

ONE-32 User Manual

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User manual signs convention

 **Warning:** An indication that a hazardous situation, if not handled properly, may cause personal damage to the operator.

 **Attention:** An indication that an operation, if not handled properly, may cause damage to the product.

 **Note:** A recommendation is made about a feature of the product.

1. Introduction

1.1. Introducing the Optical Networking Engine ONE-32

iPronics has developed the ONE-32, a fast, reconfigurable, and lossless Optical Circuit Switch built on programmable Silicon Photonics technology. Designed for modern AI and high-performance computing environments, the ONE-32 directly addresses the growing limitations of traditional electronic switching: Bandwidth bottlenecks, escalating power consumption, and rapidly increasing operational costs.

As AI workloads scale, packet-based electronic switches struggle to deliver the deterministic performance and energy efficiency required for advanced training and inference clusters. The ONE-32 overcomes these constraints by enabling true all-optical, non-blocking connectivity, preserving signal integrity while dramatically reducing switching overhead. With 32 input and 32 output ports, the switch supports flexible, high-bandwidth topologies that adapt to evolving data center architectures.

Beyond raw performance, the ONE-32 enhances data center efficiency by minimizing power draw, reducing cooling requirements, and simplifying network design. Its reconfigurable optical pathways allow operators to dynamically optimize interconnect layouts, improve cluster utilization, and eliminate the need for multiple layers of electronic switching. This results in lower total cost of ownership, higher reliability, and a future-proof foundation for next-generation AI infrastructure.

Key Features

- High-density Silicon Photonics architecture
- Compact 1U rack-mount design
- Per-channel optical amplification
- Non-blocking switching fabric
- Ultra-low power consumption
- Integrated gNMI server for network management



Fig. 1. ONE-32 3D representation.

1.2. Front and rear panel description

The front panel representation of the 1U chassis is shown below:



Fig. 2. ONE-32 front panel.

First, we find the input and output ports, based on MTP-12/APC (male) connectors. These connectors are identified with labels IN1, IN2, IN3, IN4 and OUT1, OUT2, OUT3, OUT4. Each of these connectors are optically linked to 8 optical ports, either inputs or outputs. The optical mapping distribution of connectors and channels can be found in

Appendix A. For communication and operation of the product, two RJ45 Ethernet Ports (10/100/1000) ports are allocated in the front panel. These ports are used to connect the device to the network and to enable its remote control. The operating details of these two ports are provided below:

1. Operation interface (ETH1): Supports dynamic IP address assignment through DHCP. **This is the interface used for integrating the ONE-32 into a SDN network (e.g. to perform remote control and monitoring operations via its gNMI interface).**
2. Service interface (ETH2): It comes with a fixed IP address (10.45.0.125), and it is meant to be used as a service port to which an operator connects for maintenance operations.

A representation of the back panel can be seen below:



Fig. 3. ONE-32 back panel.

On the left side, two swappable power supply units can be found, with their corresponding IEC C-14 plug. Additionally, five non swappable air fans are distributed horizontally across the back panel to ensure effective heat dissipation.

1.3. Switch architecture description

The switch contains 32 input ports and 32 output ports, which must be connected to the transmit (TX) and receive (RX) fibers, respectively, of a unidirectional transceiver. The SiPh is responsible for performing strictly non-blocking switching, i.e., the spatial permutation of the signals, by connecting each input (TX) to an output (RX). The figure below illustrates a simple diagram of the operating principle of the 32×32 switch.

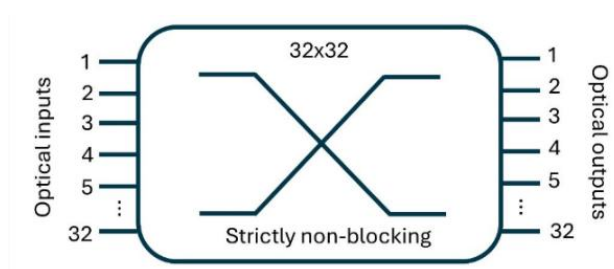


Fig. 4. ONE-32 switch architecture representation.

2. Safety information

2.1. Electrical safety

⚠ Never dismantle the product. Internal circuits may carry dangerous voltages and are not intended for user repair. Only certified technicians should perform maintenance.

⚠ **Power down before any intervention.** Disconnect all electrical sources and ensure the unit is completely de-energized before cleaning or servicing.

