DATA HARVEST

EASYSENSE V-Hub
Reference Manual
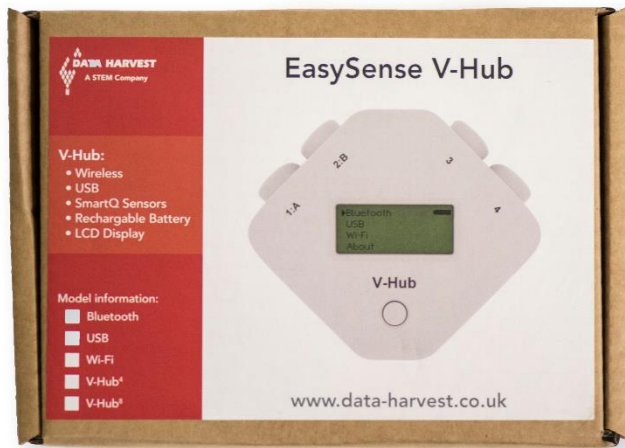
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What's supplied?

The V-Hub interface

2 x long sensor
leads (3005)

1 x mini USB lead
(standard A to mini B)
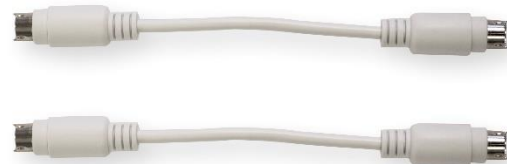
2 x short sensor leads (3004)

1 x mounting rod

Getting to know your V-Hub interface

Charge EASYSENSE V-Hub fully before first use

Connect V-Hub directly to a USB port on your computer* (or a powered USB hub) using the USB cable supplied with it. A full charge can take up to 4 hours.

V-Hub can also charge from a USB mains charger that outputs 5 V at 1 A or more.

A battery charging symbol will be displayed on V-Hub's screen while the logger is charging.

*Your computer must be turned on and not in sleep or standby mode; otherwise the battery may drain instead of charge.

