PDA 100

Photo Diode Amplifier

Manual

Manual: M-020 Version 03

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Dear Customer,

Welcome to the TOPTICA community!

We have designed this product to be easy to use and reliable so that you can focus on your work. Should you have questions or need advice on how to integrate it into your setup, please do not hesitate to ask. We will provide you with quick and competent help through our service staff and product managers.

You can contact us in the following ways:

- internet: www.toptica.com. In our support section you can find a list of frequently asked questions and a service contact form
- email: service@toptica.com
- phone: +49-89-85837-0.

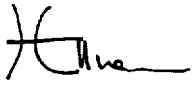
Our customers in the USA and Canada may contact TOPTICA Photonics Inc.:

- email: service@toptica-usa.com
- phone: +1-585-657-6663

Please have your product-ID/serial number ready when contacting us so we can quickly retrieve all relevant information.

As we are constantly improving our products, we greatly value all customer feedback. We encourage you to tell us what you like about our products as well as any suggestions for improvement.

Best regards,



Harald Ellmann
Service Manager
TOPTICA Photonics AG

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1 Short Description

The PDA 100 system consists of the amplifier PDA-S and a separate power supply. The photo diode amplifier PDA-S is a sensitive and fast general purpose pre-amplifier for photo diodes. Two identical outputs are available which can be AC- or DC coupled. The amplifier gain can be varied over several decades by a 6-step turn-switch. Within one decade the gain can be continuously fine tuned by a trimpot.
An offset adjustment is also possible by a trimpot.

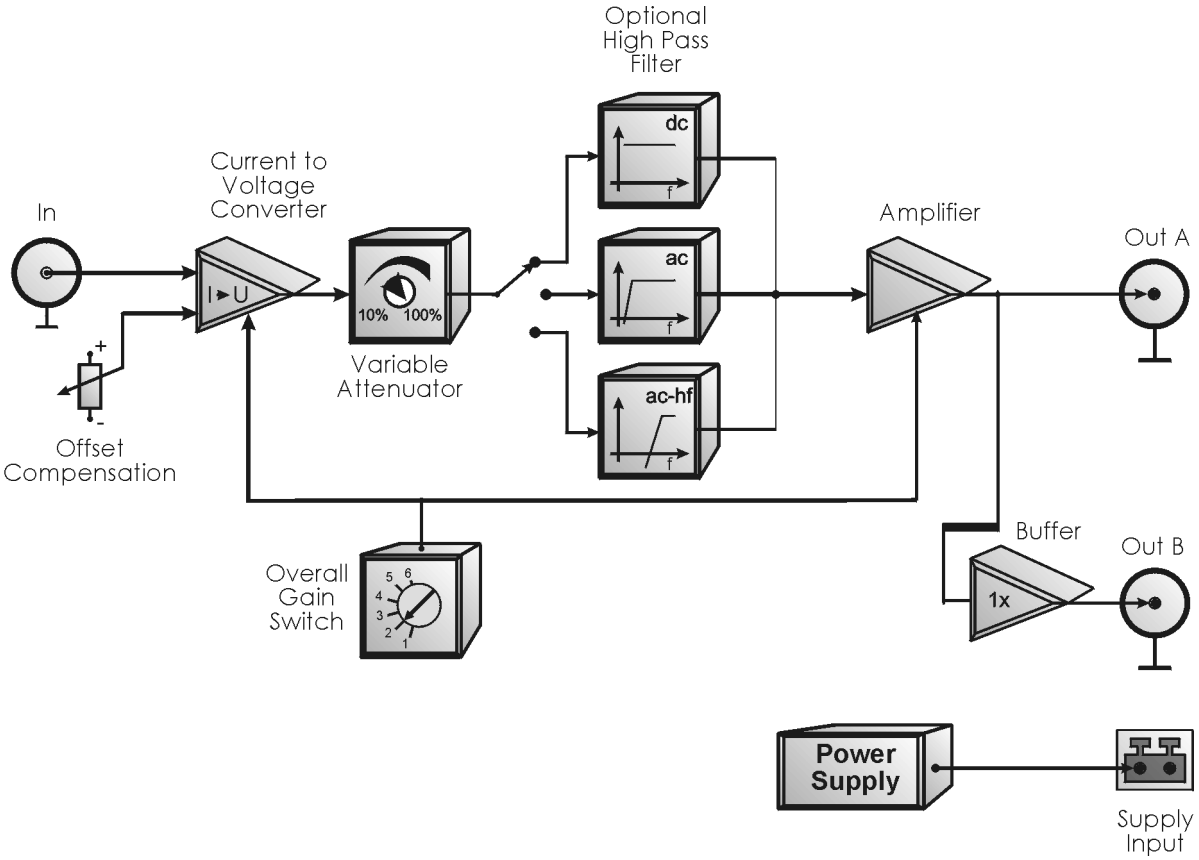

Figure 1 PDA 100 Schematic Setup

The PDA Photo Diode Amplifier can be used in conjunction with TOPTICA´s FPI 100 with one of the following photo diodes:

