (AW) – Wind speed and direction relative to the boat. Apparent Wind is measured in the frame of reference of the boat, which may be subject to boat movement through the water (propulsion by sails, engine, etc) and movement of the body of water itself (currents, tides, etc). Apparent Wind is relative to the boat.

Apparent Wind Direction (AWD) - Compass direction from which the wind is coming relative to the boat.

Apparent Wind Angle (AWA) – Apparent Wind Angle is expressed in angle to the bow of Ownship, in degrees to port or starboard of the Heading, as measured by the onboard wind instrument.

Apparent Wind Speed (AWS) – Wind speed relative to the boat as measured by the onboard wind instrument

Average Speed (AVS) – Average Boat Speed through the water. (Trip Log / Trip Time)

Bearing to Waypoint (BTW) – Compass bearing to active waypoint measured from the current position.

Bearing Waypoint to Waypoint – Compass bearing to a waypoint measured from the previous waypoint.

Boat Position (POS) – Latitude and Longitude of the boat

Boat Speed (BSP or STW) – Sometimes called **Speedo** Speed of the boat through the water as measured by the onboard speed transducer.

Compass Course (CC) - The course steered from the magnetic compass using adjustments for True, Variation and Magnetic Deviation values. True-Variation-Magnetic-Deviation-Compass (TVMDC) values.
Course (CRS) – Compass direction that the boat is moving through the water (HDG + Leeway). Note that the difference between CRS and COG is Current. **CRS** does not include the effect of current.

Course to Steer (CTS) - The course to steer to offset the effect of currents, wind and other factors.
Speed to go (STG) -

Course Over Ground (COG) – Actual Compass direction that the boat is moving over the surface of the earth. (HDG + Leeway + Current) "The actual course you are moving along at the moment relative to the fixed land, meaning actual direction you travel regardless of the course steered and temporary variations in heading around this course. Things that cause COG to differ from heading include: current, leeway, poor helmsmanship, or compass errors." Often derived from GPS.

Speed Over Ground (SOG) - The speed actually achieved which includes the effect or current set (direction) & drift (speed), wind and leeway and helmsman errrors. Same as SMG. Often derived from GPS.

Course Made Good (CMG) - Is the course actually steered which includes the effect of current set (direction) & drift (speed), wind and leeway and helmsman errrors. Note we distinguish COG (course over ground) from cmg (course made good), as one being present dynamic value, and the other being past. The phrase "course made good," can be used to refer to a single track line or to the combination of several course changes between two points. If i sailed 1 mile north and 1 mile east, i made good a course of 045. Or, if i tried to sail course 200 but was being set between 10 and 20°, then i might end up "making good a course" of say 214. The distinctions between terms is not often critical, but may help to clarify some communications.

Speed made good (SMG) - The speed actually achieved which includes the effect or current set (direction) & drift (speed), wind and leeway and helmsman errrors.

Cross Track Error (XTE) – The perpendicular distance from the direct route (rhumb line or great circle) between two waypoints to the current position of the boat (POS)

Dead Reckoning, also Ded Reckoning (DR) - Dead reckoning is the process of determining one's present position by projecting known or estimated course(s) and speed(s) from a known past position, or predicting a future position by projecting known or estimated course(s) and speed(s) from a known present position. The DR position is only an approximate position.

Drift (DFT) – Speed that the water is moving. This movement may be caused by a number of factors, including; tide, ocean currents, river flows etc.

Electronic Chart Display & Information System (ECDIS) – An ECDIS is a computer-based navigation information system that complies with International Maritime Organization (IMO) regulations and can be used as an alternative to paper nautical charts. IMO refers to similar systems not meeting the regulations as Electronic Chart Systems (ECS)

Electronic Navigational Chart (ENC) - An ENC is an official database created by a national hydrographic office for use with an ECDIS. An ENC must conform to standards stated in the International Hydrographic Organization (IHO) Special Publication S-57 before it can be certified as an ENC. Only ENCs can be used within ECDIS to meet the International Maritime Organisation (IMO) performance standard for ECDIS.

Ground Wind (GW) Wind speed and direction relative to the ground (same as landspeople's true wind). Ground Wind direction is expressed in compass direction. Ground Wind speed and direction is also relative to boats anchored or moored and stationary relative to the earth. Ground Wind is used in weather forecasts and reports.

Ground Wind Direction (GWD) - Wind direction relative to the ground (same as landspeople's true wind). Ground Wind direction is expressed in compass direction.

Ground Wind Speed (GWS)- Wind speed relative to the ground.

Heading (HDG, HDT, HDM) - Compass direction in which the boat is pointed. The abbreviations HDT and HDM are typically used to distinguish between heading degrees true and heading degrees magnetic, whereas HDG does not infer either a true or a magnetic heading. Whether HDG displays true or magnetic values, will depend on sensor selection and system setup.

Heel (HEL)– Heeling Angle in degrees of the port/starboard inclination of the boat. Heeling angle is associated with the boat's lateral movement, or Leeway

Layline – Theoretical COG that will be achieved if the current conditions (TWD, TWS, TWA, SET, DFT, BSP, HEL etc), remain constant. There are port and starboard laylines that represent port and starboard tacks (or gybes). There are boat laylines, which emanate from the boat, and waypoint laylines, which emanate from the active waypoint. They are used to indicate when it is beneficial to tack or gybe.

Leeway – Leeway is the angle between the HDG and the CRS and results from the lateral movement experienced by the boat as she moves forward through the water.. The empirical formula is that
Leeway = -1 * k * Heel / BSP^2. The formula itself is often called into question, especially with planning hulls. The k value, which is boat specific, will vary according to crew numbers and boat loading.

Log (LOG) – Record of distance travelled

NMEA National Marine Electronics Association has several standards NMEA0183 and NMEA2000. Nmea2000 uses manufacturer PGN's. Two Links for Nmea 0183 NMEA0183 Sentencesand NMEA0183 Revealed[736]

Set (SET) - Compass direction of moving water (In the direction of the moving water). This

movement may be caused by a number of factors, including; tide, ocean currents, river flows etc.

Speed Over Ground (SOG) - Speed that the boat is moving over the surface of the earth or ground.

Speed Polars – Theoretical values for maximum BSP for a range of given TWSs and TWAs.

Target (Boat Speed) – (BSP) Theoretical values for TWA and BSP for a range of given TWSs that result in the highest VMG. It is derived from the Speed Polars.

