Operational Manual

PROTON PIO-E

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2 Welcome

Dear content creator,

thank you for choosing our PROTON PIO-E for your next project.

PROTON PIO-E is the smallest IP-based camera control interface in the market, providing PoE-powered connectivity for all PROTON cameras up to 12 W (which excludes the HFR which has 15 W).

This will give you seamless remote control and easy scaling.

This **Operational Manual** gives you a short overview of how to operate the PIO-E. Detailed information about the control interface and command protocol can be found in the **Reference Manual**.

In case you are missing a feature in our product, feel free to share your thoughts with us. We love to get your feedback to bring even more innovation into our products.

Your PROTON CAMERA INNOVATIONS Team.

FUTURE. MINI. CAMERA.

3 Technical data

3.1 Overview

Size	66x22x27 mm
Weight	43 g
Operation voltage	PoE (802.3af) or passive injection 40-56 V
Power delivery	12 V 1 A (12 W)
Operational temperature	-30 ... 60 °C
Computer Interface	Ethernet (IP) or USB-C
Camera connector	Hirose 6P (HR10A-7R-6P)
Service port	USB-C (for local connection)
Compatibility	All PROTON cameras except HFR

Note: PIO-E delivers 12 W (12 V 1 A), while the PROTON HFR camera requires 15 W. For HFR cameras, use a CyanView CI0 with external power supply or our PIO (USB) with external PSU (with at least 12 V 1 A power delivery).

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3.2 Dimensions and features

The PIO-E has a size of 22x27x66 mm with 4x M2.5 mount points on the bottom. Check the technical drawing below for details.

Hirose 6P camera connector

Push button

RJ45 Ethernet

RGB status LED

USB-C service port

66mm

22mm

M2.5mm — 14mm

14mm — M2.5mm

3mm — 54mm — 3mm
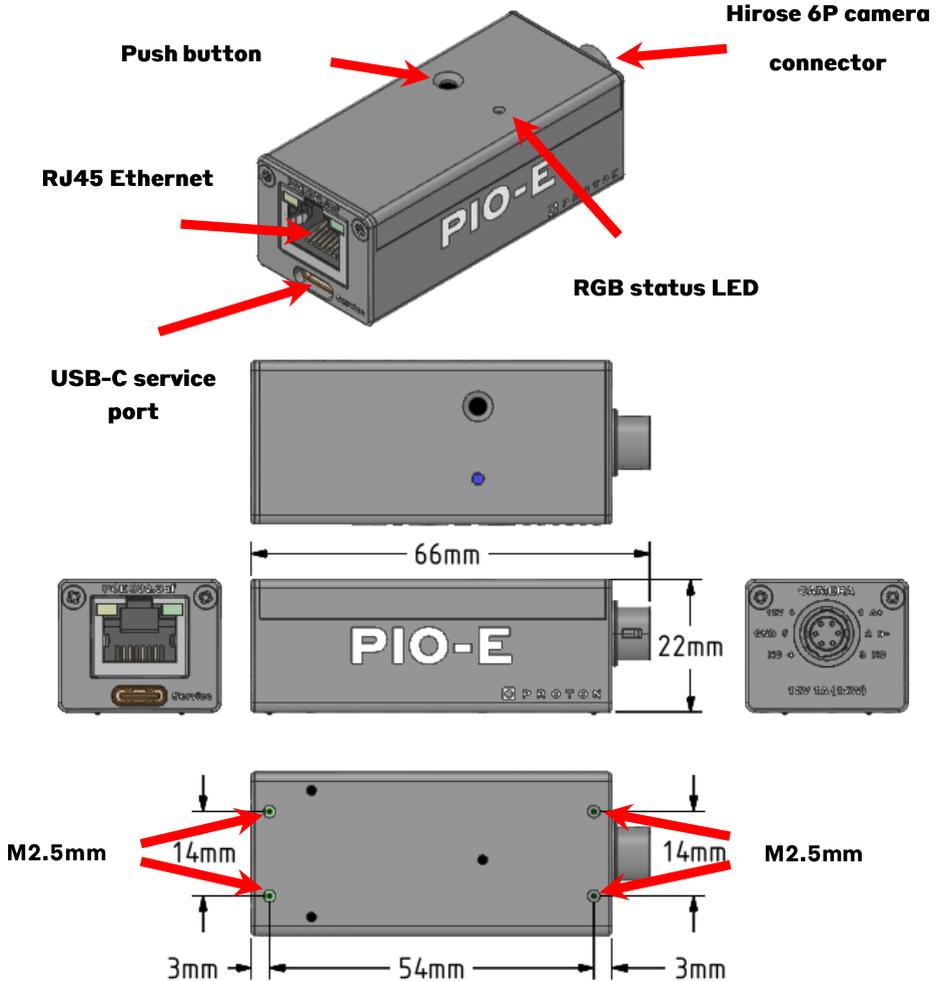
3.3 Status LED

The PIO-E has a single RGB status LED on top that indicates the current operational status:

LED Color	Blink Pattern	Status
Cyan	Static	Boot / Verify / Upgrade firmware
Purple	Blinking (2.5x per second)	Operational - Static IP mode (DHCP disabled or no DHCP address received yet)
Blue	Blinking (2.5x per second)	Operational - DHCP mode (DHCP enabled and address received)
Green	Blinking (2.5x per second)	Connected to control software or RCP
Red	Static	Button pressed
Red	Blinking (2.5x per second)	Error detected
Red/White	Alternating	Reserved for future use (button held >2 s)
Red	Static (after alternating)	Ready for reset (button held >8 s)
Off	No light	Check cable, switch and PoE power

3.4 Push Button

The PIO-E has a single push button on top that can be used to perform a factory reset.

This helps you to recover the device if its network configuration is wrong or unknown. After the reset the PIO-E is configured with its default IP address and DHCP is enabled.

Factory Reset Procedure:

1. Press and hold the push button →LED turns solid RED
2. Keep button pressed → After **2 seconds** LED alternates between RED and WHITE
3. Keep button pressed → After **8 seconds** (total) the LED turns solid RED again
4. Release the button
5. PIO-E restarts with factory default settings (DHCP enabled, static IP: 10.0.0.101/24)

Note: You can also configure or reset the PIO-E via the USB-C service port using PROTON Control software.

4 Connection

The PIO-E has three physical interfaces:

1. **Ethernet Port with PoE**: Power and IP control
2. **Camera Connector**: Power and RS485 control to camera
3. **USB-C Service Port**: Local control (no power!)

4.1 Ethernet Port with PoE

The PIO-E is powered and controlled via a standard RJ45 Ethernet port with PoE (802.3af). The device is compatible with both active PoE switches and passive power injectors supplying more than 40 V.

When connecting multiple PIO-E units to the same switch, ensure the total power draw does not exceed the switch's maximum output.

Default IP Configuration:

- **IP Address**: 10.0.0.101
- **Netmask**: 255.255.255.0
- **Gateway**: 10.0.0.1
- **DHCP**: Enabled (default)

The above static settings are only used if DHCP is disabled. The device supports IPv4 only.

4.2 Camera Connector

The PIO-E provides power and RS485 control to PROTON cameras via a 6-pin Hirose HR10 connector. The pin assignment is identical to the connector on PROTON cameras.

Connector Pinout:

Pin	Color	Signal
1	White	RS485 A+
2	Black	RS485 B-
3		
4		
5	Blue	GND
6	Brown	12V 1A

Mating Connector: HR10A-7P-6S(73)

4.2.1 RS485 Baud Rate

The RS485 output supports all typical baud rates used with PROTON cameras: 250000, 230400, 115200, 57600, 19200, 14400, and 9600 baud. The default is 115200 baud.

To change the baud rate, use PROTON Control or the `system baudrate` command (see Reference Manual for details).

4.2.2 Camera Power

Power to the attached camera can be turned on or off using the `system power` command via PROTON Control or terminal. This allows power cycling of cameras or permanent shutdown to conserve power in battery-powered scenarios.

Note that the power state is saved so if camera power is turned off, it will stay off even after a reboot or power cycle of the PIO-E.

4.3 USB-C Service Port

IMPORTANT: The USB-C port does not power the device and camera. The device must be powered over the Ethernet port via PoE (802.3af) or a power injector with at least 40 V.

The USB-C service port creates a virtual serial port when connected to a PC or Mac, allowing local control via:

- PROTON Control software
- Terminal applications (PuTTY, Tera Term, etc.)

The USB port has the following use cases:

- Configure PIO-E network settings in the field
- Recover device if IP configuration is unknown or invalid
- Local control of the camera
    - o PROTON Control detects cameras via USB
- Update PIO-E firmware without network connection
- Debug and analyze communication

The selected baud rate of the virtual serial port on your PC or Mac has no effect on the transfer speed or the RS485 interface baud rate.

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5 Control

The PIO-E can be controlled via three methods:

- **PROTON Control Software:** PC/Mac application for camera setup and PIO-E configuration
- **CyanView or Skaarhoj RCP:** Professional remote-control panels

PIO-E **supports multi-client** use cases with up to 8 controllers at the same time (e.g. PROTON Control for general configuration and an RCP for shading). For details, please see the reference manual.

PROTON Control Software usage:

PROTON Control is an easy-to-use application for Windows and macOS that provides full control of both the PIO-E and connected cameras.

