



A **NORBIT** Company

PRODUCT DOCUMENTATION

Underwater GPS



This PDF is generated automatically from the online documentation and contains the same information. The online version is always the most up to date:

<https://docs.waterlinked.com/underwater-gps/introduction/>

Content last changed 2026-09-28 · cc00d5c

Contents

G2	
Introduction	4
Quickstart	8
Reference frames	14
Interface	
GUI	16
LED	22
Wiring	24
Warnings	25
Hardware setup	
System setup	26
Components	
Power supply	30
Topside	34
Baseline	
Antenna	40
Receiver-D1	44
Locators	
Locator-A1	46
Locator-D1	48
Locator-U1	50
System configurations	56
Networking	60
Integration	
API	62
External compass	63
BlueROV2 integration	
Overview	65
BlueROV2 & Locator-A1	72
BlueROV2 & Locator-U1	97
Software updates	105
Underwater GPS FAQ	106
Explorer Kit (retired)	
Quickstart	108
Introduction	110
Warnings	113
Power supply	114
Network settings	115
Hardware	116
Master-D1	119

Receiver-D1 123

Locators

 Locator-A1 125

 Locator-D1 127

 Locator-S1 (obsolete) 129

 Locator-U1 131

GUI

 Position 132

 Receivers 133

 Settings 137

 Diagnostic 139

 API 141

Software updates 142

Introduction

Underwater GPS G2

[Buy Underwater GPS G2 here!](#)



The [Underwater GPS G2](#) is a robust and reliable acoustic positioning system with a range of up to 300m (R300 edition). The purpose of the system is to give a live GPS position of ROVs, divers and other moving objects below the water surface.



Tip

We offer a live [demo](#) of the GUI of the UGPS G2 system. It runs on simulated data designed to illustrate various GUI features; this data is not necessarily realistic in all aspects!

The Underwater GPS G2 system is based upon Short Baseline (SBL) acoustic positioning. A locator ([U1](#), [A1](#), or [D1](#)) is attached to the device to be positioned. It functions as a beacon, sending out acoustic signals. Near the surface, either an [antenna](#) containing four receivers is lowered into the water, or four loose [receivers](#) are lowered into the water. These listen for the beacon signals.

Time-of-flight from the locator to each of the four receivers is used in an innovative algorithm to calculate the position of the locator relative to the UGPS G2 topside unit. We refer to as the *acoustic position*. The UGPS G2 system obtains a *global position* by combining this acoustic position with the global GPS coordinates of the topside unit. This may be provided by the topside unit's in-built GPS antenna, or, for greater precision, passed in externally by means of the UGPS G2 [API](#). This API provides output of both the acoustic and global positions calculated by the UGPS G2 system, as well as comprehensive programmatic configuration of the system.

Compared to USBL systems, the UGPS G2 system has the advantage of working well in challenging environments, for example shallow water, or reflective environments such as near ship hulls, in fish cages, near harbour installations, inside water tanks, etc. One of our [FAQs](#) elaborates further on this.

Features

- Range up to 300m (R300 version only)
- Quick deployment using an [antenna](#)
- WiFi connectivity
- Integrated global GPS antenna
- Interface supporting [BlueROV2 hardware integration](#)
- Simple and quick updating of firmware/software

Kit content

- 1 x Underwater GPS Topside housing with Master-D1 and WiFi dongle
- 4 x Receiver-D1 with 10m cable / 1 x Antenna
- 1 x Locator U1/A1/D1
- 1 x 5m power cable

Warnings

Please read the following carefully before the UGPS G2 system is installed and used for the first time.

Topic	Warning
Operation medium	The Underwater GPS G2 system is designed only to work in water. It will not work if the locator and/or antenna/receivers are out of water.
Max voltage	The absolute maximum voltage rating of the equipment is 30V. Voltages above this will damage the electronics.
Temperature	Make sure the system does not overheat. Avoid placing it in direct sunlight over extended periods of time.
Salt water	The contents of the topside housing will corrode and/or short if in contact with salt water. Keep the housing lid closed when in the field to avoid salt water getting inside.
Force	Avoid using excessive force on connectors, screws and other parts of the system, as this can lead to mechanical failure.
Locator U1	Always charge the Locator-U1 before operation. See the U1 charging procedure .
External position and U1	You can use external position data to give a better position estimate, however, if using the U1 the topside will still need GPS lock for time synchronization purposes.

Topic	Warning
Implementing an external compass	In a static environment manually setting the current heading based on a reliable compass will be sufficient. In more dynamic/challenging environments it is necessary to provide compass heading from an external compass, to achieve accurate position data.

Discussion

If you have questions, you are very welcome to contact our [customer support](#), where we will be happy to help you.

Datasheet

[Datasheet](#)

Quickstart

Intro

The UGPS system consists of three components:

- [The UGPS Topside](#)
- Baseline: [Antenna](#) or [receivers](#)
- Locator: You can choose between three different locators: [Locator-A1](#), [Locator-D1](#) and [locator-U1](#)

In addition you need a [power supply](#).

A quick guide on how to start using the Underwater GPS system:

- Power on the topside unit
- Connect your computer to the Underwater GPS topside box
- Attach the locator (unless you are using the wireless U1) and the antenna/receivers to the topside box
- Deploy the antenna or receivers in water, in such a way that it will have line of sight to the locator when it is deployed.
- Attach the locator to the unit you want to track (eg. ROV/diver etc.)
- If using a locator U1, make sure it has GPS lock before it is deployed into water (steady green LED).
- Open up the GUI and adjust the settings. Make sure to select the correct locator and channel.
- Configure antenna/receiver placement in the GUI
- Set heading



Tip

If you are using a locator U1, make sure it is charged for at least 7 hours with a 5V/2A charger (not a computer) within 24 hours before use, and that it is adjusted to your preferred channel. Choosing channel 3 is usually good advice.

Power on the topside unit

Start by connecting power to the UGPS G2 topside box using your preferred [power supply](#). Make sure to place the box where there are good GPS signals. The GPS receiver in the topside box will begin receiving signals and achieve a lock whilst we setup the rest of the system.

If you are using the Locator-U1, make sure it is fully charged and set to the chosen channel, then power it on now as well. It too will acquire a GPS lock whilst we setup the rest of the system.

If you are inside, use of a GPS repeater or similar will be necessary.

Connect to the Underwater GPS topside box

Connect to the WiFi access point **UnderwaterGPS** on your PC/tablet/smartphone. The WiFi password is **waterlinked**. Navigate to <http://192.168.7.1/> in a web browser to access the Underwater GPS web GUI.

For alternative ways to connect to the topside, see [Networking](#)

Deploy locator and antenna/receivers

Locator

Attach the locator ([U1](#), [A1](#), or [D1](#)) to your vehicle. The [BlueROV2 integration guide](#) may be helpful if integrating an A1 or D1 locator with a vehicle tether.

If using an A1 or D1 locator, connect it to the 'Locator' bulkhead on the UGPS G2 topside box. The U1 connector is wireless, which means that this step can be omitted.



Antenna

Unfold the [antenna](#) and lock the mast straight using the latches on the folding joints. Avoid the cable being pinched at the joints. Secure the three arms in place using the thumb screw. Place the antenna in water at the desired location. Secure the antenna using the RAM Mount components included with the antenna.

Connect the antenna to the bulkhead marked 'Receiver 1/Antenna' on the UGPS G2 topside box (see the above picture).

Tip

If the RAM Mount components included with the antenna do not meet your needs, many alternative RAM Mount Arms and Bases are [available](#).

Loose receivers

Before deploying the [receivers](#) in the water, add a piece of tape to each receiver cable at the desired depth, to make [configuration](#) easier. Place the receivers in the water at the desired location, and connect one to each of the four bulkheads 'Receiver 1', 'Receiver 2', 'Receiver 3', and 'Receiver 4' of the UGPS G2 topside box (see the above picture).



Tip

Add a weight just above each receiver to improve stability in the water.

Select locator and channel in the GUI

Select the correct locator type in the [GUI settings](#), and choose which channel to listen on. Channel 2 is the default. If using a [Locator-U1](#), ensure that its channel (set by completely unscrewing the lid and turning the dial inside) is set to the same channel as you configure in the GUI.



Note

If you are using the Locator-A1, depth information needs to be provided to the topside unit by means of the UGPS [API](#). You can ignore this if following the [BlueROV2 integration guide](#).

Configure antenna/receiver placement and search range

Provide the correct placement of the antenna/receivers relative to the topside box in the [GUI settings](#), and, if using an antenna, specify if it has been rotated from the default indicated in the GUI.

Specifically, for the antenna, enter the position and optionally the rotational angle manually under **Advanced settings**.

<< Menu

System status ✓

Underwater GPS G2 (3.1.0 R300)

Position

Baseline

Settings

Diagnostics

About

Diagnostics report

<<

Baseline in use ?

Antenna

Receivers

Apply

Antenna configuration ?

Place antenna as shown in the illustration. Advanced setup can be used for customization.

Antenna setup illustration

Advanced settings ⤴

Distance to Topside housing ↓ Backward

-2,5

meters

Distance to Topside housing → Right

1,32

meters

Antenna depth ↓

1,5

meters

Antenna rotation offset from Topside housing Forward(Positive clockwise) ↻

90

degrees

+

-

If using loose receivers, either drag and drop each receiver to its position, or enter the positions manually.

docs.waterlinked.com

Page 11 of 146

<< Menu

System status ✓

Underwater GPS G2 (3.1.0 R300)

Position

Baseline

Settings

Diagnostics

About

Diagnostics report

<<

Baseline in use ?

Antenna Receivers

Apply

Receiver and range configuration ?

Move the receivers and range to their approximate position by dragging the icons in the map view, click on the icons to enter exact values, then click on Apply to store settings. Scroll down for details.

+

-

Grid size: 20,00 (meters)

Search range

⌂ Direction 100,0 (Degrees)

▼ Sector 360,0 (Degrees)

↔ Radius 300,0 (meters)

Receiver 1

↑ Forward 1,3 (meters)

→ Right 1,3 (meters)

↓ Depth 1,0 (meters)

Receiver 2

↑ Forward 1,3 (meters)

← Left 1,3 (meters)

↓ Depth 1,0 (meters)

Receiver 3

↓ Backward 2,3 (meters)

← Left 1,3 (meters)

↓ Depth 2,0 (meters)

Receiver 4

↓ Backward 1,3 (meters)

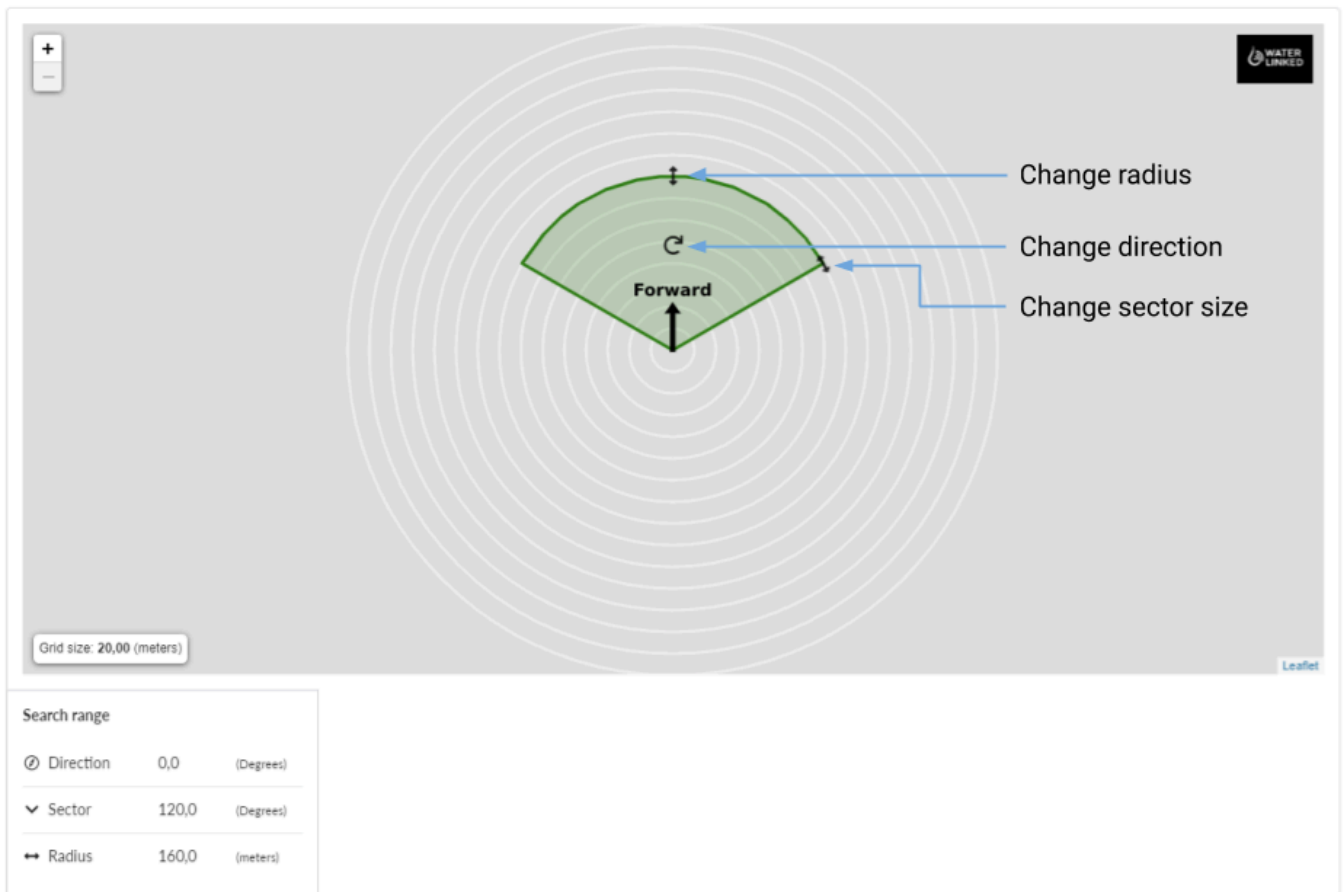
→ Right 1,3 (meters)

↓ Depth 2,0 (meters)

Limit the search area by changing its radius, direction or sector size in the GUI

docs.waterlinked.com

Page 12 of 146

**Tip**

Reducing the search area can improve the performance of the system, and we recommend to do this as far as possible, even if operating in a small area such as a tank or pool.

Set heading

In the top bar of the GUI you will see a warning about missing heading. Click the link, click to zero the gyros, then set compass heading to a reference heading (e.g. from an analogue compass, compass app, or boat compass).

**Note**

The topside does not have an integrated compass. An IMU will keep track of the heading based on the initially stated heading in the configuration. In a static environment setting the heading once will be enough, but in a more dynamic environment the IMU will drift over time and the heading will need a regular update. If operating in more demanding environments it is recommended to use an external compass to keep the heading updated.

**Info**

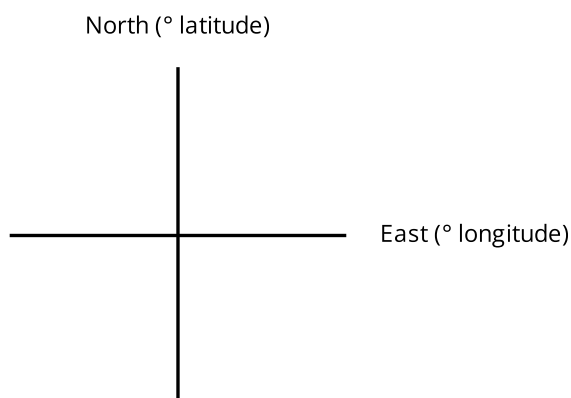
Setting the heading replaces IMU calibration as of release 3.3.0.

You are now ready to explore the underwater world while knowing where you are!

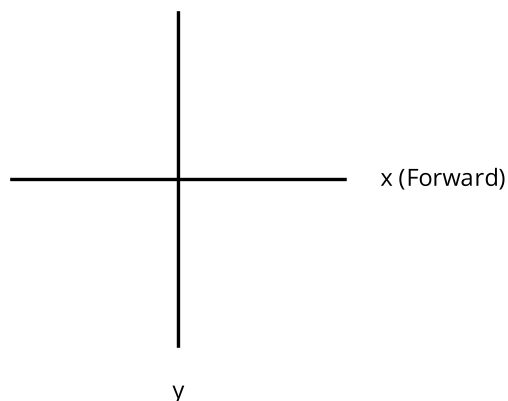
Reference frames

UGPS G2 outputs positions in two reference frames: a *global* frame and an *acoustic* frame. The position in the global frame is obtained by combining the position in the acoustic frame with global GPS data and orientation data from the topside unit's built-in GPS antenna and IMU.

Global frame



Acoustic frame



Global frame

The positions of the global frame are in terms of latitude and longitude, as defined by the WGS 84 standard, and depth (relative to the sea surface). The *Map position* tab in the *Position* panel of the GUI plots the global frame position.

Acoustic frame

The x-axis of the acoustic frame is defined by the 'Forward' direction of the topside housing (indicated by a label on the lid, as shown in the figure below). The y-axes and z-axes are defined to be 'east' and 'down' respectively in relation to this x-axis. The *Relative position* tab in the *Position* panel of the GUI plots the acoustic frame position.

The z-coordinate of the acoustic frame is always depth relative to the sea surface (not, say, relative to the antenna base, if using an antenna).



The default origin is a point on the topside housing, but can be taken to be anywhere: it is entirely defined by the positioning of the antenna/receivers with respect to it. If using an antenna, it may help intuitively to take the origin to be the base of the antenna, which can be achieved by setting both *Distance to topside housing* fields to 0 under *Baseline -> Antenna configuration -> Advanced settings*.

 Note

The axes of the acoustic frame in the first version of UGPS, the [Explorer Kit](#), were slightly different: it was the y-axis which was aligned with the forward direction of the topside housing, and the x-axis which was to the 'east' of this.

UGPS GUI

The UGPS comes with an easy to use Graphical User Interface that can easily be reached via wifi or ethernet. See [Networking](#) for details on how to connect to the UGPS's GUI.

The Underwater GPS GUI is web based. Using your favorite web browser, go the IP address as defined [here](#). We currently support and recommend Chrome, Firefox, Safari and Edge.

Attention

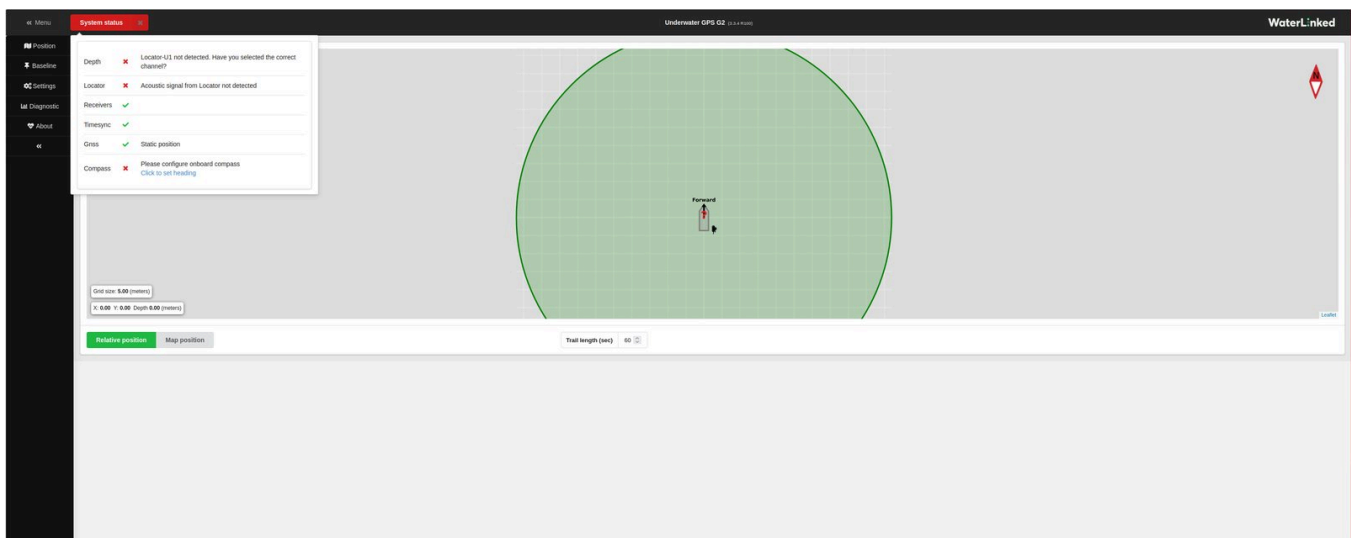
Internet Explorer is not supported as of now.

Tip

We offer a live [demo](#) of the GUI of the UGPS G2 system. It runs on simulated data, designed to illustrate various GUI features; this data is not necessarily realistic in all aspects!

The system does not need to be fully set up to access the user interface. Only the topside needs to be powered on. You will however get some status warnings as long as the topside is not able to detect any locator.

The first thing you see when opening up the GUI is the Position window with the relative position view, and the status warnings. To the **left** there is a **menu bar** where you can access all features and settings.



Note

For more information about the warnings, see: [warnings](#)

Position

This window shows you the whereabouts of the locator in relation to the topside. You can switch between relative position and map position.

Note

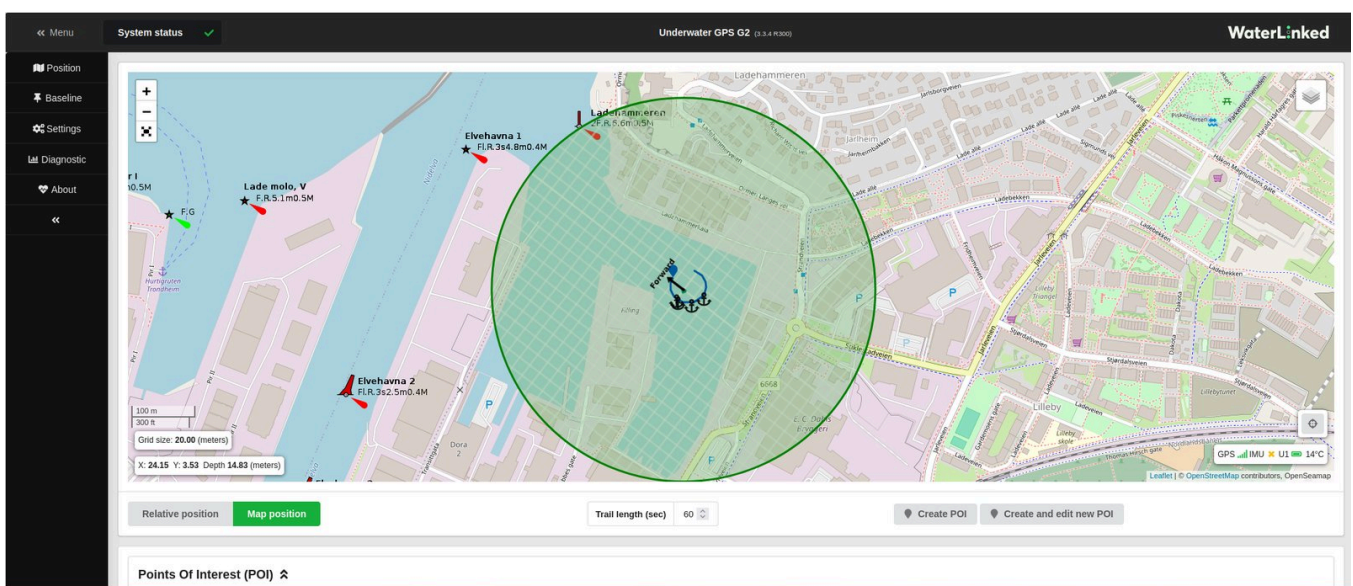
You will need **internet access** on the computer that are showing the GUI, if you also want to see the map and not only the relative position of the locator. This is because the map is fetched from the internet.

Relative position

The relative position view shows you the location of the locator in relation to the UGPS topside box.

Map position

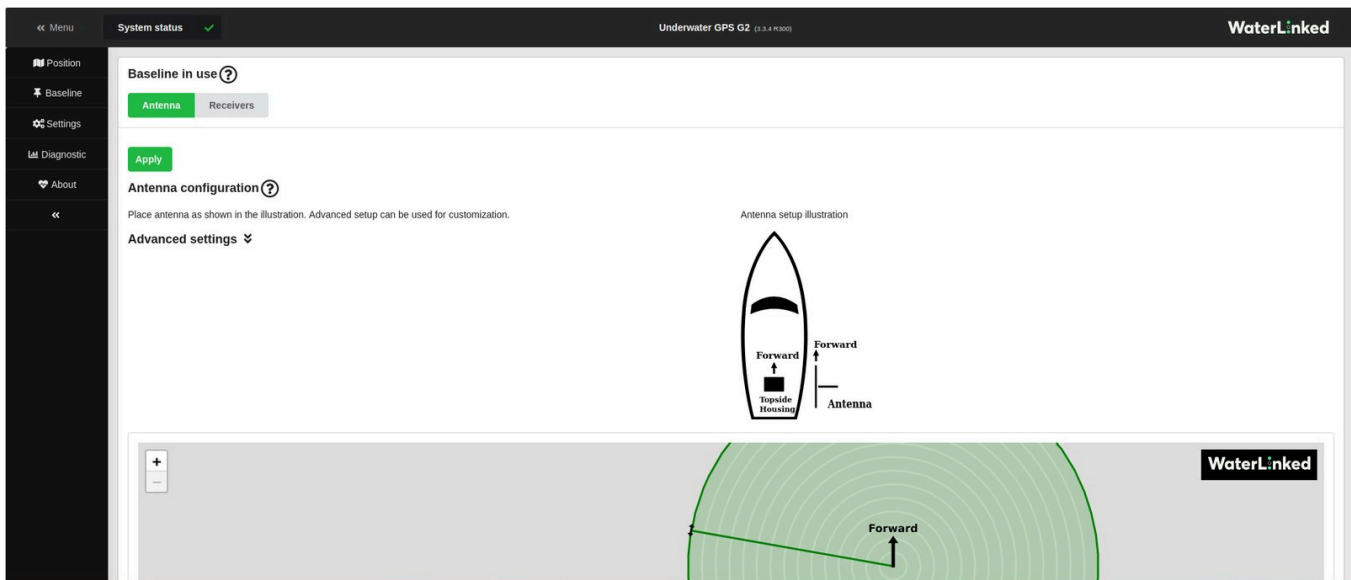
To be able to get a map position view, your computer must have internet access, as the map is downloaded from the internet. The map view gives you the position and heading of the topside and the position of the locator.



In this view you can also mark your own *points of interests*, either if you know the latitude and longitude of the destination you seek, or if you want to mark a point you pass along the route so that you can go back later.

Baseline

The baseline is the configuration of your systems settings based on your hardware setup. In this window you select your baseline setup, whether you are using an antenna or loose receivers, and their placement with regard to the topside.



In the tab at the top select **antenna** or **receivers** according to whether an [antenna](#) or loose [receivers](#) are used, and enter your systems baseline configurations. See [System configurations](#) for details on how to configure your systems baseline in the GUI.

Settings

In Settings, you configure which locator you are using and if your topside is statically mounted on a dock or if it is onboard a boat. If you are using a locator-U1, you need to configure which channel the locator is on.

If the topside is mounted in a dynamic environment, you will get the option to set your systems heading. In this case you must use a good compass and enter the heading into your system regularly. The compass of a mobile phone is not accurate enough.

You can also choose if you want to use metric or imperial units.

In the advanced settings option you can choose your preferred connection method.

Note

Remember that the locator channel has to be set both in the settings menu, and also physically on the locator-U1.

See [System configurations](#) for details on how to configure your systems settings in the GUI.

← Menu

System status ✓

Underwater GPS G2 (3.3.4 R300)

WaterLinked

Position

Baseline

Settings

Diagnostics

About

←

Adjust settings below, then click on the button to store

Apply

Locator setup

Locator type ?

Locator-D1Locator-A1Locator-U1Locator-S2Locator-P2

Channel ?

1234567

Speed of sound ?

1475 m/sCustom

Topside setup

Topside position ?

On-boardStaticExternal

63.44198Latitude

10.42467Longitude

Compass

Topside heading ?

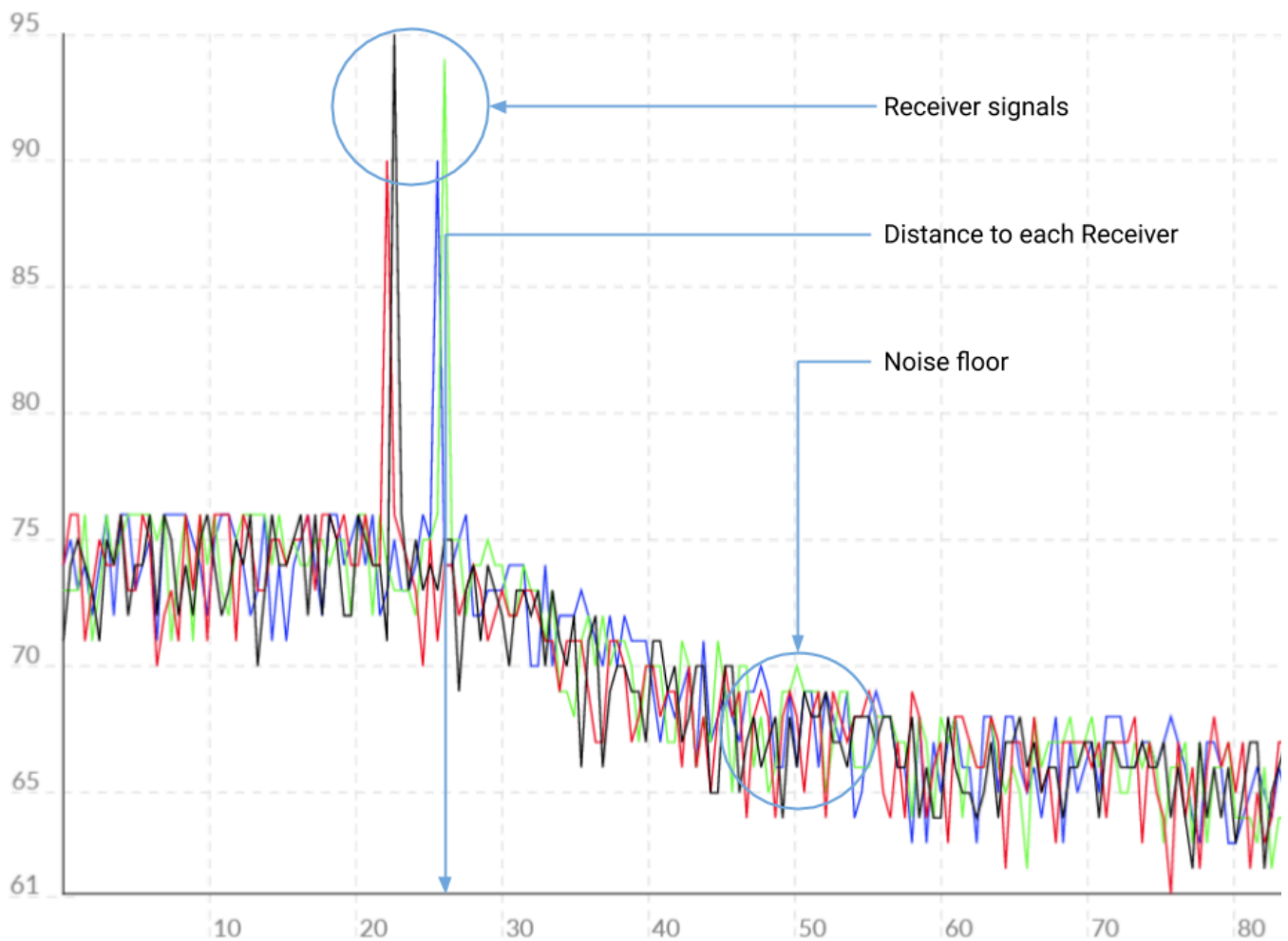
On-boardStaticExternal

210Degrees

Advanced settings ⌵

Diagnostics

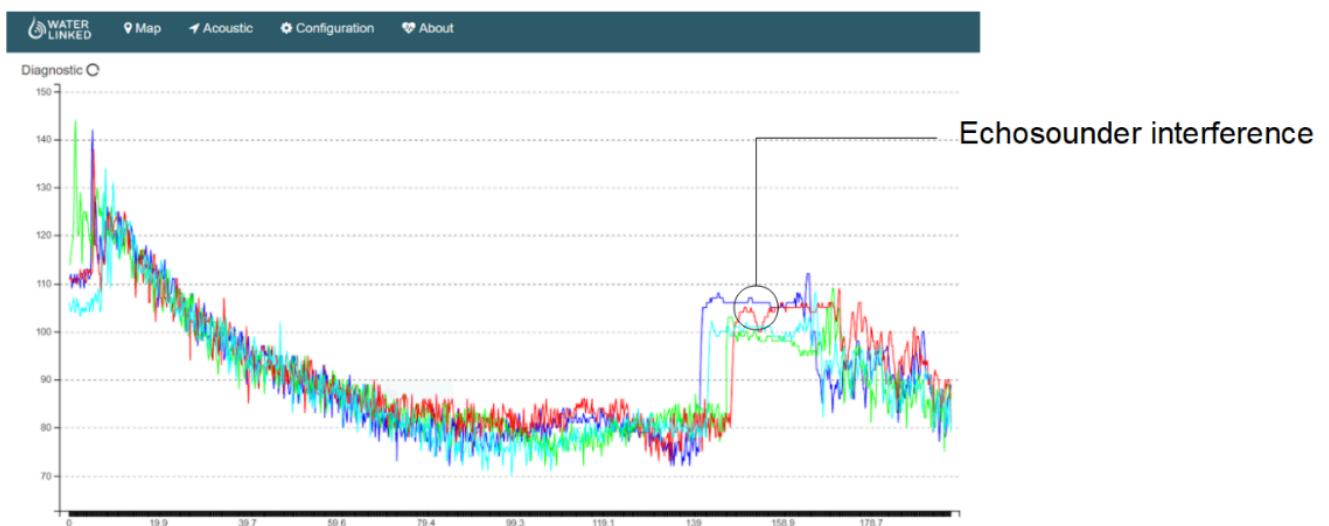
In the Diagnostic window you can see the locator position in numbers, together with a graphical view of the signal strength and system noise. This allows you to analyse your systems performance.



In the diagnostic plot you should see the signal from all 4 Receivers. The signals should be well above the noise floor.

Interference

Acoustic interference can be observed in the diagnostic plot. Echo sounders from your boat or nearby boats typically appears like burst noise.



If it is coming from your boat, try to turn off the echo sounder to improve position accuracy. In case of interference from other acoustic sources, use the GUI to try other channels to avoid the interference.

