

Phase One iXU-RS/iXU-R/iXU Aerial Camera System Installation Guide

This guide is designed to assist you with the installation of your new Phase One iXU-RS or Phase One iXU-R or Phase One iXU camera system.

As new features are introduced through firmware updates, we change the downloadable version of this document, which is available from the Downloads section of <http://industrial.phaseone.com>.

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1. What's in the Box?

- Phase One iXU-RS or iXU camera
- Focus Lock Band for LS lens (iXU only)
- 24 V DC power supply with international outlet adapters
- iXU RA power cable, 2 m
- iXU RA control cable, 2 m
- USB3 Shield cable, 2 m
- 2 mm hex screwdriver
- 4 mm flat screwdriver (iXU only)
- Microfiber cloth
- Sensor cleaning kit
- USB drive with documentation
- Installation guide
- Warranty certificate
- Suitcase for iXU-RS/iXU camera

Optional Accessories

- Rodenstock RS-32mm Lens (73137)
- Rodenstock RS-40mm Lens (73118)
- Rodenstock RS-50mm Lens (73110)
- Rodenstock RS-70mm Lens (73119)
- Rodenstock RS-90mm Lens (73121)
- Schneider Kreuznach RS-110mm Lens (73135)
- Schneider Kreuznach RS-150mm Lens (73136)
- Schneider-Kreuznach 55 mm F2.8 LS FS Lens (73003)
- Schneider-Kreuznach 80 mm F2.8 LS FS Lens (73004)
- Schneider-Kreuznach 110 mm F2.8 LS FS Lens (73005)
- Schneider-Kreuznach 150 mm F3.5 LS FS Lens (73006)
- Schneider-Kreuznach 240 mm F4.5 LS FS Lens (73007)
- iXU RA control cable, 3 m (70360)
- iXU RA multi-sync cable, 1 m (70362)
- iXU to iXA multi-sync cable, 1 m (70341)
- USB3 Shield Cable for iXU (1m) (73126)
- USB3 Shield Cable for iXU (3m) (73128)

2. Overview

iXU Camera System

1. Pod mounting threaded holes (4)
2. Lens secure cams (3)
3. CompactFlash card cover screw
4. CompactFlash card cover
5. Lens release button
6. Lens mount alignment mark
7. HDMI port cover (iXU 1000 and iXU 150)



8. Play button
9. Menu button
10. USB 3.0 port cover
11. USB 3.0 port screw
12. Data terminal A
13. Data terminal B
14. Power terminal
15. FMC button or Video button - iXU 150, iXU 1000 and iXU-RS 1000 (including NIR variations)
16. Setup button



Focus Lock Band

1. Front band screw
2. Rear band screw
3. Alignment hole
4. Distance scale window
5. Plastic clamping ring



iXU-RS/iXU-R Camera System

1. Pod mounting threaded holes (4)
2. Lens screws (3)
3. Lens assembly
4. HDMI port cover (iXU-RS 1000)
5. CompactFlash card cover screw
6. CompactFlash card cover



7. Play button
8. Menu button
9. USB 3.0 port cover
10. USB 3.0 port screw
11. Data terminal A
12. Data terminal B
13. Power terminal
14. For iXU-RS - FMC or Video button
For iXU-R - FMC button
15. Setup button



3. Preflight Planning

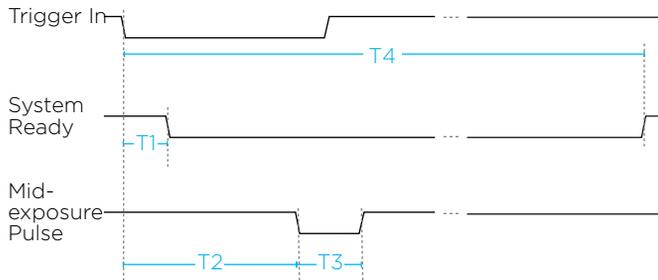


Figure 1: Exposure Sequence

Table 1 - Exposure sequence

Typical Values	Schneider-Kreuznach FS	Rodenstock Lenses	RS lenses
T1 Trigger IN - SysRdy (Low)	2 mSec	2 mSec	2 mSec
T2 Trigger IN - Mid Exposure	-50 mSec + 1/2 Exp. Time	-50 mSec + 1/2 Exp. Time	-20 mSec + 1/2 Exp. Time
T3 Mid Exposure Width	1/2 Exp. Time + 1.1 mSec	1/2 Exp. Time + 1.1 mSec	1/2 Exp. Time + 1.1 mSec
T4 (iXU 1000) Trigger IN - SysRdy (High)	950 mSec	850 mSec	600 mSec
T4 (iXU 180) Trigger IN - SysRdy (High)	1600 mSec	1250 mSec	1250 mSec
T4 (iXU 160/160 Achromatic) Trigger IN - SysRdy (High)	1450 mSec	1100 mSec	1100 mSec
T4 (iXU 150) Trigger IN - SysRdy (High)	850 mSec		

Exposure Sequence

To learn more about the capabilities of the iXU-RS/iXU-R/iXU camera, consult the industrial.phaseone.com website and the documents, which are found on the USB drive that comes with the camera.

Understanding the Exposure Sequence

There are three signals that are used to communicate with and control the iXU-RS/iXU-R/iXU exposure sequence:

- **Trigger in:** The Flight Management System (FMS) signals the iXU-RS/iXU-R/iXU to take an image.
- **System ready:** Camera ready/busy signal.
- **Mid-exposure pulse:** A signal indicates the midpoint of the exposure time.

Wiring a Control Cable

Table 2 - Camera Control Cable Description

Connector Pin	Color	Name	Description	Direction	Level	Notes
1	Orange	Reserved	Reserved	Reserved	Reserved	Reserved
2	Green	System Ready	iXU-RS/iXU-R/iXU system ready for next capture	Out	VOH, min = 4.0 V (I _o = -10uA) VOL, max = 0.8 V (I _o = 4mA)	Isolated 5 Volt Level Pull up resistor 100K Ohms to +5 V
3	Red	Black Reference Control	Indicates a black reference sequence is required	In	VIH, min = 2.4 V VIL, max = 0.8 V tiF, tiR < 1uSec	Isolated, active low See "Understanding Black Reference" on page 14
4	Purple	Trigger In	Trigger the iXU-RS/iXU-R/iXU for new capture cycle	In	VIH, min = 2.4 V VIL, max = 0.8 V tiF, tiR < 1uSec	Isolated, active low (For manual triggering, activate by short to common signal, otherwise leave floating.)
5	Blue	RS232 RX	External system can send specific information to iXU-RS/iXU-R/iXU system	In	RS232 input level +/- 15 V (VIT+ max=2.4 V VIT-min=0.8 V)	RS232 Voltage Level Isolated For baud rate and additional information, see the Phase One GPS User Guide
6	Yellow	RS232 TX	iXU-RS/iXU-R/iXU system can send specific information to external system	Out	VOH at RL=3 kΩ to GND + 5.4 V VOL at RL=3 kΩ to GND -5.4 V	
7	White	Mid-exposure pulse	Midpoint of the exposure time	Out	VOH, min = 4.0 V (I _o = -4mA) VOL, max = 0.8 V (I _o = 4mA)	Isolated 5 Volt Level
8	Gray	Reserved	Reserved	In		Short to pin 9*
9	Black	Common		Common		

VIL — maximum voltage level that is interpreted as a '0' by a input.

VIH — minimum voltage level that is interpreted as a '1' by a 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

*For iXU-RS/iXU-R/iXU cameras, this connection is mandatory.

The connection is not necessary for iXA-R/iXA cameras.

Wiring a Control Cable for an iXU Series Camera

External devices are connected to the camera with an iXU RA control cable (supplied with the camera kit). This cable has a LEMO-secured connector on one side for the camera and an open side with nine (28 AWG) wires for connection to your system.

The table below describes the functionality of the wires in the iXU RA control cable.

