1200 - Wireless Light Gate Sensor

Version: 0 | DS166

Table of contents

Introduction

Thank you for purchasing the Smart Wireless Light Gate Sensor. 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 Smart Dual Light Gate has a pair of light gates spaced at 1.5 cm to accurately measure velocity. The smart wireless light gate also has a wide gate auxiliary infra-red port and a synchronisation socket to link to another gate. The wide gate auxiliary port allows you to time the movement of items that would not fit through the arms of the gate.

The nature of wireless communications means that there is a latency between devices. The latency is in the region of 2 ms, and makes the wireless synchronisation of two light gates unrealistic for accurate data. If work requires a dual light gate set up, we recommend the use of a second dual light gate set connected by a sync link cable to reduce latency to zero.

Pack Contents

This product is supplied with the following items:

- 1 x Smart Wireless Light Gate Sensor
- 1 x USB Connecting Lead
- 1 x Link Cable
- 1 x Mounting rod
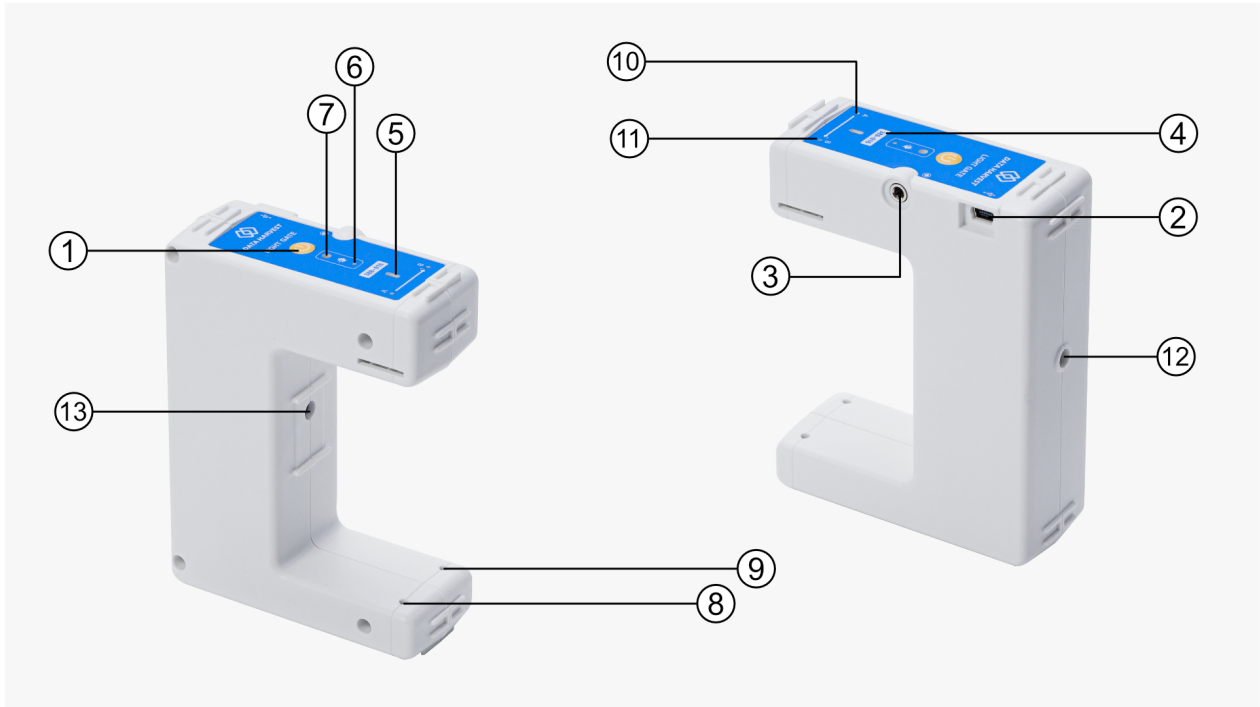
Additional Accessories

To get the most from your Smart Wireless Light Gate Sensor, the following items should be considered:

- Interrupt card set
- Data Harvest - Wireless Dynamics System
- Data Harvest - Spoked Pulley

Operational Overview

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

1. On/Off Switch
2. USB Port
3. Connection socket to attach Light Gates together
4. Unique ID Number
5. Status Indicator
6. Laser Gate
7. Laser Gate Indicator
8. A – Transmitter
9. B – Transmitter
10. A – Receiver and indicator
11. B – Receiver and indicator
12. Mounting Rod connection
13. Spoked Pulley Wheel Connection

On/Off Switch (1)

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

USB Port (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'.

Connection socket to attach Light Gates together (3)

A Jack plug connection lead is supplied with each Light Gate, this is used to connect two Light Gates together when you want a physical separation using two Light Gates.

