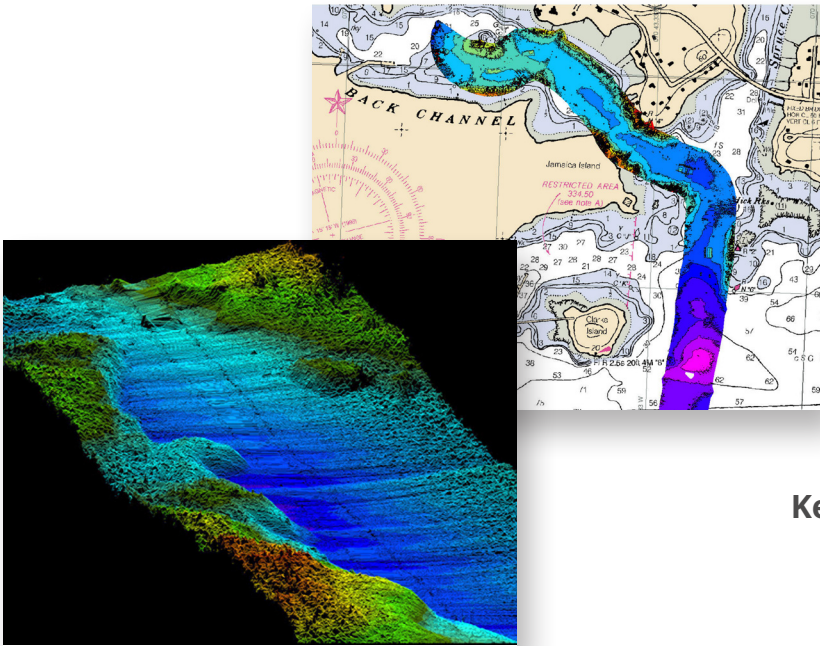


HYDROCHART 5000

SWATH BATHYMETRY SONAR SYSTEM



Key Features:

- “Best in Class” bathymetry accuracy and repeatability (IHO SP-44, special order surveys)
- High-resolution multi-beam side scan imagery
- Bathymetry coverage of up to 12 times water depth
- Co-registered geo-referenced swath bathymetry and side scan data
- Multiple mounting options
- Support for industry-standard interfaces and data formats
- Easy to install and operate with SonarPro® visualization software

Options:

- Surface sound velocimeter
- CTD sensor
- Customized hull-mount installation kit
- Motion reference unit
- Compatible with 3rd-party post-processing software

The Klein discriminator... IHO-quality bathymetry and high-resolution side scan in one system, providing unmatched performance!

The Klein HydroChart 5000 system is a hydrographic survey system which has the ability to simultaneously collect IHO-quality swath bathymetry and high-resolution multi-beam side scan sonar data in a co-registered and geo-referenced data set.

The HydroChart 5000 is the only product in its class to provide frequency modulated (FM) chirp processing for both bathymetry and side scan, providing high resolution with extended-range performance at no added cost.

The wide-swath bathymetry performance provides a 2x survey coverage advantage over traditional multi-beam echo-sounders in shallow water (50 m or less) and the multi-beam side scan has 10 cm side-scan resolution in the high-resolution mode.

The dual-functionality of the HydroChart 5000 effectively allows two surveys to be accomplished in one pass, saving significant ship time and expense.

The Difference Is In The Image

KLEIN MARINE SYSTEMS, INC. - Salem, NH



APPLICATIONS

In addition to shallow water hydrographic and geophysical surveys, the HydroChart 5000 is ideal for port and harbor security applications. Shallow water Improvised Explosive Device (IED) / mine hunting (MCM) detection demands high-resolution images that are only achievable with multi-beam side scan sonar technology. The additional co-registered bathymetric topographic mapping capability provides the ability to more accurately position bottom objects, which, in the case of IED detection, makes them far easier to return to for verification/prosecution.



