



## 1158 – Wireless EKG / ECG Sensor

Revision: 0 | DS180

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## Introduction

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Thank you for purchasing the Smart Wireless EKG / ECG 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 Smart Wireless EKG / ECG Sensor is USB and Bluetooth compatible. Using Bluetooth, a sensor can connect to mobile devices, tablets, laptops and desktops.

The Smart wireless EKG / ECG (electrocardiogram) Sensor monitors the electrical energy produced during a heartbeat. The change in electrical energy is detected by two leads and referenced to a ground signal. The changes in energy are displayed as a waveform.

The ECG Sensor is supplied with a pack of 100 ECG electrode patches for making attachment to the test subject's skin. Additional packs of these electrodes are available from your supplier - Product No. 3286.

### Notes

- This product is designed for demonstration of the ECG waveform. It is not designed or intended for medical diagnosis. Any information derived from the signal produced should be regarded as having no medical significance.
- If using a USB link to your device check that:
  1. The test subject is not able to touch the PC or any source of power connected to the equipment.
  2. The PC is electrically safe e.g. conforms to the IEC standard 60950.
- The average heart cycle is typically 0.7 to 0.8 seconds; you will need to use setup to change from the default inter-sample period to a shorter period.
- The best results are obtained from an ECG sensor if the bluetooth connection to your device is

used.

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## Pack Contents

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This product is supplied with the following items:

- 1 x Smart Wireless EKG / ECG Sensor
- 1 x USB Connecting Lead
- 1 x Pack disposable skin electrodes

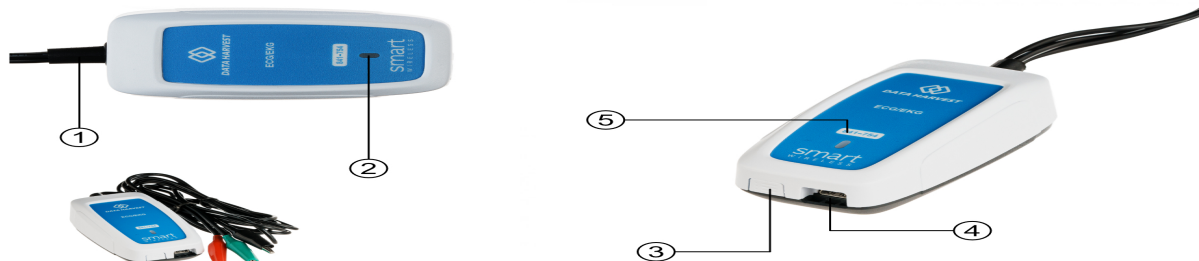
## The Electrode Patches

The electrode patches are a silver/silver chloride gel on a foil backing. The gel is hypoallergenic and has adhesive properties that enable the electrode to stick to the skin surface. The foil backing provides a constant area of contact and the gel gives a constant skin electrode resistance.

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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.



1. Sensor End Cap
2. Status Indicator
3. On/Off Switch
4. USB Port
5. Unique ID Number

### Sensor End Cap (1)

Most Smart Wireless Sensors feature an end cap that is specific to the requirements of the device's internal sensor. The sensor's end cap is the direct interface between the device's internal sensor and your experiment.

### The Status Indicators (2)

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 is On and Bluetooth advertising
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 EasySense2 app (via USB or Bluetooth) has been established
Solid Green		Fully charged
Orange flashing		Recording data
Red flashing		Battery is low

### On/Off Switch (3)

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 Port (4)

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'.

### Unique ID Number (5)

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.

## Connectivity

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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.
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## Charging the Sensor

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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 5 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

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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.

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## Usage Information

The electrode patches are disposable. A minimum of three electrode patches is required for each test subject (four to try out each attachment combination).

- To ensure good adhesion, rub the area of skin to be used with a paper towel – preferably dampened with an alcohol rub e.g. industrial methylated spirits (IMS).
- Decide on the lead type arrangement to be used (see ‘positioning the electrode patches’ below).
- Remove an electrode patch from the liner and place gel side down onto the skin, with the tab on the electrode pointing downwards on the arm or upwards on the ankle.
- Press the electrode firmly in place to ensure full contact.
- Clip the appropriate crocodile clip connector onto the tab part of the patch.
- After the investigation is complete, remove the electrode patch slowly with a peel back action.

### Notes:

- Once a pack of electrodes has been opened, they should be stored in a cool place, in a clean dry airtight container.
- The electrodes may dry out, so do not open the pouch until they are about to be used. See the pouch for the ‘use by date’. Once opened, fold the open end of the pouch over at least once and secure with a paper clip or similar.

### Positioning the electrode patches

Note: The test subject can attach both the electrode patch and leads; there is no need for the intervention of a second person. If necessary, the electrodes and leads can be connected discreetly under the test subjects clothing.

There are four suggested positions for the electrode patches – the inside of the upper left arm, the inside of the upper right arm, the area behind the ankle on the left leg and the area behind the ankle on the right leg.

