VideoRay

RI CoPilot by SeeByte

AUTONOMOUS VEHICLE CONTROL

seebyte

Awareness Made Easy

Reacquire and Identify (RI) CoPilot Operator Manual

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About this Document

VideoRay CoPilot RI is a VideoRay Pro 4 accessory. Information about the VideoRay Pro 4 can be found in the VideoRay Pro 4 Operator's Manual.

This manual provides the following:

- an overview of the VideoRay RI CoPilot hardware unit configuration and connectivity;
- a general description and specification of VideoRay RI CoPilot pilot interface; and
- operating instructions for VideoRay RI CoPilot and equipment.

Target Audience

This manual is designed and developed for operators of the VideoRay Pro 4 MicroROV with a sonar and a DVL who are required to operate the VideoRay remotely operated vehicle (ROV) systems using VideoRay RI CoPilot.

Document Conventions

Several symbols are used throughout this documentation to add emphasis and to assist in relocating important information. The following table describes these symbols and their uses.

SYMBOL	DESCRIPTION
	The **Danger** icon is used to indicate there is a potential risk of personal injury or death. Extra care should be taken to understand the risks, and all personnel should exercise caution. It may also be appropriate to warn others in the immediate vicinity.
	The **Caution** icon is used to indicate there is a potential risk of damage to the equipment or surrounding property. Personnel should receive training in the appropriate procedures before attempting to operate or maintain the equipment.
	The **Do Not** icon is used to indicate that an action or activity should NOT be performed.
	The **Note** icon is used to highlight a specific detail or point of information.
	The **Tip** icon is used to highlight a suggestion or recommendation.

Beyond this Document

There is no substitute for experience and/or training, especially with respect to the real purpose for which you plan to use this equipment. We encourage you to explore options beyond the scope of these materials to expand your knowledge and skills necessary to support your applications. In addition to this documentation, VideoRay offers training and technical support and hosts a general user discussion forum and user image gallery.

We also realize that collectively, users of our products spend considerably more time operating our systems than we do ourselves. Users also encounter more diverse operating environments across an extremely broad range of applications. We highly value this vast experience base, and invite and encourage you to share your experiences and suggestions with us. Please feel free to contact us by any of the methods listed below.

Quality Commitment

VideoRay strives to design, manufacture, deliver and support the highest quality products and services, including this documentation. We have made every effort to ensure that this documentation is accurate and provides you with the most up-to-date information.

If you find any errors in this documentation or have suggestions for improvements, each page contains a "Help us improve this document" feedback link in the left margin (you must be connected to the Internet to use this link).

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Disclaimer

This document is deemed accurate at the time of its writing, however it is not a legal contract and the information contained herein should not be construed to represent any form of commitment. This document as well as the associated products and services are subject to change without notice.

Online Manual

The full version of this manual is available online in the following formats:

- http://download.videoray.com/documentation/copilot_ri for viewing the HMTL online.
- http://download.videoray.com/documentation/copilot_ri/pdf/videoray_doc_copilot_ri.pdf for viewing the PDF online.
- http://download.videoray.com/documentation/copilot_ri/zip/videoray_doc_copilot_ri.exe for downloading the HTML and PDF files.

How to Get Help

Help for your CoPilot RI is available through several channels.

All Hours Self-Service / Crowd-Source Tools

Operator's Manuals and Standard Operating Procedures	www.videoray.com/support/manuals.html
Software Downloads	www.videoray.com/support/downloads.html
Frequently Asked Questions	www.rovfaq.com
ROV User Forum	www.rovinfo.com

Global Support

Email	support@videoray.com
Phone	+1 610-458-3000 (*select option* 1)
Skype	videoray.support (*by appointment*)
Remote Sessions	www.videoray.com/support/remote-support.html (*by appointment*)

Regional Support

VideoRay Authorized Service Centers and Dealers	www.videoray.com/dealer.html

Training

Operator Training	www.videoray.com/learn-more/training.html
Advanced Maintenance Training	www.videoray.com/learn-more/advanced-maintenance-courses.html

Operational Strategies and Tactics Support

If you need help understanding how to apply your system to a specific project, contact VideoRay or you local VideoRay dealer. We can provide guidance or help you find a certified consultant.

CoPilot RI Overview

Product Overview

VideoRay CoPilot RI provides the latest generation of SMART software tools in a simple to use, pilot-friendly form. Learning to use VideoRay CoPilot RI is painless and the intuitive tools help novice users tackle even the most complex operations.

VideoRay CoPilot RI automates the VideoRay Pro 4 MicroROV control process. The ROV can efficiently maneuver through a mission, automatically reducing the consideration of the effects of currents. The ROV can also take better quality video pictures due to the improved stability when using VideoRay CoPilot RI.

Pilots normally control a VideoRay ROV using thruster inputs to navigate a desired course and speed. Constant adjustments are required to correct the course and account for water current and tether drag. Using VideoRay CoPilot RI, operators are able to identify objects suitable for tracking and can then maintain a stable heading and range to the target as desired, without the concern of current and tether drag.

Dynamic Positioning System

A Dynamic Positioning (DP) system allows the ROV to automatically hold a requested position or navigate to a selected location. A DP system mimics automatically what a pilot would do in adjusting the thrusters to keep the desired position.

The pilot can easily control the ROV using the DP system. For example, if the pilot maneuvers the joystick to the forwards position, the ROV will move forwards whilst automatically compensating for cross-currents and tether effects. VideoRay CoPilot RI enables object relative station-keeping and approach; the system will maintain a constant range to target whilst keeping the target at the center of the sonar field of view. The user can then perform object-relative advances / retreats (reduce or increase range to target); or change depth/altitude while keeping a constant distance from the target.

Features

CoPilot RI provides the following features:

- Hover in place
- Pilot to a mouse click
- Pilot to keyed in coordinates
- Pilot to a series of coordinates (Survey)
- Pilot on a heading at a constant speed and depth (or altitude) (Cruise Control)
- Transparent manual operation (take over manual control at any time)
- Navigation display
- GPS integration
- Sonar overlay
- Chart overlay
- Markers
- Recording
- Offline planning of missions

Capabilities

CoPilot RI enables the following types of operational capabilities for your Pro 4 ROV system:

- Target re-acquisition and identification
- Area coverage - search patterns
- Transects - pipelines with a fixed standoff
- Observation - hold station
- Location marking

Quick Start Instructions

These Quick Start Instructions are streamlined to cover just the essentials of operating your CoPilot RI system. They are provided to get you started as quickly as possible, while keeping you and the equipment safe. They cover the equipment set up and basic operation, but are not intended to result in a comprehensive base of knowledge or set of operational and piloting skills. The remaining sections of this documentation should be referenced for a complete understanding of the features, capabilities, operating procedures and maintenance requirements of your CoPilot RI system.

Topics in this Section

Safety First

DANGER CAUTION Operating electrical devices in and near the water can be dangerous. There is always a risk of drowning or electrocution in such an environment. Reduce these risks by using common sense and observing safety regulations and recommended safe practices including the following:

- Never handle power cords while in contact with water or allow power cord connectors or the control panel to enter the water. The only components that can safely be placed in water are the submersible, any onboard accessories and tether, and only after making sure the connections are secure.
- Always test the safety components, such as GFCI switches and interlock devices, before beginning operations. Follow the procedures described in this manual for.
- Have proper safety equipment, such as PFDs (Personal Flotation Devices), on hand and make sure you know how to use them before you need them.
- Keep fingers, hair, loose clothing and other objects away from VideoRay's propellers and other pinch points.
- Monitor weather and sea conditions and heed any warnings or alerts.
- Be aware of and follow any legal ordinances or regulations in your area regarding operation of vessels and underwater equipment in the water.

Before setting up for or commencing any dive, it is a good practice to make sure there are no hazards to people or the equipment on land or in the water. If there are other people in the water nearby, you should advise them that you are going to be operating the ROV. As the owner/operator, it is your responsibility to ensure the safety of those around you as well as that of the equipment and nearby property.

How Safe Is Safe Enough?

Addressing all aspects of safety while working in a water environment is beyond the scope of this documentation. VideoRay encourages you to participate in safety training appropriate for your industry and applications, including such topics as vessel operations, first aid, survival and other relevant topics.

Introduction to the System Components

Unpack the system and familiarize yourself with the components.

ROV System

The base system for a CoPilot RI configuration includes the VideoRay Pro 4. For more information about the VideoRay Pro 4, see the VideoRay Pro 4 Operator's Manual.

BlueView Imaging Sonar

Forward looking imaging sonar provides extended visual range capabilities. Possible targets of interest can be observed and marked, and the system can navigate to them manually or automatically.

Teledyne RDI DVL (Doppler Velocity Logger)

The DVL is used to keep track of the vehicle's location while it is underwater. It uses an array of acoustic beams to track its course over the seafloor in a local coordinate system.

ROV GPS Antenna

The ROV GPS Antenna provides a method to identify the vehicle's location within a global reference frame. GPS is not effective underwater, so the GPS Antenna only works when the ROV is on the surface. Periodic GPS fixes can supplement the DVL tracking.

Some items shown are optional and not included with all models.

Additional Items

Additional items may be supplied with your system including tools, spare parts and other items. If included, these items are described in other sections of this documentation.

Some items shown may be optional and not included with your configuration.

Pre-Dive Preparations

Select a safe and preferably level area to set up the control panel. See the On-site Operations section of the Project Management Guide for more information about site selection and set up.

The pre-dive preparations consist of three parts, a visual inspection before setting up the system, setting up the system including making connections, and power on tests of the system's safety circuits and primary functions.

Conduct a Visual Inspection

Assuming this is your first time using the VideoRay, everything should be in proper working order and ready to go, but it is good practice to perform a pre-dive inspection before every dive, even your first. If any problems are noticed, refer to the Diagnostics and Repair section of the Maintenance Guide and take appropriate corrective action, or contact VideoRay for assistance before commencing the dive.

1. Inspect the ROV and other system components to make sure there are no visible signs of damage or loose or warn parts. Also check for water inside the ROV hull by holding it with the front facing downward and look for signs of water in the main dome or light domes.

2. Check the horizontal thrusters to make sure that the shafts are not bent and the propellers are free to spin and are not fouled, loose or binding on the thruster guards. Check the thruster cartridge seals - they are filled with oil and there should be no signs of leaking or contamination. A small air bubble in a thruster cartridge seal is acceptable. See the Maintenance Guide for warnings, replacement criteria, examples and replacement procedures.

3. Check the vertical thruster to make sure the shaft is not bent and the propeller is not fouled or loose or binding on the float block. Also, check the thruster cartridge seal following the same guidelines used to check the horizontal thruster cartridge seals. Make sure the accessory port at the rear of the ROV is sealed with either a connector from an attached accessory or an accessory port terminator plug. Removal of the float block by loosening the retaining screw may facilitate this process.

Make the Connections

CAUTION Connecting or disconnecting cables while the system is powered on is not recommended.

Most of the cables have been connected at the factory. See the appropriate sections of the Equipment Guide for detailed information about each of the connections.

You will typically need to connect only the hand controller, tether and power cord.