**Tip**

Typically, NSD (*Noise spectral density*) is around -100 dBm (in the units of version 3.3.0 or later of the software; 15 nV/sqrt(Hz) in the units of earlier software versions), or a little higher or lower. If it is much higher than this, it is likely that there is acoustic interference in the chosen channel, and a different channel should be tried.

Note in particular that acoustic devices quite commonly operate at frequencies lying in Channel 1.

**Tip**

If the NSD values are normal, signal quality is mainly indicated by the RSSI values (_Received signal strength indicator). As long as the RSSI values are not too far below the NSD values, the signal strength should be at usable levels.

The UGPS system uses advanced signal processing techniques and can work even with rather weak signals, but an RSSI of -125 dBm or so (in the units of version 3.3.0 or later of the software; -45 dBnW in the units of earlier software versions) is around the lowest possible for an NSD of roughly -100 dBm.

Typically one can expect a decrease in signal strength of around 6 dB for each doubling of distance due to spherical spreading, plus a little more due to additional absorption.

Diagnostic report

At the bottom of the page there is an option that allows you to record a diagnostic report. If you are experiencing any issues with your system, record a diagnostic logfile. The file should preferably be recorded in the moment as your system is failing. Then contact Waterlinked's technical support through the [support portal](#). Attach the diagnostic report file you recorded to your request. The file contains valuable information that will help the support team analyse your system.

**Note**

The logfile must be downloaded to your computer and sent to customer support as an email attachment.

About

The about page tells you which software version that is currently running on your system. If there is a new update available you can easily download and install from this page. But the topside must be turned on and connected to the internet for this option to be available. If not you will have to do a manual upgrade. See [Software update](#) for details on how to do this.

It is always recommended to use the latest sw update.

**Tip**

If a new software update is available, an exclamation mark will be visible next to the Waterlinked logo in the GUI.

LED Indicators

Only the topside box and the Locator-U1 have LED indicators.

Topside

LED name	LED	Description
Power		Solid green: Topside has power
Ready		Solid green: Topside has booted successfully
GPS		Flashing green: Searching for GPS lock, solid green: Topside has GPS lock. The topside uses GPS both for its own position and to synchronize its clock
LED 1		Solid green: Firmware successfully loaded
LED 2		Not in use
Locator		Solid green: Locator D1 is connected
Receiver 1		Solid green: Receiver 1 connected
Receiver 2		Solid green: Receiver 2 connected
Receiver 3		Solid green: Receiver 3 connected
Receiver 4		Solid green: Receiver 4 connected

Note

There is **No** indication when the **Antenna** is connected.

Note

NC: Not Connected.

DNC: Do Not Connect, pins used for production.

GND: Boldface indicate power lines (12 V, 3.3 V, VIN, GND).

Locator-U1

When powered on by screwing on the cap, the LED of the Locator-U1 shows whether its clock is synchronized with GPS time. The Locator-U1 uses GPS only for this time synchronization, not to find its own position.

LED	Signal	Meaning	Ready to use?
	No light	Power is off, or the battery is empty.	No
	Flashing green light (once per second)	Searching for a GPS signal. The clock is not synchronized yet.	No
	Solid green light	The clock is synchronized with GPS time.	Yes
	Flashing green light (slow)	The GPS signal has been lost, for example because the Locator-U1 is in the water. The time synchronization is still valid, so the Locator-U1 keeps working.	Yes
	Fast flashing green light (multiple times per second)	Error. Often the operating time has been exceeded and the pressure sensor needs to dry; charging the Locator-U1 helps the sensor dry more quickly. It can also be another internal failure.	No

When connected to a charger, the LED behavior depends on the serial number (SN):

SN	LED while charging
0556 and higher	The Locator-U1 only charges and does not power on.  Breathing green: charging.  Solid green: fully charged.
0555 and lower	The Locator-U1 powers on while charging. The LED does not show the battery or charging status.

Charge the Locator-U1 with a 5 V / 2 A wall adapter before use: on SN: 0556 and higher until the LED is solid green, on SN: 0555 and lower for at least 7 hours.

The serial number is printed on the flat side of the Locator-U1, where the bracket is mounted. See [Locator-U1](#) for full details on the LED signals and [charging](#).

UGPS Wiring

The UGPS system consists of several hardware units. For wiring details on each unit, see [Hardware setup/Components/](#)

[Power supply](#) [Topside Receivers](#) [Antenna](#) [Locator-A1](#) [Locator-D1](#)



Note

Locator-U1 is a wireless unit and does not have any wiring details

Warnings

Warnings that you might experience while using the UGPS.

Message	Solution
No external depth received. Is it being sent correctly?	The Underwater GPS is not receiving the depth of the Locator from the ROV. This normally means software on the ROV is not working correctly. Depth is sent to the system through the API .
No signal from Locator-U1. Have you selected the correct channel?	Verify that the Locator-U1 is powered on and that it has GPS lock (See LED signals). Verify that the same channel is selected on the settings page and the Locator rotary switch. Verify that the Locator and Receivers are in the water
Missing GPS lock/position. Please provide me with an unobstructed view of the sky	The Underwater GPS needs GPS lock for time sync purposes. Move the Topside to another location where it has better view of the sky.
Locator-D1 not detected. Please verify connection.	Locator-D1 selected but not detected by the Master-D1. Verify connection.
Receiver N not detected. Please verify connection.	Receiver N is not detected by the Master-D1. Verify connection.
External satellite position is required but not received.	External position is selected, but not received via the API . Typically this is an external software not started or not working.
External orientation is required but not received.	External orientation is selected, but not received via the API . Typically this is an external software not started or not working.
IMU is not calibrated: position will not be accurate. Please rotate the kit to calibrate or use external orientation source.	See IMU calibration for details on how calibrate.
GPS has no position, please provide me with an unobstructed view of the sky.	The Underwater GPS needs GPS lock for time sync proposes. Move the Topside to another location where it has better view of the sky.

How to install your system

Topside

The topside should be placed outdoors with an open view to the sky, to easily achieve GPS lock. The forward direction of the topside box should be in the direction you define as forward. If you are using an antenna, make sure the forward direction of the antenna aligns with the forward direction of the topside. If on a boat, typically forward aligns with the boats heading.

Antenna

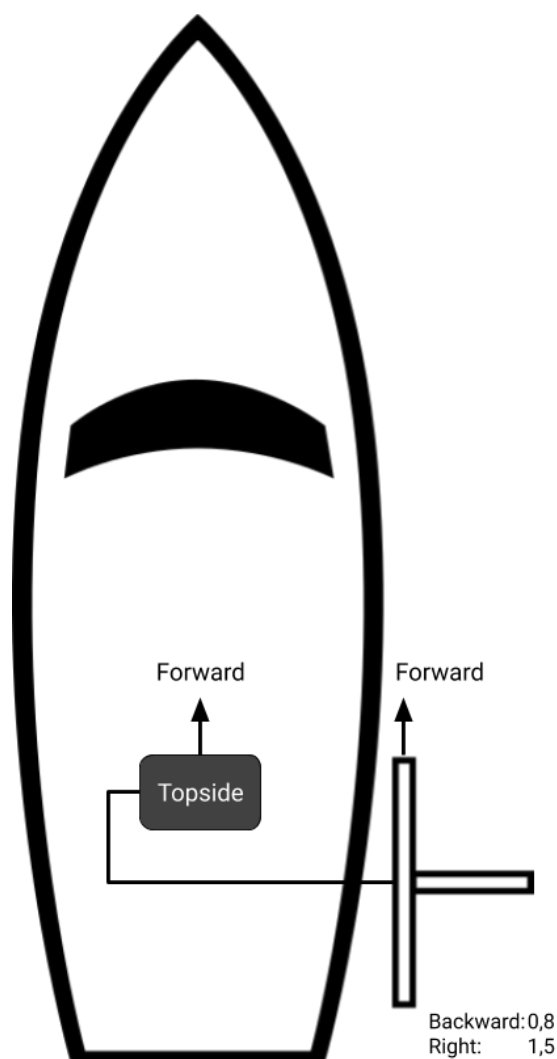
The antenna can be placed anywhere up to 10m from the topside housing (limited by cable length). Make sure its forward direction aligns with the forward direction of the topside box. If this is not possible, make sure you enter the deviation in the Baseline settings in the GUI. See [System Configuration](#)



Tip

By the *antenna base* is meant the joining point of the three prongs with the receivers at their ends.

Consideration	Guidance
Alignment	Ensure that the 'Forward' direction of the antenna as defined by a label on one of its prongs (see also the figure below) is aligned with the 'Forward' direction of the topside housing (indicated by a label on the lid). If it is not possible to physically align them, in <i>Baseline -> Antenna configuration -> Advanced settings</i>, specify the clockwise angle in degrees from the forward axis of the topside to the forward axis of the antenna. If this alignment is not carried out, the global position outputted by UGPS G2 will be incorrect.
Line-of-sight	Ensure that there will be line-of-sight between the antenna and locator.
Antenna depth	Ensure that the base of the antenna is at a depth of at least one metre (as indicated by a label upon the top folding joint of the pole of the antenna), to avoid acoustic disturbance. The depth of the antenna base (relative to the sea surface) must be specified in <i>Baseline -> Antenna configuration -> Advanced settings -> Antenna depth</i>. If it is not, both the acoustic and global positions may be incorrect.
Antenna stability	Secure the antenna tightly to the vessel using the provided Ram Mount.

**Note**

Directivity : the antenna and locators are omnidirectional, that is, signal strength should be good in all directions

Receivers

Loose receivers can be placed anywhere up to 100m from the topside housing. Go through the following, and configure the placement of the receivers in the graphical pane at *Baseline -> Receiver and range configuration* so that their positions relative to the origin and their depths are correct. See [System Configuration](#)

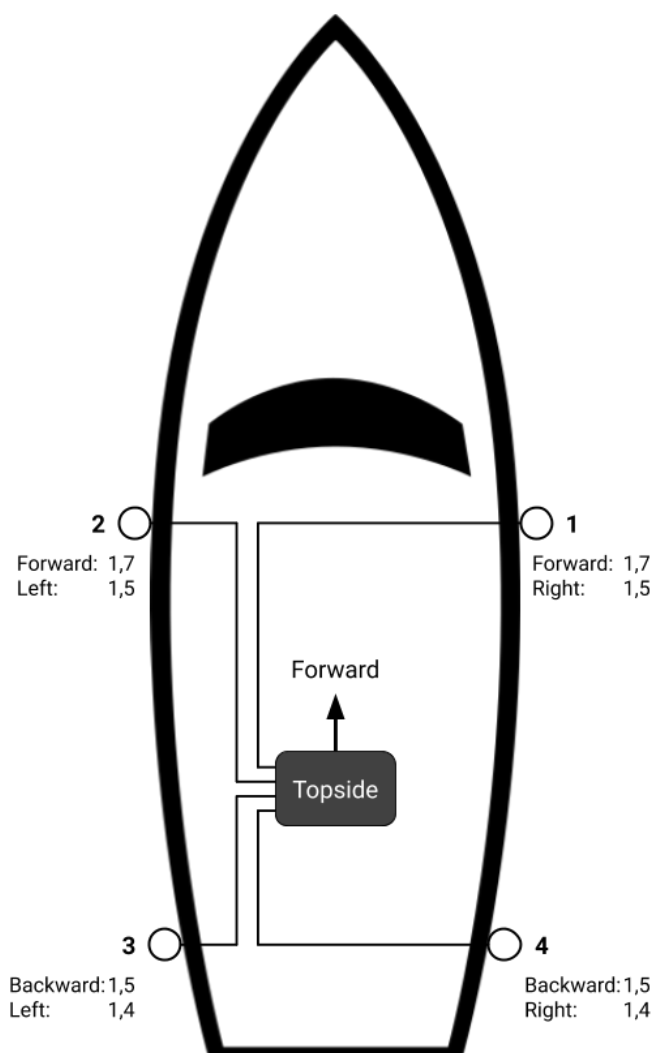
Consideration	Guidance
Line-of-sight	Ensure that all the receivers will have line-of-sight to the locator.
Separation	Ensure that the receivers are not too close, and are not all in a line. A grid of 2x2 metres should typically be sufficient for good performance, but experiment with different configurations if you experience sub-optimal performance.

Consideration	Guidance
Depth	Place the receivers at a depth of at least a metre, to avoid acoustic disturbance.
Stability	Consider adding some weight to the receiver cables just above the receivers.

Note

Directivity : The receivers and locators are omnidirectional, that is, signal strength should be good in all directions

The figure below indicates a typical loose receiver configuration when the topside unit is upon a boat. The receivers hang from the side of the boat. The origin of the the acoustic frame is in this case a point on the topside unit.



Locator setup

Select the type of locator ([U1](#), [A1](#), or [D1](#)) which you are using, and which [channel](#) you wish to use.

No matter which locator is in use, it always needs to be placed within line of sight of the receivers. In most cases this will be somewhere on top of the unit that is to be tracked.

Feature	Locator-U1	Locator-A1	Locator-D1
Connection	Wireless, battery powered	Cable to the topside, directly or through a vehicle integration	50 m or 100 m integrated cable to the topside
Depth	Internal depth sensor	No depth sensor. Depth must be provided through the API	Internal depth sensor
Status LED	Yes	No	No
GPS lock on the locator	Required before deployment	Not needed	Not needed
Max. submerged time	About 6 hours, then charge and let the pressure sensor dry	—	About 6 hours, then let the pressure sensor dry

Locator U1

As the U1 is a wireless locator it can easily be mounted on your vehicle with the included bracket.

- Remember to [charge](#) the locator for at least 7 hours before use with a 5V/2A charger.
- Power on the U1 and wait for GPS lock (solid green [LED](#)) before deploying it.
- Use the rotary switch at the back of the U1 (screw the cap completely off to access the switch) to adjust which [channel](#) you will be using. Channel 3 is a good option. Remember to adjust the channel in the GUI's [Settings](#)

Locator A1

The A1 needs to be physically connected to the G2 Topside, either directly or through a full system integration. For wiring details of the A1, see [Locator-A1](#).

If you are using the A1 on a Bluerov, see [Bluerov integration](#)

Note

If using the [A1](#) locator, the depth of the locator must be inputted by means of the UGPS [API](#).

Locator D1

The D1 comes with a 50 m or 100 m integrated cable that is coupled directly into the topside box.

For more information on the D1, go to [Locator D1](#)

Power supply

The Underwater GPS G2 can be powered using either the provided power cable connected to a 12VDC source, or with a battery (not provided).

Power cable



Connector position	Manufacturer	Part number
Underwater GPS Housing	Switchcraft	17282-2PG-300
Power cable	Switchcraft	CARA162802S19790

The power cable comes with a blunt cut end. Strip the jacket and connect the wires to your favorite 12V power source.

Wire colour	Connection
● Black	Negative

Wire colour	Connection
☐ White	Positive

Specification	Value
Input voltage	10V – 30V
Current consumption	0.25A at 12V
Power-on current surge	2.30A at 12V
Protection	Reverse polarity

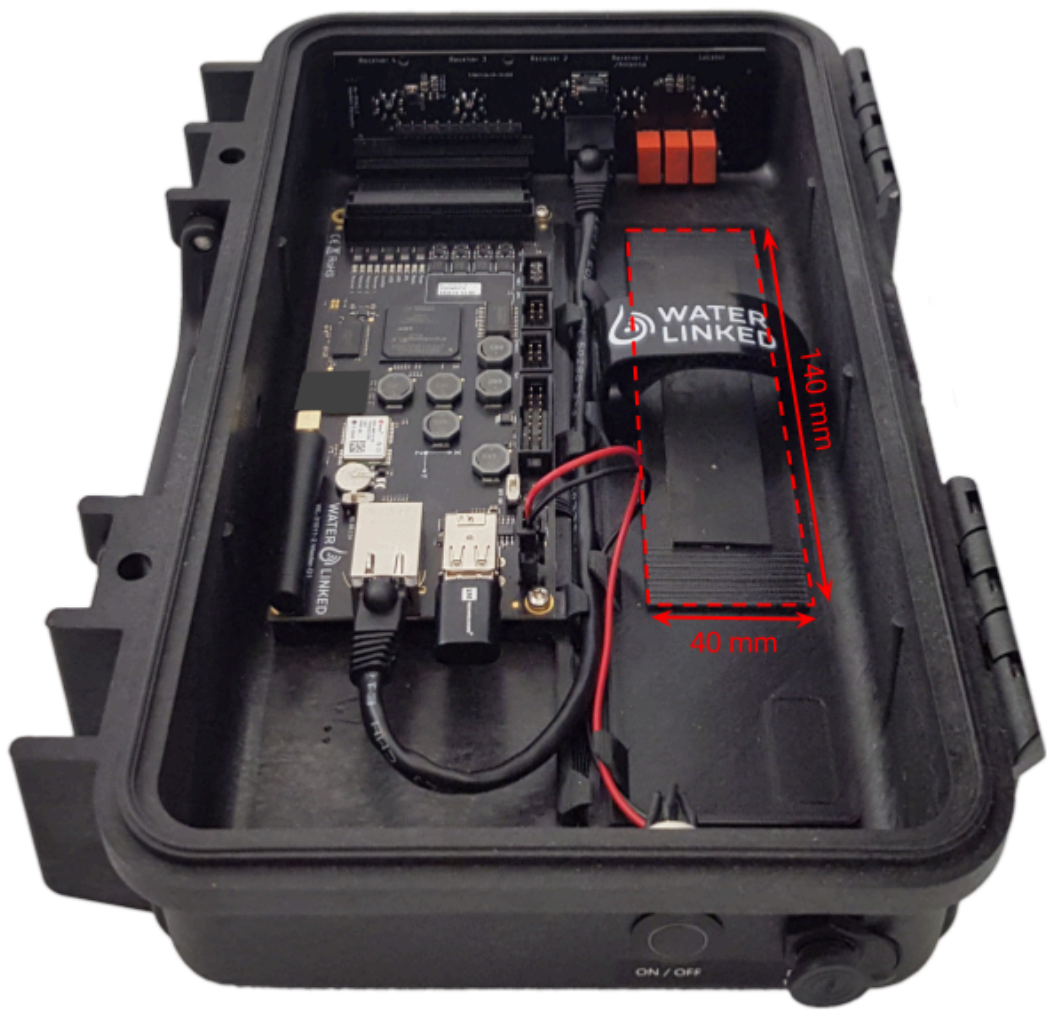
Both the power button and the power input can be found on the right side of the Underwater GPS housing. The power button will illuminate when the power is switched on.

Note

There is both an external latching power button and an internal power switch. These are OR configured, meaning they override each other. By default, the internal power switch is in the OFF position.

Battery

A battery may be used instead of wired power. Use a battery with a nominal voltage within the voltage range. A Molex-to-XT60 cable assembly is provided with the Underwater GPS kit for ease of connection to battery packs with XT60 connectors. The battery pack can be secured within the Underwater GPS housing using the provided non-slip battery strap.



Maximum battery width: 50 mm (2").

Power usage

The power usage of the Underwater GPS G2 will vary based on the supplied voltage, Receiver and Locator setup, and whether or not the [BlueROV2 Integration Kit](#) has been installed.

The table below list the average current consumption for components used with Underwater GPS G2, assuming an input voltage of 12 VDC.

Component	Current consumption (12V in)
Master Electronics	250 mA
Locator-A1	10 mA

Component	Current consumption (12V in)
Locator-D1	130 mA
Locator-S1	60 mA
4x Receiver-D1	4x35 mA
Antenna	20 mA

UGPS Topside

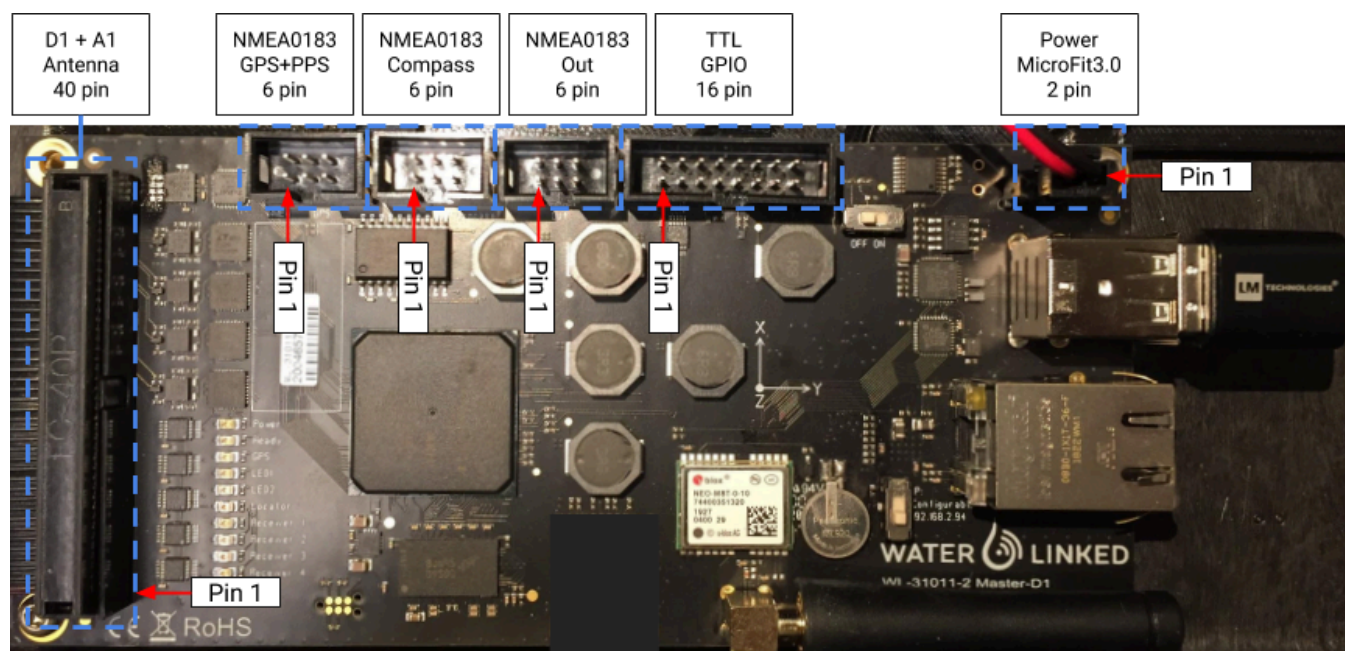
Connectors

External



* Locator-D1 is not compatible with the [BlueROV2 Integration Kit](#).

Internal



LED Indicators

LED name	LED	Description
Power		Solid green: Topside has power
Ready		Solid green: Topside has booted successfully
GPS		Flashing green: Searching for GPS lock, solid green: Topside has GPS lock. The topside uses GPS both for its own position and to synchronize its clock
LED 1		Solid green: Firmware successfully loaded
LED 2		Not in use
Locator		Solid green: Locator D1 is connected
Receiver 1		Solid green: Receiver 1 connected
Receiver 2		Solid green: Receiver 2 connected
Receiver 3		Solid green: Receiver 3 connected
Receiver 4		Solid green: Receiver 4 connected

 Note

There is **No** indication when the **Antenna** is connected.

 Note

NC: Not Connected.

DNC: Do Not Connect, pins used for production.

GND: Boldface indicate power lines (12 V, 3.3 V, VIN, GND).

40 pin Molex Interface

Signal	Pin	Pin	Signal	Function
GPIO 2*	1	2	GPIO 3	GPIO

Signal	Pin	Pin	Signal	Function
D1 TX+	3	4	D1 TX-	Locator-D1
D1 RX+	5	6	D1 RX-	Locator-D1
GND	7	8	12 V	Power out
R1 TX+	9	10	R1 TX-	Receiver-D1
R1 RX+	11	12	R1 RX-	Receiver-D1
GND	13	14	12 V	Power out
R2 TX+	15	16	R2 TX-	Receiver-D1
R2 RX+	17	18	R2 RX-	Receiver-D1
GND	19	20	12 V	Power out
R3 TX+	21	22	R3 TX-	Receiver-D1
R3 RX+	23	24	R3 RX-	Receiver-D1
GND	25	26	12 V	Power out
R4 TX+	27	28	R4 TX-	Receiver-D1
R4 RX+	29	30	R4 RX-	Receiver-D1
ANT RX 1+	31	32	ANT RX 1-	Antenna
ANT RX 2+	33	34	ANT RX 2-	Antenna
ANT RX 3+	35	36	ANT RX 3-	Antenna
ANT RX 4+	37	38	ANT RX 4-	Antenna
A1 TX+	39	40	A1 TX-	Locator-A1

* Used to control relays for switching between Receivers and Antenna.

6 pin NMEA 0183 GPS + PPS (not currently implemented)

Signal	Pin	Pin	Signal
GND	1	2	12 V
NMEA GPS TX	3	4	NMEA GPS RX
NMEA GPS PPS	5	6	GND

6 pin NMEA 0183 Compass (not currently implemented)

Signal	Pin	Pin	Signal
GND	1	2	12 V
NMEA COMPASS TX	3	4	NMEA COMPASS RX
<i>NC</i>	5	6	GND

6 pin NMEA 0183 Out (not currently implemented)

Signal	Pin	Pin	Signal
GND	1	2	12 V
NMEA OUT	3	4	<i>NC</i>
<i>NC</i>	5	6	GND

16 pin TTL GPIO

Signal	Pin	Pin	Signal
GND	1	2	12 V
<i>DNC</i>	3	4	<i>DNC</i>
<i>DNC</i>	5	6	<i>DNC</i>
<i>DNC</i>	7	8	<i>DNC</i>
GND	9	10	PPS OUT
GND	11	12	PPS IN

Signal	Pin	Pin	Signal
GPIO 0	13	14	GPIO 1
GND	15	16	3.3 V

 Note

TTL voltage: 3.3 V (5.0 V tolerant).

2 pin MicroFit 3.0 Power

Signal	Pin	Pin	Signal
GND	1	2	VIN*

* 10 - 30 VDC, 0.7 A (12 V nominal).

Fits Molex Micro-Fit 3.0 43645 series.

Receiver-D1 setup

- Connect the four Receiver-D1 cables to bulkheads marked "Receiver 1" to "Receiver 4" on the housing.
- If using the Locator-D1, connect this to the bulkhead marked "Locator" on the housing.
- If using the Locator-A1, connect this to the bulkhead marked "Locator" on the housing.
- If using the Locator-U1, no connections to the housing is needed. Just power the Locator and make sure both status LEDs on U1 and Master-D1 are solid green.



IMU

The master electronics has an built in IMU used to provide the orientation of the master electronics. This is used in combination with the acoustic position and GPS to generate the global position of the Locator.

IMU Calibration

For the IMU to work properly it needs to be calibrated. If the system is started on a new location a new calibration is needed for the IMU to work as intended. The IMU is calibrated in the [settings page](#) of the user interface.

Antenna

[Buy Antenna here!](#)



Description

The Antenna is a quick deployable analog hydro acoustic receiver compatible with the Underwater GPS G2 system. The Antenna is equipped with 4 Receiver-A1 with large dynamic range followed by advanced digital signal processing functionality when connected to the Underwater GPS G2 topside unit.

Benefits

- Foldable to minimize space during travel (54 x 12.5 x 14.5 cm).

- Quick deployable to minimize setup time.
- Small baseline (98 x 53.5 cm) suitable for small boats and tanks/pools.
- Highly robust operation in areas with reflections (shallow water, around installations etc.)
- Includes C-Size RAM Mount fixtures for universal mounting capabilities.

Wiring interface

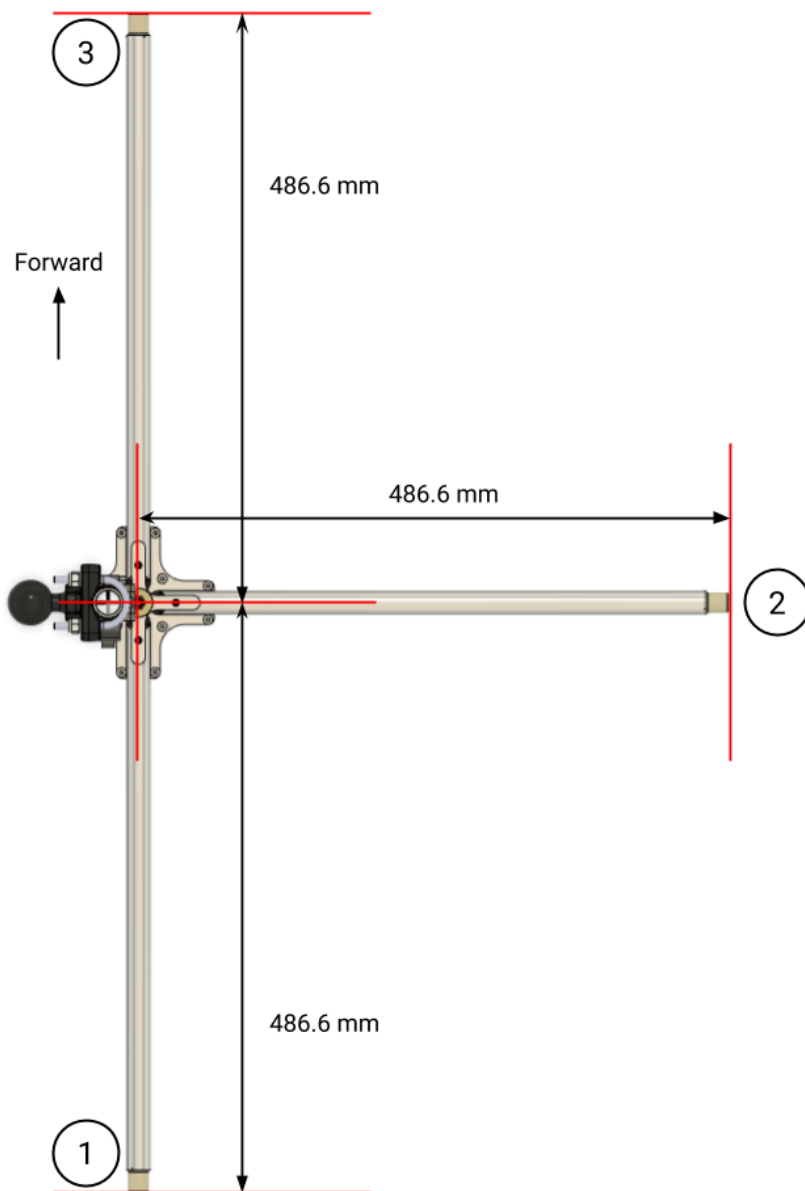
The Antenna comes with 10 meters of cable. This is the maximum cable length available for the Antenna due to noise limitations on the analog signals.

The table below shows the pinning of the Antenna connector.

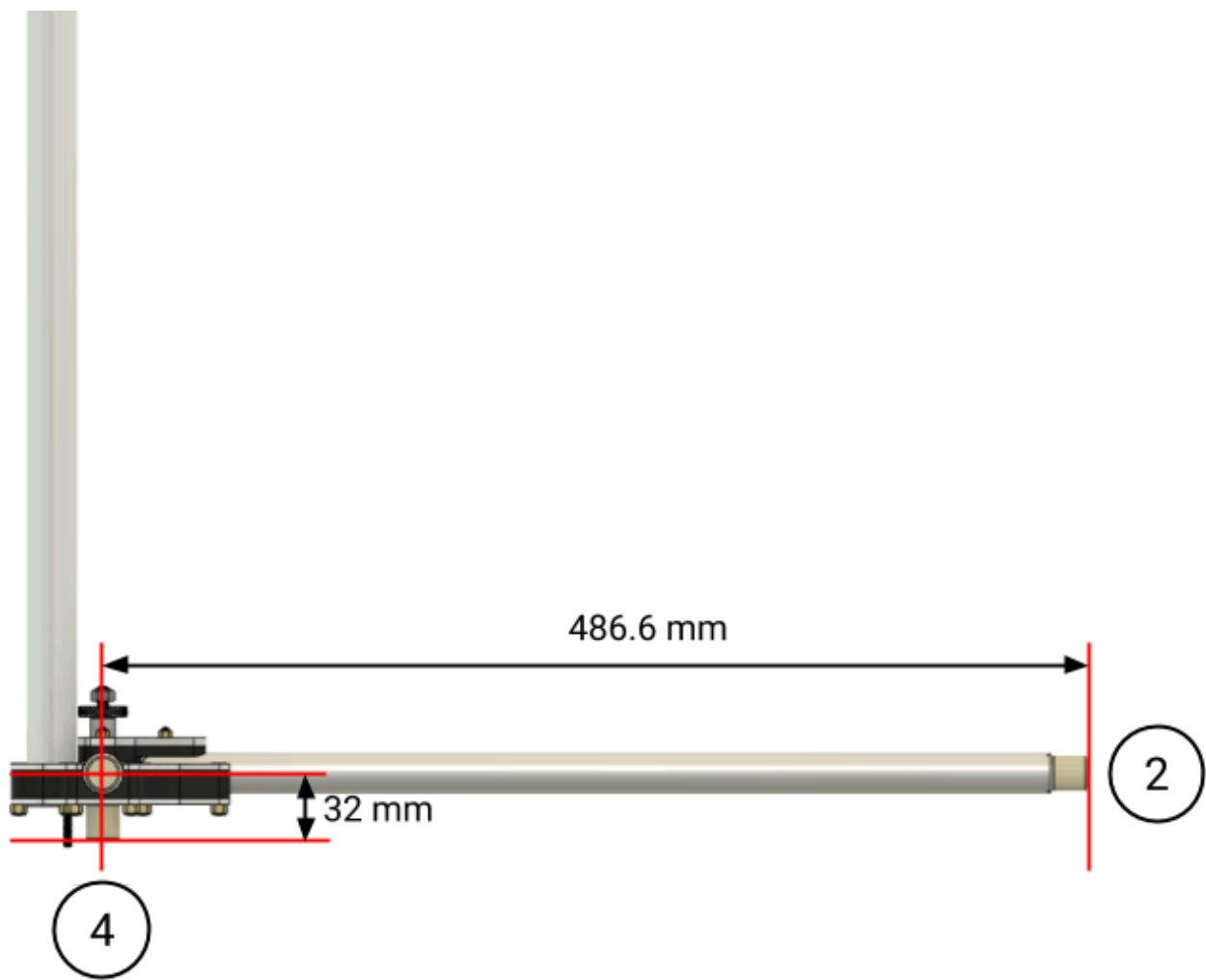
	Pin	Color		Signal	Receiver #
	1		Brown	1+	1
	2		Brown/White	1-	
	3		Orange	2+	2
	4		Orange/white	2-	
	5		Blue	3+	3
	6		Blue/White	3-	
	7		Green	4+	4
	8		Green/White	4-	

Dimensions

Top view



Side view



Receiver-D1

[Buy Receiver-D1 here!](#)

Description

The Receiver-D1 is a digital low-noise, high sensitivity hydro acoustic receiver that converts acoustic waves to a digital data stream. The receiver is equipped with a wideband analog front-end width a large dynamic range followed by advanced digital signal processing functionality. The electrical interface complies with the Water Linked D1 communication standard.

