



## Teaching Notes

# BioCapture™ : Acquiring ECG 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.

**E**lectrocardiography (ECG) is a recording used to examine the electrical activity of the heart. BioCapture uses surface electrodes to monitor the rhythm of heart muscles as they contract and expand. There are several practiced ways of acquiring an ECG signal. This quick note will demonstrate a basic 1-channel ECG recording.

## What you will need



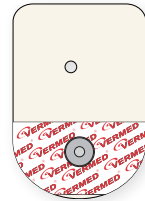
USB Bluetooth adapter (optional)



BioRadio User Unit



Alcohol wipes\*



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



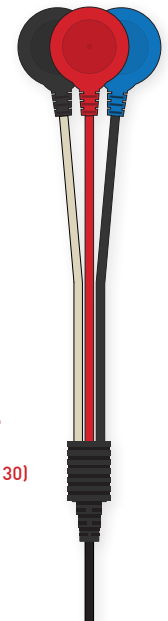
Nuprep skin prep gel\*



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



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



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

### Need to order supplies?

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

## 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's contact will diminish and you may have to repeat this process in order to ensure sufficient skin/electrode contact.

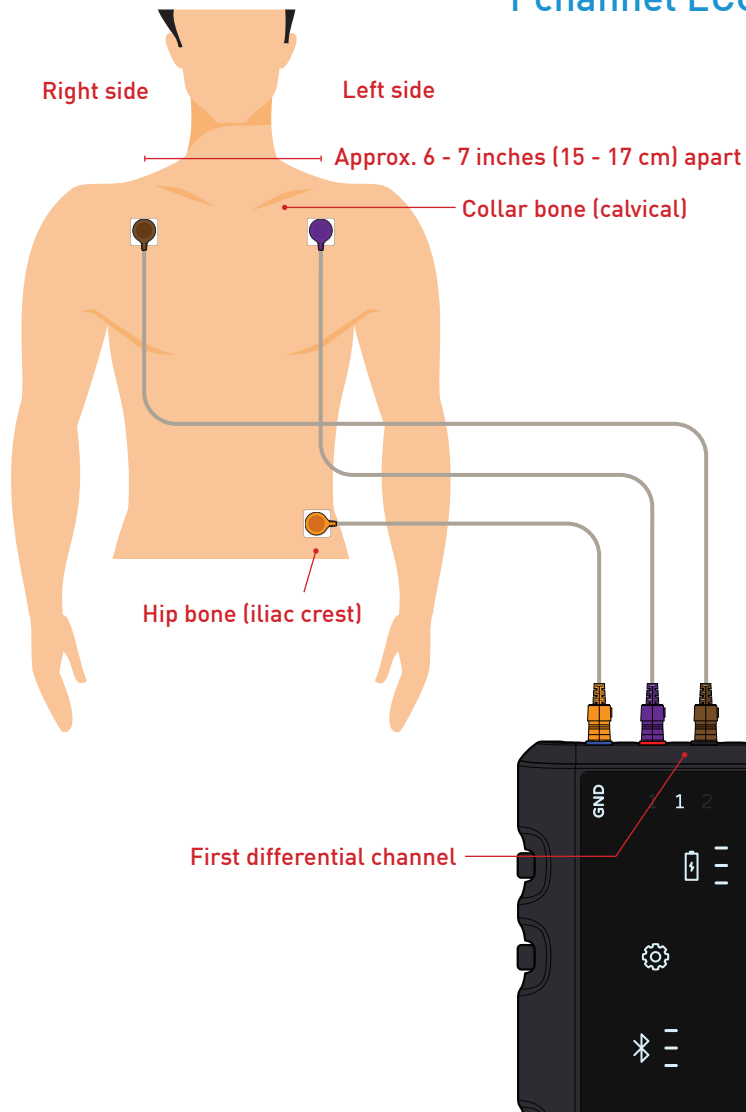
With you or a participant standing up and relaxed, place two cloth surface electrodes, approximately six to seven inches (15 - 17 cm) apart, just below the collar bone (clavicle). See figure on the next page for details.

Place a third cloth surface electrode left or right hip bone (iliac crest). This will be the ground electrode.

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

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

## 1 channel ECG hook up



For optimal ECG recording during exercise, consider a shielded lead cable and high performance foam electrodes in place of “button snap” lead cables and cloth surface electrodes.

## Connecting electrode cables to BioRadio User Unit

Connect lead cables to the first differential channel (Ch1) on the BioRadio User Unit.



For an appropriate ECG signal display, plug the **lead cable on left side** into the **red input** of **Ch1**, and the **lead cable on the right side** into the **black input** of **Ch1**.

Connect a lead cable from the hip bone (iliac crest) electrode to the **blue GND input** of the User Unit.

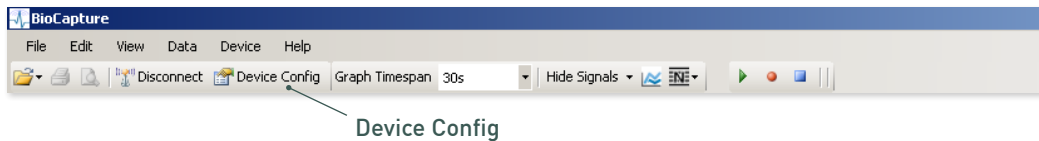


To minimize noise on the ECG signal data, twist or bundle together any dangling cables, or tape any dangling cables to the skin with medical tape.



