

Birdbox Controls: Advanced

This document describes the different settings available on your Xperibird interface. We recommend you use the default settings unless you are setting up a bespoke system. All default settings are the recommended settings to run during the Xperibird project.

There are many different options and settings can be used to record to change image and event data, image quality, video length, increase number of files and use different image effects.

The camera and motion detect programmes are very complex but there are more basic settings you may wish to experiment with in the "Camera Settings" section such as 'Timelapse interval' (see the previous *Birdbox Controls Guide*) and *brightness*.

It is important to understand and read this document in full before you make the adjustments. For example, if you increase image file size or video file length, you will reach the memory limit on your SD card sooner.

If you wish to experiment with the settings, you can always reset the settings to the default Xperibird settings.

A description of the different settings is given below.

Camera Settings

This section is found on the homepage. Click on 'Camera Settings' to expand the settings table.

Setting	Description
Resolutions	Sets the resolution using presets and custom values. The 'p' value refers to the horizontal number of pixels and the horizontal:vertical ratio is provided. The higher the resolution the greater the image quality but the larger the file size.
Timelapse interval	The value between shots in seconds. Default 60 seconds.
Annotation	Specifies annotation size, text colour, and background colour. Colours are in hex YUV format.
Buffer	Sets a buffer in milliseconds to capture images leading up to an image trigger. Buffer stores data for a short amount of time (in the RAM) before being saved or viewed to reduce chance of glitch of faults as opposed to streaming directly.

Sharpness	Sets the sharpness of the image. 0 is the default
Contrast	Sets the contrast of the image. 0 is the default.
Brightness	Sets the brightness of the image. 50 is the default. 0 is black, 100 is white.
Saturation	Sets the colour saturation, intensity of colour, of the image. 0 is the default.
ISO	Sets the sensitivity of the camera to light. A higher ISO is more sensitive to light but will result in less fine grain or 'noise'.
Metering	Defines how the camera determines the exposure. 'Average' - measures light across the whole frame, strongly biases the centre. 'Spot' - measures intensity over a small area in the center. 'Backlit' - assumes backlit image 'Matrix' - Measures light across the whole frame, strongly biases the focus point.
Video stabilisation	Turn video stabilisation on or off. Reduce blur from shaking camera or movement.
Exposure compensation	Makes image lighter or darker than recommended settings. Default is 0.
Exposure mode	Settings include <ul style="list-style-type: none"> ● auto: use automatic exposure mode ● night: select setting for night shooting ● nightpreview: ● backlight: select setting for backlit subject ● spotlight: ● sports: select setting for sports (fast shutter etc.) ● snow: select setting optimised for snowy scenery ● beach: select setting optimised for beach ● verylong: select setting for long exposures ● fixedfps: constrain fps (frames per second) to a fixed value
Colour effect	Changes colour settings. U and V are the chrominance (colour) values. The supplied U and V parameters (range 0 - 255) are applied

	to the U and V channels of the image. 128:128 should result in a monochrome image. Default 'disabled'.
Image statistics	Displays the exposure, analogue and digital gains, and AWB settings of image files when using WinSCP to access the Pi.
Rotation	Sets the rotation of the image in the viewfinder and resulting image. This can take any value from 0 upwards, but due to hardware constraints only 0, 90, 180, and 270 degree rotations are supported.
Flip	Flips the preview and saved image horizontally and/or vertically.
Sensor region	Allows the specification of the area of the sensor to be used as the source for the preview and capture. This is defined as x,y for the top-left corner, and a width and height, with all values in normalised coordinates (0.0 - 1.0). So, to set a region at halfway across and down the sensor, and a width and height of half of the sensor, use: x 0.5, Y 0.5 w 32768 h 32768
Shutter speed	Sets the shutter speed, time the sensor is exposed to light while taking the image, to the specified value (in microseconds). There's currently an upper limit of approximately 330000 ms.
Image quality	Image_quality (1-100) controls quality of still image captures. The number does not match normal jpeg Q factor as the Raspberry camera compression software Q factor is quite non linear. The default 10 is approximately equivalent to 75 in normal JPEG usage and gives a decent trade-off between quality and file size. 7 is about Q 50, and 20 is about Q 95.
Preview Quality	quality (1-100) controls the quality of the live image preview. Dlver sets preview fps relative to video fps so default 1 gives a 1 to 1 fps preview/video.
Raw Layer	Records all sensor data before it has been processed.
Video Bitrate	Set video bit rate (data recorded per second). 10Mbits/s would be 10000000. For H264, 1080p30 a high quality bitrate would be 15Mbits/s or more. Maximum bitrate is

