# Boxfish

# LUNA

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## Camera Operations

## Manual

**BOXFISH**® RESEARCH
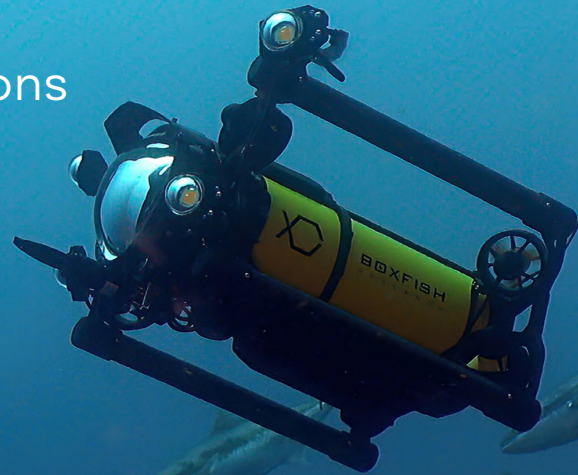
## Table of Contents

## 1 About the main camera inside the Boxfish Luna

### 1.1 Supported cameras

The Boxfish Luna is designed to contain either a **Sony a7S III** or **Sony Alpha 1** camera.

The camera mounting system and robotics within the Luna are designed with the flexibility to swap between these two cameras if you wish. Additionally, the Luna can support multiple lenses for each camera.

### 1.2 Limitations

Our design works within the following constraints:

- **Each camera integrates differently with the Luna.** Sony's design for camera outputs impacts how we are able to integrate each camera into our Luna system.
- **Bandwidth and length of the Luna fibre-optic tether**. Different recording and monitoring options for each camera are available for different tether lengths (depending on whether your tether is 300m or shorter, or over 300m).

## 2   Recording and storage hardware

The diagram below shows the recording and storage devices that may be used with the Boxfish Luna.



USB storage device
(to download media from Alpha 1 camera,
128GB USB stick supplied)

Control Station

HDMI dongle
(optional for tethers ≤300m)

Ninja V with SSD card

Tether

Internal HDMI dongle
(installed for tethers >300m)

ROV

Alpha 1

OR

a7S iii

Memory card(s)
(80GB CFExpress card included)
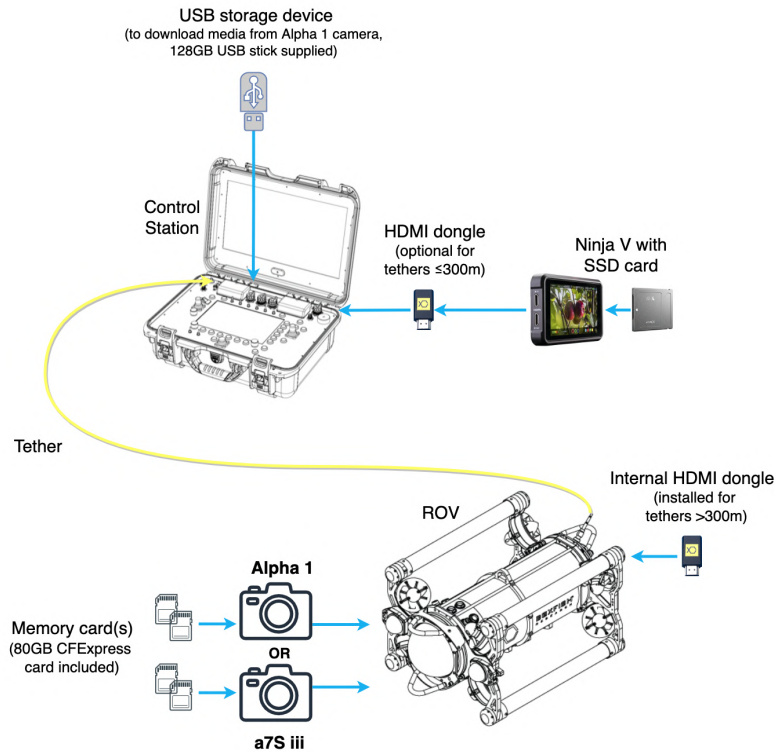
### 2.1   Video recording and storage devices

Video may be recorded on the below devices:

1. **Ninja V**. This device can be connected to and powered by the Control Station. With a compatible SSD attached, it can record the camera's HDMI output, which is transferred over the Luna's tether.
2. The **Alpha 1** or **a7S III** camera. Video may be recorded using the camera and stored to the memory card(s) installed in the camera. We supply an 80GB CFExpress card with your camera.

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### 2.2   Retrieving video files

- **Alpha 1 cameras**: There are two options:
  - o   Files may be retrieved from the card inside the camera, and
  - o   You also have the option download files over the tether to a USB storage device (a high-speed SSD is preferable) attached to the Control Station. Note that the original file will remain on the card until you manually delete it using the camera.
- **A7S III cameras**: A7S III video files cannot be sent over the tether, and must be retrieved from the card inside the camera.

### 2.3   Photo files recording device and storage/retrieval

The Luna can take still images with either the Alpha 1 or A7S III.

Photo files will be stored on the camera's memory card (80GB CFExpress card supplied with your Luna).

To retrieve the files:

- **Alpha 1 cameras**: Files may be transferred over the tether to a device (such as the 128GB USB stick supplied with your Luna) attached to a USB port on the Control Station. Note that the original file will remain on the card until you manually delete it using the camera.
- **A7S III cameras**: Files cannot be transferred over the tether, therefore the files must be retrieved from the memory card inside the camera.

### 2.4   About the HDMI dongle

The HDMI dongle will be installed internally in Lunas for tethers longer than 300m.

For Lunas with tethers ≤300m, the HDMI dongle should be used in following scenarios:

- All video recording, except for ProResRAW on the Ninja
- All still image taking.

Further details about HDMI dongle use are covered in this manual.

### 3   Initial camera setup

We will set up and test your Luna before shipping with the following settings in place on the camera.

### 3.1   NTSC vs PAL

Depending on your region we will set up your camera for NTSC or PAL. This setting can be found in the **Setup > Area/Date > NTSC/PAL Selector** menu.

