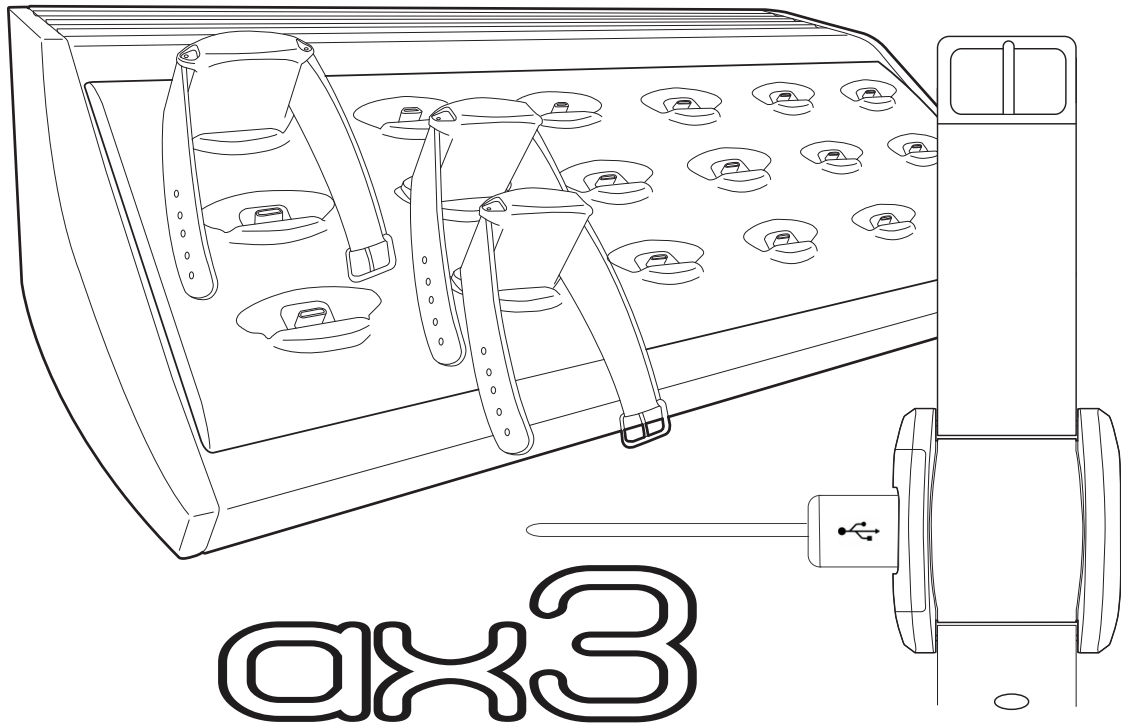


# AX3 User Guide

Revision 1.2

Axivity



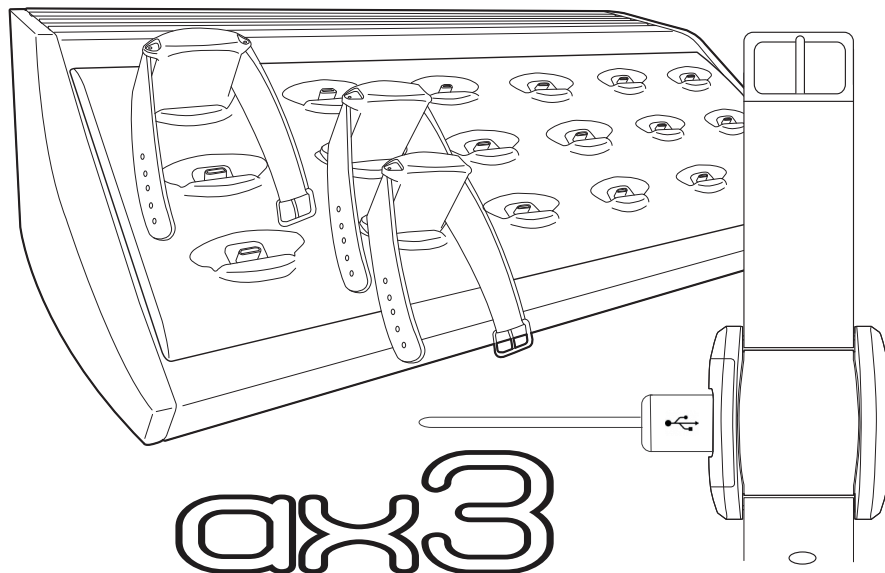
## Introduction

*The AX3 is a continuous logging accelerometer. It has been designed for a range of applications including physical activity monitoring and classification, motion analysis, digital interaction design and medical research. The AX3 modular design makes it suitable for embedding into everyday objects as well as being worn on the body for extended periods of time without discomfort. All elements of the device are discreet, waterproof and rugged. A combination that is essential for successful free-living activity monitoring.*

### Key technical features of the AX3 include:

- **Compliance with the OpenMovement data format**
- **Memory for 14 days continuous logging at 100Hz (512MB)**
- **USB 2.0 Hi-Speed download (approx 6 mins for full 512MB)**
- **Waterproof to 1.5 meters**
- **Temp Sensor**
- **Light Sensor**

This document is intended as a guide for those wishing to get to grips using the AX3, wishing to learn more about its features and to serve as a technical reference document.





## Amendments

Date	Version	Notes
February 2012	V1.0	Initial release.
April 2013	V1.1	Updated to reflect OM_GUI v1.10 software
December 2013	V1.2	LED codes changed to reflect firmware R36 defaults

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## Section 1: Quick Start

This section explains how to configure your device with the default settings (100Hz logging, sensitivity  $\pm 8g$ ) and start collecting data. It then covers downloading data and exporting to a CSV. It assumes prior installation of the drivers and that the correct windows service pack and .Net framework is installed. For more in depth instructions and explanations, please read the relevant sections of this manual.

### Step 1: Connect the device

Connect the device to a free USB port and open the OM software. The device should appear in **Device Browser Pane** after a brief delay.

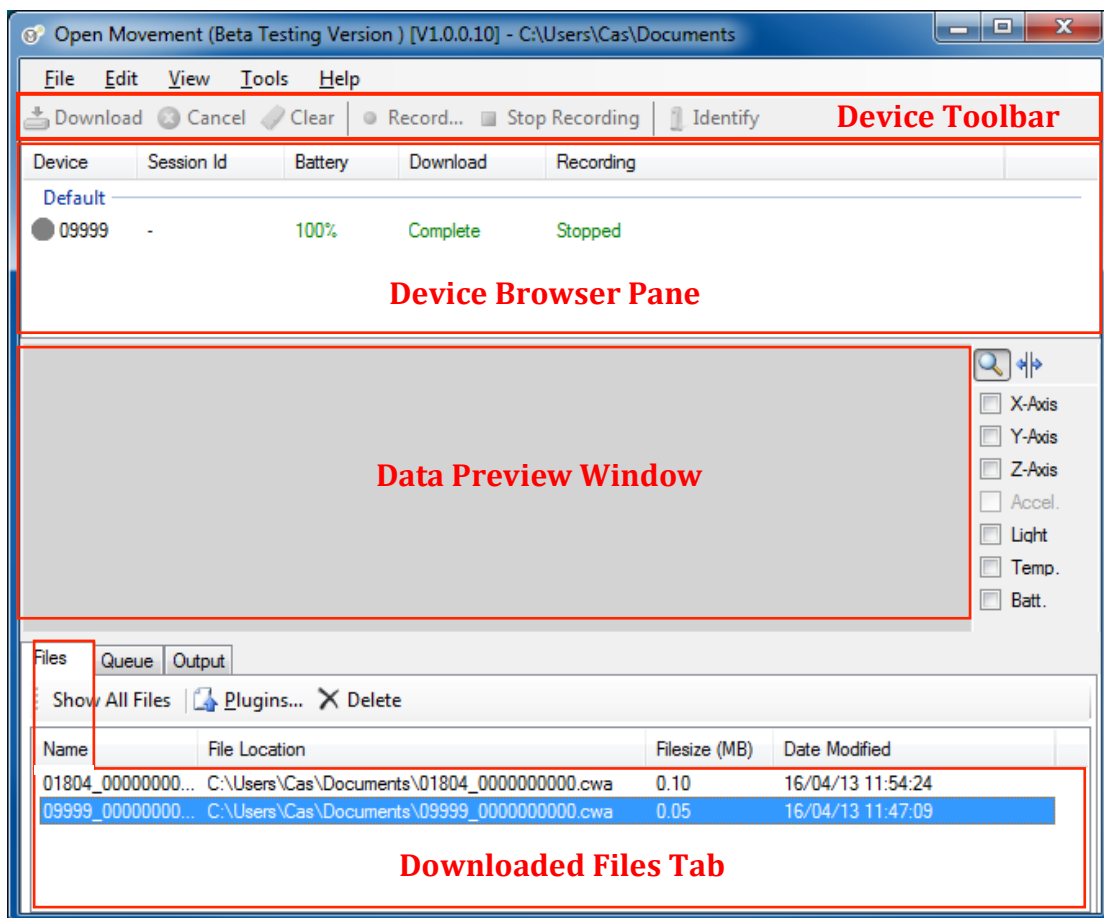


Figure 1 - OM GUI interface

### Step 2: Clear the device

The next step is to clear the device to remove unwanted pre-existing data. This can be done using the **Clear Button** in the **Device Toolbar**.

## Step 2: Configure the device to record

Press the **Record** button in the device toolbar to bring up the record dialog.

