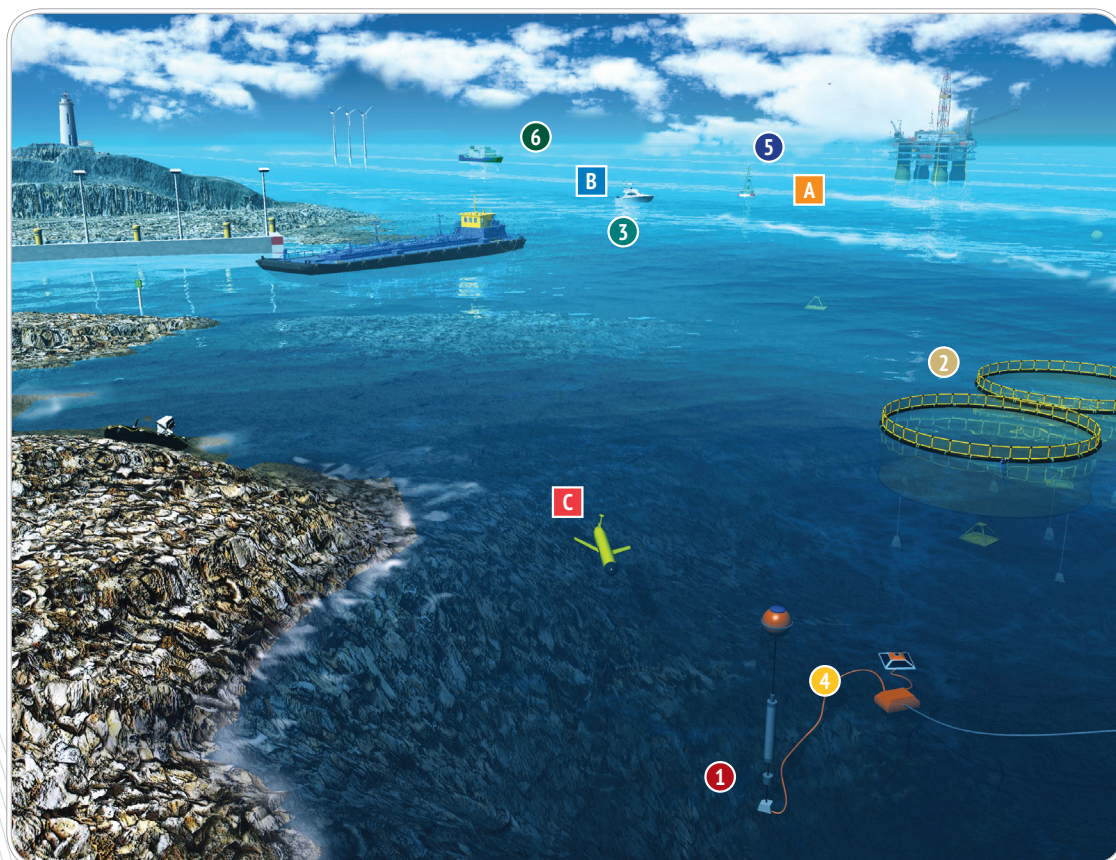


## How and where is a CTD used?



### CT/CTD Methods of Deployment:

#### A Moored

Conductivity, Temperature and (optionally) Depth (CTD) sensors mounted on surface/subsurface buoys or mooring lines at multiple depths in the water column for time series measurements at a single location.

#### B Vessel Underway

CTD sensors mounted on moving surface vessels (research, ferry, container ship, etc) using a ducted flow-through system for measurement of surface temperature and salinity.

#### C Underwater Vehicles

CTD sensors mounted on sub-surface vessels (AUV, ROV, glider, etc) for measurement of temperature and salinity.

#### 2 Fisheries

CTD measurements to support biological studies including: habitat mapping, marine protected area programs, and fisheries stock assessment.