Available framerates:

- For NTSC, 30p, 60p or 120p
- For PAL, 25p, 50p. or 100p.

### 3.2   External Output settings

What you will see at the surface (on Control Station screen and Ninja) is determined by the HDMI External Output settings (**Setup > External Output** menu).
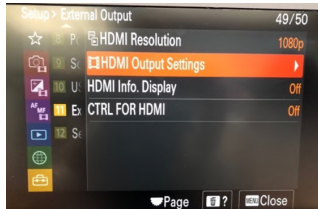


Within the menu, the following will be set:

- **HDMI Resolution** determines output when the camera is in **photo mode**. This will be set to AUTO so that you can see 4K display at the surface when the camera is in photo mode.
- **HDMI Output Settings:** These determine output to the surface when the camera is in **movie mode**. There are three settings in this menu that we will set as below.

| Setting name | Value |
|---|---|
| RAW Output | On |
| Output Resolution | AUTO |
| RAW Output Setting | 30p (NTSC) or 25p (PAL) |
| Time Code Output * | On |

\* Time Code Output will be set to On in case you wish to obtain video files that can be used in stability software, see Section 13.2.

### 4   Ninja V connection and setup

This section covers how to connect your Ninja recorder to the Control Station, and optimum settings for recording with the Ninja, depending on your tether length and desired recording framerate and resolution.

### 4.1   Hardware required

- Ninja V
- 2x HDMI cables
- Ninja power cable
- Ninja battery eliminator
- Atomos SSD, inserted into back of the Ninja
- (Optional) HDMI dongle (useful only for tether lengths ≤ 300m. If tether is >300m, dongle will be installed inside the Luna).

### 4.2   How to connect the Ninja V to Control Station

> IMPORTANT!
>
> Do not force the Ninja power cable into the ACCESSORY port on the Control Station (Step 5 below). The male pins on this connector can be broken if the cable is not aligned properly. Make sure the notch on the cable aligns with the groove on the connector before inserting the cable into the connector, and do not use force.

1. Insert the SSD card into the back of the Ninja.
2. Insert the battery eliminator into the battery compartment on the back of the Ninja.
3. Screw in the Ninja mount to the ¼" mounting point on the Control Station.
4. Attach the Ninja to the mount and set the Ninja to your desired position.
5. Attach the power cable to the input on the battery eliminator on the back of the Ninja. Connect the other end of the cable to the Ninja power output port (labelled **ACCESSORY**) on the Control Station. **Please note**: Pay close attention to the orientation of the groove on the cable and align it with the notch on the connector. Take care not to damage the pins in the connector. Push the cable down as far as you can into the connector, and screw in the cable to hold it in place.
6. Connect one HDMI cable to the **HDMI Out** port on the left side of the Ninja, and the **HDMI** port in the centre of the Control Station, just below the lid.

7.  Connect the other HDMI cable to the **HDMI In** port on the left side of the Ninja, and the other end to the **CLEAN HDMI** port on the Control Station.
8.  (Optional, if tether is ≤300m) connect it to the CLEAN HDMI port and connect the HDMI cable to the dongle.
9.  Power on the Ninja using the power button on its right-hand side and wait for the camera feed to appear on the Ninja and the Control Station 17" screen.
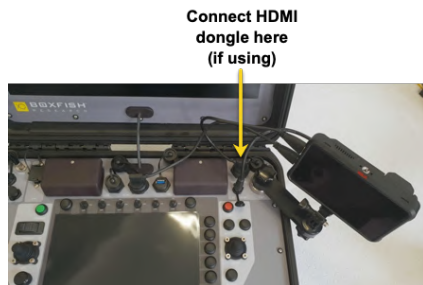


*Ninja V Recorder attached to the Boxfish Luna Control Station. If the tether is ≤300m, the dongle will force 10-bit video output (instead of RAW). The dongle must also be used for ≤300m tethers when camera is in PHOTO mode.*

### 4.3    Ninja V settings

The Ninja will be set up for you initially with the settings listed in this section. There are only a few settings that you will need to change to achieve various filming options – we have noted these below.

#### 4.3.1    Accessing settings menus

Touch the applicable item from the top menu: IN, OUT, MON or REC.



#### 4.3.2    IN menu

Settings in the IN menu determine the camera output into the Ninja.

**Note**: If you have a 300m or shorter tether, your camera will output RAW automatically. If you do not wish to record RAW, use the HDMI dongle. The HDMI dongle will force the camera to output in 10-bit instead of RAW. Because the Ninja will expect to see RAW but not receive it, a "Not

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RAW Input" icon will appear on the Ninja, and you will need to select another compression option for recording (see REC menu below).

IN settings set up at Boxfish:

| SOURCE | Input | HDMI |
|---|---|---|
| | **Signal** | 4.3Kp29.97 (if tether is ≤300m and dongle not used)) OR UHD29.97 (if tether >300m) |
| | **HDMI Standard** | 2 |
| **TRIGGER** | **Source** | HDMI |
| | **Trigger *** | Off |
| **DEVICE** | **Manufacturer** | SONY |
| | **Name** | ILCE-1 (Alpha 1) OR ILCE-75M3 (a7s III) |
| **REMOTE** | **Remote Mode** | Calibration/LANC |
| **CAMERA OUTPUT** | **Log/HDR** | On |
| | **Camera** | Standard/Sony |
| | **Gamma** | S-Log3 |
| | **Gamut** | S-Gamut3.cine |

**\*** You can set **Trigger** to On if you wish to record with the Ninja whenever the camera is set to record – see .

#### 4.3.3    OUT menu

This menu contains settings that determine how the Ninja converts the camera output to display on the Control Station 17" monitor.

| VIDEO OUT | HDMI Output | UHD29.97 |
|---|---|---|
| | **Signal** | UHD29.97 |
| | **HDMI Standard** | 2 |
| **OUTPUT OPTIONS** | **4K To 2K Output** | Off |
| | **DCI Crop** | Off |
| | **HDMI Timecode** | Off |
| **HDR** | **HDR Out** | On |
| | **HDR Type** | PQ |
| | **Gamut** | Rec.709 |
| | **LUT Out** | Off |

### 4.3.4 MON

Controls how the camera output will appear on the Ninja monitor itself. Select **REC 709**.