🔧 **Use compliant accessories and cables.** Power cords must meet the electrical specifications and safety standards for your region.

🔧 **Dual Power Inputs.** If the device uses redundant power supplies, make sure **every** power feed is disconnected before working on the unit.

🔧 **Verify Voltage.** Confirm that the input voltage matches the device's rating.

🔧 **Grounding.** Connect the chassis ground terminal to a secure earth point using the correct connector and wire gauge (minimum 18 AWG for AC; follow local codes for DC).

🔧 **ESD precaution.** Always use grounded wrist straps and ESD-safe workstations when handling connectors or components to avoid damage.

2.2. Optical safety

⚠ **Inspection.** Never look directly into a fiber or connector, even when you think the source is off. Instead, use a compatible fiber inspection probe.

🔧 **Optical sources.** Turn off all light sources before installing or disconnecting fibers.

🔧 **Optical connectors.** Clean fiber ends before every connection using approved optical-grade cleaners.

🔧 **Optical connectors.** Do not overtighten connectors; firm contact is enough.

2.3. Installation safety

🔧 **Air flow.** Ensure adequate airflow to prevent overheating; do not block ventilation.

🔧 **Secure chassis.** Distribute weight evenly and secure racks to prevent tipping hazards.

🔧 **Rack ground connection.** Maintain solid grounding for all rack-mounted devices, especially when using power strips or indirect connections.

🔧 **External conditions.** Operate the product within specified temperature and humidity limits.

2.4. Maintenance

No specific maintenance is mandatory for achieving the proper performance of the product. However, please follow the instructions detailed in the previous safety information section about cleaning procedures and how to maintain the product in the best possible condition.

If reallocation of the product is necessary, please disconnect all optical, power and communication cables that might be connected to the front or back panels. Make sure to use the protective caps in the optical ports when they are not being used to avoid dust or any source of contamination.

If you have doubts about any step or procedure, before proceeding, please contact our support address: support@ipronics.com

3. Unboxing and installation

3.1. Unboxing the ONE-32

The materials included in the shipping container are:

- 1x ONE-32
- 2x Ethernet cables
- 2x Power cords
- 8x optical fan-outs (MPO-12/APC (female) to 12x LC/UPC)

The ONE-32 is carefully packed with an antistatic wrapper, to avoid any discharge when extracting the product from the packing box. It is recommended to remove this wrapper carefully not to scratch the external frame. For unpacking the unit:

1. Open the packing box.
2. Remove first layer of protective foam and find the extra materials included with the ONE-32.
3. Remove next layers of protective foam.
4. Once the product is accessible, extract it from the packing box. The ONE-32 can be extracted by a single person but consider being helped if necessary.
5. Allocate the ONE-32 on a plain surface able to support the weight of the equipment (please refer to the datasheet information for weight information).
6. Remove the antistatic wrapper.

After unpacking the product, it is recommended to perform a visual inspection to check for any external damage, including the front and back panels. If any damage is found in the external packing case, in the product or in any of the extra materials included, please contact iPronics and report the issues found.

The ONE-32 is protected with 2x guarantee labels, located in the external frame. Please make sure that the status of these labels is preserved during the extraction, handling or reallocation of the product.

3.2. Installing the ONE-32

⚠ Before proceeding with the installation, please carefully read the instructions detailed in the Safety information section.

📖 It is strongly recommended to read the complete section before moving to the hands-on installation of the product.

For installing the ONE-32, please make sure of using the extra materials provided with the product in the packing box or use trusted and original replacements and that they are in good condition (e.g., optical fan-outs show good condition and clean surfaces in all their connectors and individual fibers). If not, specifications included in the datasheet might not be achievable.

It is recommended that the extra materials are connected prior to turning on the unit. Please note that **the unit will power up when the power cord is connected to any of the power supply connectors** located in the back panel. For this reason, we recommend following the next installation steps:

Table-top installation

If a table-top installation is needed, first, read the steps described in section 3.1. Unboxing the ONE-32. Next, follow these steps:

1. Place the unit on a surface able to sustain the weight of the equipment.
2. Ensure that the front and back panels have enough space for proper optical, power and communication connections. Additionally, consider that the fans will blow air out of the equipment thus making sure that there is room for proper ventilation is important.
3. Follow the procedures described in "After the installation process".

