

# 360

## Owner's manual

Boxfish 360 Spherical  
Underwater Camera



**BOXFISH**<sup>®</sup>  
R E S E A R C H





## Table of Contents

1	Introduction .....	6
2	About the Boxfish 360.....	6
3	Safety and care instructions for the Boxfish 360.....	7
3.1	General use .....	7
3.2	Cleaning and maintenance.....	7
3.3	Transporting the 360 .....	8
4	Battery safety, care and storage instructions.....	9
4.1	Z Cam E1 batteries.....	9
4.2	Recording Extender batteries.....	9
5	Warranty and limitations of liability.....	10
6	Boxfish 360 components.....	11
6.1	Boxfish 360 camera.....	11
6.2	Optional accessories (supplied if ordered).....	12
7	Boxfish 360 features.....	14
8	Boxfish 360 specifications.....	15
8.1	* Recording duration.....	15
9	Overview of 360 hardware.....	16
9.1	Original Boxfish 360 .....	16
9.2	Vacuum test kit.....	16
9.3	Recording Extender.....	17
10	360 hardware instructions .....	19
10.1	How to open and close the lid .....	19
10.2	Check the main O-ring .....	19
10.3	How to charge the 360.....	20
10.4	Camera memory cards .....	21
10.5	How to turn cameras on .....	21
10.6	Select recording mode: video or time-lapse .....	22
10.7	How to turn cameras off.....	22
10.8	Next steps - Z Cam E1 camera and 360 settings .....	22
11	Z Cam E1 cameras setup instructions .....	24
11.1	How to use the Z-Cam E1 camera menu controls .....	24
11.2	Errors.....	24
11.3	Date/Time settings.....	24



11.4	Aperture .....	25
11.5	White balance.....	25
11.6	Adjusting the exposure compensation value (EV).....	26
11.7	ISO value .....	26
11.8	Shutter angle .....	27
11.9	Split duration .....	27
11.10	Turn Bluetooth advertising on or off .....	28
12	Setting up 360 software using the Boxfish App.....	29
12.1	Required components.....	29
12.2	Download Boxfish App.....	29
12.3	Connect 360 to your computer and Boxfish App.....	29
12.4	Settings .....	30
12.5	Changing settings.....	31
12.6	Exit time-lapse mode .....	31
13	Attaching accessories .....	32
13.1	Accessory care.....	32
13.2	Mounting the monopod .....	32
13.3	Mounting the 360 on a tripod .....	33
13.4	Attaching floats .....	33
14	Recording instructions (without vacuum test).....	34
14.1	Prerequisites.....	34
14.2	Video recording .....	34
14.3	Time-lapse recording .....	35
15	Recording instructions (for 360 with vacuum integrity test kit).....	37
15.1	Prerequisites.....	37
15.2	About the vacuum integrity test.....	37
15.3	How to perform the vacuum integrity check.....	38
15.4	Recording video after completing vacuum integrity test.....	39
15.5	Recording time-lapse photos after completing vacuum integrity test.....	39
15.6	Vacuum monitoring .....	40
15.7	How to release the vacuum .....	40
16	Diving with the 360.....	41
16.1	Pre-dive care .....	41
16.2	Post-dive care and cleaning .....	41
17	Downloading videos and photos from Boxfish 360 .....	42
17.1	Attach multi-card reader to computer.....	42



17.2	Open Boxfish App.....	42
17.3	Copy files to your computer.....	43
17.4	Eject cards and remove from the card reader.....	44
17.5	Viewing files in your directory.....	44
17.6	Erasing memory cards after copying files.....	44
18	Creating 360 spherical video in Mistika VR.....	46
18.1	Download stitching template.....	46
18.2	How to use the stitching template to create a 360 video.....	46
18.3	Video of stitching instructions.....	47
19	Downloading log data (depth, temperature etc).....	48
19.1	Required components.....	48
19.2	Connect 360 to your computer.....	48
19.3	Copy data.....	48
19.4	Erase memory.....	49
19.5	Log data description.....	49
19.6	Exit time-lapse mode.....	50
20	Removing domes.....	51
20.1	Removing the domes.....	51
20.2	Putting domes back on and lubricating O-rings.....	52
21	Removing bottom lid to replace O-ring.....	53
22	Preparing new memory cards.....	54
22.1	Format and name memory cards.....	54
22.2	Erase cards and write config files.....	54
23	Troubleshooting.....	55
23.1	One or more cameras don't start recording when start/stop button is pressed.....	55
23.2	The batteries on some cameras drain faster than others.....	56
23.3	Boxfish App seems to hang.....	56
23.4	Vacuum valve comes undone.....	56
24	Appendix I: Z Cam E1 cameras recommended settings.....	57
24.1	Video mode settings.....	57
24.2	Shooting parameters.....	57
25	Appendix II: Turning Z Cam cameras on/off with Bluetooth.....	58
25.1	Components required.....	58
25.2	Overview of procedure.....	58



25.3	Download Z Camera App.....	58
25.4	Turn on Bluetooth advertising and find each camera's Name and Passcode.....	59
25.5	Turn camera on and off remotely .....	60
25.6	After your trip.....	61
26	Appendix III: Creating 360 spherical videos in Autopano (obsolete) .....	62
27	Appendix IV: Declaration of Conformity.....	63
27.1	For customers in the USA .....	63
27.2	For customers in Canada.....	65
27.3	For customers in Europe .....	66



## 1 Introduction

Please read these instructions carefully before using the Boxfish 360 and save this manual for future use.

If you have any questions, email [info@boxfish.nz](mailto:info@boxfish.nz) or visit <https://www.boxfish.nz/contact/>.

## 2 About the Boxfish 360

The Boxfish 360 is designed to maximise your time in the water and speed up your production workflow. A single lid provides quick access to all memory cards and long-lasting batteries. With automatically-created project files, only three seams, and precisely synced cameras, the stitching process is extremely fast and efficient. The Boxfish 360 gets you back into the water quicker to shoot more immersive high-quality video.

An integrated electronics package controls start/stop and continuously records changes to depth, temperature, and camera orientation. This eliminates the need to manually note this information during the dive, or look it up in the dive computer later. It is not only great for scientific analysis, it also looks spectacular if integrated into a HUD-style video overlay.

The Boxfish 360 has an external start/stop button. The rig is pre-calibrated to be used underwater or on the surface without having to adjust focal distances. You can shoot with or without domes on the surface, but for optimal image clarity we recommend removing them – instructions are included in this document.



## 3 Safety and care instructions for the Boxfish 360

### 3.1 General use

- Do not open the 360 in a wet or sandy environment. Protect the interior from moisture and debris to prevent malfunction or water ingress.
- Do not leave the Boxfish 360 in direct sunlight for prolonged periods.
- Keep out of reach of children to prevent injury or damage.
- Do not leave any metal items (such as the metal grabber or hex keys) near the contact areas of the power plug or near the camera batteries.
- Do not subject the Boxfish 360 to vibration, impact or static electricity.
- Data on the memory cards may be damaged or lost due to electromagnetic waves, static electricity or damage to the cameras or memory cards. We recommend backing up important data to an external device as soon as possible after a dive.
- If you have not ordered the vacuum integrity option, a water-tightness test in a bathtub or similar is highly recommended. Submerge the Boxfish 360 fully for several minutes and check for any bubbles (note that some small bubbles will escape from the metal plates around the domes). Do this before using the 360 for the first time and after changing O-ring(s).
- Discontinue use immediately if you notice any water ingress.
- Take care when opening the lid, as pressure may build up inside which increases the opening force. If you have the optional vacuum test capability, remove the vacuum from your 360 before attempting to open it.

### 3.2 Cleaning and maintenance

#### 3.2.1 O-rings

- Good O-ring maintenance is essential for maintaining water-tightness of your Boxfish 360.
- After every dive, inspect and clean the main O-ring and the groove it sits in, and lubricate the O-ring before inserting back into its groove.
- To lubricate the O-rings, only use the silicone grease provided in your case.
- Replace the main O-ring and three dome O-rings (see [Section 20: Removing domes](#)) annually, or earlier if needed.
- The bottom O-ring (accessible by removing the screws on the underside of the housing) should be replaced every two years (see [Section 21: Removing bottom lid to replace O-ring](#)).





## 3.2.2 Cleaning the 360 housing

- Before cleaning the Boxfish 360 housing, disconnect charging cord.
- Do not use solvents such as benzene, thinner, alcohol or kitchen detergent to clean the camera or housing, since it may damage the external case or coating.
- For important after-dive cleaning instructions, see [Section 16.2: Post-dive care and cleaning](#).

## 3.2.3 Monopod/tripod and other accessories

- Pay special attention to rinsing these accessories after use, especially in salt water. Ensure that the screw on the accessory (that goes into the mounting point on the 360) is thoroughly rinsed and dried after each dive, so that it does not become rusty. Use a little of the silicone grease (provided in your 'spares' pack) on this screw before attaching the accessory to your 360.

## 3.3 Transporting the 360

- Always transport the 360 inside its case.
- When travelling by air, **do not close the lid with the latches** as this may lead to a pressure difference between the atmosphere and inside the housing.
- Turn off the 360 and cameras before long journeys.



## 4 Battery safety, care and storage instructions

### 4.1 Z Cam E1 batteries

- The batteries for the Z Cam E1 cameras inside the Boxfish 360 are rechargeable lithium-ion batteries.
- Note that camera batteries become warm during and after using the Boxfish 360, and during and after charging. This is not a malfunction.
- Store the batteries inside the 360 and place the 360 in a cool and dry place with a relatively stable temperature (15°C to 25°C / 59°F to 77°F) and humidity (40% to 60% relative humidity).
- If the 360 will not be used for a few months or more, store the batteries at about 50% charged. Store the batteries inside the cameras.
- If batteries are allowed to run flat or are removed from the Z Cam cameras, all previous settings on the cameras will be lost and will return to factory defaults and you will need to re-enter any custom settings.

### 4.2 Recording Extender batteries

If you have ordered the optional Recording Extender:

- Only use batteries that have been supplied by Boxfish. They are rechargeable lithium-ion batteries.
- Charge batteries to storage voltage (30-50%) as soon as possible if they have been completely drained.
- Extreme high or low temperatures can reduce the life of the batteries and reduce operating length.

Instructions for storing batteries if you will not use your Boxfish 360 for a few months or more:

- Take the batteries out of the Recording Extender when storing the Boxfish 360 for a few months or more (to prevent damage in case of leakage).
- Store the Recording Extender batteries in a cool and dry place with a relatively stable temperature.
- Do not store the batteries while fully charged. Store the batteries at around 30-50% (use the indicator bars on the Recording Extender charger screen to guide you).



## **5 Warranty and limitations of liability**

For warranty, limitations of liability and terms of sale see our standard terms at <http://www.boxfish-research.com/terms/terms.pdf>.

Defective products should be sent back to our factory in Auckland, New Zealand, for service. Unauthorised disassembling and/or modifications could result in malfunction or leakage.



## 6 Boxfish 360 components

Your 360 will arrive in a Nanuk 933 hard case. Contents of the case are listed below.

### 6.1 Boxfish 360 camera

The Boxfish 360 contains 3x Z Cam E1 cameras inside its housing. Each camera contains a rechargeable battery and 64GB memory card. Also included are the items below.

Item	Purpose	Boxfish Part #
Neoprene cover	To hold 360 and protect domes while entering/leaving the water	[19061364]
Hex key 4mm	For removing bottom lid	[19061230]
Hex key 3mm	For removing/replacing domes	[19061229]
Dome	Spare dome 4.5"	[19051901]
Manual	Full Boxfish 360 Owner's Manual on waterproof synthetic paper	
Quick Start Guide	Laminated double-sided Quick Start Guide for easy reference	

#### 6.1.1 Plastic case labelled 'Power Pack'

Item	Purpose
Power supply	AC to DC power supply cable to charge the Boxfish 360
AC power cable	Country-specific AC power cable
Z Cam E1 manual	User manual for Z Cam E1 cameras for your reference
2x stickers	Boxfish Research stickers to adorn your kit

#### 6.1.2 Plastic case labelled 'Card reader'

Item	Purpose
Multicard reader	To transfer files from all three memory cards at once onto a connected computer
USB cable	To connect card reader to a computer
Microfibre cloth	For wiping down domes
Metal grabber	Tool to help with removing memory cards from cameras and card reader

#### 6.1.3 Plastic case labelled 'Spares'

Item	Purpose	Boxfish Part #
------	---------	----------------



<b>Silicone grease tube</b>	For lubricating O-rings	[19061323]
<b>Micro USB cable</b>	For connecting 360 to a computer when adjusting 360 settings or downloading log files	[19040139]
<b>Dome O-rings</b>	For replacing dome O-rings (annually)	[19061335]
<b>Lid O-rings</b>	For replacing O-rings in top lid (annually) and bottom lid (every two years)	[19061336]
<b>Dome fasteners</b>	4x spare fasteners for domes: M4 x 10mm Hex Socket Cap Screw	[20092146]
<b>Bottom lid fasteners</b>	2x spare fasteners for bottom lid: M6 X 12 button socket screw	[20012330]
<b>Bottom lid washers</b>	2x spare washers for bottom lid: M6 flat washer	[19092002]
<b>Reducer bushing</b>	2x 3/8"-16 to 1/4"-20 reducer bushing for bottom lid of 360 – used for mounting tripod accessory	[19061219]

## 6.2 Optional accessories (supplied if ordered)

Some accessories will require a separate case.

