iXM-GS120

Operation Guide





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iXM-GS120 Operation Guide

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1 Introduction

1.1 Scope

This guide describes how to operate the iXM-GS120 as follows:

- Section 2 iXM-GS120 Overview
- Section 3 Camera Features
- Section 4 Cable Specifications
- Section 5 Unboxing the Camera
- Section 6 Preparing the Camera
- Section 7 Connecting the Camera
- Section 8 Configuring Auto-Exposure
- Section 9 Storing Images
- Section 10 Live Video Display
- Section 11 Miscellaneous Camera Settings
- Section 12 Firmware
- Section 13 Interpreting the Camera LEDs

1.2 Applicable Documents

Item	Manual	
iX Capture	iX Capture User Guide	

1.3 List of Terms and Abbreviations

Term/Abbreviation	Description
FMS	Flight Management System.
HDMI	High-Definition Multimedia Interface connector for monitors.
XQD card	Format for flash memory cards.
CFexpress	Format for flash memory cards.



2 iXM-GS120 Overview

The iXM-GS120 is a wide area high resolution camera with high sensitivity, low noise, and minimal integration time for diverse demanding applications.

The iXM-GS120's global shutter technology enables record-breaking short exposures without the need for a mechanical shutter.

The camera can be used with various Phase One's lens series featuring different focal length options, ranging from 35mm to 180mm.

The following figures show the location of iXM-GS120 parts.



- 1. Pod mounting threaded holes (four)
- 2. Lens secure screws (four)



- 5. Storage LED
- 6. Operation LED
- 7. USB 3.1 port cover screw
- 8. USB 3.1 port cover
- 9. Left LEMO port (data)
- 10. Center LEMO port (data)
- 11. Right LEMO port (power)
- 12. Power LED



- 3. Memory card slot cover
- 4. Memory card slot cover screw



- 13. Ethernet port cover screw
- 14. Ethernet port cover
- 15. HDMI port cover
- 16. HDMI port cover screw



3 Camera Features

3.1 Exposure Sequence

The following figure and tables describe the signals and hardware pulses that control the exposure sequence.

Exposure Sequence



Exposure Sequence Signals

Signal	Description
Trigger In	The FMS signals the camera to capture an image.
System Ready	Camera ready/busy signal.
Mid-Exposure Pulse	Indicates the midpoint of the exposure time.
Black Reference/Wakeup Control	Dual-purpose signal.

Hardware Pulses and Delay Parameter Signals

Sequence Step	Shutter = ES	Shutter = LS Normal Mode
T1 Trigger IN – SysRdy (Low)	2.5 msec	2.5 msec
T2 Trigger IN – Mid Exposure	~20 msec + 0.5*Exposure Time	~25 msec + 0.5*Exposure Time
T3 Mid Exposure Width	0.5*Exposure Time	0.5*Exposure Time
T4 Trigger IN – SysRdy (High)	100 msec	122 msec
T5 Wakeup pulse (minimum)	1 msec	1 msec
T6 Wakeup pulse – Trigger IN (minimum)	350 msec	350 msec



Note

in some cases, enabling low power mode (see Section 11.5 Setting When Low Power Mode) can cause slowness in capture rate when the image capture rate is slower than the low power mode timing. If, for example, the capture rate is scheduled at 15 seconds and the low power mode is set at 10 seconds, each capture will be delayed by up to 350mS. As a result, the capture rate will be 15.35 S/F instead of 15 S/F in order to allow the camera to exit low power mode. If the capture rate is crucial, disable low power mode or use hardware wakeup signal.

3.2 Black Reference

3.2.1 Understanding Black Reference

A black reference is the process of reading the sensor output during an exposure without the sensor being exposed to light. This data is written to the camera and subtracted from regular captures to filter out sensor noise.

Updating the black reference data whenever possible enhances the image quality, particularly when shooting in conditions where the camera temperature fluctuates. If the exposure time varies considerably, the black calibration reference data should be updated.

To ensure exposure accuracy, a black reference capture should be made before starting your first flight line, or if exposure settings or ISO have been changed. This is best done before starting a new flight line, when images are not being captured.

