Operation Manual
miniMyotis 4ch-Unit conditioning unit
Used with optical fiber sensor

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I- Datasheets

A- miniMyotis unit

Datasheet

Fiber optic sensors conditioning unit miniMyotis

DESCRIPTION

The signal conditioner designed by Phonoptics is intended to be used with all the sensors that Phonoptics manufactures:

- Evotis microphone
- Alpheus dynamic pressure sensor
- Tachometer
- Vibration sensors and others in the future

It integrates a light source, a photodiode and all the required electronics in order to adapt the incoming optical signal, from Phonoptics' fiber optic sensors to the industry standard voltage.

It is a plug&play sensor very easy to use and compatible with any DAQ systems, computer or oscilloscope.

This version integrates a noise-eater function that help decreasing the noise floor

Conditioner input

Connector type	SC/APC SM
Measuring range	100 µWatt @1550nm
Low-noise bandwidth	200kHz
Bandwidth (-3dB)	800 kHz
High-pass frequency	20Hz (On BNC AC)

Supply

Voltage power supply	5V
Rated supply power	7.5 Watt
Connector type	USB type C

Environment

Storage temperature	-10 to 55° C
Operating temperature	0 to 45° C

Output

Connector type	BNC 50 ohm
	SMA 50 ohm
Output voltage	±1.65 volts on AC 0-3.3V on DC
Electrical gain	0, 20, 40dB (incremental)

