PRODUCT GUIDE

Acoustic Communications

A Full Line of Wireless Acoustic Modems



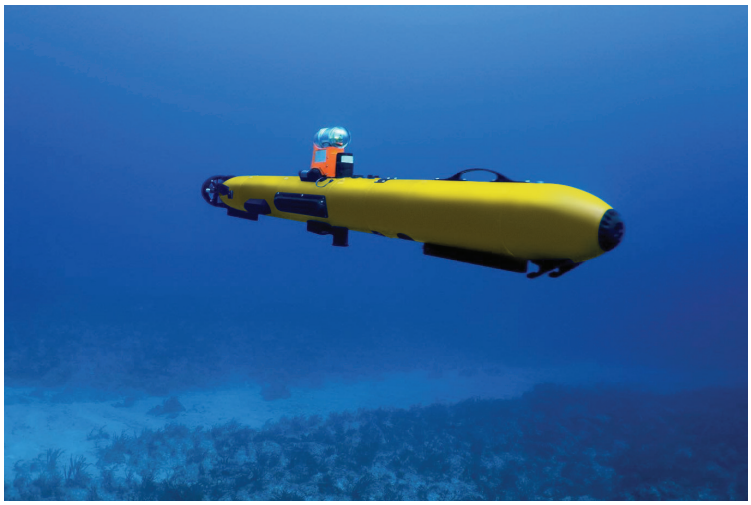
TELEDYNE MARINE
BENTHOS
Everywhereyoulook™

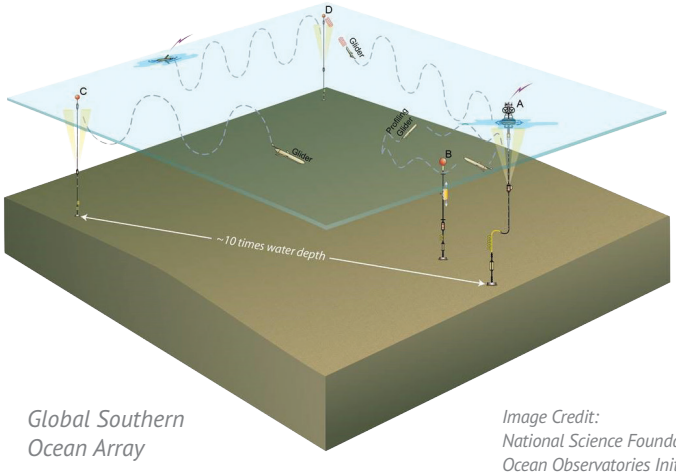
Acoustic Modem Use Cases

Ocean Observatories

The Ocean Observatories Initiative (OOI), funded by the National Science Foundation (NSF), is a series of networks of subsea sensors designed to measure physical, chemical, geological and biological variables in the ocean. This data is used by numerous stakeholders on a coastal, regional and global scale.

In deep water networks, and areas where hard wire connections are not viable, Teledyne Benthos acoustic modems make it possible to wirelessly transmit stored ocean sensor data to a passing Teledyne Webb Research glider, which in turn, is relayed to shore via satellite telemetry.





Global Southern Ocean Array

Image Credit: National Science Foundation's Ocean Observatories Initiative

Autonomous Underwater Vehicles

Today's Autonomous Underwater Vehicles (AUVs) come in all shapes and sizes, but all users share the critical need to wirelessly communicate with and track their vehicle position with a high degree of accuracy.

The industry's leading AUV manufacturers, as well as commercial, military and defense organizations around the globe depend on Teledyne Benthos to deliver proven standard and custom OEM solutions for their vehicles' combined a-comms and positioning capability.

Fisheries Management

Innovasea provides critical tools to monitor fish and marine mammal behavior, movements and habitat to enable better decisions surrounding management and conservation.

Teledyne Benthos acoustic modems are a key component of their system used for tracking and recording tagged fish populations, allowing collected data to be delivered in real time to the surface or a passing glider. Teledyne's modems are ideally suited for this application due to their robust communication schemes, low power consumption, and proven dependability in a wide array of challenging environments.





Diver Communications and Positioning

In an effort to keep commercial and military divers safe and connected, manufacturers such as Shark Marine count on Teledyne Benthos acoustic modems to provide dependable wireless communications to link divers to the surface, to one another when diving in teams, and to other assets that may be utilized in a given application.