The V-Hub interface

V-Hub[8] Light sensor

V-Hub[8] Sound sensor

V-Hub[8] Air Pressure & Humidity sensors

Plug-in sensors inputs

Plug-in sensors inputs

Screw thread for metal rod attachment

Battery status indicator

LCD display showing connection method

Button press

USB input
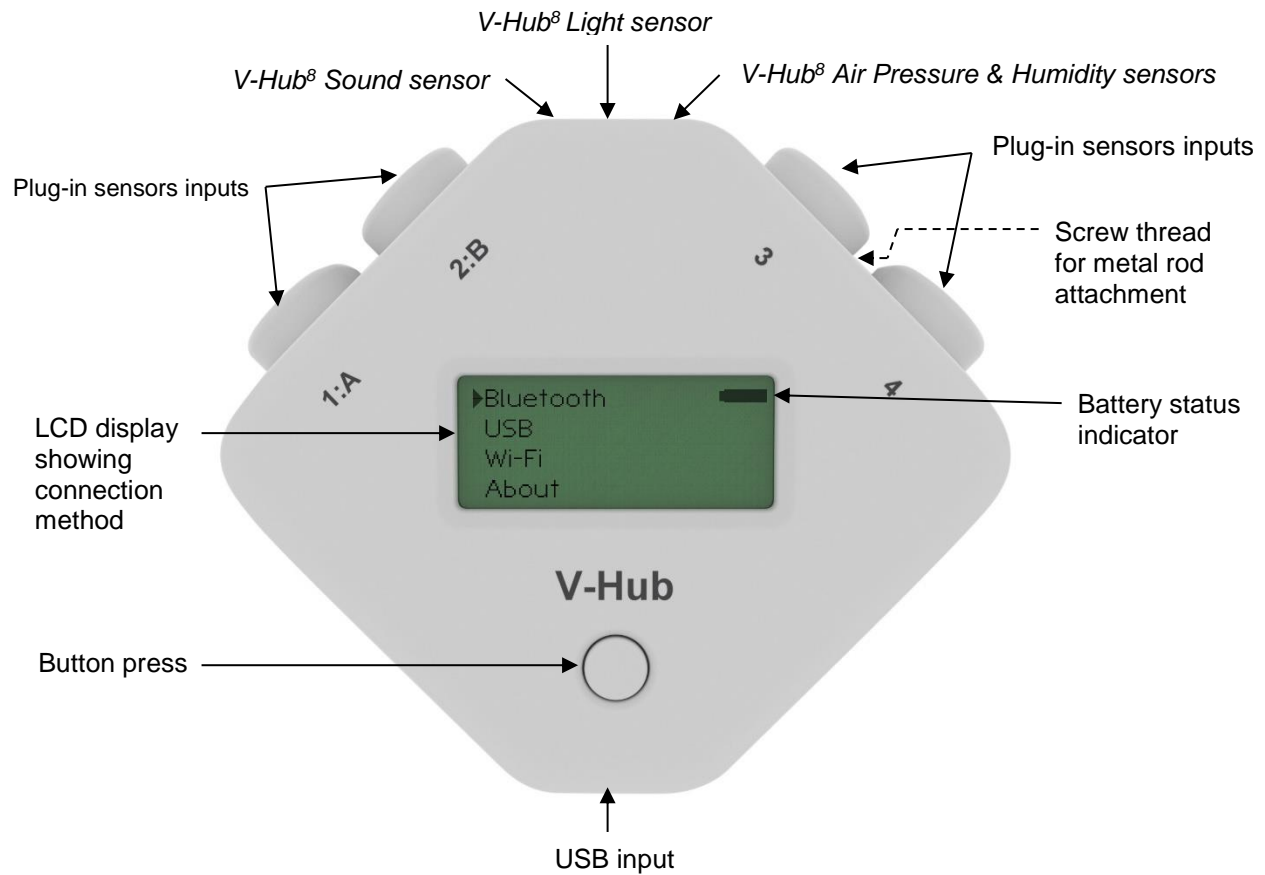
V-Hub's button

The button is used to select the connection method, reset and switch the logger on and off.

Individual short presses of the button will scroll through the cursor through the connection options: Bluetooth, USB or Wi-Fi (if fitted). With the cursor pointing at the appropriate option press the button until the option highlights then release. Use a short press to exit.
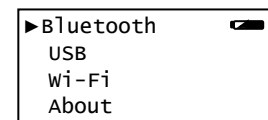
Use a 5 second press to switch V-Hub Off even when connected to power. To switch back on press and hold down the button until the word V-Hub displays then release.

To hard reset the interface press and hold down the button for about 10 seconds until the word V-Hub displays then release.

If battery powered and not in use V-Hub will switch off automatically after 2 minutes. Press the button to switch back on.

LCD display

The LCD displays a

- Menu of the connection options available to select (Bluetooth, USB or Wi-Fi, if fitted)
- About, to check the logger's firmware version, logger name and serial number
- Indicator of the status of the battery

Note: V-Hub does not display data direct from the sensors, it needs to be connected to the EasySense software that has been installed on a computer or tablet, and data will be displayed on the computer/tablets screen.

Sensors

The sensor leads

There are four sensors leads supplied with V-Hub, two long and two short. These are used to connect *Smart Q* sensors to the inputs on V-Hub.

The plug-in sensors

Smart Q Sensors are available to purchase separately and are **not** supplied with V-Hub.

Sensors can be divided into two main types:

1. Analogue - used to measure physical quantities such as temperature, sound, light, pH, etc.

2. Digital - switch-type sensors for measuring ON/OFF conditions e.g. Light gates and Timing mats to calculate time, speed and acceleration.

Please contact your supplier or the Data Harvest website (www.data-harvest.co.uk) for up-to-date information on Smart Q sensors.

Plug the Smart Q sensors into the shaped input sockets on the top of the logger using the leads supplied with the logger. When a sensor is connected it will automatically be detected.

Sensor inputs 1 and 2 are dual labelled as A and B. These inputs are for Timing operations when digital sensors must be connected to either input 1:A or input 1:A and 2:B.

Selecting the sensor range

Some of the internal sensors in V-Hub[8] and some plug-in sensors have more than one range. Once a range has been selected it will be used until reselected.

The range of a sensor can be altered e.g. using New in the EasySense software (EasyLog, Graph, Pictogram, Snapshot, Counting mode).

In the PC Windows EasySense software

- Select the New recording wizard icon.

  Click on the sensor's name (it will be listed using its current range).

  A set sensor range window will open; the current range will be highlighted.

  Note: If the sensor only has one range this window won't open.

  Select the required range, then OK. Select Finish to exit the wizard.

- Using Sensor Config in the EasySense Windows software (Settings menu).

Click on the Sensor's name

Current range is highlighted
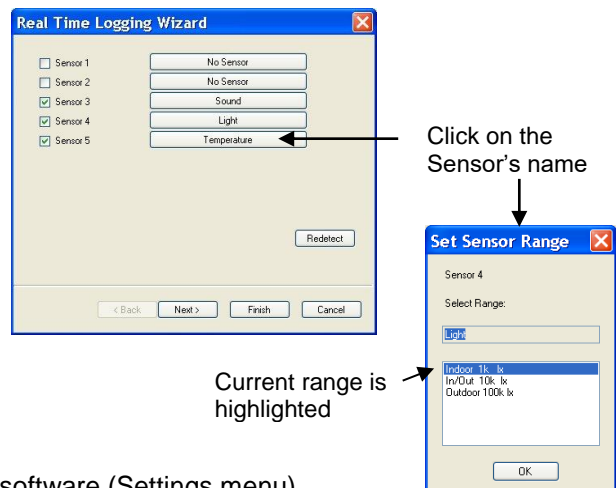
V-Hub 8's built-in sensors

The V-Hub 8 has 4 built-in sensors – Sound, Light, Humidity and Air Pressure.