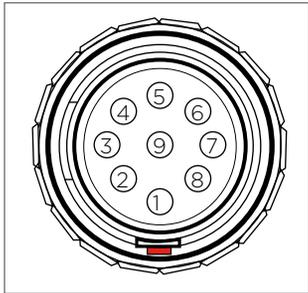


Figure 2: Communication Connector Cable Plug Pinout

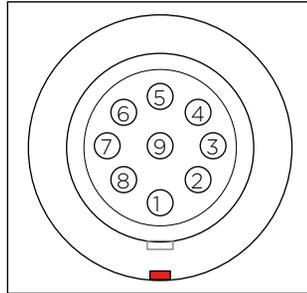


Figure 3: iXU-RS/iXU-R/iXU Camera Socket Pinout

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 used to subtract from the regular capture.

Updating the black reference data whenever it is possible enhances the image quality, in particular when shooting in conditions where the temperature of the camera changes. If the exposure time varies a lot, the black calibration reference data should be updated.

It is advisable to make a black reference capture before starting your first flight line and if the exposure settings or ISO have been changed. This ensures the accuracy of exposures. The best time to do this is before starting a new flight line, when images are not being captured.

Note: Black reference is performed automatically on taking the first shot after switching the camera on.

Software Activation of Black Reference

The Phase One iXU-RS/iXU-R/iXU camera can perform a black reference sequence by using the iX Capture application, the Phase One SDK, the Flight Management System or through an iX Link API.

When using iX Capture, simply click Black Ref on the iX Capture dashboard to update the black reference.

Black Reference Sequence

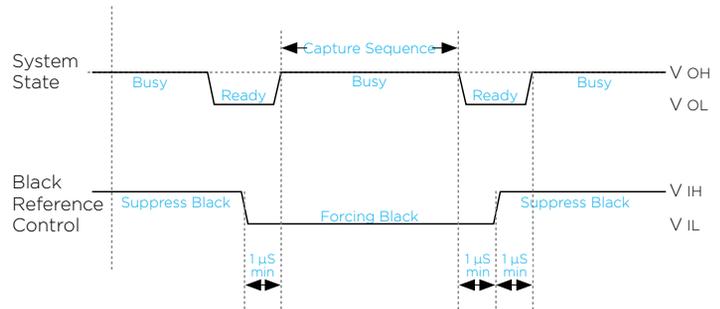


Figure 2 : Black Reference Timing

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 (i.e. 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.

Wiring the Power Cable

The camera is connected to the aircraft's power bus with a power cable. Wire the power cable using the information in the table below.

Table 3 - 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	Should provide up to 30 W
2	Black	DC In - (Common)		Input		

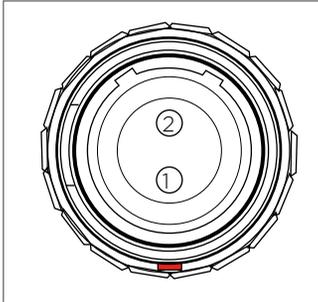


Figure 4:
Power Cable Plug Pinout iXU-RS/iXU-RS/iXU-R/iXU Camera

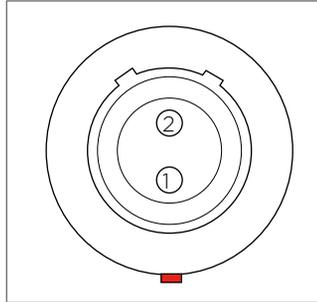


Figure 5:
Socket Pinout

Note: The iXU-RS/iXU-R/iXU camera must only be powered by a limited fused power source, up to 8 A single fault condition.

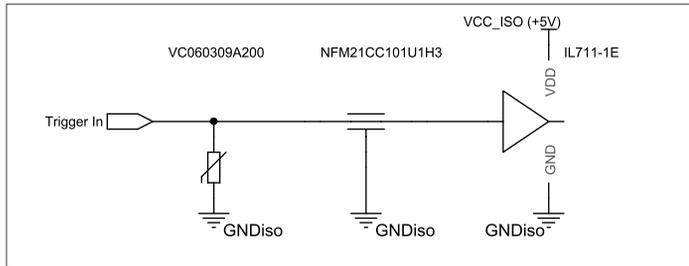
Electrical Interfaces

There are four signals that are used to communicate with and control an iXU-RS/iXU-R/iXU camera:

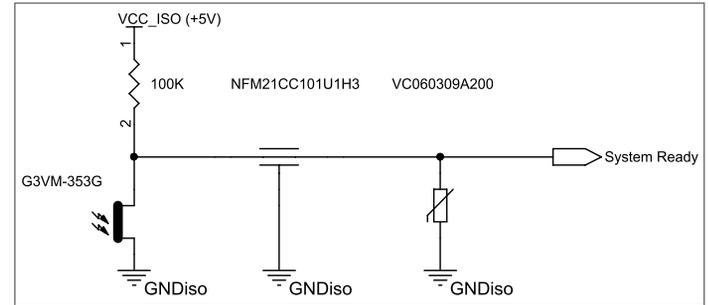
Trigger in	Triggers the iXU-RS/iXU-R/iXU for new capture cycle
Black reference	Indicates a black reference sequence is required
Mid-exposure pulse	A signal indicates the midpoint of the exposure time.
System ready	Camera ready/busy signal

The schematic drawings below contain component part numbers for reference.

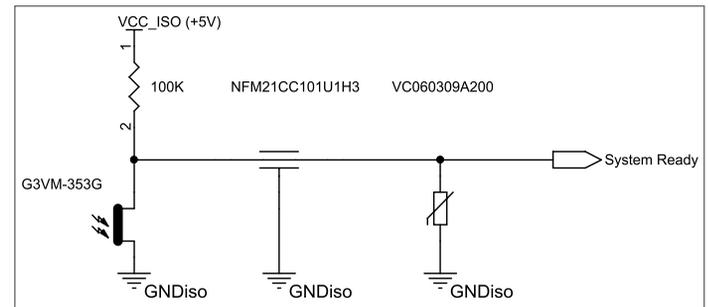
Trigger in, Black Reference



Mid-exposure pulse



System ready

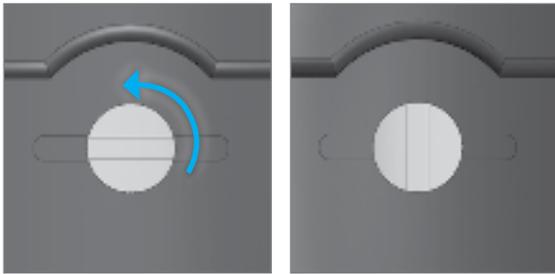


4. Preparing the Camera

Mounting an iXU Lens

Note: Before mounting or dismounting a lens, ensure that the power cable is not attached to the camera.

Ensure that the three lens clamp cams are in the unlocked position. If locked, use a flat screwdriver to rotate each cam 90 degrees counter-clockwise.



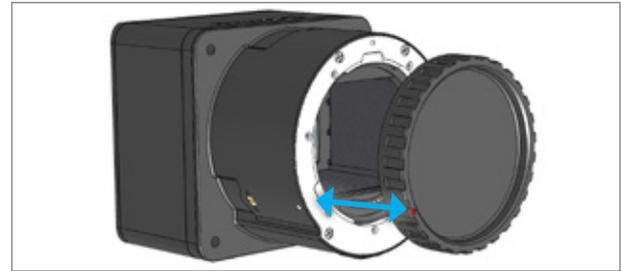
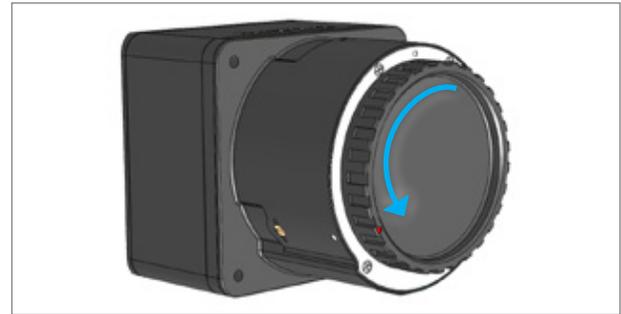
Locked

Unlocked

1. Push the lens release button toward the camera and hold.



2. Rotate the front body cap counterclockwise and lift out.



3. Remove the front and rear caps from your lens.
4. Align the white alignment dot of the lens with the white lens alignment dot of the camera and fit the lens into place.

