MINDMEDIA
NEURO AND BIOFEEDBACK SYSTEMS

User Manual

BioTrace+ Software

V2018A EN

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Intended use of this manual

Please note that this user manual only covers the use and handling of the technical functions of BioTrace+ software. It does not deal with physiological or clinical applications. Nor is this user manual or the software intended to be a guide of how to use or interpret the physiological signals, data or session results. For that kind of information, please refer to the relevant professional literature and publications.

This manual assumes that the reader is familiar with all the basics of using a Microsoft Windows ™ operating system.

We have taken great care in creating this manual. However we are always interested in feedback on how we can improve the manual or enhance our products. Remarks or suggestions are appreciated and can be send to: support@mindmedia.nl

Disclaimers and warnings

Please read the following warnings and disclaimers before using BioTrace+ software:

- Read this user manual and the NeXus hardware manual carefully before using BioTrace+ with NeXus-4, NeXus-10 or NeXus-32.
- The PC that is running BioTrace+ must be placed out of the clients reach for safety reasons. We advise 2 meters or more. Generic PCs and notebook computers are not medical devices and therefore may pose a hazard to you, the client or others. If safety is a concern we advise to run BioTrace+ only on a medical grade PC that conforms with EN-60601-1.
- Microsoft Windows ™ operating system is not a medical device. Computers running Windows ™, although increasingly more powerful every year, may fail unexpectedly in terms of hardware and software for various reasons. BioTrace+ software was designed with state of the art software development tools, but it cannot be guaranteed it will run error free under all conditions. This poses the risk that data, signals or statistics may be represented incorrectly, become invalid or data may get lost. Therefore we urge to make regular backups if maintaining the data for the long term is important.
- The operator is responsible for the safety of any device (including the computer, printers, accessories and other attached apparatus) that is used by the BioTrace+ Software or attached to the computer that is running BioTrace+.
- This software should never be used for diagnostic purposes, vital monitoring or for life supporting systems.

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1. Basics

Installation

System requirements

The system requirements for BioTrace+ are:

- Windows® 8.1 Professional, Windows® 7 Professional, with Service Pack 1or Windows® 10 Professional. Use Boot Camp for Mac OS X.
- Intel i3/ i5/ i7 series processor
- 4 GB of RAM memory or more
- Graphics card with 256 MB memory or more
- HD+ (1600 x 900) or Full HD (1920 x 1080) screen resolution
- USB 2.0 port
- Bluetooth 2.0[1]

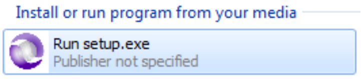
Additional requirements:

- Secondary monitor for optimal use of dual screen mode
- DVD-ROM drive for installation of BioTrace+[2] or DVD-feedback
- Broadband internet connection for software updates and access to online services

1. *It is required to use a Microsoft Windows Bluetooth Stack and not a 3rd Party Bluetooth Stack.*
2. *In case no DVD drive is available, please contact the reseller for more information about installation.*

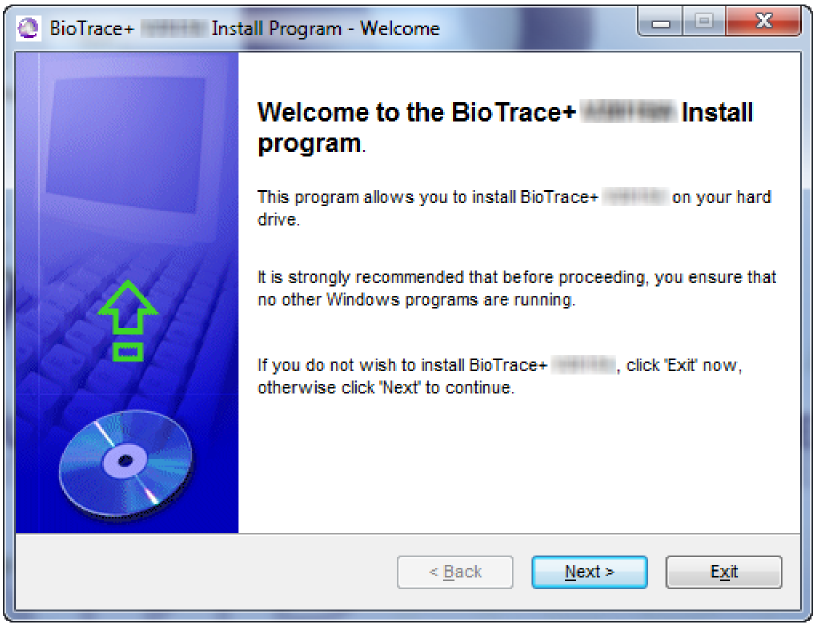
BioTrace+ setup

Insert the BioTrace+ DVD in to the drive and run **setup.exe**



It is recommend to install BioTrace+ in a root directory such as 'C:' or 'D:'.

The *Welcome* screen of the installer will appear.



Welcome to the BioTrace+ [redacted] Install program.

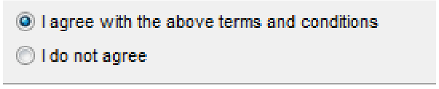
This program allows you to install BioTrace+ [redacted] on your hard drive.

It is strongly recommended that before proceeding, you ensure that no other Windows programs are running.

If you do not wish to install BioTrace+ [redacted], click 'Exit' now, otherwise click 'Next' to continue.

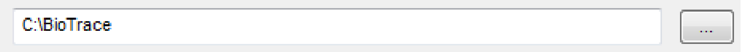
Click **Next** and follow the instructions for installation.

Please read the license agreement and select **I agree** and click **Next**.



● I agree with the above terms and conditions
○ I do not agree

Select an installation folder and click **Next** to continue.



C:\BioTrace

Click **Start** to install BioTrace+.

The driver installation will start automatically. This could take a couple of minutes.

When installation has completed, click **Exit**.

Installing updates

Download the latest version at the *Software Updates* section of the Mind Media website www.mindmedia.com/downloads/.

Or by clicking Help > **Internet: BioTrace+ Updates** in the top menu of BioTrace+.

Please contact the reseller for more information about offline installation.

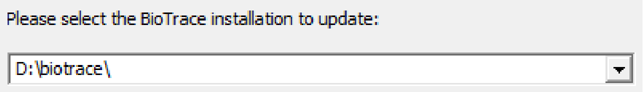
An update will improve and add functionality but it will also update screens, images, feedback content, channel sets etc. An update is language specific.

Perform the following steps to install an update:

1. Download an update by right clicking the link and selecting **Save target as**. Make sure to select to correct language.
2. Choose a location for saving the .exe file. It is recommended to save it on the desktop. Close BioTrace+ before starting the installation.
3. Run the .exe file.

An update overwrites default content. Make sure to back up changed default content (e.g. edited screen) before installation. Content with different names than default content, will not be overwritten. Updates will not make changes to any session or client data.

4. The program will scan for installed versions of BioTrace+. In case of multiple versions installed, please select the folder which needs to be updated.



Please select the BioTrace installation to update:

D:\biotrace\

Click **Next** to start the installation.

5. Click **Exit** when the update process is ready. The update is installed.

Connecting the NeXus

There are two ways of connecting the NeXus to a computer:

1. USB connection (NeXus-10 and NeXus-32 only, please refer to hardware manual)
2. Bluetooth pairing

Bluetooth pairing

Make sure the Bluetooth dongle is connected to the computer.

When using an internal Bluetooth-dongle it is possible it needs to be activated manually using shortcuts on the keyboard or a separate key / switch. As this varies for every brand and series, please consult the machine's user manual.

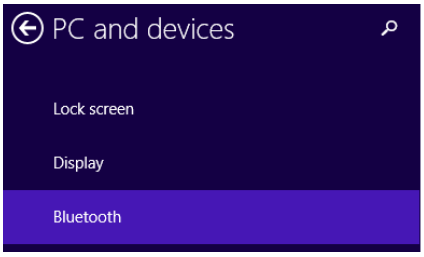
Windows 8

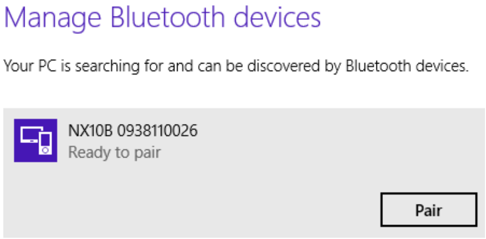
Open the windows “charms bar” by moving the mouse to the right upper corner of the screen, or by pressing the Windows key and C (⊞ + C).

Click on **Settings**

Next click on **Change PC settings** in the right bottom of the screen. Click on **PC and devices**. Click on **Bluetooth**.

Switch the NeXus on. Windows will search for the device. Select the device and click **Pair**.



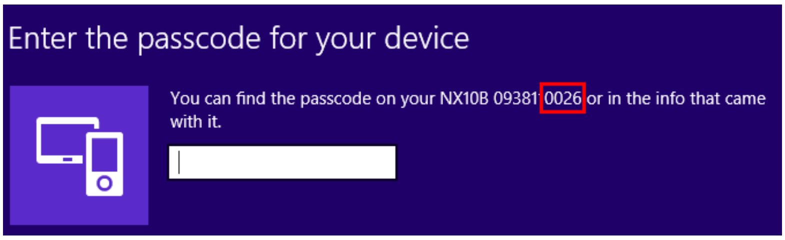


Your PC is searching for and can be discovered by Bluetooth devices.

NX10B 0938110026
Ready to pair

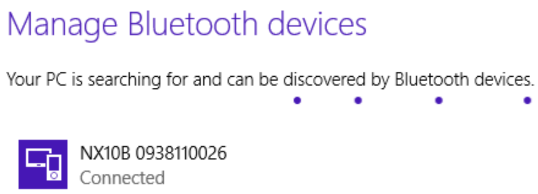
The passcode for the device are the last 4 digits of the serial number which is displayed on the ‘Enter the passcode for your device’ screen.

The serial number can also be found on the back of the device.



You can find the passcode on your NX10B 093811 0026 or in the info that came with it.

Enter the last 4 digits of the serial number and click **Next**. The device will be added to the computer.



Manage Bluetooth devices

Your PC is searching for and can be discovered by Bluetooth devices.

NX10B 0938110026
Connected

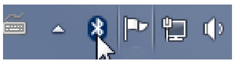
Definition of Bluetooth states:

- ‘Ready to pair’: The NeXus is not paired with the PC
- ‘Connected’: There is active communication between the PC and NeXus.
- ‘Not Connected’: The Nexus is correctly paired with the PC, but there is no active communication with the PC.

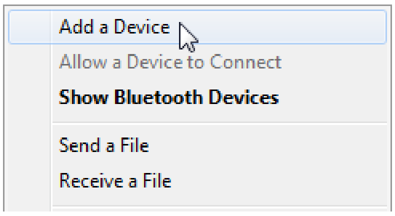
It is recommended to restart the computer after Bluetooth pairing.

Windows 7

Locate the Bluetooth icon in the Windows® taskbar, usually at the right bottom of the desktop (if not, click the arrow to show hidden items).

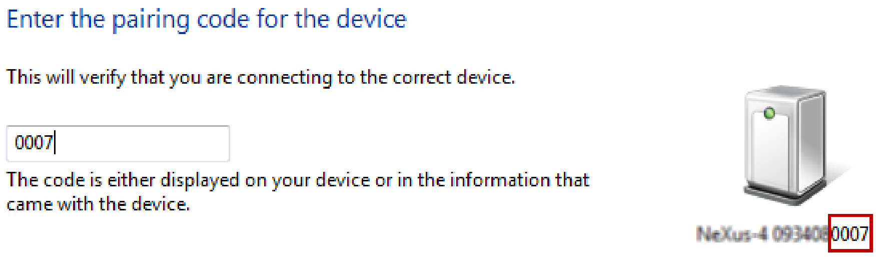


Right click the Bluetooth icon and select **Add a Device**.



Switch the NeXus on. Windows will search for the device. Select the device and click **Next**. The pairing code for the device are the last 4 digits of the serial number which is displayed on the right side of the ‘add a device’ screen.

The serial number can also be found on the back of the device.



Enter the pairing code for the device

This will verify that you are connecting to the correct device.

0007

The code is either displayed on your device or in the information that came with the device.

Enter the last 4 digits of the serial number and click **Next**. The device will be added to the computer. Click **Close** to finish the Bluetooth pairing.

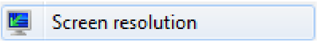
It is recommended to restart the computer after Bluetooth pairing.

Dual monitor setup

Configuring the secondary monitor needs to be performed in Windows®.

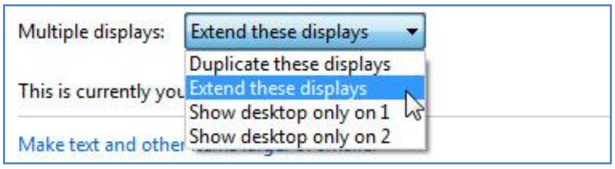
Make sure to plug in the secondary monitor first. A beamer or a television can also be used.

Right-click on the desktop in Windows and select **Screen resolution**.


Screen resolution

The display settings menu will appear.

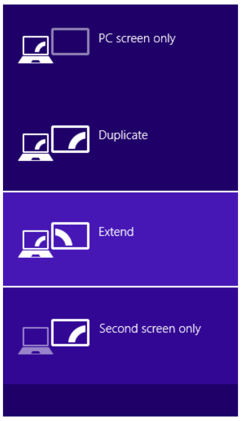
Choose **Extend these displays** under *Multiple displays* for using the secondary monitor.


Multiple displays: Extend these displays

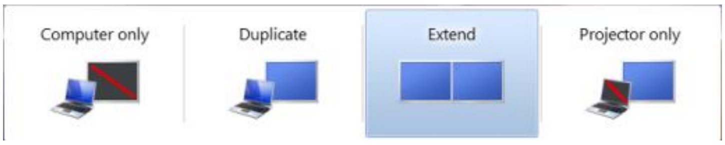
Duplicate these displays
Extend these displays
Show desktop only on 1
Show desktop only on 2
This is currently you
Make text and other

Shortcut for changing displays

Press the Windows key and P (⊞ + P) to bring up a quick menu of options:


PC screen only
Duplicate
Extend
Second screen only

Windows 8


Computer only
Duplicate
Extend
Projector only

Windows 7

Activating BioTrace+

Connect the NeXus to the computer.

For more information about connecting the NeXus, please refer to the previous paragraph

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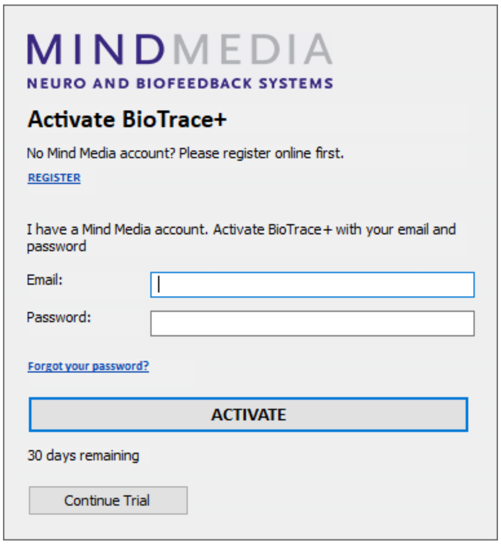
Start BioTrace+ by double-clicking on the BioTrace+ icon on the desktop or browse to the BioTrace folder and open **BioTrace.exe**.

BioTrace.exe

The *Activation* screen will appear.



MINDMEDIA
NEURO AND BIOFEEDBACK SYSTEMS

Activate BioTrace+

No Mind Media account? Please register online first.

I have a Mind Media account. Activate BioTrace+ with your email and password

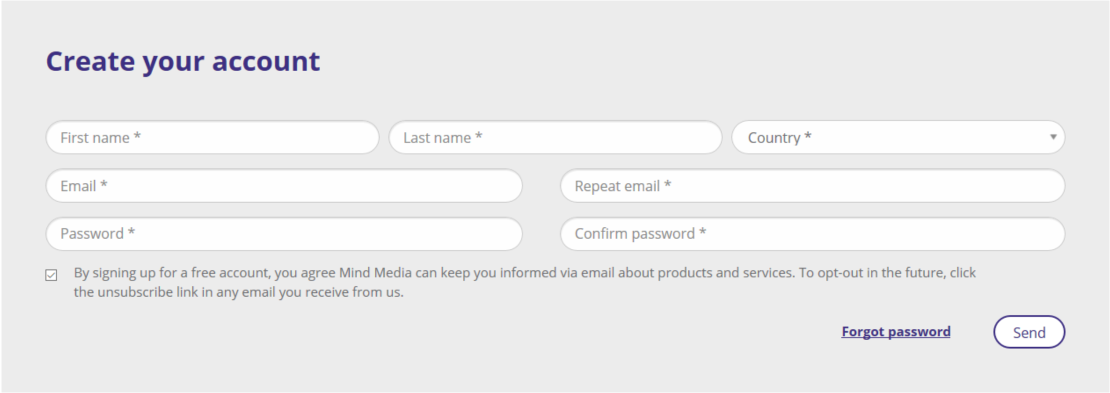
30 days remaining

REGISTER
Email:
Password:
Forgot your password?
ACTIVATE
Continue Trial

Create a new Mind Media account online by clicking **REGISTER**

Alternatively go to our website: *www.mindmedia.com/register*

Fill out the contact information and choose a password. Click **Send** to create a free account.



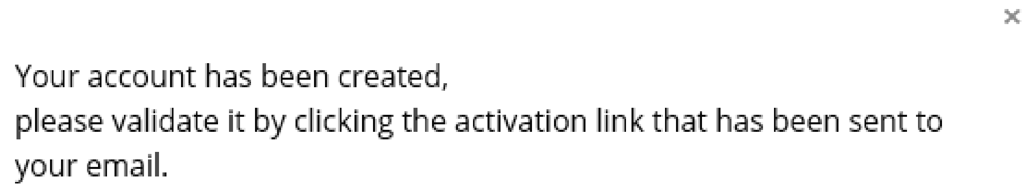
Create your account

☑ By signing up for a free account, you agree Mind Media can keep you informed via email about products and services. To opt-out in the future, click the unsubscribe link in any email you receive from us.

First name *
Last name *
Country *
Email *
Repeat email *
Password *
Confirm password *
Forgot password
Send

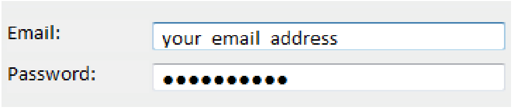
An email will be sent to the given email address.

Please confirm the contact information by clicking the link in this email.



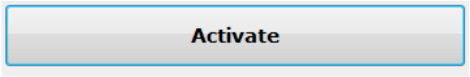
Your account has been created,
please validate it by clicking the activation link that has been sent to your email.

Once an account is created, connect the NeXus to the computer and enter the contact email address and the password in the *Activation screen* of BioTrace+.

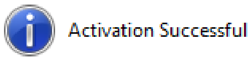


Email: your email address
Password: ●●●●●●●●●●

Click the **Activate** button.



If BioTrace+ is successfully activated, an alert box will appear.



Activation Successful

Your NeXus can be used to activate BioTrace+ on 4 computers per year. If you wish to activate additional BioTrace+ installations, please contact support

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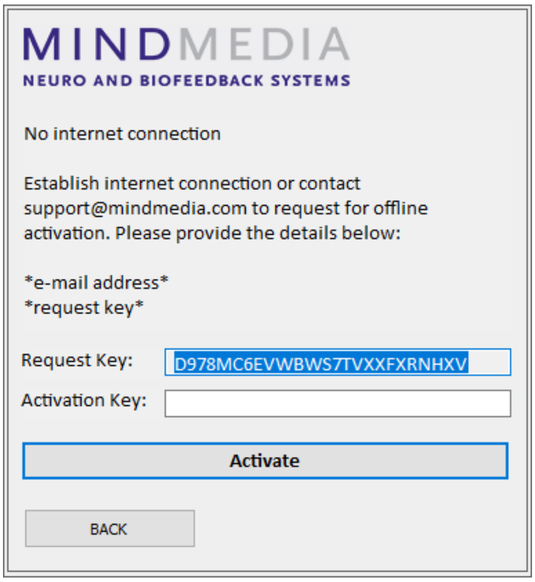
Offline activation

If the computer is unable to connect to the internet the *Offline Activation screen* will appear.



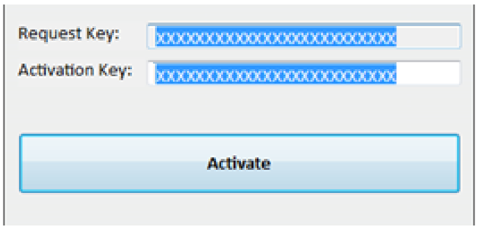
No internet connection

Establish internet connection or contact support@mindmedia.com to request for offline activation. Please provide the details below:

e-mail address
request key

Request Key: D978MC6EVWBWS7TVXXFXRNHXV
Activation Key:

Send the Request Key and your contact email address to support@mindmedia.nl to receive an Activation Key. Fill in this Activation Key and click **Activate** in order to activate BioTrace+.

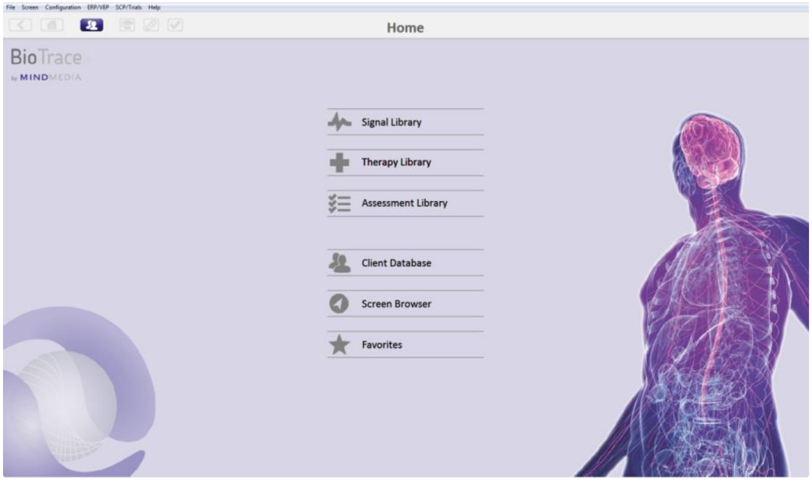


Request Key: xxxxxxxxxxxxxxxxxxxxxxxxxxx
Activation Key: xxxxxxxxxxxxxxxxxxxxxxxxxxx

Navigation

Home menu

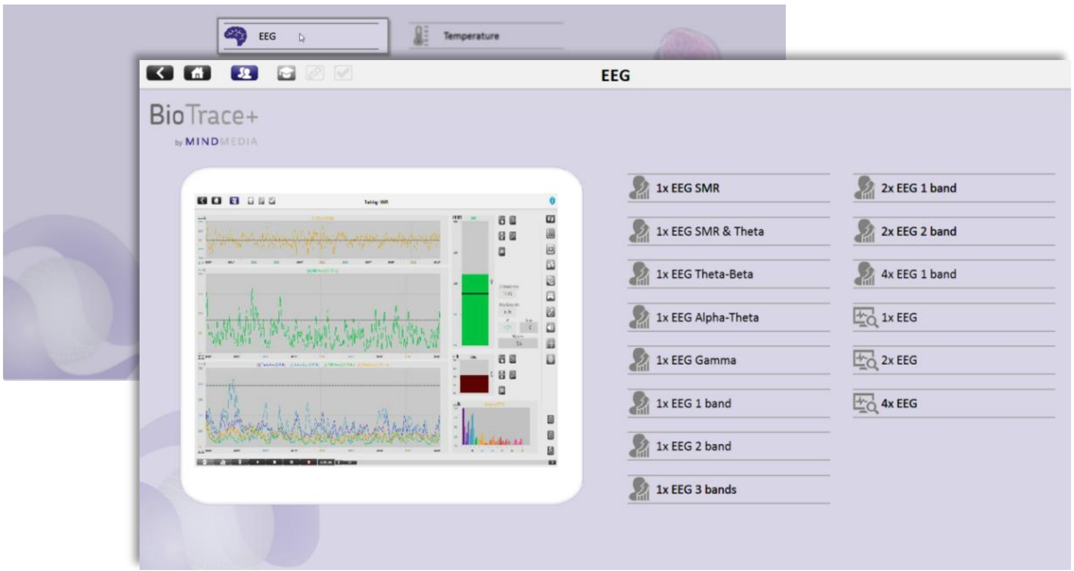
At the startup of BioTrace+, *Home* will appear.


File Screen Configuration ERP/VEP SCP/Trials Help
Home
BioTrace+
by MINDMEDIA
Signal Library
Therapy Library
Assessment Library
Client Database
Screen Browser
Favorites

Home contains the following items:

Signal Library	Choose between various types of signals or modalities.
Therapy Library	This library provides a series of protocols for specific biofeedback and neurofeedback applications.
Assessment Library	This library provides psychophysiological stress profiling protocols and stress assessment protocols.
Client Database	Browse client information and review sessions
Screen Browser	Browse all screens which are available.
Favorites	Open favorite screens

Select a signal or modality in the *Signal Library*


EEG
Temperature
EEG
BioTrace+
by MINDMEDIA
1x EEG SMR
1x EEG SMR & Theta
1x EEG Theta-Beta
1x EEG Alpha-Theta
1x EEG Gamma
1x EEG 1 band
1x EEG 2 band
1x EEG 3 bands
2x EEG 1 band
2x EEG 2 band
4x EEG 1 band
1x EEG
2x EEG
4x EEG

Every category consists of several training and data acquisition screens. These screen types are marked by the following icons:

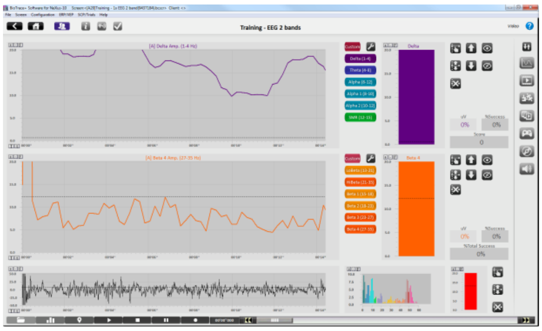
Training
Data acquisition

Training screens

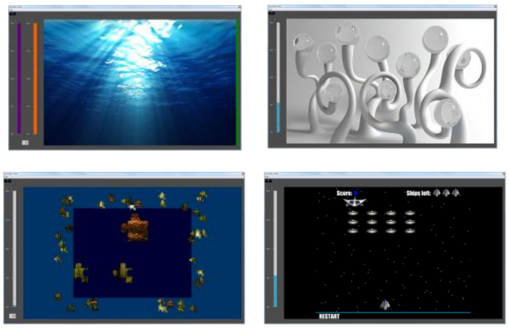
Every training screen includes one therapist screen with several client screens.

A therapist screen provides all controls for setting feedback.

A client screen provides the specific feedback for the client. Every therapist screen contains several different types of client screens.



Training - Therapist screen

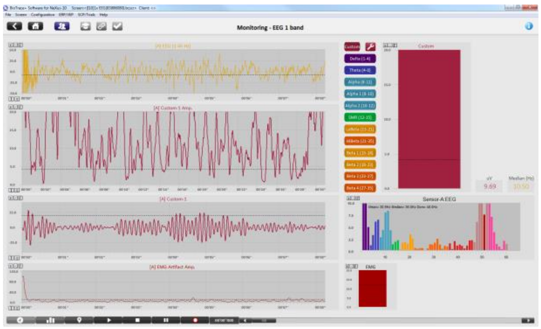


Training - Client screen(s)

It is recommended to use a dual monitor setup for the best user experience.

Monitoring screens

Monitoring screens are not intended for training but can be used for physiological monitoring. Every category in the *Signal Library* contains one or more monitoring screens.

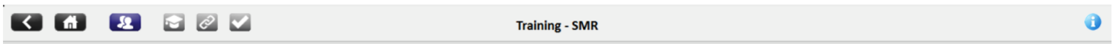


Monitoring

Monitoring screens are not linked to client screens.

Toolbar

The *Toolbar* is located at the top of BioTrace+.

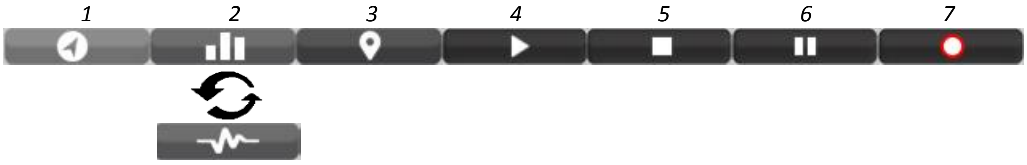


The toolbar contains the following buttons:

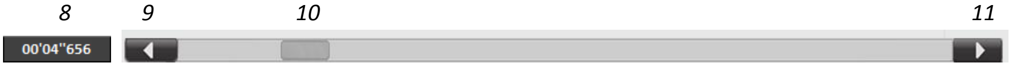
<	Back to previous screen
⌂	Home
👥	Open Client Database
🎓	About...
🔗	Connecting...
✓	Signal check
ℹ	Help button. Descriptive text will appear in a text box when moving the cursor over the buttons.

Session Control Bar

The *Session Control Bar* is placed at the bottom of every training screen. With these buttons it is possible to control a session.



1. Open Screen Browser
2. Session Overview/ Real-time mode
3. Add marker
4. Play/ replay session
5. Stop session
6. Pause session
7. Record session

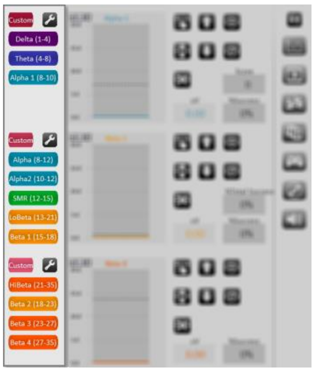


8. The time display of a session
9. Go to start of session
10. Slide session
11. Go to end of session

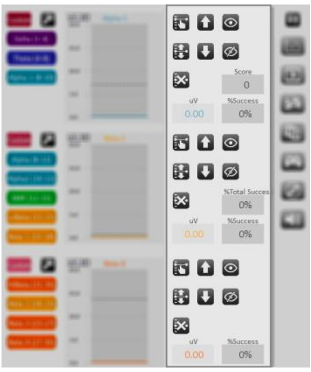
Feedback Controls

Feedback can be controlled with action buttons. Actions can be starting a protocol or loading a feedback screen. BioTrace contains the following types of feedback controls:

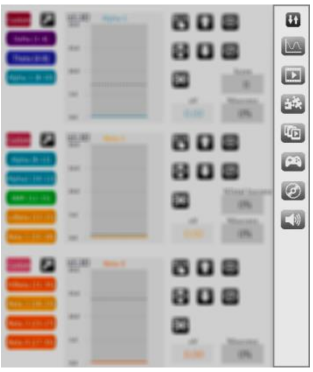
- Frequency Band Controls
- Feedback & Threshold Controls
- Client Feedback Type Controls


Custom
Delta (1-4)
Theta (4-8)
Alpha 1 (8-10)
Custom
Alpha (8-12)
Alpha2 (10-12)
SMR (12-15)
LoBeta (13-21)
Beta 1 (15-18)
Custom
HiBeta (21-35)
Beta 2 (18-23)
Beta 3 (23-27)
Beta 4 (27-35)

Frequency Band Controls


Score
0
uV
%Success
0.00
0%
%Total Succes
0%
uV
%Success
0.00
0%
uV
%Success
0.00
0%

Feedback & Threshold Controls



Feedback Type Controls

For more information about using the action buttons, please refer to Chapter 3. Feedback.

Top menu

The top menu is always available at the top of the screen and contains the following items:

File
Screen
Configuration
EEG
ERP/VEP
SCP/Trials
Help

Build New Screen	Create a new screen by opening the screen editor
Save Screen	Save screen with same name on the same location
Save Screen As...	Save screen as a copy or to a different location
Load a Screen	Open a screen with the Screen Browser
Open Session/ Database	Open a session with the Client Database
Save Channel Set as...	Save a channel set as a copy
Load Channel Set	Load a channel set
Print...	Print a data report
Print Preview	Open a print preview
Print Setup	Open printer settings
Export Session Data	Export multiple data channels in multiple formats
Exit	Exit the program

File
Screen
Configuration
EEG
ERP/VEP
SCP/Trials
Help

Edit Screen	Edit a screen by opening the Screen Editor
Edit Sequence Script	Define a fixed sequence of screens
Grid	Set the resolution of the grid in the Screen Editor
Show Full Screen	Enable full screen mode
Show/Hide Control Buttons	Show or hide the Session Control buttons
Copy Primary > Secondary	Duplicate primary screen to secondary screen
Copy Secondary > Primary	Duplicate secondary screen to primary screen
Close Secondary	Close secondary screen
Session Overview	Switch between Session Overview and Real-Time mode

File
Screen
Configuration
EEG
ERP/VEP
SCP/Trials
Help

Sensor Input Config	Open the Sensor Input Configuration
Channel Set Config	Open the loaded channel set
Channel Freq Control	Open the Frequency Control Panel
Z-Score Configuration	Open Z-Score Configuration
System Settings	Open System Settings
Color Scheme	Open Color Schemes
Multimedia DVD Control	Open Multimedia DVD Control
RSP/HRV Pacer Settings	Open Pacer Settings
FFT Analysis Settings	Open FFT Analysis Settings

File
Screen
Configuration
EEG
ERP/VEP
SCP/Trials
Help

This menu is only available for NeXus-32.

File
Screen
Configuration
EEG
ERP/VEP
SCP/Trials
Help

This menu is only available for NeXus-10 and NeXus-32.

Build New Presentation	Open the ERP/EP Event Presentation Builder
Edit Presentation	Open the Event Presentation Editor
Load Presentation	Load a presentation
ERP/EP Averaged Response	Perform ERP/EP Averaged Response Analysis

File
Screen
Configuration
EEG
ERP/VEP
SCP/Trials
Help

This menu is only available for NeXus-10 and NeXus-32.

Build New Trial Sequence	Build new trial in Trial Configuration
Edit Trial Sequence	Edit trial in Trial Configuration
Load Trial Sequence	Load trial
Trial Analysis/ Report	Open Averaged Response Analysis

File
Screen
Configuration
EEG
ERP/VEP
SCP/Trials
Help

Tutorial Videos	Videos which explain functionality of BioTrace+.
Software Manual	Show BioTrace User Manual
Keyboard Shortcuts	Open Keyboard Shortcuts overview
NeXus User Group (US)	Open User Group for support (EN)
NeXus User Group (DE)	Open User Group for support (DE)
NeXus products	Show NeXus by Mind Media products
BioTrace Updates	Show latest version of BioTrace
What's new	Show What's New document
Activation & Registration	Show status of activation
About BioTrace	Show more information about BioTrace version

Shortcuts

Shortcuts are a quick way to access the main functions. These shortcut actions are:

Screen actions	**Shortcut**
Load a screen in the *Screen Browser*	**L**
Go to *Main Menu* (and back)/ Exit screen	**Esc**
Switch to *Session Overview* (and back)	**Tab**
Enter/exit full screen mode	**F**
Show secondary screen on primary monitor	**Shift** + **<**
Show primary screen on secondary monitor	**Shift** + **>**
Screen shortcuts (user defined)	**F1** - **F12**

Object actions	**Shortcut**
Select Video Files screen	**V**
Multi-media: DVD Navigation screen	**M**
Decrease smoothing of signal	**Shift** + **S**
Increase smoothing of signal	**S**

Editing actions	**Shortcut**
Edit screen	**E**
Refresh screen	**R**
Edit script in the *Screen Sequence Editor*	**Q**
Save screen	**Ctrl** + **S**
Copy an object	**Ctrl** + **C**
Paste an object	**Ctrl** + **V**
Undo changes	**Ctrl** + **Z**

Session actions	**Shortcut**
Open a session in the *Client and Session Database*	**O**
Start a recording	**Enter**
Pause, play in replay mode	**Spacebar**
Add event marker	**Enter**
Auto event marker	**Spacebar**
Frequency Control Panel screen	**Shift** + **C**

Feedback actions	**Shortcut**
Z-Score Configuration screen	**Z**
Toggle threshold visible/invisible	**[**
Toggle threshold active/not active	**]**

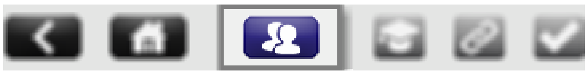
Analysis actions	**Shortcut**
Print data report	**P**
Segment Marker Shortcut Keys screen	**Y**

Channel actions	**Shortcut**
Input configuration in the *Sensor Input Configuration*	**I**
Channel selection in *Select Channels*	**C**

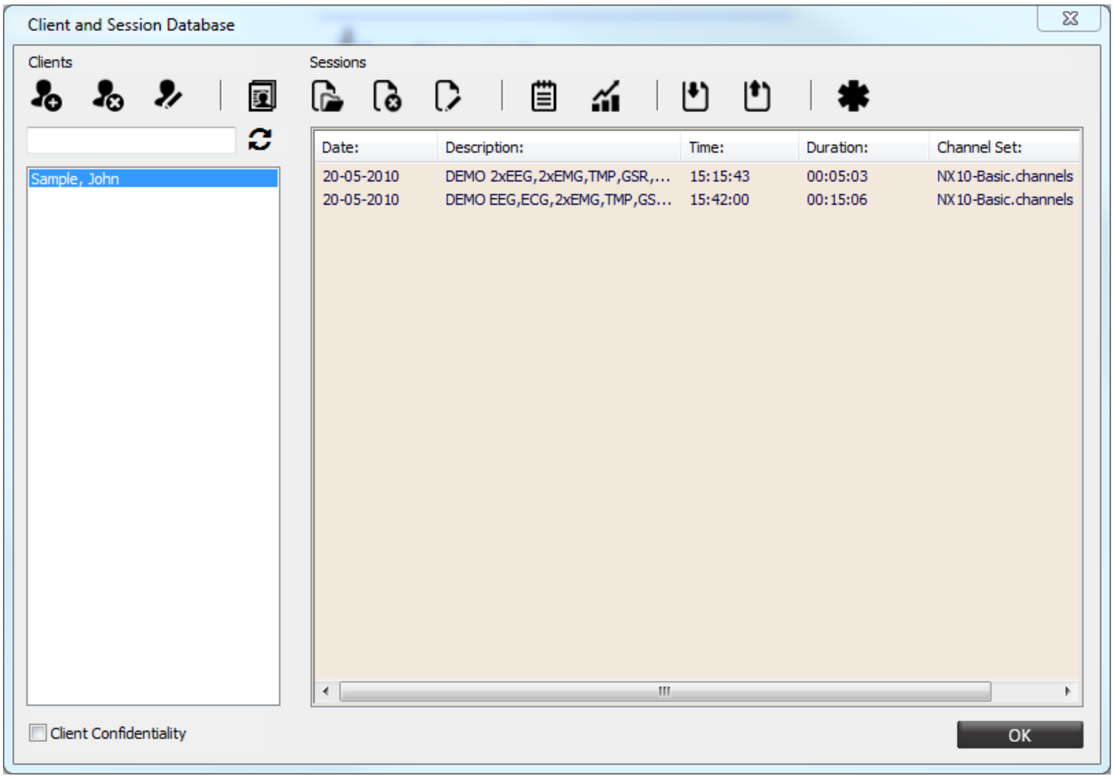
Client Database

The *Client Database* is database where all client and session data is stored. In this database it is possible to manage client data and open previously recorded sessions.

Click the following button in the top menu:



This will open the *Client Database*.



Date:	Description:	Time:	Duration:	Channel Set:
20-05-2010	DEMO 2xEEG,2xEMG,TMP,GSR,...	15:15:43	00:05:03	NX10-Basic.channels
20-05-2010	DEMO EEG,ECG,2xEMG,TMP,GS...	15:42:00	00:15:06	NX10-Basic.channels

The *Client Database* contains the following features:

- Add new client
- Delete client
- Edit client
- Open client report

- Open session
- Delete session
- Rename session
- Session notes
- Trend reports
- Import sessions
- Export sessions
- Clinic information

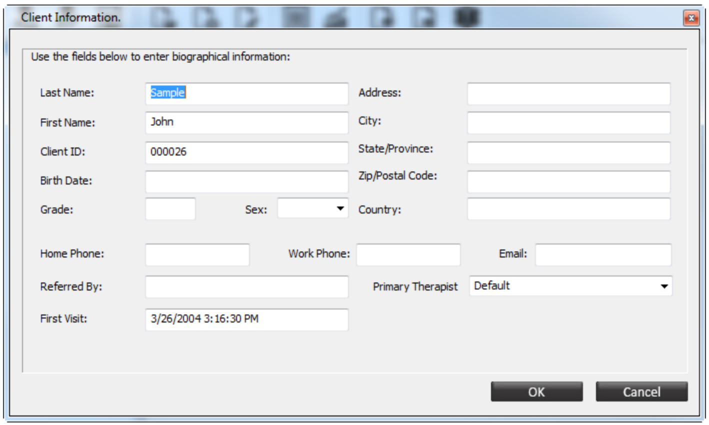
More information about managing sessions in the Client Database, please refer to chapter 2. Sessions

---

Adding and editing clients

When adding a new or editing a client, the *Client Information* screen will appear.

or



Use the fields below to enter biographical information:

Last Name: Sample
First Name: John
Client ID: 000026
Birth Date:
Grade:
Sex:
Address:
City:
State/Province:
Zip/Postal Code:
Country:
Home Phone:
Work Phone:
Email:
Referred By:
Primary Therapist: Default
First Visit: 3/26/2004 3:16:30 PM

Fill out or edit all available information about the client. At least the *Last name* and *First name* fields have to be filled out. Click the **OK** button to save the client information.

Click the following button to delete a client:

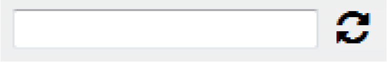
Be aware though that by deleting a client, all the client information, including all the sessions will be deleted.

Check **Client Confidentiality** above the client overview on the left.

☐ Client Confidentiality

This will mask client names.

Clients can be searched by entering the last name in the search field. To clear the search, press the ⟳ button.



Creating a client report

Click the following button for creating or editing a client report:

This will open the *Client Diagnostic Report* screen.
In this screen additional information of the client can be added or edited, like:

- Symptoms
- Diagnoses
- Clinical suggestions
- Training protocol

- Treatment channel
- Evaluation
- General notes

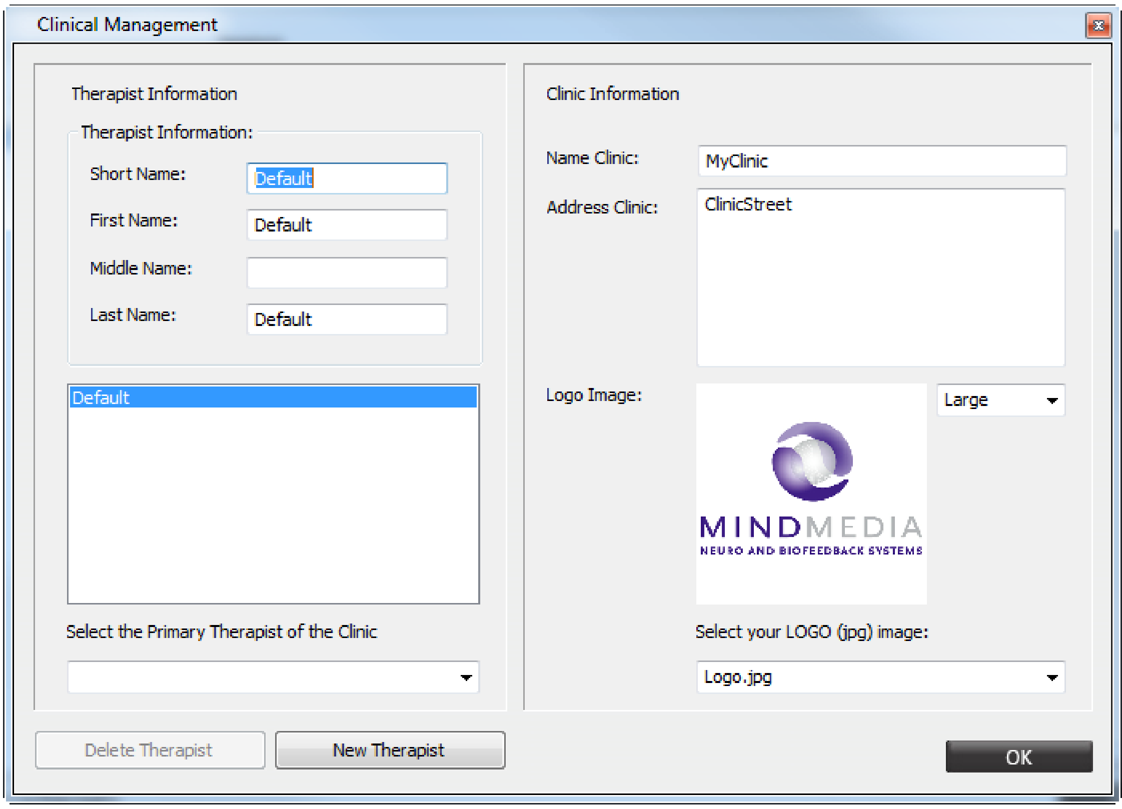
Click **Print report** to print the client report.

Edit clinic information

Click the following button in the *Client Database*:

✱

This will open the *Clinical Management* screen.



Therapist Information:

Short Name: Default

First Name: Default

Middle Name:

Last Name: Default

Default

Select the Primary Therapist of the Clinic

Name Clinic: MyClinic

Address Clinic: ClinicStreet

Logo Image: Large

Select your LOGO (jpg) image: Logo.jpg

Enter therapist information and clinic information. This information will show up when printing reports.

To add a new therapist, select the **New Therapist** button.

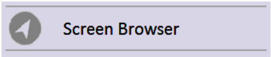
New Therapist

Reports can be created with an own logo. By putting the logo in to the BioTrace+ Folder ..\BioTrace\Images., the logo can be chosen from the drop down menu on the right bottom.

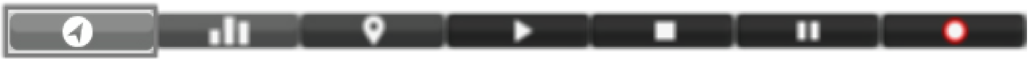
Make sure to name the logo Logo<number>, e.g. logo1, logo12. For an optimal result, the size of the logo should be 450 x 450 pixels.

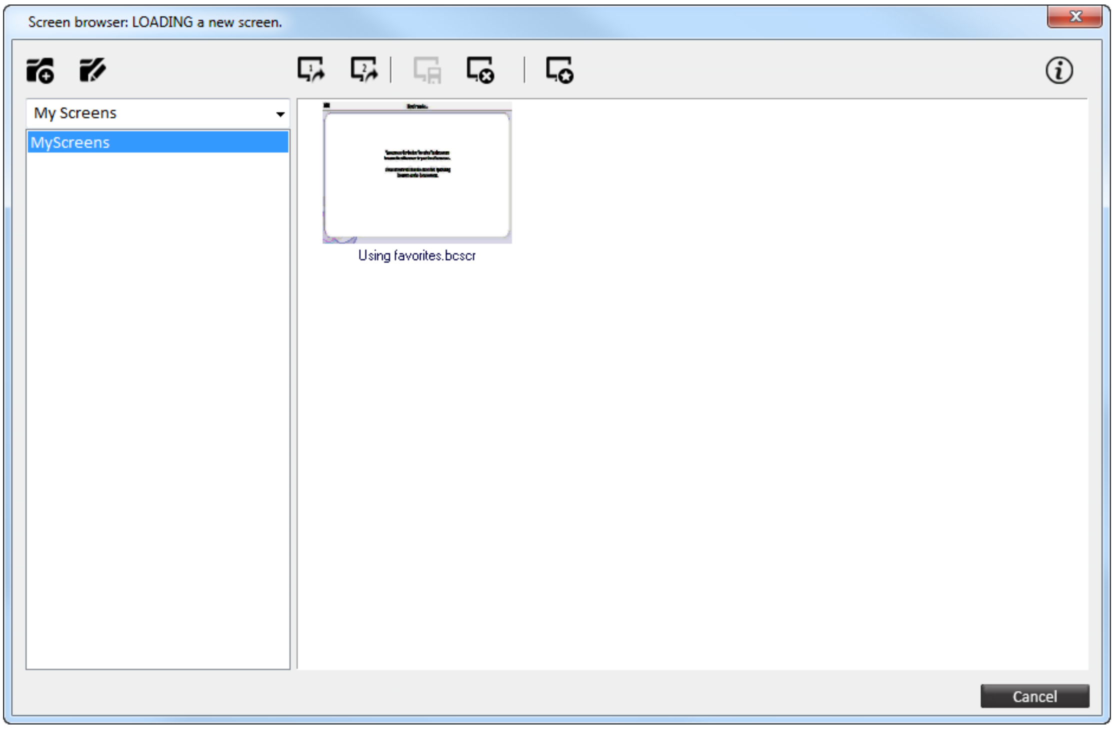
Screen Browser

The *Screen Browser* contains all available feedback screens in BioTrace+. Open the *Screen Browser* by clicking the following button on *Home*:


Screen Browser

Alternatively by clicking the **Screen Browser** button in the *Session Control Bar*.




Screen browser: LOADING a new screen.
My Screens
MyScreens
Using favorites.bcscr
Cancel

Add new category*

Rename category*

*Only applicable for *My Screens*

Load screen as primary screen

Load screen as secondary screen

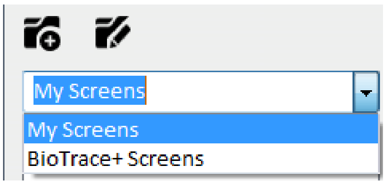
Save screen

Delete screen

Bookmark screen to favorites

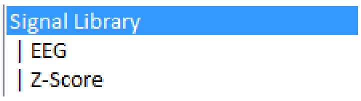
Show help text

The *Screen Browser* contains two main categories:


My Screens
My Screens
BioTrace+ Screens

My Screens display your own screens. It is possible to add new categories and to rename an existing category. *BioTrace+ Screens* show all screens which are available in BioTrace+.

Choose between the several libraries or favorites. Choose a category from the left side of the browser.



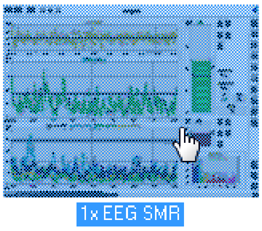
Signal Library
| EEG
| Z-Score

Open a screen by selecting the screen and click the following buttons:

for loading as primary screen for a secondary screen

Add screens to favorites

Select a screen in the *Screen Browser*.



Click the following button for bookmarking the screen to favorites.

Enter the name for the screen and click **OK**. The screen has now been bookmarked as favorites.

Open **Favorites** on the *Home* screen or restart the *Screen Browser* in order to start using the bookmarked screen.

Deleting favorites

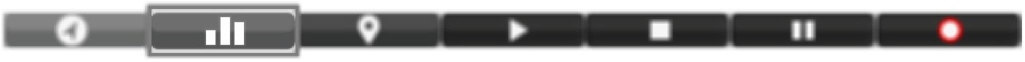
Select the bookmarked screen inside the **Favorites** folder and click to delete the bookmarked screen.

