



1500pk - Wireless Dynamics System

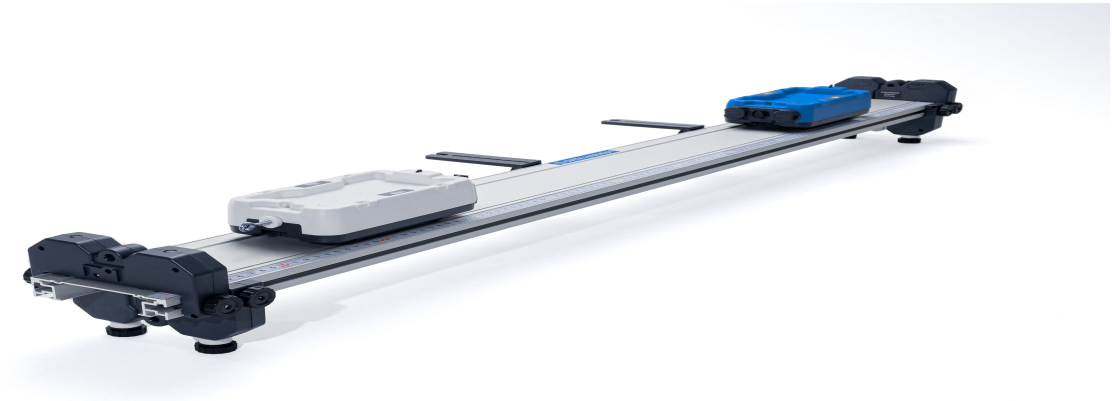
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Introduction

Thank you for purchasing the Wireless Dynamics System. We pride ourselves on producing high quality products that meet with the demands of the busy classroom environment. If you have any problems using this sensor, please read this documentation in full before contacting the Data Harvest support team.



Overview

The Wireless Dynamics System and track provides all the tools in one package to study kinematics, dynamics, momentum, collisions, and energy. The package comes with all the accessories you will need to start work as soon as it arrives.

The two colours of the supplied carts (blue and white) make it simpler to discuss what is happening in class demonstrations and explanations.

Additionally, the wireless cart has built-in sensors for measuring force, velocity, three axes of acceleration, and three axes of rotational velocity.

The cart has a wide profile for added stability and low friction wheel bearings to give consistent data. The 1.2m track provides sufficient space for good quality results in a format that will fit onto most modern laboratory benches, allowing students to study both the theory and practicals at their bench. The Data Harvest Wireless Light Gates fit to the side of the track.

The cart can be used without the track for those longer distances and demonstrations.

To use the cart, you need the EasySense2 software. The wireless connectivity means you can connect directly with no need for cables.

Pack Contents

This product is supplied with the following items:

- 2 x Smart Dynamics Self Levelling Foot
- 2 x Smart Dynamics Magnetic End Stop
- 2 x Smart Dynamics Magnet Holder
- 4 x Steel Mass
- 1 x Dynamics Cart White
- 1 x Dynamics Cart Blue
- 1 x Wireless Dynamics Track 1.2m
- 1 x Mini USB Lead
- 1 x Wireless Dynamics Set Bag of Bits



For full assembly parts and instructions please refer to the [assembly instructions guide](#).

