iX Capture 3.5

User Guide

July 2023

PHASEONE INDUSTRIAL

Contents

1 About iX Capture 3.5

iX Capture interfaces with Phase One aerial cameras. iX Capture performs streamlined capturing and processing of Phase One camera images.

This user guide is designed to assist users with Phase One iX Capture version 3.5

1.1 Credits and Legal Information

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Version 3.5 July 2023.

2 Setting Up iX Capture

2.1 Supported Cameras

iX Capture application currently supports iXA, iXU and iXM product lines.

2.2 System Requirements

For best operation results, ensure that your system complies with the following specifications:

- Windows 10® 64bit, Windows 8.1® 64 bit
- Intel Core i7™ and higher.
- 8 GB of RAM, minimum
- 200 MB of free hard disk space (in addition to hard disk space free for your images)
- Microsoft® .NET Framework (automatically installed if not present)
- Colour monitor with 1920 x 1080 resolution

2.3 Installing iX Capture

Read the release notes before installing iX Capture, then, follow the procedure below:

1 Download the iX Capture install file to your computer:

a) Click the iX Capture link on the USB drive provided with your camera, or

b) Download it from the Downloads section at http://industrial.phaseone.com.

2 Run the install file.

3 Read and accept the license agreement presented.

4 Follow the installation wizard to complete the installation.

Notes:

- *The iX Capture 3.5 installation imports all settings from the previous installation. Reconfigure only new or changed settings in iX Capture 3.5*
- *Phase One iX Capture is provided to Phase One camera users free of charge. It is available for download from the site and does not require an activation code or license for installation and use of the application.*
- *iX Capture does not install file into the same folder as Capture One.*

3 Getting started

The following section guides you through the initial procedures required to run the iX Capture application.

3.1 Connecting the Camera

To connect your camera (or cameras) to the PC:

1. Connect a Phase One USB cable to the camera (USB 3.0 type B for iXU; USB 3.1 type C for iXM). Connect the other end of the cable to your iX Controller or PC running iX Capture.
2. When using a GNSS, connect it to camera's data Terminal A (the left of the two terminals) with a Phase One Control Cable. For more details, see the iX Camera Installation Guide.
3. When using an FMS to trigger your camera, connect the I/O cable to the right terminal on the back of the camera. For information regarding using multiple cameras, refer to the iX Camera Installation Guide.

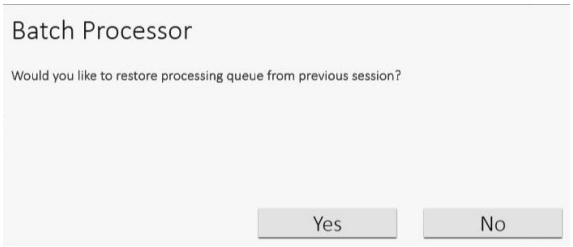
3.2 Starting and Exiting Application

To run iX Capture 3.5:

1. Select iX Capture in the Start Menu or double-click the iX Capture desktop icon.
2. To exit iX Capture, press Alt + F4 or click the "X" in the upper right corner of the window.

3.2.1 Batch Processor

If there are images present in the processing queue when the program is shut down, the following message displays the next time the program launches:



Select:

- **Yes:** Restores the processing queue from the previous session; processing continues from where it stopped.
- **No:** Deletes the spooled list without processing the files in the queue.

3.3 Function Colors

The color of a function's icon indicates its operative state:

- Orange: Active. Click the icon to implement (e.g., click "Trigger")
- Blue: Idle
- Grey: Unavailable

3.4 Navigating iX Capture

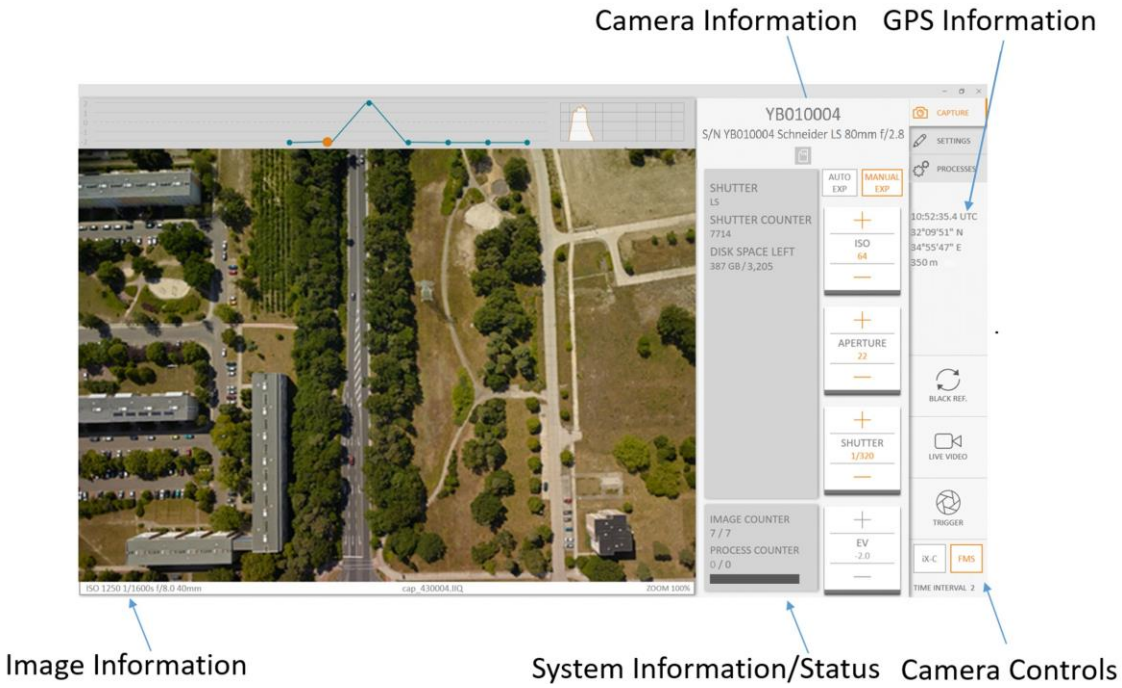
iX Capture contains three main tabs/screens located on the upper right:

- Capture (default screen)
- Settings
- Processes

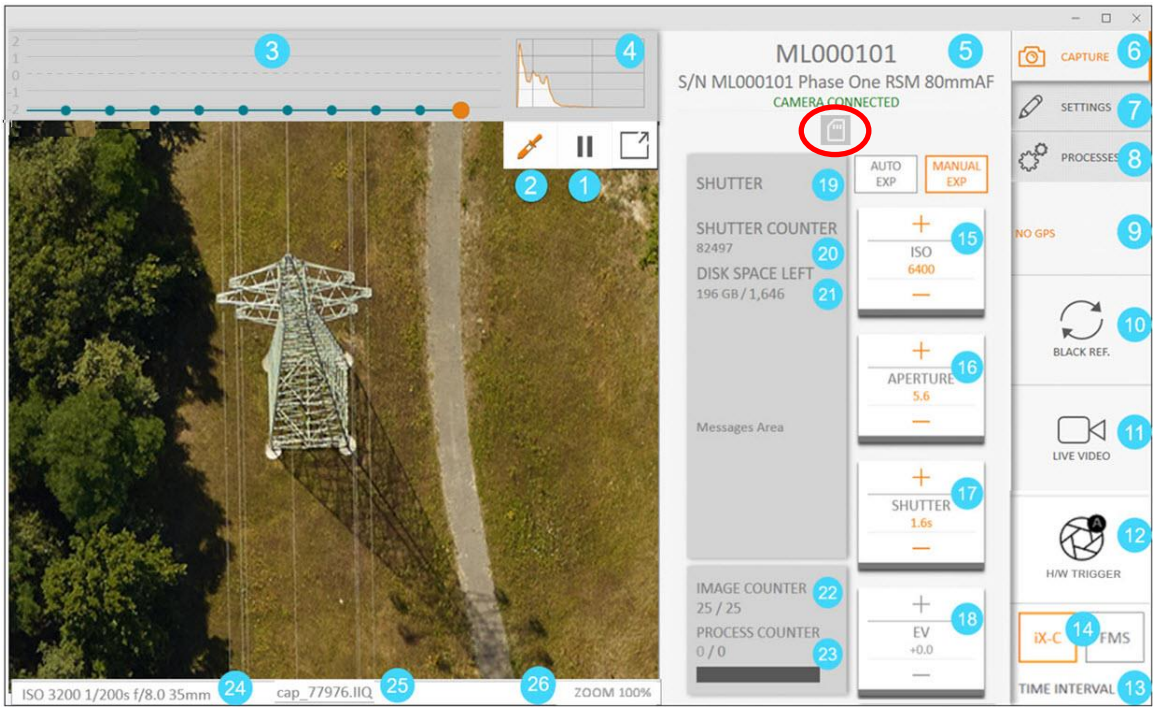
Indicators on the Capture screen provide information about the captures; controls on the screen enable you to make changes easily.

The Capture screen is divided into five areas:

- Camera Information
- GNSS Information
- Camera Controls
- System Information/Status
- Image and Image Information



3.5 Capture Screen Details



Capture Tab Functions

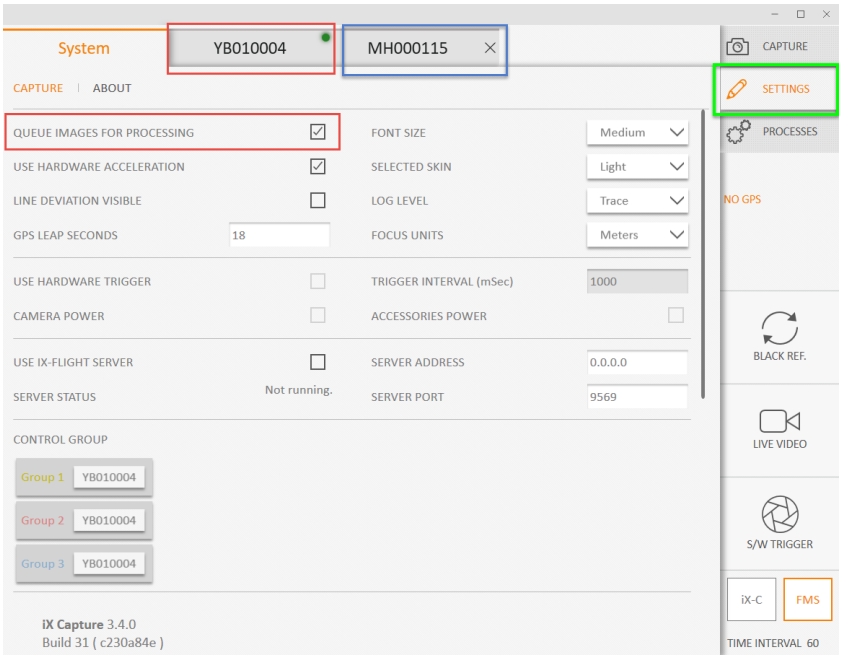
1. Pause
2. WB Picker
3. Exposure History Pane
4. Histogram
5. Camera Info
6. Capture Tab
7. Settings Tab
8. Processes Tab
9. GNSS Data
10. Black Reference
11. Live View
12. Trigger
13. Interval
14. Setting Capture Mode
15. ISO control
16. Aperture Control
17. Shutter Control
18. EV Bias
19. Shutter Mode
20. Shutter Counter
21. Disk Space Left
22. Session Image Counter
23. Process Counter
24. Exposure Data
25. Image File Name
26. Zoom

Note: The circled icon is a warning icon. It turns red upon error. Click to display error message.

3.6 Navigating Settings

The iX Capture GUI consists of:

- **Side tabs** Access the main operation modes.
- **Top tabs** Each camera has its own tab for individual configuration.
  The System tab is used for system level attributes and to queue images for processing specific **recipes** in Process mode.



3.7 Evaluating Data from Multiple Cameras

To maximize use of space on the computer monitor, some details and controls are displayed for individual cameras, each in its own tab. To activate a specific camera, click the tab corresponding to that camera. The tab of the active camera has green dot in the corner and orange borderline on top.

The following table describes different controls and data and how the information is viewed or used.

Table 1: Controls viewed by camera

Viewed By:	**Each Camera**	**Highlighted Camera**	**All Cameras**
Controls			

Viewed By:	Each Camera	Highlighted Camera	All Cameras
Histogram	•		
Exposure evaluation	•		
Exposure history	•		
Image information	•		
Auto Exposure activation		•	
Exposure control		•	
Live View	•	•	•
EV bias		•	
White balance		•	
Zoom		•	
Image counter	•	•	•
Process counter		•	
Disk space left		•	
Control shutter speed		•	
Control ISO		•	
Control aperture		•	
Shutter count		•	
GNSS data		•	
Black reference			•
Capture			•

3.8 Expanding the Image Pane

You can view images in two modes when capturing during a flight:

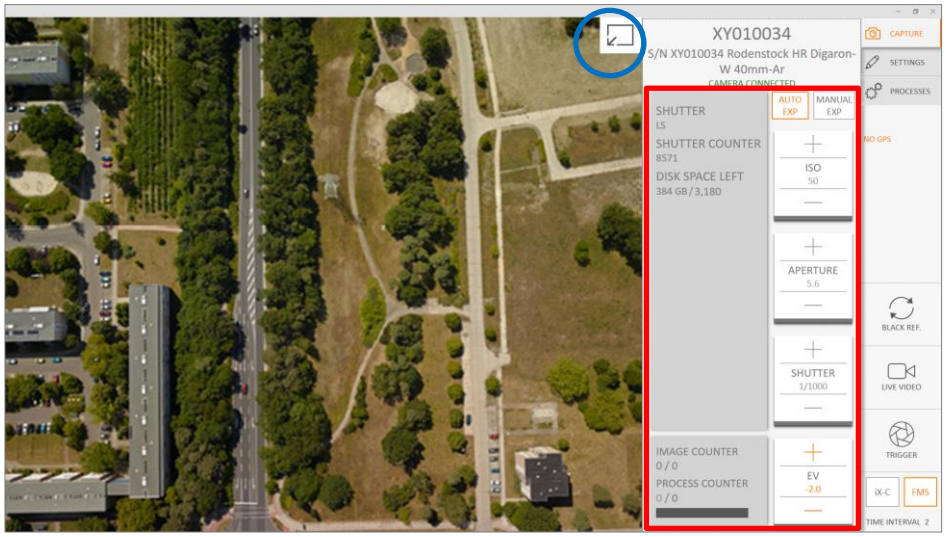
Full View:	*-Displays a large image*	*- Shutter Mode* *- Disk Space Left* *- Image Counter* *- Process Counter*	*- Camera Name* *- Camera S/N* *- Lens*
Normal View:	*- Displays a small image* *- Histogram* *- Exposure History*	*-Same as above*	*- Same as above*

To toggle between the two views, click the **View** icon  .

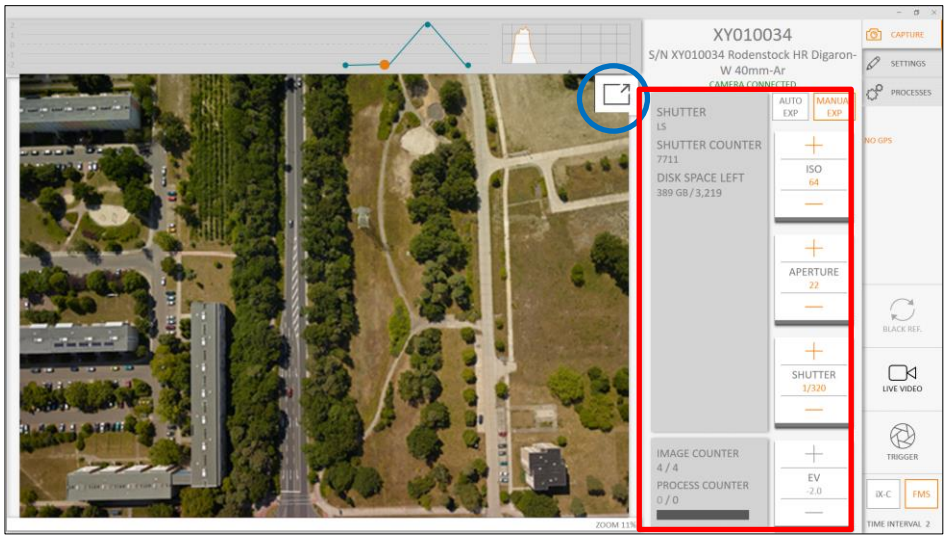
Note:

- *In multi-camera operation, the View icon toggles the image of the selected camera between:*
  - *Histogram present / Small Screen*
    and
  - *Histogram absent/ Large Screen.*

  ***Note**: When iX Capture is used in only part of the screen, the image size is constant.*



***Large image screen** / Histogram absent*



Small image screen / *Histogram present*

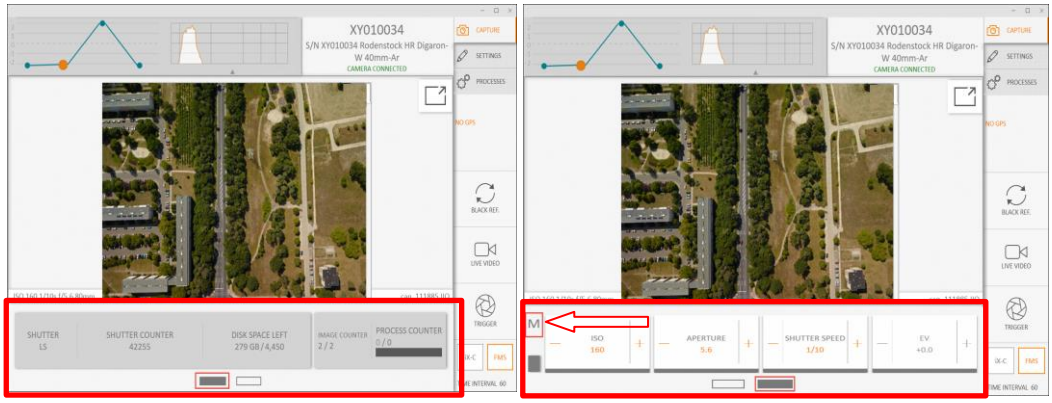
3.9 Resizing the GUI

When you reduce the width of the GUI beyond a certain amount (depending on screen size and settings), the Camera Information in the Capture Screen *moves* from the side to the bottom of the GUI.

The information is divided into 2 layers as follows:

Left selector options	Right selector options
Shutter Mode	ISO control
Shutter Counter	Aperture Control
Disk Space Left	Shutter Control
Session Image Counter	EV Bias
Process Counter	

Left selector: **Right selector:**



When the GUI is narrowed select Manual / Automatic Exposure Mode as follows:

1 For **Manual** mode, click the **Right selector** and then click the “M” at the bottom left of the window (see arrow).

2 To select **Automatic** mode, click the **Right selector** and then click the “A” (underneath the “M”at the bottom left of the GUI - not shown).