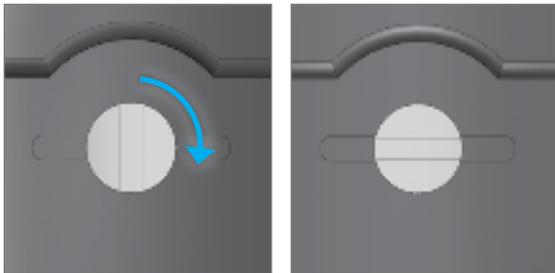




5. Rotate lens clockwise until it locks into place.



6. With a flat screwdriver, lock each of the three lens clamp cams by rotating each cam clockwise 90 degrees.

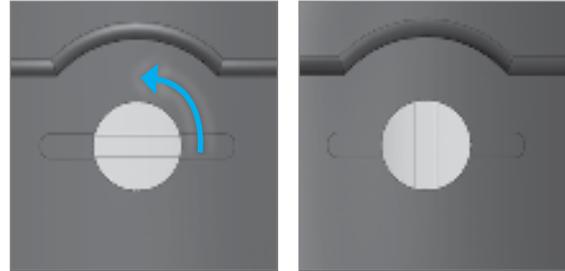


Unlocked

Locked

Dismounting an iXU Lens

1. With a flat screwdriver, unlock each of the three lens clamp cams by rotating each plunger 90 degrees counter clockwise.



Locked

Unlocked

2. Push and hold the lens release button toward the camera.



3. Rotate the lens counterclockwise and lift out.



4. Put a body cap on the camera to protect it or place another lens on the camera.

Attaching a Focus Lock Band

The focus lock band is used to keep your lens set to the focus you prefer. Follow the instructions below to secure your lens to the exact focus you choose.

To attach a Focus Lock Band to your lens:

1. Check to make sure that both front band and rear band screws are loosened. If they are tightened, loosen with the 2 mm hex screwdriver that was provided with the camera.
2. Set the focusing selector ring to either MF or AF.
3. Slide the plastic clamping ring onto the lens. The hole on the plastic clamping ring should be aligned over the white alignment dot of the lens and the opening of the plastic clamping ring should enable you to read the distance scale on the lens.



- Slide the Focus Lock Band onto the lens as far as it can go. The rear band should be positioned closest to the camera body and the alignment hole in the rear band is positioned over the white alignment dot on the lens. The distance scale window is positioned over the distance scale of the lens.



- Using a 2 mm hex key, tighten the screw on the rear band using a torque of 15 cNm.



- Perform ground calibration until optimal focus has been achieved.
- Using a 2 mm hex key, tighten the screw on the front band using a torque 15 cNm.



Note: You may remove the lens with the band attached. The procedure is the same as "Dismounting an iXU Lens" on page 23.

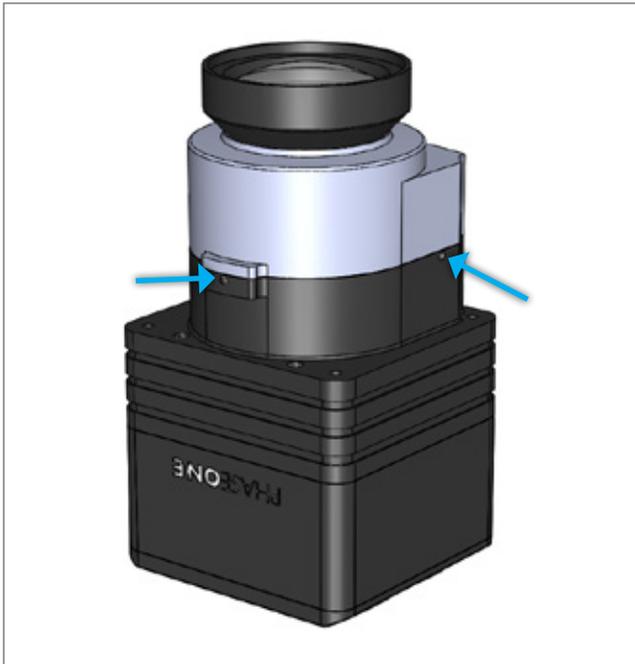
Dismounting a Lens from an iXU-RS/iXU-R

Lenses on the iXU-RS/iXU-R series of cameras are easily dismounted. Ensure that you only dismount lenses in a clean environment.

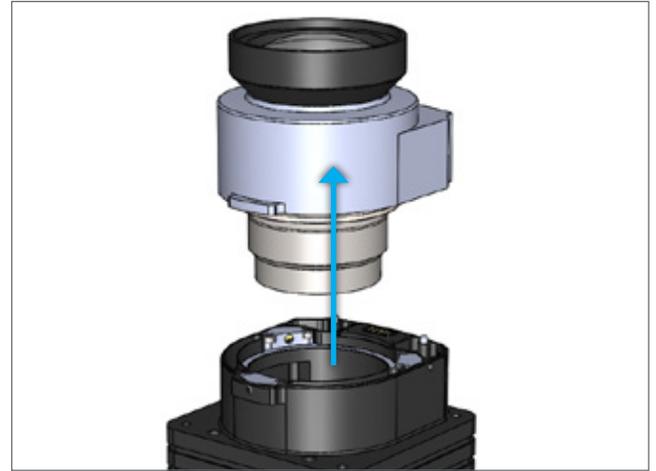
Place a soft cloth down on the table to avoid scratching the LCD and a lens cap on the lens.

To dismount the lens:

1. With a 2 mm hex key, unscrew the three lens screws. The screws remain attached to the camera.



2. Pull the lens assembly away from the camera.



3. Place a rear cap on the lens.

Note: If another lens is not being mounted on the camera, ensure that the camera is stored in a way to protect it from dust, moisture and other damage.

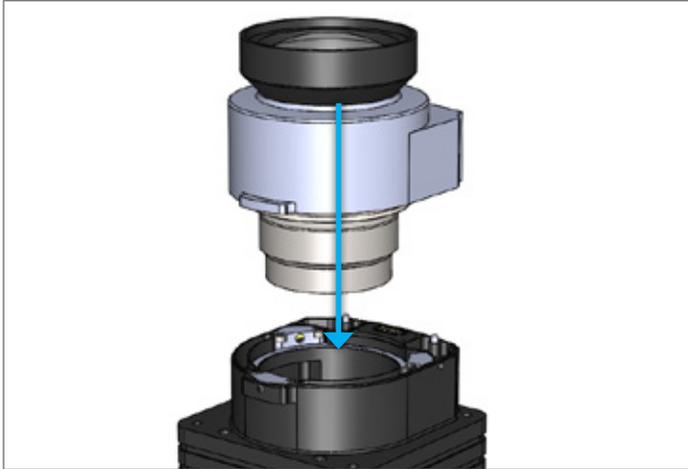
Mounting a Lens on an iXU-RS/iXU-R

Lenses on the iXU-RS/iXU-R series of cameras are easily mounted. Ensure that you only mount lenses in a clean environment.

