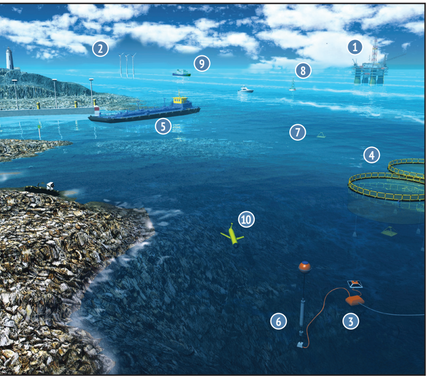
How and where is an ADCP used?



Offshore Energy Applications:

1. **Oil & Gas**
   Long range current profiles and wave measurement in support of deepwater oil and gas exploration, drilling and production. Real-time current measurement for decision making during drilling, riser deployment & recovery and ROV operations. Full water column current profiles to detect VIM phenomenon and help model VIV.

   Seismic, Cable and Pipe Laying Vessel Operations
   Real-time current profiles for streamer cable feathering angle prediction and correction, pipe lay and cable lay operations to calculate accurate touchdown position, ROV operations.
2. **Renewable Energy—Tidal/Wave/Offshore Wind**
   Current and wave measurement for site selection, design and performance monitoring, and environmental impact studies.

Coastal Applications:

3. **Biological Oceanographic**
   Wave and current measurements for oceanographic/meteorological data collection, display/analysis to quantify the biological/ecological condition of coasts and estuaries.

   Environmental Management
   Oceanographic and meteorological data collection, display/analysis to properly manage coastal development and quantify the environmental effects of development and conduct environmental impact studies.
4. **Fisheries/Aquaculture**
   Current and wave data for site assessment and short or long-term environmental monitoring.
5. **Navigation Safety**
   Current and wave measurements for oceanographic/meteorological data collection, display/analysis to increase the safety of vessel navigation within or approaching a terrestrial port.
6. **Coastal and Ocean Engineering**
   Current and wave measurements for oceanographic/meteorological data collection, display/analysis to properly design coastal structures and public works projects, provide long-term monitoring, and assess impact to the littoral environment.

   Academic Coastal Oceanography
   Current and wave measurements for research areas including nearshore circulation, tidal currents, meso/micro scale turbulence, waves and wave current interaction.

Oceanographic Applications:

7. **Integrated Ocean Observation Systems (IOOS) and Ocean Observatory Initiatives (OOI)**
   Real-time current and wave data support the integrated long-term monitoring, predicting and modeling of ocean environments with time scales ranging from minutes to decades.
8. **Deep and Mid-Water Depth Moorings**
   Moored ADCPs for oceanographic research based on the measurement of seasonal, annual, and decadal variability of ocean currents.
9. **Oceanographic Research Vessels**
   Large-scale, detailed measurements of ocean currents and motility of entrained biomass populations using vessel-mounted ADCPs.
10. **Autonomous Underwater Vehicles (AUVs) and Gliders**
    ADCPs installed onboard AUVs, gliders, and drones collect current profile data over an extended range and duration for academic, commercial, and military applications.

Pick your Perfect Profiler…a simple 3-step process.

Step 1: Select the product(s) best suited to your **Application**

Step 2: Narrow your product selection by reviewing the **Product Specifications**

Step 3: Further narrow your selection by choosing a **Method of Deployment**

Sentinel V
Versatile, next-generation self-contained ADCP.

Workhorse Monitor
Direct read for real-time data collection.

Workhorse Sentinel
Versatile self-contained ADCP for mooring, bottom-mount, or moving boat applications.

Workhorse Quartermaster
Highly flexible extended-range ADCP for "Continental Shelf" applications.

Workhorse Long Ranger
Rugged and reliable ADCP for extended range applications.

Workhorse Horizontal
ADCP that "looks out" horizontally from its mounting structure to measure near-surface water currents and multi-directional waves.

Ocean Surveyor
Advanced long-range vessel-mounted ADCP for deep water current-profiling operations.

Pinnacle
Next-generation, long-range self-contained / real-time ADCP.

