iX Controller MK 5

Installation and Operation Guide

Version: 5.0.4

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Contact Support

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1.1   Scope

This manual describes how to install the iX Controller MK 5 as follows:

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1.2   Applicable Documents

Item	Manual
Applanix AP+	APX-15 User Guide
Phase One/Applanix	GNSS Configuration Guide for PAS Systems
Phase One iX Controller	Connecting to the iX Controller Using Remote Desktop Connection
Phase One iX Capture	iX Capture User Guide
Phase One iX Flight	iX Flight Operation Guide
Phase One iX Flight Pro	iX Flight Pro Operation Guide
Phase One iX Process	iX Process Operation Guide
Phase One iXM Cameras	Refer to your camera operation guide for your specific camera.

1.3   List of Terms and Abbreviations

Term/Abbreviation	Description
DP	DisplayPort connector for monitors.
GNSS	Global Navigation Satellite System.
HDMI	High-Definition Multimedia Interface connector for monitors.
IMU	Inertial measurement unit.
PPS	Pulse-per-second (time synchronization output mark from internal GNSS)
SATA	Serial ATA interface for connecting drives to computers.
SSD	Solid-state drive.

2 What's in the Box

The following table lists all iX Controller MK 5 parts.

iX Controller MK 5 Parts

Part No.	Item	Image
40900705	SSD carrier key.	
40900718	1.5 mm hex screwdriver.	
70306000	iX Camera to External GNSS Control Cable.	
70348000	Aircraft to iX Controller MK 5 power cable. **Note** If the iX Controller MK 5 is supplied as part of system with a stabilizer, a different power cable is supplied, as detailed in the Operation Guide for that system.	
70364000	iX Controller MK 5 to camera power cable.	
70378000	iX Controller MK 5 to camera I/O cable.	

Part No.	Item	Image
73275000	iX Controller MK 5.	
76004600	SSD frame (for assembly in post-processing host computer).	
86718900	USB drive with documentation.	
86720500	iX Products warranty certificate	Phase One Geospatial Warranties PHASEONE

2.1   Product Identification

To enable support for your system, you must record the serial number mark on the rear panel of your unit.

3   Overview

3.1   Hardware

The iX Controller MK 5 is a new generation of aerial controller. This robust command center onboard the aircraft is designed for smooth performance of geospatial project missions. A preconfigured precision GNSS-Inertial (AP+ AV) is integrated inside the controller.

The controller is provided with ports to connect with up to six cameras, three monitors, a gyrostabilizer, the Applanix IMU unit, and standard aircraft power supply. A high-capacity data storage SSD tray (factory provided with two 1 TB SSD drives) can be easily accessed or removed for rapid download of image and telemetry data.

iX Controller MK 5 - Front Panel

1.   SSD carrier eject button
2.   SSD carrier keylock
3.   SSD drive LEDs
4.   SSD drive carrier
5.   AUX2 power ports (x3)
6.   AUX2 Power LED
7.   AUX1 Power LED
8.   AUXILIARY Power LED
9.   MAIN Power LED
10. AUX1 power ports (x3)
11. Main circuit breaker
12. Auxiliary circuit breaker
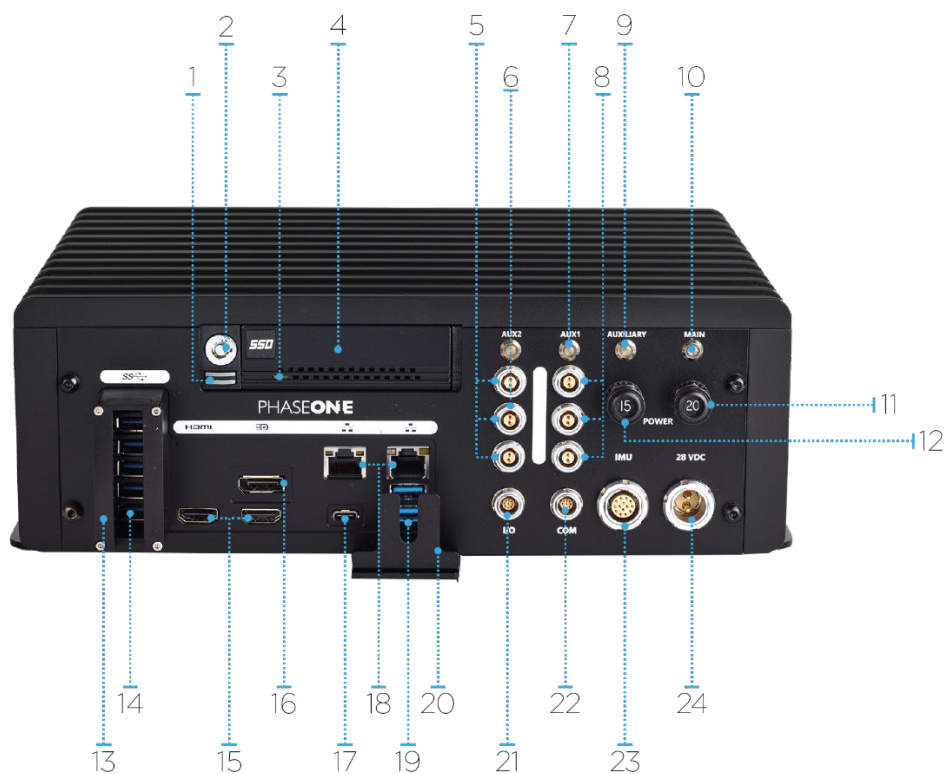
13. Camera USB 3 cable bracket
14. Camera USB 3 ports (x6)
15. HDMI ports (x2)
16. DP port
17. USB-C port
18. Ethernet ports (x2)
19. USB 3 ports (x2)
20. USB 3 cable bracket
21. I/O port
22. COM port (for stabilizer)
23. IMU port
24. 28 VDC power in port