Unique ID Number (4)

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

The Status Indicators (5)

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

Status Light		Indicates
No light		The sensor is Off. Short press the On/Off switch
Blue flashing		The sensor is On and advertising Bluetooth
White flashing		Charging via USB mains charger or USB port, Sensor is On and Bluetooth advertising
Red, Green, Blue Flashing		Charging via USB mains charger or USB port, Sensor is Off
Green flashing		Communication with the EasySense app (via USB or Bluetooth) established
Solid Green		Fully charged
Orange flashing		Recording data, a fast pulse indicates awaiting trigger in Remote Mode
Red flashing		Battery is low

Laser Guide (6)

This can be used with any laser, when using a larger object that will not fit between the Light Gate transmitter and receiver (a laser is not supplied with the light gate).

Laser Gate Indicator (7)

This will show a green light when the laser has been detected and will turn red when an object breaks the laser beam.

A – Transmitter (8)

This is where the infrared beam for A starts. A measurement should be taken if needed for distance.

B – Transmitter (9)

This is where the infrared beam for B starts. A measurement should be taken if needed for distance.

A – Receiver and Indicator (10)

This is where the infrared beam for A ends. A red light will appear when the beam has been broken.

B – Receiver and Indicator (11)

This is where the infrared beam for B ends. A red light will appear when the beam has been broken.

Mounting Rod Connection (12)

This is used to secure the metal mounting rod bar which can then be used in the boss on a retort stand.

Spoked Pulley Connection (13)

A spoked pulley can be purchased separately (product number 3177) and secured here. The spoked pulley will block the infrared beam of the Light Gate as it rotates and can therefore be used for continuous recording of time/distance, time/velocity and time/acceleration relationships. (A spoked pulley is not supplied with a Light Gate)

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 EasySense 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 eight 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:
  o The computer platform it is being used with and the EasySense app's version number.
  o A description of the problem being encountered.

The Sensor and EasySense

Please make sure that you use the latest release of the EasySense series of software. Both collection and analysis of data is available here, on a variety of operating systems.

Direct Data Logging

The sensor is designed to work directly with EasySense (as an installed application or PWA). A full compliment of experiments can be run by using the sensor through Bluetooth™ or USB. EasySense will support direct logging and data storage when connected as above.

Remote Data Logging

The ability to capture data independently (free of a capture station) is done through EasySense's Remote Mode.

This facility may be found in EasySense, under Setup. Once the conditions for data collection have been established, the sensor can be set to initiate collection for example, using a rapid press of the power button. Initiation of the experimental data collection by the software is followed by remote detachment; collection is then on the sensor.

Data gathering is realised by using Setup once again.

Details are given in the latest EasySense User Guide.

Connectivity

The sensor is both USB and Bluetooth compatible. Install the EasySense app, if it is not already on your device. For details of how to operate the EasySense app, please refer to the EasySense 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 app.
4. Within the EasySense 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 EasySense app user manual system requirements for further details.

Quick Notes on Bluetooth Connectivity

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

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

Quick Steps

1. Short press the on/off switch to turn the sensor on, blue LED will flash.
2. Open the EasySense 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 four 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 five minutes 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.

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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 EasySense 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 EasySense app, the sensor will have to be reconnected after performing the update.

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Firmware Updates

Usage Information

The wireless Light Gate is a double light gate meaning it has "A" and "B" gates within one housing. Experiments when you need to go from A to/and/then B can be completed with just the one Wireless Light Gate.

You can also use two Wireless Light Gates together when you want to have a physical separation. When using two wireless Light Gates, you need to connect them using a link cable which is supplied with each Wireless Light Gate.

To connect one Wireless Light Gate
1. Open the EasySense app.
2. Turn on the Light Gate using the button on the Light Gate.
3. Select the red device button on the top left of the EasySense app. The Light Gate will appear in the available list listed as Light Gate and a 6-digit number (unique to each Light Gate).
4. Select connect to the Light Gate - the number will match the label on the actual Light Gate.
5. Select setup on the bottom left of EasySense app, then change the Mode to Timing and set up the relevant experiment.

To connect two Wireless Light Gates
1. Open the EasySense app.
2. Turn on the wireless Light Gate using the button on the Light Gate that will be the first to be interrupted in your practical.
3. Select the red device button on the top left of the EasySense app. The Light Gate will appear in the available list listed as Light Gate and a six digit number (unique to each Light Gate).
4. Highlight the number of the light gate you want to connect and select connect.
5. Select the drop-down menu to the right of the Light Gate and select two Light Gates. The one you connected to will be Light Gate A.
6. Connect the link cable between the two light gates and turn on the second (the one you did not connect to the EasySense app) Light gate B.
7. Select Setup on the bottom left of EasySense app, then change the Mode to Timing and set up the relevant experiment.