1. ROV Accessories Connections - ROV accessories are connected to the ROV using the ROV Accessory Port, The connectors are "stackable" The preferred order of connection is the sonar first, then the DVL and then the ROV GPS antenna to the ROV's accessory port. Make sure the connections are sealed using a terminator dummy plug installed in the last connector.
2. Connect the hand controller to one of the USB ports on the back of the control panel or directly to one of the USB ports on the computer.
3. Connect the female end of the tether connector to the ROV. The connectors have one pin that is offset towards the center of the connector. Make sure the connectors are clean, align the pins, and push the connectors together - do not twist the connectors. Secure the locking collar by screwing the halves together, and connect the strain relief cable from the ROV to the braided strap on the tether.
4. Connect the male end of the tether to the control panel. When not in use, keep the tether connectors clean and protected for the best performance and reliability.
5. Plug the control panel power cord into a conventional power source (100-240 Volts AC, 50,60 Hz). Power can be supplied through a land-based power outlet, generator or battery and inverter. See the Control Panel section of the Equipment Guide for power source requirements.

Power On Tests

DANGER **CAUTION** If the system does not pass any of the following tests, it should not be used until the problem is identified and corrected. See the Diagnostics and Repair section of the Maintenance Guide for more information.

The VideoRay Pro 4 includes circuit safety component.

- The GFCI (Ground Fault Circuit Interrupter) / Circuit Breaker

Testing the Circuit Safety Components

Test the GFCI / Circuit Breaker switch (The system must be connected to a working power source to perform this test.)

1. Set the GFCI / Circuit Breaker switch to the On position.
2. Press the test switch on the GFCI. The GFCI / Circuit Breaker switch should turn off.
3. Set the GFCI / Circuit Breaker switch to the On position.

Set the Power switch to the On position. The green Power On indicator light should turn on. If the green Power On indicator light is not on, make sure the system is connected to a working power source and the GFCI / Circuit Breaker switch is turned on.

Starting VideoRay Cockpit Control Software

Make sure the system is connected to a working power source and the GFCI / Circuit Breaker and Power switches are turned on.

1. Turn on the computer and wait for the system to complete the boot up process.
2. After the computer has started, start VideoRay Cockpit using the desktop icon, or by selecting it from the Start->All Programs->VideoRay menu.
3. When VideoRay Cockpit starts, you will see the Video Window, the Control Instruments and the Control Bar. For now, you will only need to focus on the video window. See the VideoRay Cockpit Guide for details about using VideoRay Cockpit.

VideoRay Cockpit screen with simulated video image - your image will likely be different.

Testing the System's Functions

The next step is to ensure that the essential features of the ROV are functioning properly. Use the hand controller to perform the following tests. See the Hand Controller section of the Equipment Guide for more information about using the hand controller.

Test the thrusters

CAUTION For the next two steps, do not operate horizontal thrusters out of water for more than 30 seconds to avoid overheating or premature wear of the cartridge seals.

1. Gently move the joystick forward and backward and left and right - the horizontal thruster motors should turn the propellers. Release the joystick - it will return to center on its own, and the propellers will stop turning.

2. Rotate the Depth Control knob - the vertical thruster motor should turn the propeller. Return the Depth Control knob to center to cease the vertical propeller rotation.

Test the lights

CAUTION For the next two steps, do not leave the lights on bright for more than 30 seconds while the ROV is out of water to avoid overheating.

1. Press and hold the Lights Bright button to increase the intensity of the lights - the lights should get brighter.
2. Press and hold the Lights Dim button to dim the lights - the lights should dim.

Test the camera functions

1. Press and hold the Camera Tilt Up button - the camera should tilt up smoothly through its entire range.
2. Press and hold the Camera Tilt Down button - the camera should tilt down smoothly through its entire range.
3. Press and hold the Camera Focus In button - the camera should focus in smoothly through its entire range.
4. Press and hold the Camera Focus Out button - the camera should focus out smoothly through its entire range.

 If a manipulator or other accessories are attached, these items should be checked at this time.

Good Advice

The time to catch small problems before they become big problems is during the pre-dive inspection.

Dive Operations

After all of the pre-dive checks and tests have been completed successfully, you are almost ready to commence the dive. But, there is one more issue to address that could affect the performance of the ROV. The ROV is designed to be operated in a near neutrally buoyant configuration, so the last step before launching your VideoRay is to check the buoyancy. For most operations, the buoyancy is optimal when the top of the float block is even with the water surface and the ROV is level. If the ROV is to buoyant or heavy, the vertical position may be hard to maintain or control.

Buoyancy Check and Adjustment

To determine if the buoyancy is correct, lower the ROV and at least 3 meters (10 feet) of tether into the water. You can lower the ROV by the tether - it will not hurt the tether because there is Kevlar in it. Observe the ROV in the water - it should not be floating too high or sink. It should also be floating level and not tipped to one side or pitched up or down. If the ROV floats too high, you will need to add some ballast weights. If the ROV sinks, you will need to remove some ballast weights. If the ROV is not floating level, you can change the locations of the weights.

The buoyancy can be adjusted by opening the skid pods and adding or removing the supplied ballast weights. To open the skid pods, turn the ROV upside down. Unhook the retaining o-ring on the end of the pod, and lift up on the pod. The weights can be added to or removed from the slots by hand. For most operations, the weights should be evenly distributed.

 Buoyancy will need to be adjusted for use in fresh water versus salt water and depending upon whether accessories are used with the ROV.

Commence the Dive

Once the buoyancy has been adjusted the ROV is ready to launch. Lower it into the water and operate the controls to maneuver it.

- Start with the ROV on the surface and push the joystick forward slightly to make the ROV move forward. Move the joystick to the left or right to make it turn left or right. Get a feel for how agile the ROV is.
- Observe the video display as well as the ROV to become acquainted with the camera's wide angle lens and its affect on depth perception underwater.
- Once you feel comfortable with the horizontal maneuverability of the ROV, rotate the depth control knob to dive the ROV. Tilt the camera down as you dive so you can see towards the bottom. Rotate the depth control knob to bring the ROV back to the surface. Tilt the camera up as you surface so you can see towards the surface.
- Change the lights settings, and adjust the camera focus. If you have a manipulator, tilt the camera down so you can see it and open and close the jaws.
- As you get familiar with maneuvering the ROV, you can start to observe some of the on-screen displays including the depth, heading, camera settings and other data.

For your first dives, practice until you are comfortable operating the controls without looking at them and you are able to control the ROV with some precision.

 See the Hand Controller section of the Equipment Guide for complete information about using the hand controller and see the Piloting section of the Operations Guide for more advanced tips on piloting the Pro 4.

Practice Makes Perfect

Developing the skills to operate your CoPilot RI like an expert may take some time. Practicing on a regular basis is highly recommended.

Post-Dive Operations

At the conclusion of your dive, retrieve the VideoRay and power down the system by closing VideoRay Cockpit, shutting down the computer and turning off the Power switch. Make sure the ROV is secure before disconnecting the tether. After disconnecting the tether, keep the tether connectors clean and do not let them drag on the ground.

Proper maintenance of your VideoRay system ensures a long service life and that it will be ready to operate when you are. After each dive, you should visually inspect the system for damage that might have occurred during your operation.

VideoRay Cockpit includes an online interactive Post Dive checklist. See the Post Dive Checklist section of the VideoRay Cockpit Guide

 Keeping the ROV clean is one of the most important aspects of good preventative maintenance practices, especially after using it in salt water. If you use your ROV in salt water, or water with contaminants, you should first rinse it, and then soak it in clean fresh water for at least one-half hour. After cleaning the ROV and tether, they should be allowed to air dry before being put away for storage.

 Failure to properly maintain the ROV by thoroughly cleaning it after use may dramatically reduce its service life.

Debriefing

Congratulations! You are well on your way to becoming an accomplished micro-ROV operator, but there are still many things to learn and skills to master. Continue learning about the system by reviewing the additional sections of this documentation and, most importantly, practice, practice, practice.

If you encountered any difficulties or have any questions, review these Quick Start Instructions and the other documentation that came with your system, including the Equipment Guide and Maintenance Manual. If you still have difficulty or questions, contact VideoRay. Your success is our success, and we are here to help you get the most out of your VideoRay.

 VideoRay contact information is available on the About this Documentation page.

Ready to Learn More?

To accelerate your learning and receive recognition for your knowledge and skills, VideoRay offers in-person classes and online training as well as the Micro-ROV User Certificate program. Training can be delivered at your site and customized to your needs. To learn more about these opportunities, click on the training link above to visit the VideoRay Educational Resources website.

Requirements

Specifications

⚠ CoPilot RI features and specifications are subject to change without notice.

Product News

See www.videoray.com for the most up-to-date product information.

CoPilot RI Glossary

DP - Dynamic Positioning - the state of CoPilot RI in which the system is controlling the motion of the ROV.

DVL - Doppler Velocity Log - an acoustic sensor instrument that can be used to track vehicle speed and relative direction.

Identify - The process of determining the identity, nature or significance of a target.

Nudge Box - A tolerance indicator on the screen that represents the area of proximity around the ROV. If the objective location is within this nudge box, the ROV is considered in-position.

Objective Location - The desired location to which the ROV is being guided manually or automatically.

Reacquire - The process of sending the ROV to the location of a target, marker or point of interest.

Target - A sonar return that represents a known or potential object of interest.

Virtual Machine - An alternate operating environment other than the native operating system on an computer.

Equipment Guide

VideoRay CoPilot RI requires that the Pro 4 ROV is equipped with a Doppler Velocity Log (DVL) an ROV GPS Antenna and a BlueView P900 Sonar. These components are described in more detail in the following sections.

ROV System

The base system for a CoPilot RI configuration includes the VideoRay Pro 4. For more information about the VideoRay Pro 4, see the VideoRay Pro 4 Operator's Manual.

Sonar

Forward looking imaging sonar provides extended visual range capabilities. Possible targets of interest can be observed and marked, and the system can navigate to them manually or automatically.

DVL

The DVL is used to keep track of the vehicle's location while it is underwater. It uses an array of acoustic beams to track its course over the seafloor in a local coordinate system.

GPS

The ROV GPS Antenna provides a method to identify the vehicle's location within a global reference frame. GPS is not effective underwater, so the GPS Antenna only works when the ROV is on the surface. Periodic GPS fixes can supplement the DVL tracking.