	25Mbps/s (-b 25000000), but much over 17Mbps/s won't show noticeable improvement at 1080p30.
MP4 Boxing mode	Turns on the conversion of video file data to MP4 or turn off to to saved in h264 format and can be converted later. May be useful to smooth out any advanced regular stop-start recording.
Annotation size	Sets the size of annotation text.
Custom Text colour	Set the text colour. The Y component determines the brightness of the color (referred to as luminance or luma), while the U and V components determine the color itself (the chroma)
Custom background colour	Set the background colour YUV format. The Y component determines the brightness of the color (referred to as luminance or luma), while the U and V components determine the color itself (the chroma)
Watchdog	Checks to see if preview is working. Interval is the time between checks in seconds and errors in the trigger point for preview failure before rebooting the system.
Motion detect Mode	There are two modes of motion detect: External - uses a linux programme and gives you access to the settings (motion detect must be on to do this). Internal - an alternative algorithm for motion detect that may reduce false triggers (recording without real motion) but may increase the chance of missing movement.

The Scheduler

Click on 'Edit Schedule Settings' on the homepage to access the scheduler.

We recommend these settings are not adjusted unless you understand and require changes to the settings. The scheduler can be used to start and stop motion detection during different periods eg. Day/night..

A Stop button shows when the background scheduling program is running and turns into a start button if it is not. Normally it should just be left running. Note that if it is stopped then motion start stop triggers will not be actioned as they pass through the scheduler. If the software is updated without rebooting then stop and start scheduler to make sure the new version is running.

Changes will be passed to the background program and take immediate effect. These settings may be backed up and restored.

Different rows (in the bottom table) will be shown according to the day mode selected. For example if Fixed Times is selected then 12 time based rows appear.

Click on 'Command reference' to expand a drop down list of command parameters.

[← Back | Terug | Arrière | Zurück](#)

Save Settings
Backup
Restore
Show Log
Stop

Parameter	Value	Parameter	Value
Fifo_In	<input type="text" value="/var/www/html/FIFO1"/>	Fifo_Out	<input type="text" value="/var/www/html/FIFO"/>
Cmd_Poll	<input type="text" value="0.03"/>	Mode_Poll	<input type="text" value="10"/>
Management_Interval	<input type="text" value="3600"/>	Management_Command	<input type="text"/>
PurgeVideo_Hours	<input type="text" value="0"/>	PurgeImage_Hours	<input type="text" value="0"/>
PurgeLapse_Hours	<input type="text" value="0"/>	GMTOffset	<input type="text" value="0"/>
PurgeSpace_ModeEx	Select Mode <input type="text" value="Off"/>	PurgeSpace_Level	<input type="text" value="10"/>
DawnStart_Minutes	<input type="text" value="-180"/>	DayStart_Minutes	<input type="text" value="0"/>
DayEnd_Minutes	<input type="text" value="0"/>	DuskEnd_Minutes	<input type="text" value="180"/>
Latitude	<input type="text" value="52.00"/>	Longitude	<input type="text" value="0.00"/>
Max_Capture	<input type="text" value="0"/>	DayMode	Select Mode <input type="text" value="Sun based"/>
AutoCapture_Interval	<input type="text" value="0"/>	AutoCamera_Interval	<input type="text" value="0"/>

