



User Guide (EN)

ADL-1000

Rev. 1.7.6

plc2 Design GmbH
Ersteiner Straße 19
79346 Endingen a. K.
Germany

+49 7642 92118 0
plc2.com

Project	ADL-1000
Document Title	User Guide
Version	1.7.6
Editor	plc2 Design GmbH
Date	July 27, 2026

Copyright

The information in this document must not be changed without separate notification from plc2 Design GmbH. Furthermore, plc2 Design GmbH does not enter into any further obligations with this document. The software presented in this document is provided based on a general licensing agreement or an individual license. Use and duplication is permitted only in agreement with the contractual stipulations.

Under no circumstances must any part of this publication be copied, reproduced, stored in a retrieval system, or translated into another language in any form without written permission from plc2 Design GmbH.

© **Copyright 2024** plc2 Design GmbH, Endingen a. K.

The names and designations used in this document are trademarks or brands belonging to the respective owners.

Contents

01 About This Document	6
01.1 Classification of Warnings	6
01.2 Presentation of Supporting Information	6
02 General Safety Information	7
02.1 Requirements for Users and Obligations of the Operator	7
02.2 Intended Use	7
02.2.1 Area of Application of the Product	7
02.2.2 Requirements for the Technical Condition of the Product	7
02.2.3 Requirements for Operation	7
02.2.4 Power Supply	7
02.2.5 Approved Cables	7
02.2.6 Requirements for the Installation Site	8
02.2.7 Wiring Requirements	8
02.2.8 Configuration Requirements	8
02.2.9 Transport	8
02.2.10 Storage	8
02.2.11 Installation	8
02.2.12 Ventilation Requirements	9
02.2.13 Maintenance	10
02.2.14 Repair	10
02.2.15 Cleaning	10
03 Product Description	11
03.1 Functions	11
03.1.1 Recording Application	11
03.1.2 Features of ADL-1000	12
03.1.3 Technical Features	12
04 Hardware	13
04.1 Architecture	13
04.2 ADL-1000 Interfaces	13
04.2.1 Power and GPIO Connector	13
04.2.2 U.2 Drive Trays	15
04.2.3 RJ45 Connectors	16
04.2.4 USB-A Connectors	16
04.2.5 SFP+ Connectors	16
04.2.6 QSFP Connectors	17
04.2.7 Mini-SAS HD PCIe Interface	17
04.3 Power Button and RGB LED	17
05 ADL-1000 Installation Instructions	18
05.1 Safety Instructions	18
05.2 Installation of the ADL-1000	18
05.3 Wiring	19
05.4 Installation of the U.2 Trays	19
05.5 Checking the Function of the ADL-1000	21
06 General Data	22
06.1 Technical Data	22
06.1.1 Ambient Conditions	22
06.1.2 Mechanical Data	22
06.1.3 Electrical Data	22

06.2 Product Conformity	23
06.2.1 European Union	23
06.2.2 CE Conformity	23
06.2.3 FCC Conformity	23
06.2.4 Product Return and Recycling	23
06.2.5 REACH Conformity	23
06.2.6 Use of Open Source Software	23
07 Troubleshooting	24
08 Contact Information	25
08.1 Headquarter	25
08.2 Technical support	25
List of Acronyms	26
List of Figures	27
List of Tables	27

01 About This Document

01.1 Classification of Warnings

The safety messages used here warn of dangers that can lead to personal injury or damage to property:



DANGER

Indicates an imminently hazardous situation. If this is not avoided, death or very serious injuries will result.



WARNING

Indicates a possibly imminent hazardous situation. If this is not avoided, death or serious injury will result.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

01.2 Presentation of Supporting Information



NOTICE

Indicates a situation which, if not avoided, may result in property damage to the product or other property.

02 General Safety Information

Carefully read the accompanying documentation for the product (Safety Advice and this User Guide) prior to commissioning. plc2 Design GmbH (hereinafter referred to as PLC2) accepts no liability for damage caused by improper handling, use other than for the intended purpose and non-compliance with safety precautions.

02.1 Requirements for Users and Obligations of the Operator

Failure to comply with the Safety Advice may lead to the risk of damage to life and limb or property. PLC2 and its representatives accept no liability for any damage or injury caused by improper operation or improper use of the product. Only use the product if you have read and understood the information concerning safe operation and have the required qualifications and training for this product. If you have any questions about safe operation, please contact PLC2 using the contact information mentioned in chapter 08.

The product is only approved for the applications described in this Hardware User Guide. When using and operating this product, all applicable regulations and laws must be observed.

02.2 Intended Use

The Automotive Data Logger-1000 Series (ADL-1000) is intended to be used as measurement equipment. Its main purpose is for the recording of data over multiple Ethernet interfaces to U.2 Solid-State Drives (SSDs).

02.2.1 Area of Application of the Product

- The product is approved for use in the following areas: Automobiles, laboratories and industry.
- Do not operate the product in a wet or damp environment.
- Do not operate the product in potentially explosive atmospheres.

02.2.2 Requirements for the Technical Condition of the Product

The product is designed in accordance with state-of-the-art technology. Only operate the product and its accessories if they are in perfect working condition. Shut down a damaged product immediately. Do not modify the product. Modifications must only be implemented by PLC2. Only PLC2 or a trained member of staff is permitted to open the ADL-1000. If this is not followed, the warranty will be void.

02.2.3 Requirements for Operation

It is recommended to operate the product with the latest software and firmware. You can find information about updating the software and firmware in the Software User Guide.

02.2.4 Power Supply

The ADL-1000 is designed to be powered directly by automotive board power from 12 V to 48 V nominal DC voltage. No further filtering or voltage smoothing is necessary. Make sure that the power supply can cover the maximum power requirements of the ADL-1000 and does not exceed the maximum rating mentioned in table 06.3.