	Built-in Sensors	Ranges
	Sound	40 to 110 dBA ±2000 mV
	Light level	0 to 1 k (Slow) lx (0 to 1,000 lx) 0 to 1 k (Fast) lx (0 to 1,000 lx) 0 to 10 k lx (0 to 10,000 lx) 0 to 100 k lx (0 to 100,000 lx)
	Humidity	0 to 100% RH
	Air Pressure	Pressure 85 to 110 kPa Pressure 850 to 1100 mBar Pressure 25 to 33 inHg Altitude -200 to 1,000 m Altitude -500 to 5,000 m Altitude -500 to 10,000 m

The **Sound sensor** has two ranges:

- **Decibel range** (40 to 110 dBA) used to measure sound pressure level (loudness). It is responsive to both single sounds (such as a whistle or handclap) and continuous background noise (such as passing traffic, classroom noise, etc.).
- **Millivolt range** (±2000 mV) used when examining the frequency content of sound e.g. sound waves: monitoring the effect of altering frequency and amplitude, wave forms of musical instruments, beat patterns, etc.

The **Light level sensor** has 4 ranges:

- **0 to 1 k lx (slow)**. This lower range is suitable for recording at indoor light levels and so is normally selected for use in the classroom.
- **0 to 1 k lx (fast)**. Unlike the other ranges this low range is unfiltered and so has a fast linear response. It can monitor rapid variations in light intensity, which cannot be observed with the eye e.g. fluctuations in the light intensity of a bulb due to voltage fluctuation.
- **0 to 10 k lx**. This medium range is suitable for recording bright light levels indoors or low light levels outdoors.
- **0 to 100 k lx**. This large range makes it ideal for outdoor use (sunlight) and environmental monitoring.

The **Humidity sensor** has one range, 0 to 100%. The sensor is used to monitor relative humidity i.e. the amount of water actually in the air compared with the amount of vapour needed to make the air saturated at the air's current temperature.

The **Pressure sensor** is used to measure **barometric** pressure or **altitude** in meters above sea level.

- For barometric pressure readings use either the kPascals range (85 to 110 kPa) or its equivalent in millibar (850 to 1100 mbar) or inches of mercury (23 to 33 inHg).
- For altitude in meters above sea level use either the -200 to 1,000 m, -500 to 5,000 m or -500 to 10,000 m range.

The average pressure exerted at sea level by the atmosphere in Britain is 101.325 kPa (1 atmosphere); the equivalent values are 29.92 in.of mercury (at 0˚C) or 1013 millibar.

The metal rod

V-Hub is supplied with a steel rod (size 100 mm long x 10 mm diameter with a M6 thread) which can be screwed into the mounting thread situated on the base of V-Hub. The rod can be used for clamping into a suitable holding device e.g. a retort stand.

Ways to capture data

V-Hub is entirely driven by the software on the host device (PC Windows, iPad or Android). The data from the sensors is transmitted immediately to the computer and displayed on the computers screen using the applications in the EasySense software. This method of collection is useful for many classroom-based experiments.

Powering V-Hub

EASYSENSE V-Hub can be powered by:

1.   The USB port (whilst connected to the computer).

2.   Its internal batteries (when charged).

Connect V-Hub directly to a USB port on your computer* using the USB cable supplied. A full charge can take up to 4 hours. A battery charging symbol will be displayed on V-Hub's screen while the logger is charging.

V-Hub can also be charged using a USB mains charger that outputs 5 V at 1 A or more.

*Your computer must be turned on and not in sleep or standby mode; otherwise, the battery may drain instead of charge.

Note: V-Hub can only be connected directly to a computers USB port or if using a USB hub it should be powered. (V-Hub requires an output current of 500 mA when charging from USB). An extension cable must be of a single direct port extension type.

It is recommended that when possible V-Hub is connected to a power supply when used in Wi-Fi mode as the power requirements are high, and will drain the battery quickly.

Batteries

V-Hub is fitted with a rechargeable lithium-ion battery pack. Whenever V-Hub is connected to the USB port on the computer, it will automatically re-charge the battery.

Wait a few seconds after disconnecting power before checking battery charge status (top right of screen).

When its battery is in good condition and fully charged it can power a V-Hub Bluetooth connected for about 8 hours, or Wi-Fi about 5 hours.

V-Hub will stay awake if Bluetooth or Wi-Fi is turned on. Disconnect after use, the battery will continue to drain if V-Hub is stored with Wi-Fi or Bluetooth still selected.

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 V-Hub should be stored at about 40% or more charge. Do not store V-Hub with its battery fully discharged or with sensors connected. If V-Hub is to be stored for lengthy periods without use then it's a good idea to recharge the battery every 6 – 8 weeks.

The speed at which a lithium-ion battery will age is governed by both its storage temperature (preferably less than 40ºC) and state-of-charge. Eventually the battery pack will no longer deliver the stored energy and will need to be replaced. A fully charged battery that loses its charge quickly will demonstrate the need for replacement. When this happens, contact Data Harvest.

