GREAT LAKES NEUROTECHNOLOGIES

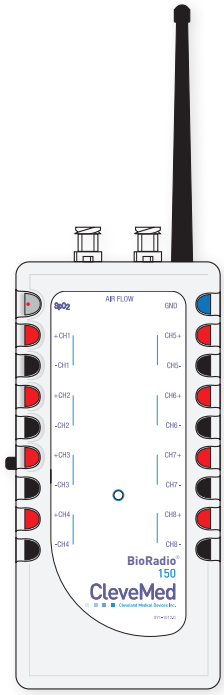
Quick Notes

BioCapture™ : Acquiring EMG data

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.

What you will need

Need to order supplies?
Contact your local Sales Representative, call 1-855-GLNeuro (855-456-3876) or e-mail sales@glneurotech.com

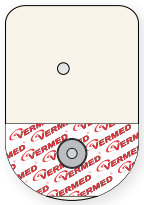


2.4 GHz BioRadio 150 User Unit


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

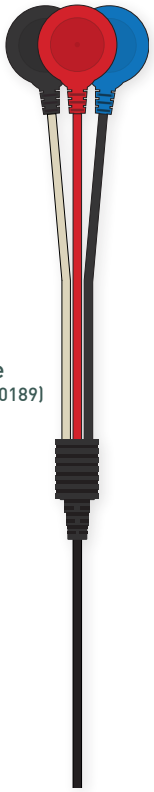
2.4 GHz USB Receiver

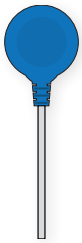
Alcohol wipes*


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


Nuprep skin prep gel*

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


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


3 "button snap" electrode 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.

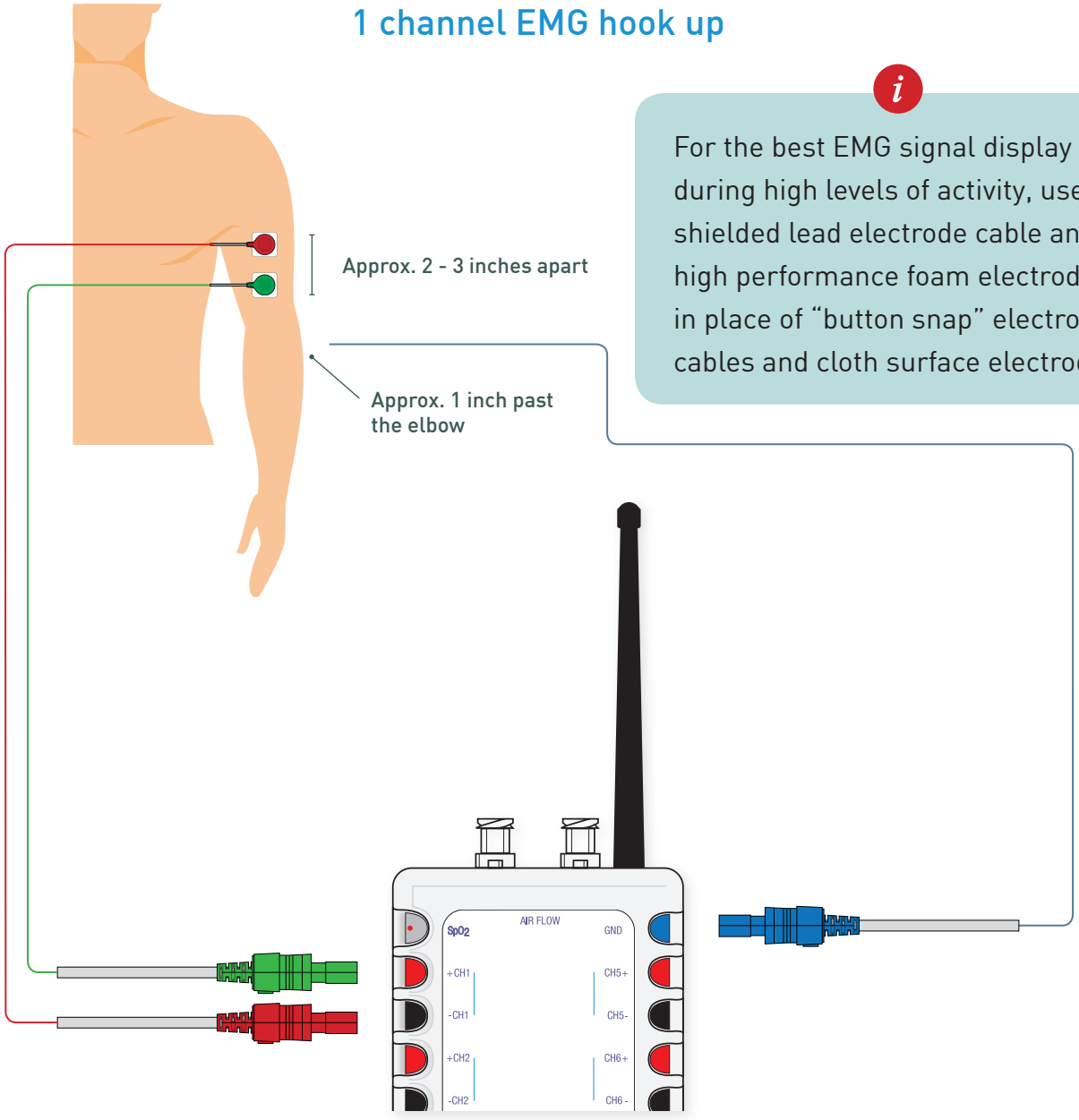
If sweating occurs, the cloth surface electrode contact will diminish and you may have to repeat this process in order to ensure sufficient skin/electrode contact.