02.2.5 Approved Cables

- Only use the ADL-1000 with the included power cable.
-  **CAUTION! Do not use any damaged cables.**
- The connector and connection must be clean.

02.2.6 Requirements for the Installation Site

The product must be installed by a professional in a clean environment.

02.2.7 Wiring Requirements

-  **CAUTION!** *Ensure that the cabling does not cause additional hazards (e.g. tripping hazards, strangulation, etc.)*
- Route the cables such that they are protected against abrasion, damage, deformation and kinking.
- Correctly align the connector with the port.
- Do not connect the connector by force.
- Do not place any objects on the cables.
- Avoid blocking air intake with the cable.

02.2.8 Configuration Requirements



DANGER

Risk of vehicle malfunction

Connecting the ADL-1000 to any safety-critical infrastructure can cause improper behavior or malfunction of the vehicle or subsystems thereof.

Do not connect the ADL-1000 to safety-critical infrastructure inside the vehicle. If data of subsystems should be measured by the ADL-1000, make sure to use a read-only connection.

02.2.9 Transport

- Transport and store the product only in standard ADL-1000 packaging.
- Remove all connected cables before transportation accessories.
-  **CAUTION!** *Only carry the ADL-1000 individually by holding both handles.*
-  **NOTICE:** *Do not carry the product by the connected cables. This can damage the connectors.*

02.2.10 Storage

Make sure the ambient conditions in table 06.1 are met when storing the ADL-1000.

02.2.11 Installation

- Installation is possible in any orientation.
- It is recommended to use horizontal or vertical orientation with the airflow away from user access.
- Vertical installation with the user interface at the top should be avoided.
- The ventilation requirement needs to be fulfilled (see next section).

02.2.12 Ventilation Requirements

Ensure that there is sufficient air circulation for efficient heat exchange. The minimum ventilation required is:

- **Front:**
 - Distance: $\geq 80 \text{ mm} / 3.15 \text{ in}$
 - Minimum area: $80 \times 480 \text{ mm} / 3.15 \times 18.9 \text{ in}$
 - Intake temperature: $\leq 60 \text{ }^{\circ}\text{C} / 140 \text{ }^{\circ}\text{F}$
- **Rear:**
 - Distance: $\geq 80 \text{ mm} / 3.15 \text{ in}$
 - Minimum area: $80 \times 440 \text{ mm} / 3.15 \times 17.3 \text{ in}$
 - Outtake temperature: $\leq 75 \text{ }^{\circ}\text{C} / 167 \text{ }^{\circ}\text{F}$