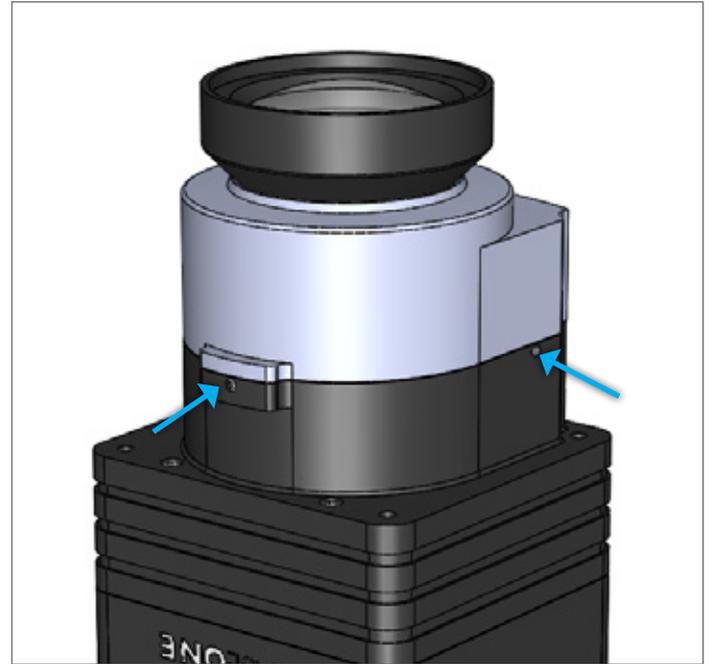
Place a soft cloth down on the table to avoid scratching the LCD and a lens cap on the lens.

Ensure that you remove the rear lens cap (if attached) before mounting the lens.

1. Place a lens assembly on the iXU-RS/iXU-R body.



2. With a 2 mm hex key, secure the lens assembly onto the iXU-RS/iXU-R by gently tightening each locking screw.
3. Tighten the locking screws a second time using a torque of 50 cNm.



5. Connecting a Camera

Attaching the Camera to a Pod

Attach the iXU-RS/iXU-R/iXU camera to a pod using four M4 bolts.

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

Connecting a Control Cable

1. Insert the iXU RA control cable into a data terminal on the iXU-RS/iXU-R/iXU camera body.
2. Connect the other end of the iXU RA control cable to an external device.



Note: The two data terminals are not interchangeable. Connect devices to data terminal A or B depending on the specific device. See details in "Connecting Control Cables to Devices" on page 34 and "Activating iX Link" on page 46.

Connecting the Power Cable

To connect the camera to the aircraft's power bus:

1. Insert the iXU RA power cable to the power input of the iXU-RS/iXU-R/iXU camera.
2. Connect the other end of the iXU RA power cable to the aircraft's power bus.

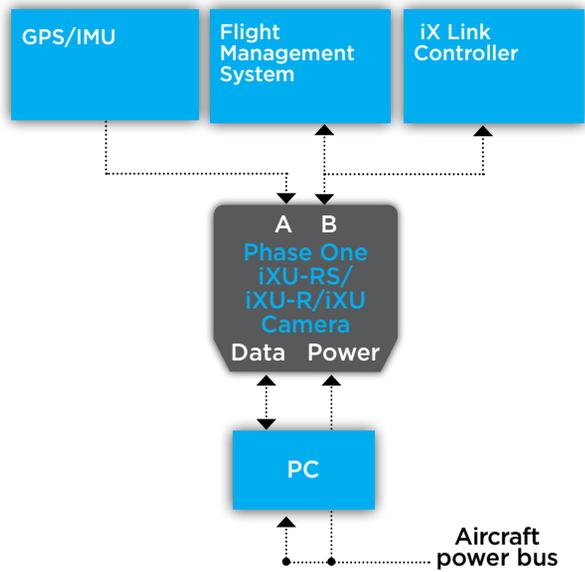
Note: When not in use, disconnect the power from the camera.



Connecting Control Cables to Devices

Depending on how you choose to configure your iXU-RS/iXU-R/iXU, the camera can be connected to the following:

- Flight Management System
- GPS/IMU
- Controller via iX Link



To connect your iXU-RS/iXU-R/iXU to external devices:

1. Insert the iXU RA control cable into data terminal A (the left data terminal) of the iXU-RS/iXU-R/iXU camera body.

2. Connect the other end of the iXU RA control cable into the GPS/IMU.



3. Insert an iXU RA control cable into data terminal B (right data terminal).



4. Connect the other end of the iXU RA control cable into your Flight Management System and / or a controller using iX Link.

Note: Ensure that the camera and all connected devices are connected to a power source.

Connecting Cables for Multiple Camera Configuration

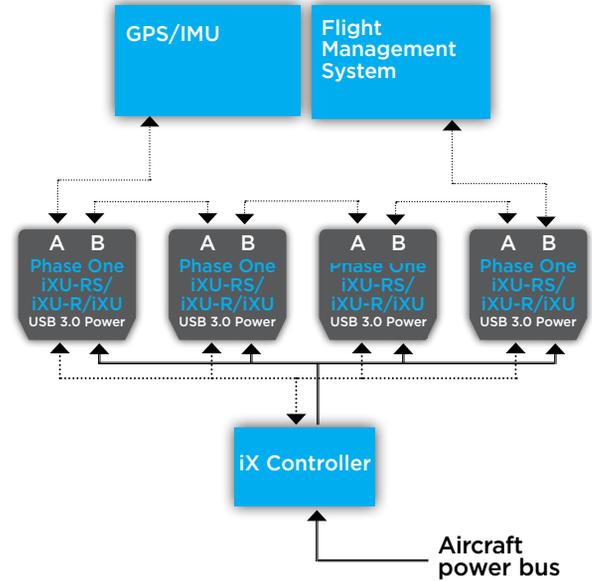
Multiple iXU-RS/iXU-R/iXU cameras can be synchronized to shoot simultaneously. When using iXU-RS/iXU-R/iXU cameras, ensure that you have mounted Schneider-Kreuznach fast sync [S] lenses on the cameras. The first camera in the daisy-chain is triggered with an iXU RA control cable.

Before connecting, ensure that all cameras in the array do not have iX Link activated. See "Deactivating iX Link" on page 47.

1. Insert an iXU RA control cable into data terminal A (left one) on an iXU-RS/iXU-R/iXU camera.
2. Connect the other end of the iXU RA control cable into the GPS/IMU.
3. Insert an iXU RA multi-sync cable into the camera's data terminal B (right one).
4. Connect the other end of the iXU RA multi-sync cable to data terminal A of the second camera.



5. Repeat for additional cameras.
6. Connect an iXU RA control cable from data terminal B of the last camera in the daisy-chain.
7. Connect the other end of the iXU RA control cable to the flight management system or other device.



Identifying a Fast Sync Lens

When shooting with multiple iXU cameras, ensure that you are using Schneider-Kreuznach fast sync lenses. Schneider-Kreuznach fast sync [S] lenses can be identified by [S] on the side of the lens.



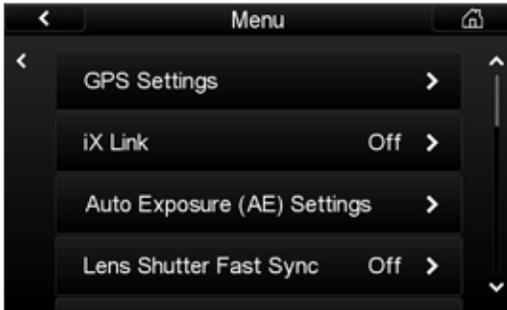
Note: R & RS lenses are Fast Sync.

Activating Fast Sync Mode

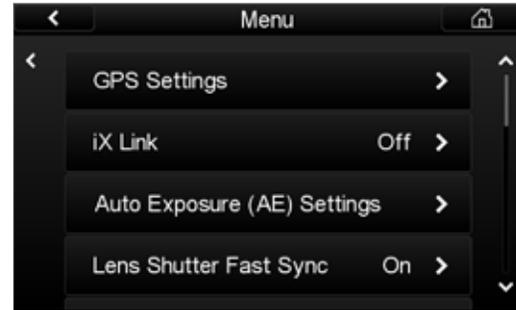
Use Fast Sync Mode when you are using two or more synchronized cameras in the same array. Ensure that Fast Sync Mode is set according to your preference. To deactivate Fast Sync Mode, follow the "Deactivating Fast Sync Mode" on page 39.