Teledyne's OEM modems' compact size, low power draw, and ability to provide simultaneous acoustic comms and acoustic positioning, allows divers to navigate their mission with full confidence and precision.

A full suite of interoperable solutions to empower your next deployment

Teledyne Benthos proven acoustic modem processing technology can also be found in our acoustic positioning and recovery product lines, greatly expanding the capabilities, value and versatility of these systems.

Universal Topside (UTS)

The UTS-9500 is the result of a focused engineering effort to devise the ideal topside unit for any level of user.

From novice to the seasoned pro, the UTS delivers a user-friendly interface with powerful, intuitive, communication, command and control features to enhance the user experience and ensure you remain in control of your operations at all times.

This Universal Topside can communicate with Teledyne Benthos' full line of acoustic modems, releases and positioning products.



Teledyne Benthos offers these additional modem-based products to meet your subsea needs:



All-In-One: Range, Bearing, and Data Communication

Teledyne Benthos DAT (Directional Acoustic Transponder) is an extension of the modem family which automatically estimates the azimuthal and vertical arrival angles of a message sent by a remote modem. This allows the system to work as a "modified" ultra-short baseline (USBL), utilizing a broadband component of a message to form estimates of arrival angle(s) to deliver bearing as well as the range info that's provided by all of our modem-based products.

The DAT's compact size and low power consumption make it appropriate for both surface and subsurface platforms.

The DAT OEM version allows integration of both acoustic modem and subsea positioning functionality onboard subsea and surface vehicles.

Acoustic Releases

Teledyne Benthos full line of acoustic releases employ the latest in digital signal processing (DSP) technologies, allowing them to report system status and other critical data to ensure the health and integrity of your mooring, and ensuring its safe recovery.



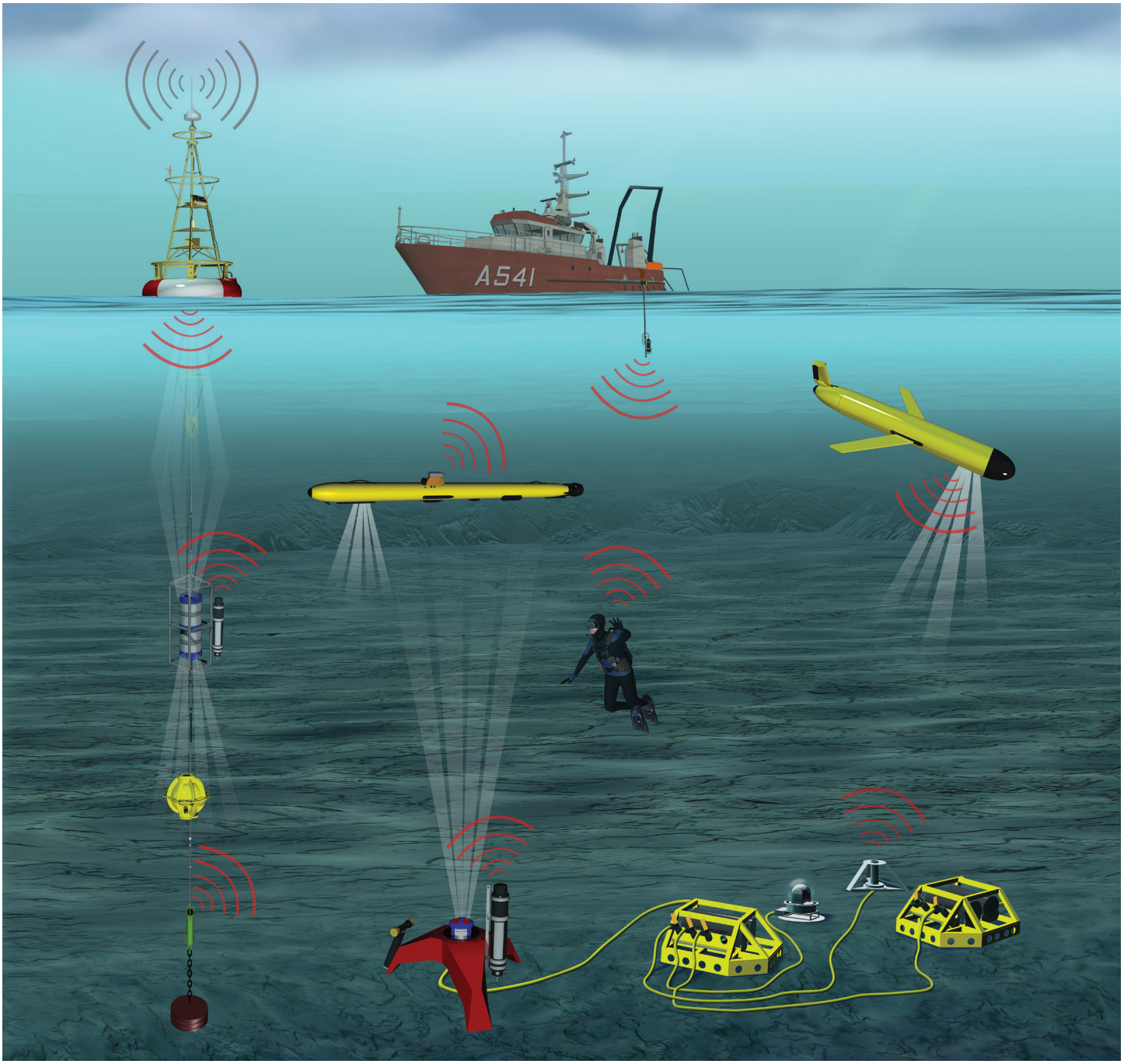
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How and Where Acoustic Modems are Used