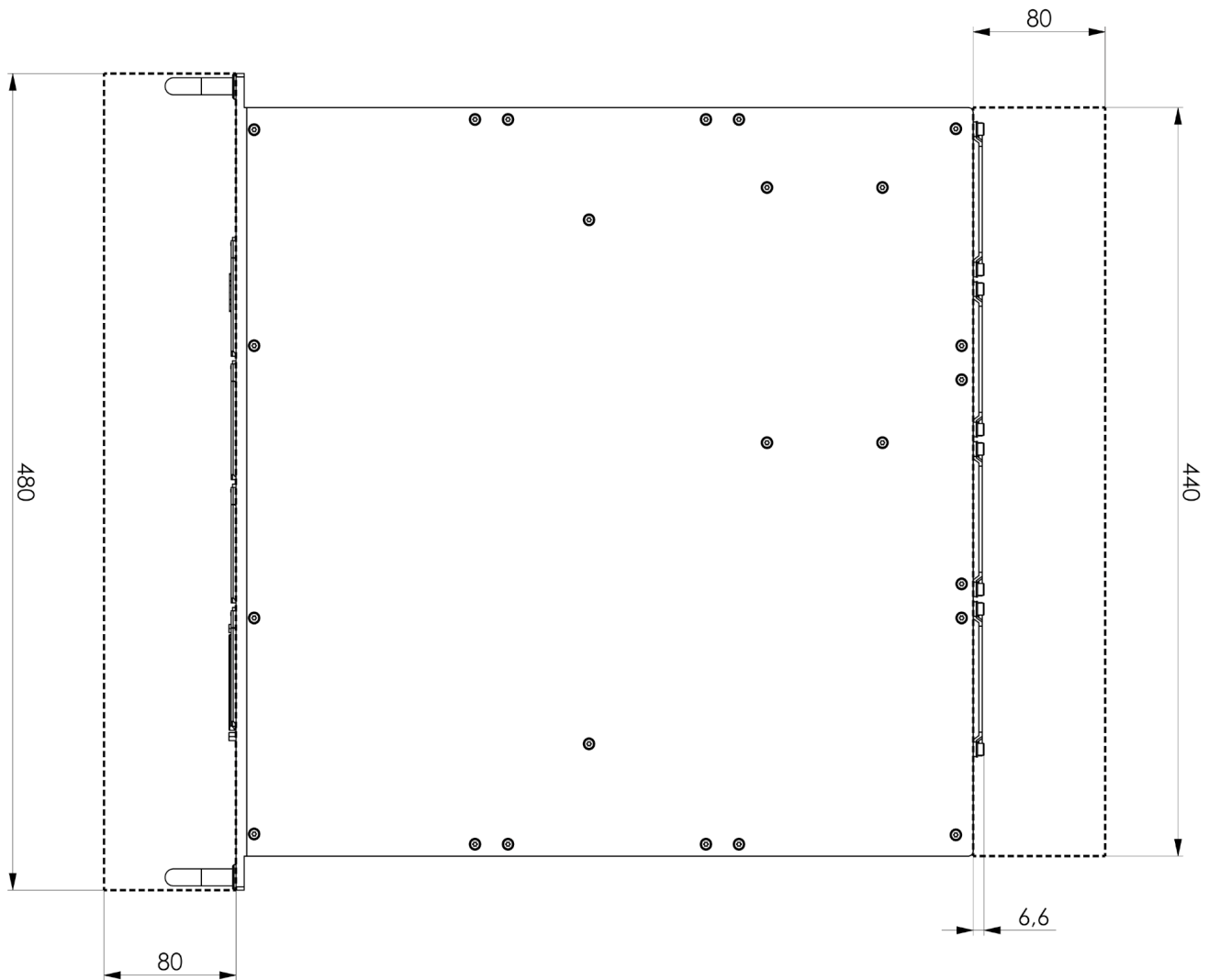


Figure 02.1: Area of minimum ventilation, values in mm



NOTICE

Potential overheating of the box

If the ventilation requirements are not met, correct heat exchange is not possible. This can lead to higher temperatures inside the device. Although the ADL-1000 is protected against overheating, this can lead to degrading overall performance.

Make sure to fulfill the ventilation requirements to get the best performance.

02.2.13 Maintenance

ADL-1000 devices should undergo regular, scheduled maintenance.

These maintenance tasks should be performed by PLC2 or the distributor once per year.

02.2.14 Repair

In case of malfunction or damage, contact PLC2 and return the product if needed. Personal data must be deleted/destroyed before returning the old device. The user is responsible for the complete deletion of personal data.

02.2.15 Cleaning

- **NOTICE:** *Only clean the product when it is de-energized. This will ensure that there are no accidental shorts or similar.*
- **NOTICE:** *Do not use compressed air to clean the dust filter. Dust could get through the filter and damage the device.*
- **NOTICE:** *Make sure that no moisture or water enters the product. Moisture or water could get into the device and damage it.*
- **NOTICE:** *Carefully vacuum off dust particles and loose foreign bodies.*
- **NOTICE:** *When using a vacuum cleaner, make sure to use the lowest setting to prevent the fans from spinning too fast.*

03 Product Description

This document contains hardware and software installation instructions for the ADL-1000. The PLC2's ADL-1000 is a high-speed, Ethernet-centric data logger and edge accelerator for in-vehicle use. Its primary purpose is to support the development of Automated Driving (AD) and Advanced Driver Assistance System (ADAS) systems by recording camera image streams and ancillary data and storing them on Non-volatile memory Express (NVMe) SSDs. ADL-1000 is designed for use in pre-Start of Production (SoP) test vehicles.

ADL-1000 is designed to integrate seamlessly with a number of probes that act as bridges between ADL-1000's Ethernet interfaces and protocols such as CAN, FlexRay or LIN. Using an optional add-on processing card, ADL-1000 can automate the task of recording interesting situations by integrating Artificial Intelligence (AI)-based *smart triggering* algorithms.

03.1 Functions

03.1.1 Recording Application

Recording Application States

The ADL-1000 recording application shall support the following states:

- Stopped: Not recording and not receiving any sensor measurement data.
- Acquisition: Actively receiving sensor measurement data, but not recording to NVMe(s).
- Recording: Recording sensor measurement data to NVMe(s).

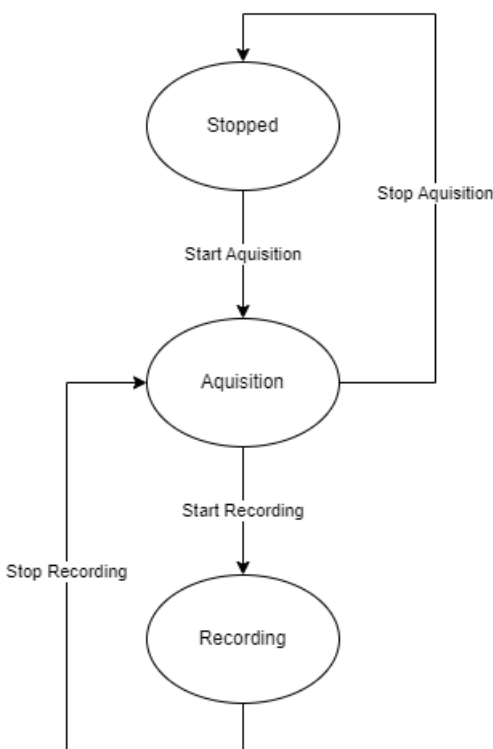


Figure 03.1: Recording states

Recording format

ADL-1000 will record all data in a proprietary format, which is yet to be defined. PLC2 shall provide a software Readout and Conversion Application (RCA) tool which can convert the recorded data files into standard, user-facing formats such as PCAP or MDF4 on readout.

For optimal SSD performance, the operating system shall be configured to support the trim command on the SSDs, so that the SSDs knows which pieces of data are no longer needed and can be erased. This improves both the SSD write performance and its longevity.

Recording Data Encryption

As the recorded data may contain sensitive or Personally Identifiable Information (PII), ADL-1000 shall provide a way to encrypt the content of the SSDs.

A potential solution is a Self-Encrypting Drive (SED), which consists of SSDs with built-in full-disk encryption and secure disk erasure capabilities, for example according to the TCG OPAL 2.0 specification. SEDs have a user-facing first-level passphrase called the authentication key which is used to decrypt a second-level data encryption key, which is in turn used to encrypt and decrypt the data that's stored on the disk. Whereas the authentication key is known and provided by the user, the data encryption key is generated and kept internal to the SSD.

ADL-1000 shall be capable of storing one authentication key per SSD set, which means that all SSDs in a set must share the same authentication key.