To activate Fast Sync Mode:

1. Go to Menu > Lens Shutter Fast Sync.
The Lens Shutter Fast Sync screen appears.



2. From the Lens Shutter Fast Sync screen, select On.
The Menu appears with On displayed.



Deactivating Fast Sync Mode

To deactivate Fast Sync Mode:

1. Go to Menu > Lens Shutter Fast Sync.
Lens Shutter Fast Sync appears.



2. From the Lens Shutter Fast Sync screen, select Off.
The Menu appears with Off displayed.

Connecting iXU-RS/iXU-R/iXU and iXA-R/iXA Cameras in the Same Array

iXU-RS/iXU-R/iXU and iXA-R/iXA cameras can be connected to capture simultaneously in the same array. When mixing iXU-RS/iXU-R/iXU and iXA-R/iXA cameras, iXU-RS/iXU-R/iXUs must be connected to each other to form a group and iXA-R/iXAs must be connected to each other to form another group. These two groups are connected to each other with a special sync cable (iXU to iXA sync cable p/n 70341).

Note: iXU to iXA sync cables have gray hoods.

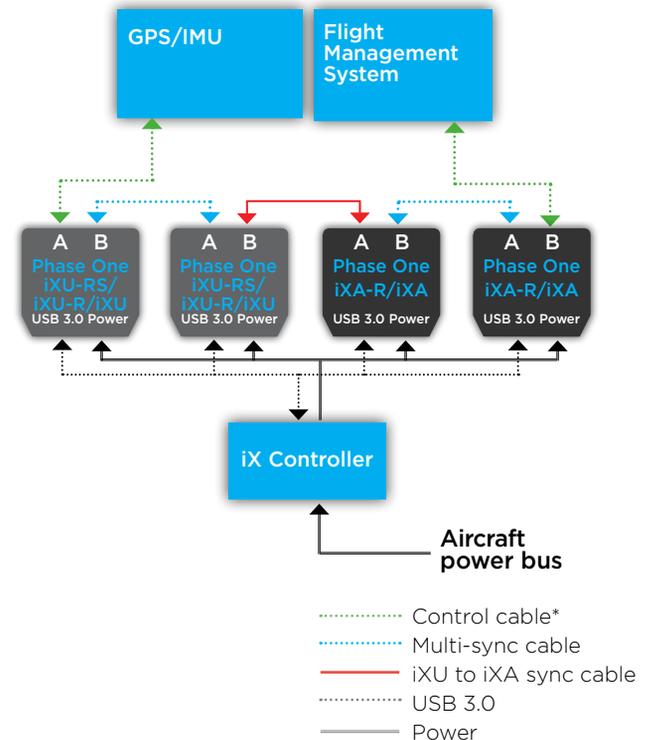
Ensure that you have mounted Schneider-Kreuznach fast sync [S] lenses on the cameras.

Before connecting, ensure that all iXU-RS/iXU-R/iXU cameras in the array do not have iX Link activated. See "Deactivating iX Link" on page 47.

To create an array of iXU-RS/iXU-R/iXU and iXA-R/iXA cameras:

1. Insert an iXU RA control cable into data terminal A (left one) on an iXU-RS/iXU-R/iXU camera.
2. Connect the other end of the iXU RA control cable into the GPS/IMU.
3. If the next camera in the array is an iXU-RS/iXU-R/iXU:
 - a. Insert a multi-sync cable into the iXU-RS/iXU-R/iXU's data terminal B (right one).
 - b. Insert the other end into data terminal A of the next iXU-RS/iXU-R/iXU.
 - c. Repeat for additional iXU-RS/iXU-R/iXU cameras.
4. If the next camera is an iXA-R/iXA:
 - a. Insert a iXU to iXA sync cable into the iXU's data terminal B
 - b. Insert the other end of the iXU to iXA sync cable into data terminal A of the first iXA-R/iXA.
5. If the next camera is another iXA-R/iXA camera:
 - f. Connect a Phase One multi-sync cable from data terminal B of the iXA-R/iXA.
 - g. Insert the other end into data terminal A of the next iXA-R/iXA.

- h. Repeat for additional iXA-R/iXA cameras.
6. Connect a Phase One control cable from data terminal B of the last camera in the iXA-R/iXA group.
 7. Connect the other end of the Phase One control cable to the flight management system or other device.



* For iXU-RS/iXU-R/iXU cameras, see "Wiring a Control Cable" on page 12.

For iXA-R/iXA cameras, see "Wiring the Camera Control Cable" in the iXA-R/iXA Installation Guide.

Checking Compatibility of USB 3.0 Cards

For a list of USB 3.0 cards for Windows computers that have been tested with the iXU-RS/iXU-R/iXU camera, read the USB 3.0 Compatibility document available in the Downloads section of the <http://industrial.phaseone.com> website.

Connecting a USB 3.0 Cable to an Onboard Computer

To connect a USB 3.0 cable to a computer:

1. Using a 2 mm hex key, unscrew the screw on the cover of the USB 3.0 port.
2. Remove the cover with screw and store it.



3. Insert the end of the USB 3.0 cable into the USB 3.0 port on the camera.
4. Using a 2 mm hex key, tighten the screw on the USB 3.0 cable lock into the camera.



5. Connect the other end of the USB 3.0 cable into the USB port of your iX Controller or on the back of your onboard computer.

Note: Shielded USB3 cable is compatible with iXU S/N's starting with **02****

Connecting a GPS/IMU

Connecting a Phase One camera to a GPS/IMU involves three steps:

- Physical connection of the camera to the GPS
- Configuring the camera
- Configuring the GPS/IMU

In order to facilitate communication between your Phase One aerial camera and a GPS receiver, the parameters in your GPS receiver and camera must match.

Note: The GPS receiver must use the same baud rate as the camera (9600, 19200, 57600 or 115200).

A comprehensive guide to connecting Phase One aerial cameras with a GPS receiver is available for download from <http://industrial.phaseone.com/downloads>.

Connecting an HDMI Cable to an iXU-RS 1000/iXU 1000/iXU 150

To connect an HDMI cable to an iXU 1000/iXU 150 camera:

1. Remove the rubber cover of the HDMI port.
2. Insert an HDMI cable into the HDMI port of the iXU camera.



3. Connect the other end to a monitor or other device.

Connecting to a Host Controller with iX Link

The iXU-RS/iXU-R/iXU camera can be connected to a host controller enabling you to control the camera and capture images. Images are sent directly to a CompactFlash card.

In order to work with a host controller, use the Phase One proprietary iX Link protocol. iX Link is a Phase One protocol of sending and receiving data, and sending commands to an iXU-RS/iXU-R/iXU camera from an external controller using RS232.

To use iX Link with your iXU-RS/iXU-R/iXU camera, you need to:

- Activate iX Link.
- Program the controller device you are using to transmit and receive the iX Link commands.

See the iX Link Programming Guide, which contains the application programming interface (API), which is needed to program your controller. It is available from the Downloads section of <http://industrial.phaseone.com>.

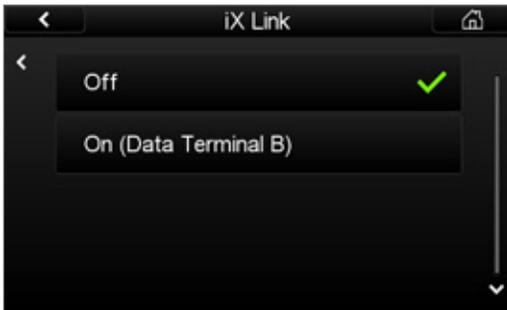
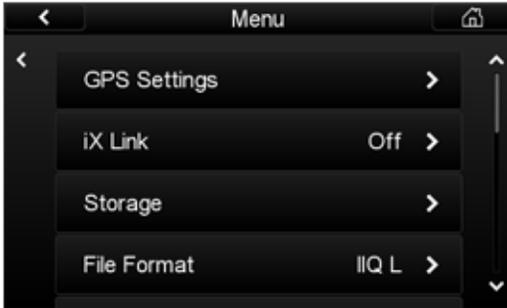
Activating iX Link

Activating iX Link changes the iXU-RS/iXU-R/iXU camera's data terminal allocation so that data terminal B (the right terminal) is dedicated to iX Link usage.

