Frequently Asked Questions

What hardware and software are required to perform a multibeam survey?

A multibeam survey requires 4 sensors as a minimum: a multibeam echosounder, a positioning sensor, an attitude sensor, and a heading sensor. The Baywei M5 is an integrated system which contains all the required sensors, whereas the Baywei M2 model is a standalone sonar which must be operated together with external sensors to provide a navigation solution.

A sound velocity profiler is also required, which is deployed at periodic intervals to measure the sound speed throughout the entire water column. This is used for ray tracing.

Baywei systems are operated via a Commercial Off-The-Shelf laptop or computer, using the Baywei Graphical User Interface (GUI).

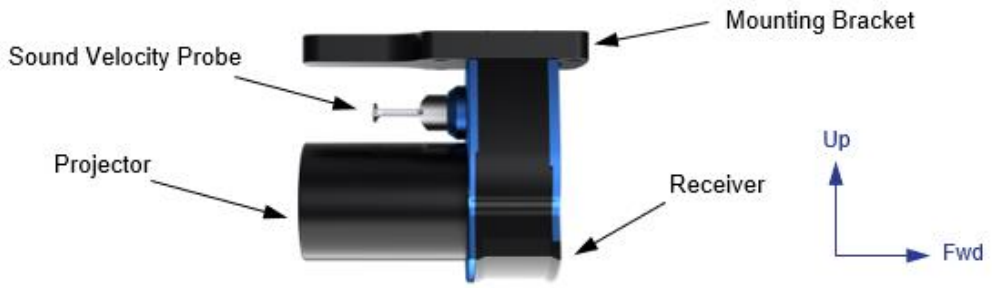
There are many data acquisition and processing software options available to collect and process Baywei data.

What software is required to process Baywei sonar data?

Baywei sonars are fully supported by all the major data acquisition and processing packages used by professionals of the hydrographic industry (eg.: those from HYPACK, QPS, or EIVA).
We also would like to draw the attention of Baywei Customers to some FREE software for simpler tasks, - e.g. MB-Systems, Sonar-Scope, or QGIS.
As Baywei uses a common and well-known data format, - the export of survey data to the above software packages is easy.

How should the sonar be mounted?

Mount the sonar with the projector pointing aft. The sonar should be mounted at least 0.7m below the waterline, and certainly below the vessel keel. On smaller platforms (ASVs and USVs) shorter depths may be necessary.



The sensors must be mounted rigidly and free from vibration, and there must be no independent movement between sensors. For Baywei M5, the GNSS antennas must have a clear sky view. It is recommended to separate the GNSS antennas by a distance of 2m.

Keep the sonar away from external noise sources such as engines and thrusters which cause interference. Ensure that the water flow over the sonar is smooth to avoid bubbles and turbulence, which impact acoustic performance.

What is the recommended survey speed?

The Baywei cylindrical array presents a more hydrodynamic profile allowing for faster transit, less vibration, and use of lighter mounting hardware. The typical speed for normal operation is 4-6 knots. Faster speeds are possible, but beware that increasing speed reduces sounding density in the along-track direction.

What factors affect resolution and sounding density?

The resolution of sonar data is determined by several factors. Frequency determines the beam width, and therefore the beam footprint, which determines the smallest detectable target size. Higher frequencies have smaller beamwidths which allow smaller targets to be measured. However, higher frequencies also have higher signal attenuation, which reduces range performance. For most applications, 400kHz is recommended.

The across-track sounding density is determined by the number of beams (256), swath angle, and beam distribution mode as defined by the user. Reducing the swath angle compresses all 256 beams into a smaller sector, increasing the sounding density. Using Equidistant beam spacing ensures equal spacing across the entire swath, whereas Equiangular spacing has a higher density at the nadir region and reduced sounding density at the outer beams.
The along-track sounding density is determined by the sonar ping rate and range (or depth). The sonar pings as fast as it can be based on the time it takes for the signal to travel from the transmitter to the seabed, and back to the receiver. Ping rate generally decreases as water depth increases. Vessel speed also impacts along-track sounding density.

How much overlap should I allow between survey lines?

The assumption with all multibeam systems is that the most reliable data is at the nadir region, directly beneath the vessel. Uncertainty increases away from nadir due to the influences of roll, sound velocity and offset uncertainties. The surveyor should aim to overlap the outer beams of adjacent survey lines to provide redundancy in areas with greatest uncertainty.

What inputs are required on the topside unit?

For Baywei M2, a timing input is required from a GNSS receiver. The input must be an NMEA ZDA message, interfaced to the serial port on the topside unit, and a 1 Pulse Per Second (1PPS) signal connected to the BNC port. Both inputs are essential for accurate time stamping of sonar data.

For Baywei M5 models, no inputs are required from external sensors, as the unit contains an integrated Inertial Navigation System (INS) which automatically handles the timing requirements internally.

What is the purpose of the sound velocity probe and sound velocity profiler?

Each multibeam system requires a surface sound velocity probe and a sound velocity profiler. The two sensors serve different purposes and should not be confused. Both are essential for hydrographic surveys. Incorrect sound velocity measurements cause the seabed profile to “smile” or “frown”, with greater errors in the outer beams.

The surface SVP is installed at the sonar head and is used to calculate tiny time delays for incoming signals as part of the beam steering process. It measures continuously throughout the survey.

An SV profiler is deployed at periodic intervals to measure the sound speed throughout the entire water column. This is used to compensate for the effects of sound velocity on signal trajectory through the water column.

How often should I deploy the sound velocity profiler?

It depends very much on the environment. In open seas, where the water column is fully mixed, it may be sufficient to deploy the profiler once every few hours as the sound velocity environment does not change much. In rivers and estuaries, where the sound velocity environment changes rapidly, more regular deployments are necessary. It is always better to have too many profiles than too few, as it cannot be easily corrected in post-processing.

Other questions?

Please contact us: support@bayweisonar.com