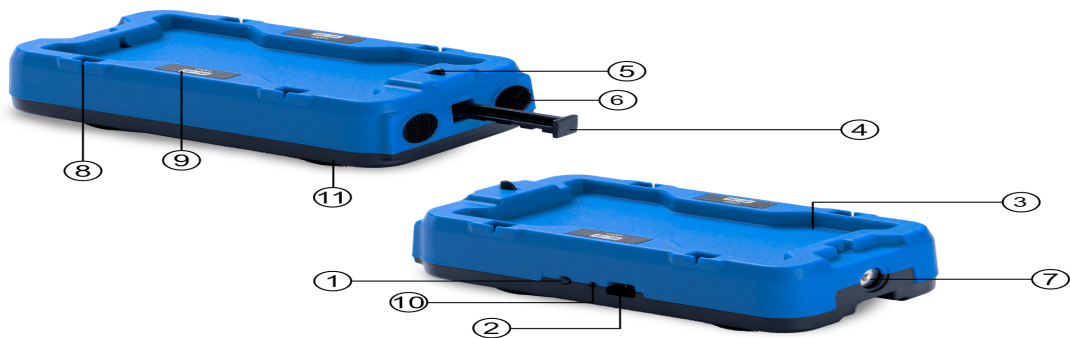
Additional Accessories

To get the most from your Smart Wireless Dynamics System, the following item should be considered:

- Smart Wireless Light Gate Sensor
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Operational Overview

The diagram below shows the specific parts of the sensor. Read further to explore the functionality of each part of the sensor.



On/Off switch (1)

The sensor's on/off switch allows you to turn the sensor on, off or perform a hard reset.

To switch the sensor off

- Press and hold down the On/Off switch until the white light shows, then release.
- If not communicating with the EasySense2 app, the sensor will turn off after a period of one hour of inactivity.

Hard resetting the sensor

- If necessary, attach the sensor to power.
- Press and hold down the On/Off button for at least 8 seconds until the status LED gives a flash of blue light, then release.
- If the sensor fails to respond, contact Product Support at Data Harvest. Please provide details of:
 - The computer platform it is being used with and the EasySense2 app's version number.
 - A description of the problem being encountered.

USB Input (2)

- Use to connect to a computer or a charging unit.
- For specific USB or Bluetooth connectivity instructions, please see the 'Connectivity' section of this documentation.
- For instructions on charging your device, see the section on 'Charging the Sensor'.

Bay for masses (3)

2 x 280g masses are supplied with each cart, these can be stacked here.

3 Position Plunger (4)

The spring-loaded plunger has three positions for firing/release the plunger.

Plunger release button (5)

This is the button to use to fire/release the plunger

Velcro (6)

Each cart has Velcro fitted, for easy connection.

Force sensor, connection for spoked pulley string & magnets (7)

This is the position of the Force sensor (+/- 100N). It is also where the magnets are connected, and string can be attached to use the spoked pulley. Please see worksheets, which can be found on our website, for more information.

Interrupt card slots (8)







When using Light Gates/Photo Gates, this is where the double/single interrupt card is fitted.

Unique ID number (9)

All Smart Wireless Sensors are labelled with a unique ID number. This number is used in the EasySense2 app, so that you can identify each sensor when making a connection wirelessly.

Status Indicator (10)

The sensor features a single status indicator that changes colour and flashes. See the table below for further information.

Status Light		Indicates
No light		Sensor is Off. Short press the On/Off switch
Blue flashing		Sensor On and Bluetooth advertising
White flashing		Charging via USB mains charger or USB port
Green flashing		Communication with the EasySense2 app (via USB or Bluetooth) has been established
Orange flashing		Recording data
Red flashing		Battery is low

Wheels (11)

These are the spring-loaded wheels.

Connectivity

The sensor is both USB and Bluetooth compatible. Install the EasySense2 app, if it is not already on your device. For details of how to operate the EasySense2 app, please refer to the EasySense2 documentation.

USB Connectivity

Quick Steps

1. Connect the sensor to the computer's USB port using the USB cable supplied.
2. The computer will automatically detect a new device and depending on your operating system, will install any applicable device drivers.
3. Start EasySense 2 app.
4. Within the EasySense2 app, the Devices icon will change to green to show that the sensor is connected, and the status light on the sensor will also turn green.
5. Begin your practical investigations.

Bluetooth Connectivity

Using Bluetooth, the sensor can wirelessly connect to mobile devices such tablets and mobile phones, as well as desktop or laptop computers, giving students the ability to run experiments independently without being tethered to a device.