Note

Black reference is performed automatically with the first shot after switching the camera on.

3.2.2 Hardware Activation of Black Reference

If you are building your own hardware control box, you can update the black reference data in the camera. The black reference control signal should be kept low while an image capture cycle is initiated. The signal must remain low for the full capture cycle.

This makes it possible to create a black reference whenever it is convenient (such as when turning an aircraft around or between flight lines). When the force black signal is kept high, the camera uses the last updated black reference data.

Black reference timing is shown in the following figure.





3.2.3 Software Activation of Black Reference

The iXM-GS120 camera can perform a black reference sequence through iX Capture, the Phase One SDK, or the Flight Management System.

The following table describes the black reference mode to use for your capture flow.

Black Reference Mode	Description
Prerecorded	This mode uses a prerecorded black reference created during iXM-GS120 production. As a
	result, there is no delay in capture flow and the black reference is used for each capture.
Once	This mode takes a black reference one time only. This mode is usually selected for normal captures in where there are no large changes to exposure time, ISO, or temperature. Phase One recommends that you initiate a new black reference sequence whenever possible (for example, during flight while turning the aircraft).
Always	This mode takes a new black reference for every capture. Note This closes the capture cycle (approximately twice as close) but does provide ap
	accurate, custom black reference for each capture.
On Change	The camera uses an internal algorithm to decide when a new black reference is required, based on specific values of exposure, ISO, or large changes in temperature.



3.3 **Electrical Interfaces**

The following figure shows the four signals that control the iXM-GS120 camera:



Schematic Drawings



4 Cable Specifications

4.1 Power Cable

The power cable open end is connected to the aircraft's power bus, and the LEMO connector end is connected to the camera right LEMO (power) port.



Figure 2: Power Socket Pinouts



1. Connect the power cable using the information in the following table:

Power Cable Description

Connector Pin	Color	Name	Description	Direction	Level	Notes
1	White or yellow	DC In +	Provides positive power	Input	12 - 30 V DC	Provides up to
						20 W
2	Black	DC In -	(Common)	Input		



4.2 Control Cable

The control cable open end is connected to your system through nine (28 AWG) wires, and the LEMO connector end is connected to the camera center or left LEMO (data) port, depending on your system configuration.

The following figures and table show the cable pinout and signals.



Control Cable Plug Pinout

Camera Socket Pinout



Control Cable Signals

Pin	Color	Name	Description	Direction	Parameter Voltage Levels (see next table)	Notes
1	Orange	Reserved	Reserved	Reserved	Reserved	Reserved
2	Green	System Ready	iXM-GS120 ready for next capture.	Out	VOH, min = 4.0V (Io = -10uA) VOL, max = 0.8V (Io = 4mA)	5 V level pull up resistor 47.5K Ohms to +5 V
3	Red	Black Reference/ Wakeup Control	Indicates a black reference sequence is required.	In	VIH, min = 2.4V VIL, max = 0.8V tiF, tiR < 1uSec	Isolated. Active low. For black reference, see Section 3.2 Black Reference



Pin	Color	Name	Description	Direction	Parameter Voltage Levels (see next table)	Notes
			Signal the camera to wakeup from low power mode.			Understanding Black Reference. For low power mode control, see Section 3.1 Exposure Sequence.
4	Purple	Trigger In	Trigger the iXM-GS120 for new capture cycle.	In	VIH, min = 2.4V VIL, max = 0.8V tiF, tiR < 1uSec	Active low (for manual triggering, activate by short to common signal, otherwise leave floating).
5	Blue	RS-232 RX	External system can send specific information to the iXM- GS120.	In	RS-232 input level +/- 15V (VIT+ max=2.4V) (VIT- min=0.8V)	RS232 voltage level isolated. For baud rate and additional information, see the Phase One Camera and GNSS IMU Installation
6	Yellow	RS-232 TX	iXM-GS120 can send specific information to external system.	Out	VOH at RL=3 kΩ to GND + 5.4V VOL at RL=3 kΩ to GND - 5.4V	Guide.
7	White	Mid-Exposure Pulse	Midpoint of the exposure time.	Out	VOH min = 4.0V (lo= -4mA) VOL max = 0.8V (lo= 4mA)	5 V level.
8	Gray	Reserved	Reserved	In		Short to pin 9 (mandatory).
9	Black	Common		Common		

