



# Single Pixel Motion Demonstrator Kit

ezPyro™

For low cost, low power, non-contact mid IR movement detection

## User Guide

Version 1.0

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1	Introduction .....	3
1.1	Kit requirements .....	3
2	Kit Contents.....	3
3	Getting started.....	4
3.1	Kit contents.....	4
3.2	Minimum system requirements .....	4
4	Installation .....	5
4.1	Install the Pyreos software.....	5
5	Installing the ST Microcontroller USB Driver .....	6
6	Installing .NET 4.5 framework.....	6
6.1	Connect the ezPyro demo kit .....	6
7	Running the Software .....	7
8	Presence Detection Mode .....	12
8.1	Proximity Detection Algorithm Parameters .....	13
8.2	Proximity Algorithm .....	14

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## 1 Introduction

This user guide describes the Pyreos motion direction evaluation kit for ezPyro™ single pixel motion sensor.

### 1.1 Kit requirements

- Microsoft Windows PC (all versions supported currently)
- Local administrative rights to install device drivers
- Microsoft .net framework 4.0 (if not present it will be installed during software setup)
- 1 free USB port

## 2 Kit Contents

1. Mini USB cable
2. EzPyro Motion Software
3. EzPyro Motion kit

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Figure 1 ezPyro Motion Direction Demo Kit

## 3 Getting started

### 3.1 Kit contents

1. EzPyro - Motion Sensor Demonstrator Kit
2. MicroUSB-to-USB cable
3. Pyreos Motion detection software (Setup file included in software package)
4. USB drive with software and documentation

### 3.2 Minimum system requirements

1. Microsoft® Windows PC (all versions supported currently)
2. 2 GB of RAM
3. 450 MB of available hard-disk space for installation, additional free space required for storing CSV files
4. 1024x768 display (1280 x 1024 recommended)
5. Local administrative rights to install device drivers
6. .NET Framework 4.5
7. 1 free USB port

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## 4 Installation

### 4.1 Install the Pyreos software

From the software pack included with the kit, select the “setup.exe” file that has this icon. This will start the installation process.