The software is available for download at: https://docs.proton-camera.com/docs/softwares

5.1 Connecting via Network (DHCP)

1. Connect your computer and PIO-E to the same network.
2. Ensure the PIO-E is powered by a PoE switch
3. Open PROTON Control software.
4. Click "Find Devices" - the software will scan for PIO-E devices on the network.
5. Select your PIO-E from the list to control the connected camera.

5.2 Connecting via USB-C

1. Connect the PIO-E to your computer using a USB-C cable (must support power and data).
2. Ensure the PIO-E is powered via PoE or a power injector.
3. Open PROTON Control software.
4. The PIO-E will appear as a serial port (e.g. COM3) in the PIO Configuration tab.
5. Select the device to configure network settings, update the firmware or control the connected camera.

5.3 Manual IP Connection

If automatic discovery fails (due to firewalls, VLANs, or network restrictions):

1. Open PROTON Control software.
2. Click the "Network" drop-down list.
3. Select "Manual Host/IP".
4. Enter the PIO-E IP address.
5. Click "Find Devices".

6 Network configuration

6.1 Default Configuration (DHCP)

The PIO-E comes configured with DHCP enabled by default: Simply connect it to your network and it will automatically receive an IP address from your DHCP server. The status LED will blink BLUE when the device has received an IP address via DHCP.

6.2 Setting a Static IP

To configure a static IP address:

1. Open PROTON Control and navigate to the "PIO Configuration" tab.
2. Click "Find PIO Devices" and select your PIO-E.
3. Uncheck the "DHCP" option.
4. Enter your desired static IP configuration:
   - IP Address
   - Gateway
   - Netmask
5. Click "Set IP Configuration".
6. The PIO-E will disconnect briefly and reconnect with the new settings.
7. The status LED will change to blinking PURPLE when using a static IP.

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Note: If you enter an invalid configuration or forget the IP address, you can always:

- Perform a factory reset using the push button (see section 3.4)
- Connect via USB-C to check or change the configuration.

7 Safety

The PIO-E is designed for safe operation in professional broadcast environments.

The product is tested safe according to EN 62368-1 (2025-01).

7.1 Operational Safety

- The device operates at low voltage (PoE, 802.3af standard).
- Ensure proper PoE switch compatibility to avoid power issues.
- Do not exceed the camera power delivery specification (12 W max).
- Use only the specified Hirose connector for camera connections.

7.2 Network Security

- The PIO-E accepts only one IP connection at a time.
- Ensure proper network security measures (firewalls, VLANs) are in place for production environments.
- Change default network settings if required by your security policy.

7.3 Cable Handling

- Use proper PoE-compliant Ethernet cables.
- Ensure USB-C cables support both power and data (some cables are power-only).

- Do not force connectors - verify pin alignment before connection.

8 Warranty

PROTON Camera Innovations GmbH warrants that this product will be free from defects in materials and workmanship for a period of **6 months** from the date of purchase. If a product proves to be defective during this warranty period, PROTON Camera Innovations GmbH, at its option, will either repair the defective product without charge for parts and labor or will provide a replacement in exchange for the defective product.

To obtain service under this warranty, you the Customer, must notify PROTON Camera Innovations GmbH of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Customer shall be responsible for packaging and shipping the defective product to a designated service center nominated by PROTON Camera Innovations GmbH, with shipping charges pre-paid. Customer shall be responsible for paying all shipping changes, insurance, duties, taxes, and any other charges for products returned to us for any reason.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. PROTON Camera Innovations GmbH shall not be obligated to furnish service under this warranty: a) to repair damage resulting from attempts by personal other than PROTON Camera Innovations GmbH representatives to install, repair or service the product, b) to repair damage resulting from improper use or connection to incompatible equipment, c) to repair any damage or malfunction caused by

the use of non PROTON Camera Innovations GmbH parts or supplies, or d) to service a product that has been modified or integrated with other products when the effect of such a modification or integration increases the time or difficulty of servicing the product.

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9 Certifications

This equipment has been tested and found to comply with the limits for a Class B digital device in a residential environment according to the following rules:

- European Council Directive- EMC Directive 2014/30/EU.
- General Product Safety Directive (GPSD)
- RoHS Directive 2011/65/EU + 2015/863
- FCC rules part 15.

10 Recycling

You can return an old or damaged PROTON Camera Innovations product for recycling. The recycling is free of charge.

For recycling, please request an RMA form for your device via email from

>   weee@proton-camera.com

We need the following information:

- Subject: Recycling
- Product name
- Product serial number
    - Can be found on bottom of product

Please ship the product at your expense to our office, including the RMA form.

>   **PROTON Camera Innovations GmbH**
>   **Fockestraße 10**
>   **30827 Garbsen**
>   **Germany**

By sending in the product, it will be owned by Proton Camera Innovations GmbH and will be recycled according to German law.