#### 3 Hydrographic Surveys

Speed of Sound measurements to support bathymetry measurements.

#### 4 Ocean Observing Networks

CTD measurements to support long-term monitoring in coastal observation networks.

#### 5 Climate Change Research

CTD measurements to support calculations of the density and temperature in the ocean for global heat conveyor and climate change studies.

#### 6 Remote Surveys

CTD measurements to support ocean models and world ocean circulation studies.

### CT/CTD Applications

#### 1 Environmental Monitoring

Routine Conductivity, Temperature and (optionally) Depth (CTD) measurements for model inputs, outfall monitoring and environmental impact assessments from fixed stations.



# Pick the CTD that's right for you...a simple 3-step process.



**Step 1:** Select 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**



**CTD-NH**  
Internal Field CTD for moored subsurface remote data collection



**CTD-NV**  
Internal Field CTD for profiling real-time data collection



**TS-NH**  
Thermosalinograph CTD for vessel-mounted data collection



**CTD-ES/ER**  
External field CTD for moving real-time and remote data collection



**CT-EK**  
External field CTD OEM kit with and without housing for real time data collection

### Application

Environmental Monitoring	•	•	•	•	•
Fisheries	•	•	•		
Surveys		•	•		
Ocean Observing Networks	•	•	•	•	
Climate Change Research	•	•		•	
Remote Surveys			•		

### Product Specifications

Sampling Rate	1-8 Hz • 1-15 Hz Logging	1-8 Hz • 1-15 Hz Logging	1-8 Hz • 1-15 Hz Logging	1.83-4.5 Hz	Varies
Depth Rating	500 m	500 m, 7000 m	500 m	500 m, 7000 m	500 m, 7000 m
Direct Read Package	•	•	•	•	•
Autonomous Package	•	•			
Anti-Biofouling Head	•				
External Inductive Field Conductivity (EIC)				•	•
Non-External Inductive Field Conductivity (NXIC)	•	•	•		
3rd Party Sensor Interface	•	•			

### Method of Deployment

Moored	•	•			
Vessels Underway			•		
Underwater Vehicles / Floats / Gliders	•	•	•	•	•

## What is a CTD?

A Conductivity/Temperature/Depth (CTD) Sensor measures the three parameters necessary to determine salinity, density and speed of sound. CTD measurements have perhaps the longest history and are the most ubiquitous of all oceanographic sensors.

### How do they work?

The key distinguishing feature of the Citadel CTD is that conductivity is measured inductively. A pair of inductors is arranged such that one will induce ion movement in a fluid and the other will measure the extent of that movement. In early iterations of the Citadel CTD a single pair was used, which results in a fairly large external field with the potential for interference from other objects or fields near the instrument. The benefit of its relatively large measurement volume results in a measurement volume that is naturally well flushed and so does not require pumping. The most recent iterations of the Citadel CTD use a patented technology with two pairs of inductors oriented to contain the field within two parallel sampling volumes—eliminating external influences entirely.