### 4.3.5 REC

We recommend using the ProRes codec. Approximate recording durations are given below for a 500GB SSD.

| Codec Format | Compression | Approx. length of recording (500GB SSD) |
|---|---|---|
| ProRes | LT | 2.5 hours (2:34:06) |
| ProRes | 422 | 1.75 hours (1:46:24) |
| ProRes | HQ | 1.15 hours (1:11:53) |
| ProRes | ProRes RAW * | 22 minutes (0:22:12) |

**\* Notes:**
- ProRes RAW will be available only if your tether is less than 300m, and you are not using the HDMI dongle.
- If you have not purchased your Ninja from us, you will need to install ProResRAW onto your Ninja.

### 4.3.6 Other useful settings

RGB Parade is useful for monitoring exposure.



See the Ninja V User Manual for more: https://www.atomos.com/product-support.

## 5 Summary of recording options available with the Luna

The Luna provides several recording options:

1. Ninja recorder (video only)
2. Video with Alpha 1 or A7S III camera
3. Photos with Alpha 1 or A7S III camera
4. Both Ninja and Alpha 1 / A7S III camera.

Instructions for all options are covered in this manual.

The below table may be useful to determine devices and setup needed to achieve your objectives.

| | Recording device | | | |
|---|---|---|---|---|
| | Ninja only | Camera only | Ninja and camera (start/stop recording independently) | Ninja and camera (Ninja start/stop recording triggered by camera) |
| **ProResRAW** (tethers ≤300m) | ✓ | | ✓ | ✓ |
| **Framerates > 25/30fps** | | ✓ | ✓ | ✓ |
| **8K** | | ✓ | ✓ | ✓ **(but not recommended)** |
| **4:4:4 colour sampling** | ✓ **(Alpha 1 only)** | | ✓ **(Alpha 1 only)** | ✓ **(Alpha 1 only)** |
| **Still images** | | ✓ | ✓ | ✓ |
| **Transfer media files to surface** | | ✓ **(Alpha 1 only)** | ✓ **(Alpha 1 only)** | ✓ **(Alpha 1 only)** |
| **Obtain files for stability correction with Sony Catalyst Browse** | | ✓ | ✓ | ✓ |
| **Obtain RAW files for stability correction in Gyroflow** | | | | ✓ |

## 6   Overview of Control Station controls for Boxfish Luna

The below diagram shows camera control functions of the Boxfish Luna. Full explanations are given in later sections of this manual.
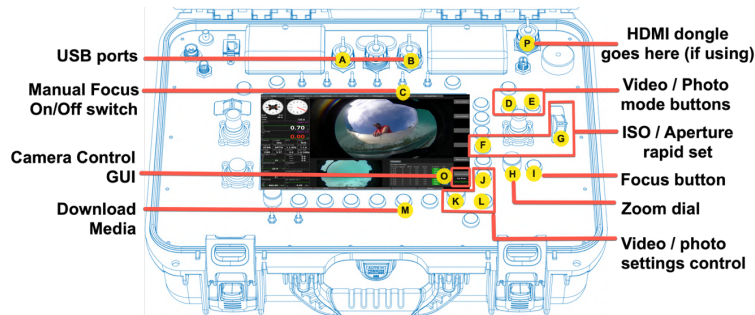


| | |
|---|---|
| A. | USB ports: Used to connect a USB stick/SSD device to the Control Station for |
| B. | photo and video transfer (video transfer available for Alpha 1 cameras only). |
| C. | Manual Focus On/Off switch |
| D. | VIDEO button. Press once to start recording video on-camera. Will also start recording on Ninja if Time Code Control is On, and Trigger on Ninja is On. Also used for troubleshooting: press and hold for six seconds to restart camera. If in Photo mode, press once to return to Video mode. |
| E. | PHOTO button. Change to photo mode/take a photo |
| F. | (Optional) Rapid Set button. Use in conjunction with thumb wheel (**G**) |
| G. | (Optional) Thumb wheel to rapidly change ISO or aperture values, depending on what is shown under the Rapid Set label (**F**) |
| H. | Zoom dial. Rotates lens to zoom in and out |
| I. | Focus button |
| J. | Button to display menus available for remote control of camera photo and video settings |
| K. | Scroll dial. Used to scroll through available camera settings within each menu selected with (**J**) |
| L. | OK button (✓). Used to select a new setting |
| M. | Download Media button. Can be used with Alpha 1 cameras only. Used to download photos and/or videos recorded on-camera (to memory card) to a USB stick connected to Control Station |
| N. | Camera Control GUI: Graphical User Interface for the camera control options available on the Control Station |
| O. | HDMI dongle goes here if using (between HDMI port and HDMI cable to Ninja) |

## 7   Boxfish Luna start-up sequence

### 7.1   Power up sequence

> **IMPORTANT!**
>
> Power on the Control Station and allow it to completely boot up **before** powering up the ROV. Do not connect any USB devices to the Control Station before it is powered up.

Always power on the Control Station before powering up the ROV.

This will ensure that the correct camera settings appear on the Control Station.

When the Luna is powered up, the device powering the camera controls (indicated by the Camera Control GUI) will also start up.

**Note**: The full start-up sequence can take a few minutes – please be patient.

### 7.2   Camera Control GUI start-up screen

When the start-up sequence is successful, **A1 Ready** or **A7SIII Ready** will be displayed in green text on the Camera Control GUI.

### 7.3   Troubleshooting

If the start-up sequence does not complete properly, press the VIDEO button for six seconds. This will restart the camera system. Wait for the **A1 Ready** or **A7SIII Ready** label to appear.

## 8   Remote control of movie/photo settings

The **Camera Control GUI** (under the Camera Control label on the bottom right of the telemetry screen) displays camera settings available for adjustment via the Control Station.