Operations like activating SSD encryption, setting and changing data encryption keys, as well as securely erasing and formatting disks shall be available through the REST API. For every mounted SSD drive, ADL-1000 shall report the authentication status (no key, key valid, key error) through the REST API and on the corresponding U.2 slot LED.

03.1.2 Features of ADL-1000

The features of ADL-1000 are listed below:

- Recording with time synchronization 64 GB RAM DDR4
- Up to 100 Gbit/s lossless recording
- NVMe storage capacities of up to 124 TiB using removable drives
- Small size (450x440 mm / 17.7x17.3 in base footprint)
- Target power consumption for typical recording use case ≤ 200 W (4x 10G input, 4x SSDs, no external devices)
- Air-cooled; temperature-controlled
- Optional smart triggering and pre-labeling
- Optional L5 data compression and decompression
- Optional GETK logging over PCIe

03.1.3 Technical Features

- Based on AMD-Xilinx Zynq UltraScale+ MPSoC for maximum flexibility
- I/O bandwidth up to 260 Gbp/s (theoretical)
- Up to 256 GB of data buffer DDR4 memory with ECC
- Compact size: 450x450 mm / 17.7x17.3 in
- 8x U.2 NVMe slots
- 2x USB 3.0
- 2x 1 GbE, RJ45 connector
- 1x Mini-SAS HD connector for Gigabit-Emulator-Tastkopf (GETK) (optional)

04 Hardware

04.1 Architecture

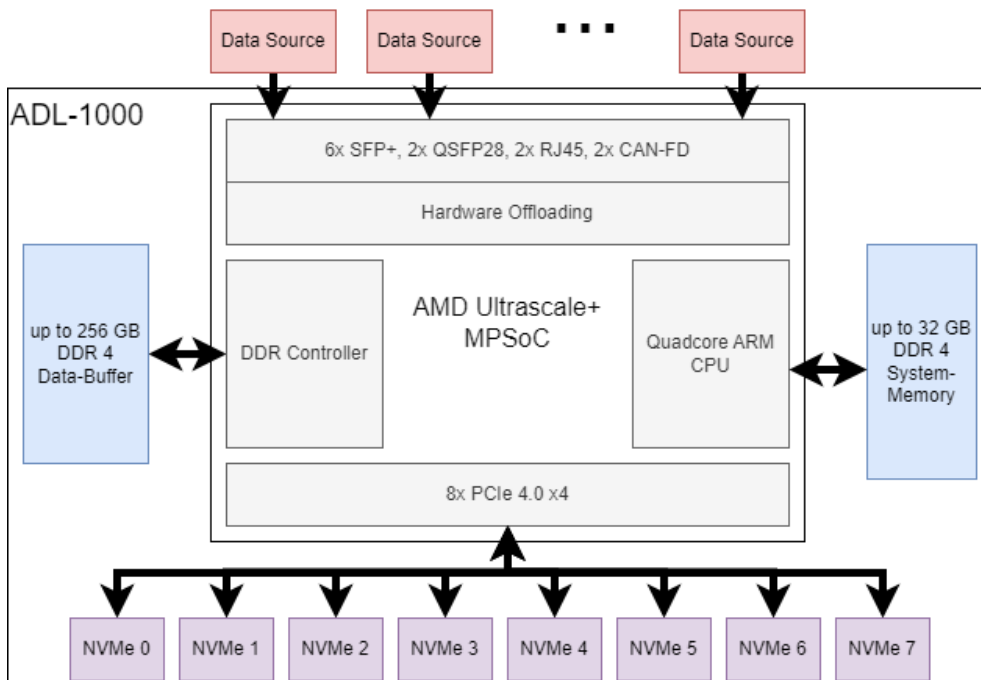


Figure 04.1: ADL-1000 architecture

04.2 ADL-1000 Interfaces

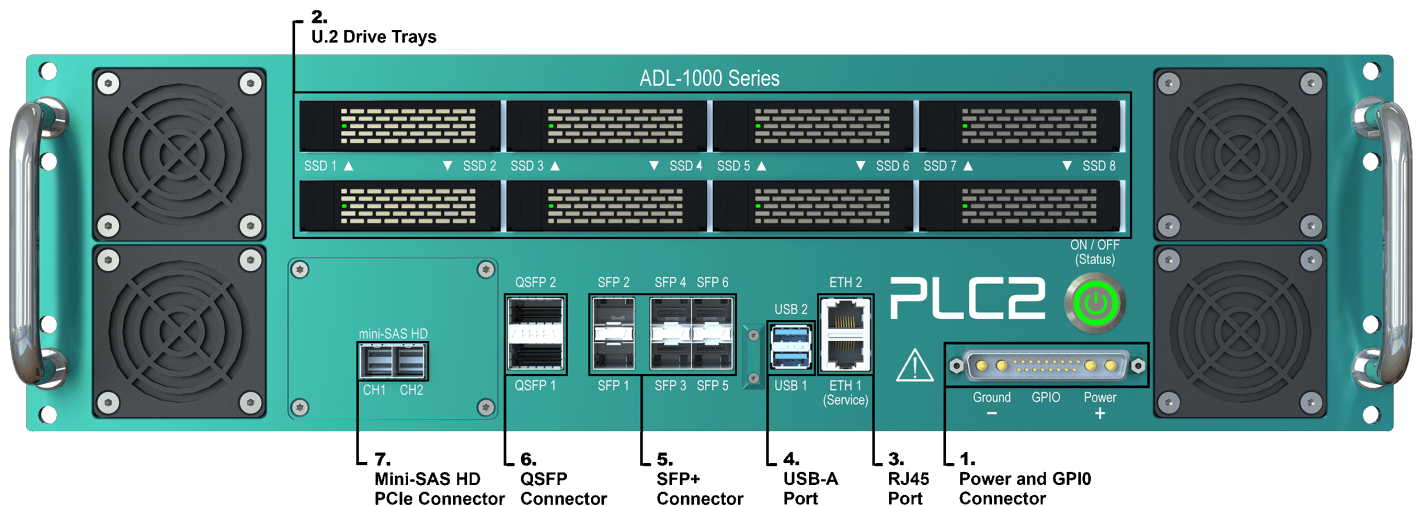


Figure 04.2: ADL-1000 interfaces

04.2.1 Power and GPIO Connector

ADL-1000 features a heavy-duty D-Sub connector for power, General-Purpose Input and Outputs (GPIOs) and Controller Area Network (CAN)-Bus. The connector provides four General-Purpose Input (GPI) and four General-Purpose Output (GPO). A total of two CAN-FD interfaces are available, of which one can be used for booting up the system on a user-defined command.