Auto switch off

While battery powered and not in use V-Hub will normally auto switch after 2 minutes to reduce power consumption. Press the button to switch back on.

If V-Hub is accepting power from the USB port or Wi-Fi or Bluetooth connected it will not operate auto switch off.

Hard Reset

If V-Hub fails to respond to the computer or a button press, carry out a hard reset.

- If necessary attach V-Hub to power.
- Press and hold down the button for about 10 seconds until the word V-Hub is displayed then release.

If V-Hub still fails to respond contact Product Support at Data Harvest.

Please provide details of:

- The computer platform it is being used with.
- The software version number.
- Its firmware number and serial number. (With the cursor pointing at About, press the button until this option highlights then release. Use a short press to exit).
- A description of the problem being encountered

If possible, telephone from a location where you can operate V-Hub with the computer.

Specifications

- V-Hub [8] only: 4 built-in sensors (Light, Sound, Humidity, Air Pressure)
- 4 *Smart Q* sensor inputs
- Timing inputs A & B
- 12 bit analogue sampling resolution
- Digital timing accuracy: 3.2 µs
- Fastest logging speed (per channel): 50,000 samples per second [20 microsecond (µs) between samples (50 kHz)]
- Firmware upgradeable
- USB communication to PC V1.1 & V2.0 compatible
- Power specifications: 5 V at 500 mA or more from USB, or 1 A or more from charger
- Rechargeable battery pack: Lithium-ion 3.7 V, 1300 mAh
- Operating range: 0 - 40˚C and 0 to 95% RH (non-condensing).
- Graphical LCD display (approx. 17 mm high x 41 mm wide).
- Weight of V-Hub (logger only): approx. (166g + 7 g Wi-Fi version)
- External dimensions of V-Hub: approx. Height 92 mm x Width 110 mm x Depth 34 mm.
- Pack size: approx. Height 160 mm x Width 230 mm x Depth 55 mm. Weight 435 g + 7 g Wi-Fi version
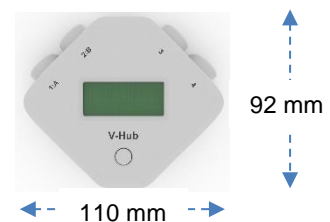
Bluetooth

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

Wi-Fi

V-Hub Wi-Fi is a wireless enabled data logger. It is classed as a mobile device and has a usable transmission range of 0.2 m to 10 m in open air.

- V-Hub are compatible with IEEE 802.11**n**.
- Supports WPA-Personal (TKIP) and WPA2-Personal (AES) Security (802.11i)*
- Frequency Range: 2412-2462 MHz
- Channels supported: 1 to 11

*V-Hub Wi-Fi will automatically detect and use the required security protocol.

Hereby, Data Harvest Group Ltd., declares that V-Hub Wi-Fi is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU

A full copy of the Declaration of Conformity can be obtained by writing to the following address: Data Harvest Group Ltd.,1 Eden Court, Leighton Buzzard, Bedfordshire, LU7 4FY, UK.

Care & Maintenance

- Clean with a damp cloth, do not immerse in water or detergent. V-Hub is **not** waterproof.
- Do not subject to extreme heat or cold or leave in a location where it will get wet.
- Do not place your logger in an environment in which high humidity levels are possible as this may result in damage or malfunction
- If V-Hub has been left in the cold, let it warm to near room temperature before waking it from sleep.
- Do not expose to direct sunlight for extended periods of time.
- Do not expose to temperatures greater than 60˚C, e.g. near a heater or inside a car in hot weather.
- Do not store V-Hub with its battery fully discharged. Ideally V-Hub should be stored at least **40% or more** state-of-charge.

Updating EASYSENSE V-Hub's Firmware

Occasionally Data Harvest may release updated firmware which will contain improvements or new features. Updates will be made available from the Data Harvest website. To update the firmware of your **EASY**SENSE V-Hub logger:

Step 1. Download the Firmware Update for V-Hub onto the hard disc of your computer, decompress (e.g. Extract All) and then run the .exe.
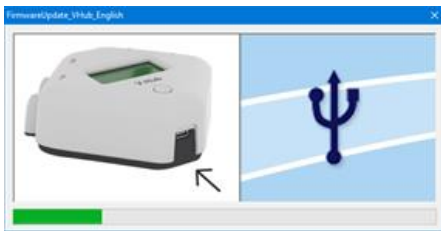
Step 2. Connect V-Hub to the computer using the USB cable.

Step 3. Wait for a few seconds. A progress bar will indicate V-Hub is being programmed.

A **tick** will indicate if the process was successful. Disconnect V-Hub. To repeat this process, connect another V-Hub and click on the update window.

A **cross** will indicate that an error occurred. Click on the update window to go back to the start screen and re-program.

# Using V-Hub connected via USB to a Windows PC for the first time

Step 1:

Install the EasySense software, if it is not already on your computer. For details of how to install and operate this program, please refer to the instructions provided with the EasySense software.