Benefits

- Extremely small footprint enabling easy integration in other equipment.
- Highly robust operation in areas with reflections (shallow water, around installations etc.)

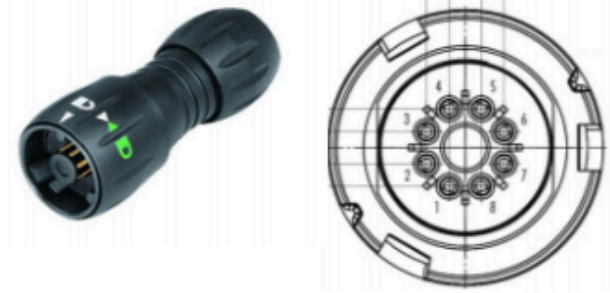
Wiring interface

The tables below shows the pinning of the Receiver interface connectors.

GH connector

	Pin #	Wire Color	Signal
	1	Orange/White	<u>GND</u>
	2	Orange	12V
	3		
	4		
	5	Brown/White	RX-
	6	Brown	RX+
	7		
	8		

Binder connector

	Pin #	Wire Color	Signal
	1	Orange/White	<u>GND</u>
	2	Orange	12V
	3		
	4		
	5	Brown/White	RX-
	6	Brown	RX+
	7		
	8		

Dimensions



Datasheet

[Datasheet](#)

Locator-A1

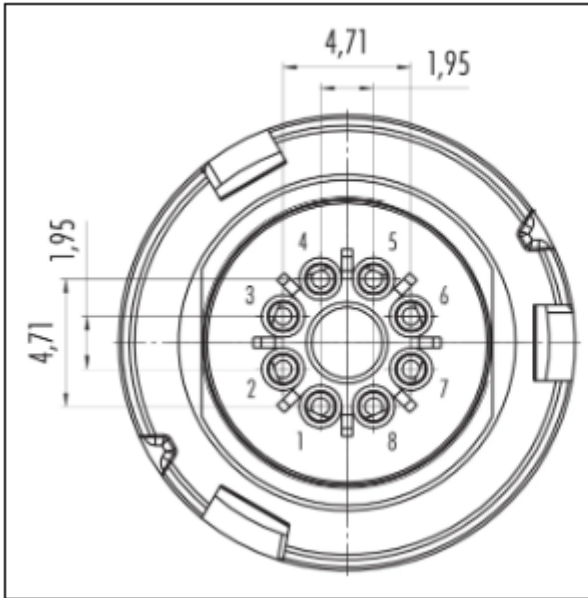
[Buy Locator-A1 here!](#)

Description

The Locator-A1 has the smallest physical footprint in our series of locators. It can be integrated into even the most compact ROVs. The Locator-A1 does not carry its own depth sensor, so the UGPS G2 system requires that the depth be provided from your underwater vehicle (ROV, etc.) This can be achieved by means of the [UGPS API](#).

Wiring interface

The table below shows the pinning of the A1 interface connectors.



Pin	Wire color	Signal
1		
2		
3		
4		
5		
6		
7	Blue/white	ANA+
8	Blue	ANA-

Dimensions



Datasheet

[Datasheet](#)

Locator-D1

[Buy Locator-D1 here!](#)

Description

The Locator-D1 carries its own depth sensor and can therefore operate fully stand-alone and independent of the device you want to position. It is offered with a 50 m or 100 m integrated cable that connects directly to the topside box.

**Warning**

The Locator-D1 can only be submerged for about 6 hours. It then needs to dry the pressure sensor in order to give correct depth readings.

Wiring interface

The tables below show the pinning of the D1 interface connectors.

GH connector

	Pin #	Wire Color	Signal
	1	Orange/White or Black	GND
	2	Orange or Red	12V
	3	Blue	TX+
	4	Blue/White	TX-
	5	Brown/White	RX-
	6	Brown	RX+

Binder connector

	Pin #	Wire Color	Signal
	1	Orange/White	GND
	2	Orange	12V
	3	Blue	TX+
	4	Blue/White	TX-
	5	Brown/White	RX-
	6	Brown	RX+
	7		NC
	8		NC

Dimensions



Datasheet

[Datasheet](#)

Locator-U1

[Buy Locator-U1 here!](#)

Description

The Locator-U1 is a battery-powered, digital hydroacoustic locator device. It includes an internal GPS-based time-sync module, eliminating the need for a tether. This makes it ideal for divers, ROVs lacking convenient power sources, or other underwater applications.

The Locator-U1 has its own pressure sensor and measures its own depth. The topside uses this depth together with the acoustic signal to calculate the position of the Locator-U1.

The Locator-U1 uses GPS only to synchronize its clock, not to find its own position. The topside needs GPS as well: for its own position and for the same clock synchronization. Both clocks must be synchronized for the topside to position the Locator-U1. The synchronization of the Locator-U1 is what its status LED reports, and it is often called *GPS lock*.

Note

You will need GPS lock on the topside as well when using the U1. This is for timing purposes, it will not help to use only external GPS position as this can not be used for time synchronization. It is not enough to only have GPS lock on the U1.

Before each use

Use this checklist to get the Locator-U1 ready. Each step links to the detailed description further down the page.

Step	What to do	LED
1	Charge the Locator-U1 with a 5 V / 2 A wall adapter, within 24 hours before use. On SN: 0556 and higher the LED turns solid green when the battery is full; on SN: 0555 and lower, charge for 7 hours.	 SN: 0556 and higher
2	Unplug the charger. With the cap off, set the channel on the rotary switch to the same channel as in the GUI.	
3	Check that the O-ring in the cap is clean and undamaged, then screw the cap on to power on. The Locator-U1 searches for a GPS signal to synchronize its clock.	
4	Keep the Locator-U1 in open sky until the LED turns solid green. Its clock is now synchronized and it is ready to use.	
5	Make sure the topside also has GPS lock, then deploy. Recover the Locator-U1 within about 6 hours .	

Charging

The Locator-U1 has an internal rechargeable battery. Use the included USB-C cable and a 5 V / 2 A (or higher) wall adapter to charge it. Always fully charge the Locator-U1 before each operation.

Warning

Do not use your computer to charge the locator. A computer USB port does not supply enough power to charge the Locator-U1.

1) Remove the cap

Unscrew the cap completely to access the USB-C charging port.

2) Insert the USB-C cable

Plug one end of the cable into the Locator-U1's charging port.

3) Connect to a suitable power source

Attach the other end of the cable to a wall adapter providing at least 5 V / 2 A.

4) Charge the battery

On **SN: 0556 and higher**, the LED shows when the battery is full: charging is finished when the LED stops breathing and is solid green.

On **SN: 0555 and lower**, the LED does not show the charging status, so leave the Locator-U1 connected for a full 7 hours.

Charging overnight the night before use is a recommended routine.

LED behavior while charging

The LED behavior while charging depends on the serial number (SN) of your Locator-U1. The serial number is printed on the flat side of the Locator-U1, where the bracket is mounted. Select the tab that matches your unit.

SN: 0556 and higher

When connected to a charger, the Locator-U1 only charges. It does **not** power on, does **not** search for GPS, and the LED shows the charging status only:

LED	Signal	Meaning
	Breathing green light (slowly fading in and out)	The Locator-U1 is charging.
	Solid green light	The battery is full. Here solid green means <i>fully charged</i> , not time synchronized.

Screw the cap on to power the Locator-U1 on. The LED then shows the time synchronization status instead, as described in [LED behavior while in use](#).

SN: 0555 and lower

When connected to a charger, the Locator-U1 powers on and charges at the same time. The LED does **not** indicate charging progress:

LED	Signal	Meaning
	Flashing green light	The Locator-U1 is powered on and working normally, for example searching for a GPS signal. This does not reflect charging status.
	Solid green light	The Locator-U1 is powered on and its clock is synchronized. This does not mean it is fully charged. Keep charging for the full 7 hours.

Powering on and off

- **To power on** the Locator-U1, securely tighten the cap over the charging port. The LED will begin flashing to indicate that it is searching for a GPS signal. Once the LED stops flashing and becomes solid, the clock of the Locator-U1 is synchronized and it is ready for use.
Ensure the O-ring in the cap is undamaged before submerging the device.
- **To power off** the Locator-U1, unscrew the cap until the LED turns off.

LED behavior while in use

These signals apply when the Locator-U1 is powered on by screwing on the cap. The LED shows whether the clock of the Locator-U1 is synchronized with GPS time, which it needs in order to be positioned by the topside (the topside must be synchronized too). For the LED while connected to a charger, see [LED behavior while charging](#).

LED	Signal	Meaning	Ready to use?
	No light	Power is off, or the battery is empty.	No
	Flashing green light (once per second)	Searching for a GPS signal. The clock is not synchronized yet.	No
	Solid green light	The clock is synchronized with GPS time.	Yes
	Flashing green light (slow)	The GPS signal has been lost, for example because the Locator-U1 is in the water. The time synchronization is still valid, so the Locator-U1 keeps working.	Yes
	Fast flashing green light (multiple times per second)	Error. See Error indication .	No

 Note

The animations above illustrate the LED patterns. The exact timing on the Locator-U1 may vary slightly.

Empty battery

A completely empty battery looks the same as a Locator-U1 that is switched off: the LED stays dark. So if the LED is dark with the cap screwed on, the Locator-U1 most likely needs [charging](#).

If the LED also stays dark when the Locator-U1 is connected to the charger, the battery is so deeply discharged that it may be damaged. Leave the Locator-U1 connected to the charger, as this can recover the battery. If the LED is still dark after a full charge, contact [support](#).

Error indication

A fast flashing LED often means one of the following:

- The Locator-U1 has exceeded its [operating time](#) and the pressure sensor needs to dry. Charging the Locator-U1 helps the sensor dry more quickly.
- Another internal failure. If the LED keeps flashing fast after the pressure sensor has dried, contact [support](#).

Channel selection

The channel is selected with the rotary switch inside the cap. Unscrew the cap completely to access the switch. The channel on the Locator-U1 must match the channel selected in the [GUI settings](#). Channel 3 is usually a good choice. See the [channel overview](#) for the frequency band of each channel.

Operating time

The Locator-U1 can be used for about 6 hours at a time. After this it needs to be brought to the surface, because all three of the following have run out:

- The pressure sensor needs to dry, otherwise the depth readings become inaccurate.
- The battery needs recharging. How long the battery lasts varies with the water temperature, and is shorter in cold water.
- The GPS time synchronization needs refreshing, which the Locator-U1 does in open sky.

 Warning

Do not keep the Locator-U1 submerged for longer than about 6 hours. It then requires charging and time to dry the pressure sensor in order to provide accurate depth readings.

Troubleshooting

Problem	What to check
The LED is dark when the cap is screwed on	Make sure the cap is fully tightened. If the LED stays dark, see Empty battery .
LED keeps flashing once per second	The Locator-U1 has not synchronized with GPS time yet. Move it outdoors with a clear view of the sky. Indoors, a GPS repeater or similar is needed.
No signal from the Locator-U1 in the GUI	Check that the LED of the Locator-U1 is solid or slowly flashing green, that the topside has GPS lock, and that the channel on the rotary switch matches the GUI. See also Warnings .
Fast flashing LED	See Error indication .
Battery runs out sooner than expected	Charge within 24 hours before use with a 5 V / 2 A wall adapter, not a computer. The battery also lasts shorter in cold water.

Wiring interface

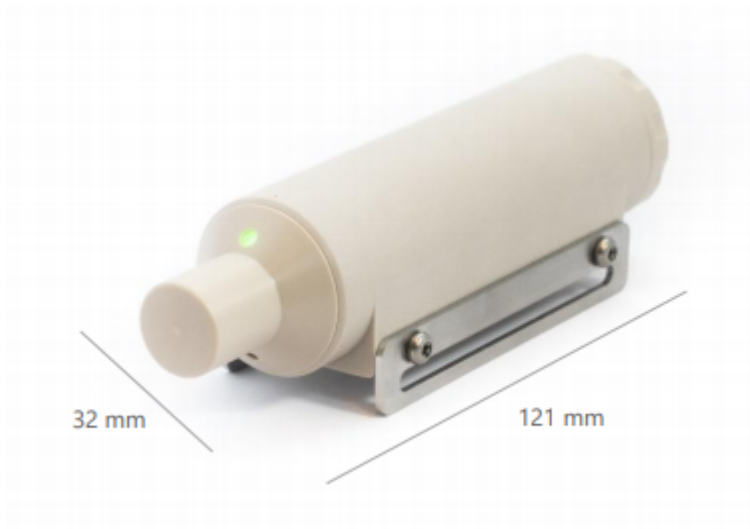
Since the Locator-U1 is battery powered, its only interface is the charging port, which is a standard USB-C connector.

Included in package

- Locator-U1
- USB-C charging cable
- Mounting bracket

Mounting and dimensions

Each side of the Locator-U1 has three M3 mounting holes, and the included bracket fits these. The serial number is printed on the flat side where the bracket is mounted.



Datasheet

[Datasheet](#)

Adjusting your UGPS systems configuration and settings

The setup in the GUI needs to mirror your actual setup in the real world for your positioning information to be correct. In the GUI there are two systems that needs to be adjusted; the [Baseline](#) and the [Settings](#).

In the Baseline window in the GUI, you adjust the placement of your antenna/receivers in relation to the topside box. In the Settings window you choose which locator you are using and the placement of the topside in the environment.

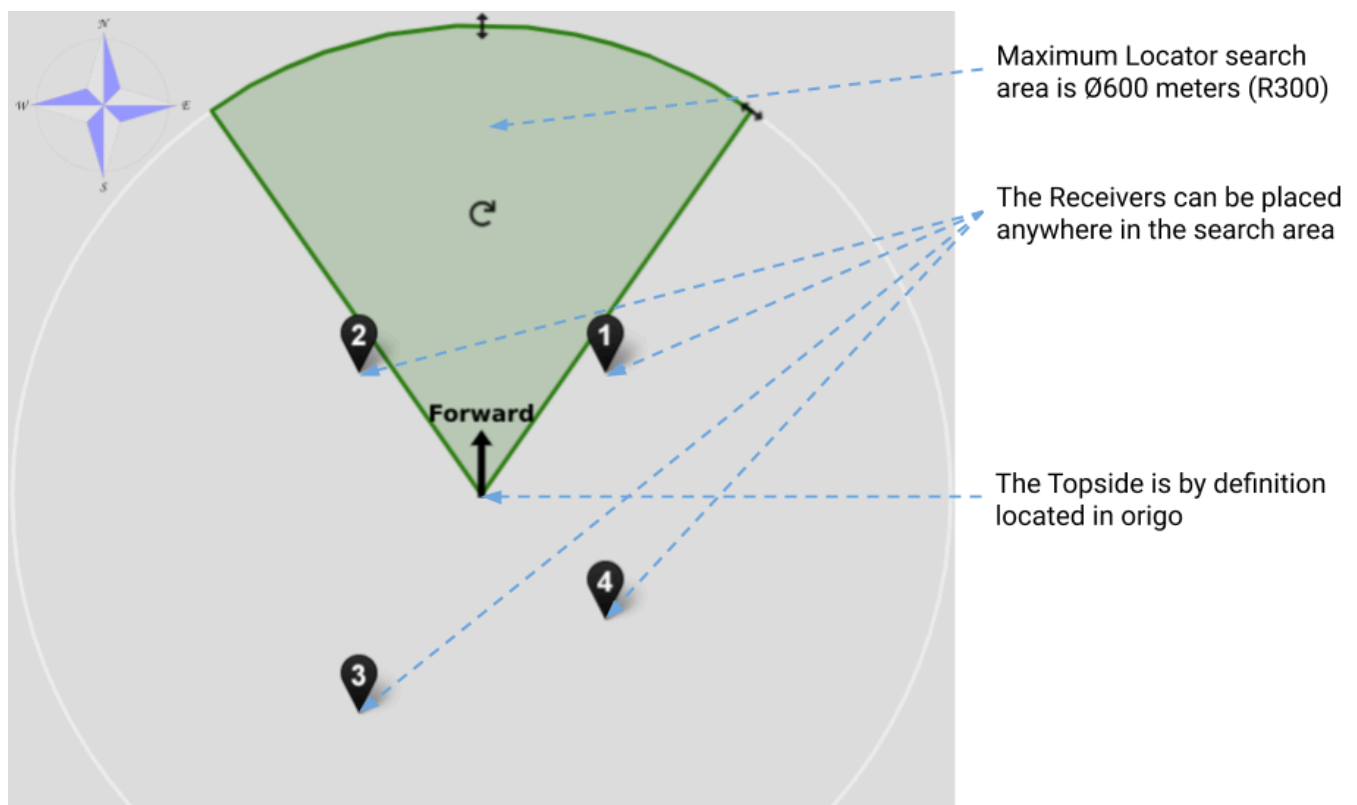
Baseline settings

Go to [Baseline](#) from the left menu in the GUI. In the tab at the top select **antenna** or **receivers** according to whether an [antenna](#) or loose [receivers are used.](#)

In the receiver view, in the graphical configuration panel, you either drag and drop the receivers to their actual position in relation to the topside, or you fill in the position manually in the input fields below the panel. (You might need to drag the receivers apart for the manual input fields to become visible) Remember to fill in the receivers depth.

In the antenna view you need to open Advanced Settings to fill in the position of the antenna in relation to the topside.

Improved positioning will likely be obtained by **limiting the search area** : Restrict the search area as far as possible by dragging and dropping the arrows in the graphical configuration panel.



Locator and topside settings

Configurations of the topside and locator settings is conducted in [Settings](#), from the left menu in the GUI.

Locator settings

Select the type of locator ([U1](#), [A1](#), or [D1](#)) which you are using, and which [channel](#) you wish to use.

Note

If using the [U1](#) locator, the channel must match the rotary switch at the back of the U1 (screw the cap completely off to access the switch).

Note

If using the [A1](#) locator, the depth of the locator must be inputted by means of the UGPS [API](#).

Channel overview

The frequency bands of the available channels are as follows. Lower frequency typically corresponds to greater range due to less acoustic absorption, though there are other factors involved: if you experience issues with signal quality (low RSSI or high NSD), try a different channel. Often channel 3 is recommended.

From (kHz)	To (kHz)	Channel
31.25	62.5	1
62.5	93.75	2
93.75	125.0	3
125.0	156.25	4
156.25	187.5	5
187.5	218.75	6
218.75	250.0	7

Topside settings

The default source for the topside position and heading is *On-board*. This configuration should be chosen if the topside is located in any dynamic environment, like on a boat or similar.

If the topside unit/antenna is at a globally stationary position (like a jetty) the *static* configuration of position and heading will give best accuracy of the system. Below you can see how the position and heading is set to static. Clicking on the map button opens a map window to help you input the static position.

WaterLinked

Underwater GPS G2 (3.3.4 R300)

System status ✓

Menu

Position

Baseline

Settings

Diagnostics

About

Adjust settings below, then click on the button to store

Apply

Locator setup

Locator type ?

Locator-D1 Locator-A1 **Locator-U1** Locator-S2 Locator-P2

Channel ?

1 2 3 **4** 5 6 7

Speed of sound ?

1475 m/s Custom

Topside setup

Topside position ?

On-board **Static** External

63.44198 Latitude

10.42467 Longitude

Topside heading ?

On-board **Static** External

210 Degrees

Advanced settings ⌵

IMU calibration

The link "Onboard IMU calibration" takes you to a window where you can reset the gyros and set the heading manually.

INERTIAL MEASUREMENT UNIT

Step 1: Reset Gyros

Place the topside housing on the ground and make sure there is no movement.

Ready?

Reset gyros

Step 2: Set Heading

Using a magnetic compass (eg. boat or mobile phone) take a note of the heading of the G2 topside. This is the heading of the forward arrow that can be seen on the G2 topside. Enter this value and click "Set current heading".

The on-board compass can drift 5-20 degrees per hour. To improve the compass heading accuracy: set compass heading regularly during operation or alternatively use an external compass.

0 Degrees

Set current heading

Axis Angle

Heading 0.0

It is advisable to reset the gyros before every use. Place the topside on a static horizontal area and press "Reset gyros".

The topsides heading has to be set manually. Use a decent compass and enter the heading in the heading field, and press "set current heading".

Note

When you are using On-board positioning the heading has to be set periodically, as the IMU will drift over time.

For best performance on boats or similar, with a moving topside unit, we recommend to use an external input of heading data (e.g. from a GPS compass) as well as global position data. An external device will likely be more accurate than the topside unit's built-in GPS receiver and IMU. For a thorough description on how to do this, see [External Compass](#)

User preferences

Select whether to use metric or imperial units, and/or if you would like a dummy boat to be displayed on the map and receiver configuration pages.

Advanced settings

Advanced settings allows you to configure ethernet and wifi.

Network Settings

The Underwater GPS GUI is web based, and can be accessed using your favorite web browser. Connect to the system through either of the methods listed below.

Note

We currently support and recommend Chrome, Firefox, Safari and Edge. Internet Explorer is not supported as of now.

WiFi

The local Underwater GPS WiFi is configured as:

Setting	Value
Mode	Access Point
SSID	UnderwaterGPS
Password	waterlinked
Security	WPA2-Personal

To connect to the UGPS over it's local wifi - Power on the UGPS and wait for GPS lock and the Ready LED to be lit. - Connect to the UnderwaterGPS GUI on: <http://192.168.7.1/>

Ethernet

At power-up, the Master-D1 reads the IP switch settings. The ethernet network mode depends on the switch position.

Network mode	Direction	IP switch position
Configurable	UP	 IP: Configurable 192.168.2.94
Static IP 192.168.194.94	DOWN	 IP: Configurable 192.168.2.94

Configurable mode

In the configurable mode the UGPS will receive an IP address from the local router and can be reached on the assigned IP address.

Fallback or static IP

The UGPS can always be reached on its static IP address.

Before turning the UGPS on:

- Connect the UGPS ethernet directly to your computer
- Set the switch in the static IP position

Then:

- Power on the UGPS and wait for GPS lock and the Ready LED to be lit.
- Configure your computer to static IP on the same subnet as the UGPS. For example: If the IP address of the UGPS is 192.168.194.94 the host computer needs to be configured to a different 192.168.194.x address e.g. 192.168.194.100.
- Connect to the UnderwaterGPS GUI on: <http://192.168.194.94/>

Note

With blueOS the static IP is 192.168.2.94

API

The Underwater GPS G2 system comes with an easy-to-use software HTTP API. Through the API you can, amongst other things:

- Read acoustic and global position data
- Read GPS and IMU raw data
- Read and set POIs
- Set configuration parameters

See demo.waterlinked.com/swagger for the details of the API.

Interaction

Any programming language can be used to interact with the API. We have examples in both [Python](#) and [Go](#), which currently cover, for instance:

- Sending of locator depth when using the [Locator A1](#) (see the script `externaldepth.py`).
- Sending in of satellite GPS data (positioning and/or heading) from an external GPS receiver (see the script `nmeainput.py` or its [Go analogue](#))
- Export of tracks to a GPX file (see the script `tracklog.py`)
- Output of the positions calculated by the UGPS G2 system in NMEA format (see the Python script `nmeaoutput.py` or its [Go analogue](#))

How to implement external GPS compass data in the UGPS

In very dynamic conditions with rapid changes in angles, the IMU will drift too much to provide sufficient heading accuracy. In this case it is recommended to implement an external compass to provide updated heading information.

Which compass to use

If the UGPS is permanently installed on a boat, the simple solution is to use the boats compass, if it provides the possibility to output NMEA data. Otherwise it is possible to use any portable compass that provide NMEA0185 or NMEA2000 information.

External compass on the UGPS:

To use an external compass with the UGPS it has to be integrated in the software on your computer. As for now there are no direct hardware connection available. The needed firmware can be installed by following this procedure:

Note

This is valid only for compasses that provides NMEA0183

- Go to: <https://github.com/waterlinked/ugps-nmea-go> under "Readme" and "Installation" and "Download the application", choose v.1.8.0
- Download the .zip-file.
- In windows: run the file. Follow the instructions you get. (It is advisable to create a folder on your computer specifically for this configuration)
- In linux, in the directory you saved the file in: use `chmod +x` (It is advisable to create a folder on your computer specifically for this configuration)
- Go back to the "ugps-nmea-go" repository and download the file: "config-example.yml", save it in the same folder as the application and rename it to `config.yml`.
- Open the file and make sure you have the correct com or tty-port on "device" and the correct position sentence. If you are uncertain, check the gps manual. The baudrate is usually 9600. If you still are uncertain of the baudrate, open the device with a serial program like putty or minicom and connect to the compass. Try different baudrates and see which one that gives you sensible data. -Save the changes you made to the `config.yml` file.
- Connect the UGPS topside to your computer and turn it on.
- Run the application from a terminal. To do this, navigate to the correct folder with "`cd /`" (in your terminal) and run the application with `./nmea_ugps_linux_amd64` or `./nmea_ugps_windows_amd64.exe`
- In the UGPS GUI, go to Configuration -> Topside setup and choose "external" compass.

 Note

The UGPS do still need GPS lock to synchronize time with the locator, but as long as the UGPS has access to a GPS signal (is outside) you do not have to worry about it.

If you have an NMEA2000 GPS compass

In this case you will need an NMEA0183 to NMEA2000 converter. Below are link's to converters that can be used for the purpose:

<https://www.mrad.co.za/wp-content/uploads/2019/09/ngw-1-user-manual.pdf>

<https://actisense.com/products/nmea-2000-gateway-ngw-1/>

Overview BlueROV2 integration

The Water Linked Underwater GPS G2 (from now UGPS) system can be integrated with a BlueROV2 from Blue Robotics in different ways, depending upon the choice of locator.

Most common integration methods

- We recommend you to use the [Locator-A1](#) together with the [BlueROV2 Integration Kit](#) when integrating the UGPS system with the BlueROV2. The integration steps are described in [BlueROV2 Integration Locator-A1](#). Hardware modification must be carried out on the ROV, FXTI and UGPS Topside which serve two purposes: Firstly, a spare twisted wire pair in the tether is used to connect the Locator-A1 to the UGPS Topside. Secondly, the UGPS Topside is modified to connect directly to the communication between ROV and topside computer. The advantage of integrating using this method is that there is no additional topside computer configuration required, which can be challenging with different operating systems (i.e. Linux, iOS).
- If you wish to avoid carrying out hardware changes to the ROV, as they are required to integrate the A1-Locator, then we recommend you to use the [Locator-U1](#). The locator can simply be attached to the BlueROV2 in any convenient way. However some configuration steps in the topside computer are required to establish a network bridge, so the position calculated by the UGPS Topside is available in QGroundControl. These steps are described in [BlueROV2 Integration Locator-U1](#). Be aware that setting up a network bridge in operating systems other than Windows can be challenging.

Alternative integration methods

- If you wish to use a [Locator-A1](#), however you wish to avoid purchasing the full integration kit then this can be done. The Locator-A1 must be installed on the ROV and connected to the G2 Topside and then it is necessary to set-up a network bridge. The steps in these sections are relevant
 - [Modifications to the BlueROV2](#)
 - [Modifications to the FXTI](#) with the deviation that the blue/white  twisted pair between Tether Connection PCB and Binder-connector-pigtail-assembly does not need to be connected.
 - [Establish a network connection with a network bridge](#)
 - [Final steps](#)
- If you wish to use the [Locator-U1](#), however you wish to avoid the complication in setting up a network bridge, it is possible to integrate by using the [BlueROV2 Integration Kit](#). The steps in these sections are relevant
 - [Mount the Locator-U1 to the BlueROV2 frame](#)
 - [Modifications to the UGPS Topside](#)
 - [Modifications to the FXTI](#) with the deviation that the green/white  twisted pair between tether and Binder-connector-pigtail-assembly does not need to be connected.
 - [Establish a network connection with powerline communication](#)
 - [Final steps](#)

- If using a [Locator-D1](#), use the D1's cable and attach the D1 locator to the BlueROV2 in any convenient way. No further hardware integration is then required. As with the Locator-U1,
 - [Establish a network connection with a network bridge](#)
 - and follow the [final steps](#)

Final steps of integration independent of Locator

If you have successfully installed a Locator with one of the above linked guides, these are the final configuration steps to be performed.

BlueROV Software Update and UGPS extension

Your BlueROV2 runs BlueOS

This section is for the R4 version of the BlueROV2 that uses the [Navigator Flight Controller](#) or ROVs that have been upgraded to [BlueOS](#) software.

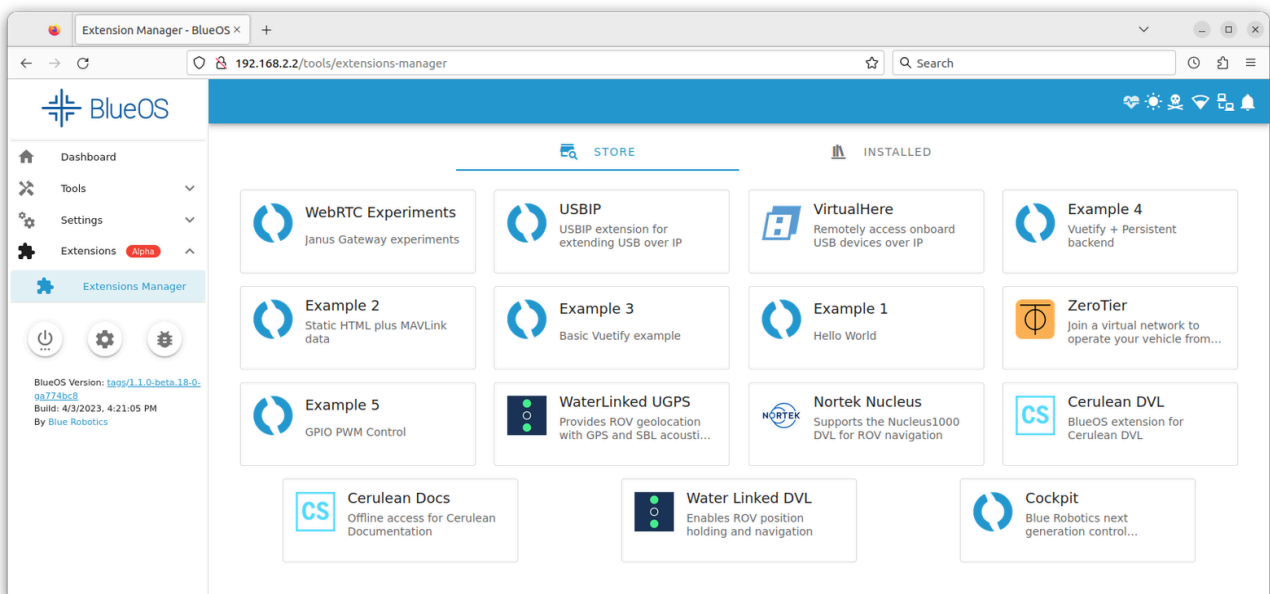
Info

If you have an older R1, R2, or R3 version of the BlueROV2 that uses a Pixhawk autopilot and you want to upgrade to using BlueOS, you can either carry out a software upgrade only ([described here](#)) or upgrade the hardware from Pixhawk to Navigator flight controller and the software ([described here](#)).

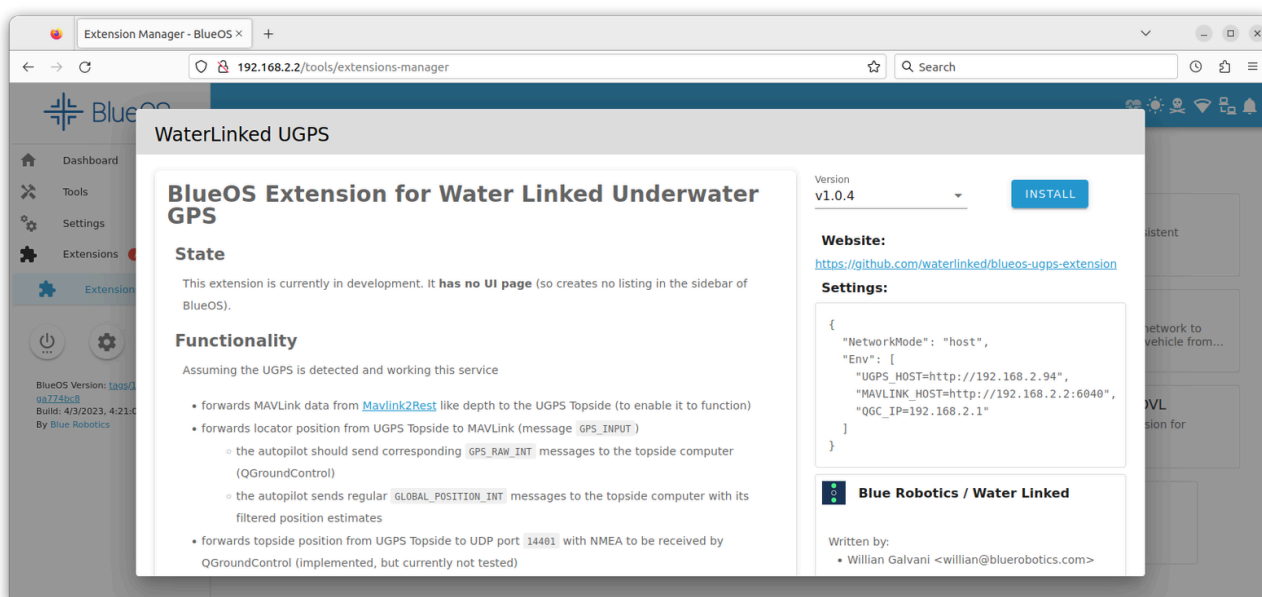
The Water Linked UGPS system requires an extension in BlueOS to be able to communicate with the autopilot (Pixhawk or Navigator flight controller). BlueOS has to be updated to **BlueOS 1.1.0** or newer to assure that extensions are supported sufficiently. Follow the Update Software section of the [BlueROV Software Setup guide](#)

To enable the UGPS extension navigate to "Extensions", that should show up in the side bar after the above described BlueOS update.