GPI

The GPI are capable of sensing voltages from 0 V to the maximum operating voltage of 55 V. A logic low is measured when the GPI has an external voltage of maximum 0.8 V applied. A logic high is measured when the GPI has an external voltage of minimum 3 V applied.

GPO

The GPO are implemented as open-drain driver outputs. Each output can sink up to 1.0 A.



NOTICE

Risk of damaging the open-drain driver

The GPO has a clamping diode to V_{BAT} . The GPO voltage should never exceed V_{BAT} . Failure to comply with this rule will damage these outputs.

It is recommended to use a pull-up resistor of 10 k Ω for these pins, connected to either V_{BAT} or a lower voltage than V_{BAT} .

Power

The power-pins are terminated to two cable lugs. The cable lug with black shrinking tube is the ground connection. The cable lug with the red shrinking tube is the power connection. This should be connected to a suitable supply that fulfills the requirements mentioned in table O6.3.



CAUTION

Risk of hot cable lugs

When connecting the power cable to the power source, a poor connection could result in a high impedance. This can cause excessive heat, which can lead to a risk of burns from a hot surface or can result in the cable being damaged.

Make sure the cable lugs are properly screwed in with a suitable torque.

GPIO and CAN D-Sub connector

The following pin-out is used for the 15-pin D-Sub GPIO and CAN connector. The user can connect with their own cable here.

Pin number D-Sub	Signal Name
1	GND
2	V_{BAT}
3	GPI_0
4	GPI_1
5	GPI_2
6	GPI_3
7	CAN_O_H
8	CAN_O_L
9	GND
10	GPO_0
11	GPO_1
12	GPO_2
13	GPO_3
14	CAN_1_H
15	CAN_1_L
GND	CAN_Shield

Table 04.1: GPIO and CAN D-Sub pin-out

Standby voltage

The standby voltage V_{BAT} is used for the internal Real-Time Clock (RTC) inside the ADL-1000. This voltage powers the device in standby mode. This extends the lifetime of the internal RTC battery.

04.2.2 U.2 Drive Trays

ADL-1000 features eight U.2 SSD trays for the fast exchange of SSDs. These are accessible on the front panel. At the end of a recording session, the user can remove the corresponding SSDs (indicated by the LED light of the U.2 tray) and plug them into another computer or a server for readout. See the Software User Guide for more information.

The ADL-1000 provides eight slots for NVMe storage, which can be U.2 and U.3 drives with PCIe 4.0 x4. The available power at each port can be seen in table 06.3.

LED Color	Description
Red	Error on drive detected.
Blue	No drive detected.
Green	Drive in operation.
Orange	Drive is over 90% full.

Table 04.2: LED states of U.2 trays



NOTICE

Potential Damage of U.2 Slots

The U.2 form factor allows any drive with an outer dimension of 2.5" to be used. Plugging incompatible devices into these slots can permanently damage it.

Use only U.2 and U.3 NVMe SSDs with the ADL-1000.

Two variants of U.2 trays from ICY DOCK are available and compatible with the ADL-1000. The standard tray – MB991TRAY-B – has a mechanical spring lock mechanism to hold the U.2 drive in place. The second variant – MB994TK-B – has an additional key lock to prevent opening due to heavy vibrations or shocks.



NOTICE

Potential Damage of U.2 Slots

Using any other U.2 tray than the compatible variants mentioned above can lead to damage to the U.2 Slots.



(a) MB991TRAY-B without key lock



(b) MB994TK-B with key lock

Figure 04.3: ADL-1000 compatible trays



CAUTION

Risk of burns from hot surface

During recording, the SSDs are heavily loaded. This can heat the SSDs above 50 °C and can create a risk of burns due to the hot surface.

When replacing the SSDs, be sure that the SSDs and the tray are not too hot or wear protective gloves.

04.2.3 RJ45 Connectors

ADL-1000 features two RJ45 connectors for Gigabit Ethernet (GbE) connectivity:

- ETH1 is used for general networking such as SSH communication and accessing the REST API.
- ETH2 is used for connecting additional devices such as the Star Cooperation FlexDevice-L2 bridge or an Ethernet PTP Master.

04.2.4 USB-A Connectors

ADL-1000 features two USB 3.0 type-A receptacle connectors, which can be used to connect external devices such as a GPS receiver, a keyboard, a mouse or an external USB hard drive for local data transfer. The available power on each port can be seen in table 06.3.

04.2.5 SFP+ Connectors

ADL-1000 features six SFP+ connectors supporting 10 Gbps signaling speed. Those are used for 10 GbE connectivity, such as interfacing to the GigE Vision data sources.

These ports support Direct-Attached Copper Cable (DAC-Cable), Active Optical Cable (AOC) and optical transceiver modules. The available power at each port can be seen in table 06.3.