### 6.2.1 Recording Extender

<b>Item</b>	<b>Purpose</b>
<b>Recording extender</b>	To hold extra batteries for powering the 360 and Z Cam cameras. Will be installed in the lid of the Boxfish 360
<b>Rechargeable batteries</b>	3x rechargeable batteries for Recording Extender
<b>Power adapter</b>	Eliminates the need for a power cable from the Recording Extender to the 360 power port. On arrival, this part will be installed in the 360 power port
<b>Battery charger</b>	1x AC/DC battery charger with 1x AC power cord for charging the Recording Extender batteries.

### 6.2.2 Vacuum integrity test

<b>Item</b>	<b>Purpose</b>
<b>Vacuum pump</b>	Used to set vacuum inside 360
<b>Vacuum valve extraction tool</b>	For removing or reattaching vacuum valve (you should not need to do this but we have included this tool just in case)



## 6.2.3 Monopod

Open monopod with wrist strap and mounting plate (mounting plate to be removed before use).

## 6.2.4 Tripod

Open tripod with carry case.

## 6.2.5 Floats package

2x floats with mounting screw pre-installed.



## 7 Boxfish 360 features

The cameras capture circular fisheye 4K-UHD video or JPG+DNG RAW still images. The view from the three lenses overlap a short distance outside the housing in all directions.

Coverage	Full-spherical 360
Recording modes	Video, photo time-lapse
Spherical video resolution	5040x2520 at 24, 25 and 29.97 fps.
Spherical photo resolution	12.1 MP
Record RAW photos	Yes (DNG)
Gel filter holders included	Yes
Underwater stop/start	Yes
Genlocked cameras	Yes, millisecond accuracy
Audio buzzer	Yes, for acoustic confirmation and sync backup
Aperture control	Yes, manual from f/2.8 to f/11
Frame rate control	Yes, 24, 25 and 29.97
ISO control	Yes, auto and manual from ISO100 to ISO102400
Shutter angle control	Yes, auto and manual from 45° to 360°
White balance control	Yes, auto and manual from 2300K to 7500K
Exposure compensation control	Yes, -3EV to +3EV
Colour space control	Yes, sRGB and Z-LOG
Record depth	Yes
Record temperature	Yes
Record orientation	Yes
Can be used on surface	Yes
File management app included	Yes, for Windows and OS X
Stitching templates included	Yes
In-camera stitching	No



## 8 Boxfish 360 specifications

Housing body	Aluminium alloy
Surface treatment	Hard anodized
Dome material	Acrylic
Depth rating	300m / 1000ft
Buoyancy	Slightly negative
Dimensions	300 x 165mm / 11.8 x 6.5 inch
Weight with cameras and batteries	6.0kg / 13.2 lbs.
Battery life	Up to 90 min (up to 240 mins with optional Recording Extender)
Video format	MOV H.264
Photo format	JPG + DNG
Recording bitrate	60Mbit per camera
Dynamic range	10 stops
Aperture	F1.8 to F16, manual iris. Easily adjustable from f/2.8 to f/11 via aperture lever
Recording media	Micro SD 64GB
Sensors	Panasonic MN34230 Micro Four Thirds
Lenses	185° circular fisheye
Mounting options	3x 1/4" and 2x 3/8" threads
Supplied memory card (we recommend and test this card only)	SanDisk 64GB Extreme PLUS UHS-I microSDXC Memory Card
Approx. video recording duration with supplied 64GB memory card (video)	140 minutes (2:20 hours) *

### 8.1 \* Recording duration

- It is possible to record a **total** of 2:20 of video on the memory card
- To record 2:20 uninterrupted recording, you will need a Recording Extender, **and** you will need to ensure that your Z Cam E1 cameras can continue recording after 29 minutes\*

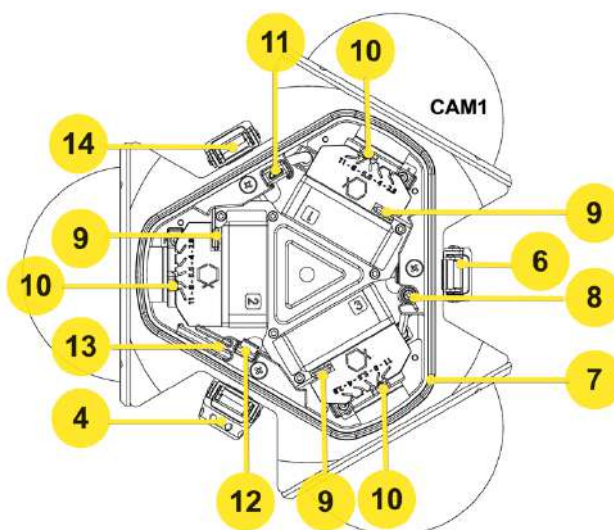
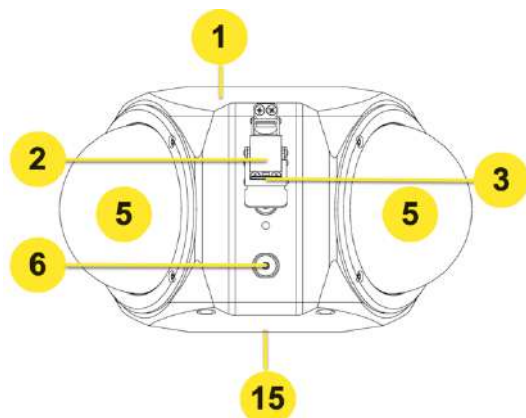
\* **Note:** Some Z Cam E1 cameras manufactured before 2018 have a maximum video recording duration of 29 minutes. If your 360 contains these cameras, you can press the start/stop button to pause recording before the 29 minutes is up. This will reset the video counter to zero. Press the start/stop button again to resume recording.





## 9 Overview of 360 hardware

### 9.1 Original Boxfish 360

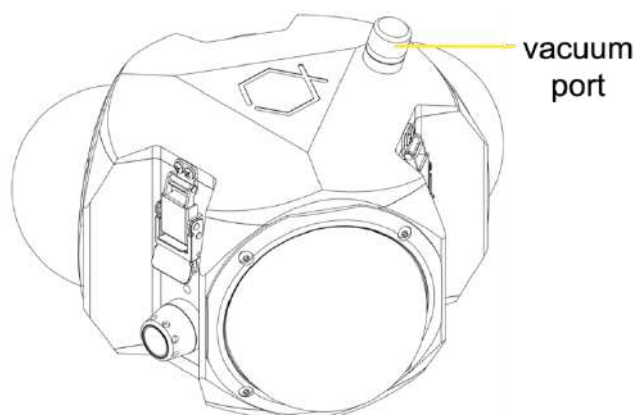


- |   |                                |
|---|--------------------------------|
| 1. Top lid  | 9. Camera power button levers  |
| 2. Latch  | 10. Aperture adjustment levers |
| 3. Latch safety catch                                     | 11. Micro USB port             |
| 4. Recording start/stop button                            | 12. Grabber for memory cards*  |
| 5. Domes  | 13. Hex keys                   |
| 6. Depth sensor   | 14. Monopod mounting point     |
| 7. Main O-ring  | 15. Tripod mounting point      |
| 8. Charging port / DC plug for Recording Extender adapter |                                |

\* Note: Grabber will not fit inside the housing if Recording Extender is present; it will be in the plastic case labelled 'Card Reader' instead.

### 9.2 Vacuum test kit

In addition to the above features, 360 devices with the vacuum test kit installed will have a vacuum port on the lid.





## 9.3 Recording Extender

The Boxfish Recording Extender is an optional add-on that provides extra battery power to power your 360 to up to four hours.

The SD cards supplied in your Z Cam E1 cameras will record video for up to 2 hours 20 minutes, so the Recording Extender allows you to use the external start/stop button to pause recording, for example if you need to surface during a dive, without having to open up the housing to turn off the cameras.

### 9.3.1 How to charge the Recording Extender batteries

Note: The batteries take some time to charge - around 4.5 hours from empty.

1. Plug the power cable into the charger.
2. Insert the batteries into the charger, and switch on the power. The LED display will light up when the batteries are charging. Indicator bars for each battery will guide you as to how full each battery is. If you are going to be storing the batteries for a while, stop when the indicator shows the batteries at about 50%.
3. When the batteries are fully charged, the LED display will turn off.



### 9.3.2 How to charge the 360 when you have a Recording Extender

You will need to remove the Recording Extender's cable-eliminating adapter from the power port before you can attach the 360's power cable.



*Cable-eliminating adapter present in the 360 charge port*



*Charge port with adapter removed*

Keep the adapter in a safe place and replace it into the charging port after charging the 360.



*Cable-eliminating adapter for the Recording Extender. This should be installed in the power port of the 360 when the 360 is not being charged.*

### 9.3.3 Diving with the Recording Extender

When you're ready to dive:

1. Install the batteries into each compartment, noting correct polarity. It does not matter which battery goes into which compartment.
2. Ensure the cable-eliminating adapter is installed in the power port of the 360
3. When placing the lid on the 360, ensure the contacts from the Recording Extender (shown below) meet the contacts on the cable-eliminating adapter.



*Recording Extender contacts that must be touching the cable-eliminating adapter contacts when the lid is in place.*



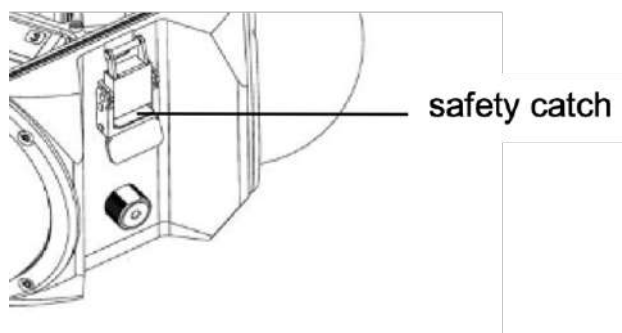
## 10 360 hardware instructions

Read this chapter to familiarize yourself with your Boxfish 360 hardware.

### 10.1 How to open and close the lid

#### 10.1.1 Opening

1. Always place the 360 on a flat surface or securely in your lap and open it with the lid facing up.
2. The 360 can be opened with the three latches. To open a latch, press its safety catch and then lift the latch up.



**Note:** If you have the vacuum test kit and there is a vacuum applied from a previous dive, unscrew the vacuum port cap on the lid of the 360 and press the red button to release the vacuum.

#### 10.1.2 Closing

Before closing the lid, make sure the main O-ring is free of dirt and there is nothing caught between the top lid and the main housing.

Position the lid safely on the housing, making sure not to pinch the O-ring. Then place the latches over the catch, and press the latches fully down until the lid is flat with the housing.

### 10.2 Check the main O-ring

Every time you open the Boxfish 360:

1. Verify the main O-ring is in good condition and is not perished. If it is, replace it with the spare provided by Boxfish. Spares are included in your case – if you run out of spares, contact us for some more.
2. Carefully remove the O-ring from its groove (do not use a sharp object). Dab a small amount of the silicone grease provided onto your fingers. Run the O-ring through your fingers to lightly coat the O-ring with grease.
3. Clean the O-ring groove with the supplied microfibre cloth to remove any dust or debris.



4. Replace the main O-ring into the groove by gently pushing it, first at the corners, then the whole perimeter.

## 10.3 How to charge the 360

You can charge all three cameras at the same time using the 360 charge port.

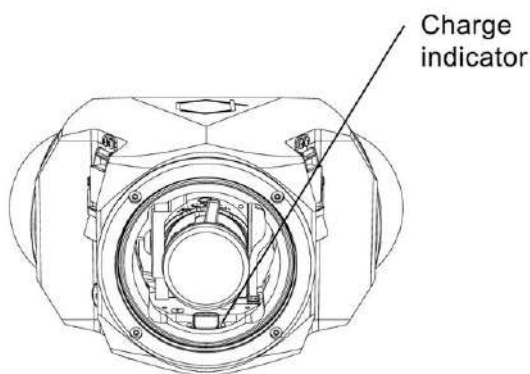
**Note:** Ensure the batteries for all three cameras are in place before charging.

1. Connect the charge cord to the AC adapter.
2. If you have the optional Recording Extender installed in the lid of your 360, remove it so you can access the charge port.