Track (TRK) – A record of the ships position as it proceeds on its voyage.

True Wind (TW) - Wind speed and direction relative to the surface of the water. Sailors sail in the interface between air and water, therefore mariners' True Wind is relative to water and different from landspeople's true wind. True wind is perceived when the boat is stationary in the water, but moving with the tide or current; similar to the wind in the plane of reference of a stick floating down a river.

True Wind Direction (TWD) - Compass direction from which the wind is coming over the surface of the water.

True Wind Angle (TWA) - True Wind angle is typically expressed as angle to the bow of Ownship. Note that mariners use the expression Wind angle relative to the bow in degrees to port or starboard of CRS
(some instrument systems do not consider leeway in the calculation of TWA and in this case TWA is the wind angle relative to the bow in degrees to port or starboard of HDG).

True Wind Speed (TWS) - Wind speed over the surface of the water.

Velocity Made on Course (VMC) – Speed achieved directly toward the active waypoint. The value of VMC changes the longer the tack. VMC decreases the greater the angle to the mark, until on the layline where it turns to "0" and then starts getting negative because the distance from the mark is increasing.

Velocity Made Good (VMG) – Speed achieved directly towards, or away from, the TWD. The average value of VMG is an indicator of optimum sailing angle, and should be used as a general indicator, however the skipper should be using Target Boat speed to sail at the optimum tacking angel.

Estimated Time of Arrival (ETA) ETA is not an accurate way to judge progress or performance in a tacking sailboat because it does not account for the greater distance sailed between waypoints. VMC (to Waypoint or Course) changes the longer the tack is (VMG decreases dramatically as the boat gets to the 'layline' for the mark, because of the increased angle from the mark) and VMG (to Wind) has similar problems because it is not relative to a destination. So these terms are not effective for sailing.

Tacking Time to Destination (TTD) Calculates in advance how long it will take to tack (or jibe) a sailboat to a particular destination in particular wind conditions, including factors such as wind changes, currents, waves, boat polars, sail and boat bottom conditions. An

approximation of performance. [From Sailtimer documents]. **Tacking Time to Destination TTD** may also provide a better measure of performance than ETA and VMG. Tacking performance is commonly judged by using **Target boat speeds** now.

Time to go (TTG)

Turn Rate The AIS class A “Turn rate” signal normally comes from a gyro or satellite compass. It's not calculated by the AIS itself.

Heading Rate Heading rate is the rate of the heading which is typically derived from a magnetic compass. This is the absolute orientation of the boat.

AWA Apparent Wind Angle
AWD Apparent Wind Direction
AWS Apparent Wind Speed
GWA Ground Wind Angle
GWD Ground Wind Direction
GWS Ground Wind Speed
TWA True Wind Angle
TWD True Wind Direction
TWS True Wind Speed
VMC Velocity Made Good (to Waypoint, course)
VMG Velocity Made Good (to Wind)
POS Boat Position
SPD Boat speed thru the water
SOG Speed over ground -Gps
COG Course over ground (Includes the effect of HDG + Leeway + Current) -Gps
CRS Course - Compass direction that the boat is moving through the water (Includes effect of HDG + Leeway).
Track
HDG Heading Compass direction in which the boat is pointed.
HDT Heading Compass True direction in which the boat is pointed.
HDM Heading Compass Magnetic direction in which the boat is pointed.
DFT Drift -Speed that the water is moving.
SET Compass -Direction water is moving towards
Leeway Angle between the HDG and the CRS
LOG Record of distance travelled
XTE Cross track error
ETA Estimated time of Arrival
TTG Time to Go
BSP or **Target Boat Speed** for various points of sail in various winds for optimal performance.
TTD Tacking time to Destination

FAQ

Where is my log file?

Read this explanation - *Getting Started*

Where is my config.ini file?

Read this explanation - *Getting Started*

Where can I download the User Manual?

It is downloaded with the software, so use "**?**" icon and then "**Help**"! It is also available on the Website Download page[737] Then scroll to the bottom under ARCHIVES.

How to find all those files you are talking about?

A big contributing factor to this problem is that Windows default settings hides system files, and also by default, don't show file extensions.

1. These settings can be changed however.
2. In XP go to *My Computer* → *Tools* → *Folder Options* -*View*. Mark "Show hidden files and folders" and uncheck "Hide extensions for known file types".
3. Other versions of Windows are similar, but may not be exactly like this.

Now you should find the files we talked about in the previous paragraph.

Is there a compatible Hardware List?

Keeping an updated list of all the devices available is virtually impossible.

1. As long as your device is able to produce NMEA 0183, OpenCPN most likely won't have any problem understanding it.
2. Rather than looking for a list, which can't contain everything, ask in the support forum whether your equipment of choice is likely to work with OpenCPN before going shopping.
3. If still looking for lists, you may like the following links
   a. Information about connecting various devices to OpenCPN:Supplementary hardware[738]
   b. Radars for OpenCPN: Radar Overlay

Can OpenCPN receive multiple data streams from a USB hub?

- Yes. Simple Setup. The USB Hub with the device drivers creates a separate Virtual COM port for each USB at the required speed. OpenCPN then acts as the Multiplexer when you make separate Connections for each of the virtual COM ports created.

Example:

- Inateck USB3.0 3-port hub with gigabit ethernet port $20
- Bu-353-S4 GPS puck[739] $25
- dAISy AIS Receiver[740] $70
- Tiny Seatalk Link[741] $150 for Raymarine Instruments (up to ST60).
- Label the ports for the devices and use those ports or you'll be redoing OpenCPN “Connections”.
- Install each device's drivers.
- or another example, Vesper AIS and RS422 NEMA instruments.
- For more about Supplementary Hardware[742] or consult with a marine electronics service.
- A multiplexer will join multiple sources into a single output to OpenCPN. Multiplexers come in a great variety, to do many different jobs, read the specs.

Is there an ipad or iphone version of OpenCPN?

- OpenCPN runs with many OS including Android, Linux (many flavors), Windows & MacOS.
- OpenCPN will never work directly with iphone because the iphone store limits production of a version of OpenCPN.
- OpenCPN can be used on an iphone with VNC.
  - Use a small Linux computer like Raspberry Pi 3 running Openplotter.
  - Then use a VNC viewer in full screen mode on an iPhone or iPad to view the RPi screen over Wi-Fi.
  - Put OpenCPN on the RPi and you effectively have OpenCPN on an iThing.
  - You can get the RPi for <$50 US.
  - Screenshot of VNC with an iPad or iPhone

Trouble with Installation, finding Charts, and connecting GPS & Instruments.