Shortcuts

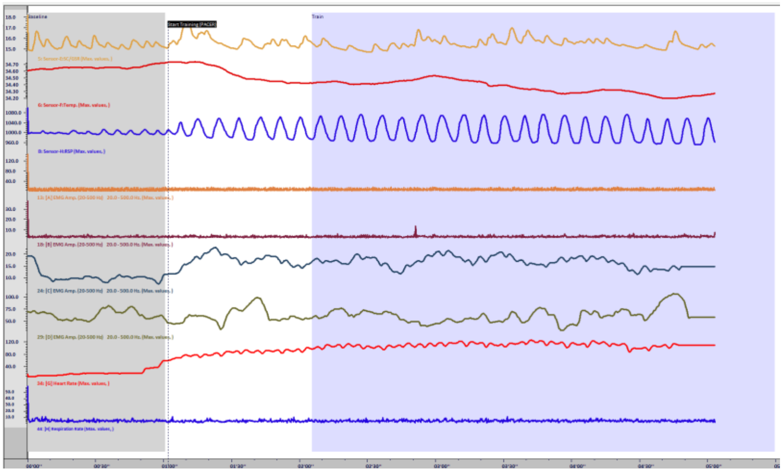
It is also possible to assign a function key (F1-F12) to a screen. Select a screen and press one of the function keys (**F1**-**F12**). Press the **K** key for an overview of the shortcuts. The defined shortcut can be found on the right side of this window. Hold the **Ctrl** for loading this screen as a secondary screen.

Session Overview

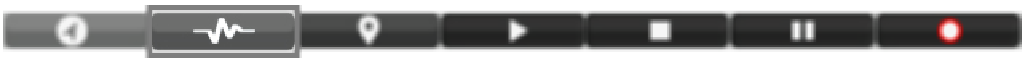
Session Overview is used to view or review data and perform (offline) analysis.



This will open the **Session Overview**.



Switch back to *Real-Time* mode by clicking the following button in the *Session Controls*:



Alternatively press the **Tab** key to quickly switch between both (or by clicking Screen > **Session Overview** in the top menu).

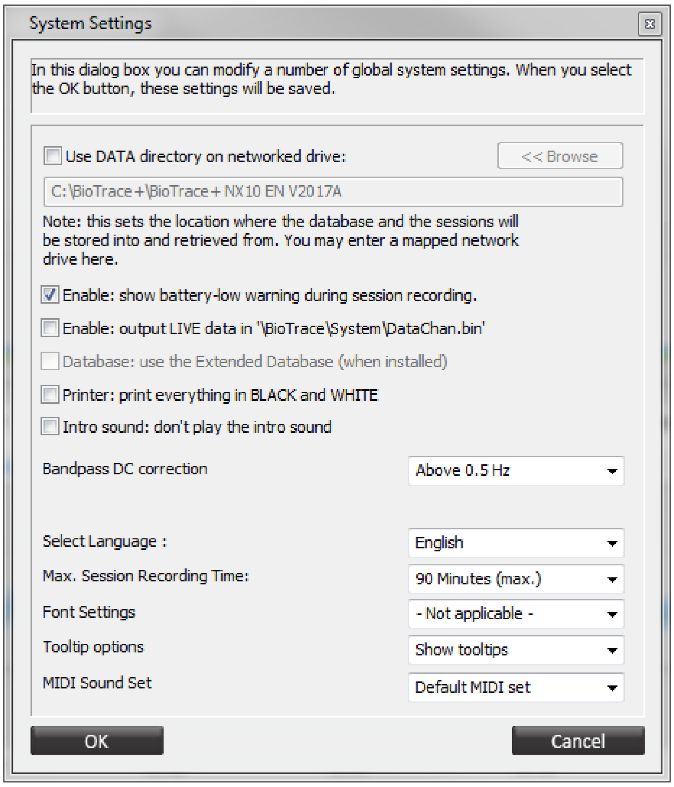
It is also possible to switch between modes during a recording.

For more information about data analysis, please refer to 4. Review and 5. Analysis & Reporting.

Settings

System settings

Open the *System Settings* by selecting Configuration > **System Settings** in the top menu.



System Settings

In this dialog box you can modify a number of global system settings. When you select the OK button, these settings will be saved.

☐ Use DATA directory on networked drive:

C:\BioTrace+\BioTrace+ NX10 EN V2017A

Note: this sets the location where the database and the sessions will be stored into and retrieved from. You may enter a mapped network drive here.

☑ Enable: show battery-low warning during session recording.

☐ Enable: output LIVE data in '\BioTrace\System\DataChan.bin'

☐ Database: use the Extended Database (when installed)

☐ Printer: print everything in BLACK and WHITE

☐ Intro sound: don't play the intro sound

Bandpass DC correction	Above 0.5 Hz
Select Language :	English
Max. Session Recording Time:	90 Minutes (max.)
Font Settings	- Not applicable -
Tooltip options	Show tooltips
MIDI Sound Set	Default MIDI set

Select *Use data directory* option for data storage on a networked drive. In that case several computers will be able to have access to the same database. Browse for a database.

Please refer to 2. Sessions for more information about session backup.

The *Battery-low warning* option enables an alert when the battery of the device turns low during operation. This option is enabled by default.

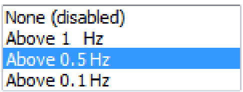
The *Output live data* option can be enabled for storing output data in '\BioTrace\System\DataChan.bin'.

The extended database option shall be selected when using the database system incorporated in BioTrace+ versions released prior to 2006.

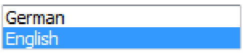
Printer: black & white. Enable this option for printing all reports in black and white.

The *Intro sound* can be disabled by checking this option. This mutes the intro and outro sound during startup and exit.

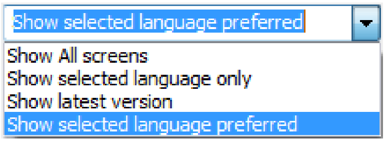
The *Bandpass DC correction* option sets bandpass correction. Choose one of the following options:


None (disabled)
Above 1 Hz
Above 0.5 Hz
Above 0.1 Hz

Select the *Language* of all menus and screens. Choose between (other languages may be available):

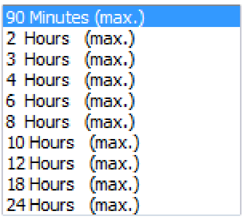

German
English

The option *Select Screen Selection Strategy* sets which screens are visible in the screen browser and the routing/menu buttons.

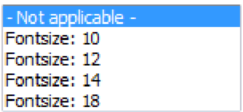

Show selected language preferred
Show All screens
Show selected language only
Show latest version
Show selected language preferred

- *Show All screens* shows all screens available for this instance of BioTrace+.
- *Show selected language only* shows only screens from the selected language.
- *Show latest version* shows the screens with the highest available version number from the own or the English language.
- *Show selected language preferred* shows screens from the own or the English language with a preference for the own language, regardless of the version number of the English screen. This last option is the default option in BioTrace+.

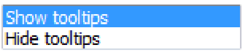
The *Session recording time* option sets the recording maximum session recording time. Choose between the following time settings:


90 Minutes (max.)
2 Hours (max.)
3 Hours (max.)
4 Hours (max.)
6 Hours (max.)
8 Hours (max.)
10 Hours (max.)
12 Hours (max.)
18 Hours (max.)
24 Hours (max.)

With the *Font settings* option font size of objects on therapist screens can be adjusted. Choose between not applicable (default), 10, 12, 14, and 18.

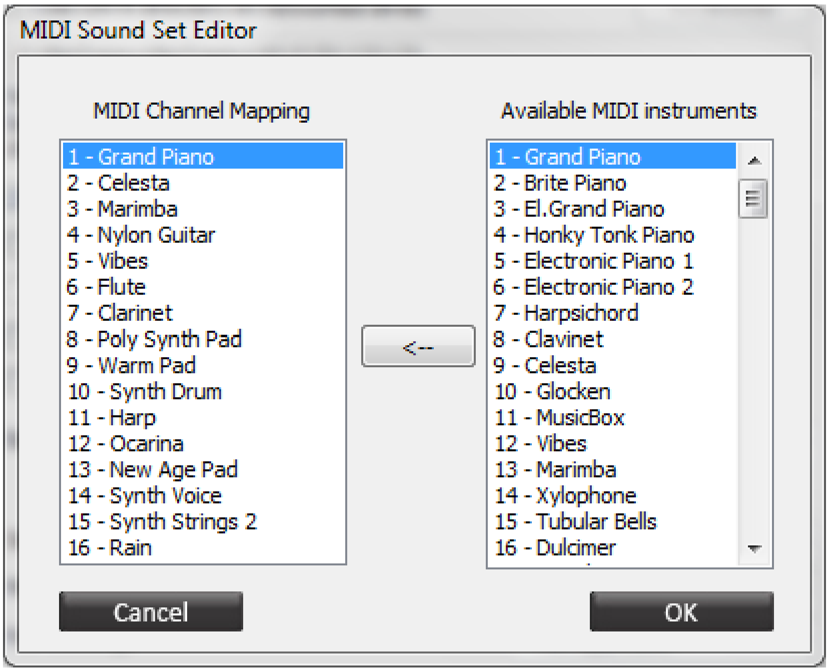

- Not applicable -
Fontsize: 10
Fontsize: 12
Fontsize: 14
Fontsize: 18

The *Tooltip* option enables the tooltip when hovering over objects.


Show tooltips
Hide tooltips

The *MIDI Sound Set* option allows choosing between the *default MIDI set* and *User MIDI set.*

The *User MIDI set* allows to create a custom MIDI set of up to 16 MIDI channels, selectable from 128 available MIDI instruments.



MIDI Channel Mapping

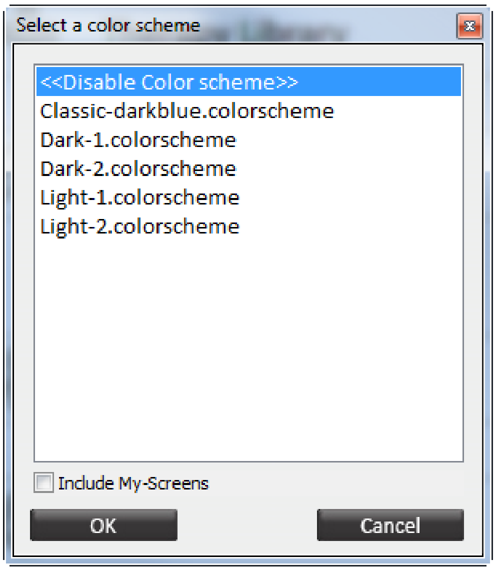
1 - Grand Piano
2 - Celesta
3 - Marimba
4 - Nylon Guitar
5 - Vibes
6 - Flute
7 - Clarinet
8 - Poly Synth Pad
9 - Warm Pad
10 - Synth Drum
11 - Harp
12 - Ocarina
13 - New Age Pad
14 - Synth Voice
15 - Synth Strings 2
16 - Rain

Available MIDI instruments

1 - Grand Piano
2 - Brite Piano
3 - El.Grand Piano
4 - Honky Tonk Piano
5 - Electronic Piano 1
6 - Electronic Piano 2
7 - Harpsichord
8 - Clavinet
9 - Celesta
10 - Glocken
11 - MusicBox
12 - Vibes
13 - Marimba
14 - Xylophone
15 - Tubular Bells
16 - Dulcimer

Color schemes

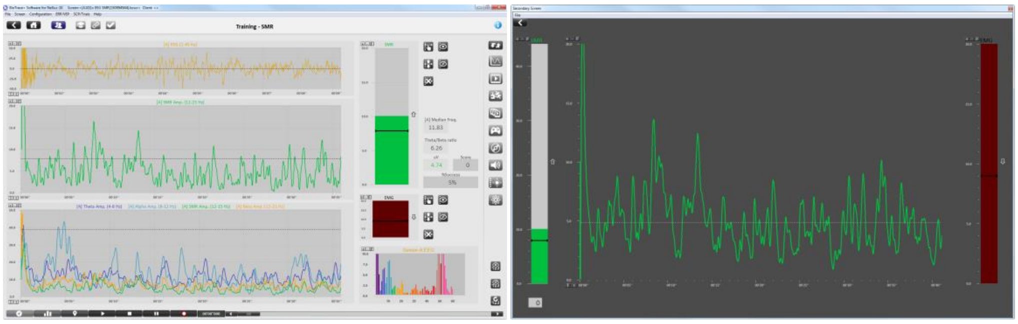
The Color schemes enable to load different color layout of the therapist and client screens. Open the *Select a color scheme* screen by selecting Configuration > **Color Scheme** in the top menu.



<<Disable Color scheme>>
Classic-darkblue.colorscheme
Dark-1.colorscheme
Dark-2.colorscheme
Light-1.colorscheme
Light-2.colorscheme

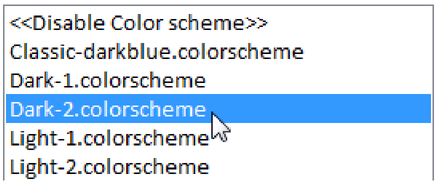
☐ Include My-Screens

Disable the color scheme **<<Disable Color scheme>>** to leave the screens in the original color set. Color schemes are disabled by default.

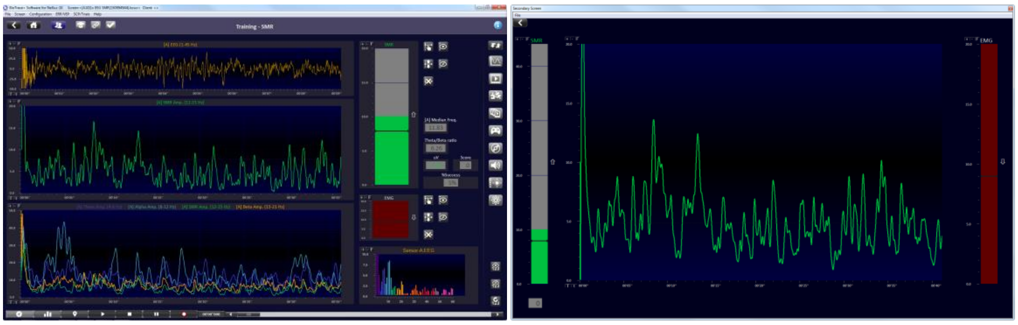


Disable Color scheme/ default color settings

Select one of the various color schemes, and click **OK** to apply the scheme for all therapist and client screens.



<<Disable Color scheme>>
Classic-darkblue.colorscheme
Dark-1.colorscheme
Dark-2.colorscheme
Light-1.colorscheme
Light-2.colorscheme



Dark-2.colorscheme enabled

Check Include My-Screens for enabling a color scheme to all available screens in My Screens.

☑ Include My-Screens

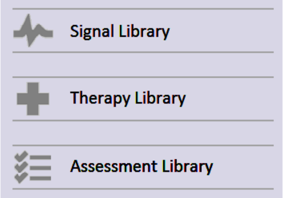
2. Sessions

This chapter describes recording sessions and how to store client data.

Refer to applicable hardware manual for additional information.

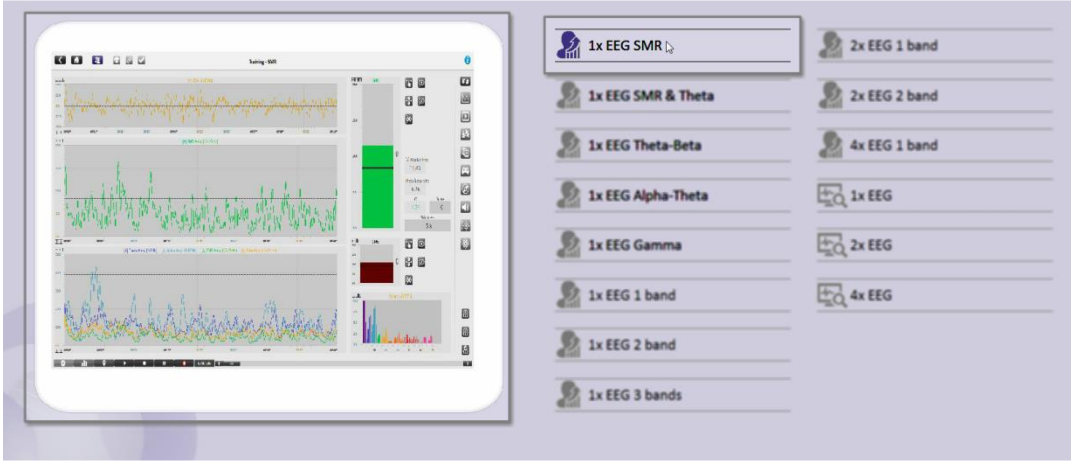
Starting a session

Start a session by using one of the following libraries on the *Home* menu:

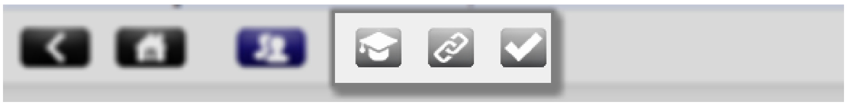

Signal Library
Therapy Library
Assessment Library

Alternatively start a session with the Screen Browser. Please refer to 1. Basics.

Select a screen in the list. A preview is shown when hovering over a button.


1x EEG SMR
1x EEG SMR & Theta
1x EEG Theta-Beta
1x EEG Alpha-Theta
1x EEG Gamma
1x EEG 1 band
1x EEG 2 band
1x EEG 3 bands
2x EEG 1 band
2x EEG 2 band
4x EEG 1 band
1x EEG
2x EEG
4x EEG

Now the screen is loaded. Use the *Toolbar* getting more information about the signal, learn how to connect the hardware, or perform a signal check.

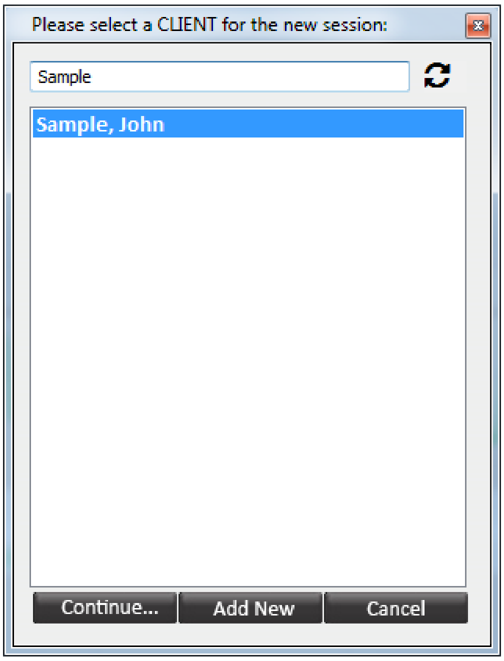


Recording a session

It is not possible to start a recording if the NeXus is not paired to the computer. Always make sure the device has sufficient power before starting a recording.

Click the **Record** button of the *Session Control Bar* at the bottom of the screen, to start a recording.

The *Select a client* dialog box will appear. Clients can be searched by entering the last name in the search field. To clear the search, press the ↻ button.



Please select a CLIENT for the new session:

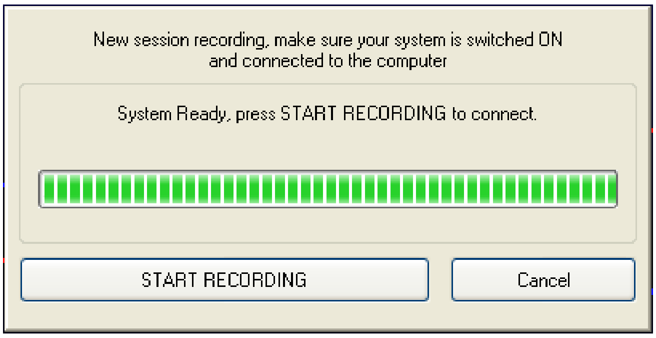
Sample

Sample, John

Select a client and click **Continue...**

Note that client information can be edited in the Client Database.

The *New session recording* screen will appear. The computer starts the connecting to the NeXus.



New session recording, make sure your system is switched ON and connected to the computer

System Ready, press START RECORDING to connect.

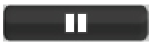
Click **Start recording** to start recording a session.

To create a new client, click the **Add new** button in the *Select a client* screen.

The *Client Information* screen will appear. Fill out at least a *Last name* and a *First name*. Click **OK** to save the new client.

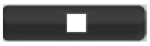
Pausing a session

In order to pause a recording, click **Pause** in the *Session Control Bar*.

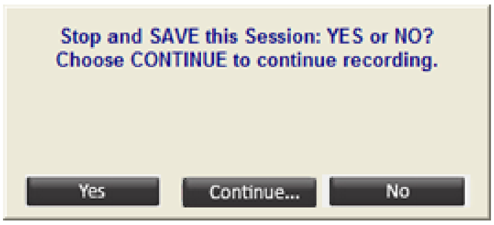


Saving a session

In order to stop a recording, click **Stop** in the *Session Control Bar*.

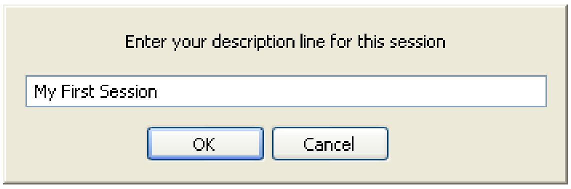


An alert box will appear.



Stop and SAVE this Session: YES or NO?
Choose CONTINUE to continue recording.

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



Enter your description line for this session

My First Session

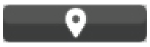
Confirm by clicking **OK**, the session is now saved.

Click **Continue...** to continue recording the session.
Click **No** to end the session without saving it.

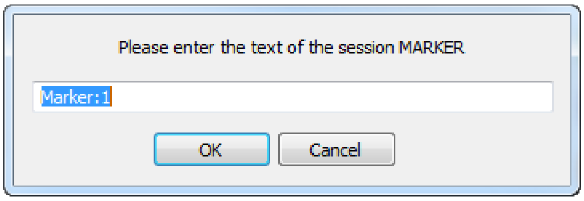
It is possible to rename or delete a session in the Client Database. Please refer to chapter 1. Basics.

Adding markers

Markers can define a certain event during a recording. These markers can be added manually by pressing the following button in *Session controls* (or by pressing **Enter**):



The following dialog box appears for naming markers.



Please enter the text of the session MARKER

Marker:1

It is also possible to set automatic consecutive numbering (1, 2, ..) markers by pressing **Space bar**. Markers by using 'space bar' or 'enter' will show up as a dotted line in the session overview screen.

Please note that the marker is set at the exact time the 'space bar' or 'enter' key are pressed.

Use the NeXus device for adding markers or triggers:

- NeXus-4 and NeXus-32: Press the on/off button
- NeXus-10: Press the marker button

Markers generated by NeXus will show up as a straight pink line in the session overview screen.

For more information about markers, please refer to chapter 4. Review

---

Opening a session

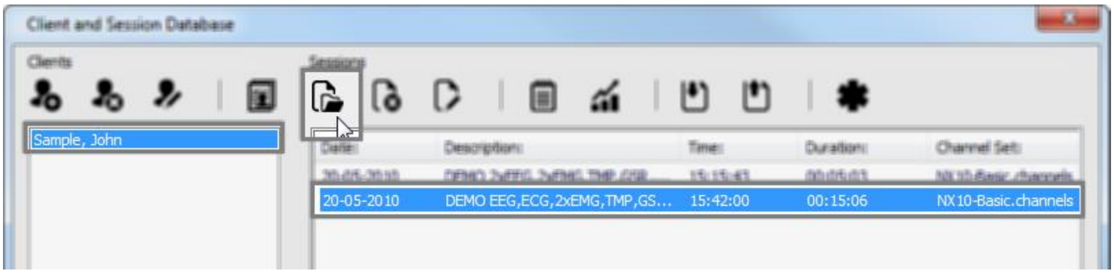
Click the **Client Database** button in the *Top Menu* for opening a session

Or go to File > **Open Session/Database** in the top menu.

Select a client on the left side. All sessions of this client are shown on the right.

Open a session by clicking the following button:

or by double clicking the session.



Sample, John

Date:	Description:	Time:	Duration:	Channel Set:
20-05-2010	DEMO EEG,ECG,2xEMG,TMP,GS...	15:42:00	00:15:06	NX10-Basic.channels

---

'John Sample' is a sample client with prerecorded sessions.

If a screen has not been loaded yet, a dialog box will appear. Click **Yes** to load a screen in the *Screen Browser*.

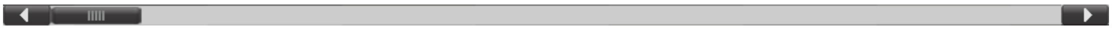
Select a screen which can display the recorded data, like an EMG screen for a session that contains EMG data.

Replaying a session

Click the **Play** button of the session control buttons for reviewing a session.

Press the **Stop** button for stopping the replay.

The time slider can be used during review mode only, to scroll through the session.



Click inside the scrollbar and move the scrollbar while holding (dragging) the scrollbar. This function only works in case a session has been loaded.

Another way to navigate is by using the session control keys:

- Left cursor (arrow) key: steps back 1 second
- Right cursor (arrow) key: steps forward 1 second
- Page-Down key: steps forward 5 seconds
- Page-Up key: steps back 5 seconds

Holding the **Ctrl** key down while using the cursor keys, will step through the session in steps of 50 milliseconds.

Editing sessions

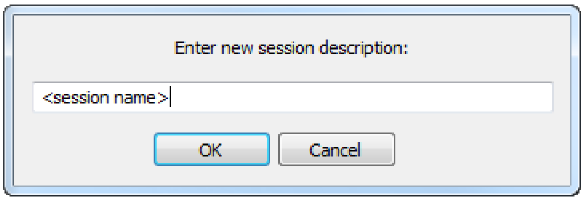
It is possible to edit sessions in the *Client Database.*

Deleting sessions

Delete one or multiple sessions by clicking the following button

Renaming sessions

Rename a session by selecting a session and clicking the following button



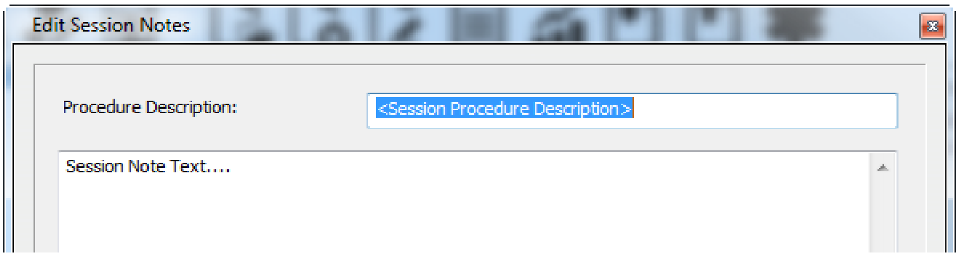
Enter new session description:

<session name>

Enter a description and click **OK**

Adding session notes

Click the following button for adding or editing session notes:



Procedure Description: <Session Procedure Description>

Session Note Text....

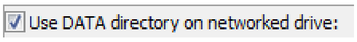
Add a description and enter session note text. Click **OK** for adding the session notes.

Backing up sessions

Store data on networked drive

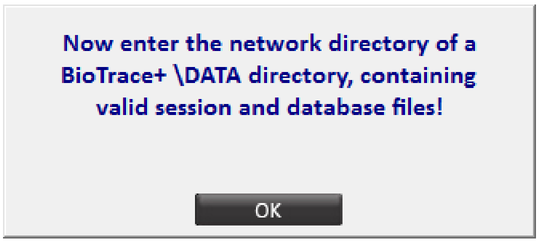
With data storage on a networked drive several computers will be able to have access to the same database.

Click Configuration > **System Settings** in the top menu. This will open *System Settings*. Check the following box:



☑ Use DATA directory on networked drive:

A dialog box will appear for entering the network drive.



Now enter the network directory of a BioTrace+ \DATA directory, containing valid session and database files!

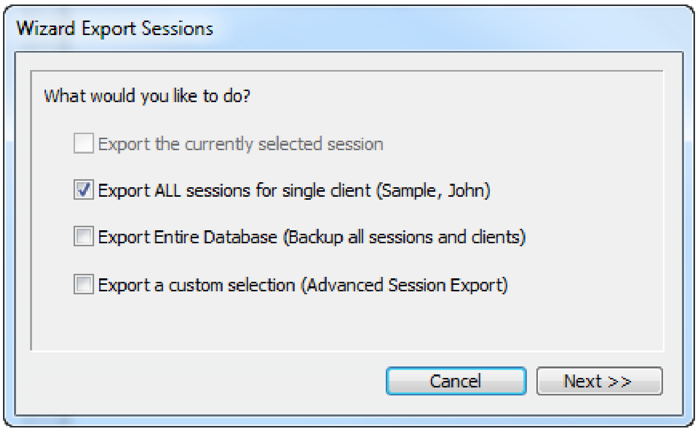
After clicking **OK** a *.mdb file can be selected. Click **Open** to store data in this selected file.

The entire folder Data will have to be moved to the networked drive in order to perform this procedure.

Exporting sessions

Open the *Client and Session Database*, select a session from a client and click the following button:

This will open the *Wizard Export Sessions*.



Wizard Export Sessions

What would you like to do?

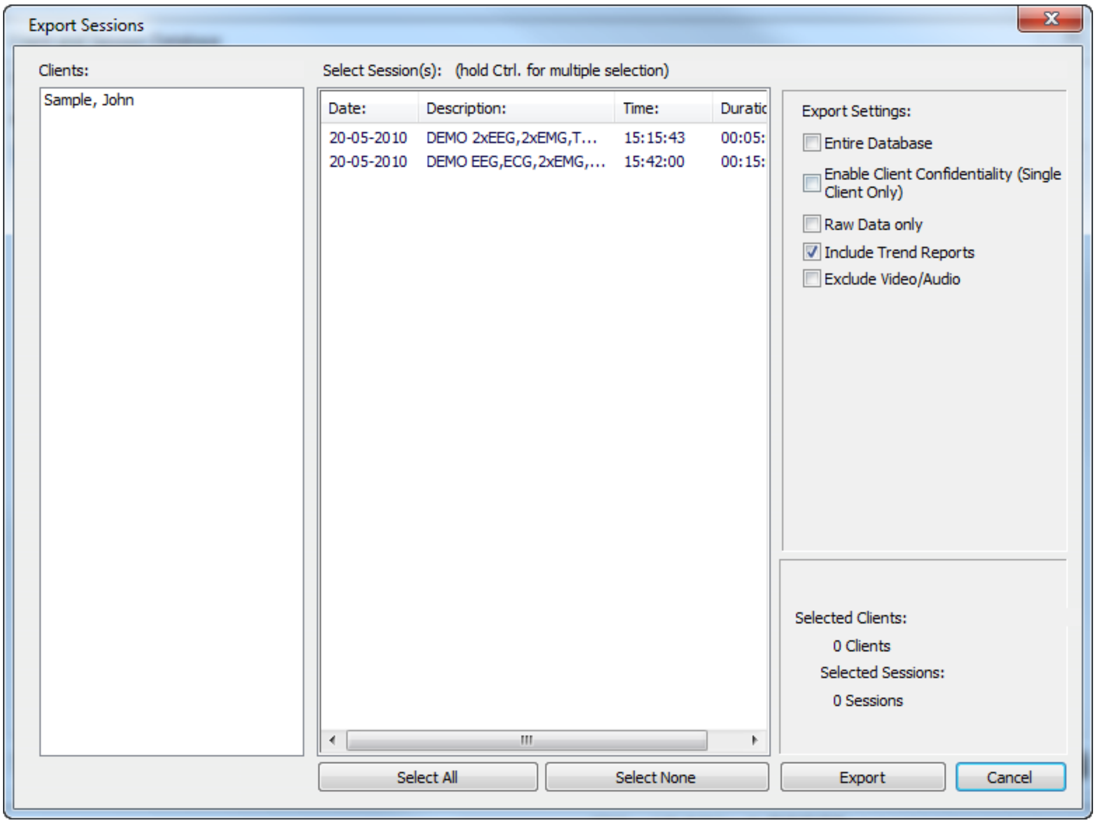
☐ Export the currently selected session
☑ Export ALL sessions for single client (Sample, John)
☐ Export Entire Database (Backup all sessions and clients)
☐ Export a custom selection (Advanced Session Export)

Choose between the following options:

- Export the selected session
- Export all sessions for the selected client
- Export the entire database
- Export a custom selection.

The first three options will export directly to *.bcd file. Select an option and click **Next.** Click the **Save** button to export a session.

Select **Export a custom selection** for more options. This will open the *Export Sessions* screen.



Export Sessions

Clients:

Sample, John

Select Session(s): (hold Ctrl. for multiple selection)

Date:	Description:	Time:	Duratic
20-05-2010	DEMO 2xEEG,2xEMG,T...	15:15:43	00:05:
20-05-2010	DEMO EEG,ECG,2xEMG,...	15:42:00	00:15:

Export Settings:

☐ Entire Database
☐ Enable Client Confidentiality (Single Client Only)
☐ Raw Data only
☑ Include Trend Reports
☐ Exclude Video/Audio

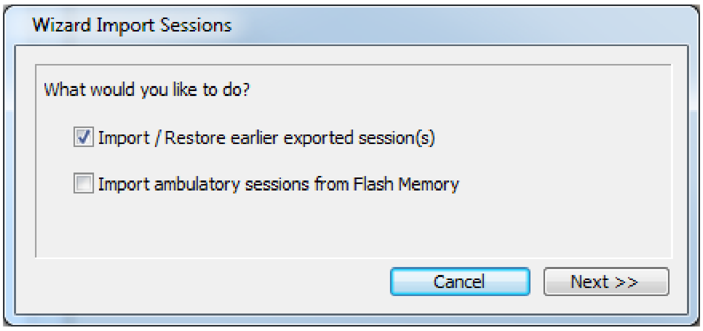
Selected Clients:
0 Clients
Selected Sessions:
0 Sessions

It is possible to select multiple sessions and/or clients. Edit *Export Settings* for advanced options like client confidentiality, raw data only, include trend reports, and exclude video/audio. Click **Export** for exporting the selection to a *.bcd file.

Importing sessions

Open the *Client and Session Database* and click the following button:

This will open the *Wizard Import Sessions* screen.



What would you like to do?

☑ Import / Restore earlier exported session(s)

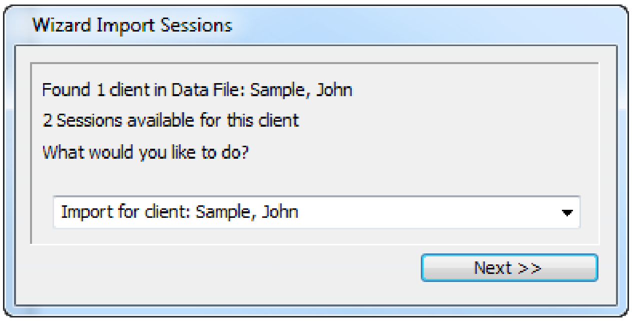
☐ Import ambulatory sessions from Flash Memory

Import exported session

Select **Import / Restore earlier exported session(s)** to import a previous exported session.

Click the **Next** button. An alert box will appear.

Click **OK** and select a *.bcd file. Click **Open**. The *Wizard Import Session* screen will appear.



Found 1 client in Data File: Sample, John

2 Sessions available for this client

What would you like to do?

Import for client: Sample, John

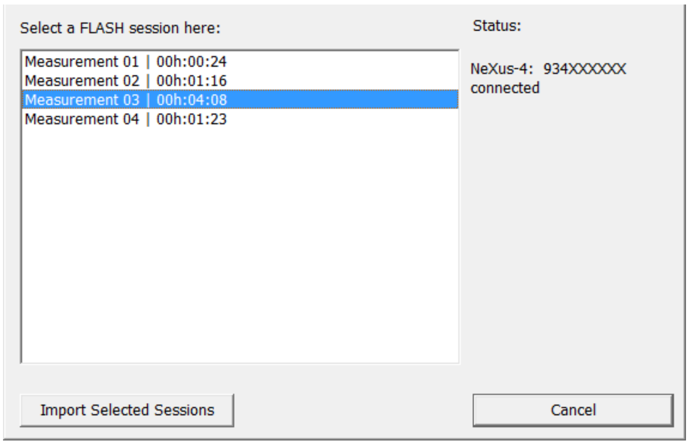
Select a client or create a new client from the drop-down menu. Click **Next >>** to import the file.

Import from flash memory for NeXus-4

Import ambulatory sessions by selecting **Import ambulatory sessions from Flash Memory**.

When this option is not available, make sure that the latest driver is installed.

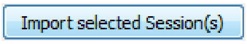
This will open the *Import flash* screen.


Select a FLASH session here:
Status:
Import Selected Sessions
Cancel

Measurement 01 | 00h:00:24
Measurement 02 | 00h:01:16
Measurement 03 | 00h:04:08
Measurement 04 | 00h:01:23

NeXus-4: 934XXXXXX
connected

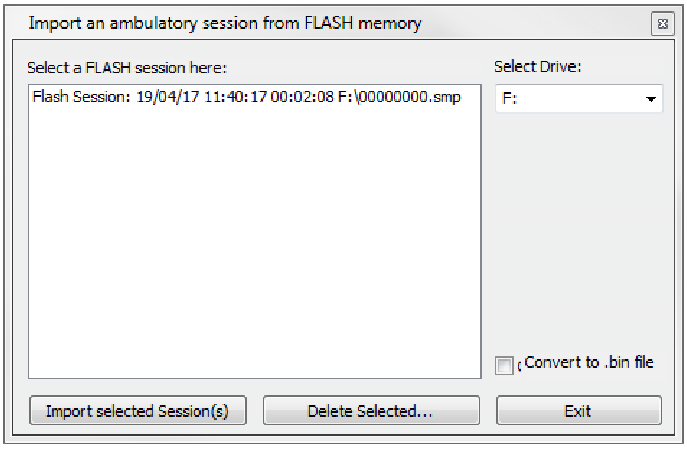
Select one or more sessions and click the **Import Selected Sessions** button to import the session into the *Client and Session Database*.


Import selected Session(s)

Import from flash memory for NeXus-10/NeXus-32

Import ambulatory sessions by selecting **Import ambulatory sessions from Flash Memory**.

This will open the *Import flash* screen.


Import an ambulatory session from FLASH memory
Select a FLASH session here:
Select Drive:
Import selected Session(s)
Delete Selected...
Exit

Flash Session: 19/04/17 11:40:17 00:02:08 F:\00000000.smp

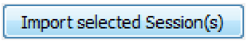
Select Drive: F:

☐ Convert to .bin file

Check **Convert to .bin file** if needed

BioTrace+ can handle ambulatory session of up to 24 hours. Ambulatory sessions that are longer than 24 hours need to be converted to .bin files which will present the data as arrays of float values.

Select one or more sessions and click the **Import Selected Sessions** button to import the sessions into the *Client and Session Database*.



Please note that after importing an ambulatory session you need to recompute the session overview in order to assign the virtual data channels to your sensor input channels.

Open the desired client screen where the recorded data has to be displayed.

*Load the ambulatory session via the **Client and Session Database** and switch to the overview screen.*

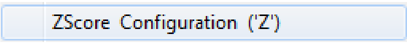
*Click right mouse button in the overview screen, select **Recompute Session Overview** and click **Yes** twice to recompute and save the session.*

Z-Score

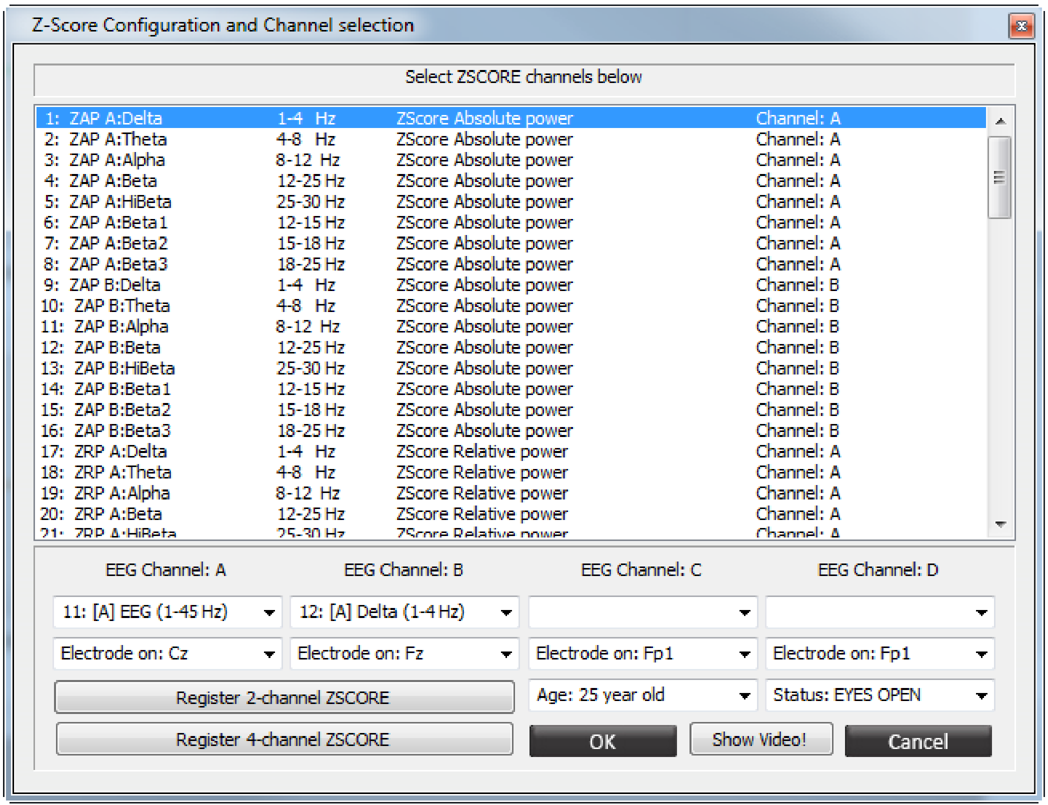
Read the Z-Score white paper for more information about how to use Z-Score. Visit our Knowledge Base (http://www.mindmedia.com/support) for an overview of the latest guides.

Configuring Z-Score

Go to the top menu and select Configuration > **ZScore Configuration** (or press the **Z** key).



This will open the *Z Score Configuration and Channel Selection*.


Z-Score Configuration and Channel selection
Select ZSCORE channels below

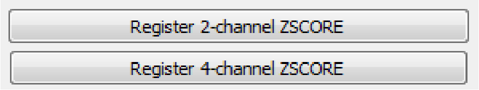
1: ZAP A:Delta	1-4 Hz	ZScore Absolute power	Channel: A
2: ZAP A:Theta	4-8 Hz	ZScore Absolute power	Channel: A
3: ZAP A:Alpha	8-12 Hz	ZScore Absolute power	Channel: A
4: ZAP A:Beta	12-25 Hz	ZScore Absolute power	Channel: A
5: ZAP A:HiBeta	25-30 Hz	ZScore Absolute power	Channel: A
6: ZAP A:Beta1	12-15 Hz	ZScore Absolute power	Channel: A
7: ZAP A:Beta2	15-18 Hz	ZScore Absolute power	Channel: A
8: ZAP A:Beta3	18-25 Hz	ZScore Absolute power	Channel: A
9: ZAP B:Delta	1-4 Hz	ZScore Absolute power	Channel: B
10: ZAP B:Theta	4-8 Hz	ZScore Absolute power	Channel: B
11: ZAP B:Alpha	8-12 Hz	ZScore Absolute power	Channel: B
12: ZAP B:Beta	12-25 Hz	ZScore Absolute power	Channel: B
13: ZAP B:HiBeta	25-30 Hz	ZScore Absolute power	Channel: B
14: ZAP B:Beta1	12-15 Hz	ZScore Absolute power	Channel: B
15: ZAP B:Beta2	15-18 Hz	ZScore Absolute power	Channel: B
16: ZAP B:Beta3	18-25 Hz	ZScore Absolute power	Channel: B
17: ZRP A:Delta	1-4 Hz	ZScore Relative power	Channel: A
18: ZRP A:Theta	4-8 Hz	ZScore Relative power	Channel: A
19: ZRP A:Alpha	8-12 Hz	ZScore Relative power	Channel: A
20: ZRP A:Beta	12-25 Hz	ZScore Relative power	Channel: A
21: ZRP A:HiBeta	25-30 Hz	ZScore Relative power	Channel: A

EEG Channel: A	EEG Channel: B	EEG Channel: C	EEG Channel: D
11: [A] EEG (1-45 Hz)	12: [A] Delta (1-4 Hz)		
Electrode on: Cz	Electrode on: Fz	Electrode on: Fp1	Electrode on: Fp1
		Age: 25 year old	Status: EYES OPEN

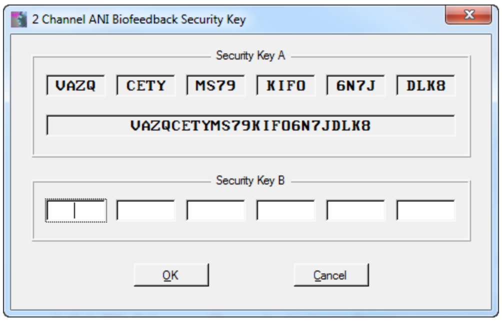
Select EEG channels 1 to 4 with the related electrode position. It is also possible to select age and condition (eyes closed or open).

Activating Z-Score

Click the buttons at the bottom of the *Z Score Configuration and Channel Selection* screen for registering Z-Score.


Register 2-channel ZSCORE
Register 4-channel ZSCORE

Read the license agreement and accept this agreement. This will generate a security key called 'Security Key A'.


2 Channel ANI Biofeedback Security Key
Security Key B
OK
Cancel

Security Key A

VAZQ CETY MS79 KIFO 6N7J DLK8

VAZQCETYMS79KIFO6N7JDLK8

Mail this 'Security Key A' to the supplier. After receiving 'Security Key B', enter this key and click **OK**. Z-Score will now be activated.

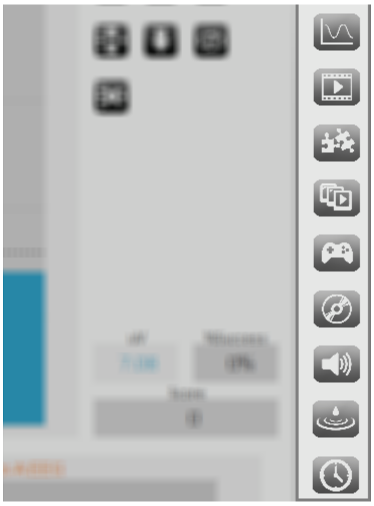
3. Feedback

This chapter describes the feedback settings during a session.

Types of feedback

Selecting feedback

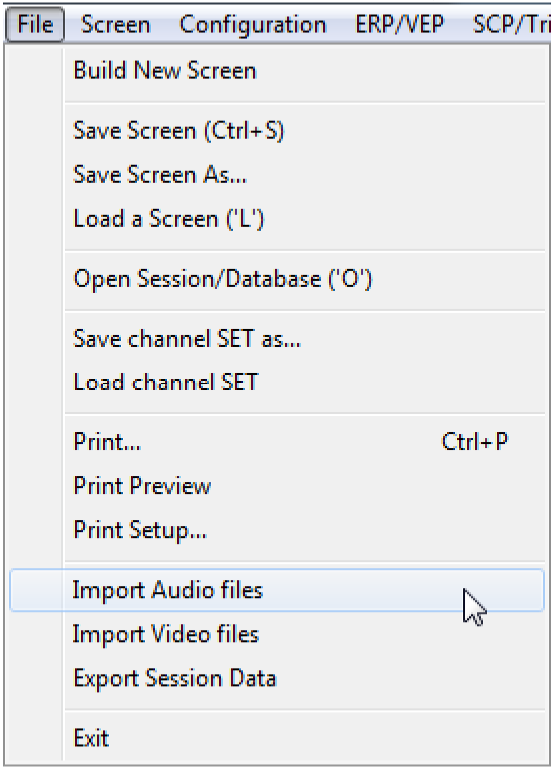
There are several types of feedback which can be selected on a therapist screen. This can be performed by the *Feedback Type Controls* on the right of a training screen:



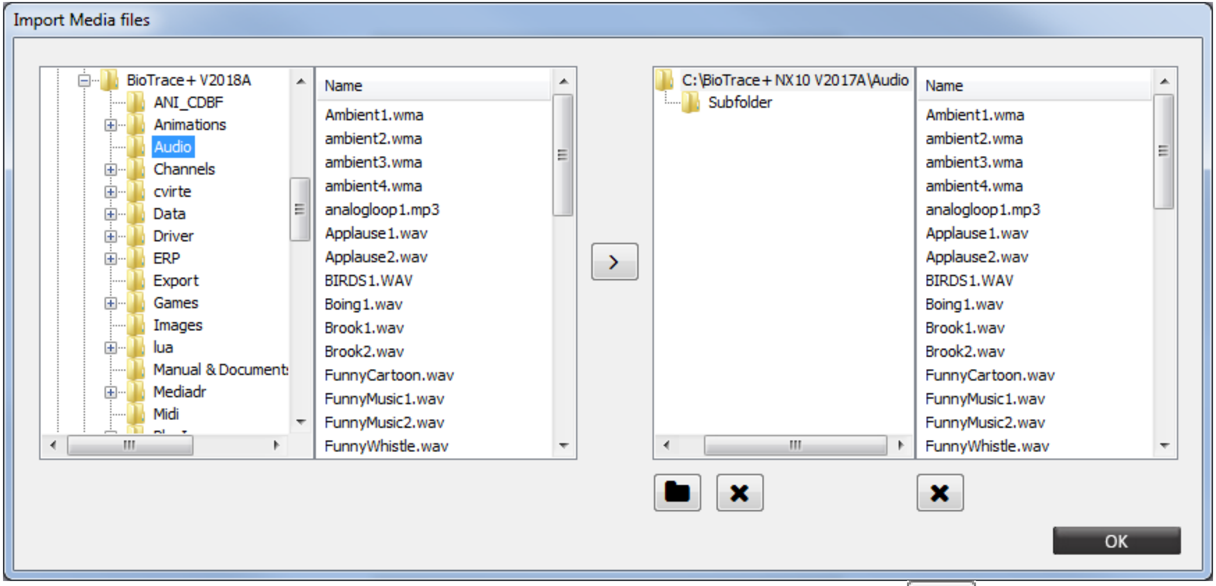
- Graph
- Video
- Puzzle
- Animation
- Game
- Disc
- Audio
- Water ripple
- Clock
- Zoomer
- Mandala
- Protocol

Importing audio and video files

Own video and audio files can be imported.


File
Screen
Configuration
ERP/VEP
SCP/Tri
Build New Screen
Save Screen (Ctrl+S)
Save Screen As...
Load a Screen ('L')
Open Session/Database ('O')
Save channel SET as...
Load channel SET
Print... Ctrl+P
Print Preview
Print Setup...
Import Audio files
Import Video files
Export Session Data
Exit

Choose *Import Audio files* or *Import Video files* from *File* in the top menu.


Import Media files
BioTrace+ V2018A
ANI_CDBF
Animations
Audio
Channels
cvirte
Data
Driver
ERP
Export
Games
Images
lua
Manual & Document
Mediadr
Midi
Name
Ambient1.wma
ambient2.wma
ambient3.wma
ambient4.wma
analogloop1.mp3
Applause1.wav
Applause2.wav
BIRDS1.WAV
Boing1.wav
Brook1.wav
Brook2.wav
FunnyCartoon.wav
FunnyMusic1.wav
FunnyMusic2.wav
FunnyWhistle.wav
C:\BioTrace+ NX10 V2017A\Audio
Subfolder
Name
Ambient1.wma
ambient2.wma
ambient3.wma
ambient4.wma
analogloop1.mp3
Applause1.wav
Applause2.wav
BIRDS1.WAV
Boing1.wav
Brook1.wav
Brook2.wav
FunnyCartoon.wav
FunnyMusic1.wav
FunnyMusic2.wav
FunnyWhistle.wav
OK

Choose a folder and add audio or video files by selecting them and pressing >.