### 8.1   How to load camera settings upon start-up

1. Power on the Control Station and wait for it to boot.
2. Power on the ROV and wait until the **A1 Ready** or **A7SIII Ready** appears in green text on the Camera Control GUI.
3. Press the Menu button (bottom button on right hand side of telemetry screen) to load the current settings saved on the camera (on startup the camera will be in Movie mode. Therefore, movie settings will appear).

### 8.2   Changing from movie mode to photo mode (and back)

1. To change to Photo mode, press the **PHOTO** button on the Control Station once.
2. Wait about 10 seconds for the system to change modes (do not press any buttons). When photo settings are ready, the label **Photo-Manual** will display in green text.
3. To change back to Movie mode, press the **VIDEO** button once and wait. When settings have loaded, **Movie-Manual** will appear in green text.
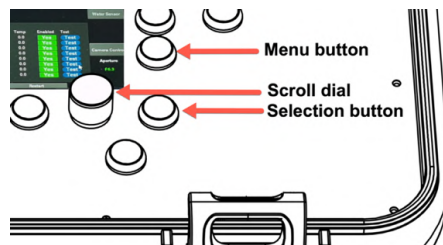
### 8.3   Camera control settings labels on the Camera Control GUI

Under the **Camera Control** heading are the following labels:

- Top label in white colour (eg Aperture) is the name of the setting
- Middle label in green colour (eg F6.3) is the currently selected value for the setting

### 8.4   How to change camera settings

To change a setting, use the controls shown below.

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1. Press the **Menu** button (bottom right) until you reach your desired menu. The name of the menu will be displayed in white text. The currently selected setting for that menu item will appear in green text.
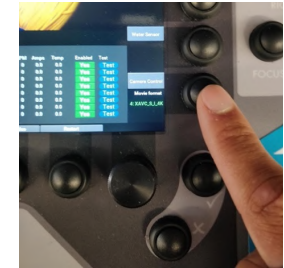


2. Use the scroll dial to scroll through other available settings for that menu item. Turn the dial slowly and wait for each option to appear. Options will appear in white text.
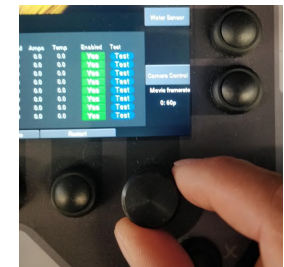


3. Select the setting you want by pressing the **OK (✓)** button. The label will turn from white to yellow briefly before turning green to indicate the setting is now in use.



### 8.5   (For Lunas with Rapid Set thumbwheel only) Quickly change ISO and aperture values

**Note**: This functionality is only available for Control Stations that have the rapid set thumbwheel **(G)** on the right-hand side and Rapid Set label onscreen next to button **(F)** (third from the bottom on the right of the screen).
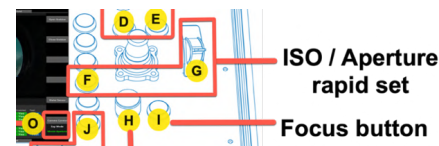


1. Press the **Rapid Set** button until **Aperture** appears under the **Rapid Set** label

on the telemetry screen, indicating that aperture values will be adjustable by moving the thumbwheel up (to increase values) and down (to decrease values).

2. Stop moving the thumb wheel when your desired value appears in the Camera Control GUI (**O**).
3. Press the **Rapid Set** button until ISO appears under the **Rapid Set** label. Adjust values with the thumbwheel as above.

## 8.6    Troubleshooting camera settings

If you experience any problems with changing settings, press and hold the VIDEO button for six seconds to restart the camera system.

# 9    Remote control of zoom and focus

## 9.1    Zoom dial

**Note**: only available for zoom lenses.

Turn the **ZOOM** dial to zoom the camera in (clockwise) /out (anti-clockwise). Turn the dial slowly for best results.

## 9.2    Focus controls

### 9.2.1    Manual focus switch in OFF position

Default position of this switch is in the OFF position, and the camera will be in Autofocus mode. In Autofocus mode, the label **[AF]** appear in the Camera Control GUI.

### 9.2.2    Manual focus switch in ON position

When the switch is moved to the ON position, the camera will keep the current focus setting and not change focus distance. The label **[MF]** will appear on the Camera Control GUI.

### 9.2.3    Focus button

Pushing and holding this button will temporarily enable autofocus when the button is held down. You can use this to focus on a specific object. Release the button when desired focus is achieved.

**Note**: Pushing and holding the Manual Focus switch up to the FN (top) position will perform the same function as pushing and holding the focus button.

## 10 How to record video with the Ninja V

### 10.1 Recording options

The following options are available for recording with the Ninja.

**Note**:

- ProResRAW compression on the Ninja is only available for tethers 300m or shorter, as RAW output is not possible over longer tethers
- For tethers 300m or shorter, RAW output can be changed to 10-bit by inserting the HDMI dongle.

| Available formats (tether ≤300m) | Monitoring at surface | Storage device |
|---|---|---|
| ▪ ProRes RAW compression: 4.3K 25p (PAL)<br>▪ ProRes RAW compression: 4.3K 30p (NTSC) | ▪ 4.3K25p (PAL)<br>▪ 4.3K30p (NTSC) | Ninja SSD |
| ▪ 4K: 10-bit 25p (PAL) at 4:2:2 or 4:4:4 **\***<br>▪ 4K: 10-bit 30p (NTSC) at 4:2:2 or 4:4:4 **\*** | ▪ 4K25p (PAL)<br>▪ 4K30p (NTSC) | Ninja SSD |

\* 4:4:4 colour sampling not available for Lunas with a7S III cameras

| Available formats (tether >300m) | Monitoring at surface | Storage device |
|---|---|---|
| ▪ 4K: 10-bit 25p (PAL) at 4:2:2<br>▪ 4K: 10-bit 30p (NTSC) at 4:2:2 | ▪ 4K25p (PAL)<br>▪ 4K30p (NTSC) | Ninja SSD |

### 10.2 Procedure

1. Connect HDMI dongle (optional, only for tethers ≤300m if you do not wish to record RAW) **\*see note below**.
2. Connect Ninja to Control Station.
3. Check Ninja settings and select compression option (REC menu).
4. Configure camera settings as desired using the Camera Control GUI.
5. When ready to record, press the Record icon on the bottom left of the Ninja screen. The button will turn red when recording.
6. When finished recording, download video from the Ninja SSD using the SATA to USB converter in your accessory box.

