

## 10-MHz ADV Expanded Description



The SonTek 10-MHz ADV (Acoustic Doppler Velocimeter) is a versatile, high-precision instrument used to measure 3D water velocity. The ADV is used to measure water velocity in a wide range of environments including laboratories, rivers, estuaries, and the ocean.

The ADV uses acoustic Doppler technology to measure 3D flow in a small sampling volume located a fixed distance (10 cm) from the probe. The velocity range is programmable from  $\pm 3$  to  $\pm 250$  cm/s. Data can be acquired at sampling rates up to 25 Hz. With no zero offset, the ADV can measure flow velocities from less than 1 mm/s to over 2.5 m/s.

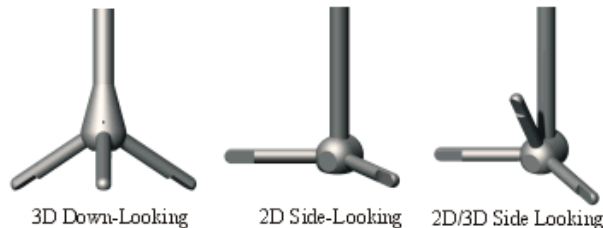
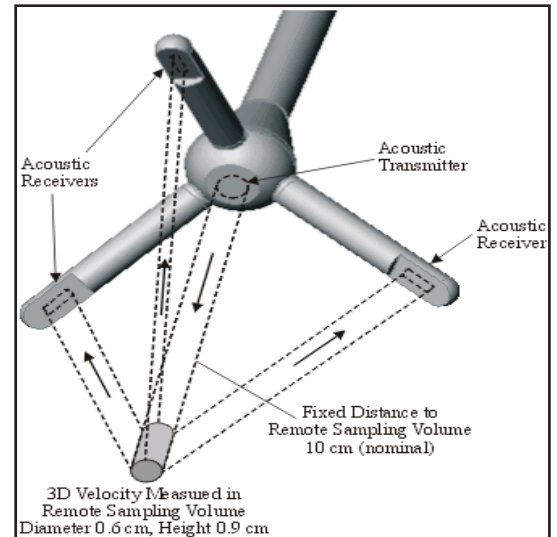
The ADV consists of three basic elements: the probe, the signal conditioning module, and the processor. The probe is attached to the conditioning module, which contains low-noise receiver electronics enclosed in a submersible housing. The ADV conditioning module and probe are connected to the processing module using a custom shielded cable up to 20-m long.

The ADVfield processor is a set of three printed circuit cards that operates from external DC power and outputs data using serial communication or a set of analog voltages. The ADVfield can be operated from any PC-compatible computer or can be integrated with a variety of data acquisition systems.

For autonomous deployment (internal data storage and battery power), the ADV can be integrated as part of a SonTek Hydra system.

### ADV Probe

The ADV probe configuration is determined by a combination of four factors: sampling volume location, coordinate resolution (3D or 2D), sensor mounting, and sensor orientation. Probes can be constructed with almost any combination of these options, including the use of a flexible cable.



### Sampling Volume Location

The location of the ADV sampling volume is 10 cm from the tip of the probe.

### Coordinate Resolution: 3D or 2D

For most applications, a 3D velocity measurement is preferred. 2D probes are available for a number of specialized applications. A 2D side-looking probe can operate in as little as 3 cm of water; a 2D down-looking probe can be used in very narrow channels (width less than 5 cm) or for measurements along-side underwater structures.

### Sensor Mounting

The acoustic sensor can be mounted on a 25-cm rigid stem or on a 100-cm flexible cable. For field applications, a 25-cm stem provides a more rigid installation. The 100-cm cable mounting provides great flexibility for probe installation, but requires a user-

SonTek/YSI, founded in 1992 and advancing environmental science in over 100 countries, manufactures affordable, reliable acoustic Doppler instrumentation for water velocity measurement in oceans, rivers, lakes, harbors, estuaries, and laboratories. Headquarters are located in San Diego, California.

supplied mounting fixture to ensure reliable sensor orientation.