Create subfolders by clicking ■. Delete folders or video by clicking ✖.

Newly imported video and audio files can now be accessed by choosing video or audio feedback and clicking ⇅ in the right top of feedback screens.

For more information on videos and audio files, please refer to chapter 6. Objects

---

Change feedback content

Select other content during a recording by clicking the change feedback button on the top. This can only be performed for videos, animations, games, puzzles, and audio.

⇅

For each type of feedback a selection window will appear. This enables to select other feedback content for the client screen.

For more information on videos, animations, puzzles, and audio files, please refer to chapter 6. Objects

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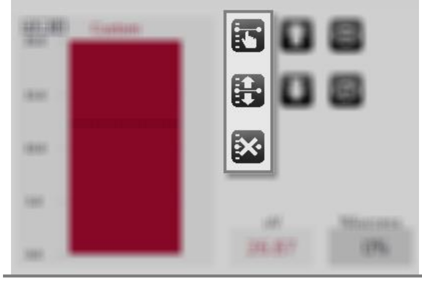
Setting thresholds and feedback

Threshold modes

The threshold setting controls are displayed on the right of a bar graph:



Manual threshold

Automatic threshold

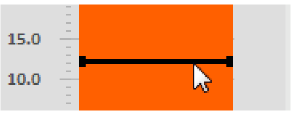
Disable threshold

*Use the **Feedback Options & Thresholds** menu for custom settings. Please refer to the next paragraphs.*

Manual threshold

Set a manual threshold by clicking the following button:

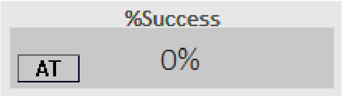
The threshold can be set by swiping the bar to the right value with the mouse cursor.



Automatic threshold

Set an automatic threshold by clicking the following button:

*When the automatic threshold type is based on statistics (see **Advanced threshold options**) the **AT (Automatic Threshold)** button will appear in the %Success indicator*



%Success

AT

0%

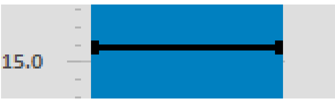
*By pressing the **AT** button you are able to select the desired (success) target for the automatic threshold from a list with steps of 5% increments.*

Please note that when you change the direction of training while the automatic threshold is activated, you need to reset the automatic threshold to the desired target.

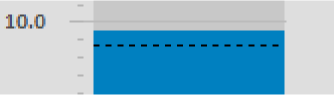
Disable threshold

Disable thresholds by clicking the following button:

A dotted line means that no feedback options have been set for this object. A solid line means that feedback options have been activated.



Feedback enabled

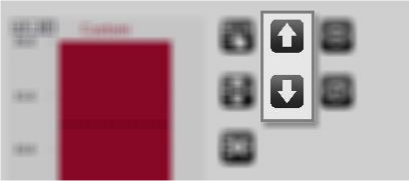


Feedback disabled

*The **]** key can also be used to the enable or disable feedback. To show or hide the threshold line press **[**.*

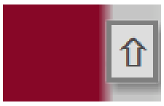
Threshold directions

The threshold direction controls are displayed on the right of a bar graph:



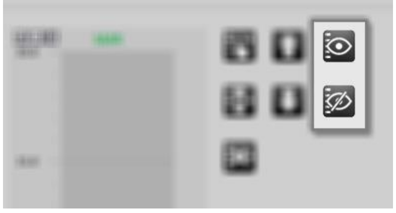
⇧	Train up
⇩	Train down

The graph will show an arrow to indicate which direction is set.



Hide/show graph

It is possible to hide and unhide the bargraph feedback on the client screen

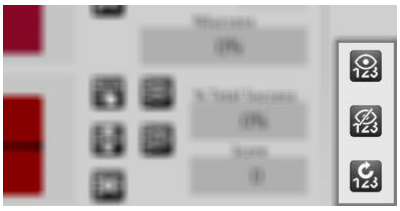


👁	Show graph on client screen
⊘	Hide graph on client screen

If bar graphs are hidden, feedback settings are not activated on the client screen.

Hide/show/reset counter

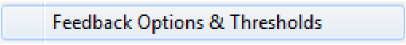
Control counters on the therapist and client screens. The counter controls are located in the bottom right corner of a screen:



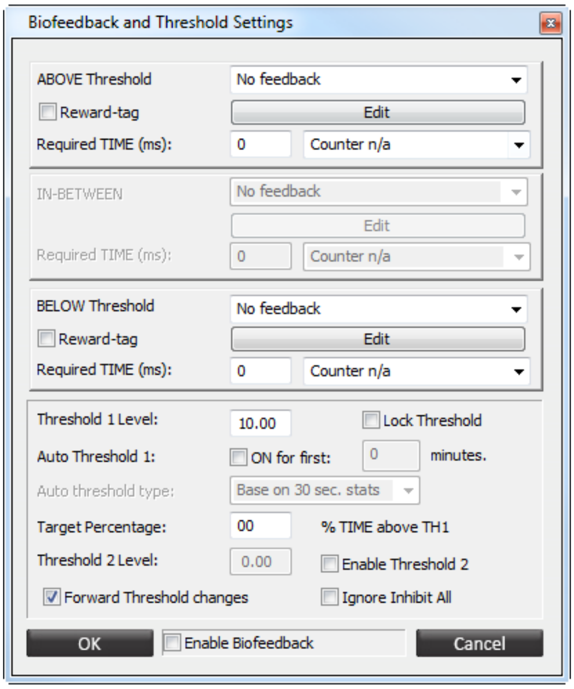
👁	Show counter on client screen
⊘	Hide counter on client screen
↻	Reset counter

Advanced threshold options

By right-clicking an object and choose **Feedback Options & Thresholds** in the drop down menu.



The *Biofeedback and Threshold Settings* dialog box will appear.



Biofeedback and Threshold Settings

ABOVE Threshold: No feedback
☐ Reward-tag
Required TIME (ms): 0 Counter n/a

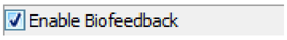
IN-BETWEEN: No feedback
Required TIME (ms): 0 Counter n/a

BELOW Threshold: No feedback
☐ Reward-tag
Required TIME (ms): 0 Counter n/a

Threshold 1 Level: 10.00 ☐ Lock Threshold
Auto Threshold 1: ☐ ON for first: 0 minutes.
Auto threshold type: Base on 30 sec. stats
Target Percentage: 00 % TIME above TH1
Threshold 2 Level: 0.00 ☐ Enable Threshold 2
☑ Forward Threshold changes ☐ Ignore Inhibit All
☐ Enable Biofeedback

Enable/unable feedback

Enable thresholds and feedback settings by checking **Enable Biofeedback** at the bottom.

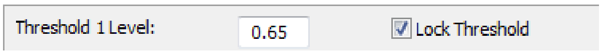


☑ Enable Biofeedback

Un-check to disable all feedback by the object.

Setting manual threshold level

Set a value for a manual threshold under *Threshold 1 Level*. Thresholds can be locked by checking **Lock Threshold**. In this case the threshold will stay fixed.



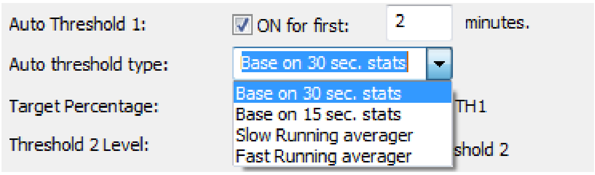
Threshold 1 Level: 0.65 ☑ Lock Threshold

When right clicking within a line graph or bar graph object, a threshold line will appear.

Setting automatic threshold level

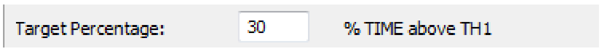
By checking **On for first** an automatic threshold can be set for a set time in minutes. After the set time in minutes the threshold will automatically stop, representing the last calculated value.

The automatic threshold is based on either 15 or 30 second statistics or is a slow or fast running average.



Auto Threshold 1: ☑ ON for first: 2 minutes.
Auto threshold type: Base on 30 sec. stats
Target Percentage:
Threshold 2 Level:

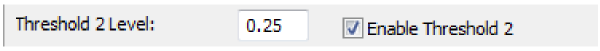
Target percentage will create a threshold in which the value will be a percentage of the time above threshold.



Target Percentage: 30 % TIME above TH1

Setting threshold 2 level

A second threshold can be set when checking **Enable Threshold 2**.

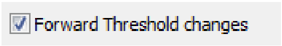


Threshold 2 Level: 0.25 ☑ Enable Threshold 2

Note that when enabling the second threshold, the settings for *In-between thresholds* will be activated. Threshold 2 should always be below threshold 1.

Forward threshold changes

By checking **Forward Threshold Changes** all objects showing the same signal will have the same threshold as this object.

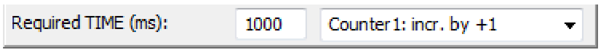


☑ Forward Threshold changes

Setting a counter

A counter can be set for showing scoring above, in-between, or below thresholds. A numerical indicator will have to be present and set for scoring to become visible.

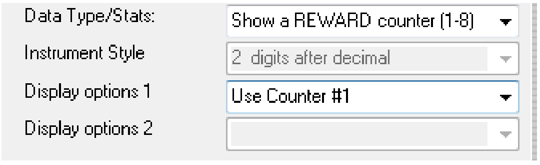
Right-click a numerical indicator, choose **Display Options & Ranges** and display a counter value in order to show scoring.



Required TIME (ms): 1000 Counter 1: incr. by +1

Required time (ms) defines how long a threshold condition should last, before the feedback starts, a feedback delay (e.g. setting it to 1000 ms, means that feedback will start whenever the feedback condition has been met for at least 1 second).

The reward-tag can be used in combination with the **Show %reward** function which can be set in the *Display Options and Range Settings* screen under *Data Type/Stats*.

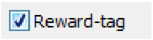


Data Type/Stats: Show a REWARD counter (1-8)
Instrument Style: 2 digits after decimal
Display options 1: Use Counter #1
Display options 2:

A counter can be shown by a numerical object. Refer to Chapter 5. Objects.

Adding a reward tag

Above and/or below threshold can be selected as reward. Check the box **Reward-tag**.



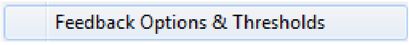
☑ Reward-tag

Bargraph objects can be set for up- or down training, or both by ticking the Reward-tag checkbox in the Biofeedback and Threshold Settings dialog of the bargraph object.

Load (client)

Advanced feedback options

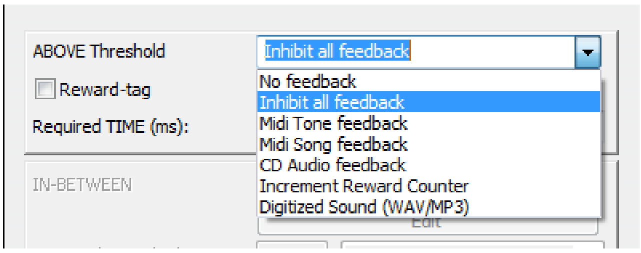
Right-click an object and select **Feedback Options & Thresholds**.


Feedback Options & Thresholds

This will open the *Biofeedback and Threshold Settings* dialog box.

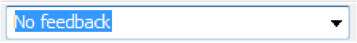
Select one of the following feedback types for above, in-between, or below threshold(s).

Always enable feedback for setting audio feedback (see previous paragraph).


ABOVE Threshold
☐ Reward-tag
Required TIME (ms):
IN-BETWEEN
Inhibit all feedback
No feedback
Inhibit all feedback
Midi Tone feedback
Midi Song feedback
CD Audio feedback
Increment Reward Counter
Digitized Sound (WAV/MP3)
Edit

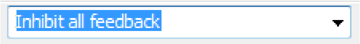
No feedback

The feedback type for each threshold state can be set on **No feedback**. This means no feedback is set for above, in-between, or above a threshold states.


No feedback

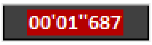
Inhibit all feedback

Inhibit all feedback is often used as a condition for an undesired state.

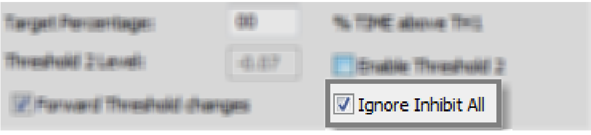

Inhibit all feedback

In case an inhibit state is active all audio and visual feedback will be ‘paused or stopped’ until the inhibit state goes away. It does not matter in which screen (primary or secondary) the inhibit is activated.

An inhibit state is indicated by a red background in the time display of the session control buttons.



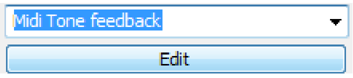
Check **Ignore Inhibit all** for deactivating 'inhibit all feedback' of other objects.


☑ Ignore Inhibit All

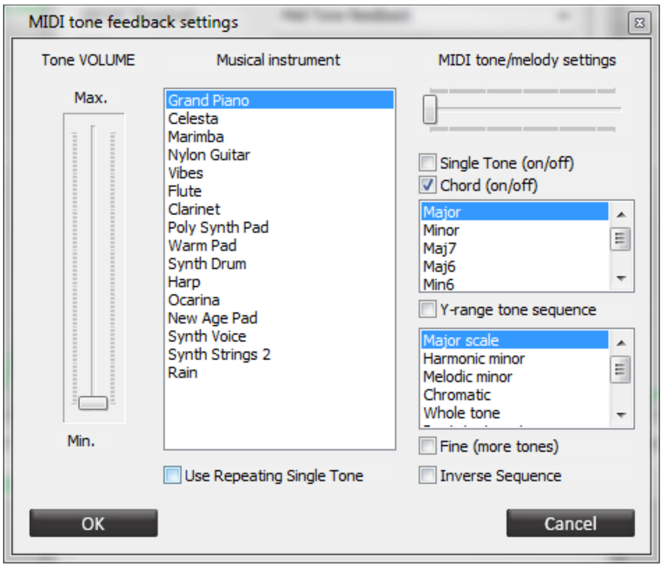
The object will not respond to inhibits by other objects.

Midi tone feedback

This option will play a tone, a chord or sequence of MIDI tones. Click **Edit**.


Midi Tone feedback
Edit

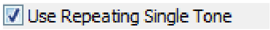
This will open the *MIDI Tone Feedback Settings* dialog box for setting the volume, type of instrument and tone/melody settings.


MIDI tone feedback settings
Tone VOLUME
Max.
Min.
Musical instrument
Grand Piano
Celesta
Marimba
Nylon Guitar
Vibes
Flute
Clarinet
Poly Synth Pad
Warm Pad
Synth Drum
Harp
Ocarina
New Age Pad
Synth Voice
Synth Strings 2
Rain
☐ Use Repeating Single Tone
MIDI tone/melody settings
☐ Single Tone (on/off)
☑ Chord (on/off)
Major
Minor
Maj7
Maj6
Min6
☐ Y-range tone sequence
Major scale
Harmonic minor
Melodic minor
Chromatic
Whole tone
☐ Fine (more tones)
☐ Inverse Sequence
OK
Cancel

Set the volume with the slider on the left from min. to max. Choose a musical instrument in the middle column.

The available musical instruments can be customized in the ***System Settings***

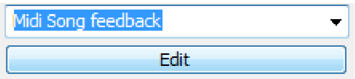
Check **Use Repeating Single Tone** to continuously play the tone in case the feedback condition is met.


☑ Use Repeating Single Tone

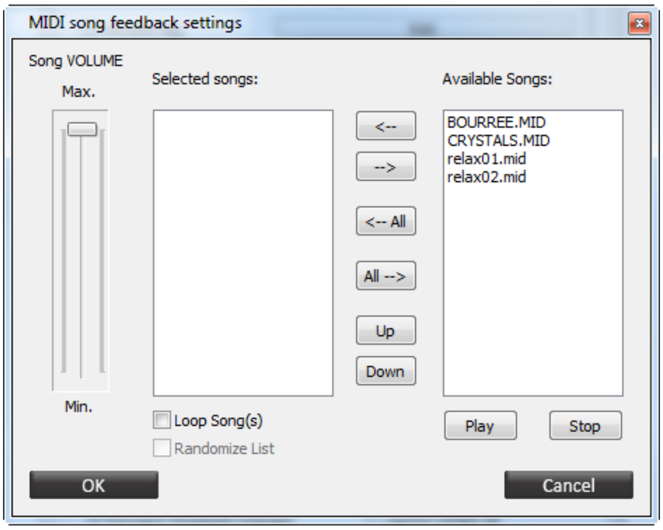
Instruments can be edited in the right column *MIDI tone/melody settings*.

Midi song feedback

Click **Edit** to select a song, change volume, loop songs, etc.


Midi Song feedback
Edit

This will open the *MIDI song feedback settings* dialog box.


MIDI song feedback settings
Song VOLUME
Max.
Min.
Selected songs:
Available Songs:
<--
-->
<-- All
All -->
Up
Down
BOURREE.MID
CRYSTALS.MID
relax01.mid
relax02.mid
Loop Song(s)
Randomize List
Play
Stop
OK
Cancel

Click **<--** to move a song from *Available songs* (right) to *Selected songs* (left). Use the **<--All** to select all available songs.

Click **Play** for a preview of the song. Click **Stop** to stop a preview.

Checking **Loop Song(s)** will keep on playing the midi-tone as long as the feedback condition is met.

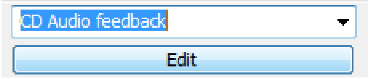
☑ Loop Song(s)

Change the order of the selected songs by selecting a song and clicking **Up** or **Down**.

CD audio feedback

It is also possible to play tracks from an audio CD. Insert an audio CD. The CD-drive will automatically be detected.

Click **Edit** to select tracks, loop tacks, etc. It is not possible to change volume.

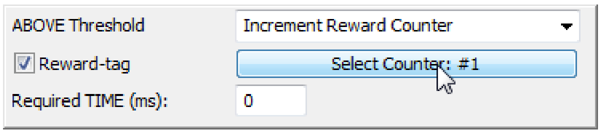


CD Audio feedback

The functionality is the same as the option Midi Song feedback.

Increment reward counter

Above and/or below threshold can be selected as reward. Select Counter #1 / #8 by clicking the following button.



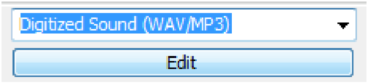
ABOVE Threshold: Increment Reward Counter

☑ Reward-tag: Select Counter: #1

Required TIME (ms): 0

Digitized sound feedback

Click **Edit** to select a media file (WAV, MP3 or WMA), change volume, loop songs, enable volume feedback etc.



This will open the *Digital sound & song feedback settings* dialog box.

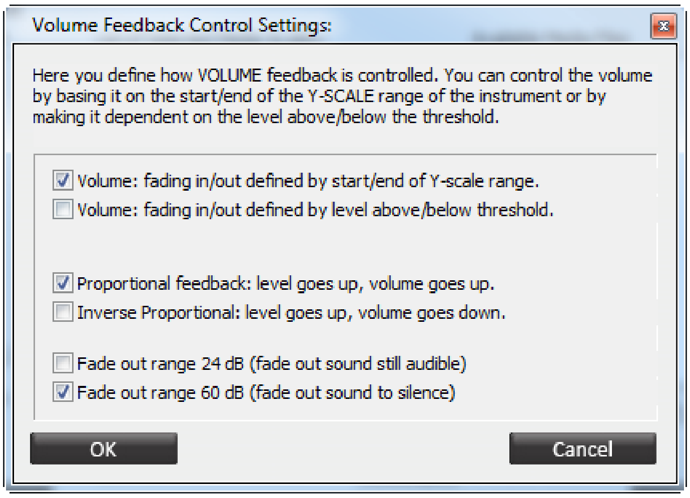
Most of the functionality is the same as the option Midi Song feedback.

Check **Volume Feedback** to use a special option that uses 'fading in and out' control on your sound files.

☑ Volume feedback

Choose the ⚙ button for defining the volume feedback.

This will open the *Volume Feedback Control Settings* dialog box.


Volume Feedback Control Settings:

Here you define how VOLUME feedback is controlled. You can control the volume by basing it on the start/end of the Y-SCALE range of the instrument or by making it dependent on the level above/below the threshold.

☑ Volume: fading in/out defined by start/end of Y-scale range.
☐ Volume: fading in/out defined by level above/below threshold.

☑ Proportional feedback: level goes up, volume goes up.
☐ Inverse Proportional: level goes up, volume goes down.

☐ Fade out range 24 dB (fade out sound still audible)
☑ Fade out range 60 dB (fade out sound to silence)

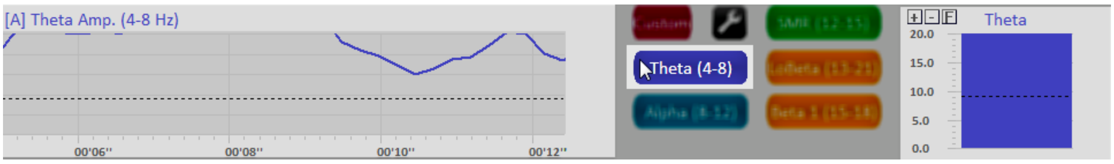
There are three settings which can be edited:

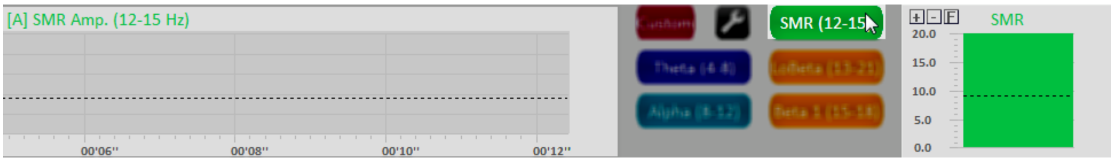
- Volume fading
  - **... defined by start/end of Y-scale range** will set the minimum volume at the bottom of the y-scale. At the top of Y-scale the volume will reach its maximum. The sound will only play above threshold so make sure the threshold is towards or below the beginning of the Y-scale.
  - **... defined by level above/below threshold** will set the minimum volume at the threshold and the maximum volume at a certain level (as a percentage of the total range) above or below threshold. Set the range as a percentage of the total range.
- Proportional feedback
  - **Proportional feedback** will set response of the volume go up, when the level goes up.
  - **Inverse proportional** will set the response of the volume goes down when the level goes up.

- Fade out range
    - **24 dB** defines volume level fading out to soft but still audible level.
    - **60 dB** defines volume level fading out to total silence.

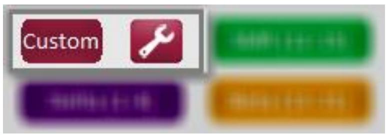
Frequency bands and ranges

When clicking the Frequency Band Controls, the frequency range setting is pushed to the linked objects. In this way it is easy to switch between different bands:

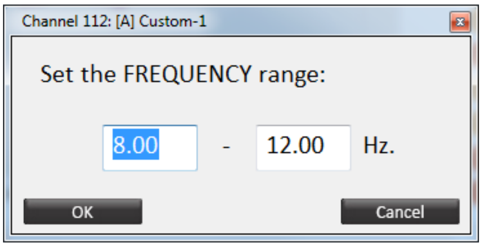

[A] Theta Amp. (4-8 Hz)
00'06''
00'08''
00'10''
00'12''
Theta (4-8)
Theta
20.0
15.0
10.0
5.0
0.0


[A] SMR Amp. (12-15 Hz)
00'06''
00'08''
00'10''
00'12''
SMR (12-15)
SMR
20.0
15.0
10.0
5.0
0.0

When clicking the **Custom** button, the custom frequency range setting is pushed to the selected instruments.



The range of the frequency can be set by clicking the button next to it.



Channel 112: [A] Custom-1

Set the FREQUENCY range:

8.00 - 12.00 Hz.

Respiration/HRV pacer

The pacer can be used for 'pacing' or training signals using a template wave-form

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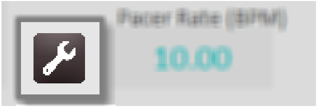
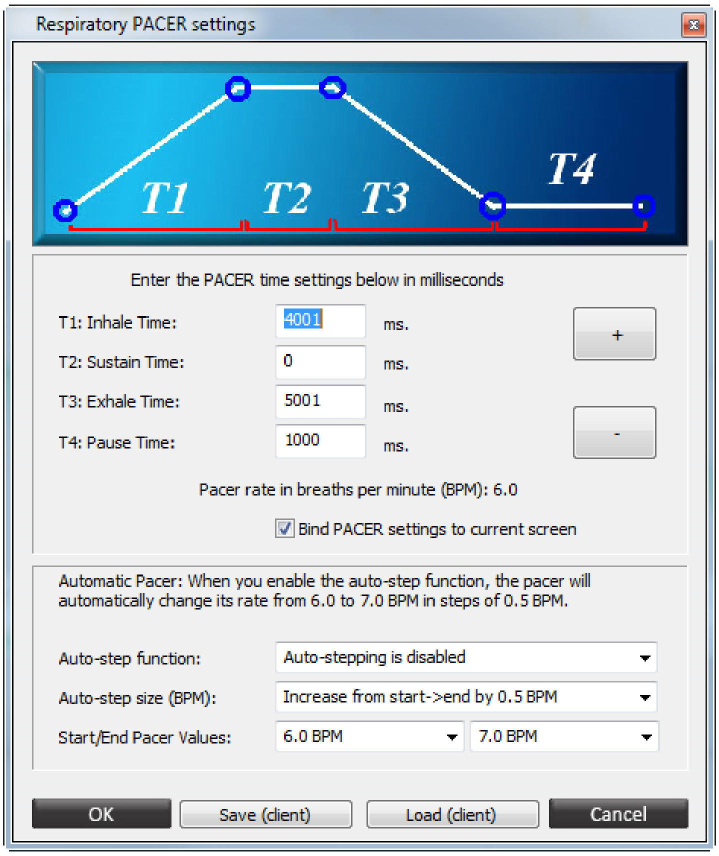
This option is only applicable for all screens with a respiration pacer.

Click the following icon to set the respiration pacer (or go to the top menu and select Configuration > **RSP/HRV Pacer Settings**)


Pacer Rate (BPM)
10.00

This will open the *Respiratory Pacer Settings* screen.



Enter the PACER time settings below in milliseconds

T1: Inhale Time: 4001 ms.
T2: Sustain Time: 0 ms.
T3: Exhale Time: 5001 ms.
T4: Pause Time: 1000 ms.

Pacer rate in breaths per minute (BPM): 6.0

☑ Bind PACER settings to current screen

Automatic Pacer: When you enable the auto-step function, the pacer will automatically change its rate from 6.0 to 7.0 BPM in steps of 0.5 BPM.

Auto-step function: Auto-stepping is disabled
Auto-step size (BPM): Increase from start->end by 0.5 BPM
Start/End Pacer Values: 6.0 BPM 7.0 BPM

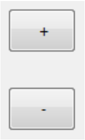
Setting parameters

The following parameters can be set (time entered in milliseconds):

- *T1 Inhale Time*: the time it takes to go from baseline (0) to the maximum (inhale).
- *T2 Sustain Time*: the time the signal will be sustained (hold) at maximum.
- *T3 Exhale Time*: the time the signal will drop from maximum to baseline (exhale).
- *T4 Pause Time*: the 'pause time' in between this and the next cycle.

Based on these parameters, a pacer rate in breaths per minutes (BPM) will be calculated.

Click the **+** and **-** button to change the pacer rate while maintaining the same ratios.



Use the **+** and **–** keyboard keys during a session in order to speed up or slow down the pacer.

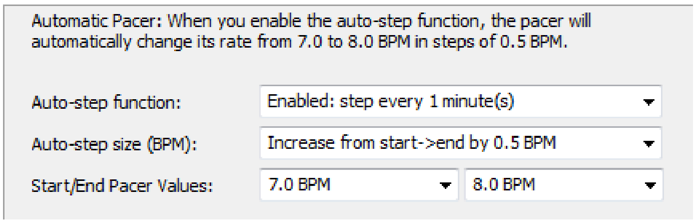
Check **Bind pacer settings...** to always have the same setting for the loaded screen.

☑ Bind PACER settings to current screen

This feature requires a pacer to be present in the screen. It is of no importance which type of object, as long as it is connected to the pacer-input of the channel set.

Setting automatic pacer

A pacer can be set to change over time with a preset start/end and with a pre-set step size.



Automatic Pacer: When you enable the auto-step function, the pacer will automatically change its rate from 7.0 to 8.0 BPM in steps of 0.5 BPM.

Auto-step function: Enabled: step every 1 minute(s)

Auto-step size (BPM): Increase from start->end by 0.5 BPM

Start/End Pacer Values: 7.0 BPM 8.0 BPM

Edit the following properties for setting up the automatic pacer.

- *Auto-step function*
    - Disable automatic pacer
    - Enable automatic pacer: auto-step every 1 to 10 minutes
- *Auto-step size (BPM)*
    - Increase from start > end by 0.5 to 1.0 BPM
    - Decrease from start > end by 0.5 to 1.0 BPM
- *Start/end pacer values*

Saving and loading pacer settings

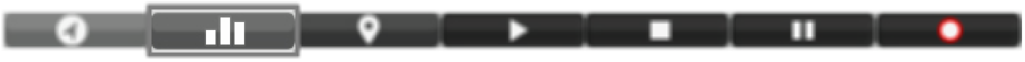
Click **Save (client)** to save this pacer settings for the currently selected client. BioTrace will auto-load these pacer settings every time this client is selected for a new recording.

Save (client)

Click **Load (client)** to load saved pacer settings for the currently selected client.

4. Review

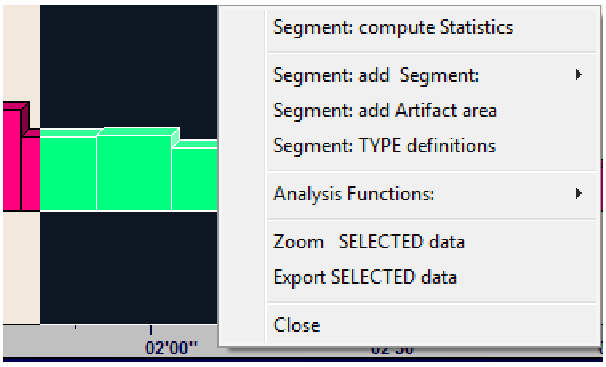
This chapter describes the data for analyzing sessions. Data can be viewed and edited in *Session Overview* by clicking the following button in the *Session Control Bar*.



Or go to Screen > **Session overview** in the top menu (or press the **Tab** key).

Selecting data

Select data by clicking the left mouse button and dragging the mouse to the left or right.


Segment: compute Statistics
Segment: add Segment:
Segment: add Artifact area
Segment: TYPE definitions
Analysis Functions:
Zoom SELECTED data
Export SELECTED data
Close
02'00"

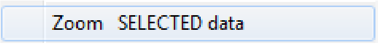
A selected area

The selected data will be highlighted by a black background. When releasing the mouse button, a drop down menu will appear, presenting several options.

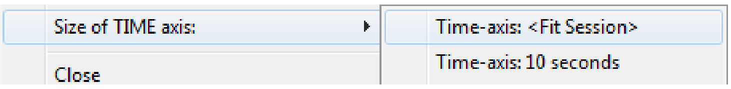
It is recommended to use the x-axis (time) at the bottom of the screen for selecting data. This prevents unwanted changes in the data, like moving segments.

Zooming data

Choose **Zoom selected data** after having selected data by left clicking and dragging the mouse.


Zoom SELECTED data

Another way of zooming in and out is by choosing the option *Size of TIME axis* when clicking the right mouse button in the session overview screen mode. Choose the length of the time axis from a drop down menu.


Size of TIME axis:
Close
Time-axis: <Fit Session>
Time-axis: 10 seconds

The time-axis can also be set by using the **+** and **-** keys on the numerical keyboard.

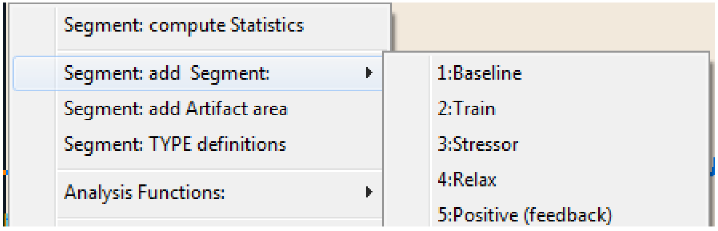
To zoom out, right mouse click and choose **Time-axis <Fit Session>**. Quickly zoom out by pressing **Backspace**.

Segments

Adding segments

Add specific segments in the session to distinguish different phases in a recording.

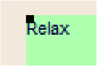
After selecting a part of the data, a segment can be defined by using the *Add Segment* option.


Segment: compute Statistics
Segment: add Segment:
Segment: add Artifact area
Segment: TYPE definitions
Analysis Functions:
1:Baseline
2:Train
3:Stressor
4:Relax
5:Positive (feedback)

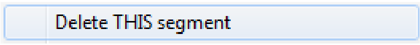
There are several predefined segment types available, like baseline, train, stressor, relax etc.. These are distinguished by name and color.

Deleting segments

To delete a marked segment, select the segment by left clicking it. A selected segment will show black ‘handles’ around it.



Right click and select Segment options: > **Delete this segment** (or left-click a segment and press the **Delete** key).

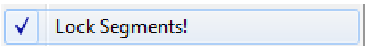

Delete THIS segment

A dialog box will appear. Press the **Yes** button to confirm deleting the segment.

When deleting a segment, only the segment will be deleted, not the actual data!

Locking segments

Protect segments for editing or deleting by right clicking and selecting Segment options: > **Lock Segments!**

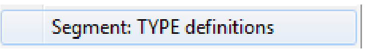

✓ Lock Segments!

This can be done for just one segment by first selecting the particular segment. Or this can be done for all segments together in the data by selecting no segment(s).

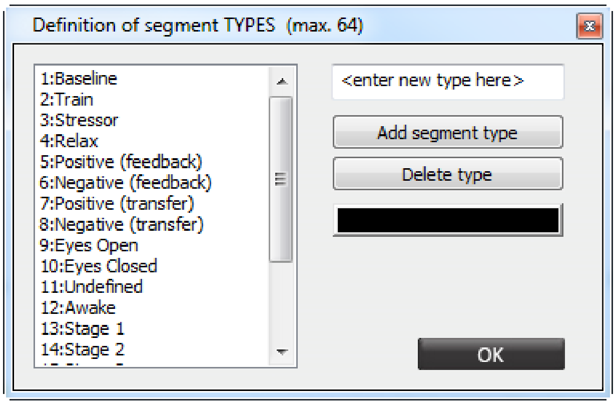
Just click this same option again to unlock segments for editing.

Defining and adding segment types

By right-clicking the screen and selecting Segment options: > **Segment: Type definitions**, custom type definitions for segments can be added.


Segment: TYPE definitions

The *Definition of segment types* screen will appear.


Definition of segment TYPES (max. 64)
1:Baseline
2:Train
3:Stressor
4:Relax
5:Positive (feedback)
6:Negative (feedback)
7:Positive (transfer)
8:Negative (transfer)
9:Eyes Open
10:Eyes Closed
11:Undefined
12:Awake
13:Stage 1
14:Stage 2
<enter new type here>
Add segment type
Delete type
OK

Enter a segment name in the text box and click **Add segment type** to add a new segment. The new entry will be placed at the bottom of the list.

To attribute a color to a new or existing segment, first select the segment in the list and then click on the color box on the right to select a color.

Select **Delete type** for removing a segment type.

Artifact areas

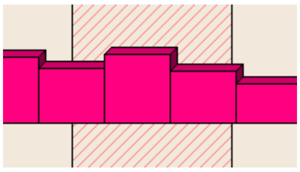
Manually marking artifact areas

Mark a new artifact area by selecting data, and choosing **Segment: add Artifact area**.

Segment: add Artifact area

Artifact areas are special types of segments that mark a part of the session as being ‘invalid’. These artifact areas will be excluded for analysis. The data in the artifact area will not be deleted, it is only ‘marked’ as being artifact.

The Artifact segment will appear as a red cross hatched area.

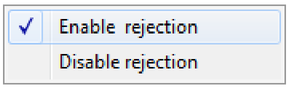


Manually selected artifact area

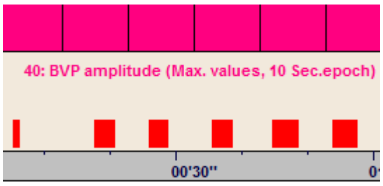
Artifact areas can be removed just like segments.

Automatic artifact rejection

Enable automatic artifact rejection by right clicking the screen and open Automatic artifact rejection > **Enable rejection**.


✓ Enable rejection
Disable rejection

One or two criteria for data rejection can be set. Whenever a signal meets a criterion, red marks will appear just above the time axis.



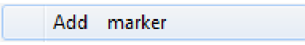
Automatically defined artifact area

When marking a part of the data as an artifact area, data of all channels at that certain time point will be marked as artifact and excluded in the analysis.

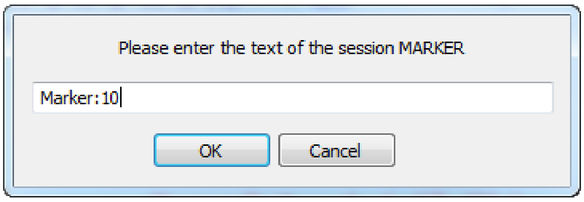
Event markers

Adding markers

To insert event markers after the data recording, right-click the screen and select Event markers: > **Add marker**.



A text screen will appear.



Please enter the text of the session MARKER

Marker:10

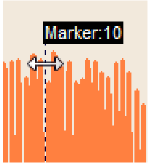
Enter text and click **OK**.

A marker is shown as a black dotted line in the session overview mode.

Editing markers

Moving a marker

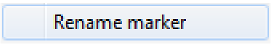
A marker can be moved when hovering the mouse over the dotted line. The cursor of the mouse will transform into a cursor with two arrows.



Now move the marker by pressing the left mouse button and moving the mouse to the left or right.

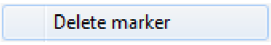
Renaming a marker

Rename a marker by selecting it, pressing the right mouse button, and selecting Event markers: > **Rename marker**.



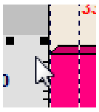
Deleting a marker

Delete a marker by selecting it, pressing the right mouse button, and selecting Event markers: > **Delete marker** (or by selecting a marker and press the **Delete** key).



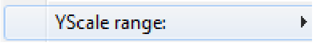
Changing display of signals

Right-click the y-axis for changing the display of signals.



Setting the range

Change the Y-scale range by choosing *YScale range*.

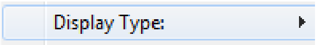


The following options are available:

- **Manual range**: enter the range manually.
- **Auto range 0-max**: an automatic range with 0 as the minimum and the maximum value of the signal as a maximum.
- **Auto range min-max**: an automatic range with the minimum value of the signal as a minimum and the maximum value as the maximum.
- **Inverse polarity**: inverts display of line graphs

Display type

Change the display type by choosing *Display type*.

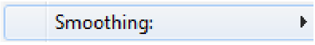


This option enables to select the graphical way the data is displayed:

- **Lingraph** (default)
- **Linegraph with markers**
- **Bargraph 2D**
- **Bargraph 3D**

Smoothing data

Set smoothing of the signal by *Smoothing*.

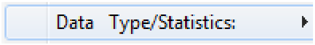


.

Smoothing is an option that will ‘dampen’ a signal, in case it is rapidly moving up and down. Setup smoothing with a factor 2 till factor 64. Smoothing is disabled by default. This option is only available for line graphs.

Data Type/Statistics

Select the option *Data type/statistics* to change the way the data is processed before being displayed.

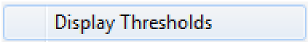


Choose between the following options:

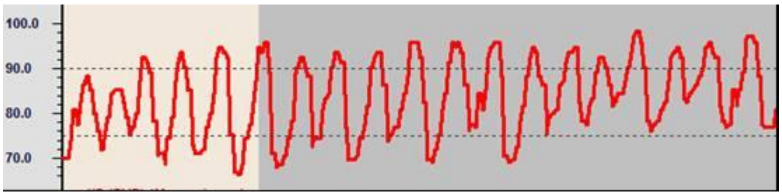
- **Show RAW samples** will show the unprocessed data.
- **Base epochs on segment**
- **Show N second statistics** will show a summary of data over N seconds to shows trends in the data.
- **Show <statistics>** (e.g. mean) indicates which statistic will be used to summarize the data.

Displaying thresholds

Display thresholds by choosing Thresholds > **Display thresholds**.



Change the value of the thresholds by choosing **Change threshold** (1 or 2)

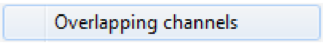


HR graph with thresholds.

When computing statistics, the settings of the thresholds will provide an estimated value of the percentage of time the signal was above threshold-1 and below threshold-2.

Overlapping channels

Show multiple signals within one Y-axis by choosing overlapping channels.



This will open the *Select channel* screen.

Select (highlight) a channel in order to add it to display it. To delete a channel from the display, just click it again in order to deselect it.

Click **OK** to select the channels.

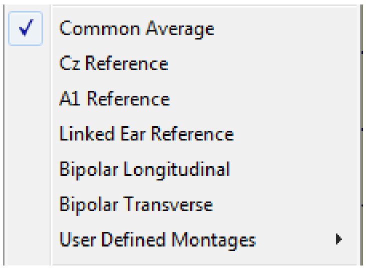
Use this option only to combine channels that are in the same y-range. This option is only available for the line graphs display type.

EEG signal (re)montaging

This feature is only available for NeXus-32.

The amplifier acquires EEG signals with a common average reference. From this common average source signal, all other montages are derived. Montages can be changed on the fly, also during a recording.

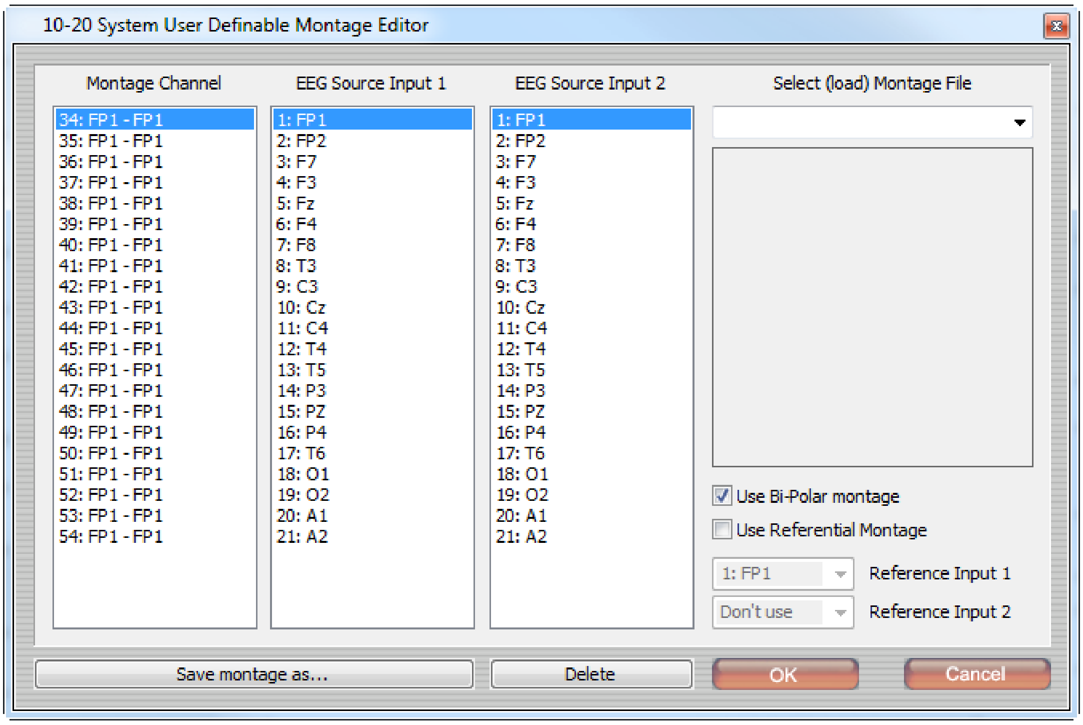
Change the montage by choosing **EEG** in the top menu. The current montage is indicated with a check mark. The following EEG montages can be set:


✓ Common Average
Cz Reference
A1 Reference
Linked Ear Reference
Bipolar Longitudinal
Bipolar Transverse
User Defined Montages ▸

Editing montages

Choose User Defined Montages **> Open Montage Editor** in the top menu to define own bipolar or referential montage.

This will open the *Montage Editor* screen.


10-20 System User Definable Montage Editor
Select (load) Montage File
Save montage as...
Delete
OK
Cancel

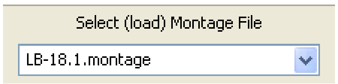
Montage Channel	EEG Source Input 1	EEG Source Input 2
34: FP1 - FP1	1: FP1	1: FP1
35: FP1 - FP1	2: FP2	2: FP2
36: FP1 - FP1	3: F7	3: F7
37: FP1 - FP1	4: F3	4: F3
38: FP1 - FP1	5: Fz	5: Fz
39: FP1 - FP1	6: F4	6: F4
40: FP1 - FP1	7: F8	7: F8
41: FP1 - FP1	8: T3	8: T3
42: FP1 - FP1	9: C3	9: C3
43: FP1 - FP1	10: Cz	10: Cz
44: FP1 - FP1	11: C4	11: C4
45: FP1 - FP1	12: T4	12: T4
46: FP1 - FP1	13: T5	13: T5
47: FP1 - FP1	14: P3	14: P3
48: FP1 - FP1	15: PZ	15: PZ
49: FP1 - FP1	16: P4	16: P4
50: FP1 - FP1	17: T6	17: T6
51: FP1 - FP1	18: O1	18: O1
52: FP1 - FP1	19: O2	19: O2
53: FP1 - FP1	20: A1	20: A1
54: FP1 - FP1	21: A2	21: A2

☑ Use Bi-Polar montage
☐ Use Referential Montage
1: FP1 Reference Input 1
Don't use Reference Input 2

Enable bi-polar montage configuration by selecting **Use Bi-Polar montage**. Select EEG Source Input 1 and EEG Source Input 2.

Enable configuration of uni-polar montages by selecting **Use Referential Montage**. Select one or two reference inputs

Select **Save montage as…** to save the current configuration. After restart of BioTrace+ the new montage will appear in the drop down menu.



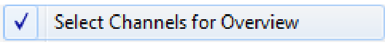
Select (load) Montage File

LB-18.1.montage

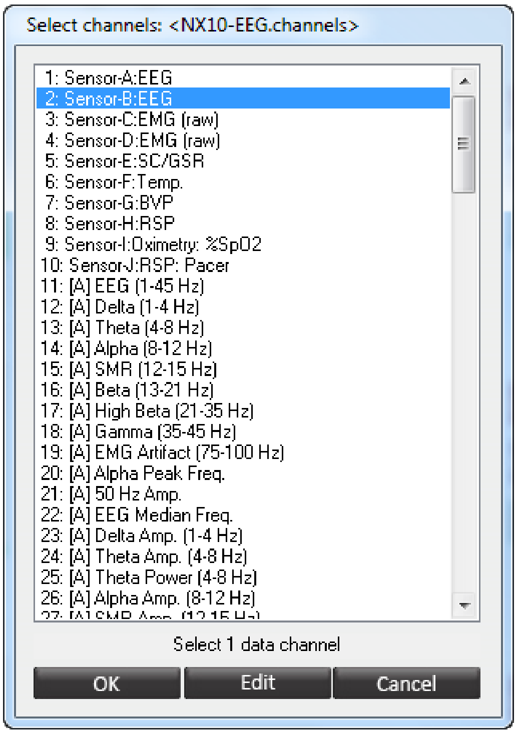
Delete the currently selected montage file by clicking **Delete**.

Adding or deleting channels

More channels (signals) can be viewed by right-clicking the screen and choosing **Select channels for overview**.



The *Select channels* screen will appear.



Select channels: <NX10-EEG.channels>

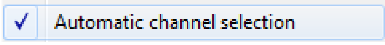
1: Sensor-A:EEG
2: Sensor-B:EEG
3: Sensor-C:EMG (raw)
4: Sensor-D:EMG (raw)
5: Sensor-E:SC/GSR
6: Sensor-F:Temp.
7: Sensor-G:BVP
8: Sensor-H:RSP
9: Sensor-I:Oximetry: %SpO2
10: Sensor-J:RSP: Pacer
11: [A] EEG (1-45 Hz)
12: [A] Delta (1-4 Hz)
13: [A] Theta (4-8 Hz)
14: [A] Alpha (8-12 Hz)
15: [A] SMR (12-15 Hz)
16: [A] Beta (13-21 Hz)
17: [A] High Beta (21-35 Hz)
18: [A] Gamma (35-45 Hz)
19: [A] EMG Artifact (75-100 Hz)
20: [A] Alpha Peak Freq.
21: [A] 50 Hz Amp.
22: [A] EEG Median Freq.
23: [A] Delta Amp. (1-4 Hz)
24: [A] Theta Amp. (4-8 Hz)
25: [A] Theta Power (4-8 Hz)
26: [A] Alpha Amp. (8-12 Hz)

Select 1 data channel

Select (highlight) a channel in order to add it to display it. To delete a channel from the display, just click it again in order to deselect it. Click **OK** to view the selection. At the bottom the number of channels selected is shown.

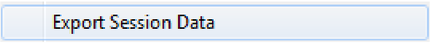
Automatic channel selection

The option automatic channel selection will automatically show all signals that are also shown in the feedback screen mode.

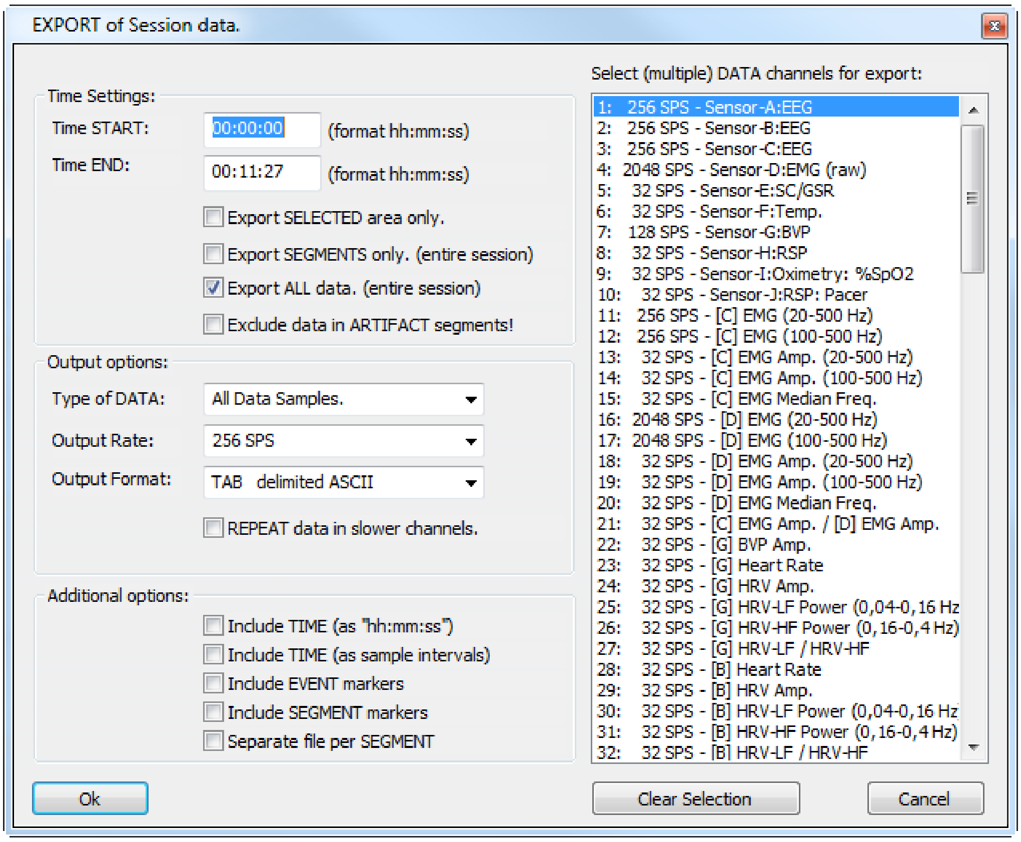


Exporting session data

To export session data, choose File > **Export session data**.



