

e4Patch - connection diagram





Revision History

Date	Version	Description
06/03/2025	1.0	New document format



Acronyms

e4Patch: 4 channels Patch Clamp Elements device.

IN: input pin.

GND: ground. The potential of the Faraday cage.

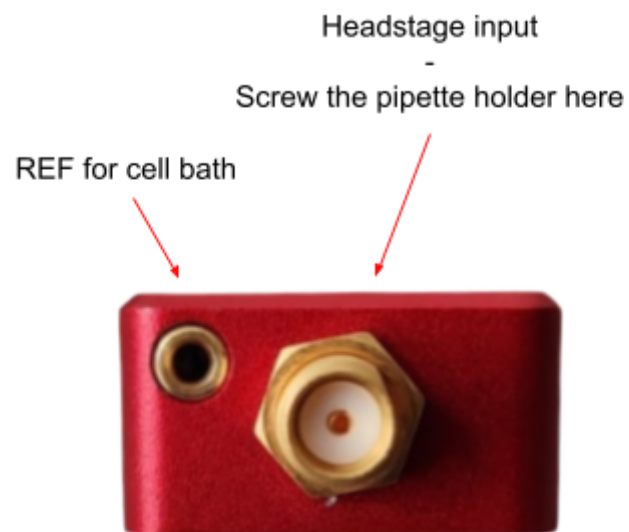
REF: reference.

DUT: device under test. Usually a cell patched via a pipette, but can also be a model cell with resistors and/or capacitors.

EMI: electro-magnetic interference. Environmental noise affecting the measurements.



Headstage - Front view





Main Unit - Front, rear and lateral view

e4Patch Main Unit front-side connections

BNC input connectors
-
Connect the headstages here





e4Patch Main Unit back-side connections





e4Patch Main Unit lateral connections



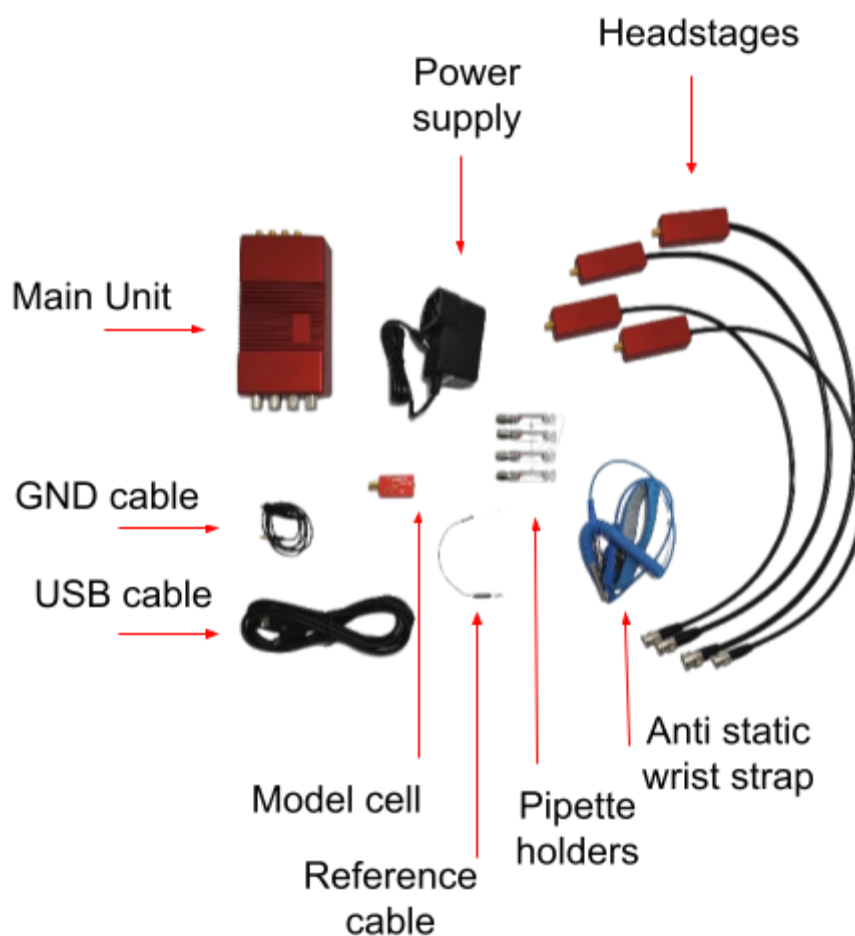


e4Patch setup

The e4Patch 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.