- Photo Diode VIS (330 nm - 1100 nm)
- Photo Diode NIR (900 nm - 1700 nm)
- Photo Diode IR (1000 nm - 3400 nm)

2 Operator Controls

Figure 2 PDA-S Operator Controls

1 Gain fine potentiometer
2 Input BNC-connector
3 Output offset trimpot
4 Gain coarse switch
5 DC/AC/AC-HF switch
6 PDA-S Supply
7 Control LED
8 Output A BNC-connector
9 Output B BNC-connector

1 Gain fine • potentiometer	Fine adjustment of amplifier gain: 10 % to 100 % of the setting selected with Gain coarse switch (4).
2 PD Input • BNC-connector	Input BNC-connector for connecting a photo diode (no reverse voltage applied).
3 Output offset • trimpot	Trimpot for offset adjustment of Output A and B (8,9).
4 Gain coarse switch	Coarse adjustment of amplifier gain. **Switch** / **Gain, Fine potentiometer (1) set to 100 %** / **Bandwidth (typ.)** Pos. 1: 3.3×10^4 V/A, 1 MHz Pos. 2: 1×10^5 V/A, 600 kHz Pos. 3: 3.3×10^5 V/A, 400 kHz Pos. 4: 1×10^6 V/A, 150 kHz Pos. 5: 3.3×10^6 V/A, 120 kHz Pos. 6: 1×10^7 V/A, 45 kHz
5 DC/AC/AC-HF switch	Selector switch for optional high-pass. DC no high-pass AC high-pass, lower cut-off 10 Hz AC-HF high-pass, lower cut-off 300 Hz
6 PDA-S Supply	Connector for connecting the PDA-S power supply (stabilized 12 V DC voltage).
7 Control LED	The green LED lights up if the PDA-S power supply is on.
8 Output A • BNC-connector	Amplified PD signal. **NOTE !** Output A (8) and Output B (9) provide the identical signal.
9 Output B • BNC-connector	Amplified PD signal. **NOTE !** Output A (8) and Output B (9) provide the identical signal.

3 Operation

3.1 Connection of Photo Diodes

The layout of the circuit was developed with respect to the usage of different types of photo diodes, which are connected by a shielded cable to the PDA-S. In many other concepts of photo diode amplifiers the usage of cables with different length, capacitance or inductivity between photo diode and amplifier is very critical. Also the specifications of the photo diode itself, especially its depletion layer capacitance, have to be taken into account exactly. Either the amplifier must be adapted to photo diode and cables or the characteristics bandwidth, signal to noise ratio and oscillation suppression suffer strongly.

The circuit technique used here however is very insensitive to oscillations so that an adaption of the amplifier to a photo diode or cable is not necessary in most cases.

However it is advisable to use cables as short as possible between photo diode and PDA-S. The illuminated photo diode itself has no defined impedance so that it is impossible to adapt the signals to the used cable. Commonly used are cables with an impedance of 50 Ohms which distort the shape of the photo diode signals due to reflection effects when longer cables are connected. The cable is also a capacitance which leads to low-pass characteristics of the signal current from the photo diode.

CAUTION ! Do not exceed the maximum allowed incident laser intensity on the photo diode.
Photo Diode VIS: P < 20 mW
Photo Diode NIR: P < 10 mW
Photo Diode IR: P < 1 mW

3.1.1 Photovoltaic Photo Diodes

For standard applications the photovoltaic operation is chosen: The cathode (or anode if negative output voltage is desired) is connected to the shield (gnd), the anode (respectively cathode) is connected to the signal input.

3.1.2 Applying Reverse Voltages to Photo Diodes

A disadvantage of applying reverse voltages to a photo diode is the fact that leakage currents lead to a significant offset. The leakage currents are often proportional or super proportional to the reverse voltage and, in addition, strongly dependent on the temperature. Another disadvantage of using a reverse voltage is that its polarity has to correspond to the non-conducting polarity of the photo diode.

3.2 PDA-S Outputs

The PDA-S offers two identical outputs which can be used alternatively or simultaneously, without influencing each other. When connecting the outputs to any devices, take care that the signals are not distorted due to cable reflections or interferences between different connected devices. Often the output signal is used for monitoring (e.g. oscilloscope) as well as controlling (e.g. PID controller) purposes, but some devices distort the output signal so that it cannot be used for both purposes simultaneously.

The outputs can be DC, AC or AC-HF coupled by the DC/AC/AC-HF switch (5). When very low signals are detected, interferences from the 50/60 Hz mains voltage often are the strongest distortion signals. It is advisable to employ AC output coupling for observation with an oscilloscope if the DC portion shows no evaluable signal.

If the DC offset is so large that one of the internal amplifier stages is saturated, the AC output signal goes to zero. Therefore, the offset value must be adjusted while observing the DC signal and has to be checked regularly.