Time Offset: 0
Sunrise: 05:08
Sunset: 18:51
Current: 02:22
Period: AllDay

Period	Motion Start	Motion Stop	Period Start
Night	<input type="text"/>	<input type="text"/>	<input type="text" value="em night"/>
Dawn	<input type="text"/>	<input type="text"/>	<input type="text" value="md 1,em night"/>
Day	<input type="text" value="ca 1"/>	<input type="text" value="ca 0"/>	<input type="text" value="em auto"/>
Dusk	<input type="text"/>	<input type="text"/>	<input type="text" value="md 0,em night"/>

Command reference

Settings Description

Setting option	Description
Fifo_in	Fifo_In defines the named pipe that schedule monitors. It should be the same as where motion sends its commands.
Fifo_out	Fifo_Out is where scheduler sends its commands to raspimjpg Do not change these without good reason. Other configs are relying on these and would need to be changed as well.
Cmd_Poll	Cmd_Poll is how often the scheduler checks the Fifo_In for incoming commands. It should be kept quite short to avoid unnecessary delays

Mode_Poll	how often the scheduler checks for changes between the 4 main daily periods. Setting it to 10 means there might be a 10 second delay in determining when day starts for example.
Management Interval	Causes Scheduler to run a task every Interval (seconds). This is an optional user command plus automated purging
Management command	A macro facility which will be run every Management interval. macros are commands held in the macros folder in the web site typically shell scripts. This is a change from previous operation where any direct system command could be executed. The system installer must put any commands in the macros folder and give them execution rights. Take care when using this facility; test out any macros first.
Purge Settings	The scheduler has facilities for removing old files automatically. There are two mechanisms which are both checked and used at each Management_Interval. First the 3 PURGE_HOURS (one per file type) are checked and any file older than this is removed. So if PurgeVideo_Hours is set to 98 then any video captured more than a week ago will be removed. Setting the values to 0 disables this . This type of purging is useful when there is plenty of storage but you just want to remove old material. The second mechanism purges based on filing system space available or media space used. The detailed mechanism is selected with PurgeSpace_Mode which can be Off, Min Space % or Max Usage %, Min Space GB, Max Space GB. Min Space means that the available remaining space is checked and older files are removed until there is at least the level of free space set available on the filing system. Max Usage means that older files are removed so that the total space used by the media is less than the level set. The level in either case may be set in GB or as a % of the total filing system size depending on which Mode was selected.
GMTOffset	GMTOffset adjusts for sunrise / sunset calculation. Set in hours or TimeZone string
Latitude, and Longitude	Latitude, and Longitude define where the camera is and allow the sunrise and sunset times to be calculated throughout the year.
DayMode	provides 3 different types of scheduling. <ul style="list-style-type: none"> • Sun based splits the day up into 4 periods (Night, Dawn,Day, Dusk) based on sunrise

	<p>and sunset calculations and the offsets.</p> <ul style="list-style-type: none"> • All Day uses just the Day settings for the whole 24 hour period. • Fixed Times splits the Day up into up to 6 periods based on fixed times. The commands in force are those for the time just less than current time. These do not have to be in order.
<p>AutoCapture_interval Max_Capture</p>	<p>If non zero sets the scheduler to issue capture starts at this interval. This is used in conjunction with Max_Capture to set up a repeating sequence of fixed length recordings of maxcapture duration at the autocapture interval. Note that Max_Capture should be set a little less than the AutoCapture_interval to make sure the video is stopped before the next is due to start. 1 second less should be sufficient.</p>
<p>AutoCamera_interval</p>	<p>If non zero then this sets the system up to only run the camera system when there is an active browser client attached. The interval determines how long the camera stays on after the browser stops watching the stream. The camera will automatically start when the browser next views the stream. Only use in situations where you expect the browser to be used normally. Scheduling and motion detection will not work in this mode if no browser is attached.</p>
<p>Period Table</p>	<p>allows mode changes and start and end commands to be different in each of the daily periods. Times are to the nearest minute and there can be an additional delay of Mode_Poll seconds before a period change is detected. Each row in the table also has weekday checkboxes.</p> <p>Motion Start are used to start captures when a motion trigger start is received. If left blank (e.g. at night) then no capture happens when motion is detected.</p> <ul style="list-style-type: none"> • Motion Stop are used to end captures when a motion trigger stop. • Period Start are used to send in commands at the start of each daily period. So, for example they may be used to control motion detection and change camera settings. Changing to night mode for example extends the usefulness of the camera in dusk and dawn periods. They may also be used to start and stop recordings at the beginning of each period. <p>Note the scheduler is calculating the day periods based on local time conditions. The raspberry pi should have the appropriate time zone set in raspi-</p>