Application

Oil and Gas	●	●	●	●	●	●		●
Seismic, Cable and Pipe Laying Vessel Ops	●	●		●			●	●
Renewable Energy	●	●	●			●	●	
Biological/Oceanographic	●	●	●	●	●			●
Environmental Management	●	●	●					●
Fisheries/Aquaculture	●	●	●					
Navigation Safety	●	●	●			●		●
Coastal and Ocean Engineering	●		●					●
Observatories	●	●	●	●	●			●
Deep and Midwater Moorings	●		●	●	●			●
Research Vessels	●						●	●
Academic Coastal Oceanography	●	●	●	●	●		●	●

Product Specifications

Measurement Range	0.7 m–159 m	0.6 m–150 m	0.6 m–150 m	10 m–300 m	20 m–600 m	6 m–200 m	10 m–1000 m+	30 m–1000 m
Sampling Rate—Typical (Minimum)	1–60 min. (4 Hz)	1–15 min. (4 Hz)	1–60 min. (4 Hz)	1–60 min. (0.6 Hz)	15–60 min. (0.3 Hz)	1–15 min. (1Hz)	5–20 min. (0.3–1 Hz)	2s (1s)
Profile Resolution—Typical (Minimum)	1/2/4 m (30/60/100 cm)	1/2/4 m (5/10/20 cm)	1/2/4 m (5/10/20 cm)	8 m (40 cm)	16 m (80 cm)	2/4/8 m (20/50/100 cm)	8/16/24 m (2/4/8 m)	32 m/8 m (NB) 16 m/4 m (BB)
Typical / Peak Deployment Duration	30–90 days / > 1 year	Real Time / > 5 years	30–90 days / > 1 year	90–180 days / > 1 year	90–180 days / > 1 year	Real Time / > 5 years	Real Time / > 5 years	180-365 days / > 1 year
Operational Depth Rating	200 m	500/1000/6000 m	500/1000/6000 m	1500/3000/6000 m	1500 m/3000 m	200 m	Up to 50 m	2000 m
Standard Sensors / # of Beams	HPR/Temp/Press / 5 beams	HPR/Temp / 4 beams	HPR/Temp / 4 beams	HPR/Temp/Press / 4 beams	HPR/Temp/Press / 4 beams	HPR/Temp/Press / 3 beams	Temp / 4 beams	HPR/Temp/Press/HEM / 4 beams
Available Upgrades	Bottom Track, Waves	Bottom Track	Bottom Track, Waves	Bottom Track		Waves		Bottom Track
Data Quality and Confidence Parameters	Error Velocity Screening, Fish Contamination Rejection, Correlation Threshold Screening, and Echo Intensity Threshold Screening							

Method of Deployment

Moving Vessel	●	●	●	●			●	●
Mooring/Bottom Mount	●	●	●	●	●			●
Marine Structure	●	●	●	●	●	●		●

What is an ADCP?

An Acoustic Doppler Current Profiler (ADCP) is a type of sonar that measures and records water current velocities over a range of depths. Teledyne RD Instruments actually designed and delivered the industry's first ADCP in 1982. The ADCP is now considered an essential tool for oceanography, estuary, river, and stream flow current measurement worldwide.

How do they work?

An ADCP transmits sound bursts into the water column. Suspended particles carried by water currents produce echoes (from these sound bursts) which are "heard" by the ADCP. Echoes arriving later, from deeper in the water column, are assigned greater depths in the echo record. This allows the ADCP to form vertical profiles of current velocity. The ADCP senses in four different directions simultaneously. Particles within the current flow moving towards the instrument exhibit different frequencies from those moving away. This is the famous Doppler shift, which enables precise measurement of current speed and direction.

What do they do?

