EOD Workspace Guide

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EOD Workspace Manual

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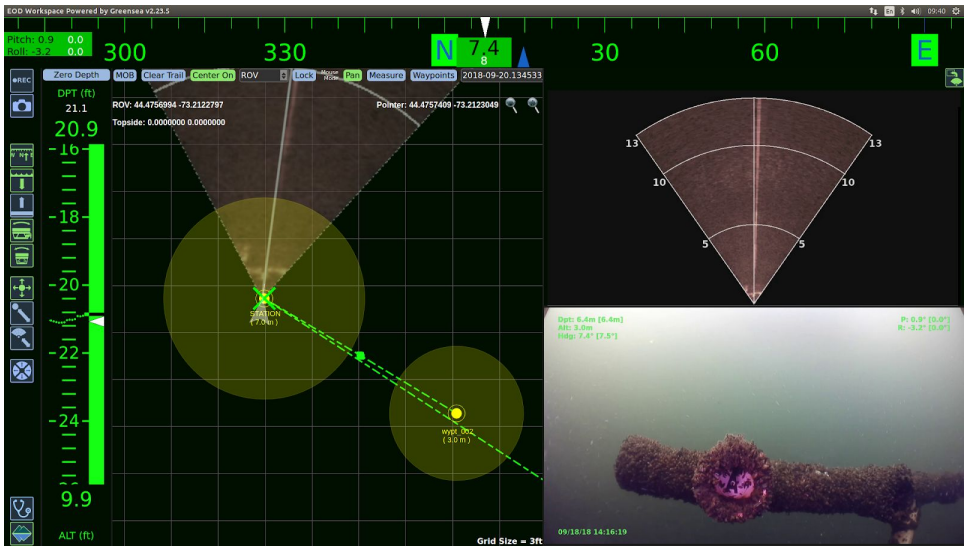
EOD Workspace Manual

Greensea's EOD Workspace represents years of development resulting in a robust, user-oriented platform to complete mission objectives. Workspace allows operators to use a single screen interface to easily direct and maneuver your vehicle and quickly adapt to changing mission objectives. It is designed and able to be used on multiple devices and configurations.



1 What you Will Find in This Guide

This Guide is broken into four sections, Flight View, Dynamic Waypoint Positioning, Diagnostics View, and Alarms.

1.1 Flight View

Flight View is the operational side of Workspace, this will be the primary view that you will be interacting with as you conduct missions. This section will describe the functions of Flight View.

1.2 Dynamic Waypoint Positioning

Dynamic Waypoint Positioning describes the tools specific to controlling your vehicle. This is one of the most fundamental concepts of operation within EOD Workspace. If you are trying to command the vehicle to go somewhere, this is where you should be looking.

1.3 Diagnostics View

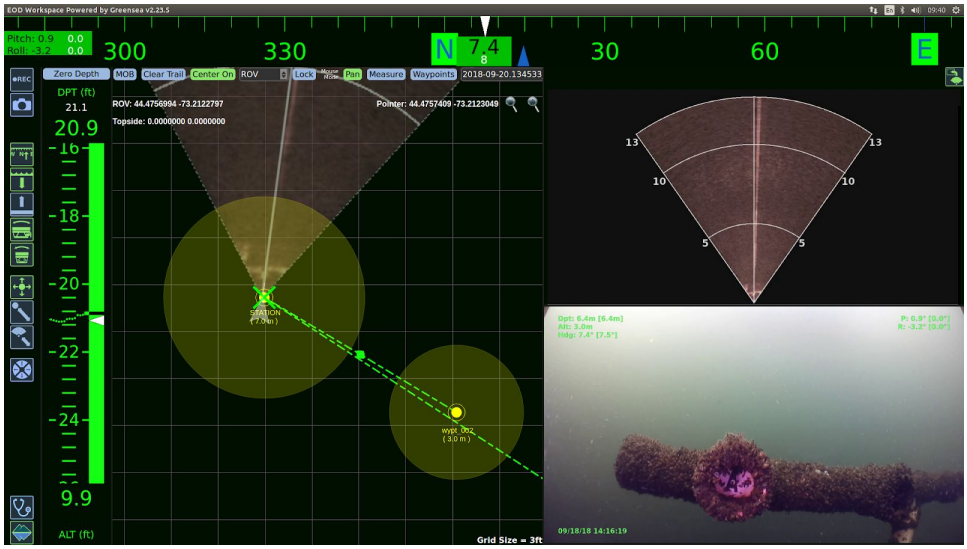
The Diagnostics View is where you are able to see the functions and systems of the vehicle. If you are trying to diagnose an issue with a sensor, this is the place to start.

1.4 Alarms

Tasks are simple functions performed in Workspace beyond commanding the vehicle. If you are looking to do a specific task in Workspace, look at this section.

2 Flight View

Flight View is the primary view that you will use when performing tasks and completing operations. All navigational readouts and tools for directing the vehicle and planning missions are found in this view.



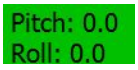
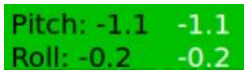
2.1 Compass and Heading Bar

The Compass and Heading Bar displays the vehicle pitch and roll, heading, course over ground, and any alarms that my be currently triggered. The compass is centered on the current vehicle heading.

2.1.1 Pitch and Roll

If auto-pitch and roll is disabled, the vehicle's current pitch and roll will be shown as black. If using auto-ptich and roll, there will be a smaller number in white beneath to the right of the current pitch and roll. This Setpoint is the pitch and roll setpoint.

The pitch setpoint can be controlled from the hand controller.

	
Auto-Pitch and Roll Disabled	Auto-Pitch and Roll Enabled

2.1.2 Alarms

Alarms will appear in the right of the Compass and Heading Bar. For more information about alarms, please see Section 5.

2.1.3 Heading

If auto-heading is disabled, the vehicle's current heading will be black. If using auto-heading, there will be a smaller number in white beneath the Current Heading, this will be the Vehicle's Heading Setpoint. This Setpoint is the commanded heading.

	
Auto-heading Disabled	Auto-heading Enabled

2.1.4 Compass Markers

There are two Compass Markers or "Carrots" displayed on the Compass Bar. Depending on what tools are enabled, they may or may not be displayed.

	Heading Setpoint	The commanded heading. This is enabled if you are using Auto Heading.
	Course Over Ground	The direction your vehicle is currently traveling, this is independent of Heading. The Compass Bar prioritizes vehicle heading, so the Course Over Ground will not always be displayed

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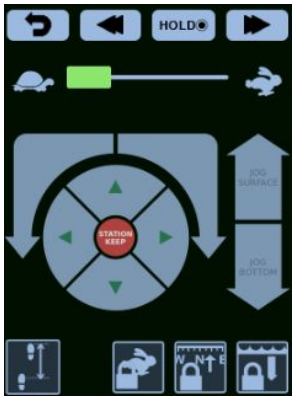
2.2 Control Icons

The Control Icons toggle navigation modes for the ROV.

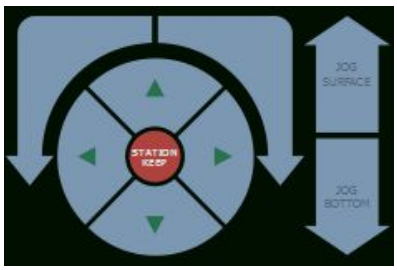
Icon	Name	Function
	Record	Toggles mission logging. When enabled, the icon will turn green, and Logging will appear at the top of the Map View.
	Screenshot	Takes a screenshot of the current Workspace View.
	Auto-heading	Toggles auto-heading. When enabled, the vehicle controls will use the heading setpoint to direct the vehicle. This will start with the current heading.
	Auto-depth	Toggle auto-depth. When enabled, the vehicle will maintain and follow the depth set point. This will start with the current depth. Toggling Auto-depth on will disable auto-altitude and vice versa.
	Auto-altitude	Toggles auto-altitude. When enabled, the vehicle will maintain and follow the depth set point. This will start with the current altitude. Toggling Auto-altitude on will disable auto-depth and vice versa.
	Auto-Pitch	Toggles Auto-Pitch. When enabled, the vehicle will maintain and follow the Pitch setpoint. Pitch can be controlled and zeroed from the hand controller.
	Auto-Roll	Toggles Auto-Roll. When enabled, the vehicle will maintain its current roll. Roll can be zeroed from the hand controller.
	Positioning	Toggles positioning. Toggling positioning will always stop the vehicle. When toggled to enabled, positioning will drop a waypoint at the vehicle position. While positioning is active you will be moving the waypoint and the vehicle will follow it. When positioning is toggled off the vehicle stops and is returned to direct user control.
	Point of Interest	Toggles point of interest mode. Allows you to place a Point of Interest marker. Vehicle control will orient itself to the point of interest.
	Sonar Target Control	Sonar Target Control is only available when using Sonar Target Tracking. When Enabled, vehicle control will be oriented to the selected sonar target.
	Toggle Control	Toggles the Autopilot Jog window. This window is where you will find the Autopilot Jog controls.
	Diagnostics View	Changes to the diagnostic view.
	Flight View	The default Workspace View, this will be used for day-to-day vehicle operation.

2.3 Autopilot Jog Window



The Autopilot Jog Window allows you to control the vehicle while using Dynamic Waypoint Positioning, or executing a mission. For more information on Dynamic Positioning, look at Section 3

NOTE: You will need to activate Positioning in order to use the Jog Window controls.

Icon	Name	Function
	Reverse	Reverses the order of the waypoints the vehicle is traveling.
	Back	Commands the vehicle to travel to the previous Waypoint on its current mission.
	Pause	When Active (Green) the vehicle will stop at the Waypoint it is currently traveling towards.
	Forward	Commands the vehicle to travel to the next waypoint in order.
	Speed Control	Increases or reduces the speed at which the vehicle travels between Waypoints.
	Jog Controls	Jog controls will control the location of the current Vehicle Waypoint. These will move from the perspective of the Vehicle.
	Step Control	Step Control changes the distance the jog commands. Big Steps, by default, will move the vehicle one meter or three degrees for each jog click. Little Steps, by default, will move the vehicle five centimeters or one degree for each jog click.

	Speed Lock	Blue - Vehicle Heading will be dictated by the current mission waypoint. Green - You have active control of the vehicle speed.
	Heading Lock	Determines whether or not you have independent control of heading while the vehicle is on a mission. Blue - The Vehicle Heading will be dictated by the current mission waypoint. Green - You are able to control the vehicle heading independent from the current waypoint.
	Depth Lock	Determines whether or not you have independent control of depth while the vehicle is on a mission. Blue - The vehicle depth will be dictated by the current mission waypoint. Green - You are able to control the vehicle depth independent from the current waypoint.

2.4 Depth and Altitude

The Depth and Altitude Tracker is used, as you might expect, to track the depth and or altitude of the vehicle. These are tracked in Meters or Feet depending on your settings, which are applied from the Mission View Menu.

2.4.1 Depth

The vehicle's current depth is displayed at the top of the tracker. If Auto-depth is enabled, the depth setpoint will be displayed as a white number above the current vehicle depth. The setpoint is the current commanded depth of the vehicle, the setpoint will be shown as a white marker on the depth and altitude bar.

2.4.2 Altitude

The vehicle's current altitude is displayed at the bottom of the tracker. If Auto-altitude is enabled, the altitude setpoint will be displayed as a white number below the current vehicle altitude. The setpoint is the current commanded location of the vehicle, the setpoint will be shown as a white marker on the visual tracking bar.

2.4.3 Vehicle Setpoint

The vehicle setpoint is shown by both a white number and white marker on the visual tracking bar. This is the commanded depth (or altitude) the vehicle will attempt to achieve and hold.