The screenshot shows a 'Session Range' dialog box with the following fields and options:

- Recording Session ID: 0
- Sampling: Sampling Freq. (Hz) 100, Range (±g) 8
- Recording Time:  Immediately on Disconnect,  Interval
- Start Date: 22/04/2013, Start Time: 11:02
- Duration: 0 days, 0 hours, 0 minutes
- End Date: 22/04/2013, End Time: 11:02
- Study: Study Centre, Study Code, Study Investigator, Exercise Type, Operator, Notes
- Subject: Code, Sex: male, Height, Weight, Handedness: right, Site: waist, Notes
- Warning Window (red text)
- OK, Cancel buttons

Figure 2 - the recording dialogue allows recording settings to be configured

The recording dialogue allows configuration of:

- Sampling parameters
- When to record
- Recording metadata that accompanies the recording

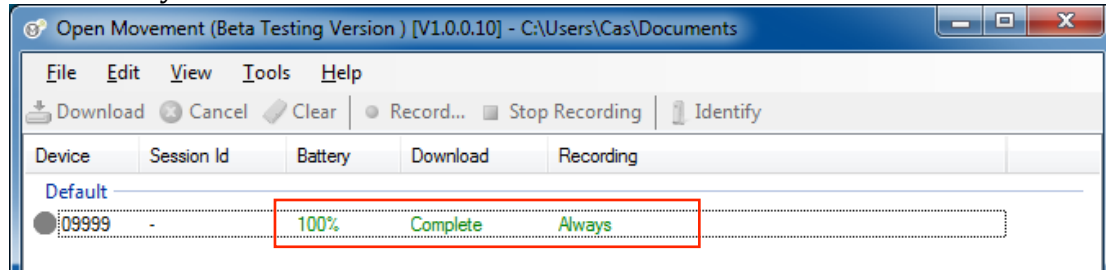
To Quick Start the recording process and start recording immediately on device disconnect, click the **OK** button and leave the default settings unchanged.

**NOTE:** The warning window is there to highlight any potential problems that the current settings **may** have on the recording.

**NOTE:** On clicking OK, the device time will be synchronized to the PC time

## Step 2: Collecting data

At this stage the device browser pane will show that the device is set to “Always” record. The device can now be disconnected and it will start recording immediately.



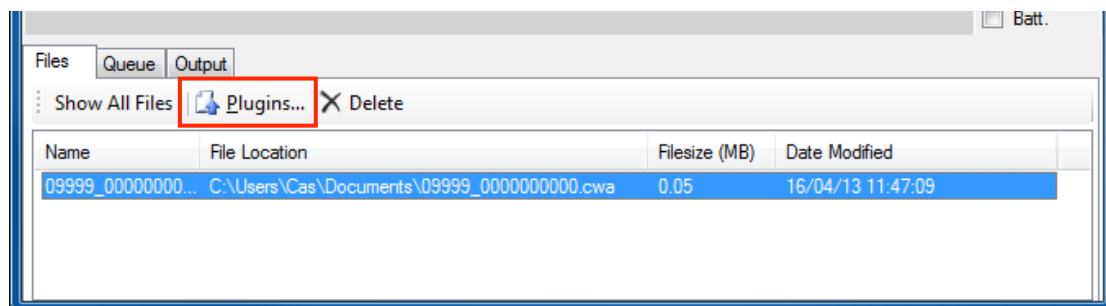
## Step 2: Downloading the data

After the recording period the next step is to download the data from the device. To accomplish this, plug the device in to the USB port of the computer and wait for it to appear in the **Device Browser Pane**. Next click the **Download** button in the **Device Toolbar**. The file then start to download to your working folder. Once downloaded the file will appear in the **Downloaded Files Tab**.

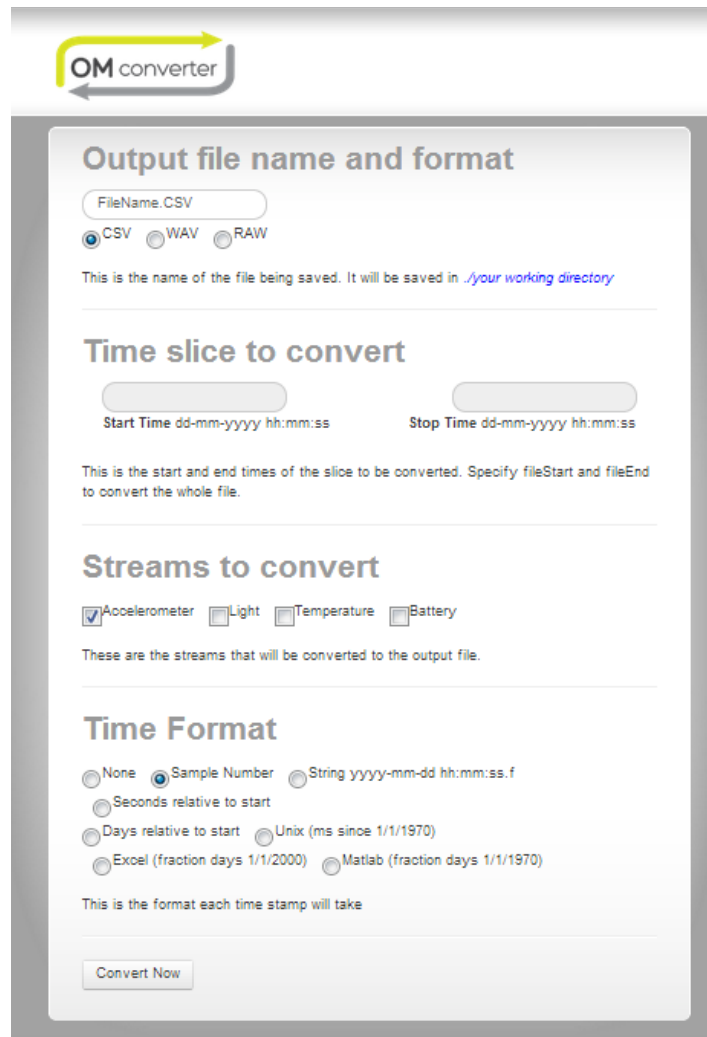
The data file is stored in an **.CWA** binary format. This format is not compatible with Matlab/Excel/SBSS/Elan etc. to make it in a more friendly format it must first be **converted** using the converter Plugin.

## Step 3: Converting the data

In order to use the data with a third party software package such as Matlab, Elan, SBSS, Excel etc. it must be converted into a suitable format. This can be done using the converter Plugin distributed with the OM GUI software. To run this Plugin select the file in the **Downloaded Files Tab** and click **Plugins** button.



If you have more than one plugin installed, select the “Convert CWA Plugin”. The following Web Form can be used to specify the conversion parameters. The following can for the basis for a default (a full explanation of each of these parameters is given later in this user-guide):



The screenshot shows a web form titled "OM converter" with the following sections:

- Output file name and format:** A text input field contains "FileName.CSV". Below it are three radio buttons: "CSV" (selected), "WAV", and "RAW". A note states: "This is the name of the file being saved. It will be saved in *.your working directory*".
- Time slice to convert:** Two text input fields for "Start Time" and "Stop Time", both with the placeholder "dd-mm-yyyy hh:mm:ss". A note states: "This is the start and end times of the slice to be converted. Specify fileStart and fileEnd to convert the whole file."
- Streams to convert:** Four checkboxes: "Accelerometer" (checked), "Light", "Temperature", and "Battery". A note states: "These are the streams that will be converted to the output file."
- Time Format:** A group of radio buttons: "None", "Sample Number" (selected), "String yyyy-mm-dd hh:mm:ss.f", "Seconds relative to start", "Days relative to start", "Unix (ms since 1/1/1970)", "Excel (fraction days 1/1/2000)", and "Matlab (fraction days 1/1/1970)". A note states: "This is the format each time stamp will take".
- A "Convert Now" button is located at the bottom of the form.



## Section 2: Understanding your AX3

### AX3 hardware

The AX3 device is made from multiple components. Below is an exploded view and a description of each component.

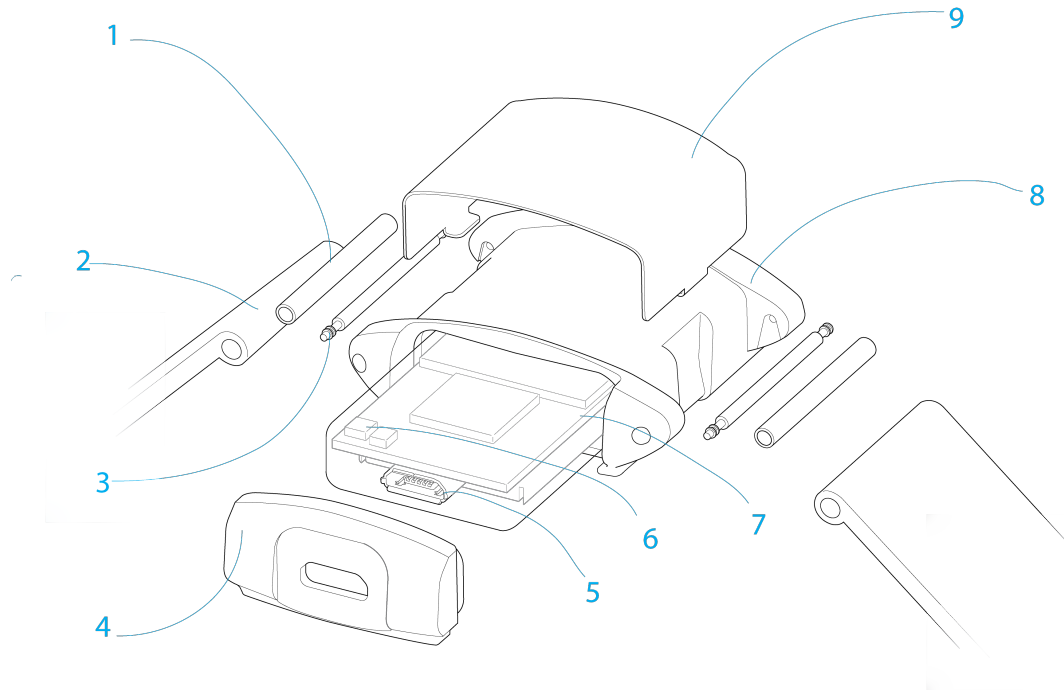


Figure 3 - Exploded AX3 device

Item	Description	Notes
1	Strap Bar	Used to reinforce the strap
2	Strap	Used to connect the device to the users wrist
3	Strap Pin	Connects the strap to the casing. Made from stainless steel
4	Outer Casing Lid	Made from food-safe, hypoallergenic Polycarbonate
5	USB Connector	Used for configuration, download and charging
6	LED	Used to display status to the user
7	Inner Puck	Contains all electronics in a waterproof package
8	Outer Casing	Made from food-safe, hypoallergenic Polycarbonate
9	Clip	This is an optional extra