Software Guide

Program Start-up Procedure

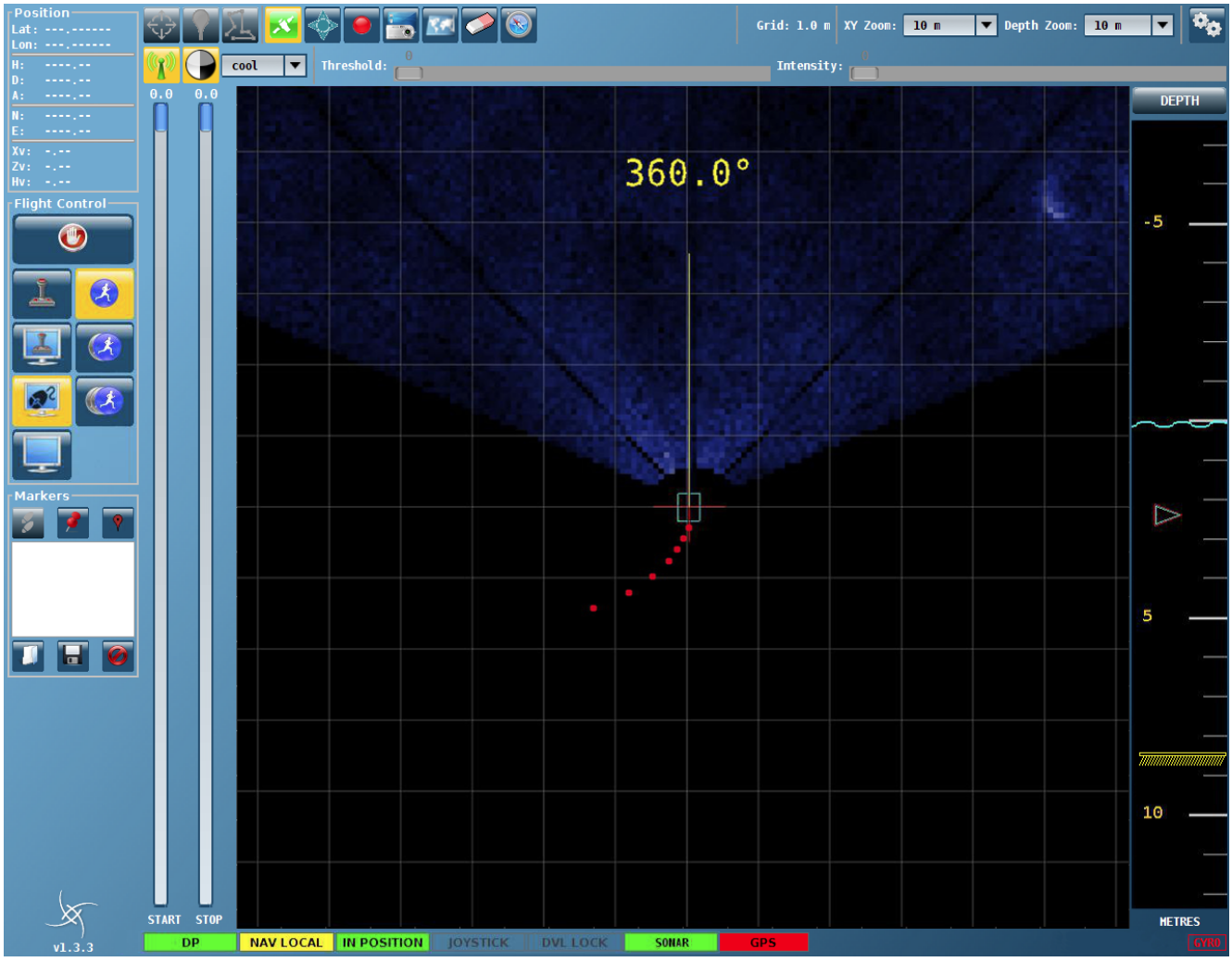
CoPilot RI software requires that VideoRay Cockpit be operating. For more information about the Pro 4 and VideoRay Cockpit, see the Pro 4 Operator's Manual.

To access the Copilot RI operating environment, make sure VideoRay Cockpit is running and the ROV is operating, then click on the CoPilot button on the VideoRay Cockpit control bar.

This will start a Virtual Machine, which will appear on the second monitor by default. On the "desktop" of the virtual machine, there is a program icon for the CoPilot RI program. Double click the CoPilot RI icon (or right-click and select "Open") to start CoPilot RI.

Interface Overview

The VideoRay CoPilot RI interface presents the user with an overview of the ROV's status and its position in the navigation chart. The overall look of the pilot interface is designed to be easy to read and intuitive to use.



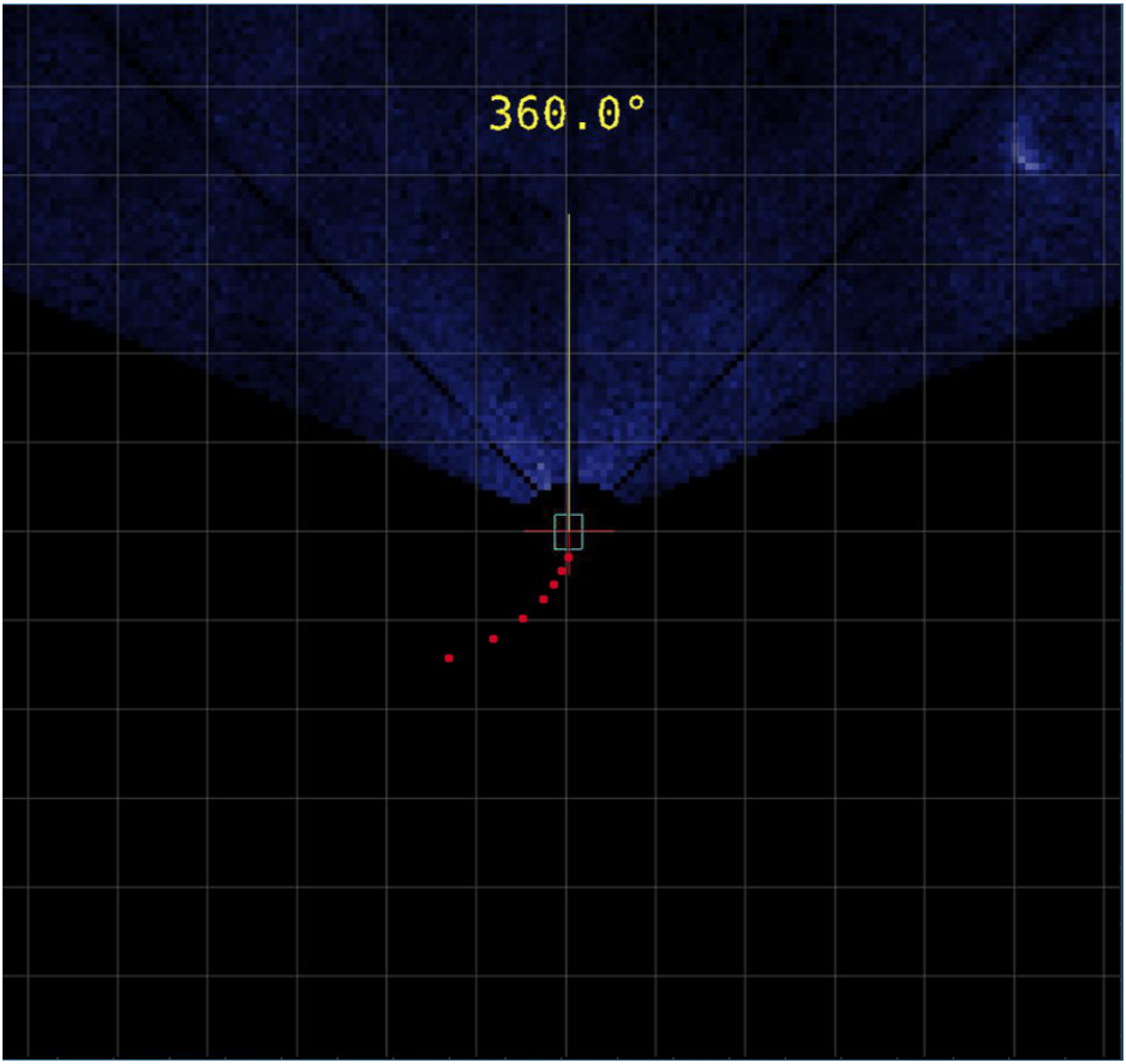
The VideoRay CoPilot RI interface consists of the following sections:

- Navigation Chart Display
- Water Column Display
- Flight Status Panel
- Flight Controls Panel
- Markers Panel
- Status Indicators
- Alarm Indicators
- Operational Support Tools

Each of these sections are described in more detail in the following pages.

Navigation Chart Display

The navigation chart display is the main panel in the pilot interface. It allows the user to monitor the position of the ROV in real-time. It is also possible to use the navigation chart display to generate pilot commands for the ROV by selecting coordinate locations with a mouse when in an Auto Fly mode. For example, when in AUTO FLY Click and Go mode, a left-button mouse click in this display generates a new position request for the ROV, and a right-button mouse click generates a new heading request. The background of the Navigation Chart Display can be either a grid or a chart. A sonar image overlay can also be displayed for target recognition and location determination.



The navigation chart displays a plan view of the ROV and the surrounding area. The ROV position is calculated by VideoRay RI CoPilot's navigation system - the accuracy of which depends on the frequency and quality of the absolute navigation fixes. The display is always centered on the ROV, so it will appear as if the grid or chart is moving under the ROV.

By default, magnetic north is up on the screen. The ROV will rotate in the center of the screen to reflect the current ROV heading. Other viewing modes are available, see the view orientation section of the Operations Support Tools for more information.

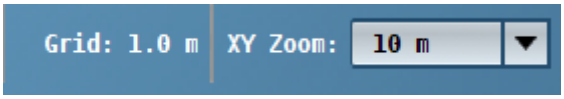
The ROV is represented by a blue rectangle with a line projecting in the direction the ROV heading. Other general interface elements include:

- Red Dots - A breadcrumb trail of red dots indicating the path that the ROV has taken can be displayed.
- Range and Bearing - The range and bearing from the ROV to the position indicated by the mouse can be displayed.
- Turns count - The number of turns the ROV makes over its own axis is displayed on the left side of the navigation chart display. A clockwise turn is represented by a positive value, and an counter-clockwise turn is represented by a negative value.

The navigation chart display is also responsible for displaying heads-up messages and auto flight indicators. The auto flight indicators can help the operator understand what the system is doing.

- "DP Standby" message - The system does not have sufficient sensor data for tracking and cannot initiate an auto flight mode.
- "Offline" message - The offline planning mode is active. The Offline planning mode allows surveys to be created and simulated.
- Red Cross - The Objective Location, which indicates the location to which CoPilot will attempt to navigate the ROV while in an auto flight mode.
- Yellow Line - The Objective Heading, which indicates the heading to which CoPilot will attempt to turn the ROV while in an auto flight mode.
- Red Line - Connects the location of the ROV (at the moment when auto flight is initiated) with the Objective Location defined by the operator.
- Green Line - Connects the current location of the ROV with the Objective Location when auto flight is in progress. This line updates continuously until the Objective Location is reached.
- In Position Tolerance Indicator (Nudge Box) - A gray box displayed around the ROV. If the Objective Location is within this box, the ROV is considered In Position. This box is only displayed when the mouse is hovered over the blue rectangle ROV indicator.
- Blue Lines - Indicate a planned survey route.
- Survey Waypoint Numbers - Indicate the sequence in which the survey waypoints will be visited.
- Blue Dots - Markers.
- Yellow Dot - Selected marker.

Navigation Chart Display Zoom Scale Control



The navigation chart display zoom scale allows the user to change the viewable area and displayed size of objects. The scale of the viewable area is measured from the center of the view to the right or left edge of the viewable area. The scales are set to pre-defined values of 2m, up to 50,000m (or their equivalent values in feet).

Water Column Display

The water column display is positioned on the right side of the interface. It allows the user to visualize the depth and altitude above the seabed (if available) of the ROV in the water column. The ROV remains in the center of the display at all times. A left-button mouse click in this display generates a new depth/altitude request for the ROV. A right-button mouse click has no effect in this display.