Rack installation

If the product is to be installed on a rack, please follow the next steps carefully:

1. For the Front Support Installation
 - a. Identify the Front Supports. Note that each support is marked with a specific Ground & ESD (Electrostatic Discharge) protection sticker. Orientation Note: The support with the ground sticker must be placed on the left side of the unit to ensure the symbol is oriented correctly (not upside down).
 - b. Align the supports with the designated mounting points.
 - c. Secure the supports using the six (6) screws provided (3 on each side). Tighten them firmly to ensure the supports are stable and properly seated.
2. For the Rear Slider Preparation
 - a. Before mounting the unit into the rack, prepare the Rear Screw Support Sliders:
 - i. Install the individual screws into the designated threaded holes on the sides of the main unit. Important: Ensure these screws are fully tightened before moving to the next step.
3. Slider Attachment
 - a. Align the sliders with the screws previously installed on the sides of the unit.
 - b. Fit the slider bracket between the "shoulders" of the screws.
 - c. Once positioned, the slider should be supported by the unit but remain adjustable (sliding) to allow for precise depth alignment within the rack.
4. Securing the Unit to the Rack
 - a. Complete the mounting process within the rack frame:
 - i. Insert the square nuts (cage nuts) into the corresponding holes on both the front and rear rack rails.
 - ii. Align the unit with the nuts and use the mounting screws to fix the assembly in place.
 - iii. Final Check: Ensure that both the front and back screws are properly tightened to fully secure the unit to the rack structure.
5. Grounding and ESD Protection
 - a. To protect sensitive electrical components from static damage, install the provided grounding wire: connect one end of the wire to the unit and the other to the rack's chassis ground.

After the installation process

Once the installation is finished, the unit is prepared to be connected and powered.

Please follow the next steps to do so:

1. Review the status of the components that will be connected to the equipment.
2. Clean all the optical interfaces and connectors before plugging them into the front panel. For this, MPO and LC-UPC cleaners or specific connector vision systems should be employed.
3. Connect the 8x optical fan-outs to the MPO connectors located in the front panel. Please note that MPO connectors have a mechanical guide included and a single orientation is used. Make sure that the MPO connector and the MPO from the optical fan-out are aligned through the mechanical guide. After insertion, a “click” should be heard meaning that the connector is well-placed. In

4. Appendix A, the corresponding connector – fan-out – switch channels mappings are detailed.
5. Connect one of the provided ethernet cables to the “Operation” ethernet port.
6. Connect one of the provided power cords to the back panel. Connecting the secondary power cord is recommended but it is not mandatory to make the ONE-32 operational.

4. Operation

First, ensure that the following prerequisites are met to complete initial installation and run the provided working examples:

- A computer running Windows, macOS, or Linux
- A Gigabit Ethernet Network Interface Card
- Network connectivity to the same subnet as the ONE-32

Also, you should have received a copy of the software documentation (``swtchd-docs.zip``) alongside this Manual. This documentation can be accessed by unzipping it and pointing a web browser to ``swtchd-docs/user/intro.html``

4.1. Controlling the ONE-32 via the gNMI SDN interface

The ONE-32 can be controlled via the gNMI requests. This is the recommended control interface for integrating the ONE-32 into an SDN, where the SDN orchestrator software would use the gNMI protocol to configure connections and monitor the ONE-32.

Once the unit has been turned on (approximately 60s after power connection), the gNMI server will start running at ``your-ocs-ip-address:50051``.

For an example on how to interact with the gNMI server and configure the first OCS connections, refer to the ``swtchd-docs/user/notebooks/gnmi_client.html`` page in the software documentation.

This page contains an executed Jupyter notebook where several OCS functionalities are demonstrated. This notebook can also be executed interactively on your computer by running the ``gnmi_client.ipynb`` source file included in the documentation. We recommend using Visual Studio Code to run the notebook.

🔧 **Note:** If under any unexpected circumstances, the SDN server stops responding, please reboot the system and try connecting to the server again.

🔧 **Note:** If under unexpected circumstances the amplification stage deviates from its lossless behavior, reboot the system and check the output power has been stabilized.

4.2. Accessing the Control module via SSH

The ONE-32 can be accessed via a SecureShell (SSH) connection. Authentication is done using SSH key files protected by password. The SSH key files for logging as the ``one`` and/or ``root`` users may be provided by the support team together with the passwords for unlocking them.

To use an SSH key to log into the ONE-32 you should first save it to your computer (e.g. to ``C:\Users\username\.ssh\`` on Windows or ``$HOME/.ssh/`` for Linux).