1. *OpenCPN Installation*
2. *Chart Files Tab*
3. Installing Charts with Chart Downloader Plugin *Chart Downloader*
4. Installing GPS *GPS Setup and Status*
5. Instruments - Devices must provide NMEA 0183 data via Serial or Network with a range of protocols and settings available. The description for connecting to hardware is in the Options > Data Connections section. Connections and for additional assistance *NMEA Sentences*
6. See Supplementary Hardware[743]

7. Also read Supplementary Software[744] which has information about using an Android Phone's GPS[745], etc.

OpenCPN crashes, what should I do?

1. It is highly unlikely that uninstalling and reinstalling OpenCPN is going to resolve anything, really. But if you can't resist the temptation, help yourself, it is equally unlikely that it makes the things worse.
2. You should have a look into the logfile to find out whether it contains some clues that could help isolate the problem. If the crash is related to displaying a chart, try to isolate on which one and create the simplest possible scenario we could reproduce. You should try to get fresh charts.
3. You should try disabling OpenGL if it is enabled or vice versa.
4. While OpenCPN is not running, move the complete data folder (*C:\ProgramData\opencpn* on Windows, *~/.opencpn* on Linux *~/Library/Preferences/opencpn* / on Mac) to a backup location and see whether something was rotten in your local OpenCPN data. Do **not** delete it if you want to keep your waypoints, routes and tracks!
5. If on Linux, run opencpn from command line and see whether it produces a backtrace to help identify the cause of the crash.
6. Still on Linux, you can use gdb or another debugger to get the backtrace and help identify the cause of the crash.

Why is recently updated OpenCPN performing badly?

1. Look in the opencpn.log file. Try closing Opencpn, deleting the opencpn.log file and then reopening OpenCPN to create a new log file, then use Opencpn to cause the trouble again. Then look at the Log file to find messages that are associated with the problem.
2. Verify the problem is not from an old and outdated opencpn.ini file. Rename your opencpn.ini file for possible reuse later, and restart Opencpn to create a fresh new opencpn.ini file. Test for the problem.
3. Do you have Chart Display problems? Try turning on or off OpenGL and Running update of the Chart Database.
4. Do you have a problem with paid charts? see Oesenc or ocharts.
5. Do you have old plugins? Disable and uninstall all external plugins with the plugin uninstall program. Test OpenCPN and then download new updated plugins and install them one at a time and test.
6. Final Resort: Try starting over by uninstalling Opencpn following this approach.
    - Go to the ProgramFiles “OpenCPN” folder, and use the uninstall programs, preferably starting with the plugins, and ending with the OpenCPN.
    - Check that the “opencpn” initialization folder of program data has been removed. Otherwise, do it manually.
    - Use the CCleaner software to clean the PC Windows registry in particular. (option)
    - Download OpenCPN again and all the plugins you need.
    - Install OpenCPN.
    - Run OpenCPN to verify that the operation is correct.
    - Install, one by one, the plugins you need.
    - Run each plugin before installing another one

I have a problem so I reinstalled, but that did not help.

- Try this approach instead - *Troubleshoot Installation[746]*

GPS: A stupid question. When a GPS position is used as a waypoint to goto, is it using a great circle route?

When you “Navigate to” a waypoint from OpenCPN, he does the following:

1. Create a temporary route from current position to selected point. The route has only two points, start and end.
2. Activate that route.
3. If a suitable output connection is available, he sends the following NMEA messages periodically to that port.
    - ECRMB
    - ECRMC
    - ECAPB
    - ECXTE
4. The Cross-track error (XTE) output by OCPN is calculated as for Rhumb Line Sailing, i.e. straight line on Mercator chart.

If an autopilot is steering the boat, it may choose to follow GC route if it wants to. The current GPS position and the target waypoint position are available in the messages sent above.

If the A/P uses only XTE, then it is sailing Rhumb Line. Alternatively, if it ignores XTE, and computes a running GC course based on the target waypoint location and current ownship position, then it is doing GC Sailing.

If the A/P is doing GC Sailing, then you would see the XTE reported by OpenCPN diverging from zero, as expected.

Of course, other chart plotters may do this differently from OpenCPN.

Personally, I wonder why we care. Rare indeed would be the case in which a two-point route long enough to benefit from GC Sailing would be traveled without need to change course for other tactical reasons (weather, traffic, etc.). Could happen with a large motor vessel, I suppose…

Users generally prefer rhumb line because

- Course does not keep changing.
- A route on any normal paper chart is a rhumb line. If my plotter uses the same rhumb lines everything matches, such as XTE, courses and distances.

GPS is not found by OpenCPN, but my GPS is working!

- See Getting Started > GPS Setup
- But I know my GPS is working because the GPS program shows that it is working fine. Have you closed that program before trying to connect OpenCPN to the GPS? **Only one**

program can connect to the GPS at a time.

GPS Program (EG: Delorme Earthmate LT-20) is recognized by Win10 and position is shown, but OpenCpn Connections does not have a GPS Comm Port available

If you can “see” your position in the Win10 GPS Program, OCPN would also find it if you:

1. Disconnect the GPS Device from any program using the assigned Com port.
2. Connect OCPN to the same Com port using the correct baud rate.

See OCPN wiki how to find what Com port to use[747]

GPS Puck only works sometimes. What is wrong?