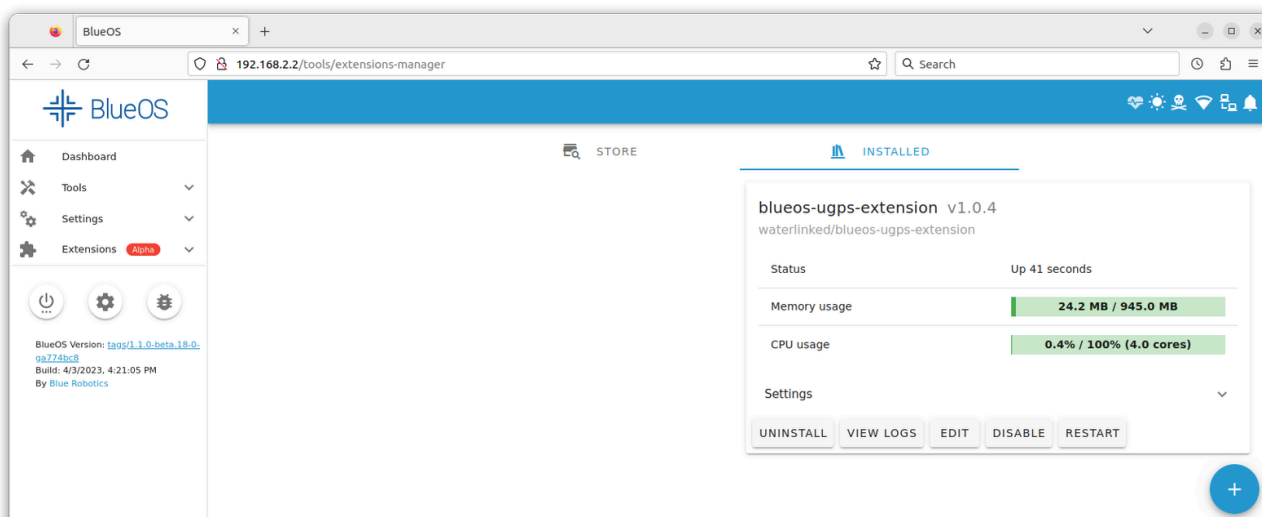
Click on the "Water Linked UGPS" extension.



In the pop-up make sure the latest version (> 1.0.4) is selected and click "Install".



The extension should show up in the "Installed" tab.



Your BlueROV2 runs ArduSub Companion

This section is for older R1, R2, or R3 versions of the BlueROV2 that use a Pixhawk autopilot and [Companion](#) software.

To work properly, the Water Linked UGPS system requires ArduSub Companion image version **0.0.21** or newer and the most recent stable release of QGroundControl for your operating system. If your Companion image is out of date, please follow the BlueROV2 Software [Update procedures](#).

Note

No special extension for the UGPS system is necessary in Companion OS. It is natively supported.

Checking UGPS to autopilot connection on land

If you open QGroundControl you should be able to establish a connection to the ROV as before UGPS integration. Furthermore you should be able to see messages of type `GPS_INPUT` in the MAVLink Inspector (click on Q-logo, then Analyze Tools, then MAVLink Inspector in sidebar). This is the MAVLink message that is provided by the UGPS BlueROV Extension to the autopilot (Pixhawk or Navigator flight controller). For detailed information about the extension see the [BlueOS Extension for UGPS GitHub page](#).

Daily operation

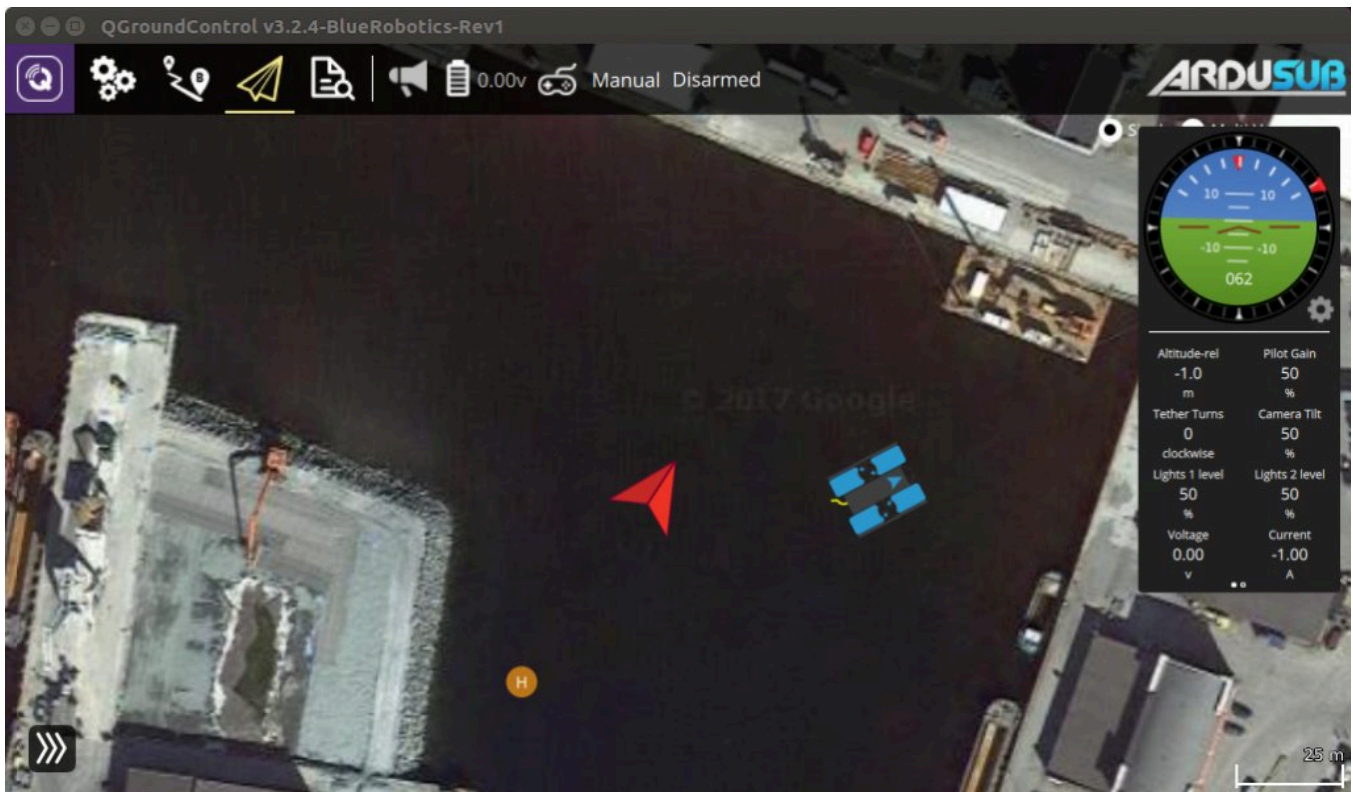
This section will help you if a UGPS system was already integrated with the BlueROV2 and you want to use and not also install it.

1. Follow the instructions of the UGPS Quickstart-Guide from the Water Linked Documentation for [antenna](#) or [loose receivers](#) deployment.
2. Connect BlueROV2, FXTI, topside computer and UGPS Topside and assure the network connection is working:
 - For the Locator-A1, follow [this section](#)
 - For the Locator-U1, follow [this section](#). In addition, note the channel setting in the Locator-U1 and close the lid to power it up.
3. Follow the steps of the [Quickstart-Guide](#) from the Water Linked Documentation for:
 - Selecting the locator in the GUI
 - Configuring antenna/receiver placement and search range.
 - Setting of heading.
4. Start QGroundControl and verify the connection to the BlueROV2. Even if the ROV can not have a location fix above water it should now receive data from the UGPS system. See [Checking UGPS to autopilot connection on land](#)
5. Dive the BlueROV2 so the Locator is submerged a few centimeters below the surface.

If everything is operating correctly, you should now find a ROV position on the map in QGroundControl. The ROV position is indicated by a BlueROV2 image. The position of the surface vessel or Water Linked UGPS Topside housing is indicated by a red arrow or Q-symbol depending of QGroundControl version. The small 'H' icon indicates the 'home position', the location of the ROV's first GPS lock.

UGPS Topside position

The UGPS topside position is not shown reliably on all systems. It is sent as NMEA to UDP port 14401, so check your configuration in QGroundControl.



Troubleshooting

'No External Depth' error in UGPS Topside GUI, or QGroundControl connection issues (for ArduSub Companion)

This almost certainly means that the network between the UGPS G2 topside and the BlueROV2 has not been successfully established. First carry out the following steps:

1. Ensure you are using the latest versions of ArduSub Companion and QGroundControl: [Update Software](#)
2. In the Companion Web Interface, go to the [MAVProxy](#) page: <http://192.168.2.2:2770/mavproxy>
3. Click on the "Restore Default Options" button.
4. Power cycle the BlueROV2.
5. Check the PLC LED (3) on the [PLC module](#) (see box "What do the LEDs on the PLC module mean?")

If the issue persists, if you are using the FXTI approach to the networking, you may wish to try the network bridge approach, as the FXTI sometimes fails to handle the connections satisfactorily. In addition, double-check that you did not skip the [Modifications to the FXTI](#).

If none of this solves the problem, you are very welcome to [contact us](#), and we will be happy to support you.

Connection to BlueROV2 lost when connecting Underwater GPS to FXTI

The current draw by the FXTI can exceed 500 mA when connecting the Underwater GPS to the PLC network. This can then cause the FXTI to become unstable if it's connected to a standard USB 2.0 port on the computer since USB 2.0 allows for a maximum of 500 mA current draw. There are two known solutions:

1. Connect the USB cable of the FXTI to a USB 3.0/3.1 compatible USB-A port. USB 3.0/3.1 allows for a maximum of 900 mA current draw. A USB 3.0/3.1 compatible USB-A port should be recognized by its blue plastic parts.
2. Add a separate power source to the [Fathom-X](#) inside the FXTI. The Fathom-X board has screw terminals marked BATT which can attach to a 7-28V DC power source.

Water Linked software updates

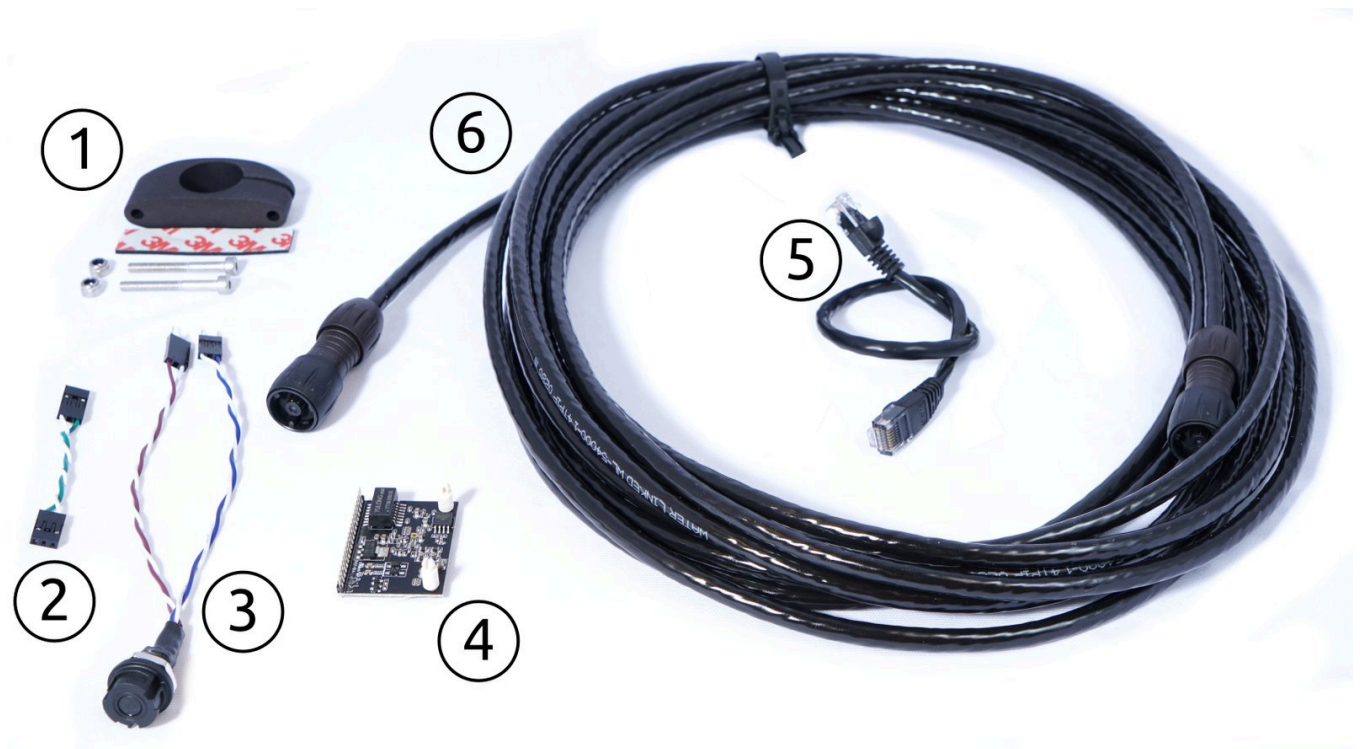
Keep the Water Linked software [up to date](#). The GUI should notify when an update is available, but the current version can also be checked at 192.168.2.94/#/about.

Installation of Locator-A1 on BlueROV2 with integration kit

This guide describes the hardware modifications to the ROV, FXTI and UGPS Topside in order to integrate the [Locator-A1](#). To summarize, two main changes are performed: A spare twisted wire pair in the tether is used to connect the Locator-A1 and the UGPS Topside. Secondly, the UGPS Topside is connected directly to the communication between ROV and topside computer.

Required parts and tools

- [BlueROV2 Integration Kit](#) from Water Linked.



It contains the following parts (purpose in parentheses)

1. Mechanical parts (for physical mounting of Locator-A1)
 - Locator-A1 mounting bracket, [printable 3D model](#)
 - rubber pad
 - 2 M4x35 Socket head cap screws
 - 2 M4 Lock Nuts
2. A female-to-female jumper wire, white/blue  (for locator connection in FXTI)
3. A Binder-connector-pigtail-assembly, with [Binder 770 Series NNC Miniature Cable Connector](#), pins 1/2: white/blue , pin 7/8: white/brown  (analog connection and Powerline connection in FXTI)
4. Powerline communication (PLC) module [LX200V30](#) (for Powerline communication in UGPS Topside)

5. 30cm Cat5e cable (for Powerline connection in UGPS Topside)
6. 8 m cable with [Binder 770 connectors](#) "deck extension cable"(for analog connection and Powerline communication between FXTI and UGPS Topside))

Powerline communication (PLC)

The term Powerline communication describes the technology with which the FXTI and the BlueROV communicate with each other over the Fathom-X Tether. It is usually used to transmit data and communication signals, e. g. Ethernet, on existing electrical wiring in buildings, allowing for data transfer and communication without the need for dedicated network cables.

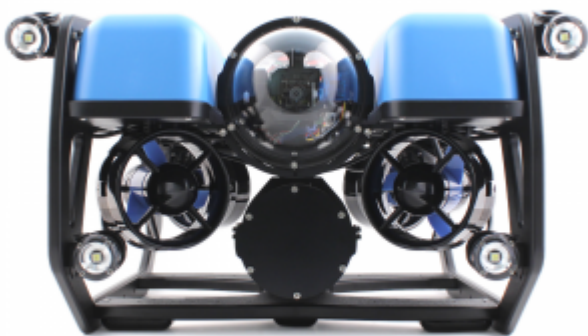
- [Locator-A1](#)



- [UGPS G2 Topside](#)



- Your [BlueROV2](#)



- [M10-5.5mm-LC WetLink Penetrator](#) from Blue Robotics



WetLink Penetrator size

The Locator-A1 cable has an outer diameter of 5.7 mm. We recommend the M10-5.5mm-LC WetLink Penetrator (compatible with 5.2–5.8 mm cables). The M10-6.5mm-HC (compatible with 5.7–6.3 mm cables) might also be an option, but the cable is at the lower edge of its range.

- [WetLink Bulkhead Wrench M10](#) from Blue Robotics



- [Hex Key Set](#) e.g. from Blue Robotics, especially 2, 2.5 and 3 mm hex key



- [Silicone Grease](#)
- Isopropyl Alcohol Wipe
- 7 mm spanner or wrench
- 4 mm drill bit
- [Cable jacket stripper](#), a utility knife, or a sharp blade
- Cutting pliers
- A soldering iron and solder
- Heat shrink tube

Optional components/tools

- [WetLink Penetrator Assembly Block](#) and a vice to secure it
- [WetLink Penetrator Plug Wrench 14mm](#) and a A 1/4 inch (6.3mm) square drive ratchet or torque wrench

- Large flat head screwdriver
- Bottle of threadlocker
- Hot air gun

Modifications to the BlueROV2

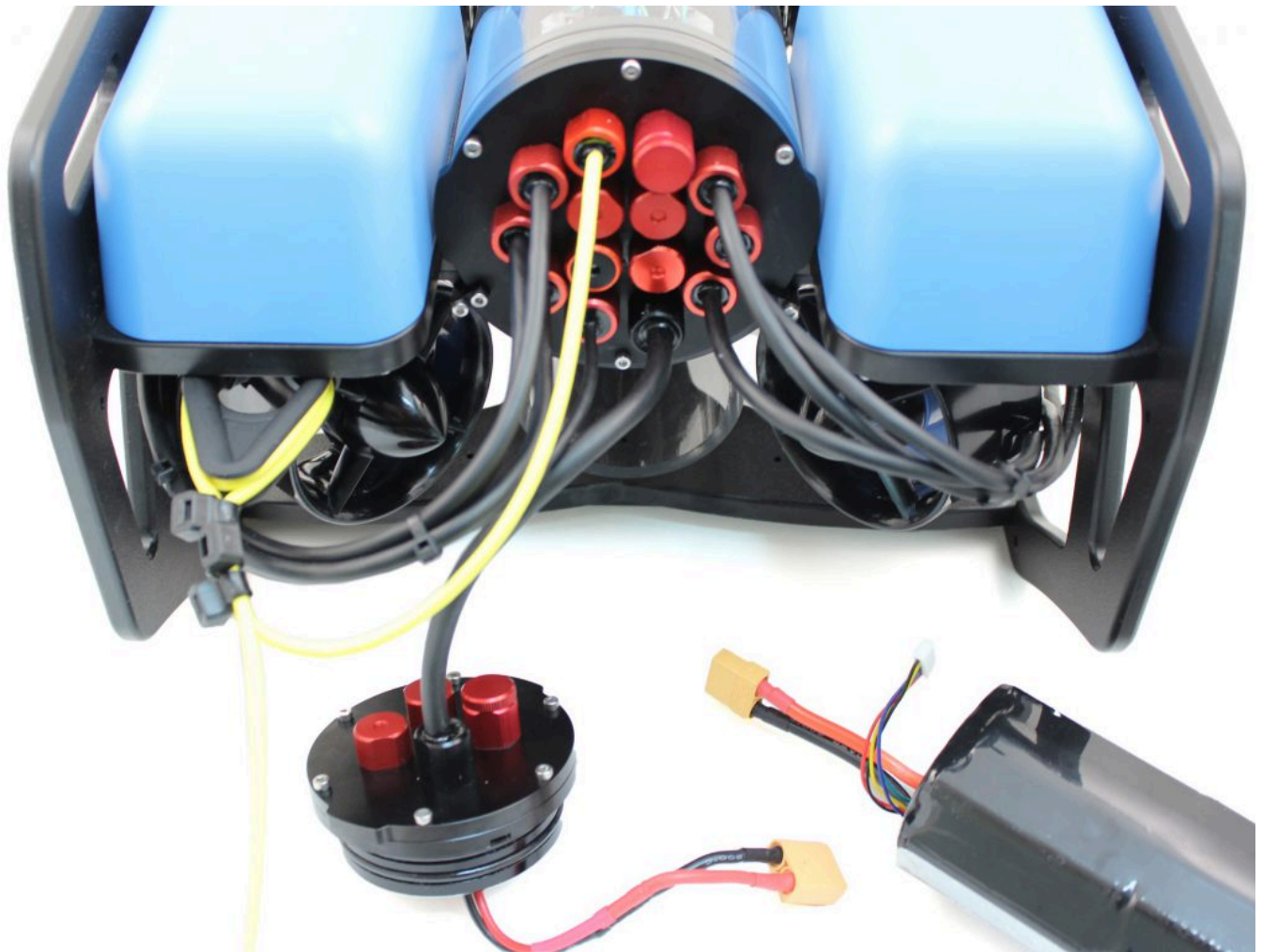
The Locator-A1 will use one of the spare cable penetrators in the back of the BlueROV2 and will connect to the spare green and white  twisted pair in the tether. The locator is attached with a mounting bracket included in the BlueROV2 Integration Kit.

Open the electronics enclosure

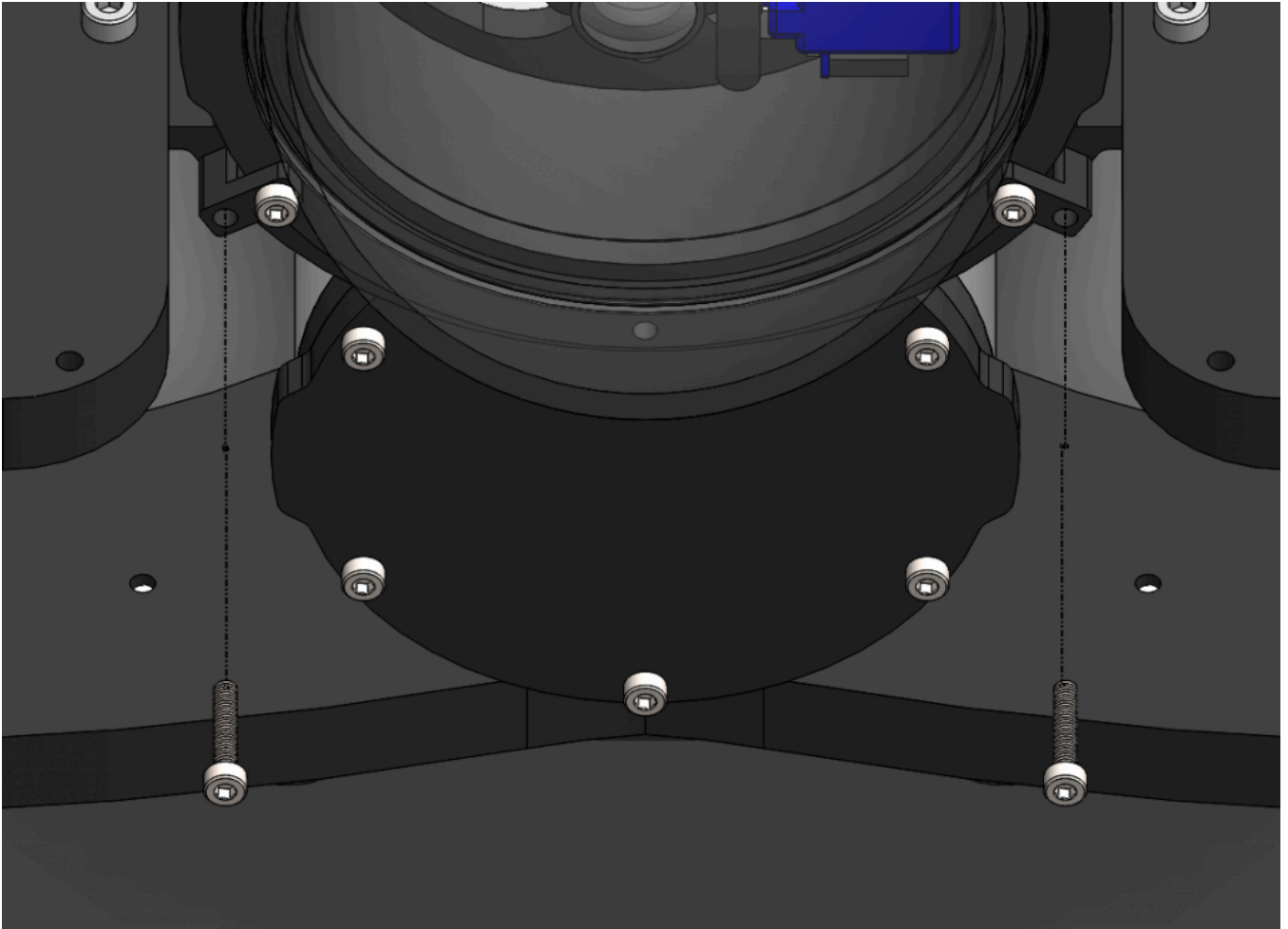
To open the electronics enclosure, you will need the following parts and tools:

- 2.5 mm hex key
- Large flat head screwdriver (optional)

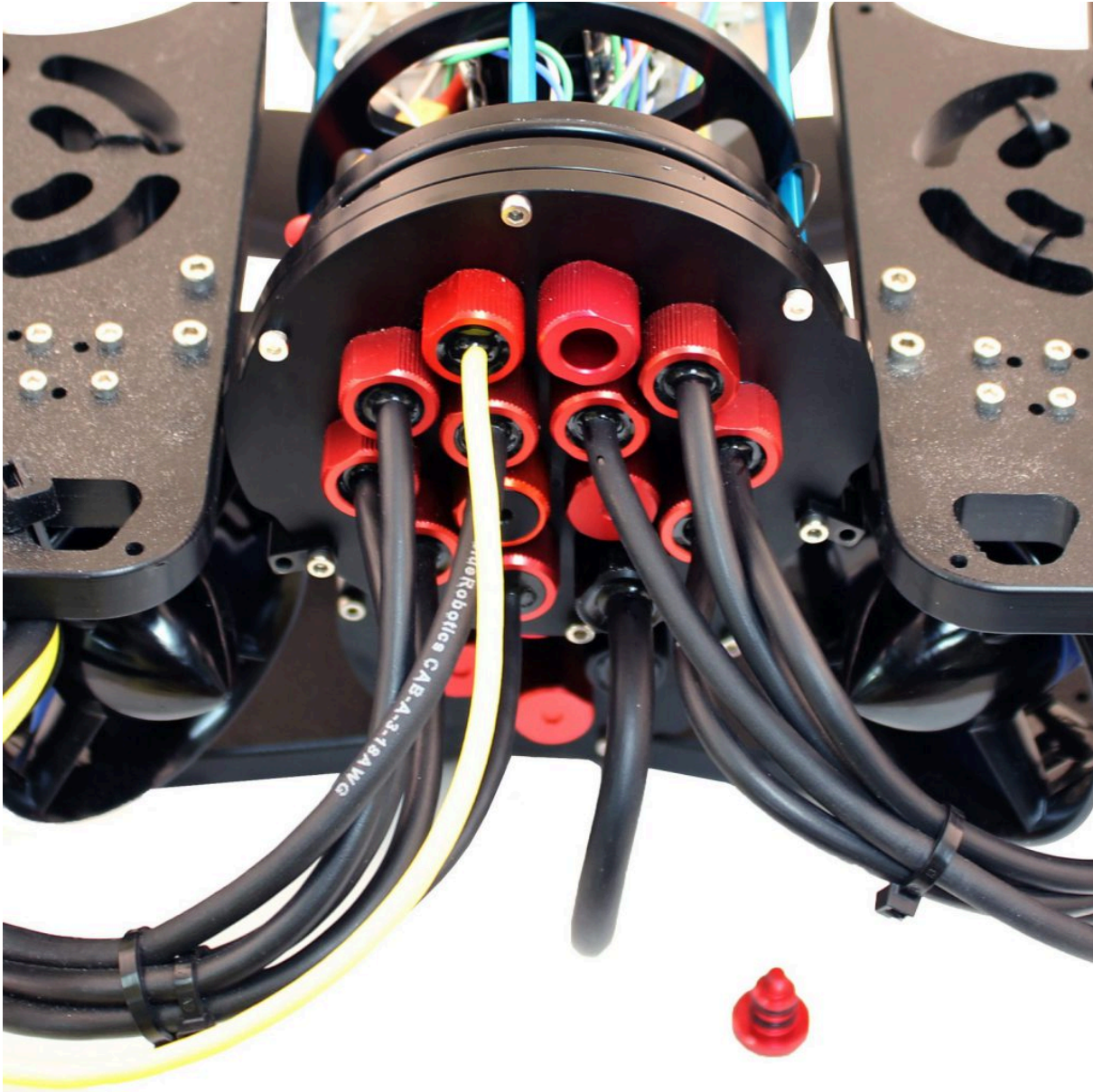
To ensure your ROV is completely powered off, please remove the battery completely from the 3" enclosure and place to the side.



Unscrew the M3x16 screws that mount the electronics enclosure to the ROV cradle (in the front and in the back). The number of screws depends on the model version of your ROV.



Remove the Vent Plug from the Vent Penetrator Bolt on the electronics enclosure. Remove the 4" tube and forward dome assembly from the rear end cap by sliding it forward. A large flat head screw driver can help to do that.



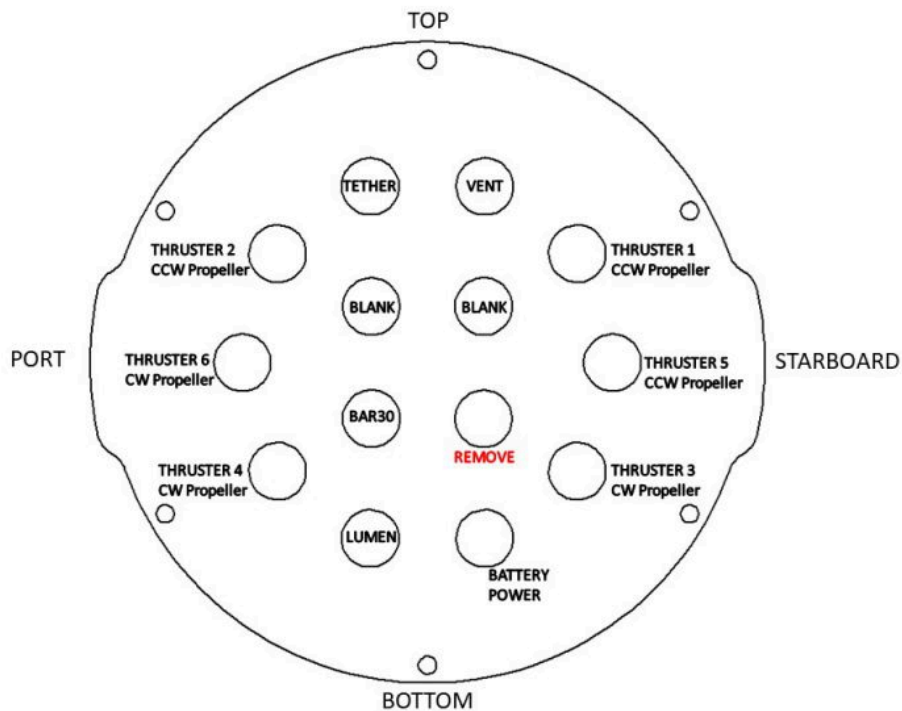
Replace blank penetrator with Locator-A1 penetrator

To remove a blank penetrator and install the cable of the Locator-A1 into the end cap, you will need the following parts and tools:

- [Locator-A1](#)
- [M10-5.5mm-LC WetLink Penetrator](#) from Blue Robotics
- [Silicone Grease](#)
- Isopropyl Alcohol Wipe
- [WetLink Bulkhead Wrench M10](#) from Blue Robotics
- [WetLink Penetrator Assembly Block](#) and a vice to secure it (optional)
- [WetLink Penetrator Plug Wrench 14mm](#) and a A 1/4 inch (6.3mm) square drive ratchet or torque wrench (optional)
- [Cable jacket stripper](#), a utility knife, or a sharp blade

- Cutting pliers

Remove the blank penetrator as pictured from the 4" End Cap with the penetrator bulkhead wrench.



Cut the cable of the Locator-A1 to the correct length with cutting pliers considering that about 15 cm of cable are needed inside the enclosure. For the recommended mounting position you need a length of around 70 cm. Double check that this is sufficient for your mounting position.

Remove 10 cm of the cable jacket using a cable jacket stripper, a utility knife, or a sharp blade. Cut off everything except the twisted pair of wires using cutting pliers.

Follow the Blue Robotics [WetLink Penetrator Assembly Guide](#) and install the WetLink penetrator onto the Locator-A1 cable.

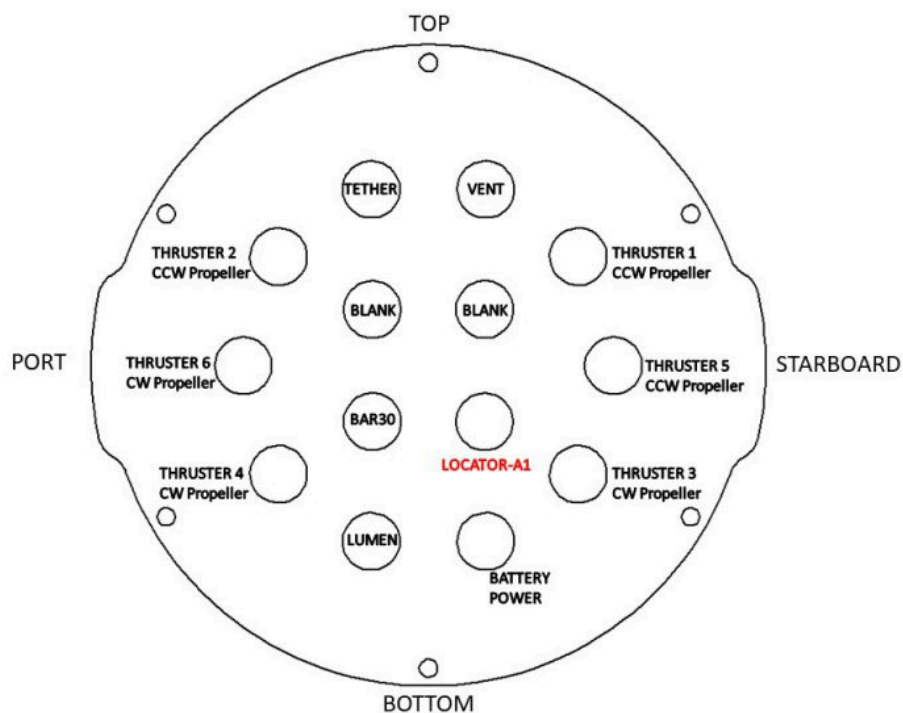
Wipe the exterior surface of the electronics enclosure end cap clean with an isopropyl alcohol wipe, and make sure it is free of any particles in the areas where the penetrator O-ring will sit.

Remove the O-ring from the bag and apply silicone grease to it.



Install the O-ring onto the WetLink penetrator.

Install the WetLink penetrator with the Locator-A1 cable onto the end cap in the hole you previously removed a blank penetrator from. Tighten to finger tight, then use the bulkhead wrench to tighten it an additional $\sim 1/16$ of a turn. If you can't loosen it with your fingers, it is tight enough.