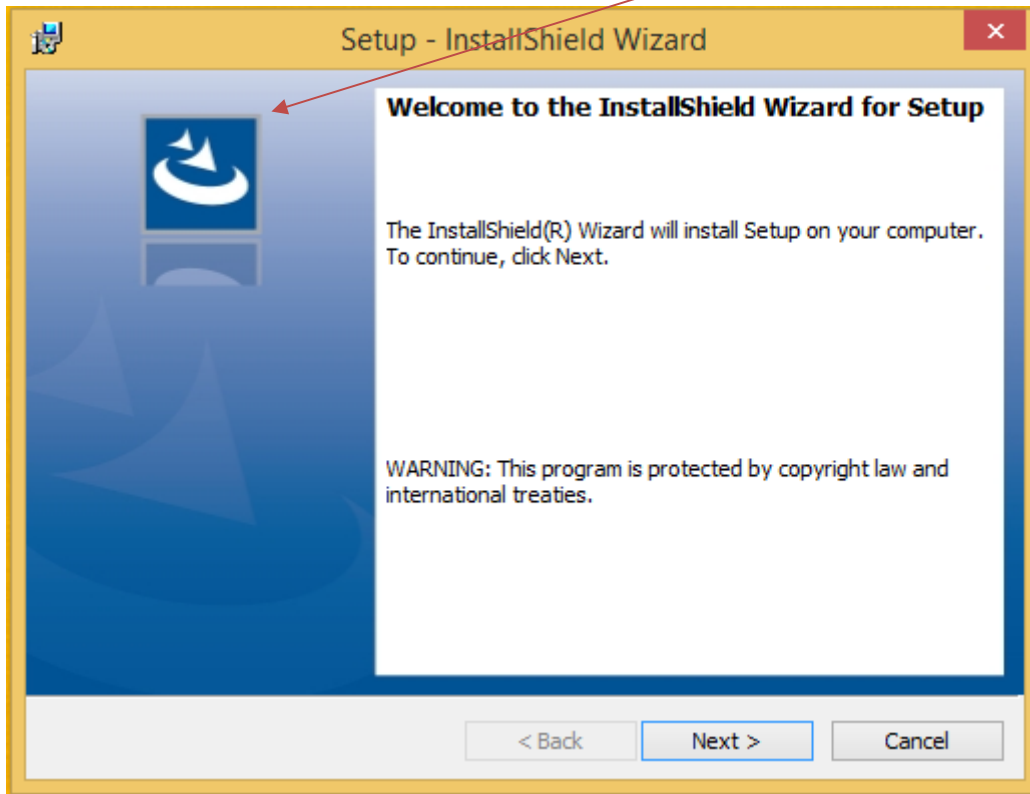


Figure 2: Installer screen

Follow the on screen instructions and enter the information required.

As part of the installation process a check will take place to see if .NET Framework 4.0 is present. If not, the setup routine can be cancelled and the .NET framework 4.0 can be downloaded from Microsoft’s website.

A driver is needed for the STM32F303K8T6 microcontroller. This is included in the software package.

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## 5 Installing the ST Microcontroller USB Driver

The USB supplied contains a folder called “en.stsw-link009.zip”. Extract the files and run either the application “dpinst\_amd64.exe” if you have a 64bit system or “dpinst\_x86.exe” if you have a 32 bit system. This will install the USB driver for the ST microcontroller that is connected to the ezPyro board.