- Make sure you have downloaded the latest drivers. For BU-353-S4 use USGlobalsat Corporate[748]
- Older Globalstar models (before BU-353-S4) don't work well with Windows after W7.
- Always plug the Puck into the same usb port. (Label your USB Hub ports with each USB device to be connected.) This is not a requirement but it makes the connections more reliable and trouble free without having to change Opencpn settings each time.
- Another approach for Windows Users:
  - When the GPS is inserted into a USB port, the comuter assigns a COM port number to that device. Go to Device Manager and look for the line Ports (COM & LPT). Click on the > to the left of this line. The newly installed device will be listed. In the case of many GPS units the driver will be listed as 'Prolific USB-to-Serial Comm Port (COMX)', where 'X' is the number that has been assigned by the computer to that USB port for that device.
  - If you now insert the GPS into another USB port you will find the computer assigns a different number to the GPS.
  - To setup your computer for maximum convenience in being able to insert the GPS into any USB port and have the same COM port number (making OpenCPN happy) you can change all USB ports to have the same COM port number for the GPS.
  - Procedure: Right-click on the line “Prolific ….”. Left-click on 'Properties'. Open the tab 'Port Settings'. Click on the button 'Advanced'. Click on the elevator button. Scroll to the COM port number you want to use for the GPS in all USB ports and click on it. (I use COM1) Click on 'OK' twice. The COM port number you selected appears in the 'Prolific … ' line. (Older versions of Windows requires refreshing)
  - But only this USB port has been changed. To make other ports the same remove the GPS and plug it into another port. If you left the Device Manager page showing you will see the 'Ports (COM&LPT) line disappear and re-appear. The 'Prolific …' line will show another COM port number. Follow the procedure above to select the same number you first used. This time when you display the list of COM ports your target COM port will show '(in use)' after it. Disregard and select it. Click on 'OK'. This brings up an error window 'Communications Port Properties' advising the selected COM port number is being used by another device etc. Click on 'Yes'. When the windows clears click on 'OK'.
  - Repeat the above for the rest of the USB ports. Now it doesn't matter which port you happen to use for the GPS the assigned COM port number is the same.
  - Now go to OpenCPN and select your common port number under Options/Connections.

GPS is installed and I think its working, what next?

1. *OpenCPN Installation*
2. Perhaps you'd like to download some charts? We suggest using Chart Downloader.

Charts used to show, but using 3.0.2 and later, they no longer work.

1. OpenCPN used to display charts with an unknown projection as a Mercator chart. The same thing applies to an “UNKNOWN” or not recognized geodetic datum, where OpenCPN used to default to WGS84.
2. This is no longer the case. If OpenCPN don't recognize the chart projection, it will not be displayed.
   - Potentially serious errors are thus avoided.
   - The event is logged in the opencpn.log.
   - Users may run into problems if a chart projection is stated as “UNKNOWN” even though it really is a prefect Mercator chart.
3. Unfortunately, some conversion tools take a shortcut and don't enter the “PR” tag in the kap-chart-header correctly.
   - The projection of a chart can always be found, and the “PR=UNKNOWN” should always be avoided.

Official charts that OpenCPN really can't display, with a latitude < 70 degrees north/south, are very few indeed. Really only a handful of legacy, Gnomonic, large scale charts. Charts with “UNKNOWN” or blank geodetic datum are best avoided, they may be dangerously inaccurate.

Many error messages when starting OpenCPN from Linux command line.

Messages like:

- “`ALSA lib pcm.c:2217:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.side ALSA lib audio/pcm_bluetooth.c:1614:(audioservice_expect) BT_GET_CAPABILITIES failed : Input/output error(5)`” or
- “`(opencpn:8979): Gdk-CRITICAL : IA_gdk_drawable_get_size: assertion `GDK_IS_DRAWABLE (drawable)' failed`”
- `'(opencpn:8979): Gdk-CRITICAL : IA_gdk_drawable_get_depth: assertion `GDK_IS_DRAWABLE (drawable)' failed Error opening coefficient file“`
- ”`(opencpn:8979): Gdk-CRITICAL : IA_gdk_window_get_origin: assertion `GDK_IS_WINDOW (window)' failed“`

are quite normal and have nothing to do with OpenCPN. Just ignore them!

Toolbar is not visible in OpenCPN 4.8.4 and 4.6.0 under Ubuntu

Apparently sometimes Toobar works and sometimes not. When the toolbar is not visible, the problem is that ocpnToolbarDialog was created with very small dimensions. See Github Issue #820[749] for how to edit the config file.

Why doesn't the plugin work?

1. See Plugin API Versions[750]
2. It is best to keep OpenCPN and plugins updated to the most current version.
3. If you are having trouble, it is likely you will be asked to update plugins and Opencpn to be current.

When will OpenCPN be ported to Android?

1. There are two versions in the Google Play Store. We suggest you will be happiest with the paid version created by D. Register because it is updated regularly and is current. There is a forum at http://bigdumboat.com/aocpn/forum/[751].

Why do vector charts take so long to load?

1. The behavior you see is expected for ENC charts. ENCs must be converted to internal SENC format before use for navigation. This takes a little bit of time, depending on your system capabilities. But it only has to be done once, and the converted SENCs are stored on your system for later use.
2. All ECS systems must convert ENCs to SENCs. Some take longer, (like OpenCPN), so that subsequent access is faster. Some convert faster, leaving more work to do at the time of actual chart display. Its a design decision. OpenCPN is optimized for speed in real use, not for speed in conversion.

Why don't charts show at all zoom levels while quilting is enabled?

1. If I turn off quilting, I can select the individual maps just fine and zoom to any level on them. No amount of clicking/hiding the maps using the map bar at the bottom of the screen show the maps. Only a zoom allows them to be seen. This problem of disappearing maps happens all over the country at different zoom levels.
2. Answer: OpenGL is turned off. Without OpenGL, OpenCPN will not quilt Mercator and Transverse Mercator charts together. Try enabling OpenGL with Options (wrench tool icon)> Display> Advanced. Click on the box between “Graphics” and “Use Accelerated Graphics (OpenGL)” to put a checkmark in the box.
3. When OpenGL is enabled, OpenCPN will quilt Mercator and Transverse Mercator charts (and some other projections).
4. If “Texture Compression with Caching” is enabled under “OpenGL Options” there will be a delay before each chart is displayed for the first time. Subsequent display of the charts in the cache will be faster.

Whenever a specific chart is opened, OpenCPN crashes. What's going on?

- Chances are the chart file is corrupted.
- Note the name and number of the suspect chart and replace it with a fresh download.
- Read the log file that may contain relevant information regarding the chart.
- Sometimes the bad chart blocks OpenCPN from restarting.
- Follow these instructions instead Troubleshoot Installation[752]

What are all those 'U' s or '*' astericks in triangle all over my Vector Charts?

On the water areas, there are triangles shown with a varying number of stars inside

them. What does this represent and is it possible to avoid the triangles being shown?

Most users just want to get rid of the triangles, but please refer to the Quality of Data Documentation.

1. In *Options* > *Charts* > *Vector Charts Tab* when using Display Category "All", Uncheck *"Chart Information Objects"* which hides the "U" symbols .
2. In *Options* > *Charts* > *Vector Charts Tab* for a finer grain control when using Display Category "Mariners Standard", In the selection List Box, Uncheck *"Quality of Data"* which hides the "U" symbols.