Note: The size of the image pane does not affect this feature, only the width of the GUI.

3.10 Keyboard Shortcuts

iX Capture has several keyboard shortcuts:

Alt + F4	Exits iX Capture
Ctrl+Shift+S	Toggles between the Settings and Capture screens
Ctrl+Shift+F	Toggles between FMS and iX-C Capture mode
Esc	Cancels open dialog box
Enter	Identical to clicking OK in a dialog box

4 Capture Tab

Use the Capture tab to captures images and make changes to specific settings.

When using iX Capture, the camera can be triggered by the Flight Management System (FMS) or by iX Capture at a predetermined time interval. FMS capture mode can also be used when capturing with a remote release.

The Trigger button can be used in FMS mode to capture a single image. However, when using multiple cameras, we recommend to **not** capture images using the trigger button. **For multi-camera operation, use hardware triggering to capture images** (see page 21).

4.1 Black Reference Capture

A black reference capture is used to cancel noise inherent to the capture process due to physical and/or environmental conditions. For more information, see the relevant iXU or iXM Installation Guides.

Note:

- *iXU and iXA: The user can manually force a black reference by pressing the BLACK REF button in the main screen.*
- *iXM CAMERAS: A manual reference capture requires that the Black Reference setting for the camera be set to ONCE. When set to ON CHANGE, the first capture after turning the camera ON includes a black reference capture.*
- ***ONCE**: A Black Reference capture is automatically done one time following the first capture after turning the camera ON.*
- ***ON CHANGE**: Every time a specific setup is changed (e.g., a change to ISO, a large exposure time change, or large temperature change), the next capture is automatically accompanied by a black reference capture.*

To ensure the highest possible image quality, make a black reference capture **before:**

- Your first flight line
- A new flight line
- After a change to the exposure or to the ISO settings and **before** capturing images.
  Note: iX Flight 12 automatically takes a Black Reference 5 seconds before capturing the first image of each photography line.

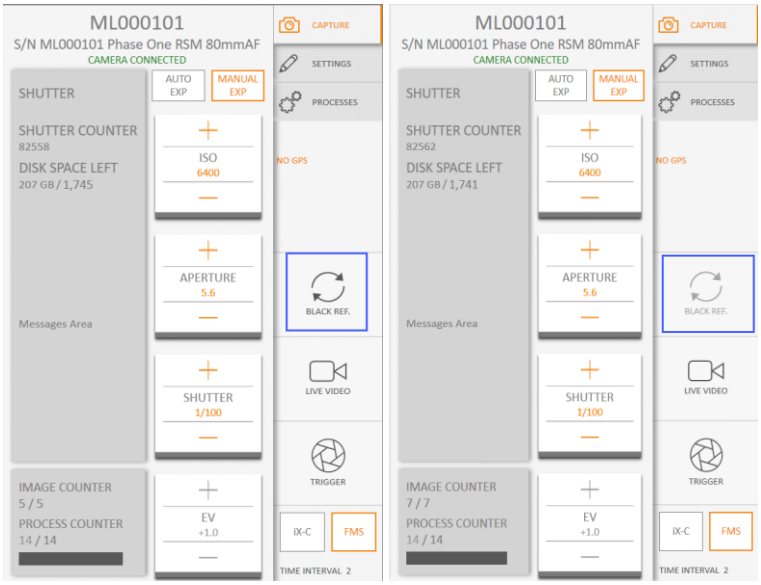
To make a Black Reference capture image:

1 From the Capture screen, click **Black Ref.**
The icon turns grey, indicating a successful Black Reference image capture.

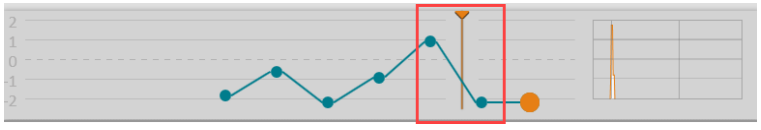
a An orange-colored **Black Ref** indication displays in the Exposure History window; it indicates which of the captures is a Black Reference.

Notes:

- *Image count does not change following the first Black Reference capture; shutter count does advance.*
- *The first capture made **after** switching the camera ON, automatically does a Black Reference capture. However, that capture is not visible on the exposure time line.*
- *Manual Black Reference captures are saved as normal image captures except that their name includes the prefix **"black_ref"**. For names that are automatically generated, the capture count iterates normally.*



Black Reference: Before / After



Histogram w/Black reference

4.2 Live View Mode

Live View enables you to view full high definition (if applicable) video using Phase One iX Cameras ***and*** to capture images while viewing a subject of interest.

To use Live View:

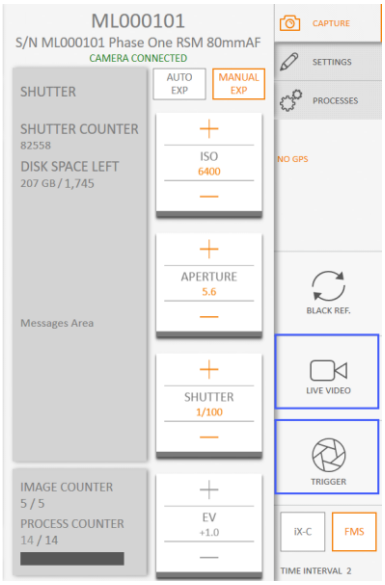
1. From the Capture screen, click the **Live View** button.
   The screen displays a video image.

   a) Click the **Trigger** button to capture an image.
   The camera captures an image.
   Note: Live View is unavailable during a capture.

   b) To exit Live View, click the button again.
   Live View mode turns off.

Notes:

- *During Live View, video is not recorded.*
- *After exiting Live View, the last image captured displays on screen.*
- *When capturing an image while in Live View, the Live View pauses and displays the last frame shown. Live View resumes after processing finishes*
- *The Live View button displays only when a **CMOS** based camera is connected.*



Histogram w / Live View / Trigger

There are 2 Live View options. One displays a live view in the Capture screen, as seen by the camera; the other outputs HDMI to a dedicated HDMI connector. Setup is done in Settings/HDMI.

4.3 Trigger Button

The Trigger button triggers image captures using either software trigger or hardware trigger, as selected in Settings.

FMS mode: Clicking the trigger generates a single trigger.

iXC mode: Clicking on the trigger creates continuous triggering in the selected interval until the next click on the trigger.

4.3.1 Software | Hardware Trigger Option

When using a Controller, you can activate the Hardware Trigger option in System Settings by checking the "Use Hardware Trigger" option (see below).

To set the HW Trigger option:

1 Go to Settings | System | Use Hardware Trigger.

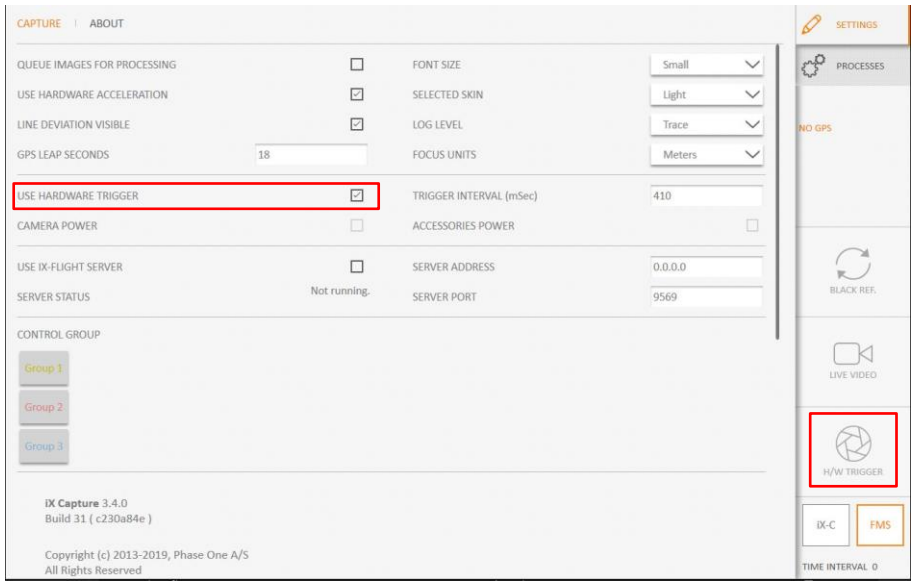
2 Place a check in the option box.

3 Enter the **Trigger Interval** to use.

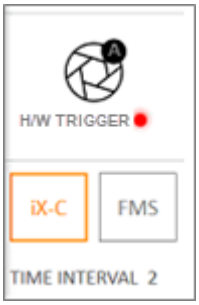
When the H/W Trigger option is set, all cameras that are daisy chained to the **Controller I/O** are triggered simultaneously - with no delay.

Note:

- *When this option is not set, the trigger is controlled by the software.*
- ***Trigger multiple cameras using hardware trigger only.***



The state of the Trigger button is indicated by its color as follows:

FMS mode:	During capture, the button is coloured **black**; it shows a red dot when the camera starts the exposure; the dot turns off when the exposure ends.	
Auto mode:	When **idle**, the Trigger button is **grey,** and an A is displayed. To initiate a capture, click the button. When the Trigger button is clicked, it turns **black**, an A is displayed, and the button displays a **red dot** when the camera starts the exposure. The dot turns off when the exposure ends. To exit Auto mode, press the button again.	

4.4 Setting Capture Mode

To select the capture mode for controlling the camera:

1. Select the **Capture** tab.
   The Capture screen appears.

   a) Select:

   - **FMS**: To use the Flight Management System to control
   - **iX-C**: To use iX-Capture at predetermined intervals to control

Notes:

- *When using **FMS** to control the camera:*
  - *Connect the FMS to the camera with a Phase One control cable, only.*
- *To **test** the camera in FMS mode:*
  - *Click **Trigger** to take a single capture.*
- *When testing the camera in **iX-C** mode:*
  - *Click **Trigger** once to take multiple pictures*
  - *Click **Trigger** again to stop iX-C mode capture*

4.5 Exposure Settings

Function	Description
Auto Exposure Mode	**To activate Auto Exposure mode:** 1. From the Capture screen, tap **AUTO EXP**. • The **AUTO EXP** button turns **orange** • The **ISO** and **Aperture** buttons become inactive {grey) • The **EV bias** button becomes **active**

Function	Description
	To exit **Auto Exposure** mode: • Tap MANUAL EXP.
Setting Auto Exposure Mode	**To set Auto Exposure Ranges:** • Refer to the section ”Setting Auto Exposure Ranges”.
Manual Exposure Mode	**To activate Manual mode:** 1. From the Capture screen, tap MANUAL EXP. • The **MANUAL EXP** button turns orange • The ISO and Aperture buttons become active • The EV bias button becomes **inactive** (grey) **To deactivate Manual mode:** • Tap AUTO EXP.
Shutter speed	**To set shutter speed:** 1. Go to Capture 2. Click the shutter box. 3. Choose the shutter speed to use by rotating the scroll wheel of your mouse, then clicking on the number selected. 4. The shutter speed displays in the box.
ISO	**To set ISO:** 1. Go to Capture. **2.** Click the ISO box. **3.** Select the ISO to us by scrolling your mouse, then click an aperture number to select it. The ISO displays in the box
Aperture	**To set Aperture:** 1. Go to Capture. **2.** Click the Aperture box. **3.** Select the aperture to use by scrolling your mouse, then click an aperture number to select it. The Aperture displays in the box.
Adjusting EV Bias	Auto exposure settings can be adjusted to increase or decrease EV bias (compensation). It is recommended to use EV Bias to underexpose captures instead of other options. Adjustments are made in increments of 1/3 of an f-stop; the total adjustment range is ± three f-stops. To adjust EV Bias: 1. Activate Auto Exposure mode, 2. Click **EV** and select the compensation value to use from the scroll list that displays.

Function	Description
	— Or — 3. Activate Auto Exposure mode, then click the EV "+" (or "—") to increase (or decrease) EV Bias by 1/3 f-stop. **Note:** ▪ *Auto Exposure **must** be active to enable changing the EV BIAS.*  *Auto Exposure, EV Bias: active (left) / inactive (right)*

4.6 Message Area / Counters

The message area displays information from the shutter and three several counters.

- Camera Name
- Shutter
- Shutter Counter
- Image Counter
- Process Counter

Function	Description
Shutter	Displays the mode (abbreviated). Note: Lens dependent. RSM Lens show grey only (no options). iXU and IXU-RS LENSES list options.
Shutter Counter	The Shutter Counter displays the number of **total shutter actuations** or the number of **session actuations** (depending on camera and lens).
Image Counter	The image counter increments with every actuation of the shutter during a session. When using multiple cameras, the number displayed refers to the total of **all** cameras that are connected. The number on the left lists the number of images saved to the computer's disk. The number on the right lists the number of images captured. When there is a large difference between the two numbers, it is because some images have been (temporarily) stored in the camera and are **not** saved to the disk. For the **iXU-RS1900** camera, the image counter advances only when the synchronized left and right parts of the image are found. Check GNSS and **system settings** whenever the counter does not advance for more than 10 triggers.
Disk Space Left	"Disk Space Left" displays the amount of storage remaining and the total space. When there is enough space for only 100 additional images, the number is **red**. **Note**: The amount of space displayed includes the space available on the XQD card (if inserted).
Process Counter	The Process Counter displays the processing status of the **current session**. The number on the **left** lists the number of images successfully **processed**, the number on the **right** is the number of images **queued** for processing. A progress bar under the process counter indicates the progress of each frame. When the process queue is paused, the number on the left is gray.

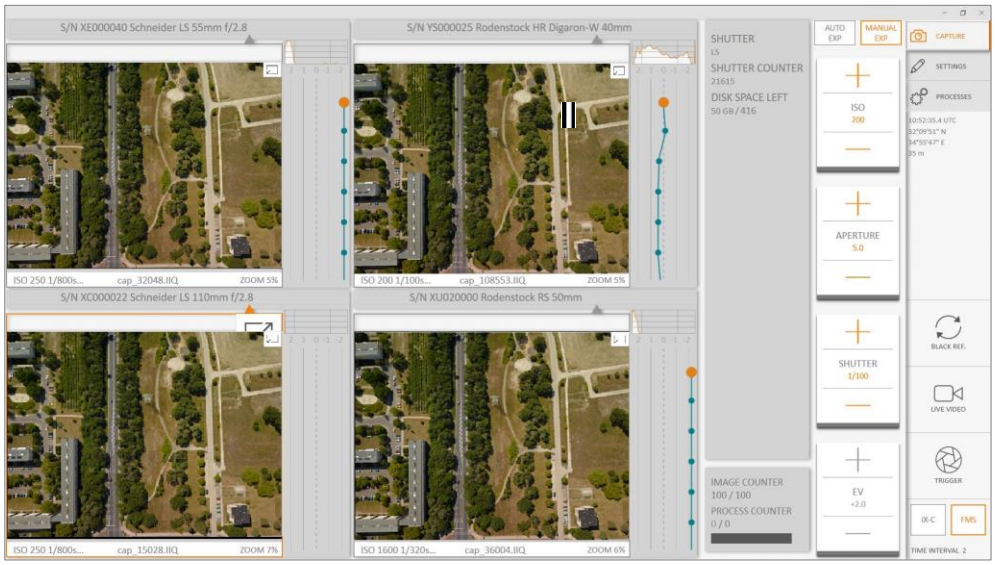
4.7 Inspecting Images

Images display on screen immediately after capture.

4.7.1 Multiple Cameras

When multiple cameras are configured, images from the active cameras are **tiled** in individual windows on screen.

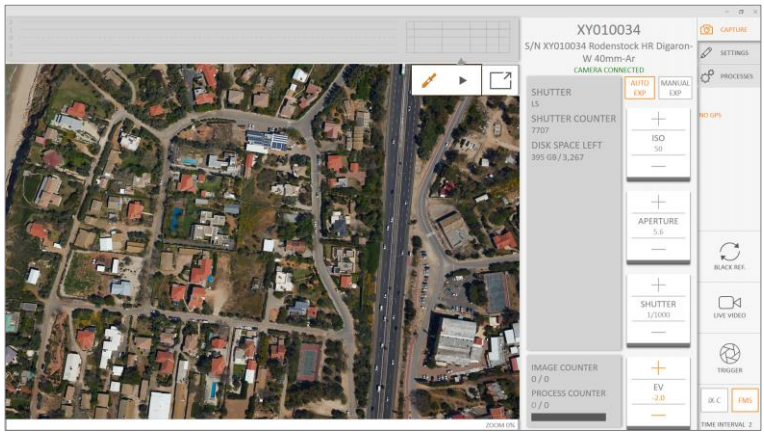
Note: You can move the *non-active* preview windows using "drag & drop". Drag from the camera name or the histogram, not the image itself.