Once the driver has been installed the USB cable can be connected between the ezPyro Board and the computer.

Once connected the green light on the ezPyro board will be on constantly and the red light will flash (The microcontroller is the inverse of this, red is on constantly and green flashes).

## 6 Installing .NET 4.5 framework

If you do not have the .NET 4.5 framework installed on your computer then use the installer provided (“dotnetfx45\_full\_x86\_x64”) in the software package.

### 6.1 Connect the ezPyro demo kit

1. Connect the USB cable to the kit and Windows PC

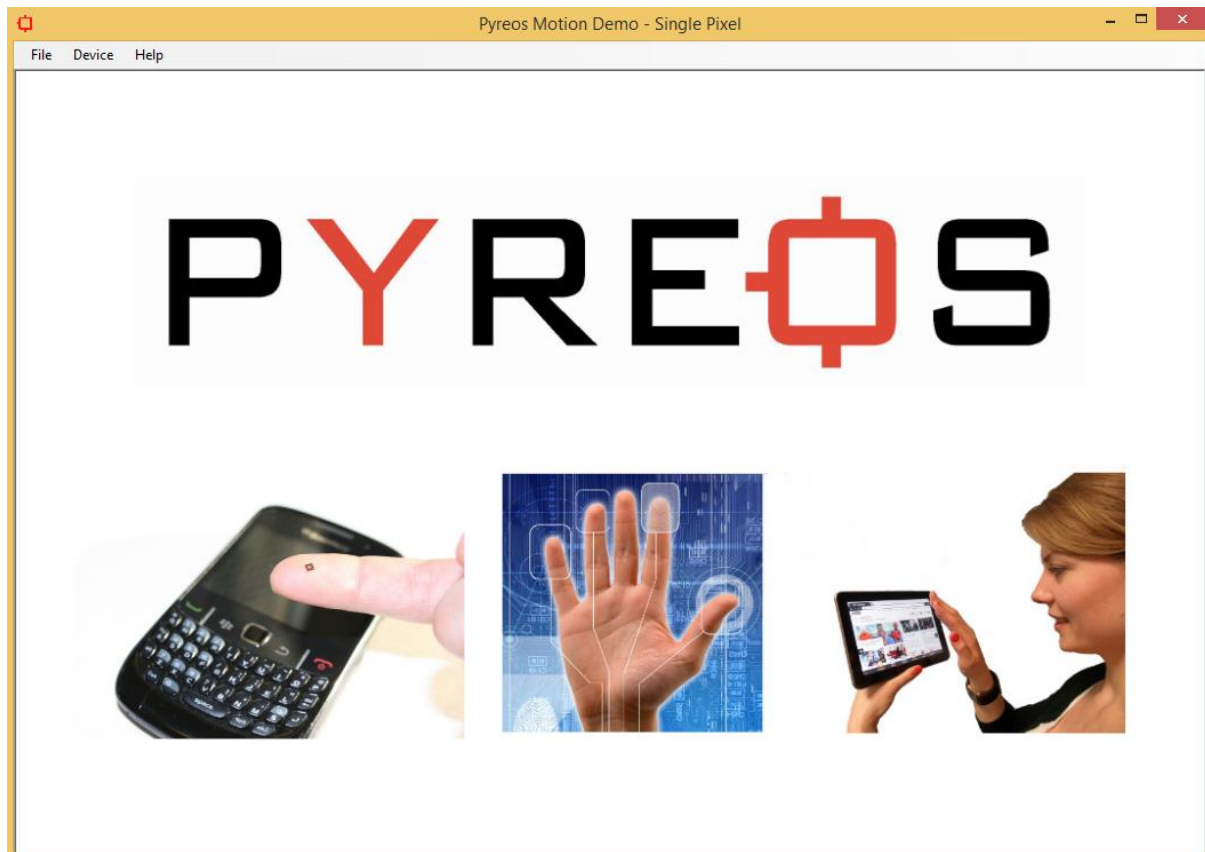
You may see a message suggesting you are required to install a device driver. Follow the on screen instructions and download a driver from Windows Update or install from the software package provided.