What are those acronyms on the charts?

To learn the acronyms used in this application search the S57 'Object and Attribute' catalog at: http://www.s-57.com/[753]
Also, when viewing ENC charts:

1. "U's" show up all over the charts
2. Text detail seems to be missing ..like bouy identification ..Bridge names and clearances etc…
3. Depth sounding seem to disappear zooming in and out.

Hit Text: The *A+* button. To show text.

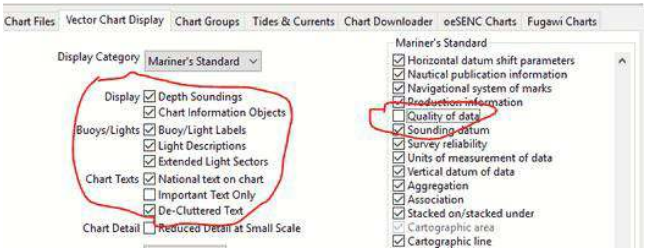
How to remove those pink crosses (isolated anger symbology)?

This isolated danger symbology is a part of the new ENC S57 presentation standard which OpenCPN complies with, get used to it. OR You can try to cover them with your depth setting. Look at the manual Vector Display Tab > Shallow, Safety & Deep Depths Safety Contour", where you will find an example of just how depth is taken into account when displaying the magenta cross.

- Safety Depth = 2 meters almost of the pink crosses are covered, but not those in depths 2-5m.
- Safety Depth = 10 meters all pink crosses are covered and you have lost your pink friends.

Why don't the vector charts have names on towns, ports and waters?

Chart text can quickly be hidden/shown by the key "T" but be sure to have correct text options checked, see below. Alternatively click on the "A+" Icon in the toolbar. If still no joy, make sure you do not have the texts disabled in the configuration Options > Charts > Vector Display Tab[754]. Also see Chart Text Settings[755].



What are those black regions associated with ENC CM93 shipping lanes near Gibraltar?

1. The black regions never seem to go away, but change the Vector Chert Setting, “Boundaries” from “Symbolized” to “Plain” and the problem is resolved. These may be hatched/plain areas when changing the settings, or perhaps some national water delimitation is drawn plain or fine-dashed (Gibraltar).

Many of my Navobjects and waypoints disappeared. Why?

1. Try using the “V” shortcut key which shows/hides Hides/shows all navobjects. The only exceptions being the active route and track which are always drawn on the chart canvas.

Kap files are no longer displayed correctly. Why?

1. Old versions of OpenCPN were correcting broken KAPs on the fly. (They work on 3.2 but not on any 4. release) The new ones don't do it anymore as the number of damaged charts circulating around decreased significantly and we gained some extra performance during chart loading. Refer to these sections of the User Documentation too.
2. Chart Conversion Manual[756] Specifically libBSB and ImgKap and Kap files.
3. To fix your charts, run bdbfix on them.

What causes spurious waypoints which must be deleted?

1. Condition: Multitude of repeated waypoints, which get copied when a waypoint is dragged. Sometimes a route WP is shifted, two routes are made, one with the name, the other unnamed.
2. Possible Solutions: Determine if the addition of waypoints are from inadvertantly hitting the wrong keys on the keyboard, or the mouse.
3. The other possiblity is that the navobj change file is corrupted. Close O and try to delete the change file In W8.1 it is found in C:\ProgramData\opencpn/navobj.xml.changes. Normally, after that O will work again.

Can I use my Seaclear wci or OziCharts?

See Use-seaclear-wci-charts[757] and Oziexplorer to Opencpn[758] Also see Not supported formats that can be converted[759] and Map2Kap and WCI Charts

Can I import SeaClear routes and waypoints into OpenCPN?

- Yes. I had originally created and maintained all my routes and waypoints in SeaClear, exported them, loaded them into GPS Utility (for Windows) and saved them as text files.
- To import into OpenCPN I opened all my text files (routes and waypoints) with GPSUtility, saved that out as one big gpx file, and loaded it into OpenCPN. Works like a champ.
- I've edited them and saved them back out as GPX files with no trouble.
- Individual routes can be edited and saved in appropriately named GPX files.

Can I import Maxsea Waypoints and Tracks?

No, not directly, they are in different formats. But you can convert them with the GPS Utility Program. Here's an older writeup Conversion of MaxSea Routes and Tracks[760] Use an external tool to convert the proprietary Maxsea data to the open GPX format. Either the free C2GPXKML[761] or shareware GPSUtility[762] could help. Also if you have access to Maxsea, export all waypoints as Gpx and OpenCPN will read the gpx file. If different color waypoints is used, export them separately and and in a text editor change icon name to an icon used in OpenCPN.

How to synchronize Routes, Waypoints & Marks with another computer?

Three ways to synchronize:

- From the *Route & Mark Manager > Route Tab*, select “Export all visible” or highlight select routes and “Export Selected” to a gpx folder. Then use saved gpx file to import the Routes to another computer. For Marks pick the Waypoint Tab, select “Export all visible” or highlight select waypoints and “Export selected” to a gpx folder. Then import waypoints from the other computer.
- Copy the navobj.xml file to the second computer's navobj.xml file, which will overwrite your routes and marks on that computer. If you are connected via a network you can make a batch file to do this.
- To copy all waypoints or routes, make a copy & rename the navobject.xml file to .gpx file and import the waypoints, routes and/or tracks. This does all waypoints/routes/tracks at once.

The navobj.xml file resides in the same folder as the opencpn.ini settings file, under the OpenCPN User folder. For windows this is usually “C:\programdata\opencpn\”. The navobject.xml file is in in fact a .gpx file containing all waypoints/routes/tracks. See Navigation Data Backup for more information.

Make a script or batch file to copy to navobject.xml file. Make an icon for the batch file on your desktop. Examples: Make an icon for the batch file on your desktop.

Copy-Routes-AB.bat

```
Copy \\ComputerA-name\C:\ProgramData\opencpn\navobj.xml \\ComputerB-
name\C:\ProgramData\opencpn\navobj.xml
```

Copy-Routes-BA.bat

```
Copy \\ComputerB-name\C:\ProgramData\opencpn\navobj.xml \\ComputerA-
name\C:\ProgramData\opencpn\navobj.xml
```

For more discussion see Cruiser Forum Thread Real-time sharing waypoints and routes[763]

Can I restore my Route, Wpts or Track from backups? Somehow?