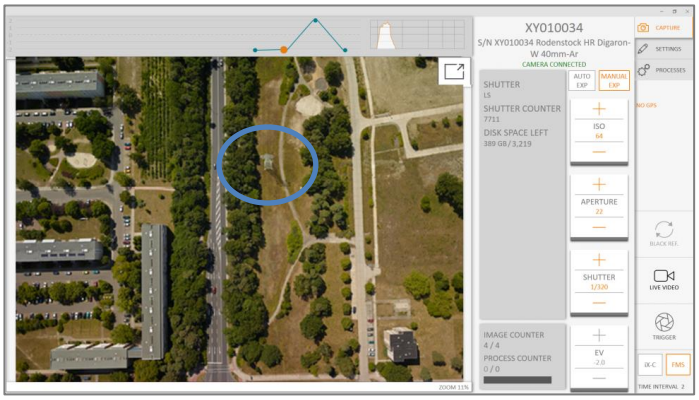
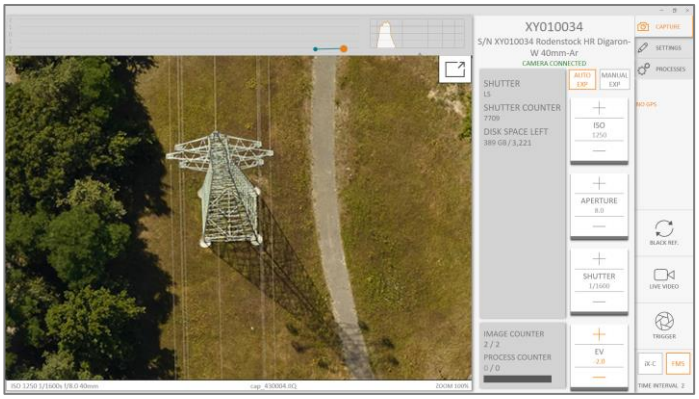


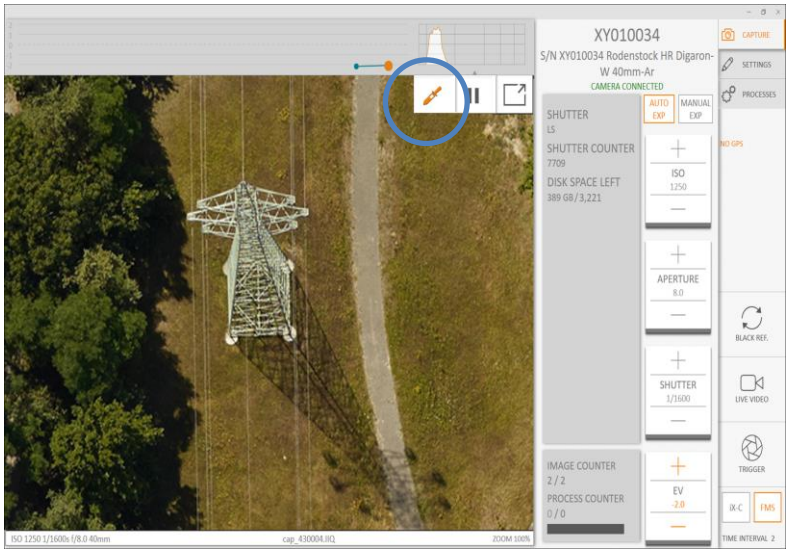
Multiple cameras; Tiled image windows

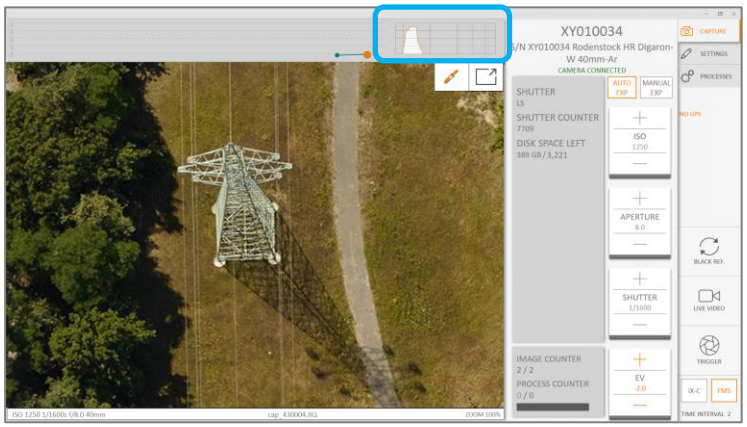
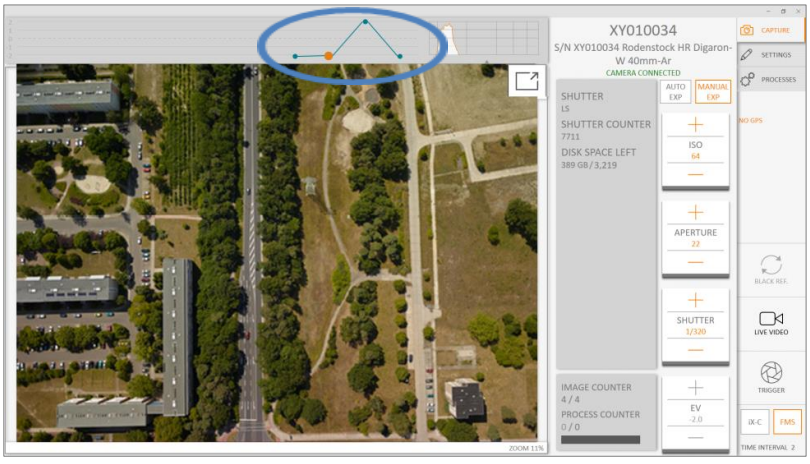
4.7.2 Implementing Inspection functions

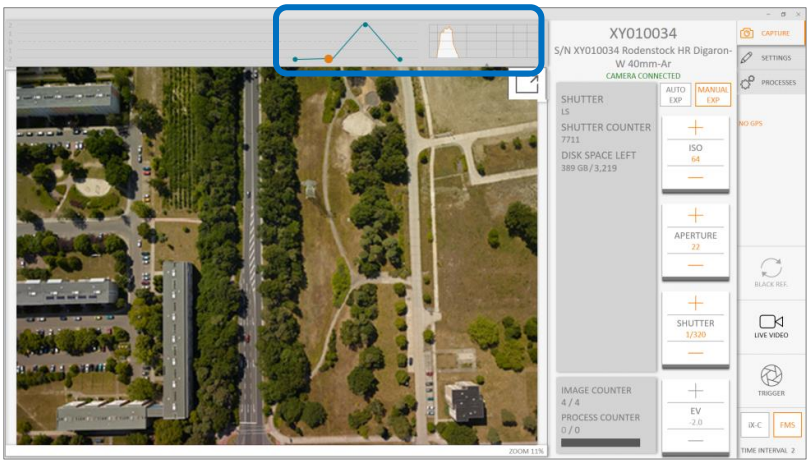
Function	Description
Pausing Image Display	To view and inspect the current image while continuing to capture, pause the image display; the camera continues to capture and store images. **To pause the image display**: 1. Click once on the image. A pause icon (and the Picker tool) displays in the upper right corner of the image area (they will disappear in 3 seconds if you do nothing). 2. Click the pause icon. The image display pauses and the icon **toggles** to **play**. 3. To restart the image display, click the play icon. The last image captured displays. **Notes:**

Function	Description
	▪ *Pausing the image display does **not** affect the processing queue (when enabled).* ▪ *Each image displays **only until the next image arrives** (at which point the new image displays). To retain an Image in the display for inspection a specific image, click the Pause icon (as described above).* 
Zoom	You can zoom into an image to enlarge it and inspect details not easily visible in normal view. **To zoom in on an image**: 1. **Double click** the image area to view at 100 percent. The image zooms to 100 percent and display of new images pauses. 2. **To view other areas of the image**, click and hold the left mouse button and drag the image. • When using a touchscreen, touch the screen and drag with your finger. The screen image pans. 3. Double click **again** to return to normal view. The image zooms out to normal view, the percent zoom is listed at the bottom right of the image area. The Play icon displays in the upper right of the image. 4. To resume viewing new captures, return to normal view then, in: a. **FMS** mode (camera controlled by an FMS): Click **Play**. b. **IXC** mode (trigger button triggers camera): Click **Trigger** or **Play**. c. **Auto Exp**: Click **Play**. **Notes:** ▪ *The zoom feature also works with multiple cameras.*

Function	Description
	▪ *To move to a specific point to the center of a zoomed image* — *Double click the image.* — *Click once to center.*  **Area to be centered**  **Image zoomed and centered**
Customizing White Balance with the WB Picker	The WB Picker customizes the white balance (WB). Click the image to display the WB Picker. It displays in the upper right-hand corner of the image for about 3 seconds unless the image is paused (see: ”Pausing Image Display”). **To customize the white balance of images before capturing**: 1. Go to the Capture screen and display the histogram. 2. **Click the image.** The picker and pause tools display in the upper right of the screen. 3. Click the Pause tool, then the Picker, then click the area of the captured image that you want to use as a reference to white color. This captures the white balance of that area as a **Custom WB.** The white balance setting of that area is now used on this and subsequent captures. The **WB** setting in Settings > Camera > Image becomes “**Custom**” and

Function	Description
	is used for the rest of the session. **Note**: In *subsequent* sessions, this WB is the "Last WB" 4. Click the **Play** icon to capture images using the custom WB. 5. Click the Picker tool to return to normal display. **Notes**: ▪ *To **return** the white balance to Daylight:* ▪ *Go to Settings, select the camera, click Image, click WB, then select Daylight from the dropdown.* ▪ *For more details about setting the white balance, see "Setting White Balance".*  *WB Picker*

Function	Description
Reading the Histogram	You can view exposure details from the Capture screen. This enables you to evaluate the actual image exposure. These histograms correspond to the actual number of pixels at each level, from pure black (color 0) to pure white (color 255). • In **underexposed** captures, the histogram moves to the **left.** • In **overexposed** captures, the histogram moves to the **right**. 
Evaluating Exposure	The Exposure tab is used to evaluate and adjust an image based on exposure values. It provides a visual illustration of an image's exposure. When an image is captured, it is represented in the Exposure History window as a dot. • When the image is properly exposed, the dot representing it is placed **on** the zero line. • When the dot is **above** the line, the image is **overexposed**. • When the dot is **below** the zero line, the image is **underexposed**. The display covers a range of four exposure values (f/stops). If captures are over or under exposed, adjust the capture settings so that subsequent captures are properly exposed. 

Function	Description
Understanding Exposure History	The exposure history is a useful way of viewing the consistency of exposures. In the Exposure History window, the **currently viewed** capture is indicated as an **orange** dot. **Previous** exposures are shown as **blue** dots. When only the current and previous captures are shown, there are no blue dots to the right of the orange dot. Blue dots to the right are captures in the buffer which were not shown. 
Changing Exposure	You can change exposure settings from the **Capture** screen. To change exposure settings: 1. For ISO, Aperture or Shutter speed. click the **+** or **—** to increase or decrease the value. 2. Or, click ISO, Aperture or Shutter. A drop down displays the available values for that parameter. 3. Select the appropriate number. All subsequent captures use the new exposure setting. 4. Check the histogram and exposure value to ensure that the new exposure is appropriate.  **Note:** ▪ *The + sign and the – sign gray out when the current value is at the limit of its range.*

4.8 GNSS Data

The camera can be connected to a GNSS system with a Phase One Control Cable via a data terminal on the back of the camera (left terminal). The camera writes the GNSS data to each EXIF file. During each capture, the following GNSS data is displayed for each captured image if your GNSS system provides this data:

- Time GNSS (UTC time of day or weeks:seconds)
- Latitude Longitude
- GNSS Altitude

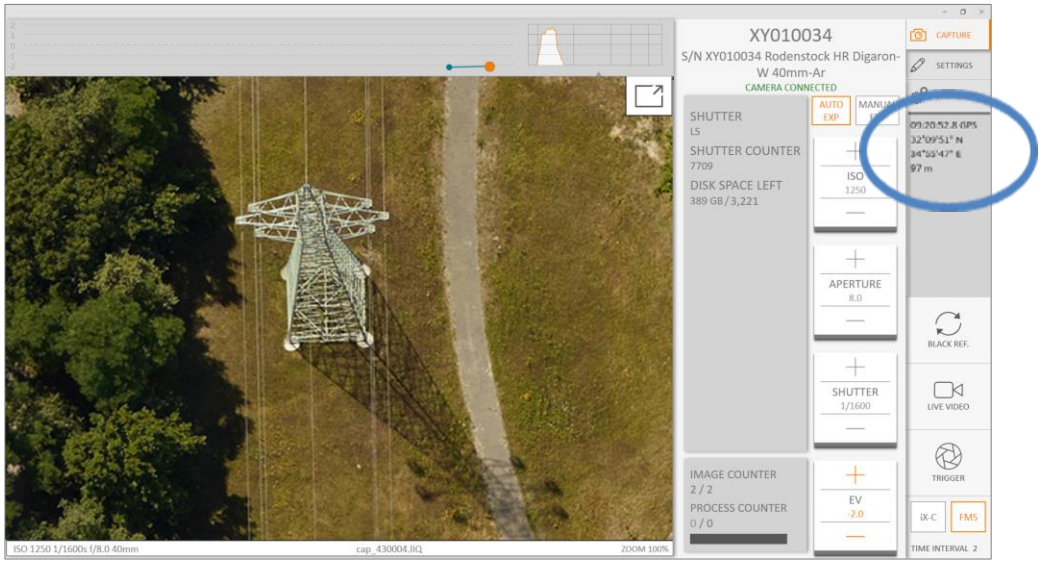
To activate the GNSS Data feature, refer to the section “Configuring GNSS Recording”.

A GNSS Installation Guide for Phase One aerial cameras is available from the Downloads section of http://industrial.phaseone.com.

4.9 Viewing GNSS Data

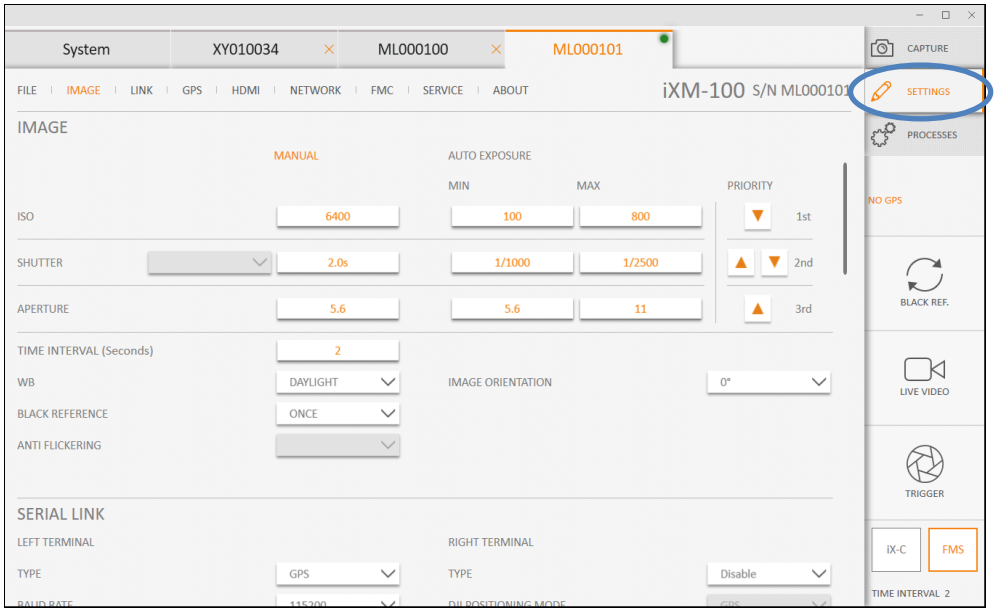
The Capture screen displays four GNSS data items on the right side of the screen. The values displayed are the GNSS values recorded with the last image capture.

If a GNSS is not connected to your camera, the fields are not populated with data and NO GNSS text flashes to show lack of data. Click on the caption to stop the flashing.

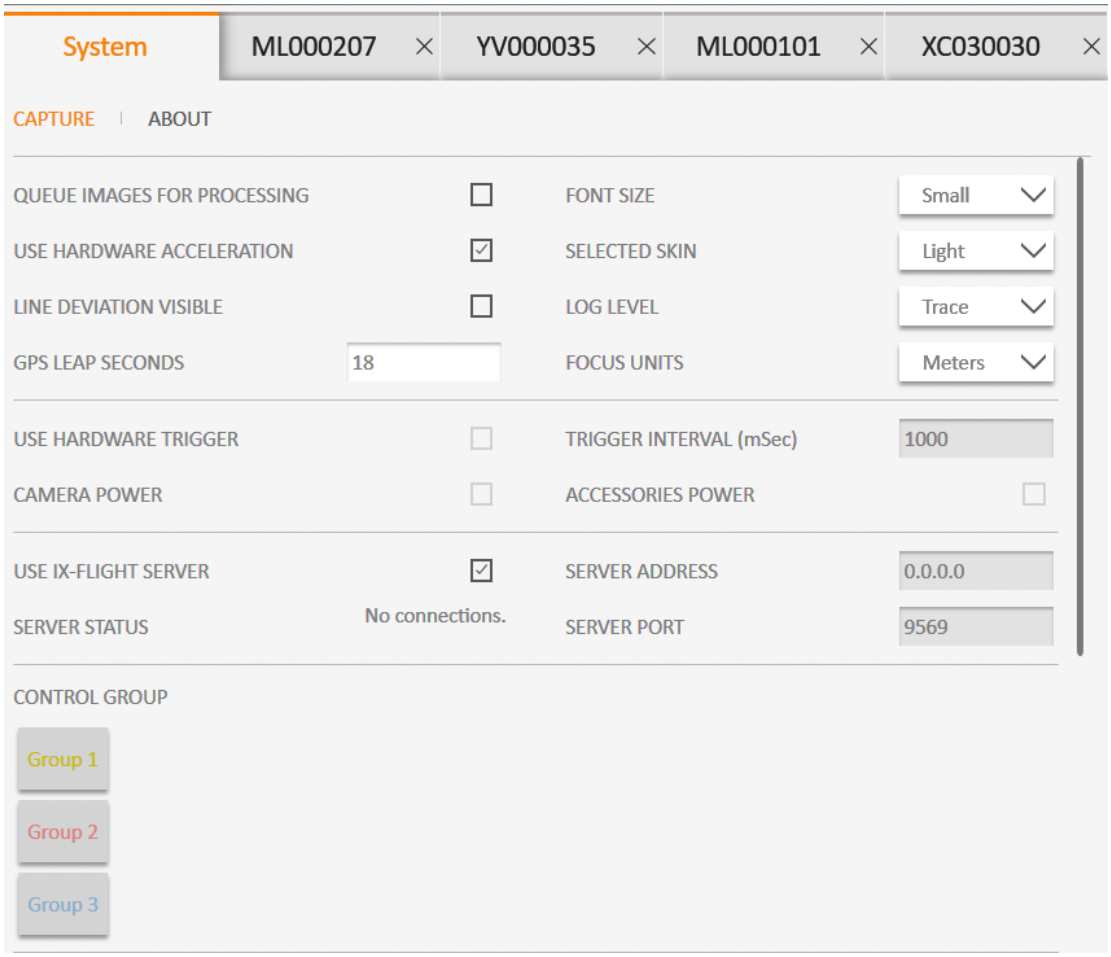


5 Settings Tab

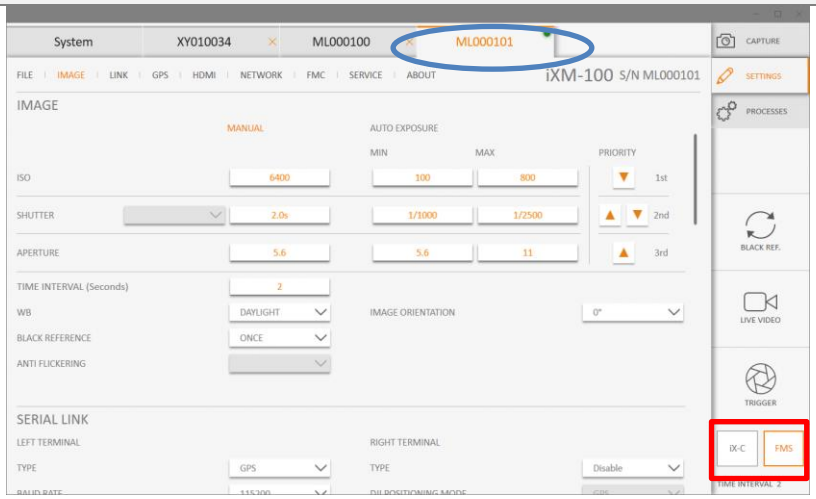
Configure general **system** settings and **camera** settings from the **Settings** tab.