Figure 4 - Description of figure

### Device specification

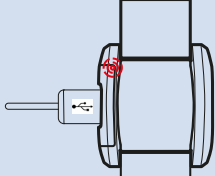
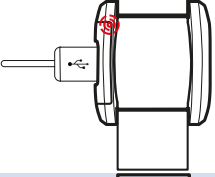
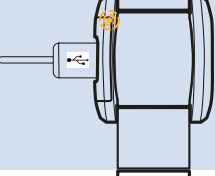
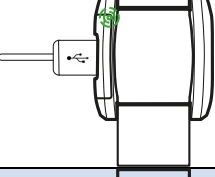
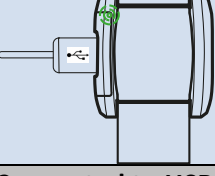
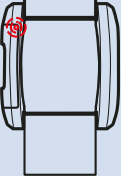
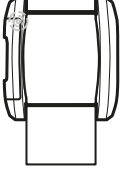
The AX3 is a combination logging sensor for collecting data in a variety of applications including free-living monitoring of daily behavior. At the heart of the sensor is a state of the art three-axis micro electro-mechanical system (MEMS) accelerometer and a large block NAND flash memory chip linked by a USB enabled microcontroller. A temperature sensor, ambient light sensor, real time clock (RTC) and lithium polymer power source are also integrated into the hermetically sealed plastic encapsulation. The device can be charged in less than 2 hours for up to 21 days continuous recording of all sensor data.

Key specifications of the AX3 are as follows:

<b>Mechanical Parameter</b>	<b>Value</b>
Puck dimensions	23x32.5x7.6 mm
Wrist case dimensions	39x36x12.5 mm
Puck weight	9g
Wrist case weight with puck	19g
Puck Material	ABS
Case Material	Polycarbonate
<b>Environmental Protection</b>	
Moisture Ingress	IPx8
Material Ingress	IP6x
Operating Temperature	0°C to 40°C
Mechanical Impact	1m drop resistant
<b>Memory</b>	
Memory	512Mb NAND flash Non-Volatile
Logging Frequencies	12.5Hz-800Hz
Maximum Logging Periods	30 days at 12.5 Hz or 14 days at 100Hz
<b>Timing</b>	
Type	Quartz stabilised real time clock
Frequency	32.768KHz
Accuracy	±20ppm
Drift	±1.7s per day maximum
<b>Accelerometer</b>	
Sensor Class	MEMS
Dynamic Range	±2g to ±16g
Digital Range	13 bit
<b>Light Sensor</b>	
Sensor Class	Silicon Photodiode
Wave length	470-650 nm
Range (logarithmic)	3-70K LUX
Digital Range	10 bit
<b>Temperature Measurement</b>	
Sensor Class	Linear active thermistor
Range	-40°C to 125°C
Resolution	0.3°C
Accuracy	4°C max
<b>USB Connection</b>	
Device Class	USB 2.0 Full Speed
Charge time	~1.5 hours
Download	650Kbps (~6 mins for 512 MB)

## LED codes

The AX3 uses a multi-colour LED as its primary feedback mechanism to relay device state and configuration to the user during deployment. The following tables are illustrations to enable the user to decode LED patterns and thus decipher device state and function:

Connected to USB	LED Description	Notes
	Blinking <b>RED</b>	Battery in precharge. Could take up to 60 seconds to get out of precharge.
	Flashing <b>RED</b>	Device in Bootloader mode
	Fading <b>AMBER</b>	Device enumerated to USB and charging. Device could take up to 2 hours to charge.
	Fading <b>White</b>	Device enumerated to USB and charged.
	Solid <b>Green</b>	Device charged but NOT enumerated
<b>NOT Connected to USB</b>		
	Blinking <b>RED</b>	Battery on device low. Not Logging.
	No LED	Possible modes are Silent Logging, Hibernate or Delayed Activation.

## Section 3: Getting Started

### System requirements

To use the AX3 the following are a minimum system requirements:

- Windows PC with XP SP3 or later operating system
- .NET Framework v3.5 or later
- 1GB RAM memory
- 5GB HDD space

### Driver installation (windows)

**Administrator privileges are required to install the drivers for the AX3 device. Once installed any user is able to then run the software and use the device.**

1. Ensure the version of Windows is installed and .NET is up to date.
2. Download the AX3 drivers and utilities from the support section of the Axivity website [here](#).
3. Connect the AX3 to the USB port of the computer. If the driver wizard appears proceed to step 6. If the driver wizard does not appear navigate to the **device manager** by right clicking **computer**(named **my computer in XP**), selecting properties and then selecting device manager.

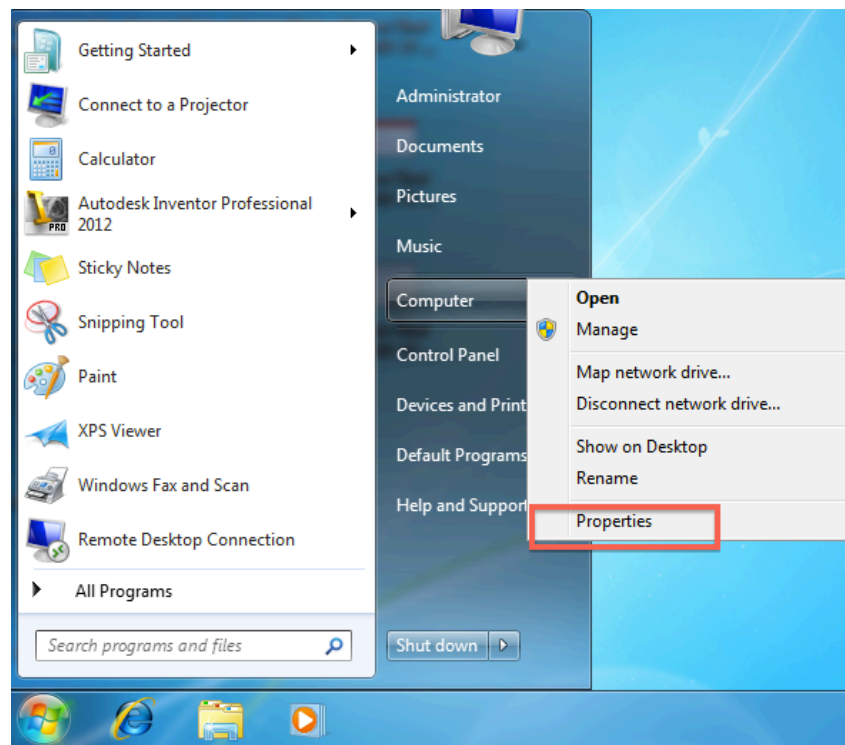


Figure 5 - launch device manager through computer properties

4. Under devices you should see “AX3” with an exclamation mark next to it. Right click this and select “**update driver software**”.