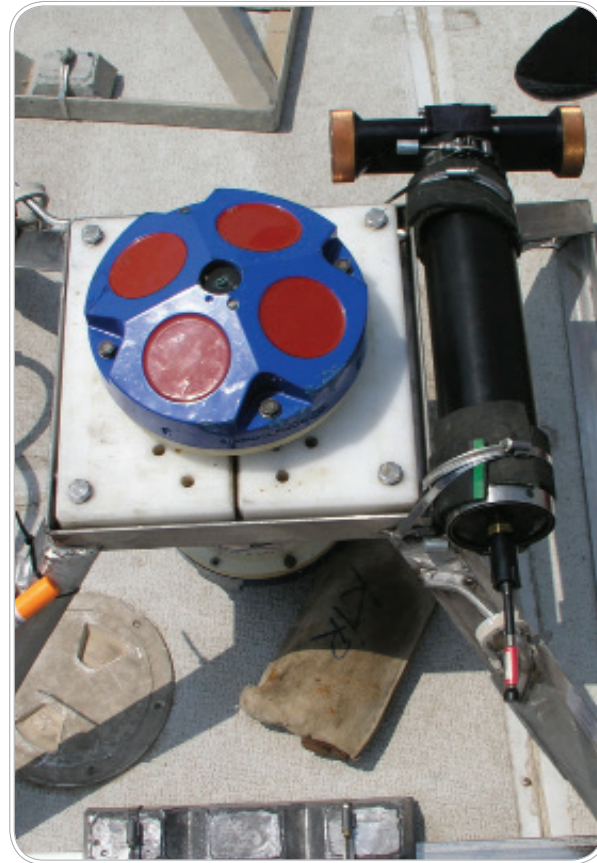
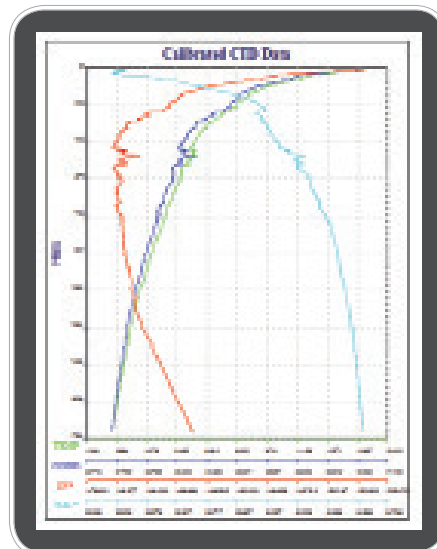
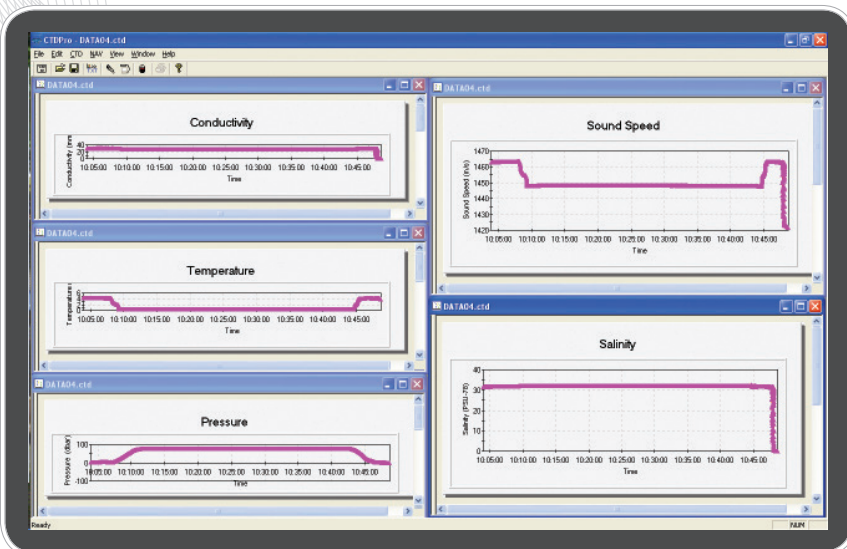
### What do they do?

Because CTDs measure all parameters required to calculate salinity, density and speed of sound, they are used throughout the world ocean for a variety of purposes, including (but not limited to):

- Real-time input to coastal models
- Monitoring of outfalls and estuaries
- Environmental Impact Assessments
- Fisheries research
- Sea surface temperature and salinity for satellite ground truthing
- Speed of sound measurement to correct bathymetric measurements
- Speed of sound measurements for military operations
- Density measurements for oceanography

### How is my data displayed?

Each Citadel CTD product is shipped with a software package that allows you to easily test, configure, calculate power consumption, and deploy your Citadel CTD. After recovering your instrument, this same software package allows you to download your data, and provides a “quick view” to confirm your data integrity. Detailed data processing is just a few clicks away. This same package can export the data in a variety of formats, including one suitable for our post-processing package, which can filter the data, adjust the lags, and create publication-quality graphics.



