



Introducing the new CastAway-CTD: Overview and Basic Application

Abstract



The YSI CastAway-CTD is a lightweight, easy to use hydrographic profiling instrument designed for quick and accurate measurement. High-resolution (5-Hz) sampling of conductivity, temperature and depth data can now be collected in minutes rather than hours.

The one-pound, palm-sized CastAway-CTD can easily be deployed by hand. Each cast is referenced with both time and location using a built-in GPS receiver. Latitude and longitude are acquired both before and after each profile. Plots of conductivity, temperature, salinity and sound speed versus depth can be viewed immediately on the CastAway's integrated color LCD screen in the field. Raw data can be easily downloaded via Bluetooth to a Windows computer for detailed analysis and/or export at any time.

Rugged, non-corrosive housing, flow-through design, AA battery power and tool-free operation reflect the technician-friendly pedigree of the CastAway-CTD. So do the simple, intuitive features – everything an operator needs to know about deploying the CastAway-CTD, viewing data and downloading the files fits on a single sheet of paper in the lunchbox-sized carrying case.

With the tap of a magnetic stylus and a crank of the reel, the YSI CastAway-CTD makes quick and easy work of gathering accurate conductivity, temperature and depth readings in up to 100 meters of water. A long list of tasks becomes almost effortless, including, just to name a few:

- Speed of sound profiles
- Verifying other sensors
- Taking point measurements
- Profiling thermoclines and haloclines

With a sampling rate and sensor response of 5 Hz, the palm-sized CastAway-CTD gathers high-resolution data during the downcast, free falling at the design speed of one meter per second, and then again on the upcast when it's reeled back in.

The ease and accuracy of the CastAway-CTD will undoubtedly encourage more frequent casts. Multiple data points facilitate tasks such as precise corrections of acoustic oceanographic measurements and hydrographic surveys. The CastAway-CTD's built-in GPS makes it



The CastAway is a multi-functional tool that incorporates the most modern technology available - yet is simple to use. It is designed for CTD profiling down to 100 m and is easy to deploy as demonstrated in this photo taken at Hoover Dam.

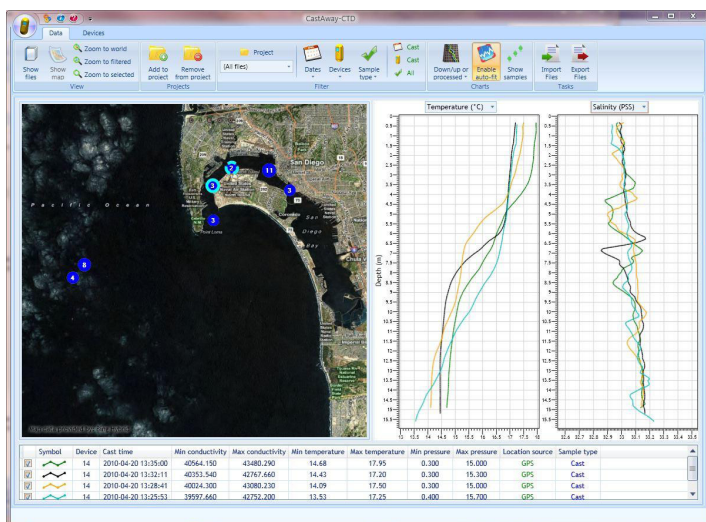
easy to apply the corrections in real time or during post processing because CastAway data is always referenced in time and space.

This instrument also allows field technicians, hydrologists, surveyors and researchers to quickly verify readings from other in-situ sensors, track salinity, study mixing zones or just capture a quick profile from nearly any boat, bridge or dock.

Rugged and Reliable

The flow-through cell of the CastAway-CTD houses a suite of sensors designed to deliver highly accurate data with no moving parts, dramatically simplifying maintenance and extending operating life. Other features include:

- A temperature system that allows the CastAway to respond in less than 200 milliseconds.
- A pressure sensor accurate to within 0.25 percent of FS.
- A conductivity cell with six nickel electrodes arrayed and sequenced to enhance accuracy and stability.
- A fully contained cell that eliminates possible conductivity errors from nearby conductive materials.



Screen capture of Windows-compatible CastAway-CTD software displaying data collected in and around San Diego Bay, California.

The sensors are optimized to function together so samples are synchronized in space and time. Every cast data file is coded with the unit serial number, geo-referenced and time stamped, eliminating worries about lost or illegible notes. This metadata helps analysts track temporal and spatial variations and streamline the analysis of groups of data from other casts or other CastAways.

The electronics are protected in a rugged, non-corrosive housing that has endured brutal testing at YSI's development laboratory, from two-meter drops onto concrete to industrial shakers to temperature extremes in pressure chambers. A twist of the unit's bayonet seal opens the battery compartment, where a pair of alkaline or rechargeable AA batteries powers the CastAway-CTD for several days. There is even a spare magnetic stylus inside the battery compartment, just in case. There are no screws to turn, no tools to keep track of and no cables to connect.

Even maintenance is simple. There is no pump to maintain, and the CastAway-CTD's corrosion-resistant electrodes require no field calibration. A quick rinse with clean, fresh water and an occasional scrubbing of the electrodes with household dish soap is all that is required to keep the CastAway-CTD shipshape between recommended annual factory calibrations.