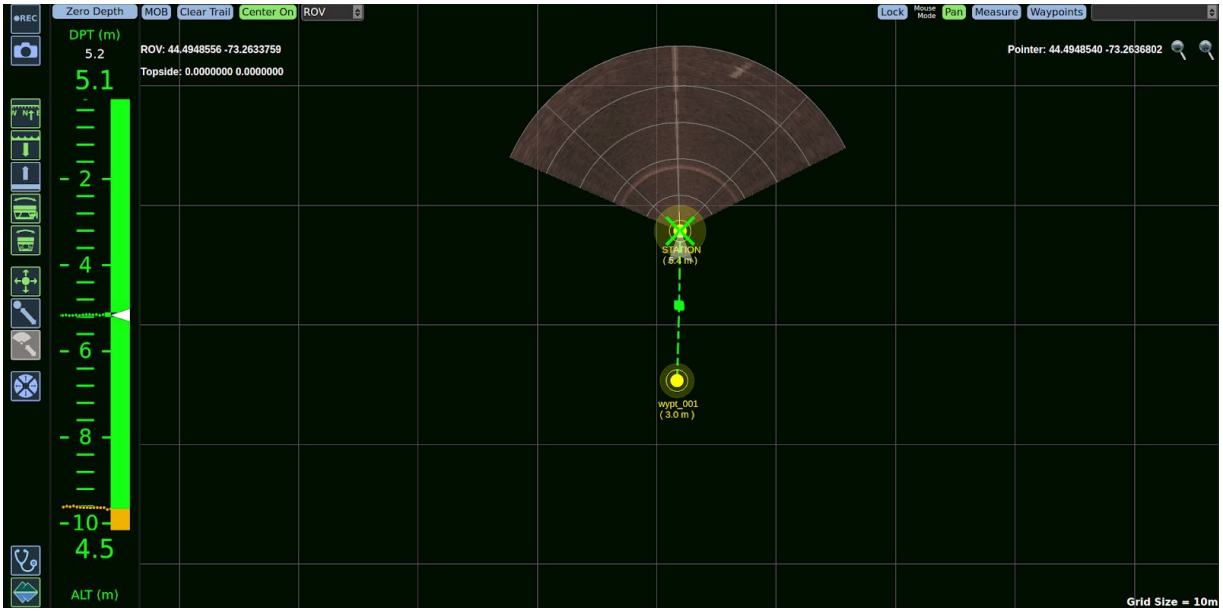
2.4.4 Visual Tracking

The vehicle's vertical location in the water column is displayed graphically. The vehicle's current and recent historic vertical position is tracked by the green dots or breadcrumbs, the spacing of these dots can be used to show how fast or slow the vehicle is moving vertically. If you have achieved bottom lock with the Doppler Velocity Log (DVL) and are in sight of the bottom on the tracker, you will also see the bottom tracked with orange breadcrumbs.

The vehicle tracking meter bar displays three colors:

- Blue - Showing above water.
- Green - Showing the water.
- Orange - Tracking the location of the bottom.

2.5 Mission View



Mission View is a 2D display that shows vehicle, ship, and the vehicle's position, ship's position, and any charts loaded into the map view. You can use the Map View to create navigational elements like markers and waypoints.

2.6 Heads-Up Display

The Map View Heads-Up Display (HUD) is superimposed across the four corners of the Map. It can be enabled or disabled from the Misc. tab within Map Config.

The top-left HUD shows both the vehicle's and ship’s name and position.

The top-right HUD shows the current coordinates of the cursor.

The bottom-left HUD shows the results of the last measurement taken with the Measure Tool. Once a measurement is taken, only the last taken measurement will be displayed.

The bottom-right HUD shows the map's scale.

2.7 Map View Functions

2.7.1 Waypoints

Waypoints are the fundamental control unit used to direct a vehicle in Workspace. Waypoints are used to station keep or used to create a mission. Waypoints are described more completely in Section 3.

2.7.2 Markers

Markers are used to note specific locations on the map they are not part of a mission.

To add a marker to the map, right-click on the location you want to place a marker and select Add Marker.

Unselected markers are green, while a selected marker is cyan. You can adjust the position of markers by clicking and dragging them to the desired location on the map, or by manually setting editing their position parameters in the Markers menu.

Markers can be locked along with Waypoints by clicking the Lock button in the upper-right corner of the map view.

All Marker data can be accessed from the Mission View Tools Menu, selecting Chart Items tab, and then the Markers subtab.

To delete markers, right-click the marker you want to remove and select Delete. Alternatively, select the marker from the list in the Markers subtab and click the red X in the Delete column.

2.7.3 Adjusting the Map Scale

You can click the magnifying glasses located next to the Grid Size in the upper-right corner of the map. Alternatively, you can use the mouse scroll wheel to zoom in and out.

2.8 Map View Pop-Up Menus

By right-clicking locations and objects in the Map View, you are able to open a menu of options allowing you to quickly interact with items in and on the map view.

2.8.1 Map Pop-Up Menu

By right-clicking an open area on the map view, a general pop-up menu with the following selections.

Menu Item	**Description**
Add and Goto Waypoint	Creates a new waypoint and commands the vehicle to travel to the selected location. This Waypoint will be part of a new mission. The vehicle will only begin traveling to this waypoint if Positioning is Enabled.
Add Waypoint	Creates a Waypoint at the selected location. This Waypoint will be part of the currently selected mission.
Add Marker	Creates a marker at the selected location.
Set Point of Interest	Sets a point of interest and enables Point of Interest Mode. Vehicle controls will be oriented towards the Point of Interest.
Copy Position	Copies the latitude and longitude location of the cursor.
Set Position	Relocates the ROV location to the location of the cursor.

2.8.2 Waypoint Pop-Up Menu

Right-clicking a Waypoint opens a waypoint specific pop-up menu with the following options.

Option	Description
Edit Waypoint...	Opens the Waypoint Editing Window to edit waypoint details.
Go to Waypoint	Commands the vehicle to go to the selected Waypoint. This will change the current mission to the mission that includes the selected Waypoint.
Set Point of Interest	Sets a point of interest and enables Point of Interest Mode. Vehicle controls will be oriented towards the Point of Interest.
Edit Mission...	Opens the Edit Mission Window for the selected Mission.
Execute Mission	Commands the vehicle to execute the selected mission.
Add to Mission...	Opens a dialogue to add the selected Waypoint to a mission.
Lock Waypoint	Locks the current Waypoint.
Hide/Show Waypoint Tolerance	Toggles the display of the current waypoint tolerance radius.
Delete Waypoint	Deletes the selected Waypoint.

2.8.3 Mission Pop-Up Menu

The Mission Pop-Up Menu is accessed by right-clicking the blocks connecting Waypoints.

Option	Description
Edit Mission...	Opens the Edit Mission Window for the selected Mission.
Add to Mission...	Opens a dialogue to add the selected mission to another mission.
Remove Mission	Deletes the selected Mission.
Execute Mission	Commands the vehicle to execute the selected mission.

2.8.4 Region Pop-Up Menu

Additional Options are added when you right-click on a region on the Map View.

Option	Description
Set Coverage	Opens the Region Coverage Window. From this window, you are able to create a mission to cover the defined region.
Clear Coverage	Deletes the mission created for this Region.
Execute Mission	Commands the vehicle to execute the mission associated with the Region.
Toggle Exclusion Zone	Toggles the region to become an Exclusion Zone. NOTE: If a mission is associated with the Region, this will delete the mission.
Unlock Region	Unlocks the region. When unlocked, you are able to click and drag the datum to move the region, or click and drag the other vertices of the region to reshape it.

2.8.5 Marker Pop-Up Menu

Right-clicking a marker opens a pop-up menu with the following options.

Option	Description
Go to Marker	Commands the vehicle to go to the selected marker.
Delete Marker	Deletes the selected marker.
Show/Hide Safety Zone	Toggles the display of the safety zone surrounding the Marker.

2.9 Map Controls

The top of the Map View includes several controls their function is described below.

2.9.1 Zero Depth

Located above the Depth and Altitude gauge. This will reset the depth and altitude to zero. This is usually done before the start of a mission to allow for altitude differences.

2.9.2 MOB (Man Overboard)

Man Overboard (MOB) is a specialized marker that saves vehicle location, attitude, and time created.

To create a MOB marker, click the MOB button in the top-left corner of the map view. Unlike standard markers, the MOB records instantaneous vehicle attitude and position when the button is pressed.

Man Overboard Marker appears as a green triangle beneath the vehicle with the triangle pointing in the direction of the vehicle heading when the MOB was created.

MOB marker data is stored in the Man Overboard tab under Chart Items in the Mission View Tools Menu.

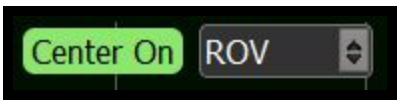
If Display Range/Bearing is enabled from the MOB tab on the navigation menu, it will display in the upper-left corner of the map view.

2.9.3 Clear Trail

Clicking this button will clear all travel history from the map but will preserve all Markers and Waypoints.

2.9.4 Center On

When enabled, Center On will keep the Map View focused on the vehicle selected from the drop-down to the right of the Center On button. When Center On is enabled (highlighted green) the Map View will snap the vehicle to the center of the Map View whenever the vehicle moves off the visible area, or you move the map away from the vehicle.



There is an alternate Center On mode, the True mode will keep the vehicle in the center of the Map View. This is changed from the Mission View Menu.

2.9.5 Lock

Locks all waypoints and markers. When a lock is active, the Lock Button will be colored green.

2.10 Map Modes

2.10.1 Pan

Selecting the Pan mode allows you to use the mouse pan the map view. This will allow you to click and drag the mouse to move the map.

2.10.2 Measure

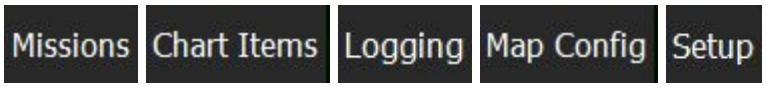
The Measure tool allows you to click and drag the mouse to measure the distance and heading between the point clicked and the point the mouse was released. After measuring, the coordinates of the two points will display in the bottom left corner of the Map View, the distance between and bearing between

the two points will appear at the termination of the measurement. These will remain on screen until the map is clicked again.

2.10.3 Waypoints

When enabled, Waypoints Mode allows you to left-click to add a waypoint to the currently selected mission. Missions are selected from the drop-down menu to the right of the Waypoints button.

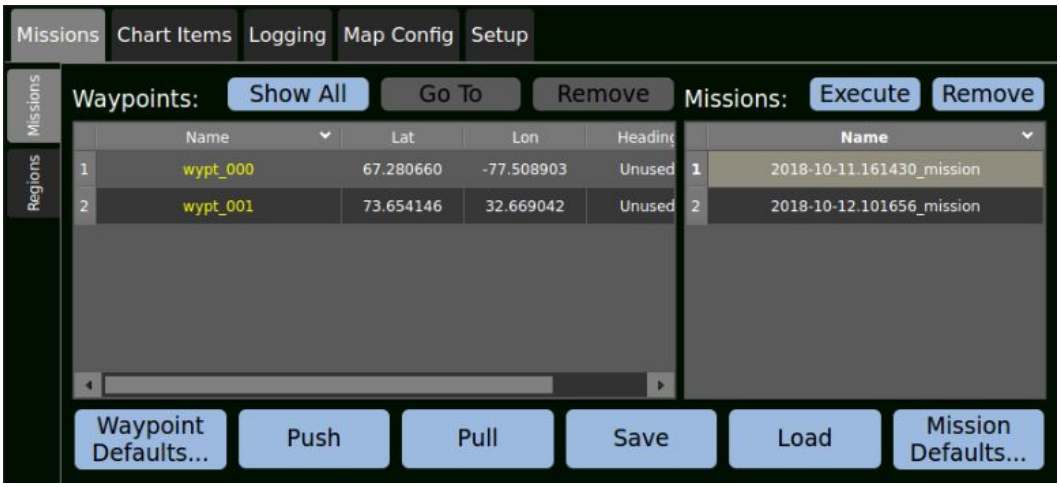
2.11 Mission View Menu



The Mission View Tools Menu is located at the bottom of the Map View and is usually hidden. It can be accessed by either hovering over the bottom of the Map View, or by using the drag handle at the bottom of Map View. It is made up of five main tabs: Missions, Chart Items, Logging, Map Config, and Setup.