**Note:** If you remove the HDMI dongle from the Control Station during a dive or testing, you must restart the camera controls by holding down the VIDEO button for six seconds.

### 10.3 How to record 10-bit 4:4:4 on the Ninja

**Note**: This is only available for Alpha 1 cameras, and only if your tether is ≤300m.

1. Use the HDMI dongle to force 10-bit output
2. Change the **Format** setting to 8K25p / 8K30p. The sensor will read 8K full-frame but down-sample the output to 10-bit 4K25p / 4K30p 4:4:4.

## 11  How to record video with the Alpha 1 or A7S III camera

From the surface, the VIDEO button can be used to start/stop recording with the front camera (Alpha 1 or A7S III).

Media files will be stored on the camera's memory card.

Advantages of recording with the camera:

- Recording with the Alpha 1 or A7S III allows you to record higher framerates and higher resolutions than is possible with the Ninja, because output to the surface over the tether is limited to 25/30p.
- For Luna with Alpha 1 cameras, media files may be transferred to the surface via the tether for review during a dive if you wish.
- With Sony Alpha 1 and A7S III cameras, metadata about camera movement will be recorded on camera video files to enable later stability correction using software such as Sony Catalyst Browse.

### 11.1  Recording options

#### 11.1.1  Alpha 1

**Note**: the HDMI dongle must be inserted at the surface if tether is ≤300m.

| Recording video on Alpha 1 | Monitoring at surface | Storage device | Retrieval options |
|---|---|---|---|
| - 4K: 10-bit 25/50/100p (PAL)<br>- 4K: 10-bit 30/60/120p (NTSC)<br>- 8K: 10-bit 25p (PAL)<br>- 8K: 10-bit 30p (NTSC) | 4K25p (PAL) / 4K30p (NTSC) | Camera memory card | - Transfer to surface USB SSD attached to Control Station, OR<br>- Camera memory card directly |

#### 11.1.2  a7S III

**Note**: the HDMI dongle must be inserted at the surface if tether is ≤300m.

| Recording video on a7S III | Monitoring at surface | Storage device | Retrieval options |
|---|---|---|---|
| - 4K: 10-bit 25/50/100p (PAL)<br>- 4K: 10-bit 30/60/120p (NTSC)<br>- 8K: 10-bit 25p (PAL)<br>- 8K: 10-bit 30p (NTSC) | 4K25p (PAL) / 4K30p (NTSC) | Camera memory card | Camera memory card |

### 11.2  Memory card specifications

Card must be a **CFexpress card Type A** (an 80GB card is supplied with your Luna). If you wish to use another card, it must have a minimum read/write speed 500MB/s.

### 11.3  Procedure for recording video on camera

1. Connect HDMI dongle (only for Lunas with tethers ≤300m when recording higher framerates than 30p, otherwise will not get camera feed to the surface). **\*see note below**
2. Configure camera settings as desired using the Camera Control GUI. For higher framerates (>30p) and higher resolutions (>8K) see later in this section.
3. Press VIDEO button **\*see note below** to begin recording with the camera. A red [REC] label will appear in the Camera Control GUI to indicate the camera is recording video.
4. Press VIDEO button again to stop recording with the camera. You may start and stop recording as many times as you like, as long as there is space on the memory card. If there is no space left on the card, an error message will appear in the Camera Control GUI.
5. Download files from camera memory card. For Alpha 1, it is possible to download files to the Control Station while the tether is connected, see Procedure for downloading video files to Control Station.
6. Delete files from memory card.
7. Reformat memory card inside camera.

**Notes**:

- If you remove the HDMI dongle from the Control Station during a dive or testing, the camera controls must be restarted by holding down the VIDEO button for six seconds.
- The camera will be in movie mode by default at start-up. If it has been changed to PHOTO mode, press the VIDEO button once to change to movie mode, and once again to start recording.

### 11.4  Procedure for downloading video files to Control Station

**Note**: This procedure is only possible for Lunas with Alpha 1 cameras.

1. Insert a **USB storage device (\*see note below)** into a USB port on the Control Station.
2. Press **Download Media** button to download video files from the camera memory card to the USB device.

3. The Camera Control GUI will display **Pending**, and the video feed will disappear from the 17" screen, replaced by the text "Mass Storage Mode".

4. After file transfer is complete, the system will restart, and the USB device will automatically be ejected from the Control Station. Wait for the **Alpha 1 ready** message to appear on the Camera Control GUI.

5. When the memory card is full, you will need to open the Luna and manually delete files from the card, then reformat the card inside the camera. There is no way to delete files from the memory card using the Control Station.

**\* Note**:

■ We recommend using a high-speed SSD (minimum read/write speed of 500MB/S) to speed up the transfer process for video files. Device must be formatted exFAT and name of the device must not include any spaces. Device must have at least as much space as camera memory card.

### 11.5 How to record 4K50/60p, 4K100/120p or 8K25/30p

Using the Camera Control GUI, settings may be as follows:

1. From the **Movie Format** menu, select:
   a. XAVC_S_I_4K (supports 50/60p only)
   b. XAVC_S_L_4K (supports 50/60p or 100/120p)
   c. XAVS_HS_4K (supports 60p or 120p)
   d. XAVC_HS_8K for 8K (supports 25/30p only)

2. Select your desired format by pressing the **OK (✓)** button. The label onscreen will turn from white to yellow briefly before turning green to indicate the setting is now in place.

3. On the **Movie Framerate** menu, available framerates are:
   a. 100/120p (cannot use with 8K)
   b. 50/60p (cannot use with 8K)
   c. 25/30p – use this with 8K Movie format.

4. Select the framerate you want by pressing the **OK (✓)** button on the Control Station.

### 12 How to take still images

Still images may be captured from the surface using the front camera. Images will be stored on the camera's memory card.