Parameters Description

Parameter	Setting
VIL	Maximum voltage level that is interpreted as 0 by an input.
VIH	Minimum voltage level that is interpreted as 1 by an input.
VOL	Guaranteed maximum voltage level that appears on output set to 0.
VOH	Guaranteed minimum voltage level that appears on output set to 1.
VIT+	Input threshold voltage when the input voltage is rising.
VIT-	Input threshold voltage when the input voltage is falling.
VIL	Maximum voltage level that is interpreted as 0 by an input.
VIH	Minimum voltage level that is interpreted as 1 by an input.
VOL	Guaranteed maximum voltage level that appears on output set to 0.



5 Unboxing the Camera

Verify that all parts were supplied according to the specific packing list for your system.



6 Preparing the Camera

Note

- Before mounting or dismounting a lens, verify that the power cable is not attached to the camera.
- Mount/dismount lenses only in a clean environment.
- Place a soft cloth on the table to avoid scratching the camera.
- Place a lens cap on the lens.

6.1 Mounting an RSM Lens

To mount a lens on a camera:

1. Place the camera interface with the sensor facing up and the camera contacts (solid blue) closest to you.



2. Hold the RSM lens so that the lens contacts (solid green) are aligned with the camera contacts (solid blue).



3. Place the lens groove on the camera ridge (opening-to-opening).



4. With the openings touching, lower the lens contacts to the camera contacts.



5. Hold the lens with both hands and press it firmly down onto the camera, so that the O-Ring seal is pressed inside.



6. Use a 2 mm hex key to tighten the 4 screws on the camera interface to a torque of 50 cNm.



6.2 Dismounting a RSM Lens

To dismount a lens from an iXM:

- 1. Use a 2 mm hex key to unscrew the four screws on the iXM camera.
- 2. Hold the lens and gently pull up at an angle.



6.3 Mounting a RS Lens

To mount an RS lens on the camera:

- 1. Remove the rear lens cap.
- 2. Hold the RS lens so that the lens contacts strip is above the RS adaptor contacts.
- 3. Slowly lower the lens opening onto the RS adaptor opening (opening -to-opening).
- 4. Use a 2 mm hex key to secure the lens assembly onto the RS adaptor by gently tightening each of the three locking screws.
- 5. Tighten the 3 locking screws a second time using a torque of 50 cNm.





6.4 Dismounting a RS Lens

To dismount the lens from an iXM-RS:

1. Use a 2 mm hex key to unscrew the three lens screws.

Note

The screws remain attached to the camera.

- 2. Pull the lens assembly away from the camera.
- 3. Place a rear cap on the lens.





7 Connecting the Camera

7.1 Attaching the Camera (iXM-GS120) to a Pod

1. Attach the iXM-GS120 camera to a pod using four M4 screws.

Note

Do not insert screws deeper than 6 mm into the threaded holes on the front of the camera.

7.2 Connecting a Control Cable

- 1. Connect the control cable LEMO connector to camera left LEMO (data) port (near the USB port).
- 2. Connect the other end of the control cable to your external device.

Note

- The two data ports (left and center LEMO ports) are not interchangeable.
- If the camera is being used with a Phase One system, use a control cable with LEMO connectors at both ends, and connect the other end to the iX Controller i/O port.

7.3 Connecting the Power Cable

To connect the camera to the aircraft power bus:

- 1. Connect the power cable LEMO connector to camera power port.
- 2. Connect the other end of the power cable to the aircraft power bus.



Caution

The iXM-GS120 camera must be powered by a limited fused power source only, up to 2A single fault condition.



7.4 Connecting a USB Cable

To connect a USB 3.1 cable to a PC:

- 1. Using a 2 mm hex key, remove the screw securing the USB 3.1 port cover.
- 2. Remove the cover and store it.
- 3. Connect the USB 3.1 cable connector to the camera USB port.
- 4. Tighten both locking screws on the USB connector to secure it to the port using a torque of 25 cNm.