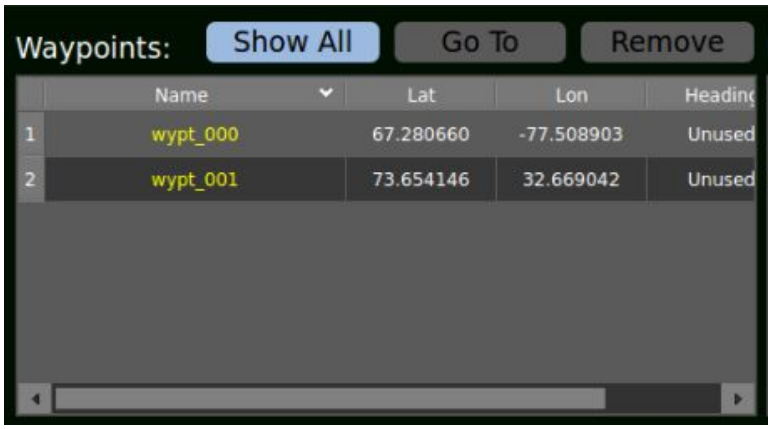
2.11.1 Missions

You are able to interact with waypoints and missions directly using the Map View. However, you are also able to interact with waypoints and missions from the Missions Tab.



2.11.1.1 Waypoints

The Waypoints list typically only shows the waypoints that are part of the mission selected from the mission list to the right. You are able to select a specific waypoint from the list or double click it to open the edit waypoint list. You are also able to ctrl+click or Shift+click to select multiple waypoints from the list.



2.11.1.2 Show All

The Show all button will display all waypoints currently created in the map view

2.11.1.3 Go To Waypoint

The Go To Waypoint button commands the vehicle to go to the current waypoint selected from the Waypoint List. This button does not respond to Waypoints selected from the Map View.

NOTE: The vehicle must first be in positioning mode to begin traveling to the waypoint.

2.11.1.4 Remove Waypoint

Removes the currently selected waypoint from the waypoint list and from the map view. This button does not respond to Waypoints selected from the Map View.

2.11.1.5 Open Waypoint Editing

You are able to open Waypoint Editing Window by double-clicking a waypoint from the Waypoints List.

2.11.1.6 Missions

2.11.1.6.1 Execute Mission

Execute Mission commands the vehicle to execute the mission selected from the Missions List. This button does not respond to Mission selected from the Map View Mission Selector.

2.11.1.6.2 Remove Mission

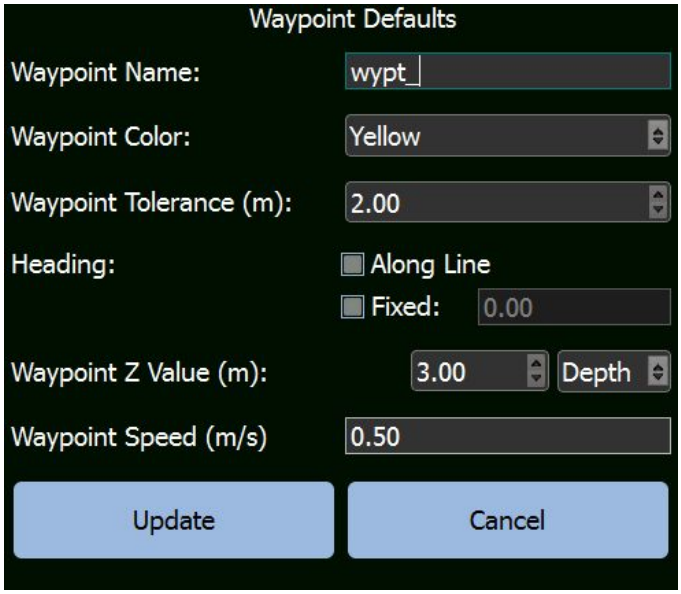
Deletes the mission selected from the Missions List.

Removing a mission is not reversible and does not require confirmation. If you want to reuse a mission, make sure to save it prior to removing it.

2.11.1.7 Mission Tab Buttons

2.11.1.7.1 Waypoint Defaults...

Opens the Waypoint Defaults window. This will allow you to edit the default values for future waypoints created in Workspace.



2.11.1.7.2 Push

Pushes missions from Workspace to the vehicle.

2.11.1.7.3 Pull

Pulls missions from the vehicle to Workspace.

2.11.1.7.4 Save

Saves all waypoints and missions to a .yml file.

NOTE: This only saves waypoints and missions, and will not save Markers.

2.11.1.7.5 Load

Loads previously saved waypoints and missions from a .yml file

2.11.1.7.6 Mission Defaults...

Opens the Mission Defaults Menu, allowing you to edit the default Mission Color and name suffix. This will apply to all future waypoints and missions.

2.11.1.8 Regions

The Regions Subtab allows you to create and edit regions on the map. Regions are defined areas of the map that can be used to automatically create missions covering the created region

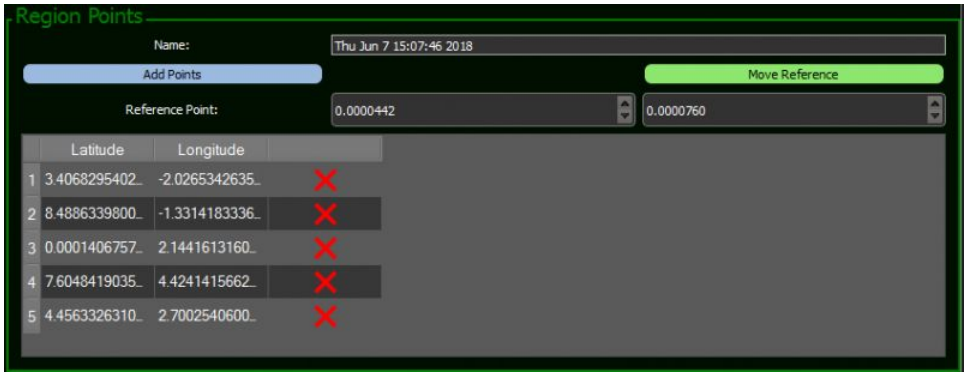
2.11.1.8.1 Regions

Displays a list of all created regions.

Button	Function
Move All Regions	Unlocks all regions together.
New Region	Starts creation of a new region.
Center Region	Centers the map on the datum for the region selected from the region list.
Load Regions File	Loads a previously saved region.
Save Regions File	Saves all regions into a YML file.

2.11.1.8.2 Region Points

The Region Points block allows you to work with the individual points within the selected region. To interact with the Region Points area you need to first select a region from the regions list to the left.



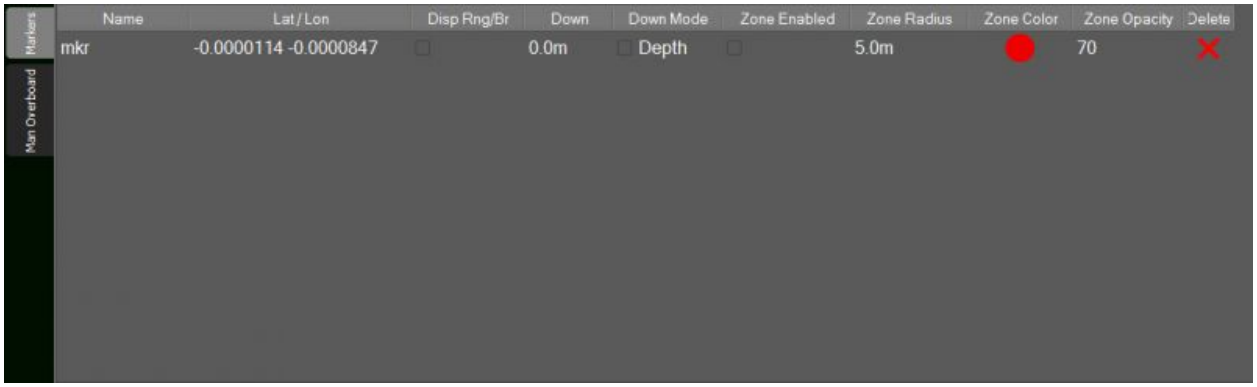
Button	Function
Add Points	Turns on point adding mode. While active (green) clicking on the map will add a
Move Reference	

2.11.2 Chart Items

The Chart Items tab allows you to interact with markers appearing on the map view.

2.11.2.1 Markers

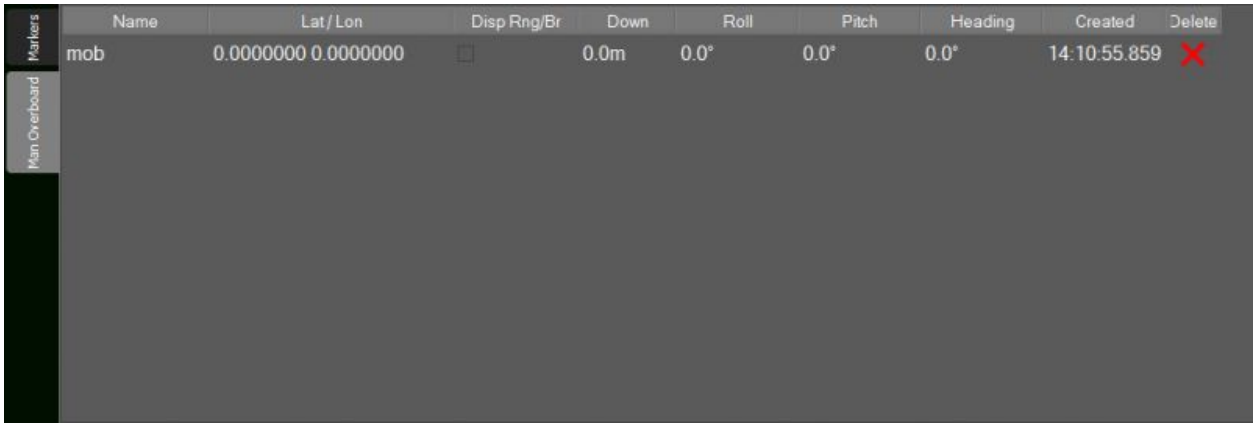
Lists all markers currently in the Mission View. Marker properties can be edited by double-clicking the fields in the table shown below.



Field	Description
Name	Unique identifier given to a specific marker.
Lat/Lon	The marker's latitude and longitude, measured in degrees.
Disp Rng/Br	Shows or hides the range and bearing of a marker in the top left HUD.
Down	The vertical position of the marker. This is either measured from the surface or the bottom as dictated by the Down Mode.
Down Mode	Toggles how the vehicle's vertical position is measured. The field displays the current down mode. Depth measures from the surface, Altitude measures from the bottom.
Zone Enabled	Enables or disables a Safety Zone displayed the marker.
Zone Radius	Sets a Safety Zone radius around the marker.
Zone Color	The color of the Safety Zone around the marker. The color can be changed by double-clicking on the circle and selecting a new color from the menu that appears.
Zone Opacity	Changes the shading of a Safety Zone. A higher zone opacity will result in a more darkly shaded zone. This can be changed by double-clicking the zone opacity field, pressing the up and down arrows, or manually entering the desired value.
Delete	Removes a marker from the map by clicking the red 'X' in the delete field.

2.11.2.2 Man Overboard

Lists all MOB markers. Each MOB property can be edited by double-clicking the field in the table shown below.