04.2.6 QSFP Connectors

ADL-1000 features two QSFP28 connectors, which are used for 40 or 100 GbE connectivity. Compared to the SFP+ connectors, QSFP connectors allow for higher integration density and data rates. They also enable the ADL-1000 to be connected to a 40G or a 100G network switch. One of the QSFP28 connectors can be used for 100GbE upload.

These ports support DAC-Cable, AOC and optical transceiver modules. The available power at each port can be seen in table 06.3.

04.2.7 Mini-SAS HD PCIe Interface

ADL-1000 features a Mini-SAS High Density receptacle for connecting to a GETK P4 control unit interface. It provides a PCIe 4.0 x4 connection for recording directly over PCIe to the U.2 SSDs.

These ports support DAC-Cable, AOC and optical-transceiver-modules. The available power on each port can be seen in table 06.3.



CAUTION

Risk of burns from hot surface

When using active cables or modules for any data communication, the temperature of the cables or modules can exceed 50 °C. This creates a risk of burns due to the hot surface.

Be careful when handling active cables or modules and ensure that they are not too hot or wear protective gloves.

04.3 Power Button and RGB LED

The ADL-1000 front panel features a push power button with an integrated color LED. Briefly press the push button to power the device up into the next step. Pressing and holding the push button will take it back into the previous state.

The power button color LED signals the following states:

LED Color	LED State	Description
-	Off	Device is not powered.
Orange	On	Device is in standby (low power mode).
Blue	On	Device is in service mode.
Green	On	Operational mode.
Orange/Blue/Green	Blinking	Transition into next/previous mode.
White	Fast blinking	Box identify command.
Red	On	Error Mode. Something went wrong during booting; safety shutdown.
Purple	On	Device is in bring-up mode. No valid configuration available. Please contact your distributor.

Table 04.3: LED states of power button

05 ADL-1000 Installation Instructions

Take basic safety precautions to avoid the risk of fire, electric shock or injury.

05.1 Safety Instructions

Please read the Safety Advice included with the ADL-1000 carefully and follow its rules.

Here are additional notices to avoid material damage.



NOTICE

Potential material damage

- Wear an ESD wrist strap and make sure that the ESD wrist strap is in contact with your skin. Connect the end of the ESD wrist strap to an unpainted metal surface of the housing.
- Only touch the slot bracket or edges of the card. Avoid touching the board or the connectors on the board.
- Connect only certified SFP+, QSFP, USB-A and RJ45 modules and cables and follow the safety instructions of all the modules and cables.
- Make sure that the SFP+, QSFP, USB-A and RJ45 modules are correctly aligned before plugging them in.
- Carefully insert the SFP+, QSFP, USB-A and RJ45 modules.
- Make sure when inserting SFP+, QSFP, USB-A or RJ45 modules to plug them in at ideally 90 ° to the front so as to not damage the ports.
- If the SFP+, QSFP, USB-A and RJ45 modules are not aligned correctly or if too much force is used when inserting them, the connection may be damaged or they may come off completely from the board.

05.2 Installation of the ADL-1000



CAUTION

Risk of bruises

Because of the weight of the ADL-1000, negligent handling can result in dropping the device and therefore bruises.

It is recommended that two persons install the ADL-1000.

The ADL-1000 is built to be mounted into a 19 in server rack. Hold the device in the 19 in server rack at the desired height. Use at least four M6 screws, two on each side, of matching length. Use M6 nuts with washers or cage nuts to secure the device to the 19 in server rack frame.

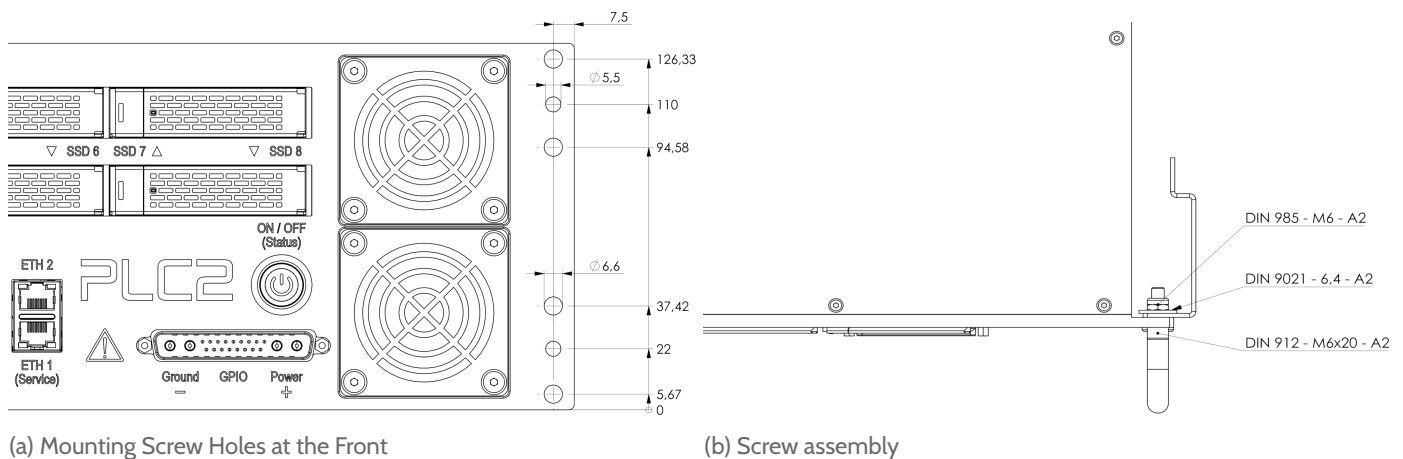


Figure 05.1: Mounting the ADL-1000, values in mm

05.3 Wiring

Connect all data sources to the correct data interface. Use cables that are rated for at least the desired speed. E.g. to connect a GVSP-Camera with an SFP+ port, use an SFP+ cable that is rated at least for 10 Gbit/s signaling speed. Using a lower rated cable will result in connection losses or undesired behavior.

