Power supply, ground level and noise issues

5 posts by 4 authors

Christian Tatarau

Jan 7

Hello and first of all Happy New Year!

We set up an acquisition box with one Intan headstage and we got a lot of electrical noise even after connecting everything to ground and after playing around with the ground cables. I was thinking about replacing the 5V power supply with a rechargeable battery and interrupting the power and ground lines of the USB cable. Like that I would completely disconnect acquisition box and Intan chip from the building and from the PCs power and ground. Is this flawed as a concept? Would that work and help with noise?

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Charles Latchoumane

Jan 7

In our lab set up, even recording within a coulborn system (all metalic box that deliver a alternative electric shock), we were able to remove all source of noise through grounding. I assume the noise you are talking about is 60ish Hz right

We have a copper net that surrounds the recording area and that is grouded to the same point than the PC and the shock delivery machine, when all is to ground virtually 0 noise is visible except when electrical shock are delivered).

The method that describe should also work if you totally isolate your system, so it is worth trying, but a simple copper net might do it. Please let us know how it goes!

Charles

On Friday, January 8, 2016 at 5:21:18 AM UTC+9, Christian Tatarau wrote:

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> connecting everything to ground and after playing around with the ground cables. I was thinking about replacing the 5V power supply with a rechargeable battery and interrupting the power and ground lines of the USB cable. Like that I would completely disconnect acquisition box and Intan chip from the building and from the PCs power and ground. Is this flawed as a concept? Would that work and help with noise?

Jon Newman

Jan 7

Re: [open-ephys] Re: Power supply, ground level and noise issues

Other recipients: kskus...@gmail.com

Isolation might be a good idea, but the mains might not be the ultimate cause of your problem.

Often, in audio-frequency bandwidth systems like those used in ephys, low frequency noise (in the 10s to 1000's of Hz range) is actually high frequency noise that has parasitically exerted its effect on the sensitive analog portion by parasitically coupling from the power supply rails to the high-impedance analog inputs of the IC. A good example is switching noise from a cheap switch mode power supply, like the wall warts that are often used to run the opal-kelly boards. The linear regulators used to clean up the power supply rails on the OE board are essentially transparent to this noise. Switch mode supplies often have signals with rising edges that contain power out in the 10s-100's of MHz and linear regulators' PSRR drops off exponentially is this range.

My suggestion is before going crazy with isolation is to try to use a nice bench top power supply to power your opal kelly board.

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Re: [open-ephys] Re: Power supply, ground level and noise issues

Other recipients: kskus...@gmail.com, jpne...@mit.edu

Hi,
First of all do not, under any circumstace, cut the ground line on the USB while leaving the data lines connected, that would leave the data lines floating with no reference and could very easily damage your USB port or the FPGA USB interface. Should you really need to isolate the USB connection there are special devices available tha completely isolate all lines, removing this issue.
That said, have you connected the board itself to the ground plane your animal is in? Most of the grounding issues I've seen are solved by connecting the board itself to ground, either via the screw ports on its side (you have to open the board to acces those) or via the ground in the BNC connector.
Having a good power supply always helps, of course, but from what I've seen line noise can affect the boards' ADC but very rarely the headstages themselves (the long cables combined with the decoupling capacitor in the headstage create a rather efficient LC filter that removes high frequency components).
Best,