EGI Support Report

EGI *dense array EEG*

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For the most direct method to contact the EGI Support team, send an email directly to supportteam@egi.com or fill out this form. You may also reply directly to this email, making sure to include detail about your questions. Please do not cut and paste the email address in the "From" field of this email, as it is a coded address and will not reach us.

New Training and Technical Support web page

EGI is pleased to announce the rollout of our new Training and Technical Support area of the website. This new area provides quick links to manuals, Net application instructions, tips on setting up your EEG lab or clinic, and a quick form for requesting an RMA for any time you might need to return a product to EGI for repair.

Also see our newest 2-minute Net Application Refresher video for a quick reminder of the key steps to great Net Application and as a result, great data.

New Knowledge Center coming soon!
In response to your requests for extra educational resources, we have begun a new project to build a searchable Knowledge Center. We are excited about this new website area, which will contain educational articles on theory, detailed technical information, helpful hints, workflow guidance, and troubleshooting advice. Look in your email inbox for our announcement when this is fully operational and ready to use.

As you can imagine, there is a lot of information we can add to this area. We want to know what is the highest priority for you, so that the Knowledge Center can become your "go to" web page for all your training and technical information needs. Please send us your ideas on articles or other information you would like to see in the Knowledge Center.

Advice on moving from Windows XP to Windows 7 on your E-Prime computer

Our gold standard for using E-Prime software in combination with Net Station 5.2 is E-Prime 2.0.10.356 with EENS 2.0.2.26 running in a Windows 7 environment. In the past, we have recommended that if you want to upgrade to Net Station 5.2, you should also upgrade your E-Prime computer from Windows XP to Windows 7. However, we have since discovered that some customers are experiencing a range of problems when upgrading, which can vary for different computer configurations.

Based on this experience, we feel we must change our advice. We now recommend that, rather than upgrading, you purchase a new computer with the Windows 7 OS from EGI.

In addition, EGI has now tested and supports the use of PST's new Chronos device with the software combination detailed above. All new E-Prime Systems are now shipping with the Chronos device, but it is not necessary to upgrade if you are currently using the SRBox.

EGI's new preterm infant Nets

EGI has just released two preterm infant sizes of our HydroCel Geodesic Sensor Net (GSN). If you are thinking about using these Nets, we want to point out a few differences compared to the larger HydroCel GSNs.

- **Smaller electrodes.** EGI's proprietary electrode design has been well tested over many years for exceptional comfort with minimal skin irritation, so we maintained this basic design. To optimize the geometry of such a tiny Net, we simply made our electrodes smaller. You'll notice that the tops of the pedestals are smaller.
- **Minor sensor layout change.** The head shape of a preterm infant is somewhat different from full term infants. In addition, their skin is more sensitive. To account for these differences, we slightly changed the configuration of the Net on the forehead. If you look at the picture to the right, you will notice that the nasion electrode is in line with the other electrodes on the forehead row of the Nets. This slightly higher placement of the nasion electrode, in comparison to our larger Net sizes, distributes the pressure more evenly on the preterm head, allowing all of the electrodes to make contact with skin.
- **No face straps.** As with our other infant Nets, we do not include face straps on the preterm Nets. There are several benefits of this design choice:
  - Infants tend to cry less when applying Nets without face straps. Thus, most of our customers prefer to have a design without face straps to ensure that a higher percentage of infants can be included in a study.
  - The lack of face straps allows other medical devices to be used simultaneously with EEG.
  - The HydroCel GSN without face straps is safer to apply, minimizing the chance of touching the eyes.

Note that all of the new preterm infant size Nets are sponged, which are designed to be used with a saline solution, not a gel or paste. For the lowest possible risk of skin irritation, use sterile saline plus baby shampoo instead of EGI's standard recipe using KCl.

All of our infant Nets have 124 built-in EEG channels, because there are no face straps, and therefore no face electrodes. If you desire, you can use up to four outrider electrodes for detecting eye movement,

using electrodes plugged into the outriders on the Net connector. For this purpose, we recommend Grass electrodes and any gel or paste approved by your facility. Note that if you do not use outrider electrodes, you should insert the included outrider plugs into the outrider ports to minimize noise from the empty channels.

We do want to add an extra word about safety when working with preterm infants, which is somewhat different from our standard Net application advice. Preterm infants have very delicate skin, so one should take care to make sure that the fit of the Net is not too tight. Contrary to advice for larger sizes, if the preterm infant Net seems too tight, a larger size should be used. In addition, one should think carefully about limiting the length of the EEG exam so as to not cause undue skin irritation. Finally, during an EEG exam, the infant should be monitored at all times.