*Recording Extender cable eliminator in place in DC charging port – this will need to be removed before the charging cable can be connected*

3. Plug the cable into the 360 charge port and your wall outlet and switch on the power.
4. Check inside the CAM1 dome – the orange charge indicator LED will light up during charging, and turn off when charging is complete. **Note:** Please wait until the orange LED turns off as there is also an internal controller battery that needs to be charged fully for the 360 to operate correctly.







## 10.4 Camera memory cards

Open the top compartment of each camera and verify that each camera has a memory card in place.

To take out the memory cards, press down on each memory card with your fingernail. The memory cards should slightly pop up so they can be taken out (although be careful not to remove your finger too quickly otherwise they can fly out and get lost inside the housing - if this happens you can remove the bottom lid to get them out).



*Note the orientation of the memory card inside the camera*

Use the supplied metal grabber tool to help you take them out. Check that the number label on the card matches the number on the camera.

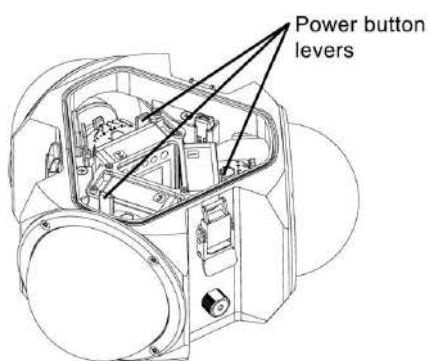
**Note:** the memory cards are ready to record when you receive them after shipping. For subsequent uses, you will need the Boxfish App and card reader to erase the cards and write configuration files for the next use. See [Section 17.6: Erasing memory cards after copying files](#).

**Important:** Do not format the memory card in the camera as they will not contain the necessary config files for proper operation.

## 10.5 How to turn cameras on

**Note:** The cameras can only be turned on while the lid of the 360 is removed.

1. Locate the yellow power levers that are used to press the power buttons for each camera.



2. Press the lever inwards for three seconds.
3. After a few - up to five - seconds the cameras will power up and you will see the LCD screen on the camera turn on.
4. Check there are no errors on the camera screen, for example a red icon next to the battery bars icon indicates that the camera's memory card is not correctly in place.

## 10.6 Select recording mode: video or time-lapse

After powering on the cameras, check which mode they are in - video or photo. The default mode is video, indicated by a video icon in the top left of the camera's LCD screen.

To change to photo mode (so that the 360 can record in time-lapse mode), press the yellow lever for one second. The video icon on the top left of the screen will change to a camera icon.

Note that for time-lapse mode, the 360 is set for the cameras to take one photo each every 10 seconds. You can change this interval with the Boxfish App.

## 10.7 How to turn cameras off

Press the yellow lever for three seconds to power the cameras off.

## 10.8 Next steps - Z Cam E1 camera and 360 settings

### 10.8.1 Z Cam E1 camera settings

Before your dive, ensure the cameras are optimally set up for your recording conditions. See [Section 11: Z Cam E1 cameras setup](#).

### 10.8.2 360 settings

Before your dive, ensure that settings on the 360 are set to your preferences.

For example if you are recording in darker environments you may wish to turn off the red LED inside the Cam 1 dome to prevent the reflection from appearing



in the footage.

Instructions are in [Section 12: Setting up 360 software using the Boxfish App](#).





## 11 Z Cam E1 cameras setup instructions

You will use each camera's screen and menu buttons to select your desired settings.

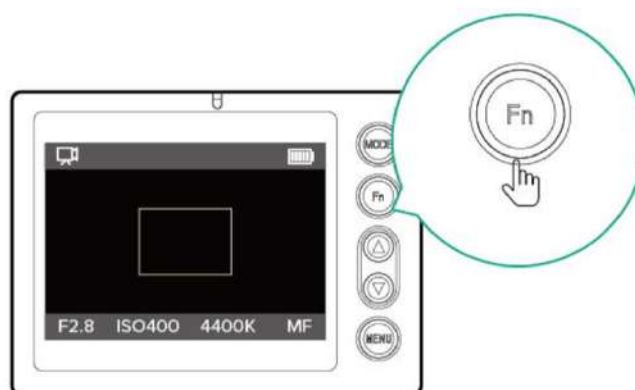
### Notes:

- Removing the camera batteries or allowing them to go completely flat will restore the settings to factory defaults. Defaults are listed in [Appendix I](#). If you have any preferred custom settings, it's best to check each camera has these settings before every dive.
- If any of the cameras have Bluetooth Advertising set to ON, this will cause the batteries to continue to drain even if the camera is turned off with the yellow lever. We have recently noticed that Bluetooth Advertising is ON by default in some cameras, so please check this and change to OFF (unless you will be using this feature).

### 11.1 How to use the Z-Cam E1 camera menu controls

Press the:

- Fn button to select an item
- Up arrow to navigate upwards through a menu
- Down arrow to navigate downwards through a menu
- MENU button to go back to previous menu.



For a quick reference of these buttons, see the Z Cam E1 manual included in your 360 case, or online at <https://www.z-cam.com/documentation/>.

### 11.2 Errors

Check that the memory card is inserted correctly (if not there will be a red memory card outline icon next to the battery icon) and that no other errors are showing.

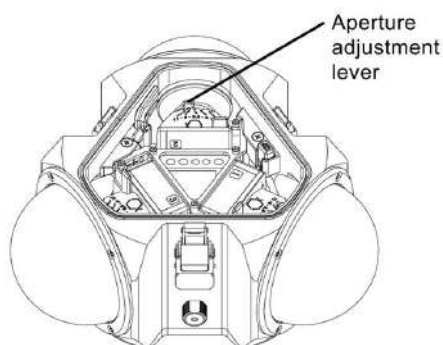
### 11.3 Date/Time settings

If any of the Z Cam cameras' internal batteries have gone flat (which can happen after a long period of not using or charging the cameras), you can set the Date/Time manually to ensure that your video/photo files show the correct Date/Time.



1. Press the Fn button to access Camera Settings.
2. Press the up/down arrow buttons to scroll through the menu options until you come to the Setup Menu.
3. Press Fn to go into the Setup Menu.
4. Press the up/down buttons to scroll through the options until you come to the Date/Time setting.
5. Set Date/Time as required.

## 11.4 Aperture



The aperture adjustment lever shown is used to adjust the aperture. Available values are (f/2.8, f/4, f/8, f/11). We ship the 360 with each camera's aperture set to f/4, which is best for general underwater use.

Some recommendations:

- f/4 for general underwater video. Generally, we recommend f/4 for underwater use as it offers the right amount of DOF and sharpness across the whole image.
- f/2.8 for low-light underwater environments
- f/8 for outdoor surface shooting. Because the lenses are calibrated to a shorter focus distance for underwater use, f/8 offers the right DOF without a water/dome barrier. Because the lenses are adjusted for use behind the domes underwater, the f/2.8 will not produce a sharp image on the surface.
- f/4 for indoor surface shooting
- If you want to shoot above and below the water in one take, then f/5.6 is a good compromise. Use f/8 if it's bright. Use f/4 if your surface subjects are close (<1m) and it's acceptable to lose some detail in the distance.

## 11.5 White balance

We recommend shooting with Auto White Balance. Because lighting conditions tend to change during a dive, this generally produces the best results.



However, on some occasions it might be beneficial to set a manual value for the white balance. To do this:

1. Press Fn button to enter the main menu.
2. Use the arrow buttons to scroll to "White Balance", and press Fn to select.
3. Use the arrow buttons to change the value to "Manual".
4. Press Fn button to confirm.
5. Press Menu button to exit.

Now that you are in Manual White Balance mode you will be able to select it from the shooting menu.

6. Press the Menu button to enter the shooting menu.
7. Use the arrow buttons to navigate to the White Balance setting.
8. Press Fn button to select. A red value will appear on the bottom of the screen.
9. Use the arrow buttons to change the value to your desired colour temperature.
10. Press Fn button to confirm.
11. Press Menu button to exit.

## 11.6 Adjusting the exposure compensation value (EV)

We recommend shooting with EV of -1. Due to the wide range of exposures present on the 185-degree lenses this generally produces the best results.

On some occasions it might be beneficial to use a lower EV value, for example when it's important to preserve detail in the brightest area, like surface ripples.

The EV value of -1 will be visible on the bottom right of the screen of each camera. To change it:

1. Press Menu button to enter the shooting menu.
2. Use the arrow buttons to navigate to the EV setting.
3. Press Fn button to select. The EV value will turn red.
4. Use the arrow buttons to change the value to the desired value.
5. Press Fn button to confirm.
6. Press Menu button to exit.

## 11.7 ISO value

We recommend shooting with Auto ISO. Because lighting conditions tend to change during a dive, this generally produces the best results.

Because exposure compensation relies on adjusting ISO sensitivity, a fixed ISO value disables automatic exposure compensation.



For best noise control we recommend a maximum ISO value of 1600.

1. Press Menu button to enter the shooting menu.
2. Use the arrow buttons to navigate to the ISO setting.
3. Press Fn button to select. A red AUTO label should appear on the screen.
4. Use the arrow buttons to change the red value onscreen to the desired value.
5. Press Fn button to confirm the value.
6. Press Menu button to exit.

## 11.8 Shutter angle

We recommend shooting with Auto Shutter Angle. Because of changing lighting conditions during the dive this generally produces the best results.

1. Press Menu button to enter the shooting menu.
2. Press smaller buttons above to navigate to the Shutter Angle setting.
3. Press Fn button to select. A red AUTO label should appear on the screen.
4. Press smaller buttons below to change the red value onscreen to the desired value.
5. Press Fn button to confirm the value.
6. Press Menu button to exit.

Shutter angle to shutter speed conversion chart:

<b>Shutter angle</b>	<b>Shutter speed (24 FPS)</b>	<b>Shutter speed (25 FPS, PAL)</b>	<b>Shutter speed (29.97 FPS, NTSC)</b>
45°	1/192	1/200	1/240
90°	1/96	1/100	1/120
135°	1/64	1/66	1/80
180°	1/48	1/50	1/60
225°	1/38	1/40	1/48
270°	1/32	1/33	1/40
315°	1/28	1/28	1/34
360°	1/24	1/25	1/30

## 11.9 Split duration

Ensure the split duration in the Recording menu is set to 30 mins. This is the maximum length of time for one file.

**Note:** Some Z Cam E1 cameras manufactured before 2018 have a maximum video recording duration of 29 minutes. If your 360 contains these cameras, you



can press the start/stop button to pause recording before the 29 minutes is up. This will reset the video counter to zero and should create a new file for each camera. Press the start/stop button again to resume recording.

## 11.10 Turn Bluetooth advertising on or off

Ensure Bluetooth Advertising on each camera set to OFF, otherwise it causes the camera batteries to drain quite quickly even if the camera is turned off with the yellow switch.

1. Press the Fn button once to access the camera settings.
2. Scroll down (using the down arrow) to the Setup Menu. Press Fn to select it.
3. On the Bluetooth menu, scroll down to Bluetooth and press Fn to select it.
4. In the Bluetooth menu, turn Bluetooth advertising to OFF.



## 12 Setting up 360 software using the Boxfish App

Several settings for the 360 can be adjusted on the Boxfish App, Settings tab.

### 12.1 Required components

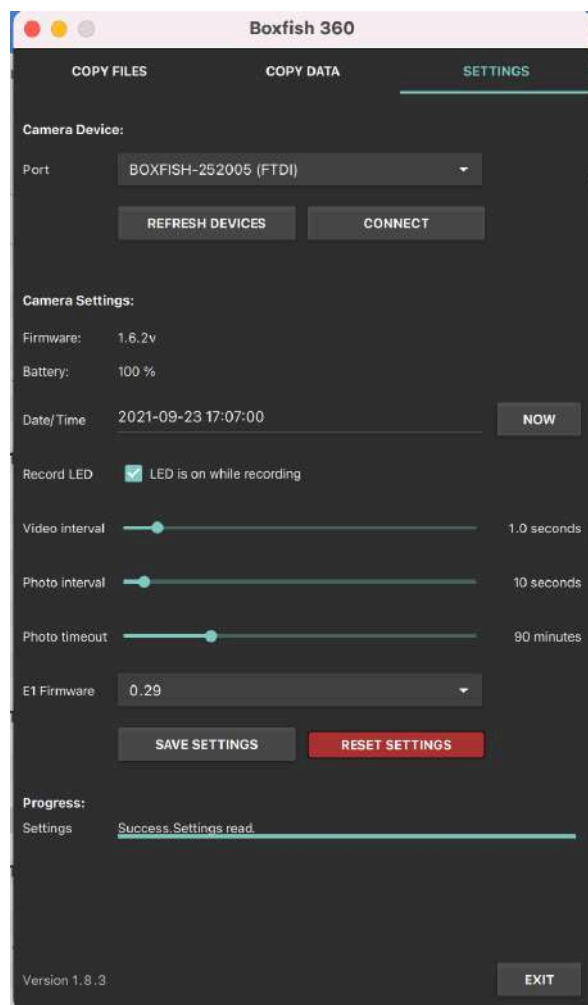
- Boxfish 360, lid opened, cameras off
- Micro-USB cable
- Computer with Boxfish App installed.