Connect Locator-A1 wires to ROV tether

One pair of twisted wires from the Locator-A1 (blue/white ) must be connected to a spare twisted pair on the BlueROV2 tether. To solder the wires together you will need:

- A soldering iron and solder
- A utility knife, or a sharp blade
- Heat shrink tube
- Hot air gun (optional)

Note

Alternatively to soldering you can use your favorite headers to establish an electrical connection.

Remove 5mm wire insulation on both the tether wires and the locator wires with a knife.

Put heat shrink tube onto the wires before soldering.

Connect the Locator-A1 wires (blue/white ) to a spare twisted pair of the tether (recommended: green/white ) by soldering.

Pull the the heat shrink tube over the solder-connection and shrink it with a hot air gun or alternatively with your soldering iron turned to low.

Reassemble BlueROV2 Electronics Enclosure

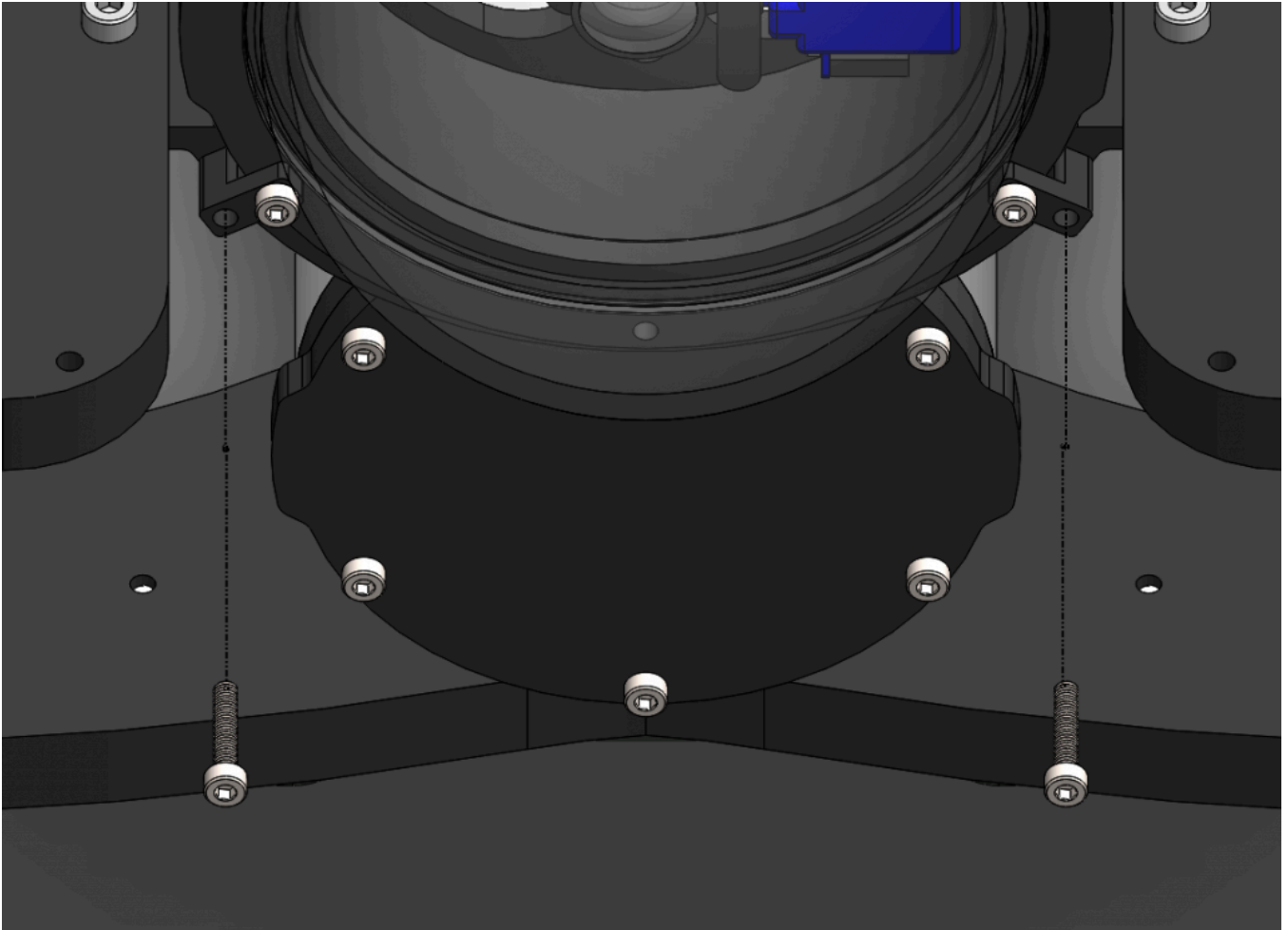
To reassemble your BlueROV2 Electronics Enclosure, you will need the following parts and tools:

- M3x16 screws that were placed off to the side during disassembly (number depends on your BlueROV version)
- [Silicone Grease](#)
- 2.5 mm hex key

Reinstall 4" Watertight Enclosure onto ROV with the following steps:

Apply silicone grease to the two radial O-rings on the O-Ring Flange (4" Series) that is attached to the Electronics Tray. Then slide the Watertight Enclosure (4" Series) with installed Dome End Cap over the electronics tray and the O-Ring Flange (4" Series) while trying to align the clips for the screws in the front and back.

Mount the Electronics Enclosure to the frame using the M3x16 screws so that the dome is on the same side as the front center panels (the center panels without the 3 large holes). Install the M3x16 screws through the clips and into the Enclosure Cradle (4" Series). It is easier to install these screws if the clips are not fully tightened until all screws are through the clips and threading into the Enclosure Cradle (4" Series). This allows clips to rotate so you can find the threaded hole in the Enclosure Cradle (4" Series) easily.



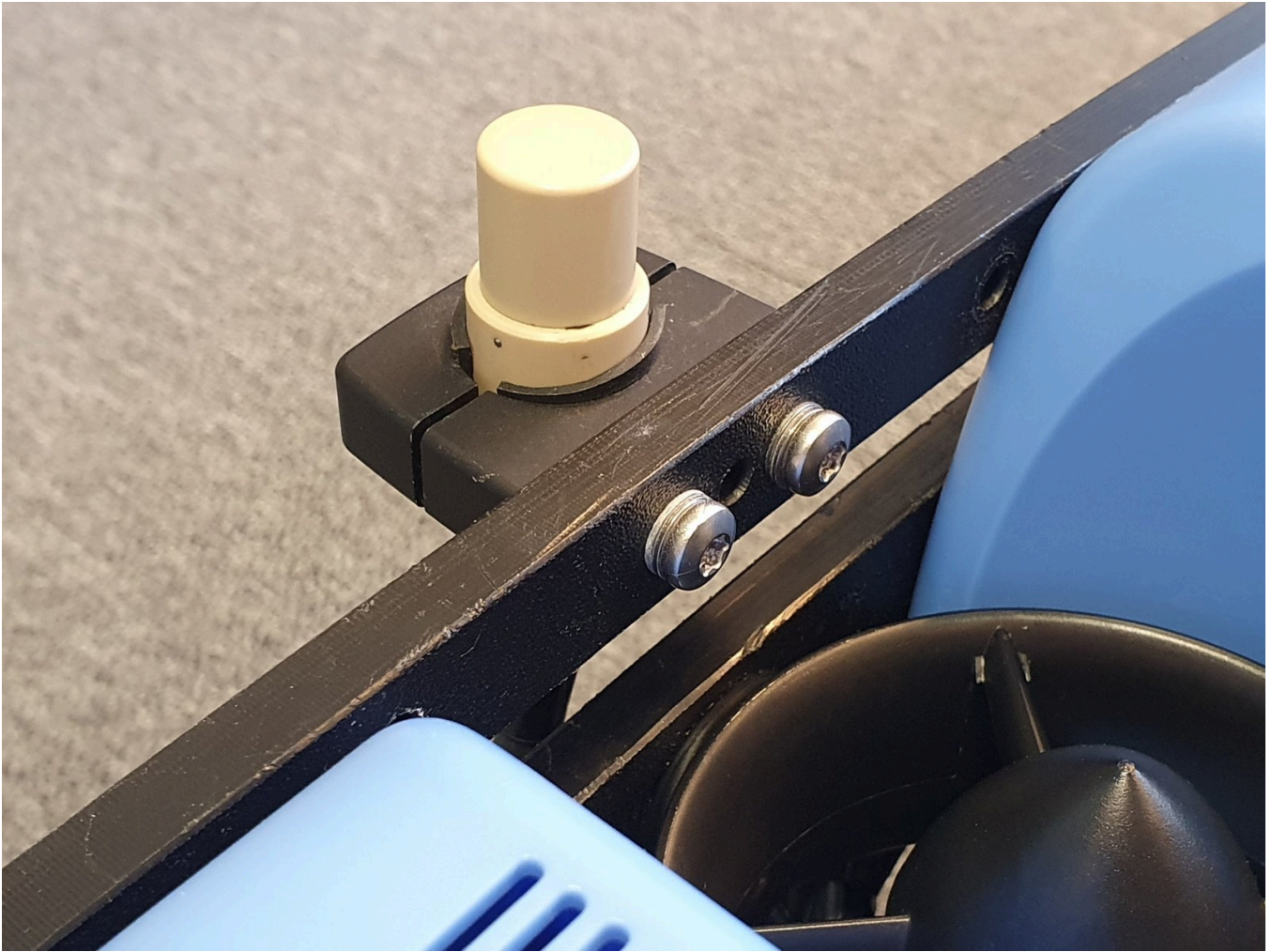
Mount the Locator-A1 to the BlueROV2 frame

To mount the Locator-A1 to the BlueROV2 frame, you will need the following parts and tools:

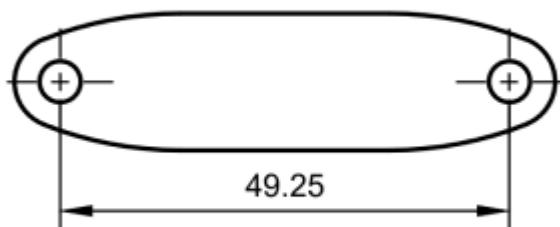
- Locator-A1 mounting bracket (included in the BlueROV2 Integration Kit)
- rubber pad (included in the BlueROV2 Integration Kit)
- 2 M4x35 Socket head cap screws (included in the BlueROV2 Integration Kit)
- 2 M4 Lock Nuts (included in the BlueROV2 Integration Kit)
- 3 mm hex key
- 7 mm spanner or wrench
- 4 mm drill bit

Route the locator cable to one side of the ROV.

The below picture illustrates the recommended mounting position. Your mounting bracket might look differently.



Find an appropriate spot to attach the Locator-A1 mounting bracket to the frame of the BlueROV2. Drill out two holes spaced 49.25 mm apart using a 4 mm drill bit.



Wrap the locator in the rubber pad before inserting into the mounting bracket.

Attach the Locator-A1 to the Locator-A1 mounting bracket, and secure the bracket to the BlueROV2 using the M4x35 Socket head cap screws and lock nuts.

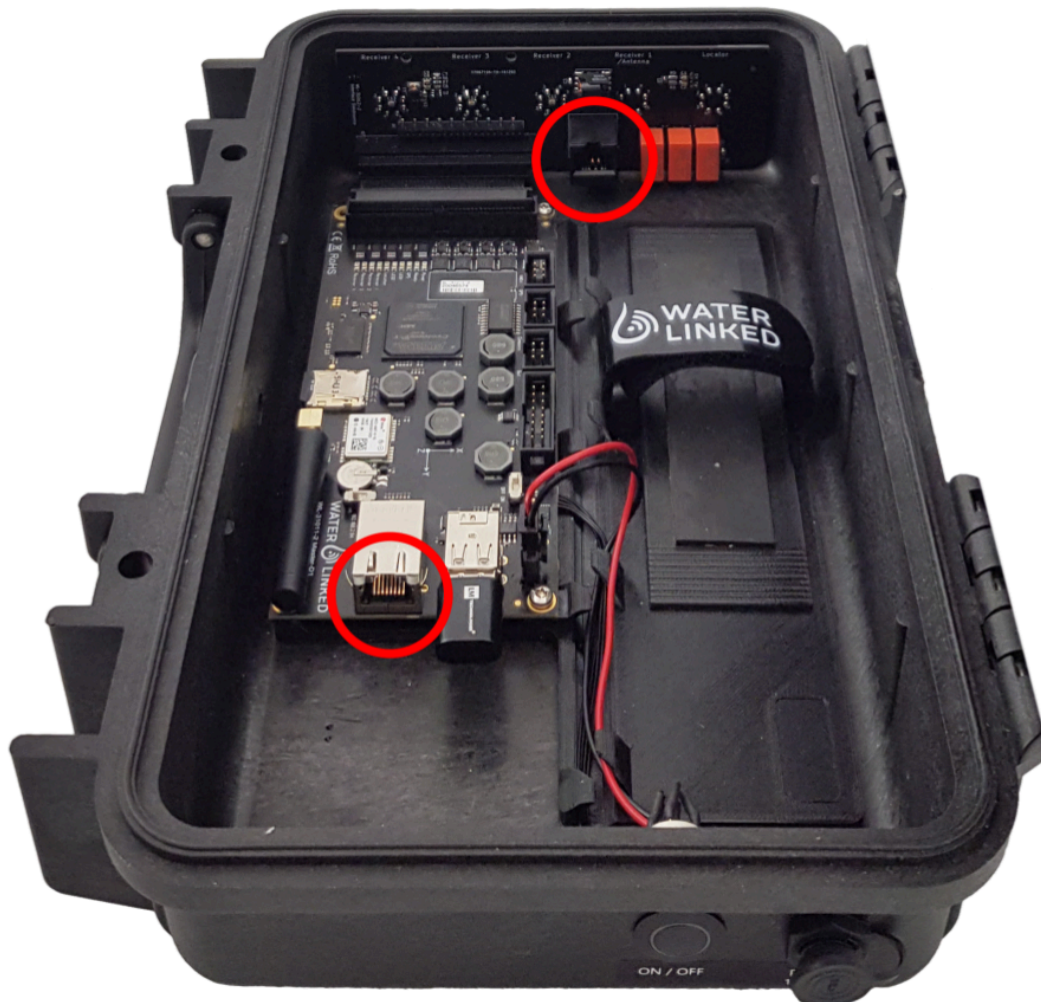
Modifications to the UGPS Topside

In the following steps you will upgrade your UGPS G2 Topside with Powerline communication (PLC) capabilities to communicate directly with the BlueROV2. In order to do that, you will need the following parts and tools:

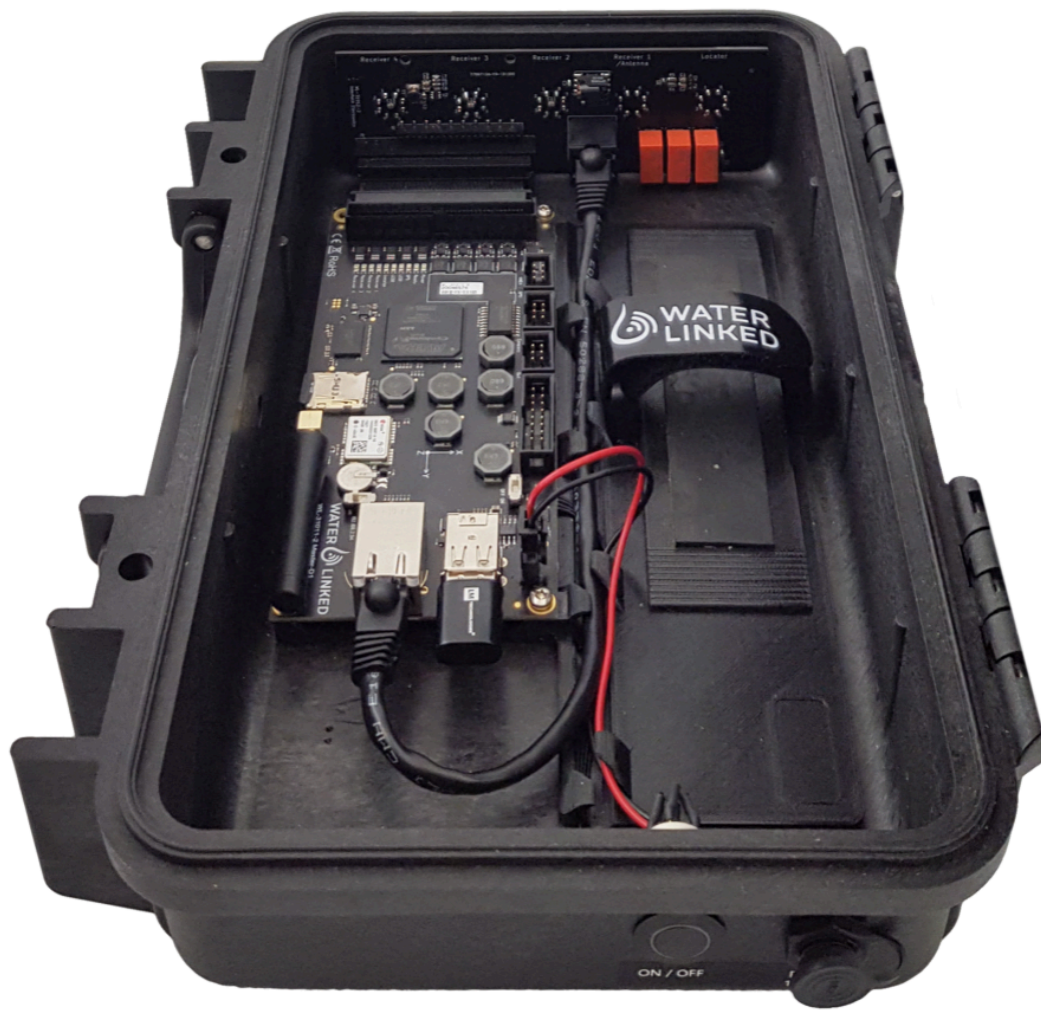
- [UGPS G2 Topside](#)
- Ethernet cable (included in the BlueROV2 Integration Kit)
- Powerline communication (PLC) module [LX200V30](#) (included in the BlueROV2 Integration Kit)
- Soldering iron

Connect Ethernet cable

Locate the ethernet ports on the Interface Electronics board and the Master Electronics board.

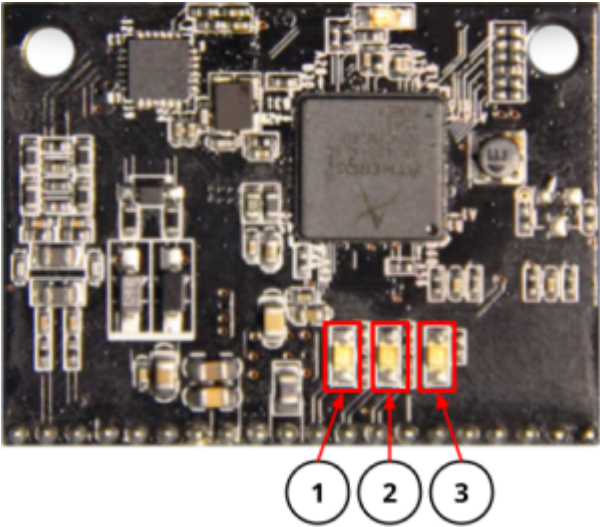


Connect the included Ethernet cable to the two ports.



Install the PLC module

In this step the the Powerline communication (PLC) module is installed on the Interface Electronics board.



LED	Definition	Function
1	Power	Lights when the PLC module has power
2	Ethernet	Flashes when there is data flow from Master Electronics
3	PLC	Lights when a link is established with FXTI or BlueROV2

Locate the socket for the PLC module on the Interface board.



Press the PLC module into the socket, making sure that the press-fit standoffs latch into the holes in the Interface Electronics board.



Modify Interface Electronics

Whether this step applies depends on the hardware configuration of the Interface Electronics board in your UGPS Topside, not on the purchase date. Two configurations exist:

- **Original configuration:** The positions R2 and R3 are populated with 0 ohm resistors (solder links). This configuration was used on units produced before about June 2021.
- **Updated configuration:** The positions R2 and R3 are populated with small inductors. This configuration has been used on units produced since about June 2021. The PCB designators still read R2 and R3.

Not sure which configuration you have?

The transition date is approximate. If you are unsure which configuration your unit has, in particular for units produced around the transition, contact [Water Linked Support](#) with the serial number of your UGPS Topside *before* modifying the board.

Populated R2/R3 positions and a voltage reading do not by themselves identify the hardware configuration. See also the [Underwater GPS FAQ](#).

Both configurations connect the internal 12 V supply of the Underwater GPS to the PLC pair of the bulkhead connector labelled "Locator" (pin 1 (GND) and pin 2 (12 V)). In the documented integration the PLC pair is carried on the blue/white  wires (pins 1/2) of the Binder-connector-pigtail-assembly, while the Locator-A1 signal is carried on a separate pair, the white/brown  wires (pins 7/8). With the wiring described in this guide the PLC supply is therefore not applied to the Locator-A1 signal pair.

Warning

Approximately 12 V DC from the Underwater GPS can be present on the PLC pair (pins 1 and 2 of the "Locator" bulkhead connector) in the updated configuration, and in the original configuration until R2 and R3 have been removed. Connecting unsuitable or non-isolated external equipment to the PLC pair may damage the Underwater GPS or the external equipment. The updated inductors do not provide galvanic isolation from the internal supply and do not make arbitrary external equipment safe to connect.

This warning does not mean that the inductors of the updated configuration must be removed. The documented integration with the BlueROV2 Integration Kit and the wiring in this guide works with the updated configuration as delivered.

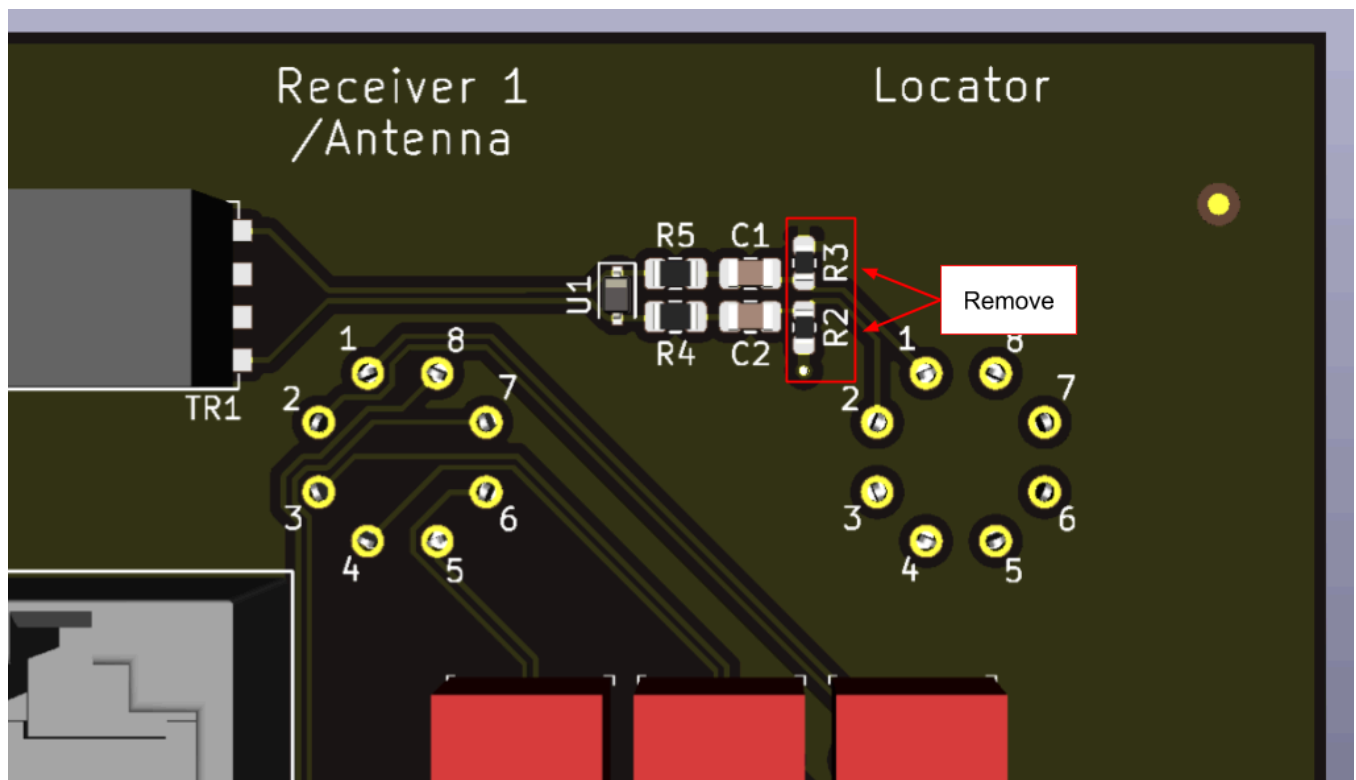
Note

Disconnect the power supply from the UGPS Topside before modifying the Interface Electronics board.

Original configuration (0 ohm resistors)

This step is required for the original configuration. The 0 ohm resistors R2 and R3 connect the 12 V supply directly to the PLC pair. This lets the power supply load the high-frequency PLC signal and interfere with the communication between the FXTI, the BlueROV2 and the Underwater GPS G2. For the documented integration, the resistors *must* be removed.

Remove the resistors R2 and R3 with a soldering iron.



Note

Removing R2 and R3 disconnects the 12 V supply from the "Locator" bulkhead connector. A Locator-D1 can then not be used with this UGPS Topside unless the resistors are soldered back on. Note that the Locator-D1 is not compatible with the BlueROV2 Integration Kit in any case, see the [BlueROV2 integration overview](#).

Updated configuration (inductors)

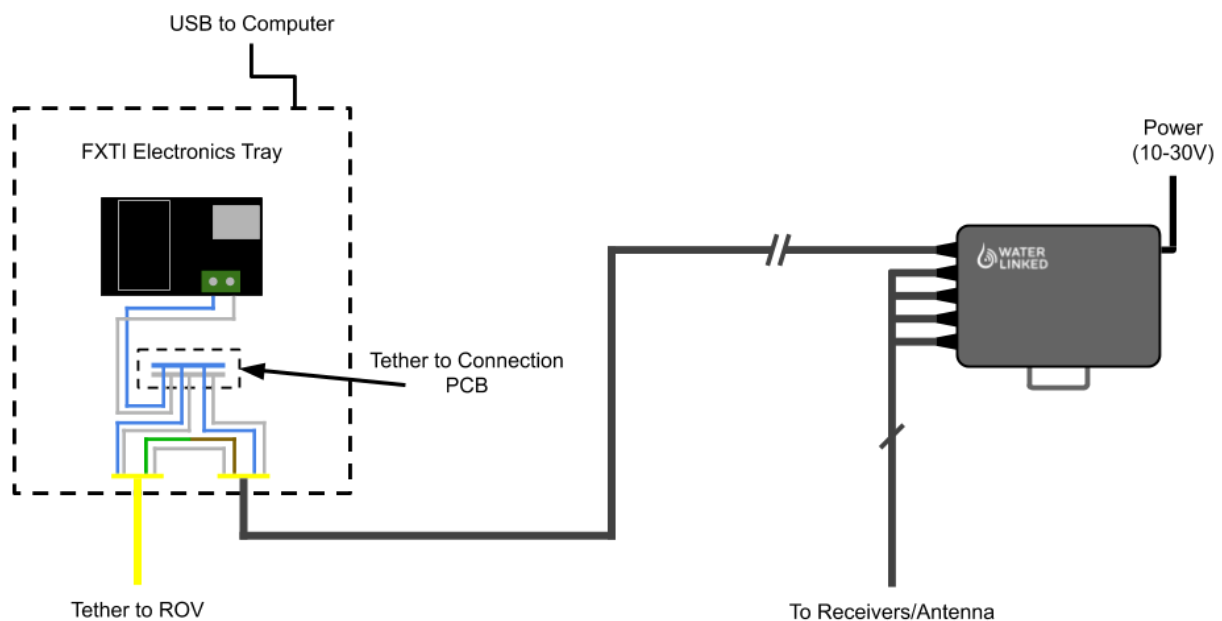
No modification is required. Leave the inductors in the positions R2 and R3 fitted. They reduce the loading of the PLC signal by the 12 V supply, which is why removing them is not needed for the documented integration. They still provide a DC connection, so approximately 12 V between pins 1 and 2 of the "Locator" bulkhead connector remains expected on a powered unit.

Note

Populated R2/R3 positions and a 12 V reading do not by themselves indicate the original configuration. See the [Underwater GPS FAQ](#) if you are unsure whether the components should be removed.

Modifications to the FXTI

In this step the FXTI will be modified to firstly connect the analog signal of the Locator-A1 between the ROV tether and the UGPS Topside. Secondly the UGPS Topside is connected to the existing communication wires between the BlueROV and the FXTI electronics (Powerline Ethernet signals). A high level diagram of how this will look is shown below.



In order to make these connections, you will need the following parts and tools:

- Binder-connector-pigtail-assembly (included in the BlueROV2 Integration Kit)
- A female-to-female jumper wire, white/green ☐ ☒ (included in the BlueROV2 Integration Kit)
- 2 mm hex key

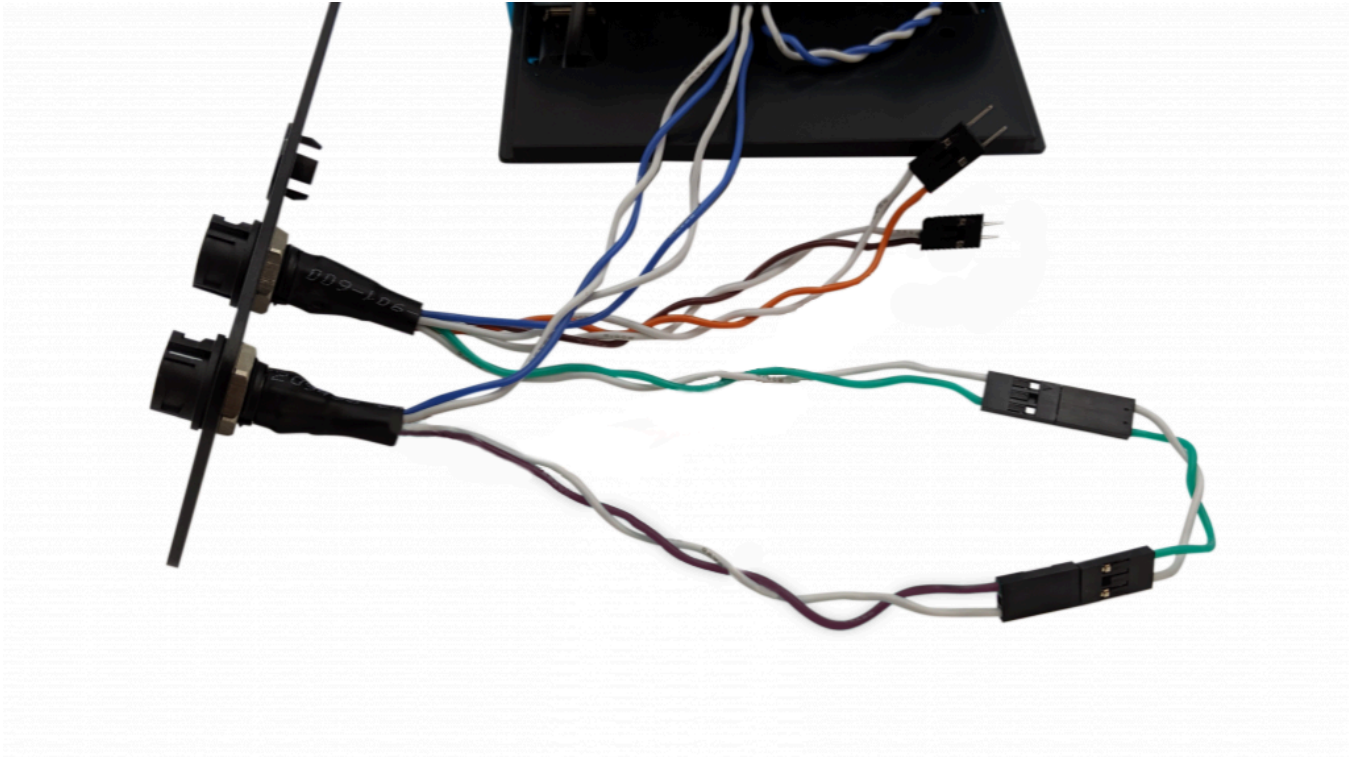
Unscrew the connector panel from the FXTI with the hex key and remove one of the black plastic plugs from one of the auxiliary ports.



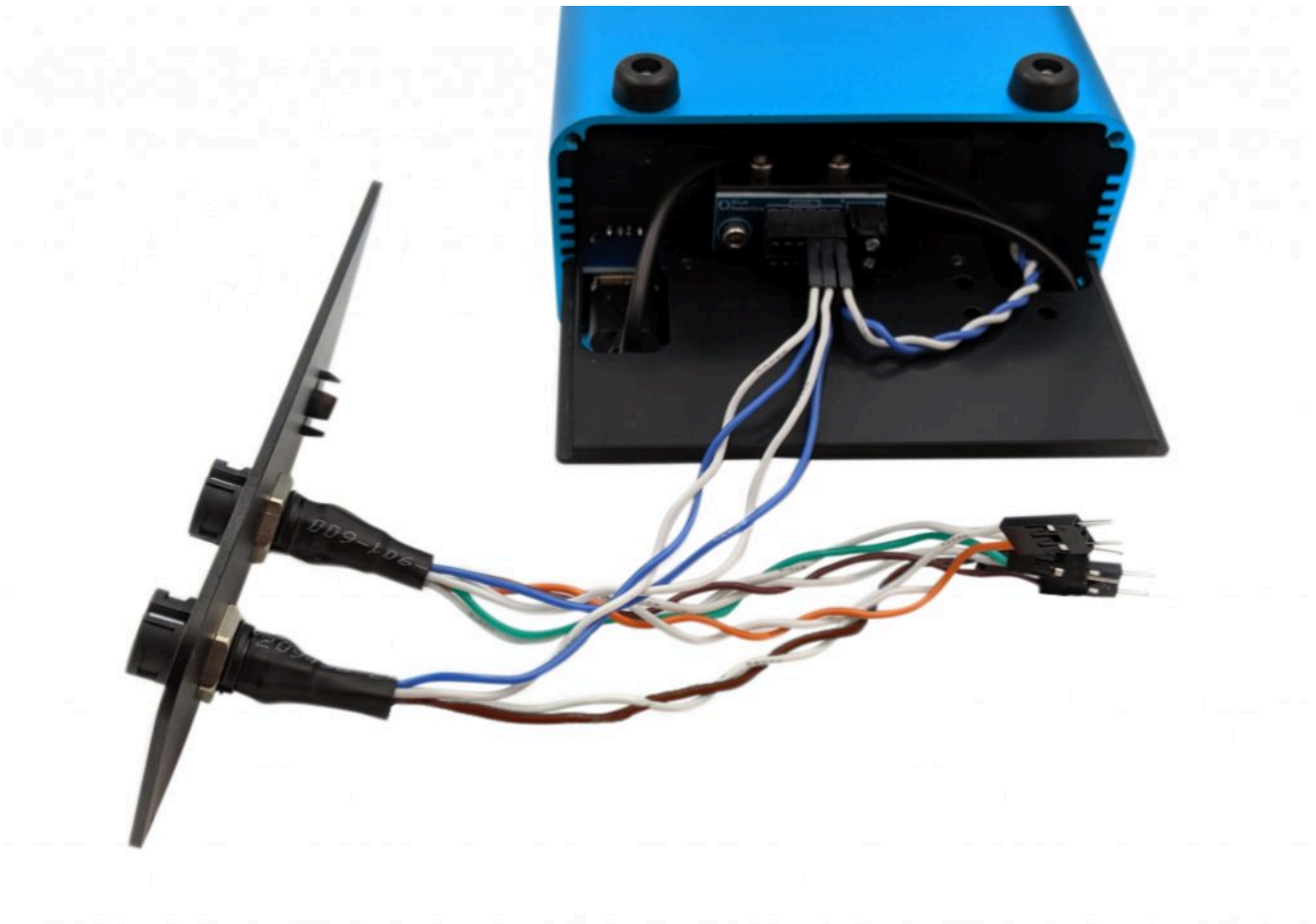
Thread the Binder-connector-pigtail-assembly into the open port and secure in place with the included bulkhead nut.