Our Preterm Infant Net Placard details specific instructions for applying the Net on preterm infants. You can find all manuals and use instructions on the EGI website under the Training and Technical Support tab.

Effectively dealing with power line noise

One of the most difficult issues you can encounter within your recording environment is power line noise. This is high frequency activity, centered on either 50 or 60 Hz — depending upon where you are in the world — that makes it impossible to see your EEG signal. Your first question is likely to be be, how do I know what is power line noise? To answer that, we must first briefly discuss one of the main ways in which we can remove it from our data … notch filters.

A notch filter is a narrow bandpass filter, centered on a particular frequency. It is designed to remove, or more accurately stated, attenuate, frequencies in a narrow range around the particular frequency, while having no impact upon the frequencies outside that range. Typically, line noise is 60 Hz in the United States and 50 Hz in most other countries, and so using Net Station's 50 Hz or 60 Hz built-in Notch Filter is an essential part of troubleshooting.

Identifying noise in your data

Let's start with an easy example to train our eyes to see power line noise. The word "noise" is great to describe what you see, because your data genuinely looks noisy. I always imagine that if you could hear your EEG signal being drawn on the screen, you would hear white noise, like radio static, over the more rhythmical EEG signal. In the example below, the data to the left of the orange line is contaminated by 60 Hz power line noise. You can see that the EEG looks 'fuzzy' … almost like the lines have been scribbled instead of drawn. The orange line represents the application of a 60 Hz notch filter, and you can see how crisp the signal has become. By removing the high frequency (60 Hz) signal, you can see the clean EEG signal, which is no longer contaminated by the power line noise.
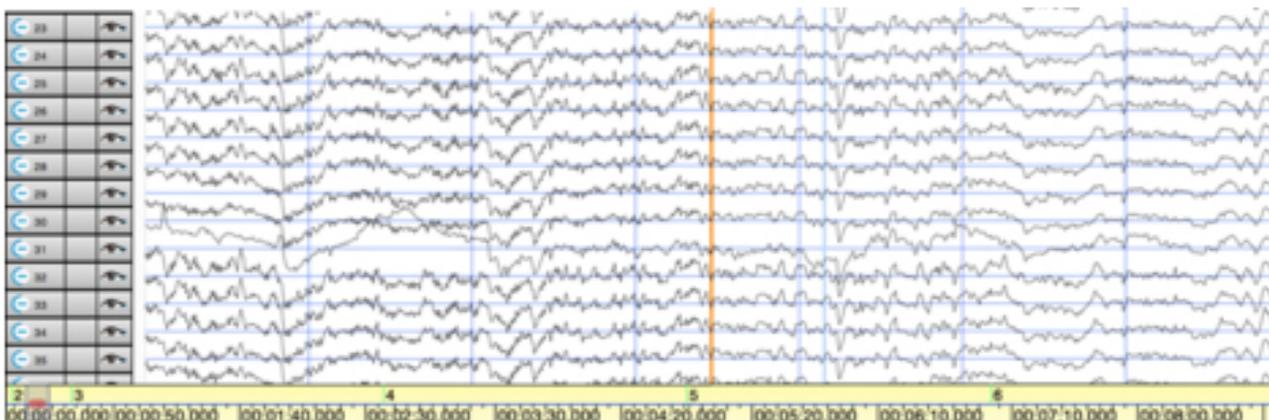
In the example below, we are again looking at noisy data to the left of the orange line and 60 Hz Notch filtered data to the right. In addition to the 'fuzziness' of some signals, for example on channel 87, we also get the sense of just how strong power line noise can be. In some sense, because this noise is effectively removed by the Notch filter, this is actually considered clean-noise. In a future edition of the Support Report we will consider broadband noise, which visually looks like power-line noise but is not responsive to the application of a Notch filter.
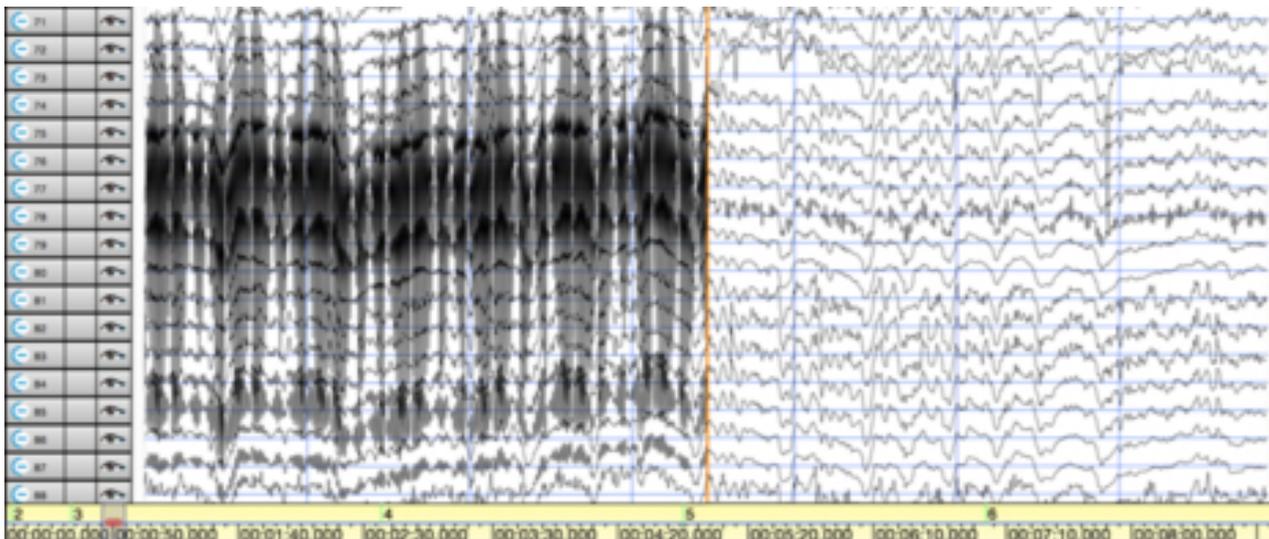
Minimizing power-line noise in your data