### 12.2 Download Boxfish App

Download the app for Windows or Mac from [www.boxfish.nz/downloads/](http://www.boxfish.nz/downloads/).

### 12.3 Connect 360 to your computer and Boxfish App

1. Remove the top lid and locate the Micro-USB port.
2. Connect the 360 to your computer using your Micro-USB cable.
3. Put the 360 into time-lapse mode:
  - a. If you have the original 360 without the vacuum test capability, double-tap the start/stop button as you would when recording time-lapse photos.
  - b. If your 360 has vacuum test capability, press the start/stop button twice to put the 360 into vacuum test mode. The 360 will beep five times. You can verify the 360 is in vacuum test mode as the red LED in the CAM1 dome will be blinking. Once in vacuum test mode, press the start/stop button once more. The 360 will emit a long beep (approx. 2 seconds). After the beep, the red LED will stop blinking and the 360 will be in time-lapse mode.
4. Open the Boxfish App. Click on the **Settings** tab.
5. Click the **Refresh Devices** button. Your device should appear in the field next to **Port**.
6. When you see your Device appear, click the **Connect** button and wait a few seconds (up to 30) while the app reads the current settings on your 360.
7. When the app has finished reading the current settings on the 360, a message saying "Success. Settings read." will appear under the **Progress** heading.



## 12.4 Settings

Configurable settings are explained below. Please ensure the settings match the below recommendations.

- **Date/Time:** Press the NOW button to set this to the current Date/Time. This will be used as the Date/Time for the Log Data (see [Section 19: Downloading log data](#)).
- **Record LED:** If this is checked, the red LED in Cam 1 will remain on while the 360 is recording. In darker environments the LED can reflect off the inside of the dome, so you can uncheck this box to leave it off while recording. If this box is unchecked, the red LED will turn on briefly when recording starts and briefly when recording stops.
- **Video interval:** Record LED flashing interval – leave this as 1 second.
- **Photo interval:** The interval for photos taken by the cameras while the 360 is in Time-lapse mode. Default is 10 seconds. Should be set to at least 8 seconds.



- **Photo timeout:** Time after which the 360 will turn off if in time-lapse mode. If you have a Recording Extender you will need to adjust this to longer than 90 minutes so that the cameras don't turn off in the middle of a dive.
- **E1 Firmware:** This should be set to 0.29.

## 12.5 Changing settings

If you need to change any of the above settings, set them to your desired value and press the **Save Settings** button to save your changes to the 360.

You will see a message saying "Success. Settings saved." under the **Progress** heading.

## 12.6 Exit time-lapse mode

To continue using the 360 as normal, remove the micro-USB cable and hold the start/stop button for at least six seconds to reset the controller.





## 13 Attaching accessories

### 13.1 Accessory care

**Important:** Ensure all accessories are thoroughly rinsed in fresh water after each use, especially after use in salt water.

Rinse, dry and apply silicone grease to the screws that attach to the mounting point(s) on the 360 (either side or on the bottom lid) to ensure they do not rust and damage the mounting points.

### 13.2 Mounting the monopod

Use the ¼” side mounting point to attach the monopod to the 360.

The monopod components are shown below. Before mounting, you will need to unscrew the top disc from the monopod before mounting so that it fits into the recessed area of the 360. It will not fit while the disc is in place.



*Top of monopod with mounting screw, wrist strap and top disc removed.*



*Monopod mounted to 360 without the top disc*

To remove the top disc from the monopod, remove the screw indicated below using the Allen key supplied with your monopod.



*Take out the screw indicated in red to remove the disc from the monopod.*

Once the top disc is removed and the centre mounting screw is in place on the monopod, the protruding end of the mounting screw will attach to the mounting point on the side of the 360.

**IMPORTANT:** Always apply silicone grease (supplied in your spares kit) to the



mounting screw before mounting it to the 360 before a dive. This will also help to maintain the waterproof coating on the mounting point of the 360. After use, always thoroughly rinse the mounting screw with fresh water and apply silicone grease to prevent it rusting. And of course, thoroughly rinse the 360 housing and mounting point.

## 13.3 Mounting the 360 on a tripod

The bottom 3/8" mounting point on the 360 housing can be used to attach the tripod mounting to the 360. Take the ball mount off from the tripod to expose the mounting screw on the tripod.

**IMPORTANT:** Always apply silicone grease (supplied in your spares kit) to the mounting screw before mounting it to the 360 before a dive. This will also help to maintain the waterproof coating on the mounting point of the 360. After use, always thoroughly rinse the mounting screw with fresh water and apply silicone grease to prevent it rusting. And of course, thoroughly rinse the 360 housing and mounting point.

### 13.3.1 Hiding tripod legs from view

Ensure that the tripod legs are aligned with the recessed sides of the housing, and that the domes do not look out over the tripod legs.

This ensures that the tripod legs are not visible in the stitched spherical video, as they will fall into the area where the field of view of the individual cameras overlap.

## 13.4 Attaching floats

To attach floats, simply screw the floats package directly into the mounting hole on the lid of the 360 and screw in until flush.



*Floats package with mounting screw and 360 lid with mounting point in the middle*

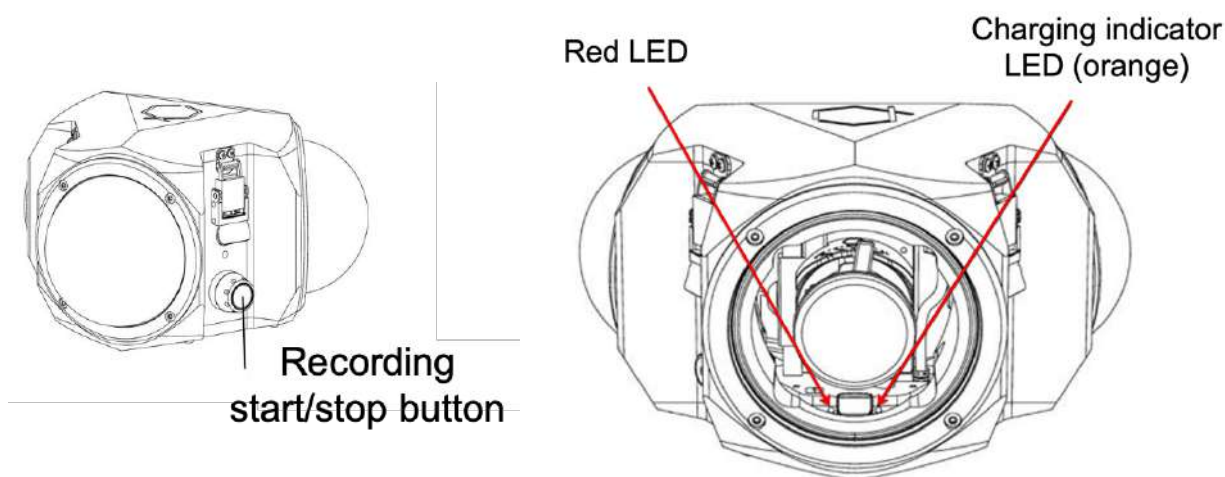


*Floats package attached to lid of 360*



## 14 Recording instructions (without vacuum test)

**Note:** If you have the 360 with the optional vacuum test capability, follow the instructions in [Section 15: Recording instructions \(with vacuum integrity test\)](#).



### 14.1 Prerequisites

Before you start recording with your 360, ensure you have:

- Erased the memory cards and written configuration files to the cards using the Boxfish App (note: you don't need to do this for first-time use)
- Put the memory cards in each camera
- Fully charged the 360 with all batteries inside all cameras
- Set the Z Cam E1 cameras with desired recording mode (video or time-lapse) and settings
- Set the 360 software with your desired settings using the Boxfish App (if recording time-lapse photos, extend the timeout interval)
- Fully charged the Recording Extender batteries.

### 14.2 Video recording

1. Turn all cameras on by pressing the yellow lever for each camera for 3 seconds.
2. Confirm camera settings are as desired and that cameras are not in Bluetooth-discoverable mode.
3. Confirm each camera is in video mode: a video icon will display on the top left of each camera's main screen.
4. Switch the Recording Extender ON. The fans will start spinning. Ensure that the Ensure the cable-eliminating adapter is installed in the power port of the 360, and the lid is oriented so that the Recording Extender power adapter inside the lid connects with the cable eliminator inside the 360 housing.



5. Close the lid with the three latches, ensuring that the O-ring is not pinched and the lid is flat with the housing. Note: if you have the Recording Extender, the orange LED light in Cam 1 dome will come on to indicate power is being supplied from the Recording Extender.
6. Press the start/stop button (on the outside of the housing) firmly once and release it. You will hear a beep while the button is pressed.
7. After three seconds the cameras will start recording and a short 'sync beep' is emitted. This beep can be useful to verify camera synchronization in post. (If this is followed by a very long beep, this indicates that the cameras were not turned on.)
8. Verify that all cameras are recording by looking for the red blinking recording LEDs for each camera, which are visible through each dome. Note: the red LED in Cam 1 will also be on while the 360 is recording. In darker recording environments you may wish to turn this off – instructions are in [Section 12: Setting up 360 software using the Boxfish App](#).
9. You can stop the recording by pressing the start/stop button again. The cameras will stop recording but will still need to be turned off with the yellow levers. You can press the start/stop button to resume recording.
10. **Note:** Some Z Cam E1 cameras manufactured before 2018 have a maximum video recording duration of 29 minutes. If your 360 contains these cameras, you can press the start/stop button to pause recording before the 29 minutes is up. This will reset the video counter to zero. Press the start/stop button again to resume recording.

## 14.3 Time-lapse recording

Note: If you have the Recording Extender and wish to record for longer than 90 minutes, please change the **Photo Timeout** setting to your desired duration (depending on the maximum recording time of your cameras' memory cards). Instructions are in [Section 12: Setting up 360 software using the Boxfish App](#).

1. Turn all cameras on by pressing the yellow lever for each camera for 3 seconds.
2. Press each camera's power lever again once to switch them into photo mode. The icon on the top left of each camera's screen will change to a camera icon.
3. Confirm camera settings are as desired and that cameras are not in Bluetooth-discoverable mode.
4. Switch the Recording Extender ON. The fans will start spinning. Ensure the cable-eliminating adapter is installed in the power port of the 360, and the lid



is oriented so that the Recording Extender power adapter inside the lid connects with the cable eliminator inside the 360 housing.

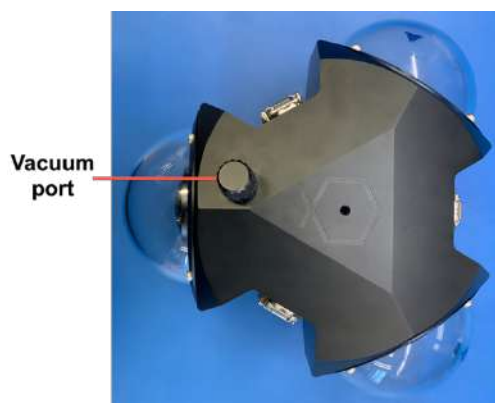
5. Close the lid with the three latches, ensuring that the O-ring is not pinched and the lid is flat with the housing. Note: if you have the Recording Extender, the orange LED light in Cam 1 dome will turn on to indicate power is being supplied from the Recording Extender.
6. Press the start/stop button (on the outside of the housing) firmly twice and release it. You will hear a beep while the button is pressed, and three beeps after the double press.
7. Verify that all cameras are recording by looking for the red blinking recording LEDs for each camera, which are visible through each dome. The cameras' LEDs will blink twice every time a photo is taken. Note: the red LED in Cam 1 will also be set on while the 360 is recording. In darker recording environments you may wish to turn this off – instructions are in [Section 12: Setting up 360 software using the Boxfish App](#).
8. You can stop the recording by pressing the start/stop button again. The cameras will stop recording but will still need to be turned off with the yellow levers. You can press the start/stop button to resume recording.



## 15 Recording instructions (for 360 with vacuum integrity test kit)

If you have the 360 with the vacuum test kit installed, follow the instructions in this section.

You will need to complete the vacuum test immediately before your dive. However, we recommend you become familiar with these steps well in advance of your dive.



*Boxfish 360 with vacuum port on lid      Vacuum pump supplied*

### 15.1 Prerequisites

Before you complete the vacuum integrity test and start recording with your 360, ensure you have:

- Erased the memory cards and written configuration files to the cards using the Boxfish App
- Put the memory cards into each camera
- Fully charged the 360 with all batteries inside all cameras
- Set the Z Cam E1 cameras with desired recording mode and settings
- Set the 360 software with your desired settings using the Boxfish App
- Fully charged the Recording Extender batteries.

