



**The Professional Motion Reference Unit:
A Motion, Heading and Position Sensor
for Marine Applications**

Hydrography and Bathymetry

Bathymetric or Hydrographic surveys are survey methods used for submarine topography that have been implemented for observation of marine landscapes and structures for several decades. With the technology for executing a survey becoming more affordable, many businesses which can benefit from such data begin to pursue the proper equipment to use for themselves. Most users have a common goal of being environmentally aware of changes occurring due to the interaction with nature. Studying these changes usually involves measuring physical and chemical features of a body of water; or generating a 3D map of an underwater landscape/structure, to show its current state, or how it changes over time. A few examples of these survey methods being put into practice are:

- Floodplain analysis
- Dock maintenance
- Seafloor tectonic interpretation
- Submarine life conservation
- Submarine natural resources deposit investigations

Enhancing Accuracy with Input From External Sensors

While operating on water, it's always beneficial to input aiding data from other sensors in order to increase accuracy of position, orientation and velocity. During extensive maneuvers or testing during harsh weather conditions, increased accuracy from external input into the Inertial Labs Motion Reference Units (MRUs) provides an extra layer of comfort. This aiding data, whether it be from a Stand-Alone Magnetic Compass (SAMC) or the vessel's gyrocompass, supplies important heading corrections particularly during GPS outages. This is because these instruments do not rely on satellite Line of Sight (LoS). Additionally, data can be input into the Inertial Labs MRUs from both an external GNSS receiver, or a Doppler Velocity Log (DVL).

TYPICAL ELEMENTS USED TO PERFORM SUBMARINE SURVEYS

Motion Reference Unit



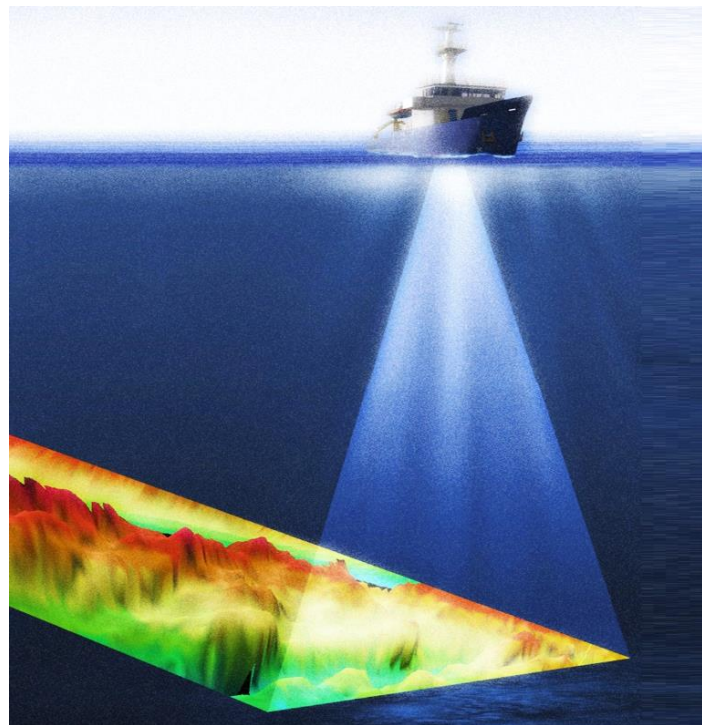
Naval Vessel

GNSS Antennas



Processing Software

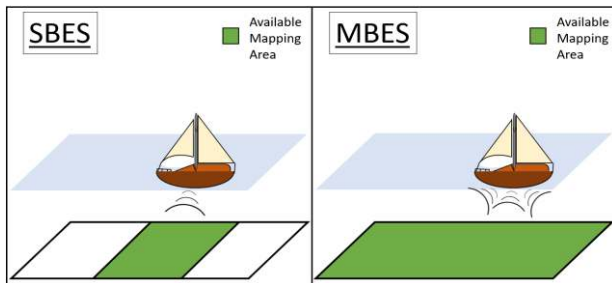
Multi-Beam Echosounder



The Inertial Labs MRU-PD is able to receive data from external sensors using industry-wide accepted sentence formats, where it directly passes it to internal algorithms while operating. Such sentences are National Marine Electronics Association (NMEA) messages. The NMEA-0183 sentence structure has many variants that can be used depending on the application need.

Compatibility with Single And Multi-Beam Echosounder

Building a quality hydrographic survey system means potentially needing to integrate an MRU with other devices to form a single stable framework. When investigating market solutions for integrable products to form a complete solution for surveying, the nature of how compatible the device is could help you avoid delays and unnecessary expenses. Inertial Labs offers full compatibility with both Single and Multi-Beam Echosounders (SBES, MBES). Unlike a SBES, a MBES utilizes multiple acoustic transducers arranged radially to increase the swath width when performing surveys. The image below shows the difference.