The *Export of Session Data* screen will appear.



Time Settings:

Time START: 00:00:00 (format hh:mm:ss)

Time END: 00:11:27 (format hh:mm:ss)

☐ Export SELECTED area only.

☐ Export SEGMENTS only. (entire session)

☑ Export ALL data. (entire session)

☐ Exclude data in ARTIFACT segments!

Output options:

Type of DATA: All Data Samples.

Output Rate: 256 SPS

Output Format: TAB delimited ASCII

☐ REPEAT data in slower channels.

Additional options:

☐ Include TIME (as "hh:mm:ss")

☐ Include TIME (as sample intervals)

☐ Include EVENT markers

☐ Include SEGMENT markers

☐ Separate file per SEGMENT

Select (multiple) DATA channels for export:

1: 256 SPS - Sensor-A:EEG
2: 256 SPS - Sensor-B:EEG
3: 256 SPS - Sensor-C:EEG
4: 2048 SPS - Sensor-D:EMG (raw)
5: 32 SPS - Sensor-E:SC/GSR
6: 32 SPS - Sensor-F:Temp.
7: 128 SPS - Sensor-G:BVP
8: 32 SPS - Sensor-H:RSP
9: 32 SPS - Sensor-I:Oximetry: %SpO2
10: 32 SPS - Sensor-J:RSP: Pacer
11: 256 SPS - [C] EMG (20-500 Hz)
12: 256 SPS - [C] EMG (100-500 Hz)
13: 32 SPS - [C] EMG Amp. (20-500 Hz)
14: 32 SPS - [C] EMG Amp. (100-500 Hz)
15: 32 SPS - [C] EMG Median Freq.
16: 2048 SPS - [D] EMG (20-500 Hz)
17: 2048 SPS - [D] EMG (100-500 Hz)
18: 32 SPS - [D] EMG Amp. (20-500 Hz)
19: 32 SPS - [D] EMG Amp. (100-500 Hz)
20: 32 SPS - [D] EMG Median Freq.
21: 32 SPS - [C] EMG Amp. / [D] EMG Amp.
22: 32 SPS - [G] BVP Amp.
23: 32 SPS - [G] Heart Rate
24: 32 SPS - [G] HRV Amp.
25: 32 SPS - [G] HRV-LF Power (0,04-0,16 Hz
26: 32 SPS - [G] HRV-HF Power (0,16-0,4 Hz)
27: 32 SPS - [G] HRV-LF / HRV-HF
28: 32 SPS - [B] Heart Rate
29: 32 SPS - [B] HRV Amp.
30: 32 SPS - [B] HRV-LF Power (0,04-0,16 Hz
31: 32 SPS - [B] HRV-HF Power (0,16-0,4 Hz)
32: 32 SPS - [B] HRV-LF / HRV-HF

The following properties can be set:

- *Time settings*
  - Time start
  - Time end
  - Export selections, segments, all data
  - Exclude artifact segments
- *Output options*
  - Type of data
  - Output (sample) rate
  - Output format (Tab or comma delimited ASCII, EDF, EDF+, Matlab)
  - Repeat data in slower channels
- *Additional options*
  - Include time as hh:mm:ss or as sample intervals
  - Include event markers
  - Include segments
  - Separate file per segment
- *Select data channels*

Note that in case of EDF or EDF+ , the option **Use maximum range** will become available. This function is necessary to accurately display EDF files in 3rd party software.

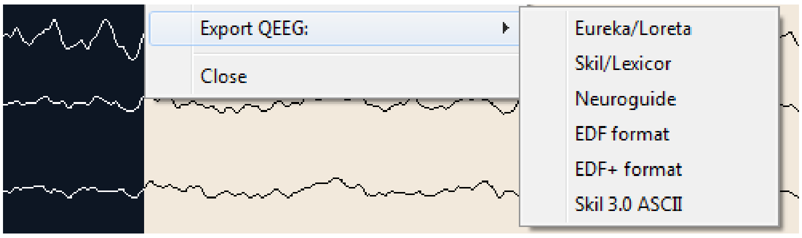
Exporting (Q)EEG data

This feature is only available for NeXus-32

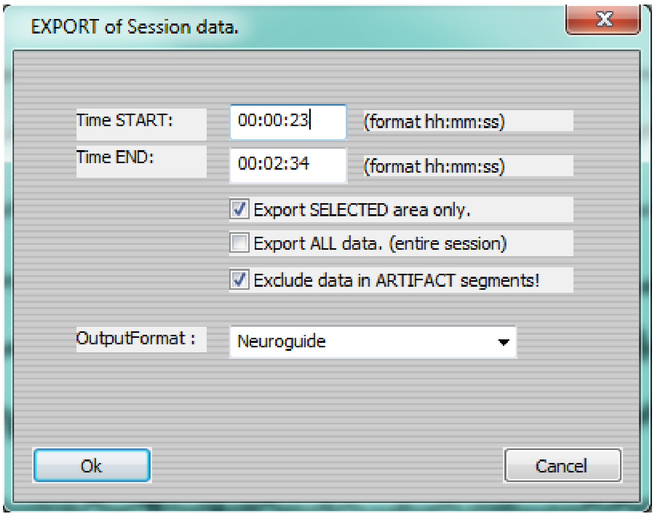
Select **EEG** the top menu to export all data. Alternatively select a segment and select **Export QEEG**.

Choose the format:

- Eureka/Loreta
- Skil/Lexicor
- NeuroGuide
- EDF/EDF+ (supported by WinEEG)
- Skil 3.0 ASCII


Export QEEG:
Close
Eureka/Loreta
Skil/Lexicor
Neuroguide
EDF format
EDF+ format
Skil 3.0 ASCII

Confirm the parameters in the following dialog box and click the **OK** button to save the file.

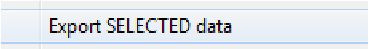

EXPORT of Session data.
Ok
Cancel

Time START: 00:00:23 (format hh:mm:ss)
Time END: 00:02:34 (format hh:mm:ss)
☑ Export SELECTED area only.
☐ Export ALL data. (entire session)
☑ Exclude data in ARTIFACT segments!
OutputFormat : Neuroguide

Click **OK** for exporting data. Click **Save** to save the file (by default in the folder .../BioTrace/Export)

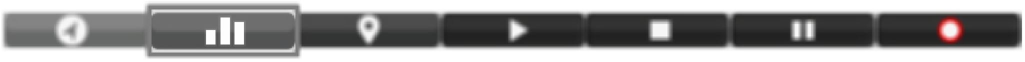
Exporting a selection

Alternatively, select data in the session overview screen, and choose **Export selected data** from the drop down menu.


Export SELECTED data

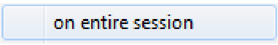
5. Analysis & Reporting

This chapter describes analysis of session data. Data can be analyzed in the *Session Overview* screen by clicking the following button in the *Session Control Bar*.

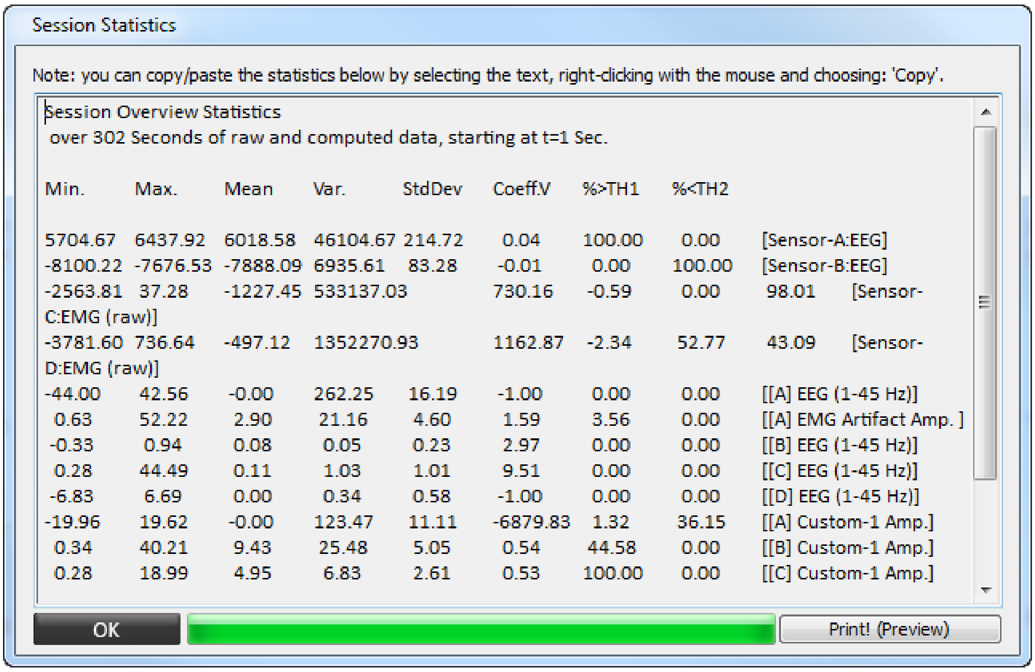


Session statistics

Right click the *Session Overview* screen and choose Compute statistics: > **On entire session**.


on entire session

The *Session Statistics* screen will appear.


Session Statistics
OK
Print! (Preview)

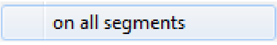
Note: you can copy/paste the statistics below by selecting the text, right-clicking with the mouse and choosing: 'Copy'.

```
Session Overview Statistics
 over 302 Seconds of raw and computed data, starting at t=1 Sec.

Min.     Max.     Mean     Var.     StdDev   Coeff.V  %>TH1    %<TH2

5704.67  6437.92  6018.58  46104.67 214.72    0.04    100.00    0.00    [Sensor-A:EEG]
-8100.22 -7676.53 -7888.09 6935.61   83.28   -0.01     0.00   100.00    [Sensor-B:EEG]
-2563.81  37.28   -1227.45 533137.03         730.16   -0.59     0.00     98.01     [Sensor-
C:EMG (raw)]
-3781.60 736.64   -497.12  1352270.93        1162.87  -2.34     52.77    43.09     [Sensor-
D:EMG (raw)]
-44.00    42.56    -0.00    262.25   16.19    -1.00    0.00     0.00    [[A] EEG (1-45 Hz)]
 0.63     52.22     2.90    21.16     4.60     1.59    3.56     0.00    [[A] EMG Artifact Amp. ]
 -0.33     0.94     0.08     0.05     0.23     2.97    0.00     0.00    [[B] EEG (1-45 Hz)]
 0.28     44.49     0.11     1.03     1.01     9.51    0.00     0.00    [[C] EEG (1-45 Hz)]
 -6.83     6.69     0.00     0.34     0.58    -1.00    0.00     0.00    [[D] EEG (1-45 Hz)]
-19.96    19.62    -0.00   123.47    11.11  -6879.83   1.32    36.15    [[A] Custom-1 Amp.]
 0.34     40.21     9.43    25.48     5.05     0.54   44.58     0.00    [[B] Custom-1 Amp.]
 0.28     18.99     4.95     6.83     2.61     0.53  100.00     0.00    [[C] Custom-1 Amp.]
```

This will compute basic statistics (min, max, mean, etc.) for each signal that is displayed. Text from this dialog box can be copied and pasted in to other programs

Computing statistics on segments

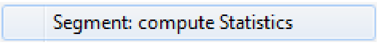
Right-click the screen and choose the option Compute statistics > **On all segments**.


on all segments

The session statistics box will show up, showing basic statistics for each type of segment.

Computing statistics on a selected area

Select an area and click **Segment: compute statistics**.


Segment: compute Statistics

Use this option to compute basic statistics for a selected area.

Printing the statistics

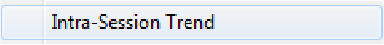
Click the **Print! (preview)** button.

Print! (Preview)

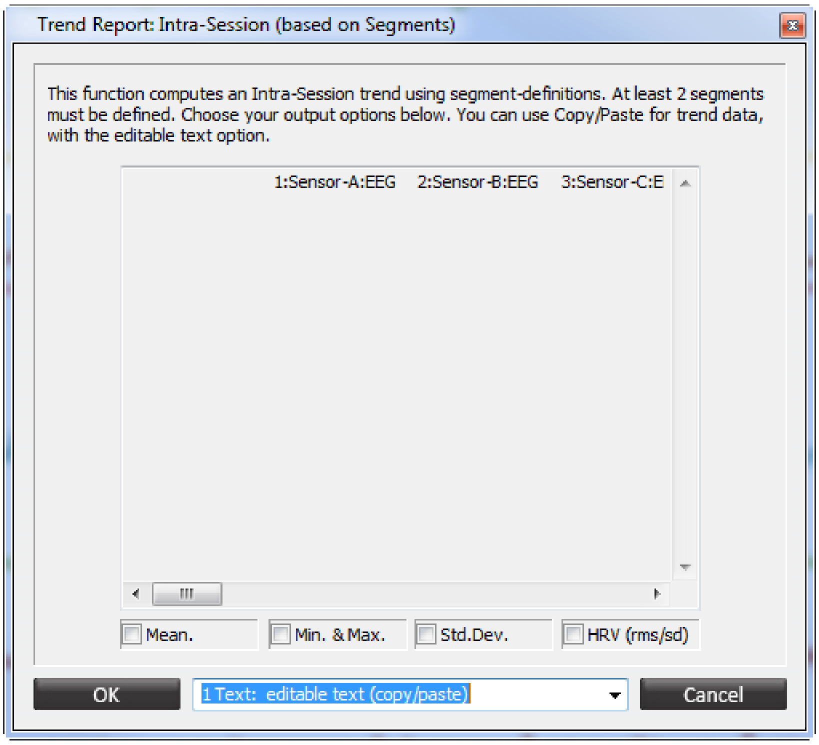
A preview of the graphs, basic client information and the statistics will be presented. This preview can be printed or stored as a PDF file, depending on the software installed on the computer

Intra-session trends

Right-click the *Session Overview* screen and choose **Intra-session trend**.


Intra-Session Trend

The *Trend Report* screen will appear.


Trend Report: Intra-Session (based on Segments)

This function computes an Intra-Session trend using segment-definitions. At least 2 segments must be defined. Choose your output options below. You can use Copy/Paste for trend data, with the editable text option.

1:Sensor-A:EEG
2:Sensor-B:EEG
3:Sensor-C:E
☐ Mean.
☐ Min. & Max.
☐ Std.Dev.
☐ HRV (rms/sd)
OK
1 Text: editable text (copy/paste)
Cancel

Intra-session reports can be generated which are based on the segments. At least 2 segments must be defined. Choose the type of statistics.

Choose the type of output:

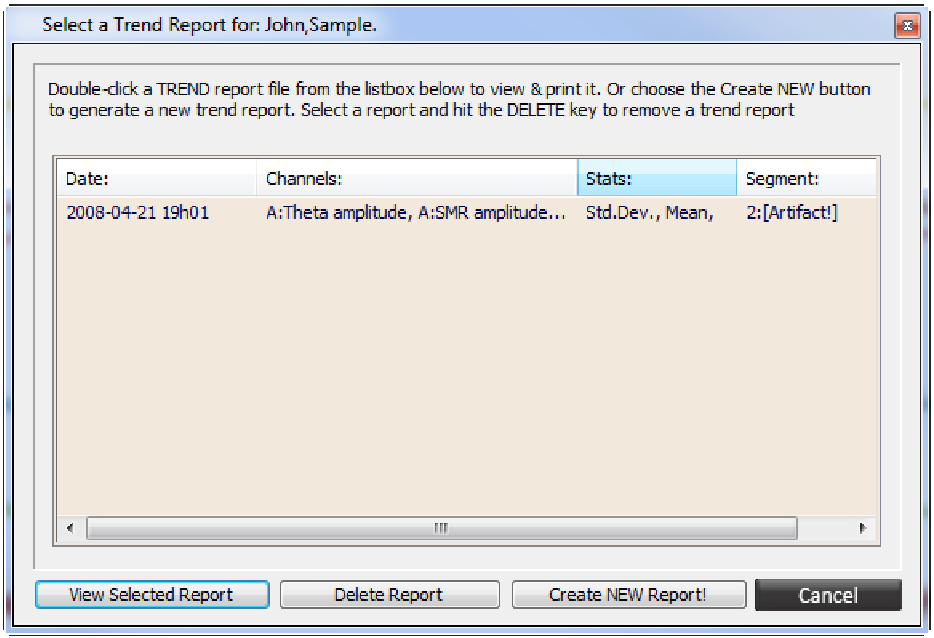
1. Copy/paste the report
2. Create an ASCII file.

Click **OK** to generate the report.

Trend reports

Open the *Client and Session Database* and select a client. Click the **Trend reports** button.

The *Select a Trend Report* screen will appear.



Select a Trend Report for: John,Sample.

Double-click a TREND report file from the listbox below to view & print it. Or choose the Create NEW button to generate a new trend report. Select a report and hit the DELETE key to remove a trend report

Date:	Channels:	Stats:	Segment:
2008-04-21 19h01	A:Theta amplitude, A:SMR amplitude...	Std.Dev., Mean,	2:[Artifact!]

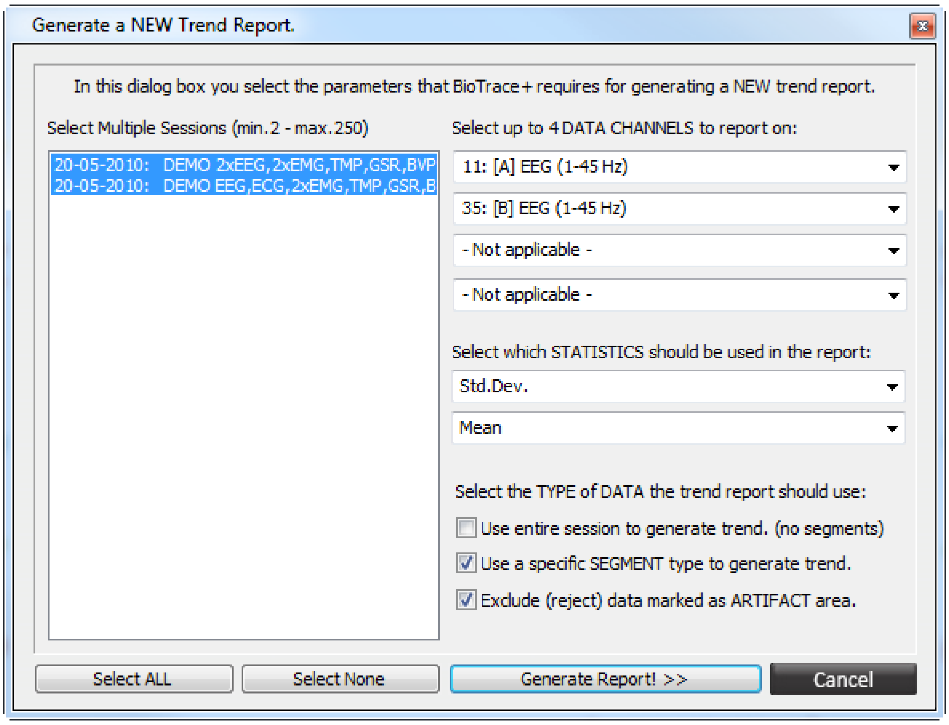
View Selected Report
Delete Report
Create NEW Report!
Cancel

Click **View selected report** for viewing previously generated reports. Click **Delete report** for deleting reports.

Select **Create new report!** to create a new trend report.

Create NEW Report!

The *Generate a New Trend Report* screen will appear.



Generate a NEW Trend Report.

In this dialog box you select the parameters that BioTrace+ requires for generating a NEW trend report.

Select Multiple Sessions (min.2 - max.250)

20-05-2010: DEMO 2xEEG,2xEMG,TMP,GSR,BVP
20-05-2010: DEMO EEG,ECG,2xEMG,TMP,GSR,B

Select up to 4 DATA CHANNELS to report on:

11: [A] EEG (1-45 Hz)
35: [B] EEG (1-45 Hz)
- Not applicable -
- Not applicable -

Select which STATISTICS should be used in the report:

Std.Dev.
Mean

Select the TYPE of DATA the trend report should use:

☐ Use entire session to generate trend. (no segments)
☑ Use a specific SEGMENT type to generate trend.
☑ Exclude (reject) data marked as ARTIFACT area.

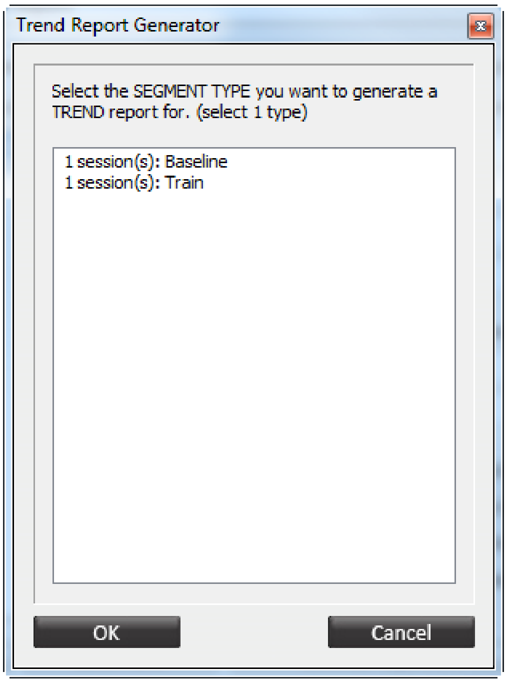
The following items can be configured:

- Number of sessions (min. 2 - max. 250)
- Number of channels. (up to 4)
- Statistics
- Type of DATA the trend report should use (total session, segments, exclusion of data)

Choose **Generate Report! >>** to generate the report.

The *Trend Report Generator* will appear. When selecting **Use entire session to generate trend** the report will immediately be generated.

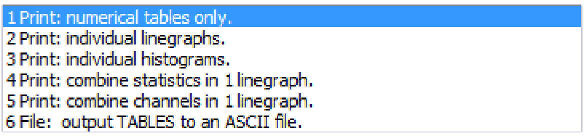
When selecting **Use a specific segment type to generate trend** the following box will appear:



Select the SEGMENT TYPE you want to generate a TREND report for. (select 1 type)

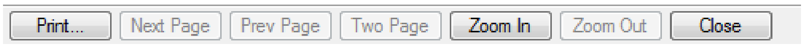
1 session(s): Baseline
1 session(s): Train

Choose the segment to generate the trend report for and click next. Now choose the way the data should be presented and the Y-scale range.



1 Print: numerical tables only.
2 Print: individual linegraphs.
3 Print: individual histograms.
4 Print: combine statistics in 1 linegraph.
5 Print: combine channels in 1 linegraph.
6 File: output TABLES to an ASCII file.

After clicking **OK** a print preview will appear. Click the **Print...** button on the left top to print the trend report.



The **Close** button will close the report.

HRV Analysis

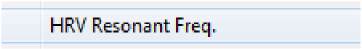
For more information about the HRV analysis, please refer to the HRV white paper. Visit our Knowledge Base(http://www.mindmedia.com/support) for an overview of the latest guides. Perform an HRV analysis by selecting a segment of data, or by right-click the session overview screen and choosing Analysis Functions > **HRV Analysis**.

HRV Analysis

This will open the *HRV Analysis & Interbeat Interval Table* screen. In this screen it is possible to set artifact criteria or remove artifacts. It is also possible to generate a HRV report or export an IBI Table.

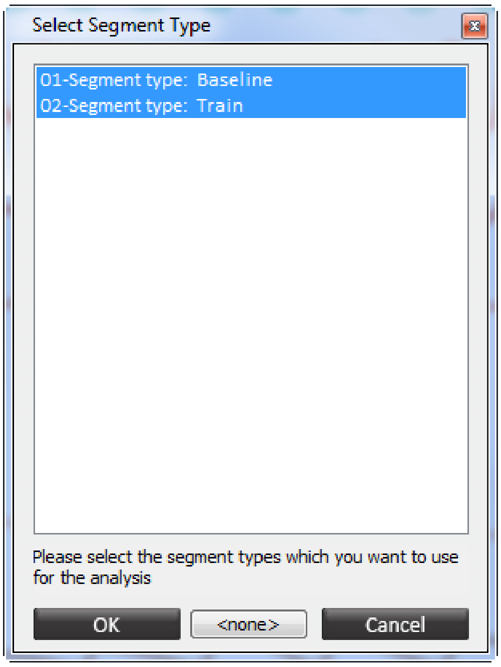
HRV Resonance Frequency Analysis

Right-click the overview screen and choosing Analysis functions: > **HRV Resonance Freq**.



HRV Resonant Freq.

This will open the *Select Segment Type* screen.



Select Segment Type

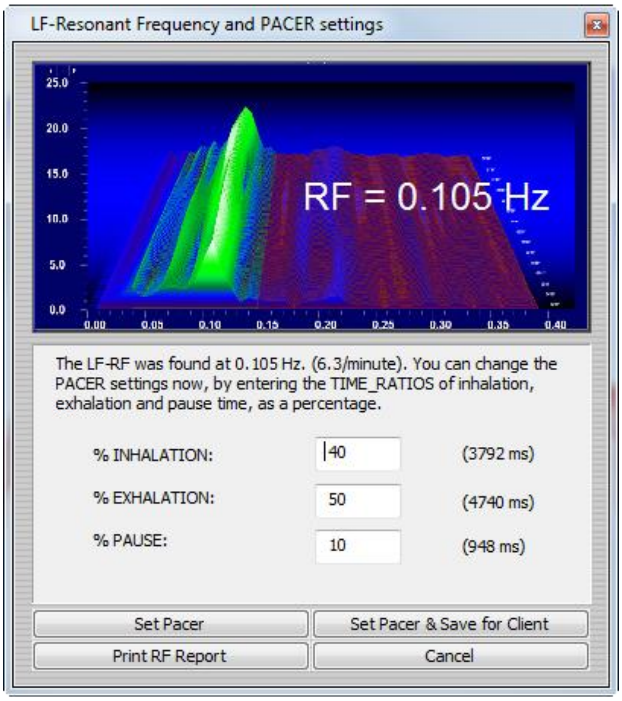
01-Segment type: Baseline
02-Segment type: Train

Please select the segment types which you want to use for the analysis

Select the segment types to be analyzed.

Click **OK** to continue.

This will open the *LF-Resonant Frequency and Pacer Settings* screen.



LF-Resonant Frequency and PACER settings

25.0
20.0
15.0
10.0
5.0
0.0
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
RF = 0.105 Hz

The LF-RF was found at 0.105 Hz. (6.3/minute). You can change the PACER settings now, by entering the TIME_RATIOS of inhalation, exhalation and pause time, as a percentage.

% INHALATION: 40 (3792 ms)
% EXHALATION: 50 (4740 ms)
% PAUSE: 10 (948 ms)

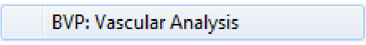
Set Pacer
Set Pacer & Save for Client
Print RF Report
Cancel

Select **Set Pacer**, to save the calculated data as the current pacer. Save a pacer for a client by selecting **Set Pacer & Save for Client**. Whenever choosing this client, the pacer will automatically be set to a specific pacer setting.

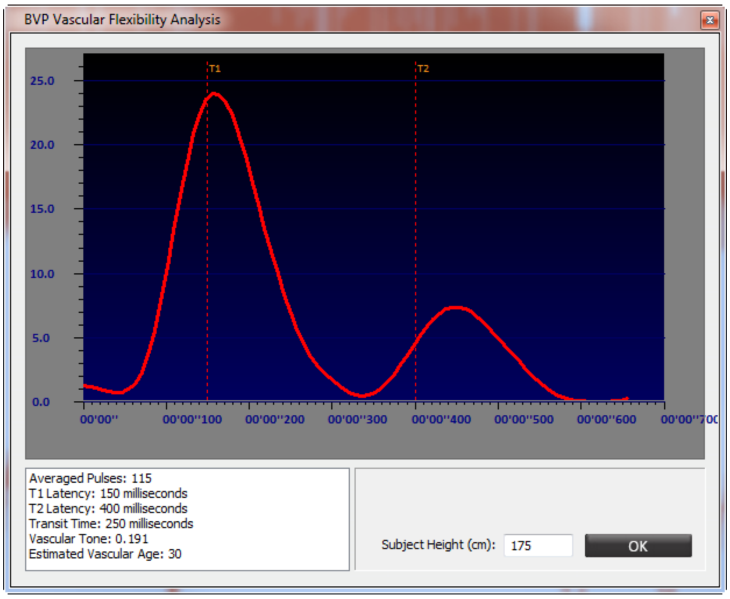
Click **Print RF Report**, to create a report of the RF calculation. The report will show the peak frequency and if applicable, the segment withholding the peak frequency.

BVP Vascular Analysis

Right click in the overview screen and choose Analysis functions: > **BVP Vascular Analysis.**


BVP: Vascular Analysis

This will open the *BVP Vascular Flexibility Analysis* screen.


BVP Vascular Flexibility Analysis
T1
T2
25.0
20.0
15.0
10.0
5.0
0.0
00'00''
00'00''100
00'00''200
00'00''300
00'00''400
00'00''500
00'00''600
00'00''700
OK

Averaged Pulses: 115
T1 Latency: 150 milliseconds
T2 Latency: 400 milliseconds
Transit Time: 250 milliseconds
Vascular Tone: 0.191
Estimated Vascular Age: 30

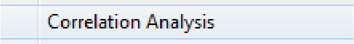
Subject Height (cm): 175

The BVP vascular analysis is based on a small database and should be used as a relative measure for improving vascular flexibility (decreasing vascular age).

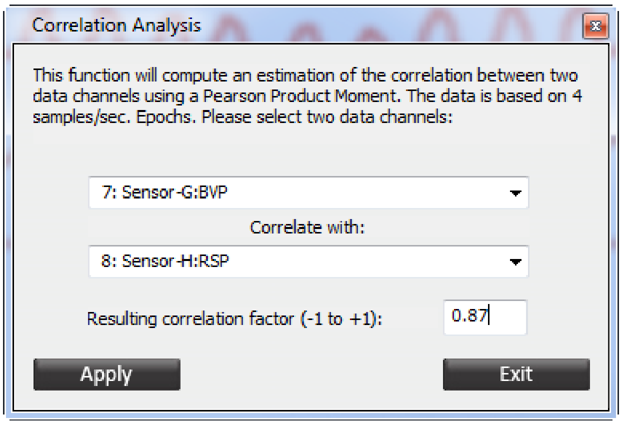
This function uses BVP data to get an idea of vascular flexibility. Set the marker T1 at the first peak and T2 at the second peak of the mean BVP signal.

Correlation Analysis

Right-click the session overview screen and choose Analysis functions: > **Correlation Analysis**


Correlation Analysis

The *Correlation Analysis* screen will appear.



Correlation Analysis

This function will compute an estimation of the correlation between two data channels using a Pearson Product Moment. The data is based on 4 samples/sec. Epochs. Please select two data channels:

7: Sensor-G:BVP

Correlate with:

8: Sensor-H:RSP

Resulting correlation factor (-1 to +1): 0.87

To obtain the estimate of correlation, click the **Apply** button. Correlation is expressed in a number between -1 and 1.

This function uses a Pearson Product Moment on epoch based channel data. Epochs contain summary data and statistics, which are stored 4 times per second. Therefore the correlation function works well on analyzing slow signals (<10 Hz) or trends over longer time periods (larger than 10 seconds).

ERP/VEP

For more information, please refer to the ERP/VEP white-paper. Visit our Knowledge Base(http://www.mindmedia.com/support) for an overview of the latest guides.

For analyzing ERP/EP data it is required to build or load an *.presentation file.

Select ERP/VEP > **Load Presentation** in the top menu for loading presentation. Select a *.presentation file and click 'OK'.

Select ERP/VEP > **Build new Presentation** in the top menu for building a new presentation.

Choose for an ERP, VEP, or ATT presentation. Set the type of paradigm and stimulus related to the type of presentation. This can be set in the "ERP/EP Stimulus and Event Presentation builder" screen.

Click **Next >>** for the *ERP Event Presentation List Generator*. In this dialog box it is possible to set the parameters of the selected ERP paradigm.

Click **Next >>** to finish the presentation. This will open an alert box which will ask to build the presentation.

Click 'OK'.

This will open the *Event Presentation Editor* for editing the events in the presentation.

For performing the analysis, select ERP/VEP > **ERP/EP Averaged Response** in the top menu (or right-click the session overview screen and click Analysis functions: > **ERP/EP Averaged Response**)

ERP/EP Averaged Response

This will open the *ERP Analysis* screen for editing the settings of the analysis.

Click **Print ERP Report!** for generating the report.

Click **Save ERP: ASCII File** for saving the ERP analysis.

SCP Averaged Response

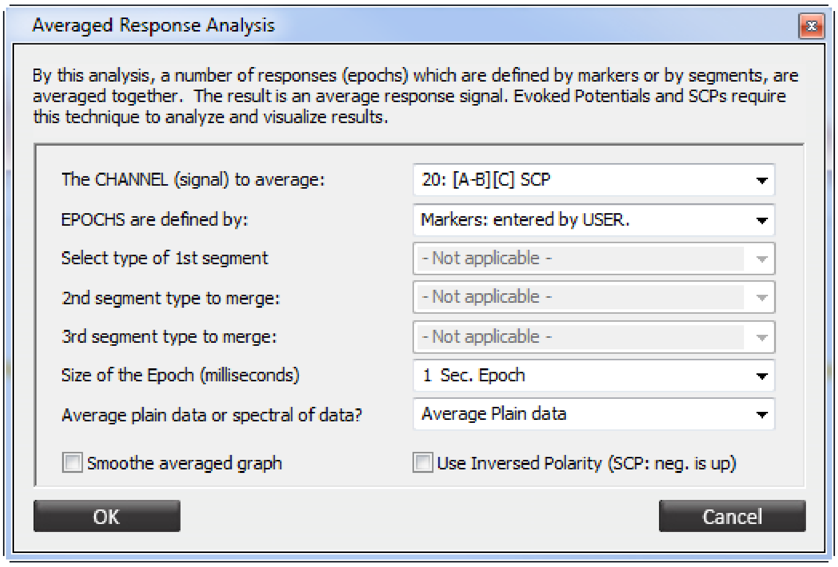
For more information, please refer to the SCP white-paper. Visit our Knowledge Base(http://www.mindmedia.com/support) for an overview of the latest white papers.

This function computes an ‘averaged response’ of SCP trials. Go to the top menu and choose SCP/Trials > **Build new trial sequence** for building a new trial.

Click-right in the session overview screen and select Analysis functions: > **SCP averaged response**.

SCP Averaged Response

This will open the *Averaged Response Analysis* screen.



By this analysis, a number of responses (epochs) which are defined by markers or by segments, are averaged together. The result is an average response signal. Evoked Potentials and SCPs require this technique to analyze and visualize results.

The CHANNEL (signal) to average: 20: [A-B][C] SCP

EPOCHS are defined by: Markers: entered by USER.

Select type of 1st segment: - Not applicable -

2nd segment type to merge: - Not applicable -

3rd segment type to merge: - Not applicable -

Size of the Epoch (milliseconds): 1 Sec. Epoch

Average plain data or spectral of data? Average Plain data

☐ Smoothe averaged graph

☐ Use Inversed Polarity (SCP: neg. is up)

The following items can be configured:

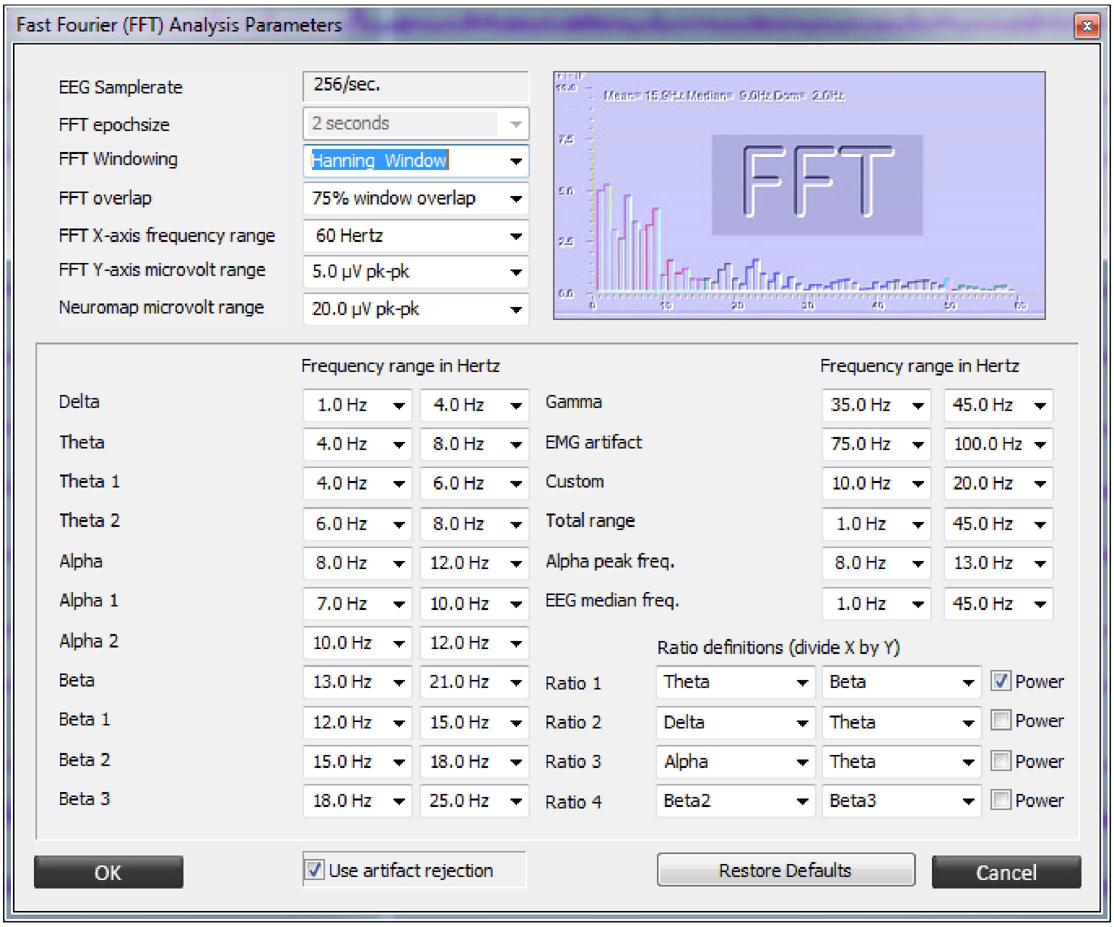
- The CHANNEL (signal) to average
- Definition of EPOCHS: how are epochs/events defined.
- Type of 1st/2nd/3rd segment, if applicable.
- Size of the Epoch (milliseconds).
- Average plain data or spectral of data

Averaged graphs can be smoothed by choosing **Smooth averaged graph**. Check **Use Inversed Polarity** to inverse polarity.

FFT Analysis

The FFT Analysis can be changed through Configuration > **FFT Analysis Settings** in the top menu.

The *Fast Fourier (FFT) Analysis Parameters* screen will appear.


Fast Fourier (FFT) Analysis Parameters
Mean= 15.9Hz Median= 9.0Hz Dom= 2.0Hz
FFT
10.0
7.5
5.0
2.5
0.0
0
10
20
30
40
50
60
OK
Restore Defaults
Cancel

EEG Samplerate: 256/sec.
FFT epochsize: 2 seconds
FFT Windowing: Hanning Window
FFT overlap: 75% window overlap
FFT X-axis frequency range: 60 Hertz
FFT Y-axis microvolt range: 5.0 µV pk-pk
Neuromap microvolt range: 20.0 µV pk-pk

	Frequency range in Hertz			Frequency range in Hertz	
Delta	1.0 Hz	4.0 Hz	Gamma	35.0 Hz	45.0 Hz
Theta	4.0 Hz	8.0 Hz	EMG artifact	75.0 Hz	100.0 Hz
Theta 1	4.0 Hz	6.0 Hz	Custom	10.0 Hz	20.0 Hz
Theta 2	6.0 Hz	8.0 Hz	Total range	1.0 Hz	45.0 Hz
Alpha	8.0 Hz	12.0 Hz	Alpha peak freq.	8.0 Hz	13.0 Hz
Alpha 1	7.0 Hz	10.0 Hz	EEG median freq.	1.0 Hz	45.0 Hz
Alpha 2	10.0 Hz	12.0 Hz			
Beta	13.0 Hz	21.0 Hz			
Beta 1	12.0 Hz	15.0 Hz			
Beta 2	15.0 Hz	18.0 Hz			
Beta 3	18.0 Hz	25.0 Hz			

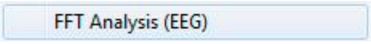
Ratio definitions (divide X by Y)

Ratio 1	Theta	Beta	☑ Power
Ratio 2	Delta	Theta	☐ Power
Ratio 3	Alpha	Theta	☐ Power
Ratio 4	Beta2	Beta3	☐ Power

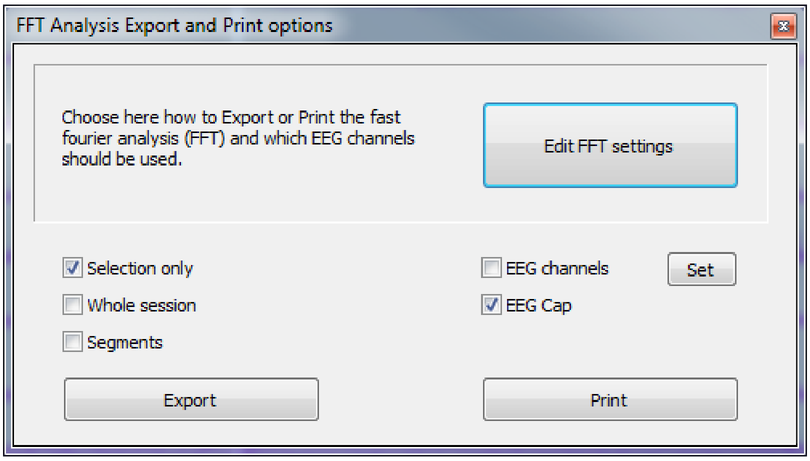
☑ Use artifact rejection

Enable artifact rejection by checking **Use Artifact Rejection.** Click **OK** to finish the configuration.

To perform a FFT analysis, select an area in the overview screen and click Analysis functions: > **FFT Analysis (EEG)**.


FFT Analysis (EEG)

The *FFT analysis: Print and Export options* screen will appear:



Choose here how to Export or Print the fast fourier analysis (FFT) and which EEG channels should be used.

☑ Selection only
☐ Whole session
☐ Segments
☐ EEG channels
☑ EEG Cap

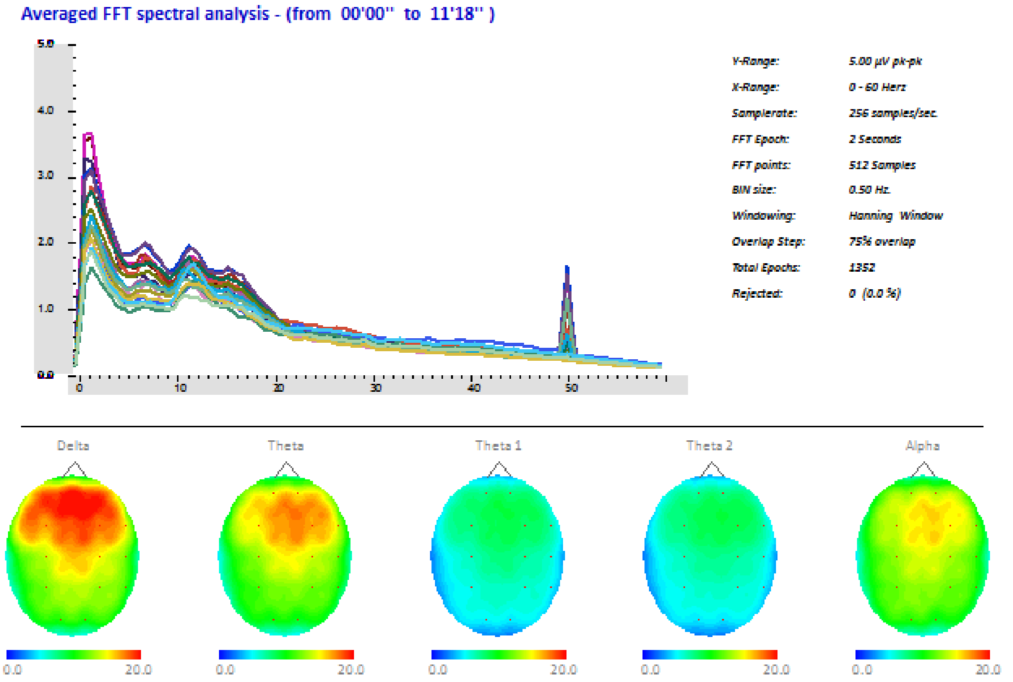
Choose to export FFT data to an excel file for either training channels (EEG channels) or the EEG Cap (NeXus-32). Export or print data for a selection or the whole session. FFT analysis for segments can only be exported.

Absolute amplitude and power, relative amplitude and power, standard deviation amplitude and power per frequency band, a spectral analysis for each bin of 0.5 Hz, amplitude and power ratios , EMG artifact amplitudes, alpha peak frequencies and EEG median frequencies will be calculated.

NeuroMapping Report

This feature is only available for NeXus-32.

To create a NeuroMapping report, select an area or right-click in the overview screen and click NeuroMapping Report. The NeuroMapping includes an FFT spectral analysis for each channel and 14 brainmaps for different frequency ranges. Frequency ranges and microvolt ranges for the spectral linegraphs and brainmaps can be changed in the FFT settings (Configuration > FFT Analysis settings). An option for automatic scaling on minimal and maximum values per brainmap can be chosen (AUTO µV Range), as well as multiple options (2-45 µV peak-peak) for a fixed scale for all brainmaps.



Averaged FFT spectral analysis - (from 00'00" to 11'18")

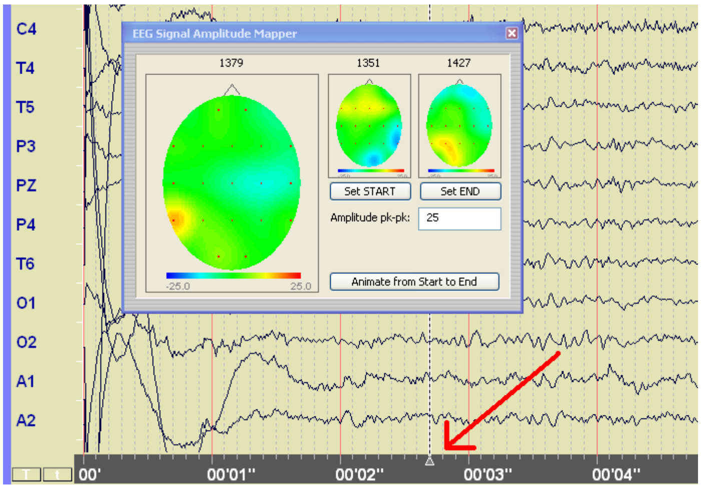
Y-Range: 5.00 µV pk-pk
X-Range: 0 - 60 Herz
Samplerate: 256 samples/sec.
FFT Epoch: 2 Seconds
FFT points: 512 Samples
BIN size: 0.50 Hz.
Windowing: Hanning Window
Overlap Step: 75% overlap
Total Epochs: 1352
Rejected: 0 (0.0 %)

EEG Signal Amplitude Mapping

This feature is only available for NeXus-32 and will only work in the EEG multiline graph, not in review mode. It will also only work when a referential montage has been selected

---

In the EEG multiline graph screen, left click on the time-scale and drag the mouse.



Amplitude pk-pk: 25

C4
T4
T5
P3
PZ
P4
T6
O1
O2
A1
A2
EEG Signal Amplitude Mapper
1379
1351
1427
-25.0
25.0
Set START
Set END
Animate from Start to End
00'
00'01"
00'02"
00'03"
00'04"

The *EEG Signal Amplitude Mapper* screen will appear.

Define a start sample location and an end sample location, by dragging the selection line to a time point and pressing respectively the **Set START** and **Set END** button. Then select the button **Animate from Start to End**.

6. Objects

There are the following categories of objects:

General objects

These objects can be used for general purposes on a screen, they do not display any signals.

Icon	Object type	Description
T	The Text Object	Display (descriptive) text
	The Image Object	Display a (static) image

Action objects

These objects can be used for performing actions on a screen.

Icon	Object type	Description
	The Button Control Object	Display buttons which can perform specific actions

Line graphs

These objects can be used for displaying signals in a line graph.

Icon	Object type	Description
	The Single Y-Scale Line Graph	Display a line graph for 1 type of signal
	The Dual Y-Scale Line Graph	Display a line graph for 2 types of signals
	The Polylinegraph	Display up to 32 channels as linegraph on 1 X-axis

FFT line graphs

These objects can be used for displaying signals in a FFT graph.

Icon	Object type	Description
	The Single FFT Spectrum	Displays spectral analysis for a single channel
	The Dual FFT Spectrum	Displays spectral analysis for a dual channel.
	The 3D FFT Spectrum	Displays spectral analysis in 3D for a single channel
	The Spectogram	Displays spectral analysis in 2D for a single channel
	The NeuroMap (*NeXus-32 only*)	Maps activity of the 21 remontaged EEG channels on a 2D surface

Bar graphs

These objects can be used for displaying signals in a bar graph.

Icon	Object type	Description
	The Bargraph	Displays a bargraph for a single channel
▲	The Vernier Instrument	Displays a horizontal bargraph for a single channel
	The Zoomer Instrument	Displays a rectangle, circle, or image which expands or contracts in all direction for a single channel

Numerical objects

These objects can be used for displaying numerical data.

Icon	Object type	Description
123	The Numerical Instrument	Displays numerical data

Imaging objects

These objects can be used for visualizing ranges of signals or display certain states.

Icon	Object type	Description
	The Animation Instrument	Displays an animated series of images
💧	The Water Effect Instrument	Displays a water ripple effect
DirectX	The Direct-X Plug-In Instrument	Displays installed Direct-X plug-ins
🕒	The Clock Counter Instrument	Displays very small increments or decrements of physiological signals

Multimedia objects

The following Multimedia objects can display certain states.

Icon	Object type	Description
▶	The Video Object	Plays video files
💿	The Disc Object	Plays DVDs
🎮	The Game Object	Starts games
f	The Flash Animation Object	Plays an animation or video

Capturing objects

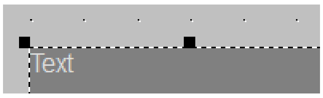
These objects can be used for capturing audio and video.

Icon	Object type	Description
	The Video Capture Instrument	Captures video and audio from a digital camera or webcam
	The Audio Capture Object	Captures only audio

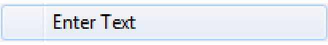
The Text Object

Place a new object by selecting the following item in the *Object Toolbar*.