See the EasySense2 app user manual system requirements for further details.

Quick Notes on Bluetooth Connectivity

Only use with the EasySense2 app, you do not need to pair the device. If paired, the sensor will not be available to the EasySense2 app.

Computers or devices will need to support Bluetooth Low Energy (BLE). For further information refer to the instructions provided for the EasySense2 app.

Quick Steps

1. Short press the on/off switch to turn the sensor on, blue LED will flash.
 2. Open the EasySense2 app.
 3. Select the Devices icon.
 4. Select your sensor from the list of available sensors to connect to the device. Your sensor is identified by its unique ID in the list.
 5. Click on connect at the side of your sensor in the list.
 6. The Devices icon will change to green and the status light on the sensor will flash green to indicate a connection has been established.
 7. Begin your practical investigations.
-

Charging the Sensor

The Smart Wireless sensors are fitted with a rechargeable lithium-ion battery and can be charged via the USB port. Use the supplied USB lead to connect the sensor either directly to a USB port on your computer, a powered USB hub or a USB mains charger that outputs 5 V at 500 mA or more.

A full charge can take up to 4 hours.

Additional Information

Whenever the sensor is connected to the USB port on the computer or to a USB mains charger (output 5 V at 500 mA or more), it will automatically recharge the battery (LED status flashing white).

When connected to a computer, the computer should be turned on and not in sleep or standby mode, as the battery may drain instead of charge.

The sensor will stay awake for 60 mins when Bluetooth advertising (LED status flashing blue).

Lithium-ion batteries are 'memory-free' and prefer a partial rather than a full discharge. Constant partial discharges with frequent recharges will not cause any harm. Frequent full discharges should be avoided whenever possible. Ideally the sensor should be stored at about 40% or more charge.

The speed at which a lithium-ion battery will age is governed by both its storage temperature (preferably less than 40 C) and state-of-charge.

Firmware Updates

Occasionally Data Harvest may release updated firmware which will contain improvements or new features.

Updates will take place when you connect your sensor to the EasySense2 app. You will be given the option to decline an update.

Updates can be performed over USB or Bluetooth and will typically take less than one minute. Updating firmware over USB will be quicker than Bluetooth.

Do not disconnect the sensor, or power off during the update.

If you have a wireless connection to the EasySense2 app, the sensor will have to be reconnected after performing the update.

Usage Information

The cart is fitted with a unique suspension system that should protect the cart from damage by dropping or over burdening, but care should be taken to prevent this.

- When using the track use the end stops to prevent the carts from leaving the track.
- Only use low angles of track incline (less than 15 cm of elevation). The system will perform significantly better than traditional dynamics apparatus.
- After storage use a soft brush to remove debris from the track grooves.
- Do not install the magnetic bumper unless you know you will be using them in the practical work.
- Magnetic repulsion is only for low-speed collisions with other carts whilst using the Dynamics System magnetic end stops. If the speed is high the repulsion will bounce the carts off the track.

When setting up

- Always check the Handedness of the fixtures.
- Insert the captive bolts required for the light gate brackets first.
- Insert the support / feet second and move down the track by at least the width of the support.
- Insert the end stops last.
- Do not over tighten the securing bolts, you could potentially damage the track.

Both carts provide a spring-loaded plunger

- The plunger provides three different forces to move the cart. Each notch is 1x more than the previous.
- As you push the plunger in it will click at each position, a final click position is provided to hold the plunger level with the cart's exterior.
- To activate the plunger, tap on the pin on the top of the cart.

The carts and the masses both have a nominal mass of 280g (weigh before use).

For expert work on momentum, collisions, $F=ma$ the mass of the carts and masses should be accurately obtained.

Practical Investigations

The Wireless Dynamics System can be used to investigate a number of scientific experiments such as:

Using the distance encoder.