Teledyne Benthos Underwater Acoustic Modems are used worldwide in subsea applications to transmit data wirelessly through the water. Wireless transmission significantly reduces the cost, complexity, and risk associated with traditional underwater cables and connectors, and allows for endless versatility. Acoustic modems can be used in any number of scenarios to transmit data or commands to/from a subsea asset to the surface; or between subsea assets.



What Sets Us Apart

- Reliable, robust, proven long distance communications
- Flexible housing designs to fit virtually any deployment configuration
- Optional features such as high capacity data logging, in band acoustic recording, arbitrary waveform play, dual serial port available and GNSS/Nav
- Transducer options including omnidirectional and directional, both integrated and remote versions
- Modems can be used in conjunction with the Benthos positioning product line
- All modems are compatible with the new Janus interoperability standard

Teledyne Benthos Acoustic Modem Selection Guide

BLUESTREAMX2
Double Data Rate WideBand C

A Solution for Every Application

Products not shown to scale >>



UCM-900 Series
Smallest Benthos modem available



CM-900 Series
Value-priced compact modem

	Ultra Compact Modem	Compact Modem
Depth Rating	Up to 6000m OEM / 750m self-contained	1000m
Power Source	External power only	External power or internal battery options
External DC Input Power	12-36 VDC	7–14 VDC
OEM Board Dimensions (L x W x H, inches)	2.4 x 1.9 x 1.1	6.50 x 1.63 x .94
OEM Board Weight (in air)	0.12 lb (0.05 kg)	0.06 lb (0.03 kg)
Housing Dimensions (inches), xducer not included	5.75 in. long x2.7 in. dia	14.3 in. long x 2.9 in. dia
Housing Weight (air/water), approx	1.4 lb (0.675 kg) / 0.47 lb (0.214 kg)	3.7 lb (1.68 kg) / 1.3 lb (0.59 kg)
Frequency / Typical Range[2]	Wide Band C (20-30 kHz) up to 1.8 km range	LF (9-14 kHz) up to 4 km range; MF (16-21 kHz) up to 2 km range; Wide Band C (20-30 kHz) up to 1 km range
Frequency Band / Source Level	Wide Band C (20-30 kHz) 175 dB re 1 µPa @ 1 m typical	LF (9-14 kHz) MF (16-21 kHz) 170 dB re 1 µPa @ 1 m typical WideBand C (20-30 kHz) 172 dB re 1 µPa @ 1 m typical
Addressable modems	250	
Bit rates / Modulation Techniques	140-4800 bits/sec (BLUESTREAMX2); 140–2400 bits/sec (MFSK transmit/receive); 80 bits/sec (FH transmit/receive)	
Tilt range & Accuracy	0–180° in 1° increments & ± 1° in minimal motion conditions	
Temperature, operating	-5°C to 50°C	
Temperature, nonoperating	-45°C to 85°C	
Serial Interface	True RS-232	3.3 VDC CMOS serial or 3.3 VDC RS-232 Emulation mode
Receive Active Power Consumption	345 mw @12 VDC, typical 360 mw @12 VDC, max	400 mW @12 VDC, typical 445 mW @ 12 VDC, max
Transmit Power Supply Requirements	4 W, average; 10 W, peak	2 W, average; 5 W, peak
Low Power[3]	3.5 mW max with 48-sec wake up period	3 mW max @ 12 VDC with 48-sec wakeup period
Additional Feature Key Options	LBL/Multi Receive (-M) Waveform play (-W)	LBL/MultiReceive (-M) Waveform play (-W)