**Note:** If you have the Recording Extender and wish to record **time-lapse photos** for longer than 90 minutes, please change the **Photo Timeout** setting on the Boxfish App to your desired duration (depending on the maximum recording time of your cameras' memory cards). Instructions are in [Section 12: Setting up 360 software using the Boxfish App](#).

### 15.2 About the vacuum integrity test

The vacuum integrity test is designed to be completed immediately before your dive. The test consists of putting the 360 into a “vacuum test mode”, then vacuuming the air out of the housing until the sufficient pressure is reached.





Once in a vacuum state, the 360 will monitor the pressure and emit warning beeps if it detects any loss of vacuum.

## 15.3 How to perform the vacuum integrity check

1. Turn all cameras on by pressing the yellow lever for each camera for 3 seconds. If recording time-lapse photos, press each camera's yellow lever again to change the cameras' mode to photo.
2. If using the optional Recording Extender, switch the Recording Extender ON. The fans will start spinning. Ensure the cable-eliminating adapter is installed in the power port of the 360, and the lid is oriented so that the Recording Extender power adapter inside the lid connects with the cable eliminator inside the 360 housing.
3. Close the lid with the three latches, ensuring that the O-ring is not pinched and the lid is flat with the housing. Note: if you have the Recording Extender, the orange LED light in Cam 1 dome will come on to indicate power is being supplied by the Recording Extender.
4. Press the start/stop button on the side of the 360 TWICE in quick succession. This will put the 360 into **vacuum test mode**. The 360 will make five beeps as you press the buttons to put it into vacuum test mode.
5. Check that the red LED inside the CAM1 dome (located on the opposite side of the start/stop button) is blinking. The LED should be blinking once per second to indicate that the 360 is in vacuum test mode.
6. Unscrew cap on the vacuum port and set aside.
7. Take your vacuum pump and hold it to the valve firmly enough to form a seal. Pump the handle up and down to extract air from inside the 360.
8. Continue to pump until the vacuum reaches the target of 800mbar. When 800mbar is reached, the 360 will emit two long beeps and the red LED will flash twice before turning off.



**Note:** setting the vacuum of 800mbar shouldn't take more than around 15-20 pumps. If it takes too long, there may be a leak too large to reach the target pressure.



9. We recommend you pump one more time to account for any future temperature fluctuations (which may cause the pressure to go over 800mbar later when you start recording).
10. Remove the pump from the vacuum port and screw on the vacuum port cap.
11. Ensure that the red LED on CAM1 stays OFF for 5-10 minutes to indicate that the vacuum is stable.
12. Once you are satisfied that the 360 is holding the vacuum, you can start recording.

## 15.4 Recording video after completing vacuum integrity test

Follow the below steps directly after verifying that the 360 is holding the vacuum:

1. Hold down the start/stop button for approx. 1-2 seconds until the 360 stops beeping. You can now press the start/stop button once to start recording video. After three seconds the cameras will start recording and short 'sync beep' is emitted. This beep can be useful to verify camera synchronization in post. If this is followed by a very long beep, the cameras were not turned on. The 360 will emit two long beeps after the short 'sync beep' to indicate the pressure is still below 800mbar.
2. Verify that all cameras are recording by looking for the red blinking recording LEDs for each camera, which are visible through each dome. Note: the red LED in Cam 1 will also be set on while the 360 is recording. In darker recording environments you may wish to turn this off – instructions are in [Section 12: Setting up 360 software using the Boxfish App](#).
3. Press the start/stop button again to stop recording. You can press the start/stop button to resume recording.
4. **Note:** Some Z Cam E1 cameras manufactured before 2018 have a maximum video recording duration of 29 minutes. If your 360 contains these cameras, you can press the start/stop button to pause recording before the 29 minutes is up. This will reset the video counter to zero. Press the start/stop button again to resume recording.
5. After your dive, the cameras will still need to be turned off with the yellow levers.

## 15.5 Recording time-lapse photos after completing vacuum integrity test

Assuming you have set up each camera to record time-lapse photos (see [Section 10.6: Select recording mode – video or time-lapse](#)), follow the below





steps directly after verifying that the 360 is holding the vacuum:

1. Press the start/stop button once to start recording in time-lapse mode.
2. Verify that all cameras are recording by looking for the red blinking recording LEDs for each camera, which are visible through each dome. The cameras' LEDs will blink twice every time a photo is taken. Note: the red LED in Cam 1 will also be set on while the 360 is recording. In darker recording environments you may wish to turn this off – instructions are in [Section 12: Setting up 360 software using the Boxfish App](#).
3. Press the start/stop button again to stop recording. The cameras will still need to be turned off with the yellow levers.

## 15.6 Vacuum monitoring

The 360 will continue to monitor the vacuum while the cameras inside are recording.

If the 360 detects the vacuum pressure has risen more than 40mbar, it will begin to beep quickly, and the red LED will flash quickly (more than once per second). After one minute of doing this, it will beep and blink even more quickly. The 360 will not stop beeping/flashing until forcefully turned off by holding down the start/stop button for 6 seconds.

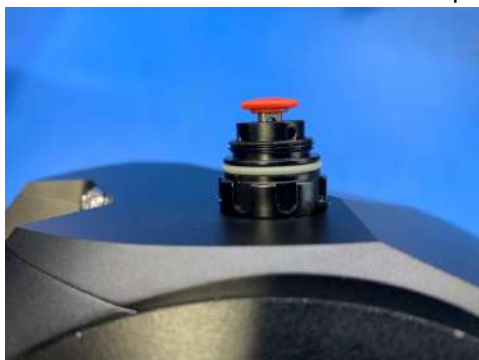
The 360 will not monitor the vacuum while the 360 is turned off.

The 360 will automatically turn off after 20 minutes if left in vacuum test mode, to prevent battery drain.

## 15.7 How to release the vacuum

To open the 360 lid you will need to release the vacuum first.

1. Unscrew the cap from the vacuum port.
2. Press the red button on top of the valve down until vacuum is released.



3. Screw the cap back onto the vacuum port.



## 16 Diving with the 360

### 16.1 Pre-dive care

Before getting in the water, place the Boxfish 360 inside the supplied neoprene bag to protect the domes while getting into the water.

Once in the water, remove the neoprene bag.

### 16.2 Post-dive care and cleaning

- Before getting out of the water, place the Boxfish 360 inside the neoprene bag to protect the domes.
- Once safely out of the water, ideally soak the housing in fresh water (if this is not possible, rinse thoroughly with fresh water). While soaking or rinsing, press the start/stop button a few times to prevent accumulation of salt residue or other debris.
- If accessories have been used (such as monopod, tripod or floats), give the insides of the mounting points a good rinse and clean and ensure each mounting point is free of rust from the mounting screws on the accessories.
- Rinse all accessories well and apply silicone grease to the mounting screws.
- Dry the 360 with a towel before opening.
- After each day of diving, inspect the main O-ring at the of the housing. Remove it from its groove and inspect it for damage. Also check that the O-ring retains its original circular shape. Never stretch the O-ring excessively or remove it with a sharp object.
- Clean the O-ring to ensure it is free from any salt deposit or foreign material. Lightly coat the O-ring with the provided silicone grease before reinstalling it in the groove.
- If the O-ring is damaged or perished, immediately replace it with a spare from your spares it. **Note:** only use replacement O-rings provided by Boxfish Research.
- If you notice a buildup of salt inside the start/stop button, you can unscrew it to clean it inside (this will not cause any water ingress inside the housing).





## 17 Downloading videos and photos from Boxfish 360

Use the supplied multi-card reader and the Boxfish App to download and organize the files recorded on the cameras' memory cards.

### 17.1 Attach multi-card reader to computer

1. Open the top compartment of each camera and remove each memory card. Push the card down with your fingernail and it should pop up (be careful though that it doesn't shoot out of the camera and fall into the housing; if it does you can get it out by removing the bottom lid). Once popped up, use the supplied metal grabber to remove it from the camera.
2. Insert the memory cards into the card reader as shown. We recommend using the left reader for card 1, middle reader for card 2 and right reader for card 3.

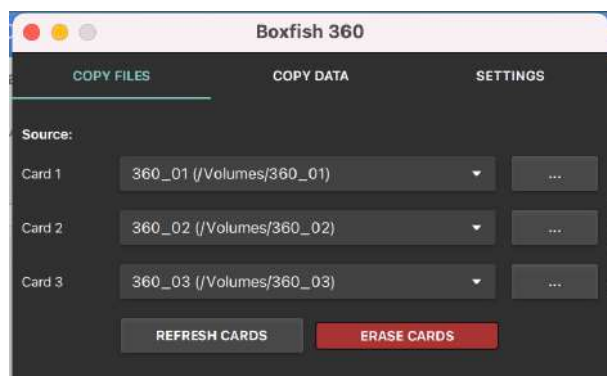


*Memory cards in the triple card reader Note orientation of cards*

3. Connect the card reader to your computer with the supplied USB cable.

### 17.2 Open Boxfish App

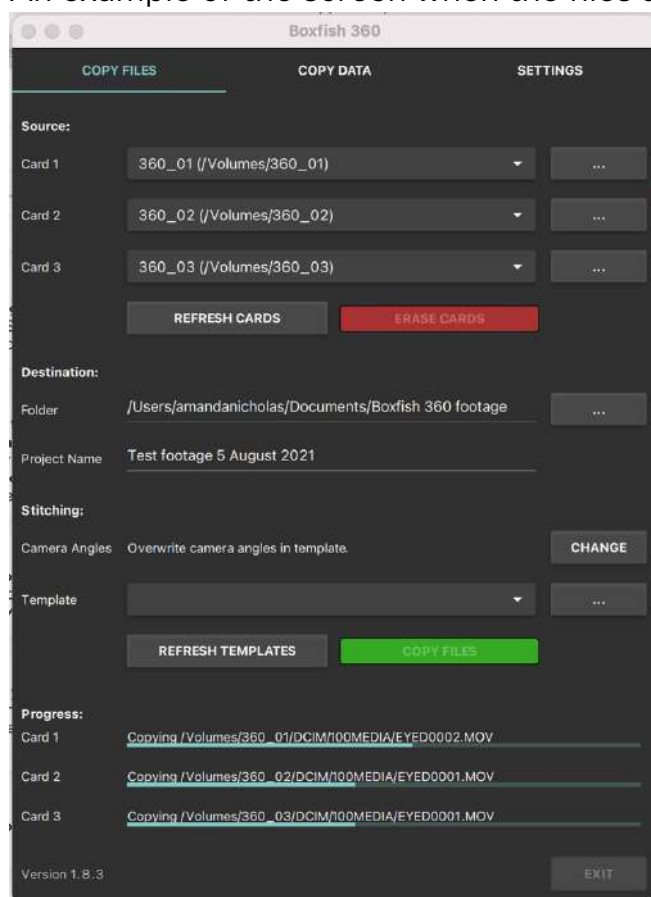
1. After connecting the card reader to your computer, start the Boxfish App on your computer.
2. Click on the **Copy Files** tab.
3. On the **Copy Files** tab, in the **Source** section, the cards should appear automatically, and be assigned to the correct drive. If not, click **Refresh Cards**.
4. Check that the app has automatically assigned the correct drive to each card, as shown (so that card 360\_01 shows in the Card 1 field, 360\_02 shows in Card 2 and 360\_03 shows in Card 3). If not, choose the source drive for each card manually.



## 17.3 Copy files to your computer

1. In the **Destination** section, choose the folder to copy your files to.
2. Specify a **Project Name** that will be added to every copied file name. This can make it easier to organise your files later.
3. Ignore the **Stitching** section – Camera Angles and Template here is for Autopano editing software only (we recommend using Mistika VR software).
4. Press **Copy Files** to copy the contents of the cards onto your computer. The app will copy the files in parallel and the **Progress** section will show a progress bar for each card as the files are copied across. Note that the copying process can take some time – about 30 minutes for a full 64GB card.

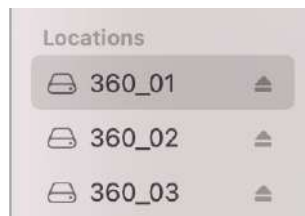
An example of the screen when the files are in progress is below.





## 17.4 Eject cards and remove from the card reader

Make sure you eject each card individually from your computer before disconnecting the card reader.

