

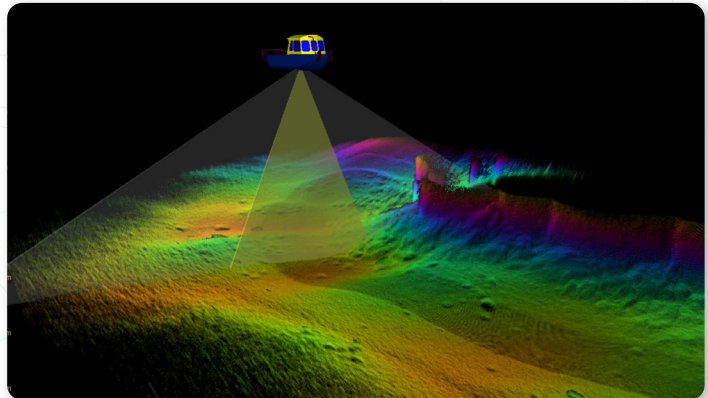
# Echoscope PIPE® WAVM

*Wide-Area Volumetric Mapping (up to 125° across track x 25°)*

The next-generation real-time volumetric mapping and underwater spatial awareness tool - transforming subsea mapping from post-processed bathymetry into live volumetric spatial intelligence.

The Echoscope PIPE® Wide-Area Volumetric Mapping technology, available, now on all Echoscope PIPE®, represents the next evolution of real-time 3D volumetric sonar mapping, combining proven Echoscope®-derived technology with ultra-wide-area acoustic mapping capability across swaths of up to 125 degrees across-track x 25 degrees.

Traditional multibeam systems are fundamentally optimized for sequential bathymetric surface acquisition, where the primary objective is to generate a seabed map for later analysis. In contrast, the Echoscope PIPE® WAVM technology is designed to simultaneously monitor a live underwater scene with moving targets in real time while continuously generating true real-time 3D volumetric data across an expanded field of view, enabling simultaneous visualization of vertical structures, subsea infrastructure, water-column targets, and seafloor environments within a single coherent acoustic scene.



This allows operators to move beyond conventional “survey-after-the-fact” workflows and instead interact with a persistent live 3D acoustic representation of the subsea environment as operations are taking place.

This wide-area volumetric imaging and mapping technology can, for example, provide an instantaneous mapped seafloor coverage area of approximately 1,300 m<sup>2</sup> in only 25 m water depth, while simultaneously maintaining persistent real-time volumetric observation of the full water column and surrounding underwater environment.

The system also incorporates our patented ERSA (Enhanced Resolution Split Aperture) beamforming technology (patent **US12,566,264**), enabling significantly improved beam detection accuracy, angular precision, and target localization performance across the entire swath — including at extreme steering angles where conventional beamforming approaches typically experience degradation in resolution and phase coherence. By utilizing advanced split-aperture processing techniques, ERSA maintains high-fidelity target definition, improved edge-of-swath performance, and enhanced volumetric consistency throughout the full acoustic field of view.

Echoscope PIPE® users can already benefit from our Sequencer technology, which allows them to use a single device for multiple purposes simultaneously. Sequencer allows you to configure multiple sets of acoustic parameters and processing steps, which will be run concurrently and provide separate data streams that can be used for different purposes. WAVM can make full use of Sequencer’s capabilities, allowing the user to collect ultra-wide-angle seabed data while also gathering tightly focussed high-frequency data on a specific area of interest.

In addition to real-time 3D volumetric imaging and mapping, the system provides simultaneously steerable full-time series acoustic data products for:



This enables concurrent acquisition of high-resolution volumetric mapping data together with focused application-specific acoustic views throughout the survey, maintaining persistent full water-column observation without compromising update rate or spatial fidelity.