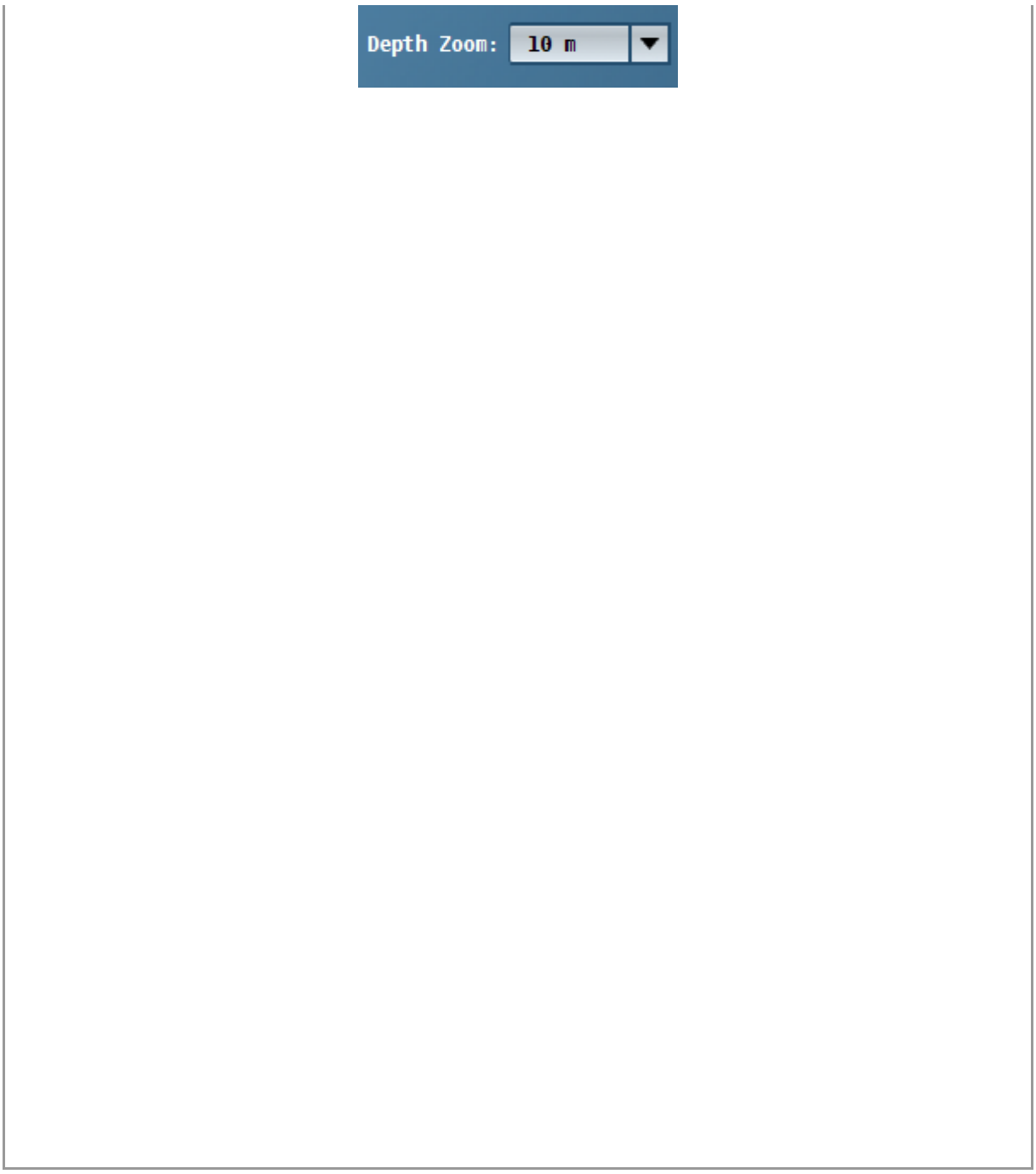
The water column display can be operated in either depth or altitude mode. This option allows the ROV to remain at a constant user-defined value. In depth mode, the ROV will maintain the specified depth of the ROV relative to the sea surface; in altitude mode, the ROV will maintain the specified altitude of the ROV relative to the sea bed. The depth/altitude mode can be changed by clicking on the button at the top of the water column display. For example, if the button indicates that the display is in "Depth" mode, it will change to "Altitude" when selected.

While in AUTOFLY or CRUISE mode, the user can control the ROV's Z axis (Heave) by left clicking at the desired objective depth or altitude. The ROV will then ascend or descend to the specified depth or altitude, depending on the selected display mode.

The sea surface is displayed in cyan and the seabed icon in yellow. The current depth/altitude is represented by an arrow the same color as the ROV and the objective depth/altitude selected by the user is represented by an arrow the same color as the target waypoint in the navigation chart.

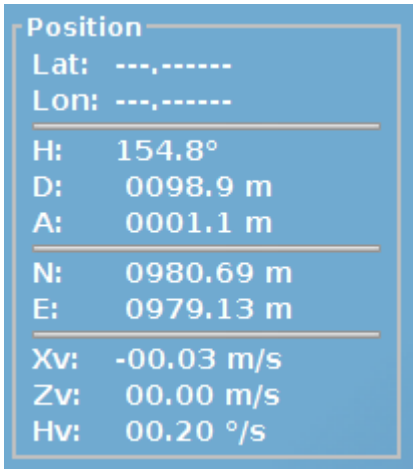
Water Column Display Zoom Scale Control

The water column zoom scale allows the user to change the range of view above and below the ROV. The ROV is always at the center of the water column display; the water surface and seabed are also displayed but move according to the current depth and altitude of the ROV. The zoom scale of the viewable area is measured from the center of view to the top or bottom of the viewable area. The scales are set to pre-defined values of 2m, 5m, 10m, 20m, 50m, 100m, 200m, 500m and 1000m (or their equivalent values in feet).



Flight Status Panel

The Flight Status Panel is displayed in the upper left of the interface. It provides real time information about the position and movement of the ROV.



The flight status panel provides the user with the following ROV information:

- **Lat** - ROV Latitude
- **Lon** - ROV Longitude
- **H** - ROV Heading
- **D** - ROV Depth
- **A** - ROV Altitude
- **N** - ROV Northing (local coordinate system)
- **E** - ROV Easting (local coordinate system)
- **Xv** - ROV Horizontal Velocity (+ is forward)
- **Zv** - ROV Vertical Velocity (+ is diving)
- **Hv** - ROV Rotational Velocity (+ is clockwise)

This information is normally updated from the navigation system, but if the DP is in standby only the raw ROV information is displayed. No values are displayed if no ROV information is detected.

Flight Controls Panel

The Flight Controls Panel is used to select the flight mode and indicate which flight mode is active. It is also used to select the desired speed of the ROV while operating in an auto flight mode.

Selecting a flight mode button changes the flight mode and the active button is displayed in yellow with a cyan outline. Likewise, selecting a speed button changes the speed at which the ROV will operate when operating in an auto flight mode. The selected speed is displayed in yellow with a cyan outline.

Flight Modes include:

- Stay
- Manual Mode
- Auto Hover
- Auto Fly
- Cruise

Speeds include:

- Slow (0.0125 m/s)
- Medium (0.25 m/s)
- Fast (0.5 m/s)

When the DP is in standby, the only mode enabled is MANUAL and the rest of the buttons are disabled.

When using the joystick to override an auto mode (other than Cruise Mode, where the joystick override is not enabled), the ROV's maximum speed is still restricted by the speed selection. If you want full power, you will need to change to Manual Mode.

MANUAL Mode

In Manual Mode, the pilot is in full control of the ROV. CoPilot will not make any attempt to control the ROV's behavior.

Stay Command

The Stay Command can be used to interrupt an auto flight mode and stop the ROV. After the Stay button is pressed, the system will engage Auto Fly mode with the ROV holding station according to the user preferences setting for Enable Station Keeping.

The Stay command can be used to stop the ROV in an emergency while it is in an auto flight mode.

Velocity Controls

The velocity controls allow the user to select the desired speed of the ROV while in an auto flight mode. The speeds are defined as slow (0.125 m/s), medium (0.25 m/s) and fast (0.5 m/s).

While in an auto flight mode, the speed can be reduced at any time, but the speed cannot be increased without first reverting to manual mode.

In manual mode, the speed setting is ignored, however when using the joystick to override an auto flight mode, the maximum speed will be restricted to the selected speed setting.

AUTO HOVER Mode

In Auto Hover mode, CoPilot will attempt to maintain the ROV's current position, depth (or altitude) and heading within a set tolerance about its current position.

The user can use the joystick to override Auto Hover mode for horizontal and/or vertical control of the ROV.

If there are no joystick navigation control inputs, the "In Position" status indicator will turn green and CoPilot will attempt to control the ROV according to the setting of the Enable Station Keeping selection in User Preferences.

- With Enable Station Keeping selected, CoPilot will attempt to keep the ROV within a set tolerance centered about the current location, but NOT necessarily attempt to maintain the ROV's heading.
- With Enable Station Keeping NOT selected, CoPilot will attempt to maintain the ROV's heading, but will NOT necessarily attempt to keep the ROV within the set tolerance. CoPilot will also attempt to prevent the ROV from moving forward or backward, but NOT prevent it from drifting laterally.

To exit Auto Hover mode, select another Auto Fly Mode, Manual mode, or press the Stay command. Pressing the Stay command will cause the system to enter Auto Fly mode.

⚠ If you manually override Auto Hover by using the joystick, all aspects of Auto Hover are disabled. This means that if you pilot the ROV to a new location, the depth (or altitude) will not be maintained, and must be manually controlled as well. Conversely, if you change the ROV's depth (or altitude), the ROV may drift from its current horizontal location.

⚠ When using the joystick to override Auto Hover mode, the ROV's maximum speed is still restricted by the speed selection. If you want full power, you will need to change to Manual mode.

⚠ If the system loses DP while in Auto Hover mode, Auto Hover mode will be canceled and manual control mode will be entered.

AUTO FLY Mode

Auto Fly will attempt to navigate the ROV to a desired location or series of locations specified by the user. There are several Auto Fly modes. After selecting Auto Fly, the user selects the Auto Fly sub mode.

1. Click and Go
2. Go to Waypoint
    a. Global Waypoint
    b. Local Waypoint
    c. Relative Waypoint
3. Survey Plan

These modes are described in the following sections.

AUTO FLY - Click and Go

In AUTO FLY Click and Go mode, CoPilot will attempt to control the ROV's motion according to mouse inputs in the Navigation Chart area. A left-button mouse click changes the objective location for the ROV to the coordinates where the click occurred, and CoPilot will navigate the ROV to that location at the speed specified by the Velocity Controls selection. A right-button mouse click in the Navigation Chart area will cause CoPilot to change the ROV's heading to the bearing from its current position to where the click occurred.

The ROV's depth (or altitude) can be controlled by a mouse click in the Water Column display area.

When AUTO FLY Click and Go is initiated, the ROV's objective location, heading and depth (or altitude) are initially defined as its current location.