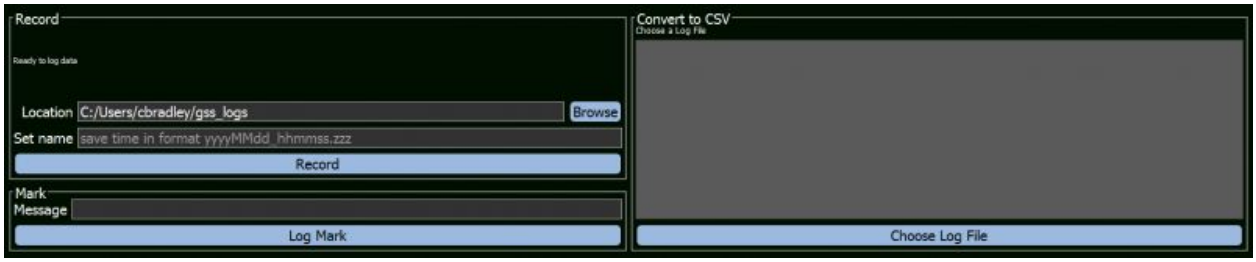


Field	Description
Name	The default for a MOB marker is mob.
Lat/Lon	The vehicle's latitude and longitude when the MOB button was clicked.
Disp Rng/Br	Enables or disables the Range and Bearing of the MOB marker in relation to the vehicle in the top left HUD.
Down	The vertical position of the marker.
Roll	The roll of the vehicle when the MOB button was clicked.
Pitch	The vertical tilt of the vehicle when the MOB button was clicked.
Yaw	The heading of the vehicle when the MOB button was clicked.
Created	The system time when the MOB button was clicked.
Delete	Removes the MOB from the map by clicking the red 'X' in the delete field.

2.11.3 Logging

NOTE: Logging can be more quickly initiated by using the Rec Icon found on the Control Icon Menu.

2.11.3.1 Logging



2.11.3.2 Record

Starts mission recording of your current Workspace session. The record button toggles the recording of data. The log will be saved in the location dictated by the Location field.

2.11.3.3 Mark

Clicking the Mark button creates a mark in the playback. This can be used to note an event that has occurred during an in-process recording.

2.11.3.4 Convert to CSV

Opens a file viewer to select a log file to be converted to a CSV file.

2.11.4 Map Config

The Map Config tab allows you to edit the information displayed on the map.

2.11.4.1 Charts

The Charts Subtab allows you to add, edit the visibility of, and move the Chart Layers in the Map View.

2.11.4.1.1 Chart Visibility

From the Visible Column, you can toggle whether or not a chart is displayed. The checkbox indicates that the chart is currently visible, if unchecked, the chart will be hidden.

2.11.4.1.2 Chart Opacity

The Opacity field allows you to adjust the opacity of the selected chart layer. By double-clicking the field, you are able to adjust the opacity of the selected chart.

2.11.4.1.3 Zoom to Layer

The Zoom to Layer button moves and adjusts the focus of Map View to center on and fit the entirety of the selected chart in the view.

2.11.4.1.4 Layer Up / Layer Down

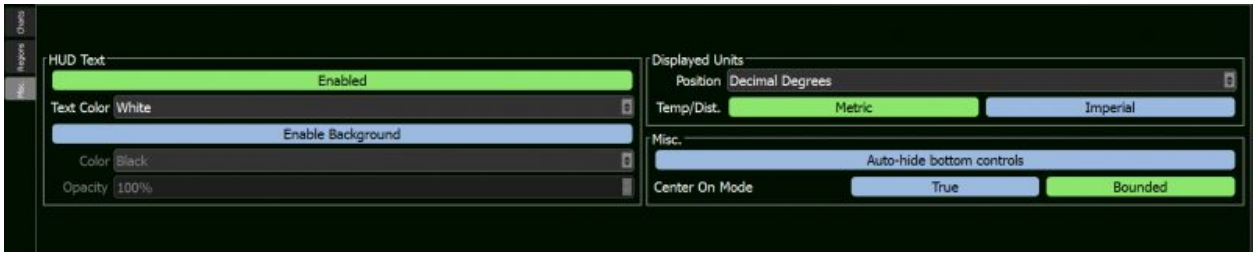
The Layer Up and Layer Down buttons move the selected chart up or down in the chart stack.

2.11.4.1.5 Remove Layer

Deletes the selected chart layer from the Map View.

2.11.5 Misc.

The Misc Subtab allows you to configure the Heads-Up Display, displayed units, and button display preferences.



2.11.5.1 HUD Text

The HUD text enables or disables the text overlay on the map view. You can also select the color of the text.

Background color and opacity can be set from a menu of colors based on your preference.

2.11.5.2 Displayed Units

Position can be displayed in Decimal Degrees; Degrees, Minutes, Seconds; Degrees, Decimal Minutes; and UTM. As well, you can choose between Imperial and Metric units for Temperature and Distance.

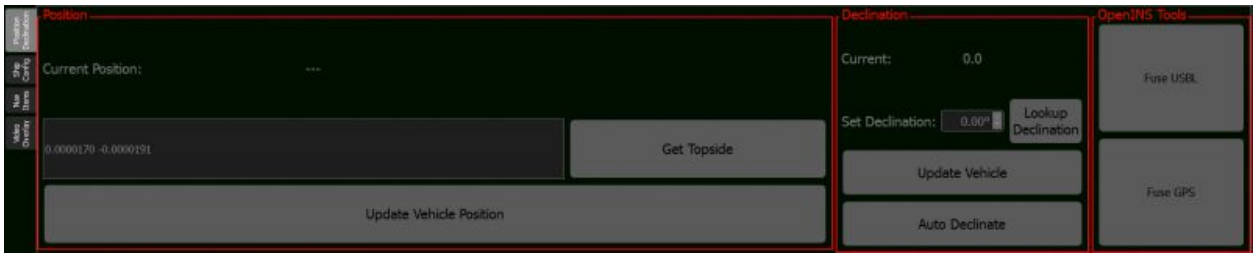
2.11.5.3 Misc.

Auto-hide bottom controls will toggle the Mission View Bottom Menu to be hidden by default. Once hidden, the menu can be accessed by moving your cursor on the bottom of the Map View.

Center Mode True disables the Pan Mouse Mode and keeps the selected vehicle in the center of the map at all times.

2.12 Setup

2.12.1 Position Declination



2.12.1.1 Position

You can use the Copy Ship's Position button to auto-fill the position textbox with the ship's current position.

The Position Textbox can also be used to update the position of the ROV.

2.12.1.2 Declination

Note: Lookup Declination requires a valid position.

It will calculate the declination based on the value of the vehicle's current position as displayed in Mission View. If the vehicle's position is 0,0 (as if no real position has been provided) it will calculate the declination at 0,0.

2.12.1.3 Auto Declination

This button enables Auto Declination Detection; when enabled, the widget will listen for a valid GPS message. If successful, the resulting declination will be pushed down to the vehicle and be posted as both the "Current" and "Commanded" declination values. If the lookup fails, nothing will be pushed to the vehicle and "0.00" will remain in the Commanded value, Current will not be altered. The system will continue to retry declination lookups every 5 seconds as long as valid GPS messages are present.

When auto-declination is active, "Lookup Declination" and "Update Vehicle" will be disabled.

If you are using Auto Declination and turn it off, declination will not be altered further until you manually update it.

If you are in manual declination mode and turn Auto Declination on, the first valid GPS fix will set the declination.

2.12.1.4 Lookup Declination

If you are using topside GPS, clicking Lookup Declination will update the commanded declination to the value of your current location.

2.12.1.5 Update Vehicle

Updates the Vehicle's Declination to the Commanded Declination.

2.12.1.6 Fuse USBL

Toggles the use of USBL (Ultra-Short Baseline) as part of your navigation solution. Under certain conditions, USBL can be noisy, or produce inaccurate readings, one of these situations can occur if and when the ROV is near the ship.

Disabling this option will remove USBL as part of your navigation solution.

When enabled, Workspace will use the USBL readings as part of your navigation solution.

2.12.1.7 Fuse GPS

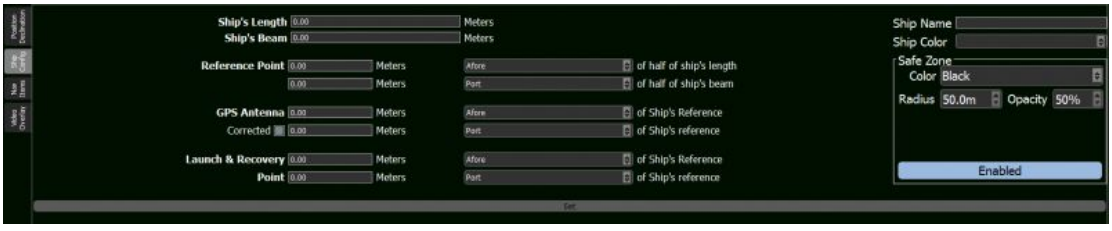
Toggles the use of GPS as part of your navigation solution. GPS is only available when the vehicle is on the surface, and when surfacing the estimated vehicle position and GPS may differ. It is generally recommended to disable Fuse GPS when surfacing, especially when using positioning.

Disabling this option will remove GPS as part of your navigation solution.

When enabled, Workspace will use GPS readings as part of your navigation solution.

2.12.2 Ship Config

Allows you to define the dimensions and locations of key vehicle features, this includes designated reference point of the ship, the location of the GPS, and a launch/recovery point.



2.12.3 Nav Items

The Nav Items Subtab allows you to create or edit nav items that will appear on the map view.

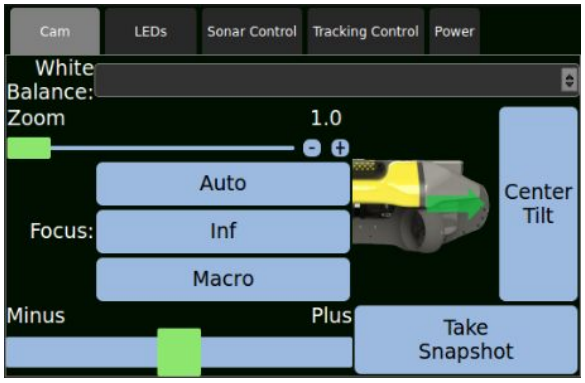
Creating a GPS Beacon

1. Select the Setup tab in the Mission View Menu
2. Select the Nav Items Subtab
3. Select the Channel OPENINS_GPS_STAT
4. Use the Item Type Beacon
5. Select the Color for the Beacon
6. Select the Radius
7. Set the Opacity
8. Click The Set button.

2.13 Sonar and Video Controls

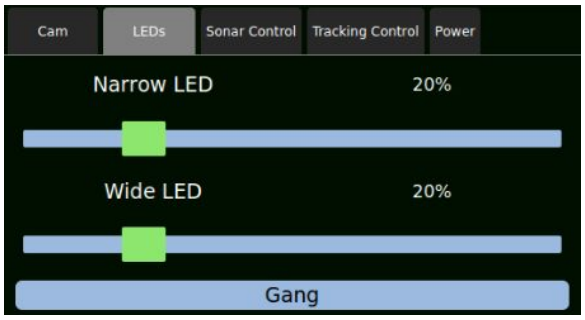
These controls are hidden by default and opened by hitting the F6 Key while Sonar or Video is in the view. There are five submenus within Sonar and Video Control.

2.13.1 Cam



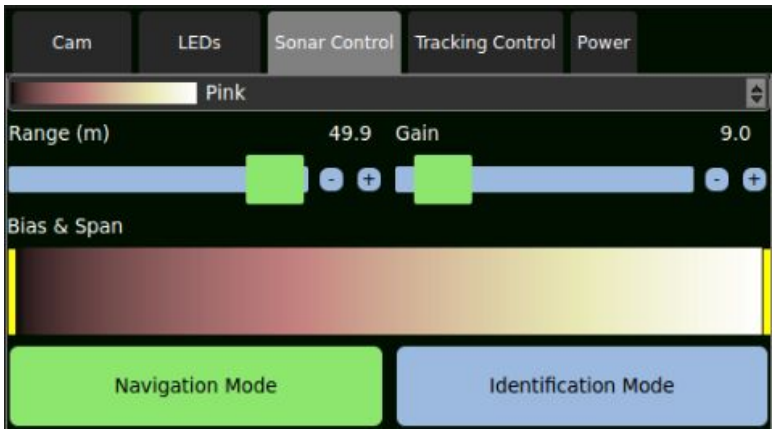
Allows you to select the White Balance for changing light conditions, zoom, focus, and tilt the camera. You can also use the camera control to take a picture using the onboard camera.