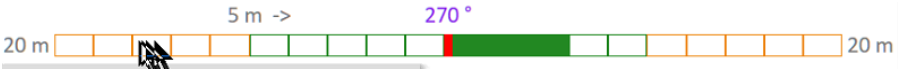


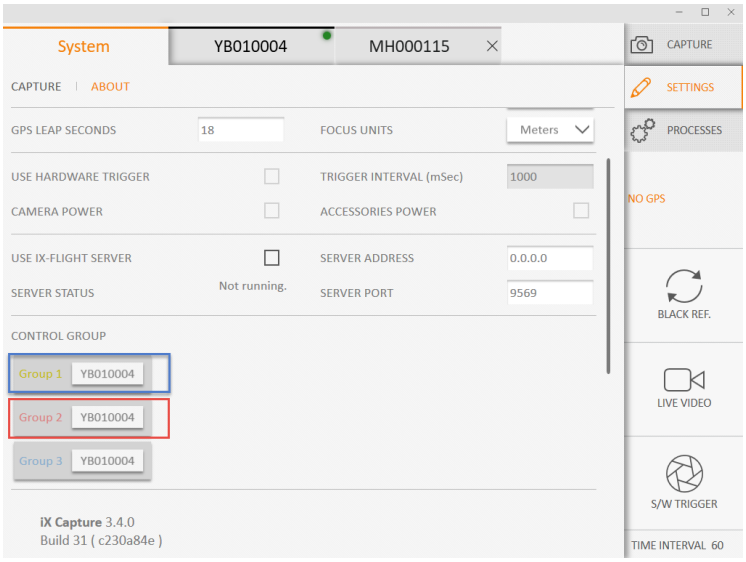
5.1 Settings: System



Function	Description
Setting Capture Mode	To select the system for controlling the camera: 1. Tap the Capture tab. 2. Select (see bottom right of figure in "Selecting Camera"): • **FMS** for control via the Flight Management System. • **iX-C** for *iX-Capture* control at predetermined intervals.
Selecting Camera	1. Tap the Settings tab. 2. Select the camera (e.g., ML000101).

Function	Description
	
Queuing Images for Processing	Images can be queued for processing by the iX Capture app. The function **QUEUE Images For PROCESSING** is used for processing *while* capturing, or to select images for later processing. Processing while capturing is not recommended as it uses large amounts of computing resources and may negatively effect the performance of flight management system. For further information on how to set parameters for the processed files (the Recipe), refer to the section “ Processed Image Parameters”. **To set the queue for image processing:** 1. Go to Settings > System tab. 2. Select the (System) Capture tab. The (System) Capture screen appears. 3. Click the check box next to **Queue Images for Processing** either ON or OFF. 4. Set the Process Recipe in Settings > Camera > Processes if it has not already been set.
Using Hardware Acceleration for Processing	iX Capture is able to use a GPU (Graphic Processing Unit). Hardware acceleration is selected by default. The application determines if your system is compatible and hardware acceleration is automatically turned off if it is unsupported
Font Size	Select **small**, **medium** or **large** font size.
Selecting a Skin	There are two different skins available: light (for daylight in cockpit operation) and dark (for office use). **To select a skin:** 1. Go to Settings > System tab. 2. From the dropdown menu beside Selected Skin, select either:

Function	Description
	• Light • Dark The skin changes appearance to match your selection.
Selecting Log Level	iX Capture creates a log for use by the Support team for analysis. **To select the logging level:** 1. Go to the Log Level dropdown menu; you can select the level of detail (Error, Normal, Info, Trace). 2. Leave the level at its default position unless the Support team asks you to change it. The log file is stored at C:\Users\[USER]\AppData\Local\iX Capture\Logs **Note:** ▪ *Change [USER] to your Windows user name to access the log.*
Line Deviation Visible	Checking this brings up a line deviation guidance information from iX Flight. 
GPS Leap Seconds	The difference between GPS and UTC time in seconds.
Focus Units	Input units to the focus setting arrow for motorized lens. 
Use Hardware Trigger	iX Controller MK3 and up may send either a software trigger through the USB or a hardware trigger through the I/O port. Checking this option sets the trigger to hardware trigger through the I/O port. This option must be used for synchronized multiple cameras.
Trigger Interval (mSec)	Input of trigger interval in milliseconds
Camera Power	Controls the left 3 power ports in iX Controller MK4.
Accessories Power	Controls the right 3 power ports in iX Controller MK4. Should be used for GPS and screens power.
Use iX Flight Server	This option must be checked for the connection between iX Capture and iX Flight to work. When the connection works Server Status will show “1 Connection”. This connection is a must for iX Capture to get Line Number and Image Number from iX Flight for attribution of the image file name. To start the connection click on the camera “on” in iX Flight sensor handler.

Function	Description
Server Address *Server port*	These values are put by the system and should not be changes.
Selecting Control Groups	When controlling multiple cameras, you may simultaneously apply parameters to a group of cameras by pre-grouping the cameras. **To Group cameras:** 1. Click the right Settings tab, then click the System tab (top row). 2. Select the group at the (group line). 3. Click on the cameras to assign to that group. The camera tab shows the group colour. 4. **To rename a Group -** Click on the group name and enter a new name. **Note:** All members of the group must have the same type of camera and lens.  This function is not available while using Auto Exposure.
Version Information and Credits	Displays version and build information. 1. Click **Credits** to display all credits and rights information.

5.2 Camera tabs

Individual camera tabs display when a camera **is currently** connected or **was** previously connected to the current computer.

Notes:

- *The tab of the **active** camera has a green dot in its upper right corner.*
- *Tabs for cameras not currently connected are not active (no green dot).*

- *When multiple cameras are connected, each camera is configured separately (click the camera tab to configure that specific camera).*

5.3 Camera tab controls

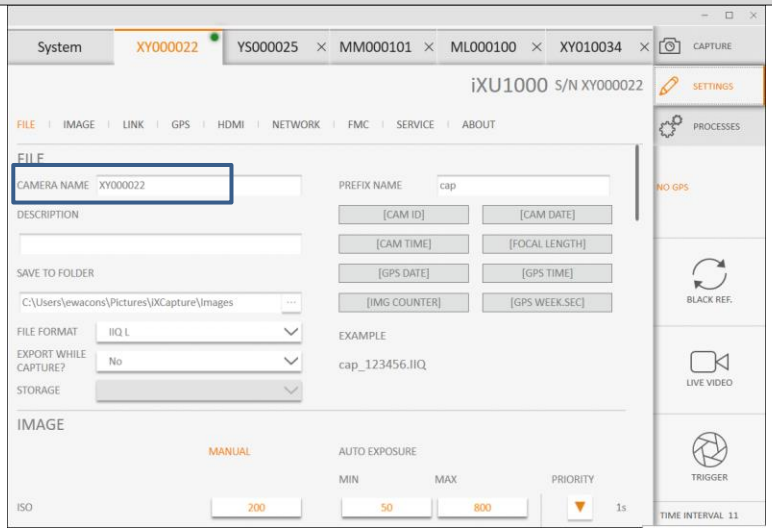
The Settings Camera File tab contains the functions listed below; click the function for instructions:

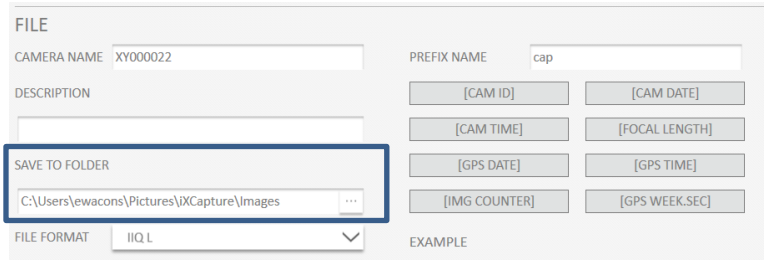
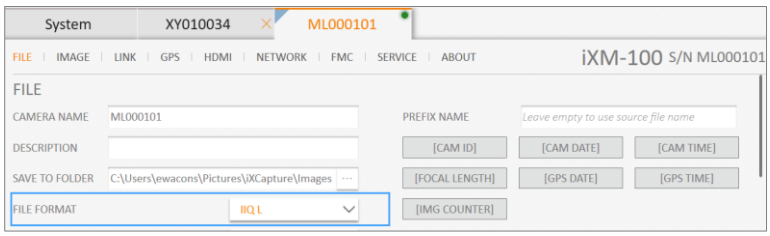
Function	Description
CAMERA NAME	Enter a name for the camera instead of the default serial number. The given name will be displayed on the camera tab. Use short descriptive names.
DESCRIPTION	Enter camera description (e.g. “Forward camera”, Left Camera”).
SAVE TO FOLDER	Saves images to the location entered here.
FILE FORMAT	iX Capture can save files in the following formats: • Raw – An image file containing minimally or unprocessed data from the camera’s image sensor. • IIQ L (large) – 14 bit, a Phase One, **lossless** compression format. • IIQ S (small) – 14 bit, a Phase One, **slightly lossy** compression format; smaller files than iiQ L.
EXPORT WHILE CAPTURE?	Select the name of the recipe to use for export (see the section “Process Recipe”) during capture, or select “No”. **Note**: Phase One does not recommend processing while capturing unless there are *at least* 10 seconds between image captures.
STORAGE	For iXM *only*. Storage options are: **Auto, Host**, **Local** and **Both**.
PREFIX NAME	You can add a predefined, dynamic prefix, to the image file names.
Prefixes	**Note:** An example of the prefixes selected displays beneath the prefix options.
GPS DATE	Inserts the date set in the GPS/GNSS device (for example, 2019-07-10) Due to GNSS message limitation - the capturing PC time and date should be set to UTC (GMT) time and date for the GNSS date to be always correct.
GPS WEEK.SECONDS	Inserts the GPS Time count in weeks and seconds. **Note:** Week 0 begins on January 6, 1980 at the Sat/Sun transition.

Function	Description
IMG COUNTER	Inserts an image counter.
NUM IN LINE	Photography flights are flown in lines; each flight line is numbered and each *image in the line is numbered* separately. **NUM IN LINE** is the number of the photograph in a given flight line. These numbers are part of the flight plan (available when iX Flight is connected).
CAM ID	Inserts the 4 digits of the camera's serial number (for example, C0198 [C for "camera" + 4 last digits])
GPS (GNSS) TIME	Inserts the UTC time of day set in the GPS/GNSS device (for example, 12-41-40, which is 12:41:40 UTC)
GPS EVENT	In Event mode, the GPS sends an event number as part of a response to the mid exposure pulse. This event number is also stored in the GPS internal storage and can be used to connect the image to the GPS data.
LINE NUM	Photography flights are flown in lines; each line is numbered. LINE NUM is the number of a specific line in a flight. These numbers are part of the flight plan (available when iX Flight is connected).
FOCAL LENGTH	Inserts the focal length of the lens being used (for example, L55)
CAM DATE	Inserts the date set on the camera (for example, 2019-07-10)

5.3.1 Implementing File Tab Functions

Function	Description
Assigning a Camera Name	**To assign the camera a name:** 1. Go to Settings > [Camera] > File. 2. Click **Camera Name** field. a) Enter the new name in the CAMERA NAME field and click any field. The new name appears in the Camera tab at the top of the screen. **Notes:** ▪ *iX Capture remembers the camera name. If a camera is disconnected from a computer running iX Capture and reconnected at a later date, iX Capture remembers the camera name and description.* ▪ *If multiple cameras are connected, give each camera a unique name. The names appear in the top tabs.*

Function	Description
	
Add Camera Description	iX Capture enables you to name and describe the camera you are using. If you are using multiple cameras, each camera is identified with its own name and description. **To add a description of the camera:** 1. Go to Settings > Camera > File. 2. Click **Camera Description** field. 3. Add an optional camera description. **Note:** ▪ *iX Capture remembers the camera name. If a camera is disconnected from a computer running iX Capture and reconnected at a later date, iX Capture remembers the camera name and description*
Save to Folder	Set the location to store the images: 1. Go to Settings > Image > File. 2. Click the **Save to Folder** field. 3. Enter the path to the folder to use to store the captured images. Or: a) Click the three dots beside the Save to Folder field. A “Save to Dialog box” opens. b) Browse to the location. The location selection displays in the Save to Folder field on the left. **Notes:** ▪ *When you enter a location for the images, the system automatically creates a subfolder with the name of the camera’s serial number.*

Function	Description
	Recommendation: ▪ *When working in multi-camera mode, save files to more than only one hard drive.* 
Selecting the File Format	**To save files in the required format:** 1. Go to Settings > [Camera Tab] > File. 2. In the File Format drop down box select: **IIQ L**, *or* **IIQ S** The format selected is highlighted. 
Export While Capturing	Select the appropriate processing recipe (see the section ”Process Recipe”) from the dropdown menu. It runs image processing while capturing. **Note**: Use this option **only** when using a high-performance computer.
Storage	For iXM *only* (other cameras are greyed out). **Select:** • Auto – Auto selected • Host – Stores on PC, turns Local off • Local – Stores on camera, turns Host off • Both – Stores on both
Image Prefix Name	Sets the prefix, format and location of image files. **To set the image name prefix:** 1. Go to Settings | Camera | File. 2. Place the cursor in the prefix name field (also works for Camera Name) and click the predefined prefix button. The prefix is placed into the name field; the button is highlighted with an orange border. **Notes:**

Function	Description
	▪ *The image numbering, in the suffix of the name, is continuous and reflects the actual number of images recorded by the sensor module.* *If the camera is disconnected and reconnected at a later date, the numbering starts from the last number used by the camera. This unique identifier is not changeable.* ▪ *The Image Counter Prefix can be edited to enable correlating numbering among cameras.* ▪ *If a name prefix is not selected, the last name prefix appears by default.* **Prefixes** Dynamic file prefixes are dynamic names added to the beginning of each file's name. You can combine any of the seven dynamic file prefixes in any order. **To set the Dynamic File Prefix**: 1. Go to Settings > Camera > File. 2. Next to the **Name Prefix** field, click one or more of the dynamic prefixes. The dynamic prefix appears in the File Prefix field. • **GPS DATE (GNSS)** — Inserts the date set in the GNSS device (for example, 2015-11-10) Due to GNSS message limitation - the capturing PC time and date should be set to UTC (GMT) time and date for the GNSS date to be always correct. • **GPS WEEK.SECONDS** - The GPS Time count in weeks and seconds. Week 0 begins on January 6, 1980 at the Saturday/Sunday transition. • **IMG COUNTER** - Inserts a counter of all images since start of the current mission. To edit the Image Counter**:** 1. Click on the field and click **Enter** to start editing. 2. Enter the edits. 3. Click **ESC** to stop editing To remove a file prefix, click on the prefix, re-click the prefix. • **NUM IN LINE** — Photography flights are flown in lines; each flight line is numbered and each *image in the line is numbered* separately. **NUM IN LINE** is the number of the photograph in a given flight line. These numbers are part of the flight plan. • **CAM ID** — Inserts the last 4 digits of the camera's serial number. (For example, C0198 (C for camera + 4 last digits)) • **GPS/GNSS TIME** — Inserts the UTC time of day set in the GNSS device (for example, 12-41-40, which is 12:41:40 UTC)

Function	Description
	• **GPS/GNSS EVENT** — In Event mode, the GPS sends an event number as part of a response to the mid-exposure pulse. This event number is also stored in the GPS internal storage and can be used to connect the image to the GPS data. • **LINE NUM** — Photography flights are flown in lines; each line is numbered. LINE NUM is the number of a specific line in a flight. These numbers are part of the flight plan. • **FOCAL LENGTH** — Inserts the focal length of the lens being used (for example, L55) • **CAM DATE** — Inserts the date set on the camera (for example, 2015-11-10)

5.4 Image Controls

The Settings Camera Image tab configures the following controls for each connected camera:

- ISO
- Shutter
- Aperture
- Auto Exposure Range
- Auto Exposure Priority
- Time Interval
- White Balance
- Black Reference
- Anti-Flickering
- Image Orientation
- Preview Size

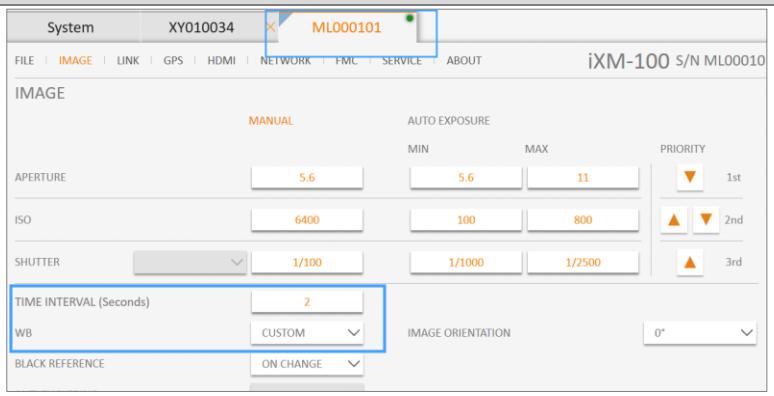
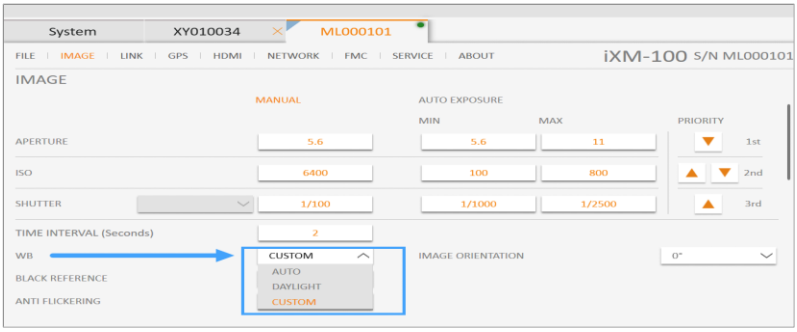
Note:

- *ISO, aperture and shutter speed can be changed during operation from the Capture screen in Manual Exposure mode.*

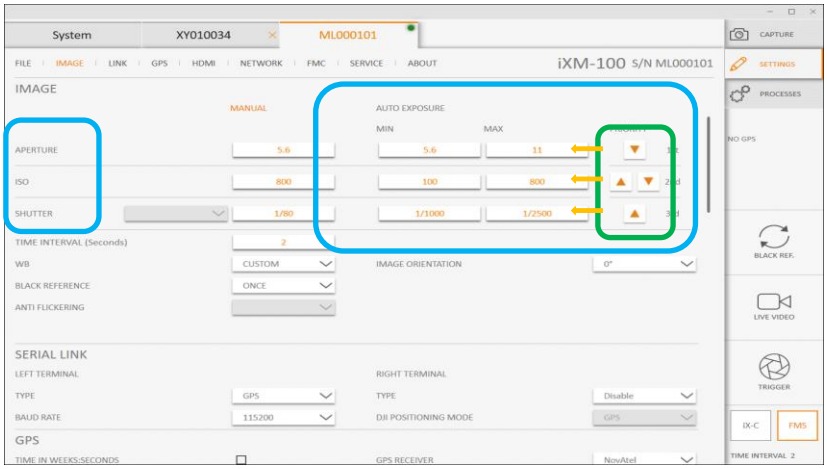
5.4.1 Implementing Image Controls

Function	Description
Aperture	Sets Aperture values. **To set the Aperture**: 1. Go to **Settings**. 2. Click the tab for the camera in use and click **Image**. Then: **Manual**:

Function	Description
	3. Tap the current Aperture value, a scroll box opens; scroll to the aperture value to use and click it. The value selected is now the manual shutter speed. **Auto Exposure:** 4. See “To set the Auto Exposure Range”.
ISO	Sets ISO values **To set the ISO**: 1. Go to **Settings**. 2. Click the tab for the camera in use and click **Image**. Then: **Manual**: 3. Tap the current ISO value, a scroll box opens; scroll to the ISO value to use and click it. The value selected is now the manual shutter speed. **Auto Exposure:** 4. See “To set the Auto Exposure Range”.
Shutter	Sets Shutter speed. **To set the shutter speed:** 1. Go to **Settings**. 2. Click the tab for the camera in use and click **Image**. Then: **Manual**: 3. Tap the current Shutter speed, a scroll box opens; scroll to the shutter speed to use and click it. The value selected is now the manual shutter speed. **Auto Exposure:** 4. See “To set the Auto Exposure Range”.
Setting Time Interval	**To set the time interval between auto captures:** 1. Go to **Settings**. 2. Click the tab for the camera in use and click **Image**. 3. In the Setup area, click on the **Time Interval** to open the drop-down menu. 4. Select the time interval to wait between auto captures. This selected interval is now used for the upcoming captures.