When an objective location has been defined be a left mouse click, it is represented by a red cross. A red line is displayed from the point at which Click and Go was activated to the objective location. A green trajectory line is drawn between the current ROV position and the objective location and this line is updated as the ROV approaches the objective location.

When an objective heading has been defined be a right mouse click, it is displayed by a yellow line of fixed length from the current ROV position and oriented at the requested objective heading. The objective heading is also displayed as a number at the end of the objective heading line.

Once the objective location or heading is achieved, the "In Position" status indicator will turn green and CoPilot will attempt to control the ROV according to the setting of the Enable Station Keeping selection in User Preferences.

- With Enable Station Keeping selected, CoPilot will attempt to keep the ROV within a set tolerance centered about the current location, but NOT necessarily attempt to maintain the ROV's heading.
- With Enable Station Keeping NOT selected, CoPilot will attempt to maintain the ROV's heading, but will NOT necessarily attempt to keep the ROV within the tolerance box. CoPilot will also attempt to prevent the ROV from moving forward or backward, but NOT prevent it from drifting laterally.

The user can use the joystick to override AUTO FLY Click and Go mode for horizontal control of the ROV. Depth cannot be overridden. If manual override is performed, the objective location will become to location of the ROV when the pilot releases the joystick.

To stop the ROV while under CoPilot control, press the Stay command button. Pressing the Stay command will cause the system to enter Auto Fly mode.

To exit Auto Fly Click and Go mode, select another Auto Fly mode or Manual mode.

⚠ When using the joystick to override Auto Fly mode, the ROV's maximum speed is still restricted by the speed selection. If you want full power, you will need to change to Manual mode.

⚠ If the system loses DP while in an Auto Fly mode, Auto Fly mode will be canceled and manual control mode will be entered.

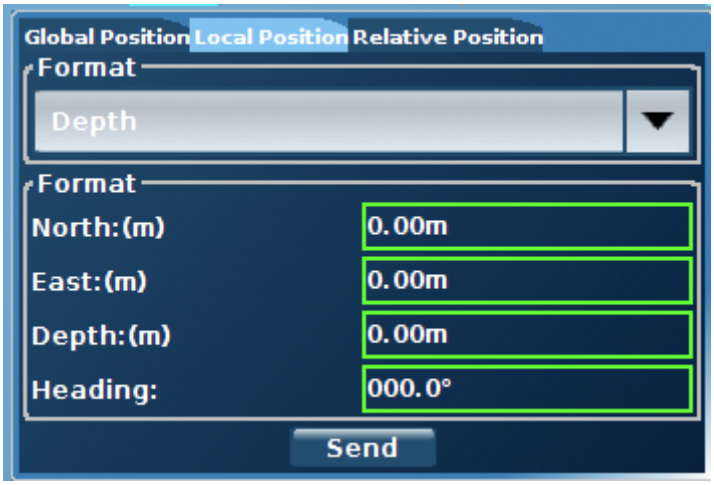
AUTO FLY - Go to Waypoint

In AUTOFLY Go to Waypoint mode, CoPilot will attempt to control the ROV's motion according to keyed in values entered by the operator. Once the objective location is entered, CoPilot will navigate the ROV to that location at the speed specified by the Velocity Controls selection.

There are three types of Waypoints:

1. Global Position - GPS coordinates and depth (or altitude)

2. Local Position - Coordinates entered and depth (or altitude) in a local reference frame



3. Relative Position - Distances measured from the current location of the ROV

Once the Waypoint is achieved, the "In Position" status indicator will turn green and CoPilot will attempt to control the ROV according to the setting of the Enable Station Keeping selection in User Preferences.

- With Enable Station Keeping selected, CoPilot will attempt to keep the ROV within a set tolerance centered about the current location, but NOT necessarily attempt to maintain the ROV's heading.
- With Enable Station Keeping NOT selected, CoPilot will attempt to maintain the ROV's heading, but will NOT necessarily attempt to keep the ROV within the tolerance box. CoPilot will also attempt to prevent the ROV from moving forward or backward, but NOT prevent it from drifting laterally.

The user cannot use the joystick to override Auto Fly Go to Waypoint mode for horizontal or vertical control of the ROV.

To stop the ROV while under CoPilot control, press the Stay command button. Pressing the Stay command will cause the system to enter Auto Fly mode.

To exit Auto Fly Go to Waypoint mode, select another Auto Fly mode or Manual mode.

⚠ When using the joystick to override Auto Fly mode, the ROV's maximum speed is still restricted by the speed selection. If you want full power, you will need to change to Manual mode.

⚠ If the system loses DP while in an Auto Fly mode, Auto Fly mode will be canceled and manual control mode will be entered.

AUTO FLY - Survey Plan

In AUTOFLY Survey Plan mode, CoPilot will attempt to control the ROV's motion according to a series of survey waypoints entered using mouse clicks or keyed into a table. Once a survey is started, CoPilot will navigate the ROV through the series of survey waypoints at the speed specified by the Velocity Controls selection.

Survey controls include:

- Stop
- Reverse
- Play / Pause
- Skip
- Delete Survey
- Load Survey
- Save Survey
- Edit Survey

Once a survey waypoint is achieved, the "In Position" status indicator will turn green and CoPilot will attempt to control the ROV according to the setting of the Enable Station Keeping selection in User Preferences.

- With Enable Station Keeping selected, CoPilot will attempt to keep the ROV within a set tolerance centered about the current location, but NOT necessarily attempt to maintain the ROV's heading.
- With Enable Station Keeping NOT selected, CoPilot will attempt to maintain the ROV's heading, but will NOT necessarily attempt to keep the ROV within the tolerance box. CoPilot will also attempt to prevent the ROV from moving forward or backward, but NOT prevent it from drifting laterally.

The user cannot use the joystick to override Auto Fly Survey Plan mode for horizontal or vertical control of the ROV.

To stop the ROV while under CoPilot control, press the Pause or Stop button in the survey controls panel or Stay command button in the Pilot Controls Panel. Pressing the Stay command will cause the system to enter Auto Fly mode.

To exit Auto Fly Survey Plan mode, select another Auto Fly mode or Manual mode.

 When using the joystick to override Auto Fly mode, the ROV's maximum speed is still restricted by the speed selection. If you want full power, you will need to change to Manual mode.

 If the system loses DP while in an Auto Fly mode, Auto Fly mode will be canceled and manual control mode will be entered.

 Surveys can be planned and simulated in Offline Planning mode.

CRUISE Mode

In Cruise mode, CoPilot will attempt to maintain the ROV's speed and heading. Once selected, Cruise will cause the ROV to begin navigating at the selected speed and current heading. The user can issue right clicks on the Nav Chart to specify a new heading. The user can issue left clicks in the Water Depth chart to change the ROV's objective depth (or altitude).

The user cannot use the joystick to override Auto Hover mode for horizontal and/or vertical control of the ROV.

In Position does not apply to Cruise mode.

To exit Auto Hover mode, select another Auto Fly Mode, Manual mode, or press the Stay command. Pressing the Stay command will cause the system to enter Auto Fly mode.

 If the system loses DP while in Cruise mode, Cruise mode will be canceled and manual control mode will be entered.

Markers Panel

VideoRay RI CoPilot allows the user to place markers onto the navigation chart area of the pilot interface to denote positions of interest. These markers can be placed automatically at the vehicles current position, manually with a CTRL Left mouse click or at a keyed in location specified by the operator. Markers can be saved and reloaded by the operator.

Markers Interface

Placing a Marker at the Current Position

The user can place a marker at the vehicles current position, which will be visually denoted by a yellow dot on the Pilot Interface, by clicking the Place Marker Icon. A marker entry will be added to the markers list in the markers panel.

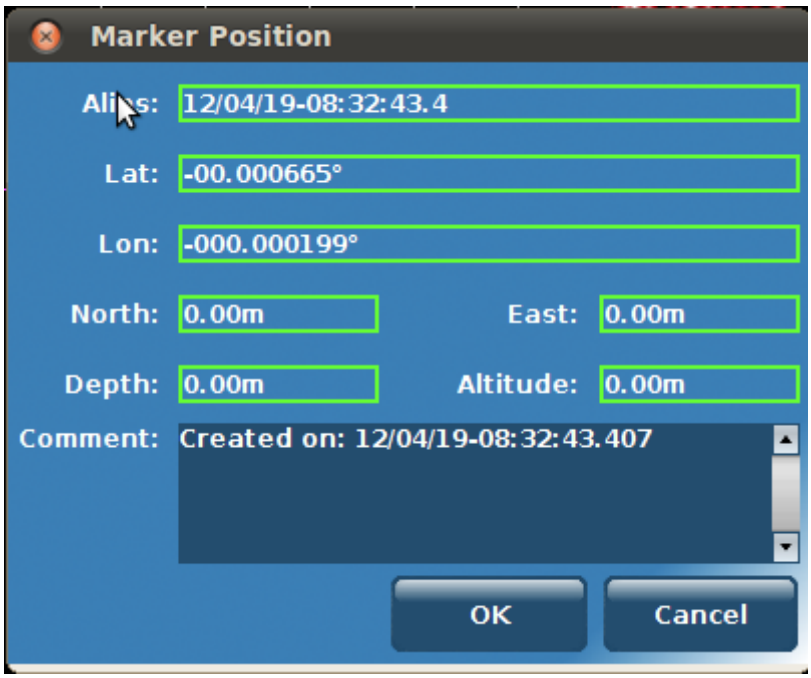
Place Marker Icon

Manually Placing a Marker

The user can manually place a marker by selecting the Manually Place Marker icon:

Manually Place Marker

The user will then be instructed to enter the coordinates of their chosen location into the window. Once entered, the user should click "save" to place the marker. If incorrect coordinates have been entered, a warning message will alert the user of this, and correct coordinates should be entered before saving. A marker entry will be added to the markers list in the markers panel.



Entering the Coordinates of a Marker

Fly to Marker

Once a marker has been placed, the user, at any time during their mission, can instruct the vehicle to fly to the Marker by clicking on the chosen marker(s) within the Markers Interface, and then selecting the Fly to Marker Icon.

Fly to Marker

Save Marker Positions

The user has the option of saving the position of their current marker(s) for use at a later date. To do this, the Save icon should be selected. Once clicked, the file will automatically be saved to the data folder.