2.13.2 LEDs



Control the total brightness of the LED banks. The Gang button ties these controls together.

2.13.3 Sonar Control

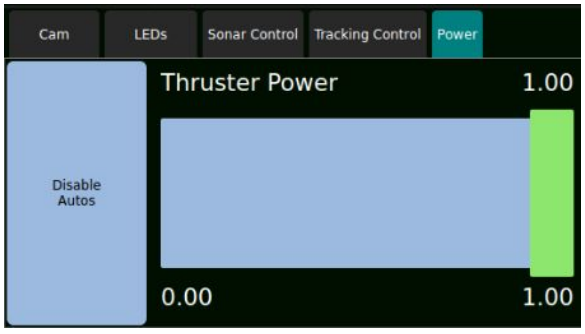


Allows you to adjust the Sonar image, this includes palette, Range, Gain Bias and Span.

2.13.4 Tracking Control

Enables you to enable and tune the sonar target tracking. You can use these controls to isolate the object you want to track using Sonar Positioning.

2.13.5 Power



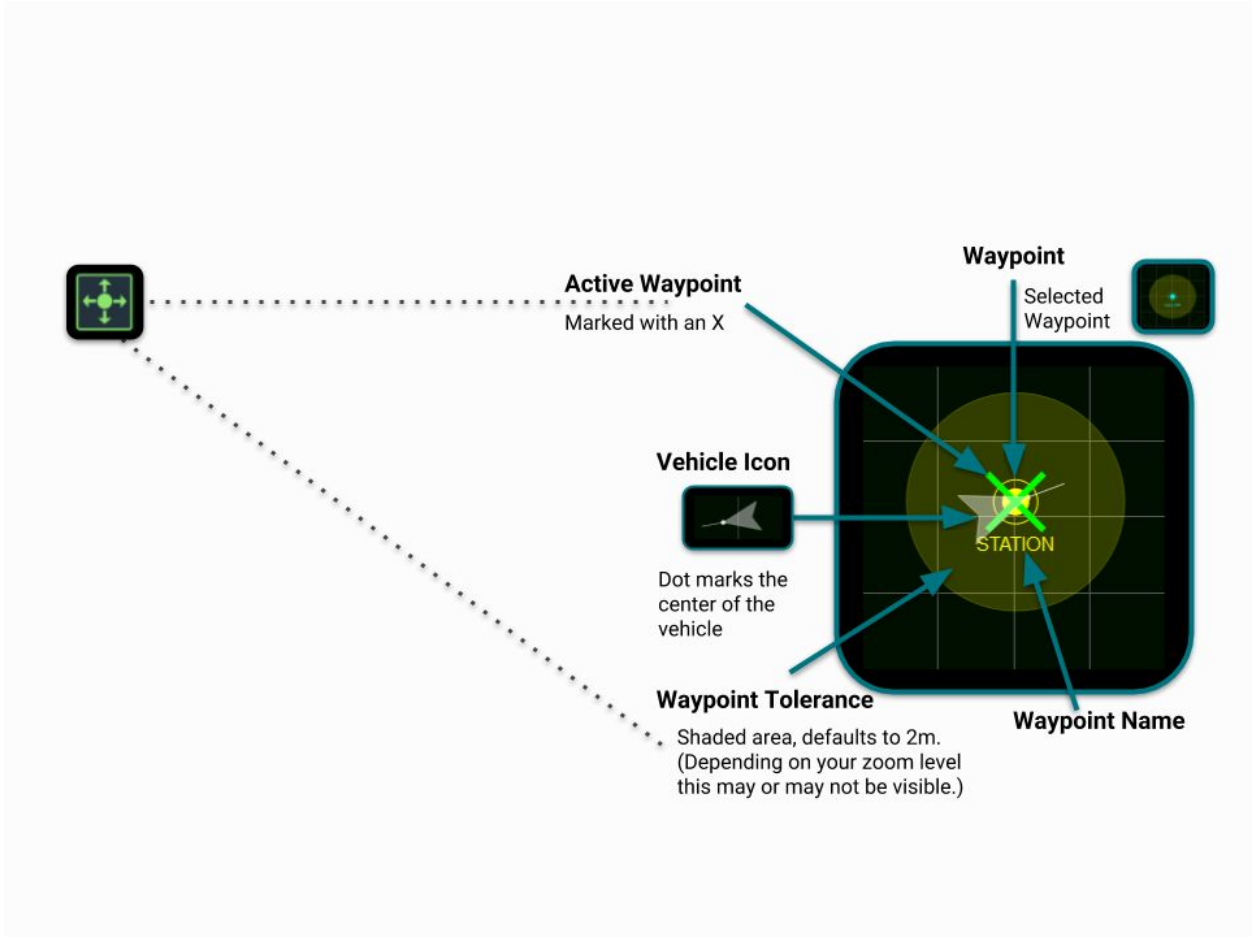
The power slider sets the total thruster power. This will affect the autopilot controls overall aggressiveness.

3 Dynamic Waypoint Positioning

Dynamic Waypoint Position is a fundamental concept of operation in EOD Workspace. You are able to control your vehicle by controlling waypoints in real-time without having to plan in advance or push a mission to your vehicle. This section will describe how to direct your vehicle using Dynamic Waypoint Positioning.

3.1 The Waypoint

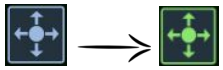
The First concept to understand with Dynamic Waypoint Positioning is the waypoint. A Waypoint in EOD Workspace is a location in three dimensions.



3.1.1 Types of Waypoints

There are three kinds of Waypoints found in EOD Workspace

- Active Waypoint
  - This is marked with a green X
  - The Vehicle is currently trying to reach the Waypoint location at a default speed dictated by the waypoint
  - Step Controls in the Autopilot Jog Window will move this Waypoint
- Station Waypoint
  - Any Waypoint named STATION
  - If a STATION Waypoint is the Active Waypoint, moving the joystick will move the waypoint to the location of the vehicle when the joystick returns to null
- Non-Station Waypoint
  - Named anything other than STATION (usually wypt_XXX)
  - If a Non-station Waypoint is the Active Waypoint, moving the joystick will create a new STATION that is part of the current active mission when the joystick returns to null

3.2 Enable Positioning 

This is the first thing that you will need to enable before you can control your vehicle using Dynamic Waypoint Positioning. When you enable positioning, Workspace will create a mission with a single waypoint. This is your Station Keeping Waypoint.

When you look at this waypoint, you will immediately see some details that will help you understand how to interact with Workspace to create and execute missions.

The most prominent thing you will see on the Station Keeping Waypoint is a bright green X, this marks the location the vehicle is currently traveling to. The vehicle will attempt to achieve and maintain its position based on the location of the X. As you eventually add more Waypoints, the X will always mark the location your vehicle is traveling toward.

The waypoint is surrounded by an area called the Tolerance, the Tolerance is the area surrounding the waypoint that the vehicle must reach in order to consider the waypoint achieved. The smaller the tolerance, the more power the vehicle will expend to achieve the Waypoint. Conversely, a vehicle trying to reach a larger tolerance will expend less energy, but the location it reaches will be less precise.

Waypoints are the building blocks of missions, you can control your vehicle by using a single waypoint, or you can define a specific path using multiple waypoints.

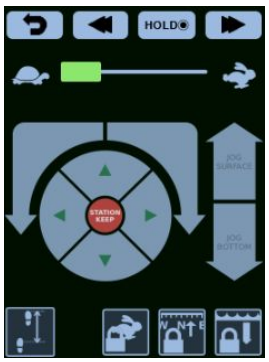
NOTE: Clicking the Positioning button will always stop your vehicle. If you need your vehicle to stop, enable positioning. If you need your vehicle to during a mission disable positioning. If currently using

positioning, you can also tap your vehicle controls to immediately have Workspace drop a new station keeping waypoint.

3.2.1 Using a Waypoint to Control your Vehicle

You are able to control your vehicle by moving the station keeping waypoint. When positioning is enabled, you can control the vehicle by moving the currently selected waypoint to a new location. To move the waypoint, click and drag it. The vehicle will move in a straight line to reach the location of the waypoint.

3.3 Controlling the Vehicle using Dynamic Positioning

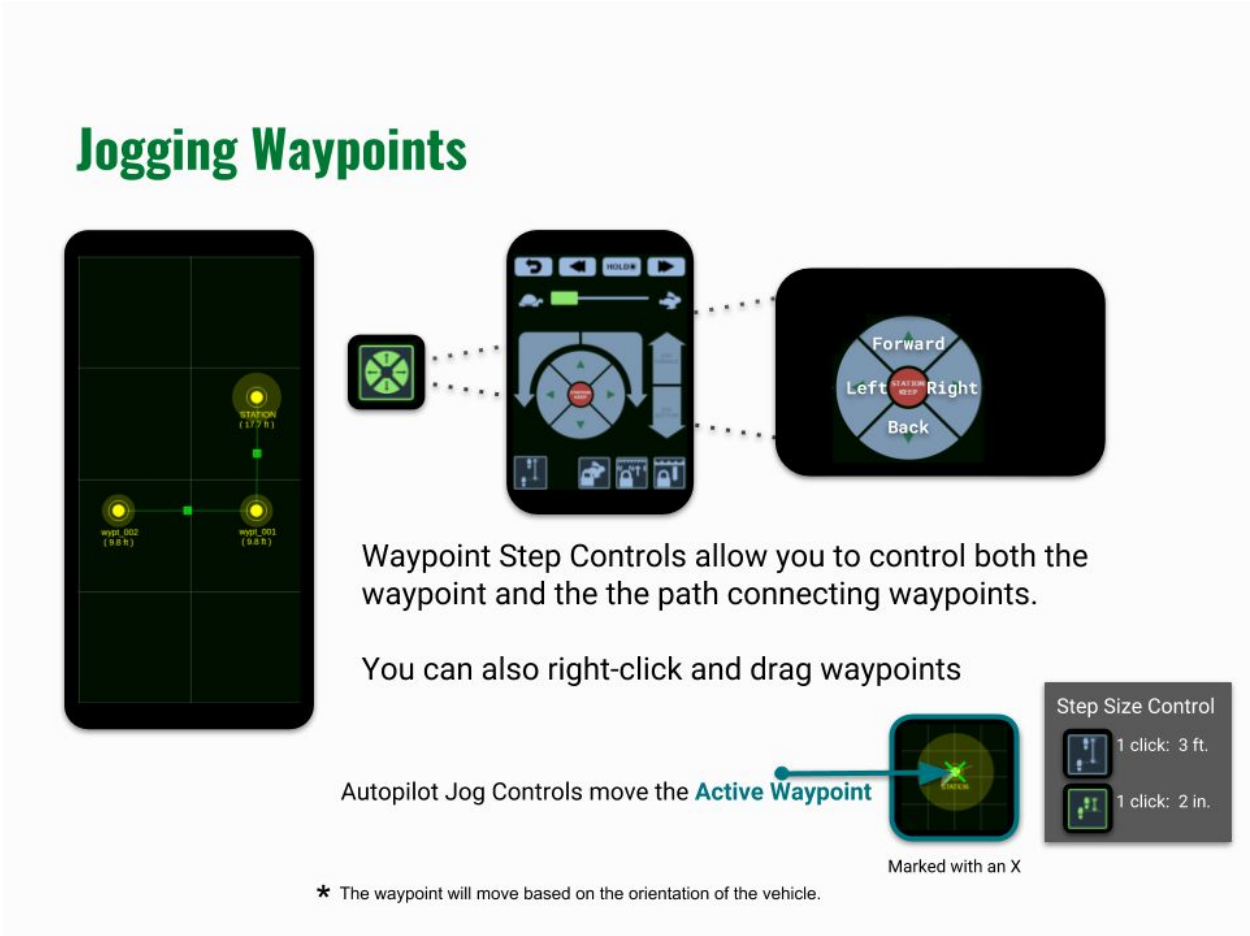
		
	When this icon is active, the vehicle will move 2in or 1 degree for each jog click.	When this icon is active, the vehicle will move 3 ft or 5 degrees for each jog click.