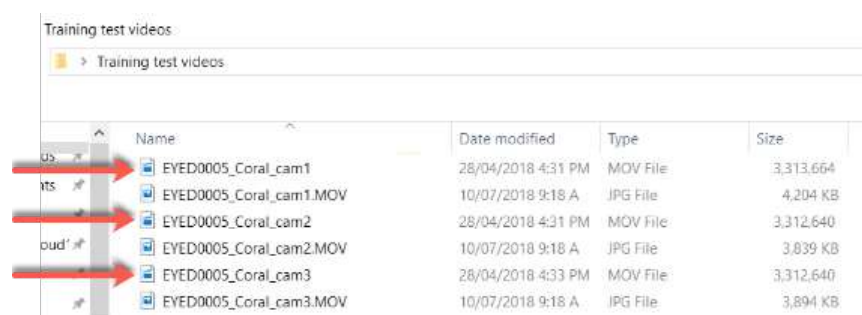


Use the supplied grabber to remove the cards from the card reader and return them to the correct camera in the 360.

## 17.5 Viewing files in your directory

The Boxfish App will deliver each set of clips into your specified directory. The video clips (MOV Files) will be interspaced by an image file (JPG file) for reference. All clips will have the Project Name you set up in the Boxfish App.

**Note:** Z Cam E1 cameras split the video files for each camera into a maximum duration of 30 minutes each (shorter durations can be set in Z Cam settings, see Appendix I).



To import the files into Mistika for stitching, see [Section 18: Creating 360 spherical videos in Mistika](#).

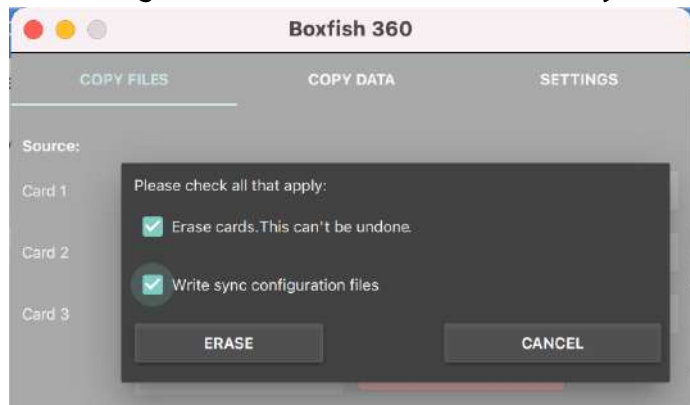
## 17.6 Erasing memory cards after copying files

After copying files to your computer, you'll need to erase the memory cards before you next use the camera. As part of this process, the app will write the configuration files necessary for the synchronized autostart for the next time you use your 360.

1. Insert the memory cards into the supplied card reader.
2. Connect the card reader to your computer.
3. Start the Boxfish App on your computer.



4. Click on the red **Erase Cards** button. Ensure there are checkmarks in the **Erase cards** and **Write sync configuration file** boxes. The Boxfish App will erase the cards and write camera id and configuration files. **Note:** The configuration files are needed for synchronised autostart to work.



5. When the cards are erased, “erased and prepared” will appear in the progress bar for each memory card.



6. Eject all cards from your computer before returning them to their respective cameras.



## 18 Creating 360 spherical video in Mistika VR

Mistika VR is the software we recommend for stitching together your videos. Download Mistika VR from <https://www.sgo.es/mistika-vr/>.

### 18.1 Download stitching template

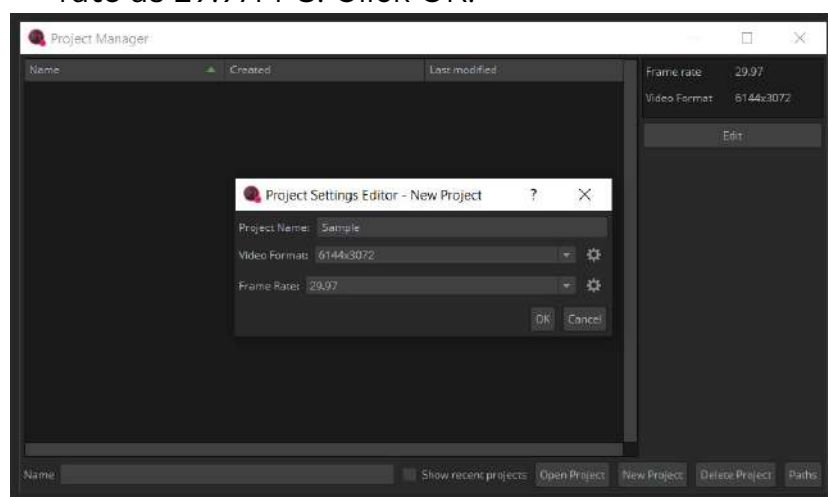
We provide a stitching profile (template) that automatically stitches together your recorded files. To access it, go to <https://www.boxfish.nz/downloads/> and enter your 360 camera's serial number. You will be able to download stitching templates for underwater and surface shooting.

### 18.2 How to use the stitching template to create a 360 video

**Note:** The stitching template is designed to help you quickly create stitched videos for review only. For a professional production you will most likely have to adjust several parameters, including horizon, convergence, stitch feather, and set edge points and animations.

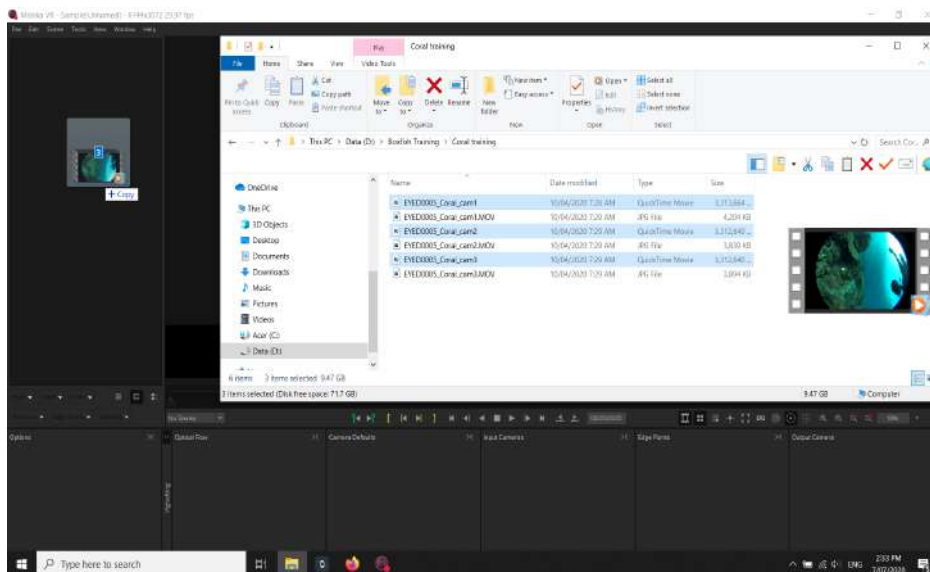
When you've got your video files and the stitching profile, you're ready to use Mistika VR.

1. Open Mistika VR software. **Select File > Project Manager.**
2. In the Project Manager dialogue box, select **New Project**
3. Give your project a name, and set the resolution as 6144x3072. Set the frame rate as 29.97FPS. Click OK.

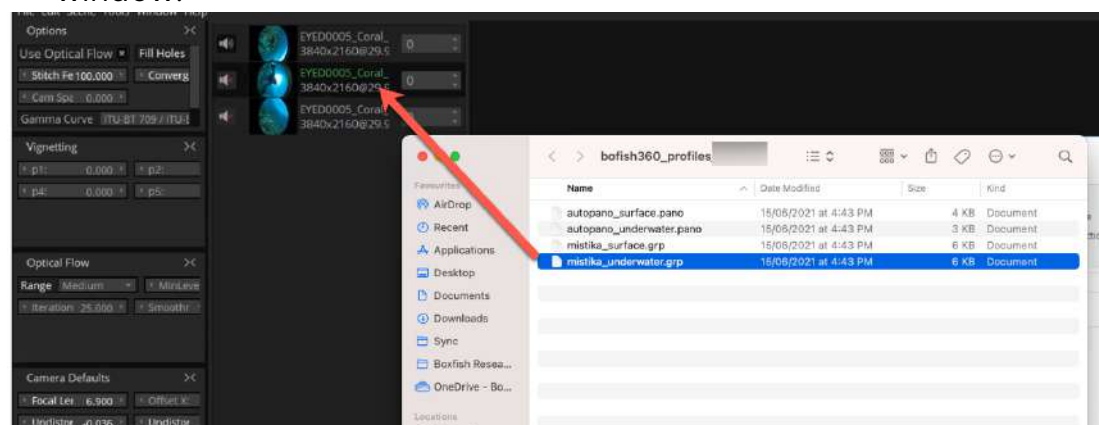


4. Select your 3 video streams and drag them into the camera construct window. The screenshot below shows the three video files being dragged simultaneously to the camera construct window.





5. After dragging the video files, click **Continue** in any dialogue boxes that pop up.
6. Now, find the stitching template file that you downloaded from the Boxfish website. Drag and drop it on top of the video feeds in the camera construct window.



7. Click through the timeline. You will see that the stitching profile has automatically stitched the videos together.

## 18.3 Video of stitching instructions

A brief video of the above instructions are available for your reference at <https://vimeo.com/279403835/277ea65788>.





## 19 Downloading log data (depth, temperature etc)

The Boxfish 360 logs time, depth, temperature, heading, and orientation during video and photo recording. This information can be used to create information overlays or HUD style video elements, or for scientific analysis.

The data is stored in the internal memory of the Boxfish 360 camera controller. You can download this data using the Boxfish App by connecting the Boxfish 360 to your computer using the supplied Micro-USB cable.

### 19.1 Required components

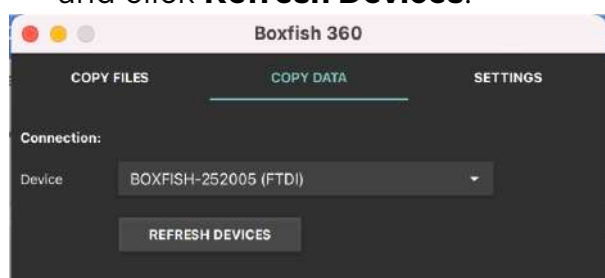
- Boxfish 360, lid opened, cameras off
- Micro-USB cable
- Computer with Boxfish App installed.

### 19.2 Connect 360 to your computer

1. Remove the top lid and locate the Micro-USB port.
2. Connect the 360 to your computer using your Micro-USB cable.
3. Put the 360 into time-lapse mode:
  - a. **For 360 without vacuum test capability:** double-tap the start/stop button as you would when recording time-lapse photos.
  - b. **For 360 with vacuum test capability:** press the start/stop button twice to put the 360 into vacuum test mode. The 360 will beep five times. You can verify the 360 is in vacuum test mode as the red LED in the CAM1 dome will be blinking. Once in vacuum test mode, press the start/stop button once more. The 360 will emit a long beep (approx. 1-2 seconds). After the beep, the 360 will be in time-lapse mode.
4. Open the Boxfish App. Click on the **Copy Data** tab.

### 19.3 Copy data

1. On the **Copy Data** tab, your 360 should show up in the Device field. If the list is empty, make sure the Boxfish 360 is connected and in time-lapse mode, and click **Refresh Devices**.





2. Choose the destination folder. If the folder doesn't exist it will be created.
3. You can specify a project name that will be added to every copied file name.  
This can make it easier to organise your files later.
4. Click **Copy Data**. The 360 will beep once as you click this.
5. The App will copy the log data, creating a new file per recording. It takes about 30 seconds to copy 500 datasets.
6. Open the CSV files in a program such as Excel or a text editor.

Sample data files:

Name	Date Modified	Size	Kind
boxfish360_reef_19991129-135700.csv	Today, 10:58 AM	551 bytes	Comm...t (.csv)
boxfish360_reef_20170806-200900.csv	Today, 10:57 AM	146 bytes	Comm...t (.csv)
boxfish360_reef_20170807-201500.csv	Today, 10:57 AM	780 bytes	Comm...t (.csv)
boxfish360_reef_20170807-201600.csv	Today, 10:57 AM	215 bytes	Comm...t (.csv)
boxfish360_reef_20170807-201900.csv	Today, 10:57 AM	147 bytes	Comm...t (.csv)
boxfish360_reef_20170807-203800.csv	Today, 10:58 AM	1.1 MB	Comm...t (.csv)

## 19.4 Erase memory

After downloading the data you can press “Erase memory” to free up log space for future data. The memory can hold up to 32 thousand log entries, which is roughly 12 hours of recording at one entry per second.