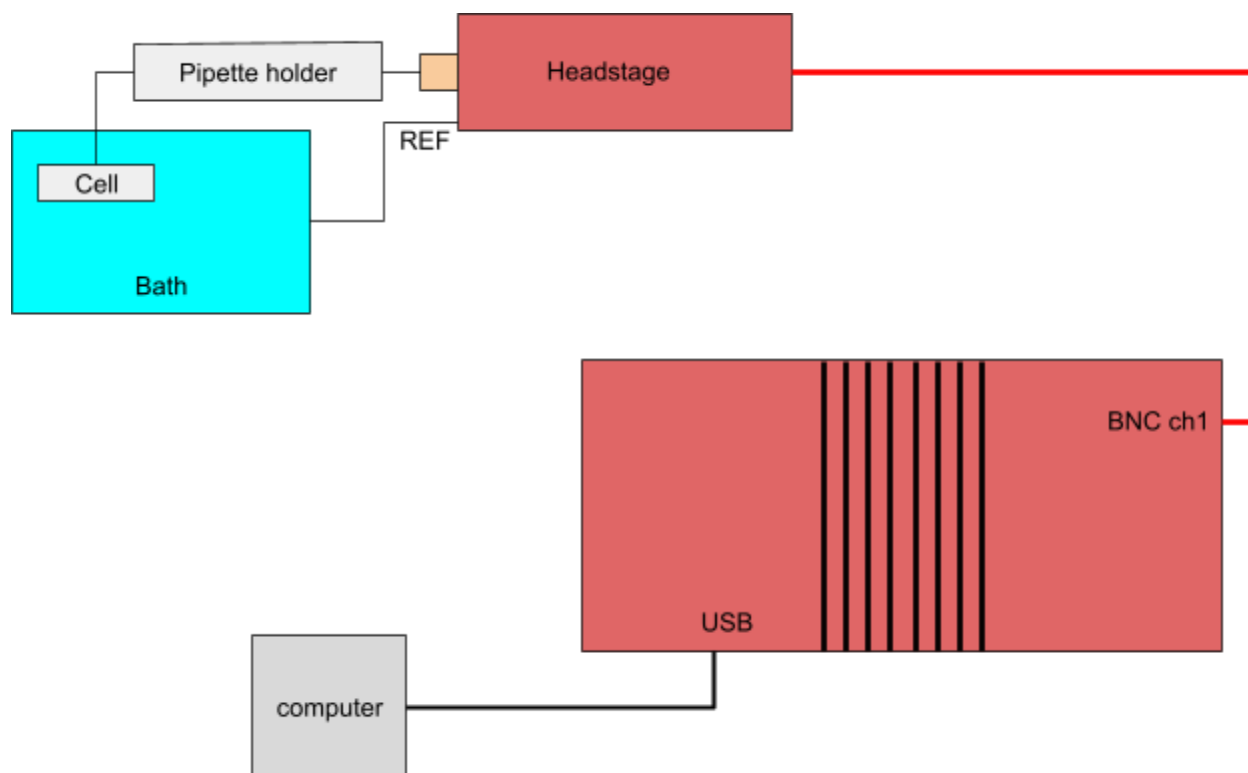
To add an external Faraday cage connect it to the GND plug using the GND cable.

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.



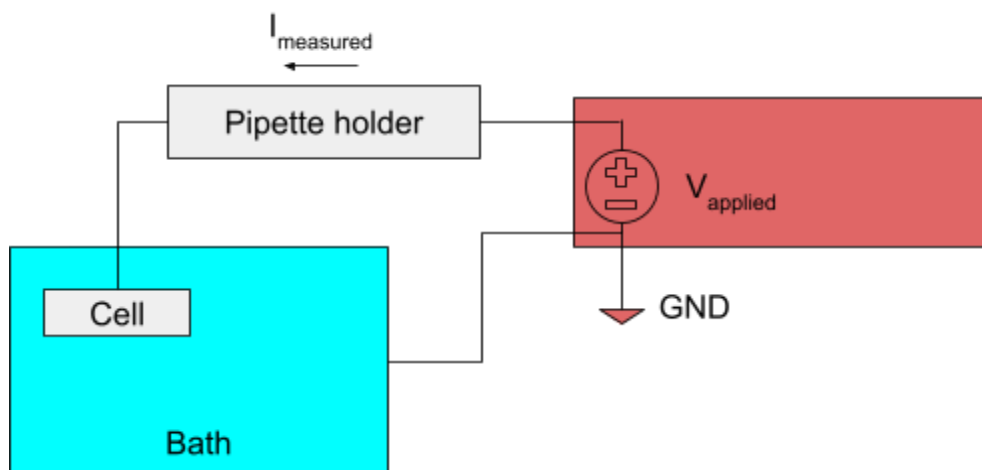


The figure below shows how to connect the e4Patch to the DUT and to the computer.





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





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ELECTROSTATIC SENSITIVE DEVICES

Connections best practices

The way the experiment is set up 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 an external Faraday cage.** It is strongly recommended to enclose the headstages and the DUT in an external Faraday cage that encloses the whole experimental setup. 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 e4Patch 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.