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.

1 channel EMG hook up



For the best EMG signal display during high levels of activity, use the shielded lead electrode cable and high performance foam electrodes in place of "button snap" electrode cables and cloth surface electrodes.

Connecting electrode cables to BioRadio 150 User Unit

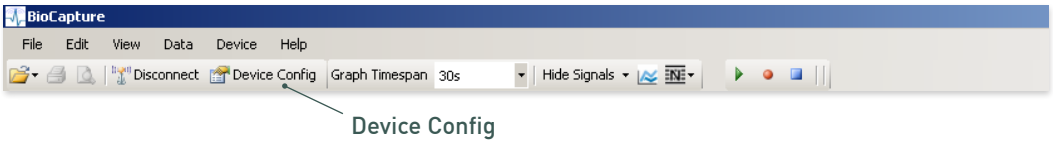
Connect the biceps muscle electrode cables to the +CH1 and -CH1 inputs on the BioRadio 150. It does not matter which input an electrode cable connects to.

Connect the elbow ('Ground') electrode cable to the GND input of the User Unit.

To prevent motion artifact from encroaching 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 your BioRadio 150 turned on and your USB Receiver connected and ready for use, launch BioCapture and click Device Config, from the tool bar to configure your BioCapture system for one channel of EMG.

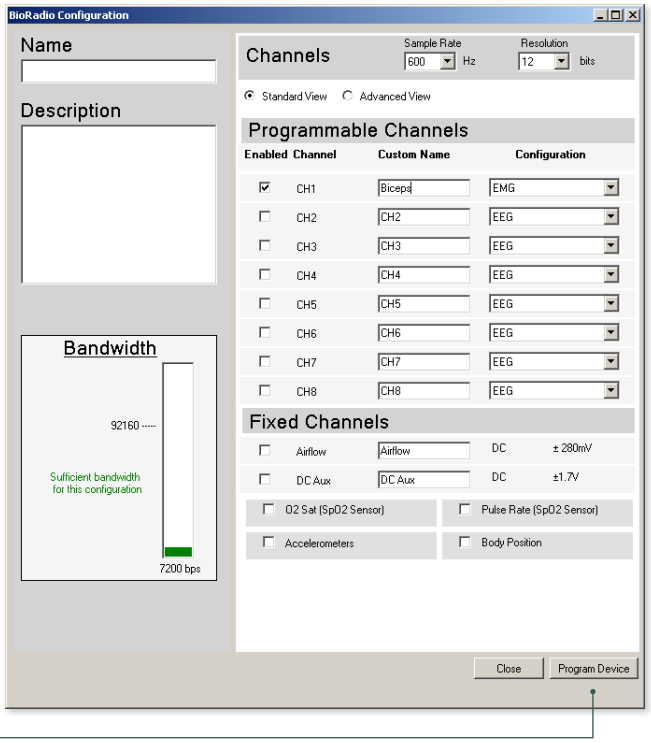


From the Standard View, enable Channel 1 ('CH1'), type in EMG for a custom name and the select EMG option under the Configuration drop down box.