### Sensor Orientation

The down-looking sensor orientation (standard for all systems) is ideal for measurements close to the bottom. Side-looking probes are typically used in wave flumes to avoid flow interference. If the primary interest is to measure velocity in the surface layer or under structures, an up-looking probe may be preferred.

### ADV Signal Conditioning Module

The standard ADV signal conditioning module (for ADVFields with no optional sensors) is a cylindrical acetyl (Delrin) housing. The cable to the processing module attaches using an underwater mateable connector. The probe is permanently mounted to the front of the housing.



*Top: Standard Conditioning Module  
Bottom: Conditioning Module with Sensors*

ADVField systems that include optional sensors (compass/tilt, pressure, temperature) use an expanded acetyl (Delrin) conditioning module. The cable to the processing module attaches with an underwater mateable connector. The probe is permanently mounted to the front of the housing.

### ADV Processor

The ADV processor can be housed in different ways depending upon how the system will be used and whether the processor will need to be submerged.

The ADVField operates from DC power and is typically connected to a laptop computer running SonTek's powerful data acquisition software. It can also be integrated with a variety of data acquisition systems using either serial communication or the analog output voltages.

For applications where the ADV processor does not need to be submerged, the processor is enclosed in a splashproof housing with connectors for the probe, power, communication, and auxiliary input/output (analog voltages and external synchronization). The splashproof housing can include an internal rechargeable battery (capacity for 6-10 hours of operation).



*ADVField Splashproof Processor*



*ADVField Underwater Processor*

The ADVField processor can also be housed in an underwater canister with separate underwater mateable connectors to the probe and the external interface (power, communication, and auxiliary input/output). The power and communication cable can be up to 1500-m long for deployment in a wide range of environments.

## Standard Features

ADV systems include the following standard features.

ADV Probe/ Conditioning Module	ADVField Processor
<ul style="list-style-type: none"> <li>• Factory calibration (can only change with physical damage to the probe)</li> <li>• Programmable velocity range from <math>\pm 3</math> to <math>\pm 250</math> cm/s</li> <li>• Interchangeable probes (standard conditioning module only)</li> <li>• All components submersible to 60 m</li> <li>• 10-m cable to processor (20-m max.)</li> </ul>	<ul style="list-style-type: none"> <li>• Dual serial communication (RS232 standard, RS422 for cables up to 1500 m)</li> <li>• Four analog output voltages (3 velocity, 1 signal strength) for integration with analog data acquisition systems</li> <li>• Hardware synchronization with external sensors using sync input and output</li> </ul>

## Options

Several options, including the following, are available for use with ADV systems.

### Analog Outputs (ADVField Splashproof)

Three analog output voltages (for 3 components of velocity) for integration with an analog data acquisition system.

### Salt Water Upgrade

Zinc anode for corrosion protection and water-block puck to prevent flooding in case of cable damage. Standard on ADVField underwater systems.

### Internal Battery (ADVField Splashproof)

Rechargeable lead-acid battery for short-term field deployments (capacity for 6-10 hours operation).

### Compass/Tilt Sensor (ADVField)

The compass and 2-axis tilt sensors allow the ADVField to report velocity data in Earth (East-North-Up) coordinates. The sensor has a built-in calibration feature to compensate for magnetic distortion. The user can easily re-orient the compass for up, down, or side-looking operation.

### Pressure Sensor (ADVField)

A strain gage pressure sensor can be installed in the ADVField to measure wave height (PUVW for directional wave spectra) and deployment depth. The pressure sensor is available in a variety of ranges for most any environment.

### Temperature Sensor (ADVField)

Any ADVField with compass/tilt or pressure sensor includes a temperature sensor to compensate for changes in sound speed. Sound speed is used to convert Doppler-shift to water velocity.

### The Hydra – Autonomous Operation

The ADV can be integrated with a wide range of other sensors as part of SonTek's Hydra autonomous ocean sensor system (including internal data storage and battery power). For more information on the Hydra system, go [here](#).

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