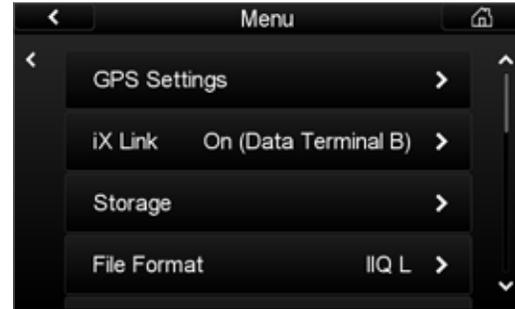
To activate iX Link:

1. Go to Menu > iX Link

The iX Link screen appears.



2. From the iX Link screen, select On (Data Terminal B).
The Menu appears with On (Data Terminal B) displayed.



Note: When iX Link is activated, data terminal B can only be used with iX Link or a flight management system.

Deactivating iX Link

Deactivating iX Link changes the iXU-RS/iXU-R/iXU camera's data terminal allocation so that data terminal B (the right terminal) can be used for multi-syncing cameras.

To deactivate iX Link:

1. Go to Menu > iX Link
The iX Link screen appears.
2. From the iX Link screen, select Off.
The Menu appears with Off displayed.

Activating Forward Motion Compensation

Forward Motion Compensation (FMC) is an option on the iXU-RS 180, iXU-RS 160 and iXU-RS 160 Achromatic, iXU-R 180, iXU-R 160 and iXU-R 160 Achromatic. iXU 180, iXU 160 and iXU 160 Achromatic. To order FMC, view <http://industrial.phaseone.com/PhaseOne-FMC.aspx>.

To activate FMC, read the iXA User Guide, which can be downloaded from <http://industrial.phaseone.com>.

Using a Near Infrared Camera

If the camera model is a Near Infrared (NIR) model, follow the steps below to configure the camera for NIR or RGB use.

Configuring a NIR Camera

To configure a NIR camera:

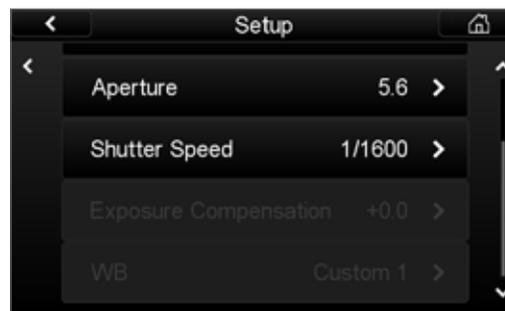
1. Place a filter over the lens.
2. Go to Menu > Lens Filter.
The Lens Filter screen appears.



3. Select the lens filter that you are using:
 - IR Cut — For RGB photography
 - IR 830nm — For NIR photography above 830 nm wavelength.
The Menu appears with the selection displayed.

Note: By selecting IR 830nm lens filter, the camera records achromatic images.

The Home screen displays Custom 1 as the white balance and White Balance menu options are grayed out.



6. Using Auto Exposure

The camera's exposure parameters can be controlled manually or with auto exposure by adjusting the settings on the camera's LCD screen or with iX Capture.

Auto exposure controls the camera's three exposure parameters:

- ISO
- Aperture
- Shutter speed

When auto exposure is activated, the camera reads the histogram of each image after it is captured and adjusts the exposure parameters for the next image. The adjustments are in third stop increments.

To use Auto Exposure mode, do the following:

- Select Auto Exposure Range
- Select Auto Exposure Priority
- Activate Auto Exposure Mode
- Adjust Auto Exposure Bias (if needed)

The camera uses the following parameters for the first exposure:

- ISO — Value selected in Auto Exposure Minimum.
- Aperture — Average aperture between Auto Exposure Minimum and Maximum.
- Shutter speed — Value set in Auto Exposure Maximum.

When using auto exposure, the camera uses the parameters listed above for the first exposure. Capture a few images before your first flight line in order for auto exposure to set the optimum exposure.

When Auto Exposure mode is activated, the exposure parameters (ISO, aperture and shutter speed) are grayed out.

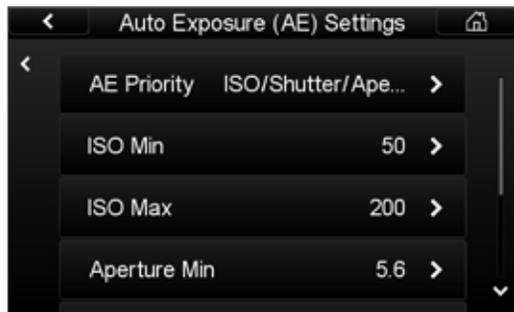
If the camera has Auto Exposure mode and FMC activated, Auto Exposure mode only controls ISO and aperture. The shutter speed is controlled manually.

Selecting Auto Exposure Range

To keep your exposure parameters within the range you prefer, set Auto Exposure Minimums and Maximums.

The default auto exposure range is set based on the optimum settings for each camera and sensor. You can choose to use the default settings or to create your own.

1. Go to Menu > Auto Exposure (AE) Settings.
The Auto Exposure (AE) Settings screen appears.



2. From the Auto Exposure (AE) Settings screen tap ISO Min.
The ISO Min screen appears.
3. From the ISO Min screen, select the minimum ISO you want Auto Exposure Mode to use.
A green check mark appears beside your selection.
4. Tap ISO Max.
The ISO Max screen appears.
5. From the ISO Max screen, select the maximum ISO you want Auto Exposure Mode to use.
A green check mark appears beside your selection.
6. A green check mark appears next to your selection and the Auto Exposure (AE) screen appears.
7. Repeat the procedure and select the minimums and maximums for Aperture and Shutter Speed.

The default auto exposure range settings are:

	iXU-RS 1000 iXU-R 1000 iXU 1000 iXU 150	iXU-RS 180 iXU-R 180 iXU 180 iXU-RS 160 iXU-R 160 iXU 160	iXU-RS 160 Achromatic iXU-R 160 Achromatic iXU 160 Achromatic
ISO Min	100	50	200
ISO Max	400	200	800
Aperture Min	F/5.6	F/5.6	F/5.6
Aperture Max	F/11	F/11	F/11
Shutter speed Min	1/1000	1/1000	1/1000
Shutter speed Max	1/1600	1/1600	1/1600

Note: Once the ranges are selected, they become the camera's new default range for auto exposure. Default ranges are reset if Restore to Defaults has been performed or a new firmware has been loaded.

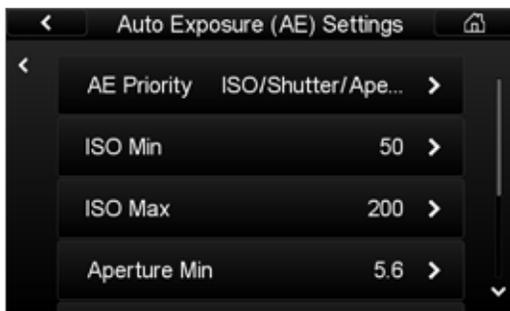
Selecting Auto Exposure Priority

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, if an exposure adjustment is needed, the camera adjusts the first parameter until it reaches the minimum or maximum that you choose, then goes to the second parameter and if needed, continues to the third.

The camera adjusts the exposure using the minimums and maximums of the three exposure parameters in the order that you set. If you want to ensure that a specific value is chosen, set the minimum and maximum for the specific value (e.g. F/5.6 or 1/1000 s).

