Quick Guide

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eNPR-10MHz - connection diagram

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Revision History

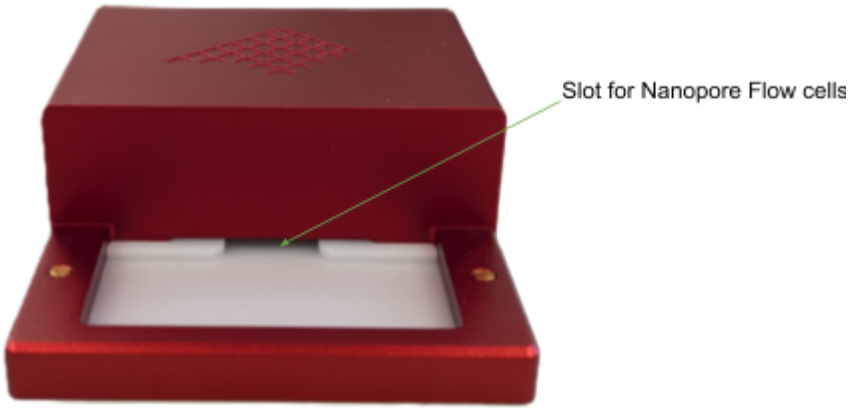
Date	Version	Description
21/08/2024	1.0	New document format

Acronyms

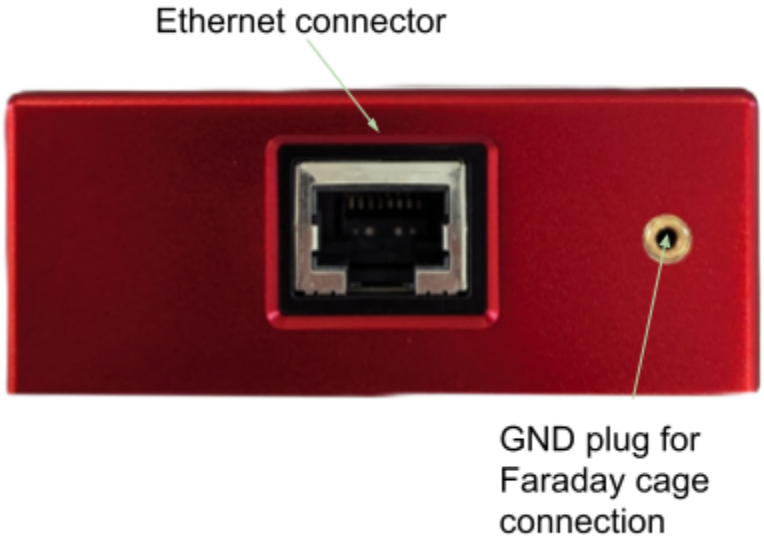
eNPR-10MHz: 10MHz bandwidth Elements Nanopore Reader.
IN: input pin.
GND: ground. The potential of the Faraday cage.
REF: reference.
DUT: device under test. Usually a flow cell with a membrane or a nanopore, but can also be a model cell with resistors and/or capacitors.
EMI: electro-magnetic interference. Environmental noise affecting the measurements.

Front and rear view

eNPR10 MHz analog module front-side connections

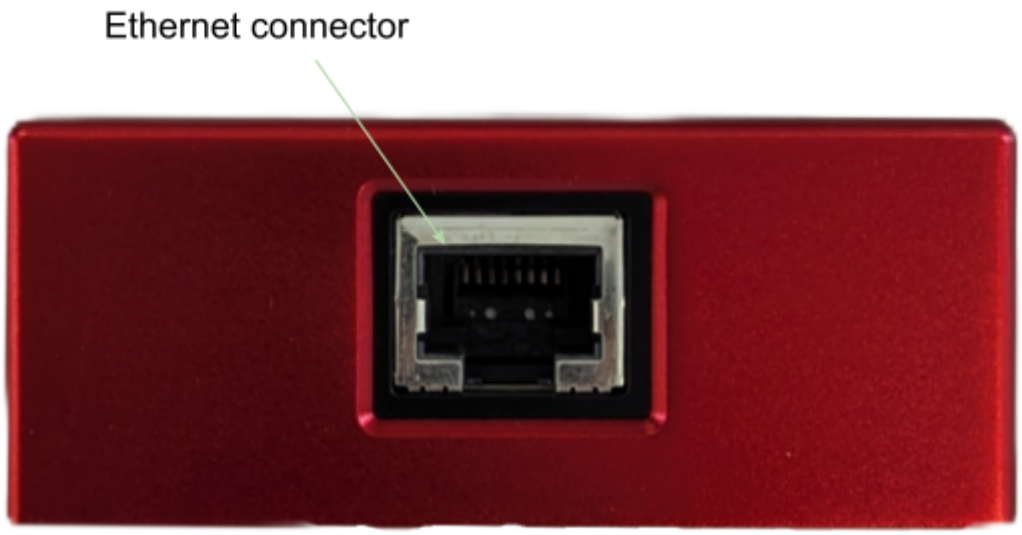


eNPR10 MHz analog module back-side connections[1]