When you have positioning enabled you are able to control the vehicle by using the Autopilot Jog window to control the location of the current waypoint. The vehicle will follow this waypoint.

To open the Autopilot Jog Controls, click the above icon in Workspace, it should be on the left side of the screen by default.

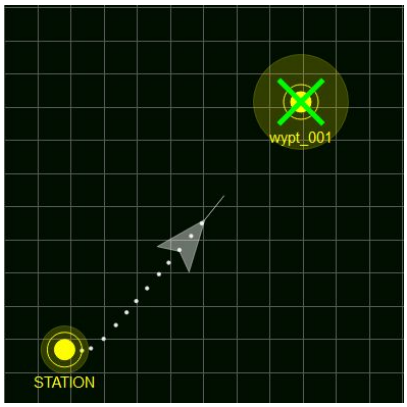
When you are using the Autopilot Jog Controls to move the vehicle, it is important to understand that you are not directly controlling the vehicle. Instead, you are controlling the waypoints and the vehicle is following those waypoints. The vehicle will travel in a straight line path from its current location to the location of the waypoint. You can use the Autopilot Jog controls to change waypoints on the fly as your mission parameters change.

There are some things to consider when using Autopilot Jog controls, first is determining if your current mission requires fine movement. If you want finer vehicle movement, you will likely want your vehicle to move less each time you click one of the Autopilot Jog directional controls. To do this you will also want to enable the "Little Steps" button. When Little Steps are enabled (shown to the right) the vehicle will only move 5cm per click of a directional button and 1o per click of a heading button, this is opposed to "Big Steps" which will move the waypoint 1m per click of a directional button, and 3o per click of a heading button.



NOTE: Autopilot Jog controls will move the waypoint in relation to the orientation of the vehicle. The forward jog will move the waypoint away from the direction the front of the vehicle while the right jog will move the waypoint to the right of the direction the vehicle is pointing.

3.3.1 Right Click and Go



With positioning enabled you can quickly command the vehicle to travel to a position by right-clicking on the map to open the Map View Pop-up menu and select the option Add and GoTo Waypoint, this will add a waypoint and command the vehicle to go to travel to it. The vehicle will travel in a straight line to reach the new waypoint. As with the Station Keeping waypoint, you can left-click and drag this waypoint to direct the vehicle. You can also right-click a previously added waypoint to command the Vehicle to Go To Waypoint to direct the vehicle to travel to the selected waypoint.

3.3.2 Vehicle Speed

You can control Vehicle Speed from the Autopilot Jogs Window by using the Turtle and the Rabbit. These are fairly self-explanatory, the Turtle will slow down the vehicle while the Rabbit will speed up the vehicle.

3.4 Creating a Mission Using Multiple Waypoints

Now that you're able to control the vehicle with a single Waypoint, the next step is to build a multi-waypoint mission. If this is your first time using multiple waypoints to control your vehicle try you find an unobstructed area free of obstacles.

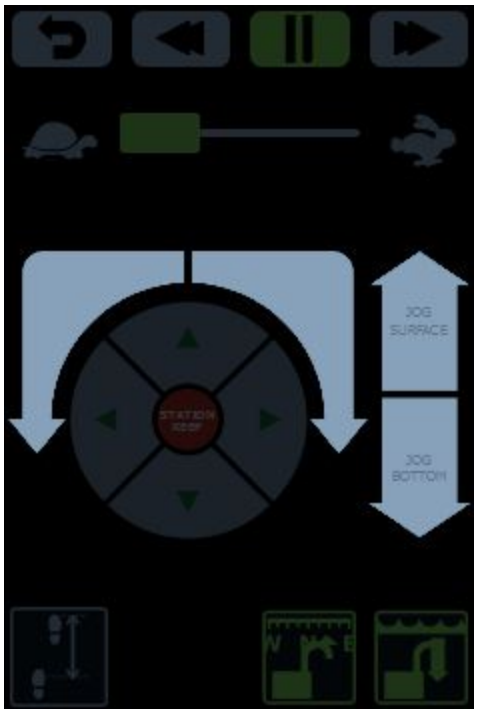
Click the drop-down in the upper-right corner of the Map View and select Create Mission.... This will open the mission editing window and give you the ability to rename the mission, the mission name will default to the format YYYY-MM-DD.HHMMSS_mission. Once you have created the mission and selected a default color for the mission, click OK. Now you can start adding waypoints to your mission by right-clicking anywhere on the Map View and selecting Add Waypoint.

Add a few waypoints at least 10 meters apart for a test mission. They will be connected by lines, these lines define the route the vehicle will travel on in order to complete its mission. As the vehicle executes this mission, it will attempt to travel along these lines.

Now that you have a few waypoints, right-click the first waypoint on the map and select Go To Waypoint. A few things should happen, the vehicle will begin to travel directly to the selected waypoint, the green X should appear on the selected waypoint, and Workspace will make the selected mission the Active Mission. The route of the active mission will be highlighted by a thick dotted line. The Waypoint the vehicle is moving towards will always be marked with a green X. You are able to click and drag waypoints on the fly and the vehicle will change its course to reach the waypoint.

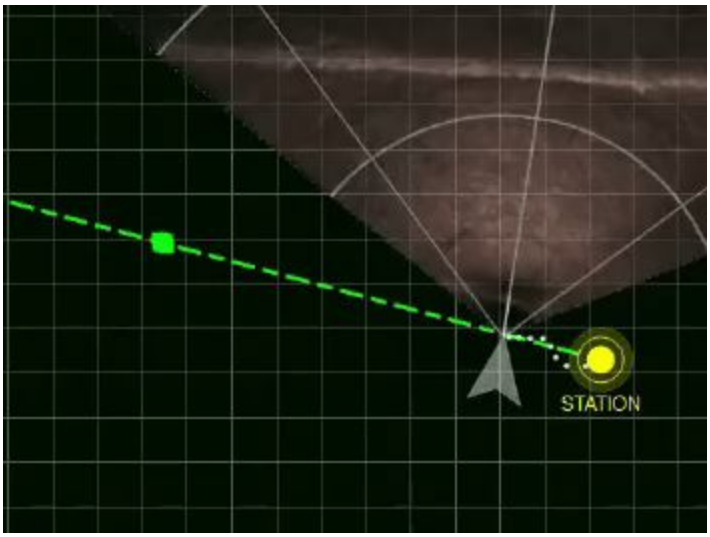
You can use the Autopilot Jog Controls to move the current active waypoint, its speed, and whether or not the vehicle will hold at each waypoint before continuing its mission. To open the Autopilot Jogs window click the icon shown to the left.

	
Heading Unlocked	Depth Unlocked



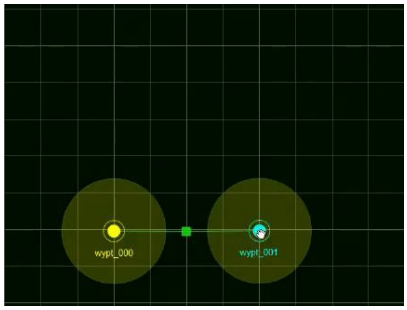
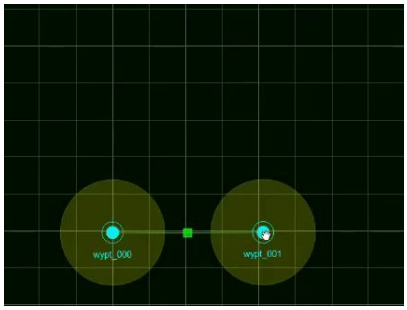
When controlling a vehicle during a multi-waypoint mission, the first thing you should look for is if the Pause Button is enabled or disabled if the pause button is enabled, the vehicle will stop at each Waypoint and hold until you command the vehicle to move to the next or previous waypoint using the forward and back buttons. If the Pause button is disabled the vehicle will automatically begin traveling to the next Waypoint as soon as the Vehicle reaches the waypoint tolerance.

By default, Workspace will adjust the vehicle heading to face the current waypoint it is traveling toward. It will also adjust its depth to match that of the Waypoint. If you want to have independent control of either heading or depth, unlock the Heading and Control in Autopilot Jogs Window (these are shown to the right). With these unlocked, you will be able to use the Autopilot Jog Controls or the vehicle controller to control the vehicle's heading and depth independent of waypoint variables as it moves through mission waypoints. The independent heading control can be used to have the vehicle move laterally to survey features (shown below). When you re-engage the Heading and Depth locks, the vehicle will return to facing the waypoint, and will raise or lower its depth to that of the current waypoint.

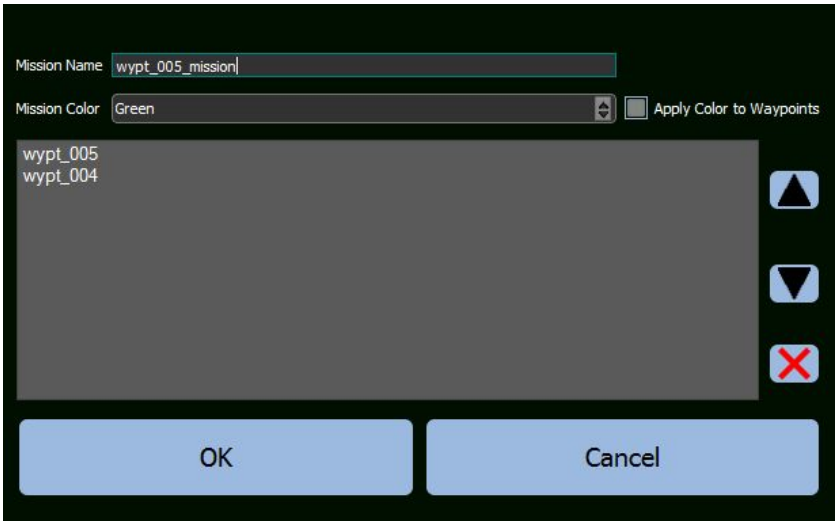


3.5 Dynamic Line Positioning

Each mission is defined not only by the waypoints that comprise it but, more importantly, by the lines between those waypoints. The vehicle will attempt to follow the lines between waypoints while completing missions. When you move a waypoint you will change the lines connecting them. You are able to move a single waypoint by clicking and dragging it, or you can move multiple waypoints by holding the CTRL button when selecting waypoints. When you select and move multiple waypoints at once, the selected waypoints will keep their orientation to each other.

	
Moving a single Waypoint	Moving Multiple Waypoints

3.5.1 Waypoint Order



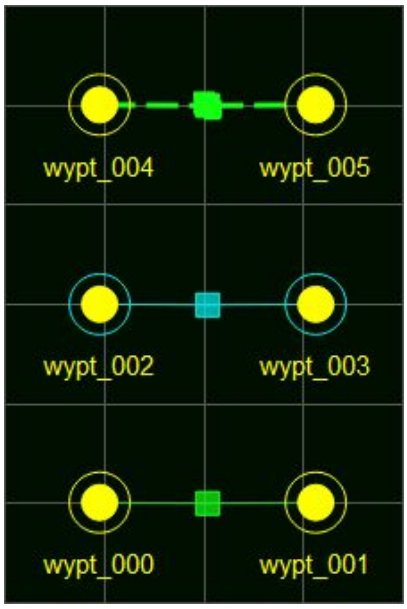
By default, the order of the waypoints will be the same as the order they are added to the map. You can click and drag waypoints to reorder their positions to reorganize the mission. Alternatively, you can reorganize the waypoint order within a mission. By double-clicking the mission from the Missions List found in the Missions tab you will open the Edit Mission Window. This will allow you to change the default color of the mission route, or change the order of mission waypoints. To do this click the waypoint you want to change and then use the up and down arrows to change the position of the waypoint in the list. Click the OK button to change the mission.