## 19.5 Log data description

Number	Id	Datetime	Timestamp	Runtime	Type	Depth	Temperature	Heading	Roll	Pitch
1	23	7/08/17 20:38	1502095113	0 v	-0.42	20.4	178.7	-5.9	14.3	
2	24	7/08/17 20:38	1502095114	1 v	-0.43	20.4	178.7	-5.9	14.3	
3	25	7/08/17 20:38	1502095115	2 v	-0.43	20.4	178.7	-5.9	14.3	
4	26	7/08/17 20:38	1502095116	3 v	-0.42	20.4	178.7	-5.9	14.3	
5	27	7/08/17 20:38	1502095117	4 v	-0.42	20.4	178.7	-5.9	14.3	
6	28	7/08/17 20:38	1502095118	5 v	-0.43	20.4	178.7	-5.9	14.3	
7	29	7/08/17 20:38	1502095119	6 v	-0.43	20.4	178.7	-5.9	14.3	

Definitions of the data recorded are as follows:

Column	Data
Number	File sequence number starting with 1 for the first entry in this file
Id	Memory sequence number starting with 1 for the first entry in the camera memory.
Datetime	Recording date as string. Representation depending on your locale.
Timestamp	Recording date. Seconds since Epoch (01/01/1970)
Runtime	Seconds since recording was started (this file)
Type	Type of file: v for video, p for photo



Depth	Depth in meters. Negative depths means camera is not submerged
Temperature	Temperature in degrees Celsius
Heading	Compass heading, not adjusted for variation or deviation
Roll	Camera roll in degrees
Pitch	Camera pitch in degrees

## 19.6 Exit time-lapse mode

To continue using the 360 as normal, remove the micro-USB cable and hold the start/stop button for at least six seconds to reset the controller.

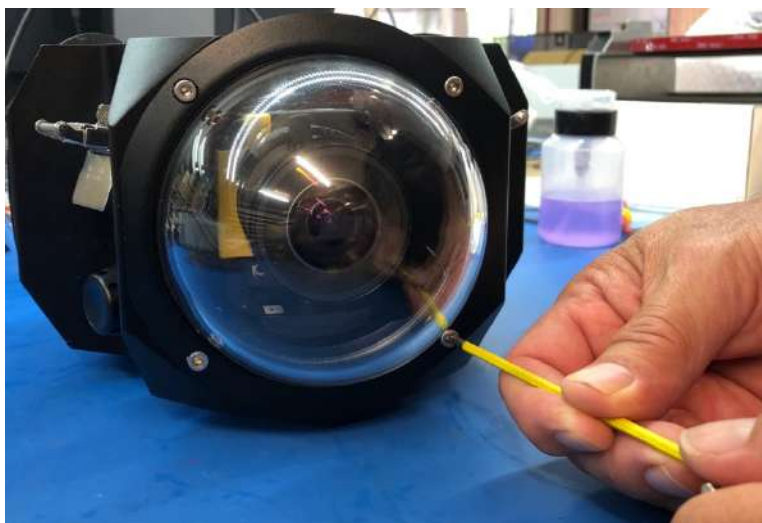


## 20 Removing domes

You can remove the domes for shooting while out of the water, or for the purpose of periodically checking the O-rings to ensure the 360 remains watertight.

### 20.1 Removing the domes

1. Using the supplied 3mm hex key included inside the 360 housing, unscrew the four screws from the black surrounding plate around the outside of the dome.



2. Carefully remove the black surround and the dome. Hold the dome lightly by the outside (as shown) to prevent scratching the dome.

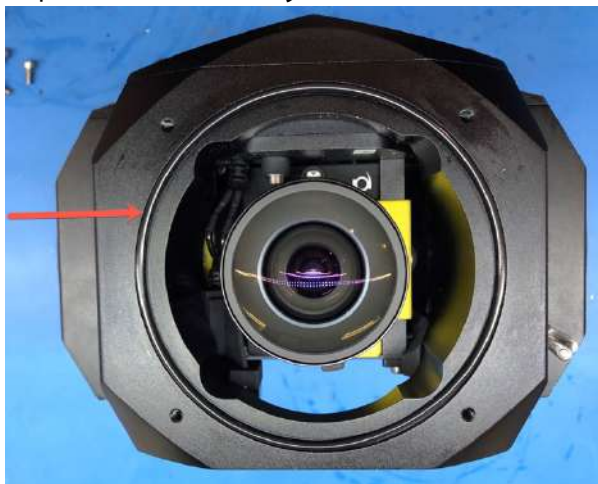


3. If shooting while out of the water, replace the black dome surrounding plate (noting the orientation: flat edges go on the sides, and the curved edges at the top) and fasten with the four screws.

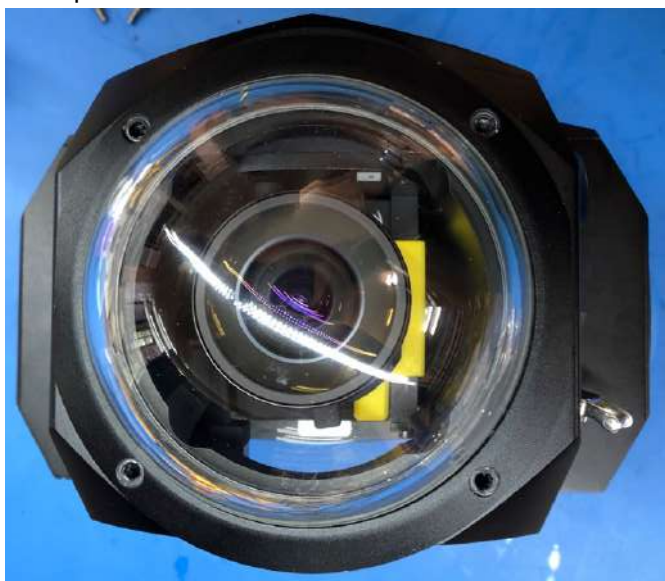


## 20.2 Putting domes back on and lubricating O-rings

1. If you've used the 360 for out-of-water shooting, unscrew the four screws and take off the black surround.
2. Inspect the O-ring inside for signs of perishing or damage. Replace with a spare if necessary.



3. Carefully remove the O-ring from the groove. Do not use a sharp object to remove it. Sand, salt and dust tend to build up in this groove, so wipe it clean with a microfibre cloth.
4. Lightly coat the O-ring with the supplied silicone grease before placing it back into the groove.
5. Place the dome in position on top of the O-ring.
6. Place the black surrounding plate in position. Note the correct orientation of the plate - with the flat edges on the sides and the curved edges on the top/bottom:



7. Fasten with the four screws, working with diagonal screws first.



## **21 Removing bottom lid to replace O-ring**

To remove the bottom lid, place the 360 upside down onto a supportive surface, supporting the vacuum valve if present.

Use the supplied 4mm hex key to remove the screws and washers from the bottom lid of the 360.

Replace O-ring and lubricate by applying a small amount of silicone grease onto your fingers and running the O-ring through your fingers.

Remove any dust from the O-ring groove by wiping clean with a microfibre cloth.

Put O-ring into the groove, first into the corners and then stretching around the perimeter.

Ensure O-ring is not pinched when replacing bottom lid, and that the lid sits flush with the housing.

Replace screws and washers onto the lid and tighten – at first gently and then more firmly. Tighten the screws on opposite sides of the lid (in a sort of star pattern) – first quite loose and then tighter - to ensure even tightening over the whole lid.





## 22 Preparing new memory cards

**Note:** Any cards other than the ones we supply and recommend (SanDisk 64GB Extreme PLUS UHS-I microSDXC Memory Card) are untested and we cannot guarantee they will work properly with your 360.

If you wish to buy more of the recommended cards, follow the instructions below **before** using the memory cards in the cameras.

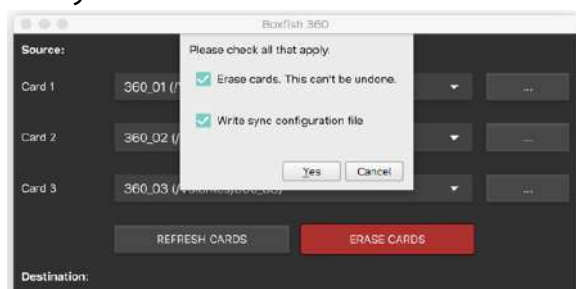
### 22.1 Format and name memory cards

Before using memory cards with the 360 for the first time, format the cards to the exFAT file system and name the cards according to which camera they belong to. **Note:** You will need to label each card with a 1, 2 or 3 according to which camera they will go in.

1. Connect the first memory card (that will go in Camera 1) to your computer using the supplied card reader. The card should appear as a drive in your Windows explorer.
2. Right-click the name of the memory card/drive. From the menu, select **Format**, and select **exFAT**.
3. Click Start.
4. Confirm OK to start formatting.
5. Once the card is formatted, right click on the name of the card and rename it to 360\_01.
6. Repeat steps 1-5 for the other two memory cards, renaming them to 360\_02 and 360\_03 respectively.

### 22.2 Erase cards and write config files

1. Start the Boxfish App for Windows or Mac. Click on the red "Erase Cards" button.
2. Ensure there are checkmarks in the **Erase cards** and **Write sync configuration file** boxes. The Boxfish App will erase the cards and write camera id and configuration files. **Note:** This step is required for the synchronised autostart to work.





## 23 Troubleshooting

### 23.1 One or more cameras don't start recording when start/stop button is pressed.

Possible cause	Resolution
Cameras are not turned on	Open the housing (not underwater) and check that all cameras are turned on.
Cameras are out of power	Recharge camera with provided AC power supply.
Memory cards are not inserted, or not seated properly	Open the housing and ensure each camera has a memory card inserted, and no error is showing on the screen (red card symbol next to battery status).
Memory cards are full	Using the app, copy all files off the cards then erase the memory cards.
Cameras are not in sync mode	Change each camera to photo mode with a tap on the power button, and then back into video mode. This will identify the sync board and put the camera into sync mode.
Firmware version of camera is incorrect	Connect to the Boxfish App and check that the E1 Firmware is set to 0.29.
Sync board is not connected	<p>Try to start recording by pressing the red record button on the camera. You will need to use a pen or similar long thin item to reach it.</p> <p>If the camera <b>does</b> start recording when this button is pressed, but does not start recording when following the usual workflow when the start/stop button is pressed, it could be because the sync board is not inserted correctly.</p> <p>To resolve this, remove the bottom lid. Ensure the electronics board plugged into each camera is seated securely, and all cables are attached.</p>





## 23.2 The batteries on some cameras drain faster than others

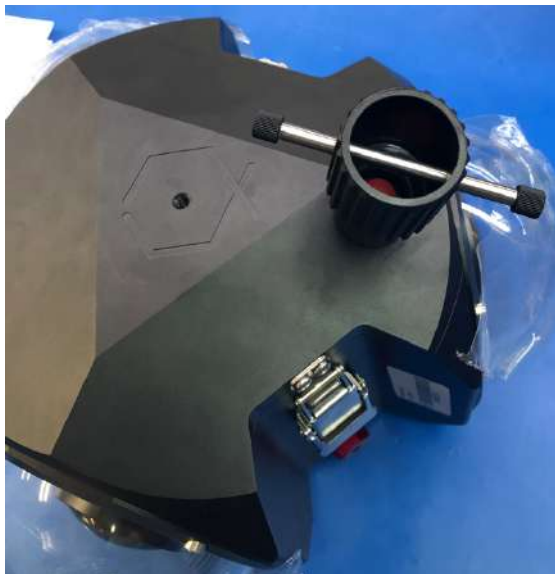
Check that the camera is not advertising Bluetooth. Instructions are in [Section 11.9: Turn Bluetooth advertising on or off](#).

## 23.3 Boxfish App seems to hang

If you have any trouble connecting to the Boxfish App, or it seems to pause at any point during connection, try resetting the 360 by pressing the start/stop button for six seconds before trying to reconnect again.

## 23.4 Vacuum valve comes undone

If the vacuum valve should come undone (which is unlikely), you can use the valve tightener included to tighten it back in place, as shown. You will know if the valve has come loose if the 360 does not hold a vacuum during the vacuum test.



*Valve tightening for vacuum valve on 360 lid*



## 24 Appendix I: Z Cam E1 cameras recommended settings

Below are our recommended settings.

The 360 is shipped with each camera pre-configured with these settings, however these can be overridden with factory defaults if the batteries are removed from the cameras or go flat.

### 24.1 Video mode settings

Usage:

1. Press Fn button to access menus.
2. Press arrow buttons below to navigate through the **Record, Image** and **Setup** menus.
3. Press Fn button to select a menu.
4. Use the arrow buttons to navigate through the items inside the menu.
5. Press Menu button to cancel

#### Setup menu

Ensure Bluetooth Advertising is set to Off (unless using Bluetooth), and Version is set to 0.29. You can amend Date/Time in this menu if you wish.

#### Image menu

Nothing to change from the default settings.

#### Record menu

Ensure that the Recording Duration is set to its maximum of 30 minutes (unless you would like a shorter duration).

### 24.2 Shooting parameters

1. Press Menu button to enter shooting menu
2. Press smaller buttons above to navigate
3. Press Fn button to select
4. Press Menu button to cancel Parameters:

- Shutter angle: Auto
- ISO: Auto
- EV: -1.0
- Focus area: Center
- White Balance: (only available if White balance set to manual in "Image" menu).