CastAway-CTD Specifications

	Range	Accuracy	Resolution
Conductivity	0 – 100,000 $\mu\text{S}/\text{cm}$	$0.25\% \pm 5 \mu\text{S}/\text{cm}$	$1 \mu\text{S}/\text{cm}$
Temperature	$-5^{\circ} - 45^{\circ} \text{C}$	0.05°C	0.01°C
Pressure	0 – 100 dBar	0.25% of FS	0.01 dBar
Salinity (Derived)	Up to 42 (PSS-78)	0.1 (PSS-78)	0.01 (PSS-78)
Sound Speed (Derived)	1400 – 1730 m/s	0.15 m/s	0.01 m/s
GPS		10m	

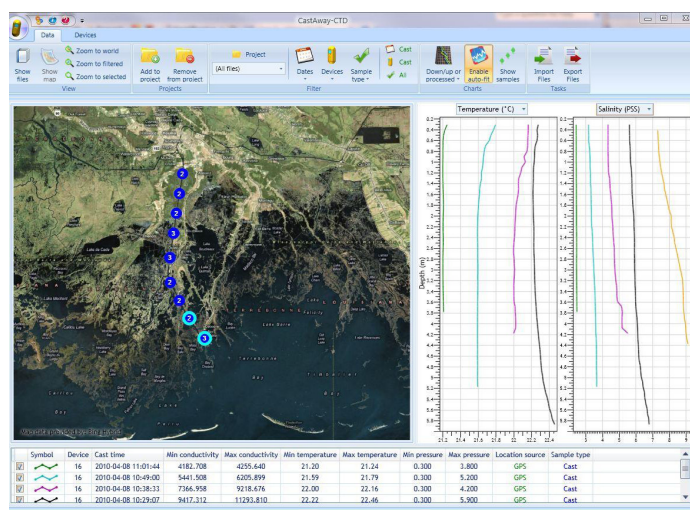
Embedded Processing Power

The CastAway-CTD features embedded firmware that harnesses the power of YSI's extensive experience in processing-intensive optic and acoustic sensing technology. Immediately after each cast, the CastAway-CTD charts measured parameters – conductivity, and temperature versus depth – as well as derived values for speed of sound and salinity. The instrument's built-in, waterproof, color LCD screen also displays minimum, maximum and average values for each profiled parameter.

Wireless data transfer via Bluetooth requires only that the system be within range of a computer running the included Windows-compatible software. The CastAway-CTD software exports data in a number of formats for archiving or easy sharing with colleagues. Data may be transferred among systems running CastAway software, or, with the click of a mouse, exported to other industry standards such as Excel, Hypack or Matlab.

The CastAway-CTD software package is a powerful data processor and an intuitive visualization tool. It can handle thousands of individual casts, linking them to interactive maps that can be further augmented with imported geo-referenced images. Selecting a single dot on the map graphs the cast profile data from that location. Highlighting several casts to graph is a simple click-and-drag operation. Data can be sorted by time, location or even CastAway serial number.

File drag-and-drop functions allow users to import data by simply dragging a folder onto the screen. Project folders can be used to group, sort and share data, permitting the display of multiple casts from a single



A screen capture of data from a river delta in Louisiana acquired using a CastAway-CTD. The technicians collected 21 casts in less than 3.5 hours.

system – or from several CastAway-CTDs – on a single graph. Processing is fast, accurate and easy, and the system never changes the raw data to ensure quality control and reliability.

How Fast?

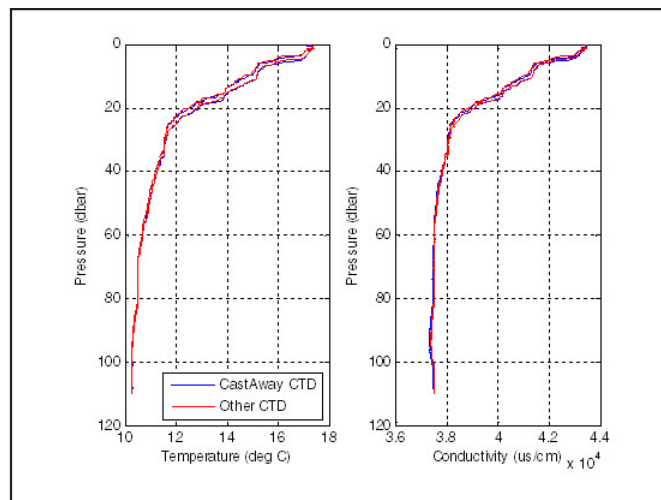
How fast is the CastAway-CTD? A field deployment goes as follows:

- A tap of any button turns the unit on. The GPS acquires a position in moments.
- Pushing the right-hand button begins data collection.
- The operator submerges the instrument for 5 to 10 seconds at the water's surface to bring the system to equilibrium.
- The downcast begins as the CastAway-CTD free falls to the bottom.
- The operator reels in the instrument using a standard line, fishing rod, diving reel or other such device.
- A tap of the right-hand button stops the data collection, and an upcast GPS position is acquired.
- The LCD monitor displays a series of graphs of the collected data.

It's THAT fast!

Outstanding Results

Small, convenient and accurate, the CastAway-CTD



Comparison of CastAway-CTD upcast and downcast data with another manufacturer's CTD offshore of San Diego, CA.

delivers high-resolution data comparable with scientific instruments that cost several times more money and present far greater challenges during deployment. Whatever task brings operators to the water – from oceanographic research to hydrographic surveys, hydrology or military operations – the CastAway-CTD takes just minutes to put detailed profile data right into the palm of their hands.

Analysts will appreciate the seamless flow of data, the accuracy and stability of the measurements, the geo-referenced and time-stamped files, and the overall convenience of the CastAway-CTD software. Field technicians around the globe will appreciate this scientific-caliber instrument built for everyday use – and designed to make a tough job easy.



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