If you connect with a USB connection the process is the same with the exception that USB connections to Data Harvest data logging devices will automatically be identified as active connections in the EasySense app. You will not need to worry about the identity number.

If you are connecting two Light Gates, the same requirement to connect only one Light Gate and link to the second by cable is present. Only turn on the second Light Gate once the link cable is in place.

If you require power to the Light Gates and wish to use BT connectivity you will need to use a mains powered USB charging port.

To Use the Laser receiver with one Light Gate *(a laser is not supplied with the Light Gate)*
1. Open the EasySense app.
2. Turn on the Light Gate using the button on the Light Gate.
3. Select the red device button on the top left of the EasySense app, the Light Gate will appear in the available list listed as Light Gate and a 6-digit number (unique to each Light Gate).
4. Select the drop-down menu to the right of the Light Gate and select Lasers.
5. You can use a laser by pointing it at the laser receiver area on the Light Gate. This allows larger objects to be used with the Light Gate, as the laser beam can be broken by an object.
6. Select Setup on the bottom left of EasySense app, then change the Mode to Timing and set up the relevant experiment.

Any laser can be used

When only using one Light Gate with the laser receiver, this means only at A experiments can be

conducted.

To Use the Laser receiver with two Light Gates *(a laser is not supplied with the Light Gate)*
1. Open the EasySense app.
2. Turn on the Light Gate using the button on the Light Gate.
3. Select the red device button on the top left of the EasySense app, the Light Gate will appear in the available list listed as Light Gate and a 6-digit number (unique to each Light Gate).
4. Select the drop-down menu to the right of the Light Gate and select Lasers.
5. Connect the link cable between the two light gates and turn on the second (the one you did not connect to the EasySense app) Light gate (Laser) B.
6. You can use a laser by pointing it at the laser receiver's area on the Light Gate A and B. This allows larger objects to be used with the Light Gate, as the laser beam can be broken by an object.
7. Select Setup on the bottom left of EasySense app, then change the Mode to Timing and set up the relevant experiment.

Any laser can be used.

If you connect with a USB connection the process is the same with the exception that USB connections to Data Harvest data logging devices will automatically be identified as active connections in the EasySense app. You will not need to worry about the identity number.

If you are connecting two Light Gates, the same requirement to connect only one Light Gate and link to the second by cable is present. Only turn on the second Light Gate once the link cable is in place.

If you require power to the Light Gates and wish to use BT connectivity you will need to use a mains powered USB charging port.

Practical Investigations

The Smart Wireless Light Gate Sensor can be used to investigate a number of scientific experiments such as:

- Dynamics experiments involving calculating time, speed, velocity, acceleration using inclinable planes and air track
- Newtons 2nd law (f = ma)
- Study collisions and momentum changes
- Acceleration due to gravity investigations
- Pendulum investigations
- Measure the time period of an oscillating body
- Used with the Force sensor to investigate: Impulse and change in momentum and centripetal force in a pendulum

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 EasySense 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.
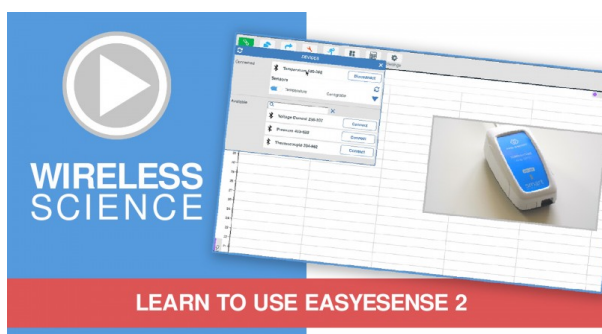
See our website for further information and links.

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 EasySense

The core of our science platform is our EasySense app. 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	Timing Data
Accuracy	1 µs
Probe wavelength	940 nm
A/B Gate separation	0.025 m
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 to 40 C
Internal Battery	Rechargeable internal lithium-ion 3.7 V
Physical Specifications	Weight: approx. 144 g External dimensions: approx. height 130 mm x width 40 mm x length 100 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.

Troubleshooting

The wireless Light Gates work using an infra-red beam, natural light is infra-red and can affect the beam of the Light Gate. Use away from direct sunlight.

When using two Light Gates with the connection lead, make sure the connection lead is fully inserted.

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	**If the sensor loses Bluetooth connection and will not reconnect try:** Closing and reopening the EasySense 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?	Only one Light Gate can be connected to the EasySense software at a time. Once connected, you need to connect each light gate with the Light Gate connection lead ACC-24

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 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 EasySense software at a time.

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
* X
* 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.