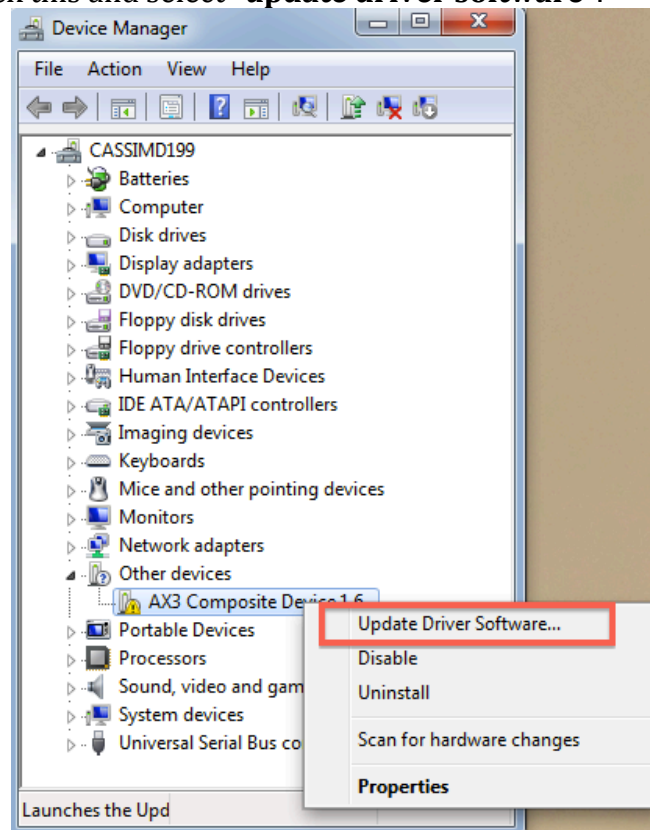


Figure 6 - select Update Driver Software

5. Choose to “**browse my computer for driver software**” .

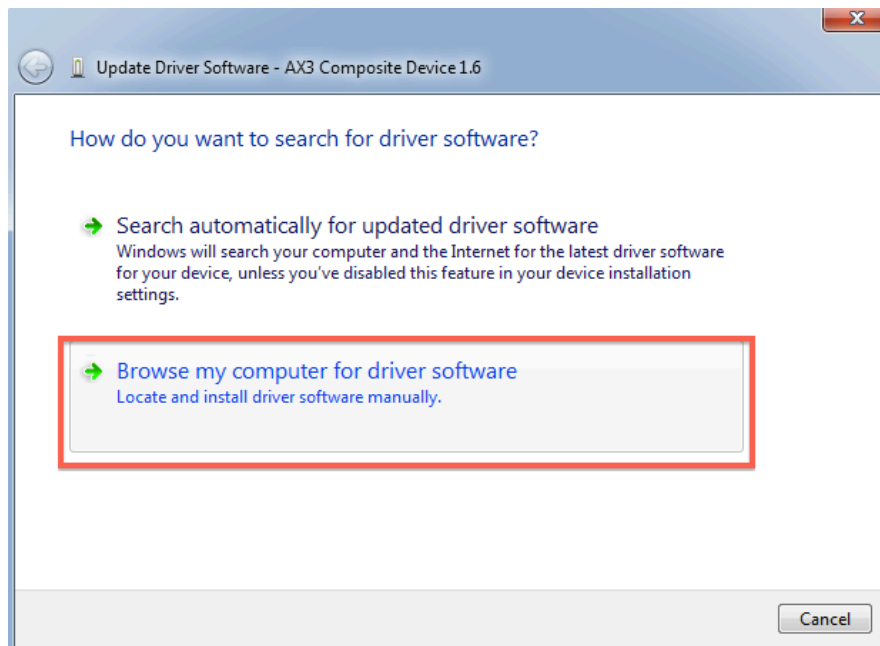


Figure 7 - choose to browse for the driver

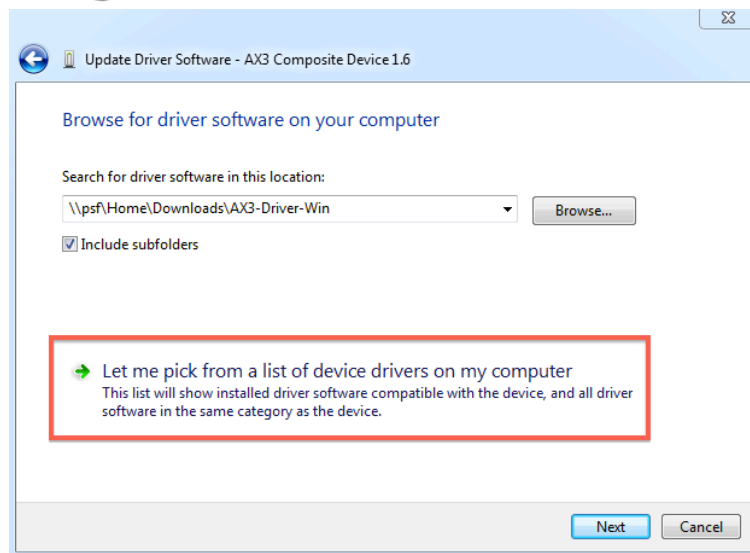


Figure 8 - choose to pick driver from a list

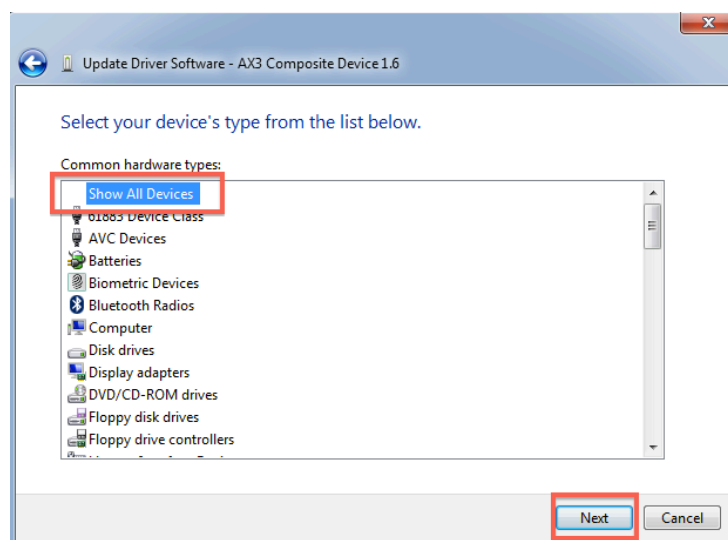


Figure 9 - choose all devices and then select next

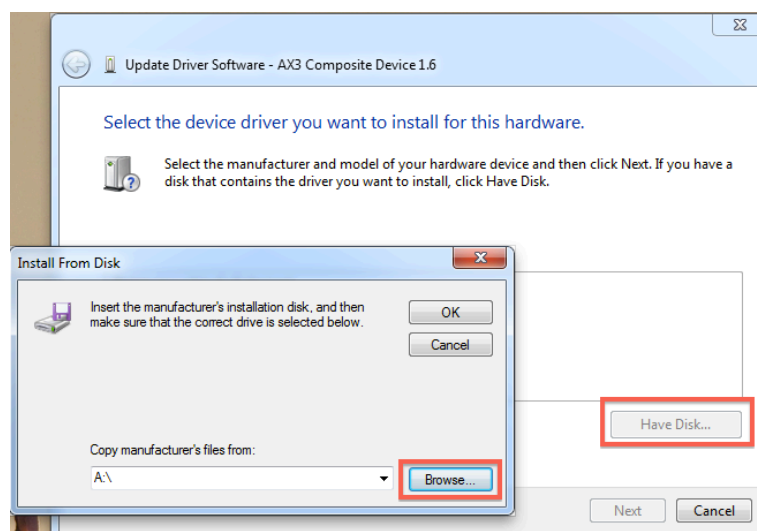


Figure 10 - choose have disk and then browse

6. Navigate to the driver that was downloaded from the website and proceed to install.

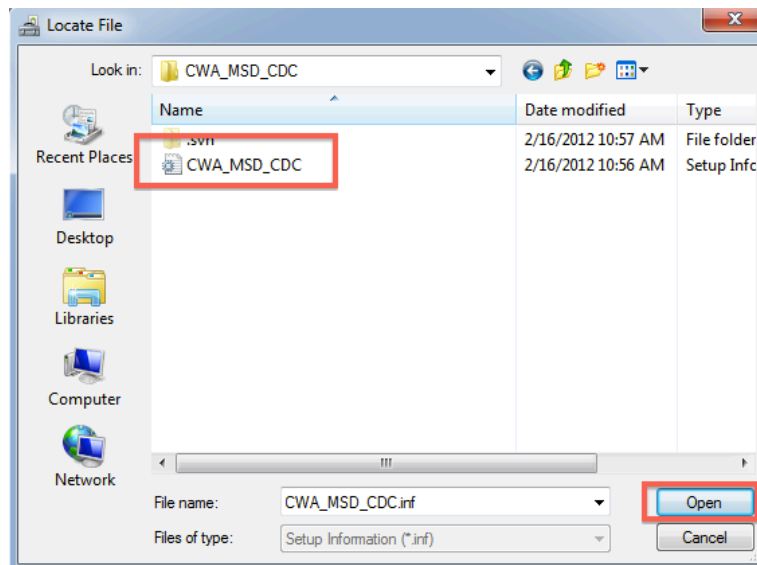


Figure 11 - select driver downloaded from the website

7. If any security warnings pop-up. Please select the “Install this driver anyway” option.

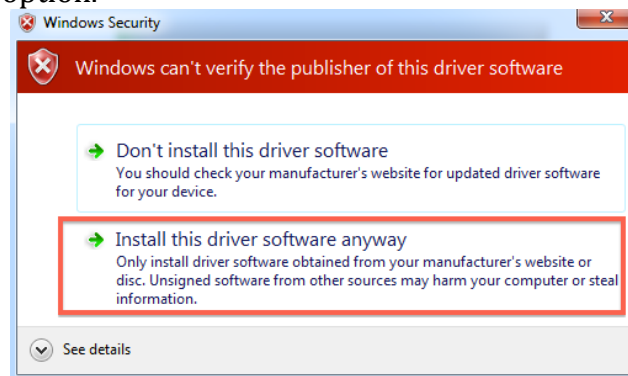


Figure 12 - select to install driver anyway

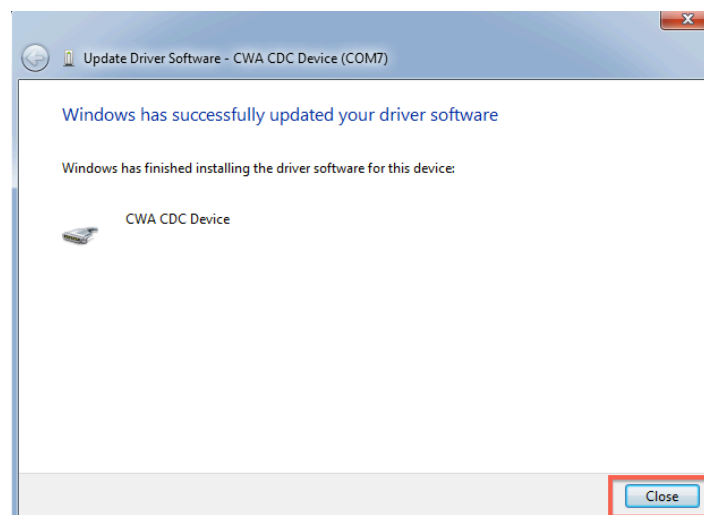


Figure 13 - the driver will now be installed

A full video of the driver installation process is available [here](#).

## Section 4: Understanding the device settings

### Accelerometer

The accelerometer has configurable sample rates, adjustable sensitivity and a low power mode. The sample rate affects both the maximum sampling period and the battery life. Higher sample rates reduce the amount of time the device can record for and use extra battery power during recording. The accelerometer has a low power mode to reduce the current consumption and increase battery life, this setting increases the amount of noise present on the accelerometer output and may not be suitable for high precision applications. The device is designed to sample for at least 2 weeks on a full battery charge at 100 Hz in the full power mode. The table below shows how adjusting the sample rate will affect the battery.