	<p>config. This may be checked by issuing a date +%R command line which should show local time. It is also displayed on the schedule settings page.</p> <p>Example: Enable motion detection all day</p> <p>When scheduler starts up (or if the camera system is restarted) then it detects which period it is in and performs the commands configured in the period start for that period.</p> <ol style="list-style-type: none"> 1. In All Day mode then there is only 1 period so any commands in period start are always sent. md 1 will therefore start motion detection 2. In Sun based or Fixed Times mode then the period start commands for the current period are sent. Say you are in Sun based and put md 1 in Day and md 0 in Dawn, Night, Dusk. After a reboot if the time is in a day period then motion will be started, else it will wait till next day period starts.
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Using the Scheduler to activate timelapse full-res picture capture on a sun-based schedule.

The scheduler is fairly general purpose and not constrained to motion capture video.

Any sequence of the supported commands can be put into the motion start, motion stop, and period start fields. This can include changing camera settings, taking still images, videos, or controlling time lapse sequences.

Motion Start and Motion Stop commands get executed whenever a trigger (1=Start, 0=Stop) get entered into the scheduler FIFO1. Normally these would come from the motion detection logic but can come from anywhere (e.g. PIR motion detectors, door triggers etc).

The Period Start commands get executed whenever a period change is detected. In All Day mode there is only one set, but time based and Sun based allow different commands at different periods of the day. In a lot of cases these are used to determine what camera settings to use or whether to enable motion detection, but they can be used for anything. So for example, a time lapse sequence could be started at the beginning of a period and terminated at the next period start.

For additional flexibility one can use the Management command facility of the scheduler. Any commands here are periodically run at the Management interval. Typically one would use a sy command to execute a macro periodically that could do whatever logic was required and in turn issue further commands back to the command queue FIFO to initiate, image, video and time-lapse operations.

Motion Detection

There are two modes of motion detect that can be selected in camera settings. Once selected external or internal - click on motion settings to access the different options. 'External' is the default option.

External - uses a linux programme and gives you access to the settings (motion detect must be on to do this).

Internal - an alternative algorithm for motion detect that may reduce false triggers (recording without real motion) but may increase the chance of missing movement.

Internal

The internal motion detection scheme. It is activated by selecting the motion detect mode under camera settings to be Internal. When this is done the original motion settings button disappears and a new Motion Settings control appears on main page.

This does not work in all browsers and it is recommended to use mjpeg stream mode to minimise problems.

The current detection parameters are Noise Level, Threshold, Mask Image, Change frames to start and still frames to stop. The detection is working at full video frame rate (e.g. 25 fps) so one may want to use a fairly large still frame count to avoid early stop.

External

The motion screen gives access to the motion config settings. Motion detection must be on for this to work.

Not all motion settings are relevant here. A filtered list is shown and the full list can be accessed if required. Settings can be saved backed up and restored. Saving does tell motion to start using the new settings.