Function	Description
	 *Camera select, Time Interval & WB (White Balance)*
Setting White Balance	iX Capture enables you to set the white balance (WB). The default setting is **Daylight**. (See previous figure.) To set the white balance of images about to be captured: 1. Open the Settings tab and click the **Setup tab** (top of screen). 2. In Setup, click the WB **dropdown** box and select the balance to use: • **Daylight:** Uses the average daylight balance • **Last:** Now uses the previously customized WB. The WB selected is highlighted. **Notes**: ▪ *Use the WB Picker to customize the WB in flight. The picker is at the upper right corner of a paused picture. See "Customizing White Balance with the WB Picker".* ▪ *After using the WB picker, the WB switches from Daylight to **Custom** and the new WB value is stored for future setups.* 
Black reference	A black reference capture is used to cancel noise inherent to the capture process due to physical and/or environmental conditions. **For instructions on how to make a Black reference capture, click here.**
Anti-Flickering	Anti flickering options (in Live View) are: OFF, 50Hz, 60Hz.

Function	Description
	Note: The function is active only for iXM.
Setting Auto Exposure	Auto exposure controls the camera's three exposure parameters: • ISO • Aperture • Shutter speed The camera's exposure parameters can be controlled **manually** or with **auto exposure** by selecting the corresponding settings on the Setup tab. When in auto exposure mode, the camera reads the histogram of each image after capture and adjusts the exposure parameters for the next image. Adjustments are in increments of 1/3 f-stop. **The following Auto Exposure Mode options are available:** 1. Auto Exposure Range (see "Setting Auto Exposure Ranges"). 2. Auto Exposure Priority (see "Auto Exposure Priority"). 3. Auto Exposure Mode (on the Capture screen). 4. Adjust EV Bias (on the Capture screen). **The camera uses the following parameters for the first exposure**: • ISO - The value selected in Auto Exposure Minimum. • Aperture - The **average** value of the Aperture's Auto Exposure Minimum / Maximum. • Shutter speed - The value set in the Shutter's Auto Exposure **Maximum**. 5. Capture a few images before your first flight line in order for auto exposure to set the optimum exposure. If you have activated FMC (only with CCD iXA and iXU Camera products), Auto Exposure Mode controls ISO and aperture only. Shutter speed is controlled manually. When Auto Exposure mode is activated, the exposure parameters (ISO, aperture and shutter speed) in the Capture screen are disabled.
Setting Auto Exposure Ranges	To keep your exposure parameters within the range you prefer, set Auto Exposure minimum and maximum values. The default auto exposure range is automatically set based on the optimum settings for each camera and sensor. You can choose to use the default settings or to create your own. **To set the Auto Exposure Range:** 1. Go to Settings. 2. Click the tab for the camera to configure. 3. Click the Image tab at top. 4. In the Image settings area do the following: a) Set the Min/Max values for **Aperture**, **ISO** and **Shutter**.

Function	Description
	To set an Auto Exposure value: Click the current value to open a scroll bar. Scroll to the value to enter and click it. The value selected appears in the display. b) Set the order of priority (use the arrows) in the Priority area. The top arrow moves the priority of the parameter on the top line. The middle arrow moves the priority of the parameters on the middle line. The bottom arrow moves the priority of the parameter on the bottom line.
Auto Exposure Priority	Auto Exposure Priority is the method in which the camera adjusts the three exposure parameters (ISO, aperture and shutter speed) to ensure proper exposure. When in Auto Exposure mode and when an exposure adjustment is needed, the camera adjusts the first parameter until it reaches the minimum or maximum level that you choose. Then continues to the second parameter, and if needed, continues to the third. **To ensure that a specific Auto Exposure value is chosen:** 1. Set both the minimum and maximum to that specific value.  *Setting Auto Exposure* **Note:** ▪ *Once the ranges are selected, they become the camera's new default range for auto exposure.*
Camera Orientation	Orientation of the camera with respect to flight direction **Orientation Options are 0°, 90°, 180°, 270°**
Preview Size	Select the preview size of the capture. Options are: • 640 x 480 • 1280 x 960

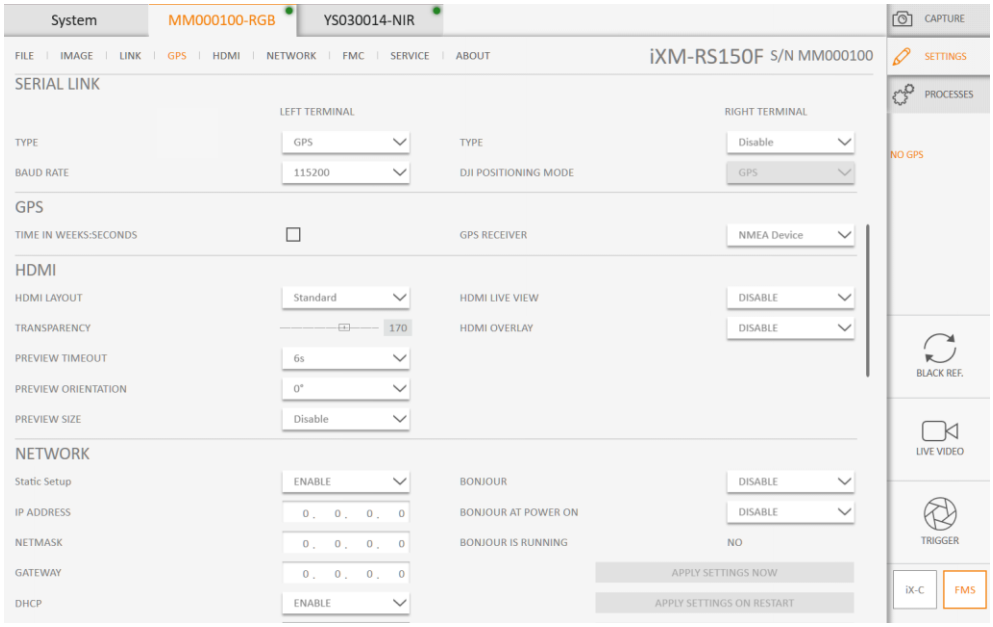
Function	Description
	• 1920 x 1440 • 2560 x 1921

5.5 Serial Link Controls

1 For GPS connections, select GPS.

2 For DJI Positioning mode, select **DJI Link**.

3 Select the required Baud Rate

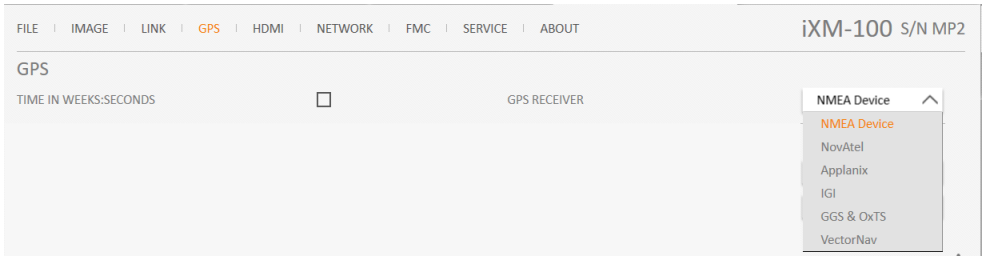


Left and **right,** refer to the Lemo connectors on the camera.

Function	Description
Left Terminal TYPE	Options are: GPS, OFF
Left Terminal BAUD RATE	Sets the communication baud rate.
Right Terminal TYPE	**The control is active for iXM cameras only.** Options are: Disable, iX Link, DJI Link.
Right Terminal DJI POSITIONING MODE	**Active for iXM cameras only.** To use the DJI drone, set the mode: to DJS or RTK.

5.6 Configuring GNSS Recording

The camera can accept and record GNSS information in "Event Mode" or in "NMEA Mode".



To activate "Event Mode" recording

Select the type of GPS you are using from the drop down list.

In "Event Mode", the GNSS sends a set of data in repose to the mid exposure pulls received from the camera. This data is accurate at the time of the mid exposure pulls. In "NMEA Mode" the GPS sends asynchronous messages. The camera records the last message before the mid exposure pulls.

To activate "NMEA Mode" recording

Select "NMEA" from the drop-down list.

In both of the above, consult the Phase One "GPS/IMU Installation Guide" and the relevant GNSS manual for proper GNSS configuration.

- The data is recorded in the pictures' EXIF data.
- IMU information is recorded in the XMP area.

To activate GNSS data recording:

Select GPS in the left terminal; select the GNSS type and the communication baud rate.
Note: When GNSS is available, the data is used and presented.

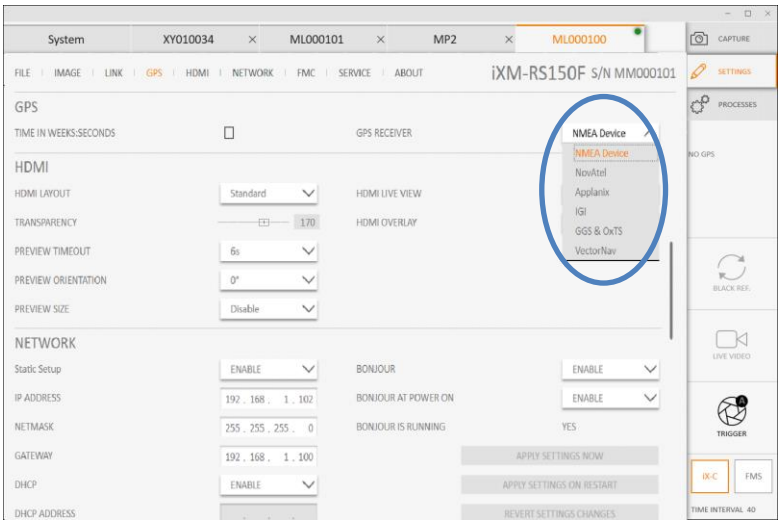
After taking a picture, the GNSS data (coordinates, height and time) display in the GNSS information section at the right of the screen.

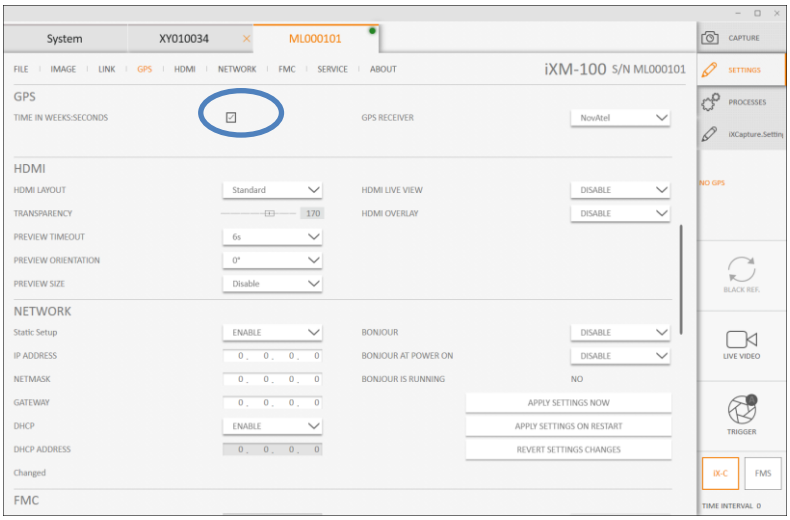
Notes:

- *When using a multi-camera setup, configure each camera separately; connect the camera to the others only with a **Phase One multi-sync cable**.*
- *When using two cameras, connect the Phase One control cable from the first camera to the GNSS via **data terminal A** (the left terminal of the two).*
- *Then, use a Phase One multi-sync cable, to connect **data terminal B** (the right data terminal) with data terminal A of the second camera.*

- *When connecting an iXA with iXU/iXM, consult the iXU or iXA installation guide and order a special **iXU to iXA multi-sync cable**.*

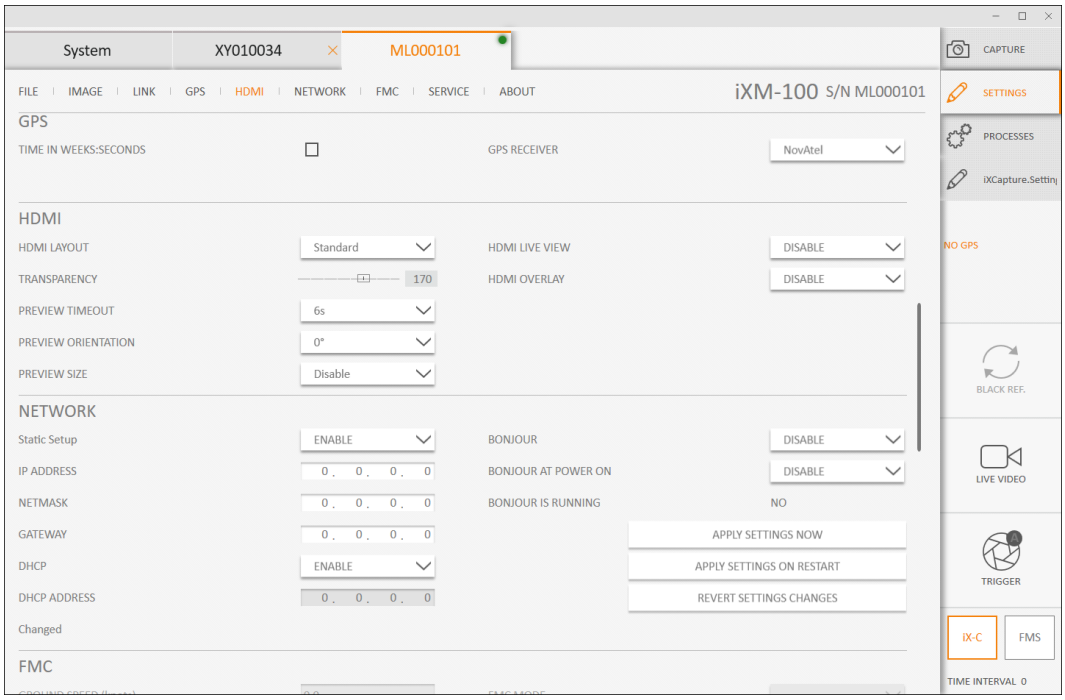
5.6.1 Implementing GNSS Recording

Function	Description
Selecting a GNSS Receiver	**To select your GNSS receiver**: 1. Go to Settings > Camera > GPS (or GNSS). A dropdown box appears with a choice of six GNSS receivers: • NMEA Device • NovAtel • Applanix • IGI • GGS & OxTS • VectorNav (**only** with iXM) 2. Click the device you are using. 3. Consult the GNSS Instantiation Guide for the proper configuration of GNSS set. 

Function	Description
iXU-RS-1900/iXM-RS280F operation with GNSS	When a GNSS is connected, the iXU-RS-1900/iXM-RS280F adds specific meta data (the **GNSS event ID**, or the GNSS **time**) to each image. That data is used to select the image sets for processing. When a GNSS is **not** connected, the camera generates an *internal* **event ID** (instead of using GNSS data) and uses the communication port to transmit this internally generated data. That (internally generated) data is used later to select the image sets for processing. However, if a GNSS **is** connected but is **not** functioning, the camera does **not** generate an internal event ID; it looks instead for GNSS event IDs, or GNSS time data – but that *data is **not** present*. The result is that there is no data that can be used to automatically select images for processing. Therefore, **To operate the iXU-RS1900/iXM-RS280F with a GNSS:** 1. *Verify that a GNSS is connected and is functioning properly*. 2. If there is no GNSS data – disconnect the wire between the GNSS and the camera to enable the camera to generate its own Event ID.
GNSS time format	**To change GNSS time format from *hh:mm:ss.ss* to *weeks:seconds*:** 1. Go to Settings > Camera > FMC/GNSS (GPS). The Setup page appears. 2. Click the checkbox next to **Time in weeks:seconds**. 

Function	Description
	Notes: ▪ *The EXIF log uses UTC time in HH:MM:Sec. Decsec and in weeks:seconds.* ▪ *Due to GNSS message limitation (the camera does not get the week number from the GNSS messages), we recommend that you **set the computer to UTC date and time**.* ▪ *The accuracy of recorded time is the accuracy available in the GNSS message and can be as precise as microseconds.*
EXIF LOG	The EXIF log is generated in CSV format for Global Mapper and in tab delimited TXT format for other software tools. The EXIF log is located in the Image directory and contains the following: • File name • Time • GNSS location • Event ID • IMU angles (if connected) • Exposure parameters

5.7 HDMI Controls



5.7.1 Implementing HDMI Controls

Function	Description
HDMI Layout	STANDARD, DJI
Transparency	Slider values from 0 – 255. 255 is completely solid. Zero is completely transparent.
Preview timeout (seconds)	2, 4, 6, 10, 15, 30
Preview Orientation	The orientation of the image relative to the orientation at the camera. Options: 0^0, 90^0, 180^0, 270^0
Preview Size	DISABLE, SMALL, LARGE
HDMI Live View	DISABLE / ENABLE
HDMI Overlay	DISABLE / ENABLE
Focus Peaking	Highlights the areas of sharpest focus in the image with a false-color halo.
Focus Peaking Threshold	Use the slider to adjust the contrast level at which focus peaking activates.