## Configuring your BioCapture system

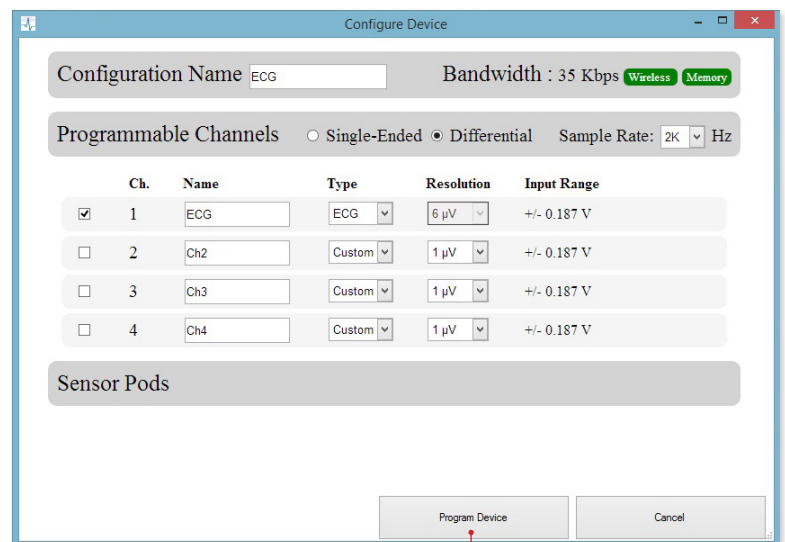
With BioCapture launched and your BioRadio turned on, connected and ready for use, press Device Config, from the tool bar to configure the BioRadio for one channel of ECG.



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

Ensure that all other inputs are disabled. For this demonstration, the Sampling Rate can remain as-is.

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

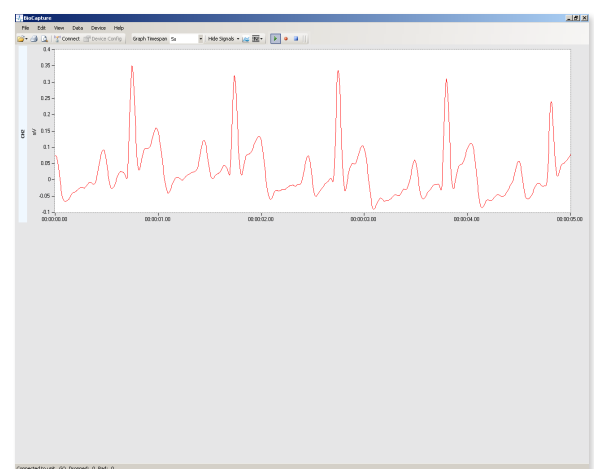


Press Program Device to program your BioRadio.

## Acquiring ECG data

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

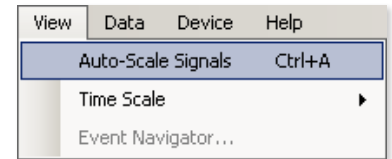
With arms at rest and relaxed, press Start Acquisition from the tool bar to begin acquiring data. A small data trace will appear.



Start Acquisition

▲ 1-channel ECG signal display

**i** You may need to access the Y-Axis Set Max/Min option for a more prominent ECG signal display. The ECG hardware configuration option sets a display range of  $\pm 12$  mV. You can auto-scale all signals by pressing Ctrl + A or by selecting View > Auto-Scale Signals.

