



Teaching Notes

BioCapture™ : Acquiring EMG data

The BioRadio™ is intended for use in education and research applications only. The BioRadio has not yet been reviewed, certified, or approved by the FDA or similar organization for use with patients or clinical purposes. In no case should the BioRadio be used for any diagnosis, treatment or other medical decision-making purposes. All use of the BioRadio must be in compliance with 45 CFR 46 and appropriate human subjects' procedures as they exist within your institution.

Electromyography (EMG) is a recording used to examine the electrical activity of the muscles. More specifically, BioCapture uses surface electrodes for surface electromyography (sEMG) to monitor the general picture of superficial muscles that are close to the skin. This quick note will demonstrate a basic 1 channel EMG recording.

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Need to order supplies?

Order from our online store, call 1-855-GLNeuro (855-456-3876), e-mail sales@glneurotech.com, or contact your local representative.

What you will need



BioRadio User Unit



3 cloth surface electrodes
(P/N 040-0026, pkg of 30)

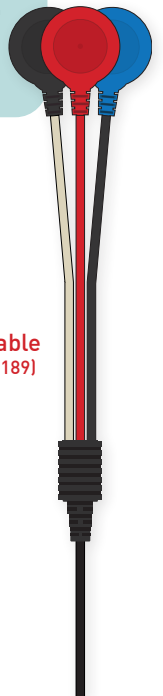


Alcohol wipes*

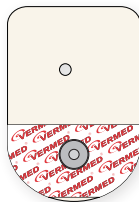


Nuprep skin prep gel*

Shielded lead cable
(optional, P/N 502-0189)



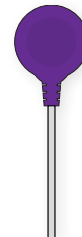
USB Bluetooth adapter
(optional)



3 high performance foam snap electrodes
(optional P/N 040-0038, pkg of 60)



Free weight (optional)
(e.g., a heavy book or bag or dumbbell)



3 "button snap" lead cables
ANY COLOR
(P/N 116-0045-R, pkg of 5)

*part of Disposable Supply Kit, P/N 602-0036-R

Set up

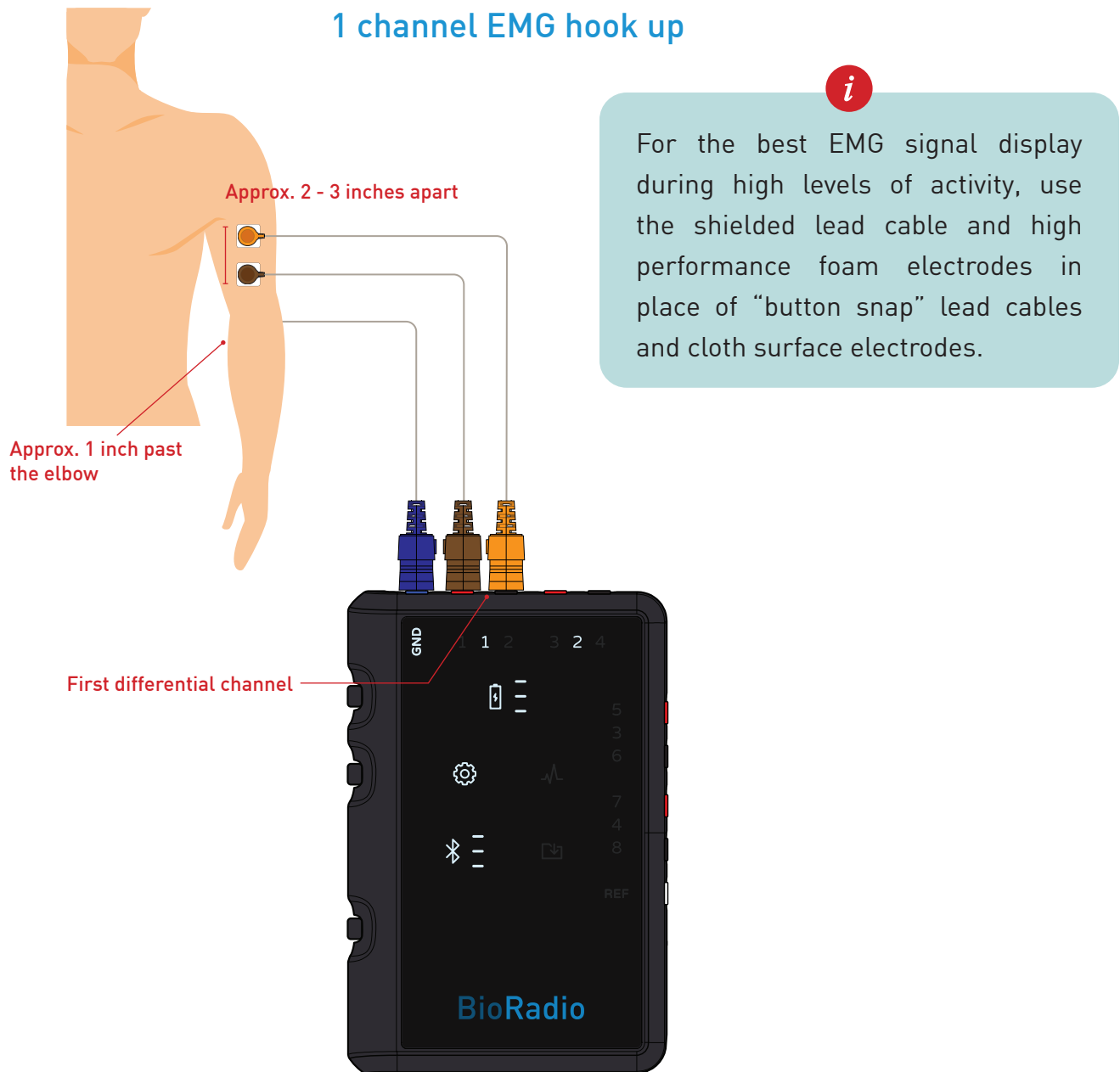
Using an alcohol wipe and skin prep gel, prepare the surface of the skin where the electrodes will be placed by gently abrading and then wiping clean the area. Make sure the skin is dry before placing the electrodes.