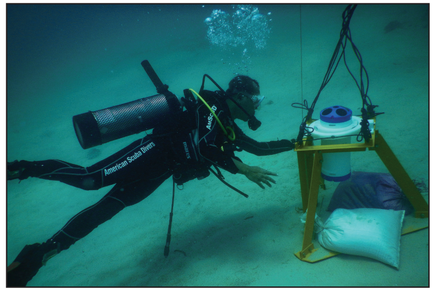
When the ADCP is mounted in a moving vessel, the information obtained is used to measure water current speed, vessel speed and direction, and also distance above the sea bed. The ADCP also shows the distribution of suspended material. When the ADCP is mounted on the seabed to look upwards it measures current velocity and direction and—with a simple software add-on—the direction of waves. So with a Teledyne RDI ADCP you can:

- **Survey** the patterns of currents, suspended sediments, and zooplankton.
- **Simplify** difficult measurements—e.g. river discharge and biomass.
- **Receive** rapidly updated hi-res data in shallow water and observe short-lived events or small sized features.
- **Measure** vessel movement through water or over the bottom.
- **Determine** position and altitude of underwater vehicles such as AUVs and ROVs.
- **Collect** high-resolution time series of currents at many depths using a single instrument.

What makes Teledyne RDI's ADCPs unique?

With well over 30,000 Doppler products delivered worldwide, Teledyne RDI's Workhorse ADCP products have become the de facto standard instrument used worldwide by scientists and field engineers to improve their understanding of water current circulation. Teledyne RDI's proven ADCP products provide:

- **Our Broadband processing** for significantly improved data quality, power efficiency, and error detection over competing narrowband systems.
- **Our patented 2-dimensional phased array transducer design** for significantly reduced size, weight, and deployment complexity.
- **Our unique 4-beam configuration** designed to ensure data redundancy for quality and reliability.
- **A highly flexible design**, which ensures that your base instrument is designed to meet your current needs and future needs as well.



Teledyne RD Instruments ADCPs are versatile enough to be used in a wide range of marine applications.

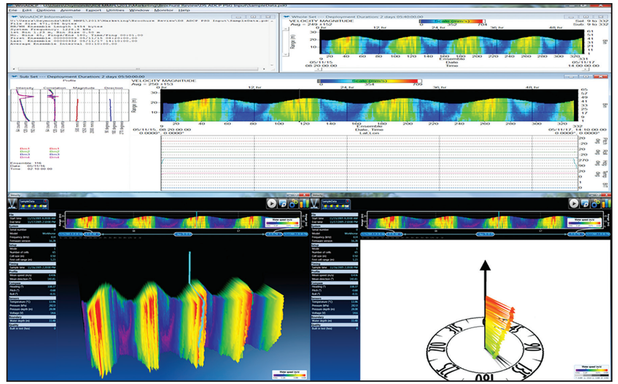
Teledyne RDI's ADCPs have become synonymous with high-quality data, ease of operation, and unsurpassed value. Each and every one of our products is backed by:

- **The best customer services team and philosophy in the industry.** We gauge our success by your success.
- **24/7 emergency service and support.** You'll never be left to sort out an issue alone.
- **Our worldwide offices** and leading industry representative network to ensure local support when and where you need it.
- **Our uncompromising commitment** to product quality and field dependability.

How is my data displayed?

Teledyne RDI offers an array of software suites designed to quickly convert data into a variety of graphical display options, allowing you to quickly and easily view and assess the data you've collected. Our versatile software packages allow you to study the results of long-term self-contained deployments, or watch your real-time measurements as they unfold.

For those new to data collection, Teledyne RDI's software offers Wizards that quickly walk you through your system setup and data collection functions. For those with advanced or highly specific data requirements, Teledyne RDI offers the most comprehensive and powerful ADCP software in the industry. From rivers to deep-ocean projects, Teledyne RDI has a software solution to meet your project needs. Consult with our sales staff to see which option is right for you.



Teledyne RDI's Velocity post processing software package offers options and displays designed for novice to expert users.

For over 30 years, Teledyne RD Instruments has been the industry's leading supplier of Acoustic Doppler Current Profilers (ADCPs) for oceanographic and inland waterway applications. Teledyne RDI's Marine Measurements business unit offers a full family of innovative ADCP products that provide fast, easy, highly accurate current profiling and wave measurements for coastal and deepwater oceanographic environments. Teledyne RDI's sister companies provide complementary products for imaging sonars, remotely operated vehicles, autonomous surface vehicles, and more, offering our customers one-stop shopping.