3.3 Power Supply of the PDA-S

The PDA-S module must be connected to the power supply which provides a stabilized 12 V DC voltage.

CAUTION ! Before connecting the PDA 100 power supply to your mains line, please check whether the voltage indicated on the power supply is equal to your local mains voltage.

CAUTION ! Only use the power supply delivered with the PDA-S. The electronics of the photo diode preamplifier is adapted to the characteristics of this power supply. Especially the use of an unstabilized power supply can lead to a significant deterioration of the electronic specifications, and, due to occasionally higher output voltages, lead to the destruction of electronic components. If, for certain reasons, a power supply different from the supplied one should be used, adaptions to the electronic may be required. Please contact TOPTICA Photonics AG for assistance.

4 Guarantee and Service

On the following page you will find the **Guarantee Registration Form** in which the warranty conditions are defined. Please fill in the Guarantee Registration Form immediately after you have received your device and return it to TOPTICA Photonics AG by mail or fax.

As a first step towards obtaining technical support, please contact your local distributor or visit the support pages on our web site: http://www.toptica.com/support/

In case you wish to return a product for diagnosis and/or repair, please contact us prior to sending it so we can issue a **Return Material Authorization** (RMA) number for you.

You can contact us in the following ways:

- internet: www.toptica.com. In our support section you can find a list of frequently asked questions and a service contact form
- email: service@toptica.com
- phone: +49-89-85837-0.

Our customers in the USA and Canada may contact TOPTICA Photonics Inc.:

- email: service@toptica-usa.com
- phone: +1-585-657-6663

Guarantee Registration Form

QM form:	Status of form:	Version of form:	Page:
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return to

TOPTICA Photonics AG
Customer Service
Lochhamer Schlag 19
D- 82166 Graefelfing/Munich
Germany

sender:

_____
_____
_____
_____
_____

FAX: +49 89 85837-200

Guarantee Conditions

The products of TOPTICA Photonics AG are produced with the greatest possible care using high-quality components and are checked in detail before being delivered. Therefore, as the manufacturer, TOPTICA Photonics AG gives a guarantee of durability according to the following terms:

1. **TOPTICA Photonics AG guarantees the buyer that there will be no defects in the product based on defective material or processing, for a period of 12 months from first delivery (guarantee period).** Natural wear and tear as well as defects resulting from improper use or use contrary to the specifications, from failure to observe operating instructions, from insufficient maintenance and care or from modifications, interventions or attempted repairs that are neither carried out nor authorized by TOPTICA Photonics AG, are not covered by the guarantee.
2. **Unless expressively stated in the order acknowledgement or the invoice semiconductor light emitting devices like laser diodes, tapered amplifier chips etc. whether sold as single parts or integrated in systems are not covered by the guarantee.**
3. If a defect covered by the guarantee arises during the guarantee period, TOPTICA Photonics AG shall rectify such defect within a reasonable period at its own discretion by repairing or replacing the product or the defective part.
4. The guarantee period shall commence upon delivery of the product by TOPTICA Photonics AG or by a third party that obtained the product directly from TOPTICA Photonics AG for the purpose of selling it to the buyer.
   The claim under the guarantee shall be excluded if the defect is not notified to TOPTICA Photonics AG in writing immediately after having been discovered, and no later than one month after expiry of the guarantee period.
   For the purpose of rectifying a defect covered by the guarantee, the product or the relevant part shall be sent to TOPTICA Photonics AG at the expense and risk of the buyer. The product shall be returned at the expense and risk of TOPTICA Photonics AG.
5. No claims may be derived from this guarantee other than claims for rectification of the defects falling within the scope hereof, in accordance with the present terms. In particular, the buyer is not entitled under this guarantee to claim damages or a reduction in price from TOPTICA Photonics AG, or to rescind the contract. Potential, more far-reaching claims of the buyer against its seller shall not be affected by this guarantee.
6. **Important!: The obligation of TOPTICA Photonics AG under this guarantee is subject to the condition that the buyer gives his/her express consent to them by sending the signed duplicate of this form to TOPTICA Photonics AG immediately after delivery, also truthfully indicating the model number, the serial number and the date on which the product was delivered.**
7. The buyer may not assign claims under this guarantee to third parties without the prior written consent of TOPTICA Photonics AG.
8. This guarantee is governed by substantive German law to the exclusion of the provisions of the UN-Convention on Contracts for the International Sale of Goods (CISG). The Regional Court [Landgericht] Munich I shall be the court of exclusive international, local and subject-matter jurisdiction for legal disputes arising under or in connection with this guarantee.

I request the above mentioned guarantee for the purchased products and herewith consent to the above mentioned Guarantee Conditions:

Model No.: _____ Date: _____

Serial No.: _____ Signature: _____

Date of Delivery: _____ Name/Title: _____

To be completed by the buyer and returned to TOPTICA Photonics AG by mail or fax (+49 - 89 – 85837 – 200).