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## 7 Running the Software

Double clicking on the .exe file will open the application.

This will open the window shown below:



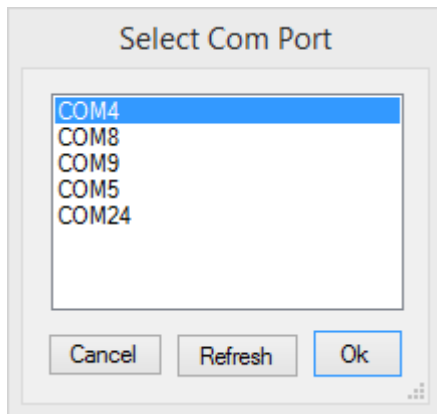
To connect to the demo kit, select the Device -> Connect to Device



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This will open a window with all available devices on COM ports.



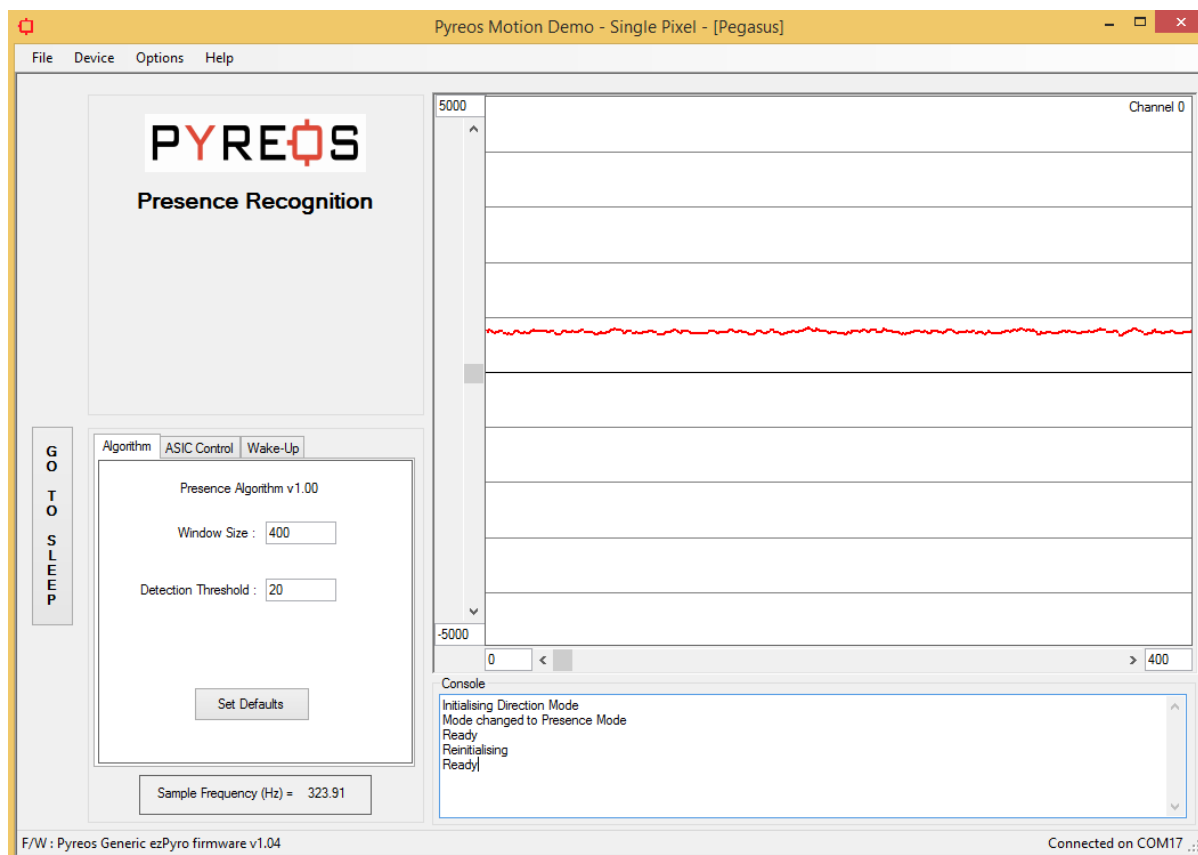
Connect to the port that appears once the device is connected. This can be checked by disconnecting the device and refreshing the list. Re-connect and refresh the list then select the COM port that has appeared and click OK.

Once the device has been selected the software runs through a calibration sequence, whilst the calibration sequence is running the arrow that indicates a movement direction will spin round and then vanish upon completion of the calibration. This is required when using the device without a method of stopping drafts from running across the device.