iX Controller MK 5 - Rear Panel

1. Satellite Tracking LED
2. Antenna Connector
3. PPS Output

3.1.1 iX Controller MK 5 Power Overview

The Auxiliary power circuit breaker controls all power to the six AUX1 and AUX2 power ports. It also controls power to the internal GNSS AP+ card. The output voltage from all six power ports is the same as the incoming voltage from the iX Controller MK 5 power source.

Each set of power ports (AUX1 and AUX2) can be software-controlled using iX Capture.

See Appendix A.2 - Power Specifications for more information.

3.2 Configuration Options

The iX Controller MK 5 with its internal GNSS supports connection to the following IMUs for a range of orientation accuracies:

- Applanix IMU 79 - internal
- Applanix IMU 69 - external
- Applanix IMU 82 - external
- Applanix IMU 91 – external
- Applanix IMU 57 - external

Note

- All GNSS-enabled configurations are provided with the Trimble AV39 FAA certified GNSS antenna.
- All GNSS-enabled configurations are provided with an interface cable between the iX Controller MK 5 and the external IMU.
- If you will be using an external IMU, it should be mounted on the pod plate as follows:
  - X axis - towards flight direction
  - Y axis - towards the right wing

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> If you cannot mount the IMU in these directions, you will need to configure the rotation around the Z axis accordingly as described in the GNSS Configuration Guide for PAS Systems.
>
> - You can also use the following external GNSS solutions:
>   - Applanix POS AVX 210
>   - Applanix POS AV V6
>
> For more information, refer to the GNSS Configuration Guide for PAS Systems.

3.3 Software

3.3.1 iX Flight Pro

iX Flight Pro uses iX Plan data to manage and guide the precise execution of aero-photography flight. Using the pilot and operator monitors, the pilot can easily maintain precise trajectory by following altitude and localizer instructions, while the operator manages the flight, controls the order of passes, tags images and start/stops image collection.

For detailed information on using iX Flight Pro, see the iX Flight Pro Operation Guide.

> ### Note
> To process images captured with iX Flight Pro, use iX Process available from Phase One.

3.3.2 iX Capture (3.4.7 or higher)

iX Capture is a professional capture and raw file converter software that provides full control over the cameras installed on the iX Controller MK 5 aerial system. It enables the operator to easily monitor and control every aspect of aerial digital data acquisition using the operator monitor.

iX Capture enables you to capture, monitor, and process images in a fast, flexible, and efficient workflow.

For detailed information on installing iX Capture on another PC and using iX Capture, see the iX Capture User Guide.

3.3.3 Licensing

For software licensing details, contact Phase One.

4   Connecting Cables and Peripherals

> ## Warning
>
> - The iX Controller MK 5 has been tested and certified for connection to a 28 VDC power supply. Installation on aircraft with other power supplies is not recommended unless special measures are taken to provide the iX Controller MK 5 with a 28 VDC supply.
>
> - On the aircraft side, a 10 A circuit breaker must be installed on the 28 VDC power supply.