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BLUESTREAMX2
Double Data Rate WideBand C

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ATM-910 Series
Shallow-water acoustic modems, battery or external power



ATM-920 Series
Mid-water acoustic modems, battery or external power



ATM-960 Series
Deep-water acoustic modems, battery or external power



ATM-903 Series
OEM modem board set with transducer

	Acoustic Telemetry Modem - ATM Series			
Depth Rating	500m	2000m	6000m	Up to 6000m
Power Source	ATM-914 Internal[1] / ATM-915 Internal / ATM 916 External	ATM-924 Internal[1] / ATM-925 Internal / ATM 926 External	ATM-964 Internal[1] / ATM-965 Internal / ATM 966 External	External Power
External DC Input Power	12-36 VDC			
OEM Board Dimensions (L x W x H, inches)	5.64 x 2.78 x 1.83			
OEM Board Weight (in air)	0.6 lb (0.27 kg); 0.7 lb (0.32 kg) SD Datalogger ("-D") option			
Housing Dimensions (inches), xducer not included	914- 30.4 in. long x 4 (OD) 915- 32.2 in. long x 4 (OD) 916- 16 .1 in. long x 4 (OD)	924 - 29.7 in. long x 3.5 (OD) 925 - 33.5 in. long x 3.5 (OD) 926 - 14.9 in. long x 3.5 (OD)	964- 28.8 in. long x 5 (OD) 965- 29.2 in. long x 5 (OD) 966- 14.7 in. long x 5 (OD)	*See OEM Board Dimensions Above
Housing Weight (air/water), approx	914- 20 lb (9.1 kg) / 6 lb (2.7 kg) 915- 22 lb (10 kg) / 6 lb (2.7 kg) 916- 12 lb (5.4 kg) / 4lb (1.8 kg)	924 - 21 lb (9.5 kg) / 9 lb (4.1 kg) 925 - 24 lb (10.9 kg)/ 11 lb (5.0 kg) 926 - 9 lb (4.1 kg)/ 4 lb (1.8 kg)	964- 37 lb (16.8 kg) / 19 lb (8.6 kg) 965- 38 lb (17.2 kg) / 20 lb (9.1 kg) 966- 16 lb (7.3 kg) / 7 lb (3.2 kg)	*See OEM Board Weight Above
Frequency / Typical Range[2]	LF (9-14 kHz) up to 6 km range; MF (16-21 kHz) up to 4 km range; Wide Band C (20-30 kHz) up to 1.8 km range			
Frequency Band / Source Level	LF (9-14 kHz) 185 dB re 1 µPa @ 1 m typical MF (16-21 kHz) 183 dB re 1 uPa @ 1 m typical WideBand C (20-30 kHz) 178 dB re 1 µPa @ 1 m typical			
Addressable modems	250			
Bit rates / Modulation Techniques	140-4800 bits/sec (BLUESTREAMX2); 140–2400 bits/sec (MFSK transmit/receive); 80 bits/sec (FH transmit/receive)			
Tilt range & Accuracy	0–180° in 1° increments & ± 1° in minimal motion conditions			
Temperature, operating	-5°C to 50°C			
Temperature, nonoperating	-45°C to 85°C			
Serial Interface	True RS-232/422/485/3.3V CMOS			
Receive Active Power Consumption	550 mW typ@ 24VDC, Acoustic Recorder or SD Datalogger / 630 mW typ @ 24VDC, with Acoustic Recorder or SD Datalogger option 600 mW max@ 24VDC, without Acoustic Recorder or SD Datalogger / 720 mW max @ 24VDC, with Acoustic Recorder or SD Datalogger option			
Transmit Power Supply Requirements	20W average, 60w peak			
Low Power[3]	10.2 mW typ @ 24 VDC 12 mW max @24 VDC			
Additional Feature Key Options	LBL/Multi Receive (-M); SD Datalogger (-D); Dual Serial Port (-B); Acoustic Recorder (-I); Waveform play (-W)			

[1]Remote head transducer [2]Dependent on multipath and environmental conditions [3]Hibernate state "low power" for Compact Modems / Sleep state "low power" for ATM