5.8 Network Controls

5.8.1 Implementing Network Controls (for iXM only)

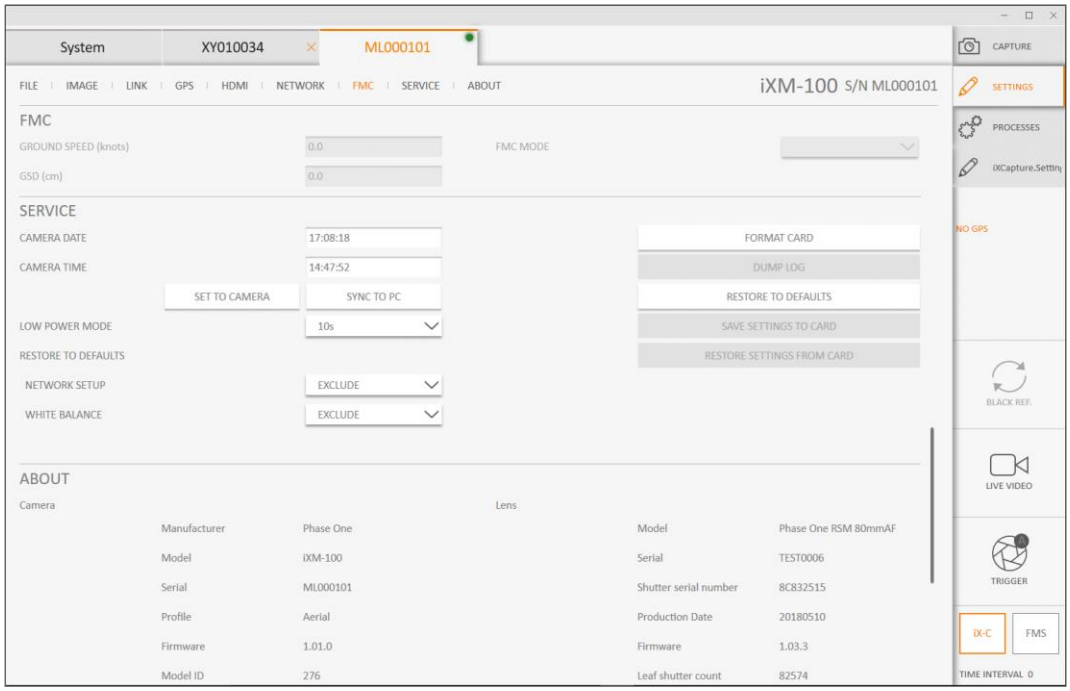
Note: Network configurations must be configured by the user.

Function	Description
10G	The setting to enable iXM cameras' 10G connection. **Note**: Currently, iX Capture connects only to 10G cameras using "Bonjour" implementation. Bonjour must be installed on the computer by the user.
Static Setup	The camera's static IP Address.
IP Address	The camera's NETMASK value.
Netmask	The Gateway for the network that the camera connects to.
Gateway	ENABLE / DISABLE Dynamic Host Configuration Protocol. The DHCP server assigns a dynamic IP address and other parameters to the camera to enable communication with other networks.
DHCP	The address of the DHCP controller.

Function	Description
DHCP Address	The camera's static IP Address. **Note**: ▪ *The factory camera setup is (static configuration):* ► *IP: 192.168.1.xxx* *Where **xxx** are the last 3 digits in camera S/N.* ► *Mask: 255.255.255.0* ► *Gateway: 192.168.1.101*
Bonjour	An Apple implementation for configuring devices through the network.
Bonjour at Power On	ENABLE / DISABLE
Bonjour is Running	YES/NO

5.9 FMC Controls

FMC controls are available only for iXA cameras for which the Forward Motion Compensation (FMC) feature was activated, and Fast Sync (FS) lenses are used



Note:

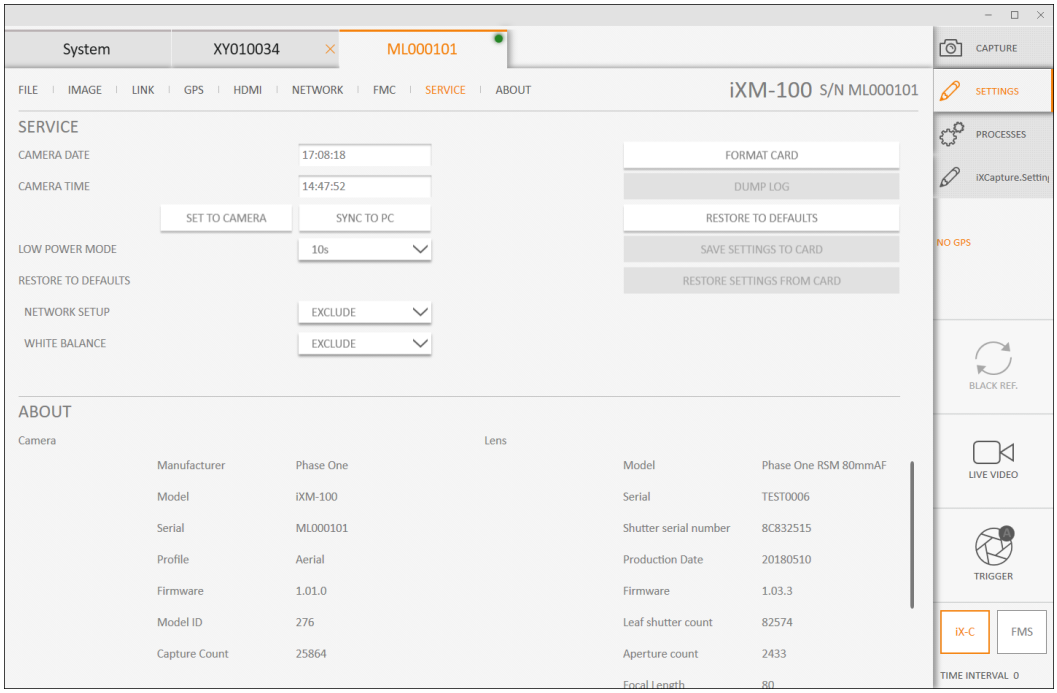
- *Verify that the values entered are identical to the ones used in your flight setup.*

5.9.1 Implementing FMC Controls

Function	Description
FMC Mode (Setting the FMC Direction)	FMC is available as an option on the iXA series, iXA-R series and CCD-based iXU cameras. It can be purchased with a camera or ordered as an add-on that can be activated. A camera operating at FMC mode must be installed in the nadir landscape orientation. You can mount it in either of two (landscape) positions when the camera connectors are facing forward or backward with respect to flight direction. Configure the FMC direction is done on the camera's touchscreen menu. If more than one camera is used, each camera must be configured separately. **To set the FMC direction:** 1. Go to Settings > [Camera] > FMC.

Function	Description
	2. From the **FMC Mode** dropdown menu, select one of the following to set the FMC direction or turn FMC off. FMC direction can be set to either: • Off (disables FMC) • Forward • Backward When FMC is ON, in either the forward or backward modes, the letters FMC and the direction appear on the Capture screen indicating the FMC status. The shutter mode changes to Leaf Shutter if the shutter mode was set to FPS (iXA only).
Inputting Ground Speed	**To input the ground speed:** 1. Go to Settings > Camera > FMC. 2. Click inside the Ground Speed field. The field is highlighted. 3. Enter the ground speed in knots. **Note**: ▪ *When using cameras without FMC, FMC parameters are not displayed.*
Inputting GSD	**To input the GSD:** 1. Go to Settings > Camera > FMC. a) Click the GSD field. The field highlights. b) In the GSD field, enter the **value of the pixel size on the ground** (in **cm**) for the height AGL of the flight. **Note:** ▪ *During the flight, if the height AGL changes, enter the new GSD value.*

5.10 Service Controls (for iXM only)

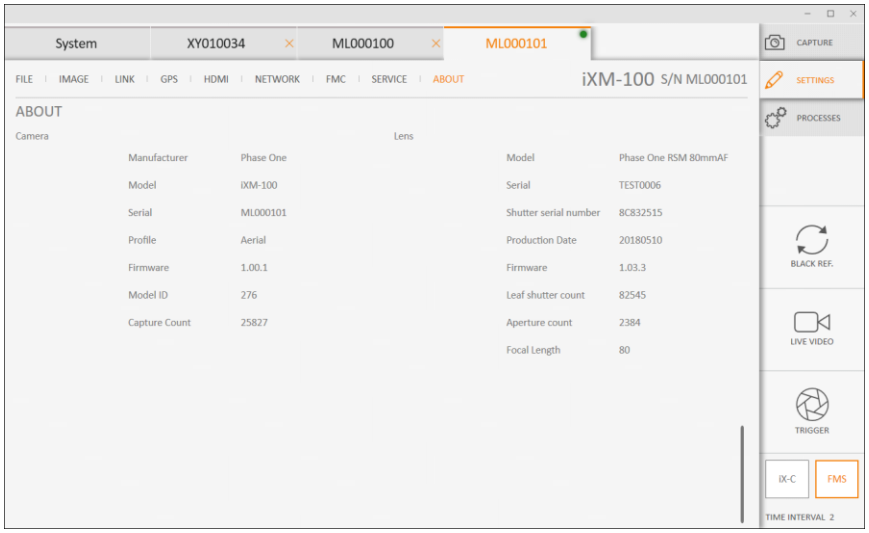


5.10.1 Implementing Service Controls

Function	Description
Camera Date	Initial date is the date of the PC. Click field to edit manually.
Camera Time	**Sync to PC** — Click to synchronize the time to the PC's clock. Or, enter the time manually.
Low Power Mode	The amount of time until the camera enters low power mode. Click to select the amount of time. **Note**: ▪ *Make sure that the value selected here is **greater** than the capture rate.*
Restore to Defaults	Restores to default values.
Network Setup	EXCLUDE/INCLUDE this parameter when using "Restore to Defaults".
White Balance	EXCLUDE/INCLUDE this parameter when using "Restore to Defaults".
Format Card	Formats the memory card. **ERASES ALL DATA.**
Dump Log	Creates a dump log of all of the camera's internal activity. Used by Service personnel.

Function	Description
Restore to Defaults	Restores **all parameters** to their default values subject to the above EXCLUDE limitations.
Save Settings to Card	Saves the current parameter settings to a file on the memory card.
Restore Settings From Card	Restores settings from card.

5.11 About



About Information

Camera Data	Description	Lens Data	Description
Manufacturer	Phase One	Model	Lens model.
Model	The camera's model name.	Serial	Lens serial number
Serial	The camera's serial number.	Shutter Serial	The shutter serial number
Profile	The camera profile (e.g., aerial).	Firmware	Lens firmware version
Firmware	The firmware version.	Leaf Shutter Count	The leaf shutter count. See "Message Area / Counters".
Model ID	The model ID.	Aperture Count	The aperture count. See "Message Area / Counters".
Capture Count	The number of images captured. See "Message Area / Counters".	Focal Length	The focal length of the lens.

6 Processes Tab

The iX Capture Processes tab provides the following options:

- **Export** images from Phase One IIQ compressed format to TIFF or JPG.
- **Generate distortion free images** from IIQ and TIFF images originated at calibrated Phase One cameras.
- **Generate 3-band CIR, 4-band CIR and NDVI images** from images recorded by co-located Phase One RGB and NIR cameras.
- **Generate distortion free images** from IIQ and TIFF images originated by Phase One iXU-RS1900 and iXM-RS280F cameras.
- **Generates large frame** 190 MP RGB and 280MP and CIR images (3 band, 4 band and NDVI) from images recorded by Phase One iXU-RS1900 and iXM-RS280F camera and co-located Phase One NIR camera.

The processes tab is an iX Capture interface for control and monitor of the image-processing phase. It includes two main parts:

- Processing - used for monitoring the status of the process
- Recipe - used for control over the processing.

Exporting Images to TIFF and JPG formats during flight is an available option when a high-performance computer is used. Otherwise, we recommend performing all processing off line.

iX Capture processing can take into account changes made to the image by the Capture One software tool, provided that the source images are **kept in the same directory** in which the changes in Capture One are done.

To edit the radiometric properties of multiple images:

1 Open the RAW images in Capture One,

2 Edit a representative image

3 Apply changes to all images and exit Capture One.

While processing the images, iX Capture will take into account all changes made by Capture One.

6.1 Generating CIRs – How Does It Work?

The processing routine assumes that each image set (RGB and NIR) covers the same area. The process also assumes that the orientation of the RGB camera and NIR camera are fixed, and installed close to each other.

When generating a CIR, the processing routine automatically performs the following steps:

1. Matches RGB and NIR couples using one of the following options:
   a) A **GNSS Event ID** or **time stamp** – when an import directory is selected.
   b) The sequential file order – as selected by the user.

c) Removes distortion in the RGB and the NIR images using the **Australis calibration** data derived by Phase One.

d) Generates an Affine transformation from NIR to RGB using the first couple (if this process fails, the application goes to the next couple).

e) For all following images, after the first couple, the algorithm generates coarse registration using the affine transformation generated by the first couple. This includes adaptation of different scaling of images.

f) Detects a number of well-distributed points of interest in the RGB image.

g) Matches these points with respect to the NIR scene.

h) Determines a projective transform to co-register the NIR image with respect to the RGB image.

i) Co-registers and stacks each NIR image onto the corresponding RGB image (CIR generation).

j) Checks the accuracy of registration at the tie points.

k) Exports the 3-band or 4-band CIR image.

l) Calculates the NDVI of the co-registered and stacked CIR image (optional).

Notes:

- *The RGB and NIR images **must have the same pixel depth** (both of the input images must be represented as either 8 bit or as 16 bit; mixing is **not** supported).*
- *The process generates a log file at C:\Users\[user]\AppData\Local\iX Capture\Logs*

6.2 Generation of 190mp and 280mp Images – How Does It Work?

190 and 280 megapixel images are generated by **fusing** images taken by two camera heads whose image areas have an overlapping area between them.

iX Capture uses the overlap area to generate the fine projective transformation between the two images. When the overlap area does not contain information (e.g., when flying over water, etc.), a geometric fusion may be done by selection of output option that overrides error conditions.

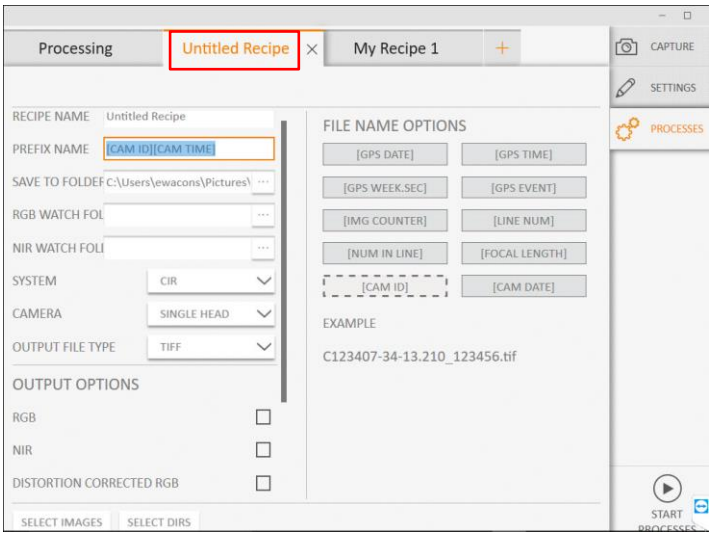
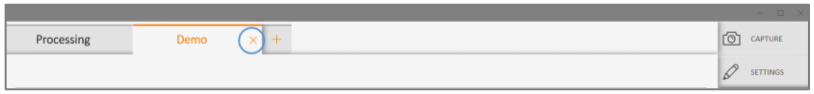
6.3 Process Recipes

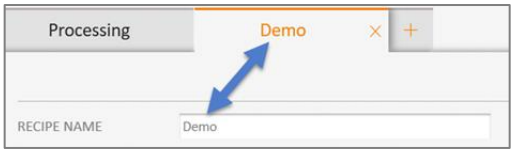
A Process Recipe defines the output files and file types, required by the user, and the input files and required information in order to generate the outputs.

To process files during capture:

1. Create / add a specific Recipe. See “Adding a Recipe”.
   Options include generating TIFF or JPG; offline options include generating TIFF, JPG, (distorted and corrected images) CIR and NDVI.

6.3.1 Implementing Process Recipe functions

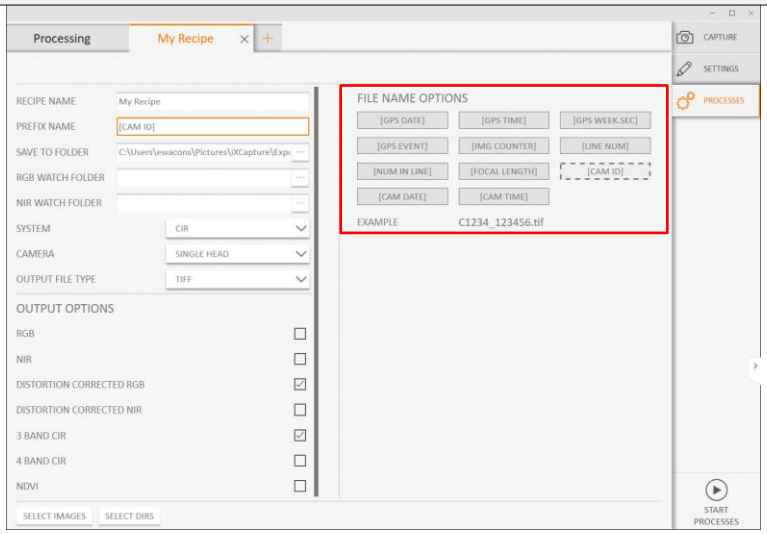
Function	Description
Adding a Recipe	**To add a recipe:** 1. Click on the plus (+) at the right of the upper tabs. A new recipe page displays. 
Deleting a recipe	**To delete a recipe:** 1. Click the “**X**” in the recipe tab name.  A warning message appears. 2. To continue deleting the recipe click **OK**. **Note:** ▪ *Settings related to the deleted recipe are not retained anywhere.*

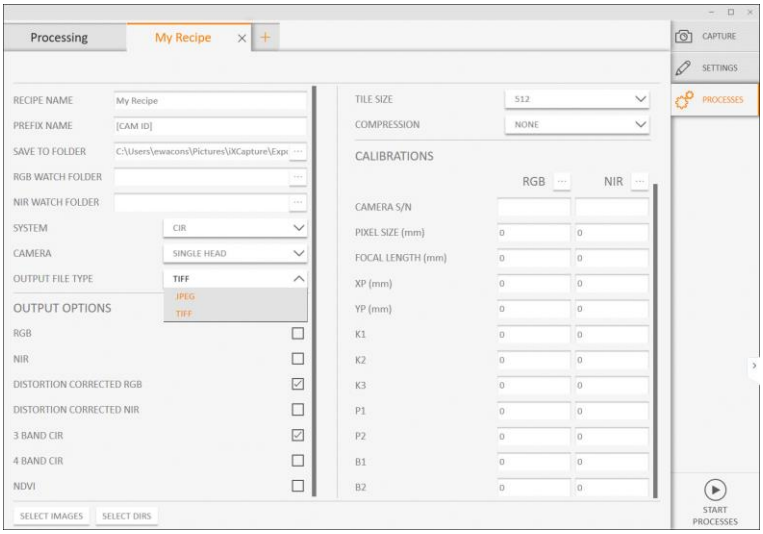
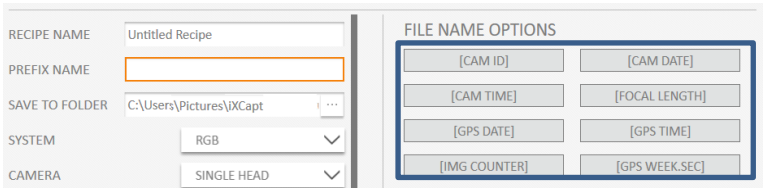
Function	Description
	
Naming a Recipe	**To name a recipe for future identification.** 1. Enter a descriptive name in the Recipe Name field. The Recipe name is now appears on the recipe tab. 