4.1   iX Controller MK 5 Power Cable (P/N 70348000)

To connect the iX Controller MK 5 power cable to the iX Controller MK 5:

1. Connect the open end of the power cable to the aircraft power supply as shown in the following figure and table:

> ## Caution
>
> Before connecting the power cable to the adaptor, make sure you have verified voltage polarity.

Aircraft Power Cable Pinout

Wire	Pin	Polarity
Red	1	+
Black	2	GND

Aircraft Power Cable Pin Designation

LEMO female connector, (view from connector side)
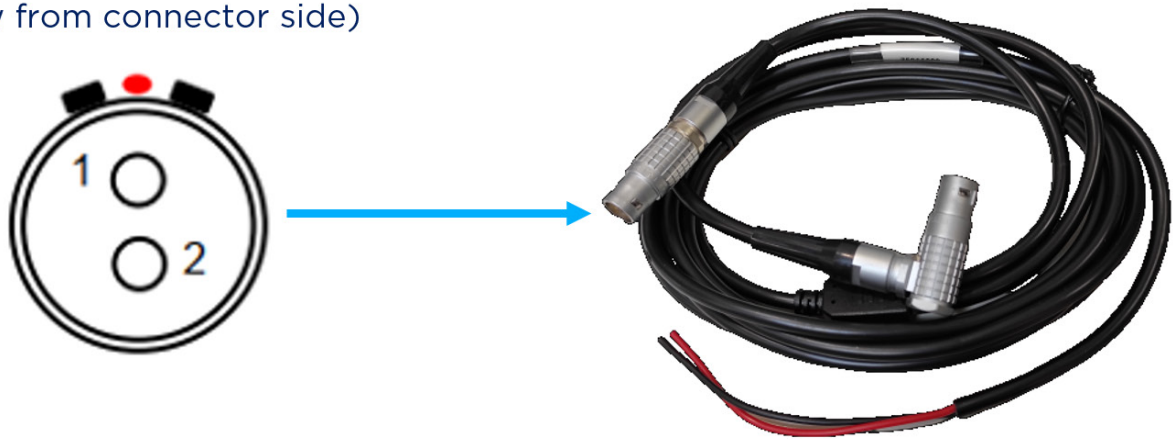
2. Connect the power cable with the LEMO connector to the iX Controller MK 5 28 VDC port.

Power Cable Connection to iX Controller MK 5

iX Controller MK5 Power Port

4.2   Grounding Cable

Connect a grounding cable (not supplied by Phase One) as follows:

1. Connect one end of the grounding cable to the uncoated underside of a mounting panel.

Mounting Brackets
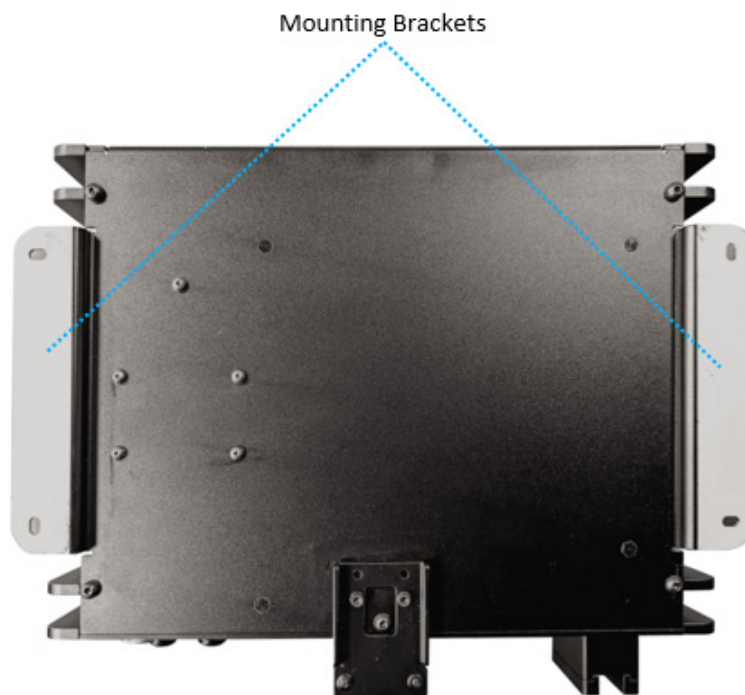
2. Connect the other end to the aircraft frame.