Leveraging adaptive variable transmit steering, the sonar can dynamically optimize acoustic energy distribution toward mission-critical regions of interest — including vertical assets such as quay walls, monopiles, risers, pilings, vessel hulls, and subsea infrastructure — while simultaneously maintaining wide-swath high-resolution seafloor mapping performance. The steerable architecture allows operators to prioritize target regions and inspection geometries in real time while preserving the high target density, volumetric resolution, and low-latency responsiveness associated with standard Echoscope® systems.

**Key capabilities include:**



Real-Time 3D Volumetric Mapping and Imaging



Concurrent 2D Imaging Sonar Capability



Up to 125° Across-Track x 25° Wide-Area Swath Coverage



Simultaneous Narrow Beam Imaging (NBI)



ERSAs (Enhanced Resolution Split Aperture) Beamforming



Integrated Profiling and Cross-Sectional Analysis Modes



Simultaneous Full Water-Column Observation



Adaptive Application-Focused Transmit Steering



Dense Real-Time Acoustic Point-Cloud Generation



Simultaneous Vertical and Horizontal Asset Mapping



Steerable Full Time-Series Acoustic Data Output



Echoscope® - Class Spatial Resolution and Target Fidelity

The platform is designed for advanced subsea operations requiring instantaneous spatial awareness and persistent volumetric observation across complex underwater environments, including:



Offshore Energy and Renewables Inspection



Port and Harbor Security



Digital Twin Generation



Subsea Construction and Intervention



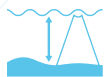
Hydrographic and Dredging Operations



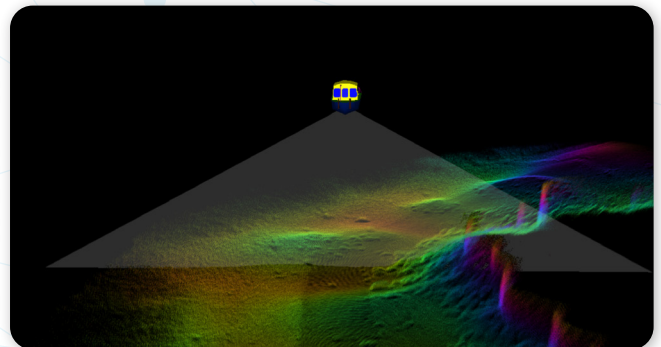
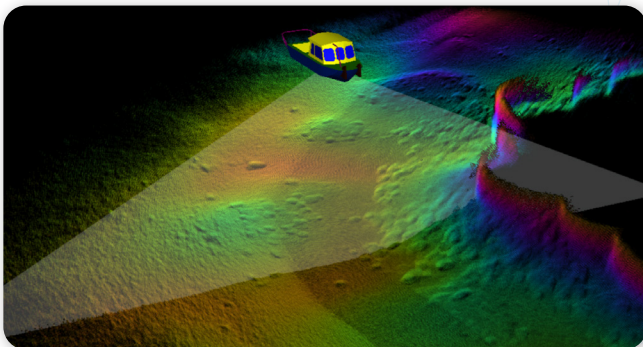
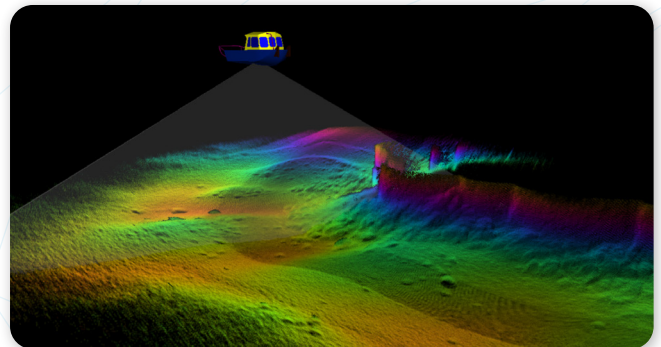
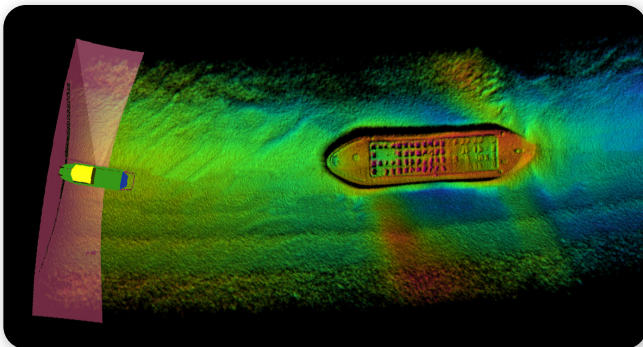
UXO and Object Detection