i If sweating occurs, the cloth surface electrode contact will diminish and you may have to repeat this process in order to ensure sufficient skin/electrode contact.

With arms relaxed, place two cloth surface electrodes approximately two to three inches apart on the left or right biceps muscle. See figure on the next page for details.

Place a third cloth surface electrode right below the elbow of the same arm, ensuring the electrode is over a bony surface. This will be the ground electrode.

Connect any color “button snap” electrode cable to each cloth surface electrode.



Connecting electrode cables to BioRadio User Unit

Connect the lead cables from the bicep to the black and red inputs of the first differential channel (Ch1), on the BioRadio. It does not matter which input a lead cable connects to.

Connect the elbow (‘Ground’) electrode cable to the blue GND input of the User Unit.

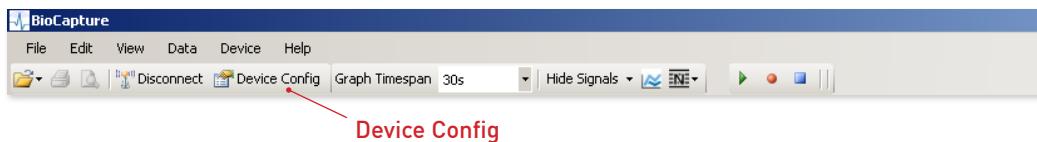


To minimize noise on the EMG signal data, twist or bundle together any dangling cables, or tape any dangling cables to the skin with medical tape.



Configuring your BioCapture system

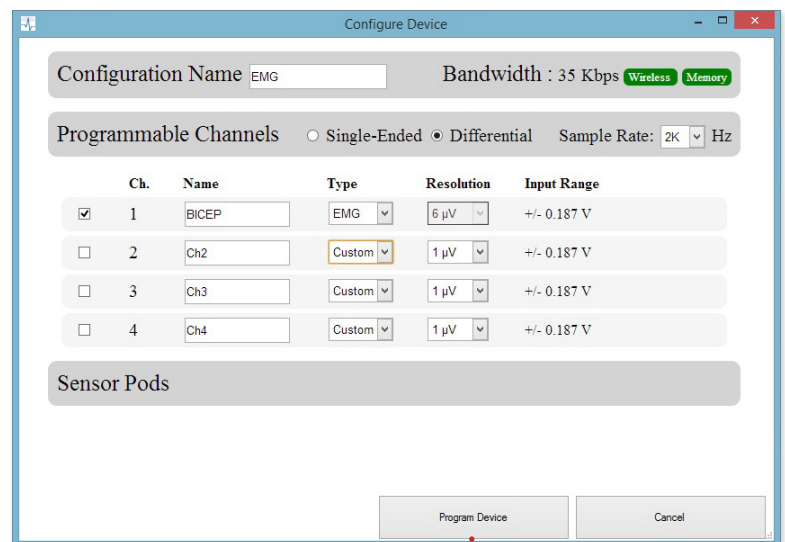
With BioCapture launched and your BioRadio turned on, connected and ready for use, press Device Config, from the tool bar to configure the BioRadio for one channel of EMG.



From the Configure Device window, select Differential, enable Channel 1 (Ch1), type in EMG for a custom name and the select EMG option under the Type drop down box.

Ensure that all other inputs are disabled. For this demonstration, a 2 kHz sampling rate is recommended.

i For further reading on Sampling Rate and Resolution, please refer to the BioCapture Owner's Manual.