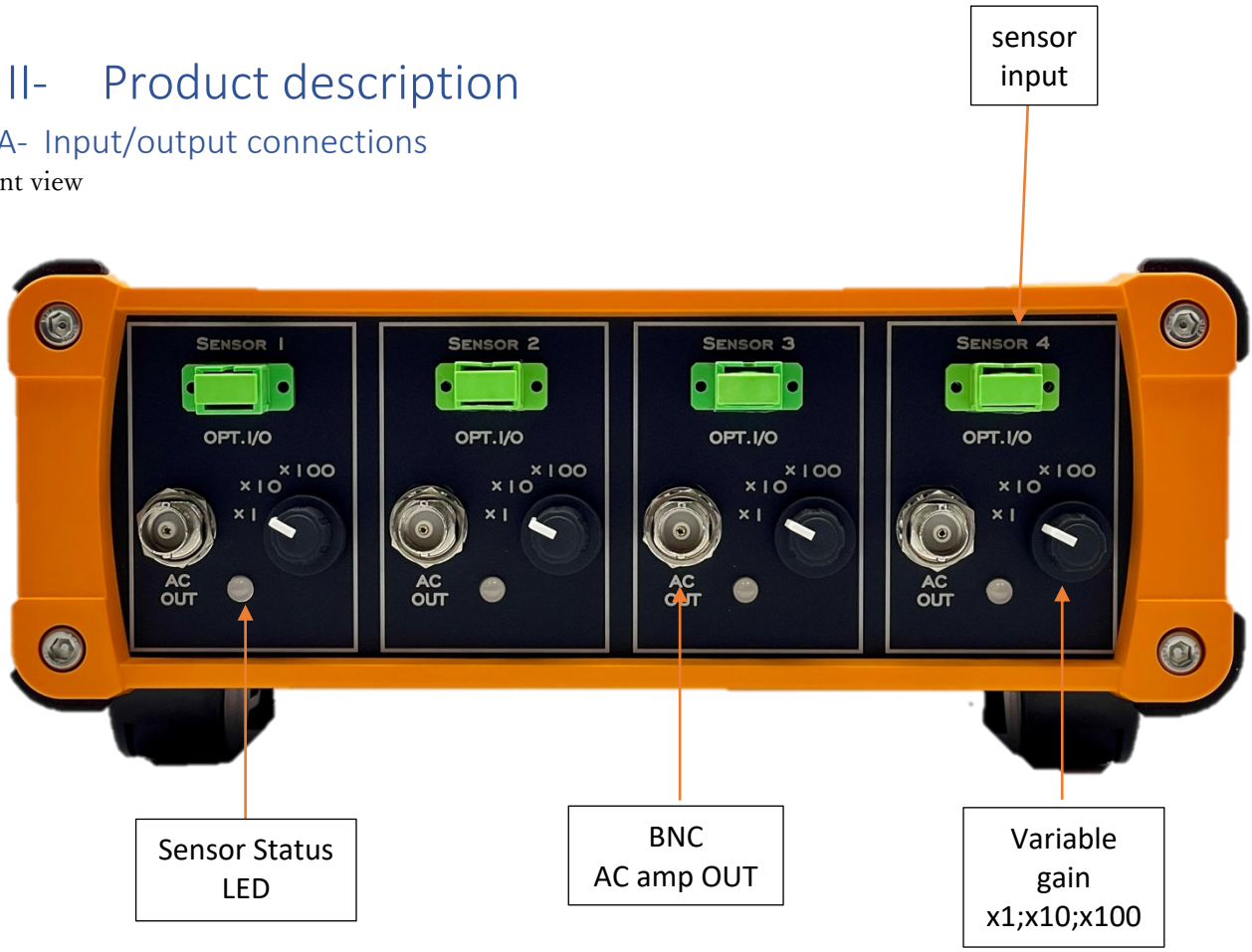
Fiber Optic hydrophone

To come

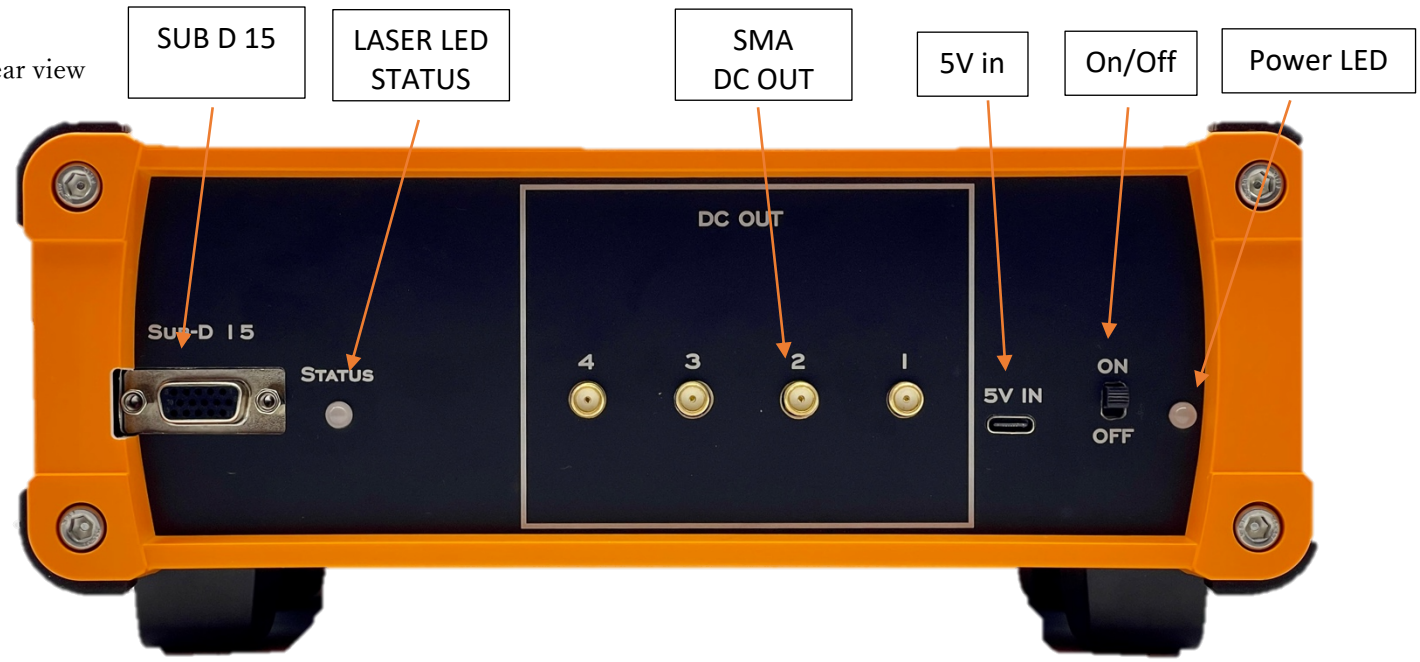
II- Product description

A- Input/output connections

Front view



Rear view



On the front panel:

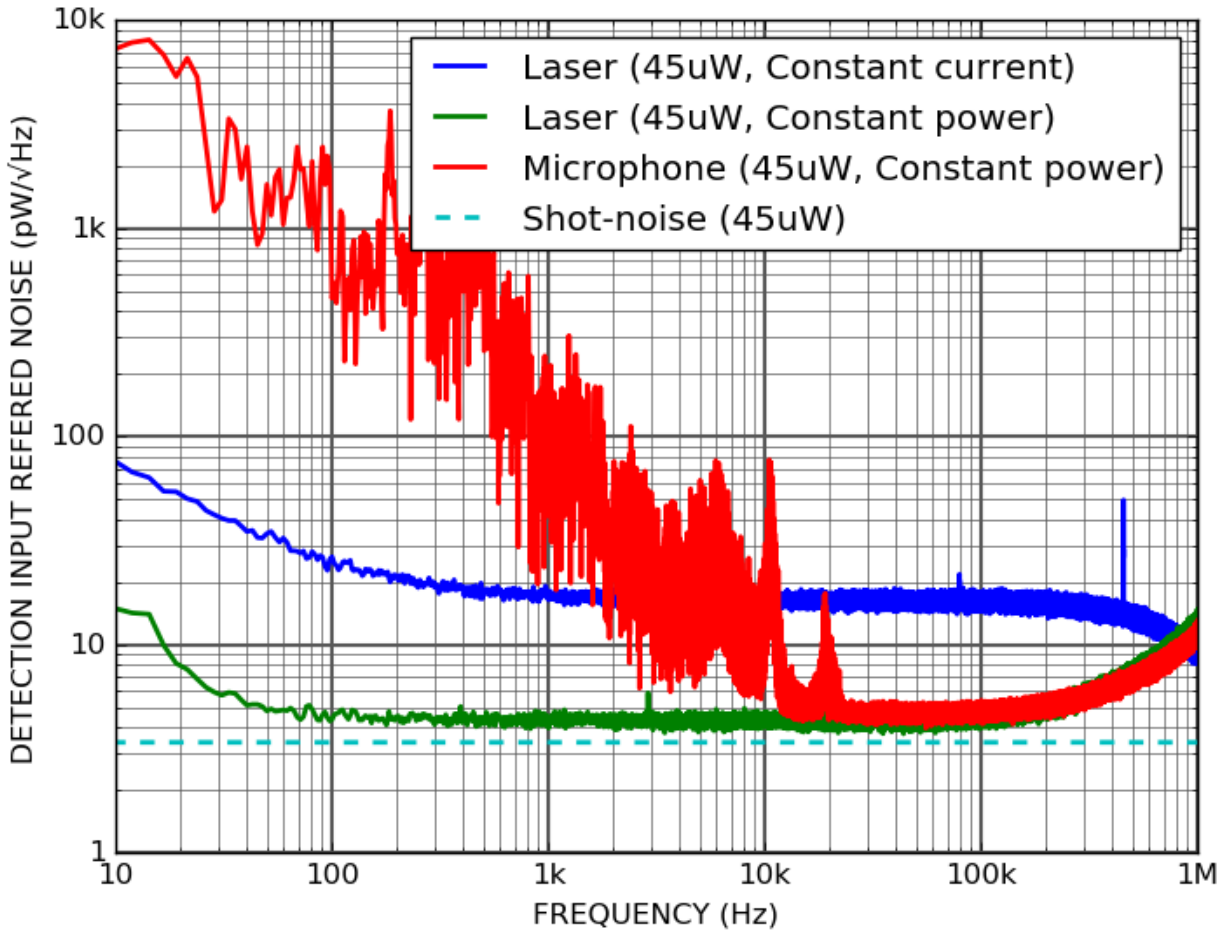
- 4 OPT I/O (optical input/output): SC/APC Single mode fiber optic connector for connection with fiber optic sensor (single mode only)
- 4 BNC 50ohm for AC signal output ±1.65V.
- Each BNC comes with a 3 positions selector: x1, x10 and x100 amplification. If higher setting, it keeps the highest gain setting: x100. The Gain switch is continuous.
- 4 LED status for the sensor: if LED is Green → Sensor and connection is OK. If LED is RED : sensor not connected or broken.

On the rear panel:

- 5V USB type C input. 1.5A minimum.
- On/Off switch.
- Power led status: RED is for 5V connection, device turned off. LED turns GREEN if power is ON.
- 4 SMA DC output : 0-3.3V

B- Noise-eater functionality

This device has been implemented a functionality of noise reduction.
Most part of the noise comes from the light source itself. While Phonoptics choose the best light source available, it is still a noisy component. To remove as most possible the noise, we implemented a noise-eater.
It is automatically done, and the user does not have to deal with it.
The result is a decrease of almost 20dB at low frequency and around 10dB of the floor noise up to 200kHz. As a result, the optical noise reaches down the optical shot-noise limit (green curve on below picture). Between 200kHz and 800kHz, there is still a benefit, but the noise increases again and after 800kHz the benefit is negative.