Sample Rate (Hz)	Normal Battery Life (days)	Low Power Battery Life (days)
400	5	5
200	9	10
100	14	18
50	21	31
25	34	47

Table 1 - Sample rate Vs Battery life

The accelerometer has a variable sensitivity to allow it to be used in many applications. The selectable ranges are +/- 2 g, +/- 4 g, +/- 8 g and +/- 16 g ( $g$  is the acceleration due to gravity or  $\sim 9.81\text{ms}^{-2}$ ). The user should experiment with these ranges to trade off sensitivity against dynamic range. Accelerations outside the selected dynamic range result in saturation (“clipping”) of the recorded acceleration. The dynamic range of the accelerometer has no effect on the battery life or memory constraints. Table 2 shows a typical use case for each of the available sensitivities.

Sensitivity	Example Use Case
±2g	Fine movements such as hand writing or painting
±4g	Mild activities such as walking,
±8g	Moderate activities such as sprinting, jumping
±16g	Severe activities such as boxing

Table 2 - Typical use cases for each sensitivity setting

### Memory

The AX3 has a built in 512 MB NAND Flash memory chip to store the accelerometer data, this type of memory has a limited lifespan of 100,000 read/write cycles and over time will begin to develop “wear”. The AX3 has an inbuilt firmware algorithm to ensure the memory is “wear levelled”, this ensures the general condition of the memory wear remains constant over the entire range. The memory is typically used to store the raw binary data from the sensors as this offers the optimal data compression, error detection and error recovery. Most errors will be single bit errors (affecting a single accelerometer sample) and can in some cases can be ignored. There are two other possible



means of removing these errors: error removal and error correction. Error removal discards the chunk of data that contains the error, this is very fast and can be performed on the final binary files after downloading them from the device. The chunk size in seconds depends on the sample rate, at 100 Hz this is 1.2s. The error correction method may be required by some applications where no data loss is acceptable. With this feature turned on the download time will be increased as every sample is checked for errors during the downloading step. Additionally, a battery life penalty of ~10% will be observed. Users are recommended to only use the error correction mode if data integrity must be guaranteed or longer download times are acceptable.

- Download time of 512MB **WITHOUT** error correction enabled ~ 6mins
- Download time of 512MB **WITH** error correction enabled ~ 11mins

## Additional Sensors

The AX3 has built in ambient light level and temperature sensors. These can be added to the data stream to enrich the gathered data. The effect of adding these sensor outputs on battery life is low and, in most cases, there are no additional memory requirements. In the typical usage scenario, the sampled light level and temperature are added to every chunk of data written to the device memory. This allows ~1.2 samples per second at 100Hz accelerometer sample rate (this figure scales with the chosen accelerometer sample rate).

## Battery

The AX3 has a high energy density lithium polymer cell which is used as the power source whilst gathering data. The lithium polymer battery is rated at 500 recharge cycles; battery empty to battery full. Battery charging is via a high performance charge controller that permits a full recharge of the battery within ~90 minutes. Once charged, the battery will keep the internal clock running for ~200 days, it is important to note that the battery is being slowly depleted during this time. Many applications will wish to use the scheduled sampling mode to automatically start the device recording once a specific time and date has been reached. If the start date is ~100 days in the future then the battery may only have sufficient capacity to log 1 week of data when it finally starts recording. An even lower power mode is available for device storage where the clock value is not retained. This mode is suited to applications where the devices are fully charged and then stored for a long period before deployment, in this mode the device will retain 90% of its battery capacity for ~100 days.

***It is always recommended to only deploy devices with a fully charged battery.***

## Real time clock

The AX3 has a built in, accurate clock and calendar which provides the time base for the recorded acceleration data. Over time this internal clock may lose synchronisation from other devices and this will make the alignment of different device data sets difficult. To overcome this issue, tools are available [here](#) for synchronising to an external clock and for modifying the recorded data between devices to restore time base synchronisation.

## Section 5: Data capture and download

The AX3 device is predominantly designed to capture movement data. Various configurations are available for data collection and for further explanation of these settings section 4 should be referred to. The following guide assumes the standard pre-set settings are used ( $\pm 8g$  at 100Hz sample rate) which are suitable for many applications. Each of the other settings are explained in detail:

### Working Folders

Keeping gathered data organized and safe is critical. Problems often arise due to unconventional file naming, folder structures and multiple copies of data being in existence. The OM software does not force you to stick to a specific convention (everyone has their own requirements), however it has been designed to make following a convention intuitive. The “**Working Folder**” can be thought of as a project directory. Each project will likely be kept in a separate folder or location on disk and all associated files organized within this folder. The default working folder used is located at “**C:\Users\User\Documents**” however this can be changed easily from the “**File->Change working folder**”. The **Files/Queue/Output** tabs are all specific to a working folder

### Recording Settings

The AX3 can be configured to record either immediately on disconnect, from a specified time or between two specified times. All these options are found in the recording dialogue.

The recording dialogue can also be used to specify the sampling frequency and range settings used during a recording.

Session Range

Recording Session ID: 0

Sampling

Sampling Freq. (Hz): 100 Range (±g): 8

Recording Time

Immediately on Disconnect

Interval

Start Date: 22/04/2013 Start Time: 13:53

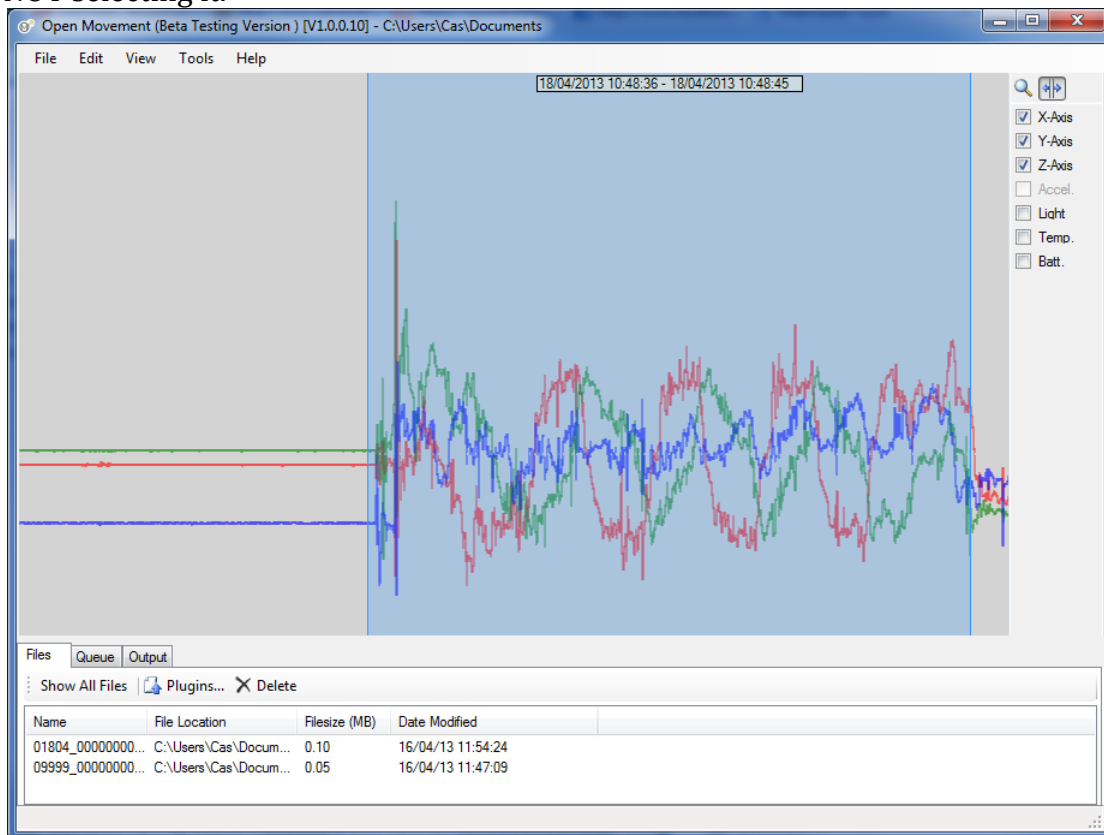
Duration: 0 days 0 hours 0 minutes

End Date: 22/04/2013 End Time: 13:53

## Data Previewer

The data preview window allows the user to have a quick look over the data either on a connected device OR in a file selected in the File Browser Tab. The preview window allows for different data streams to be toggled as well as a zoom facility.

The data preview tool also provides a second function, it specifies a chunk of data that can be passed to a plugin. For instance if there was a period of un-interesting data collected, this can be excluded from a conversion operation by NOT selecting it.



In the converter plugin window, the Start/Stop times will be auto populated with the start and end of the selected data:

### Time slice to convert

18/04/2013/\_10:48:38      18/04/2013/\_10:48:44

**Start Time** dd-mm-yyyy hh:mm:ss      **Stop Time** dd-mm-yyyy hh:mm:ss

## Mounting Conventions

The AX3 device is suitable for monitoring human movement data. However, for successful data capture the AX3 must be securely fastened to the target with minimal room for vibration, slip or twist; this helps preserve only the motions of the target are captured. In addition, an attachment convention for device orientation will assist in consistent and comparable datasets being gathered. The below is a suggested orientation convention for popular body mounting sites. With the exception of the left wrist, the USB port is configured to point towards the ground.