V-Hub requires **version 3.9** or later of the EasySense PC Windows software. (The version number can be verified in About from the Help menu).

Step 2:

On V-Hub short press the button until the cursor points to USB. Press the button for approximately 3 seconds until the option highlights then release. The screen will show the name of the logger.

Bluetooth
►USB
  Wi-Fi
  About
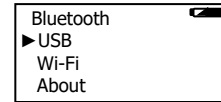
Step 3:

Connect V-Hub to the computer's USB port using the USB cable supplied. Windows will automatically detect a new device and install the drivers. When a connection is established the word USB will be displayed top left of screen.

USB
Fisher 20
                    ○ to exit
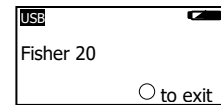
Step 4:

Connect the *Smart Q* sensors being used to the sensor inputs.

Note: If digital sensors are to be used for Timing operations they must be connected to the inputs labelled 1:A and 2:B.

Step 5:

Open the EasySense software program

The first time the EasySense program is opened a 'Select Program Level' window will automatically open. Select a suitable user's level.
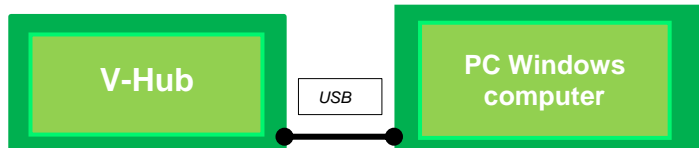
Level 1 is aimed at 'start' level (e.g. up to 9 years old), Level 2 is aimed at 'mid' level (e.g. 9 – 15 years old) and Level 3 is aimed at 'exam' level (e.g.15 years plus).

Note: The program level can be altered at any time using the Level icon.

Step 6:

An Interface option window will open.

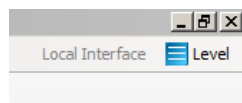1) If connecting V-Hub direct to a PC Windows computer select:

V-Hub ─ USB ─ **PC Windows computer**

(a) **Local Interface**

(b) Interface: **EasySense Range**

(c) **USB Port** as the connection.

(d) If these settings will stay the same leave the 'Show at startup' box unticked.

  If the box is ticked (enabled) the 'Select Interface' window will automatically open when you next start **EASY**SENSE, so you can check the selected method of connection is correct

(e) Click on OK. The program will save the selection.
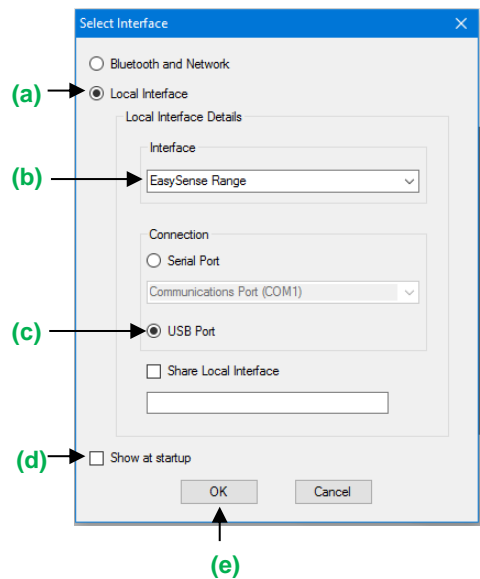
The text at the top right of the **EASY**SENSE window will indicate that a Local Interface connection has been established.

Local Interface Level

Select Interface

○ Bluetooth and Network
(a) ● Local Interface
    Local Interface Details
      Interface
(b)   EasySense Range
      Connection
      ○ Serial Port
        Communications Port (COM1)
(c)   ● USB Port
      □ Share Local Interface

(d) □ Show at startup
      OK   Cancel
(e)

2)   If simultaneously sharing data with other network users.

Data is captured in real-time by the Controller and instantly relayed to any Viewers that have made the connection to the Controller via the local network

On the Windows computer acting as the **Controller** (interface connected to the computer) select

(a) **Local Interface**.

(b) EasySense Range as the interface.

(c) **USB Port** as the connection.

(d) **Share Local Interface** to allow others network user's to connect as Viewers.

Note: Type in a more appropiate name for the controller computer if preferred.

(e) If the settings will always stay the same leave the 'Show at startup' box unticked.