7.5 Connecting Cables for Multiple Camera Configuration

You can connect multiple iXM-GS120 cameras through a daisy-chain to capture images simultaneously. The first camera in the daisy-chain is triggered through the control cable.

- 1. On the first camera in the daisy chain, connect a control cable LEMO connector to the left LEMO port.
- 2. Connect the other end of the control cable to your external device.
- 3. Connect one end of the Multi-Sync cable to the center LEMO port.
- 4. Connect the other end of the Multi-Sync cable to the left LEMO port of the next camera.
- 5. Repeat for any additional cameras.
- 6. On the last camera in the daisy chain, connect a control cable LEMO connector to the center LEMO port.
- 7. Connect the other end of the control cable to your flight management system or other device.

Note

- For a multiple camera setup, do not use the software trigger or software black reference from iX Capture. Use hardware signals only.
- When creating a daisy-chain between iXM-GS120 and iXU-RS/iXU cameras, each camera can be configured in any position required. However, you must disable the low power mode for the iXM-GS120 cameras.



7.6 Connecting the HDMI Cable

To connect an HDMI cable to an iXM-GS120 camera:

- 1. Using a 2 mm hex key, remove the screw securing the HDMI port cover.
- 2. Remove the cover and store it.
- 3. Connect an HDMI cable connector to the camera HDMI port.
- 4. Connect the other end of the HDMI to your display.









8 Configuring Auto-Exposure Mode

You can operate the camera in manual or auto-exposure mode.

In auto-exposure mode, the camera controls the following parameters:

- ISO
- aperture
- shutter speed

When auto-exposure mode is active, the camera reads the histogram of each image it captures and adjusts the exposure parameters for the next image. The adjustments are in third-stop increments.

To toggle between manual and auto exposure modes:

- 1. Run iX Capture.
- 2. Click CAPTURE.
- 3. Click AUTO EXP or MANUAL EXP as required.



To configure auto-exposure mode:

1. Run iX Capture.

System MV000024 MM000100 × +		CAPTURE
FILE IMAGE LINK I GPS I HDMI I NETWORK I FMC I SERVICE I ABOUT	S/N MV000024	
IMAGE		PROCESSES
MANUAL AUTO EXPOSURE		
MIN MAX	PRIORITY	NO.COC
ISO 200 200 1600	🔻 1st	NO GPS
SHUTTER LS V 1/2500 1/1000 1/2500	A 2nd	
APERTURE 9.0 8.0 11	A 3rd	

- 2. Click SETTINGS.
- 3. Click the required camera tab.
- 4. Click IMAGE.



5. Under AUTO EXPOSURE:

a. Set the ISO, SHUTTER and APERTURE ranges.

System	MV000024	MM000100	× +			
File i image i link	GPS HDMI NETWORK	FMC SERVICE	ABOUT		S/N MV000024	
IMAGE						PROCESSES
	MANUAL		AUTO EXPOSURE			
			MIN	MAX	PRIORITY	
ISO		200	200	1600	T 1st	NO GPS
SHUTTER		1/2500	1/1000	1/2500	🔺 🔽 2nd	
APERTURE			8.0	11	🔺 3rd	

b. Click the arrows to set the auto-exposure priorities between ISO, SHUTTER and APERTURE:

System	MV0000)24	MM000100				CAPTURE
FILE I IMAGE I LINI	K i gps i hdmi	NETWORK	FMC SERVICE	ABOUT		S/N MV000024	
IMAGE							PROCESSES
		MANUAL		AUTO EXPOSURE			
				MIN	МАХ	PRIORITY	NO CR
ISO						🔻 1st	NU GPS
SHUTTER			1/2500	1/1000	1/2500	🔺 🔻 2nd	
APERTURE			9.0	8.0		A 3rd	



c. Click **CAPTURE** and click the **EV** + and – icons as required to adjust the Exposure Value.