III- Operating the miniMyotis 4Ch

A- Connection and operation

1- Insert the USB type C at the rear of the unit. The power LED should turn RED.

2- Slid the switch to ON position (upper side).

You will notice that the Status LED turned GREEN on.
On the rear left side, you should notice the laser status LED turning RED. After few moments, the LED should turn GREEN meaning the laser is on optimal running condition inside the unit. Using of sensors is possible from this moment.

3- Connect the sensor to OPT I/O input port. You should hear a clear “click” sound.

After few seconds, if sensor is in working condition, the status LED will turn GREEN on. It means the sensor is detected and in operation condition.

The first setup is completed. Now you should connect the right cable to the right connector depending on what should be measured:

- For general measurement, one should use the BNC AC connector and then connect it to ADC, DAQ or oscilloscopes.
- Then you can control the amplification level with the Gain switch.
- The SMA DC connector should be use in case you want to track the average power level of the sensor. Moreover, if using an ADC or DAQ which can support only positive voltage, this output is recommended.

C- Increasing fiber length with patch cable

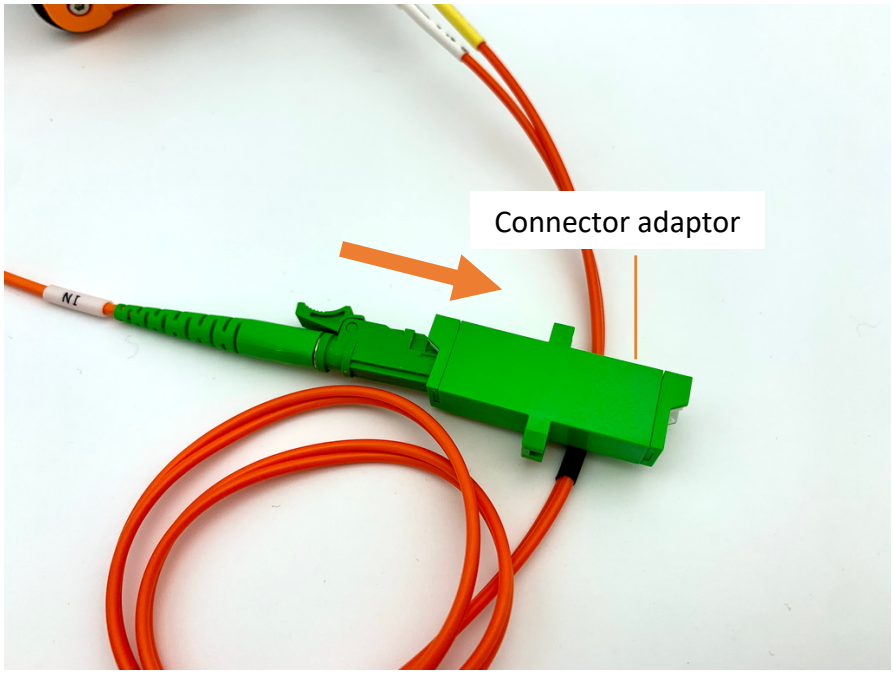
Phonoptics sensor technology is very convenient to use because it is not wavelength dependent nor length dependent.