6.4 Selecting Output File Type

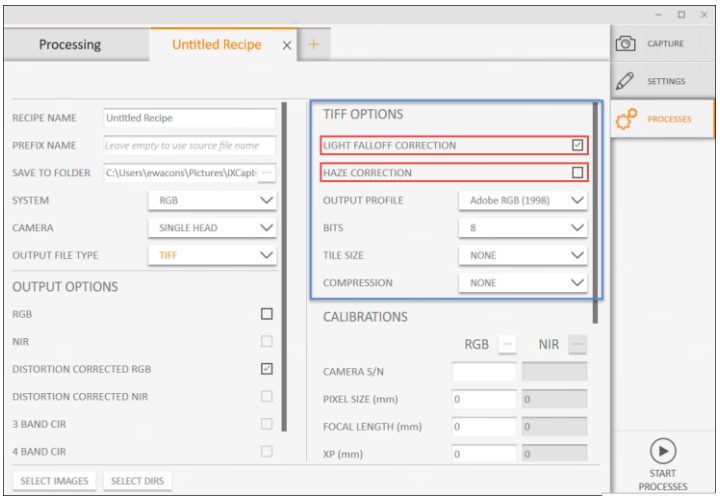
iX Capture can export RAW (IIQ) files to TIFF or JPEG files.

Function	Description
Setting Processed File Prefix Name	You can assign a prefix to output files names. The prefix can be **static** *or* **dynamic**. **Note:** *To keep the original file name do not use this field*. **To set the Static Processed File Prefix:** 1. In the Processed File Prefix field, enter the prefix to use for processed images. **The Process File Prefix replaces the original file prefix**. The file "cap" numbering remains the same. If left blank, the original file name is used.

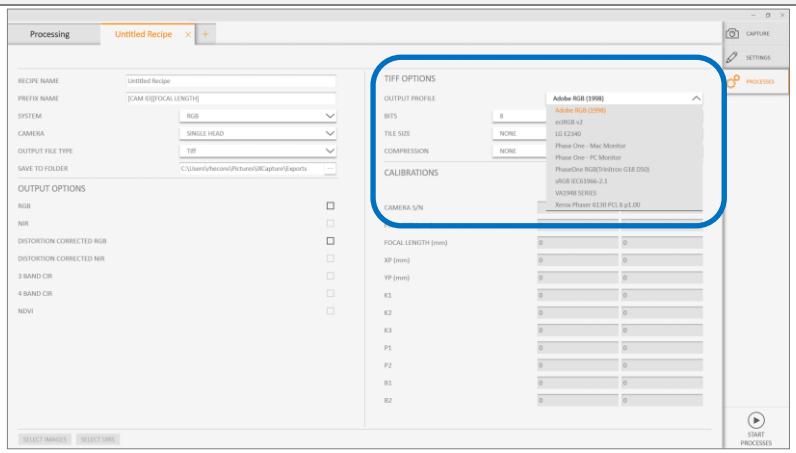
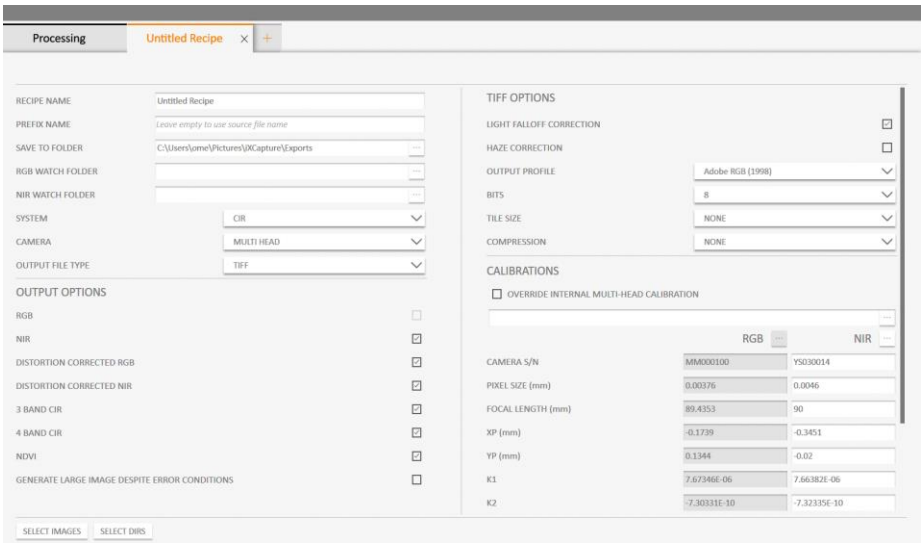
Function	Description
	
Save To Folder	**Set the location to store the images:** 1. Go to Settings > Image > File. 2. Click the **Save to Folder** field. 3. Enter the path to the folder to use to store the captured images. Or: a) Click the three dots beside the Save to Folder field. A “Save to Dialog box” opens. b) Browse to the location. The location selection displays in the Save to Folder field on the left. **Notes:** ▪ *When you enter a location for the images, the system automatically creates a subfolder with the name of the camera’s serial number.* ***Recommendation:*** ▪ *When working in multi-camera mode, save files to **more than one hard drive**.* 
RGB Watch Folder	iX Capture will start automatically, processing RGB images when they are put into this folder. A recipe needs to be set up before.

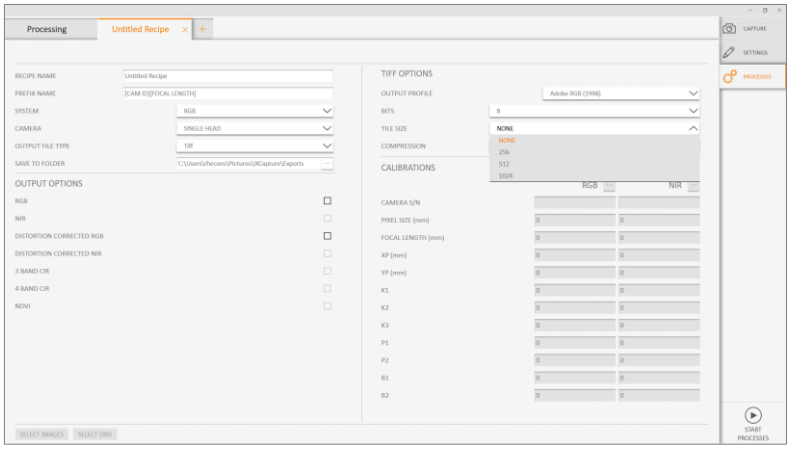
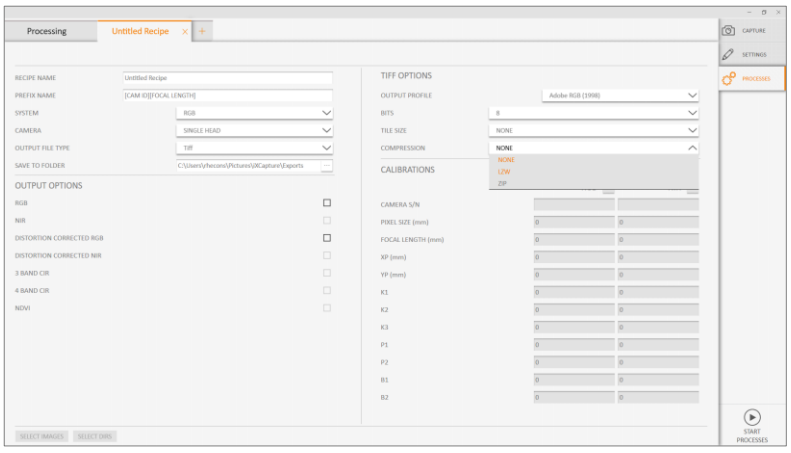
Function	Description
NIR Watch Folder	iX Capture will start automatically, processing NIR images when they are put into this folder. A recipe needs to be set up before.
Setting System	**To set the System type:** In the SYSTEM field, select the system type. For RGB cameras, select RGB. For NIR cameras (requires CIR processing), select CIR.
Setting Camera Type	**To set the Camera type:** In the CAMERA TYPE field, select if the camera is a SINGLE HEAD (iXA or iXU or iXM) or a MULTI HEAD camera (iXU-RS1900 or iXM-RS280F).
Setting Output File Type	Select either **TIFF** or **JPG**. You can select multiple options for TIFF files. **To select the file type of the conversion process:** 1. From the Process Recipe area, click the dropdown menu beside OUTPUT FILE TYPE. 2. Choose either: • JPEG • TIFF 
Setting Dynamic Processed File Prefix	Dynamic file prefixes are identifiers that are added to the beginning of the processed file names. You can combine any of the seven dynamic file prefixes. Enter prefixes in any order.  **To set the Dynamic Processed File Prefix:** 1. Go to the Process File Prefix field and click one or more of the dynamic prefixes.

Function	Description
	• **GPS DATE** — Inserts the date set in the GNSS device. (For example, 2015-11-10). • **GPS TIME** — Inserts the UTC time of day set in the GNSS device to millisecond accuracy. (For example, 12-41-40, which is 12:41:40 UTC). • **GPS WEEK.SECONDS** — The GPS Time count in weeks and seconds. • **GPS EVENT** (number)— In Event mode the GPS sends an event number as part of a response to the mid-exposure pulse. This event number is also stored in the GPS internal storage and can be used to connect the image to the GPS data. • **IMG COUNTER** — Enables the user to set a counter for all connected cameras. The counter synchronizes parallel count in all cameras. To edit the counter, select the counter block and click “Enter”. To stop editing the block click “Esc”. • **LINE NUM —** Aero photography flights are flown in lines; each line is numbered. Line Num is a specific line from a flight. • **NUM IN LINE (Image in the line number)** – Photography flights are flown in lines; each line of the flight is numbered and *each image in the line is numbered separately*. These numbers are part of the flight plan. iX Flight sends the flight’s line number and the image number in the line to iX Capture. iX Capture places the numbers into the log; they can then be used for various purposes, for example - as part of an image name for sorting based on line and image number. If we photograph a line or an image twice – we see it immediately and can select which image we want to use. • **FOCAL LENGTH** — Inserts the focal length of the lens being used. (For example, L55). • **CAM ID** — Inserts the last 4 digits of the camera’s serial number. (For example, C0198 (C for camera + 4 last digits)). • **CAM DATE** — Inserts the date set on the camera. (For example, 2015-11-10). Each prefix selected appears in the Processed File Prefix field and the option box outline becomes dashed. To “un-choose” a prefix, click again on the prefix block or delete the text.
TIFF Options	**To process the image files as TIFFs:** 1. Go to the TIFF Options area on the right side of the screen and select. • (Optional) Light Falloff Correction (Automatic) • (Optional) Automatic Haze Correction (Automatic)

Function	Description
	• Output Profile • Bits • Tile Size • Compression 

Function	Description
About Color Output Profiles	Color profile depends on the final use of an image. iX Capture can output to any RGB color space. (It is necessary that the ICC profile be available on the local machine). iX Capture is provided with these profiles installed: • Adobe RGBXXX • eciRGB v2 • LG E2340 • Phase One – Mac Monitor • Phase One – PC Monitor • Phase One Grey G1.0 • Phase One Grey G1.8 • Phase One Grey G2.2 • Phase One RGB(Trinitron G18 D50) • sRGB IEC61966-2.1 • VA1948 Series • Xerox Phaser 9130 PCL 6 p.1.00 Adobe RGB is a large color space that is capable of expressing a wider gamut of colors than sRGB. Adobe RGB is, therefore, the preferred choice for images that are likely to receive extensive processing or retouching. Images processed in larger color spaces such as Adobe RGB are displayed with less color (especially green) and are often slightly too dark when shown in browsers which only display sRGB. Images that are intended to be published exclusively on the Internet should always be processed into the sRGB color space after processing because few browsers are capable of color management – the subtleties of some images can be lost or incorrectly displayed. You must export NIR images using Phase One Grey G2.2. This profile outputs the CIR images in a single, plain, “shades of grey” image.
Adding a Color Output Profile	**To add additional color output files:** 1. Generate them in Capture One, save them and place them into the following folder (assuming that it is the default installation file location): C:\Program Files (x86)\Phase One\Industrial\iX Capture 3\ ColorProfiles\Common 2. After adding a new profile, relaunch the application. 3. The added profile is now selectable in the “Color Output Profiles” list.

Function	Description
	
Setting bit planes	For best results, process and output, in 16 bit, all image files that undergo extensive manipulation. **To set the bits:** 1. In the TIFF Options area, click the dropdown menu beside **Bits**. 2. Select the output bit depth: • 8 • 16 
Setting Tile Size (MB)	**To tile TIFF files:** 1. Go to Processes > Recipe. 2. In the TIFF Options area, click the dropdown menu beside Tile Size. 3. Choose one of the following file size limitations: • None • 256 MB • 512 MB

Function	Description
	• 1024 MB 
Selecting Compression	TIFF is a non-compressed file format. However, you can compress the files using LZW or ZIP compression. **To set file compression for TIFF files:** 1. Under TIFF OPTIONS, click the dropdown menu for Compression. Choose one of the following: • None • LZW • ZIP **Note**: ▪ *The file size after compression depends on the original file contents and the compression algorithm.* ▪ *Sharp pictures, with multiple details, are sometimes difficult to compress; selecting a compression scheme in such cases may increase the file size* 

6.5 Output Options

In the OUTPUT OPTION area, you can select several types of output depending on the systems and the camera type. The following table outlines the available output options:

System type:	RGB		CIR	
Camera type	**Single head**	**Multi Head**	**Single head**	**Multi Head**
RGB	√		√	
NIR			√	√
Distortion corrected RGB	√	√	√	√
Distortion corrected NIR			√	√
3 band CIR			√	√
4 band CIR			√	√
NDVI			√	√

Type	Description
RGB and NIR	Exported from IIQ format to TIFF or JPEG.
Distortion Corrected RGB **Distortion Corrected NIR**	RGB and NIR images where the lens distortion is corrected using the metric calibration data.
3-BAND CIR	An image in which the bands are NIR, Red, Green. Image distortion is corrected.
4-BAND CIR	Image available only in TIFF output format. This image has 4 separations: Red, Green, Blue, NIR. Image distortion is corrected.
NDVI	A two-band Normalized Difference Vegetation graphical image graphical indicator used to analyze remote sensing measurements to assess whether the image contains live green vegetation.
GENERATE LARGE IMAGE DESPITE ERROR CONDITIONS	Selecting this option overrides the error conditions that might result from images over water (or other area with no tie points). A large image will be generated by placing the right and left images based on geometric calibration. The resultant image may show a vertical line in the middle of the large image.

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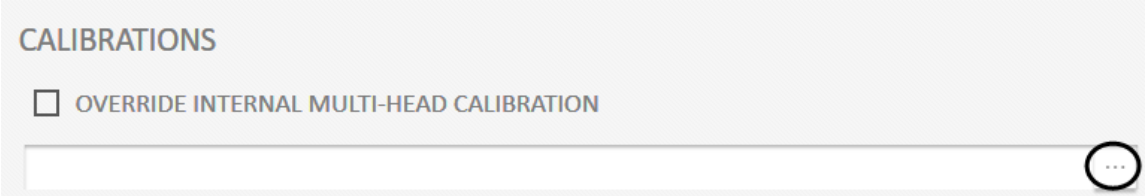
6.6 Calibrations

Calibrations are metric calibrations in Australis format. The calibrations are imported or filled out in the correct places. **In order to import a calibration file, its name should contain the camera serial number (two letters and six digits). The file should be a txt file in Australis calibration format**. To import a calibration set, click on the RGB or NIR selection icons.

The Calibrations field is grayed out. It becomes active when the selected output should be calibrated.

Images generated by the iXU-RS1900 and iXM-RS280F camera contain calibration information in the image EXIF. That is why users are not required to enter calibration information for these cameras.

The user may override the internal calibration information by importing a calibration file in the correct format. To import calibration check the box for overriding internal multi-head calibration and select the file to import by clicking on the selection button.



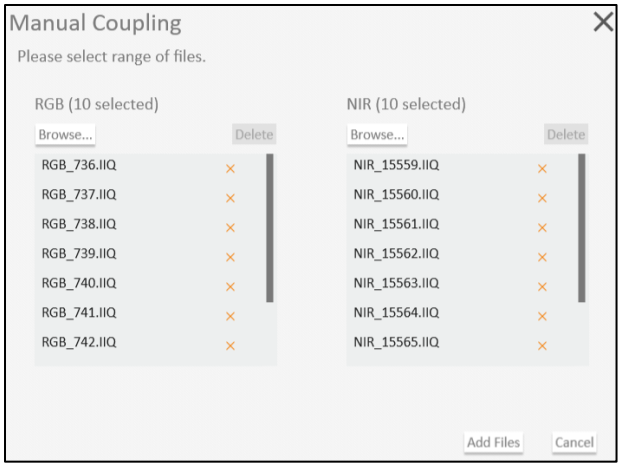
SELECT IMAGES for processing:

Use SELECT IMAGES for processing to import selected images for processing. The Select Images button is at the bottom left of the Recipe tab in the Processing window.

For CIR processing

1. Use this option when coupling of NIR to RGB will be done manually using file order.
   a Click on “SELECT IMAGES” to open the following dialog:

2. Select an equal number of RGB and NIR files.
   iX Capture assumes that the files are in their directories in the correct order.