4.3   iX Controller/iX Camera Power Cable (P/N 70364000)

The iX Controller/iX Camera power cable provides power to the camera.

To connect iX Controller/iX Camera power cables:

1. Connect one end of the iX Controller/iX Camera power cable to an iX Controller MK 5 AUX1 or AUX2 port.

<p align="center">iX Controller/iX Camera Power Cable Connection to iX Controller MK 5</p>

iX Controller MK5 to Camera Power Connector

> **Note**
>
> It is recommended to connect all cameras to the same set of power ports (AUX1 or AUX2).

2. Connect the other end of the cable to the Phase One camera power port.

3. Repeat for additional cameras.

4.4   iX Controller MK 5 to Camera I/O Cables (P/N 70378000)

The iX Controller MK 5 to camera I/O cable transfers trigger, black reference and MEP signals between the iX Controller MK 5 and the camera. In addition, it provides metadata to the camera.

To connect the iX Controller MK 5 to camera I/O cables:

1. Connect one end of the iX Controller MK 5 to camera I/O cable to the iX Controller MK 5 I/O port.

<p align="center">Camera I/O Cable Connection to iX Controller MK 5</p>

iX Controller MK5 to Camera I/O Connector

2. Connect the other end to the camera left I/O port.

> **Note**
>
> For I/O connections on additional cameras, use a Phase One camera to camera multisync cable (PN 75007000) ordered separately.

4.5   iX Controller MK 5 to Camera USB 3.0 Cables

The iX Controller MK 5 to camera USB cable (supplied with each camera) transfers control data from the iX Controller MK 5 and the camera, and images from the camera for storage in the iX Controller MK 5.

To connect iX Controller MK 5 to camera USB 3.0 cables:

1. Using a 1.5 mm hex key, remove all four screws securing the left USB 3.0 cable bracket to the iX Controller MK 5.

2. Connect up to six USB cables as required to the left USB 3 ports.

3. Place the USB 3.0 cable bracket in place on the iX Controller MK 5 and secure all four screws using the 1.5 mm hex key.

4. Connect the other end of each USB 3 cable to a Phase One aerial camera.

4.6   Monitors

Phase One recommends ordering and using the pilot and operator monitors available from Phase One. The monitors are supplied with the following cables for connection to the iX Controller MK 5:

- iX Controller MK 5 to pilot monitor cable (75021000)
- iX Controller MK 5 to operator monitor cable (75022000)

The following figure shows power and communication connections for the pilot and operator monitors.

Monitor Connections

Pilot Monitor — Power + Video/USB (75021000)

Operator Monitor — Power + Video + USB (75022000)
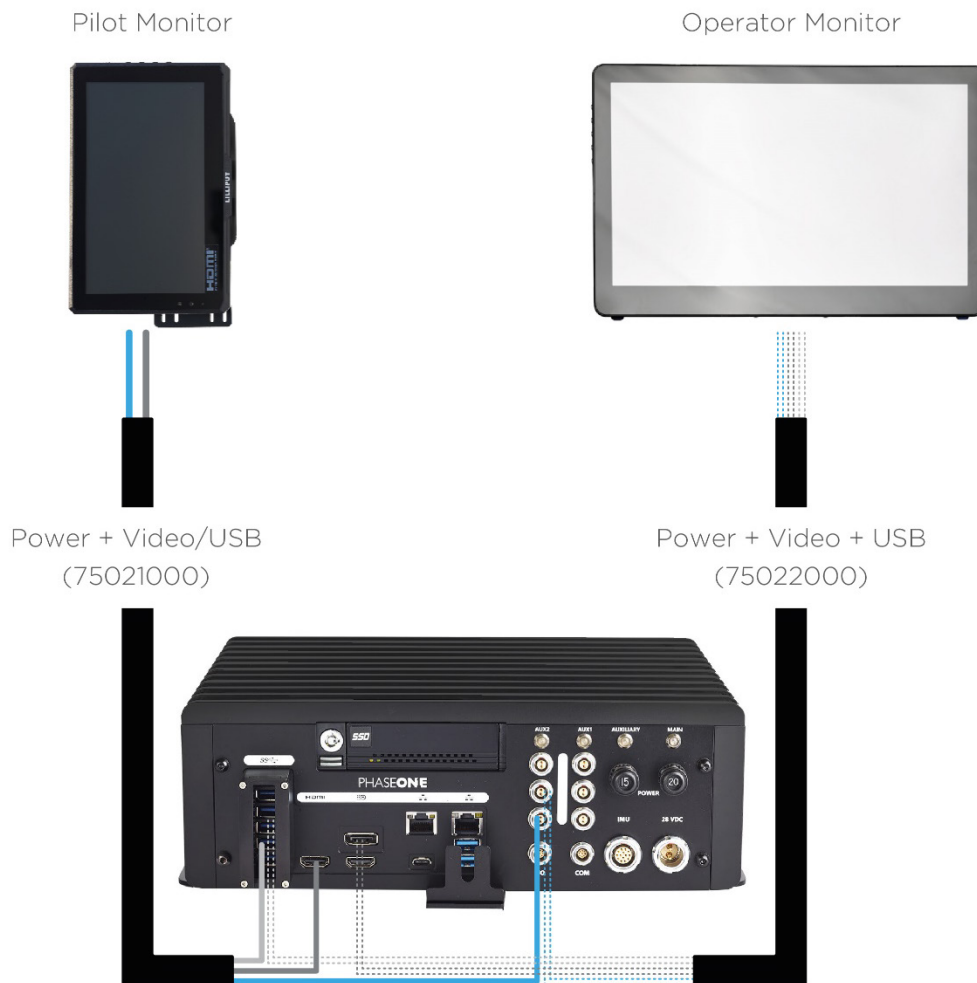
To connect the pilot monitor:

1. Connect the cable end with 2 connectors to the pilot monitor power and video ports (video cable includes USB signal).

2. Connect the cable end with 3 connectors to an iX Controller MK 5 AUX2 power port, an HDMI port and one of the camera USB 3 ports.

To connect the operator monitor:

1. Connect one end of the cable to the operator monitor power, video, and USB ports.

2. Connect the other end of the cable to an iX Controller MK 5 AUX2 power port, DP port and one of the camera USB 3 ports.

> **Note**
>
> You can connect up to three monitors simultaneously to the iX Controller MK 5 HDMI/DP ports.

4.7   Keyboard and Mouse

To connect a keyboard and mouse to the iX Controller MK 5:

1. Using a 2.5 mm hex key, remove both screws securing the USB 3.0 cable bracket front plate to the cable bracket bottom plate.

2. Remove the cable bracket front plate, the screws and washers and set them aside.

3. Connect the keyboard and mouse cables to the USB ports.

4. Use a 2.5 mm hex key to reattach the cable bracket front plate to the cable bracket bottom plate using the screws and washers you set aside in Step 2. The front plate should secure the cable hoods.

> **Note**
>
> If the length of the cable hoods prevent you from securing the cable bracket front plate to the cable bracket bottom plate, you can increase the distance between the front plate and the iX Controller MK 5 as follows:
> 1.   Gently place the iX Controller MK 5 on its upper grilled plate.

2. Remove both screws securing the cable bracket bottom plate to the iX Controller MK 5.

For USB cables
with **short** hoods

3. Mount the cable bracket bottom plate to the iX Controller MK 5 using the holes near the bottom plate edge.

For USB cables
with **long** hoods

4.8   External IMU

If you are using an external IMU (see Section 3.2 - Configuration Options), you must connect it to the iX Controller MK 5 using the cable supplied with the external IMU.

To connect an external IMU to the iX Controller MK 5:

1. Connect one end of the IMU cable to the IMU.

2. Connect the other end of the IMU cable to the iX Controller MK 5 IMU port.

4.9   PPS Output

The internal GNSS provides a pulse-per-second (PPS) time synchronization output mark.

To use this signal, connect the iX Controller MK 5 PPS output cable (73263000) to the PPS Output connector on the iX Controller MK 5 rear panel.

The following table shows the pinout for the iX Controller MK 5 PPS output cable.

iX Controller MK 5 PPS Output Cable

Wire	Pin	Voltage	Description
Orange	1	PPS_OUT	PPS (Pulse Per Second) output is the signal that indicates the integer epoch of UTC/GPS time. It is a 1 msec wide, active low 5 V pulse with a 5 µsec fall time, from buffer that can drive 8 mA.
Green	2	GND	Ground
Blue	5	AUX_Event	AUX_Event is the time marker of external pulses. It captures the exact time of the external event initiated by a sensor. Event inputs are 3.3 V LVTTL inputs, but 5 V tolerant.
Gray	8	GND	Ground
Black	9	GND	Ground