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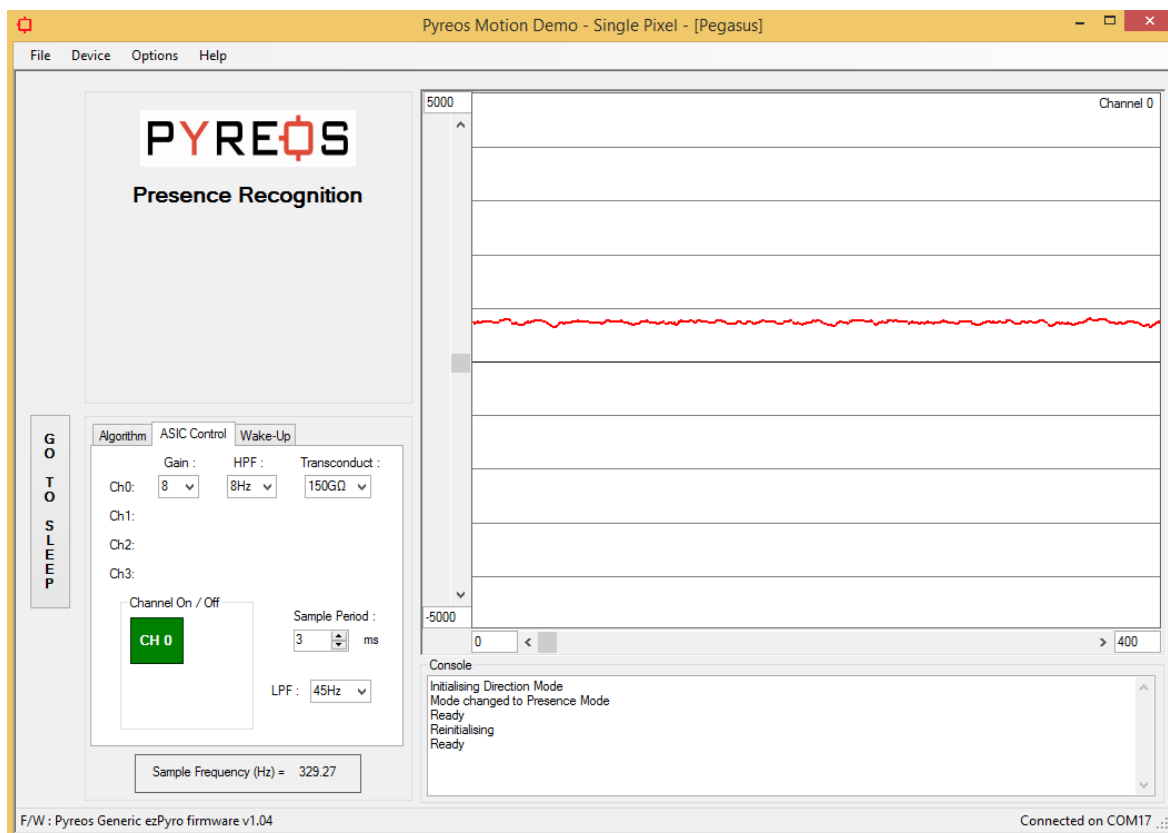
The main window contains the following sections:

## Algorithm Tab

- Window showing current detection mode (The button for the active mode, direction or presence is highlighted in blue). When an event occurs, the detected event will be shown with an icon.
- 4 scope windows which show the signals produced by each of the pixels in the sensor.
- A console which displays detected messages as well as any changes or errors and a simple setting window where the trigger threshold can be changed.

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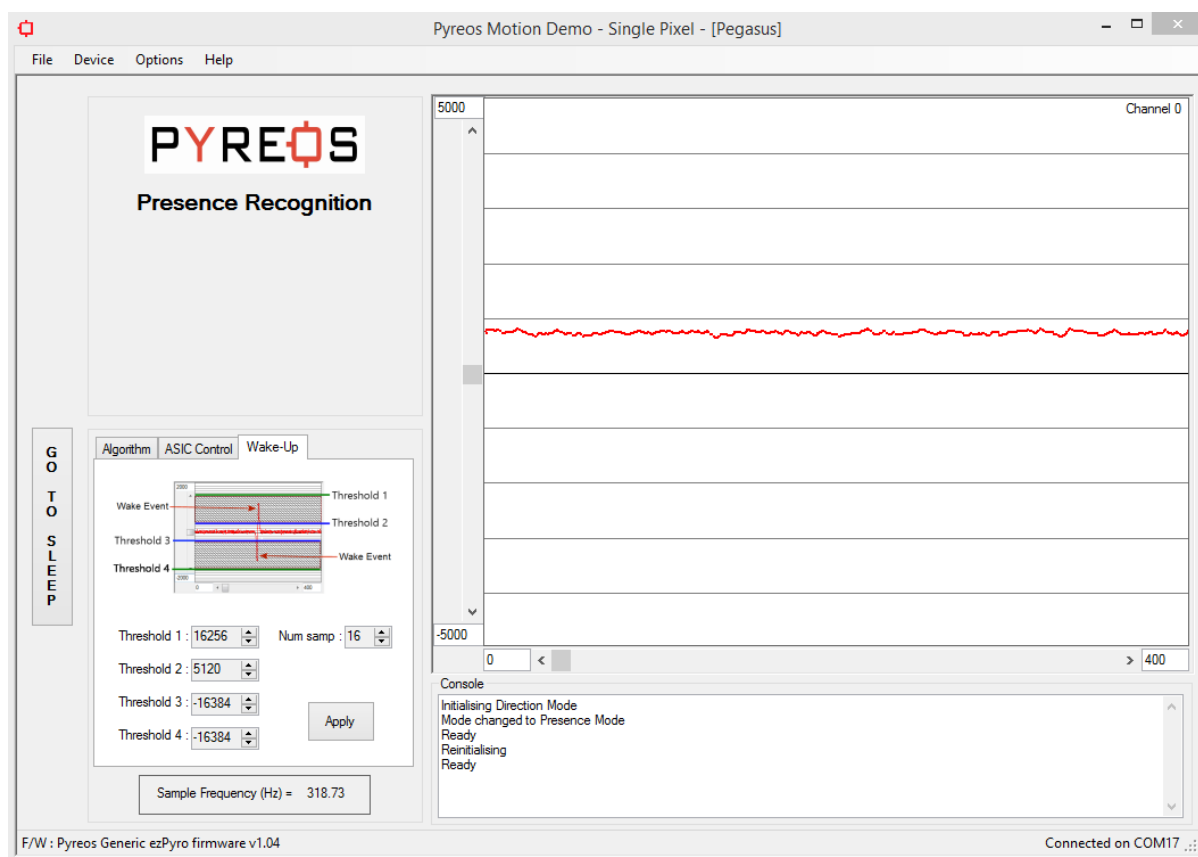


