

Distance Sensor

(for EcoLog XL)

DT187A



The Distance sensor measures the distance between the sensor and an object in the range of 0.4 to 6 m. The sensor can sample data at up to 20 times per second, making it excellent for motion and movement experiments.

The distance sensor is an analog sensor and can be used for a variety of experiments in Physics.

It is supplied with an AC/DC adaptor and with a mounting rod.

Typical Experiments

- Investigating dynamic cart motions on a track
- Studying motion graph matching
- Investigating simple harmonic motion, such as a mass hanging on a spring
- Measuring the free fall acceleration

How it Works

The Distance sensor works on the same principle as a sonar system. An ultrasonic loudspeaker and microphone are located inside the sensor's case. A capacitor is connected to the loudspeaker and constantly charges and discharges 20 times per second when measuring distances up to 3m or 10 times per second when measuring distance of 3m and above. When the capacitor is discharged, the loudspeaker emits an ultrasonic pulse. This pulse travels through the air, hits the closest item (within range) to the sensor, and returns as an echo. When the ultrasonic microphone receives the echo, the processor inside the sensor calculates the distance according to the time difference between the two events and the speed of sound.



A built-in Digital to Analog converter converts the data to an analog signal, between 0 to 5 V.

The Distance sensor is powered by six 1.2V NiCad rechargeable batteries and it is equipped with a built-in battery charger.

Sensor Specification

Range:	0.4 m – 6 m
Accuracy:	1% over entire range
Resolution:	5.5 mm
Sampling Rate:	20 samples per second for distance up to 3m 10 samples per second for distance above 3m
Receiver Viewing Angle:	$\pm 15^\circ$ to $\pm 20^\circ$
Data Logger Input Type:	Analog
External Power Supply:	12 V DC @ 300Ma
Internal NiCad Life:	4.5 to 7 hours continuous sampling
Internal Battery Charging Time:	10 hours
Features:	Equipped with a reset button

Equipment List DT187A

Distance sensor and AC/DC adaptor set	DT187A
Distance sensor	DT187
120 V AC/DC Adaptor	10956
220V AC/DC Adaptor	11456

Technical Notes


- As this sensor is current consuming, it can be powered either by internal, rechargeable batteries or by an external power source. The sensor will operate about 6 hours on its internal batteries, when they are fully charged. It will take about 10 hours to fully recharge the batteries.

- Improve the target by adding a large and flat surface to reflect ultrasound. If the reflecting surface is an irregular reflecting surface, sometimes the waves are reflected back and sometimes not.
- Remove interfering objects near the target object or sensor. Note that the Distance sensor will report the distance to the closest object such as chairs and tables in the cone-shape area about 20 ° off the axis of centerline of the beam.
- The Distance sensor has a small reset button near its cable connector. After recharging the sensor's internal battery press this button to reset the internal microprocessor.



Calibration

The Distance sensor is shipped fully calibrated.

Using the Distance Sensor with EcoLog XL and EcoLab Software

1. Connect EcoLog XL to the computer.
2. Connect the Distance sensor to the EcoLog XL's sensor input (starting from I/O-1). The sensor is automatically recognized by the EcoLab software.
3. If EcoLog XL is running in one of its stand-alone modes, press the **Stop**  button on the EcoLog XL front panel.
4. Launch EcoLab.
5. In the **Setup** window deactivate the internal sensors by clicking the button next to the sensors' icon and program the EcoLog XL's sample rate and the recording time.


To begin online recording

1. Click **Run**  on the main toolbar.
2. EcoLab automatically opens a graph window displaying the data in real-time, plotting it on the graph as it is recorded.
3. You can stop recording at any time by clicking **Stop**  on the toolbar.


To conduct remote recording

For remote logging it is necessary to send the setting to EcoLog XL before disconnecting from the computer.

1. In the **Setup** window deactivate the internal sensors by clicking the button next to the sensors' icon and program the EcoLog XL's sample rate and the recording time.

2. Click **Send Setup**  on the main tool bar, wait until you will see the following message on the EcoLog XL screen:


Remote logging
Waiting for Go

3. Disconnect the EcoLog XL from the computer, place the EcoLog XL at the desired recording location and press the **Go**  button on the EcoLog XL front panel.


To download data that was recorded offline

EcoLog XL always stores the last four experiments. To download data that was recorded offline, or while EcoLog XL was not connected to the computer:

1. Connect the EcoLog XL to the computer and if EcoLog XL is collecting data,

click **Stop**  to end collecting and to return to the main menu.

2. Launch EcoLab.

3. Click **Download**  on the main toolbar to open the **Selective Download** dialog:

Selective Download		
Sampling time	Data type	Number of samples
<input type="radio"/> 23/05/03 12:58:21	Remote EzyLog	8
<input type="radio"/> 23/05/03 12:58:37	Snapshot	4
<input checked="" type="radio"/> 23/05/03 13:00:54	Remote EzyLog	10
<input type="radio"/> 23/05/03 12:52:55	Snapshot	3

The dialog contains details of the stored experiments: the starting time and date, the logging mode and the number of samples taken.

4. Click an option to select the experiment you wish to download, and then click **OK**. This will start the Post-experiment Data Transfer communication mode. Once the transfer is complete, the data will be displayed automatically in the graph window and in the table window.

An Example of using the Distance Sensor

Motion on the inclined plane

In this experiment we place a cart on an inclined friction free plane and explore the properties of the motion. The displayed graph is the position of the Cart vs. Time.

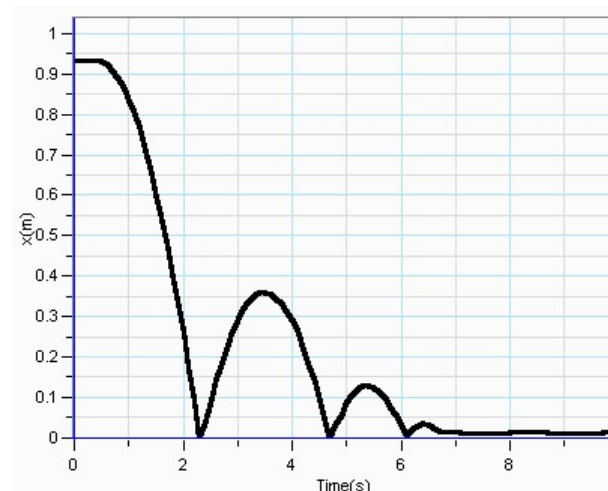


Figure 1: Position of the cart vs. Time

Technical Support

Please contact Fourier technical support as follows:

Web: http://www.fourier-sys.com/support_support.html

Email: support@fourier-sys.com

Consult the FAQs before contacting technical support:

http://www.fourier-sys.com/support_faq.html

Copyright and Warranty

All standard Fourier Systems sensors carry a one-year warranty, which states that for a period of twelve months after the date of delivery to you, it will be substantially free from significant defects in materials and workmanship.

This Warranty does not cover breakage of the product caused by misuse or abuse.

This Warranty does not cover Fourier Systems consumables such as electrodes, batteries, EKG stickers, cuvettes and storage solutions or buffers.