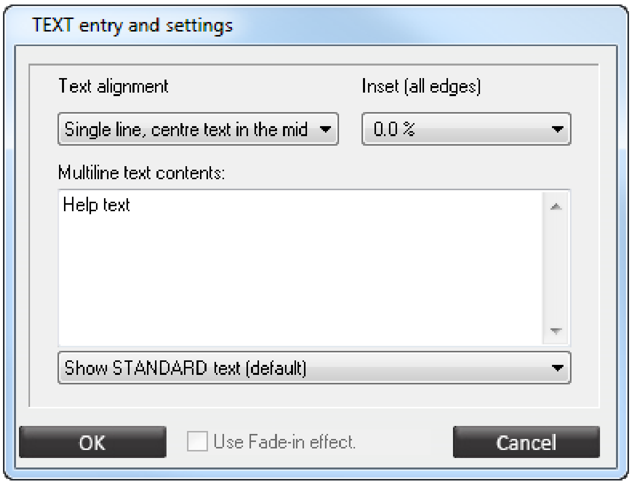
This object can display text.



When placing the text object on the grid, you can enter text. Otherwise right-click this object and select **Enter Text** to enter or edit text.



This will open the *Text Entry and Settings* screen.



Text alignment: Single line, centre text in the mid

Inset (all edges): 0.0 %

Multiline text contents:
Help text

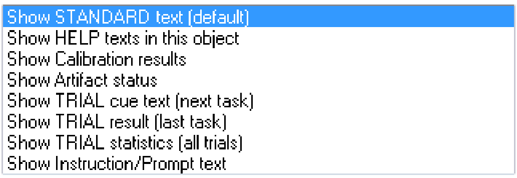
Show STANDARD text (default)

☐ Use Fade-in effect.

The following text options can be set:

- The *Text alignment* of the text defines how the text lines will be displayed.
- The *Inset* defines how much space there is around the edges of the text.
- The *Multiline text contents* with a maximum of 2500 characters.
- The *Use Fade-in effect* will initially display and then slowly fade in the text with another color (Set in **Font Settings**).

Select the following types of text can be selected:



Show STANDARD text (default)
Show HELP texts in this object
Show Calibration results
Show Artifact status
Show TRIAL cue text (next task)
Show TRIAL result (last task)
Show TRIAL statistics (all trials)
Show Instruction/Prompt text

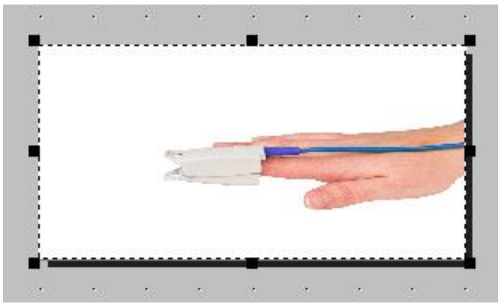
Right-click the object and click **Select Image** to select a background image for the text box.

For other basic editing options, please refer to chapter 6. Editing.

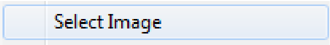
The Image Object

Place a new object by selecting the following item in the *Object Toolbar*.

This object displays a static image that can be used for instruction, as information or as a background image. Image objects support JPG and PNG images.

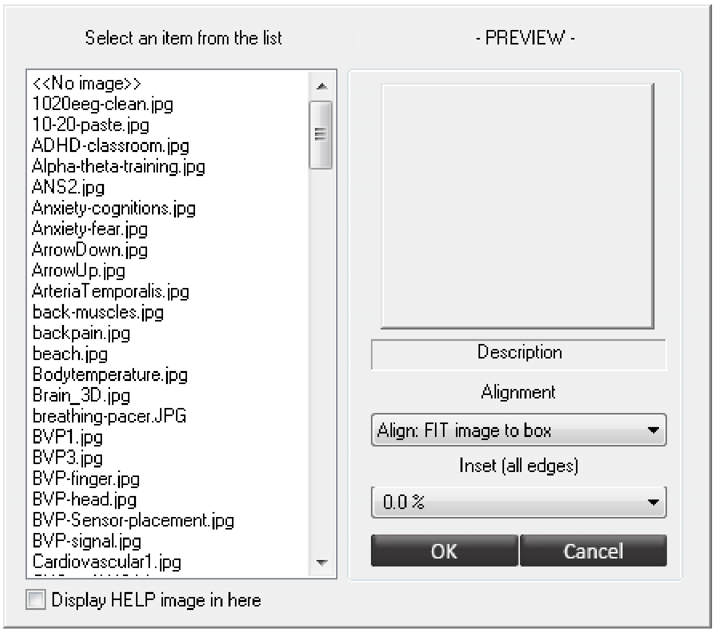


Right-click the image object and select **Select Image**.



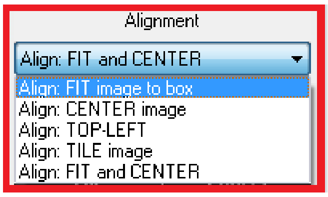
Select Image

This will show the image selection dialog box.


Select an item from the list
- PREVIEW -
<<No image>>
1020eeg-clean.jpg
10-20-paste.jpg
ADHD-classroom.jpg
Alpha-theta-training.jpg
ANS2.jpg
Anxiety-cognitions.jpg
Anxiety-fear.jpg
ArrowDown.jpg
ArrowUp.jpg
ArteriaTemporalis.jpg
back-muscles.jpg
backpain.jpg
beach.jpg
Bodytemperature.jpg
Brain_3D.jpg
breathing-pacer.JPG
BVP1.jpg
BVP3.jpg
BVP-finger.jpg
BVP-head.jpg
BVP-Sensor-placement.jpg
BVP-signal.jpg
Cardiovascular1.jpg
Description
OK
Cancel
☐ Display HELP image in here

Alignment: Align: FIT image to box

Inset (all edges): 0.0 %


Alignment
Align: FIT and CENTER
Align: FIT image to box
Align: CENTER image
Align: TOP-LEFT
Align: TILE image
Align: FIT and CENTER

Select an item from the list (left). The following options can be set:

- *Alignment*: this defines how the image will be placed or stretched inside the image object box. Alignment options are displayed in the red box.
- *Inset*: This defines how much space there will be around the image.

For other basic editing options, please refer to chapter 6. Editing.

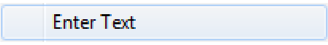
The Button Control Object

Place a new object by selecting the following item in the *Object Toolbar*.

This object displays buttons which can be used for performing specific actions. Button objects support JPG and PNG images.

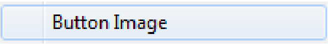
Enter text

Right-click a button and select **Enter Text** for editing text.

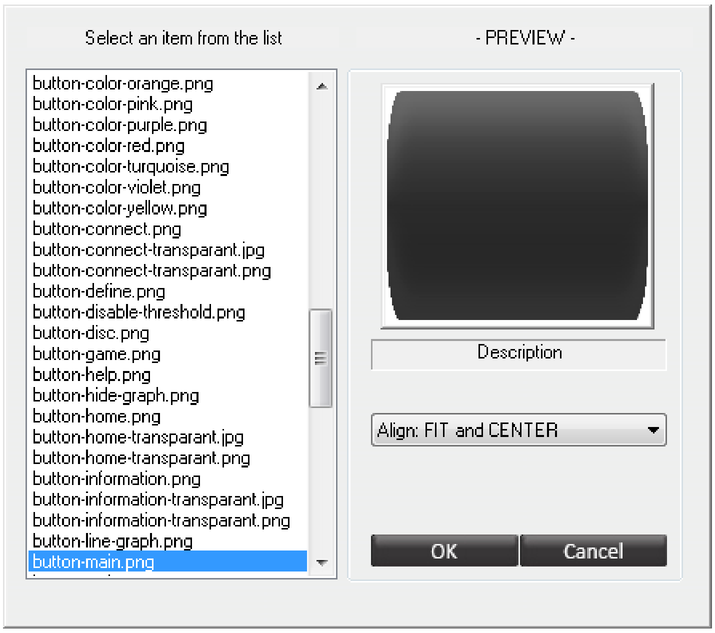


Change button image

Click **Button Image** to select an image for the button.


Button Image

This will show the image selection dialog box.



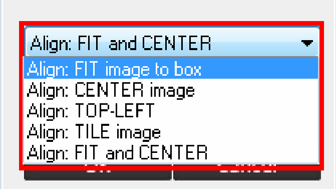
Select an item from the list

button-color-orange.png
button-color-pink.png
button-color-purple.png
button-color-red.png
button-color-turquoise.png
button-color-violet.png
button-color-yellow.png
button-connect.png
button-connect-transparant.jpg
button-connect-transparant.png
button-define.png
button-disable-threshold.png
button-disc.png
button-game.png
button-help.png
button-hide-graph.png
button-home.png
button-home-transparant.jpg
button-home-transparant.png
button-information.png
button-information-transparant.jpg
button-information-transparant.png
button-line-graph.png
button-main.png

- PREVIEW -

Description

Align: FIT and CENTER



Align: FIT and CENTER

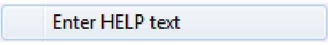
Align: FIT image to box
Align: CENTER image
Align: TOP-LEFT
Align: TILE image
Align: FIT and CENTER

Alignment of the image object can be selected.

Display help text

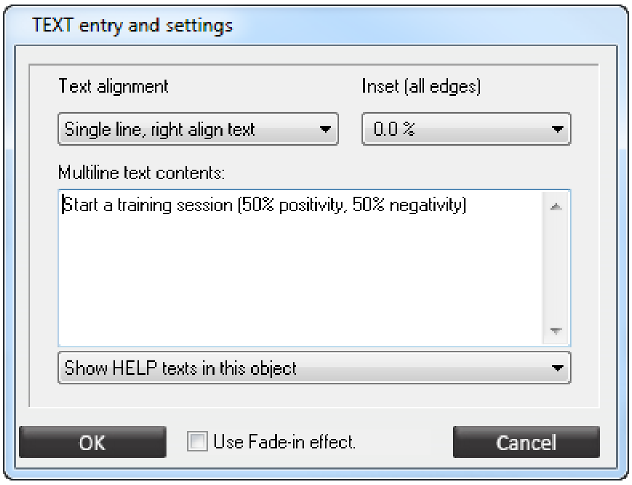
This option will link a text object to the button. This text object should display the "help" text, when the cursor moves over the button.

Right-click a button and select **Enter Help Text** to edit help text.



Enter HELP text

This will open the *Text entry and settings* screen.



TEXT entry and settings

Text alignment: Single line, right align text

Inset (all edges): 0.0 %

Multiline text contents:

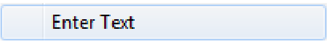
Start a training session (50% positivity, 50% negativity)

Show HELP texts in this object

☐ Use Fade-in effect.

Click **OK** for changing text contents.

Now right-click the text box which will be used to show the help texts and select **Enter Text**.



Enter Text

Select **Show HELP texts in this object** from the drop-down menu at the bottom of the dialog box.

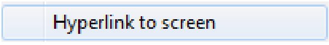
Show HELP texts in this object

Click **OK**. Now help texts will appear when hovering over buttons. Check **Use Fade-in effect** for a fade-in effect.

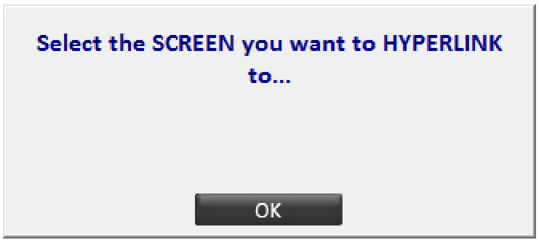
Only 1 help text object can be displayed on a screen

Hyperlink to screen

A button can be used to hyperlink to another screen. A hyperlink will load a selected screen. Right-click a button and select **Hyperlink to screen**.



An alert box will appear.


Select the SCREEN you want to HYPERLINK to...

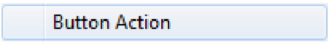
Click **OK**.

This will open the *Screens* folder in a file selector. Browse to a category and select a .*screen file.

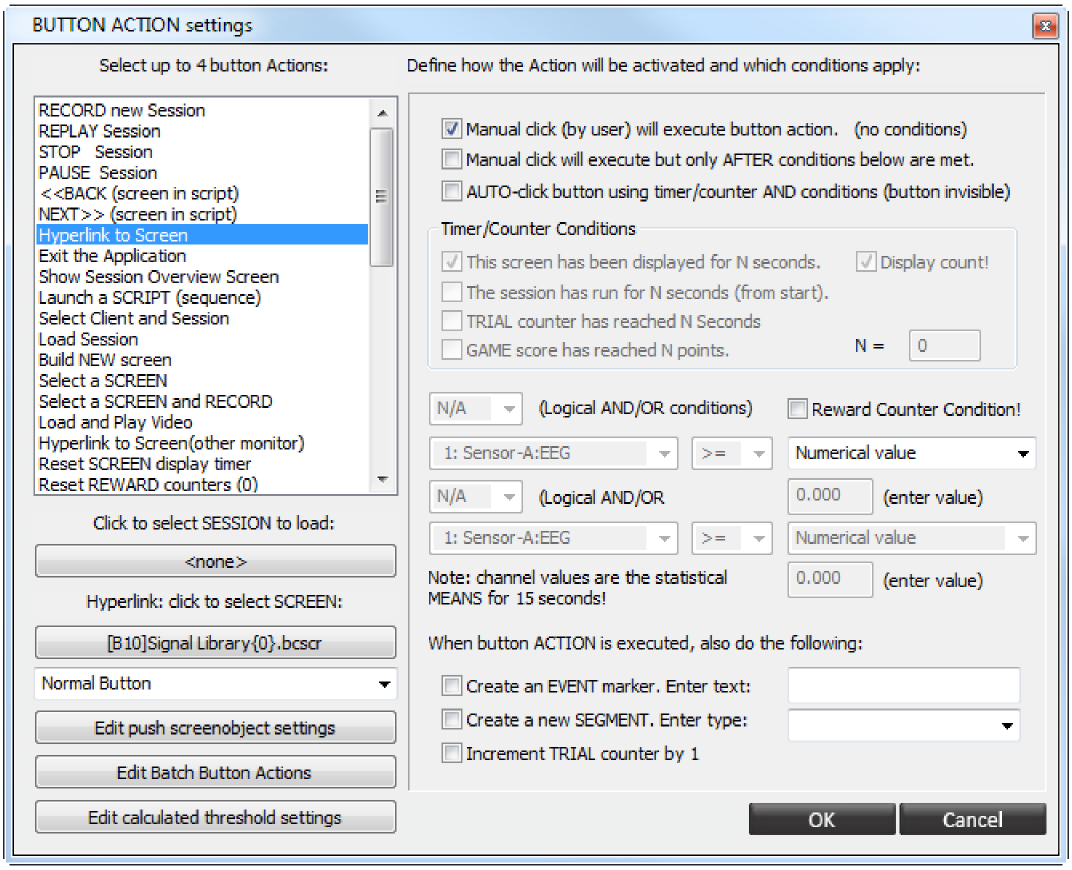
Click **Open** to link the screen.

Button actions

Apart from the basic hyperlink action, it is possible to set other button actions. Right-click the button and choose **Button Action**.



This will show the *Button Action Settings* screen.



BUTTON ACTION settings

Select up to 4 button Actions:

RECORD new Session
REPLAY Session
STOP Session
PAUSE Session
<<BACK (screen in script)
NEXT>> (screen in script)
Hyperlink to Screen
Exit the Application
Show Session Overview Screen
Launch a SCRIPT (sequence)
Select Client and Session
Load Session
Build NEW screen
Select a SCREEN
Select a SCREEN and RECORD
Load and Play Video
Hyperlink to Screen(other monitor)
Reset SCREEN display timer
Reset REWARD counters (0)

Click to select SESSION to load: <none>

Hyperlink: click to select SCREEN: [B10]Signal Library{0}.bcscr

Normal Button

Edit push screenobject settings
Edit Batch Button Actions
Edit calculated threshold settings

Define how the Action will be activated and which conditions apply:

☑ Manual click (by user) will execute button action. (no conditions)
☐ Manual click will execute but only AFTER conditions below are met.
☐ AUTO-click button using timer/counter AND conditions (button invisible)

Timer/Counter Conditions

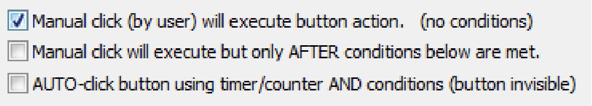
☑ This screen has been displayed for N seconds. ☑ Display count!
☐ The session has run for N seconds (from start).
☐ TRIAL counter has reached N Seconds
☐ GAME score has reached N points. N = 0

N/A (Logical AND/OR conditions) ☐ Reward Counter Condition!
1: Sensor-A:EEG >= Numerical value
N/A (Logical AND/OR 0.000 (enter value)
1: Sensor-A:EEG >= Numerical value
Note: channel values are the statistical MEANS for 15 seconds! 0.000 (enter value)

When button ACTION is executed, also do the following:

☐ Create an EVENT marker. Enter text:
☐ Create a new SEGMENT. Enter type:
☐ Increment TRIAL counter by 1

There are three options for activating an action:



☑ Manual click (by user) will execute button action. (no conditions)
☐ Manual click will execute but only AFTER conditions below are met.
☐ AUTO-click button using timer/counter AND conditions (button invisible)

1. *Manual click by user*: no conditions have to be met.
2. *Manual click after conditions are met*: after meeting the conditions it is possible to click.
3. *Auto-click after conditions and timer/counter*: No button is required to "click". The action is performed automatically by a timer/counter and by meeting conditions.

Timer/Counter conditions are:

1) *The screen has been displayed for a certain time (N seconds).*
2) *The session has run for a certain time. (N seconds).*
3) *The trial counter has reached a certain level*: The trial counter can be incremented by this or other buttons. It starts at 0 at the beginning of a new session.
4) *Game score has reached N points*.

Combine up to 2 Boolean criteria with a logical *AND* or *OR* function. Select **N/A** for no extra conditions.

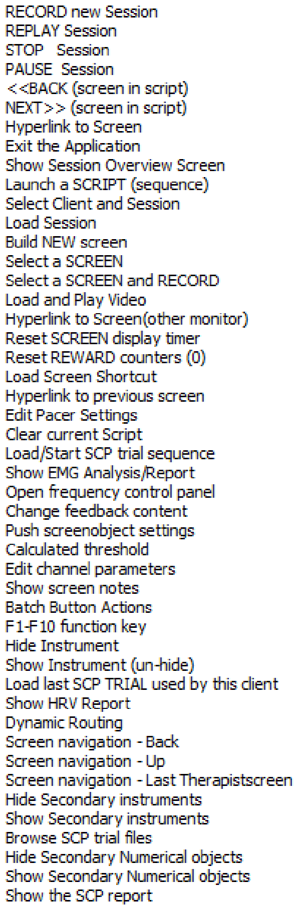
Channel values are the statistical means for 15 seconds.

When a button is clicked (or auto-clicked by a criterion) you can define a number of click-actions:

1) *Generate an event marker*
2) *Create a new segment*
3) *Increment the trial counter by 1*

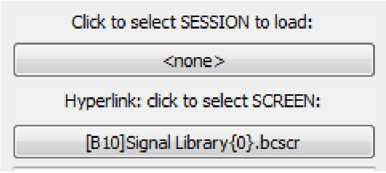
The segment will cover the period from the 'click time' of the button, to the moment that a new segment is created.

Select up to 4 button actions. Not all combinations will be valid though. There are several button actions which can be defined.



RECORD new Session
REPLAY Session
STOP Session
PAUSE Session
<<BACK (screen in script)
NEXT>> (screen in script)
Hyperlink to Screen
Exit the Application
Show Session Overview Screen
Launch a SCRIPT (sequence)
Select Client and Session
Load Session
Build NEW screen
Select a SCREEN
Select a SCREEN and RECORD
Load and Play Video
Hyperlink to Screen(other monitor)
Reset SCREEN display timer
Reset REWARD counters (0)
Load Screen Shortcut
Hyperlink to previous screen
Edit Pacer Settings
Clear current Script
Load/Start SCP trial sequence
Show EMG Analysis/Report
Open frequency control panel
Change feedback content
Push screenobject settings
Calculated threshold
Edit channel parameters
Show screen notes
Batch Button Actions
F1-F10 function key
Hide Instrument
Show Instrument (un-hide)
Load last SCP TRIAL used by this client
Show HRV Report
Dynamic Routing
Screen navigation - Back
Screen navigation - Up
Screen navigation - Last Therapistscreen
Hide Secondary instruments
Show Secondary instruments
Browse SCP trial files
Hide Secondary Numerical objects
Show Secondary Numerical objects
Show the SCP report

Some actions need to link a file. Click the buttons in the following box to link a file:



Click to select SESSION to load: <none>

Hyperlink: click to select SCREEN: [B10]Signal Library{0}.bcscr

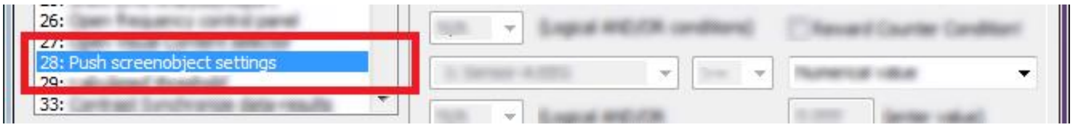
Push object settings

Action Buttons can be used to push predefined settings to an object present on a screen. The following settings of an object can be modified by a push action:

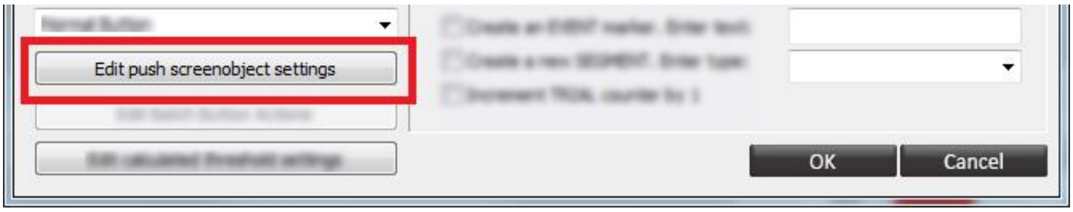
- Channel selection
- Display options and Ranges
- Feedback settings

    - feedback properties
    - enable/disable feedback
    - threshold settings
- Visual object settings
    - color and border
    - title text

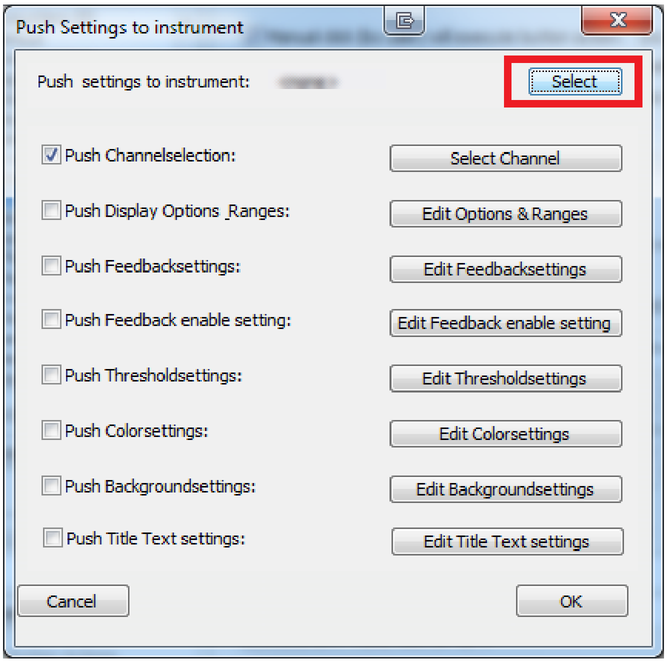
Select the **Push screenobject** setting in the list box:


26:
27:
28: Push screenobject settings
29:
33:

Select **Edit push screenobject settings** below the list box.


Edit push screenobject settings
OK
Cancel

Click **Select** to select the instrument on which the setting should be pushed.


Push Settings to instrument
Push settings to instrument:
Select

☑ Push Channelselection: Select Channel
☐ Push Display Options_Ranges: Edit Options & Ranges
☐ Push Feedbacksettings: Edit Feedbacksettings
☐ Push Feedback enable setting: Edit Feedback enable setting
☐ Push Thresholdsettings: Edit Thresholdsettings
☐ Push Colorsettings: Edit Colorsettings
☐ Push Backgroundsettings: Edit Backgroundsettings
☐ Push Title Text settings: Edit Title Text settings

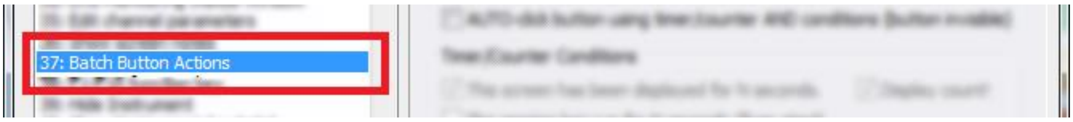
Select the properties which should be pushed the selected instrument by ticking the checkbox.

To setup the push settings, click on the button on the right of the selected push setting to open the dialog showing all the options.

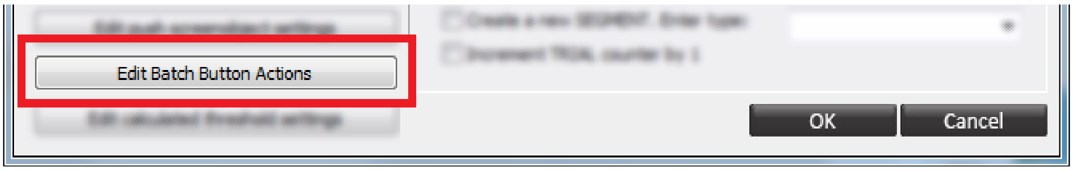
Batch button settings

A batch button action can be used to apply more than 4 actions with a single button (limitation of normal button action). It is also possible to use similar button actions multiple times with the click of a single button.

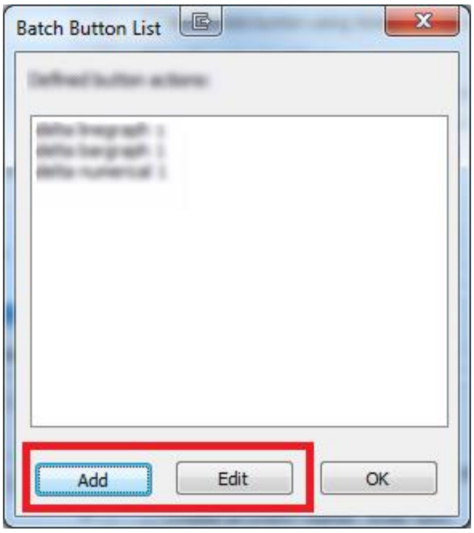
Select the **Batch Button Actions** setting in the list box. Make sure this is the only selected action.


37: Batch Button Actions

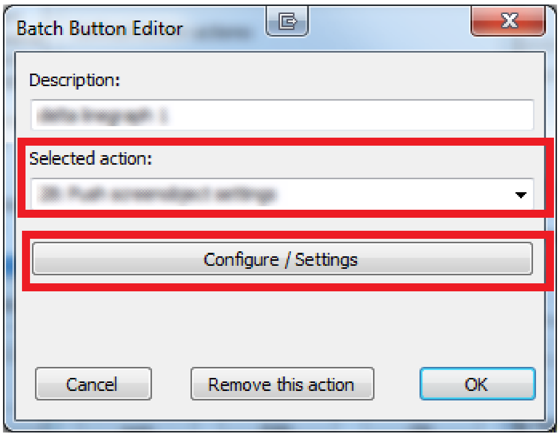
Select **Edit Batch Button Actions** below the list box.


Edit Batch Button Actions
OK
Cancel

Button actions can be added or edited in the Batch Button dialog. Click **Add** or **Edit** to open the Batch Button Editor.

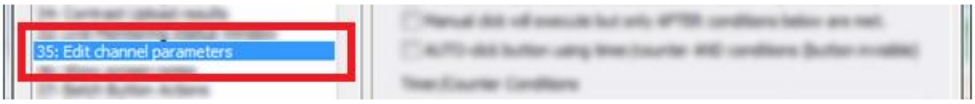

Batch Button List
Add
Edit
OK

The *Description* and *Selected action* can be set with **Select** action and **Configure / Settings**.

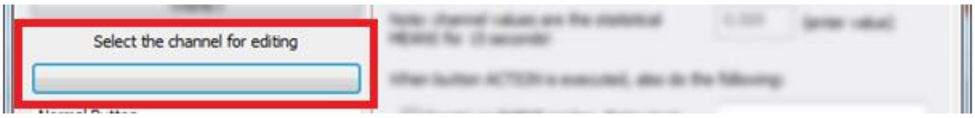

Batch Button Editor
Description:
Selected action:
Configure / Settings
Cancel
Remove this action
OK

Create a custom frequency range button

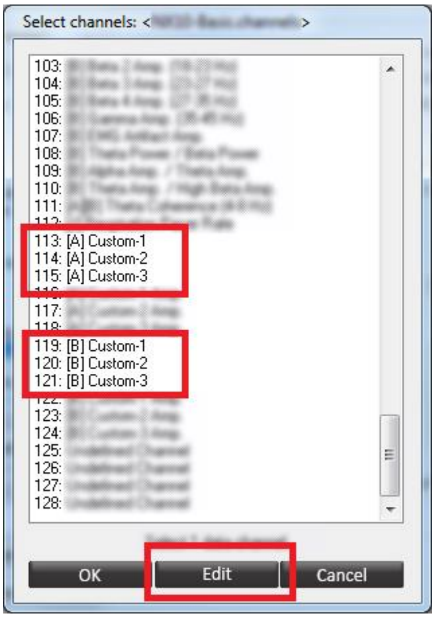
Select the **Edit channel parameter** setting in the list box.


35: Edit channel parameters

Click the button **Select the channel for editing** to open the Select channel dialog.


Select the channel for editing

Select a custom channel in this dialog and click **Edit** to open the Edit channel dialog of this custom channel.


Select channels: <
103:
104:
105:
106:
107:
108:
109:
110:
111:
113: [A] Custom-1
114: [A] Custom-2
115: [A] Custom-3
117:
119: [B] Custom-1
120: [B] Custom-2
121: [B] Custom-3
123:
124:
125:
126:
127:
128:
OK
Edit
Cancel

For information about editing channels, please refer to chapter 8. Inputs & Channels

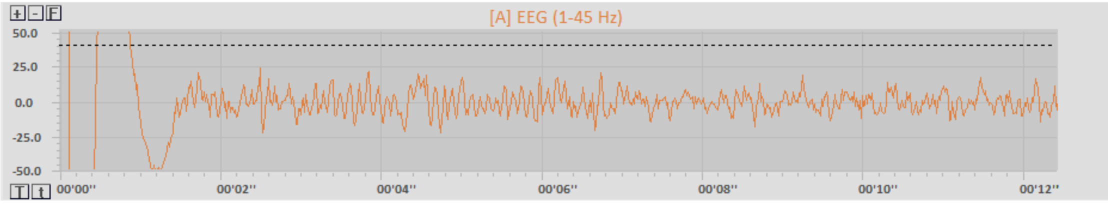
---

The Single Y-Scale Line graph

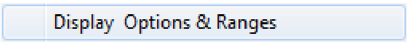
Place a new object by selecting the following item in the *Object Toolbar*.

The Single Y-Scale Line Graph can show one type of signal and is capable of displaying up to 4 channels of the same unit simultaneously.

Use the Dual Y-Scale Line graph instrument for displaying signals with different units and ranges (e.g. heart rate and temperature).

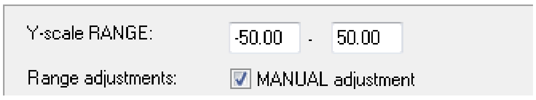


Right-click the line graph object and select **Display Options & Ranges**.



Edit properties like:

- *Range adjustments*:
    - Manual adjustment



Y-scale RANGE: -50.00 - 50.00

Range adjustments: ☑ MANUAL adjustment

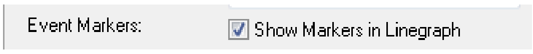
- Auto fit to min-max (Enable or disable **Linegraph: refresh each sweep**)
- Auto fit to 0-max (Enable or disable **Linegraph: refresh each sweep**)
- Auto-center

- *Smoothing*: 0 (Off) to factor 64.

Smoothing: 64

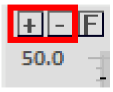
- *Data type/stats:*
    - *Current actual data value*
    - Successful POS/NEG feedback trails
    - Successful POS/NEG transfer trails
    - Successful VEOG POS/NEG trails
    - All POS/NEG feedback trails
    - All POS/NEG transfer trails
    - All VEOG POS/NEG trails
- *Instrument style*: thickness of the line
    - Width 1 (thin)
    - Width 2
    - Width 3 (thick)
    - Filled
- *Display options 1*: polarity

  - Normal
  - Inversed
- *Display options 2*: grid options
  - Show grid fine
  - Show grid medium
  - Hide grid
- *Event markers*: show markers in Linegraph (offline)

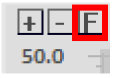


Event Markers: ☑ Show Markers in Linegraph

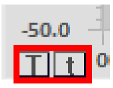
The range of a line graph can also be adjusted with buttons in the graph. Click **+** or **-** to increase or decrease the range of the Y-axis.



Click **F** to fit the range the Y-scale with minimum and maximum measurement of the session.



Change the range of the X-axis by clicking **T** for increasing the range and **t** for decreasing the range.

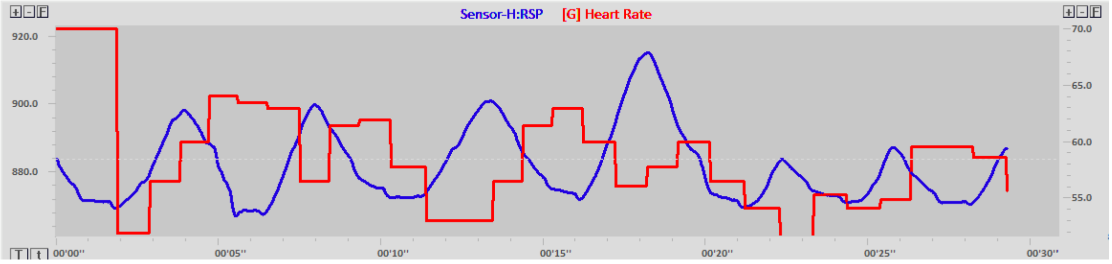


For Color Settings, Backgrounds & Borders, Title Text(s), and Font Settings, please refer to chapter 6. Editing.

The Dual Y-Scale Line graph

Place a new object by selecting the following item in the *Object Toolbar*.

The Dual Y-Scale Line Graph is a multi-purpose instrument capable of displaying up to 2 types of signals simultaneously. The dual y-scale makes it possible to display two different modalities in the same line graph.

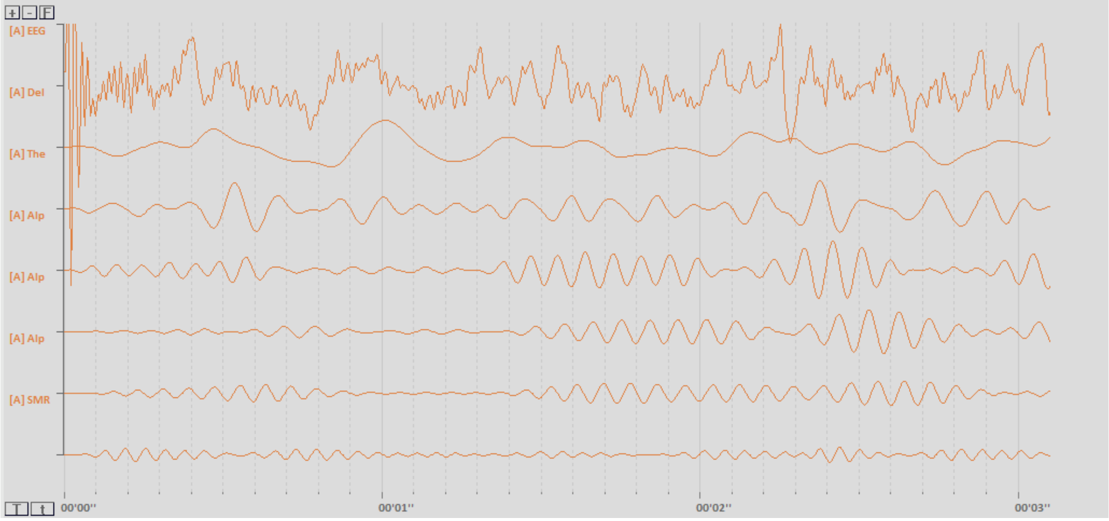


Settings are similar to the Single Y-scale Line Graph.

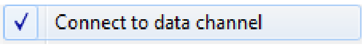
The Polylinegraph

Place a new object by selecting the following item in the *Object Toolbar*.

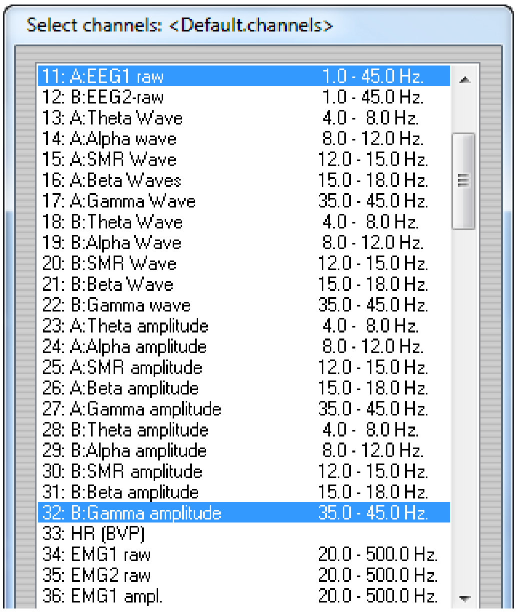
The Polylinegraph can only show signals. No feedback can be set. A maximum of 32 signals can be displayed on a single X-scale . The object auto-scales the signals, so the signal will always fit.



Select a range of up to 32 data channels. Right-click the object and select **Connect to data channel**.



The *Select channels* screen will appear.



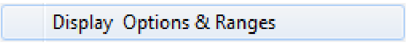
Select channels: <Default.channels>

11: A:EEG1 raw	1.0 - 45.0 Hz.
12: B:EEG2-raw	1.0 - 45.0 Hz.
13: A:Theta Wave	4.0 - 8.0 Hz.
14: A:Alpha wave	8.0 - 12.0 Hz.
15: A:SMR Wave	12.0 - 15.0 Hz.
16: A:Beta Waves	15.0 - 18.0 Hz.
17: A:Gamma Wave	35.0 - 45.0 Hz.
18: B:Theta Wave	4.0 - 8.0 Hz.
19: B:Alpha Wave	8.0 - 12.0 Hz.
20: B:SMR Wave	12.0 - 15.0 Hz.
21: B:Beta Wave	15.0 - 18.0 Hz.
22: B:Gamma wave	35.0 - 45.0 Hz.
23: A:Theta amplitude	4.0 - 8.0 Hz.
24: A:Alpha amplitude	8.0 - 12.0 Hz.
25: A:SMR amplitude	12.0 - 15.0 Hz.
26: A:Beta amplitude	15.0 - 18.0 Hz.
27: A:Gamma amplitude	35.0 - 45.0 Hz.
28: B:Theta amplitude	4.0 - 8.0 Hz.
29: B:Alpha amplitude	8.0 - 12.0 Hz.
30: B:SMR amplitude	12.0 - 15.0 Hz.
31: B:Beta amplitude	15.0 - 18.0 Hz.
32: B:Gamma amplitude	35.0 - 45.0 Hz.
33: HR (BVP)	
34: EMG1 raw	20.0 - 500.0 Hz.
35: EMG2 raw	20.0 - 500.0 Hz.
36: EMG1 ampl.	20.0 - 500.0 Hz.

It is not needed to select all channels. Just select the first and the last channel in the range which need to be displayed.

Click **OK** to select the range of channels.

Right-click an object and select **Display Options & Ranges**.



The following options can be set:

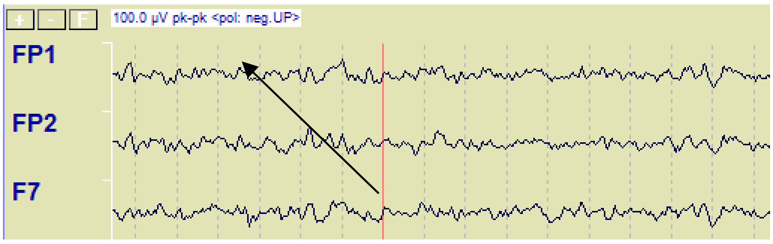
- *Instrument style*:
  - Display Linegraphs only
  - Display Linegraphs and FFTs
- *Display options 1*:
  - Use Primary Color
  - Use Channel Colors
- *Display options 2*:
  - Show Grid Fine
  - Show Grid Medium
  - Hide Grid
  - EEG Style grid

Other settings are similar to The Single FFT Spectrum.

EEG Polarity

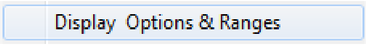
This feature is only available for NeXus-32.

The current polarity and range of the EEG displayed is shown in the left upper corner of the EEG graph.

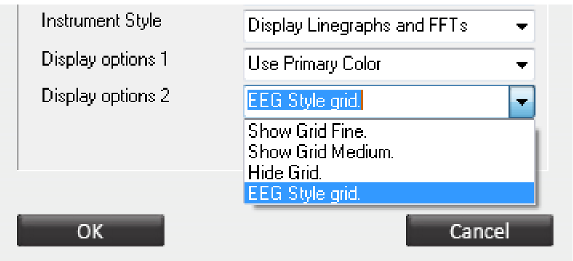

+
-
F
100.0 µV pk-pk <pol: neg.UP>
FP1
FP2
F7

The above picture shows the NEGATIVE polarity is UP and the total range of the EEG signals is 10 µV pk-pk.

Edit the polarity by right clicking on the graph and choose **Display Options & Ranges**.


Display Options & Ranges

Define the **Grid and Polarity options** under the **Display Options 2** list box.



Instrument Style: Display Linegraphs and FFTs
Display options 1: Use Primary Color
Display options 2: EEG Style grid.

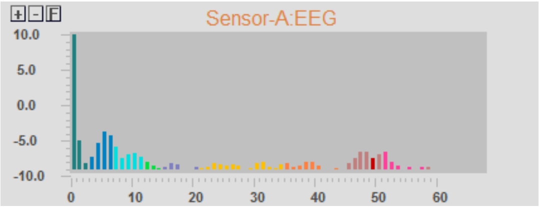
Show Grid Fine.
Show Grid Medium.
Hide Grid.
EEG Style grid.
OK
Cancel

The EEG-Style grid will display negative signals UP. All other grid styles will display positive as UP.

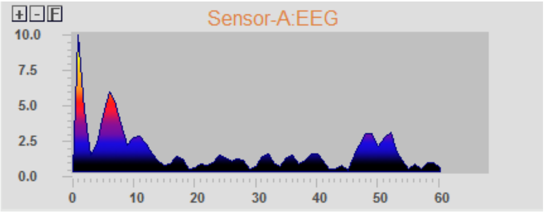
The Single FFT Spectrum

Place a new object by selecting the following item in the *Object Toolbar*.

This instrument computes and displays a spectral analysis of any time sampled signal. It is based on the fast Fourier transform (FFT).

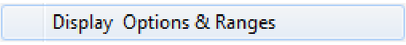


FFT Histogram (banded)



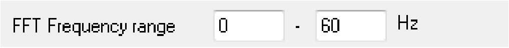
FFT Polygon (gradient)

Right-click an object and select **Display Options & Ranges**.


Display Options & Ranges

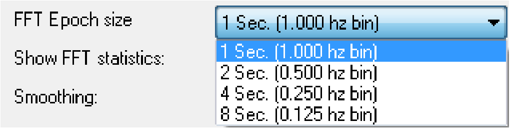
The following options can be set:

- *FFT frequency range*: Enter the start and end (Hz) of the frequency range.



FFT Frequency range 0 - 60 Hz

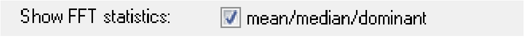
- *FFT Epoch size*: 1 to 8 sec.



FFT Epoch size: 1 Sec. (1.000 hz bin)

Show FFT statistics:
Smoothing:
1 Sec. (1.000 hz bin)
2 Sec. (0.500 hz bin)
4 Sec. (0.250 hz bin)
8 Sec. (0.125 hz bin)

- *Show FFT Statistics*: enable showing mean, median, dominant.



Show FFT statistics: ☑ mean/median/dominant

- *Instrument Style*: choose between polyline or histogram.
  - Polyline: no fill, filled, gradient
  - Histogram: normal, banded, gradient
- *Display Options 1*:
  - The 2D style is default option
  - Show SCP Trial progress
- *Display Options 2*:
  - Show magnitude-spectrum (contains the square-root values of the power spectrum)
  - Show power-spectrum.
  - Show a HRV spectrum

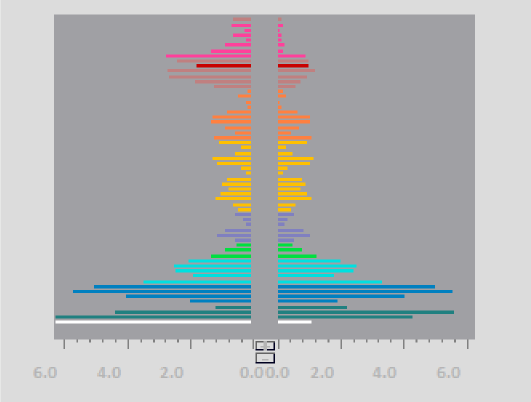
Other settings are similar to the Single Y-scale Line Graph.

For Color Settings, Backgrounds & Borders, Title Text(s), and Font Settings, please refer to chapter 6. Editing.

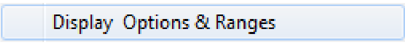
The Dual FFT Spectrum

Place a new object by selecting the following item in the *Object Toolbar*.

This object is very similar to the Single FFT Spectrum, except for the fact that it can display the spectrum of two channels of data. The display of the spectrum is shown in a horizontal fashion, where the first channel is shown to the left and the second channel is shown to the right.



Right-click an Dual FFT Spectrum object and select **Display Options & Ranges**.



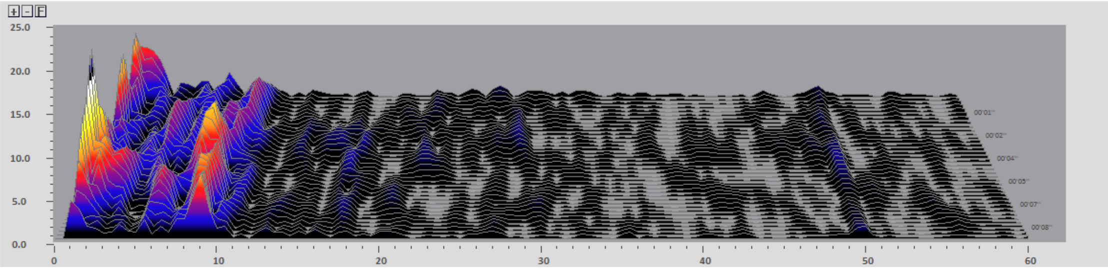
The following options can be set:
- *Display options 1*: Enable or disable refresh background.
- *Display options 2*:
  - Show magnitude-spectrum (square-root values of the power spectrum)
  - Show power-spectrum.

Other settings are similar to The Single FFT Spectrum.

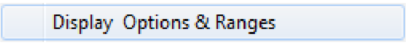
The 3D FFT Spectrum

Place a new object by selecting the following item in the *Object Toolbar*.

This object is sometimes called a spectral ‘Waterfall’ or ‘Compressed Spectral Array’. The 3D FFT Spectrum is a spectral analysis over time, where there are three axes:
1) The Y-axis, showing the amplitude of the signal
2) The X-axis, showing the frequencies
3) The Z-axis, showing the progress of time



Right-click an object and select **Display Options & Ranges**.



The following options can be set:

- *Instrument style*: PolyGon no fill, filled, gradient
- *Display options 1*: 3D style
    - 1/16 sec refresh time
    - 1/8 sec refresh time
    - 1/4 sec refresh time
    - 1/2 sec refresh time
    - 1 sec refresh time

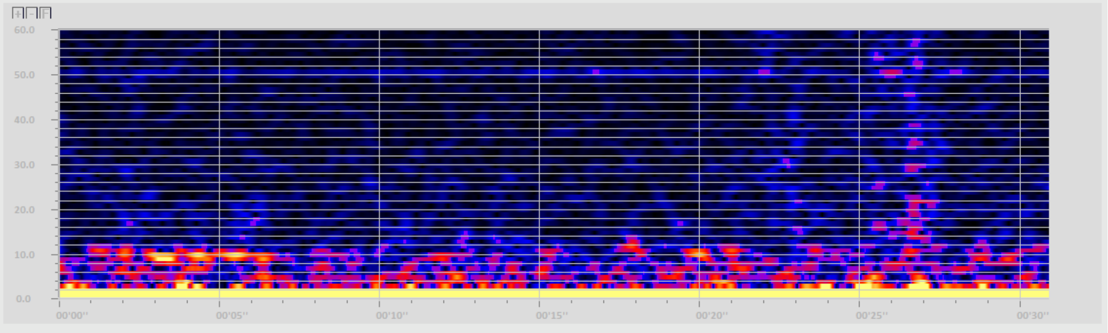
Other settings are similar to The Single FFT Spectrum. Show FFT statistics and Smoothing are not supported.

The Spectrogram

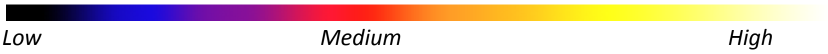
Place a new object by selecting the following item in the *Object Toolbar*.

The main use for the Spectrogram is to provide a visual overview of spectral activity over time. It displays a spectral analysis of a channel in a different way than a regular FFT Spectrum:

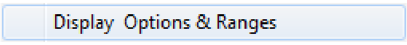
- The Y-axis, showing the frequencies.
- The X-axis, showing the time.
- The magnitude of the activity is shown by the intensity of a color.



Blue or dark colors indicate low level activity. Red, yellow and white colors indicate medium and higher levels.


Low
Medium
High

Right-click an object and select **Display Options & Ranges**.


Display Options & Ranges

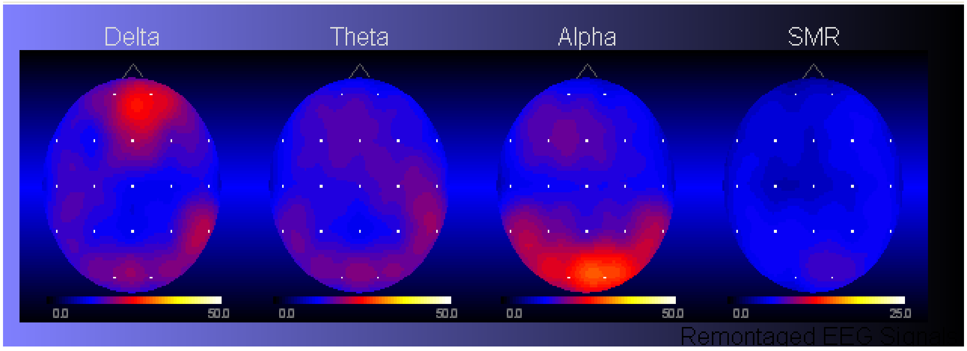
The FFT Epoch size is similar to The Single FFT Spectrum. Other options are not supported.