- Simple time distance graphing
- Introduction work on motion using the stepped plunger and additional masses
- Relationship between displacement, velocity, and acceleration.
- Elastic and inelastic collisions
- Newton's second law ($f = ma$)
- Conservation of momentum

Using the Force sensor

- Hooke's law (force extension)
- SHM
- Collisions, impulse, and crumple zones

Using the Accelerometer

- Newton's second law
- SHM (suspended)

For more ideas and details, individual worksheets are available on the web site.

Online Videos

Learn how to use data logging in the classroom with our Secondary Science Academy demonstration videos, which will walk you through using the new EasySense2 app and show you how to get hands-on with the latest Bluetooth wireless sensors. The video experiments will show you how to get the best out of your science lessons.

New online content is being continuously uploaded onto our YouTube channel, including practical worksheets as well as videos.

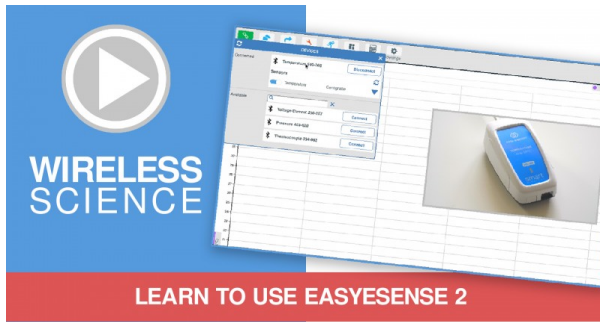
See our website for further information and links.



Explore Bluetooth Sensors

Are you looking to make the jump to our smart wireless sensors? Or have you recently purchased them and want to know more about how they work?

[View video playlist](#)



Explore EasySense2

The core of our science platform is our EasySense2 software. In these videos you will learn everything from the basics of our software to the most in-depth features.

[View video playlist](#)



Explore Science Practicals

See our Smart Wireless Sensors in action with a range of practical experiments. This is the best way to get started with the new Bluetooth sensors!

[View video playlist](#)

Sensor Specifications

Please read the following table for sensor specifications.

Feature	Detail
Measurement Ranges	<p>Distance/Displacement Velocity Acceleration Position resolution $\pm 0.1\text{mm}$ Maximum Velocity $\pm 10\text{m/s}$ Max sampling rate $500\mu\text{s}$ (2KHz)</p> <p>Force $\pm 100\text{N}$ Force resolution $\pm 0.01\text{N}$ Max sampling rate $500\mu\text{s}$ (2KHz)</p> <p>Accelerometer (X, Y, Z, Resultant) Ranges of $\pm 40\text{m/s}^2$ and 150 m/s^2 Accelerometer resolution $\pm 0.1\text{ m/s}^2$ Max sampling rate 1ms (1KHz)</p> <p>Gyroscope (X, Y, Z) $\pm 8\text{ rad/s}$ Gyroscope resolution $\pm 0.001\text{ rad/s}$ Max sampling rate 1ms (1KHz)</p>
Connectivity	Wired via USB Wireless via Bluetooth
Bluetooth Specifications	Bluetooth 4.2 low energy radio, single mode compliant Transmit (TX) power: 0 dBm Receiver (RX) sensitivity: - 90 dBm Usable transmission range: up to 30 m in open air Frequency Range: 2.402 to 2.480 GHz operation
Storage/Operating Temperature	0 - 40 C
Internal Battery	Rechargeable internal lithium-ion 3.7 V Power specification: 5 V at 500 mA
Physical Specifications (Cart Only)	Weight: approx. 280 g External dimensions: approx. height 65 mm x width 90 mm x length 169 mm

Limited Warranty

For information about the terms of the product warranty, see the Data Harvest website at: <https://data-harvest.co.uk/warranty>

Product Repairs

When returning goods to Data Harvest, please download and complete the repair return [form](#) to ensure you have sent us all the information we require, and send it to us alongside the item to be repaired. The second page of this form includes a return address label.