## ASIC Control Tab

The ASIC box gives the user access to the various parameters that can be controlled on the output of the ezPyro.

- Gain: The gains should all be set equal on every channel for motion direction detection. They are allowed to be set independently simply to allow the user complete control over every aspect of the device that can be set. The gain is set by selecting a capacitor to be used in the charge amplifier within the device.
- High Pass Filter (HPF): The high pass filters should again be set equal for motion direction detection.
- Transconductance: The transconductance gives the user the ability to set the time constant of the sensor and amplifier set-up.
- Low Pass Filter: The low pass filter used is common to all channels of the ezPyro.
- Sampling Period: This allows the sampling rate to be altered.

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## Wake-up Tab

The wake up box allows the setting of the wake up conditions for the device. The wake up only applies when the device is in sleep mode.

- The wake up works by requiring the signal to be within the range of threshold 1 and 2 or within threshold 3 and 4 for a certain number of samples.
- The number of samples required is in the top right box.
- The channel that is being used for the wake up condition is selected in the box above the 'apply' button.

For more detail on wake up conditions please refer to the ezPyro datasheet.

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## 8 Presence Detection Mode

A presence event is one that simply states that an object of higher temperature than the background radiation has come into or moved out of the FOV of the sensor.



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## 8.1 Proximity Detection Algorithm Parameters

It is possible to modify the proximity detection algorithm parameters.



- **Window Size**
  - Window width in samples used to detect event.  
Larger window allows slower movements, smaller rejects them.
  - Range : 10 to 2000
  - Typical : 400
- **Detection Threshold**
  - How high the peak value has to be before recognised for direction.
  - Range : 1 to 1000
  - Typical : 20

The same ASIC, wake up and System settings are available within the presence section as in the direction detection section.

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## 8.2 Proximity Algorithm

The Algorithm used for a presence being detected is an analysis of the rate of change of the signal. A group of 3 data points are averaged and then the following 3 data points averaged. The averaging reduces the effect of noise on the algorithm, more data points could be used to improve resistance to noise but that would be dependent on the location of the device in the end application.

These two averaged values are then used to determine the rate of change of signal by differentiating with respect to time, or the spacing between data points which in this case is three.

The detection threshold affects the required rate of change of signal to give a positive motion detection event. The initial value of 20 give good results but again this can be adjusted depending on the applications environment and optical setups that might be in use.