## What makes the Citadel CTD unique?

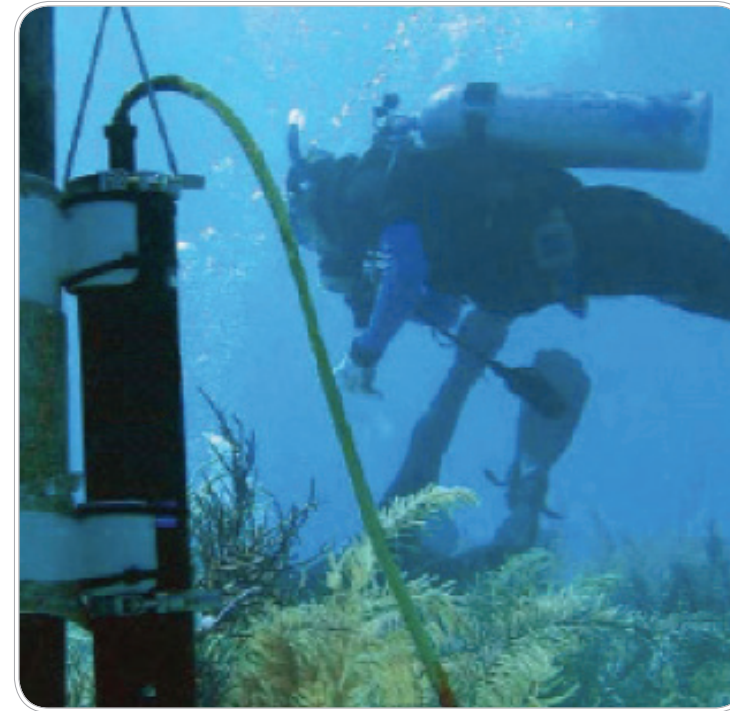
Its inductive technology is less prone to calibration drift resulting from corrosion to the sensor, allows easy cleaning in situ without the need for recalibration. Teledyne RD Instruments manufactures and calibrates all products under ISO9001:2008 standards, and provides 24/7 support with offices located in the US, Europe and China.

### Third Party Sensors:

The Citadel CTD can be integrated with a variety of third party sensors for the measurement of:

- Dissolved Oxygen (DO)
- Turbidity
- Photosynthetically Available Radiation (PAR)
- Fluorescence
- Altimeter
- Transmissometry

Photo courtesy of NOAA/AOML/OCD Lee Stocking Island, Bahamas



**Teledyne RD Instruments, Inc.** specializes in the design and manufacture of underwater acoustic Doppler products and oceanographic sensors for a wide array of commercial, academic, and defense applications. The company currently employs over 200 multi-disciplined scientists, engineers, technicians, sales, and support personnel, and resides in an 80,000 square-foot ISO-9001:2000 facility that includes state-of-the-art engineering, laboratory, manufacturing, and test areas. The company is comprised of three distinct business units, each focused on acoustic Doppler technology:

**Marine Measurements:** Acoustic Doppler current profiling, wave measurement, and CTD products for coastal and deepwater oceanographic environments.

**Navigation:** Precision acoustic Doppler navigation products for the marine environment.

**Water Resources:** Acoustic Doppler discharge and flow-measurement products for inland environments.

Since 1982, Teledyne RDI has led the industry by providing our customers with the highest quality, innovative Doppler technology backed by our unparalleled customer service and support.

### Our Commitment to you...

At Teledyne RD Instruments, we aspire to maintain leadership in our marketplace, enlisting customers as partners to work together in enduring relationships built on mutual trust and mutual benefit. From this foundation, we will continually evolve our products and services to meet our customers' needs.



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# Teledyne RD Instruments

Measuring Water in Motion and Motion in Water

