MINDMEDIA
NEURO AND BIOFEEDBACK SYSTEMS

User Guide

ECG – Heart Rate

This user guide has been created to educate and inform the reader about doing ECG measurements

For more information about NeXus, our BioTrace+ software, please visit our website or contact us.

www.mindmedia.com

V1.0

Contents

Introduction

This manual provides a step-by-step review of how to do ECG measurements with the NeXus-4, NeXus-10 or NeXus-32. The manual provides information about the required hardware, preparation and measurement steps, artefacts (appendix 1), and care of materials (appendix 2).

Required Equipment

Depending on the chosen setup, the following is required to perform ECG measurements:

- Nexus-4, NeXus-10 or NeXus-32
- EXG Sensor
- EXG Ground
- Pre-gelled ECG electrodes (Ag/AgCl)*
- Alcohol pads (optional)

*High quality electrodes like the Meditrace or ARBO electrodes are recommended to ensure good signal quality.

ECG measurement setup

Before the actual measurement can start, the equipment has to be connected. Detailed information on setting up the NeXus can be found in the NeXus User Manual or Quick Start.

Connect the EXG Sensor to input A&B of the NeXus-4 or NeXus-10 and input 25&26 of the NeXus-32. Make sure the red dot of the connector is facing downward with the NeXus-4 or NeXus-10 or upward with the NeXus-32.

Connect the EXG Ground to the Ground (Gnd) of the NeXus.

Sensors can be disconnected by pulling the silver ribbed part of the connector backward.

Snap the electrodes on to the black and red snap on of pair two of the EXG Sensor. The use of high quality electrodes like ECG Meditrace or ARBO electrodes is recommended.

Snap an electrode on to the EXG ground snap-on.

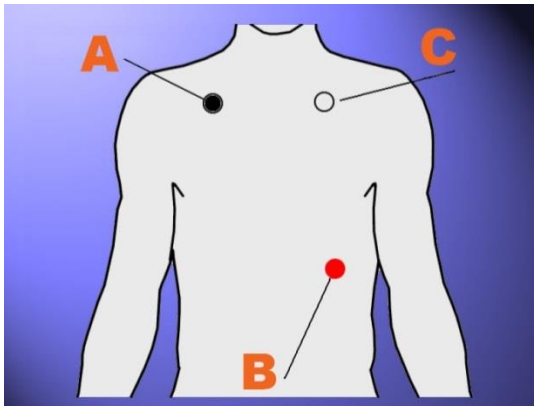
Optionally clean the skin with an alcohol pad at all electrode positions before applying the electrodes.

To acquire an ECG signal that is suitable for heart rate detection, the negative and positive electrode should be placed in such a way that the electrical activity of the heart (especially the R-peak) can be measured between the electrodes. Optimally, the electrodes are placed along the electrical heart axis, like the vertical lead II of Einthoven's triangle. Electrodes can also be placed according to the horizontal lead I of Einthoven's triangle.

Chest placement

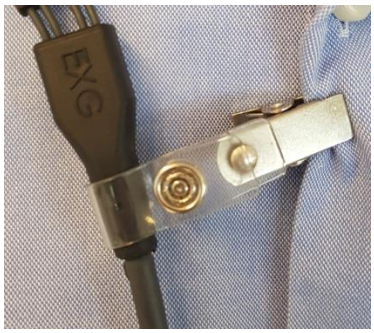
Optimally, the red (positive) electrode would be placed below the left rib cage (B) and the black (negative) electrode just below the right collarbone (A). The positive and negative electrodes should not be switched to avoid an inverted ECG signal and therefore incorrect R-peak detection and incorrect heart rate detection.

Place the ground electrode just below the left collarbone (C).



Alternatively, place the black (negative) electrode just below the right collarbone and the red (positive) electrode just below the left collarbone.

Use the clip of the EXG cable to attach the EXG sensor to prevent pulling of the cables.

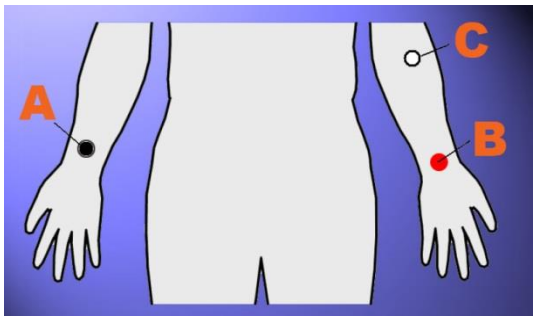


Now go to chapter 'BioTrace+' for further instructions.