Note

- For the first exposure, the camera uses the following AUTO EXPOSURE values:
 - ISO MIN.
 - APERTURE average between MIN and MAX.
 - SHUTTER speed MAX.
- Capture a few images before your first flight line so that auto-exposure can determine the optimum exposure.
- When auto-exposure is active, the CAPTURE tab parameters ISO, APERTURE, and SHUTTER are disabled.



9 Storing Images

To save images on a PC, you can:

- connect the camera with a USB 3.1 cable to a PC running iX Flight Pro, iX Capture, Phase One SDK or Capture One.
- use an XQD/CFexpress memory card as the storage device.

9.1 Using Memory Cards

Note

- Memory cards are manufactured by external suppliers and Phase One is not responsible for defective cards.
- Phase One recommends testing all new memory cards by verifying that image files are properly stored on the card and that they can be read on a PC.

9.1.1 Inserting and Ejecting a Memory Card

To insert a memory card:

1. Using a 2 mm hex key, remove the screw securing the memory card slot cover.







3. Insert a memory card with the brand label facing the camera rear.





4. Place the memory card cover in position and secure the cover with the memory card slot cover screw. Tighten the screw to torque 15 cNm.

To eject the memory card:

Caution

Before ejecting the memory card, to prevent data corruption, make sure the camera is in LOW POWER MODE as follows:

- 1. Run iX Capture.
- 2. Click **SETTINGS**.
- 3. Click the required camera tab.
- 4. Click SERVICE.
- 5. Set LOW POWER MODE to Immediately.
- 1. Momentarily push the memory card then release it. The memory card is ejected.

9.1.2 Formatting a Memory Card

To format a memory card:

- 1. Run iX Capture.
- 2. Click SETTINGS.
- 3. Click the required camera tab.
- 4. Click FILE.
- 5. Set **STORAGE** to **LOCAL**.

Note

Before capturing images for the first time, verify that local storage is enabled as follows:

- 1. Run iX Capture.
- 2. Click SETTINGS.
- 3. Click the required camera tab.
- 4. Click SERVICE.
- 5. Click FORMAT CARD and click CONTINUE.



10 Live Video Display

Note

When in Live Video or HDMI modes, repowering the camera does not disable these modes. The camera always powers up in the last working mode, indicated by a blue Operation LED.

10.1 Using Live View with iX Capture

Live View enables you to view a live video feed from the iXM-GS120 camera and to capture images while viewing a subject of interest.

To use live view:

- 1. In iX Capture, click **CAPTURE**.
- 2. Click LIVE VIDEO. The video feed appears.
- 3. Click **S/W TRIGGER** to capture an image.
- 4. Click **LIVE VIDEO** to switch off the feed. The last image captured appears on the screen.

Note

Video is not recorded during live view.

10.2 Setting HDMI Display

HDMI mode enables you to view full HD video with or without overlay.

To set HDMI mode:

- 1. In iX Capture, click SETTINGS.
- 2. Click the required camera tab.
- 3. Click HDMI.
- 4. Set the required HDMI values.



11 Miscellaneous Camera Settings

This section describes how to set common parameters using iX Capture.

Note

For more information about camera settings, see the iX Capture User Guide.

11.1 Setting shutter, ISO and Aperture

To set shutter, ISO, and aperture values:

- 1. Click SETTINGS.
- 2. Click the required camera tab.
- 3. Click IMAGE.
- 4. Set the required values.

11.2 Setting Camera Date & Time

To set the camera data & time:

- 1. Click SETTINGS.
- 2. Click the required camera tab.
- 3. Click SERVICE.
- 4. Modify the **CAMERA DATE** and **CAMERA TIME**. You can also click **SYNC TO PC** to use the PC's current date and time.

11.3 Setting Image Orientation

To set image orientation:

- 1. Click SETTINGS.
- 2. Click the required camera tab.
- 3. Click IMAGE.
- 4. Set the CAMERA ORIENTATION.

11.4 Setting GPS Time Mode & Receiver

To set GPS time mode & receiver:

- 1. Click **SETTINGS**.
- 2. Click the required camera tab.
- 3. Click GPS.
- 4. Set the GPS type and Baud rate.
- 5. Set whether to use the TIME IN WEEKS:SECONDS.