The NeuroMap

This object is only available for NeXus-32.

Place a new object by selecting the following item in the *Object Toolbar*.

This object maps the activity of the 21 remontaged EEG channels on a 2D surface, also called a topographical EEG map or "Brain Map".

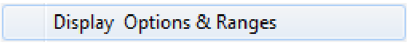

Delta
Theta
Alpha
SMR
0.0
50.0
0.0
50.0
0.0
50.0
0.0
25.0
Remontaged EEG Signal

The electrical EEG activity is analyzed through a FFT (fast fourier transformation). The following measures are derived: of:

1. Amplitude (microvolt pk-pk)
2. Power (microvolt pk-pk squared)
3. Percent amplitude
4. Percent Power
5. Mean, Dominant and Median Frequency
6. Algebraic summation, substraction and ratios of the above

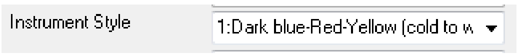
The selected parameter is plotted on 21 points interpolated over the entire map. Each white dot in the image represents a 10-20 location.

Right-click the NeuroMap object and select **Display Options & Ranges**.


Display Options & Ranges

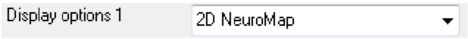
The following options can be set:

- *Instrument style:*


Instrument Style: 1:Dark blue-Red-Yellow (cold to w

  - 1: Dark blue-Red-Yellow: displays from cold color (low amplitude) to hot colors (high amplitude).
  - 2: Blue-Green-Red: displays from negative to positive.

- *Display options 1:*


Display options 1: 2D NeuroMap

  - 2D NeuroMap
  - 3D NeuroMap

Other settings are similar to The Single FFT Spectrum.

Please note that a NeuroMapping display is always a limited representation of the electrical activity which is going on in the brain. Both the spectral analysis on which it is based, as well as the graphic display and interpolations can only provide an approximate image of the complex electrical activity of the brain.

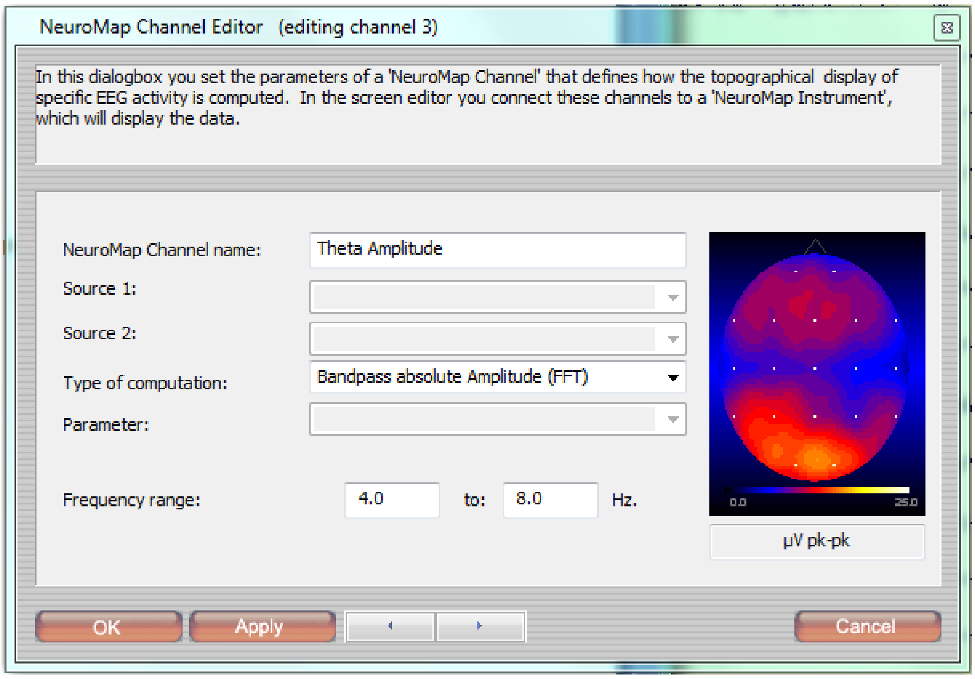
NeuroMap settings

Configure the NeuroMap settings by right clicking on the NeuroMap object and select **Choose NeuroMap Settings**.

Another way to access these settings is by choosing the top menu EEG > **NeuroMap Configuration**.

The *Select a NeuroMapping Settings* screen will appear, connect to one of the parameters. To edit these settings, click on **Edit**. Another way to access these settings is by right clicking on the NeuroMap object and select **Edit Neuromap Settings**.

The *NeuroMap Channel Editor* screen will appear.



NeuroMap Channel Editor (editing channel 3)

In this dialogbox you set the parameters of a 'NeuroMap Channel' that defines how the topographical display of specific EEG activity is computed. In the screen editor you connect these channels to a 'NeuroMap Instrument', which will display the data.

NeuroMap Channel name: Theta Amplitude

Source 1:

Source 2:

Type of computation: Bandpass absolute Amplitude (FFT)

Parameter:

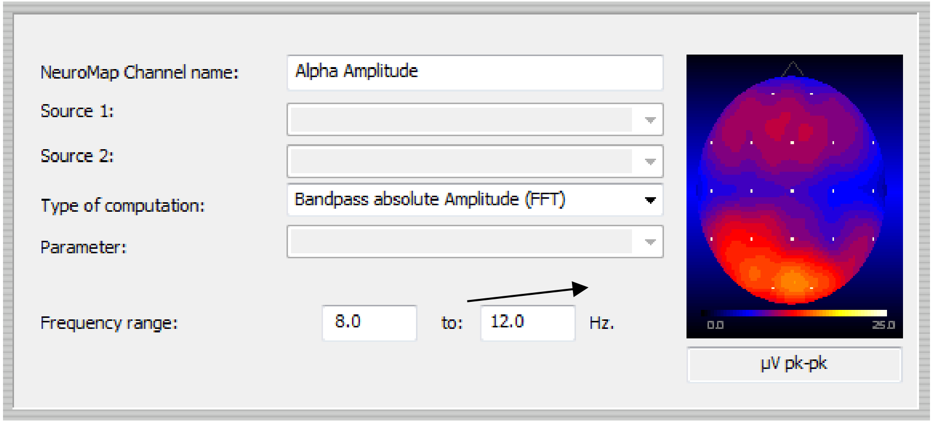
Frequency range: 4.0 to: 8.0 Hz.

µV pk-pk

The following can be set:

- NeuroMap Channel name: change the name of the channel
- Type of computation: select one of the computations
- Frequency range: Insert the range of activity for being mapped

Right below the measuring unit of the color representation is shown (in this case µV pk-pk).



NeuroMap Channel name: Alpha Amplitude

Source 1:

Source 2:

Type of computation: Bandpass absolute Amplitude (FFT)

Parameter:

Frequency range: 8.0 to: 12.0 Hz.

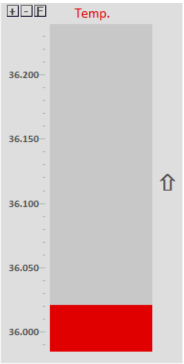
µV pk-pk

Beware to adapt the range of the instrument to the selected type of computation.

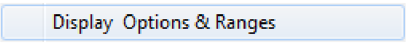
The Bargraph

Place a new object by selecting the following item in the *Object Toolbar*.

The Bargraph is a multi-purpose object capable of displaying 1 channel.



Right-click an object and select **Display Options & Ranges**.



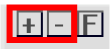
The *Display Options & Range Settings* screen will appear. The following options can be edited:

Edit properties like:

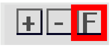
- *Range adjustments*:
    - Manual adjustment
    - Auto fit to min-max (Enable or disable **Linegraph: refresh each sweep**)
    - Auto fit to 0-max (Enable or disable **Linegraph: refresh each sweep**)
    - Auto-center
- *Smoothing*: 0 (Off) to factor 64 smoothing of the signal.
- *Data Type/Stats*:
    - Show the "min, max, mean, standard deviation, coefficient of variability and RMS amplitude" for the past 15 seconds or the whole session
    - Show all basic statistics for the past 15 seconds or the whole session.
    - Show the current state of the reward counter (1-8).
    - Show the absolute (ABS) value.
    - Show the % above or below threshold 1 (60 sec.)
    - Show the current game score or level.
    - Show screen second count-down and count-up
    - Show pace settings (beats per minute)
    - Show trial data type/statistics like trial time, trials completed, positive success.
    - Show previous segment mean.
- *Instrument style*: type of bar graph (see images above)
    - Classical bargraph
    - 3D bargraph
    - Zero in the middle bargraph
- *Display options 1*: polarity
    - Normal
    - Inversed

- *Display options 2*: bar options
    - Rectangle
    - Image (select image for vertical movement)

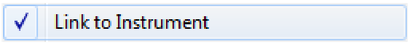
The range of a bargraph can also be adjusted with buttons in the graph. Click **+** or **-** to increase or decrease the range of the Y-axis.



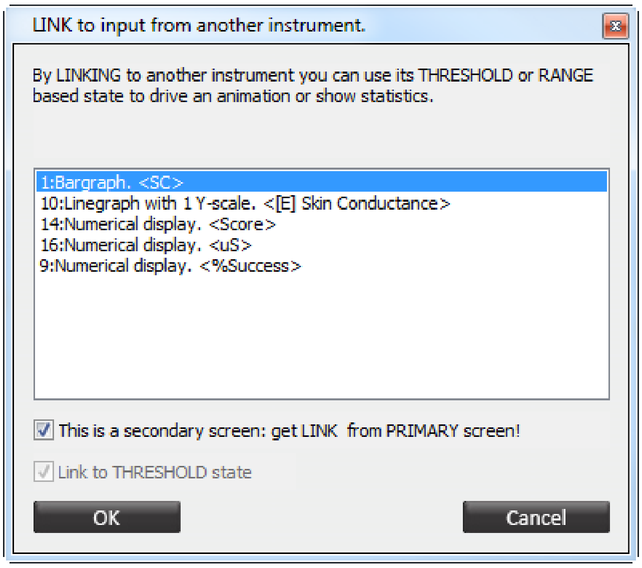
Click **F** to fit the range the Y-scale with minimum and maximum measurement of the session.



It is possible to link a bar graph to another object. Right-click a bar graph and select **Link to instrument**.



This will open the *Link to input from another instrument* screen.



By LINKING to another instrument you can use its THRESHOLD or RANGE based state to drive an animation or show statistics.

1:Bargraph. <SC>
10:Linegraph with 1 Y-scale. <[E] Skin Conductance>
14:Numerical display. <Score>
16:Numerical display. <uS>
9:Numerical display. <%Success>

☑ This is a secondary screen: get LINK from PRIMARY screen!

☑ Link to THRESHOLD state

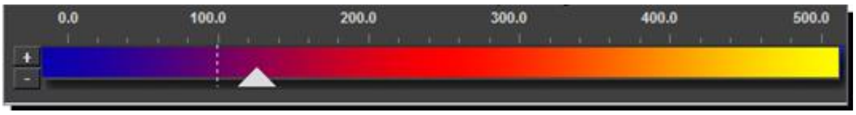
Check **This is a secondary screen** if the object is placed on a secondary screen. The object will be linked to an object on a primary screen. It will automatically link the threshold state.

For Color Settings, Backgrounds & Borders, Title Text(s), and Font Settings, please refer to chapter 6. Editing.

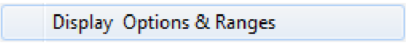
The Vernier Instrument

Place a new object by selecting the following item in the *Object Toolbar*.

This instrument is rather similar to the Bargraph, except that it displays signals horizontally.


0.0
100.0
200.0
300.0
400.0
500.0
+
-

Right-click an object and select **Display Options & Ranges**.


Display Options & Ranges

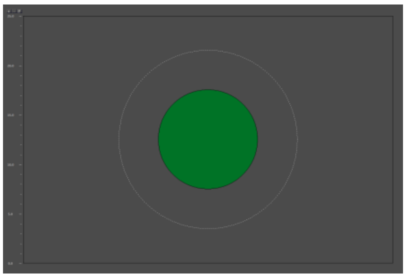
It is possible to use a counter as display option 1.

Other settings are similar to The Bargraph.

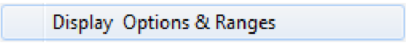
The Zoomer Instrument

Place a new object by selecting the following item in the *Object Toolbar*.

The graph of the Zoomer Instrument displays an rectangle, circle, or image which expands or contracts in all directions.



Right-click an object and select **Display Options & Ranges**.


Display Options & Ranges

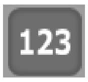
Edit properties like:

- *Instrument style*: type of zoomer (see images above)
    - Rectangle zoomer
    - Circle zoomer
    - Image zoomer
- *Display options 1*: polarity
    - Normal
    - Inversed

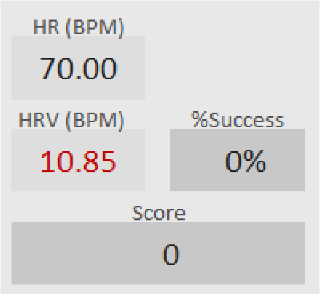
Other settings are similar to The Bargraph.

The Numerical Instrument

Place a new object by selecting the following item in the *Object Toolbar*.

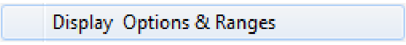


This object displays only numerical data.



HR (BPM)
70.00
HRV (BPM)
10.85
%Success
0%
Score
0

Right-click an numerical object and select **Display Options & Ranges**.

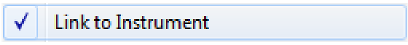


The following options can be set:

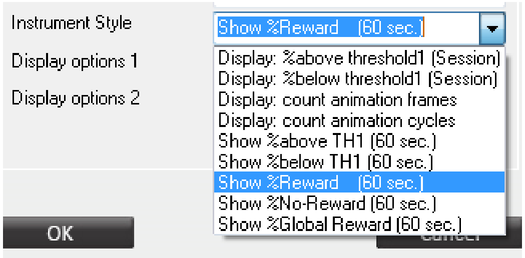
- *Data Type/Stats:*
    - Show the "min, max, mean, standard deviation, coefficient of variability and RMS amplitude" for the past 15 seconds or the whole session
    - Show all basic statistics for the past 15 seconds or the whole session.
    - Show the current state of the reward counter (1-8).
    - Show the absolute (ABS) value.
    - Show the % above or below threshold 1 (60 sec.)
    - Show the current game score or level.
    - Show screen second count-down and count-up
    - Show pace settings (beats per minute)
    - Show trial data type/statistics like trial time, trials completed, positive success.
    - Show previous segment mean.
- *Instrument style*: set 2 to 4 digits after decimal
- *Display options 1*: Use counter #1 - #8 (if needed)
- *Display options 2:*
    - *Show value*
    - *Input value*

Link to instrument

It is possible to link a numerical object to another object. Right-click a numerical instrument and select **Link to instrument**.


✓ Link to Instrument

Open the **Display Options & Ranges** for selecting the instrument style:

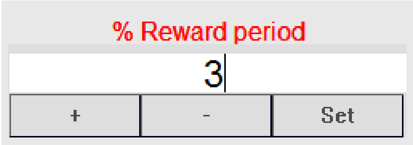

Instrument Style
Display options 1
Display options 2
Show %Reward (60 sec.)
Display: %above threshold1 (Session)
Display: %below threshold1 (Session)
Display: count animation frames
Display: count animation cycles
Show %above TH1 (60 sec.)
Show %below TH1 (60 sec.)
Show %Reward (60 sec.)
Show %No-Reward (60 sec.)
Show %Global Reward (60 sec.)
OK

Check **This is a secondary screen** if the object is placed on a secondary screen. The object will be linked to an object on a primary screen. It will automatically link the threshold state.

For Color Settings, Backgrounds & Borders, Title Text(s), and Font Settings, please refer to chapter 6. Editing.

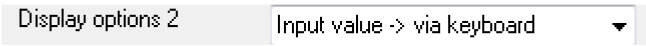
Input value

The Input value is a special numerical object.

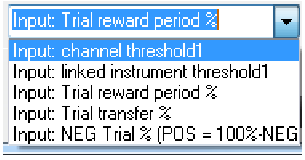

% Reward period
3
+
-
Set

Enter a value manually by using the numerical buttons on the keyboard and clicking the **Set** button. Click **+** or **-** to increase or decrease the range of the value.

Select **Input value > via keyboard** in the *Display options and range settings* to enable input values.


Display options 2
Input value -> via keyboard

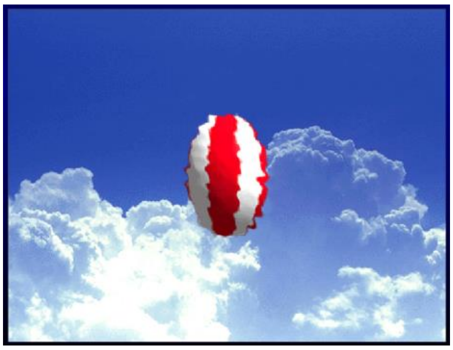
Choose between the following value options:


Input: Trial reward period %
Input: channel threshold1
Input: linked instrument threshold1
Input: Trial reward period %
Input: Trial transfer %
Input: NEG Trial % (POS = 100%-NEG

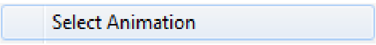
The Animation Instrument

Place a new object by selecting the following item in the *Object Toolbar*.

The Animation Instrument uses an ‘animated’ series of images that start in one position and end in another. These images are played in a sequence which usually show a change, move or expand.



Right-click the image and select **Select Animation**

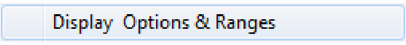


Select Animation

Select an item from the list and set alignment and inset.

It is possible to add your own animations (.bmp or *.jpg files). Animations are stored in the folder ...\BioTrace\Animations\<name of animation>. The first file of an animation is always named <filename>0001.jpg, the second <filename>0002.jpg, etc.*

Right-click an animation object and select **Display Options & Ranges**.



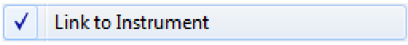
Display Options & Ranges

Options which can be set are:

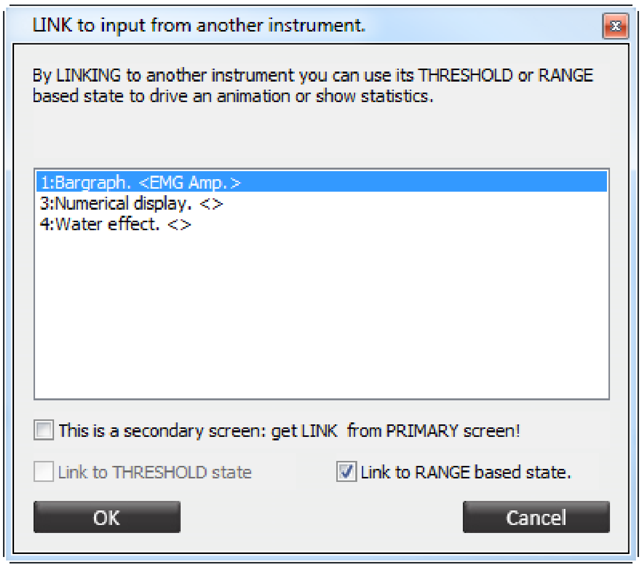
- *Range adjustments*: Manual or auto adjustment of the Y-scale range.
- *Smoothing*: 0 (Off) to factor 64 smoothing of the signal.
- *Instrument style*: Play or cycle (loop)
  - Play one way (> or < threshold)
  - Play both ways
  - Cycle one way (> or < threshold)
  - Cycle both ways
- *Display options 1*: Direction of the sequence.
  - Normal
  - Inversed
- *Display options 2*: Speed of animation (frames/sec.)

Visualize range

It is possible to link an animation object to the range of another object. Right-click the animation and select **Link to instrument**.



This will open the *Link to input from another instrument* screen.



By LINKING to another instrument you can use its THRESHOLD or RANGE based state to drive an animation or show statistics.

1:Bargraph. <EMG Amp.>
3:Numerical display. <>
4:Water effect. <>

☐ This is a secondary screen: get LINK from PRIMARY screen!

☐ Link to THRESHOLD state ☑ Link to RANGE based state.

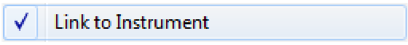
Select **Link to range based state** for linking the animation to a range of another object.

Check **This is a secondary screen** if the object is placed on a secondary screen. The object will be linked to an object on a primary screen.

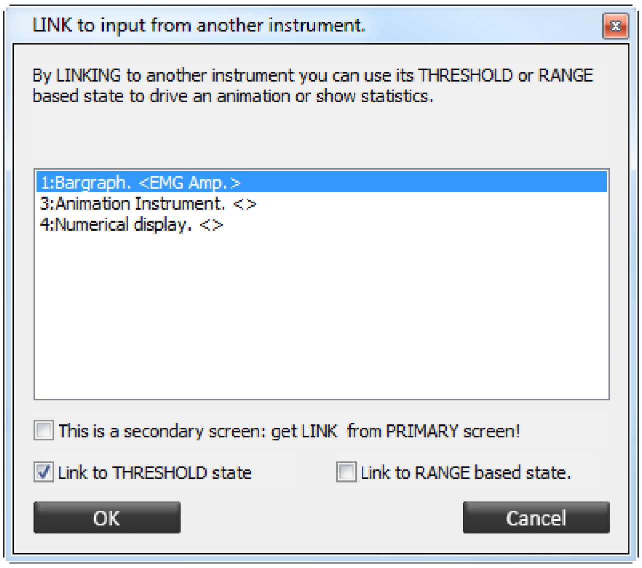
For Backgrounds & Borders and Title Text(s), please refer to chapter 6. Editing.

Visualize state

It is possible to link an animation object to the threshold state of another object. Right-click the animation and select **Link to instrument**.



This will open the *Link to input from another instrument* screen.



LINK to input from another instrument.

By LINKING to another instrument you can use its THRESHOLD or RANGE based state to drive an animation or show statistics.

1:Bargraph. <EMG Amp.>
3:Animation Instrument. <>
4:Numerical display. <>

☐ This is a secondary screen: get LINK from PRIMARY screen!

☑ Link to THRESHOLD state ☐ Link to RANGE based state.

Select **Link to threshold state** for linking the animation to a threshold of another object.

Check **This is a secondary screen** if the object is placed on a secondary screen. The object will be linked to an object on a primary screen.

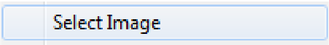
For Backgrounds & Borders and Title Text(s), please refer to chapter 6. Editing.

The Water Effect Instrument

Place a new object by selecting the following item in the *Object Toolbar*.

This object shows a water ripple effect where the height of the ripples reflect the magnitude of the linked object.

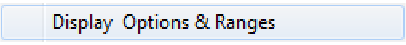
The maximum ripple level is at the top of the range. Right-click an object and select **Select Image**.



This will show the image selection dialog box. Select an item from the list and click **OK**.

Press the ***R*** *key to refresh the screen for displaying the new image.*

Right-click an object and select **Display Options & Ranges**.



The following options can be set:
- *Display options 2*: Speed
    - Slow
    - Normal
    - Fast

Other settings are similar to The Animation Object.

The DirectX Plug-in Instrument

Place a new object by selecting the following item in the *Object Toolbar*.

All kinds of DirectX plug-ins can be installed. The DirectX Plug-in object can process a set of parameters for each object it is linked to.

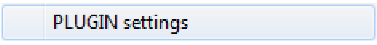
The following parameters are available to the Plug-in object:
Channel name
Data value
Range (linked instrument)
Threshold level
Threshold state (above/below)
Reward tag (above/below)
Inhibit

A Plugin object may use all available parameters or a selection thereof.

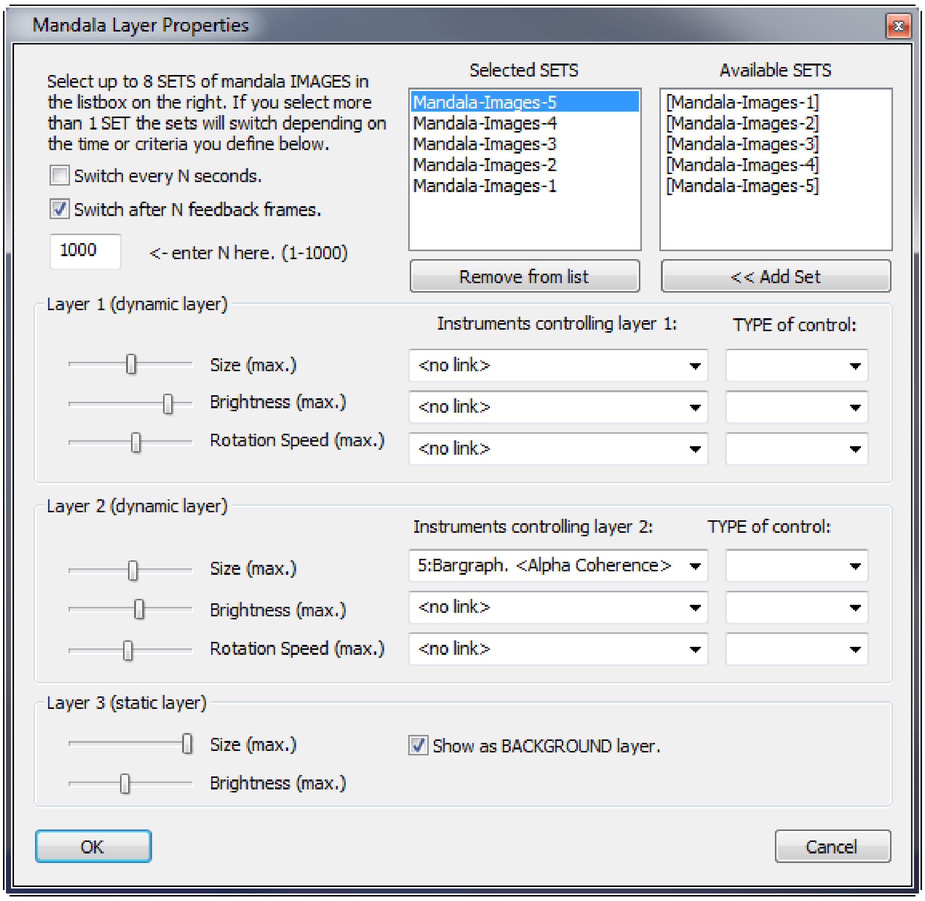
The Mandala Plug-In is a default DirectX plug-in. It rotates colored Mandalas in a 3D space. The Mandalas are layered on top of each other and their size, brightness and rotation can be steered.

Press the 'E' key and right-click on one of the black handles of the object.

Click **Select PLUGIN type** for selecting a plug-in. Click **PLUGIN settings** for setting the plug-in properties.



The *Mandala Layer Properties* screen will appear.



Select up to 8 SETS of mandala IMAGES in the listbox on the right. If you select more than 1 SET the sets will switch depending on the time or criteria you define below.

☐ Switch every N seconds.

☑ Switch after N feedback frames.

1000 <- enter N here. (1-1000)

Selected SETS	Available SETS
Mandala-Images-5	[Mandala-Images-1]
Mandala-Images-4	[Mandala-Images-2]
Mandala-Images-3	[Mandala-Images-3]
Mandala-Images-2	[Mandala-Images-4]
Mandala-Images-1	[Mandala-Images-5]

Layer 1 (dynamic layer)

	Instruments controlling layer 1:	TYPE of control:
Size (max.)	<no link>	
Brightness (max.)	<no link>	
Rotation Speed (max.)	<no link>	

Layer 2 (dynamic layer)

	Instruments controlling layer 2:	TYPE of control:
Size (max.)	5:Bargraph. <Alpha Coherence>	
Brightness (max.)	<no link>	
Rotation Speed (max.)	<no link>	

Layer 3 (static layer)

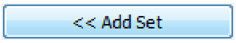
Size (max.)

Brightness (max.)

☑ Show as BACKGROUND layer.

This settings screen is different for each DirectX plugin.

The Mandala uses image sets. Each set consists of 3 layers which are projected into 3D space and are made to respond to the physiological activity. Add a set and click the **<< Add Set** button.

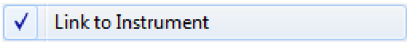


When selecting more than 1 set (max of 8), it is possible to switch sets in N seconds or N feedback frames.

A set consist of two dynamic layers and one static layer. Edit properties like:

- *Size*
- *Brightness*
- *Rotation speed* (dynamic layers only)

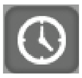
Select up to 3 objects that control both dynamic layers. Only linked objects can be selected. Right-click the Mandala object (on a black handle in editing mode) and select **Link to instrument** to link objects.



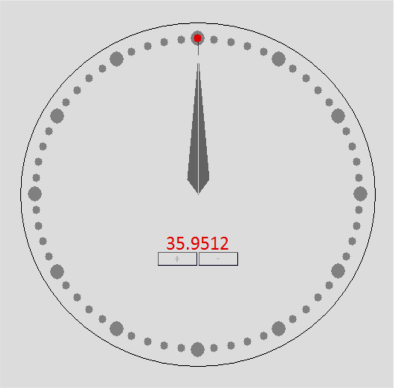
Multiple objects can be selected.

The Clock Counter Instrument

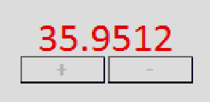
Place a new object by selecting the following item in the *Object Toolbar*.



This object can be used to feed-back very small increments or decrements of physiological signals (e.g. for temperature).



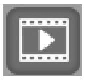
The step size of the increment/decrement can be defined from very small (0.0001) to large (1000) by clicking the **+** and **-** buttons in the middle.



It is not possible to edit Display Options & Ranges.

The Video Replay Object

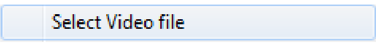
Place a new object by selecting the following item in the *Object Toolbar*.



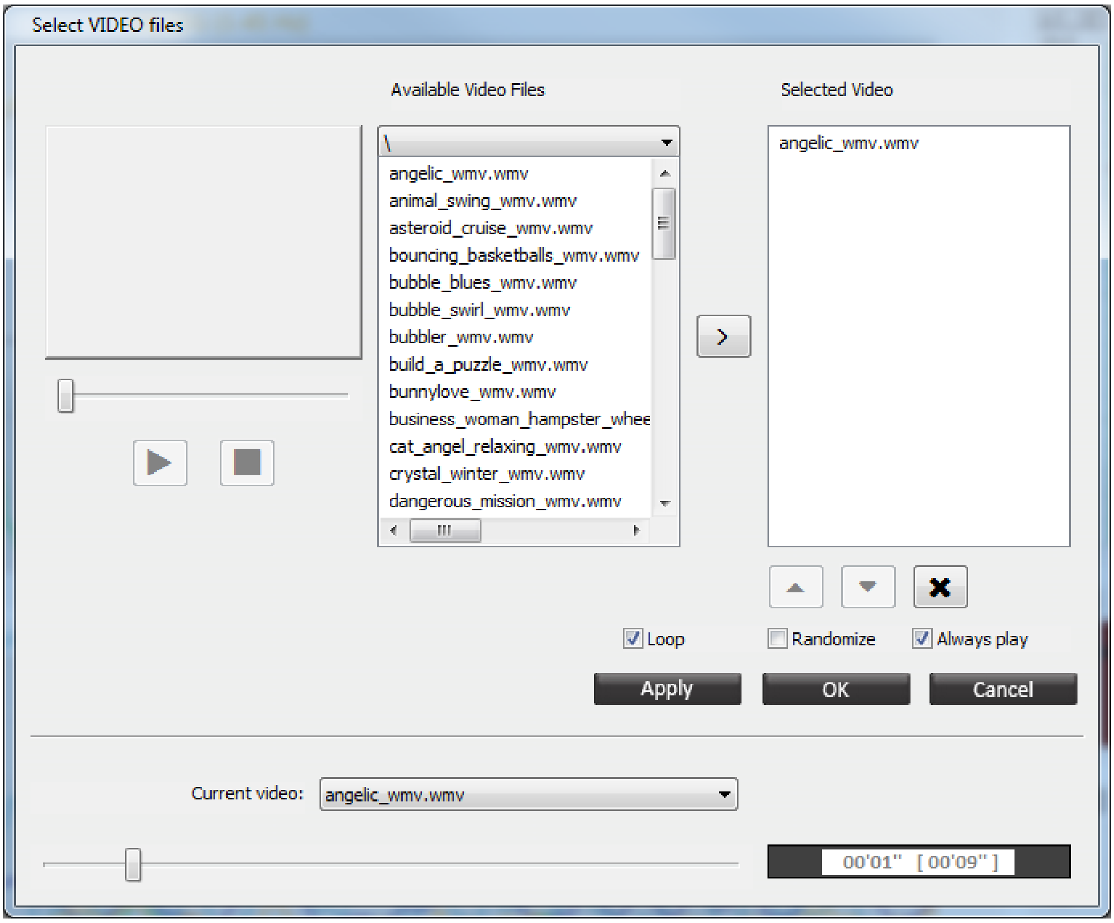
This object plays video files. It does not display physiological data. The video file is replayed in a window and will play only when the session is running in record or replay mode.

A maximum of 4 video objects can be used on a single screen.

Right-click a video and click **Select video file**.


Select Video file

This will show the *Select video files* screen.


Select VIDEO files
Available Video Files
Selected Video
\
angelic_wmv.wmv
animal_swing_wmv.wmv
asteroid_cruise_wmv.wmv
bouncing_basketballs_wmv.wmv
bubble_blues_wmv.wmv
bubble_swirl_wmv.wmv
bubbler_wmv.wmv
build_a_puzzle_wmv.wmv
bunnylove_wmv.wmv
business_woman_hampster_whee
cat_angel_relaxing_wmv.wmv
crystal_winter_wmv.wmv
dangerous_mission_wmv.wmv
Apply
OK
Cancel

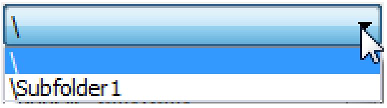
Selected Video: angelic_wmv.wmv

☑ Loop ☐ Randomize ☑ Always play

Current video: angelic_wmv.wmv

00'01" [00'09"]

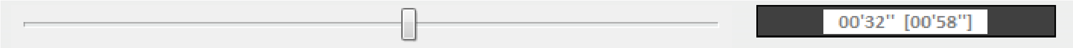
Select a video file from the *Available video files* list. Click ▶ to preview the video. Click ■ to stop the preview. Browse to a subfolder via the dropdown menu in the top of the popup screen.


\
\
\Subfolder 1

Click > (or by a double left mouse click) to add a video to the *Selected video* playlist. Own videos (*.avi, *.wmv, *.asf, *.divx) can be imported. , see chapter 3 "*Setup of the audio and video library*"

Multiple videos can be selected by holding down the “Ctrl” key on the keyboard. Check **Randomize** box to shuffle the sequence of the selected videos.

The video selection window allows you to play the video from a specific point in time. Drag the slider to the desired point, and click **OK**.

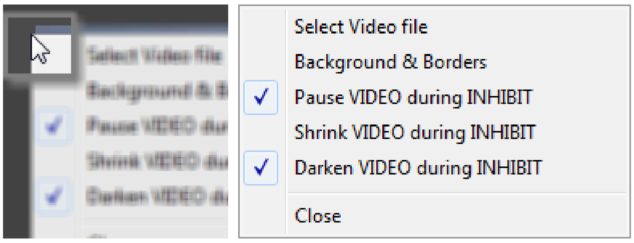


Click ✖ to remove a video from the *Selected video* playlist.

Click ▲ or ▼ for moving the selected video file up or down in the playlist.
Check **Loop** to replay a playlist once it ends.

Check **Always play video** to make the video play when there is no recording or replay active.

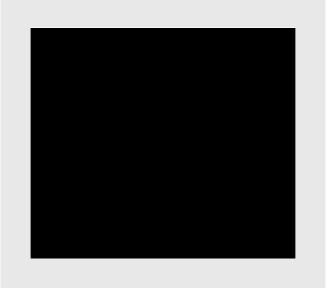
A video can pause, shrink or darken during inhibits. This can be set by right-clicking the edge of a video and selecting or deselecting the following options:


Select Video file
Background & Borders
✓ Pause VIDEO during INHIBIT
Shrink VIDEO during INHIBIT
✓ Darken VIDEO during INHIBIT
Close

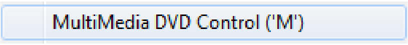
The Disc Object

Place a new object by selecting the following item in the *Object Toolbar*.

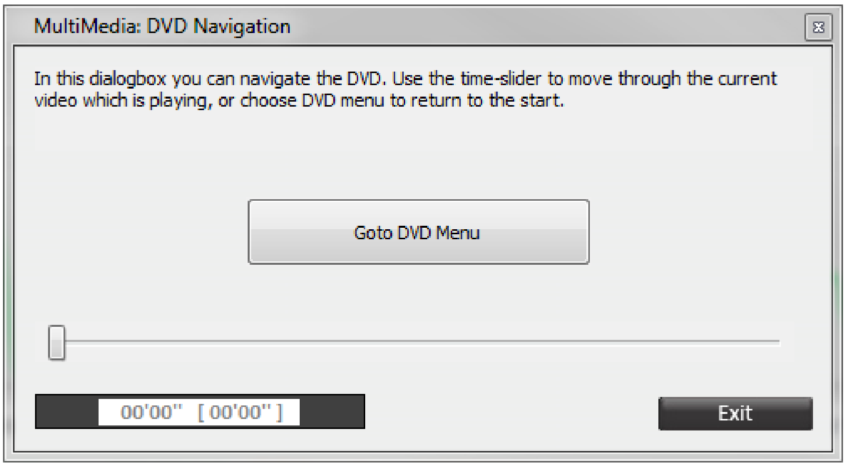
The Disc Object plays video from a DVD-disk. The DVD file is played in a window and will play only when the session is running in record or replay mode. Only one DVD object can be used on a single screen.



Insert a DVD and wait until it is loaded. Go to Configuration > **MultiMedia DVD Control** in the top menu (or press the **M** key).


MultiMedia DVD Control ('M')

This will open the *MultiMedia DVD navigation* screen.



MultiMedia: DVD Navigation

In this dialogbox you can navigate the DVD. Use the time-slider to move through the current video which is playing, or choose DVD menu to return to the start.

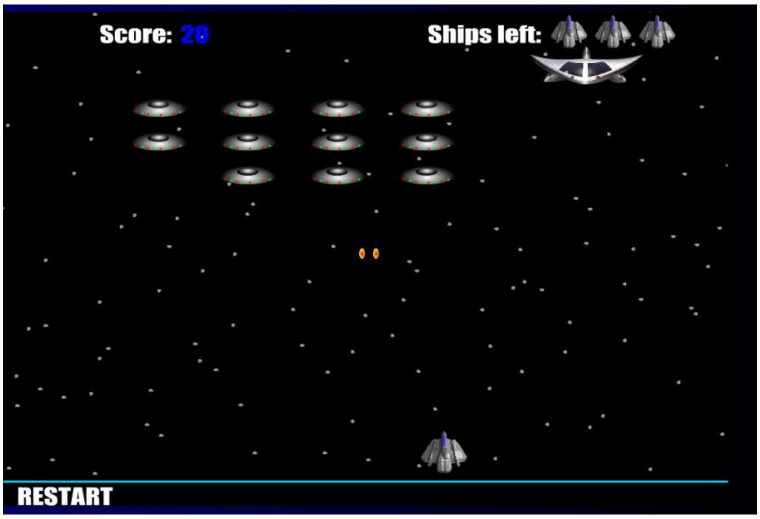
Use the time slider to move through the current video or return to the DVD menu by clicking **Go to DVD Menu**. DVD navigation is only possible during recording or replay of a session.

Similar to the Video Replay object, the Disk object supports pausing and darkening of videos during inhibits.

The Game Object

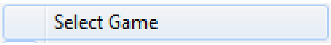
Place a new object by selecting the following item in the *Object Toolbar*.

This object allows for playing games controlled by other objects and/or the keyboard.



Right-click on one of the black handles of the object (in editing mode).

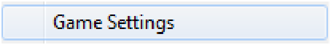
Select **Select Game** for selecting a game.



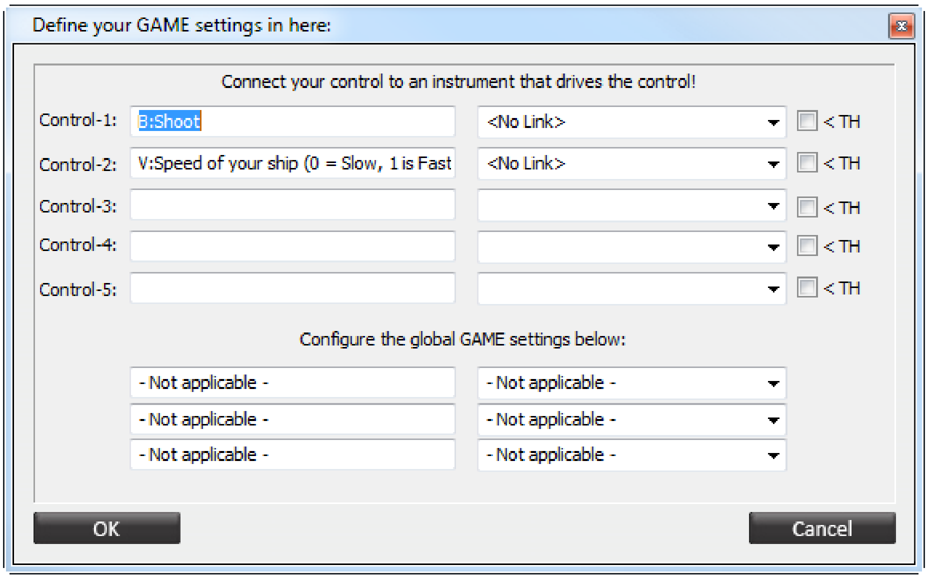
This will open a file selector. Select a game, edit alignment and inset, and click **OK**.

Game settings

Select **Game Settings** for editing game settings.



The *Game settings* screen will appear.



Connect your control to an instrument that drives the control!

Control-1: B:Shoot <No Link> ☐ < TH

Control-2: V:Speed of your ship (0 = Slow, 1 is Fast <No Link> ☐ < TH

Control-3: ☐ < TH

Control-4: ☐ < TH

Control-5: ☐ < TH

Configure the global GAME settings below:

- Not applicable - - Not applicable -

- Not applicable - - Not applicable -

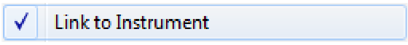
- Not applicable - - Not applicable -

There are two types of controls:

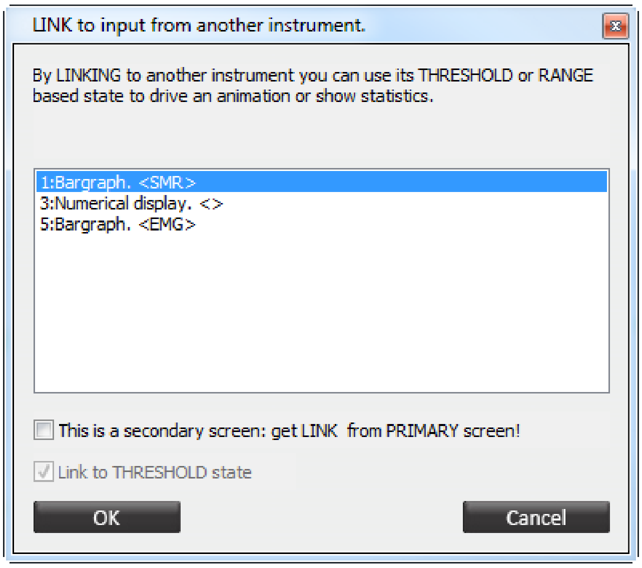
- The **B:** is a Boolean control, which is either true (> threshold) or false (< threshold). The control can be connected to an instrument (object).
- The **V:** is a Variable control, defined by the level of the signal within the range of the linked object.

Link to object

It is possible to link a game object to another object. Right-click a bar graph and select **Link to instrument**.



✓ Link to Instrument



LINK to input from another instrument.

By LINKING to another instrument you can use its THRESHOLD or RANGE based state to drive an animation or show statistics.

1:Bargraph. <SMR>
3:Numerical display. <>
5:Bargraph. <EMG>

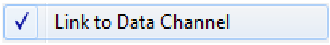
☐ This is a secondary screen: get LINK from PRIMARY screen!

☑ Link to THRESHOLD state

Check **This is a secondary screen** if the object is placed on a secondary screen. The object will be linked to an object on a primary screen. It will automatically link the threshold state.

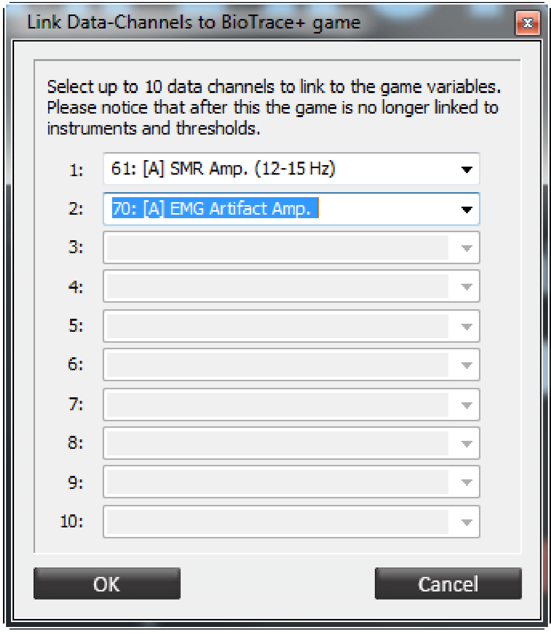
Link to data channel

It is also possible to link a game object to a data channel. Right-click a bar graph and select **Link to data channel**.



✓ Link to Data Channel

This will open the *Link data channels* screen.



Link Data-Channels to BioTrace+ game

Select up to 10 data channels to link to the game variables. Please notice that after this the game is no longer linked to instruments and thresholds.

1: 61: [A] SMR Amp. (12-15 Hz)
2: 70: [A] EMG Artifact Amp.
3:
4:
5:
6:
7:
8:
9:
10:

Select up to 10 data channels.

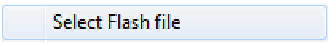
The Flash Animation Object

Place a new object by selecting the following item in the *Object Toolbar*.

This object play an animation or video file in *.swf (Shockwave Flash) format. The flash file will be played when a screen is opened.

Press the 'E' key and right-click on one of the black handles of the object.

Now select **Select Flash file**



Select Flash file

This will open the SWF file selector. Add own *.swf files in the ..*BioTrace**SWF* directory. Select a file and click **OK**. It is also possible to adjust alignment and inset.

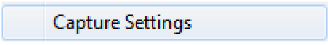
The Video Capture Object

Place a new object by selecting the following item in the *Object Toolbar*.

The Video Capture Object captures video from a digital camera or webcam during a session. The video will be synced with the data. Only one object can be used for video capture on the primary or secondary screen. During the session the video capture object will show a preview of the video.

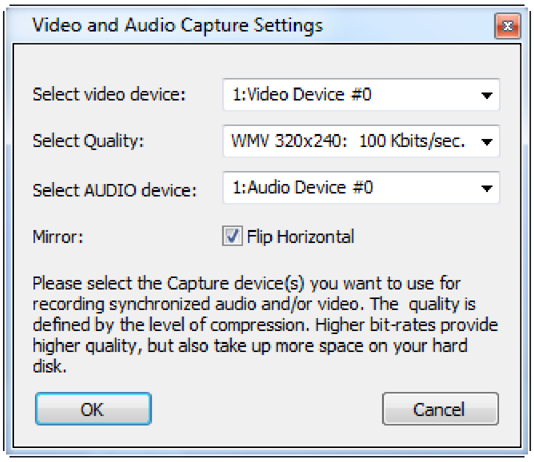
Connect the camera before starting BioTrace+ and make sure to install the latest drivers.

Right-click the video capture object and select **Capture Settings**.



Capture Settings

A dialog box will appear for configuring the video capture.



Video and Audio Capture Settings

Select video device: 1:Video Device #0

Select Quality: WMV 320x240: 100 Kbits/sec.

Select AUDIO device: 1:Audio Device #0

Mirror: ☑ Flip Horizontal

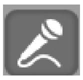
Please select the Capture device(s) you want to use for recording synchronized audio and/or video. The quality is defined by the level of compression. Higher bit-rates provide higher quality, but also take up more space on your hard disk.

Edit the following settings:

- *Select video device*: Select a camera or webcam in the list. Make sure to attach the video camera or webcam and install the latest driver. Best is to connect the device before starting BioTrace+.
- *Select quality*: this property defines how ‘good’ the image quality will be. Higher quality will generate larger files. This is only recommended for short sessions.
- *Select audio device*: Select an audio source.
- *Mirror*: Check 'Flip horizontal' for a mirrored view of the webcam.

The Audio Capture Object

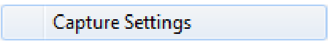
Place a new object by selecting the following item in the *Object Toolbar*.



This object only captures audio. Typically it will use a microphone to store the sounds or voice during a session.

Use the Video Capture Object for combining recording audio and video.

Right-click the audio object and select 'Capture Settings'



This will open the *Audio capture settings* dialog box.

Settings are similar to The Video Capture Object.

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7. Editing

This chapter describes editing possibilities of screens and objects.

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*Press **Ctrl** + **Z** to undo tasks which are performed in editing mode. This can be done for a maximum of five previous tasks.*

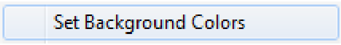
General screen properties

Except for menus, all screens can be edited. The following properties can be changed:

- Background colors
- Background sound
- Screen notes

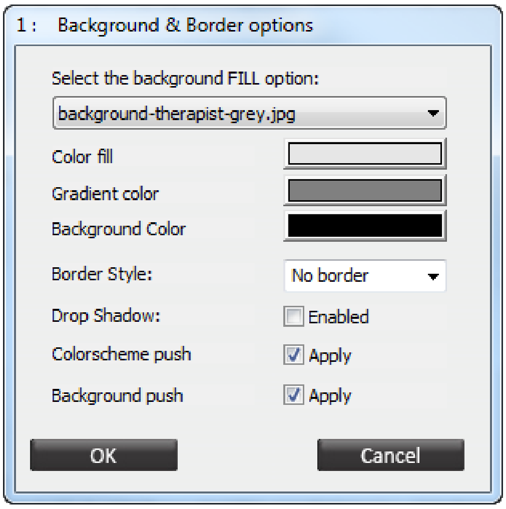
Background colors

Right-click on a screen background and select **Set Background Colors**.



Set Background Colors

This will open the *Background & Border Options* screen.



1 : Background & Border options

Select the background FILL option: background-therapist-grey.jpg

Color fill

Gradient color

Background Color

Border Style: No border

Drop Shadow: ☐ Enabled

Colorscheme push ☑ Apply

Background push ☑ Apply

Choose between the following background fill options:

- Non/ transparent (default background image)
- Solid color
- Gradient color
- Images

The solid color and gradient color options can be set with *Color fill*, *Gradient color*, and *Background color*.

Images which can be used as a background, are stored in 'Textures' folder of the BioTrace+ directory. New images can be added by placing them in this folder.

Check **Colorscheme push** to include the object in the color scheme.

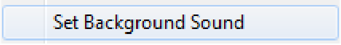
The **Background push** option allows a client screen's object-colors to be in sync with the corresponding therapist object-color.