Then, we recommend adding the ssh key to your device's ssh agent service using `ssh-add /path/to/your/private/key` in a command prompt and apply the provided password. If you don't have an SSH-Agent service installed on your machine, see the instructions in the following links:

- [Windows](#)
- [Linux](#)

Once the ssh key has been added to the agent you can log into the ONE32 with the `ssh <user>@<your-ocs-ip-address>` command in your command prompt/terminal (where `<user>` is either `one` or `root`, depending on the SSH key that you received and `<your-ocs-ip-address>` depends on the ethernet port you are connecting to) . To disconnect enter ctrl+D.

Once you are logged, you can execute commands for maintenance/administration of the Control module, and you can also interact with the `swtchd` python module to control the ONE-32 OCS features (refer to the software documentation page for details on the swtchd python module)

4.3. Software updates

Software and firmware updates are delivered via an integrated update service running on the control module. The iPronics support team will contact its users when an upgrade is available for the deployed units.

Users may connect to the update service through its web interface to review the current state and to install updates. Both application software and embedded firmware are updated through this unified process, ensuring system-wide compatibility and the latest feature set. The system provides real-time progress monitoring during the upgrade process. The software and firmware updates are handled by a web service listening in port 8080 of the ONE-32. To perform a software update, follow the next steps:

1. Connect to the software update portal using a web browser to connect to `your-ocs-ip-address:8080` web address as shown in the following screenshot.

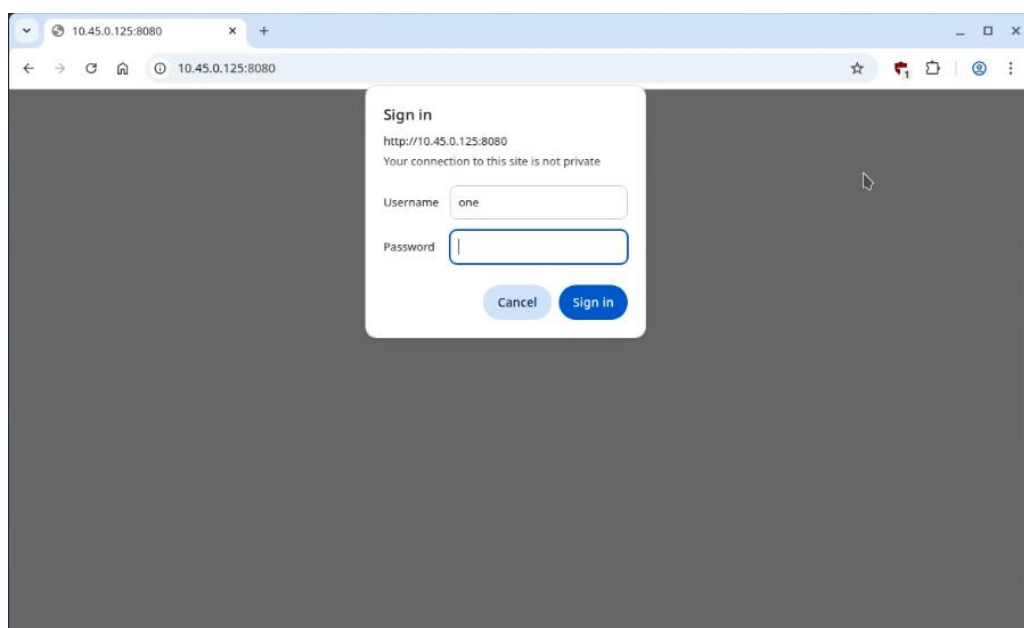


Fig. 5. Connection to the software update portal.

- The update service is locked with a default password that will be provided by the support team. It is important to note that this password is different from the one used to access via SSH. **For security reasons, we strongly recommend changing this default password.** To do so, you may connect to the ONE-32 via SSH (see instructions before) and run the ``htdigest -c /data/etc/mongoose-auth ipronics one`` command to interactively change the update service password.
- Once logged in, the update service page will show the information on the current version and the update state (see the snapshot below). It also allows you to initiate a system update.