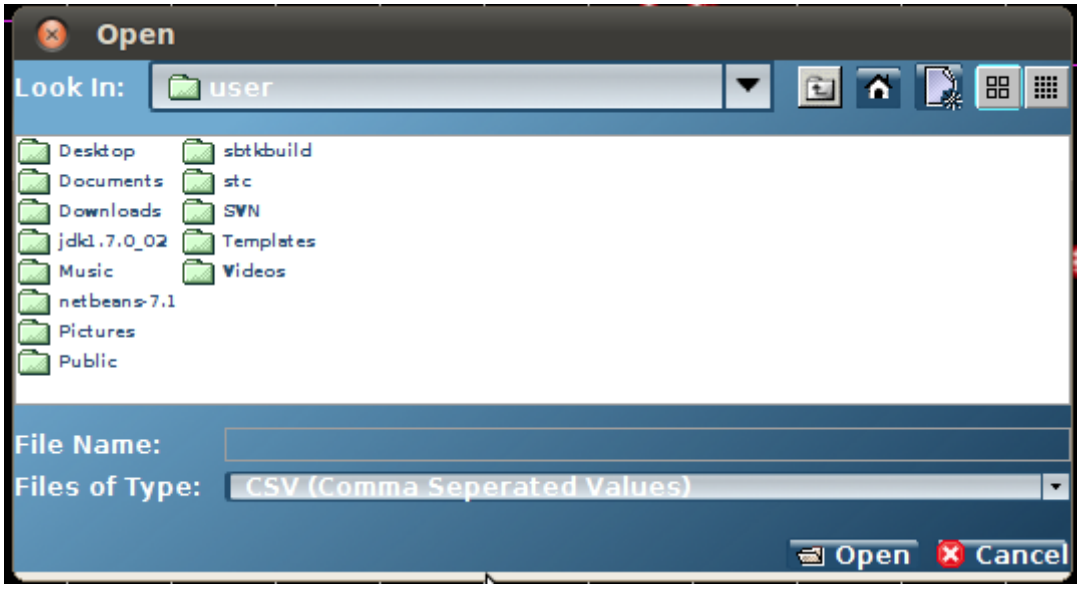
Save Marker Positions

Load a Marker File

To load a previously saved Marker File, the user must select the Load icon.

Loading a Marker File

By selecting the appropriate file from its location and selecting "open", the saved markers will be loaded onto the current Pilot Interface.



Selecting a File

Editing Markers

To change the location of a specific marker, there are two possible actions that can be undertaken:

1. Using the Pilot Interface
    - Select the Marker you wish to edit by right clicking on the Marker shown in the Pilot Interface
    - Edit the details as shown in section 2.8 Manually Placing a Marker and save. The marker position will now be changed
2. Using the Markers Interface
    - Right click on the marker to be deleted within the Markers Interface list of markers
    - Select "Edit" from the options provided
    - Edit the details as shown in section 2.8 Manually Placing a Marker and save. The marker position will now be changed

Deleting a Marker

To delete a marker, there are two possible actions that can be undertaken:

1. Using the Delete icon
    - Select the Marker you wish to delete from the Markers Interface list of Markers
    - Left click on the Delete icon

Deleting a Marker

2. Using the Markers Interface
    - Right click on the marker you wish to delete from the Markers Interface list of Markers
    - Select Delete from the available options

Your chosen marker will now be deleted.

Selecting Multiple Markers for Deletion

To select multiple markers from the Markers Interface list of Markers, the user should, whilst holding the Ctrl key on their keyboard, select the markers they wish to delete by clicking on each marker.

Deletion can continue as described previously.

Status Indicators and Alarms

Status indicators and alarms provide the operator with feedback on the system's status and operational state. In general, status indicators provide operational feedback, and alarms indicate a hardware problem.

The following status indicators are provided:

- DP Status
    - Red Standby - The system does not have a DVL lock and is unable to navigate the ROV.
    - Green DP - The system is able to navigate the ROV.
- Navigation
    - Green Nav Global - The navigation reference frame is in global coordinates and based on either GPS or DVL tracking.
    - Yellow Nav Local - The navigation reference frame is in local coordinates and based on DVL tracking.
    - Red Nav Fault - The navigation system is unable to track the position of the ROV.
- In Position
    - Gray In Position - The ROV is either in Manual mode or has not reached its objective location when it is in an auto flight mode.
    - Green In Position- The ROV has reached its objective location.
- Joystick
    - Gray Joystick - There is no joystick input.
    - Gray Joystick - There is joystick input.
- DVL Lock
    - Red DLV Lock - The DVL is not able to track the ROV's location.
    - Green DLV Lock - The DVL is tracking the ROV's location.
- Sonar
    - Red Sonar - Sonar data is not being received or the sonar has been turned off.
    - Green Sonar - Sonar data is being received.
- GPS
    - Red GPS - GPS data is not being received or the GPS has been turned off.
    - Grey GPS - GPS data is being received but it is of low quality.
    - Green Sonar - GPS data is being received and is of good quality.

The following Alarms are illuminated when the corresponding device or system is not working properly:

- AutoPos - The system has encountered an internal error.
- Depth - The ROV's depth is not detected.
- DVL - The DVL is not detected.
- GPS - The GPS is not detected.
- Gyro - The ROV's gyros are not detected.
- I/O - An internal system error has occurred.
- Navigation - The system is unable to Navigate.
- Sonar - The sonar is not detected.
- USP - An internal network communications error has occurred.

Operations Support Tools

There are further interface options available to users. These options can be found to the top center, above the pilot interface, and right, above the waterfall, of the interface toolbar. These additional functions include:

- **Toggle GPS On or Off**

Toggle GPS On or Off

- **Set Location**

Set Location

- **Start / Stop Recording**

Start / Stop Recording

- **Take a Screenshot**

Take a Screenshot

- **Load Chart**

Load Chart

- **Clear Breadcrumb Trail**

Clear Breadcrumb Trail

GPS Controls

GPS Toggle

Recording Controls

Record Video Toggle

Screen Shot / Snapshot

Chart Controls

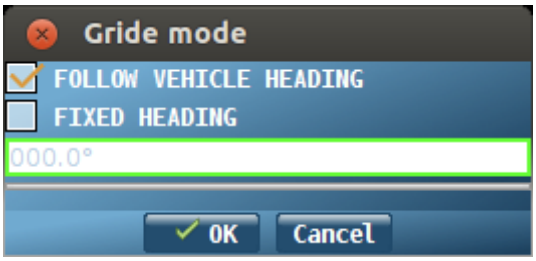
Load Chart

View Controls

Erase Breadcrumb Trail

Set Grid Orientation

Grid Settings

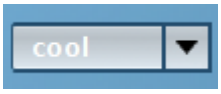


Sonar Controls

Sonar Toggle

Auto Intensity Toggle

Color Map Selection



Threshold / Intensity Sliders

User Preferences

Open User Preferences

VideoRay Cockpit Integration

VideoRay CoPilot operates in conjunction with VideoRay Cockpit. There are several key areas of integration, including:

- Override Mode
- Compass Declination
- Compass Calibration
- ROV GPS Filter

Override

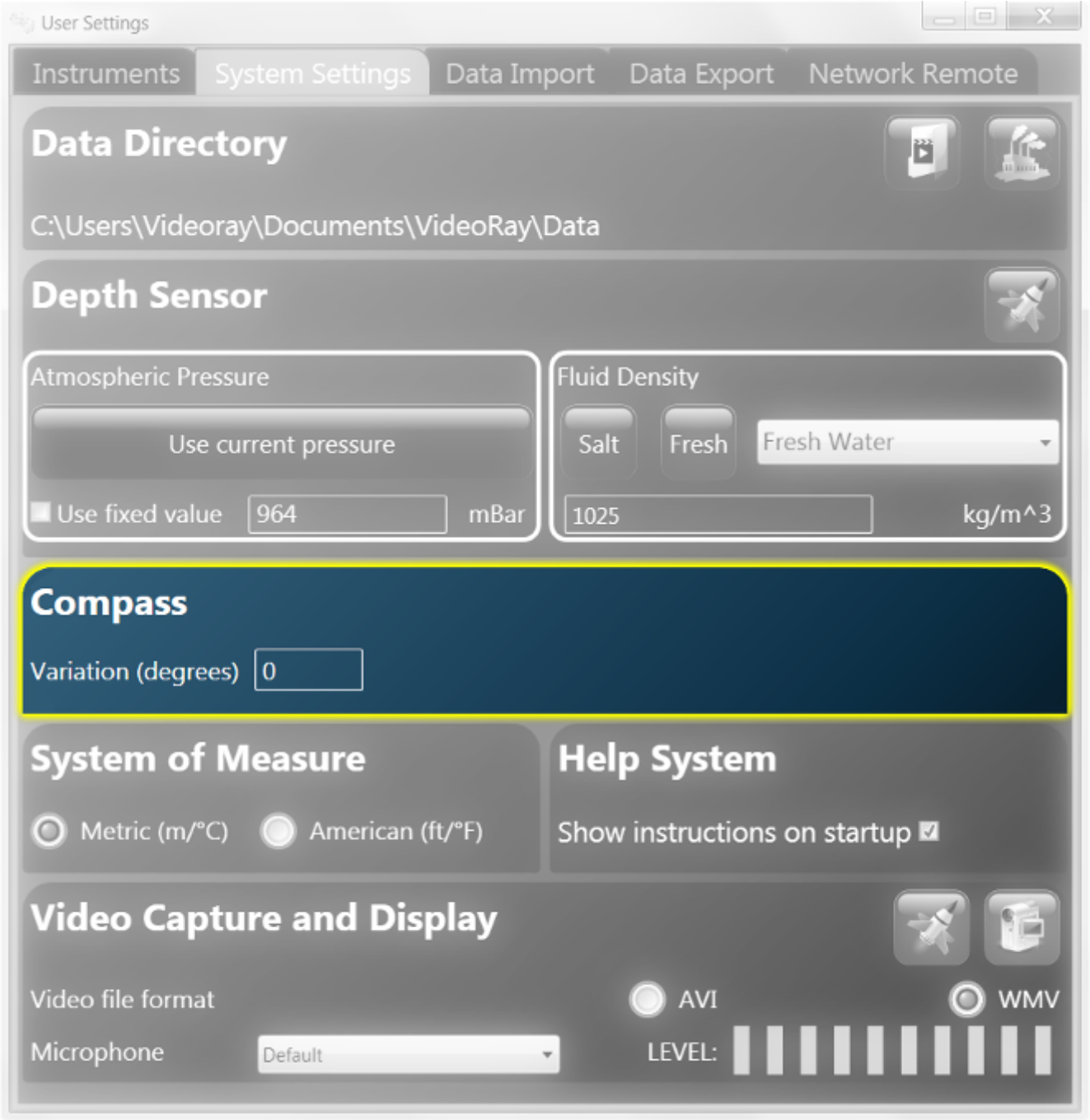
In order for VideoRay CoPilot RI to communicate with VideoRay Cockpit, Cockpit operates in override mode. This allows CoPilot RI to send piloting commands to the ROV through Cockpit. If the system becomes unstable while in an auto flight mode, the Override can be used to break this connection and return manual control to the pilot.

Compass Declination

For best results with VideoRay CoPilot RI, the local magnetic declination must be set in VideoRay Cockpit.

The remainder of this page is an expert from the Pro 4 Operator's Manual. For more information and context, see the Pro 4 Operator's Manual.

Compass



The ROV compass system is designed to display headings relative to Magnetic North. You can enter a local compass variation to account for magnetic declination. The declination is considered positive when the Magnetic North is East of True North.

The value you enter is numerically added to the heading from the ROV. For example, if you are in an area with a declination of 15 degrees West, the ROV heading will read +15 degrees when the ROV is facing True North (assuming no variation has been entered). You should therefore enter -15 for the variation, which would result in a correct True North reading of 0 when the ROV is pointed True North.

The declination is saved from session to session. Be sure to clear it or change it at the start of each session if necessary.

Beginning with version 1.8 of VideoRay Cockpit, the behavior of the Compass Variation has been reversed. In prior versions, the variation was subtracted from the ROV heading.