If the box is ticked (enabled) the 'Select Interface' window will automatically open when you next start **EASY**SENSE, so you can check that the selected method of connection is correct
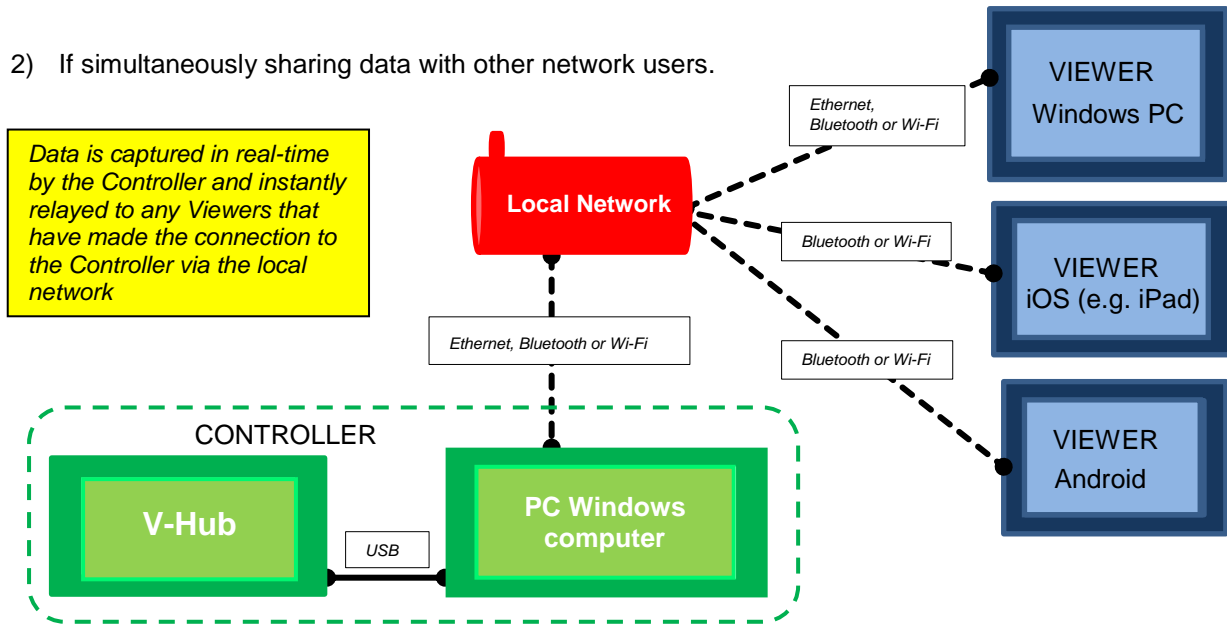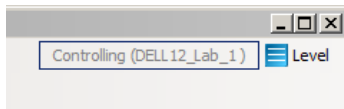
**(f)** Click on OK. The program will save the current selection.
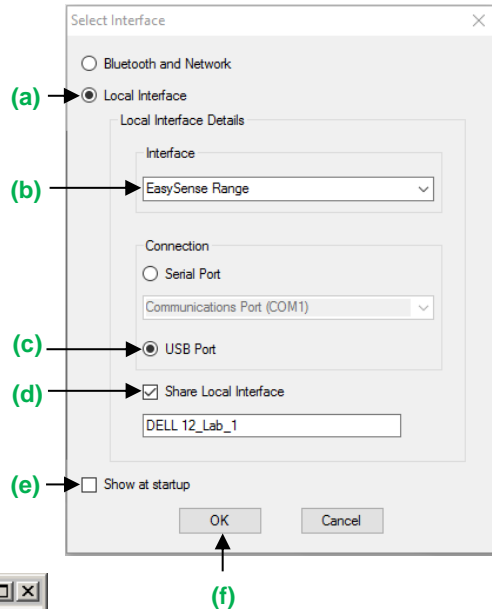
The text top right of the **EASY**SENSE window will indicate that connection as the Controlling system has been established.

On the Windows computer that will be acting as a **Viewer** select

(a) **Bluetooth and Network**

(b) If the 'Show at startup' box is ticked (enabled) this window will automatically open when you next start **EASY**SENSE, so you can check the selected method of connection is correct

(c) Click on OK. The program will save the current selection.

(d) Click on the **Not connected** text on the top right of the **EASY**SENSE window.
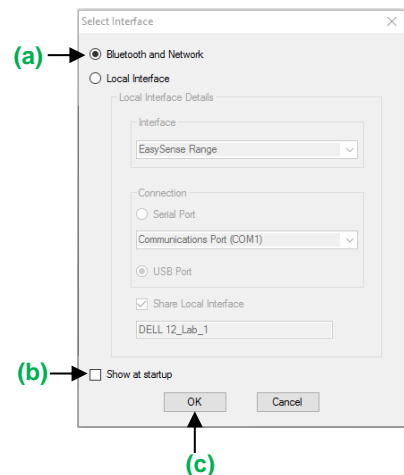
Select the computer acting as the Controller from the list of available devices, OK.

The text on the top right of the **EASY**SENSE window will indicate that connection as a Viewer has been established.
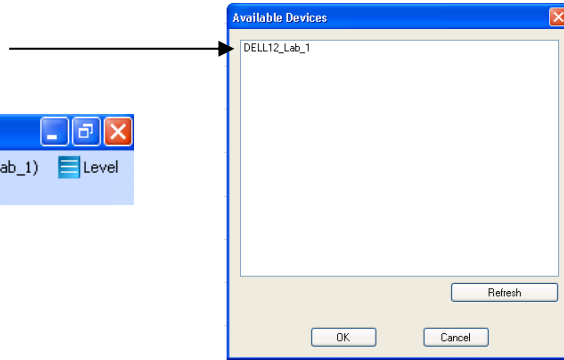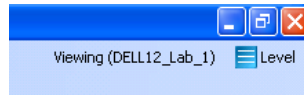
On an **iPad** that will be acting as a **Viewer:**

(a) From Settings set Wi-Fi to the same network that the 'Controller' PC is connected to.