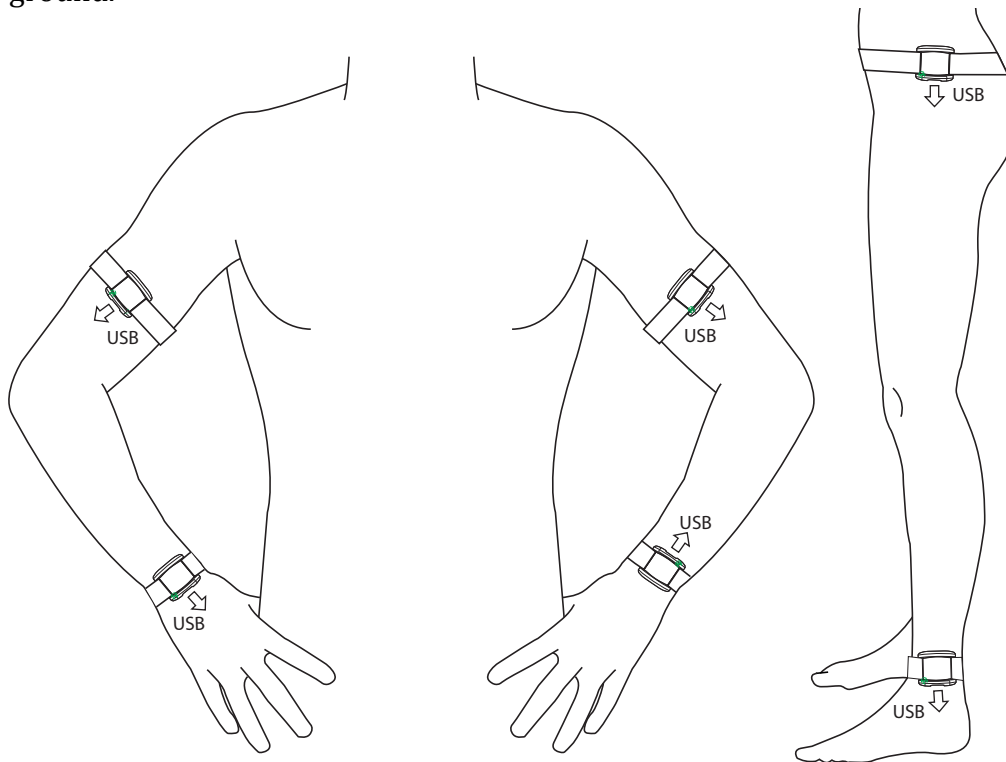


Figure 14 - mount with USB facing the ground

## Wrist mounting considerations

A popular site for mounting AX3 devices is the wrist. When in this location the user must consider the dexterity of the target. Depending on what sort of data is of interest to the user, the dominant, non-dominant or both hands may be chosen.

Typical use cases for gathering data from both hands include performing bi-manual skill assessments, fine-grained activity recognition and motor skill performance.

For single handed monitoring the choice between dominant and non-dominant hand must be based on if the data set will be used for activity classification and physical activity monitoring type applications (for which the non-dominant hand is a popular choice) or finer grained skill assessment of activities (for which the dominant hand is often used). Of course there are exceptions to these generalisations and the each experiment must be individually considered.

## Data markers

When capturing experimental data it is often useful to place markers in the data. Such markers can retrospectively be used to identify certain event start and stops. A good marker should have the following characteristics;

- Be orientation tolerant
- Be easy to manually identify in the data set
- Occur over a short period of time
- Be consistently repeatable

A popular choice for creating a data marker is to subject the device to a short impulse force. Such forces can be generated through clapping with the device attached or held in the hand. The graph below is a graphical representation of a data marker generated by 5 short successive claps.

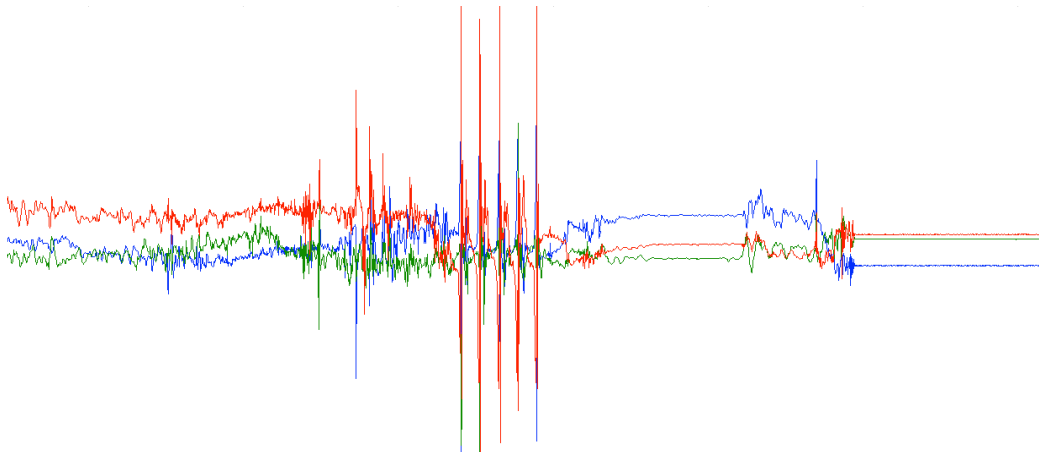


Figure 15 - Data markers visible as large spikes in the tri-axial data stream

When multiple devices are to be used in the same experiment and it is important that the captured data is retrospectively time aligned, subjecting multiple devices to the same data marking step will help this process.

## Video annotation techniques

In some experiments it is desirable to video the target while wearing the AX3 sensors. This video stream can retrospectively be used to validate any inferences made about the captured data. To assist with this process it a useful technique is to place a data marker in the data stream and video the marker being placed. Once the experiment has finished being conducted, the video and the data stream can then be aligned based on the time sequence of the video and the timestamp of the data stream. A useful third-party software tool for performing this procedure is ELAN which is multi-platform, Open Source and available [here](#).

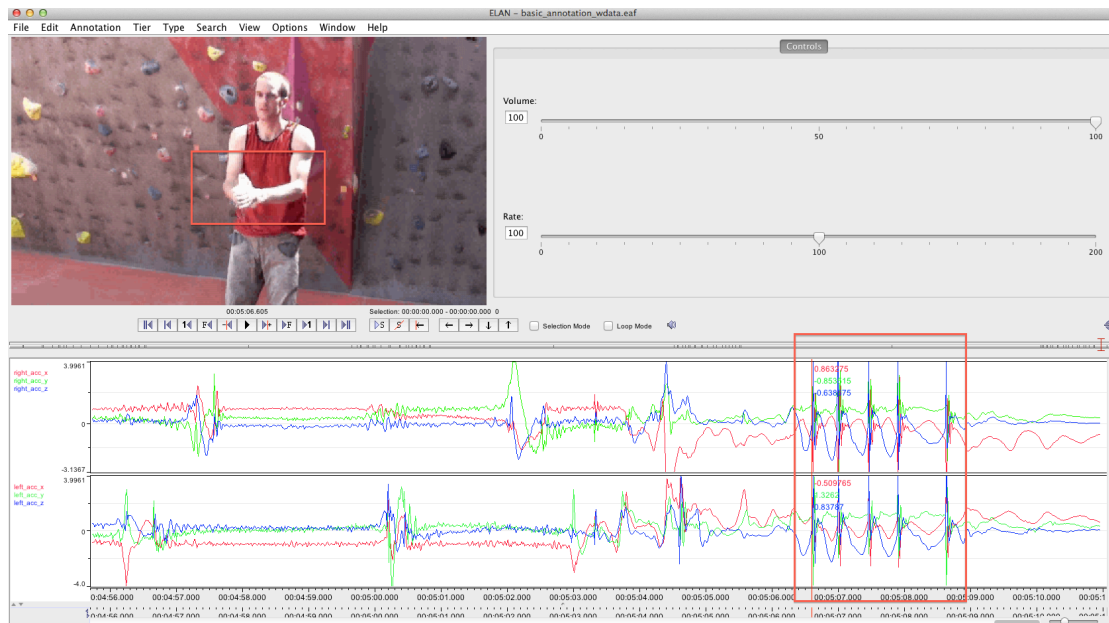


Figure 16 – ELAN is a useful tool when working with video and multi-stream accelerometer data

## Section 6: Working with captured data

### Data download

The AX3 logs accelerometer samples into its internal memory. This data is stored in a bit-packed binary format. When connected to a host computer the AX3 enumerates as a composite device; MSD (mass storage device) & CDC (communication class device). Any logged data is immediately available over the MSD interface and can be manually extracted by simply copying the file off using the operating system file browser (**Finder** on OSX, **Explorer** in Windows). Any files extracted in this fashion are in their native binary format and are bit packed as specified [here](#)

Alternatively, files can be downloaded from the device using the graphical user interface (GUI) available [here](#).

### File types: Binary vs CSV

In many cases a user may wish to convert the binary data into a format that is human readable or compatible with third party software packages (such as Matlab). To accommodate this scenario a **binary to comma separated value (CSV)**, data converter utility is provided. The converter utility is packaged as a self contained application and can either be incorporated into third party applications or instigated independently or through the **OM Gui**. The application supports friendly timestamps for the following third-party software:

- Matlab
- Elan
- SPSS
- Excel

## Section 7: Looking after your AX3

### Cleaning device

From time to time the components of the AX3 may require cleaning. Cleaning of the surfaces and strap maybe achieved using an Isopropyl alcohol based wipe such as **AF - SPA010 – Safepad Sachets**. These cleaning pads are widely available from distributors and retailers such as Farnell or RS.

From time to time the connector of the AX3 may require cleaning or sanitising (depending on wear environment and wear frequency). Connector pins can be cleaned using an Isopropyl based contact cleaner. Such cleaning fluids are widely available distributors and retailers such as Farnell or RS. In the case where excessive debris is built up in the connector, debris must first be carefully removed using a pin or tweezers before sanitising. In the process of removing debris an air-duster may also prove useful.

### Updating firmware

The AX3 hardware internally runs its own software program; **firmware**. Occasionally, it is necessary to update the firmware. This process is designed to add features as they are developed and ensure compatibility with the latest software feature in the [OM API](#). The following is a step-by-step guide to updating the device firmware under the Windows operating system.

1. Navigate to the support section of the Axivity [website](#) and download the latest firmware and the **Bootloader** application.
2. Run the **Bootloader** application.