Connect the green and white  twisted pair of the tether connector to the brown and brown/white  pair on the new Binder-connector-pigtail-assembly with the included female-to-female jumper wire.



Connect the blue and white  twisted pair of the Binder-connector-pigtail-assembly to the FXTI Tether Connection PCB, matching the orientation of the pre-installed blue and white  wire connections.



Reassemble the FXTI box.



Establish a network connection between UGPS Topside, BlueROV2 and topside computer

Now that all hardware modifications are done, you will connect UGPS Topside, FXTI/BlueROV2 and topside computer and test the network connection.

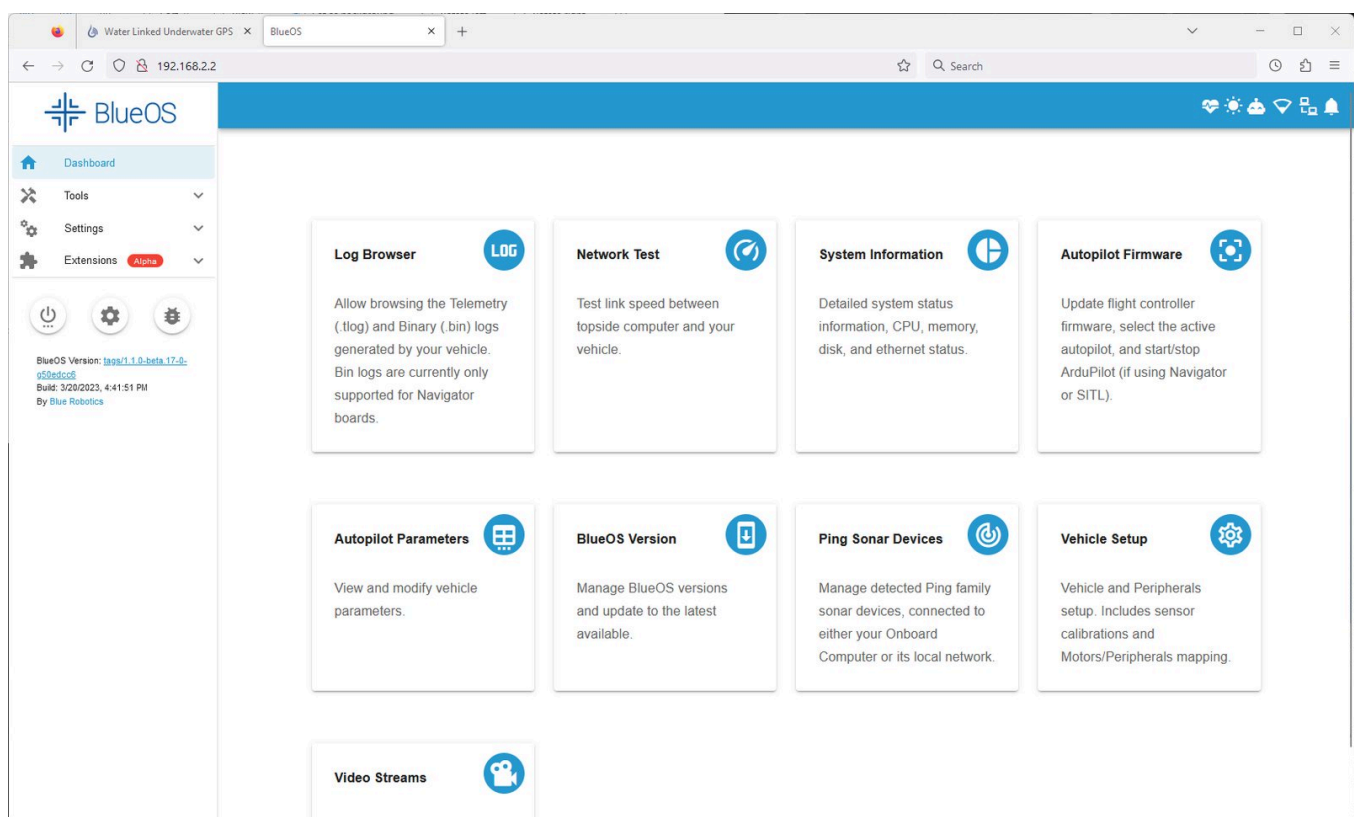
- Power up the BlueROV. Connect the BlueROV with the tether to the FXTI. Connect the FXTI with the USB-cable to the computer.

FXTI USB port

Your topside computer may have a USB port which permits higher than default (which is 500mA) current. Such ports are typically marked with a lightning or battery symbol. Also USB 3.0 ports (blue plastic) provide higher current. If available, we recommend use of one of these for plugging in the FXTI, as this can improve performance.

- Set your topside computer to have a static IP address of 192.168.2.1 with subnet mask 255.255.255.0. The BlueROV2 typically has IP address 192.168.2.2, so you probably already have this set up. Make sure your firewall allows QGroundControl to communicate with the network. Look at the [Network Setup steps at Blue Robotics](#) if you need more details.
- Set the [IP switch](#) inside the UGPS Topside unit to 192.168.2.94 (the down position). This equips the G2 topside unit with the static IP address 192.168.2.94.
- Connect the Binder-connector named "Locator" at the UGPS Topside with the newly installed Binder-connector at the FXTI using the deck extension cable, which came with the BlueROV integration kit. (Power up the UGPS Topside)[<https://waterlinked.github.io/underwater-gps/power-supply/>]. It is on when the power button is lit.

You should now be able to access both the BlueROV by typing 192.168.2.2 in your browser address line and UGPS Topside by typing 192.168.2.94. Both have to be turned on.



Final steps of integration

When you have successfully established a network connection and can access both BlueROV2 and UGPS Topside, you can continue with [Final steps of integration independent of Locator](#).

Installation of Locator-U1 on BlueROV2

This guide contains instructions for installation of the [Locator-U1](#) to a BlueROV2. The first part describes the mechanical installation and the second part describes how to establish a network bridge between UGPS Topside and FXTI/BlueROV2.

Mount the Locator-U1 to the BlueROV2 frame

Attach the Locator-U1 to the BlueROV2 for example by using zip ties. Make sure the Locator-U1 has free line-of-sight towards the antenna/receivers near the surface.



See the [general Locator-U instructions](#) for daily operation (charging, powering on, etc.).

Establish a network connection between UGPS Topside, BlueROV2 and topside computer

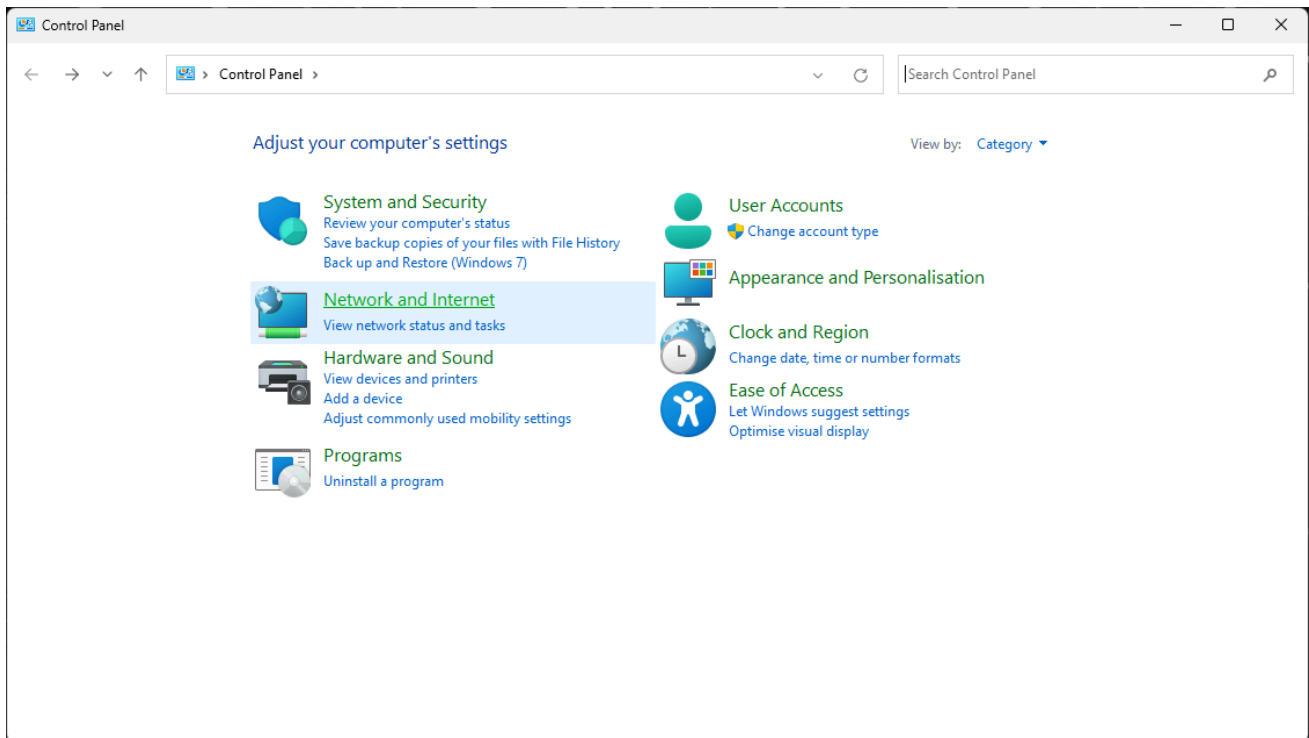
does ugps topside always have external ethernet port?

In this guide it is described how to establish a network connection between UGPS Topside, FXTI/BlueROV2 and topside computer without hardware modifications to the UGPS Topside. This is opposed to the method used with the BlueROV integration kit for Locator-A1. To put it short, the connection between the three devices is established with a network bridge and a static IP address of 192.168.2.1 (subnet mask 255.255.255.0) for your computer.

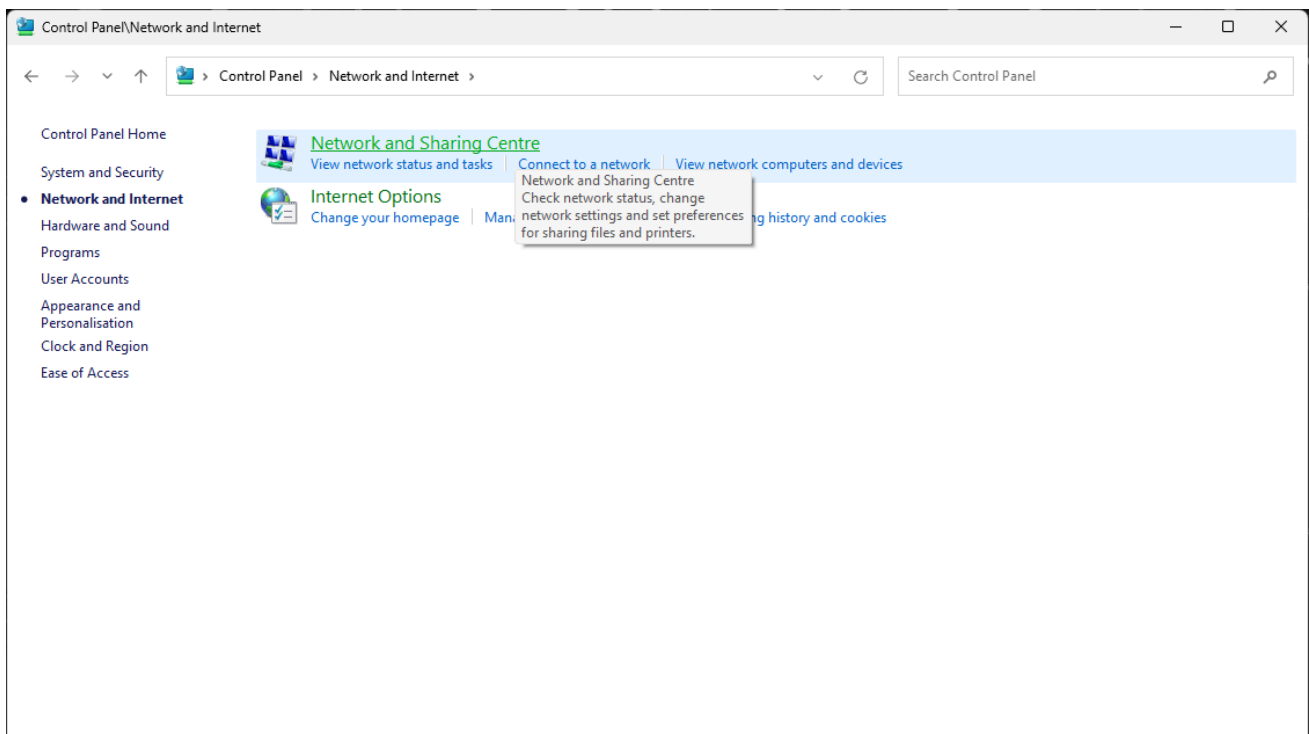
1. Set the [IP switch](#) inside the UGPS G2 topside unit to 192.168.2.94 (the down position). This equips the G2 topside unit with the static IP address 192.168.2.94.
2. [Connect power](#) to the UGPS Topside and switch on the power, resulting in the power switch lighting up.
3. Connect an Ethernet cable to the UGPS Topside.
4. Connect the BlueROV with the tether to the FXTI and plug the USB-cable into the FXTI. Power up the BlueROV.
5. Establish a network bridge on your computer. This depends on your operating system:

Windows

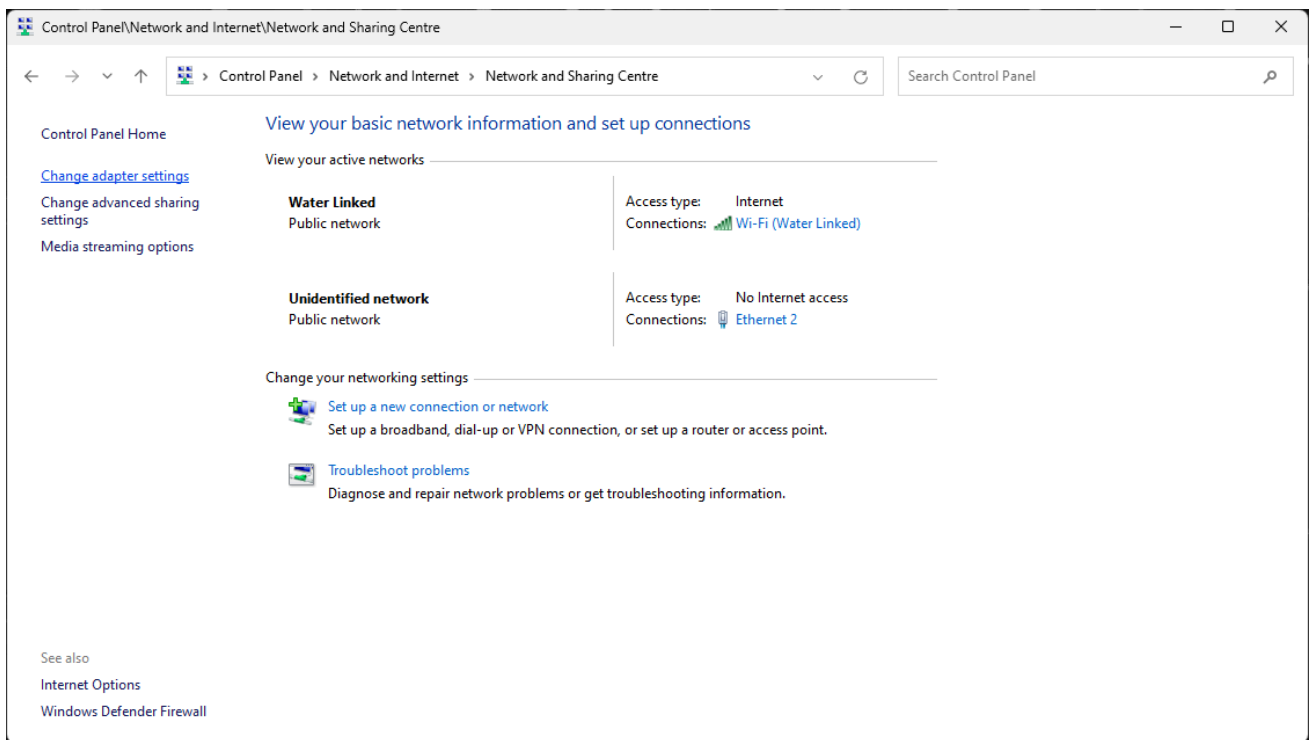
To create a network bridge between the FXTI/BlueROV2 and the UGPS Topside in Microsoft Windows, open the "Control Panel" by searching for it in the start menu. Open "Network and Internet".



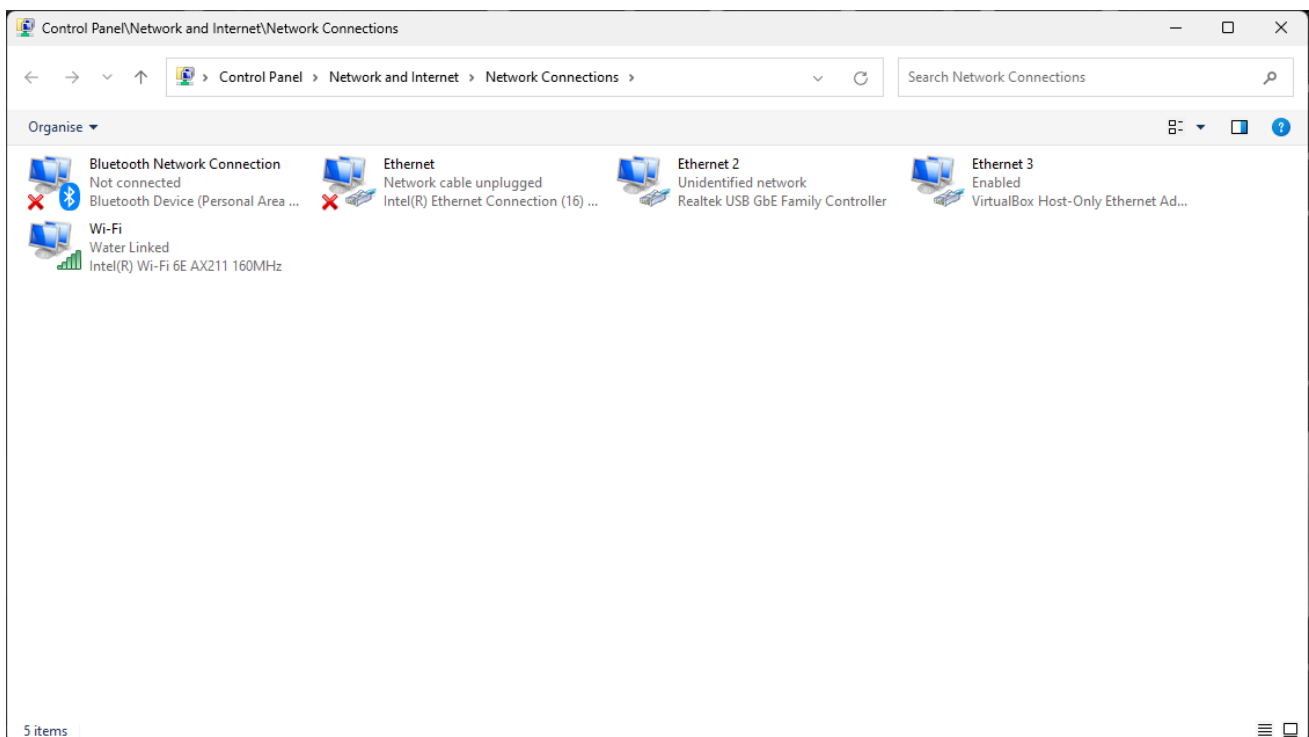
Open "Network and Sharing Center".



Click "Change adapter settings" in the sidebar.

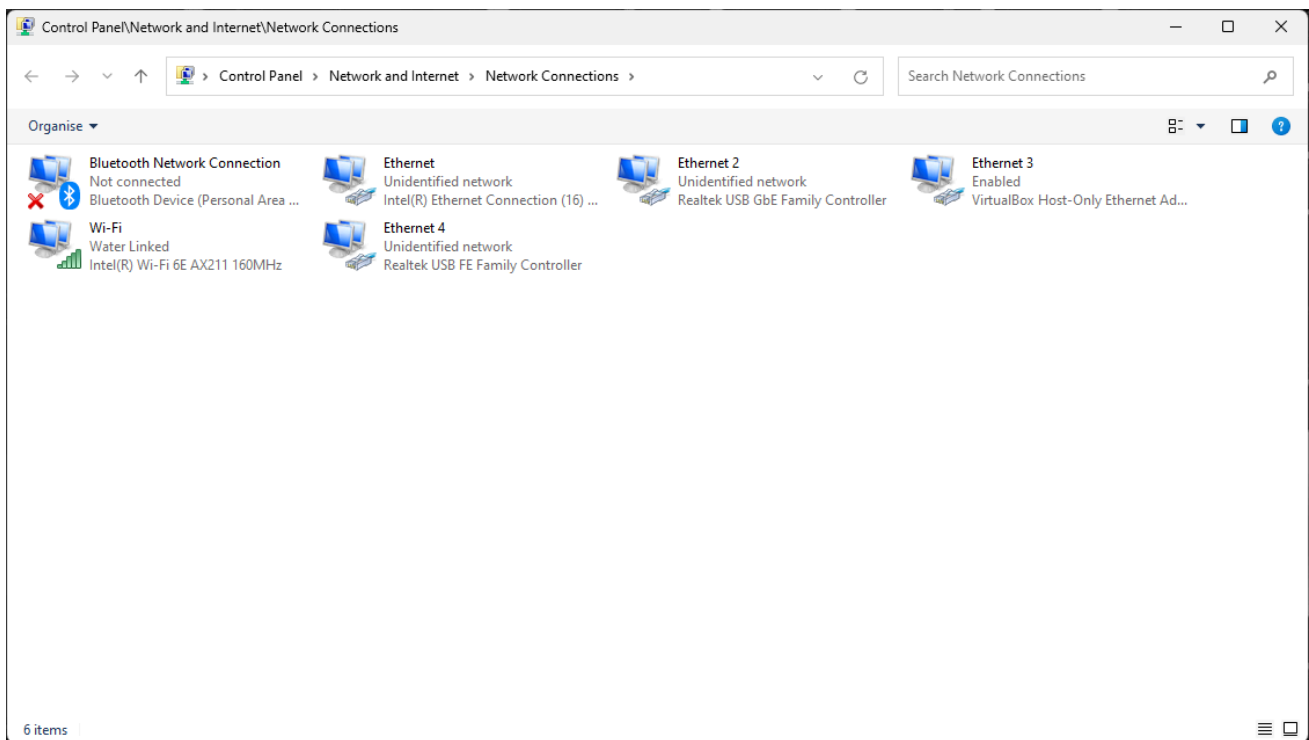


The "Network Connections" window (see below) shows all network adapters connected to your computer. The number and name of adapters shown depends on your computer hardware.

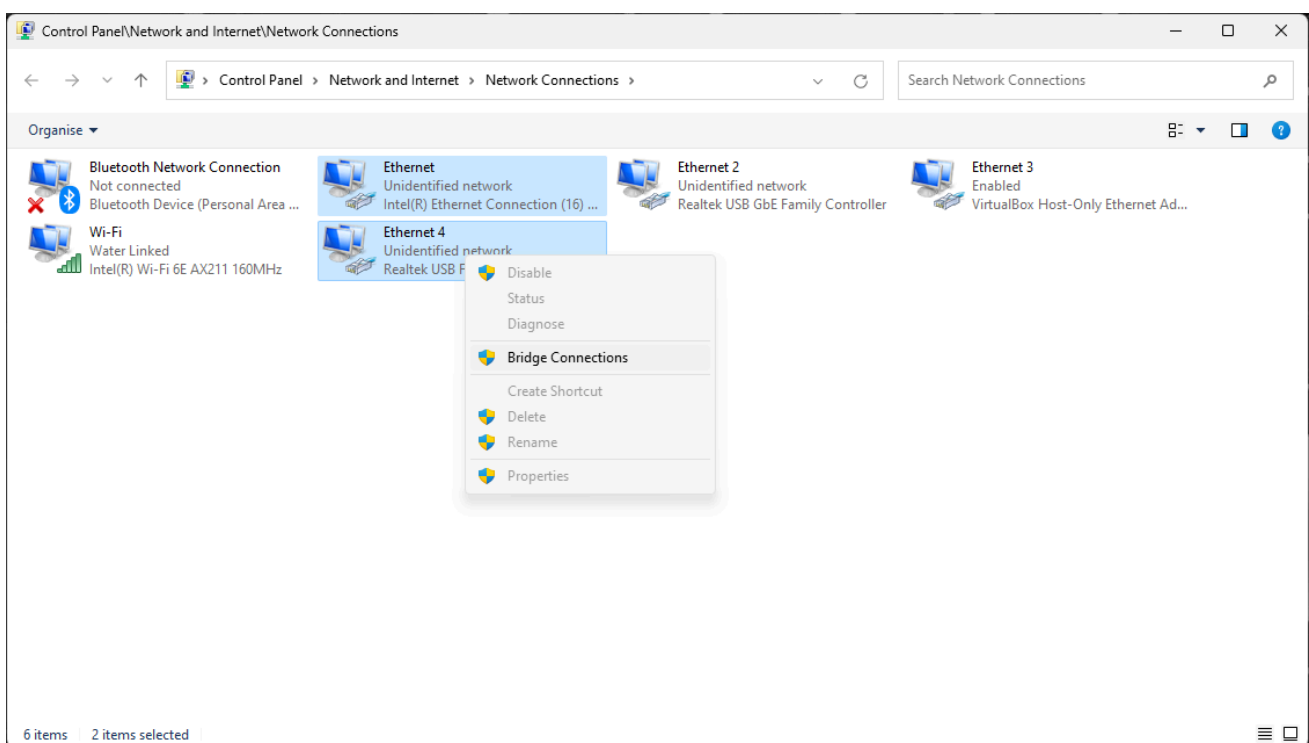


Now identify the adapter for the FXTI by connecting its USB-cable to the computer. Unplug and replug the cable if you plugged it in before. A new adapter should show up, which is called "Realtek USB..." in the gray subtitle. Note its name. In the example there are two adapters in the picture below starting with "Realtek USB", one additional by a docking station. So you can identify the correct adapter best by comparing which one is new, it is "Ethernet 4".

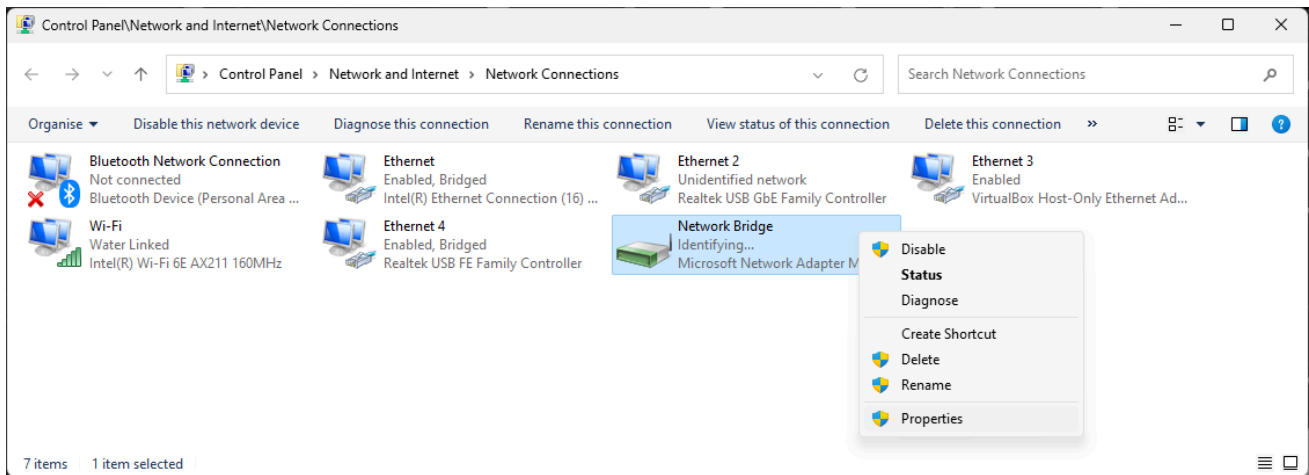
Do the same with the UGPS Topside, connect its ethernet cable to the computer. In the shown example the red cross for adapter "Ethernet" vanishes, indicating that a device is connected to the network adapter. So in the shown example "Ethernet" is the UGPS Topside and "Ethernet 4" is the FXTI.



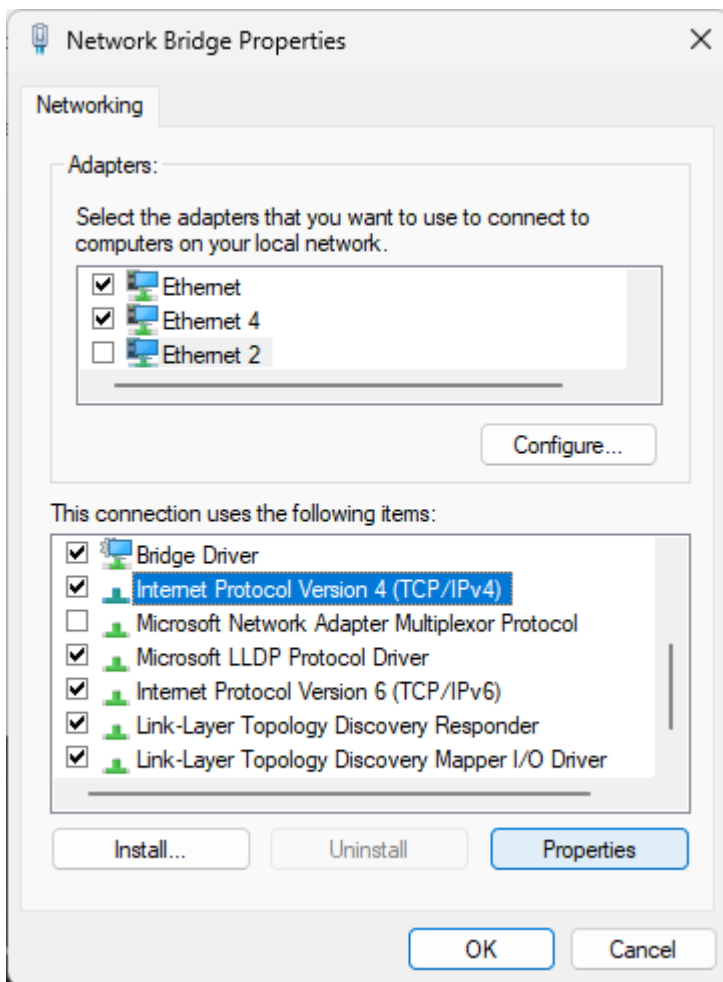
Create a network bridge between the two adapters identified in the previous step by selecting both with the help of the "Ctrl"-key. Then right click on one of them and select "Bridge Connections".



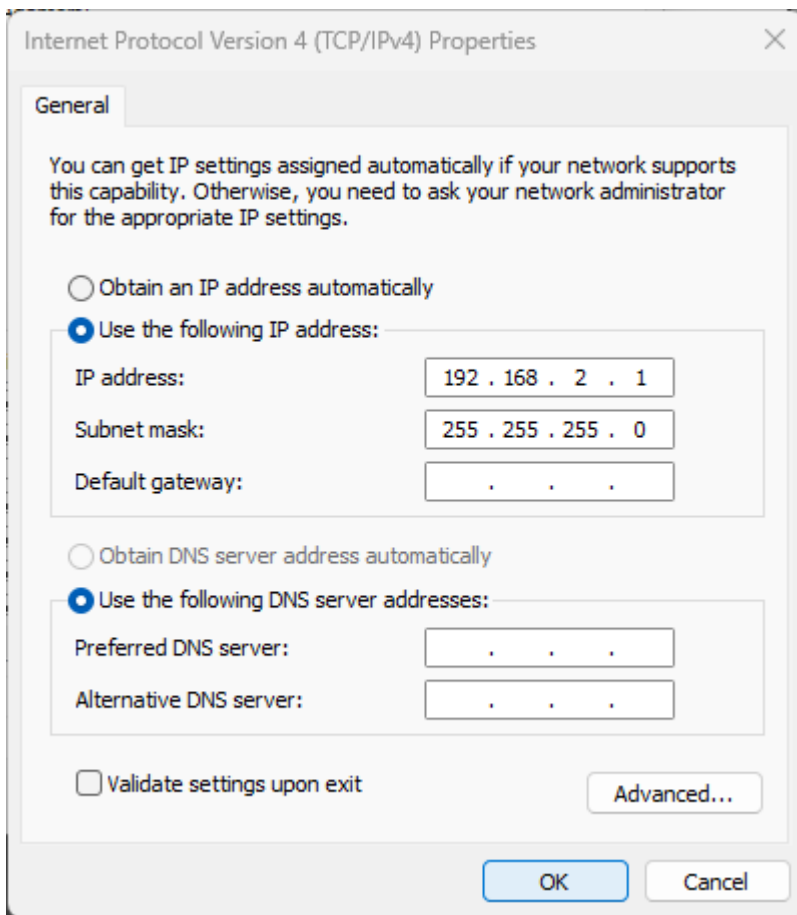
A new adapter called "Network Bridge" should appear. Right-click on it and select "Properties".