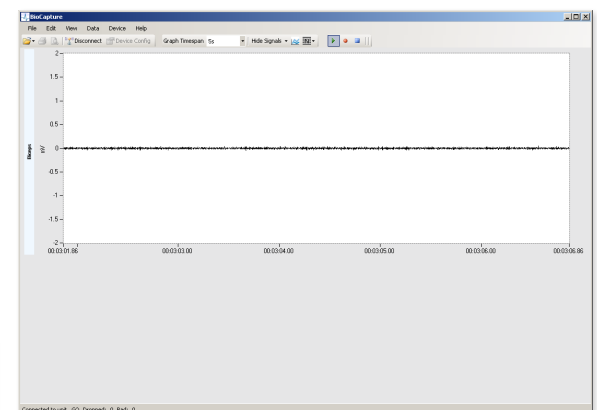
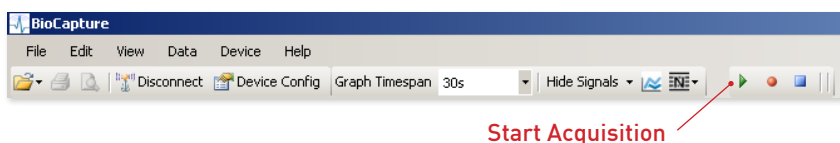


Press Program Device to program your BioRadio.

Acquiring EMG data

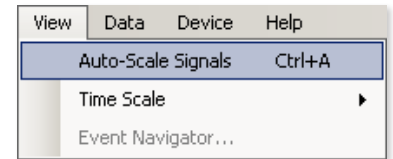
Your BioCapture system should now be ready to collect one channel of EMG data. Please note that the EMG configuration option presets the following display properties: y-axis max/min, custom filters, gain and offset.

With arms at rest and relaxed, press Start Acquisition from the tool bar to begin acquiring data. A small data trace will appear.



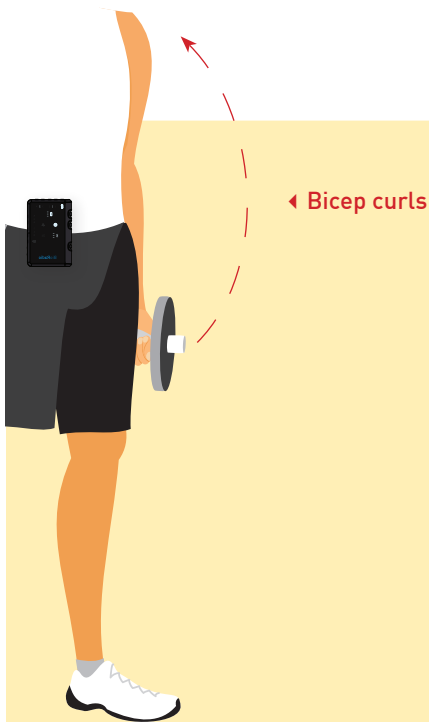
▲ This is the muscle activity at rest, also known as rest potential.

i You may need to access the Y-Axis Set Max/Min option for a more prominent EMG signal display. The EMG hardware configuration option sets a display range of ± 25 mV. You can auto-scale all signals by pressing Ctrl + A or by selecting View > Auto-Scale Signals.



Auto-Scale Signals

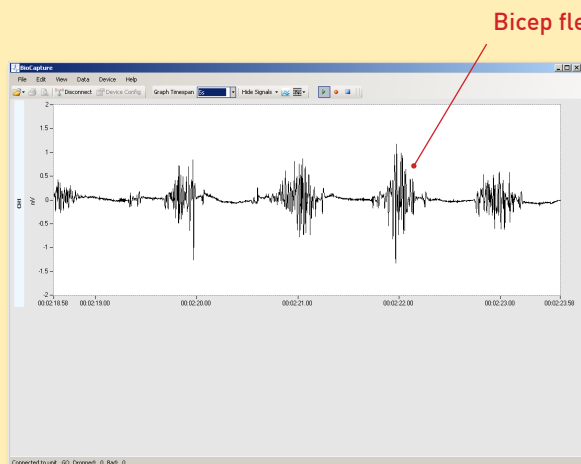
Biceps exercises



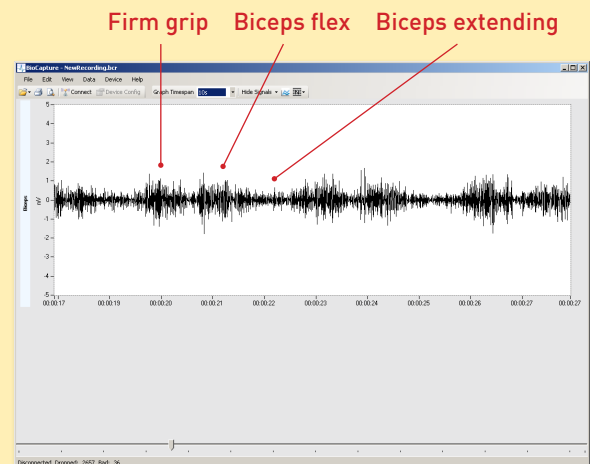
Simply squeezing, flexing or contracting your bicep muscles will produce a short series of bursts. Each burst is a summation of action potentials—the rise and fall event of the muscle cell's membrane potential. In between flexes or as soon as you stop, the biceps muscles cells' membrane potential will return to their rest potential, creating a small, electrically silent signal trace.