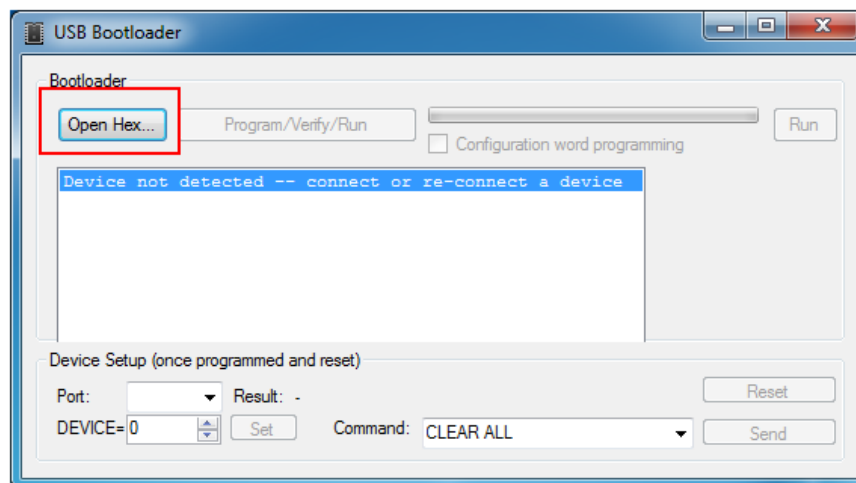
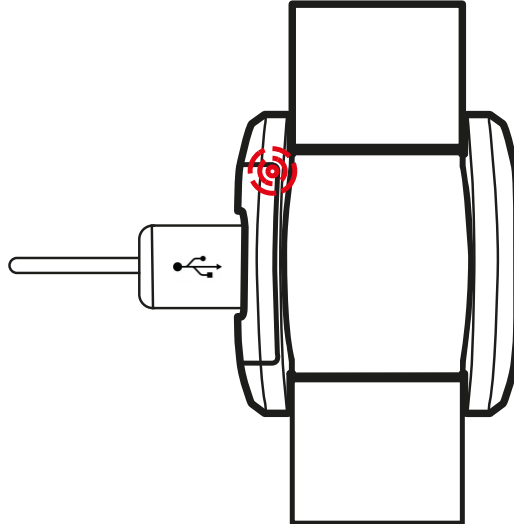


Figure 17 - download and run the Bootloader application



3. Connect a device to the USB port



4. The LED should flash **RED** at a rate of twice per second (2Hz) and the software should indicate a device has been detected.

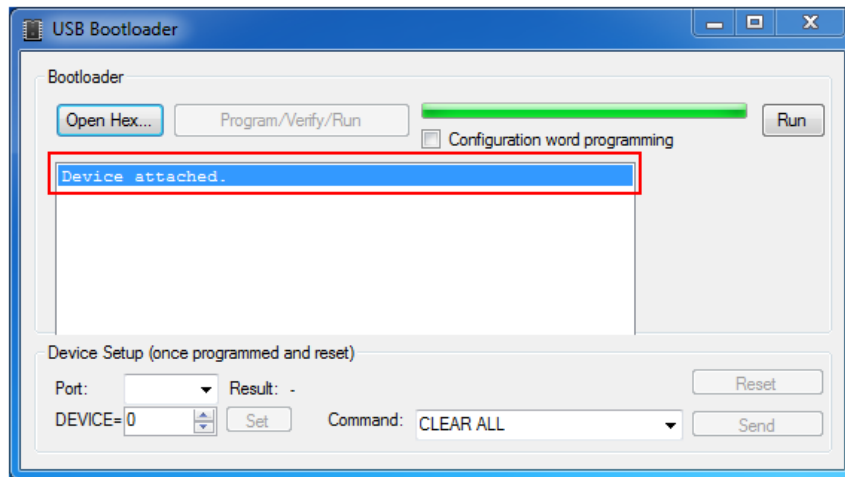


Figure 18 - once plugged in the application will auto detect the AX3

5. Click the **OPEN Hex** button and select the firmware (.HEX) file that was downloaded.

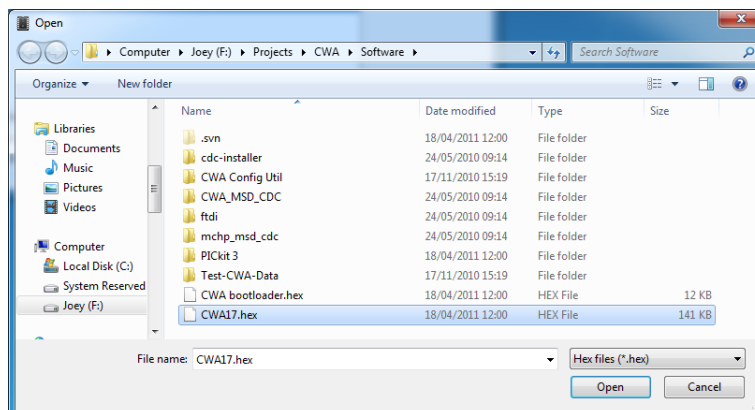


Figure 19 - navigate to and select the firmware downloaded from the website

- Now click the **Program/Verify/Run** button

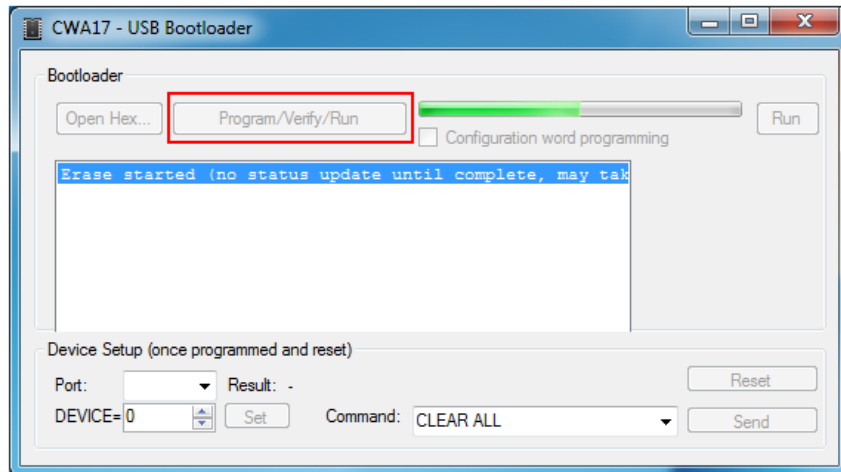
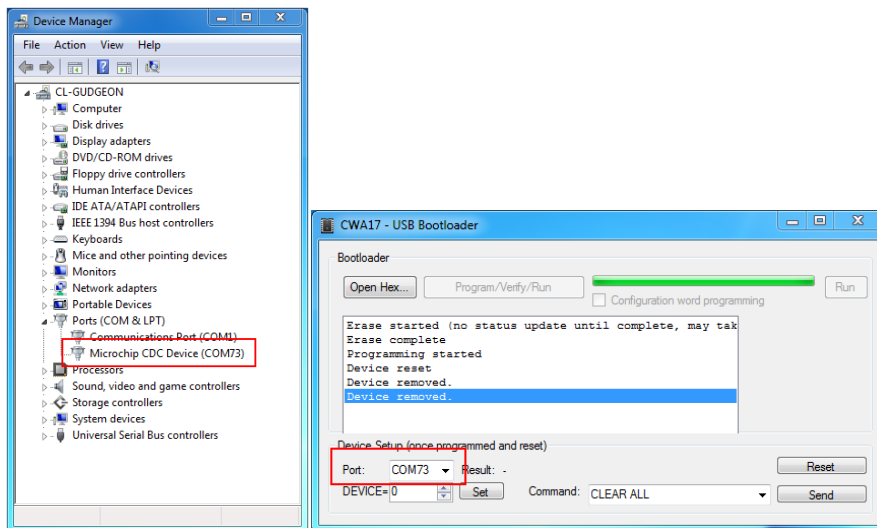


Figure 20 press the program button to load the new firmware

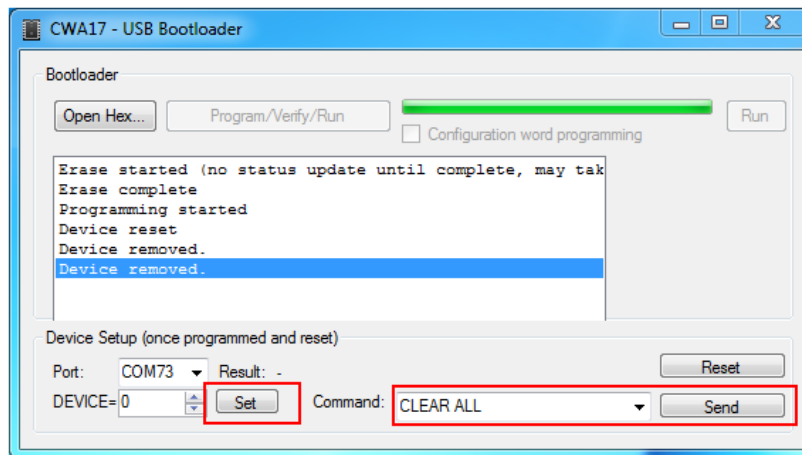
***It is imperative the device is NOT unplugged from the computer while new firmware is being programmed. Doing so may irreversibly break the device.***

- The device should now be programmed with the selected firmware and appear in both the Window's **Device Manager** as well as in the Bootloader application. (To view the device manager, right click **My Computer** and select **Properties**. The **Device Manager** can then be instigated from the selection pane).



- The Bootloader application also allows a user to change the **Device ID** as well as clearing the on-board memory. These features are accessed via the buttons at the bottom of the application.

***NOTE: changing the device ID to anything other than the issued device ID invalidates any warranties provided by Axivity and is NOT recommended.***



## Charging the AX3

It is recommended that the AX3 should be fully charged above 95% before being used in any experiment. The AX3 may be charged in 3 ways;

- Using a wall charger
- Using a USB connection on a computer
- Using a multidock charger

When connected to the USB connection on a computer or a multidock charger, the AX3 can be configured and or downloaded at the same time as charging (this can not be done when connected to a wall charger). To use the multi dock charger simply plug in the multidock IEC connection to a mains socket and the USB connection to a PC. If only charging functionality is required the USB PC connection may be omitted.