To select Auto Exposure Priority:

1. From the Home screen, tap:
Menu > Auto Exposure (AE) Settings
The Auto Exposure (AE) Settings screen appears.



2. Click AE Priority.
The AE Priority screen appears.



3. From the AE Priority screen, select the AE Priority that you want to use.
4. Select one of the following:
 - ISO/Aperture/Shutter
 - ISO/Shutter/Aperture
 - Aperture/ISO/Shutter
 - Aperture/Shutter/ISO
 - Shutter/Aperture/ISO
 - Shutter/ISO/Aperture

A green check mark appears beside your selection and the Menu screen appears.

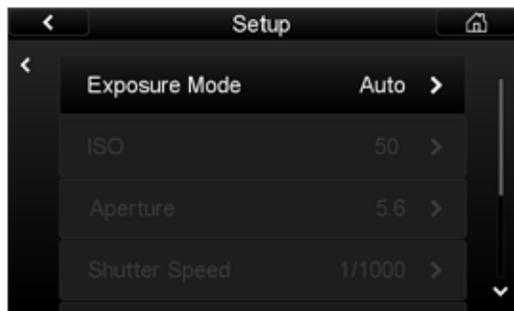
Activating Auto Exposure Mode

To activate Auto Exposure Mode:

1. From the Home screen, tap Setup > Exposure Mode.
The Exposure Mode screen appears.



2. From the Exposure Mode screen, tap Auto to activate auto exposure mode or Manual to deactivate Auto Exposure mode.



A green check mark appears next to your selection and the Setup screen appears.

Adjusting Auto Exposure Bias

Auto exposure settings can be adjusted to add or remove exposure bias (compensation). Some users prefer to use the bias to underexpose slightly.

The adjustments are made in 1/3 stop increments with a range of +/- three F stops.

Note: Exposure Bias (EV) is grayed out until Auto Exposure mode is activated.

To adjust Exposure Bias:

1. From the Home screen, tap Setup > Exposure Bias (EV).
The Exposure Bias (EV) screen appears.



2. Tap the number that corresponds with the exposure bias you want to use.
A green check mark appears beside your selection and the Setup screen appears.



7. Storing Images

Images can be saved to an onboard computer running iX Capture, the Phase One SDK or Capture One using USB 3.0. An alternative method is to work in portable mode using a CompactFlash (CF) card as your storage device.

CompactFlash Card Usage

It is important to follow a few simple guidelines to help avoid loss of data when working with CompactFlash cards, card readers and digital cameras. Phase One recommends that you test-drive all new CF cards. By performing an initial test to verify that the capture files are stored properly on the card and can be accessed on a computer, you can avoid surprises when you return from a flight. CF cards are manufactured by external suppliers and Phase One cannot guarantee that the cards are not defective.

Inserting and Ejecting a CF Card

The CompactFlash card is inserted in the slot located under the cover on the left hand side of the iXU-RS/iXU-R/iXU camera.

To insert a CF card:



1. With a 2 mm hex key, unscrew the screw on the CF cover.
2. Remove the CF card cover.



3. Insert a CF card with the brand label facing the display end of the camera as shown in the image.
4. Replace the CF cover and tighten the CF card screw using a torque of 15 cNm.

Note: To eject the card push the small button above the card once, and an ejecting pin comes out. Pushing this pin all the way back in ejects the card.

Configuring Camera for Image Storage

The camera enables storage of images either via a USB 3.0 connection or on an internal CompactFlash card. Configure the camera to suit your chosen storage method.

Image Storage Options

Auto	The camera stores images to a computer connected via USB 3.0 or CompactFlash card. If both are connected, the default is the USB 3.0 connection.
CF	The camera stores images to an internal CompactFlash card even if a USB 3.0 device is connected.
USB	The camera stores images to a computer connected via USB 3.0 even if a CompactFlash card is inside the camera.

To configure the iXU's Storage:

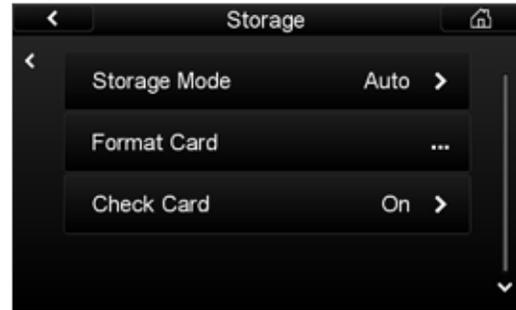
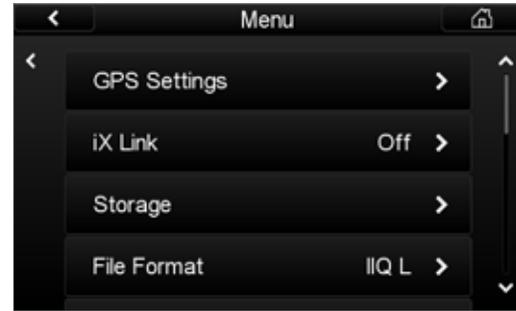
1. Go to Menu > Storage > Storage Mode

The Storage Mode screen appears.

2. Select one of the following:

- Auto
- CF
- USB

A green arrow appears beside your selection.



8. Video Display — iXU 1000/iXU-RS 1000 and iXU 150

The iXU 1000/iXU-RS 1000 is built with HDMI output capability, offering a choice of viewing the video feed on the camera's LCD or outputting to an external display. Follow the instructions below for working with the different video modes.

Note: HDMI video output is disabled on the iXU-R 1000

Activating HDMI Video Output

To configure the iXU 1000/iXU-RS 1000 video output:

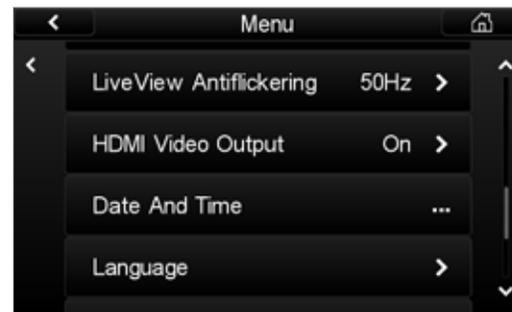
1. Go to Menu > HDMI Video Output



The HDMI Video Output screen appears.



2. From the HDMI Video Output screen, select On.



The Menu screen appears with On displayed.

3. Return to Home screen



LV changes to HDMI

Configuring HDMI Control

Before configuring HDMI control, HDMI video output must be activated. See "Activating HDMI Video Output" on page 62.

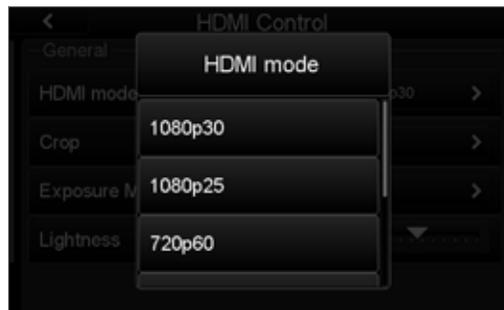
The HDMI controls can be reached by clicking HDMI on the Home screen or in the contextual menu. Clicking the HDMI button starts the video streaming.



Configuring HDMI Mode

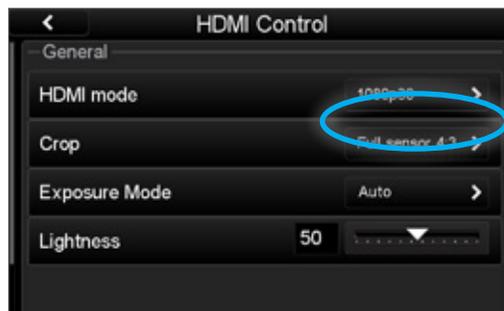
To configure the HDMI output:

1. Go to Home screen > HDMI > HDMI Mode.



The HDMI Mode screen appears.