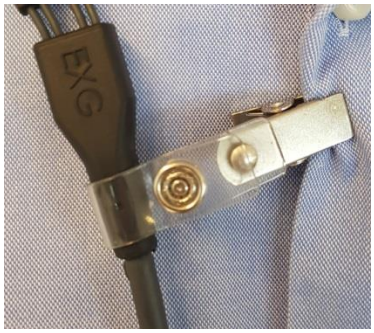
Wrist placement

This placement is easier to apply, though is more susceptible to EMG artifacts (refer to Appendix 1: Artifacts).

Place the red (positive) electrode on to the inner side of the left wrist (B) and place the black (negative) electrode on to the inner side of the right wrist (A). The positive and negative electrodes should not be switched to avoid an inverted ECG signal and therefore incorrect R-peak detection and incorrect heart rate detection.



Use the clip of the EXG cable to attach the EXG sensor to prevent pulling of the cables.

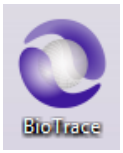


Place the ground electrode on e.g. the wrists.

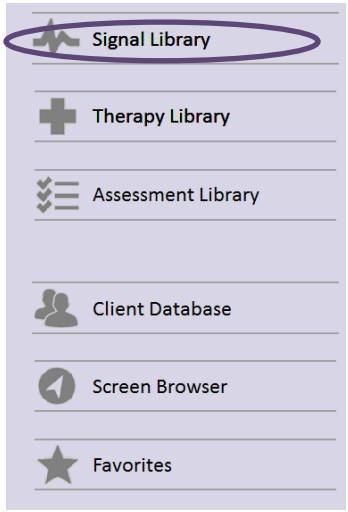
Now go to chapter ‘BioTrace+’ for further instructions.

BioTrace+

Start the BioTrace+ Software.

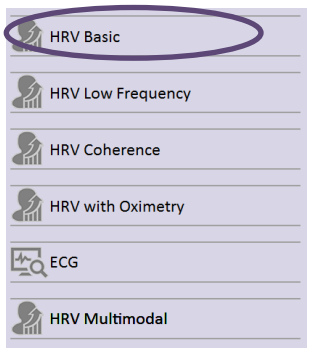


Select **Signal Library**.



Select **ECG**.

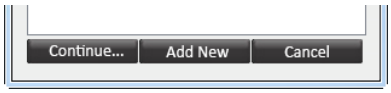
Select your preferred measurement screen (e.g. HRV basic).



Switch the NeXus on.

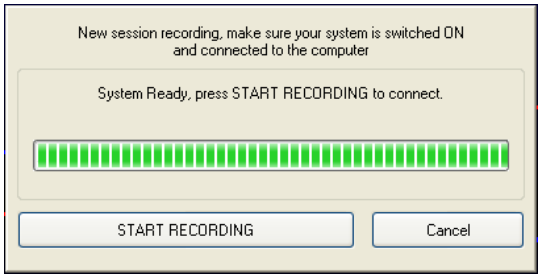
Click the **recording** button.

The *select a client* dialog box will appear.

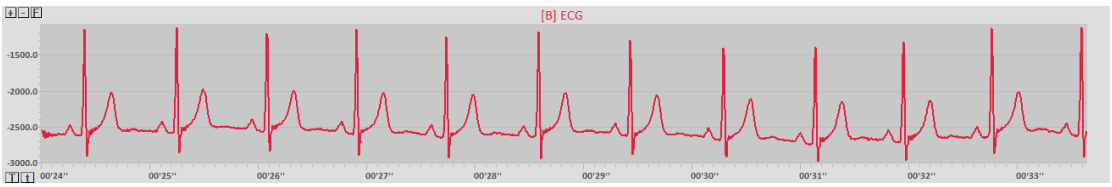


Select a client and click **Continue...** or click **Add New** for adding a new client.

The *New session recording* screen will appear. Click **Start Recording** to start recording a session.



Visually inspect the ECG to pinpoint and possibly reduce artifacts. Prevention is better than to cure and prevents having to mark and remove artifacts afterwards. For more details about artifacts, see the Appendix 1: Artifacts.



After having checked signal quality, the actual measurement can be started.

Set threshold setting controls of a bar graph.