Ensure that all other inputs are disabled. For this demonstration, a 960 Hz sampling rate is recommended. Resolution can remain unchanged.

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

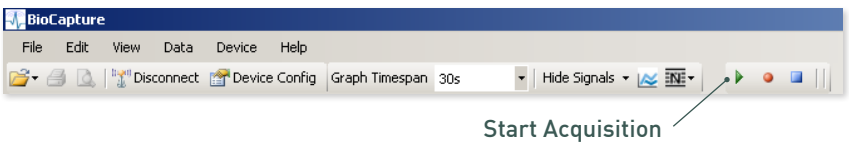
Press Program Device to program your BioCapture system.

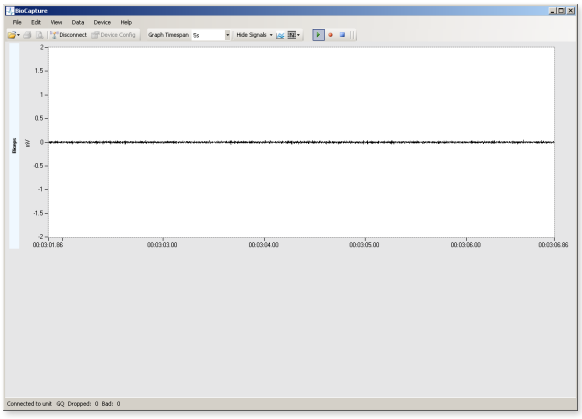


Acquiring EMG data

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.

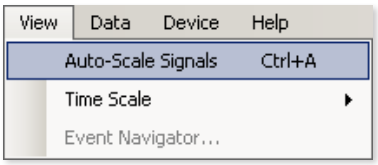
With arms at rest and relaxed, press Start Acquisition from the tool bar to begin acquiring data. A small data trace will appear.





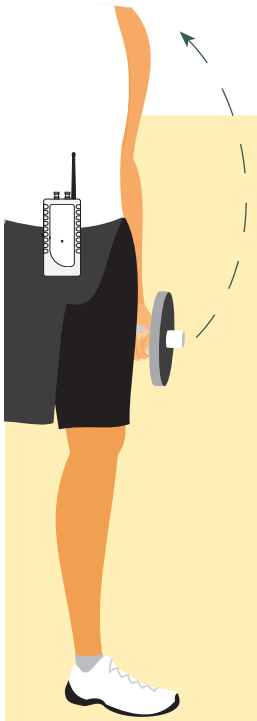
▲ This is the muscle activity at rest, also known as rest potential.