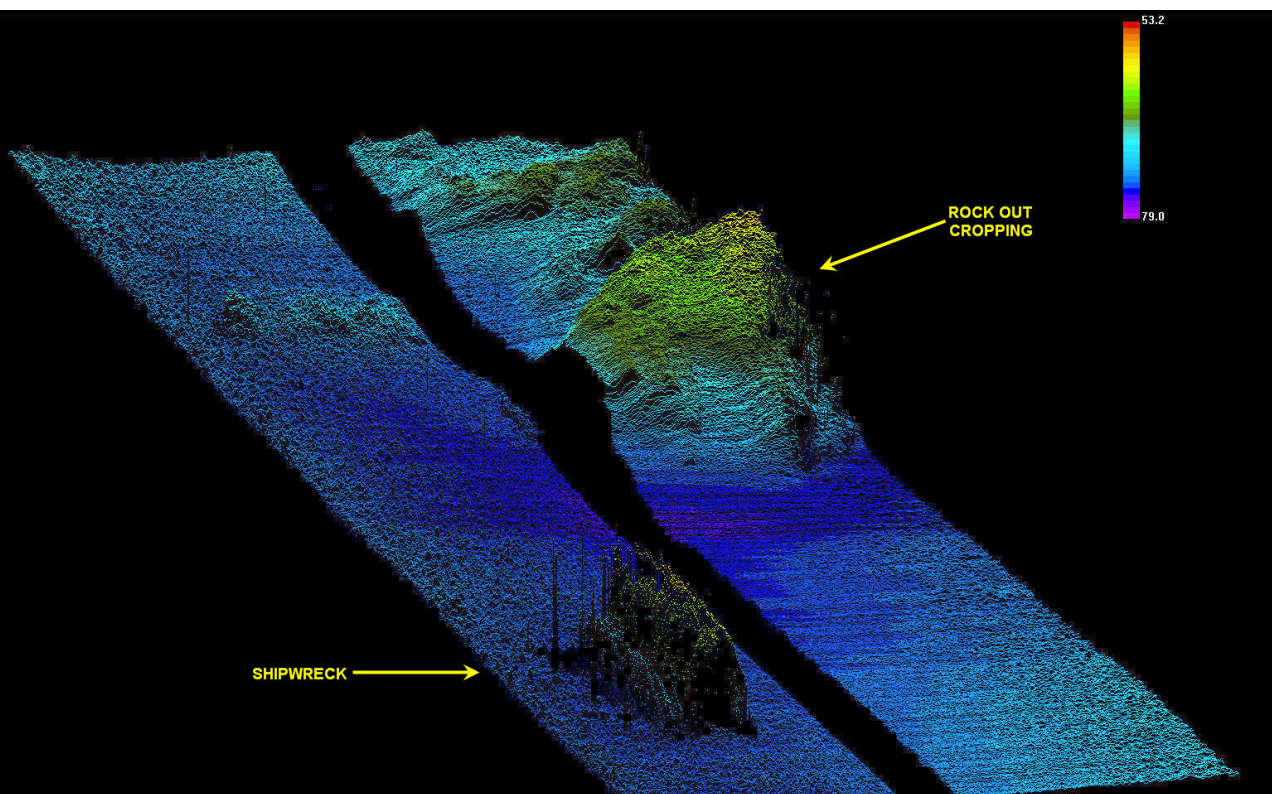
Hull Mount Option Available

Other Applications for the Klein HydroChart 5000 System Include:

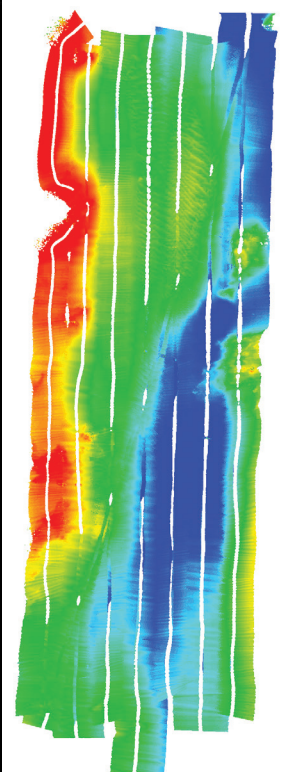
- Mine Counter Measures (MCM)
- Port and harbor security
- Shallow water hydrographic surveys
- Geophysical surveys
- Nautical charting
- Benthic habitat mapping
- Dredge operations