## 25 Appendix II: Turning Z Cam cameras on/off with Bluetooth

There is an option to remotely turn the Z Cam E1 cameras on and off using a Bluetooth connection to the Z Camera App on a mobile or tablet device.

This could be useful if you do not wish to open the lid of the 360 while at sea, however the cameras use more battery power while advertising Bluetooth, so your dive time may be reduced if you don't have the Recording Extender.

**Note:** Before storing your 360, make sure you turn Bluetooth advertising to OFF, as this will cause the Z Cam camera batteries to drain quite quickly and you will lose any custom settings you have set in your cameras.

### 25.1 Components required

- 360 camera
- Mobile device or tablet with Z Camera App pre-installed

### 25.2 Overview of procedure

An overview of the process is as follows:

1. In advance, download the Z Camera app and make a note of the name and passcode for each camera. Practice turning the cameras on and off with the app to get familiar with the process.
2. Before your dive, when you are still comfortable opening the 360, set each camera's Bluetooth advertising to ON.
3. Turn off the cameras.
4. Travel to your dive site.
5. If 360 has vacuum test kit, perform vacuum test and confirm vacuum is stable.
6. Use the Z Camera App to remotely turn on each camera.
7. Use the start/stop button to start recording (procedure depends on whether vacuum test kit is installed)
8. Complete your dive.
9. Use the Z Camera App to remotely turn off each camera.
10. When safe to do so, open the 360 and turn Bluetooth advertising to OFF.

### 25.3 Download Z Camera App

Before your trip, download the Z Camera App to a mobile device and set up all cameras to advertise Bluetooth.

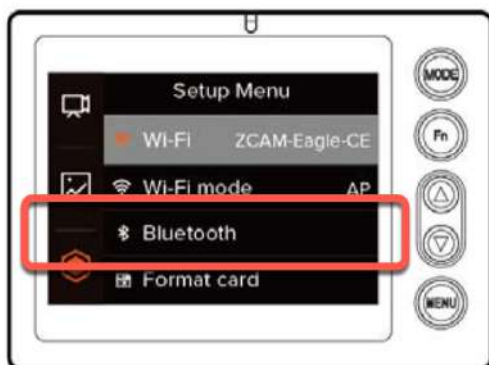


You can download the Z Camera App by ImagineVision Tech from Google Play or App Store. Accept all permissions required by the app.

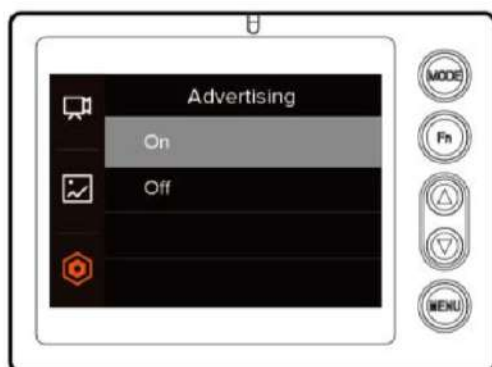


## 25.4 Turn on Bluetooth advertising and find each camera's Name and Passcode

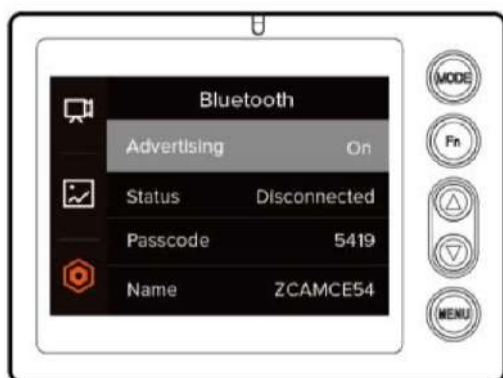
1. Turn the camera on with the yellow lever.
2. Press the Fn button once to access the camera settings.
3. Scroll down (using the down arrow) to the Setup Menu. Press Fn to select it.
4. On the Bluetooth menu, scroll down to Bluetooth and press Fn to select it.



5. In the Bluetooth menu, turn Bluetooth advertising to ON.



6. Make a note of the camera's unique **Passcode** and **Name**, as you will need these when pairing your device to each camera. We recommend keeping a list on your device.



7. Exit the menus by pressing the MENU button.
8. Repeat for each of the three cameras.

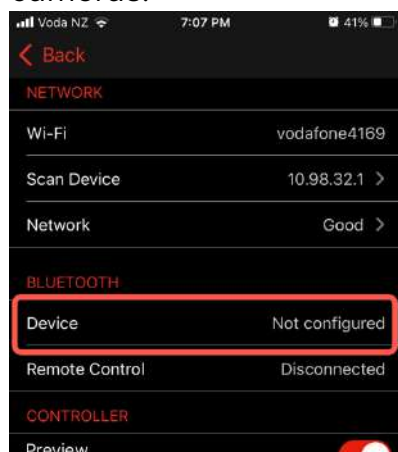
## 25.5 Turn camera on and off remotely

**Note:** You can only connect to one camera at a time. After you've turned a camera on or off, you must "forget" it before connecting to the next camera.

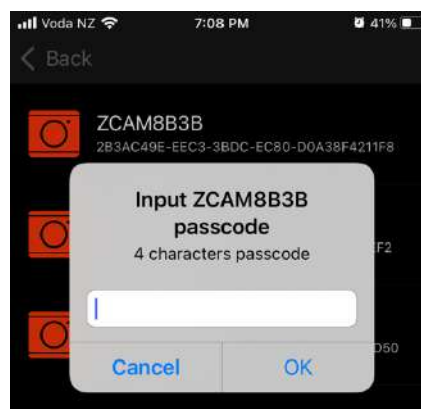
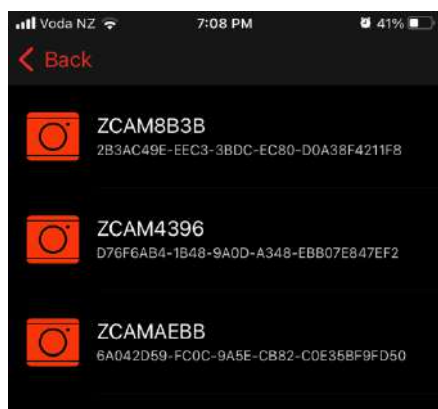
1. Open the Z Camera app and tap the gear icon in the top right corner.



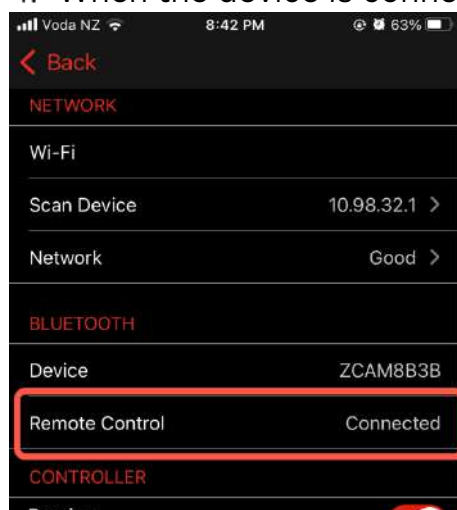
2. Under the Bluetooth heading, tap on 'Device' to see a list of available cameras.



3. Tap on the name of a camera and input its passcode.



4. When the device is connected, tap on the **Remote Control** menu option.



5. Use the On/Off button symbol in the top right corner to boot up the selected camera, or turn it off.



6. When you have turned the camera on (or off), you can proceed to do the same for the other two cameras. Select Device from the menu, and “forget” the currently-connected camera. You will then be able to select a different device to connect to.

7. Repeat until all three cameras are on (or off).

## 25.6 After your trip

As soon as you can open your 360, we recommend turning off Bluetooth advertising as it can quickly drain the battery.



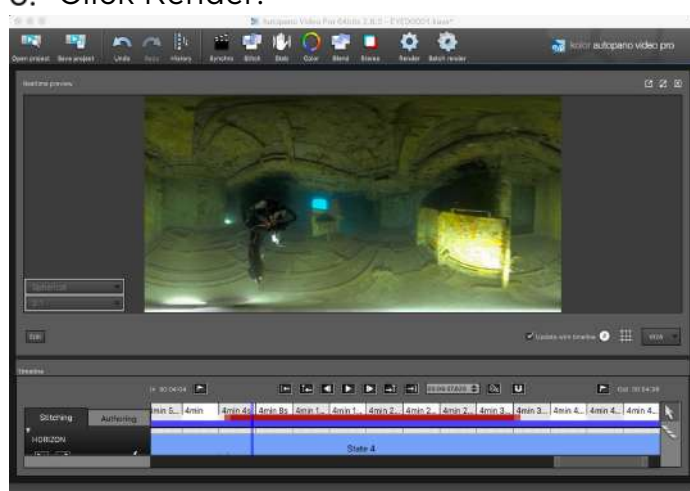
## 26 Appendix III: Creating 360 spherical videos in Autopano (obsolete)

**(Note:** Autopano is obsolete software and this section is only to support existing users.)

The Boxfish App can be configured to create an Autopano Video project file (.kava) with the chosen stitching template alongside each set of clips, and an Autopano Giga project file (.pano) alongside each photo. Sample files:

Name	Date Modified	Size	Kind
EYED0001_reef_autopano.kava	Today, 13:51	7 KB	Autopano...ct File
EYED0001_reef_cam1.MOV	Today, 13:52	93.3 MB	Apple...ontainer
EYED0001_reef_cam1.MOV.jpg	Today, 13:52	229 KB	JPEG Image
EYED0001_reef_cam2.MOV	Today, 13:52	93.3 MB	Apple...ontainer
EYED0001_reef_cam2.MOV.jpg	Today, 13:52	229 KB	JPEG Image
EYED0001_reef_cam3.MOV	Today, 13:51	93.3 MB	Apple...ontainer
EYED0001_reef_cam3.MOV.jpg	Today, 13:51	229 KB	JPEG Image
EYED0002_reef_autopano.kava	Today, 13:52	7 KB	Autopano...ct File
EYED0002_reef_cam1.MOV	Today, 13:52	333.4 MB	Apple...ontainer
EYED0002_reef_cam1.MOV.jpg	Today, 13:52	229 KB	JPEG Image
EYED0002_reef_cam2.MOV	Today, 13:52	333.4 MB	Apple...ontainer
EYED0002_reef_cam2.MOV.jpg	Today, 13:52	229 KB	JPEG Image
EYED0002_reef_cam3.MOV	Today, 13:52	333.4 MB	Apple...ontainer
EYED0002_reef_cam3.MOV.jpg	Today, 13:52	229 KB	JPEG Image

1. The App automatically creates an Autopano Video Pro project file when templates are loaded with the chosen stitching template alongside each set of clips on copy.
2. Double-click the project file (E.g. EYED00001\_autopano.kava) to open it in Autopano.
3. Select the desired part of the timeline (red line).
4. Open the Render menu.
5. Verify the target resolution, filename, frame rate, and bitrate.
6. Click Render.



Please note that the templates that come with the Boxfish 360 App are designed to help you quickly create stitched videos for review only. For a professional production you will most likely have to adjust several parameters, including horizon, FOV & K-values, and set mask points.



## 27 Appendix IV: Declaration of Conformity

### 27.1 For customers in the USA

Trade Name: Boxfish Research Model No.: BF360

Responsible Party: Boxfish Research Limited, Auckland, New Zealand

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

This equipment has been verified to comply with the limits for a class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

#### 27.1.1 Caution

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

#### 27.1.2 Recycling Lithium Batteries

Lithium-Ion batteries are recyclable. You can help preserve our environment by returning your used rechargeable batteries to the collection and recycling location nearest you.





For more information regarding recycling of rechargeable batteries, call toll free 1-800-822-8837, or visit <http://www.call2recycle.org/>.

Caution: Do not handle damaged or leaking Lithium-Ion batteries.

## 27.1.3 For supplied accessories

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.

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that are deemed to comply without testing of specific absorption ratio (SAR).



## 27.2 For customers in Canada

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

### 27.2.1 Recycling Lithium Batteries

Lithium-Ion batteries are recyclable. You can help preserve our environment by returning your used rechargeable batteries to the collection and recycling location nearest you.

For more information regarding recycling of rechargeable batteries, call toll free 1-800-822-8837, or visit <https://www.call2recycle.ca/>.

Caution: Do not handle damaged or leaking Lithium-Ion batteries.

### 27.2.2 For supplied accessories

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.

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that are deemed to comply without testing of specific absorption ratio (SAR).



## 27.3 For customers in Europe

Notice for the customers in the countries applying EU Directives

Manufacturer: Boxfish Research Limited, 224A Orakei Rd, Auckland 1050, New Zealand

Hereby, Boxfish Research Limited, declares that this equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. For details, please access the following URL:

<https://www.boxfish.nz/>.





**BOXFISH**<sup>®</sup>  
R E S E A R C H