If you have purchased a Data Harvest manufactured product via a different company, please also supply proof of purchase.

Postage Charges

- In the event of a fault developing, the product must be returned in suitable packaging to Data Harvest for repair or replacement at no expense to the user other than postal charges.
- There will be no postal charge for the return of repaired goods to any mainland UK address (for other areas, additional shipping charges may apply).

Out of Warranty Repairs

Please visit <https://data-harvest.co.uk/repairs> for the most up to date charges for out of warranty repairs.

Warranty on Repaired Items

Once an item has been serviced and repaired, the product will have 1 year warranty against further failure of the component repaired.

International Returns

Please contact the authorised Data Harvest representative in your country for assistance in returning equipment for repair.

Compliance

This product complies to the following standards

Waste Electrical and Electronic Equipment Legislation

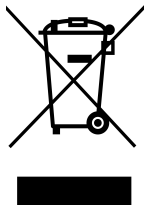
Data Harvest Group Ltd is fully compliant with WEEE legislation and is pleased to provide a disposal service for any of our products when their life expires. Simply return them to us clearly identified as 'life expired' and we will dispose of them for you.

FCC Details

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CE

This product conforms to the CE specification. It has been assessed and deemed to meet EU safety, health and environmental protection requirements as required for products manufactured anywhere in the world that are then marketed within the EU.



Troubleshooting

The Wireless Dynamics System...

If you experience any problems with your product, please try the following troubleshooting tips before contacting the Data Harvest support team.

Feature	Detail
Loss of Bluetooth Connectivity	<p>If the sensor loses Bluetooth connection and will not reconnect try:</p> <ul style="list-style-type: none"> Closing and reopening the EasySense 2 app. Switching the sensor Off and then On again. If you are using a Bluetooth Smart USB Adaptor on your computer, unplug the adaptor, plug back in again and try to reconnect. Hard reset the sensor and then try to reconnect.
How do I use 2 Light Gates at the same time for A-B type experiments?	<p>Only one Light Gate can be connected to the EasySense2 software at a time. Once connected, you need to connect each light gate with the Light Gate connection lead ACC-24</p>

Notices

Please read the following notices with regards to using your sensor

1. The sensor is much smarter than traditional Bluetooth sensors and you are not required to pair the device. If paired, the sensor will not be available to the EasySense 2 app.
 2. When the sensor is connected to a computer, the computer should be turned on and not in sleep or standby mode or the battery may drain instead of charge.
 3. Data Harvest products are designed for educational use and are not intended for use in industrial, medical or commercial applications.
 4. The sensor is not waterproof.
 5. Plastic parts may fade or discolour over time if exposed to UV light. This is normal and will not affect the operation of the sensor.
 6. Only one Light Gate can be connected to the EasySense2 software at a time.
 7. Strong magnets are present, do not dismantle or swallow magnets. Keep away from medical equipment, such as pacemakers.
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Contact Information

To contact Data Harvest directly, please use any of the following channels

Traditional Communications

Data Harvest Group Ltd.
1 Eden Court, Eden Way,
Leighton Buzzard,
Bedfordshire,
LU7 4FY
United Kingdom

Tel: +44 (0) 1525 373666

Fax: +44 (0) 1525 851638

Sales email: sales@data-harvest.co.uk

Support email: support@data-harvest.co.uk

Online Communications

We have active social media support channels using the following platforms

- [Facebook](#)
- [Twitter](#)
- [YouTube](#)

Office Opening Hours

Monday to Thursday - 08:30 to 16:45

Friday - 08:30 to 13:30

Saturday & Sunday & UK Bank Holidays - Closed

PDF Translations

The PDF formatted download of this manual is by default provided in the English (United Kingdom) language. If an alternative translation is available, it will be listed here.

We have for your convenience included a webpage translation feature to the online documentation which will allow you to translate and print individual pages of this documentation.