3. Click **Add Files** to start the import process to the processing queue.
   During the import process iX Capture checks that the images that were processed were taken by the camera for which the calibration was imported. It rejects images from other cameras.
   Note: *Do not mix multiple missions with repeating file names into the same selection.*

SELECT DIRS for processing

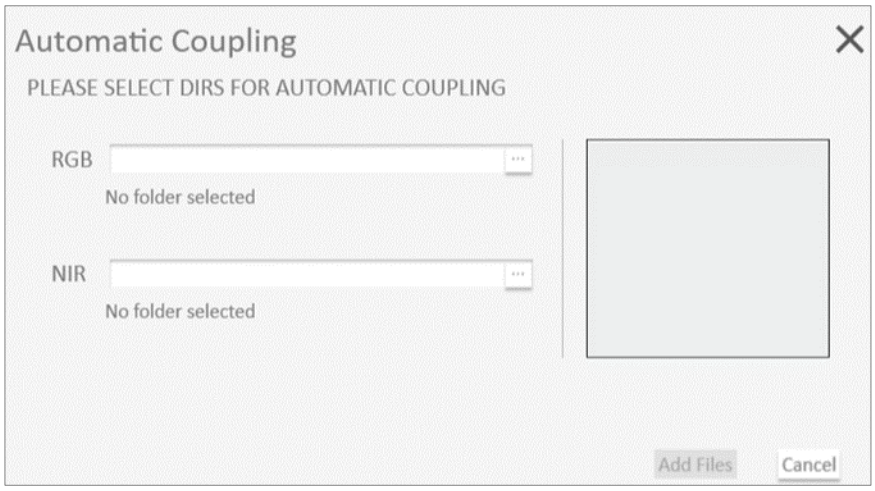
Use “SELECT DIRS for processing” when:

- There are separate directories for the RGB images and the NIR images
- Both directories have the same number of files
- The files contain GNSS event IDs or GNSS times for each exposure

iX Capture automatically **matches the RGB and NIR pairs** using the GNSS Event ID or GNSS time. GNSS writes an Event ID when connected to the camera in Event Mode; it writes the external parameters of the picture to the EXIF.

Also use “SELECT DIRS for processing” to generate large frame iXU-RS1900 and iXM-RS280F images. Select the directory holding the IIQ images (recorded in the flight).

Click “SELECT DIRS for processing” to open a directory selection window or, for CIR processing, the following form:



After selecting the directories, iX Capture displays the number of imported files.

iX Capture checks that the images are taken by the cameras which has the same camera number appearing in the calibration file name. It also checks the GPS EVENT ID at GPS time and couples images automatically.

If import or coupling of images fails iX Capture will show the number of failed files and will give a link to the log file where you may find the reason for the failure.

When the import completes, click on the "**Start Process**" button.

6.7 Processed Image Parameters

- The distortion free images retain the focal length of the source image; Xp and Yp are moved to the center of the image (0,0).
- 3 band CIR the 4 band CIR and NDVI images retain the focal length of the source RGB image. Xp and Yp of these images are also moved to the center of the image (0,0).
- In iXU-RS1900 and iXM-RS280F cameras large frame TIFF images, the focal length is the focal length of the left (master) image; Xp and Yp are set to the center of the image (0,0).
- The focal length of 190MP and 280MP CIR images (3 band, 4 band and NDVI), from images generated by a Phase One iXU-RS1900/iXM-RS280F cameras and a co-located Phase One NIR camera, is the focal length of the left (master) image of the iXU-RS-1900/iXM-RS280F; Xp and Yp are set to the center of the image (0,0).

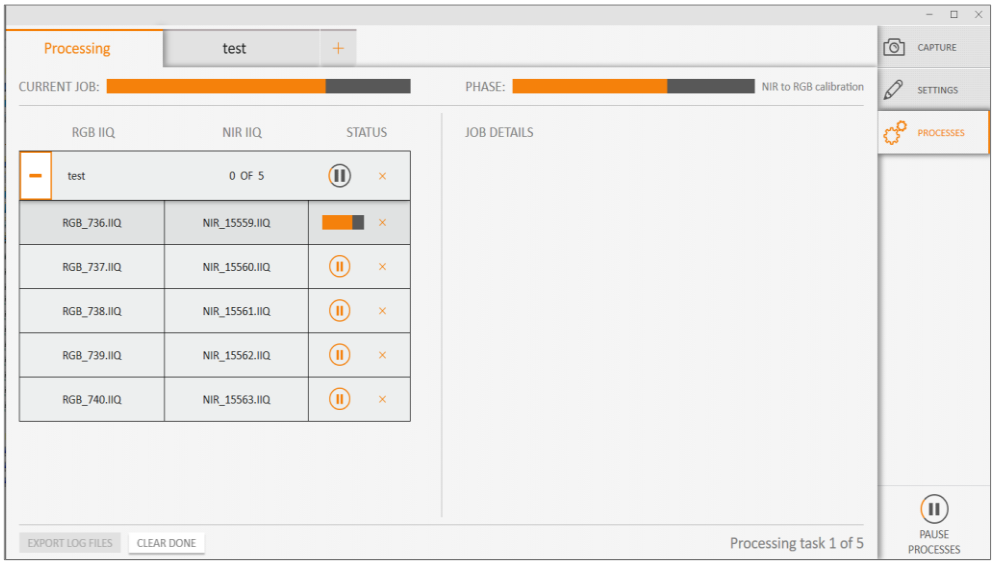
6.8 Processing Tab – Process status

The processing tab displays the status of the processing and enables starting/stopping of processing.

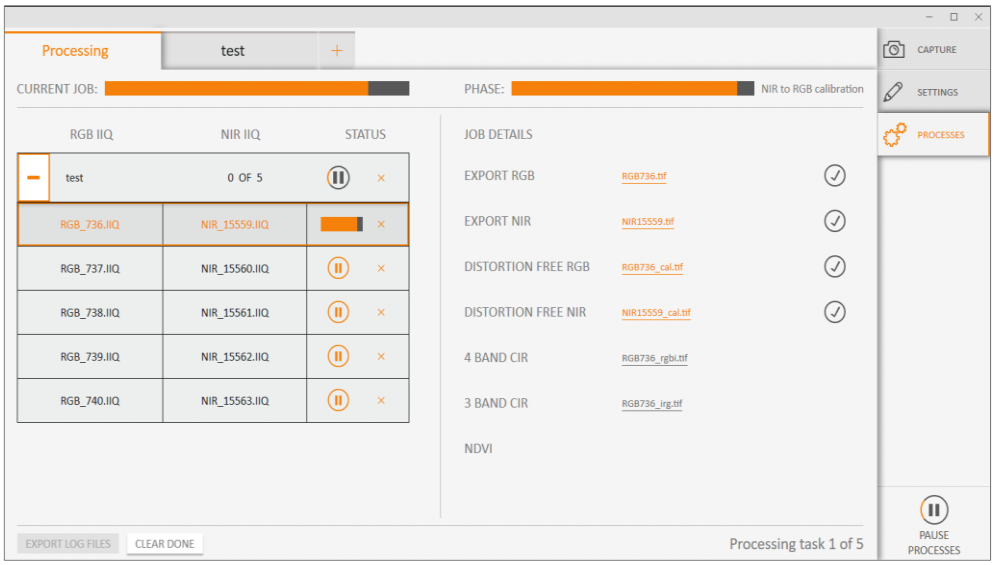
Each recipe is represented by a row.

To activate processing of several recipes at the same time:

1. Click the **+** sign at the left of the process recipe name to open a list of the images that are being processed and the status of each process.



a) Once an image line is done, click on the check mark to see job details and review the results.



b) Click CLEAR DONE to clear the queue of all done jobs.

Note: "Export log files" exports the logs to a user-selected location.

Using the Process Button

Images can be exported, while onboard (to Tiff and JPEG formats) and can also be processed off-line.

If "Queue Images for Processing" was selected in the Capture tab or if files are selected for processing in the recipe tab, you can start and stop processing at any time from the Process Button on the Processes Screen.

To start and stop the image processing:

1. On the Processing Screen, click the Start Process button.
   The button is briefly highlighted then changes to a PAUSE Process button.

   c) To stop the image processing, click the PAUSE PROCESS Button.
   The button changes to a Start Process button.

To use the maximum computer resources, you can choose Queue Images for Processing and the Stop Processing and after the flight, select Start Processing.

Note:

- *Processing continues until the current queue finishes processing.*

6.9 Error Codes

The process log may show errors. The following table lists and describes the **error codes**.

Code	Meaning	Action
1	General invalid parameter passed	Check calibration numbers.
2	Aborted function	
5	Not enough points could be found to set-up a fine projective transformation. This error occurs in the stacking phase.	Check the quality of the RGB and NIR images. The affine transformation from the calibration step is applied to the NIR image. Image matching then determines small additional shifts between RGB and registered NIR.
6	Target accuracy for fine projective transformation not reached. There are enough corresponding points, but they are not **accurate** enough.	
7	Fallback used, product generated with reduced accuracy	The fine transformation failed. The images are combined based on geometry.
15	Code 15 occurs only in the calibration process. It means that the number of corresponding points found between the given images was not enough to set-up affine transformation. This may happen if two images are taken not showing the same area or if for example, the entire scene is covered by water and therefore image matching is not possible.	If this happens, the application chooses two other images (RGB and NIR) to extract a coarse affine transformation.
16	Target accuracy for affine transformation not reached. There are enough corresponding points, but they are not accurate enough. The iterative process for the generation of the affine transformation did not converge to the pre-defined criteria.	

6.10 Support for Capture One Image Adjustments

iX Capture now supports image adjustments made by the Capture One software tool. These adjustments are stored in a file that contains all relevant information about modifications made by Capture One to an image (brightness, white balance, exposure, color temperature, etc., as well as simple, nondestructive edits). iX Capture can apply these adjustments to batches and output the resulting images.

To apply the edits done with Capture One to other files:

1 Process the images from within the *same directory* they were originally edited by Capture One (from a subfolder named "Capture One").

Refer to Capture One Help to learn about editing images in Capture One.

Note: If the Light falloff and Haze corrections checkboxes in the Recipe are ticked - they overwrite any equivalent Light level and falloff corrections that were made in Capture One. However, all other Capture One adjustments remain in effect and appear in final, processed output file.

7 Multiple Camera Operation

The iXA-R, iXA, iXU and iXM cameras are scalable systems enabling you to adapt to different requirements and to build multiple camera systems to meet diverse requirements.

Note:

- *To construct a multi-camera setup, refer to the relevant installation guide.*

iX Capture accommodates up to six cameras simultaneously. The data on the screen belongs to the "active camera" which is highlighted in orange.

When using a multi-camera setup with a GNSS, configure **each** camera for GNSS use. All multi-synced cameras share the GNSS data, which is written to each image. Complete instructions on connecting a multi-sync setup with a GNSS are available in the Phase One Cameras and GNSS Systems Installation Guide, which is available from http://industrial.phaseone.com/downloads.

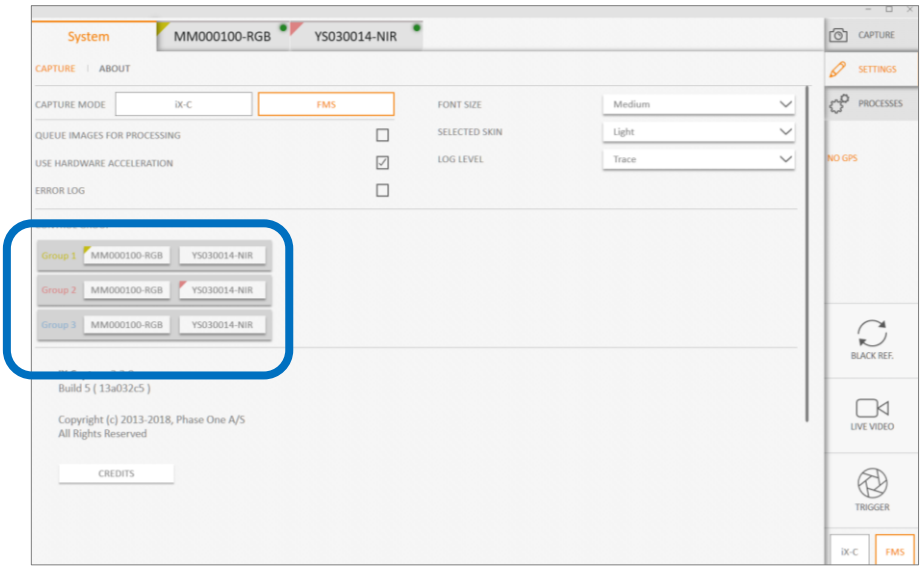
Cameras from different series can be multi-synced. Refer to your camera installation guide for details on how to connect them.

7.1 Grouping Cameras

In multi- camera systems, cameras can be grouped together according to their use. This enables you to make and change settings for all members of the group at the same time.

Note:

- *Auto exposure is not available to a group, only to individual cameras. If you change a group camera to Auto Exposure, it is automatically removed from the group.*



Control Group

The names of all cameras that are connected to iX Capture are displayed in the **Control Group** area of the Systems tab (Settings > System).

Each camera is displayed as a "button" to the right of each of the group names.

To add a camera to a group (Group 1 or Group 2 or Group 3):

1. Click the name of the camera in the Group you are adding it to.
   For example, to add camera MM000100 RGB to Group 1, go to the line Group 1 and click the MM000100 RGB button. The upper left corner of the camera button is painted with the group's color.

2. In a group, click the camera name to remove it from that group.

7.2 Multi-Camera Activation

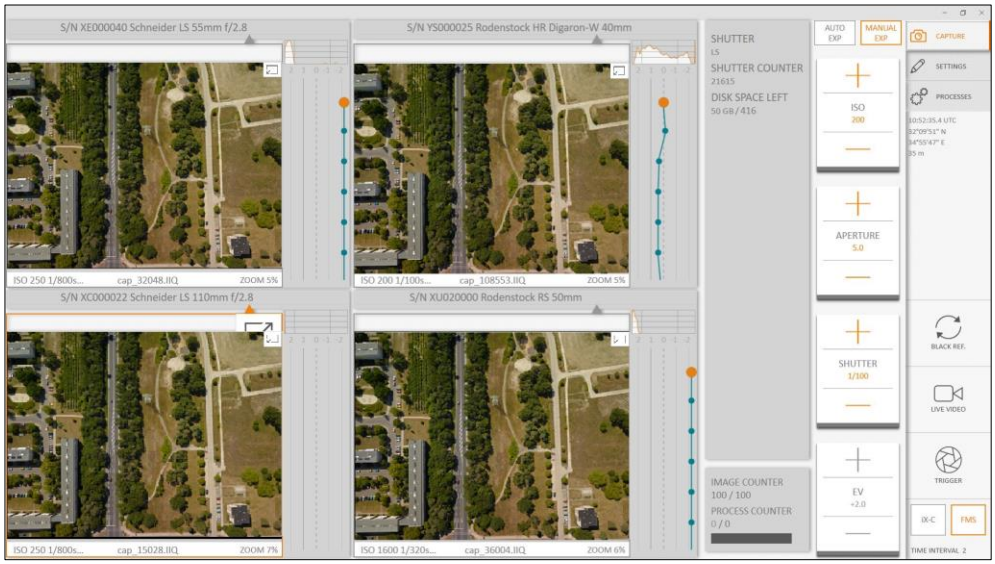
When multiple cameras are connected, the best way to trigger the camera is via the Flight Management System (FMS) or via the iX Capture hardware trigger.

You can use the Capture button on the Capture screen to trigger, but the synchronization is not as good as when triggered from the FMS.

Notes:

- *To trigger multiple cameras without a Flight Management System:*
  Use a hardware remote trigger, or an iX Capture Hardware Trigger (for iX Controllers Mk3 and up). In addition:

- *Connect a synchronization cable between the cameras.*
  ***Note**: Hardware synchronization is better than triggering from iX Capture via USB software.*
- *When using multiple cameras, you must:*
  Use either Fast Sync (FS) or RS lenses.



7.3 Changing Exposure of Grouped Cameras

When cameras are grouped, their settings are synchronized on the first change of parameters after grouping is done. iX Capture issues a warning if it could not synchronize the parameters of any camera in the group. **Set the parameters for this camera separately.**

Note:

- *Do **not** activate auto exposure when grouping cameras, or - do not group cameras when working with auto exposure. Each camera calculates its own auto-exposure settings.*

7.4 Using the Responsive Screen

When multiple cameras are configured, images from the active cameras are **tiled** in individual windows on screen.

You can set the location of each camera tile via drag and drop. iX capture remembers the new location of the camera tile.

iX Capture enables you to re-size the windows and to use the application with different sized monitors. In addition, you can move the *non-active* preview windows using "drag & drop".

Note: Drag from the camera name or the histogram, not from the image itself.

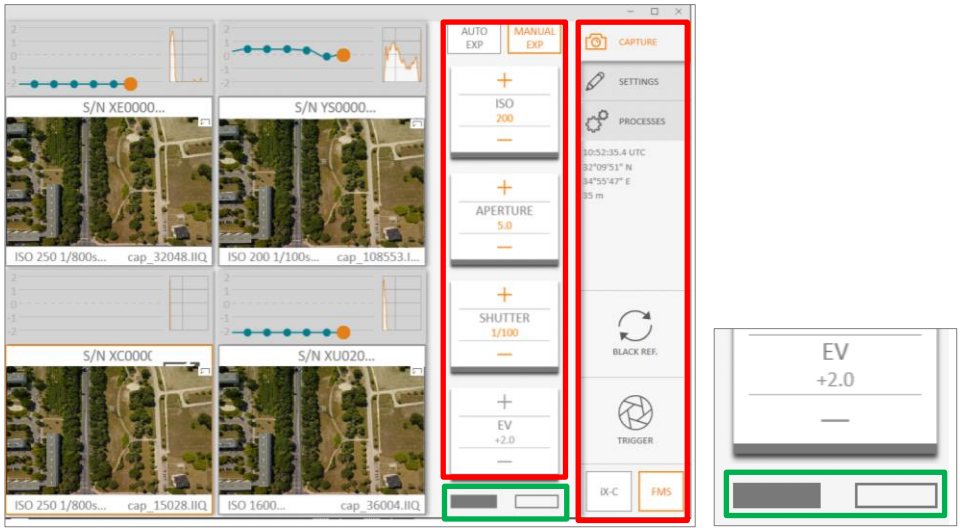
When using smaller screens, the information and camera controls are split into two or three tabs, depending on the size of the monitor.

To switch between the tabs:

Click the button at the bottom of the screen (green rectangle in figure).

Note:

> *The Settings button and some functions are visible only in full screen mode.*



7.5 About Screen

The About screen displays the version number and build of iX Capture. The screen also displays credits for iX Capture.

To access the About screen:

1. Go to Settings > System tab.

    d) Select the About tab.

8 Support

Phase One guarantees world class support and service with every purchased product. Read about the resources listed below for different support options.

8.1 End User Support Policy

At Phase One we think globally but act locally. Phase One's products are sold through a worldwide network of dedicated and competent local partners to make after-sales support convenient for you.

Phase One's local partners offer first line support to their customers. Many provide additional services such as training, extended warranty agreements, upgrade programs, and many other services that can add value to your Phase One investment. Contact your local Phase One partner to discuss your options. Camera pricing and repairs are also handled locally.

Find your local Phase One partner or take advantage of Phase One's wide range of online support tools at http://support.phaseone.com

8.2 Web Resources

Phase One has a host of online resources for aerial photographers. Find case studies and detailed information including user guides, installation guides and firmware updates in the downloads section of https://www.phaseone.com/geospatial-downloads/