5   Powering up the iX Controller MK 5

To power up the iX Controller MK 5:

1. Push the **MAIN** circuit breaker. The **MAIN** Power LED comes on and the iX Controller MK 5 powers up.

2. When the Windows 10 login window appears, log in using the following credentials:

    ▪   **User name**: user

    ▪   **No password required.**

<div style="border: 1px solid #00AEEF; padding: 10px;">
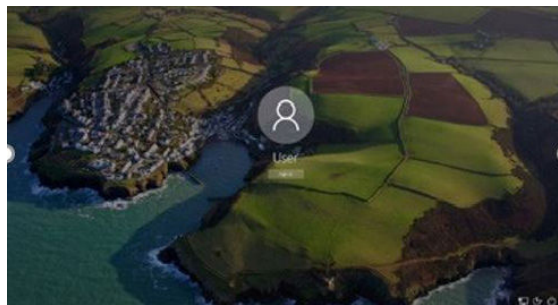
Note

To remotely login to the iX Controller MK 5, see **Connecting to the iX Controller Using Remote Desktop Connection** available for download at https://www.phaseone.com/download-categories/geo-guides-documentation/

</div>

6 iX Controller MK 5 Storage

6.1 Disk Management

The iX Controller MK 5 storage consists of a built-in frame with a removable carrier containing two SSD drives. The drives store the images captured by cameras connected to the iX Controller MK 5.

The carrier front panel contains the following LEDs:

LED	Color	State	Description
Drive power	Green	Solid	The drive is powered on.
Drive activity	Amber	Blinking	The drive is being accessed by the iX Controller MK 5.

The drives are assigned the following drive letters:

- D - top drive
- E - bottom drive

> **Note**
>
> For information on transferring data from the SSDs to the processing computer, see the iX Process Operations Guide.

6.2 Locking the Carrier

> **Note**
>
> The carrier must be locked with the SSD carrier key for the iX Controller MK 5 to recognize the drives.

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To lock the carrier in the SSD drive bay frame:

> **Note**
>
> The SSD carrier key is attached to the left side of the iX Controller MK 5.

1. Insert the SSD carrier key into the SSD carrier keylock and turn it 90° clockwise. The yellow and green SSD drive LEDs come on momentarily and the green LED remains on.

SSD drive LEDs

6.3 Removing the SSD Drive Carrier

An additional frame is provided with the iX Controller MK 5. This frame should be installed in a computer used for post-flight processing. You can then transfer the carrier with its SSD drives between the iX Controller MK 5 and the processing computer.

> **Note**
>
> Additional carriers (with or without SSD drives) with SATA or USB 3 based frames can be ordered through your Phase One sales representative.

To remove the SSD drive carrier from the iX Controller MK 5:

1. Shutdown the iX Controller MK 5 as described in Section 8 - Shutting Down the iX Controller MK 5.

2. Insert the SSD carrier key into the SSD carrier keylock and turn it 90° counterclockwise.

3. Push the SSD carrier eject button once to release the button, and again to eject the carrier from the frame.

Press eject button once

4. Gently remove the SSD carrier from the iX Controller MK 5.

6.4   Inserting the SSD Drive Carrier

To insert the SSD drive carrier into the iX Controller MK 5:

1. Shutdown the iX Controller MK 5 as described in Section 8 - Shutting Down the iX Controller MK 5.

2. If the SSD carrier eject button is protruding, push it all the way in.

3. Gently insert the SSD carrier into the iX Controller MK 5.

4. Insert the SSD carrier key into the SSD carrier keylock and turn it 90° clockwise.

5. Power up the iX Controller MK 5 as described in Section 5 - Powering up the iX Controller MK 5.

6. Verify that the green SSD drive LED comes on.

7 Operating the iX Controller MK 5

7.1 Powering Cameras

To activate cameras connected to the iX Controller MK 5:

1. Push the **AUXILIARY** circuit breaker. The **AUX1** and **AUX2** LEDs come on and the cameras are powered.

To deactivate cameras connected to the iX Controller MK 5:

1. Pull out the **AUXILIARY** circuit breaker. The **AUX1** and **AUX2** LEDs go off and the cameras are deactivated.

> ### Note
>
> The **AUXILIARY** circuit breaker also controls power to the Applanix GNSS/IMU. To deactivate cameras without powering down the internal GNSS-Inertial, control the power ports through iX Capture under **System** > **Settings**.