Benefits of HydroChart 5000:

- Much better spatial resolution than multi-ping
- Exceptional tonal image quality
- HydroChart has lower noise, higher bathymetry resolution at longer ranges



Sample Survey Data



SYSTEM CONFIGURATION

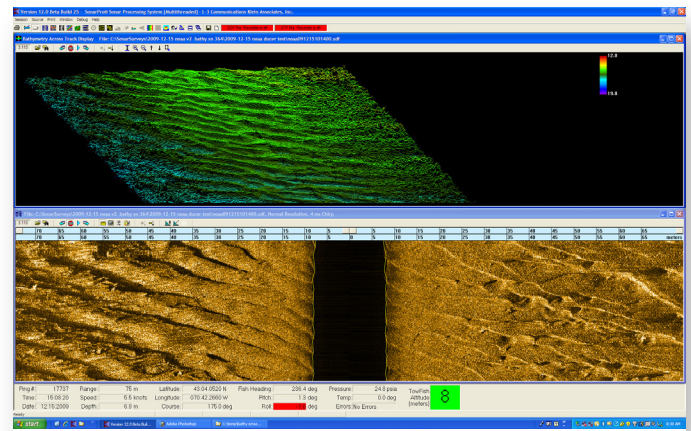
The Klein HydroChart 5000 system is specifically designed as a portable, shallow-water system which can be deployed easily in an over-the-side or bow-mount or hull-mount configuration. The system consists of the following components:

- Sonar head unit
- Transceiver processing unit
- SonarPro® workstation

Figure 1 (on back page) shows the configuration of the Klein HydroChart 5000 system. The sonar head unit consists of the sonar arrays together with a Sonar Electronics Unit (SEU), housed in a lightweight frame assembly. The SEU includes transmit/receive and digital circuits that combine time-synchronized complex stave samples, ping trigger timing and optional time-synchronized motion data from the vessel's sensors. An altimeter is provided as standard with the sonar head unit and the system readily accommodates an optional sound velocimeter or CTD. For hull-mount configurations, the SEU is located inside the vessel's hull and an optional transducer mounting bracket is required.

- As depicted in Figure 1, the system is designed to interface with a number of external sensors:
- Motion reference unit (pitch/roll/heave)
- GPS receiver (position and time)
- Gyrocompass (heading)
- Altimeter (depth below transducers)
- Surface (transducer) sound velocimeter (corrects for surface sound velocity variations) or CTD
- Sound velocity profile data or (speed of sound corrections in the water column)

A Transceiver Processing Unit (TPU) combines power for the underwater component with bi-directional communication to control the underwater circuits and receive data. The TPU accepts a 1PPS pulse from either the GPS navigation or a time reference unit. Together with a NMEA time sentence via either RS-232 or Ethernet, the pulse provides a timing reference to merge position and vessel motion with ping data, sonar, sensor and navigation data. Time stamping is accomplished in hardware with sub-millisecond accuracy, so software response time does not degrade accuracy.



SonarPro® Bathymetry / Side Scan Display

Motion data is provided to the system from an external shipboard or sound head motion sensor. The TPU can accept motion data via either RS-232 or Ethernet. Navigation, heading and sound velocity profile (SVP) data are also accepted as RS-232 or Ethernet inputs to the TPU. The HydroChart 5000 system can interface to most commercially available sensors.

The SonarPro® workstation provides the operator interface to the HydroChart 5000 system. SonarPro® is a comprehensive software package developed to support survey planning, data visualization & quality control, target management and data recording & playback. SonarPro® also performs the side scan and bathymetry data processing. Data can be logged in SDF, GSF or XYZ format. These formats are supported by most 3rd-party post-processing software applications. In addition to processed data, raw stave data can be logged together with all motion, navigation, and heading and sound speed data. This permits reprocessing of both side scan and bathymetry data in a post-processing environment.