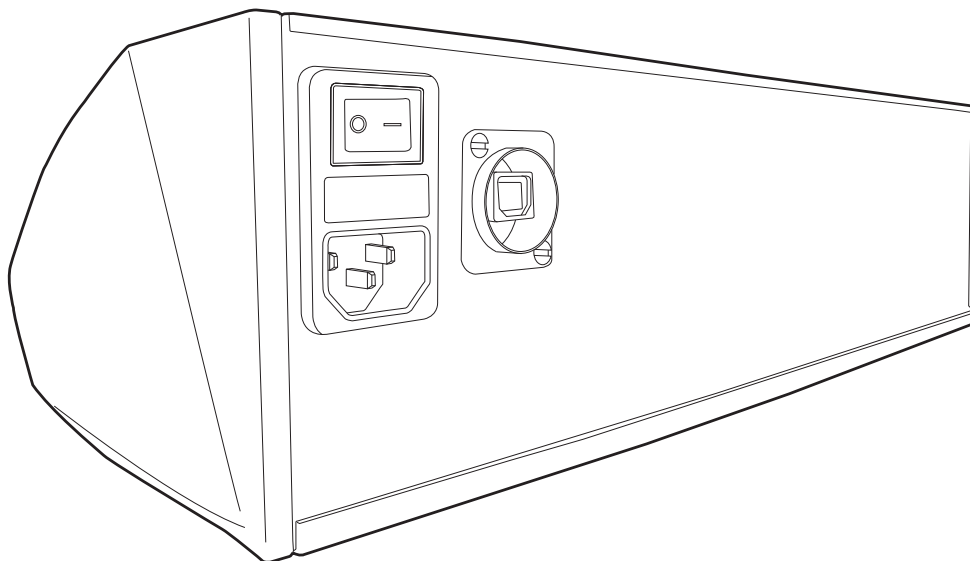
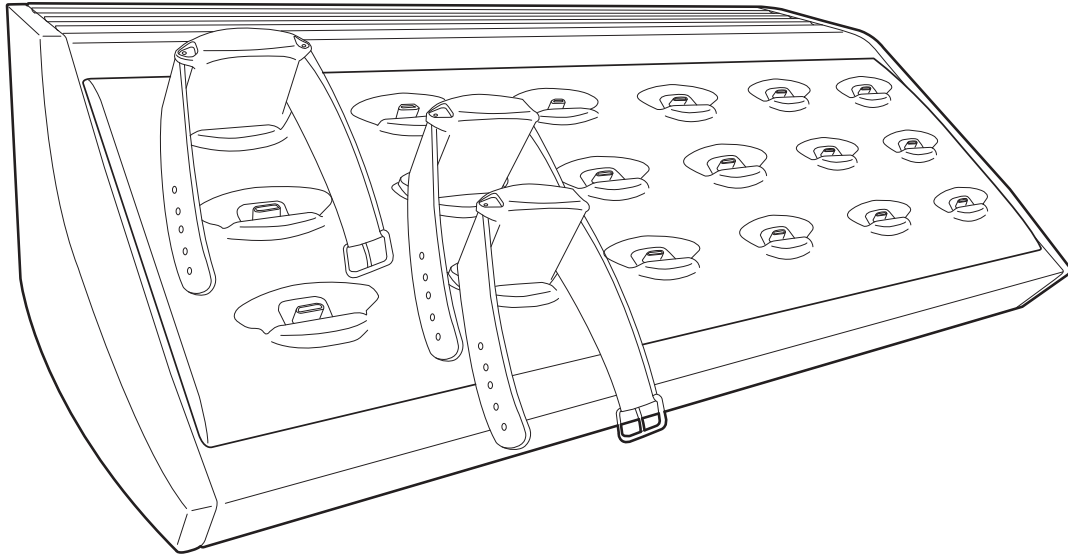


Figure 21 - plug in the multidock charger to a mains socket and a host PC

Once plugged in, the multidock charger can then be used to simultaneously bulk charge or configure up to 18 devices.

For a full charge, the AX3 requires ~1.5 hours when using the wall charger and USB multidock. When using a laptop computer USB connection to charge the device, it is recommended that the laptop is mains powered, if not the charge time of ~1.5 hours cannot be guaranteed.



**Figure 22 - the multidock can be used to simultaneously charge and configure 18 devices**

## Section 8: Technical notes

### Sensor axis

The following illustration indicates the orientation of the accelerometer axis in relation to the AX3 housing. When mounting the device or processing data collected by the device, the following positive axis of the sensor should be noted.

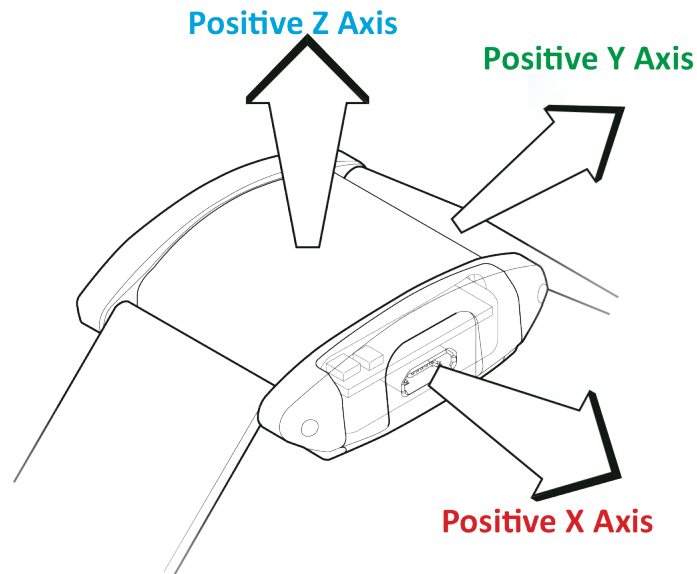


Figure 23 - device accelerometer axis

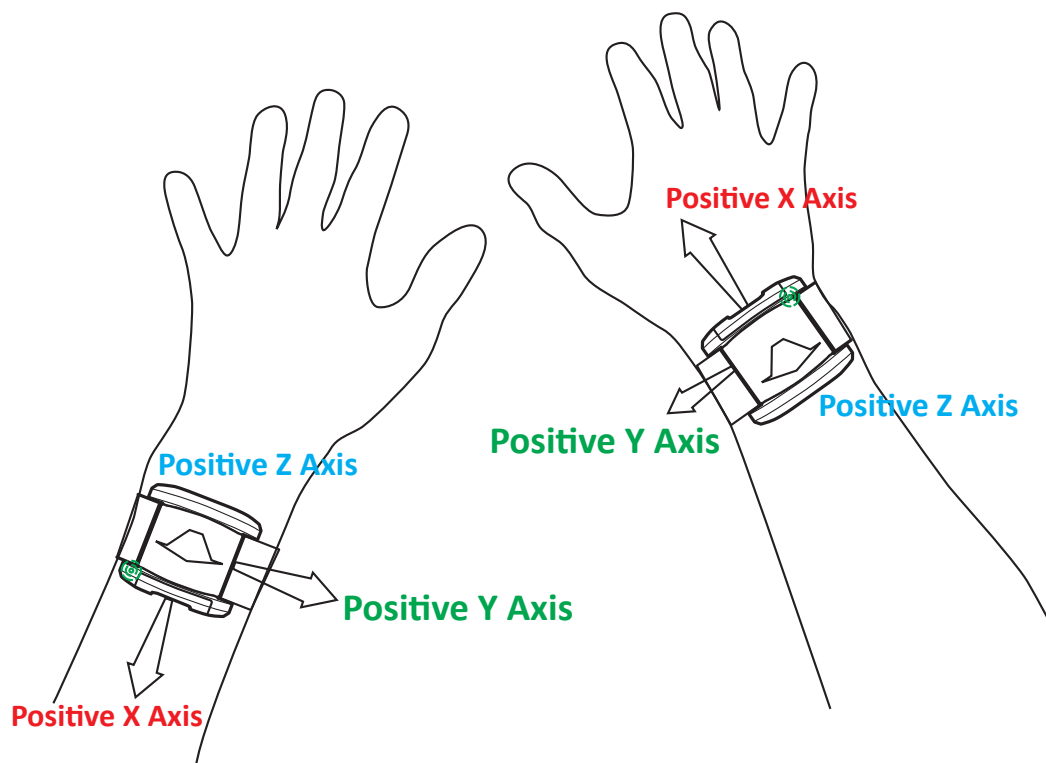





Figure 24 - accelerometer axis with respect to left and right hand

## Section 9: Certification

The following certifications are applicable to the AX3:

Certification	Test
	<p>The product is compliant with the Directive 2004/108/EC; the relevant Declaration of Conformity is available from Axivity</p> <p>The product has been tested to BS EN 61000-6-1 :2007 and BS EN 61000-6-3 :2007 (Electromagnetic compatibility (EMC), Generic standards, Immunity for residential, commercial and light-industrial environments).</p>
	<p>The product has an ingress protection rating as defined in IEC 60529 to level 68. Due to the nature of the housing (potted enclosure) the device was passed on the basis that it was fully functional both before and after each testing criterion.</p>
	<p>In accordance with the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE), the product must not be disposed of in the normal unsorted municipal waste stream. Instead, it is the user's responsibility to dispose of this product by returning it to a collection point or directly to Axivity. Separate collection of this waste helps optimize the recovery and recycling of any reclaimable materials and also reduces the impact on human health and the environment. For more information concerning the correct disposal of this product, please contact your local authority or our issuing authority</p> <p>This product meets the minimum standards of the RoHS Directive 2002/95/EC</p> <p>The lithium polymer cell has met the acceptance criterion for the UN Recommendations on the Transport of Dangerous Goods relating to lithium batteries, reference Para 38.3 of Manual tests and Criteria document No. ST/SG/AC.10.11/Rev.4:2003</p>



## **Section 10: Disclaimers**

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