To minimize the impact of power-line noise on your data, you need to start at the beginning and review your Net application technique. We recommend that you start with EGI's new two-minute Net Application Refresher Video. You will want to verify the following key steps:

- **That the Nets are appropriately sized to the participant/patient.** Your aim, for both data quality and comfort, is to achieve a very snug fit. Therefore, if you find that the head circumference falls on the cusp between two different Net sizes, you will want to select the smaller sized Net.
- **That you ensure good contact with the scalp.** Once the Net has been applied and you are sure of Net placement and symmetry, you must invest time into seating each electrode to ensure that it is sitting on the actual scalp and not on top of hair. In addition, if you have Routine nets, you will need to gently scrub the sponge against the scalp in order to remove scalp oils, utilizing the Baby Shampoo within your electrolyte mix.
- **That you check your data quality before you review impedances.** Although you want the impedances to be all under at least 100 kOhms, the most important assessment of data quality is achieved by looking at your data before you run impedances. There is a very good reason for this … your impedances could appear to be good at the beginning of your run, if a sensor is sitting on a clump of wet hair; however, that signal may look poor in terms of data quality as you would have an increased chance of picking up power line noise. As you can see above, power line noise is easily identifiable in your data, and so by quickly reviewing your data, you can mitigate noise contamination by reseating and re-scrubbing sensors. In addition, your impedance measure would then be reflecting the quality of the scalp/electrode interface.

What to look for next?

If you still see power line contamination after confirming the Net Application is correct, your next step is to assess the recording environment. If a noise generator is powerful enough, it can still introduce noise into the recording even with good Net application.

Things to look for include:

- Is the recording environment near any large noise generators, including things like air conditioners, facilities equipment, server rooms, or elevators?
- What is the patient in contact with? For example are they sitting on an electric hospital bed? If so, ensure that the bed is not just turned off, but unplugged from the wall.
- How near is the patient to the actual system? The system itself can introduce noise if it is too close to the patient, particularly the isolation transformer, and even the main power cable to the system that connects the isolation transformer to the wall.
- Ensure the patient is not touching anything metal, including any chairs or tables with metal parts. Electrically isolate the patient as much as possible. Do not ground the patient. Please refer to the GES 400 Series Geodesic EEG Systems User Manual for more detailed explanation.
- Have you introduced any non-EGI cables into your system? For example, did you add an extension lead or replace the included power strip? There is the potential that off-the-shelf power cables may introduce noise into the system.

As you do not always have control over the equipment around you, your aim may just be to minimize the distance between your participant/patient and the noise source.

Current versions of software and firmware from EGI

- Mac OS 10.10.5: Net Station 5.2.0.2 and GPS 3.0
- Net Amps 300 Firmware 0/11
- Net Amps 400 Firmware 1.6.17 (note that both 1.6.15 and 1.6.17 can be used with 5.2.0.2, but if you have the Amp Server Pro SDK 2.1 you need to be on 1.6.17.)
- Windows XP SP 3: E-Prime 2.0.8.90, E-Prime Extensions for Net Station (EENS) 2.0.1.10
- Windows 7: E-Prime 2.0.10.356, EENS 2.0.2.26

How to contact our Sales Team

Wish to upgrade or add new products? Contact EGI Order Desk.

[Contact EGI]

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