7.2 Using iX Capture

1. If you purchased a license for iX Capture and installed it, on the operator monitor run iX Capture.

2. Follow instructions for setup and use of iX Capture as described in the iX Capture User Guide on the USB drive provided with iX Controller MK 5, and available for download at: https://www.phaseone.com/download-categories/geo-guides-documentation/

7.3 Using iX Flight Pro

1. If you purchased a license and installed it, on the operator monitor run iX Flight Pro.

2. Follow instructions for setup and use of iX Flight Pro as described in the iX Flight Pro Operation Guide.

7.4 Controlling iX Controller MK 5 Power Ports through iX Capture

Through iX Capture, you can control both sets of iX Controller MK 5 power ports (**AUX1** and **AUX2**)

To control power to the power ports through iX Capture:

1. Navigate to **System** > **Settings**.

2. Select the **AUX1** and/or **AUX2** check boxes.

8 Shutting Down the iX Controller MK 5

To shut down the iX Controller MK 5:

1. On the operator monitor, shut down Windows.

2. On the iX Controller MK 5, pull the **MAIN** circuit breaker out.

8 Shutting Down the iX Controller MK 5

9 Troubleshooting

Issue	Solution
Cannot close iX Capture with mouse.	On the keyboard, press Alt+F4.
iX Controller MK 5 MAIN Power LED is on, but Windows 10 does not appear.	Pull out the MAIN circuit breaker and push it back in.
The HW trigger is grayed out / GPS GUI windows does not come up	Pull out the AUXILIARY circuit breaker and push it back in, then restart iX Capture.
GPS does not lock onto satellites.	Check antenna cable. Pull out the AUXILIARY circuit breaker and push it back in.

10 Maintenance

10.1 Replacing SSD Drives

The iX Controller MK 5 is factory provided with two 1 TB SSD drives installed in a removable carrier.

You can replace the SSDs as required. To achieve optimal performance, both SSDs should have a high writing speed (>500 MB/S). Drive capacities can be different.

To replace the SSD drives:

1. On the operator monitor, shut down Windows.

2. On the iX Controller, pull the MAIN circuit breaker out.

3. Remove the carrier from the iX Controller MK 5 (see Section 6.3 Removing the SSD Drive Carrier).

4. Remove both cover screws at the rear of the carrier.

5. Slide the carrier out from the carrier cover.

6. Remove all screws securing the SSD drives to the carrier.

7. Replace the SSD(s) in the carrier.

8. Secure the SSD(s) to the carrier.

9. Slide the cover back on to the carrier and secure it with the cover screws.

10. Insert the carrier into the iX Controller MK 5.

Appendix A Technical Data

A.1   iX Controller MK 5 Weight

Description	Weight
iX Controller	6.3 kg / 13.9 lb

A.2   Power Specifications

A.2.1   Power Requirements

Parameter	Requirement
Voltage	24 - 32 VDC
Maximum current	20 A

A.2.2   Power Consumption

Parameter	Power Consumption
Controller	100 W
Each camera (max 6)	20 W (max 120 W)
Controller, multiple cameras and external IMU	250 W (max)

Note

For power consumption data in PAS systems, refer to the operation guide of your specific system.

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Appendix B Declaration of Conformity

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EU Declaration of Conformity

This declaration of conformity is issued under our sole responsibility and belongs to the following product(s):

Product: Phase One iX Controller
Trade Name: Phase One A/S
Model: Phase One iX Controller MK 5

The product is in conformity with the following standards and/or other normative documents:

EMC: EN 61000-6-3:2007, EN 61000-6-1:2007, 61000-4-8:2010
EN 55035:2017 + A1:2015, EN 55032:2015

Other (voluntary specs):
EMC: FCC CFR 47 Part 15 Subpart B
ANSI C63.4:2014
Industry Canada ICES-003:07
CISPR 32, AS/NZS CISPR 32: 2012
VCCI Technical Requirements, V-3/2016

RoHS: Article 4(1)

Technical Documentation relevant to the product described above is held by:
Phase One, Roskildevej 39, DK-2000 Frederiksberg, Denmark

Frederiksberg, Denmark, 5-2022

Dedi Meler / Compliance Specialist

Phase One A/S ♦ Roskildevej 39, DK-2000 Frederiksberg, Denmark
Tel: (45) 36 46 0111 ♦ Website: geospatial.phaseone.com ♦ E-mail: geospatial@phaseone.com

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