3.6 Multiple Missions

There is no limit to the number of missions you can have in Workspace. However, when you have multiple missions, it is important to be able to keep them straight when working with them. In this section, we'll walk through how to differentiate and work with multiple missions.

3.6.1 Differentiating Between Missions

The first thing you will want to be able to do is to quickly differentiate between missions.



Line Types - There are two basic line types differentiating Missions.

- Thick Dotted Lines - (Shown in the image to the right at the top) This marks the current mission the vehicle is undertaking.
- Thin Solid Lines - These mark other missions. These have been created, but the vehicle is not currently undertaking.

Line Colors - Mission routes will, by default, be colored green (shown at the bottom of the image to the right). You can change the color of each mission individually when editing a mission.

- Cyan - Mission lines that are colored Cyan (shown in the middle of the screenshot to the right) have been selected using the Mission tab in the Mission View Menu at the bottom of the screen.

NOTE: If the mission has only a single waypoint, the circle around the single waypoint will be colored cyan. This can be slightly confusing as when the individual waypoint is selected the entire waypoint will be colored cyan.

3.6.2 Changing Missions

There are two main ways to select a mission as the current mission. You can right-click on a waypoint that is part of the mission and select Go To Waypoint. Workspace will make the mission the waypoint is a part of the active mission, and direct the vehicle will go directly towards the selected Waypoint. You are also able to use the Missions Tab, select the mission from the Missions List, and click the Execute Mission Button. If you do this the vehicle will head directly towards the first Waypoint and will follow the Mission according to what has been enabled in the Autopilot Jogs window.

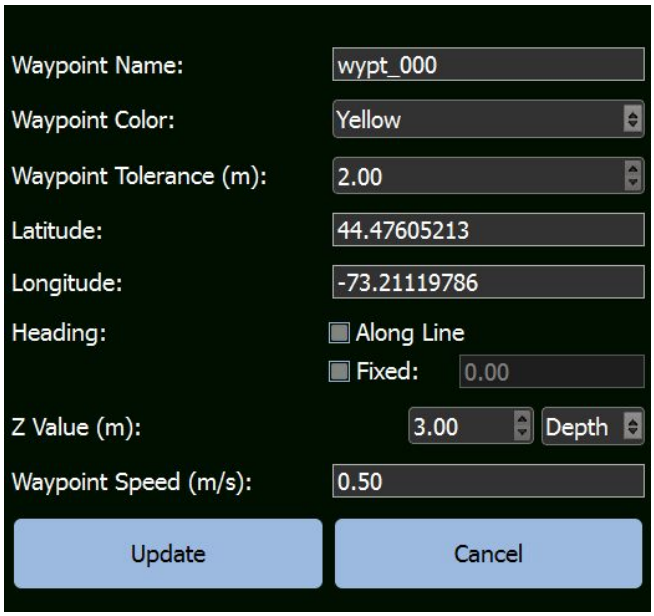
3.6.2.1 Directing to the 1st vs Subsequent Waypoints

When you are directing the vehicle to Go To Waypoint it is important to understand the behavior of the vehicle. If you are directing the vehicle to go to the first waypoint in the mission, it will take the most direct route to the waypoint. However, if you direct the vehicle to travel to any other waypoint it will attempt to follow the line first before trying to achieve the Waypoint.

3.6.3 Adding Waypoints to a Specific Mission

To add a waypoint to the specific mission you need to first select it from the Mission Dropdown on the upper right corner of the Map. Whenever you add a waypoint, it will be added to the mission indicated in the drop-down.

3.7 Editing Waypoint Details



Every waypoint has a set of details that can be edited, these changes will affect how the vehicle will interact with the Waypoint. These can be accessed by right-clicking a waypoint and selecting Edit Waypoint... from the list. The first major detail that can be edited is the Waypoint Tolerance(m) this is the radius around the Waypoint; when the vehicle reaches the Waypoint Tolerance, it will consider the waypoint achieved and, if the mission is not paused, will begin traveling to the next waypoint.

You are also able to define the exact latitude and longitude of the Waypoint. This allows for you to move a waypoint to an exact location.

The Heading option allows you to select one of two options, Along Line means that the vehicle will "look towards" the line as it travels toward this waypoint or Fixed which allows you to define the heading the vehicle will maintain a while traveling to the waypoint.

Z Value (m) allows you to define the vertical location of the waypoint. This will be either depth or altitude and will be informed by the waypoint tolerance.

3.8 Using the Mission Tab

Up until this point, you have been editing missions directly by clicking the map, using the quick menus, but you can also edit both missions and waypoints from the Missions Tab in the Mission View Menus. The Missions Tab is divided into two different areas: Waypoints and Missions.

3.8.1 Selecting Waypoints Using the Mission Tab

	Name	Lat	Lon	Heading	Z Val
1	wypt_000	0.000036	0.000071	Unused	0.00(dpt)
2	wypt_001	0.000035	-0.000017	Unused	3.00(dpt)
3	wypt_002	0.000018	-0.000063	Unused	3.00(dpt)
4	wypt_003	-0.000037	0.000057	Unused	3.00(dpt)
5	wypt_004	0.000018	-0.000135	Unused	3.00(dpt)
6	wypt_007	-0.000037	0.000126	Unused	3.00(dpt)
7	wypt_008	0.000009	0.000126	Unused	0.00(dpt)

You can use the Waypoints Tab to select an individual waypoint from the list, just like with clicking a waypoint on the map you can ctrl-click to select multiple waypoints. Additionally, in the Waypoints List, you can shift-click to select all waypoints between the first and last selected waypoints.

Once selected, you can either have the vehicle go to the waypoint or remove it.

NOTE: There is no confirmation when removing waypoints, keep this in mind before you remove a waypoint.

3.8.2 Selecting Missions Using the Missions Tab

You can select your missions from the mission list in the Missions tab. As with Waypoint List, you can select an individual mission from the list, or ctrl-click to select multiple missions. Additionally, in the Missions List, you can shift-click to select all missions between the first and last selected waypoints.

Once selected, you can either have the vehicle execute a mission or remove it, removing all waypoints associated with the mission.

NOTE: There is no confirmation when removing waypoints, keep this in mind before you remove a waypoint.

3.8.3 Saving Missions

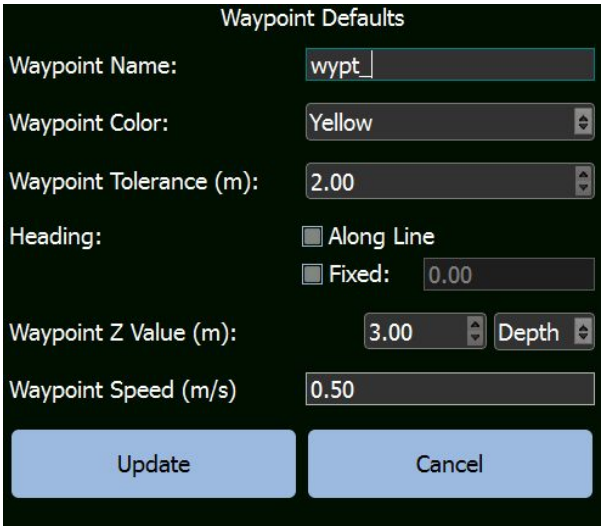
To save all missions for future use, clicking the Save button at the bottom of the Missions Tab. This will save all missions and waypoints that are currently in your Workspace session.

NOTE: Only the current missions and waypoints will be saved, markers and regions will not.

3.8.4 Changing Mission and Waypoint Defaults

From the Missions Tab, you are able to change both waypoint and mission defaults. Clicking on either the Waypoint Defaults... or Mission Defaults... button will allow you to change the defaults for all future Waypoints and Missions.

NOTE: Changing defaults does not retroactively change previously created waypoints or missions. Default changes will only affect missions and waypoints created after the change.



3.9 Point of Interest Control

To enable Point of Interest (POI) Control, click the icon to the left in Workspace. When enabling POI Control, Workspace will orient vehicle control to a specific point. This point will be marked as a green X without a Waypoint. Both Workspace and Vehicle Controls will be oriented towards this point; forward will move the vehicle closer to the Point of Interest and left and right will cause the vehicle to orbit to the left and right of the POI.

NOTE: Enabling POI Control will disable Positioning, and enabling Positioning will disable POI Control.

3.9.1 Setting your POI

You can set your POI in one of two ways,

1. You can click the POI Control button and then left-click a point on Map View or,
2. You can right-click the point on the map where you want to place the POI and select the Set Point of Interest from the pop-up menu.

Either option will have the vehicle will orient itself to look at the point of interest while holding its position.

3.9.2 Controlling the vehicle with the POI

When you enable POI, control of the vehicle will change all control to be oriented towards the defined point.

The following control changes occur when POI Control is enabled.

- Joystick X Control will move the vehicle towards or away from the Point.
- Joystick Y Control will orbit clockwise or counterclockwise around the vehicle.
- Joystick Psi is disabled when using POI control.
- Joystick Z operates using Fly-By-Wire Controls.

3.9.3 Using the Sonar Fan and POI

In the upper-right corner of the sonar widget, you will see the icon to the left. Enabling this will overlay the sonar fan onto the map. You can then use the overlay to select a point that you want to set as your Point of Interest. In the example to the right, you can see the vehicle orbiting a location on a pipeline.

3.10 Waypoints and Regions

3.10.1 Creating a Mission Using Regions

A Region in Workspace is a defined geographical location based around an initial point called a Reference Point. All other points that define a region will maintain a fixed distance from the Reference Point, allowing you to move Regions. These regions can then be used to quickly create survey missions.

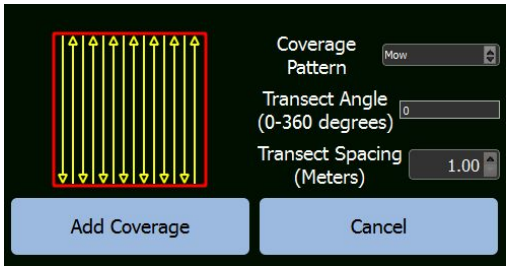
3.10.2 Creating a Region

To create a region, you need to open the Map Config tab in the Mission View Menu and open the Regions subtab. Click the **New Region** button to start clicking on the map view to add a point, the first point will be your Reference Point. While you are creating a Region every time you click the map view, you will add a point to the region. When you have finished defining your region, click the Green **Add Points** button, this will stop adding points to the region. If you want to add points later, select the region from the Regions List and then click the **Add Points** button.

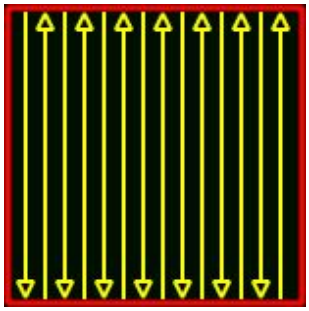
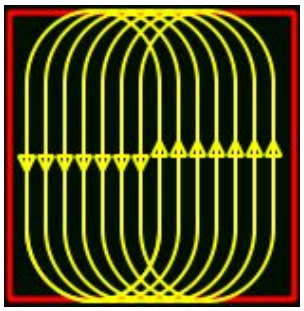
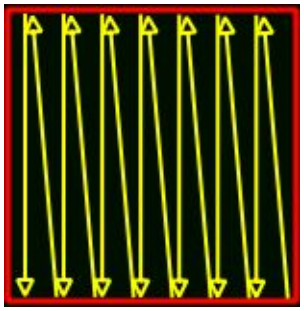
NOTE: Each new point must expand the region area, you cannot add a point to an area that within a region.