Make sure to use the included GPIO-Power-D-Sub-cable. It is not recommended to modify it any way



NOTICE

Disconnection of ADL-1000 power

The ADL-1000 is laboratory equipment. As such, the ADL-1000 requires a disconnection device in the power line, e.g. contactor, relays or switch. Ensure that these disconnection devices are easily accessible at all times.



NOTICE

Damage of power cable

The external power and GPIO are not permitted to be in a mechanically stressed environment. Avoid movement after installation and mechanical damage.

When installing the cable, secure it with cable ties (or similar) to prevent it from constantly moving. Install the cable in mechanical protected areas only, where no one can walk over the cable or damage it in any other way.



NOTICE

Damage to the electronics due to potential equalization

The cables' shield may be connected to the housing, the ground, or the ground for the product's power supply. If there are different ground potentials in the test setup, equalizing currents can flow between the products via the cables' shield.

Take account of different electric potentials in your test setup and take appropriate measures to prevent equalizing currents.



NOTICE

Damage of interface connectors

When plugging in any cable into ADL-1000 interfaces (including the GPIO-Power-D-Sub-cable), ensure to plug it into the housing at a right angle. Failure to comply will result in damage to ports and/or connectors.



NOTICE

Risk of EMC non-compliance

A test setup with simultaneously shielded and unshielded components can lead to an impairment of the signal quality and is not recommended by PLC2.

Ensure that the test setup is EMC-compliant.

05.4 Installation of the U.2 Trays

Put a compatible U.2 or U.3 NVMe SSD into the supported ICY DOCK trays MB991TRAY-B or MB994TK-B. Screw the drive to the tray with four screws and tighten them to a corresponding torque.



Figure 05.2: Mounting a drive into the tray

Put the mounted drive into one slot and slide it in. The U.2/U.3 connector should face downwards. When the tray is fully in, you can use the lever to secure the drive. To avoid problems, exchange the drive only when the ADL-1000 is not powered.

Use the following criteria to select a matching U.2 NVMe SSD:

- Estimate the data rate of the interfaces that should be recorded. Use the estimated data rates and add at least 20% on top. This should be the minimum write speed by the SSD. Consider also the speed reduction when the ambient temperature is hot.
- Multiply the data rate by the mission time to estimate the total capacity required. Divide this by eight, when using all eight drive bays, or another number, when using only some of the drive bays. This should be at least the size of each SSD. Be sure to account for the internal management and meta information size, which is up to 5% of the total capacity.
- When distributing the load on the available drives, it is recommended to have the same type and size used for all slots to avoid speed bottlenecks.
- Use drives which fulfill the environmental criteria of your mission, such as temperature. The ADL-1000 does not usually exceed a temperature rise of 15 K.
- PLC2 recommends high performance industrial NVMe drives, such as EpiStor or StorFly from Virtium.

These NVMeS were used and tested by PLC2:

- Virtium VTPU2EGGEC3T9-CS110005 (U.2; 4 TB; PCIe 4.0 x4)



NOTICE

Potential damage to the U.2 slot

Using force to plug the drive in can lead to material damage to the port or the interface connector.

Don't use force to plug in the drives.



NOTICE

Sub-optimal cooling of SSDs

Not plugging all of the SSD trays into all of the bays can lead to sub-optimal airflow. This can cause overheating of the SSD and therefore lead to damage or reduced performance.

If not all slots are used, put in dummy trays, without any drive, to achieve optimal airflow.

05.5 Checking the Function of the ADL-1000

If the ADL-1000 was installed, the user can enable the power. The LED of the Power Button indicates with an orange light the *standby*-state. By pressing the power button two times, the ADL-1000 will boot up in operational mode. After around 90 seconds, the booting process is completed and you can access the ADL-1000 through the RJ45 management port via REST-API. The total boot time depends on the configuration of the ADL-1000 and the connected devices and peripherals. Please refer to the Software User Guide for more information.



NOTICE

Potential loss of data

The product is capable of forwarding and recording data even in the event of an error. Use the monitoring capabilities and error indicators of the product and of the transmitted data to detect erroneous data. Further instructions can be found in the Software User Guide.

06 General Data

06.1 Technical Data

06.1.1 Ambient Conditions

Operating temperature range	-20 °C to +60 °C -4 °F to +140 °F non-condensing
Storage temperature range (without packaging)	-30 °C to +75 °C -22 °F to +167 °F
Max. relative humidity (non-condensing)	80 %
Max. altitude	5,000 m / 16,400 ft
Degree of contamination (IEC 60664-1, IEC 61010-1)	2
Degree of protection	IP 10

Table 06.1: Ambient conditions

06.1.2 Mechanical Data

Dimensions (H x W x D)	450 x 440 x 132 mm 17.72 x 17.32 x 5.2 in
Deadweight	12 kg / 26.5 lb
Mechanical Vibration Test	Acc. to EN60068-2-64 <i>packaging and transport</i> and MIL-STD810F 1 h per axis
Mechanical Shock Test	Acc. to EN60068-2-27 half sine wave, 11 ms, 20 G, 36,000 shocks

Table 06.2: Mechanical data

06.1.3 Electrical Data

General

Nominal voltage range	12 V to 48 V DC
Maximum operation voltage	9 V to 55 V DC
Maximum current on <i>primary</i> power	30 A
Maximum current on V_{bat} pin	3 A
Maximum power consumption	300 W
Typical power consumption	≤ 200 W
Standby power consumption	≤ 250 mW ($V_{bat} = 12$ V)
Overvoltage category (IEC 60664-1)	II

Interfaces

Maximum power delivery on every SFP+ port	2,310 mW
Maximum power delivery on every QSFP port	4,950 mW
Maximum power delivery on every USB-A port	7,500 mW
Maximum power delivery on every U.2 Slot	25 W continuous 50 W peak
Maximum power delivery on every Mini-SAS HD port	4,950 mW

Table 06.3: Electrical data

06.2 Product Conformity

06.2.1 European Union

The EU Directive 2011/65/EU limits the use of certain dangerous materials for electric and electronic devices (RoHS conformity).