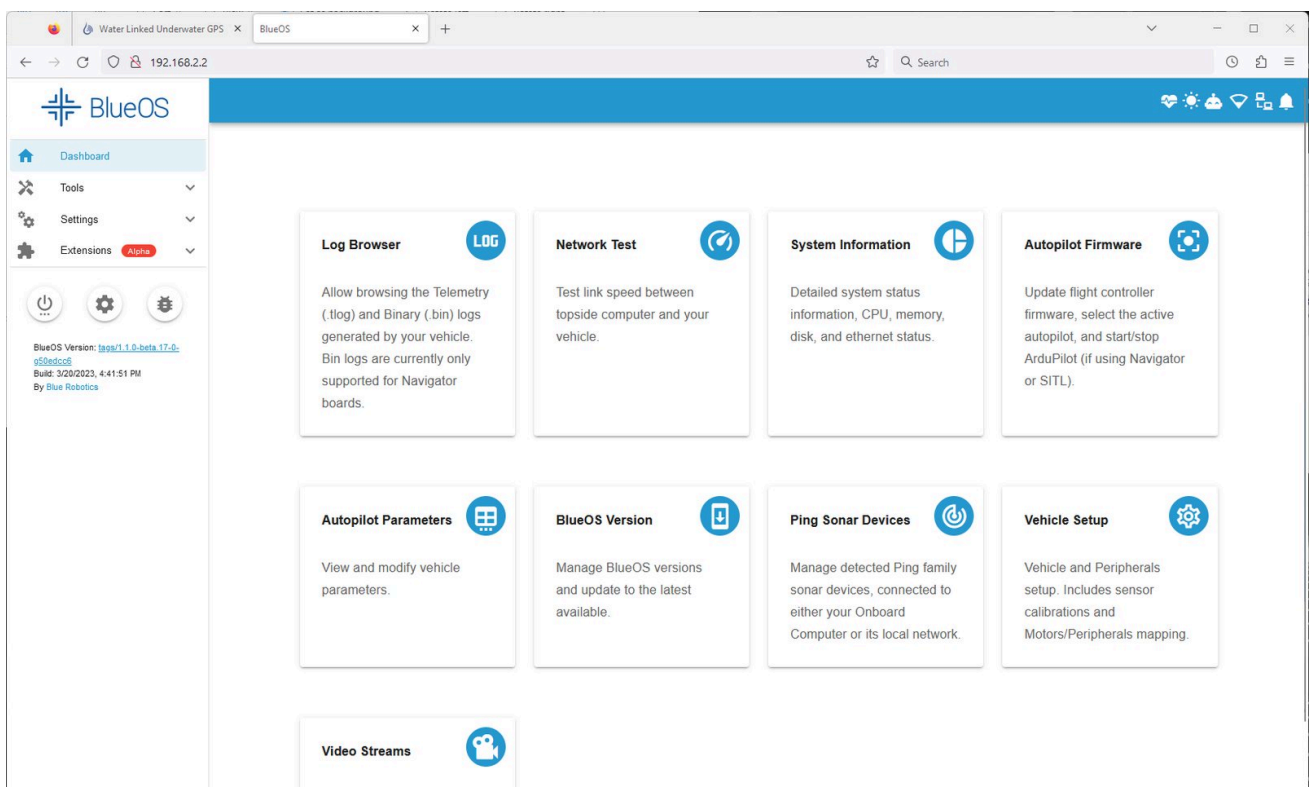
In the window "Network Bridge Properties" scroll through the lower list and select "Internet Protocol Version 4 (TCP/IPv4)". Click on the button "Properties".



In the window "Internet Protocol Version 4 (TCP/IPv4)" select "Use the following IP address" and type in the IP address "192.168.2.1" and Subnet mask "255.255.255.0". Click OK to close the window and also close the previous window "Network Bridge Properties" with OK.



You should now be able to access both the BlueROV by typing 192.168.2.2 in your browser address line and UGPS Topside by typing 192.168.2.94. Both have to be turned on.



If you do not need the network bridge anymore, you can delete it by navigating to "Change Adapter Settings" as described above, right-clicking on the Network Bridge and then clicking "Disable".

i Linux

On Linux the [instructions](#) at the Arch Linux wiki, in the section 'With iproute2', should work.

Note

Unfortunately these instructions do not work for Ubuntu.

i MacOS

On a Mac, the [instructions](#) at the Arch Linux wiki should work if the package `iproute2mac` is installed, providing an analogue of the `ip` package. Alternatively, essentially the same procedure can be followed using `ifconfig`, which should be available on a Mac, instead of `ip`.

Final steps of integration

When you have successfully established a network bridge and can access both BlueROV2 and UGPS Topside, you can continue with [Final steps of integration independent of Locator](#).

Software updates

It is recommended to always run the latest UGPS G2 software where possible. The latest software can be obtained [automatically](#) or [manually](#).

Automatic software update

The G2's [GUI](#) automatically checks and indicates if a new software version is available.

- [Connect](#) the G2 topside unit over ethernet or wifi to a network connected to the internet. If on a personal computer, it may be necessary to make a network bridge between a network interface which has access to the internet and the interface through which the G2 topside is connected.
- Go to `http://[IP_ADDRESS_OF_THE_G2_TOPSIDE]:9000` in a web browser.
- The GUI will automatically check if there is a new version available, and if so, initiate installation of it with a single click.

Offline software update

If it is not possible to connect the G2 topside to the internet, one can proceed as follows.

- Find the current version and chip ID of the G2 topside unit at *Menu -> About* in the [GUI](#).
- Manually download an update package (`.w1up`) from the [update server](#) using the chip ID.
- Verify if the downloaded version is newer than the currently running version.
- Navigate to `http://[IP_ADDRESS_OF_THE_G2_TOPSIDE]:9000` in a web browser.
- Select 'Manual upload' and then upload the downloaded `.w1up` file.

Underwater GPS FAQ

Below are some frequently asked questions about the Underwater GPS. Click on a question in the table of content to the right or simply scroll down to read the FAQ's.

1. The heading is drifting rapidly

In dynamic environments, such as in a boat at sea with rapid change of angles, the heading has to be set frequently in [Settings](#). In harsh weather this has to be done up to every minute. In such conditions it is advised to use an external compass to get accurate positioning data from the UGPS. If the UGPS is permanently installed on one boat, the boat's compass can be used. Otherwise an [external portable compass](#) can be implemented.

2. Can I set the speed of sound?

Yes, if you have the R300 version you can set the speed of sound in the "settings" menu in the GUI.

Note

If you have the R100 version you can't change the speed of sound. The option to change the speed of sound is still present, but you will get an error message saying "Bad request"

3. My UGPS system is not performing well

If your UGPS system does not perform as expected, you should contact Waterlink's technical support team through the [support portal](#) in Waterlink's home pages on the internet.

To help the support team analyze your system's behaviour, you should record a diagnostic logfile. This can easily be done by opening the Diagnostics window in the UGPS GUI. At the bottom of the page there is an option that allows you to record a diagnostic report. The file should preferably be recorded in the moment or circumstance as your system is failing. Attach the diagnostic report file you recorded to your request. The file contains valuable information that will help the support team analyze your system.

Note

The logfile must be downloaded to your computer and sent to customer support as an attachment.

4. My UGPS Topside is newer, but R2/R3 are fitted and I measure 12 V on the Locator connector. Should I remove them?

No. This question concerns the "Modify Interface Electronics" step of the [BlueROV2 Locator-A1 integration guide](#).

On the updated Interface Electronics, the positions R2 and R3 are populated with small inductors instead of the original 0 ohm resistors. The PCB designators still read R2 and R3. The inductors reduce the loading of the PLC signal by the 12 V supply, but they still provide a DC connection. Approximately 12 V DC between pins 1 and 2 of the "Locator" bulkhead connector is therefore expected on a powered unit with the updated configuration.

Populated R2/R3 positions and a 12 V reading are both consistent with the updated design. Neither observation by itself indicates the original configuration or justifies removing the components. The documented integration with the BlueROV2 Integration Kit works with the updated configuration as delivered.

If you cannot identify the hardware configuration of your unit with certainty, contact [Water Linked Support](#) with the serial number of your UGPS Topside before modifying the board.

Quickstart

Intro

This is a guide on how to start using the Underwater GPS system. The steps are:

- Power the topside unit
- Calibrate IMU
- Deploying receivers
- Connect everything
- Select locator and channel
- Configure receiver placement in GUI

Power the topside unit

Start by connecting power to the topside unit. We do this first because we want the GPS receiver to start receiving signals and achieve a lock while we setup the rest of the system. If you are using the Locator-S1, power it on now so it also has time to get GPS lock.

Calibrate IMU

Connect the Ethernet cable to the topside unit and your computer. Then open your web browser and type in the IP-address of your topside unit which is defined by the position of the dip-switch on the Master-D1. How to change the IP-address is described [here](#). At the top bar on the GUI you will see a calibration bar for the IMU. To calibrate the IMU rotate it in a figure of 8 and keep doing it until the IMU calibration bar becomes full and green.

Deploying of receivers

Before starting to deploy the receivers in the water, add a piece of tape on the receiver cable on the desired depth to make setup easier. Place the receivers in the water on the desired location and decide which number (1-4) each receiver will have. This is important when connecting the receivers to the topside unit.



Tip

Adding lead weights just above the receiver helps keep them stable when doing the positioning.

Connect everything

When connecting the receiver cables to the topside unit remember the numbering you decided on and connect the connector to the accordingly port. If this is not correct the position will be completely wrong. Next you connect the Locator if you are using the A1 or D1.



Select locator and channel

Now that everything is connected and ready it is time to select the right locator and choose which channel to listen on. This is configured on the setting page of the web GUI. The Water Linked standard is to use channel 17 and this is also the default channel for the Locator-S1.

Configure receiver placement and seach range in GUI

After selecting the correct locator, you need to provide the correct placement of the receivers to the GUI for the positioning to work correctly. This is done by drag'n drop of each receiver to the correct placment relative to the topside unit. The position of each receiver is seen below in the map view. It you click on the receiver you get a pop up with the possibility to write its exact placment. Once this is done you can limit the search range by using the same drag and drop feature.

Warning

If you are using the Locator-A1 or S1, you need to provide depth information to the topside unit. This is achieved using the [explorer-kit API](#).

Tip

Reducing the search range helps to improve the performance of the system. It is recomended to limith this range if you are operating in a smaller area. This is especially important in tanks.

You are now ready to explore the underwater world and knowing where you are at the same time.

Introduction

The Underwater GPS Explorer Kit retired and no longer available for sale.

Underwater GPS Explorer Kit



The Underwater GPS Explorer Kit is a robust and reliable acoustic positioning system with a range of 100m. The purpose of the system is to give a live GPS position of ROVs, divers and other moving objects below the water surface.



The Underwater GPS system is based on Short Baseline (SBL) acoustic positioning. The Locator is placed on the device to be positioned and functions as a beacon that send out an acoustic pulse. Near the surface, there are four Receiver hydrophones lowered into the water. The Receivers listen for the pulse from the locator. Time-of-arrival to each Receiver is used to calculate the Locator's position. SBL systems, compared to the USBL systems, have the advantage of working well in shallow water and acoustic reflective environments, such as in fish cages, near harbor installations, close to ship hulls, inside water tanks etc.

Once the position is known relative to the Receivers, the global position can be found by adding that to the position obtained by a GPS receiver. The Underwater GPS system does that part internally so that it can provide the actual global position of the ROV as its output.

Kit content

- 1 x Underwater GPS Housing with Master-D1 electronics
- 4 x Receiver-D1 with 10m cable
- 1 x Locator of choice
- 1 x 3m Ethernet cable
- 1 x 3m power cable
- 1 x External GPS antenna

Quickstart

[Getting started with Water Linked Underwater GPS](#)

Discussion

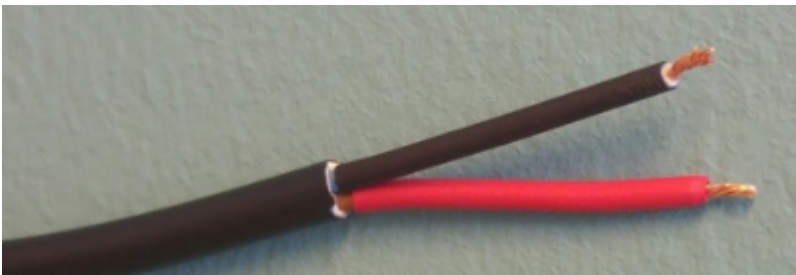
If you have questions, you are very welcome to contact our [customer support](#), where we will be happy to help you.

Warnings

To avoid the risk of damage to the Underwater GPS, please read this user manual carefully before it is installed and used for the first time.

Operation area	The Underwater GPS system ONLY work in water. It does not work in air.
Max voltage	The absolute maximum voltage rating of the equipment is 18V. Voltages above this will damage the electronics.
Reverse voltage	The board does not have reverse polarity protection. Do not apply a negative voltage to the red power wire as this will damage the electronics.
Temperature	Make sure the system does not overheat. Avoid placing it in direct sunlight over extended periods of time.
Salt water	The Master-D1 Electronics will corrode if it comes in contact with salt water. Keep the housing lid closed when in the field to avoid salt water to get in contact with any electronics.
Force	Avoid using excessive force on connectors, screws and other parts of the system as this can lead to mechanical damage.

Power supply

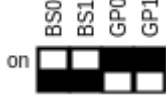


The power cable comes with stripped jacket. Connect the stripped cables to your favorite 12V power source.

Black :	Negative
Red :	Positive
Voltage :	10 – 18V
Current :	0.7A (12V nominal)

Network Settings

At power-up, the Master-D1 reads the DIP-switch settings. The network mode depends on the GP0 and GP1 position.

Network mode	GP0	GP1	DIP switch position
DHCP client	ON	ON	
Static IP 192.168.2.94	OFF	ON	
Static custom IP	ON	OFF	
DHCP Server, 192.168.0.1	OFF	OFF	

The BS0 and BS1 positions on the dip switch shall both be ON. These boot-select pins are used in factory programming only.

Use the supplied Ethernet cable to connect the Underwater GPS to a network switch or directly into the host computer.

 **Note**

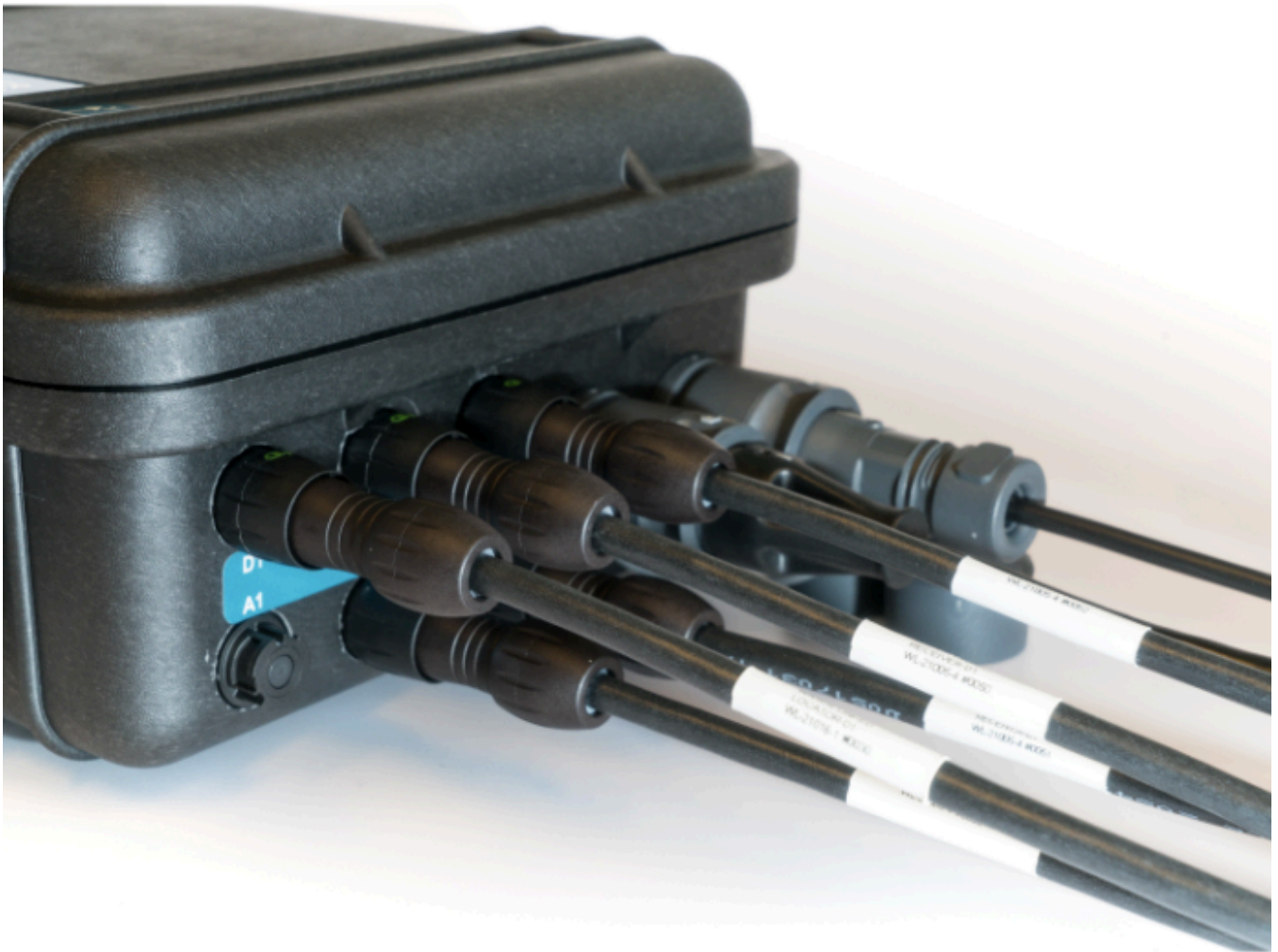
The host computer connected to the topside unit needs to have an IP-address on the same subnet as set on the Master-D1. For example: If the IP address of the UGPS is 192.168.2.94 the host computer needs to be configured to a different 192.168.2.x address e.g. 192.168.2.100.

Hardware Setup

Connectors



- Connect the four Receiver-D1 cables to channel 1 to 4 on the housing.
- If using the Locator-D1, connect this to the D1 connector on the housing.
- If using the Locator-A1, connect this to the A1 connector on the housing.
- If using the Locator-S1, no connections to the housing is needed. Just power the Locator and make sure both the status led on S1 and master is solid green.

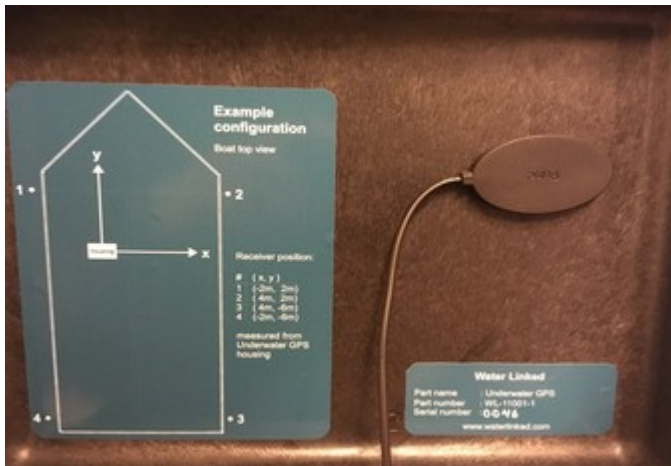


GPS

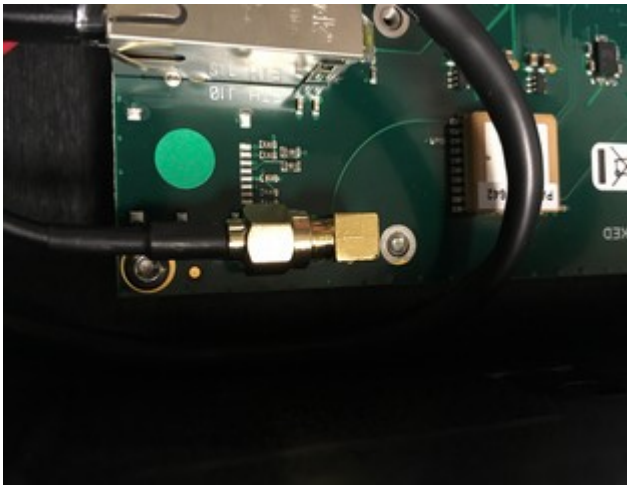
The on-board GPS module is used to position the system in a global reference system. An external antenna with integrated amplifier is used to improve GPS reception. The signal strength of the GPS can be seen on the top bar in the web GUI.

GPS-antenna assembly

The GPS-antenna can be mounted anywhere you want, but remember the GPS-antenna is the origin of the master electronics position. Therefore it is recommended to fasten the antenna on the lid of the peli case. With the 3M double sided tape, attach the GPS- antenna to the lid of the peli case.



Connect the GPS-antenna cable to the SMA connector on the master electronics. Torque the SMA nut to 3–5 in·lbf (0.3 to 0.6 N·m) or slightly more than finger tight.



IMU

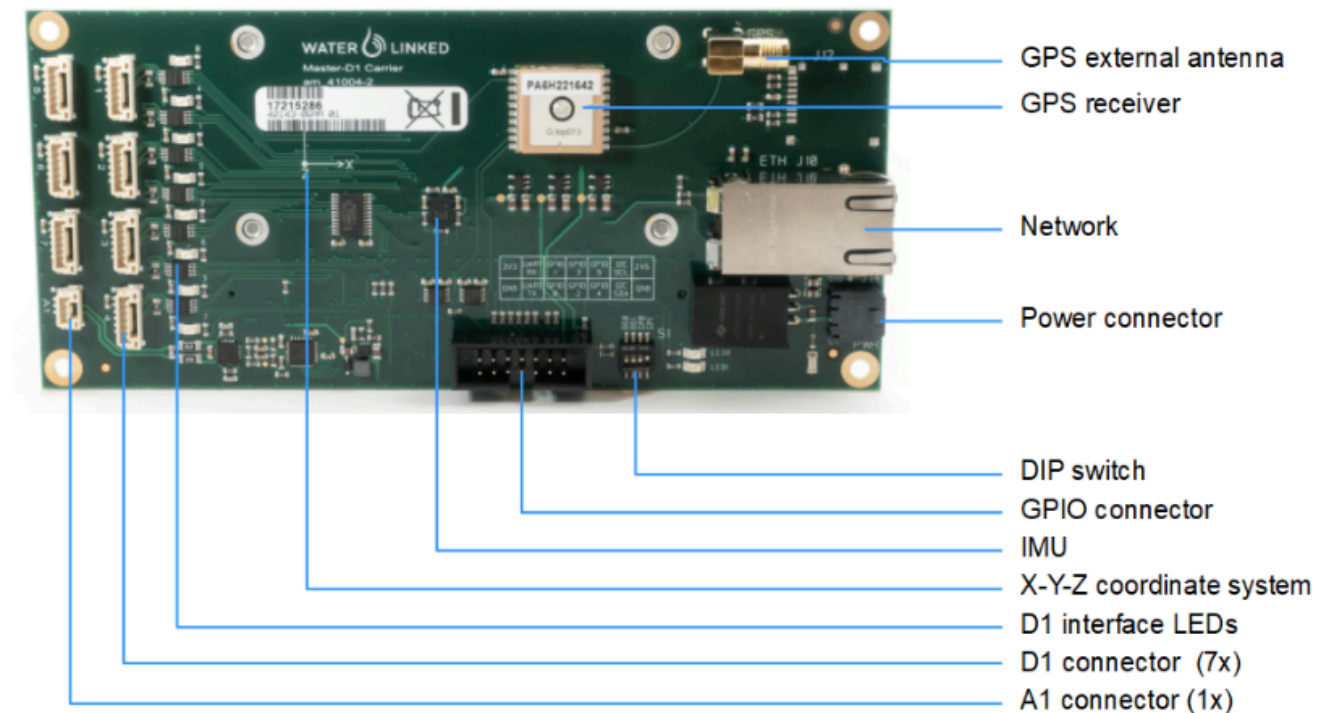
The master electronics has an built in IMU used to provide the orientation of the master electronics. This is used in combination with the acoustic position and GPS to generate the global position of the Locator.

IMU Calibration

For the IMU to work properly it needs to be calibrated. The calibration data is stored when full calibration is obtained for faster calibration on restart of the system. If the system is started on a new location a new calibration is needed for the IMU to work as intended.

To calibrate the IMU disconnect all Recivers and Locator cables, but leave power and Ethernet connected. This is to prevent damaging the cables and connector when performing the calibration. While looking at the top bar in the web GUI on the IMU status, move the peli case in a figure of 8 until all the bars are green.

Master-D1 Electronics



Description

The Master-D1 is a digital acoustic position computing board. It calculates the position of any Locator relative to the position of the Receivers, as well as global position through use of the integrated GPS and an IMU. The board supports up to 7 independent D1 devices, 1 A1 device or 1 U1 device. It is accessed through a network interface. The Master-D1 is running its own webserver which exposes an API and a GUI. With its small physical footprint, the board is easily integrated into a topside housing.

Benefits

- Extremely small footprint enabling easy integration with other equipment.
- Highly robust operation in areas with reflections (shallow water, around installations etc.)

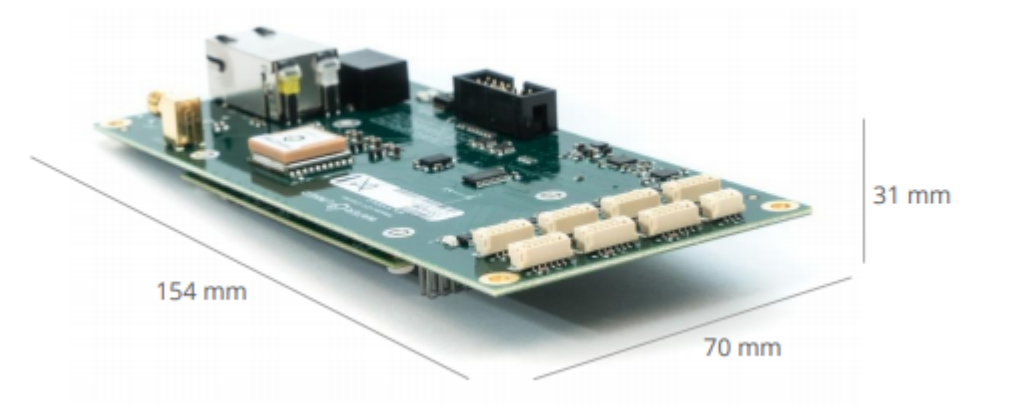
Wiring interface

Make sure the LED is ON for all D1 interfaces that are connected. The digital D1 interfaces all have a separate LED to show if the communication link is in lock. When a Receiver-D1 or Locator-D1 cable is connected to the master board, the corresponding LED should be continuously ON. The silkscreen marking of the channel LEDs on the PCB are 0-indexed. The channel labels on the housing are 1-index. We thus get following LED channel mapping:

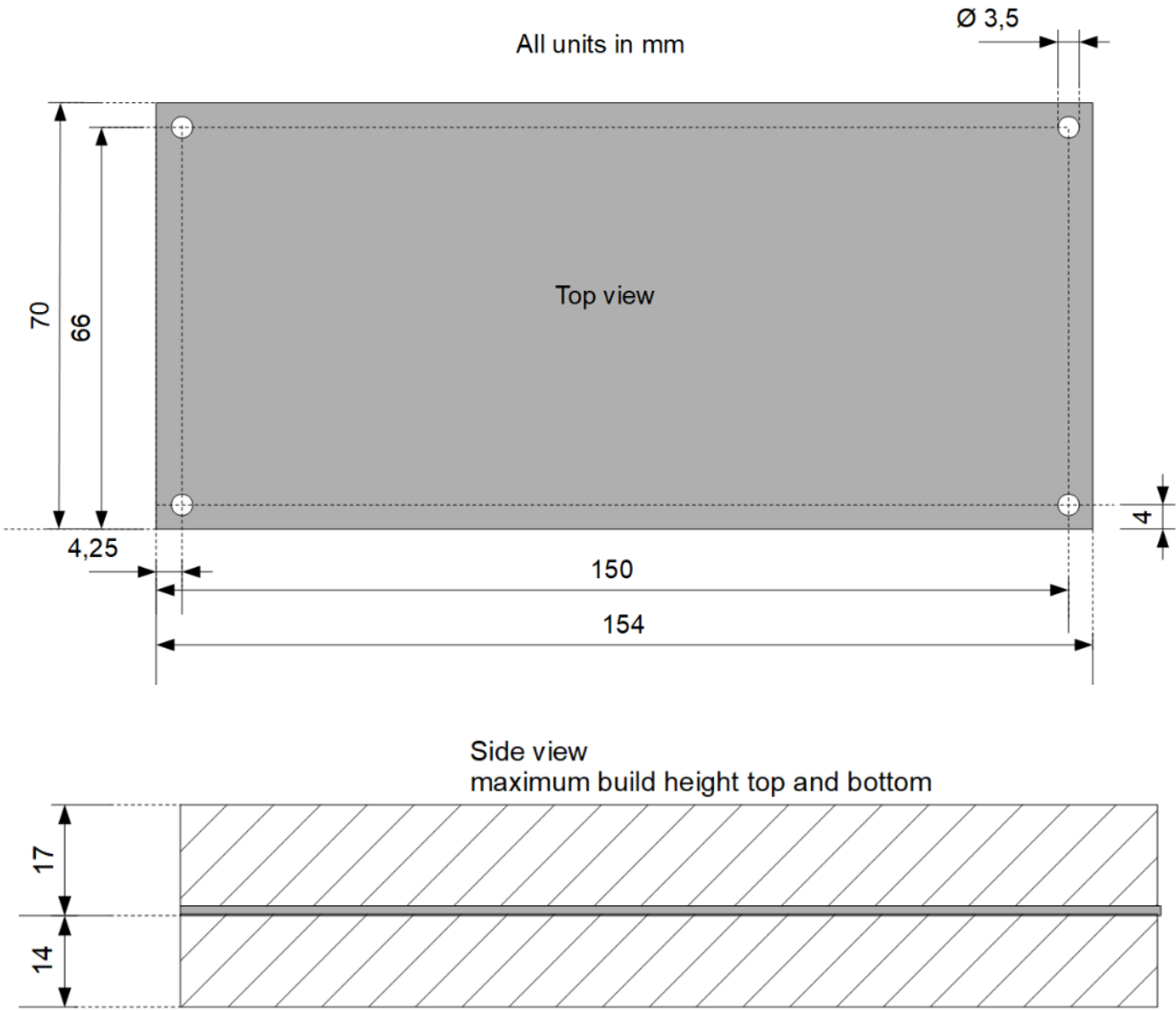
Interface	LED
Receiver, channel 1	0
Receiver, channel 2	1
Receiver, channel 3	2
Receiver, channel 4	3
Locator-D1	6

The LED on the Locator-A1 interface is not in use.

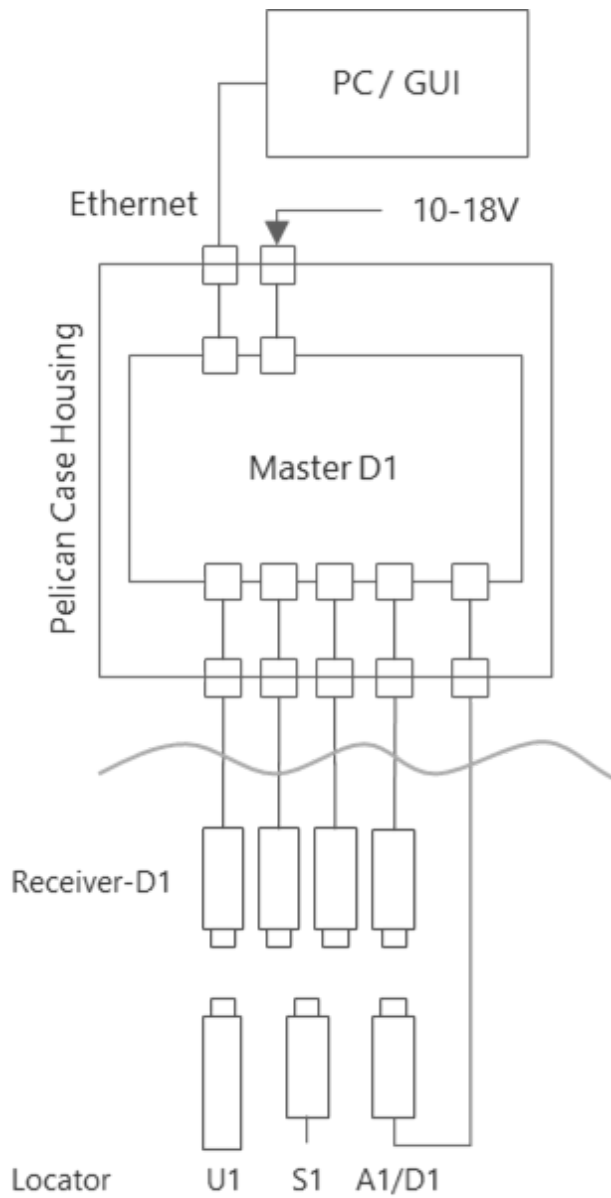
Dimensions



The diagrams below shows the mechanical dimensions of the Master-D1 electronics.



Setup



Datasheet

[Datasheet](#)

Receiver-D1

[Buy Receiver-D1 here!](#)

Description

The Receiver-D1 is a digital low-noise, high sensitivity hydro acoustic receiver that converts acoustic waves to a digital data stream. The receiver is equipped with a wideband analog front-end width a large dynamic range followed by advanced digital signal processing functionality. The electrical interface complies with the Water Linked D1 communication standard.

Benefits

- Extremely small footprint enabling easy integration in other equipment.
- Highly robust operation in areas with reflections (shallow water, around installations etc.)

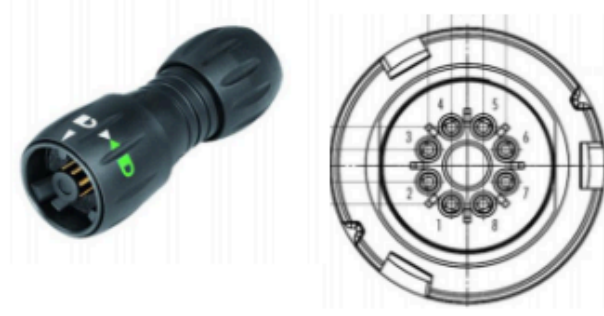
Wiring interface

The tables below shows the pinning of the Receiver interface connectors.