Performing biceps curls—arm at your side, bend your elbow and raise your hand to your shoulder—with a heavy book, bag or a dumbbell genuinely demonstrates EMG activity of the bicep muscles.

As a hand firmly grips the weight, the bicep muscles' cells become “electrically excited” and their membrane potential begins to spike or fire, creating an action potential. As the weight is curled and brought back down, the bicep flexs and extends, and the EMG signal data amplitude grows and attenuates. This coincides with the boisterous firing of the bicep's numerous muscle cells.



The harder the bicep flexes, the greater the action potential, hence, the greater the EMG signal data amplitude.

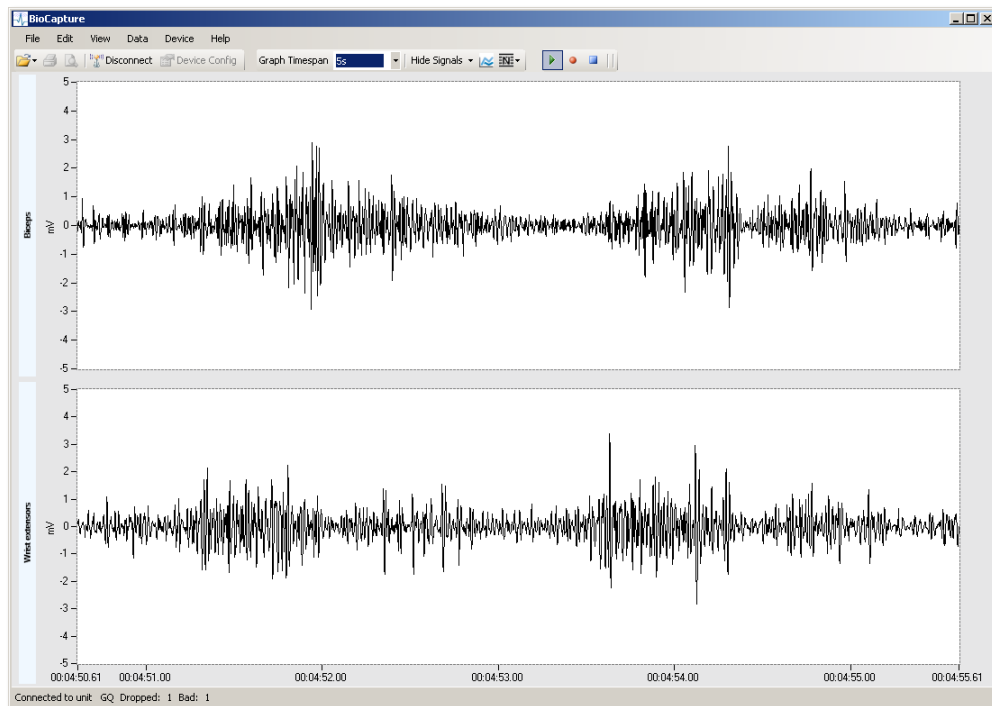


A bicep curl's dynamic range of motion requires the bicep muscles to complement other muscle groups.

Ready. Set. Go!

You are now familiar with an essential EMG recording. For further reading on EMG, please refer to the BioCapture Owner's Manual and/or the following references:

- Guyton and Hall. Textbook of Medical Physiology, 9th Edition, Saunders, Philadelphia, 1996.
- Kandel ER, Schwartz JH, Jessel, TM. Essentials of Neuroscience and Behavior. Appleton and Lange, Norwalk, Connecticut, 1998



▲ By monitoring multiple muscle groups, dynamic exercises, like bicep curls, demonstrate activity of both bicep and wrist extensor muscles.

BioCapture and BioRadio are trademarks of Great Lakes NeuroTechnologies Inc., Independence, OH. Acknowledgments: This work utilizes technologies supported by Small Business Innovation Research grants from the National Institutes of Health (NINDS, NHLBI, NIMH) and the Department of Defense.

HAVE QUESTIONS? NEED TECHNICAL SUPPORT? WE'RE HERE TO HELP.

Telephone: (216) 361-5410 or Toll-free (US only) 1-855-GLNeuro (1-855-456-3876)

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