(b) Open the EasySense iPad software, select the 'Not Connected' text at the bottom right of the screen and select the 'name' of the computer acting as the Controller from the list of devices.

(c) The text will change to indicate that connection as a Viewer is established

On an Android that will be acting as a **Viewer:**

(a) From Settings set Wi-Fi to the same network that the 'Controller' PC is connected to.

(b) Open the EasySense Android software, select the Connect icon (top right of screen) and select the 'name' of the computer acting as the Controller from the list of devices.

(c) The text bottom right of screen will change to indicate that connection as a Viewer has been established

Step 7:
The Home screen will open. Select one of the experiment modes e.g. EasyLog, Pictogram, Meters, Snapshot, Counting or Timing.

Using V-Hub connected via Bluetooth to a computer

If using V-Hub battery powered, fully charge the battery before use e.g. leave to charge overnight for use in lessons the next day. When the battery is in good condition and fully charged it will power a Bluetooth connected V-Hub for about 8 hours.

Note: V-Hub stays awake while Bluetooth is turned on. Disconnect after use as the battery will continue to drain if V-Hub is stored with Bluetooth still selected.

Do **NOT** pair the devices (when paired V-Hub will not be made available to the EasySense software).

When connecting to a Windows computer

V3.9 or later of the EasySense Windows software **must** be installed on the computer. An operating system of Windows 7 or above is required.

- Connect a 2070 or 2071 Bluetooth Smart USB adaptor to the USB port on the Windows computer. The adaptor is a plug and play device whose drivers should install automatically*.

- On V-Hub short press the button until the cursor points to Bluetooth. Press the button for approximately 3 seconds until the option highlights then release.

- The screen will show the name of the logger.

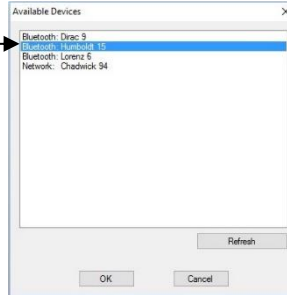- Open the EasySense software on the PC.
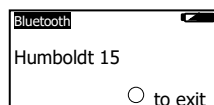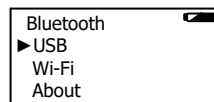
- From **File**, **Interface** select **Bluetooth and Network**. OK.

    Note: When first selected you may need to change Windows firewall settings to allow network access for this app.

- Select the connection status text top right of the EasySense window.
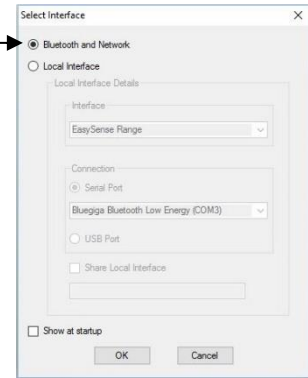
- Select the V-Hub's name (as displayed on its screen) from the list.

- The connection status will change to show that it is '**Controlling xx** or **Viewing xx** the logger.

    A link symbol ⚭ on V-Hub's screen will indicate connection to a computer.

When you've finished select the connection status icon in the EasySense software to disconnect, then press the button on V-Hub.

* If auto install fails, download and unzip the drivers for the Bluetooth USB adaptor (Product 2070 or 2071) from the Data Harvest website. Open Device Manager, right click on the entry for the dongle (typically listed under Other devices) and select Update drivers. Select to 'Browse my computer' (install manually), locate and select the BLED112 directory. When installed the adaptor will be listed under the Ports (COM & LPT) section.

When connecting to a iPad or Android device

An iPad will need to support Bluetooth Low Energy (BLE) also known as Smart or 4 (iPad 3 or later or any iPad Mini). **V1.12** or later of the EasySense iPad software **must** be installed.

An Android will need to support Bluetooth Low Energy (BLE) / Smart – OS 4.4 or later. **V1.05** or later of the EasySense Android software **must** be installed.

Note: Do **NOT** pair the devices (when paired V-Hub will not be made available to the EasySense software).

- Check in **Settings** on the device that Bluetooth is On.

- Select Bluetooth on V-Hub.

- Start the EasySense software.

- On an iPad tap on the 'Not Connected' text bottom right of the screen.

    On the Android select the connect icon 🚫 , top right of the screen

- Select the V-Hub's name from the list.

    The status will change to show that it is '**Controlling xx** or **Viewing xx**'.

When you've finished select the connection status icon in the EasySense software to disconnect, then press the button on V-Hub.

V-Hub in Wi-Fi mode

It is recommended that when possible V-Hub is connected to a power supply when used in Wi-Fi mode as the power requirements are high, and will drain the battery quickly.