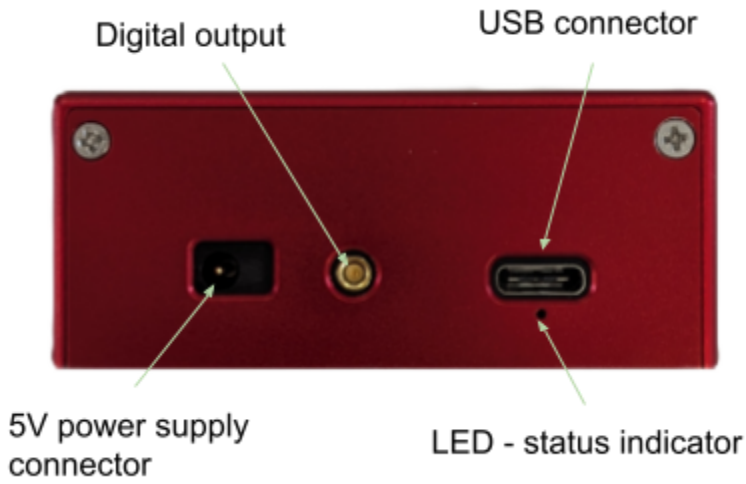


[1] The GND plug is not available in the first release of the device. Owners of these devices can use the screws on the bottom of the analog board to create a GND connection to the Faraday cage if needed.