Option	Range/Values Default	Description
framerate	Values: 2 - 100 Default: 100 (no limit)	Maximum number of frames to be captured from the camera per second.

minimum_frame_time	Values: 0 - 2147483647 Default: 0	Minimum time in seconds between the capturing picture frames from the camera. Default: 0 = disabled - the capture rate is given by the camera framerate.
netcam_url	Values: Max 4095 characters Default: Not defined	Specify an url to a downloadable jpeg file or raw mjpeg stream to use as input device. Such as an AXIS 2100 network camera.
netcam_userpass	Values: Max 4095 characters Default: Not defined	For network cameras protected by username and password, use this option for HTTP 1.1 Basic authentication. The string is specified as username:password. Do not specify this option for no authentication.
switchfilter	Values: on, off Default: off	Turns the switch filter on or off. The filter can distinguish between most switching noise and real motion. With this you can even set roundrobin_skip to 1 without generating much false detection.
threshold	Values: 1 - 2147483647 Default: 1500	Threshold for declaring motion. The threshold is the number of changed pixels counted after noise filtering, masking, despeckle, and labelling.
threshold_tune	Values: on, off Default: off	Activates the automatic tuning of threshold level. (It's broken)
noise_level	Values: 1 - 255 Default: 32	The noise level is used as a threshold for distinguishing between noise and motion.
noise_tune	Values: on, off Default: on	Activates the automatic tuning of noise level.

despeckle	Values: EedDL Default: Not defined	Despeckle motion image using combinations of erode or dilate. And ending with optional labeling.
area_detect	Values: 1 - 999999999 Default: Not defined	Detect motion center in predefined areas. A script (on_area_detected) is started immediately when motion center is detected in one of the given areas, but only once during an event even if there is motion in a different configured area.
Motion Mask	<p>The motionmask is like the external motion mask file mechanism. It is a grey scale pgm (portable grymap) image file. It is used here as a binary mask. Changes in areas where the mask is non zero (not pure black black) are included. The mask file must be the same resolution as the motion vectors. This is essentially $1/16$ of the video but rounded up by 1 in width ;121x68 for a 1920x1080 , 82x61 for a 1296x972, 49x36 for 768x576. It is best created by grabbing an example cam.jpg and then using an photo editor to first change it into a grey scale black white mask where white is the area of interest. Then resize it to the right dimensions and save as a pgm file.</p> <p>You can see what is going on with internal motion detection by including %c and %f in the annotation string (the date/time info bar at the top of the image). %c will show the filtered changes occurring by frames. When this is above the 'threshold' value then the change frame counter increments (%f) and when this exceeds the start frame count then a capture is triggered. Lower the value of the threshold to increase the sensitivity to small changes.</p>	
mask_file	Values: Max 4095 characters Default: Not defined	PGM file to use as a sensitivity mask. This picture MUST have the same width and height as the frames being captured and be in binary format.

smart_mask_speed	Values: 0 - 10 Default: 0 (disabled)	Slugginess of the smart mask. Default is 0 = DISABLED. 1 is slow, 10 is fast.
lightswitch	Values: 0 - 100 Default: 0 (disabled)	Ignore sudden massive light intensity changes given as a percentage of the picture area that changed intensity.
minimum_motion_frames	Values: 1 - 1000s Default: 1	Picture frames must contain motion at least the specified number of frames in a row before they are detected as true motion. At the default of 1, all motion is detected. Valid range is 1 to thousands, but it is recommended to keep it within 1-5.
gap	Values: 0 - 2147483647 Default: 60	Gap is the seconds of no motion detection that triggers the end of an event. An event is defined as a series of motion images taken within a short timeframe.
on_event_start	Values: Max 4095 characters Default: Not defined	Command to be executed when an event starts. An event starts at first motion detected after a period of no motion defined by gap. You can use ConversionSpecifiers and spaces as part of the command.
on_event_end	Values: Max 4095 characters Default: Not defined	Command to be executed when an event ends after a period of no motion. The period of no motion is defined by option gap. You can use Conversion Specifiers and spaces as part of the command.
on_motion_detected	Values: Max 4095 characters Default: Not defined	Command to be executed when a motion frame is detected. You can use Conversion Specifiers and spaces as part of the command.

on_area_detected	Values: Max 4095 characters Default: Not defined	Command to be executed when motion in a predefined area is detected. Check option area_detect.
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