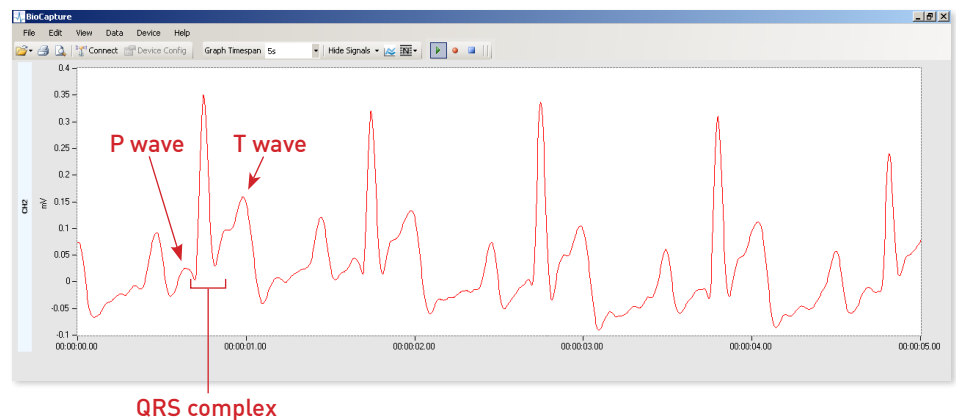


▲ Auto-Scale Signals

## ECG, heart rate and exercise

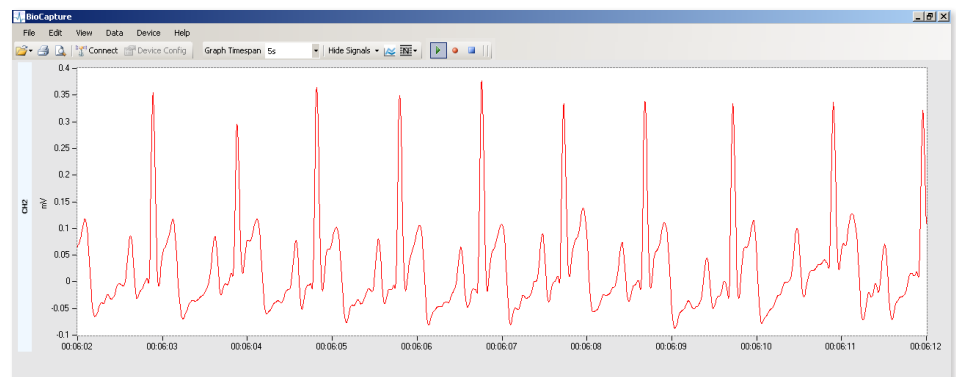
Unlike most physiological signals, ECG consists of a particular and recurring set of electrical activities. These activities, displayed in millivolts, consist of a P wave, a QRS complex, and a T wave. A heartbeat is a cardiac cycle that creates these waves and complexes.

**i** Performing any kind of aerobic exercise will cause the heart muscles to work more quickly. During and after light exercise the ECG signal display should show more heart beats – sets of P waves, QRS complexes and T waves – per minute.



The heartbeat's electrical cycle represents heart muscles—atria and ventricles—that contract and expand, creating periodic changes of each muscles' electrical state in the process.

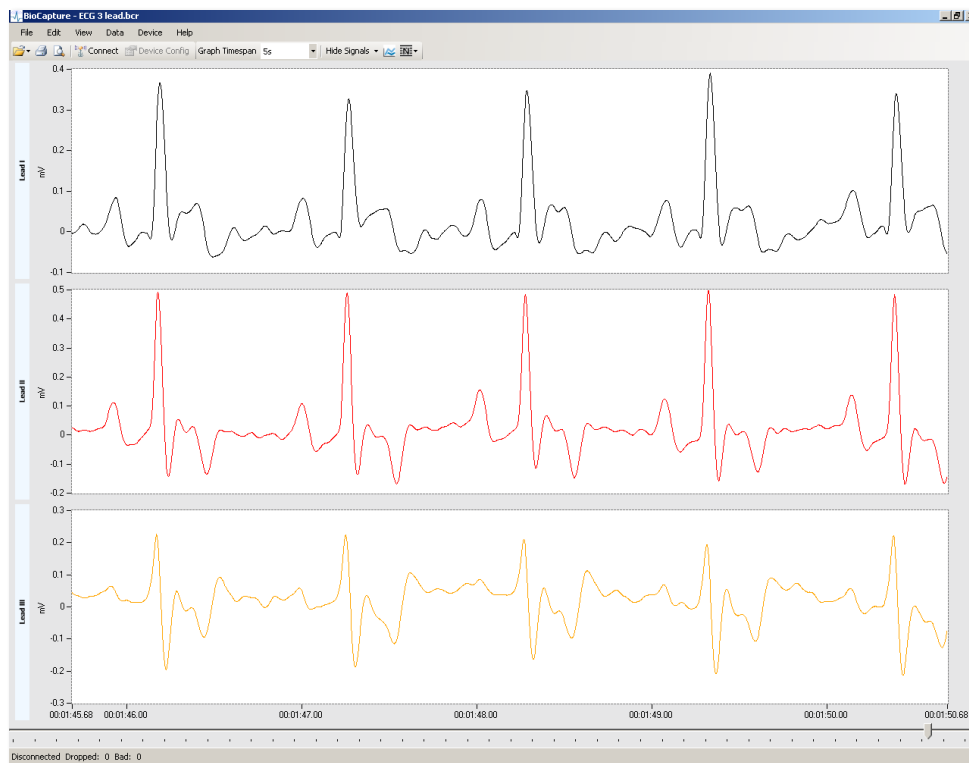
The heart rate is the inverse of the time in between any P wave, QRS complex, or T wave. For example, if the time measured between two QRS complexes is 0.8 seconds, then the number of beats per second is the inverse, 1.25 beats per second. In order to obtain the heart rate, you would simply multiply by 60 seconds per minute. This would yield 75 beats per minute.



## Ready. Set. Go!

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

- Guyton and Hall. Textbook of Medical Physiology, 9<sup>th</sup> Edition, Saunders, Philadelphia, 1996.
- Rhoades, R and Pflanzner, R. Human Physiology, Third Edition. Saunders College Publishing, Fort Worth, 1996.



▲ More complex ECG recordings can show specific electrical activity of certain heart muscles and special conductive tissues

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.

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