eNPR10 MHz digital module front-side connections

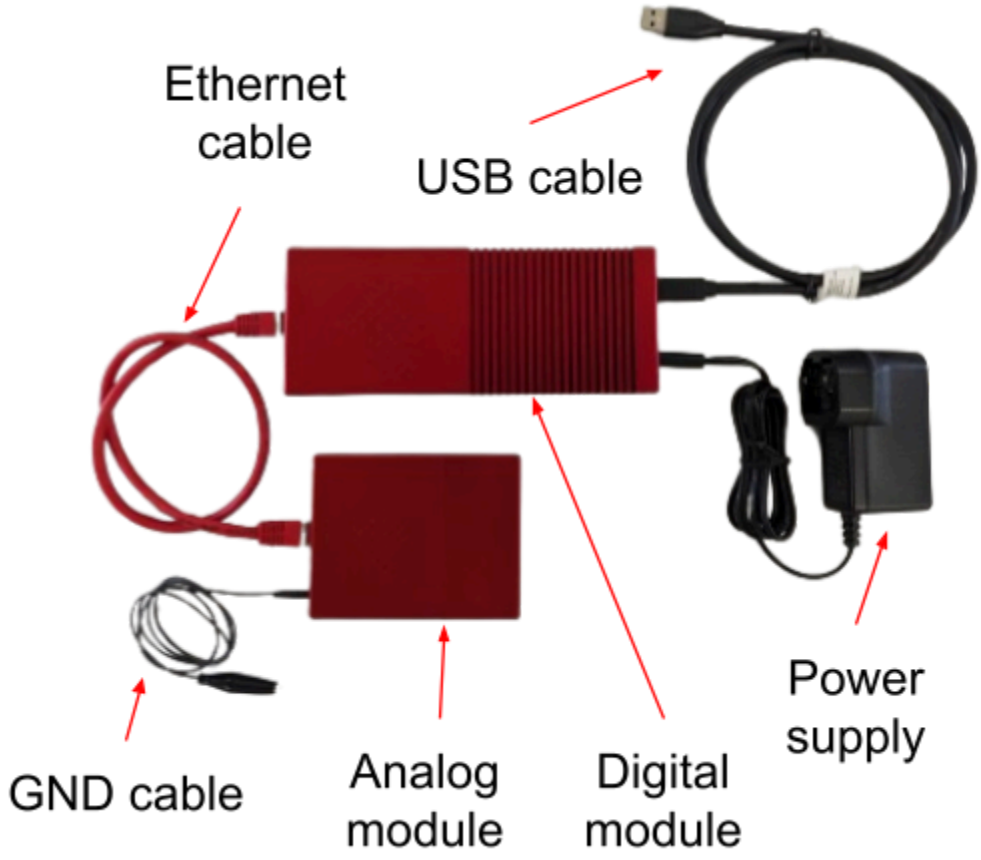


eNPR10 MHz digital module back-side connections

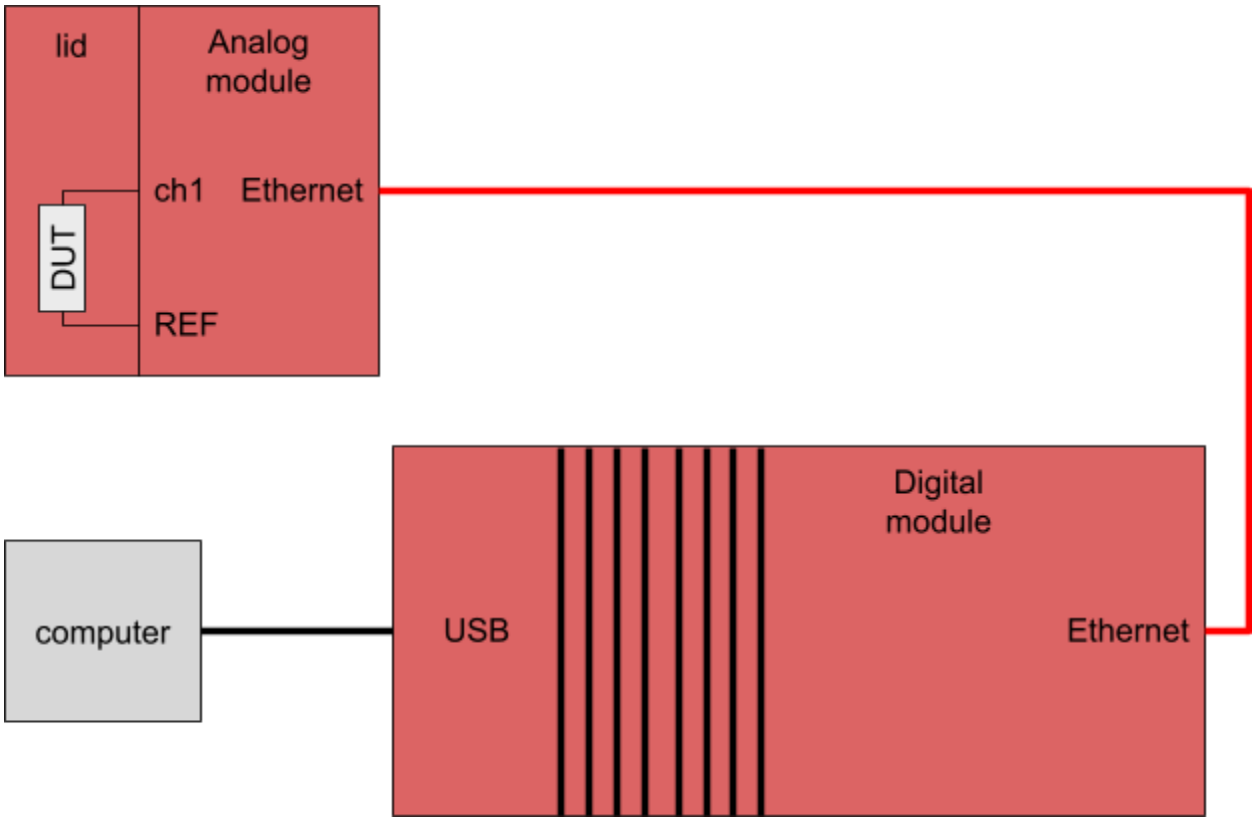


eNPR-10MHz setup

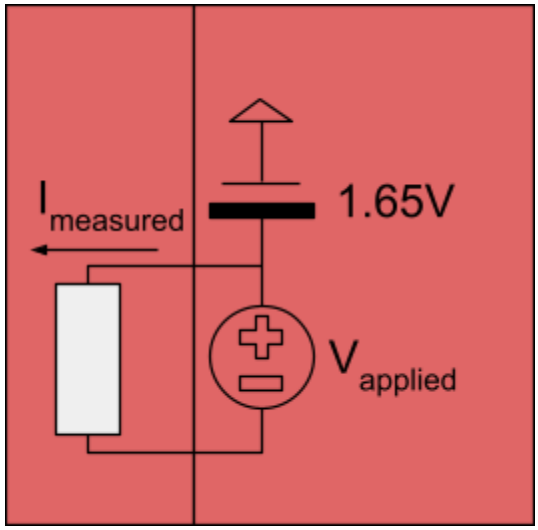
The eNPR-10MHz is directly plugged to the computer via a USB cable and it forms a complete and stand-alone system. The USB cable is used for data communication, while the power is supplied separately.
The device natively has a miniaturized Faraday cage given by the lid that sits on the analog module. It is possible, however, to add an additional external Faraday cage that should be connected to the GND plug using the GND cable.
IMPORTANT NOTE: do not connect the external Faraday cage, if used, to any part of the device other than the GND plug in order to avoid short circuits. A good strategy is to add a layer of insulating material (e.g. tape) to the internal surface of the Faraday cage.
In order to avoid possible leakage and issues with the calibration of the device or the electronics, it is important to pay attention not to wet the white plastic slot when the flow cells are filled with liquid solutions.