Resolution (progressive)	Frame rate
1080p30	30 fps
1080p25	25 fps
720p60	60 fps
720p50	50 fps

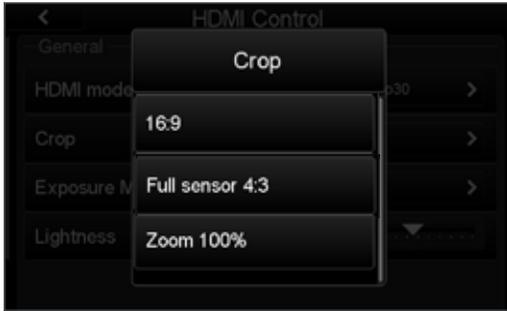


Selecting HDMI Crop

To select the HDMI crop:

1. Go to Home > HDMI >Crop

The Crop screen appears.



2. From the Crop screen, select one of the available crops:
 - 16:9
 - Full sensor 4:3
 - Zoom 100%
3. The HDMI Control screen appears with your selection displayed.

Selecting Video Exposure Mode

To select the HDMI Exposure Mode:

Go to Home screen > HDMI > Exposure Mode.

The Exposure Mode screen appears.



4.

5. From the Exposure Mode screen, select either:

- Auto
- Manual

The HDMI Control screen appears with your selection displayed.

Note: If Auto is selected, follow the instructions in "Adjusting Lightness" below.

If Manual is selected, follow the instructions in "Adjusting ISO" on page 63 and "Adjusting Exposure Time" on page 68 to achieve an optimum balance for display.

Adjusting Lightness

The HDMI output can be changed to be lighter or darker.

To adjust the lightness:

1. Go to Home screen > HDMI.
The HDMI Control screen appears.
2. Adjust the lightness by dragging your finger along the lightness scale (0 to 100) and viewing the results on your external display.



Adjusting ISO

When using Manual Mode, the sensitivity can be raised or lowered to produce different results on your monitor.

To adjust the ISO:

1. Go to Home screen > HDMI > ISO.
The ISO screen appears.



2. Select a desired ISO. (50 to 12,800).
The HDMI Control screen appears with your selection displayed.



Adjusting Exposure Time

When using Manual Mode for video, the exposure time can be adjusted to produce different results on your monitor.

1. Go to Home screen > HDMI > Exposure Time.
The Exposure Time screen appears.
An asterisk appears next to the suggested exposure time, which is based on the HDMI Mode that was previously selected.



2. Select a desired exposure time.
The HDMI Control screen appears with your selection displayed.



Using Video Mode Without a Monitor — iXU 1000 iXU-RS 1000 and iXU 150

Video mode can also be used without a monitor with an iXU 1000. The image appears on the camera's touchscreen. This is useful for setting focus of the lens.

To use video mode without a monitor:

1. Go to Menu > HDMI Video Output

The HDMI Video Output screen appears.



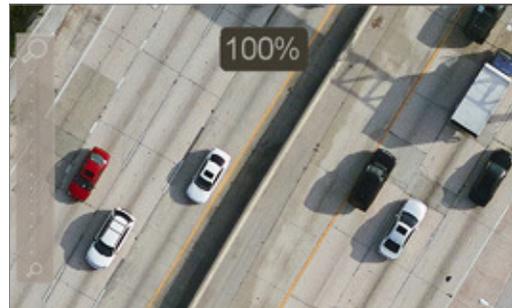
2. From the HDMI Video Output screen select Off. The Menu screen appears with HDMI Video Output Off displayed.
3. Click Home. The Home screen appears.



4. Tap the LV soft button on the Home screen or the LV icon found in the contextual menu. The camera enters video mode. An image is displayed on the camera's touchscreen.

Use the following controls to change your view on the touchscreen:

Double-tap	View the image at 100%
Double-tap again	Zoom out
Draw finger across screen	Images pans in direction of motion
Draw finger along slider	Zoom in and out



9. Firmware

The camera's LCD screen displays technical information about the hardware and embedded firmware of the camera. This is especially useful if support is needed or if you want to check if Phase One is offering a newer firmware update. Please make a note of the firmware menu contents before contacting your dealer or Phase One Support.

Checking the Firmware Version

In order to determine if you have the latest firmware installed:

1. Go to Menu > About System.



2. Check to see if the firmware version installed on the camera is the same as the latest version available in the Downloads section of industrial.phaseone.com website.

About the Phase One Firmware Updater Application

The Phase One Firmware Updater application is used to update your Phase One aerial camera with new firmware. The Firmware Updater is available in the Downloads section of the industrial.phaseone.com website.

The Firmware Updater does not in itself contain any firmware — it detects the camera attached, checks online for the latest firmware and retrieves and installs the firmware packages for your device.

Check the Firmware Updater Application Installation Guide for detailed instructions on offline methods of firmware updating.

Installing the Firmware Updater Application

To install the Phase One Firmware Updater Application, download it from the Downloads section of the industrial.phaseone.com website and do the following:

1. Open the zip file, extract and store the FWUpdater.msi.
2. Double-click FWUpdater.msi to start the Firmware Updater Setup Wizard.
3. When installation completes, click: Start > Phase One > Firmware Updater.

Updating the Firmware

Before starting, ensure that:

- The camera is connected to a power supply and is powered on.
- Your computer has the Firmware Updater application installed and the computer is connected to the Internet.

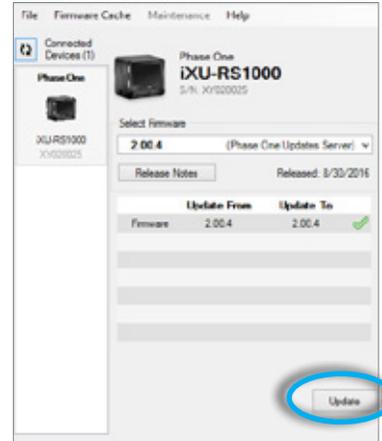
To update the iXU-RS/iXU-R/iXU firmware:

1. Connect the camera to the computer with a USB 3.0 cable.



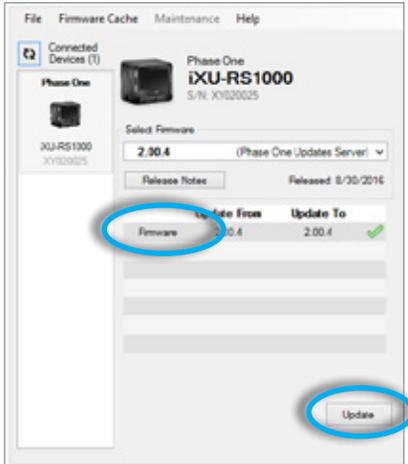
2. Start the Firmware Updater application.

3. The 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. From the Select Firmware dropdown menu, 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 the Release Notes button to download the release notes for the newest firmware.
8. To update the camera to the latest firmware, click Update. The firmware is written to the camera and a gear icon  is displayed next to the MAIN component and a progress bar displays the progress of the update.
9. Upon a successful completion of the update, the MAIN component is marked with a green check mark icon.
10. If the update fails, disconnect the USB 3.0 cable, reconnect it, and repeat the procedure described above.

Warning: Don't disconnect the USB or Power cables before firmware update is completed"

Note: CCD-based iXU cameras use a different firmware than CMOS-based iXU cameras.

Restoring the Firmware

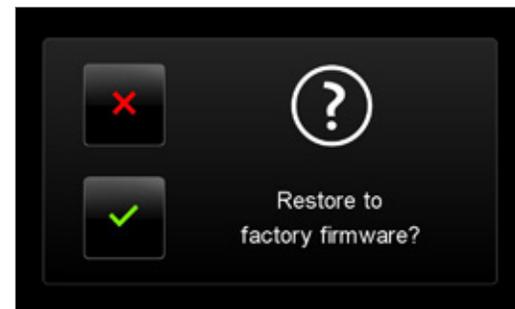
In the event you need to restore the sensor module's firmware to the factory version. (Camera settings are not affected):

1. Go to Menu > Firmware.

The Firmware screen appears.



2. Select Restore Firmware.



The original factory firmware is installed.



Visit the website for additional information
industrial.phaseone.com