If you did delete the original [route, wpt, track], you may still have an automatic backup in an older navobj.xml.[1-5] file. Don't restart Opencpn again, until you retrieve the data you want. See Navigation Data Backup for more information.

I converted a Track accidentally to a Route. Can I get the track back?

This depends on what “a bit ago” actually is - (if you have since started OpenCPN more than 5 times, every time did some change to the navigation objects and did not change the default settings for backups, you don't have it anymore) - If you do not have that backup anymore, you may still export the route as GPX file which you may later edit in a text editor and make a track again (But you already have lost some precision as during the conversion to route the points recorded in the original track are interpolated to limit their total number) - Later: your track seems to still be there as the yellow highlight it has seems to be visible, so you should be good just deleting the route.

Imported Routes, How to remove duplicates easily?

Deleted all routes in the Route & Mark Manager. Found a gpx Route File folder under documents on my computer. Importing all gpx routes into Route & Mark Manager from Route folder by highlighting all the routes. Now multiple routes with the same name show. How can I correct this. Importing a route at a time is tedious.

I had previously exported all visible routes and had that file in my GPX Route folder. What happened: I imported single listed routes by highlighting all the files in my GPX Route folder. However I didn't notice the gpx file which had a group of routes contained in it. Once I removed the gpx file with a group of files, the import gpx worked as anticipated.

Jumping GPS!

GPS AIVDO Boat Position is Jumping many miles away.

- See this entire thread. http://www.cruisersforum.com/forums/f134/opencpn-jumping-map-194531.html#post2535508[764] You will need to use OpenCPN NmeaData Window and a Free nmea decoders[765] and a program like Notepad++ to figure out what the offending sentences are.
- Remember that “The NMEA standard uses two primary sentences to for AIS data !AIVDM (Received Data from other vessels) and !AIVDO (Your own vessels information)” AIS - Automatic Identification System - Information[766]
- Problem may be from having two different Own Ship position signals at the same priority, with the additional problem that AIVDO sentences position, sog & cog are just wrong. 1. First disable all but one GPS signal. (Disconnect or turn off.) 2. Stop sending AIVDO (Use either hardware or software settings.) 3. Filter out all AIVDO messages completely. See the User Manual > Connections > Filters[767] put “AIVDO” in the Input filtering line.

Why is own ship pointing towards COG instead of directly towards the bow, and there is no magnetic heading?

Enable thw WMM World Magnetic Model please.

It makes no sense to use magnetic on true north facing mercator projections.

Ownship true north heading predictor is only displayed if true north value is available.

If HDT is not available in the nmea data stream we use HDM and variation from the WMM plugin to estimate an effective HDT.

Why are Mouse zooms very sensitive and hard to control?

The scale jumps appear very large. I have looked but cannot find a pref or other setting. It may be due to the scales of raster charts.

- Is it a driver problem? Does this happen in other programs.
- Is the battery low?
- Options > Display, check “Smooth Pan/Zooming”. It helps make zooming and panning much more controllable.
- Options > Display, check “Preserve scale when switching charts”.

Charts jump while Using Follow Ship Offset, Look Ahead & North up Modes

Chart Rotation Smoothing. When follow ship, offset mode, look ahead mode and north up mode are all turned on, the goal of the look ahead is to position the ship about 2/3 away from the farthest point directly ahead of the ship. Because the screen is a rectangle, the ship's position on the screen keeps changing, since the farthest point ahead is changing rapidly. Use *Options* > *Display* > *Advanced* **Chart Rotation Averaging Time** *[new title]* or Course-up Update Period _Time *[old title]* to smooth the chart rotation. It is actually another “always on” COG filter that smooths VP rotation and makes the chart much less jumpy. In conjunction with NMEA course and speed filtering the chart moves slowly in a nice way.

- Under *Options* > *Display* > *Advanced* see Chart Rotation Averaging Time
- and for more about Display Orientation -Look Ahead and Course up

Very Choppy Chart panning after "Navigate to Here"

Disable Options > Connections > “Output this port (as autopilot or NMEA repeater)”, particularly if it is doing nothing. Once I unchecked the issue goes away.

User Interface, Ship icon, AIS icons, Chart Objects and Depth Soundings are the wrong size or scale factor

How do I adjust scale factor for Ship and AIS, Chart Objects and the User Interface? Adjust the Three Scale Factors Adjust how large the User Interface is. Adjust how large Ships and AIS symbols are. Adjust how large Chart Objects and vector depth sounding are.

AIS Target Range and bearing does not work in a stationary operation?

OpenCPN requires a valid ownship GPS location to calculate range and bearing to AIS targets. It was not designed for stationary operation to monitor live AIS traffic without GPS input.

If you insist, you may use VDR plugin[768], by running a text file with a single GPRMC nmea sentence[769] describing your homebase location, repeated over and over….this will work, try this in a text file:

```
$GPRMC,180000.000,A,4221.0000,N,07106.0000,W,0.00,180.00,101017,,,*3E<cr><lf>
```

Why are Own Ship Icon and AIS targets very small now?

Check setting *Tools → Display → Advanced → Physical screen width*. If not already *Auto* select that and *Apply*. Now read the mm value and compare to your screen width. If it does not conform, change to "manual" and enter your actual size.

User Answer: Issue is not Opencpn but a combination of an external monitor and OpenGL. When OpenGL is disabled, ownship and AIS target icons are the correct size, also the laptop display is correct size, even with OpenGL enabled. Win 7 Pro Laptop does have an issue with determining the correct screen size of the external monitor. External monitor can be forced to display the correct sized icons by first enabling both the laptop display and the external monitor and then disabling the laptop display. OS issue rather than an OpenCPN issue.

AIS Targets HDG and COG may be wildly different

The TRUE Heading reported in the target query is always as actually reported by the target. *We do not apply variation to that value before presentation.* So, what you see is no error. Of course, in situations with strong cross currents, or maneuvering, the reported HDG and COG may be wildly different.

How can a SART Alarm be disabled or ignored?

MOB SART has been tested extensively. The methods for deactivation should work. See SART[770]. Also Disable SART[771] When Alert is active, find the Alert's MMSI number in the AIS Target List. Then Add a "New" MMSI number in Options → Ships → MMSI. Then Edit the Options → Ships → MMSI Properties to "ignore" this target. Then close the Options Dialog. Then "Acknowledge" the SART alert one more time, and no further alerts will be seen. If you restart OCPN, you will never get alerts for this target again.