ROV and AUV Navigation



Water-Column Target Tracking and Infrastructure Monitoring



Description

WAVM

Mid-Frequency

High-Frequency



Centre Frequency

345 kHz

375 kHz

630 kHz

Frequency Range

315 kHz - 375 kHz

315 kHz - 425 kHz

550 kHz - 700 kHz

Maximum Range<sup>^</sup>

120 m (394 ft)

120 m (394 ft)

80 m (262 ft)

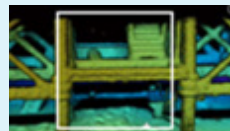
<sup>^</sup> The actual working range will depend on the target's size, reflectivity, and the level of detail required for the application.

Transmit (Tx)  
Field of View

125° x 25°

52° x 52°

25° x 25°



Switchable Coverage  
(Shapes)

Horizontal - Adaptive  
Vertical - Fixed

Fixed

Fixed

Acoustic Projectors

WAVM (345 kHz)

Mid Frequency (375 kHz)

High Frequency (630 kHz)

Adaptive Frequency  
Band

345 kHz:  
315 kHz - 375 kHz

375 kHz:  
315 kHz - 425 kHz

630 kHz:  
550 kHz - 700 kHz

Number of Beams  
(Density)

Up to 960 x 192

Up to 256 x 256

Number of Values per  
Beam

2,500  
(Dependent on Features Purchased)

Maximum Range\*

120 m (394 ft) at 375 kHz

120 m (394 ft) at 375 kHz

80 m (262 ft) at 630 kHz

Minimum Range\*

0.5 m  
(1.64 ft)

\*The actual working range will depend on the target's size, reflectivity, and the level of detail required for the application

Range Resolution	3 cm (1.2 in)				
Angular Resolution (ERSA)	Up to 0.1°				
Update Rate (Ping Rate)	Up to 50Hz				
Angular Beamwidth	Up to 0.6° x 0.6°				
Angular Coverage	315 kHz - 375 kHz	315 kHz - 425 kHz:	550 kHz - 700 kHz:		
	25° x Up to 125°	54° x 54° - 46° x 46°	33° x 33° - 25° x 25°		
Dimensions (H x W x D) (Excluding Handles and Connectors)	368 x 301 x 162 mm (14.2 x 11.9 x 6.4 in)				
Weight in Air	Surface 12.7 kg (28 lbs)		Deepwater 22.3 kg (49.2 lbs)		
Power Consumption	3 - 6 A at 24VDC **An up to 10 A inrush for less than 2 μs may occur on start up				
Depth Rating	40 m (131 ft)	250 m (820 ft)	600 m (1968 ft)	3000 m (9842 ft)	4000 m (13123 ft)

Echoscope®, Echoscope4G®, Echoscope® PIPE, Echoscope® Ping Pong, Echoscope® 5D, Echoscope® 6D, Ping-Pong Sonar®, Ping-Pong Echoscope®, Echoscope PIPE® Nano Gen Series, 4G USE®, CodaOctopus®, F180 Series®, F280 Series® (Reg, Us Pat & TM off) are trademarks of Coda Octopus. The information in this publication was correct when it was published but specifications may change without notice. Photos are included for illustrative purposes only and actual items may differ in appearance. Coda Octopus does not assume responsibility for typographical or photographic errors.