You can use the Turns Indicator instrument to facilitate easier navigation with respect to a fixed reference such as a dock. See the sections on the Turns Indicator instrument and Relative Heading for more information about using the Turns Indicator settings.

Compass Calibration

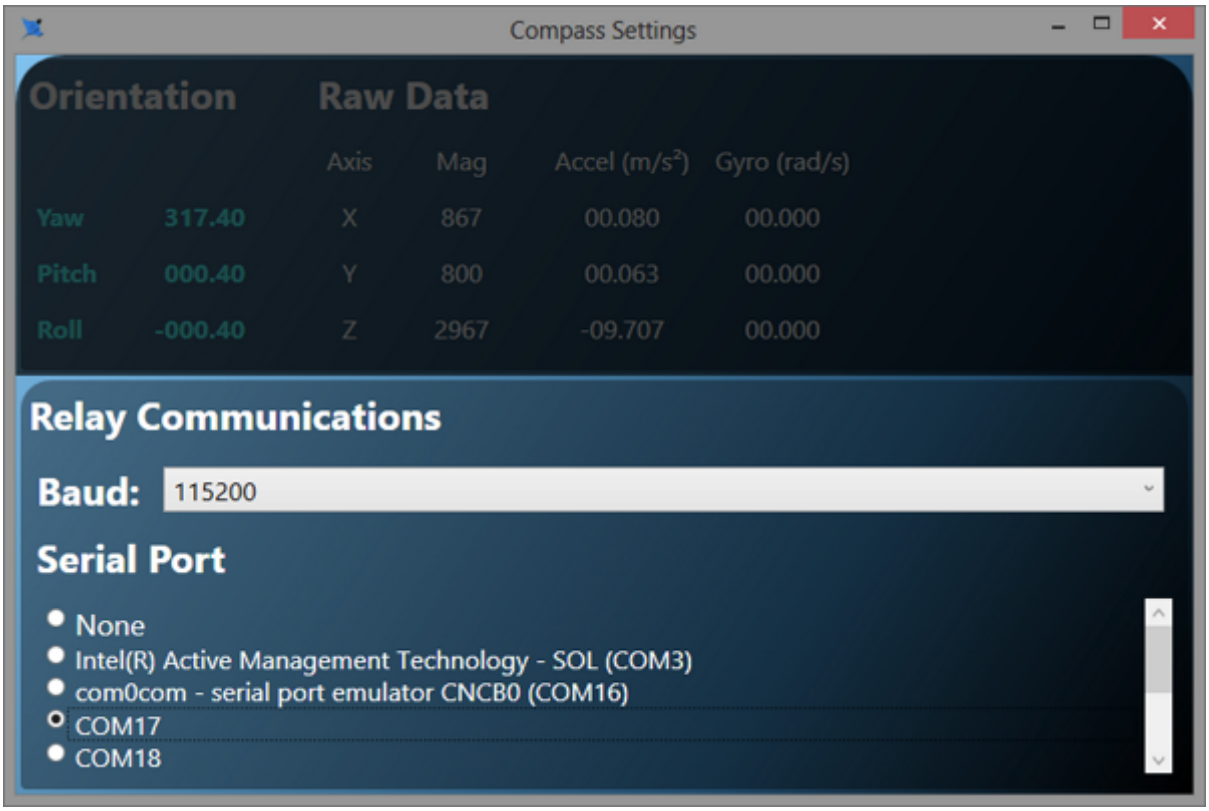
For best results with VideoRay CoPilot RI, the compass calibration should be completed to optimize its performance in your location. If you have moved 1 degree of Latitude or more from your last operating location or if you are operating near a large ferrous object like a ship, you should calibrate the compass. The compass calibration can be found in VideoRay Cockpit.

The remainder of this page is an expert from the Pro 4 Operator's Manual. For more information and context, see the Pro 4 Operator's Manual.

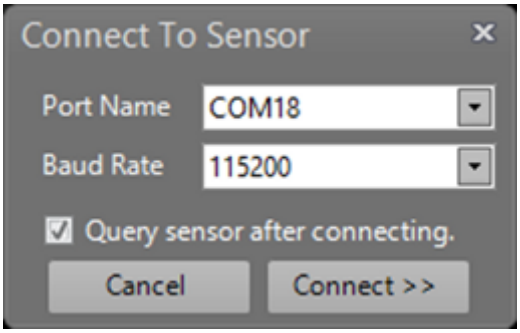
Compass Calibration - Vector Nav

To calibrate the Vector Nav compass, follow these steps:

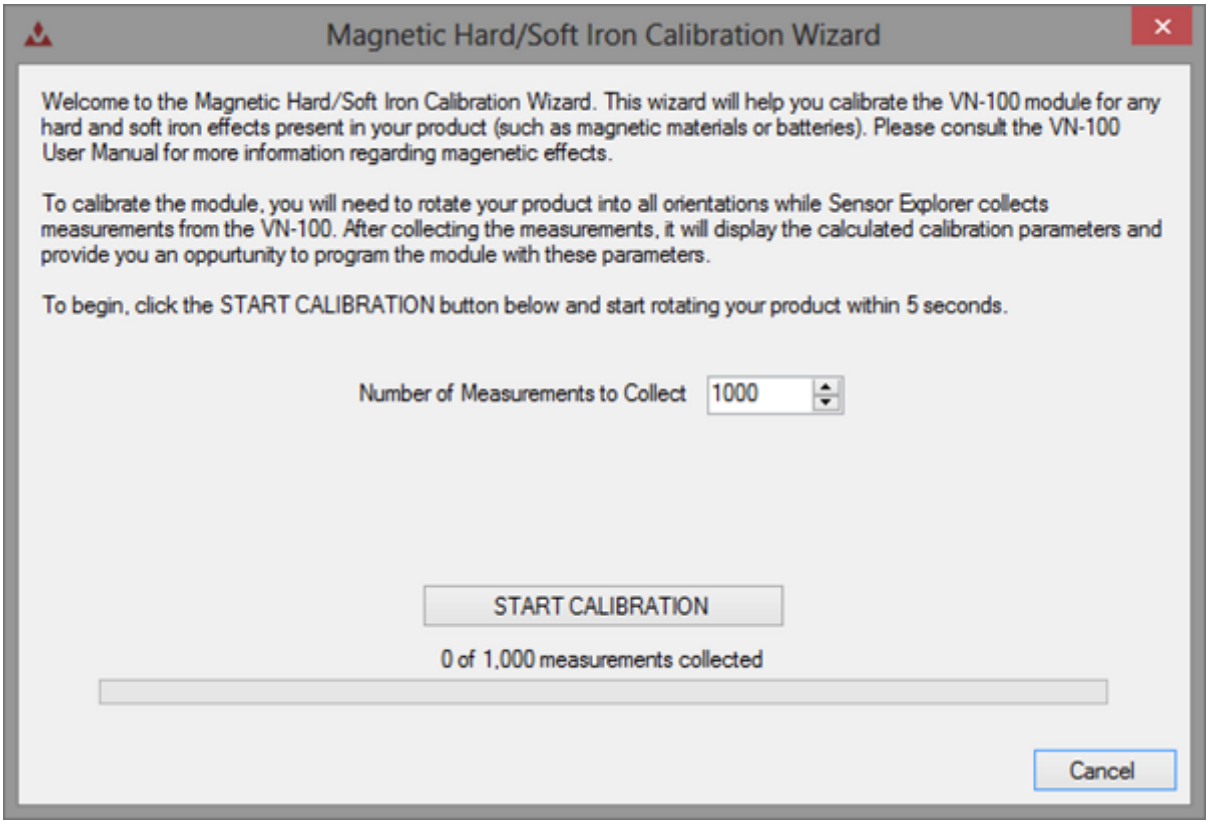
1. Start VideoRay Cockpit.
2. Click on the Engine Room button on the Control Bar.
3. Unlock the controls.
4. Click on the Calibrate Compass button, which has the magnet icon on it.
5. In the window that opens, select a Virtual Port (recommended Port is COM17). Set the baud rate to 115200 if it is not already.



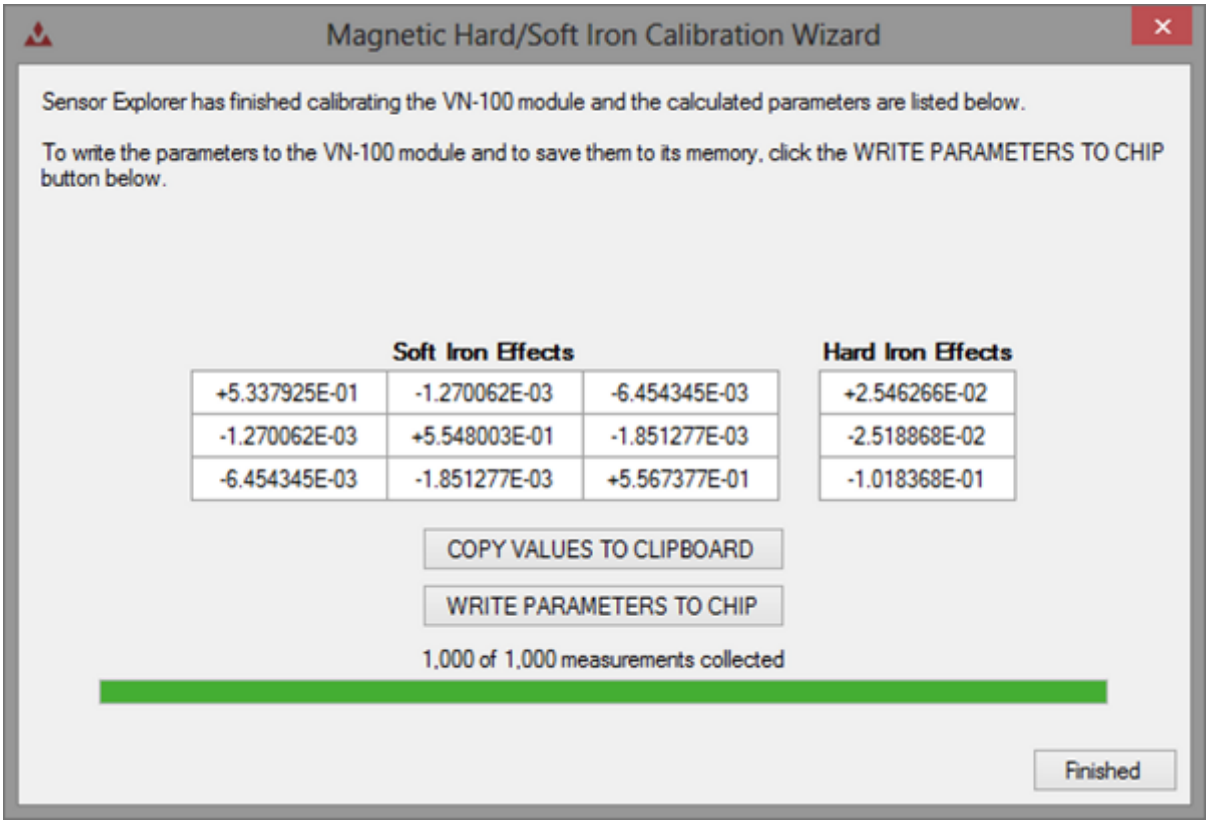
6. Minimize the Engine Room
7. Start the Vector Nav Sensor Explorer from the Windows Start Menu.
8. Select a Virtual Port (recommended port is COM18). Set the baud rate to 115200 if it is not already.