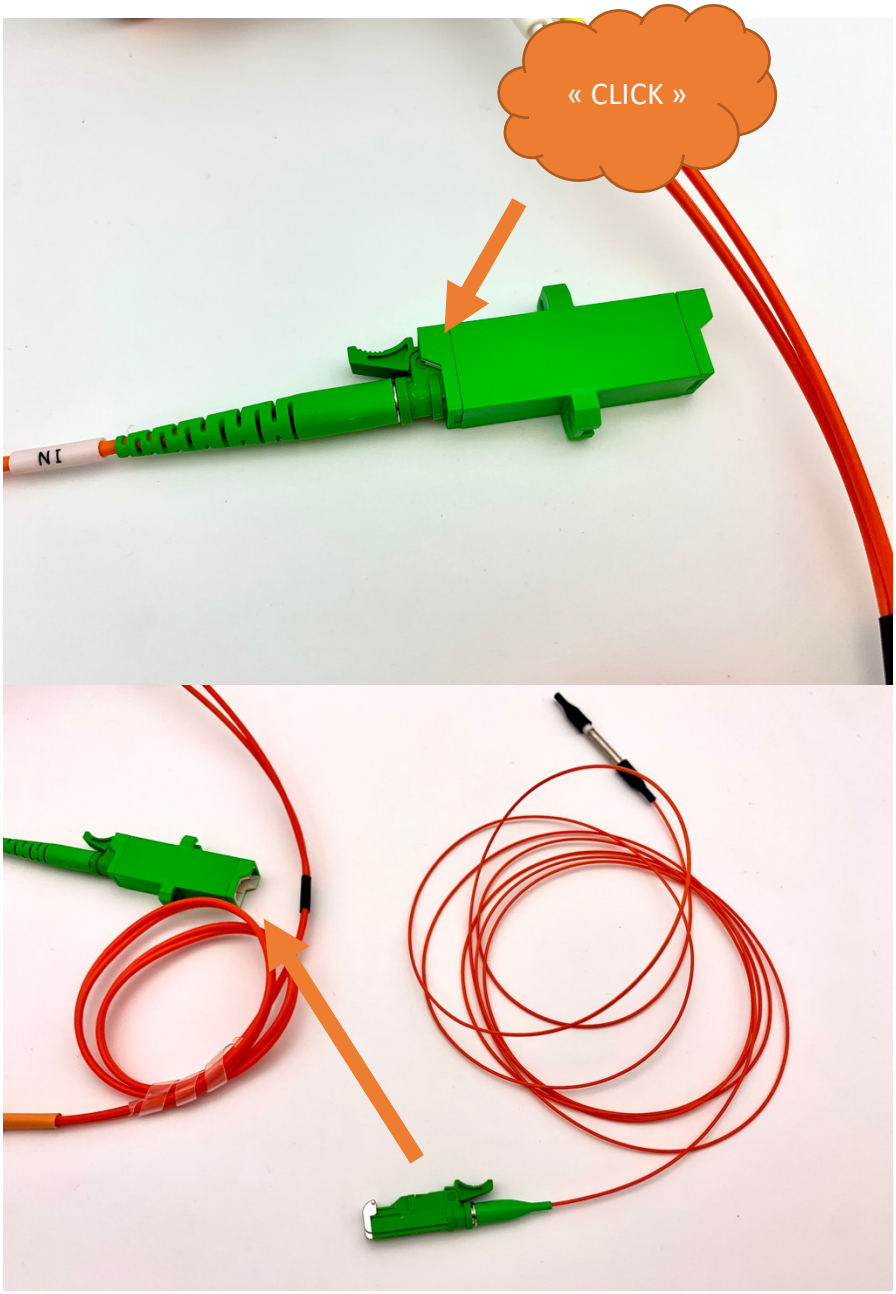
The user can add extra length between the sensor and the miniMyotis as long as the the fiber is the same core size as the fiber used for the sensor and inside the miniMyotis.
Standard fiber used is **single mode fiber SMF28 or equivalent**. OS1 or OS2 is possible.

One can buy fiber from any reseller, or Phonoptics can supply it with best performances.

To add extra length patch cable, the optical fiber cable should have the same connectors has the miniMyotis 4ch optical connector and the sensor connector. Standard connector is **SC/APC**.

Optical connectors are always male style. To connect two optical connectors together, an optical connector adopter must be used as shown on the following picture:





Maximum length possible is higher than 2kms. To use at greater distance, a more powerful laser should be used. Please contact us for such application.
Be sure when adding extra length cable that the DC voltage on the SMA DC output connector is still high enough (around 0.5 volt minimum)
Please note that when you add extra length cable, the sensitivity of the sensor may have changed. A quick calibration is recommended.

D- Cutting and reconnection of fiber

For some application, when one needs to insert the fiber through a pipe or a hole, the connector can be too big.
In such cases, cutting the fiber in two parts with one part the sensor, and the other part the connector, is possible.
This is a way to add extra length as well between the two parts.

To do so, there are two ways to proceed to re-connection:

1st - Using a fusion splicer

The splicer is the most expensive, but it is the best quality method. Moreover, the price of the splicer dropped significantly recently and starts from 1000 EUR.