---

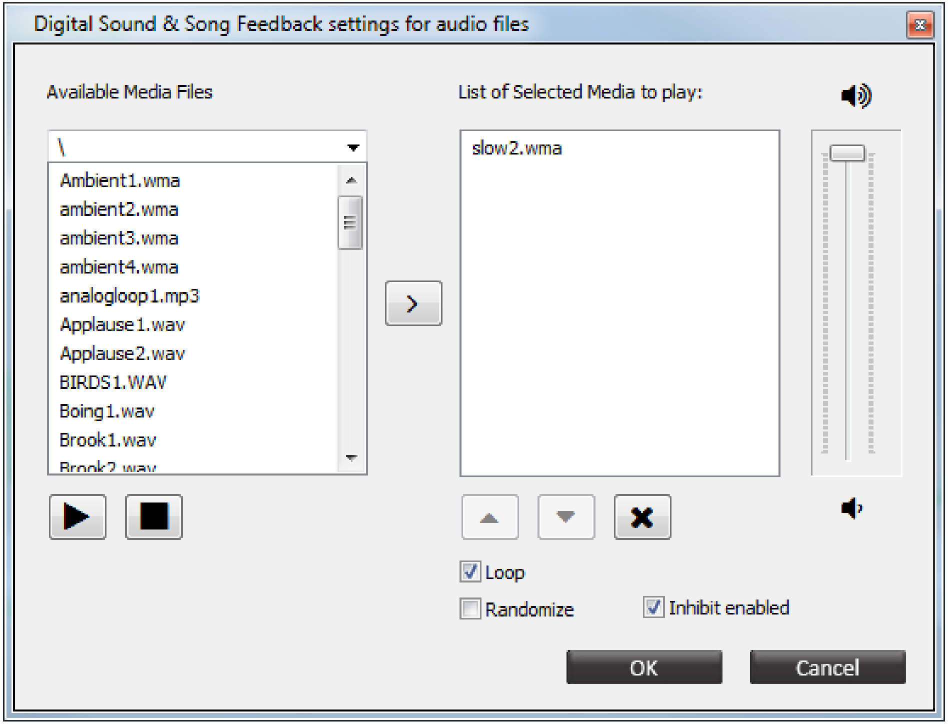
*The **Border style** and **Drop shadow** option are not applicable for the screen background.*

Background sounds

Right-click the background of the screen and click **Set Background Sound**.


Set Background Sound

The *Digital Sound & Song Feedback Settings* dialog box will appear.


Digital Sound & Song Feedback settings for audio files
Available Media Files
\
Ambient1.wma
ambient2.wma
ambient3.wma
ambient4.wma
analogloop1.mp3
Applause1.wav
Applause2.wav
BIRDS1.WAV
Boing1.wav
Brook1.wav
Brook2.wav
>
List of Selected Media to play:
OK
Cancel

slow2.wma

☑ Loop

☐ Randomize

☑ Inhibit enabled

Select one or multiple available media files for playing the sound when the screen is loaded (e.g. an instruction). When the next screen is loaded, the background sound will stop. Check the option **Loop** for replaying the playlist for as long as the screen is opened. Check the option **Randomize** to play the files from the playlist in a random order. Check the option **Inhibit enabled** to have background sounds stop once inhibits are active.

The available media files are stored in the 'Audio library' of BioTrace+. New audio files can be added, please refer to chapter 3 Setup of audio and video library'

Editing screen notes

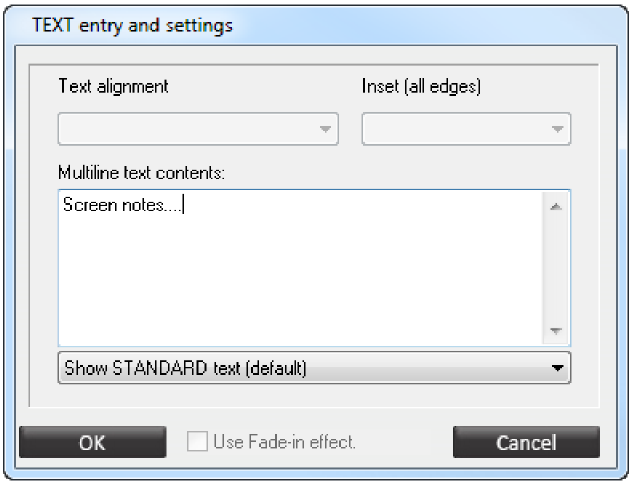
Click the following button:

ℹ

Or right-click the background of the screen and click **Show Screen Notes**

Text can be edited by selecting **Edit**.

This will open the *Text Entry and Settings* screen.


TEXT entry and settings
Text alignment
Inset (all edges)
OK
☐ Use Fade-in effect.
Cancel

Multiline text contents:
Screen notes....

Show STANDARD text (default)

Edit text in the text box. Press **OK** to save notes. Click the ☒ button (or press the **Escape** key) to close the pop-up window.

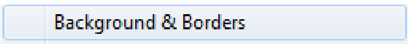
General object properties

All items on a screen are called objects, such as text boxes, images, feedback instruments, videos, buttons etc. The following object properties can be changed:

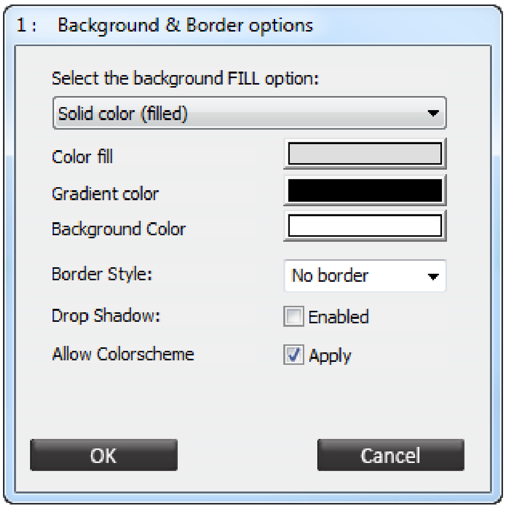
- Background & borders
- Color settings
- Font settings
- Title text

Background & borders

The background of each object can be set by a right-click and select **Background & Borders**.


Background & Borders

The *Background & Border Options* screen will appear.



1 : Background & Border options

Select the background FILL option: Solid color (filled)

Color fill

Gradient color

Background Color

Border Style: No border

Drop Shadow: ☐ Enabled

Allow Colorscheme ☑ Apply

Choose between the following background fill options:

- Non/ transparent (default background image)
- Solid color
- Gradient color
- Images

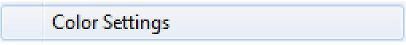
The solid color and gradient color options can be set with *Color fill*, *Gradient color*, and *Background color*.

The border style will create a 'rectangle border' around the instrument/object. Check **Enabled** for the *Drop shadow* option to create a shadow below the object.

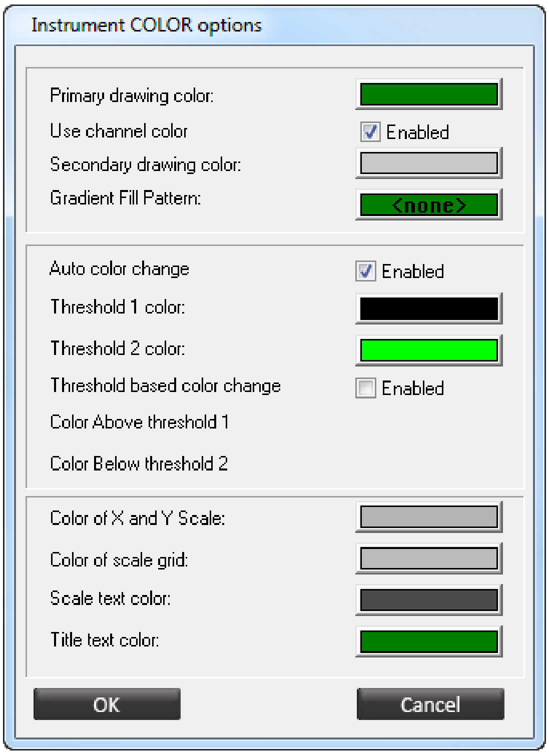
It is also possible to enable or disable color schemes.

Color settings

Change properties of the objects, instruments, scales, and screens by right clicking on them and choose **Color Settings**.



The *Instrument Color Options* dialog box will appear.



Instrument COLOR options

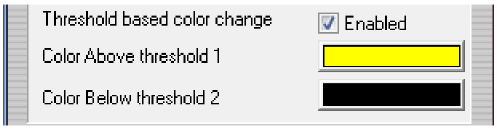
Primary drawing color: 🟩
Use channel color ☑ Enabled
Secondary drawing color: ⬜
Gradient Fill Pattern: <none>

Auto color change ☑ Enabled
Threshold 1 color: ⬛
Threshold 2 color: 🟩
Threshold based color change ☐ Enabled
Color Above threshold 1
Color Below threshold 2

Color of X and Y Scale: ⬜
Color of scale grid: ⬜
Scale text color: ⬛
Title text color: 🟩

The following color settings can be edited:

- *Primary drawing color*: The color that the object uses for drawing the signals.
- *Use channel color:* Use color in channel set.
- *Secondary drawing color*: The color that is used for the background.
- *Gradient fill pattern*: Some objects can also use a gradient for displaying signals.
- *Auto color change*: Automatic color change for above or below threshold
- *Threshold based color change*: Check **Enabled** for activating a color change that will occur when the signal are above or below threshold. Select a color for above and below threshold.



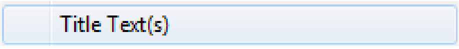
Threshold based color change ☑ Enabled
Color Above threshold 1 🟨
Color Below threshold 2 ⬛

- *Color of X and Y scale*: The color of the scaling.
- *Color of scale grid*: The color of the scaling grid.
- *Scale text color*: The color of the scaling text.
- *Title text color*: The color of the title text.

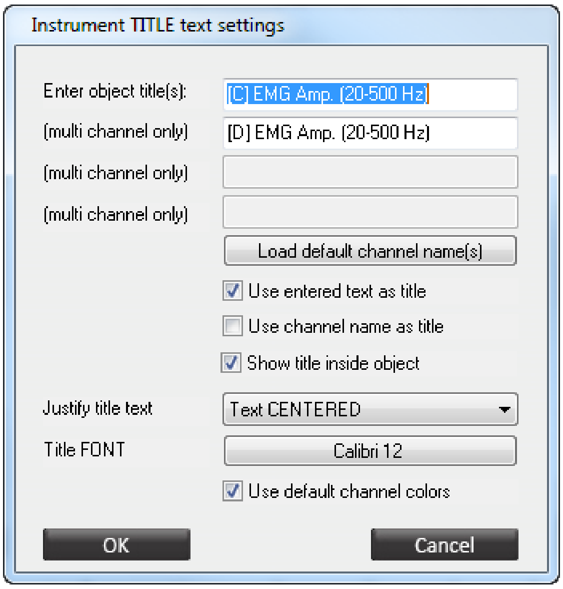
Some objects have limited settings possibilities.

Title text

A title text can be used to label an object. Enter or edit a title text by right-clicking the object and choose **Title Text(s)**.



The *Instrument Title Text Settings* box will appear.



Instrument TITLE text settings

Enter object title(s): [C] EMG Amp. (20-500 Hz)

(multi channel only) [D] EMG Amp. (20-500 Hz)

(multi channel only)

(multi channel only)

☑ Use entered text as title

☐ Use channel name as title

☑ Show title inside object

Justify title text: Text CENTERED

Title FONT: Calibri 12

☑ Use default channel colors

Enter or edit text in the text field(s). Click **Load default channel name(s)** to fill in the title texts using the channel names.

Enable or disable the following options:

- Use entered text as title
- Use channel name as title
- Show title inside object

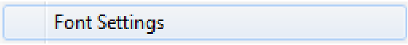
Choose left, centered, or right text justification with *Justify title text*. Change the characteristics of the font with *Title font*. A standard font selector box will appear.

---

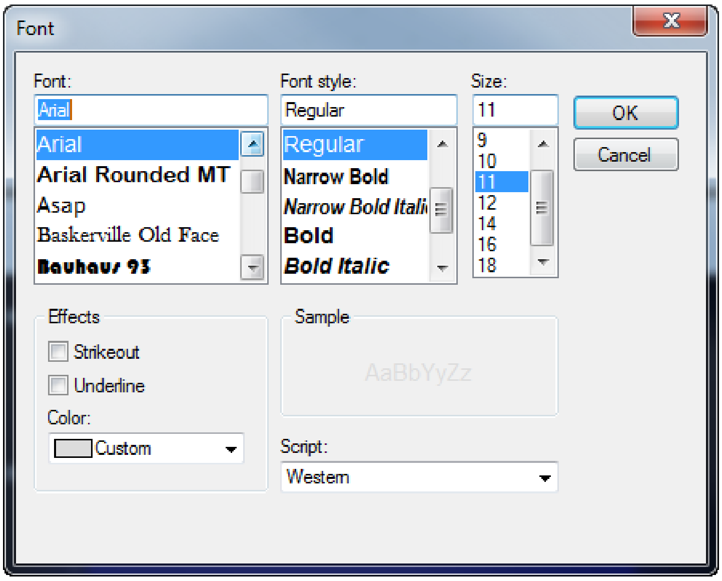
*The title text color can be set with the option **Color Settings**.*

Fonts

Right click and object and choose **Font Settings** to edit fonts.



This will open a standard font selector box.


Font
Font:
Font style:
Size:
Arial
Arial Rounded MT
Asap
Baskerville Old Face
Bauhaus 93
Regular
Narrow Bold
Narrow Bold Itali
Bold
Bold Italic
9
10
11
12
14
16
18
OK
Cancel
Effects
☐ Strikeout
☐ Underline
Sample
AaBbYyZz
Color:
Script:

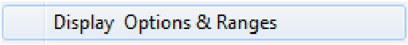
Font: Arial
Font style: Regular
Size: 11
Color: Custom
Script: Western

In this box it is possible to select the font, style, size, effects, and color.

This will not change the title font.

Display options & ranges

Right-click an object and select **Display Options & Ranges**.

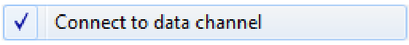

Display Options & Ranges

It is possible to change ranges of the Y-scale, configure FFT settings, set smoothing, or data type/statistics of objects.

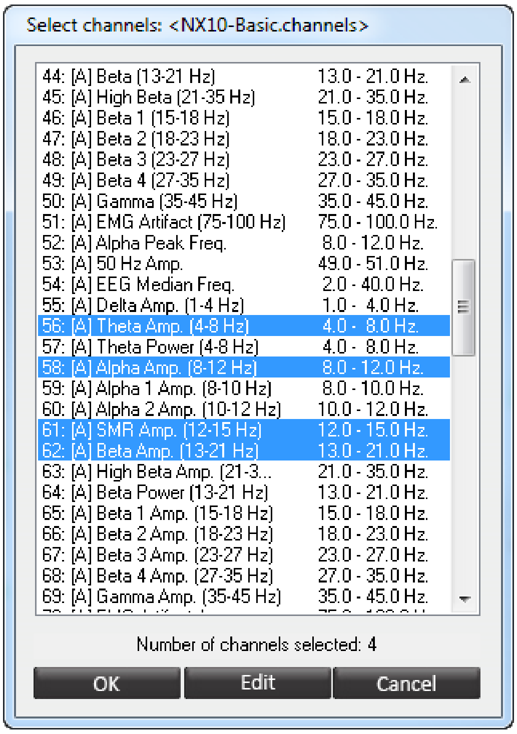
All object settings are explained in chapter 5. Objects

Displaying other data channels

All objects on a screen that display data must be connected to at least one data channel. Press the right mouse button on an object and click **Connect to data channel**.


✓ Connect to data channel

The *Select channels* screen will appear.



44: [A] Beta (13-21 Hz)	13.0 - 21.0 Hz.
45: [A] High Beta (21-35 Hz)	21.0 - 35.0 Hz.
46: [A] Beta 1 (15-18 Hz)	15.0 - 18.0 Hz.
47: [A] Beta 2 (18-23 Hz)	18.0 - 23.0 Hz.
48: [A] Beta 3 (23-27 Hz)	23.0 - 27.0 Hz.
49: [A] Beta 4 (27-35 Hz)	27.0 - 35.0 Hz.
50: [A] Gamma (35-45 Hz)	35.0 - 45.0 Hz.
51: [A] EMG Artifact (75-100 Hz)	75.0 - 100.0 Hz.
52: [A] Alpha Peak Freq.	8.0 - 12.0 Hz.
53: [A] 50 Hz Amp.	49.0 - 51.0 Hz.
54: [A] EEG Median Freq.	2.0 - 40.0 Hz.
55: [A] Delta Amp. (1-4 Hz)	1.0 - 4.0 Hz.
56: [A] Theta Amp. (4-8 Hz)	4.0 - 8.0 Hz.
57: [A] Theta Power (4-8 Hz)	4.0 - 8.0 Hz.
58: [A] Alpha Amp. (8-12 Hz)	8.0 - 12.0 Hz.
59: [A] Alpha 1 Amp. (8-10 Hz)	8.0 - 10.0 Hz.
60: [A] Alpha 2 Amp. (10-12 Hz)	10.0 - 12.0 Hz.
61: [A] SMR Amp. (12-15 Hz)	12.0 - 15.0 Hz.
62: [A] Beta Amp. (13-21 Hz)	13.0 - 21.0 Hz.
63: [A] High Beta Amp. (21-3...	21.0 - 35.0 Hz.
64: [A] Beta Power (13-21 Hz)	13.0 - 21.0 Hz.
65: [A] Beta 1 Amp. (15-18 Hz)	15.0 - 18.0 Hz.
66: [A] Beta 2 Amp. (18-23 Hz)	18.0 - 23.0 Hz.
67: [A] Beta 3 Amp. (23-27 Hz)	23.0 - 27.0 Hz.
68: [A] Beta 4 Amp. (27-35 Hz)	27.0 - 35.0 Hz.
69: [A] Gamma Amp. (35-45 Hz)	35.0 - 45.0 Hz.

Number of channels selected: 4

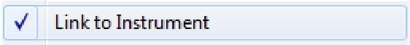
Select one or multiple data channels. The channel list box will indicate the number of selected channels at the bottom. Click the **OK** button for saving the selection.

How to edit data channels, please refer to chapter 8. Input & Channels

---

Linking objects

Some objects can be linked to another object. It will use the threshold state or data and scale range of the object. Right-click an object and select **Link to Instrument**.



All objects are explained in chapter 6. Objects

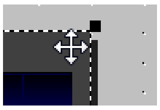
Object position and size

Enter the editing mode by selecting Screen > **Edit Screen ('E')** in the top menu.

The background will show a grey grid. All the objects on the screen will now have black handles.

Moving objects

Click on the middle of an object, the cursor will change into a symbol with 4 arrows, indicating it can be moved. The objects will snap to the grid, while moving the objects.

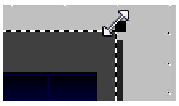


Objects can move freely when turning the grid off. This can be set in the top menu under Screen > Grid > **OFF (No Grid)**.

The default grid setting is 'fine', it can also be set to 'medium' or 'extra fine'.

Resizing objects

Click on a handle of an object, the cursor will change into a symbol with 2 arrows, indicating it can be resized.



By 'dragging' (left clicking and holding) the handles of the object, it is possible to resize objects.

Deleting objects

Delete an object by right clicking the object and select **Delete** (or select the object and press the **Delete** key).

Copying objects

Right-click an object in the editing mode, and choose **Copy** (or select an object and press **Ctrl** + **C**). Right-click the object again and choose **Paste** (or press **Ctrl** + **V**) to paste the copy.

This will create a copy which has exact same size and properties as the original object.

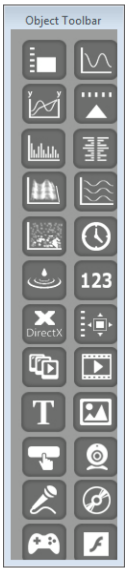
Placing new objects

For more information on objects, please refer to chapter 6. Objects

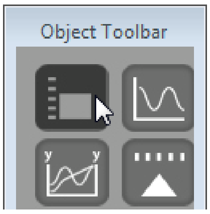
---

Enter the editing mode by selecting Screen > **Edit Screen ('E')** in the top menu.

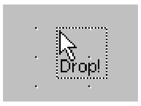
The *Object Toolbar* will appear.



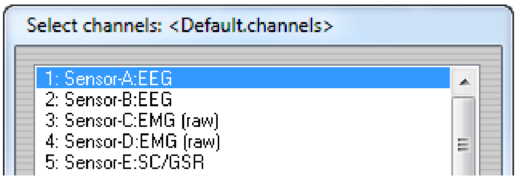
Select an object from the *Object Toolbar* by clicking it once. The object will now show an orange line around it.



Place (or 'Drop') the object by left-clicking in the grid of the screen.



The *Select channels* screen will appear.



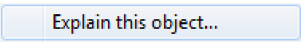
Select channels: <Default.channels>

1: Sensor-A:EEG
2: Sensor-B:EEG
3: Sensor-C:EMG (raw)
4: Sensor-D:EMG (raw)
5: Sensor-E:SC/GSR

Select one or multiple data channels which have to be displayed. Click the **OK** button for saving the selection.

A maximum of 64 objects can be placed in one screen. In case the object is capable of displaying signals, it can be connected to one or more channels.

Right-click an object in the *Object Toolbar* and select **Explain this object...** for more information about the object.

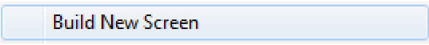


For a comprehensive explanation of all different objects, please refer to chapter 5. Objects

---

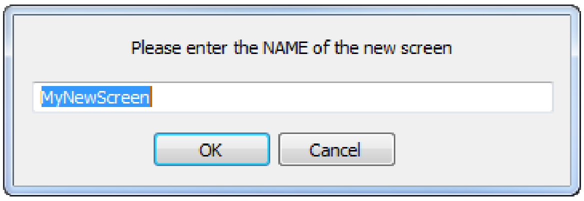
Creating a new screen

Click File > **Build New Screen** in the top menu.



An alert box will appear. Click **OK** for entering edit mode.

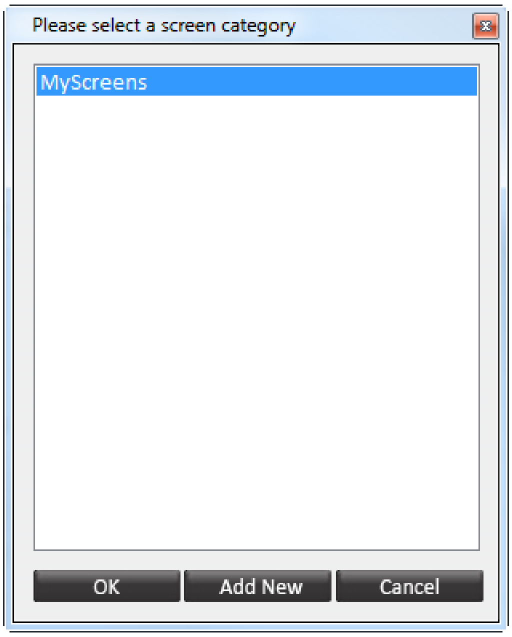
A screen will appear in which a name for the new screen can be entered.



Please enter the NAME of the new screen

MyNewScreen

Enter a name and click **OK**. A screen will appear for selecting a screen category.



Please select a screen category

MyScreens

Select a screen category and click **OK**.

Saving a screen

Overwrite existing screen

It is not recommend to overwrite default screens. In case you want to change a default screen, save this screen as a new screen.

Save an existing screen by choosing File > **Save Screen**

An alert box will appear.

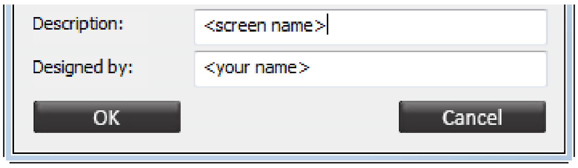
Click **YES** to overwrite an existing screen.

Save as new screen

In order to save a screen as a 'new' screen, choose File > **Save Screen As**. The *Screen Browser* will appear. Select a category and click the **Save Screen** button.

Save Screen

The *Save as a New Screen* box will appear.


Description: <screen name>
Designed by: <your name>

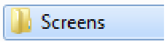
Enter a screen description of the screen and the designer's name. Click **OK** to save the screen.

Deleting screens

Select a screen in the *Screen Browser* and click the **Delete Screen** button or just press the **Delete** key. Click **YES** to confirm.

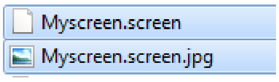
Backing up screens

Screens can easily be copied to a removable disk (or another medium). Open the folder *Screens* in the BioTrace+ directory (e.g. ...\BioTrace\Screens).

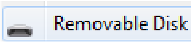


Open the folder Protocols for backing up protocols.

Now open the screen category folder in which the screen has been stored. Select the screen(s). A single screen always exists of two files, a *.screen and *.jpg. Select both files by clicking a screen and holding the **Ctrl** key.



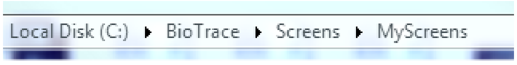
Click the right mouse button and select Send to > **Removable Disk**.



This option will copy the files to a removable disk.

Restoring screens

Copy the *.screen and *.jpg file(s) which are stored on the removable disk. Paste the files into a designated *Screens* folder of BioTrace+ on the hard disk (e.g. *MyScreens*)

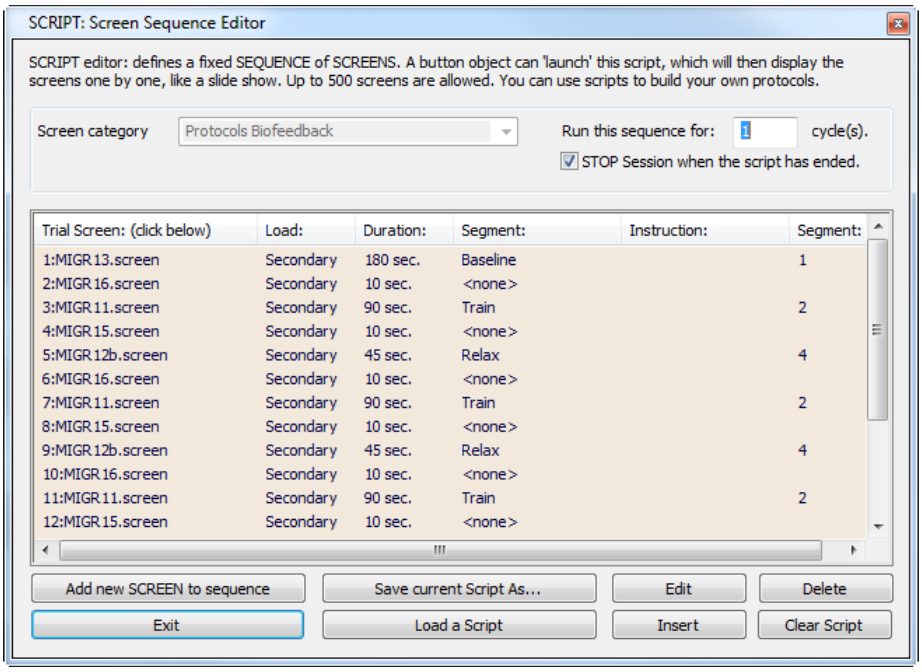


The screens can now be opened in the *Screen Browser* in the category in which the files are placed.

Defining a sequence of screens

It is possible to display the screens in a defined sequence, like a slide show. Click Screen > **Edit Sequence Script** in the top menu.

This will open the *Screen Sequence Editor*.



SCRIPT: Screen Sequence Editor

SCRIPT editor: defines a fixed SEQUENCE of SCREENS. A button object can 'launch' this script, which will then display the screens one by one, like a slide show. Up to 500 screens are allowed. You can use scripts to build your own protocols.

Screen category: Protocols Biofeedback

Run this sequence for: 1 cycle(s).

☑ STOP Session when the script has ended.

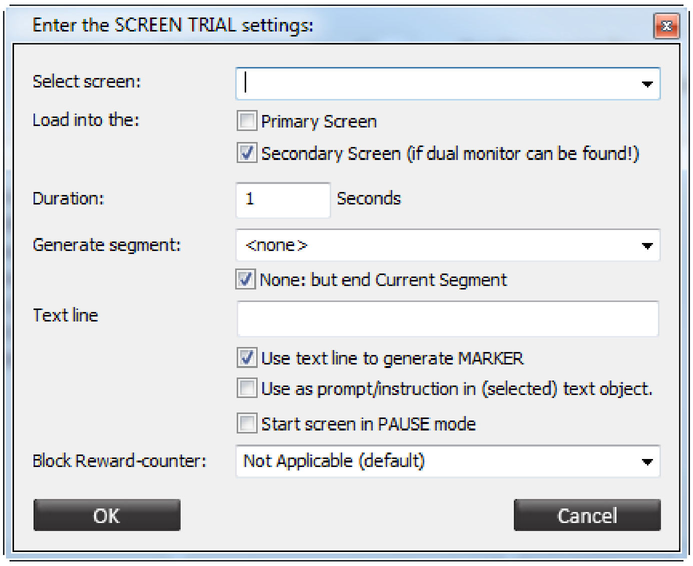
Trial Screen: (click below)	Load:	Duration:	Segment:	Instruction:	Segment:
1:MIGR13.screen	Secondary	180 sec.	Baseline		1
2:MIGR16.screen	Secondary	10 sec.	<none>		
3:MIGR11.screen	Secondary	90 sec.	Train		2
4:MIGR15.screen	Secondary	10 sec.	<none>		
5:MIGR12b.screen	Secondary	45 sec.	Relax		4
6:MIGR16.screen	Secondary	10 sec.	<none>		
7:MIGR11.screen	Secondary	90 sec.	Train		2
8:MIGR15.screen	Secondary	10 sec.	<none>		
9:MIGR12b.screen	Secondary	45 sec.	Relax		4
10:MIGR16.screen	Secondary	10 sec.	<none>		
11:MIGR11.screen	Secondary	90 sec.	Train		2
12:MIGR15.screen	Secondary	10 sec.	<none>		

The script editor can be used for defining a fixed sequence of screens. A button object can start this script. These scripts can be used for building own protocols.

To create a new script, select a screen category. Add a screen to the script by clicking **Add New Screen to Sequence**.

Add new SCREEN to sequence

This will open the *Trial Settings* screen.



Enter the SCREEN TRIAL settings:

Select screen:

Load into the: ☐ Primary Screen

☑ Secondary Screen (if dual monitor can be found!)

Duration: 1 Seconds

Generate segment: <none>

☑ None: but end Current Segment

Text line

☑ Use text line to generate MARKER

☐ Use as prompt/instruction in (selected) text object.

☐ Start screen in PAUSE mode

Block Reward-counter: Not Applicable (default)

Edit the following properties:

- Select screen: all screens of the previous selected screen category can be selected.
- Load into the: choose for a primary or secondary screen.
- Duration: how long will the screen displayed?
- Generate segment: select a segment type. Check **None** to end the current segment and if no new segment is required.
- Text line: text can be used for an automatic marker or as an instruction (check these options below)
- Pause mode: check this option when pause mode is needed. Un-pause the session manually.
- Block reward counter: reward counters can be blocked for specific screens.

Save a script by clicking **Save current Script as...**. This will save a *.script file.

Save current Script As...

It is possible to load an existing script by clicking the **Load a Script** button.

Load a Script

Select a *.script file and click **Open** to open the script.

Click **Edit** to edit a trial screen.

Click **Delete** for deleting a screen in the sequence.

Select a screen and click **Insert** to insert a screen

Click **Clear Script** to delete trial screens.

Clear Script

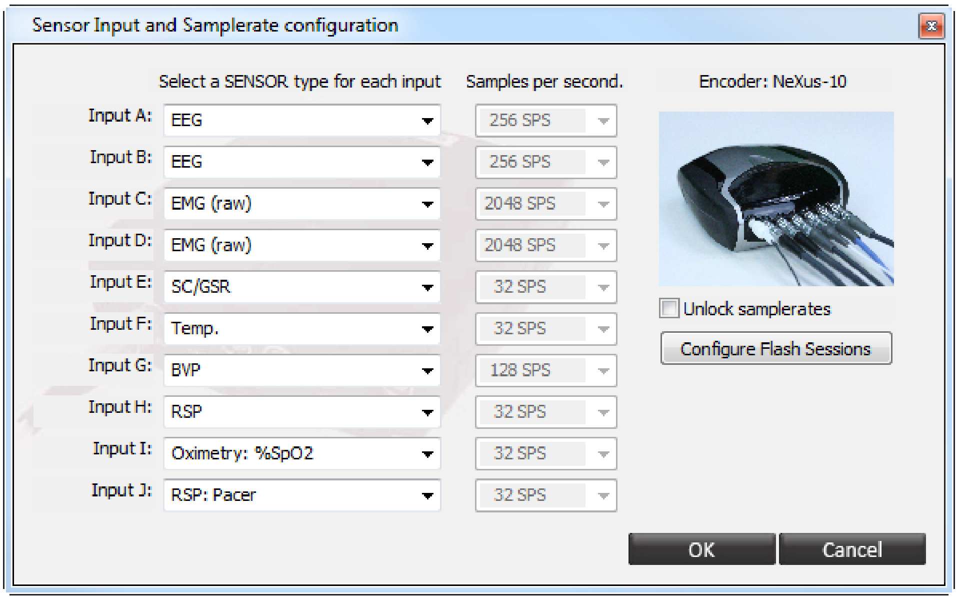
8. Inputs & Channels

This chapter describes the sensor input settings and channel settings. The first 4 (NeXus-4) or 10 channels (NeXus-10) of a channel set are used to store the physiological data coming from the sensors. The other channels are virtual data channels which have computed data, derived from the sensors. You always need to connect a specific channel set to a screen. By default this is the Default-channel set.

Sensor inputs

Default sensor input

The image below shows an example of the Sensor Input configuration for NeXus-10:



Sensor Input and Samplerate configuration

	Select a SENSOR type for each input	Samples per second.
Input A:	EEG	256 SPS
Input B:	EEG	256 SPS
Input C:	EMG (raw)	2048 SPS
Input D:	EMG (raw)	2048 SPS
Input E:	SC/GSR	32 SPS
Input F:	Temp.	32 SPS
Input G:	BVP	128 SPS
Input H:	RSP	32 SPS
Input I:	Oximetry: %SpO2	32 SPS
Input J:	RSP: Pacer	32 SPS

Encoder: NeXus-10

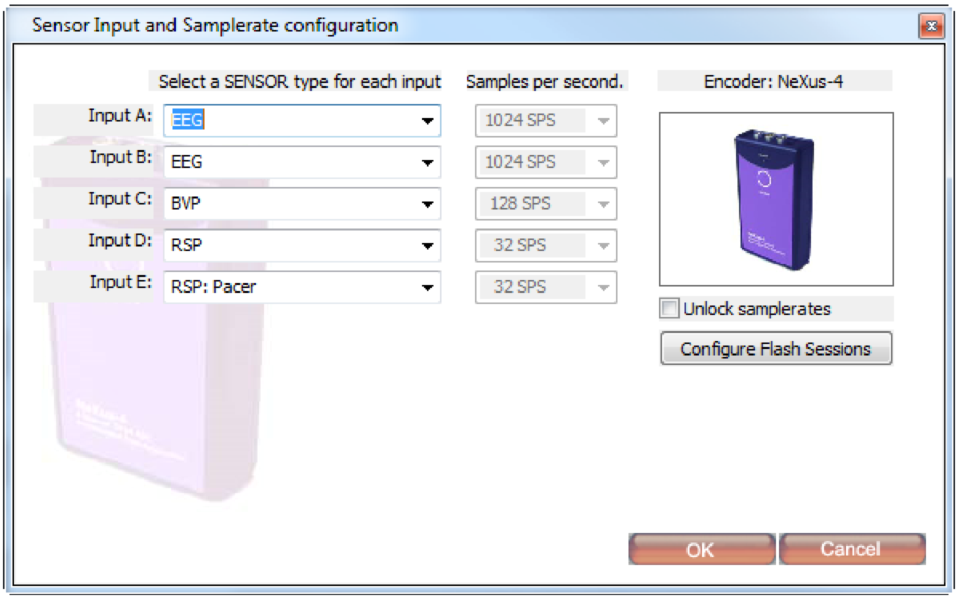
☐ Unlock samplerates

Press **I** to open the **Sensor Input and Samplerate configuration**. Input A, B, C, and, D can be used for electrophysiological signals Input E, F, G and H the peripheral sensors can be connected in any combination. Inputs I and J can be used for oximetry, the NeXus Trigger Interface (%SpO2 or pulse) and the respiration pacer.

---

*The **Sensor Input and Samplerate configuration** is saved as part of channel configurations and will display the input-channels of the last loaded channel configuration. This can be the channel configuration that is linked to the screen or a channel configuration that is manually loaded.*

The image below shows an example of the Sensor Input configuration for NeXus-4:



Sensor Input and Samplerate configuration

Encoder: NeXus-4

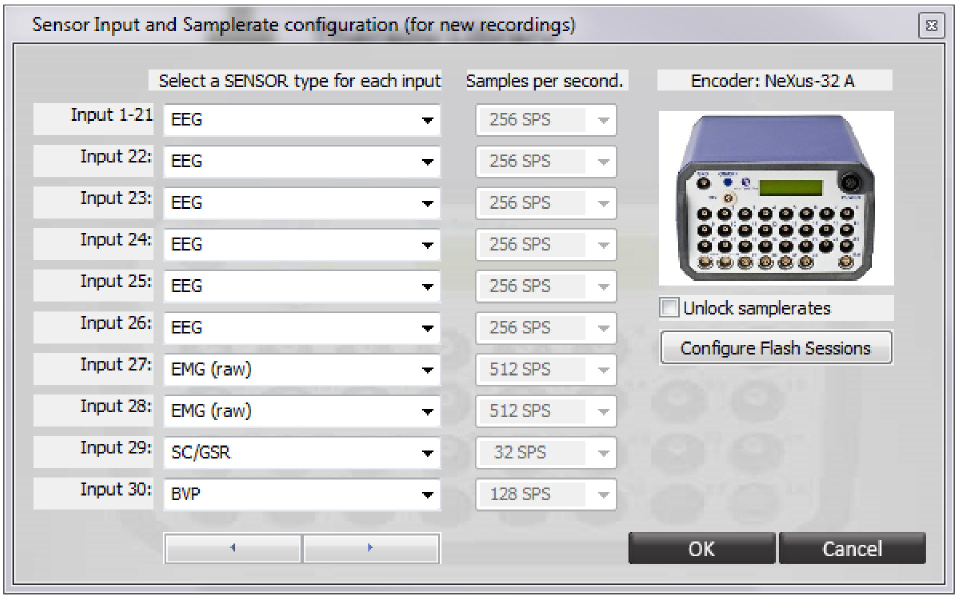
	Select a SENSOR type for each input	Samples per second.
Input A:	EEG	1024 SPS
Input B:	EEG	1024 SPS
Input C:	BVP	128 SPS
Input D:	RSP	32 SPS
Input E:	RSP: Pacer	32 SPS

☐ Unlock samplerates

Check File > **load channel set** to take a look at the available channel configurations.

Input A, B can be used for electrophysiological signals on inputs C and D, 2 peripheral sensors can be connected in any combination.

The image below shows an example of the Sensor Input configuration for NeXus-32:

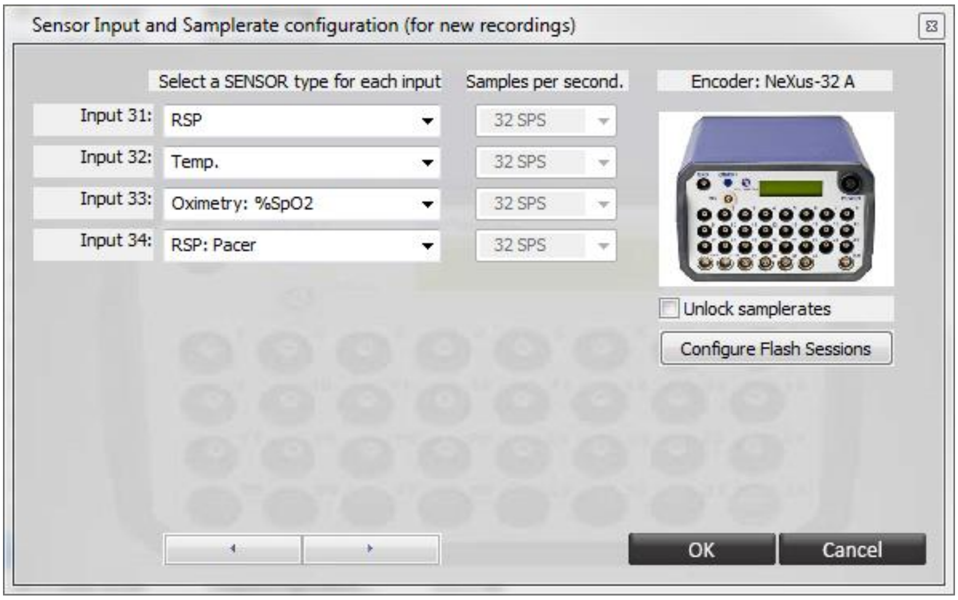


Sensor Input and Samplerate configuration (for new recordings)

Encoder: NeXus-32 A

	Select a SENSOR type for each input	Samples per second.
Input 1-21	EEG	256 SPS
Input 22:	EEG	256 SPS
Input 23:	EEG	256 SPS
Input 24:	EEG	256 SPS
Input 25:	EEG	256 SPS
Input 26:	EEG	256 SPS
Input 27:	EMG (raw)	512 SPS
Input 28:	EMG (raw)	512 SPS
Input 29:	SC/GSR	32 SPS
Input 30:	BVP	128 SPS

☐ Unlock samplerates


Sensor Input and Samplerate configuration (for new recordings)

	Select a SENSOR type for each input	Samples per second.
Input 31:	RSP	32 SPS
Input 32:	Temp.	32 SPS
Input 33:	Oximetry: %SpO2	32 SPS
Input 34:	RSP: Pacer	32 SPS

Encoder: NeXus-32 A

☐ Unlock samplerates

The first 24 inputs can be used for EEG signals in the frequency range from DC to 800Hz. Inputs 25-28 can be used for electrophysiological signals. On inputs 29-32 peripheral sensors can be connected in any combination. Inputs 33-34 can be used for oximetry, the NeXus Trigger Interface (%SpO2 or pulse) and the respiration pacer.

Sessions recorded with BioTrace+ versions prior to V2015B contain a maximum of 3 auxiliary inputs of the NeXus 32, instead of 4. Oximetry and pacer signals recorded with these previous versions will be available on channels 33 and 34, instead of 32 and 33 as was the case during recording.

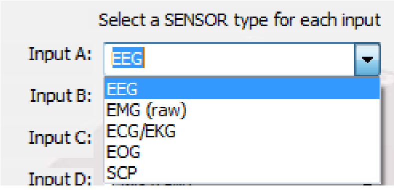
Changing sensor input

All signals are acquired by and derived from the sensors. Any change to a sensor configuration will modify the way the physiological data is represented in all the screens.

Go to the top menu and select Configuration > **Sensor Input Config.** (or press the **I** key).

This will open the *Sensor Input and Samplerate Configuration* screen.

Use the dropdown menu to change the input.


Select a SENSOR type for each input

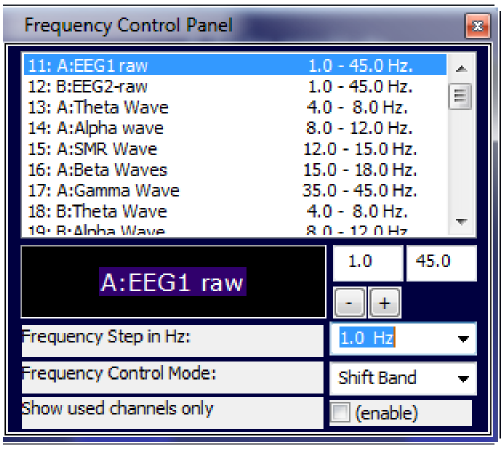
Input A: EEG

Click **OK** to confirm the changes.

Change EEG frequencies during sessions

Go to Configuration > **Channel freq. control** in the top menu (or press **SHIFT** + **C**).

This will open the *Frequency Control Panel*.


Frequency Control Panel

11: A:EEG1 raw	1.0 - 45.0 Hz.
12: B:EEG2-raw	1.0 - 45.0 Hz.
13: A:Theta Wave	4.0 - 8.0 Hz.
14: A:Alpha wave	8.0 - 12.0 Hz.
15: A:SMR Wave	12.0 - 15.0 Hz.
16: A:Beta Waves	15.0 - 18.0 Hz.
17: A:Gamma Wave	35.0 - 45.0 Hz.
18: B:Theta Wave	4.0 - 8.0 Hz.
19: B:Alpha Wave	8.0 - 12.0 Hz

A:EEG1 raw

1.0 45.0

-
+

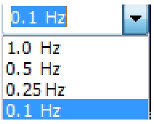
Frequency Step in Hz: 1.0 Hz

Frequency Control Mode: Shift Band

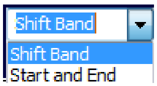
Show used channels only ☐ (enable)

With this panel it is easy to change the individual frequency during a session.

Set start and end points, or shift a whole band in steps of 1Hz, 0.5 Hz, 0.25Hz or 0.1 Hz.


0.1 Hz
1.0 Hz
0.5 Hz
0.25 Hz
0.1 Hz

Choose between **Shift band** and **Start and End** frequency control mode.

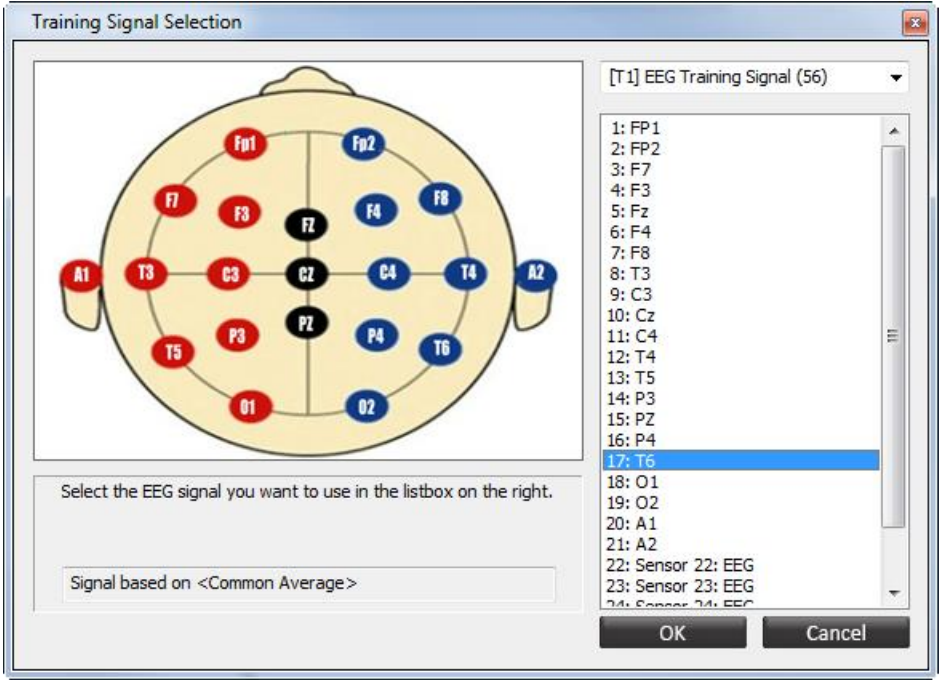

Shift Band
Shift Band
Start and End

Check **Enable** to only show the channels that are being used.

Change EEG training input

This feature is only available in EEG screens for NeXus-32.

Open the *EEG Training Input Selection* by clicking the following button in the toolbar (or go to EEG > **EEG Training Input** in the top menu or press **X**).



[T1] EEG Training Signal (56)

1: FP1
2: FP2
3: F7
4: F3
5: Fz
6: F4
7: F8
8: T3
9: C3
10: Cz
11: C4
12: T4
13: T5
14: P3
15: PZ
16: P4
17: T6
18: O1
19: O2
20: A1
21: A2
22: Sensor 22: EEG
23: Sensor 23: EEG

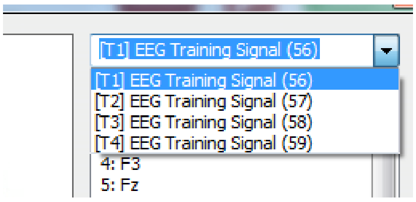
Select the EEG signal you want to use in the listbox on the right.

Signal based on <Common Average>

---

*See section **EEG signal (re)montaging** on how to change the **Signal based on <...>** to another montage.*

Select the input (T1-T4) by using the dropdown box in the upper right corner.



[T1] EEG Training Signal (56)
[T1] EEG Training Signal (56)
[T2] EEG Training Signal (57)
[T3] EEG Training Signal (58)
[T4] EEG Training Signal (59)
4: F3
5: Fz

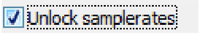
Select the 10-20 location or other sensor input on the right selection box and click **OK**. The training signals can be changed at any time. Save the channel configuration to save the training signal settings for next usages.

Change sample rates

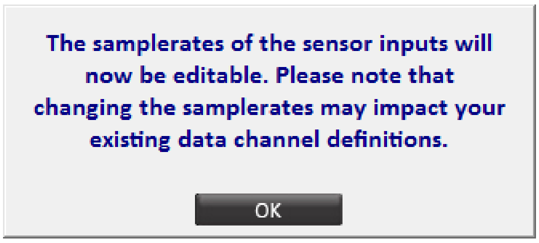
Go to the top menu and select Configuration > **Sensor Input Config.** (or press the **I** key).

This will open the *Sensor Input and Samplerate Configuration* screen.

For changing sample rates, first check the selection box **Unlock samplerates**.

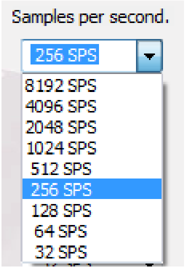

☑ Unlock samplerates

An alert box will appear.


The samplerates of the sensor inputs will now be editable. Please note that changing the samplerates may impact your existing data channel definitions.

Click **OK** for closing the alert box.

Use the dropdown menu for changing the sample rate of an input.


Samples per second.
256 SPS
8192 SPS
4096 SPS
2048 SPS
1024 SPS
512 SPS
256 SPS
128 SPS
64 SPS
32 SPS

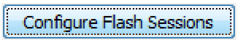
Click **OK** to save the changes.

Store data on flash memory

Go to the top menu and select Configuration > **Sensor Input Config.**

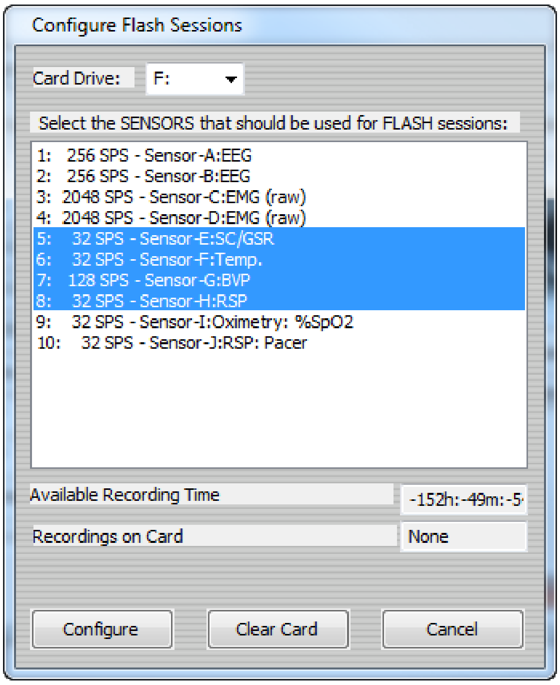
This will open the *Sensor Input and Samplerate Configuration* screen.