With ping rates of MBESs as high as 50 Hz, you can be confident that regardless of the water depth, when it is paired with an Inertial Labs MRU-PD, acceptable surveying data can be gathered without having to perform numerous passes. The MRU-PD has been tested and works seamlessly with MBES manufacturers like: Teledyne, Klein Marine Systems, Kongsberg, ITER SYSTEMS and NORBIT.

The Inertial Labs MRU-PD is Compatible with Multi-Beam Echosounders from:



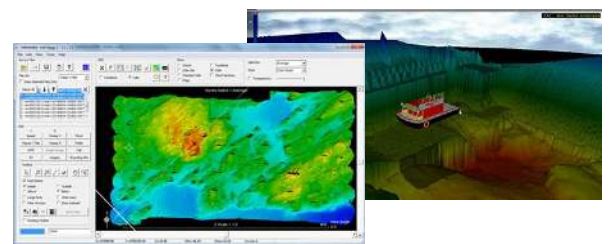
KLEIN
MARINE SYSTEMS, INC.



KONGSBERG

Fast and Reliable Post-Processing with HYPACK or QINSY

Post-processing surveyed data shouldn't be a painful process. That's why Inertial Labs has got your back when it comes to post-processing results. The MRU-PD is designed to collaborate with the most popular post-processing packages such as HYPACK, Qinsy and Qimera. When it comes to hydrography, and bathymetry, these programs are the best on the market for functionality and usability. These programs provide the best solutions to deal with collected data in a user-friendly way. HYPACK, and QPS, who owns both QINSy and Qimera, have been on the market for a long time and are knowledgeable enough to adapt to ever-changing application requirements using new technologies. With Inertial Labs collaborating with these companies, who are masters of their craft, you know you will receive the best products on the market with in-depth instruction and excellent customer care.



HYPACK hydrographic survey software solutions provides customers with data collection and processing that enable real time imaging, modeling, and statistical reporting.

QINSY QINSy software package is one of the leaders of the market for survey planning, acquisition, and real-time hydrographic data processing.

A Product You Can Trust: The Inertial Labs MRU-PD



The American Bureau of Shipping (ABS) approval process involves a design and manufacturing assessment to confirm that a product is developed in a way that conforms to the set industry standards and requirements that specifically apply to maritime and offshore assets. Depending on the manufacturing process, ABS can provide individual Unit Approval label for more custom products manufactured in smaller quantities, or a Type Approval label that then supports an efficient product certification process for bulk production in larger quantities.

During technical evaluation of all members of the Inertial Labs MRU product line, including MRU-PD, ABS assessed assembly drawings, designs and datasheets. Due to their assembly process and ability to determine: Pitch and Roll; Heave; Sway; Surge; Accelerations (X,Y and Z); Angular Rates (about X, Y, and Z axes); Heading, Velocity and Positions; the Inertial Labs MRU products are recognized as suitable for use with Dynamic Positioning Systems (DPS-1, DPS-2 and DPS-3) with an ABS approval label standing behind. ABS confirms the performance accuracy of 0.05 meters in measuring Heave, and an accuracy of 0.02 degrees when measuring Pitch & Roll (both while operating within the temperature range of -40 °C to 70 °C). As a result the Inertial Labs MRU products were issued Tier-2 PDA Certificate (Serial number 19-HS1851412-PDA) which ensures that the Inertial Labs MRU family doesn't require unit certification to be installed on ABS classed vessels.

Regularly producing a controlled, quality product, is one of the top priorities of the Inertial Labs team. The ABS stamp of approval is just one of the many things that sets us apart from other market competitors. By staying focused on the precision accuracy of our products while also collaborating with the ABS community, we are able to build lasting partnerships that are backed by trust and respect.



MRU-PD with embedded 8 or 64 GB Data Logger



	RTK	PPK
Heave, Surge, Sway (Accuracy, RMS)	0.05 m	0.02 m
Pitch and Roll (Accuracy, RMS)	0.02°	0.006°
Heading (Accuracy)	0.05°	<0.03°
Horizontal Position (Accuracy, RMS)	0.01 m	0.005 m
Acceleration (Accuracy, RMS)	0.005 m/sec ²	
Angular Rate (Accuracy)	0.0002 (deg/sec)	
Weight	320 grams	
Size	120 x 50 x 53 mm	

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About Inertial Labs Inc.

Established in 2001, Inertial Labs is a leader in position and orientation technologies for commercial, industrial, aerospace and defense applications. Inertial Labs has a worldwide distributor and representative network covering 20+ countries across 6 continents and a standard product line spanning from Inertial Measurement Units (IMU) to GPS-Aided Inertial Navigation Systems (INS). With application breadth on Land, Air, and Sea; Inertial Labs covers the gambit of inertial technologies and solutions.



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