Figure 1 - Optical fiber fusion splicer

After the operation the fiber will look like this:

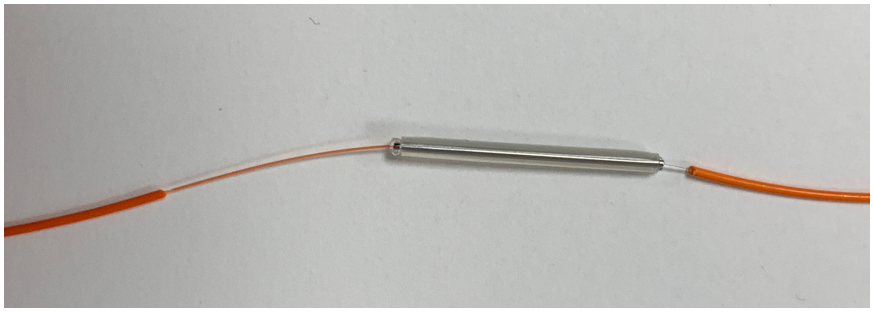


Figure 2 - Fiber spliced with protective heatshrink tube

2nd- Using an optical domino

The optical domino is a mechanical splice method similar to electrical domino. One need to insert the fibers inside the domino and then clamp it to ensure proper and stable connection. However, there are no certainty about the quality of the connection. Such method is low cost and easy to do.



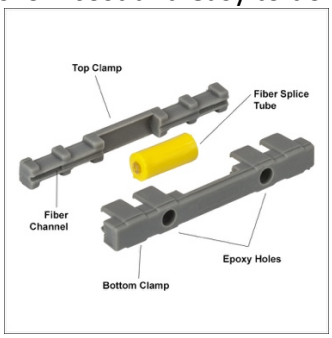


Figure 3 - mechanical fiber splicer "domino" sold by Thorlabs®

After installation, the fiber will look like this:

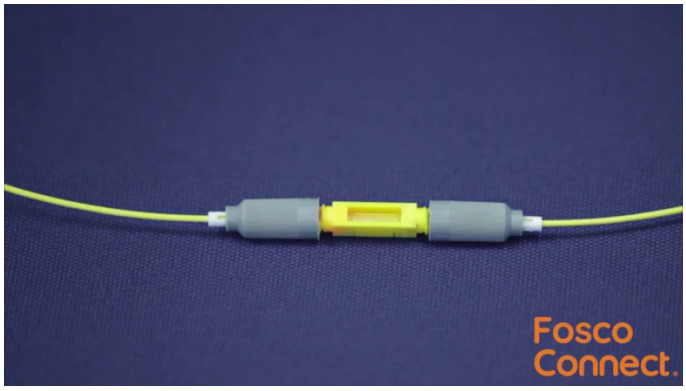


Figure 4 - mechanical fiber splice domino

For more information, please ask us directly or one can find information on internet.

IV- Calibration

To come

V- Signal analysis

A- Acquire the signal

You can measure the output signal with different material:

- Acquisition board, such as National Instrument NI® USB-6001
- DAQ system such as Sirius® from Dewesoft®
- Professional audio acquisition board
- Micro-controller ADC such as Arduino®, Teensy®, Raspberry®, etc.
- Oscilloscope
- Spectrum analyzer

Be cautious to frequency and resolution limitation. The minimum sampling frequency should be two times the bandwidth frequency.

B- Filtering

It is important to have in mind that the Aliasing can be a real issue for your acquisition board.
The analog bandwidth of the miniMyotis 4ch unit is 800kHz.

If you use a DAQ with sampling frequency lower than 1600kHz, you should use analog anti-aliasing filtering. Some devices integrate already AA filtering, which can be fixed or selectable.
If the user does not use the AA filtering, the noise floor will be higher than specifications and the signal could be corrupted by artefact.

If the DAQ system does not integrate AA filtering, you can use a simple RC filter between the miniMyotis 4ch output and the DAQ input. You can make your own or buy it from Phonoptics or any specialized company (such as Thorlabs® EF low pass electrical filter series)

Please refer to Anti-aliasing filtering subject on internet to learn more about this important point.

VI- Troubleshooting

Power status LED not turning GREEN on:

- Please check if the On/Off button is up side on the ON position
- Please verify the USB type C is inserted correctly (LED should at least turn RED)
- Check if the wall plug adaptor is working properly

Laser status LED not turning GREEN on:

- Please check if the power status LED is turned GREEN on. If so:
- Turn off and remove the power supply cable, then try again.
- Be sure the device is operated within the specified temperature range.

Sensor LED status not turning GREEN on:

- Check if sensor's connector is plugged in.
- Disconnect the sensor's connector and plug it again. You should here a click noise when properly inserted.
- Clean the sensor's connector with appropriate cleaning material.
- Clean the MiniMyotis 4ch connector with appropriate cleaning material.
- The sensor or the fiber may be broken. Try using another sensor.
- Check if the fiber is broken with Visual Fault locator or OTDR device.
- Fiber or electronic of the specific channel may be damaged. Plug the sensor in another channel.

If these steps do not work, please feel free to contact us for support.

VII- Contact

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