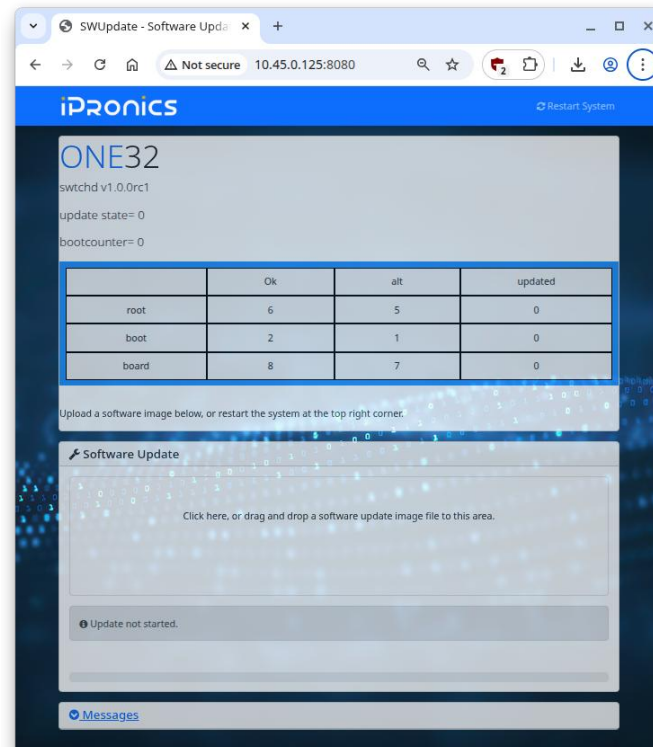


Fig. 6. Update service page.

- To initiate a system update, click to select or drag and drop a `.swu`` upgrade file provided by our support team. The update process will start immediately; a confirmation message will be shown when finished, and the OCS control unit will automatically reboot.
- Once the OCS reboots, you should connect again to the update portal page and check that the update was successful. After a successful update, the ``update state`` value should read "0", but it may show a different value ("1", "3", ...) until some automated health checks have been satisfied (**this may take up to a couple of minutes after the reboot and the web page may need to be manually reloaded for the values to be refreshed**). If, after this time, the "update state" is still different from 0, you should reboot the OCS (the ``bootcounter`` value will show how many boot tries have been done). After a third unsuccessful attempt, an automatic rollback to the previous working version will return the ONE-32 to a safe state.
- In case of any problem during this process, please contact our support team at support@ipronics.com.

5. Troubleshooting

5.1. Contacting iPronics support

For technical assistance, product inquiries, or troubleshooting support, contact our technical support team at support@ipronics.com. When reporting issues, please include your system's serial number, software version (obtained by running ``python -c 'import swtchd; swtchd.__version__`` with a ssh connection to the operation/service ports), a detailed description of the problem, and any relevant error messages or log files. For faster resolution, consider including network topology diagrams and configuration files when applicable.

6. Regulatory Compliance

6.1. FCC Compliance

FCC REGULATORY INFORMATION



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

Note 2: Equipment FCC ID: 2BCTZ-IPRDC3B

Note 3: Equipment input: 100-240 VAC 100W 50/60Hz

6.2. CE Compliance

Appendix A

CHANNELMAPPING DISTRIBUTION

MTP	Fan-out code	Description		MTP	Fan-out code	Description
1	1	IN 1		5	1	OUT 1
1	2	IN 2		5	2	OUT 2
1	3	IN 3		5	3	OUT 3
1	4	IN 4		5	4	OUT 4
1	9	IN 5		5	9	OUT 5
1	10	IN 6		5	10	OUT 6
1	11	IN 7		5	11	OUT 7
1	12	IN 8		5	12	OUT 8
2	1	IN 9		6	1	OUT 9
2	2	IN 10		6	2	OUT 10
2	3	IN 11		6	3	OUT 11
2	4	IN 12		6	4	OUT 12
2	9	IN 13		6	9	OUT 13
2	10	IN 14		6	10	OUT 14
2	11	IN 15		6	11	OUT 15
2	12	IN 16		6	12	OUT 16
3	1	IN 17		7	1	OUT 17
3	2	IN 18		7	2	OUT 18
3	3	IN 19		7	3	OUT 19
3	4	IN 20		7	4	OUT 20
3	9	IN 21		7	9	OUT 21
3	10	IN 22		7	10	OUT 22
3	11	IN 23		7	11	OUT 23
3	12	IN 24		7	12	OUT 24
4	1	IN 25		8	1	OUT 25
4	2	IN 26		8	2	OUT 26
4	3	IN 27		8	3	OUT 27
4	4	IN 28		8	4	OUT 28
4	9	IN 29		8	9	OUT 29
4	10	IN 30		8	10	OUT 30
4	11	IN 31		8	11	OUT 31
4	12	IN 32		8	12	OUT 32