Note: V-Hub stays awake while Wi-Fi is turned on. Disconnect after use as the battery will continue to drain if V-Hub is stored with Wi-Fi still selected.

Connecting V-Hub Wi-Fi to a network

V-Hub Wi-Fi can operate in two different modes:

1. Connected to its own local network (Access Point)

V-Hub Wi-Fi is set to Access Point by default. In this mode the iPad or Android connects to a network created by V-Hub. This connection is typically used when not in range or able to access the school's network (perhaps on a field trip). While connected to V-Hub in Access Point mode, the iPad or Android will NOT be connected to any other school network resources, and therefore unable to access other items such as web pages, email, cloud storage, etc.
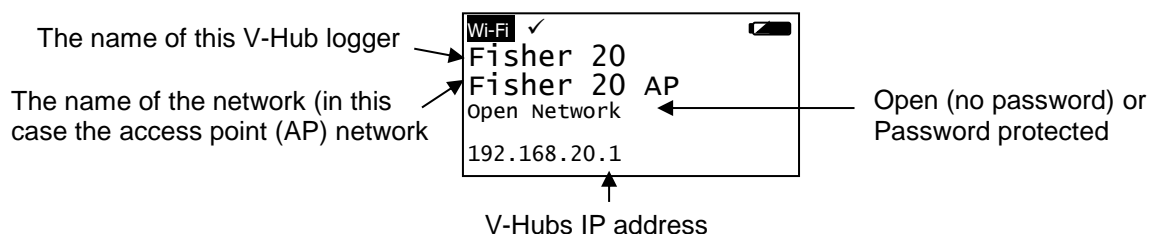
It is possible to have multiple V-Hub Wi-Fi loggers each creating their own separate network.

2. Connecting to an existing school's network (Infrastructure)

In this mode V-Hub Wi-Fi and the iPad or Android connect to the same existing network. It has the advantage of allowing the iPad/Android to remain connected to other resources delivered by the school network, such as web access, email, printing and cloud storage facilities, etc.

To set V-Hub's Wi-Fi to run in this mode download the **EasySense Logger Setup** utility from our website, data-harvest.co.uk.

Note: V-Hub Wi-Fi loggers use 802.11**n**, ensure the Wi-Fi network is **n** mode compatible.

The name of this V-Hub logger

The name of the network (in this case the access point (AP) network

Wi-Fi ✓
Fisher 20
Fisher 20 AP
Open Network
192.168.20.1

Open (no password) or Password protected

V-Hubs IP address

V-Hub Access Point connection using the default settings

1. On V-Hub short press the button until the cursor points to Wi-Fi. Press the button for approximately 3 seconds until the option highlights then release

2. Connect the iPad or Android to the V-Hub's Access Point network:

   - Select **Settings**.
   - Select the **Wi-Fi** link. Ensure Wi-Fi is ON.
   - Choose the (**V-Hub's name) AP** network from the list of available networks. Wait for confirmation that the network has been joined e.g. a tick or it shows as Connected.

3. Start the **EasySense** App.

4. On an iPad tap on the status button 'Not Connected' (bottom right of the screen), on an Android tap on the connection icon (top right of the screen). Select the V-Hub's name from the list.

5. The status will change to show that it is '**Controlling V-Hub xx** or **Viewing V-Hub xx**'.

6. When you've finished select the connection status icon in the EasySense software to disconnect, then press the button on V-Hub to reset.

Connecting V-Hub to a school's network (Infrastructure)

Download EasySense Logger Config from our website, www.data-harvest.co.uk (Product No 2080). This will let you change V-Hub's Wi-Fi settings for connection to an existing schools network.

Change the name of the logger, set an AP network password, etc.

Download EasySense Logger Config from our website, www.data-harvest.co.uk (Product No 2080).

Connecting a group of iPads/Androids to a V-Hub

It is possible for a group of devices to connect to one V-Hub Wi-Fi simultaneously to allow students to work collaboratively on a single experiment.

Note: Performance maybe impacted if lots of devices are connected to the same logger.

When connecting to V-Hub, the first device (iPad, Android or Windows PC) to connect is given 'control' of the logger and will therefore be able to setup, start and stop the experiment. All subsequent devices that connect to the logger are given 'Viewer' status, they will see the set up changes made by the controller, and as data is captured it will appear in real time.

When the recording stops, all iPads and Androids will automatically save their own copy of the captured data in its internal memory. One iPad or Android cannot change or delete the data held on another device.

To leave a group, simply tap on the status button again to disconnect (iPad users this is bottom right of the screen, Android users top right of the screen).

When the controlling iPad/Android disconnects this will disconnect all the others. A new controlling iPad/Android is chosen by ensuring that it is the first to re-connect.

Limited warranty

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

Note: Data Harvest products are designed for **educational** use and are not intended for use in industrial, medical or commercial applications.

WEEE (**W**aste **E**lectrical and **E**lectronic **E**quipment) 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.