GH connector

	Pin #	Wire Color	Signal
	1	Orange/White	<u>GND</u>
	2	Orange	12V
	3		
	4		
	5	Brown/White	RX-
	6	Brown	RX+
	7		
	8		

Binder connector

	Pin #	Wire Color	Signal
	1	Orange/White	<u>GND</u>
	2	Orange	12V
	3		
	4		
	5	Brown/White	RX-
	6	Brown	RX+
	7		
	8		

Dimensions



Datasheet

[Datasheet](#)

Locator-A1

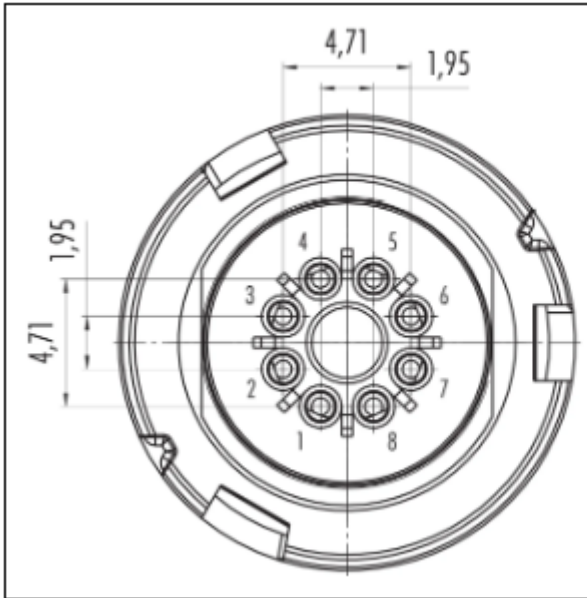
[Buy Locator-A1 here!](#)

Description

The Locator-A1 has the smallest physical footprint in our series of locators. It can be integrated into even the most compact ROVs. The Locator-A1 does not carry its own depth sensor, and the Master-D1 requires that the depth be provided from your underwater vehicle (ROV etc.) This can be achieved by means of the [UGPS API](#).

Wiring interface

The tables below shows the pinning of the A1 interface connectors.



Pin	Wire color	Signal
1		
2		
3		
4		
5		
6		
7	Blue/white	ANA+
8	Blue	ANA-

Dimensions



Datasheet

[Datasheet](#)

Locator-D1

[Buy Locator-D1 here!](#)

Description

The Locator-D1 carries its own depth sensor and can therefore operate fully stand-alone and independent of the device you want to position.

Warning

The Locator-D1 can only be submerged for about 6 hours. It then needs to dry the pressure sensor in order to give correct depth readings.

Wiring interface

The tables below shows the pinning of the D1 interface connectors.

GH connector

	Pin #	Wire Color	Signal
	1	Orange/White or Black	GND
	2	Orange or Red	12V
	3	Blue	TX+
	4	Blue/White	TX-
	5	Brown/White	RX-
	6	Brown	RX+

Binder connector

	Pin #	Wire Color	Signal
	1	Orange/White	GND
	2	Orange	12V
	3	Blue	TX+
	4	Blue/White	TX-
	5	Brown/White	RX-
	6	Brown	RX+
	7		NC
	8		NC

Dimensions



Datasheet

[Datasheet](#)

Locator-S1

Description

The Locator-S1 carries an internal GPS based time sync module. Because of this, the S1 does not require tether integration for top-side communication. It only requires external power 10-18V to be provided from the underwater device.

Some Locator-S1 attributes can be configured using an integrated UART (3V3) interface. This configuration is optional and not required for normal operation. Before deployment in water, the Locator-S1 needs to achieve a GPS lock. The integrated status-LED shows the condition of the GPS lock. Once the Locator-S1 has lock it can operate for approximately 6 hours before needing resync with GPS.

Note

The default channel for Locator-S1 is 17 on boot.

Locator-S1 supports channel 16,17 and 18.

As the Locator-S1 does not carry its own depth sensor, the depth needs to be provided from the underwater vehicle (ROV etc.) to the topside Master-D1 using the software API. This can be achieved by means of the [UGPS API](#).

LED Signals

- No green light: Power is off and the unit is **not ready** for diving.
- Flashing green light (once a second): Searching for GPS lock. The unit is **not ready** to dive.
- Fixed green light: GPS lock is achieved. The unit is ready to dive.
- Flashing green light (slow): GPS lock has been achieved but lost. The unit is ready to dive.

Wiring interface

The tables below shows the pinning of the S1 interface.

Interface	Color
Positive (10-18V)	Orange
Negative	Orange/White
UART RX	Brown

Interface	Color
UART TX	Brown/White

Terminal Interface

The Locator-S1 has a simple 3.3 volt UART interface which is used to change the channel of the locator.

Settings	Value
Baud rate	9600
Data parity stop	8N1
Flow control	None

Dimensions



Datasheet

[Datasheet](#)

Locator-U1

[Buy Locator-U1 here!](#)

The Locator-U1 is a battery-powered, digital hydroacoustic locator device with an internal GPS-based time-sync module, so no tether is required. It has its own pressure sensor and measures its own depth.

The Locator-U1 used with the Explorer Kit is the same device that is used with the Underwater GPS G2 system, and it is documented in one place:

[Locator-U1 documentation](#)

That page covers charging (including the LED behavior for each serial-number range), powering on and off, the LED signals, channel selection, operating time, troubleshooting, and the dimensions.



Note

The Explorer Kit is retired. On the Explorer Kit, the channel of the Locator-U1 is selected in [Settings](#) in the Explorer Kit GUI, and it must match the rotary switch inside the cap of the Locator-U1. Other references on the Locator-U1 page point to the Underwater GPS G2 interface.

Position view

The Underwater GPS GUI is web based. Using your favorite web browser, go the IP address as defined [here](#). We currently support and recommend Chrome, Firefox and Safari.

Attention

Internet Explorer is not supported as of now.



Receivers

Receiver Guidelines

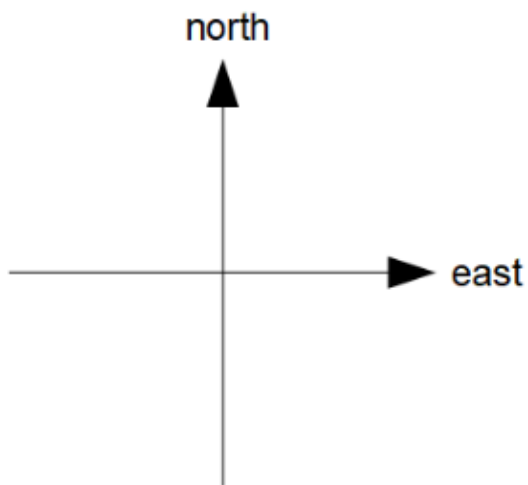
You may place the Receivers at any location within 100m from the top-side housing / Master_D1. In order to ensure the best performance, you should follow a few guidelines:

Line-of-sight	Try to place the Receivers so they all have a free line-of-sight to the Locator.
Good Separation	The system performs better when there is a decent distance between the Receivers. More separation is better, but 2x2 meters is sufficient for good performance.
Max Range	There should be maximum of 100m from any Receiver to the Locator
Receiver Depth	Place the Receivers at a few meters depth. Near the surface there are typically small air bubbles caused by waves. These small air bubbles attenuate the acoustic signal and can reduce the system performance.
Limit search area	You will get a better position if you help the search algorithm to narrow the search area. Limit the search range setting to the area where the Locator is expected to be.
Directivity	The Receivers and Locators are fully omnidirectional and transmits/receives equally good in all directions. The only direction with less performance is backwards where the cable enters.
Receiver stability	Add some weight to the Receiver cable just above the Receiver so they hang straight down in the water
On board GPS	If the master electronics is static during operation it is recommended to use the static option for the GPS. This is to remove the inaccuracy of the GPS Receiver in global position. Only use onboard GPS when the reference system is moving eg. if mounted to a boat.

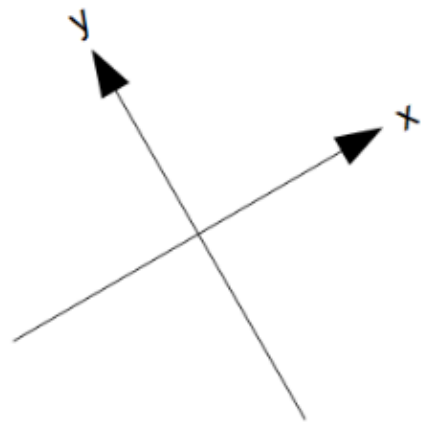
Reference Systems

In order to calculate the absolute position of the Locator we need to define two reference systems, the acoustic and the global reference system. The global reference system is defined by latitude and longitude and is the reference system used by the GPS and in maps.

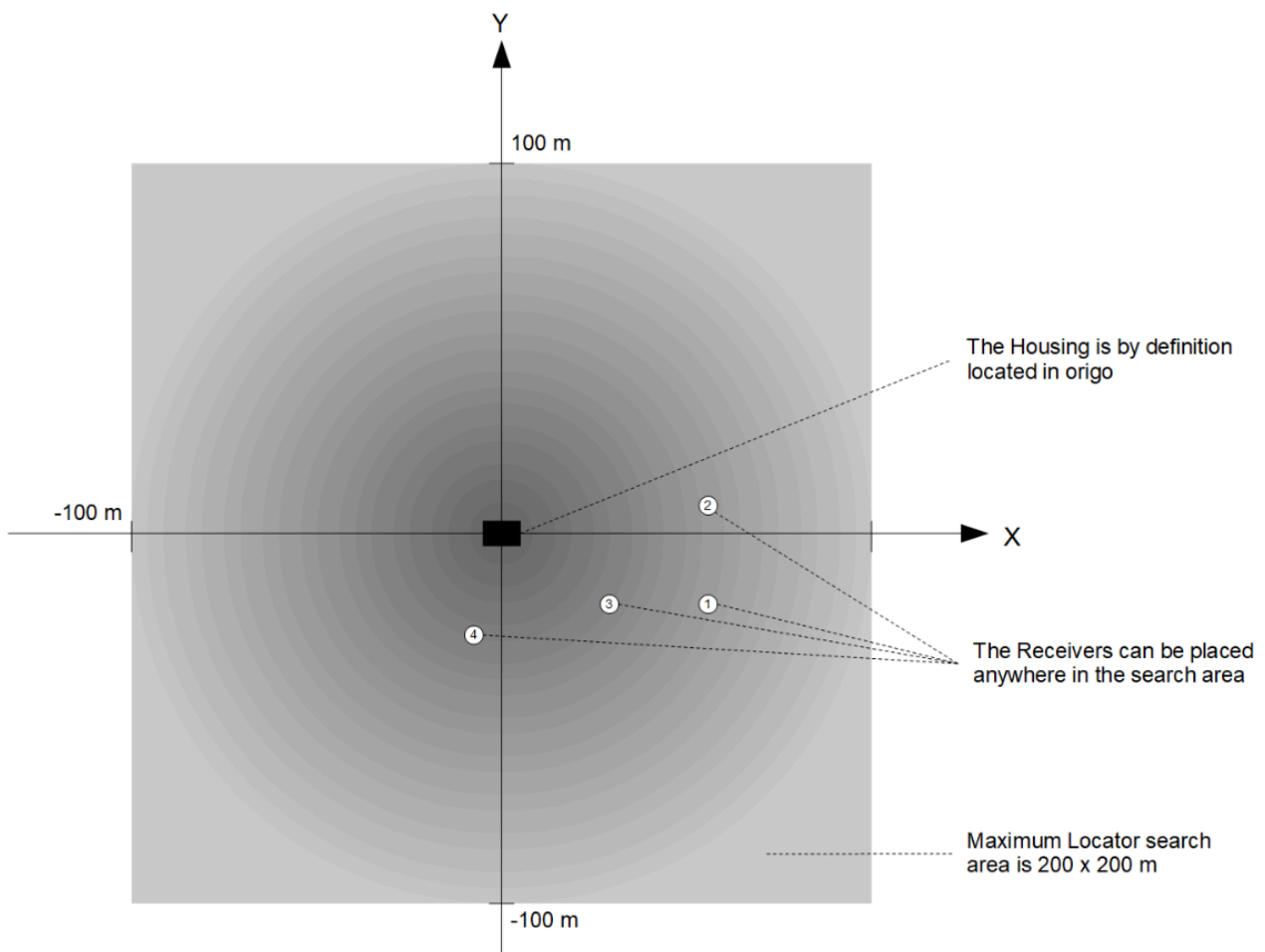
Global reference system

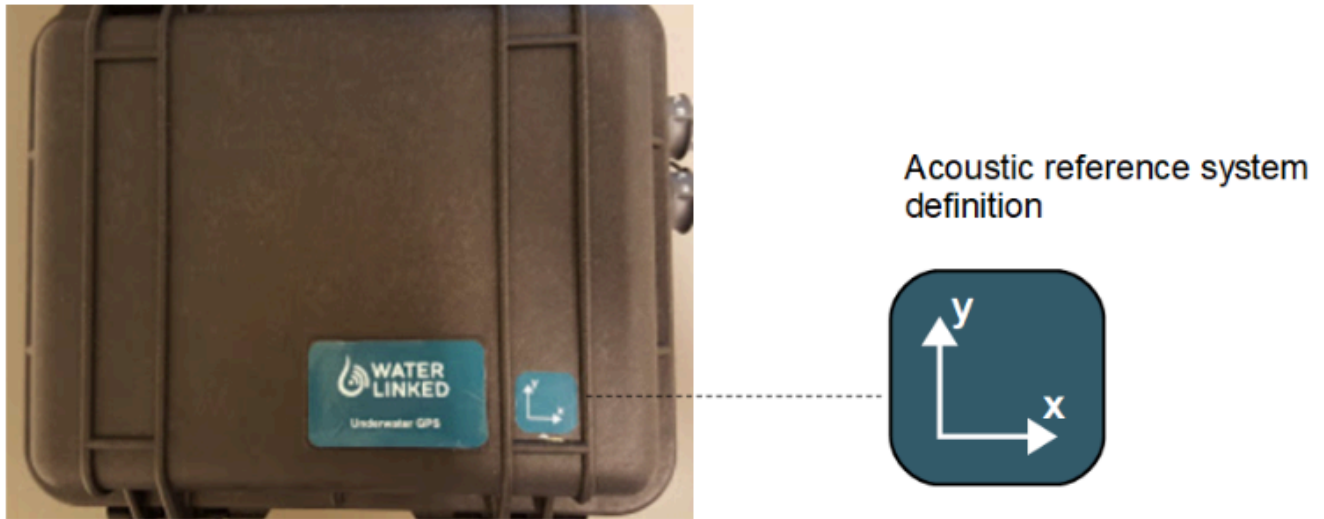


Acoustic reference system



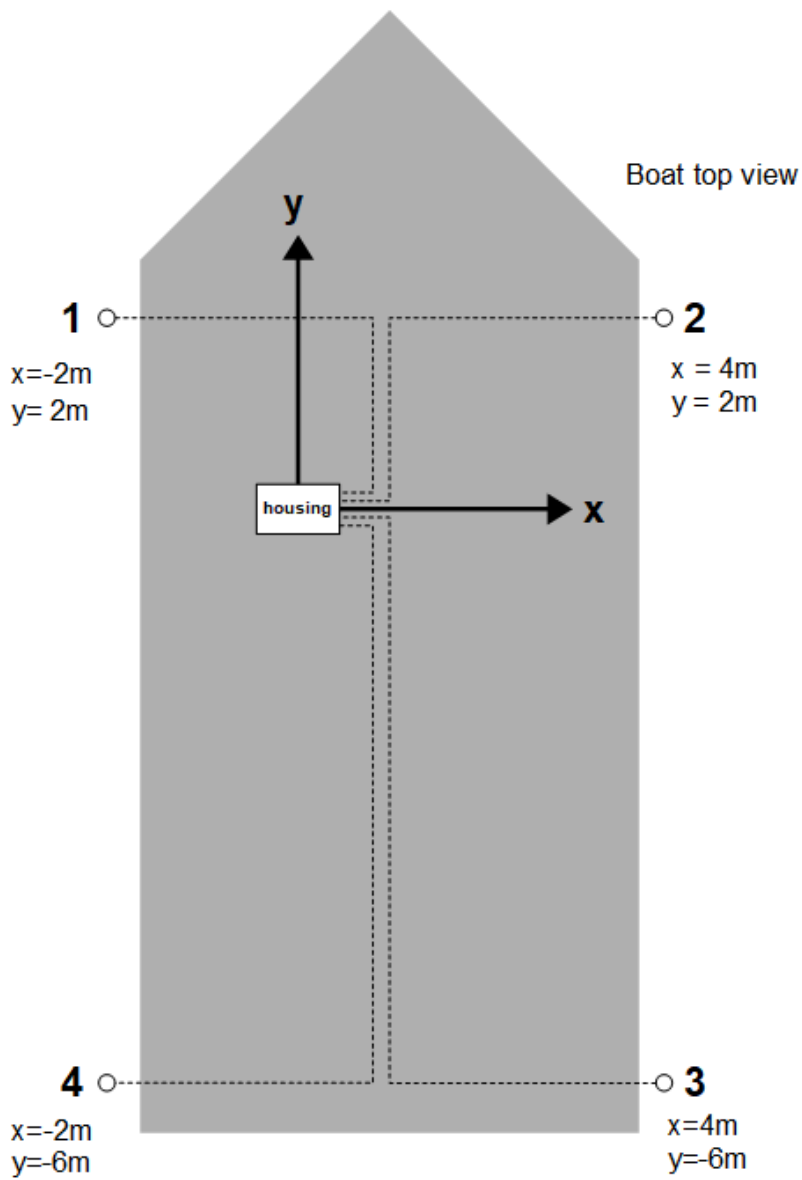
The acoustic reference system (the x and y axis) is defined by the orientation of the housing. The housing is by definition located in origin ($x=0, y=0$). A label on top of the lid indicates the x-y coordinate system.





Boat Example

The illustration bellow shows a typical Receiver configuration when installed on a boat. The Receivers are hanging from the side of the boat, one in each corner. The depth of the Receivers are typically 2-4m, deep enough to get below the hull and get free line-of-sight to the Locator. Notice how the housing defines the origin and coordinate system of the acoustic reference system.



Settings

Locator setup

In this section you choose which locator you are using with the system and on which channel it is sending. The Water Linked default channel is 17 and this is the channel that the Locator-S1 is running on. If using the Locator-U1 the channel needs to match the rotary switch at the back of the U1.

Warning

If you are using the Locator-A1 or S1, you need to provide depth information to the topside unit. This is implemented through the explorer-kit's [API](#).

Top-side Setup

In this section you have the option to choose which GPS and IMU source you are going to use. We strongly advise to use static or external GPS when operation allow for it. Because the master-D1 electronics has a standard GPS receiver it has a standard deviation of around 2-3 meters.

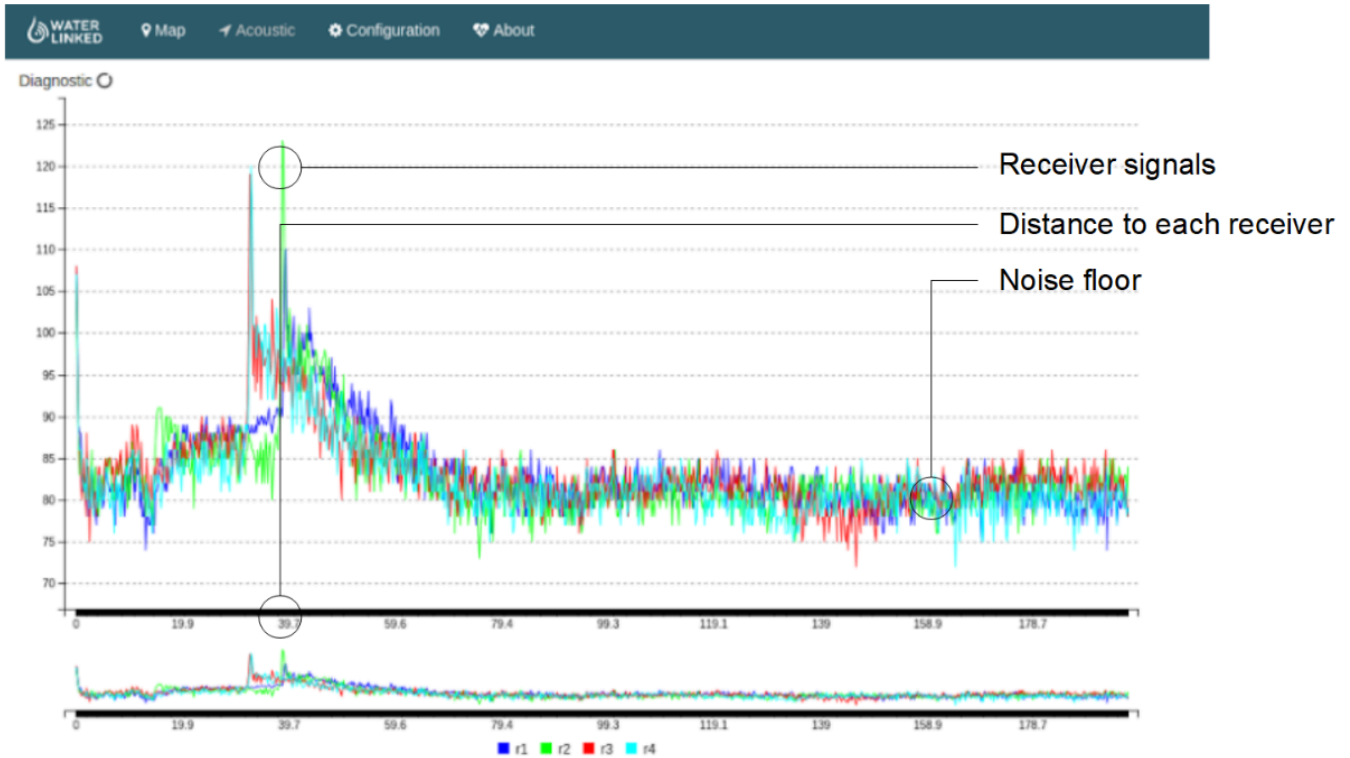
How to input external GPS and IMU with the API is described [here](#).

User preferences

In the user preferences section you can select the unit of measurements you want to use. We support both Metric and Imperial. You can also select if you want a dummy boat to be displayed on the map pages and the receiver configuration page.

Diagnostics

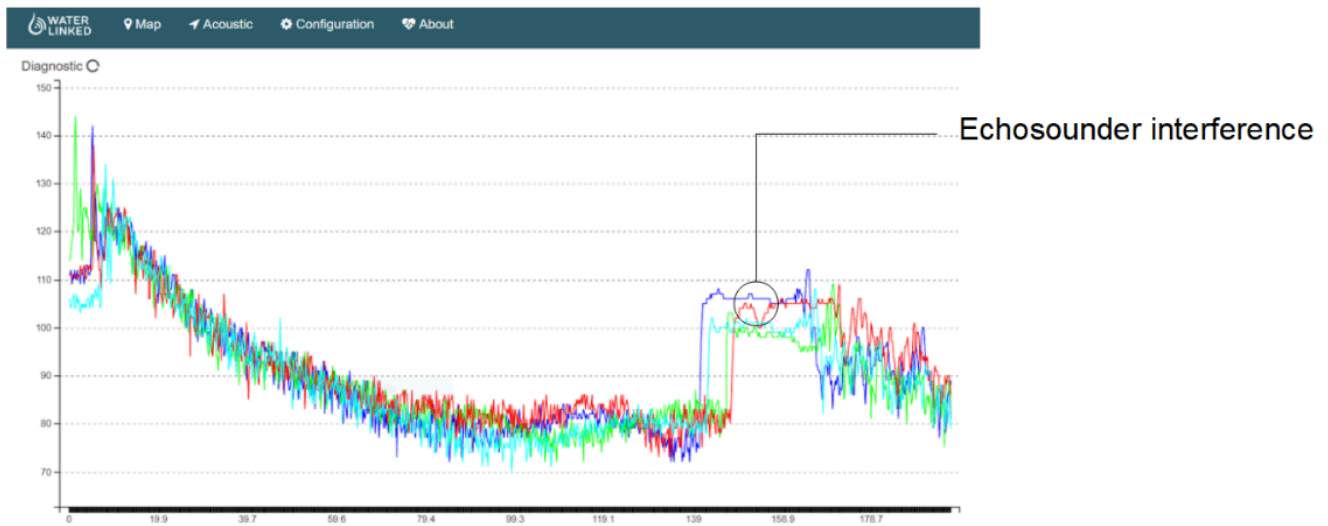
Verify Receiver signal strength in the diagnostic page on the web GUI by going to the diagnostic tab in the side panel on the left. This view will show the signal strength from all Receivers. It should look something like this:



In the diagnostic plot you should see the signal from all 4 Receivers. The signals should be well above the noise floor.

Interference

Acoustic interference can be observed in the diagnostic plot. Echo sounders from your boat or nearby boats typically appears like burst noise.



If it is coming from your boat, try to turn off the echo sounder to improve position accuracy. In case of interference from other acoustic sources, use the GUI to try other channels to avoid the interference.

API

The Underwater GPS system comes with an easy-to-use software HTTP API. Through the API you can, amongst other things:

- Read acoustic and global position data
- Read GPS and IMU raw data
- Read and set POIs
- Set configuration parameters

See demo.waterlinked.com/swagger for the details of the API.

Interaction

Any programming language can be used to interact with the API. We have examples in both [python](#) and [go](#), which currently cover, for instance:

- Sending of locator depth when using the [A1 locator](#) (see the script `externaldepth.py`).
- Sending in of satellite GPS data (positioning and/or heading) from an external GPS receiver (see the script `nmeainput.py` or its [go analogue](#))
- Export of tracks to a GPX file (see the script `tracklog.py`)
- Output of the positions calculated by the UGPS G2 system in NMEA format (see the script `nmeaoutput.py` or its [go analogue](#))

Software update

As of software release 2.1.0 the system automatically checks for updates when the host computer is connected to internet. If you have the latest release you will see a green checkmark as shown below. An exclamation mark will indicate if a newer release is available.

Software

Version information

**Software version**

2.1.1 (876.22c0d72) ✓

**Chip ID**

0xf144063063f808

Browser compatibility

The Web GUI has been tested and verified to work with the following browsers:



Chrome 63 (Recommended)



Firefox 58

A software update package (.wlup file) includes all files required to update the system. The software package is encrypted and will only work for the Chip ID it is generated for. The Chip ID can be found in the About tab of the GUI.

Update process

Please select the update process that is best suited to you:

- Type <http://192.168.2.94> in your web browser. If the Underwater GPS GUI is visible to you, please use the [Update with static IP](#).
- If the Underwater GPS GUI is not shown when using the link above, please use the [Update with DHCP](#).

**Warning**

The software upgrade will clear the receiver configuration, settings and POIs. Make sure to save the information you need before upgrading.

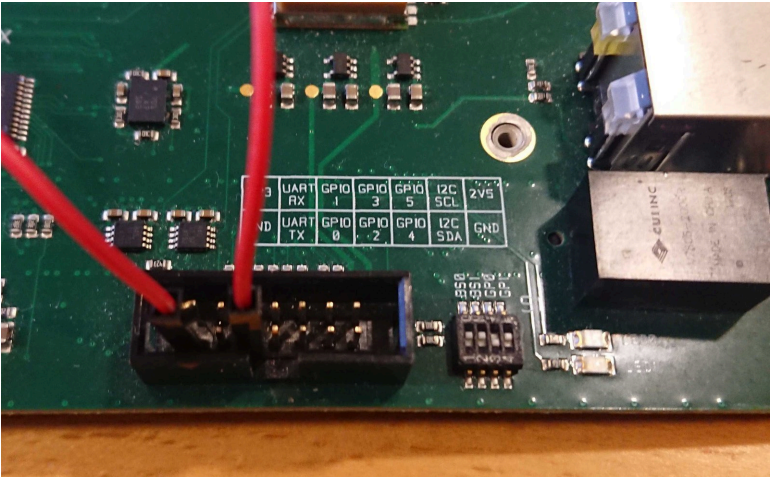
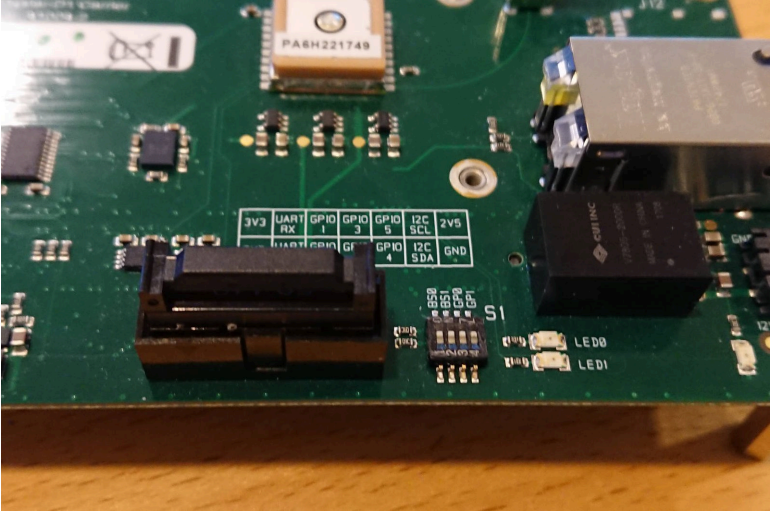
Download software package

To get the latest software package for your kit:

- Download directly from the "About" page of the Underwater GPS GUI
- Alternatively: Go to update.waterlinked.com and enter the Chip ID of your kit.

Update using static IP

This procedure works if you have haven't changed the jumpers on the Master-D1, you have set up a static IP address on your computer and you are able to see the gui on <http://192.168.2.94>.

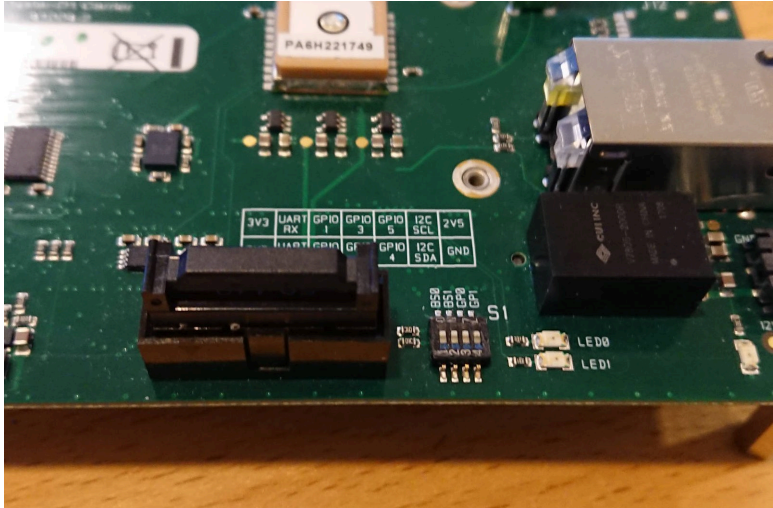
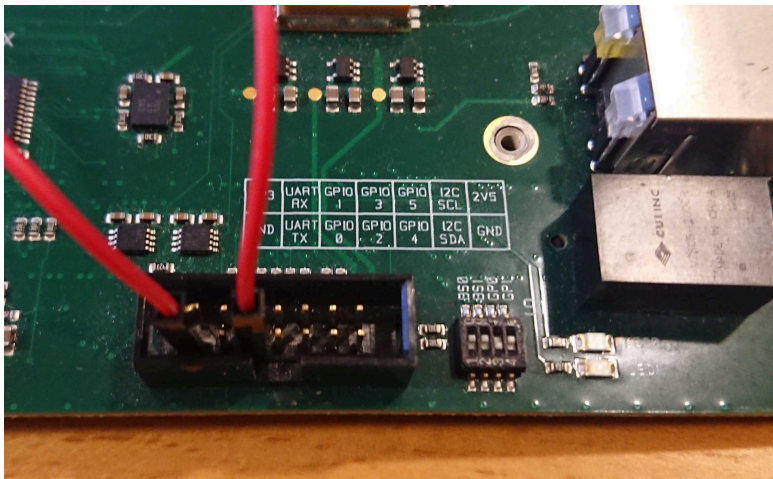
Step	Description	
1	Download the software package (.wluip) for your kit	Download software package
2	Power off the system	
3	Connect the upgrade plug included in the kit or connect GPIO0 to ground using a jumper cable	
4	Power on the system	
6	Open the web gui by typing http://192.168.2.94 in your web browser.	If you see a blank or partly broken page, try to clean browser cache by pressing Ctrl-F5 or opening the page in "Private"/"Incognito" mode

Step	Description	
7	Remove the upgrade plug or the jumper grounding GP0.	
8	Click "Browse file" and select correct <>.wlup file	
9	Wait for update process to complete	
10	When the update process is complete and successful, the system will automatically reboot to standard mode	If process fails, please try again
11	Verify that the SW version has updated by going to the web gui <i>http://192.168.2.94</i>	If you see a blank or partly broken page, try to clean browser cache by pressing Ctrl-F5 or opening the page in "Private"/"Incognito" mode
12	Upgrade process complete	Celebrate with your favorite beverage

Update using DHCP

This procedure works if you don't know how to set a static IP address on your computer.

Step	Description	
1	Download the software package (.wlup) for your kit	Download software package
2	Power off the system	
3	Set Master-D1 to DHCP Server. (Remember original setting)	See network settings
4	Connect a network cable directly from your computer to the Master-D1	

Step	Description	
5	Configure the network on your computer to get IP address from DHCP	(this is default on most computers, so if you haven't set a static ip you're good)
6	Connect the upgrade plug included in the kit or connect GPIO0 to ground using a jumper cable	 
7	Power on the system	
8	In your web browser, open http://192.168.0.1	If you see a blank or partly broken page, try to clean browser cache by pressing Ctrl-F5 or opening the page in "Private"/"Incognito" mode
9	Remove the grounding of GP0.	
10	Click "Browse file" and select correct <>.wlp file	
11	Wait for update process to complete	

Step	Description	
12	When the update process is complete and successful, the system will automatically reboot to standard mode	If process fails, please try again
13	Verify that the SW version has updated by opening the web gui in your browser: <i>http://192.168.0.1</i>	If you see a blank or partly broken page, try to clean browser cache by pressing Ctrl-F5 or opening the page in "Private"/"Incognito" mode
14	Reset network settings to original setting from step 2	See network settings .
15	Upgrade process complete	Celebrate with your favorite beverage