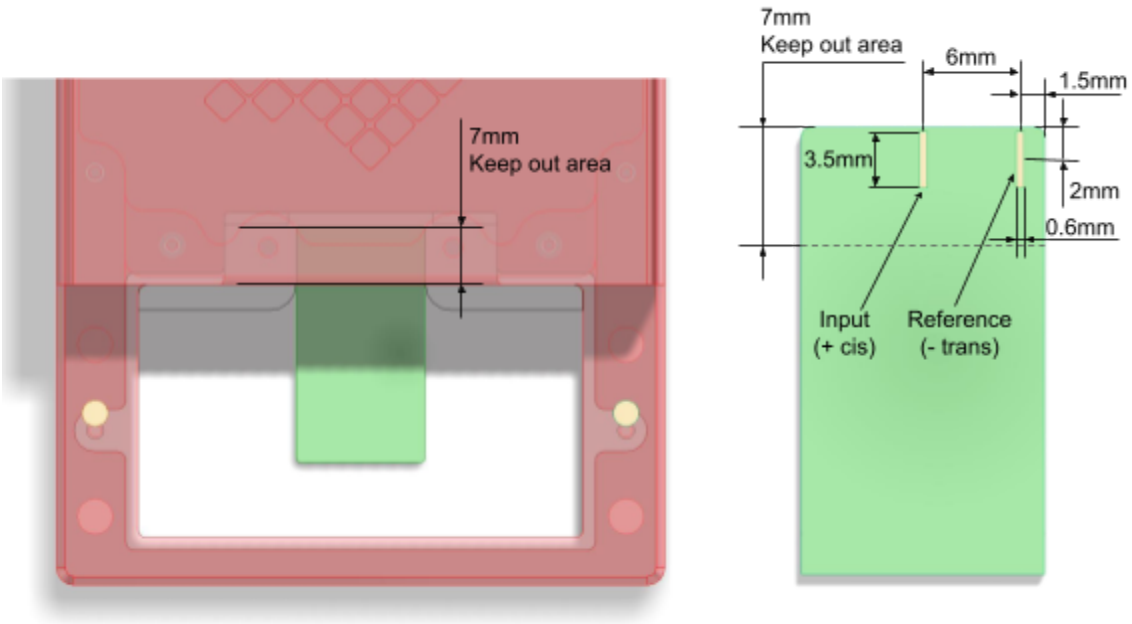
The figure below shows how to connect the eNPR-10MHz to the DUT and to the computer



The scheme below shows how the control voltage is applied and the polarity of the acquired current in the analog module.



The figure below shows the polarity when a positive bias voltage is applied. The + and - signs are shown on the PCB in the scheme below. All Elements flow cells have the same contact pads. Please, refer to this scheme to understand the polarity in the compartments of the flow cell.



Connections best practices

The way the experiment is setup greatly affects the final quality of the measurements, especially in terms of signal to noise ratio.
In the following some best practices are described to help you get the most out of your device.

- **Shielding with the Faraday cage**. If you are using a flow cell designed for the eNPR-10MHz you should be able to properly close the device's lid and in this case the experiment is optimally shielded against EMI.
- **Shielding with an external Faraday cage**. If you are not able to close the lid it is strongly recommended to enclose the device and the DUT in an external Faraday cage that encloses the whole experimental setup, such as the ELEMENTS Faraday box (p/n 000760). The external Faraday cage must be connected to the GND plug, using the provided GND cable.
  Notice, when using a Faraday cage that the GND connector pin must fit completely within the amplifier's GND plug, otherwise the connection won't be good enough to provide proper grounding.
- **Avoid coupling with the Faraday cage**. If you are using an external Faraday cage try to keep the device, the DUT and the cables between them as far as possible from the external Faraday cage to reduce as much as possible the creation of stray capacitances.
- **Reduce the length of cables connecting the DUT**. The longer the cables, the more likely they will collect EMI or create stray capacitances with nearby conductive surfaces (such as the Faraday cage). Ideally the experiment should happen within the device's integrated Faraday cage.
- **Avoid other instruments close to the DUT**. If possible, remove them or keep them off to reduce the noise as much as possible.
- **Select instruments close to the DUT**. If you need to use other instruments close to the DUT the best way to select your setup is to remove all of the instruments and check the noise in this optimal condition. Then, add one instrument at a time and turn it on, to check how much it affects the measurement. These checks should be performed with the eNPR-10MHz configured as it will during the actual experiment (especially same sampling rate).

- **Proper grounding**. If you are using a desktop computer be sure to power it up with a grounded power outlet or power strip. If you are using additional instruments close to the DUT be sure to power them up from a common power outlet or power strip.