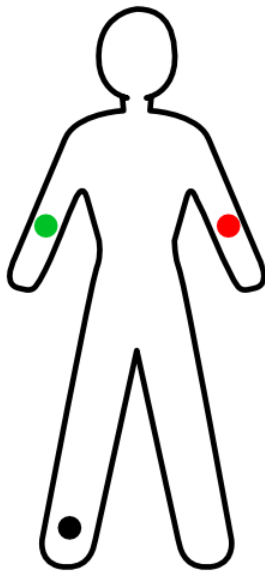
There are three electrode leads from the ECG Sensor each with a different colour crocodile clip connector. The crocodile clip for the positive lead is red, green for the negative lead, and black for the reference point (isoelectric line).

There are three different ways that the electrode leads can be connected to the electrode patches. Each arrangement of lead and electrode will record a different shape and intensity of waveform and is described as a ‘lead type’. For the majority of individuals, either the Lead I or Lead II layout will produce the ‘typical’ ECG trace.

Lead type	Red (Positive) lead	Green (Negative) lead	Black (Reference) lead
Lead I	Left arm	Right arm	Right ankle
Lead II	Left ankle	Right arm	Right ankle
Lead III	Left ankle	Left arm	Left ankle

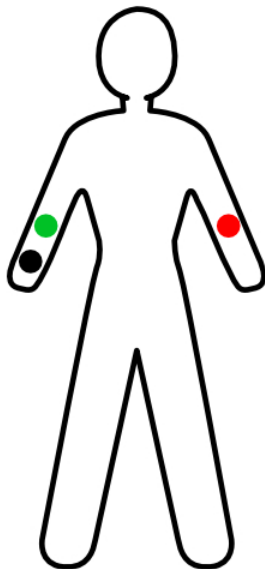
## Lead I

1. Rub the area of skin that will be used with the paper towel.
2. Place an electrode patch on the inner part of your right upper arm, your left upper arm and on the area behind your right ankle.
3. Connect the Green crocodile clip to the electrode tab on your right arm.
4. Connect the Red crocodile clip to the electrode tab on your left upper arm.
5. Connect the Black crocodile clip to electrode tab on your right ankle.



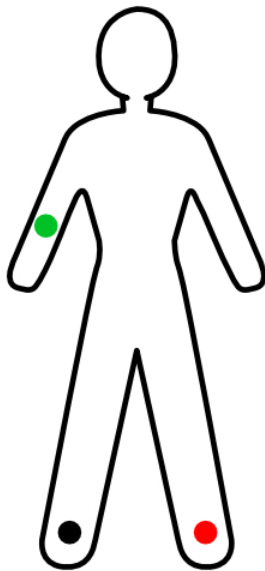
If attaching the lead to the ankle causes a problem, e.g. the test subject is wearing tights, use this alternative Lead I arrangement:

1. Place an electrode patch on the inside of your right elbow, right wrist and left elbow.
2. Connect the Green Crocodile clip to the electrode tab on your right elbow.
3. Connect the Black Crocodile clip to the right wrist.
4. Connect the Red crocodile clip to the left elbow.



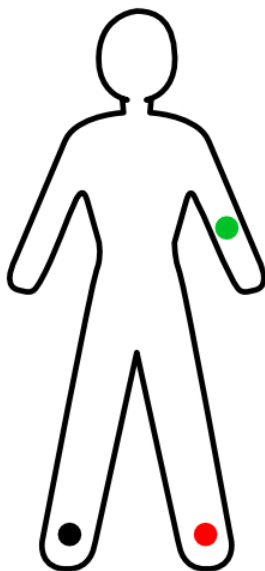
## Lead II

1. Rub the area of skin that will be used with the paper towel. Place an electrode patch on the inner part of your right upper arm, on the inner area behind your left ankle and on the inner area behind your right ankle.
2. Connect the Green crocodile clip to the electrode tab on your right arm.
3. Connect the Red crocodile clip to the electrode tab on your left ankle.
4. Connect the Black crocodile clip to the electrode tab on your right ankle.