How to send routes to GPS via USB or via NMEA Serial connection

There are so many GPS models that the answer is a bit complicated. A lot depends on which GPS model you have. OpenCPN can communicate with many GPS receivers via a serial connection. Some GPS receivers have a serial connector that can be wired to a DB-9 serial connector. Newer ones have a USB port that will appear like a serial connection to your computer. Still newer ones appear to your computer like an external drive.

If your GPS receiver shows up as a serial connection on your computer chances are you can upload routes and waypoints directly to it from within OpenCPN. The GPS and OpenCPN have to be set to the same communication protocol. If you normally have them set to NMEA (for updating the OpenCPN chart display with position data from the GPS) you may need to change a Garmin GPS to the GRMN proprietary protocol to upload routes, waypoints, and tracks. If your GPS doesn't show up as a serial connection you may still be able to transfer routes and waypoints to it outside of OpenCPN. If the GPS appears as an external drive on your computer try this. Use OpenCPN to export your routes and waypoints to a GPX file (read the User Manual section on the Route & Mark Manager for more details). Then use your operating system to copy the GPX file from your hard drive to your GPS. If that doesn't work, try GPSBabel or EasyGPS for the transfer.

Depending on your GPS model and the way the route was created in OpenCPN you may wind up with a route on your GPS or just a list of waypoints. The route points may or may not appear as waypoints on the GPS.

- Garmin has a program called Homeport which connects to most of their small GPSmap and Plotters which will upload/download waypoints and routes. I believe it will also import gpx routes.
- EasyGPS[772] is a free program that allows you to transfer routes, waypoints, and tracks between your Windows computer and your Garmin, Magellan, or Lowrance GPS.
- GPSBabel[773] is another free program that allows you to transfer data between your computer and your GPS. It runs on Windows, Mac, and Linux operating systems and supports a wide range of GPS models.
- There are also some helpful notes in the manual.
- Route & Mark Manager
- Sending Routes and Waypoints to a GPS
- Hardware GPS Devices[774]
- The oBabel plugin uses GPSBabel to transfer routes without leaving OpenCPN.

Night time Mode Title bar is too bright in Windows

- In Windows, Night, F5, mode. The title bar on the floating plugin window is a bit glaring (this mode is controlled by windows by way of a theme and is not possible to change from an application) .
- The best solution is to simply “dock” the dashboard window at night, either left or right. This brings the window decorations back under OCPN control, and we recently added logic to dim it in this mode.
- Dimming the screen, if it is available and goes far enough is often best. F6 General Dimming, in steps, of the entire Screen. (except Mac OS X). OpenGL must be off.
- Otherwise the “Change color scheme' F5 button or (C, Ctrl+C, Ctrl+G). This may or may not work on your particular computer.
- See Keyboard Shortcuts
- For Linux users, who have little differentiation between shallow water colurs and land colours, try “F.Lux” which has a 2000k setting that makes the screen quite dull over the daytime colour palette. F.lux is confirmed as massive win on Linux. Daytime palette and use F7 to drop the brightness a bit more if needed. https://itsfoss.com/night-shift-flux-ubuntu-linux/[775]

How are fonts adjusted in the User Interface?

- See Options > User Interface[776] Fonts and Font Color.

How are fonts adjusted for the AIS Target List?

- The AIS Target List does not exist in UI > Options Fonts selection. AIS target list uses the “Dialog” font key in Options > User Interface, Fonts and Font Color..

How are font sizes for vector chart Depth Soundings adjusted?

Out of the box, the “Depth” notation is unreadable.

- Try Options > User Interface > Chart Object Scale Slider set on +4 or +5.
- Try using the Swedish color palette[777] which changes depth font to black.
- The Chart Object Scale Slider is for Vector Charts only.
- Raster Chart cartography is superior and depths are very clear in comparision.

Waypoint Properties Editing Links

1. Opening the properties page, and adding a link to a JPG-image works fine. If I now edit the link, the image will no longer be displayed.
    a. The button “Edit” changes state. You click on it to switch the links above to “edit mode”, each click on any of the links opens the dialog allowing you to change it's parameters. After editing the link, you have to click on the button again and then a click on the links will again start opening whatever they link to. What will happen when you click on the link is explained in the text bellow the buttons and changes according to the “Edit button”. If it says “Links are opened in the default browser”, the linked file or internet address should open, given it exists, which gets us to..
2. Similarily, if I export a waypoint with a link to another computer, the link will not open.
    a. The link is just a link, the file you link to is NOT “included” in the waypoint. When you transfer the waypoints to another computer, for links to local files to keep working, the files you link to would have to exist on the exactly same place on your disk there. Eg. The file that on computer A is C:\MyDocuments\MyPicture.jpg would have to exist with exactly the same file name, in the exactly same folder, on the exactly same disk on computer B.

OpenCPN and Great Circle Navigation

1. There is a Route Plugin for Great Circles.
2. Raster charts display bearings and headings as straight, measurable lines on the chart. Similarly, Vector ENC's are rendered as Mercator projections in OpenCPN and most other ECS's for the same reason.
3. For typical coastal navigation, errors which occur using rhumb line instead of great circle calculations are small for the distances usually covered by one chart.
4. Mercator Charts and Mercator navigation is the standard for most navigational purposes. Other terms used instead of “Mercator Sailing” is “Loxodrome Sailing” or “Rhumb Line Sailing”.

OpenCPN 3.2.0 forward handles Great Circles directly

- Great Circle Routes are explained Great Circle Sailing.
- There is also a plugin available as well as some Supplementary Software[778] to handle great Circles.

Mouse rollover feature becomes disabled

'Enable Touchscreen interface' in Options/User Interface disables the rollover feature on my PC with a touchscreen. With this setting enabled, touching a target displays the target information. Without it enabled the rollover feature works.

“Rollover” is a mouse thing. One does not exactly “rollover” with a touchscreen. This could get very distracting to the overall UI. Thus, rollover is disabled for touch.

How to save Toolbar and Dashboard position?

1. Start OCPN. Set the toolbar as you would like it. No dashboard visible yet.
2. Grab a screenshot.
3. Exit OCPN cleanly by closing the Opencpn window normally. Restart and the settings should be saved.
4. Using the Raspberry Pi shutdown, top left corner, select shutdown, is wrong, like instant stop.
5. See Forum Thread[779]

Why aren't settings saved properly when I close Opencpn?