11.5 Setting When Low Power Mode is Activated

To set when Low Power Mode is activated:

- 1. Click SETTINGS.
- 2. Click the required camera tab.
- 3. Click SERVICE.
- Set the required LOW POWER MODE. This is the time that, after the last operation, the camera reverts to low power mode.

11.6 Restoring Default Camera Values

To restore default camera values:

- 1. Click SETTINGS.
- 2. Click the required camera tab.
- 3. Click SERVICE.
- 4. Click **RESTORE TO DEFAULTS**.

Note

By default, the **Network** and custom **White Balance** parameters are not restored to camera defaults. However, in IX Capture, you can manually add these parameters to be included when restoring.



12 Firmware

12.1 Installing the Firmware Updater

To install the Phase One Firmware Updater:

- 1. Download the Firmware Updater from www.phaseone.com/download-categories/ixm-firmware/.
- 2. Open and extract the zip file.
- 3. Save the FWUpdater.msi file.
- 4. Double-click FWUpdater.msi.
- 5. When installation wizard completes, click Start > Phase One > Firmware Updater.

12.2 Updating the Firmware

Note

Before starting, make sure Firmware Updater is installed on your PC and the PC is connected to the Internet.

To update the iXM-GS120 camera firmware:

- 1. Connect the camera to the PC with a USB 3.1 cable.
- 2. Connect the power cable to the camera and to a power source.
- 3. Start Firmware Updater.

Note

Firmware Updater automatically checks online for a new version of firmware and displays a download button if your camera requires an update.

- 4. If displayed, click the link to download the firmware. The firmware is saved locally.
- 5. In the Select Firmware list, select the firmware that you want to update.
- 6. After downloading the new firmware, the Release Notes button is no longer grayed out.
- 7. Click Release Notes to download the release notes for the newest firmware.
- 8. To update the camera to the latest firmware, click Update.

Note

The firmware is written to the camera and a gear icon is displayed next to the **MAIN** component. A progress bar displays the progress of the update.



Note

When the update is successfully completed, the MAIN component is marked with a green check mark icon.

9. If the update fails, disconnect the USB 3.1 cable, reconnect it, and repeat the procedure described above.

12.3 Checking Firmware Version

To determine if you have the latest firmware installed:

- 1. Click SETTINGS.
- 2. Click the required camera tab.
- 3. Click the SERVICE tab.
- 4. Check to see if the firmware version installed on the camera is the same as the latest version available www.phaseone.com/download-categories/ixm-firmware/

12.4 Restoring Firmware to Factory Version

If you need to restore the camera firmware to the factory version (camera settings are not affected):

- 1. Open the memory card slot cover.
- 2. Insert a pin into the hole.



- 3. Keep the pin in the hole.
- 4. Supply power to the camera.
- 5. Wait for 3 to 4 seconds.
- 6. Put the camera aside for several minutes while the firmware is restored to the factory version. Do not power off the camera until all LEDs resume normal colors (see Section 13 Interpreting the Camera LEDs).



13 Interpreting the Camera LEDs

The camera back has three LEDs that indicate camera status as follows:



Location in Figure Above	LED	Off	Green	Blue	Orange	Red
1	Storage	No storage	Storage available	-	Storing	-
2	Operation	-	Ready	Live View/ HDMI modes	Capturing	Not ready
3	Power	No power	Power on	-	Starting-up	-

13.1 Temperature Warning

When working continuously for an extended period, such as in HDMI mode or when rapid capturing, the camera internal temperature may exceed its upper limit. Temperature states are indicated by the Operation LED as follows:

State	Indication
Temperature High	Operation LED flashes green slowly (regular mode).
	Operation LED flashes blue slowly (Live View or HDMI modes).
Temperature Very High	Operation LED flashes green quickly (regular mode).
	Operation LED flashes blue quickly (Live View or HDMI modes).
Thermal Shutdown	Operation LED flashes red quickly.

Note

Thermal shutdown stops all active capturing:

- All unsaved images are lost.
- If the temperature falls below the thermal shutdown level, capturing restarts and works normally.