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

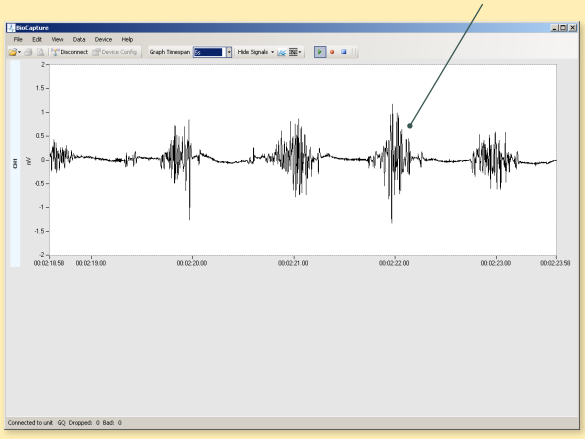


◀ Bicep curls

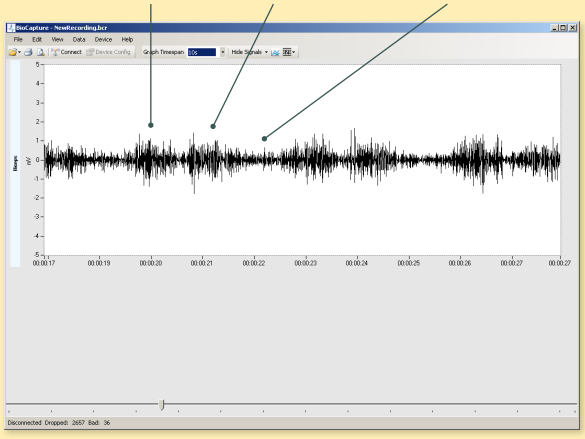
Simply squeezing, flexing or contracting your biceps muscles will produce a short series of bursts. Each burst is an action potential—a rise and fall event of the muscle cell's membrane potential. In between flexes or as soon as you stop, the biceps muscles cells' membrane potential will return to their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

As a hand firmly grips the weight, the biceps' muscle 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 biceps flex and extend, and the EMG signal data amplitude grows and attenuates. This coincides with the boisterous firing of the biceps numerous muscle cells.



▲ The harder the biceps flexes, the greater the action potential, hence, the greater the EMG signal data's amplitude.

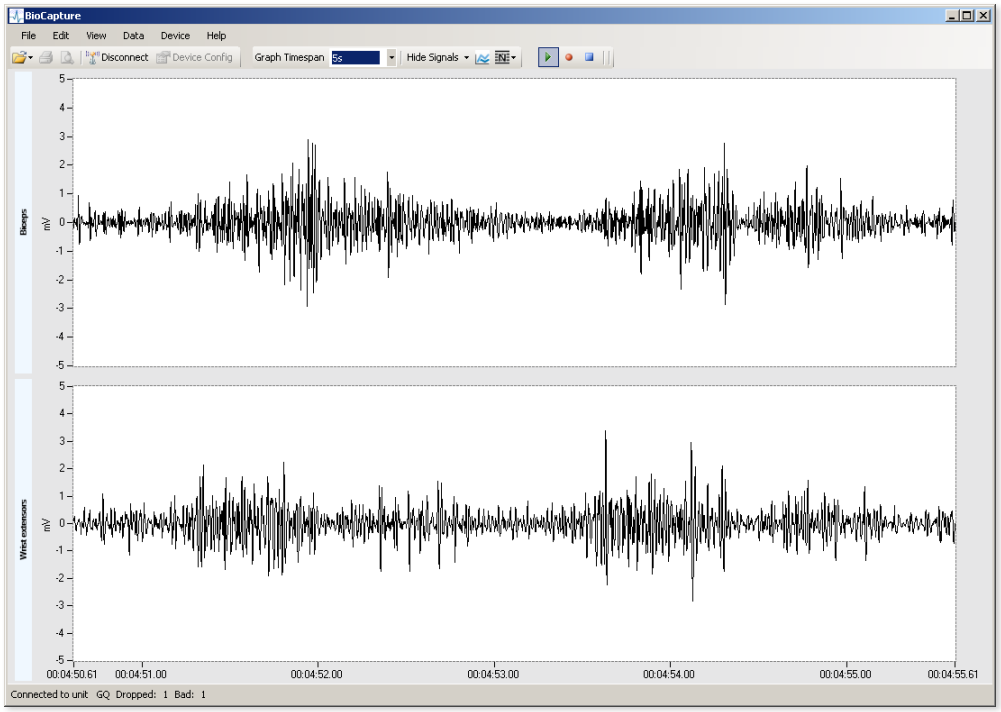


▲ A biceps curl's dynamic range of motion requires the biceps muscles to complement other muscle groups.

Ready. Set. Go!

Your are now familiar with an essential EMG recording. For further reading on EMG, please refer to the BioCapture User's Guide 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 biceps curls, demonstrate activity of both biceps and wrist extensor muscles.

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

Telephone: (216) 361-5410 or Toll-free 1-855-GLNeuro (1-855-456-3876)
9:00 a.m. - 5:00 p.m. EST, Monday – Friday
E-mail: support@GLNeuroTech.com
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