Click the **Configure Flash Sessions** button.


Configure Flash Sessions

Configuration for NeXus-10/ NeXus-32

The *Configure Flash Session* screen will appear.



Card Drive: F:

Select the SENSORS that should be used for FLASH sessions:

1: 256 SPS - Sensor-A:EEG
2: 256 SPS - Sensor-B:EEG
3: 2048 SPS - Sensor-C:EMG (raw)
4: 2048 SPS - Sensor-D:EMG (raw)
5: 32 SPS - Sensor-E:SC/GSR
6: 32 SPS - Sensor-F:Temp.
7: 128 SPS - Sensor-G:BVP
8: 32 SPS - Sensor-H:RSP
9: 32 SPS - Sensor-I:Oximetry: %SpO2
10: 32 SPS - Sensor-J:RSP: Pacer

Available Recording Time -152h:-49m:-5

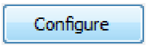
Recordings on Card None

Select the correct flash *Card Drive*. This drive will be detected automatically.

Select the sensors that need to be stored on the flash card.

Sample rates cannot be changed afterwards for stored data on a flash card.

Click the **Configure** button to save the configuration.



A dialog box will appear. Click **OK** to close this box. The configuration is now saved.

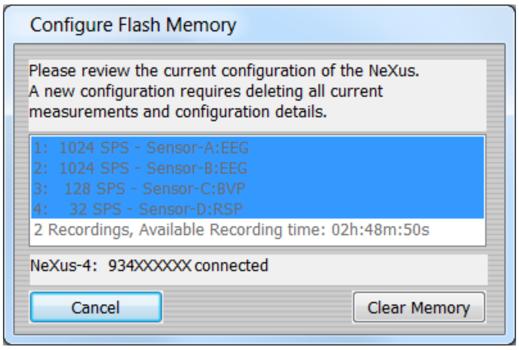
The *Configure Flash Sessions* screen will also show the available recording time that is left. This will depend on the capacity of the flash card and the selected sensors (e.g. the four fast inputs (A,B,C, and D) with a high sample rate need more storage space).

The physiological data will be stored in a compressed fashion. That is why it is needed to import the session data files from the flash card, before they can be used.

If NeXus is used in 'ambulatory mode' the wireless data connection is switched off.

Configuration for NeXus-4

The *Configure Flash Memory* screen will appear.



Please review the current configuration of the NeXus.
A new configuration requires deleting all current measurements and configuration details.

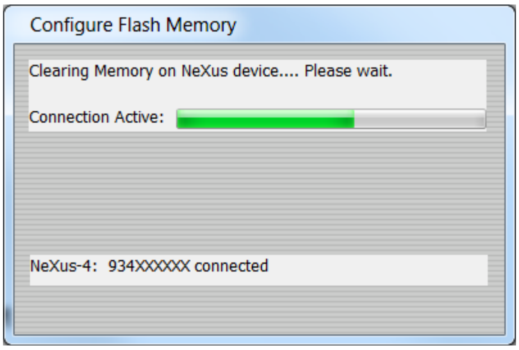
1: 1024 SPS - Sensor-A:EEG
2: 1024 SPS - Sensor-B:EEG
3: 128 SPS - Sensor-C:BVP
4: 32 SPS - Sensor-D:RSP
2 Recordings, Available Recording time: 02h:48m:50s

NeXus-4: 934XXXXXX connected

A new configuration requires deleting all current measurements and configuration details.

Click the **Clear Memory** button.

A dialog box will appear. Click **Yes** to proceed. It can take up to 5 minutes to erase the total memory.

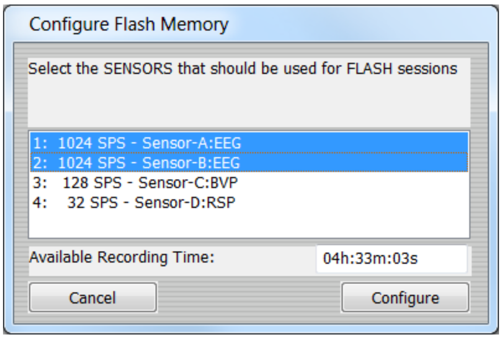


Clearing Memory on NeXus device.... Please wait.

Connection Active:

NeXus-4: 934XXXXXX connected

The *Configure Flash Memory* screen will also show the available recording time that is left on the NeXus-4 memory. This will depend on the selected sensors (e.g. the four fast inputs (A,B,C, and D) with a high sample rate need more storage space).



Select the SENSORS that should be used for FLASH sessions

1: 1024 SPS - Sensor-A:EEG
2: 1024 SPS - Sensor-B:EEG
3: 128 SPS - Sensor-C:BVP
4: 32 SPS - Sensor-D:RSP

Available Recording Time: 04h:33m:03s

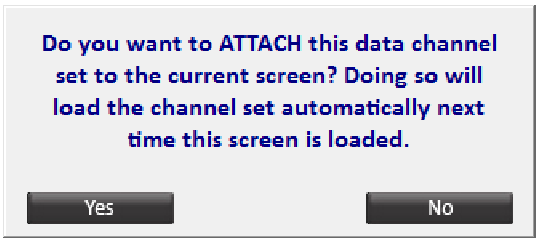
Click **Configure** to store the selected configuration to the NeXus-4 memory.

Two dialogs will appear. Click on **Yes** and then **OK** to complete the configuration.

Load and attach a channel set

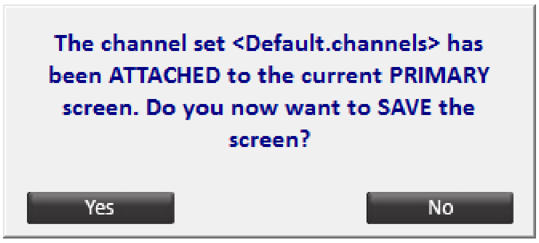
To load and attach a channel set to a screen, go to File > **Load channel set** in the top menu.

After selecting a *.channels file, a dialog box will appear.



Do you want to ATTACH this data channel set to the current screen? Doing so will load the channel set automatically next time this screen is loaded.

Click **Yes** to attach the channel set to the current screen.

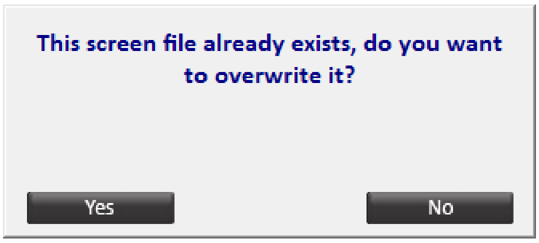


The channel set <Default.channels> has been ATTACHED to the current PRIMARY screen. Do you now want to SAVE the screen?

Click **Yes** to save the screen. This will load the channel set automatically next time.

It is not recommended to overwrite default screens!

A third alert box will appear.



This screen file already exists, do you want to overwrite it?

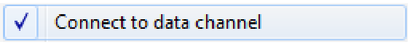
Click **Yes** for saving the screen with the attached channel set.

Edit channels

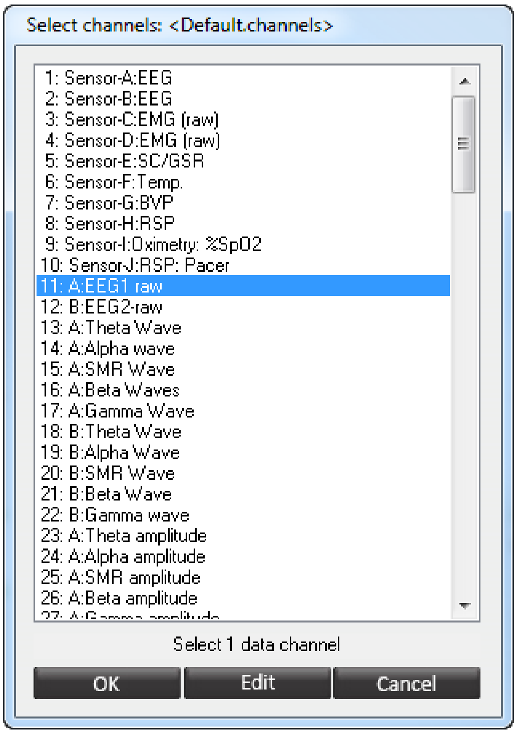
It is not possible to change channel sets during recording!

To edit channels, go to Configuration > **Channel set config.** in the top menu (or press the **C** key).

Or right-click an object and select **Connect to data channel** or edit data channel.



This will open the *Select channels* screen.


Select channels: <Default.channels>

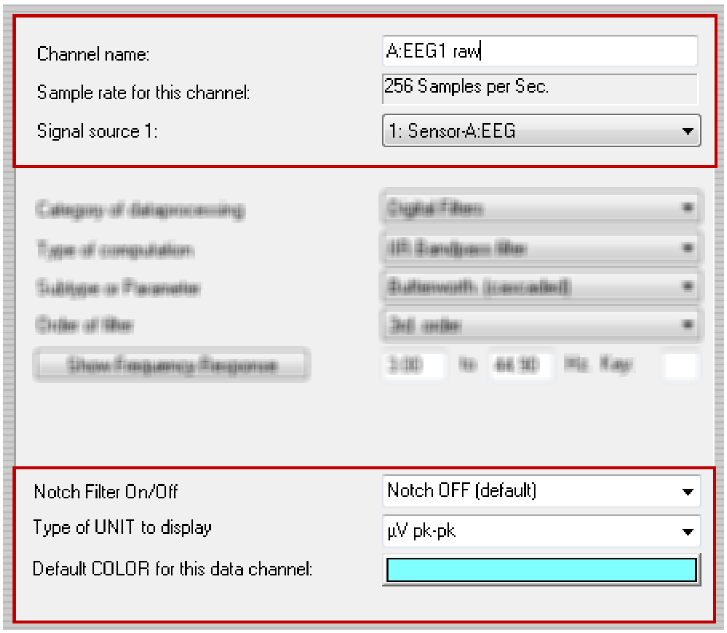
1: Sensor-A:EEG
2: Sensor-B:EEG
3: Sensor-C:EMG (raw)
4: Sensor-D:EMG (raw)
5: Sensor-E:SC/GSR
6: Sensor-F:Temp.
7: Sensor-G:BVP
8: Sensor-H:RSP
9: Sensor-I:Oximetry: %SpO2
10: Sensor-J:RSP: Pacer
11: A:EEG1 raw
12: B:EEG2-raw
13: A:Theta Wave
14: A:Alpha wave
15: A:SMR Wave
16: A:Beta Waves
17: A:Gamma Wave
18: B:Theta Wave
19: B:Alpha Wave
20: B:SMR Wave
21: B:Beta Wave
22: B:Gamma wave
23: A:Theta amplitude
24: A:Alpha amplitude
25: A:SMR amplitude
26: A:Beta amplitude

Select 1 data channel

The *<Name>* after *Select channels:* at the top of the screen, displays the name of the currently loaded channel set (e.g. <Default.channels>).

Select a channel and click **Edit.**

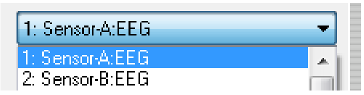
This will open the *Editing channel* screen.


Channel name: A:EEG1 raw
Sample rate for this channel: 256 Samples per Sec.
Signal source 1: 1: Sensor-A:EEG

Notch Filter On/Off: Notch OFF (default)
Type of UNIT to display: µV pk-pk
Default COLOR for this data channel:

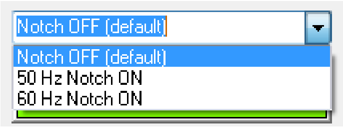
The following properties can be edited for every channel:

- *Channel name*: Name of the channel
- *Signal source 1 (and 2)*: select one of the defined channels from the dropdown.



For changing the signal source for the first 4 (NeXus-4) or first 10 (NeXus-10) channels, please refer to chapter 12. Sensor input.

- *Notch filter*: The notch filter can be changed in the channel set configuration. This filter does not change the raw signal storage and can always be turned off to return to the original data.
    - *Off*: Notch filter will not be active (default).
    - *50 Hz notch on*: The filter passes all frequencies, except for 50 Hz.
    - *60 Hz notch on*: The filter passes all frequencies, except for 60 Hz.



- *Type of unit to display*: The unit options depend on the type of signal and category of data processing. Sometimes it is possible to choose between different types:
    - *µSiemens / KOhm*: For skin conductance (GSR)
    - *°C / °F*: For temperature
    - *B/Min. / MS*: For HR (BVP)
    - *µV pk-pk / µV RMS*: For root mean square amplitudes (EEG)
- *Default color*: Select a color which is used for displaying the signal in session overview.

Use the left and right arrows at the bottom of the box to navigate through the channels.

Click **Apply** to save changes without closing the dialog box. Click **OK** to save changes and to close the dialog box.

Create and save channel sets

Most of the default screens are connected to a default channel set. If no channel set can be found, the default channel set will always be loaded.

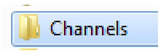
When making changes to a channel set (or creating a new one), select File > **Save channel SET as…** in the top menu.

It is not recommended to overwrite default channel sets! Create a new channel set when making changes and connect them to the screens.

Save the *.channels file in the "channels" folder of BioTrace+.

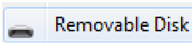
Back up channel sets

Saved channel sets can easily be copied to a removable disk (or another medium). Open the folder **Channels** in the BioTrace+ directory :



Channels

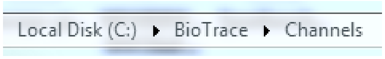
Select the *.channels file(s). Click the right mouse button and choose to copy the file(s) to a removable disk:



Removable Disk

Restore channel sets

Copy the *.channels file(s). Paste the file(s) into the *Channels* folder of BioTrace+ on the hard disk:



Local Disk (C:) ▸ BioTrace ▸ Channels

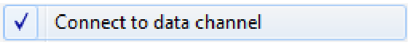
Within BioTrace+, the channel sets can now be loaded.

Data processing

When editing the type of data processing, basic knowledge of physiological signals and statistics is required.

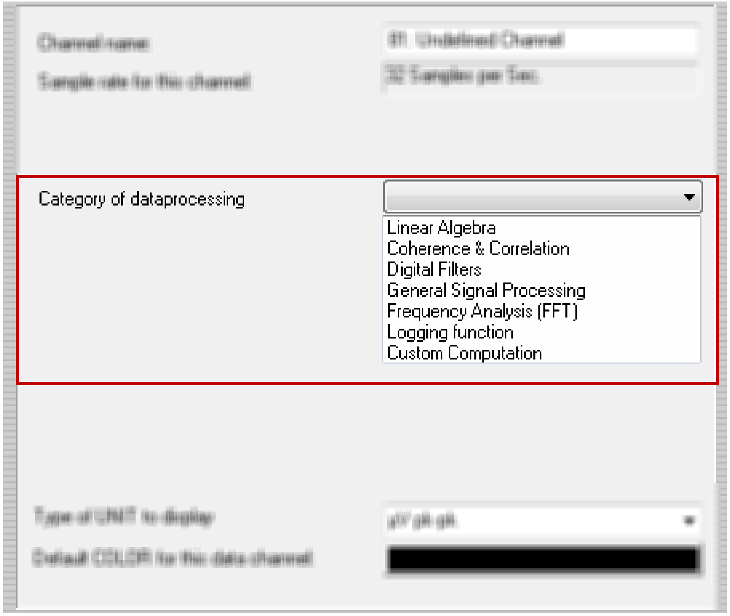
Go to Configuration > **Channel set config.** in the top menu (or press the **C** key).

Or right-click an object and select **Connect to data channel**.


✓ Connect to data channel

This will open the *Select channels* screen.

Select a channel and click **Edit** to open the *Editing channel* screen.

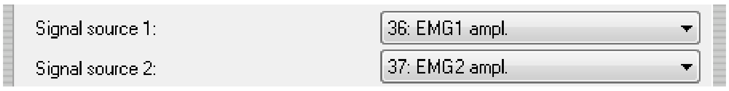

Category of dataprocessing
Linear Algebra
Coherence & Correlation
Digital Filters
General Signal Processing
Frequency Analysis (FFT)
Logging function
Custom Computation

The following types of data processing can be selected:

- Linear Algebra
- Coherence and Correlation functions
- Digital Filters
- General Signal Processing
- Frequency Analysis functions (FFT)
- Logging function
- Custom computation

Linear algebra functions

All linear algebra functions require two selected channels.

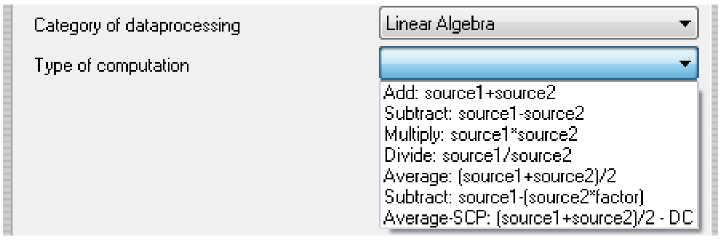


Signal source 1: 36: EMG1 ampl.

Signal source 2: 37: EMG2 ampl.

Only use channels with the same sample rate.

The following types of computation can be selected:



Category of dataprocessing: Linear Algebra

Type of computation:

- Add: source1+source2
- Subtract: source1-source2
- Multiply: source1*source2
- Divide: source1/source2
- Average: (source1+source2)/2
- Subtract: source1-(source2*factor)
- Average-SCP: (source1+source2)/2 - DC

It repeats this function for each value in the array of data values that a signal holds.

Add: source1 + source2

This function computes the sum of the signal values from source1 and source2.

Subtract: source1 - source2

This function computes the difference of the signal values from source1 and source2.

Multiply: source1 x source2

This function computes the product of the signal values from source1 and source2.

Divide: source1 / source2

This function computes the ratio of the signal values from source1 and source2.

Average: (source1 + source2) / 2

This function computes the mean of the signal values from source1 and source2.

Subtract (factor): source1 - (source2 x factor)

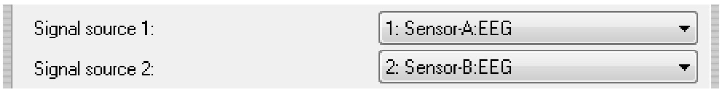
This function computes the difference of the signal values from source1 and source2 times a factor X.
Enter the factor number in the *Editing Channel* screen.

Average SCP: (source1 + source2) / 2 - DC

This function computes the mean of the signal values from source1 and source2 with a DC correction.

Coherence and correlation functions

All linear algebra functions require two selected channels.

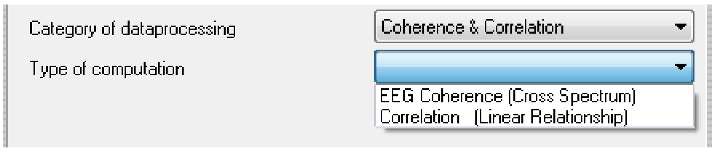


Signal source 1: 1: Sensor-A:EEG

Signal source 2: 2: Sensor-B:EEG

Only use channels with the same sample rate.

The following types of computation can be selected:



Category of dataprocessing: Coherence & Correlation

Type of computation:

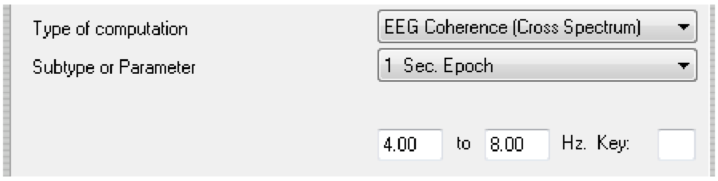
EEG Coherence (Cross Spectrum)
Correlation (Linear Relationship)

EEG coherence

Coherence is a measure of cross-correlation between two signals in the EEG frequency domain.

EEG Coherence is computed by the ratio of the auto-spectra of the two channels and their cross spectra.

The following parameters can be set:



Type of computation: EEG Coherence (Cross Spectrum)

Subtype or Parameter: 1 Sec. Epoch

4.00 to 8.00 Hz. Key:

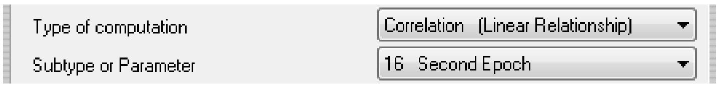
- *The size of the FFT Epoch*: 1, 2, 4, 8, 16, or 32 seconds. This depends on the sample rate of the signal source.
- *The frequency range*: Select at least a range of 4 Hertz when using *1* second Epochs, or 2 Hz when using 2 second epochs.

Correlation

This function uses a Pearson product-moment to compute the linear correlation between two signals.

The signals must have the same sample rate

Set the following parameters:



Type of computation: Correlation (Linear Relationship)

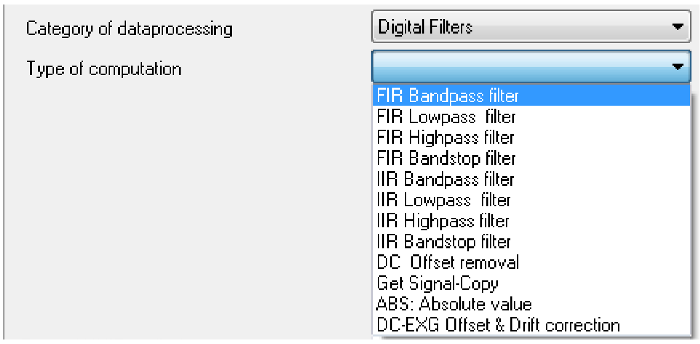
Subtype or Parameter: 16 Second Epoch

- *The size of the Epoch*: The size in seconds of the samples that should be analyzed. If the sample rate is for instance 32 SPS, setting a 16 seconds epoch means that 512 points of data will be analyzed.

Correlation may result in a value between -1 (negative linear correlation) and +1 (positive correlation).

Digital filters

The following types of computation can be selected:



Category of dataprocessing: Digital Filters

Type of computation:

FIR Bandpass filter
FIR Lowpass filter
FIR Highpass filter
FIR Bandstop filter
IIR Bandpass filter
IIR Lowpass filter
IIR Highpass filter
IIR Bandstop filter
DC Offset removal
Get Signal-Copy
ABS: Absolute value
DC-EXG Offset & Drift correction

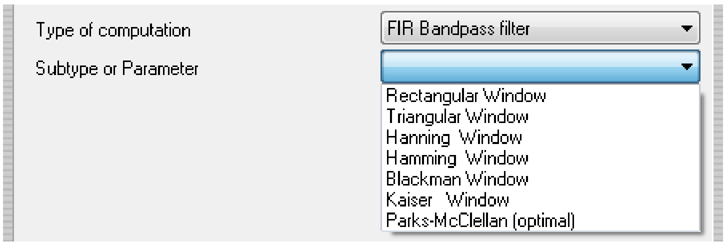
FIR filters

FIR stands for Finite Impulse Response. There is no ‘feedback’ in the filter and after a certain fixed time the filter will reset to zero when an impulse (a ‘1’) is run through it.

The following type of FIR filters can be distinguished:

- *Band pass filter*: Passes frequencies in a predefined band.
- *Low pass filter*: Filters out high frequencies, low frequencies are passed.
- *High pass filter*: Filters out low frequencies, high frequencies are passed.
- *Band stop filter*: Filters out only a (narrow) band of frequencies. The rest is passed.

Select the following subtype or parameter:

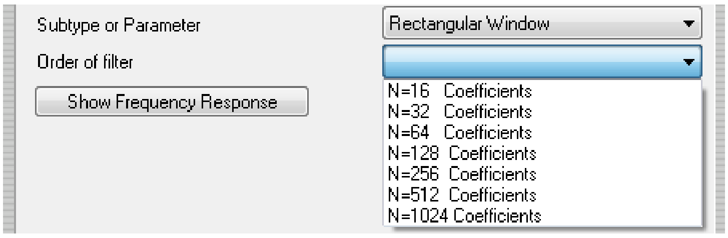


Type of computation: FIR Bandpass filter

Subtype or Parameter:

Rectangular Window
Triangular Window
Hanning Window
Hamming Window
Blackman Window
Kaiser Window
Parks-McClellan (optimal)

Select the order of the filter:



Subtype or Parameter: Rectangular Window

Order of filter:

Show Frequency Response
N=16 Coefficients
N=32 Coefficients
N=64 Coefficients
N=128 Coefficients
N=256 Coefficients
N=512 Coefficients
N=1024 Coefficients

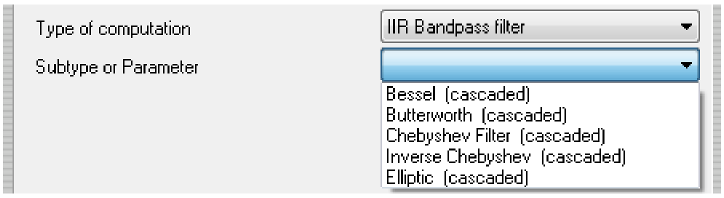
IIR filters

IIR stands for Infinite Impulse Response because there is ‘feedback’ in the filter and it takes a long time for the filter to reset to zero when an impulse (a ‘1’) is run through it.

The following type of FIR filters can be divided:

- *Band pass filter*: Filters out the frequencies in a predefined band.
- *Low pass filter*: Filters out high frequencies, low frequencies are passed.
- *High pass filter*: Filters out low frequencies, high frequencies are passed.
- *Band stop filter*: Filters out only a (narrow) band of frequencies. The rest is passed.

Select the following subtype or parameter:

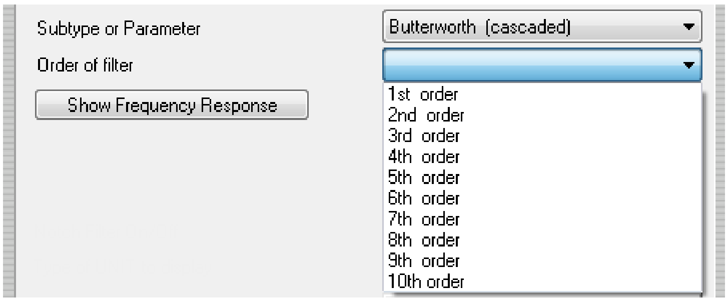


Type of computation: IIR Bandpass filter

Subtype or Parameter

Bessel (cascaded)
Butterworth (cascaded)
Chebyshev Filter (cascaded)
Inverse Chebyshev (cascaded)
Elliptic (cascaded)

Select the order of the filter:

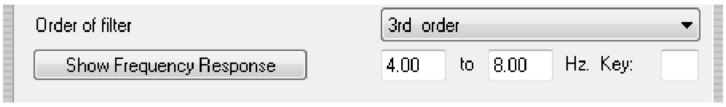


Subtype or Parameter: Butterworth (cascaded)

Order of filter

Show Frequency Response
1st order
2nd order
3rd order
4th order
5th order
6th order
7th order
8th order
9th order
10th order

Enter the frequency range in Hz.



Order of filter: 3rd order

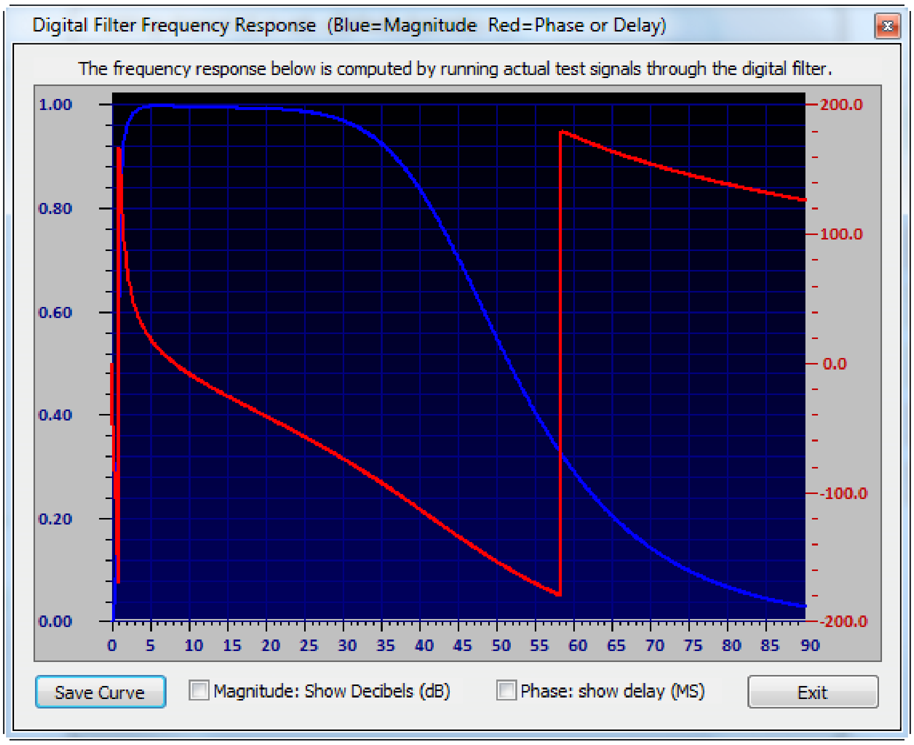
4.00 to 8.00 Hz. Key:

Show Frequency Response

Click the **Show Frequency Response** button to see the characteristics of the filter.

Show Frequency Response

This will open the *Digital Filter Frequency Response* screen.



Digital Filter Frequency Response (Blue=Magnitude Red=Phase or Delay)

The frequency response below is computed by running actual test signals through the digital filter.

☐ Magnitude: Show Decibels (dB)

☐ Phase: show delay (MS)

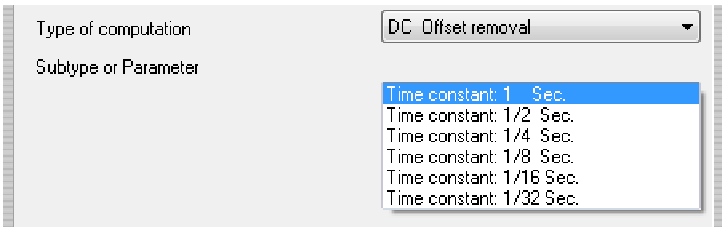
1.00
0.80
0.60
0.40
0.20
0.00
200.0
100.0
0.0
-100.0
-200.0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
Save Curve
Exit

The graph shows the magnitude of the signal at a given Hertz frequency (X-axis) in the color blue. The phase of delay will be shown in red and is expressed in degrees (-180 to +180).

Check **Magnitude: Show Decibels (dB)** to show the magnitude in decibels. Check **Phase: show delay (MS)** to show the delay in milliseconds.

DC Offset removal

This is a simple trend removal filter, much like a high pass filter, but simpler. It can be used to neutralize the DC offset of a signal (e.g. in an ECG).


Type of computation: DC Offset removal

Subtype or Parameter
Time constant: 1 Sec.
Time constant: 1/2 Sec.
Time constant: 1/4 Sec.
Time constant: 1/8 Sec.
Time constant: 1/16 Sec.
Time constant: 1/32 Sec.

Get signal-copy

Type of computation: Get Signal-Copy

ABS: Absolute value

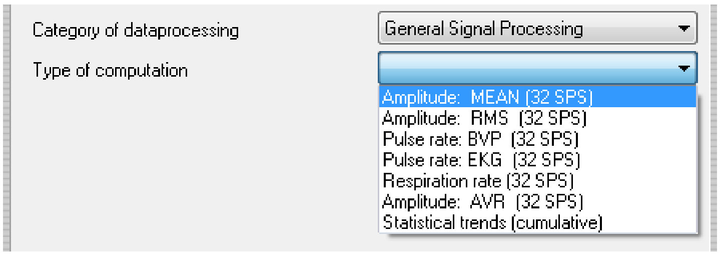
Type of computation: ABS: Absolute value

DC-EXG Offset & Drift correction

Type of computation: DC-EXG Offset & Drift correction

General signal processing

The following types of computation can be selected:

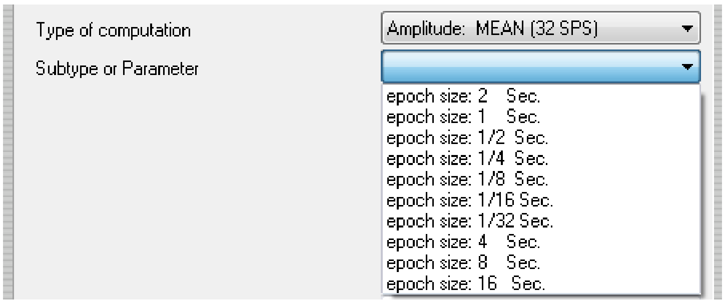

Category of dataprocessing: General Signal Processing

Type of computation
Amplitude: MEAN (32 SPS)
Amplitude: RMS (32 SPS)
Pulse rate: BVP (32 SPS)
Pulse rate: EKG (32 SPS)
Respiration rate (32 SPS)
Amplitude: AVR (32 SPS)
Statistical trends (cumulative)

Amplitude: Mean

The mean amplitude simply adds up all the sample values and divides the result by the number (N) of samples.

Set the following parameters:



Type of computation: Amplitude: MEAN (32 SPS)

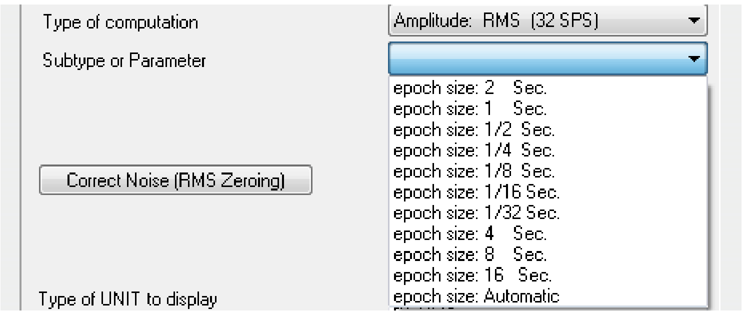
Subtype or Parameter

epoch size: 2 Sec.
epoch size: 1 Sec.
epoch size: 1/2 Sec.
epoch size: 1/4 Sec.
epoch size: 1/8 Sec.
epoch size: 1/16 Sec.
epoch size: 1/32 Sec.
epoch size: 4 Sec.
epoch size: 8 Sec.
epoch size: 16 Sec.

- *Epoch size*: The size in seconds of the samples that should be analyzed.

Amplitude: RMS

This function computes the root-mean-square of a signal. The following parameters can be set:



Type of computation: Amplitude: RMS (32 SPS)

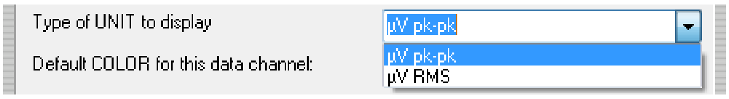
Subtype or Parameter

Type of UNIT to display

Correct Noise (RMS Zeroing)
epoch size: 2 Sec.
epoch size: 1 Sec.
epoch size: 1/2 Sec.
epoch size: 1/4 Sec.
epoch size: 1/8 Sec.
epoch size: 1/16 Sec.
epoch size: 1/32 Sec.
epoch size: 4 Sec.
epoch size: 8 Sec.
epoch size: 16 Sec.
epoch size: Automatic

The automatic epoch size setting calculates the epoch size which is needed for the minimal selected frequency. This setting is the optimal setting to keep the feedback delays as small as possible.

- *Epoch size*: Is the size of the epoch used to compute the RMS amplitude.



Type of UNIT to display: µV pk-pk

Default COLOR for this data channel:

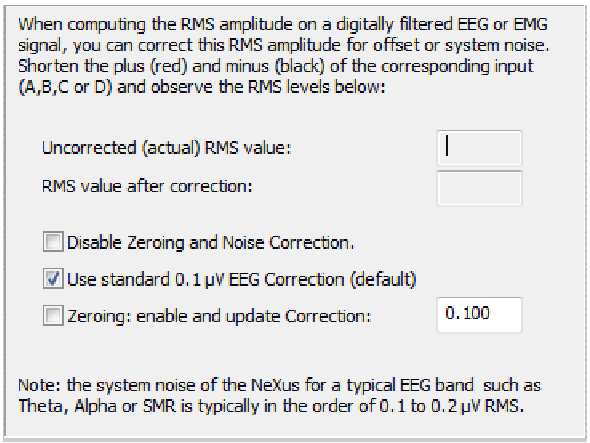
µV pk-pk
µV RMS

The peak-peak (pk-pk) microvolt level is computed by taking the RMS and multiplying it with a factor of 2 times the square root of 2.

Correct the RMS amplitude by clicking **Correct Noise (RMS Zeroing)**.

Correct Noise (RMS Zeroing)

The *RMS Offset & Noise Level Correction* dialog box will appear.



When computing the RMS amplitude on a digitally filtered EEG or EMG signal, you can correct this RMS amplitude for offset or system noise. Shorten the plus (red) and minus (black) of the corresponding input (A,B,C or D) and observe the RMS levels below:

Uncorrected (actual) RMS value:

RMS value after correction:

☐ Disable Zeroing and Noise Correction.

☑ Use standard 0.1 µV EEG Correction (default)

☐ Zeroing: enable and update Correction: 0.100

Note: the system noise of the NeXus for a typical EEG band such as Theta, Alpha or SMR is typically in the order of 0.1 to 0.2 µV RMS.

The following options can be set:

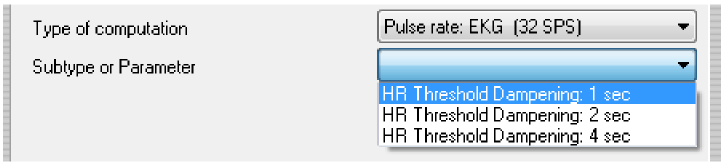
- *Disable zeroing and noise correction*: disable zeroing and correction.
- *Use standard EEG correction*: Set the amount of 'noise' correction. By default for an EEG based signal (band pass filtered) a 0.1 microvolt correction is set.
- *Zeroing : enable and update correction*: The software takes the mean noise level from the signal and subtracts that from the RMS. That means that the total noise in that band, will now be subtracted from the RMS. The minimum microvolt RMS level will be 0.1.

In that case shorten all EMG electrodes (plus, minus and ground) of the relevant input and choose the zeroing: enable and update function. This will obtain the average RMS noise level and subtract it from the RMS level being computed/displayed. Note that the raw EMG signals will never be affected and the RMS zeroing can always be undone.

A computed RMS amplitude will never be less than 0.1 microvolt. This is the lower limit of the RMS levels computed by the software.

Pulse rate: BVP and EKG

These functions are generally used to compute the heart rate from a BVP (blood volume pulse) signal or a ECG (electrocardiogram) signal. Set the following parameters:

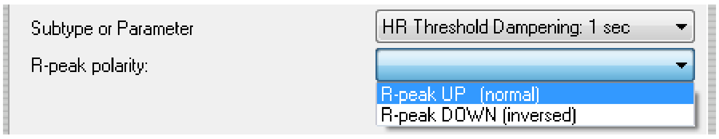


Type of computation: Pulse rate: EKG (32 SPS)

Subtype or Parameter:

HR Threshold Dampening: 1 sec
HR Threshold Dampening: 2 sec
HR Threshold Dampening: 4 sec

Also set R-peak polarity:



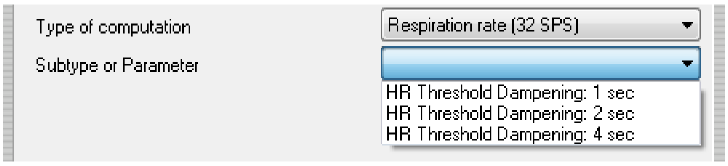
Subtype or Parameter: HR Threshold Dampening: 1 sec

R-peak polarity:

Respiration rate

This function is used to compute the respiration rate based on the input of the respiration sensor.

Set the following parameters:



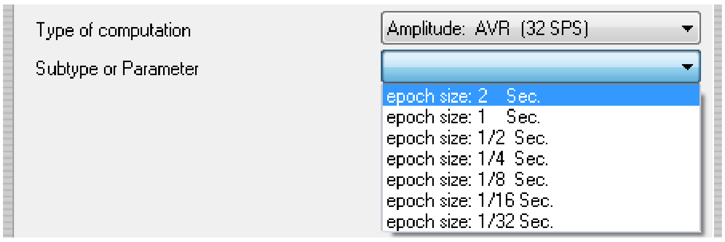
Type of computation: Respiration rate (32 SPS)

Subtype or Parameter:

HR Threshold Dampening: 1 sec
HR Threshold Dampening: 2 sec
HR Threshold Dampening: 4 sec

Amplitude: AVR

This will show the averaged rectified value of the EMG. The following parameters can be set:



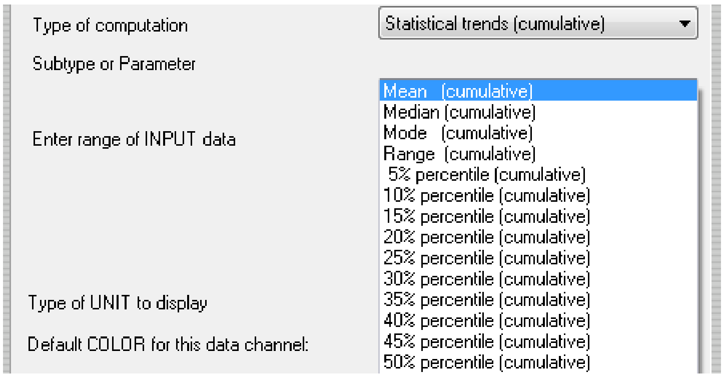
Type of computation: Amplitude: AVR (32 SPS)

Subtype or Parameter:

epoch size: 2 Sec.
epoch size: 1 Sec.
epoch size: 1/2 Sec.
epoch size: 1/4 Sec.
epoch size: 1/8 Sec.
epoch size: 1/16 Sec.
epoch size: 1/32 Sec.

Statistical trends

Set the following parameters:



Type of computation: Statistical trends (cumulative)

Subtype or Parameter:

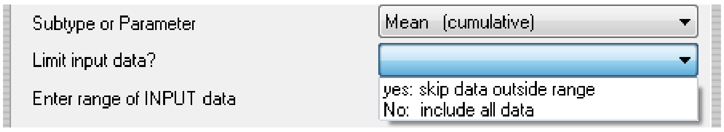
Mean (cumulative)
Median (cumulative)
Mode (cumulative)
Range (cumulative)
5% percentile (cumulative)
10% percentile (cumulative)
15% percentile (cumulative)
20% percentile (cumulative)
25% percentile (cumulative)
30% percentile (cumulative)
35% percentile (cumulative)
40% percentile (cumulative)
45% percentile (cumulative)
50% percentile (cumulative)

Enter range of INPUT data

Type of UNIT to display

Default COLOR for this data channel:

Choose between skipping data outside the range or to include all data.



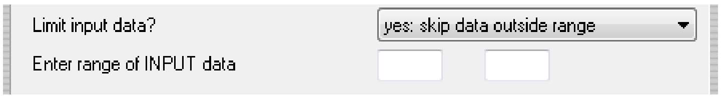
Subtype or Parameter: Mean (cumulative)

Limit input data?

yes: skip data outside range
No: include all data

Enter range of INPUT data

Enter the range of input data.

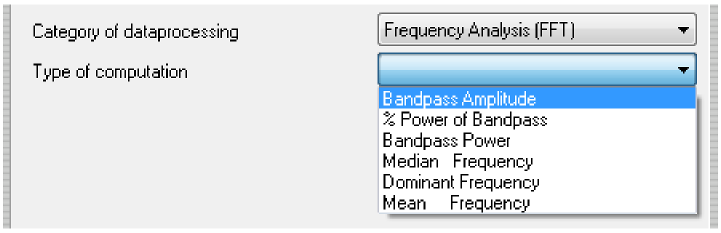


Limit input data? yes: skip data outside range

Enter range of INPUT data

Frequency analysis (FFT) functions

These functions are based on spectral analysis (FFT). Choose from the following functions:



Category of dataprocessing: Frequency Analysis (FFT)

Type of computation:

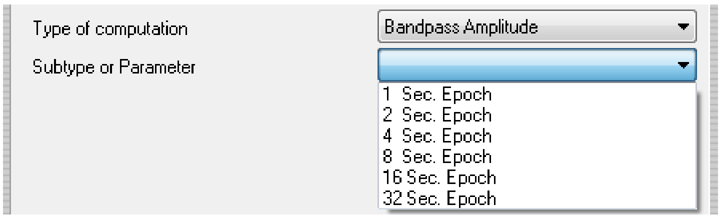
Bandpass Amplitude
% Power of Bandpass
Bandpass Power
Median Frequency
Dominant Frequency
Mean Frequency

When computing spectral analysis using an FFT the result will usually be an array of ‘bins’ for each frequency which indicate the power or magnitude of the signal at that frequency.

Band pass amplitude

This function computes the amplitude (= magnitude) of a signal in the given band width. (Band pass results in pk-pk).

Set the following subtype parameters:

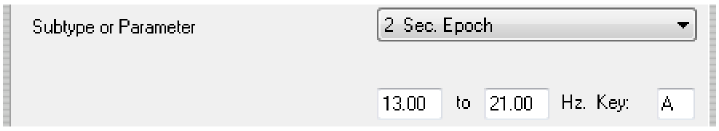


Type of computation: Bandpass Amplitude

Subtype or Parameter:

1 Sec. Epoch
2 Sec. Epoch
4 Sec. Epoch
8 Sec. Epoch
16 Sec. Epoch
32 Sec. Epoch

Set the frequency:



Subtype or Parameter: 2 Sec. Epoch

13.00 to 21.00 Hz. Key: A

With *Key*, a shortcut key can be defined for increasing or decreasing the band pass settings in discrete steps of 0.25/0.5 Hz steps.

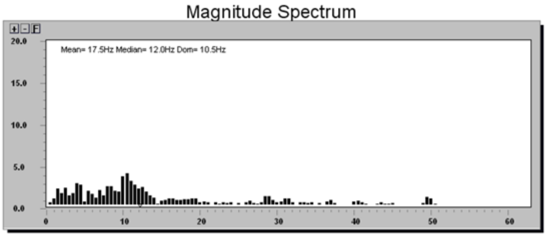
% power of band pass

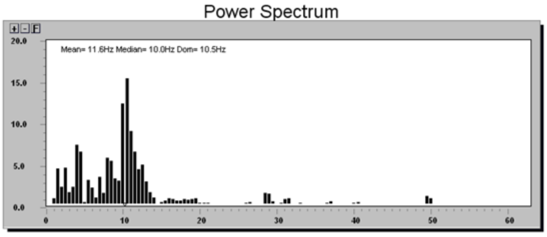
This function computes the percentage of activity within a certain frequency band, compared to the total power of the signal.

Band pass power

This function computes the power of a signal in the given band width. (band pass results in microvolts squared).

That means that when the FFT based band pass amplitude (amplitude = magnitude) generates a result of 10 microvolts pk-pk, for the same bandwidth, the band pass power would result in 100 microvolts squared.



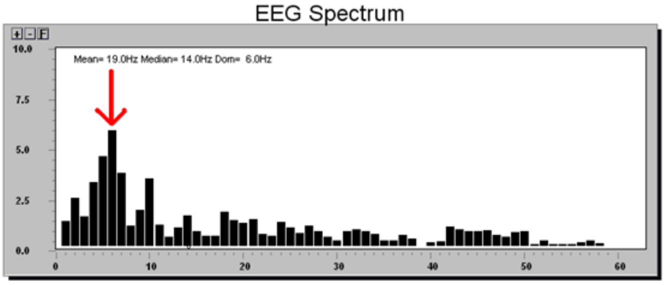


Median frequency

This function computes the median frequency of a signal in the provided frequency band.

Dominant frequency

This function computes the dominant (or peak) frequency of a signal in the provided frequency band.

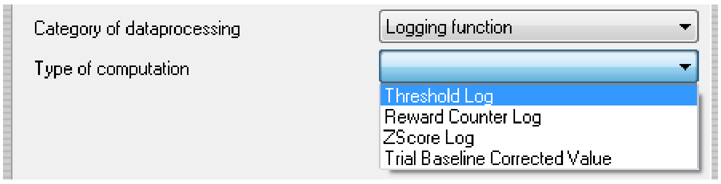


Mean frequency

This function computes the mean frequency of a signal in the provided frequency band.

Logging function

Choose from the following logging functions:



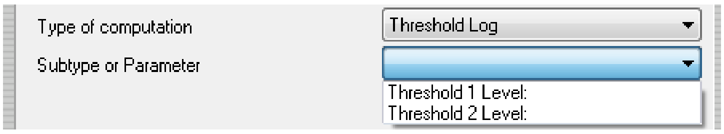
Category of dataprocessing: Logging function

Type of computation:

- Threshold Log
- Reward Counter Log
- ZScore Log
- Trial Baseline Corrected Value

Threshold log

Set the following subtype parameters:



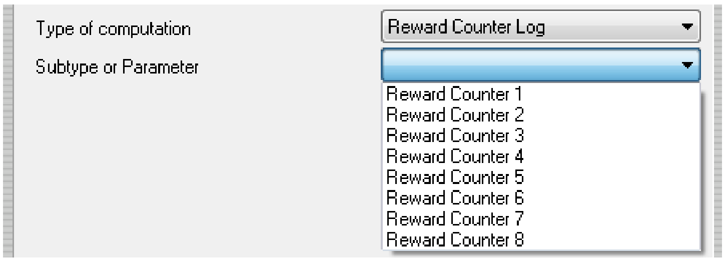
Type of computation: Threshold Log

Subtype or Parameter

Threshold 1 Level:
Threshold 2 Level:

Reward counter log

Set the following subtype parameters:



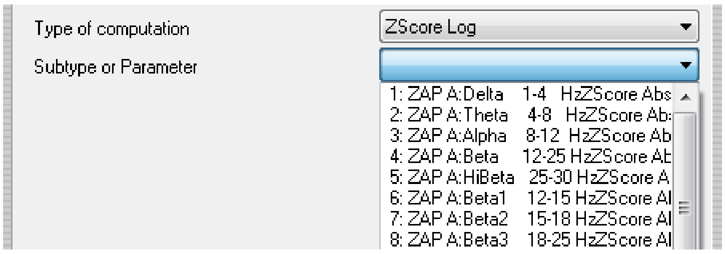
Type of computation: Reward Counter Log

Subtype or Parameter

Reward Counter 1
Reward Counter 2
Reward Counter 3
Reward Counter 4
Reward Counter 5
Reward Counter 6
Reward Counter 7
Reward Counter 8

Z-Score log

Set the following subtype parameters:

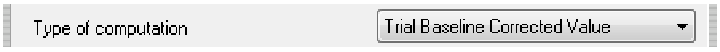


Type of computation: ZScore Log

Subtype or Parameter

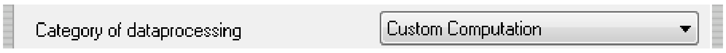
1: ZAP A:Delta 1-4 HzZScore Abs
2: ZAP A:Theta 4-8 HzZScore Ab:
3: ZAP A:Alpha 8-12 HzZScore Ab
4: ZAP A:Beta 12-25 HzZScore Ab
5: ZAP A:HiBeta 25-30 HzZScore A
6: ZAP A:Beta1 12-15 HzZScore Al
7: ZAP A:Beta2 15-18 HzZScore Al
8: ZAP A:Beta3 18-25 HzZScore Al

Trial baseline corrected value



Type of computation: Trial Baseline Corrected Value

Custom computation



Category of dataprocessing: Custom Computation