Not saving settings when exiting -due to Inland ECDIS is checked

European Inland Waterways ECDIS Mode

Issue just started with 4.8.0 where on exit doesn't save * Units * Configuration of toolbar * Starts in night mode I searched the opencpn.ini for these settings but not sure what I am looking for TBH. I also backed up this file and exited the program forming a new ini file, same issue. Any ideas?

OpenCPN is probably set to use settings for **Inland ECDIS** European Inland Waterways ECDIS

- Click the wrench (or spanner) icon on toolbar to open the “Settings” dialog.
- Select the “User Interface” tab, and
- look below the “Interface Options” for
- “Use Settings for Inland ECDIS Version 2.3”.
- Remove the checkmark on the “Use … Inland ECDIS…” line.

Right-click > Navigate > To Here has a problem

The new Active Route always disappears and I try to recreate it and it disappears again.

- If the distance to waypoint increases slightly then route manager says we have “arrived” and it tries to advance to the next waypoint.

- But in a simple “Navigate to here” scenario there is no next waypoint so it just assumes it has arrived at the destination.
- Also this problem may be due to some “noise” from the GPS position.
- Try setting *Options* > *Ships* > *Own Ship* in the Routes box check “Advance route waypoint on arrival only”.

How exactly does NMEA 0183 HDG Sentence work?

If HDG message also contains the variation and E/W flags then O will use that. If not then it will look in RMC message for a variation. If nothing there it will use WMM plugin unless user has selected the variation manually in options.

How do I save many waypoints to a Layer?

Question: Layers is a good feature, however I need a tool to create a layer with many waypoints (say 200 waypoints in Fiji). I'd like create a layer of all visible waypoints in a chart area that I have zoomed into. After creating the layer, I'd like to delete them from the waypoints list with a single command.

Answer: Using the Route & Mark Manager

- Import the waypoints into the Waypoints Tab.
- Select all the Waypoints by clicking & highlight the top waypoint, scroll to the bottom and while holding the Shift key, click to highlight all.
- Wait for all the waypoints to be highlighted.
- Click on the button “Export selected …”.
- Browse to choose the directory to save the waypoints, & name the file 'Fiji Waypoints'.
- Click on 'Save'.
- All the waypoints will be in one .gpx file which, when put in the Layers folder can be displayed or not in the Layers Tab by toggling the 'eyeball'.
- You can also use the 'List contents' in the Layers Tab to have the Waypoints displayed in the Waypoints Tab.
- When done you can clear the Waypoints Tab from the Layers tab by clicking on 'Unlist Contents'.
- See Handling Layers

How to join or combine two or more Routes into a Single Route?

1. Mark the routes in the Route&Mark Manager, recording the order.
2. Then export each route as a gpx file.
3. Open the first file in a text editor.
4. Open the next file in the text editor and copy the code between <rte> … </rte> not including them.
5. Then paste the code directly before the </rte> at the end of the first file.
6. Continue until done. Save the first file.
7. Import the gpx file with a new name.

MAC OpenCPN seems to freeze. Why?

Going to Toolbar/Options/Plugins/Grib 4.1/Preferences; OpenCPN freezes when you check “Authorize interpolation to start at current time” (a warning first followed by a freeze requiring a “Force Quit” of the application).

- It is not frozen, but the active modal window with the preferences sinks bellow the other windows as the information message dialog is displayed. Cmd-Tab to switch to another application followed by another Cmd-Tab to switch back to OpenCPN should bring it back on top (Or an Esc acts as Cancel). Certainly to be fixed with all the other z-order issues on macOS.

How to Set Local Time

Set time to local for weather routing in view→settings. Set time to local for grib_pi in preferences.

How can I change my Ownship Icon?

A user can install his or her own icons to use with marks and “own ship”. See Install your own Icons[780] “To replace the default own ship icon, red ship icon just put a file “ownship.xpm” or “ownship.png” in the UserIcons directory.”

License and Authors

OpenCPN is licensed under the GNU General Public License[781] (GPL) V2.

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Sean D'Epagnier	OpenGL Architecture, Plugins
J.P. Joubert	GRIB PlugIn enhancements
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Stuart Cunningham	BSB Chart Georeferencing Algorithms
John F. Waers	UTM Conversion Algorithms
Carsten Tschach	UTM Conversion Algorithms
Ed Williams	Great Circle Formulary
Philippe Bekaert	CIE→RGB Color Conversion Matrix
Robert Lipe	Garmin USB GPS Interface

Editors

Editors for Version 4.2

In no particular order, not even alphabetically, I found an old email list that I had started for those who helped get version 4.2.0 User Manual Ready.

- Kathi Boswell
- Roel Smidt
- Dirk Smits
- Bob Evans
- David Kester
- Mike Rossiter
- Pavel Kalian
- Will Kamp
- Jon Gough
- Sean Depagnier
- Peter Tulp
- Hartmut Weckenmann
- Lars Tarnovski
- Gilletarom
- Hakan
- Thomas Hockne
- Rick Gleason

Many thanks to everyone who contributed, and helped with sound advice and suggestions. it could not have been done without you! It's gratifying to note that many of you have continued to edit and improve the User Manual.

Of course we should all thank those who worked so hard on this manual before, including Thomas Höckne

Editors for OpenCPN Dokuwiki - Version 4.6

- Dave Register
- Kathleen Boswell
- Fabbian Dufoe
- Frederick Gleason
- Gilletarom
- Thomas Hochne
- John Macrae
- Teddy
- Drew Kerlee
- Hubert Kleis
- Mike Rossiter
- Jim Galbiati
- George Dew

- Steven Bromley
- Rick Gleason

We looking for skilled and dedicated Editors to help with this migration of the Wiki! Volunteers please advise one of the Admins below or send rgleason a PM on Cruiser's forum ***PM Rick[782]***. Thank you! We need 8 more editors.

Administrators of OpenCPN Dokuwiki

The Dokuwiki Admin have special rights to configure and update the dokuwiki. They have access to the User list and ACL. Contact an Admin if you would like to be a “Manager” who can Edit the pages.

- Dave Register
- Kathi Boswell
- Mike Rossiter
- Thomas Hockne
- Fabbian Dufoe
- Rick Gleason

Notes to Editors

See Edit User Manual[783]

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