### 12.1 Photo options

**Note**: the HDMI dongle must be inserted at the surface if tether is ≤300m.

| Photo resolution | Monitoring at surface | Storage device | Retrieval options |
|---|---|---|---|
| Alpha 1 (RAW 50MP) | 4K25p (PAL) / 4K30p (NTSC) | Camera memory card | ■ Transfer to surface USB SSD attached to Control Station<br>■ Camera memory card directly |
| A7S III (RAW 12MP) | 4K25p (PAL) / 4K30p (NTSC) | Camera memory card | ■ Camera memory card |

### 12.1.1 Note about RAW images

RAW photos will typically appear dark in post processing. This is due to the single Picture Profile option being used for video recording. The initial dark images can be corrected in post-production (as the RAW image data is not altered by the Picture Profile setting).

### 12.2 Procedure

1. For Lunas with tether ≤300m long, connect HDMI dongle (otherwise in PHOTO mode there will be no camera output to the surface) **\*see note below**

2. Put the camera in photo mode by pressing the PHOTO button on the Control Station. Wait about 10 seconds for the system to change modes and load photo settings. When ready, **Photo-manual** will appear in green text on the Camera Control GUI.

3. Adjust photo settings as desired – see [Section 8: Remote control of movie/photo settings](#). **Photo** and **File Format** headings will allow you to choose the types of files that will be saved onto the camera memory card: RAW and uncompressed file types are available.

4. Press the PHOTO button once to take a photo. A red [Img] label will appear in the Camera Control GUI to indicate that a photo was taken. The photo will

be saved to the camera memory card. Note that when the camera takes a photo it will perform autofocus, so there will be a short delay.

5. Repeat the above for as many photos as desired. Pressing the photo button rapidly will take photos in sequence, but no faster than what the camera can take (depending on the extent of focusing being performed, around 0.5 – 1 second will elapse between photos). If there is no space left on the card, an error message will appear in the Camera Control GUI.

6. Download photo files from card:

   a. Optional, available for Alpha 1 cameras only: Insert USB storage device and press **Download Media** button to download video files from the camera memory card to the USB device. The Camera Control GUI will display **Pending** while the camera goes into mass storage mode, and "Mass Storage Mode" will appear on the Control Station screen. After file transfer is complete, the system will restart, and the USB device will automatically be ejected from the Control Station. Wait for the **Alpha 1 Ready** message to appear on the Camera Control GUI. When the memory card is full, you will need to open the Luna and manually delete files from the card. There is no way to delete them using the Control Station. OR

   b. Open Luna to get card from camera and download files.

7. Delete files from memory card.

8. Reformat memory card inside camera.

**Note for tethers ≤300m**:

- If you remove the HDMI dongle from the Control Station during a dive or testing, the camera controls must be restarted by holding down the VIDEO button for six seconds.

- If filming RAW video alongside photos, note that switching between video and photo modes will require you to add/remove the HDMI dongle and restart the camera controls (by pressing the VIDEO button for six seconds). This will mean you will not be able to record continuous video with the Ninja.

- Continuous filming with the Ninja while taking photos is possible when leaving the HDMI dongle in place and shooting 10-bit video with the Ninja.

## 13  Recording with both Ninja and camera

The Ninja and camera may be used together during a dive.

### 13.1   Recording with Ninja and camera

Your Luna is set up to give you the flexibility to switch between devices or use both simultaneously during a dive.

This may be useful for the following reasons:

- Photos can be taken with the camera while maintaining video recording on the Ninja.
- Video can be taken with the camera at higher frame rates or higher resolution, while still recording 4K on the Ninja.
- Memory space can be optimised space on the camera memory card by recording snippets of high-framerate or high-res footage while maintaining continuous recording of 4K video on the Ninja.
- With Sony Alpha 1 and A7S III cameras, metadata about camera movement will be recorded on camera video files to enable later stability correction using software such as Sony Catalyst Browse or Gyroflow. Note that files for Gyroflow are most useful when the camera can output RAW video to the Ninja (only available if the tether is 300m or shorter).

#### 13.1.1    Procedure

1. On the Ninja IN menu (see Section 4.3.2: IN menu)., check that HDMI Trigger is set to Off (it should be Off by default). Otherwise pressing the VIDEO button will cause the Ninja to stop/start recording along with the camera.

2. Set other Ninja settings as desired.

3. Use the Ninja, VIDEO and PHOTO buttons to record on either or both devices as you wish.

### 13.2   Ninja and camera (recording on Ninja triggered by camera)

It is possible to set up the camera and Ninja so that whenever the VIDEO button is pressed, the Ninja will automatically start/stop recording along with the camera.

For tethers 300m or shorter, this method can be used to record to record RAW files on the Ninja while simultaneously recording video on camera. The two files can be used together by Gyroflow software to produce better stabilised video from RAW video capture.

### 13.2.1    Procedure

1. On the Ninja IN menu, set Trigger to On (see Section 4.3.2: IN menu).
2. Set the Ninja compression to ProResRAW (REC screen).
3. Press the VIDEO button to begin recording on camera and Ninja at the same time. Note that recording duration will be limited to the capacity of the smaller memory device (ie 80GB card in camera).

## 13.3    Recording options when both Ninja and camera are used

### 13.3.1    4K at higher framerates

50/60/100/120p at 4K may be recorded on camera. Resulting output to the Ninja will depend on tether length:

- For tethers longer than 300m, 4K25p/4K30p 10-bit 4:2:2 will be output to the Ninja
- For tethers 300m or shorter, the HDMI dongle must be used. 4K25p/4K30p 10-bit 4:2:2 will be output to the Ninja (if dongle is not used, camera will record 25/30p and RAW will be output to the Ninja).

### 13.3.2    8K

8K25p / 8K30p full frame may be recorded on camera.

However, because 8K cannot be transferred over the tether, the output to the Ninja will be down sampled to 4K.

Output to the Ninja will be (note that if tether is 300m or shorter HDMI dongle must be used):

- For Alpha 1: 10-bit at 25/30p with 4:4:4 colour sampling.
- For A7S III: 10-bit at 25/30p 4:2:2.