3.10.3 Creating a Mission using a Region

You can use a region as the basis of a survey mission, creating a defined waypoint mission. To create a region-based survey mission, right-click on the region and select **Set Coverage**, this will open the Define Region Coverage window.

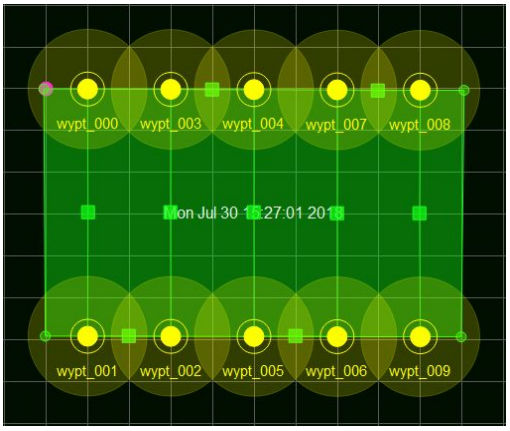
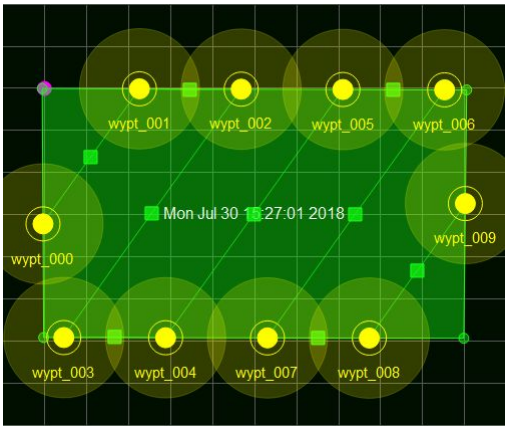


After opening the Define Region Coverage window, the first thing you will want to do is to select is your coverage pattern. This is the pattern Workspace will use to generate a mission to cover your defined region. There are three basic pattern types available in Workspace: Mow, Gapped, and Sawtooth. They are shown below.

		
Mow	Gapped	Sawtooth

The type of pattern you will want to choose will depend on the type of survey you are performing; generally, for an average quick survey, the **Mow** pattern is usually a good place to start.

Once you have selected a pattern you want to use to generate a mission, you can modify the orientation of the coverage pattern as it is drawn in the region by selecting a Transect Angle. This will change the rotation of the pattern in relation to the region. The below example is using the Mow Pattern at 0 and 45 degrees.

	
Transect Angle 0 Degrees	Transect Angle 45 Degrees

Finally, you can select the spacing distance between each transect by editing the Transect Spacing. A smaller number will result in a finer-grained survey path with more waypoints and a longer mission time, a larger number will result in fewer waypoints, a faster mission time, but this mission might be less through.

Once you've detailed your coverage click the **Add Coverage** button to generate your mission.

3.10.4 Region and Mission Interaction

After you have created a mission to cover a particular region, you are able to either interact with it independently or as part of the region. You are able to add, move, or remove individual waypoints as with any other mission. You can also use the region as a shortcut to interact with the mission you created.

If you move the region, you can create another mission from it. **NOTE:** That there can only be one mission associated with a region, creating a new mission from a region will delete the previous mission created for the region.

You are also able to start a region coverage mission by right-clicking the region and selecting **Execute Mission**.

4 Diagnostic View

The Diagnostic View is generally not used while performing tasks or completing operations. There are four tabs in the Diagnostic View: Vehicle Configuration, Vehicle NEtwork, Vehicle Sensors, and In this view, you will be able to see the status of all navigational devices connected to both Topside and Subsea as well as the status of vehicle thrusters (if applicable).

4.1 Vehicle Configuration

Vehicle Configuration is broken into four sub areas.

4.1.1 Temperature

The Current Water Temperature.

Joystick Data

The position of each Hand Controller Joystick input. This is useful for diagnosing hand controller inputs that are not in null.

Buttons

The status of each joystick button.

There are three possible statuses for each button.

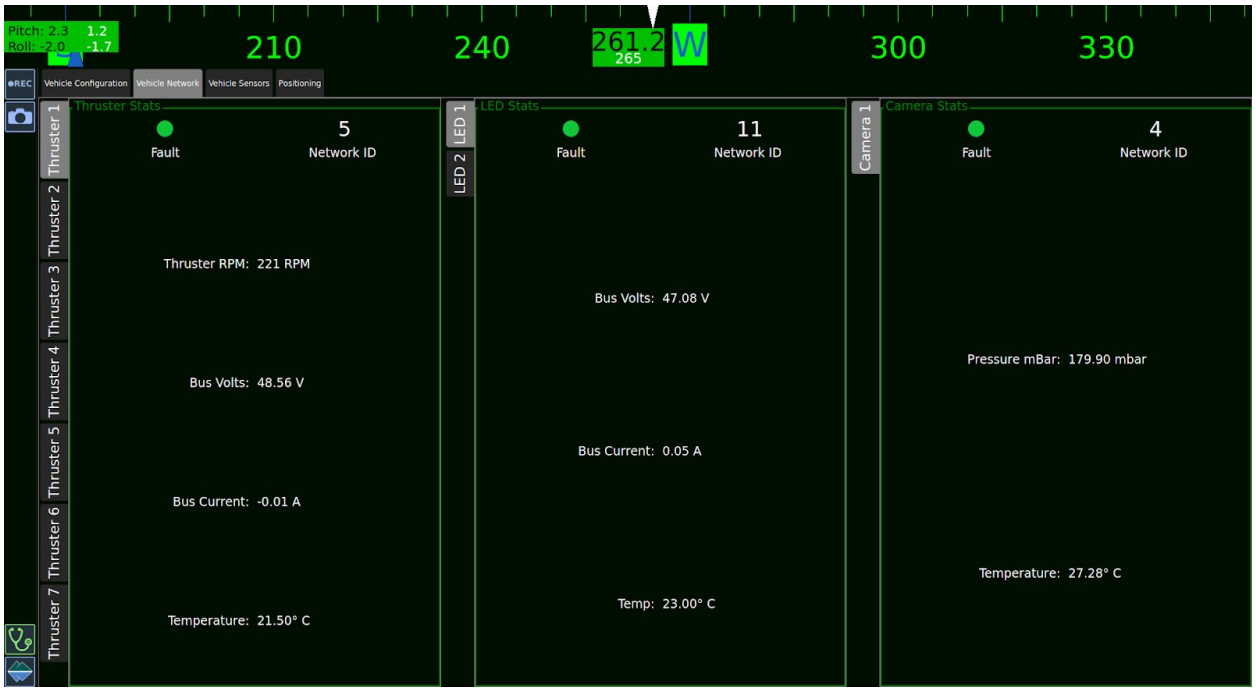
- Blue - The button is inactive, not currently being pushed.
- Green - The button is active, this will only be green when the button is pressed.
- Grey - The button is unavailable, not currently active.

4.1.2 Video Overlay

This is where you are able to select text that will appear on the video Overlay.

4.2 Vehicle Network

Details the status of each thruster, LED Panel, and Camera the is connected to the network.

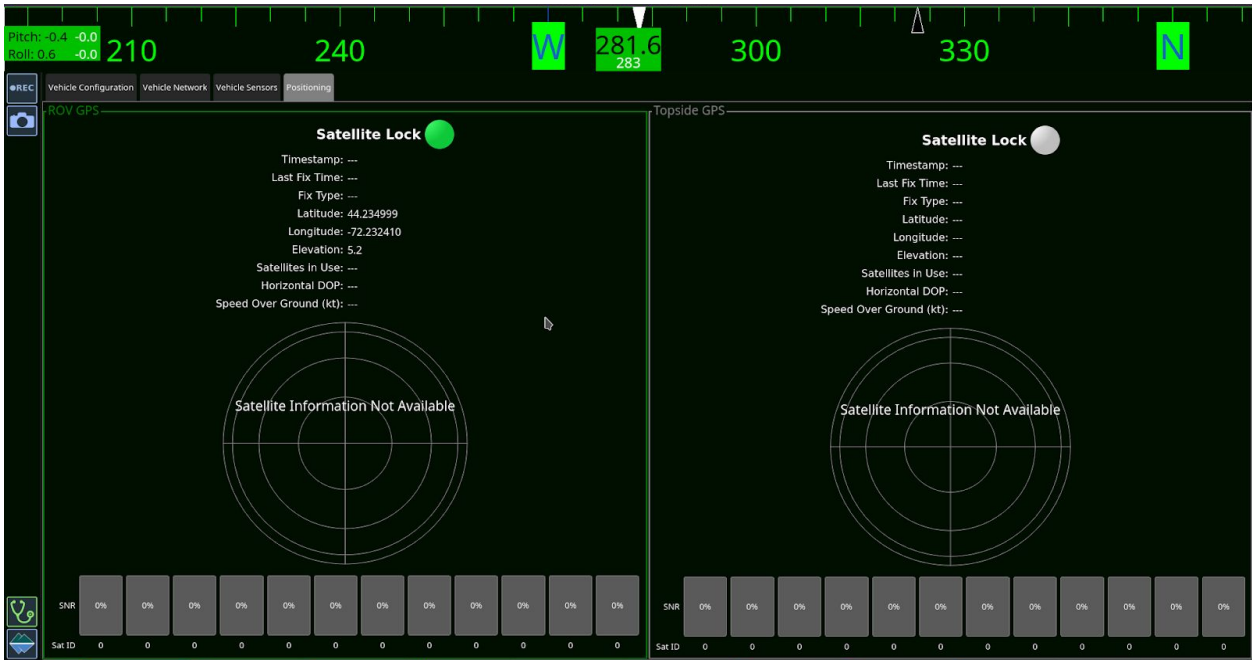


4.3 Vehicle Sensors

Provides the status for the Inertial Measurement Unit (IMU), Pressure Sensor, and Doppler Velocity Log (DVL). If you are having any problems with any of these sensors, this is the first place to look.

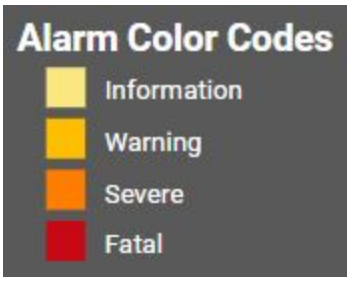
4.4 Positioning

Information regarding the Vehicle GPS and Topside GPS (If present).



5 Alarms

Alarms are used to alert you when a specific criterion is met. These can be based around any signal, this can be the vehicle reaching a certain depth, or a loss of comms.



The most recent alarms will appear at the upper right-hand corner of Workspace. There are four alarm severity levels ranging from information only, to fatal.

The default alarms and their meanings are listed below.

Alarms

Alarm	Severity	Meaning
Pitch Control	Info	Pitch Control error is too large, this could mean that the vehicle is stuck on an obstacle.
Roll Control	Info	Roll Control error is too large, this could mean that the vehicle is stuck on an obstacle.
Depth Setpoint Far	Info	Depth setpoint error is too large this could mean that you have pushed the setpoint beyond the bottom. The vehicle may be running into the ground.
Alt Setpoint Far	Info	Altitude setpoint error is too large this could mean that you have pushed the setpoint beyond the bottom. The vehicle may be running into the ground.
Heading Control	Info	Heading Control error is too large, this could mean that the vehicle is stuck on an obstacle.
Warning Thruster Comms Slow	Warning	The communications to the thruster network has slowed. Typically this means a fault within the thruster system. Check thrusters or power to the vehicle.
LED Hot	Warning	LED has gotten hotter than recommended.
Auto Positioning is Unavailable	Warning	The vehicle DVL has lost bottom lock and Dynamic Positioning and POI are unavailable, this can mean that the vehicle is either too close or too far from the bottom.
Nav Initializing	Severe	This occurs when the vehicle is powering on. Wait until this clears before piloting the vehicle.