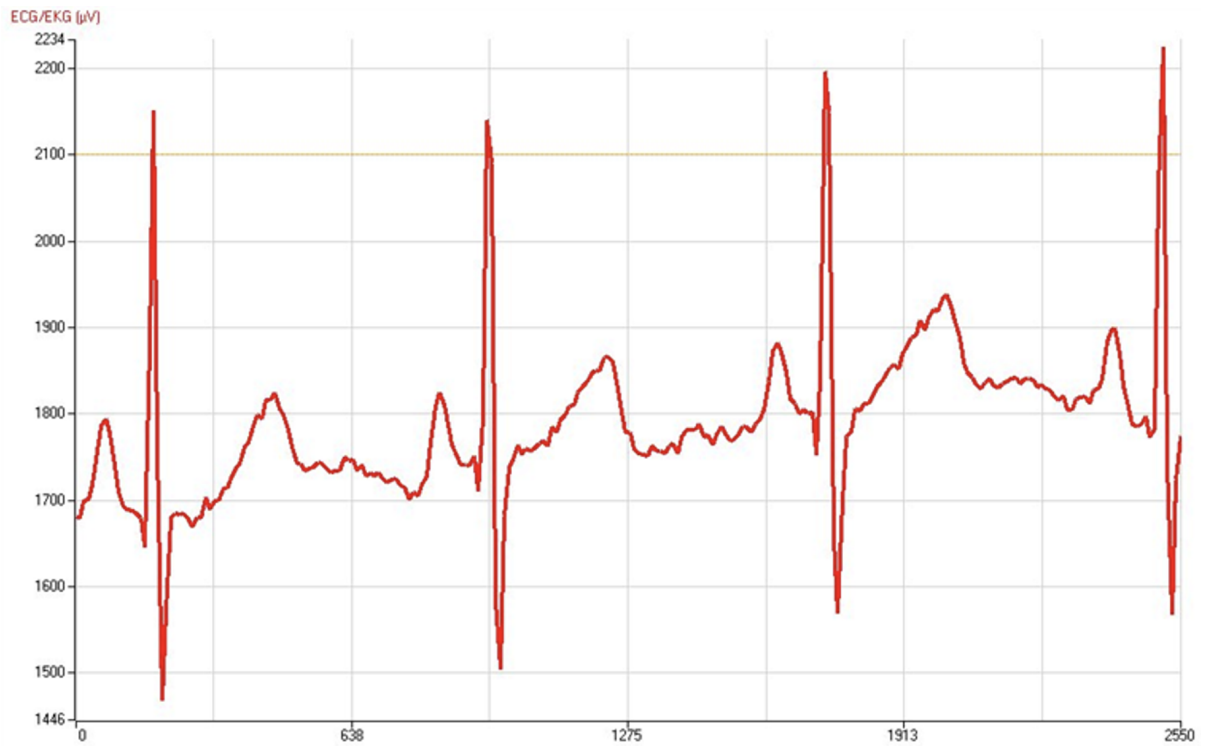
### Lead III

1. Rub the area of skin that will be used with the paper towel. Place an electrode patch on the inner part of your left upper arm, on the inner area behind your left ankle and on the inner area behind your right ankle.
2. Connect the Green crocodile clip to the electrode tab on your left arm.
3. Connect the Red crocodile clip to the electrode tab on your left ankle.
4. Connect the Black crocodile clip to the electrode tab on your right ankle.



If the connections have been correctly made you should see a typical waveform pattern as shown. There will be slight differences between the lead positions and individuals.

For analysis work (periods between stages of ECG, for example) choose a combination of inter-sample period and recording duration that gives no more than 4 cycles per chart created.



## Practical Investigations

The Smart Wireless EKG / ECG Sensor can be used to investigate a number of scientific experiments such as:

- Comparing the ECG to the waveform from the Heart Rate Sensor (Product No. 3147).
- Comparing the ECG of rested and exercised heart.
- What happens to the ECG trace if the sensor lead location is changed?
- Understand the meaning and relationship of the P, Q, R, S and T waveforms.
- Investigate the ECG after the use of mild stimulants (caffeine).

## 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.

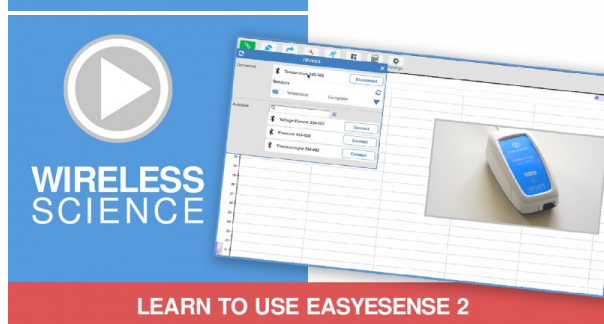
See our website for further information and links.



### 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

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Please read the following table for sensor specifications.

Feature	Detail
Measurement Ranges	ECG Waveform, 200 to 4000 $\mu$ V
Resolution	$\pm 1\mu$ V
Fastest logging speed	500 $\mu$ s (2KHz)
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 10 m in open air Frequency Range: 2.402 to 2.480 GHz operation
Internal Battery	Rechargeable internal lithium-ion 3.7 V Power specification: 5 V at 500 mA
Storage/Operating Temperature	0 - 40 C
Humidity	0 to 95% RH (non-condensing)
Physical Specifications	Weight: approx. 130 g External dimensions: approx. height 91 mm x width 49 mm x length 33 mm

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## Limited Warranty

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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.

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## Compliance

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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

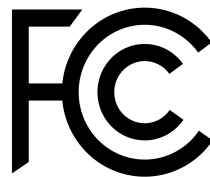
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### 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.

### UKCA

This product conforms to the UKCA specifications.



## Troubleshooting

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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><b>If the sensor loses Bluetooth connection and will not reconnect try:</b></p> <p>Closing and reopening the EasySense 2 app.</p> <p>Switching the sensor Off and then On again.</p> <p>If you are using a Bluetooth Smart USB Adaptor on your computer, unplug the adaptor, plug back in again and try to reconnect.</p> <p>Hard reset the sensor and then try to reconnect.</p>

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## Notices

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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.
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## Contact Information

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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](mailto:sales@data-harvest.co.uk)

**Support email:** [support@data-harvest.co.uk](mailto: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

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## PDF Translations

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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.

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