## 14  Troubleshooting

| Issue | Solution |
|---|---|
| No feed from main camera on Control Station or Ninja | If tether is ≤300m:<br>■ Check HDMI dongle is in place – this is needed for all shooting (except for recording ProResRAW video on the Ninja)<br>■ Filming at high resolutions and warmer temperatures can cause the temperature inside the ROV to increase, and it is possible for the camera to overheat and shut down. To power the camera back on, press the VIDEO button for six seconds to restart the camera. It is best to wait until the internal temperature of the ROV decreases before using the camera again. |
| Camera hunts for focus | This happens if water is murky and there is no object for the camera to focus on. The issue should resolve once the camera has an object within focus distance. |
| Cannot use USB storage device (Alpha 1 only) | Check the following:<br>■ USB is formatted correctly (must be exFAT)<br>■ There are no spaces in the name of the USB device. |
| Camera settings cannot be changed | If settings available in the Camera Control GUI hang or cannot be changed, hold down the VIDEO button for six seconds and wait until **Alpha 1 Ready/A7SIII Ready** appears. |
| "USB Mass Storage" appears on main screen | This is normal at start-up, when restarting camera controls, and when transferring videos across the tether. If the message appears and prevents you from operating the camera controls, open the Luna, move the camera forward and unplug the USB-C, HDMI and ethernet cables from the camera and connect them again. |

## 15  How to open your Boxfish Luna to access front camera

You will need to access the camera inside the Luna to perform tasks such as:

- Retrieving files from memory card
- Deleting files from memory card
- Adjusting physical dials on the camera
- Swapping lenses.

### 15.1  Take out internal tray from Luna

To access the front camera inside the Luna you must remove the internal tray.

> **LiPo BATTERY WARNING!**
>
> **Opening the ROV means accessing where the ROV battery pack is located. The battery pack contains LiPo batteries.**
>
> **While out of the ROV, the tray and battery pack must be treated with care and should not be dropped, bumped or knocked. Nothing should be allowed to fall onto the tray.**
>
> **Failure to follow instructions could result in fire or explosion which could cause injury, death or property loss.**
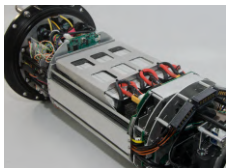


*Boxfish Luna tray. The ROV battery pack is visible in the middle of the tray.*

To take out the tray, see our **Boxfish Battery Charging Manual** available at https://www.boxfish.nz/downloads/.

### 15.2  About the camera assembly

The camera is at the front of the tray.

- The memory card slot is accessible
- For Alpha 1 cameras, you can carefully roll the tray onto its side (ideally on a piece of foam for protection) to access the screen which is placed underneath the camera

- For A7S III cameras, you will need to move the camera forward to access the screen.

### 15.3  Put lens cap on camera

We recommend putting the lens cap on while the tray is out of the Luna. Don't forget to remove it before putting the tray back in.

### 15.4  How to move camera forward

You may need to move the camera's position to do certain tasks.

#### 15.4.1  Loosen hot shoe clamp

Loosen the hot shoe clamp on the top of the camera. This holds the camera to the top rails. Don't loosen this clamp completely, just enough to allow the top sled to slide along top rails.
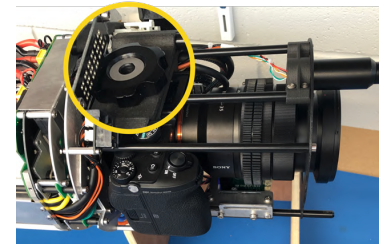


#### 15.4.2  Loosen sled on bottom rails

Next, loosen the camera sled holding the camera mount to the bottom rails.

1.  Loosen the two hex head screws shown by about ½ a turn.



2.  Repeat for the two screws on the other bottom rail.
3.  Gently slide the camera forward on the rails.

### 15.4.3    Put camera back into position

After sliding the camera back on the rails, check the position of the camera lens in the anti-reflective plate. It should be in the middle of the plate.

You can manually manipulate the position of the camera slightly before tightening the hot shoe clamp to keep the camera lens in the middle of the plate.

## 16  How to adjust settings on the camera itself, insert card and format card

### 16.1    How to adjust and save new settings

1. Press the MENU button on the camera.
2. On the camera's touchscreen, select settings as desired.
3. Press the MENU button and manually turn the camera off and on again using the dial on top of the camera.
4. Power the Luna off and on again with the magnetic key.
5. Double-check that the new settings have been saved BEFORE closing the Luna. Note: when Luna is first powered on, camera will say "USB Mode Mass Storage" for a couple of minutes while until the Luna completely boots up. Wait up to a couple of minutes for this message to disappear, then press MENU button again to check your settings have been saved.

### 16.2    How to insert / format new memory card

If you wish to use a new CFExpress memory card in the camera:

1. Unplug the USB-C and ethernet cables from the camera
2. Insert the card into the camera
3. Go to the Shooting menu > Media > Format and format the card.
4. Press the MENU button on the camera and manually turn the camera off and on again using the dial on top of the camera.
5. Power the Luna off and on again with the magnetic key.

## 17  How to swap between camera lenses

### 17.1  Preparing for lens swap

1. Find the lens and the surrounding anti-reflective plate that fits this lens.
2. Take front plate off
3. Unclip navigation camera and move out of the way
4. Loosen hot shoe clamp
5. Loosen 2x screws on each side of the sled so that camera can slide forward on the bottom rails.

### 17.2  Take off front plate surrounding lens

The anti-reflective plate needs to come off before changing lenses.

1. Remove the 2x hex head screws holding the front plate to the top rails. Store the plate in a safe place
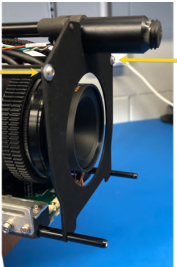


2. Slide the plate toward the end of the rails and remove it. Avoid damaging/scratching the plate while it is not in place on the mount.