TELEDYNE MARINE
RD INSTRUMENTS
Everywhere**you**look™

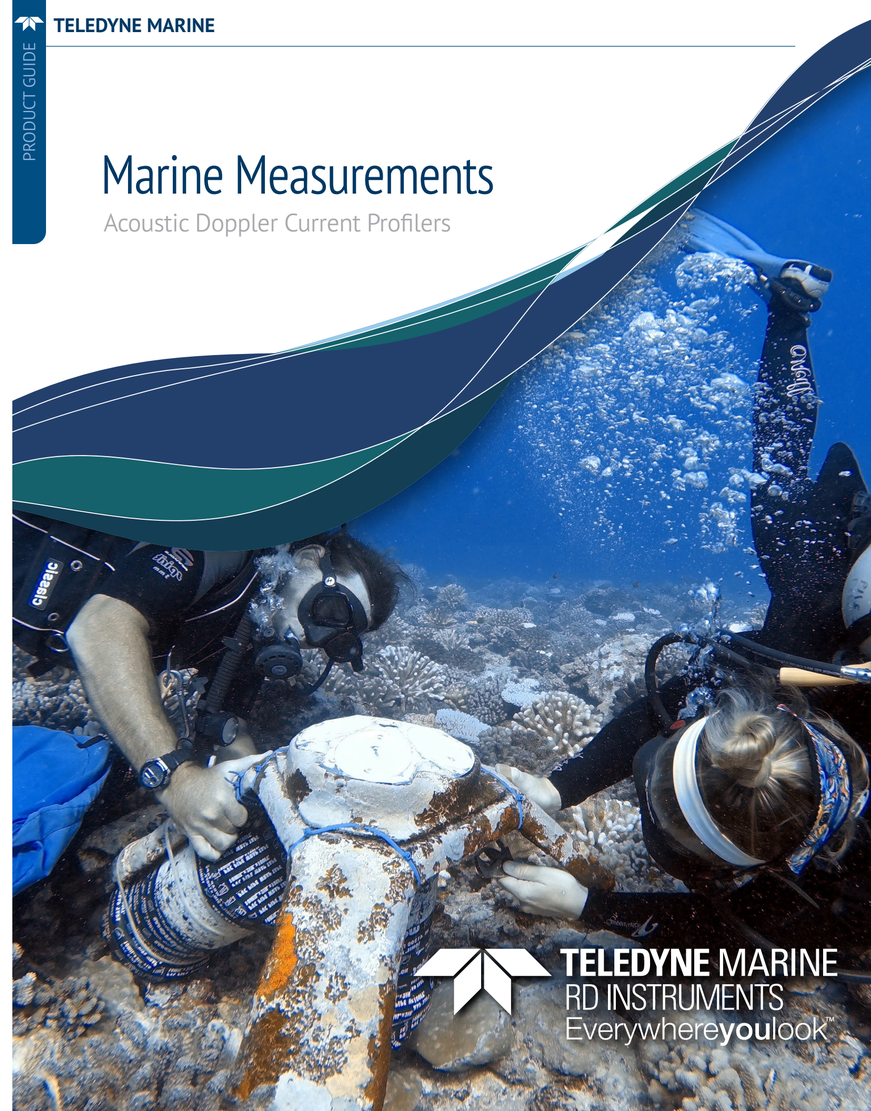
www.teledynemarine.com
14020 Stowe Drive, Poway, CA 92064 USA
Tel. +1-858-842-2600 • Email: rdisales@teledyne.com
Les Nertieres 5 Avenue Hector Pintus 06610 La Gaude France
Tel. +33-49-211-0930 • Email: rdie@teledyne.com

PRODUCT GUIDE

TELEDYNE MARINE

Marine Measurements

Acoustic Doppler Current Profilers



TELEDYNE MARINE
RD INSTRUMENTS
Everywhere**you**look™