9. Ensure Query Sensor after connecting is checked.
10. Click on "Connect."
11. Right click on Sensor A in the upper left pane, and select Tasks->Perform Hard/Soft Iron Calibration.
12. In the window that opens, click on Start Calibration.



13. Slowly rotate the ROV so that it passes through all orientations. The easiest way to do this is to think of the dome as a pain brush and you are painting the inside of a sphere. Start with the ROV facing straight down. Lift the ROV in an arc until it faces straight up. Rotate 15 degrees. Lower the ROV to face straight down again. Rotate 15 degrees and repeat this process of up and down arcs until you have rotated a full circle.
14. Continue until the measurements have been completed and "Write Parameters to Chip" button appears.



15. Click on Write Parameters to Chip button.
16. Close the Vector Nav Sensor Explorer.
17. Expand the Engine Room.
18. Select None in the Port selection of the Compass Settings Window.
19. Close the Compass Settings window.

20. Close the Engine Room.
21. Check the calibration against known source.

⚠ Support for the Vector Nav compass requires VideoRay Cockpit version 1.8.35 or higher and ROV firmware version 2.6.4 or higher.

ROV GPS Filter

For best results with VideoRay CoPilot RI, the GPS Filter should be tuned to optimize its performance in your local conditions. The GPS filter can be found in VideoRay Cockpit.

The remainder of this page is an expert from the Pro 4 Operator's Manual. For more information and context, see the Pro 4 Operator's Manual.

ROV GPS Instrument

The ROV GPS instrument provides ROV location, status and filter settings for the ROV GPS.

⚠ The GPS data is only valid when the ROV is at the surface and the GPS antenna is exposed.

Display

Use

The ROV GPS instrument will display the current location and status of the ROV GPS. It also has the ability to set filter criteria that control whether the GPS information is passed from VideoRay Cockpit to other applications.

Position

The Latitude and Longitude of the GPS fix is displayed in the top center of the instrument.

Status

- Good - Data is being received and passed. If the Toggle Filter is On, the GPS has passed all filter criteria.
- Bad - Data is being received, but the data does not pass at least one of the filter criteria (see below).
- No - No Data is being received.

The number of satellites being observed is indicated by blue indicator lights.

Filters

Filters allow for better operational performance by eliminating GPS fixes that are based on poor data and have a greater degree of uncertainty. These filters can suppress apparent jumps in the reported location due to such erroneous data. Each filter is defined by a slider that represents a cutoff threshold. The cutoff threshold is set by moving the slider left or right on a scale. The value of the cutoff threshold is displayed as a tool tip when the mouse is hovered over the slider. The value of the data being received is displayed as a bar on a scale. If the value is good, the bar is green. If the value does not meet the cutoff threshold, the bar is red.

Filter Settings

- SNR (Signal to Noise Ratio) - The strength of the actual signal relative to background noise. Higher SNRs mean that the signal is stronger, which usually implies a better result. The SNR threshold setting should be set to 30 initially. If the SNR is below the threshold, the GPS information will not be passed.
- Speed (Knots) - The maximum ground speed of the vehicle based on successive GPS readings. The speed threshold setting should be set to the maximum expected speed of the vehicle - typically 1 knot. If the Speed is above the threshold, it is assumed that the GPS information is invalid and the GPS information will not be passed.

- HDOP (Horizontal Dilution of Precision) is a measure of the impact of the geometry of the observed satellites on the quality of the fix. Lower HDOPs mean that the geometric quality is better, which usually implies a better result. The HDOP threshold setting should be set to 2 initially If the HDOP is above the threshold, the GPS information will not be passed. HDOP values are generally defined as follows:
    - 1-2 Excellent
    - 2-5 Good
    - 5-10 Moderate
    - 10+ Poor
- DGPS (Differential GPS) DGPS provides a ground referenced correction to the GPS signal to improve the accuracy. If DGPS Only is checked, GPS Information will not be passed unless the signal is recognized as DGPS quality. If DGPS is not checked, the DGPS quality of the signal checked.

Toggle Filter - Toggle filter allows the filter to be turned on or off. If the filter is On, only those signals that meet all filter criteria are passed. If the filter is Off, GPS information is always passed.

⚠ The VideoRay ROV GPS is optional and may not be included in all VideoRay Pro 4 configurations.

Software Management

Managing VideoRay CoPilot software is not as complex as it sounds. Management topics include:

- Software Installation
- Software Updates
- Folder Structure

Software Installation

CAUTION Installation of VideoRay CoPilot RI is a complex process. Improper installation can result in an unstable computer. If you do have an intermediate or better understanding of installing and configuring software, contact VideoRay Technical Support for assistance.

⚠ CoPilot setup currently REQUIRES that the logged in (and thus installing) user be named VideoRay. This is standard on VideoRay provisioned production machines.

⚠ This setup also requires systems using a ROV GPS Mast and DVL to have the device PAMS programmed with the standard ID's. This may NOT be the case for some devices. In which case they will HAVE to be reprogrammed with vrDeviceConf. Please contact VideoRay Technical Support for assistance if necessary.

Step-by-step Instructions

1. Download the installation set to a temp folder on the target machine.
2. Install VideoRay Cockpit
3. Run the VMware-player-4.0.5-893925 to install VMware player. (This is only necessary if you do not have it installed, if you do you can press REPAIR without harming anything)
    a. Press NEXT
    b. Press NEXT
    c. Uncheck "Check for product Updates..."
    d. Press NEXT
    e. Uncheck "Help Improve VMware Player"
    f. Press NEXT
    g. Uncheck "Desktop"
    h. Uncheck "Start Menu Programs Folder"
    i. Press NEXT
    j. Press Continue
    k. Press Restart Now; wait for the reboot and login
4. Run the VM-CoPilot-AllVersions_*xx_xx_xx*.exe self extracting Virtual Machine (Press RUN if asked)
    a. Wait, then press OK when prompted.
5. Run the Setup_CoPilot, just press OK/NEXT for every dialog window
6. Configure the VMware network
    a. Go to Control Panel from the Windows Start menu
    b. Click on Network and Sharing Center
    c. Click "Change Adapter Settings" which is on the left pane
    d. Double click on Local Area Connection Properties
    e. In the properties windows, click on Internet Protocol Version 4
    f. Click on Properties
    g. Select the "Use the following IP address" radio button
    h. Enter 192.168.1.3 in the IP address box
    i. Enter 255.255.255.0 in the Subnet mask box
    j. Press OK to dismiss the Internet protocol properties dialog
    k. Press Close to dismiss the local area network properties window
    l. Close the Network connections window

7. Configure the VM networking
    a. Open a Windows Explorer, navigate to C:\Program Files (x86)\VMware\VMware Player
    b. Copy the Virtual Network Editor executable vmnetcfg.exe from the temp install folder (from step 1) into the VMware Player folder
    c. Run vmnetcfg.exe from the C:\Program Files (x86)\VMware\VMware Player folder
    d. Highlight VMnet8 in the white list box at the top of the window
    e. Make sure "Select the NAT (shared hosts IP address with VMs)" radio button is checked
    f. Make sure that "Connect a host virtual adapter to this network" is checked
    g. Make sure that the "Use Local DHCP service to distribute IP address to VMs" is checked
    h. Make sure that Subnet IP is set to 192.168.107.0
    i. Make sure that Subnet mask is set to 255.255.255.0
    j. Press the NAT settings button; in the NAT Settings dialog which pops up:
        1. Set "Gateway IP" to 192.168.107.2
        2. Make sure "Allow Active FTP" is checked
        3. Make sure "Allow any Organizationally Unique Identifier" is checked
        4. Set "UDP Timeout (in seconds)" to 30
        5. Press OK
    k. Press the DHCP settings button; in the DHCP settings dialog which pops up:
        1. Set "Start Address" to 192.168.107.128
        2. Set "End Address" to 192.168.107.254
        3. Set "Default lease time" to 0 days, 0 hours, 30 minutes
        4. Set "Max lease time" to 0 days, 2 hours, 0 minutes
        5. Press OK
    l. Press OK on the "Virtual Network Editor" to close the program
8. Start Cockpit (The ROV does NOT need to be connected)
9. Press the CoPilot button in the Cockpit Control Bar
10. Press "Yes, I accept the terms..." in VMplayer dialog which pops up
11. Wait for the VM to start...
12. Select "I COPIED IT" when prompted in the VM
13. If the warning "A USB Device that was previously..." pops up just press OK to dismiss. BE CAREFUL this may pop up behind the Virtual machine window. If the virtual machine is taking a long time to boot, try closing the VM to see if this is the case.
14. If a software update screen pops up you can press Download and Install. You should wait for the install to complete, once finished press the Close button. The update requires that the machine be connected to the internet.
15. Make sure the SeeByte HASP USB license key is inserted into a USB port.
16. In the blue Virtual Machine menu bar at the top of the screen select Virtual Machine\Removable Devices\Aladdin Knowledge Hasp...\connect (disconnect from host) NOTE: you may have to do this if you move the Hasp key to a different USB port)
17. Insure that the top monitor resolution is set to 1280x1024
    a. Right click on the Windows desktop, select Screen Resolution in the pop-up menu, if necessary change the top monitor resolution to 1280x1024
18. Move the VM to the top monitor and set it to full screen
19. If the the full software suite is not licensed then certain versions need to be removed:
    a. Double-Click on the Remove-Version icon.
    b. Press the number which corresponds to the version you wish to REMOVE
    c. Press Y to confirm the removal
    d. Press Y to exit the removal tool.
    e. Repeat these steps for each additional version to remove
    f. Right click on the Remove-Version icon
    g. Select "Move to Rubbish Bin" to delete the icon
20. Copilot should be operational now. Feel free to delete the temp install folder that was created in step 1.

Software Updates

For most CoPilot RI installations, it is best to remove previous versions of VideoRay Cockpit and CoPilot RI prior to installation of an update. Once the previous versions have been removed, follow the procedures for a new software installation.

Folder Structure

All CoPilot RI data is saved to a common data folder structure.

Contents	Folder
The default folder for charts	C:\Users\VideoRay\My Documents\VideoRay\Data\CoPilot\Chart\
The default folder for marker list files	C:\Users\VideoRay\My Documents\VideoRay\Data\CoPilot\Marker\
The default folder for missions, when a mission is saved	C:\Users\VideoRay\My Documents\VideoRay\Data\CoPilot\Mission\
The default folder for navigation logs, when recording has been activated	C:\Users\VideoRay\My Documents\VideoRay\Data\CoPilot\Navigation\
The default folder for screenshots, when the screenshot button is pressed	C:\Users\VideoRay\My Documents\VideoRay\Data\CoPilot\Screenshot\
Sonar logs can be found here when the log recorder has been activated.	C:\Users\VideoRay\My Documents\VideoRay\Data\CoPilot\Sonar\

 CoPilot RI runs in a virtual machine. Therefore it does not have access to all folders on the host computer. It only has access to those folders that are shared, which includes the folders listed above.