### 17.3  Unclip navigation camera

The navigation camera can be unclipped and moved out of the way.

1. Unclip the navigation camera from the top rail (right-hand rail as you are facing the camera). The nav cam will rotate around the left-hand rail.
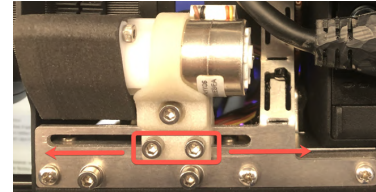


2. The nav cam will be prevented from rotating a full 180 degrees by the cables. Leave the nav cam in the position shown.
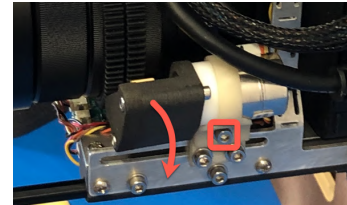
### 17.4  Loosen / rotate zoom mechanism

Move the zoom mechanism out of the way before you put the new lens on.

1. Loosen the three hex head screws shown to slide the zoom mechanism forward/back.



2. Loosen the single screw shown below to rotate the whole mechanism within the white plastic surround, which will move the zoom gear teeth toward/away from the teeth on the lens.



### 17.5  Eject lens and put new one on

1. Eject the current lens and store carefully.
2. Fit the zoom mechanism to the teeth on the lens. Adjust the zoom gear mechanism forward/back, and the teeth in/out until the gear is engaged with the teeth on the lens.



3. Ensure no cables are pinched.
4. Remove lens cap!

### 17.6  Ensure lens can move freely within anti-reflective plate and dome

1. Fit the correct anti-reflective plate (that fits the new lens) to rails and secure with fasteners.
2. Loosen hot shoe clamp and manually manipulate the position of the camera so that the lens is in the middle of the plate and will not touch the plate when zoom is used. Tighten the clamp when the camera is in the correct position.
3. Clip navigation camera back into position.
4. Put tray back inside ROV
5. Connect the ROV, power up components
6. Test camera controls:
   a. Zoom dial on the Control Station adjusts the zoom as expected, and that the teeth aren't slipping
   b. Manual focus and autofocus are working as expected
   c. Ensure the front plate and /or dome does not prevent free movement of the lens.

## 17.7   Position of camera on rails with different lenses

The below table gives an indication of where the camera would be positioned with different lenses.

| Lens | Position on mounting rails |
|---|---|
| 16-35mm F4 | 22.5mm or as far back as possible |
| 50mm F2.8 (macro lens) | As far forward as possible - TBC |
| 16-35mm F2.8 (zoom lens) | As far back as possible - TBC |
| 24mm F1.4 | TBC |
| 14mm F1.8 | TBC |

## 18   How to put the camera and tray back into the Luna

### 18.1   Check camera assembly

Ensure:

1. Lens cap is off
2. Fasteners on sled are secured
3. Correct anti-reflective plate is installed for the camera lens
4. Camera lens is in middle of anti-reflective plate cut-out
5. Hot shoe clamp tightened
6. Navigation camera is back in position.

### 18.2   Put tray back into ROV

> **LiPo BATTERY WARNING!**
>
> **Before replacing the ROV tray, you must inspect the battery pack to ensure it is in good condition and all cables are connected.**
>
> **If the battery pack is damaged or any cables have become disconnected, charging the battery pack will result in fire and/or explosion.**

For instructions, see our **Boxfish Battery Charging Manual** available at https://www.boxfish.nz/downloads/.

## 19 Document history

| Date | Description of changes | Release |
|------|------------------------|---------|
| 7/12/22 | ■ Reconfigured manual to contain a chapter for each recording device<br>■ Clarified procedures and settings for taking photos<br>■ Included some info about stabilisation correction in post-production. | R10 |
| 6/9/22 | Updated manual to reflect latest updates:<br>■ CamSoftware-1.1.3.tgz<br>■ ControlStation-1.2.85L.hex (no rapid set thumbwheel) or ControlStation-1.2.85LD.hex (rapid set thumbwheel)<br>■ ControlStation-1.1.83L.tgz<br>Release notes:<br>■ New mechanism for photo and video download (for Alpha 1 cameras only) to eliminate need to manually reformat card – now files will not be automatically removed from card so users will need to manually delete files when card is full<br>■ New procedure for operating ISO/Aperture rapid set thumbwheel. | R9 |
| 4/8/2022 | ■ New photo download procedure to surface to match video download procedure (for Lunas with Alpha 1 cameras only)<br>■ Added scenario where tether is >300m and HDMI dongle is installed inside Luna. Updated tables and diagrams. | R8 |
| 10/6/2022 | Removed instructions involving ROV battery tray, added warnings and linked to new Boxfish Battery Charging Manual. | R7 |
| 10/5/2022 | ■ Clarified that USB devices attached to Control Station must be exFAT format and name of USB device must not have any spaces. | R6 |
| 3/5/2022 | ■ Clarified that Control Station must be started up before Luna is powered on so that camera controls can start properly. Added PAL to camera | R5 |

| | | |
|------|------------------------|---------|
| | configuration options and amended document to include PAL framerates. Clarified use of HDMI dongle. Added instructions for how to format card in camera after transferring files over tether. | |
| 20/4/2022 | ■ Added instructions for how to swap lenses and perform other tasks on the camera inside the Luna. | R4 |
| 24/2/2022 | Added overview diagram to illustrate recording options for different tether lengths and different cameras. | R3 |
| 29/1/2022 | Additions include:<br>■ How to record video for tether lengths over 300m.<br>Initial setup of camera HDMI Output settings for different recording options and tether lengths. | R2 |
| 17/12/2021 | Initial release for this manual. Contains camera operation information that was previously contained in Boxfish Luna Owner's Manual. Additions for this release include:<br>■ Instructions to support setup and recording options for two front cameras (Sony Alpha 1 and Sony a7S III) using either a Ninja V monitor/recorder or on-camera.<br>■ New/changed controls from new Control Station layout.<br>■ Instructions for how to access front camera inside Luna to insert/format/remove memory card or to change camera settings. | R1 |

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