HYDROCHART 5000

SWATH BATHYMETRY SONAR SYSTEM



Specifications:

General Specifications	
Deployment Method	Over the side or hull mount
Max Water Depth Below Transducer	50 m
Frequency	455 kHz
Pulse Length	Chirp (16 msec max)
Input Voltage	115/240 VAC, 50/60 Hz
Power	120 W
Sonar Head Dimensions	64" x 7.83" x 6.62" L x W x H
TPU Dimensions	Rack Mount, 3U x 20"
SonarPro® Workstation Dimensions	Rack Mount, 2U x 19"
Swath Bathymetry Specifications	
Maximum Swath For Bathymetry	10-12 times water depth
Resolution (Along Track)	0.4°
Resolution (Across Track)	5 cm
Bathymetric Data Outputs	SDF, GSF & XYZ
Side Scan Sonar Specifications	
Swath Range	250 m (500 m swath) in reconnaissance mode
Number of Beams	5 port and 5 starboard
Resolution (Along Track)	10 cm at 38 m 20 cm at 75 m increasing to 36 cm at 150 m and 61 cm at 250 m (in reconnaissance mode)
Resolution (Across Track)	3.75 cm

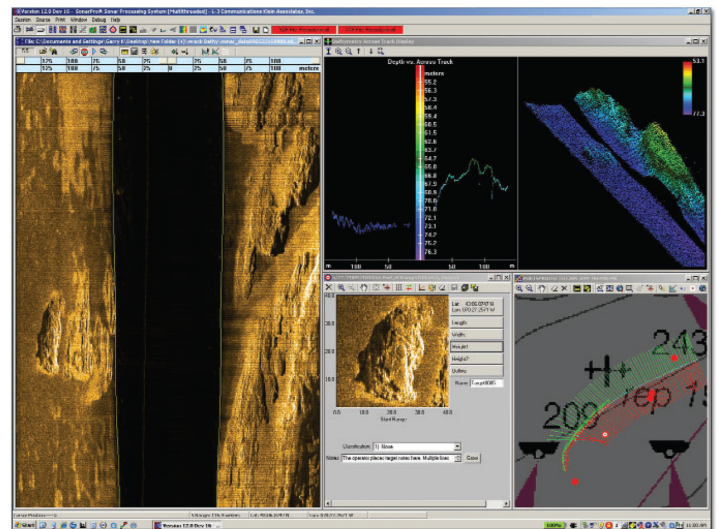
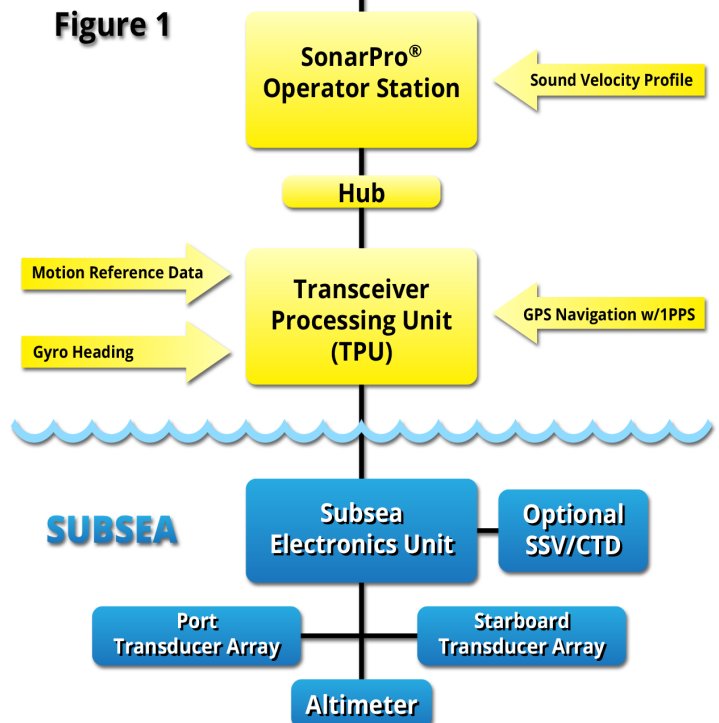


Figure 1



Accuracies demonstrated by the Klein HydroChart 5000 System meet IHO SP-44 Special Order standards for hydrographic surveys

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