This product does not contain any of the prohibited substances listed in EU Directive 2011/65/EU and does not exceed the maximum authorized concentrations specified. PLC2 confirms that the product corresponds to this directive that is applicable in the European Union.

06.2.2 CE Conformity



Figure 06.1: CE label

With the CE marking attached to the product or its packaging, PLC2 confirms that the product corresponds to the applicable product-specific directives of the European Union.

06.2.3 FCC Conformity

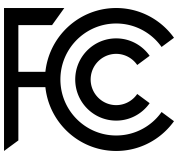


Figure 06.2: FCC label

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.

06.2.4 Product Return and Recycling



Figure 06.3: WEEE label

The European Union (EU) issued the Directive for Waste Electrical and Electronic Equipment (WEEE) to ensure the setup of systems for collecting, treating, and recycling electronic waste in all countries of the EU. This ensures that the devices are recycled in a resource-friendly way that does not represent any risk to personal health and the environment.

The WEEE label on the product or its packaging indicates that the product must not be disposed of together with regular waste. The user is obligated to separately collect old devices and provide them to the WEEE return system for recycling. The WEEE directive applies to all PLC2 devices, but not to external cables or batteries. For more information on the recycling program, contact PLC2. Personal data must be deleted/destroyed before

returning the old device. The user is responsible for the complete deletion of personal data.

06.2.5 REACH Conformity

PLC2 confirms that the product complies with the REACH Regulation (EC) No. 1907/2006 applicable in the European Union.

06.2.6 Use of Open Source Software

The product uses Open Source Software (OSS). This software is installed in the product at the time of delivery and does not have to be installed or updated by the user. Reference must be made to the use of the software in order to fulfill OSS licensing terms. More information can be found in the *OSS Attribution* document.

07 Troubleshooting

Problem Description	Solution
After pressing the power button, the ADL-1000 no longer responds and does not switch to the next/previous operating mode.	The transition to the next/previous operating mode should not take longer than 5 seconds. If the ADL-1000 has not made the switch within this time, something went wrong. Please power off the ADL-1000 (primary and V_{BAT}) and wait 60 seconds for all internal voltages to discharge. Then, reconnect the ADL-1000 to power.
When booting/shutting down the ADL-1000, the "Error" state is indicated by the red LED on the power button.	Press the power button once again to exit the error state. If pressing multiple times does not help, check for defective connected peripherals or power off the ADL-1000 (primary and V_{BAT}) and wait 60 seconds for all internal voltages to discharge. Then, reconnect the ADL-1000 to power.
An exchanged SSD is not recognized by the ADL-1000.	The ADL-1000 is not hot-plug capable on the SSD slots. Please power off the ADL-1000 (primary and V_{BAT}) and wait 60 seconds for all internal voltages to discharge. Then, reconnect the ADL-1000 to power.
The ADL-1000 shows bit errors during data recording.	• Ensure that the used SFP+ cables are certified for the required speed and that the cables are not damaged. • Also, check if the contact surfaces of the SFP slot are not contaminated.
The ADL-1000 is not accessible via the RJ45 service port after boot-up.	• Was the correct RJ45 port (ETH1 - Service) used for communication? • The Linkup and Activity LEDs on the RJ45 port indicate whether an Ethernet connection has been established and whether Ethernet packets are being exchanged. • Is the host computer in the same IP subnet as the ADL-1000? • The ADL-1000 has an IP address in the range of 192.168.11.120-199 by default.

Table 07.1: Troubleshooting

08 Contact Information

08.1 Headquarter

plc2 Design GmbH

Ersteiner Straße 19
79346 Endingen a.K.
Germany

+49 7642 92118 0

Fax: +49 7642 92118 29

support@plc2.com

www.plc2.com

08.2 Technical support

Please contact the distributor or get in touch with PLC2 directly via above-mentioned contact information.

List of Acronyms

AD	Automated Driving
ADAS	Advanced Driver Assistance System
AI	Artificial Intelligence
AOC	Active Optical Cable
CAN	Controller Area Network
DAC-Cable	Direct-Attached Copper Cable
EU	European Union
GbE	Gigabit Ethernet
GPI	General-Purpose Input
GPIO	General-Purpose Input and Output
GPO	General-Purpose Output
NVMe	Non-volatile memory Express
OSS	Open Source Software
PII	Personally Identifiable Information
RCA	Readout and Conversion Application
RTC	Real-Time Clock
SED	Self-Encrypting Drive
SoP	Start of Production
SSD	Solid-State Drive
WEEE	Waste Electrical and Electronic Equipment

List of Figures

02.1 Area of minimum ventilation, values in mm 9

03.1 Recording states 11

04.1 ADL-1000 architecture 13

04.2 ADL-1000 interfaces 13

04.3 ADL-1000 compatible trays 16

05.1 Mounting the ADL-1000, values in mm 18

05.2 Mounting a drive into the tray 20

06.1 CE label 23

06.2 FCC label 23

06.3 WEEE label 23

List of Tables

04.1 GPIO and CAN D-Sub pin-out 15

04.2 LED states of U.2 trays 15

04.3 LED states of power button 17

06.1 Ambient conditions 22

06.2 Mechanical data 22

06.3 Electrical data 22

07.1 Troubleshooting 24