

# BoatPi

## A Boat Navigation System

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## Boat Navigation System

A Raspberry Pi Boat Navigation System, based on the guide from Martin Loschwith [losch16].

### Hardware

#### Hardware Requirements

- Raspberry Pi
- Power Supply
- [Mouse and Keyboard]
- SD card with Raspbian installed
- GPS Module
- Display (preferably without additional power demands)

#### Hardware Installation

1. Insert SD card into Raspberry Pi.
2. Connect mouse, keyboard and display.
3. Connect power supply.
4. Run `sudo raspi-config`, navigate to *Advanced Options > Resolution* and set resolution according to your display (720p is recommended).
5. Run `sudo reboot`, to let changes within `raspi-config` take effect.

When other instructions are given by the display manufacturer, these need to be considered as well.

## Software

### Installing GPS Requirements

Make sure your system is up-to-date `sudo apt-get update && sudo apt-get upgrade`. Install the `gpsd` GPS daemon itself:

```
sudo apt-get install gpsd gpsd-clients python-gps
```

Change the service's configuration by editing the `/etc/default/gpsd` file. Insert the path for the interface (i.e. `/dev/ttyACM0`) of the GPS module into the `DEVICES` line. In the same file, add `-b` to `GPSD_OPTIONS`. Restart the `gpsd` service via `service gpsd restart`. Test the set-up by issuing `cgps` in a command prompt.

### Setting up OpenCPN

The OpenCPN navigation software can be installed on the Raspberry Pi with the following steps <sup>1</sup>:

1. Edit the package sources via `sudo nano /etc/apt/sources.list`.
2. Add the line `deb http://ppa.launchpad.net/opencpn/opencpn/ubuntu/trusty main`. Make sure to save the changes.
3. Retrieve the key from the keyserver by issuing `sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys C865EB40` at a command prompt.
4. Update the package list via `sudo apt-get update`.
5. Install the `opencpn` software itself by `sudo apt-get install opencpn`.
6. *optional*, if desired, install available OpenCPN plugins `sudo apt-get install opencpn*`.

### Supported Chart Formats

OpenCPN is compatible with the following chart formats<sup>2</sup>:

- Worldwide standard S56 and encrypted S63 vector chart.
- BSB v3 and earlier raster charts.
- CM93 vector charts with per cell offset corrections
- ENC's, distributed by `o-charts.org` <sup>3</sup> for selected regions

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<sup>1</sup>[https://opencpn.org/wiki/dokuwiki/doku.php?id=opencpn:opencpn\\_user\\_manual:getting\\_started:opencpn\\_installation:rasp](https://opencpn.org/wiki/dokuwiki/doku.php?id=opencpn:opencpn_user_manual:getting_started:opencpn_installation:rasp)

<sup>2</sup><https://opencpn.org/OpenCPN/info/about.html>

<sup>3</sup><http://o-charts.org>

## Fine-tuning

### Power Consumption

Since the power source on the boat may be limited, it makes sense to break down the power demands of the respective Raspberry Pi modules . Raspberry Pi requires a power supply with +5,1V. The amperage depends on the connected modules <sup>4</sup>:

- Raspberry Pi Model B requires 500 mA minimum
- HDMI port 50mA
- Keyboard and mouse (varies between 100mA or over 1000mA)
- GPS module ~60mA

Keyboard and mouse have the largest variance, it makes sense to chose a keyboard with minimal power demand. The mouse can even be omitted, in case the chosen display has touch support.

The power supply can be bridged with a power bank that is capable of simultaneous charging and providing power. A sufficiently large power bank can supply the boat navigation system trip.

### Optimize Performance

To optimize the performance of the Raspberry Pi, Martin Loschwitz suggests to set:

```
framebuffer_depth=32  
framebuffer_ignore_alpha=1
```

in the `/boot/config.txt` file [^1]. Changes will take effect after a reboot.

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<sup>4</sup><https://www.raspberrypi.org/documentation/hardware/raspberrypi/power/README.md>