Manual threshold

Automatic threshold

Disable threshold

It is possible to show and hide the bar graph feedback on the client screen

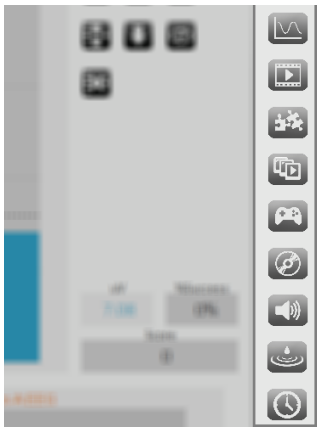
Show graph on client screen

Hide graph on client screen

Feedback Type Controls are shown on the right side of a training screen.

Press the Windows logo key +P *for extending display to dual monitor setup*

Select one of the feedback options that are available on the right side.



Graph

Video

Puzzle

Animation

Game

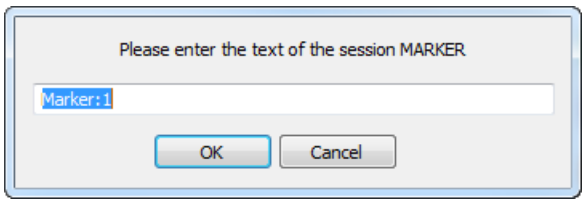
Disc

Audio

Select other content during a recording by clicking the change feedback icon in the right top corner. This can only be used with videos, animations, games, puzzles, and audio.

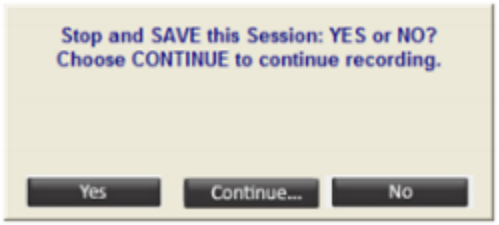
Markers can define a certain event during a recording. These markers can be added manually by pressing *the marker symbol* in *Session controls in the left bottom corner* (or by pressing **Enter**):

The following dialog box appears for naming markers.

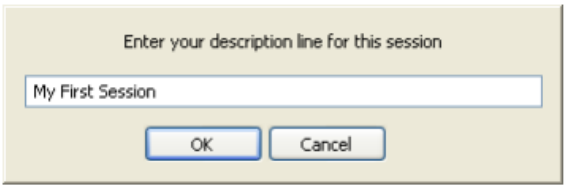


In order to stop the recording, click the **stop** button.

An alert box will appear.



Click **Yes** and save the session and enter a description of the session.

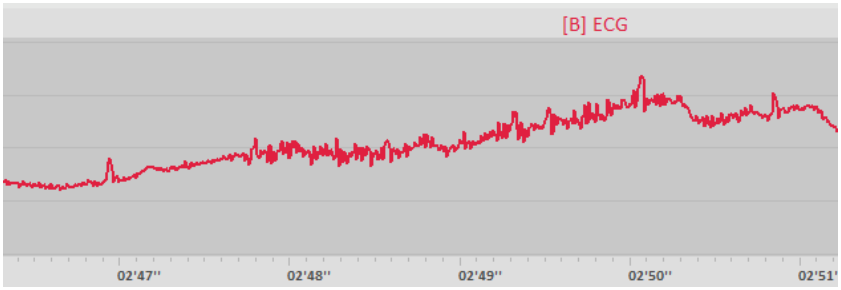


Confirm by clicking **OK**, the session is now saved.

Appendix 1: Artifacts

- **50/60 Hz interference**
  Electrical interference can arise from electrical devices, lighting, etc. Electrical devices and cables transport electrical power at a level of 110-230 Volts AC. This power is alternating 50 or 60 times per second and therefore called “alternating current” or AC. The connectors and carbon coated cables of the sensors have active noise cancellation, resulting in a minimum of noise during recording. The 50/60 Hz interference has a minor influence on the ECG signal.

- **Muscle tension**
  Depending on electrode placement electrical activity of the muscles (e.g. breast and arm muscles) can interfere with the ECG.



Appendix 2: Care of materials

NeXus EXG sensor cleaning

The NeXus EXG sensors can only be cleaned. There are no procedures or prescriptions for disinfecting.

The sensor cables and snap-ons can be cleaned with lukewarm water or alcohol prep pads (do not submerge in water or in alcohol solution).

Please avoid cleaning the connector, as this may affect its performance.