



Reference Manual



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For use with  version 6.1 or later

CLASSIFICATION



- Type BF Equipment
- Internally powered equipment
- Continuous operation



- Read Instruction Manual

CAUTION

RxOnly

- US Federal Law restricts this device to sale by or on order of licensed health care practitioners.

WARNING

- Do not operate active sensor within 10 feet (3m) of an operating cellular phone, similar radio transmitting device, other powerful radio interference producing sources such as arc welders, radio thermal treatment equipment, x-ray machines or any other equipment that produces electrical sparks.
- All encoders are totally isolated from line (110 or 220VAC) power due to battery operation and fiber optic connections to computers. However, many hospitals and the FDA require that computers, printers and any other equipment used with medical devices be electrically isolated from line voltage to UL or CSA medical safety standards.
- Do not connect inputs or outputs of the encoder or sensors to line powered devices, except through the fiber optic cable.
- The PC used with the encoder must be placed outside the patient/client environment (more than 3 meters or 10 feet) or the PC must comply with EN60601-1.1 (system safety).
- After use, the disposable electrodes may be a potential biohazard. Handle and, when applicable, dispose of these materials in accordance with accepted medical practice and any applicable local, state and federal laws and regulations.
- To diminish the risk of spreading communicable diseases, always use good hygiene practices with reusable EMG electrodes, particularly if abrasive substances are used. In all cases, refer to your facility's infection control procedure.
- Do not use in the presence of a flammable anesthetic mixture with air or with Oxygen or Nitrous Oxide.
- Not to be immersed in water.
- Take care in arranging patient and sensor cables to avoid risk of patient entanglement or strangulation.
- The operator is responsible for ensuring the safety of any devices controlled or triggered by Infiniti equipment or software, or by any software or hardware receiving data from Infiniti equipment. Infiniti equipment must not be configured or connected in such a way that failure in its data acquisition, processing or control functions can trigger patient feedback stimulus that poses an unacceptable level of risk.
- Use of any equipment in a biofeedback context should be immediately terminated upon any sign of treatment-related distress or discomfort.
- Not to be connected to a patient undergoing MRI, Electro surgery or defibrillation.

ATTENTION

- To prevent static discharge from damaging the sensor and/or encoders, use antistatic mats or sprays in your working area. A humidifier may also be used to help prevent static environments by conditioning hot, dry air.
- Not for diagnostic purposes. Not defibrillator proof. Not for critical patient monitoring.
- To prevent voiding warranty by breaking connector pins, carefully align white guiding dot on sensor plug with slot on sensor input.
- Sharp bends or winding the fiber optic cable in a loop smaller than 4 inches (10cm) may destroy the cable.
- A fiber optic cable not fully pushed into its receptacle may cause the unit not to operate; make sure that both ends of the cable are fully inserted into their receptive jacks and the nuts are tightened firmly.

- Make sure to remove electrodes from sensor snaps immediately after use.
- Apply conductive gel only to electrodes; never put gel directly on sensor snaps.
- Always use electrodes between the subject and the sensor.
- Do not plug third party sensors directly into instrument inputs. Plug only Thought Technology active sensor cable connectors into instrument inputs. All EMG electrodes and third party sensors must be connected to active sensors, either directly or through an adapter.
- Remove batteries when the device is not being used for extended period of time. Please dispose of battery following national regulations.

INTENDED PURPOSE

- Biofeedback, relaxation and muscle reeducation purposes.

CONTRAINDICATIONS

- None.

NOTE

- No preventative inspections required; maintenance must be performed by qualified personnel.
- The supplier will make available, upon request, circuit diagrams, component parts lists and description or other information required for the repair of product by qualified personnel.
- If a fiber optic or patient cable is damaged or breaks, please replace it.
- Due to the essential performance and intended use of the device, testing for immunity to electromagnetic disturbances was not required and was not performed. The device may be susceptible at levels below IEC60601-1-2 immunity test levels.
- The operator must be familiar with typical characteristics of signals acquired by this equipment, and be able to detect anomalies in the acquired signal that could interfere with treatment effectiveness. Depending on the importance of signal integrity, it may be advisable to continuously monitor the raw signals, in time and/or frequency domain, while the device is being used for biofeedback or other purposes. If anomalies are observed on acquired signals, and if you suspect a problem with electromagnetic interference, contact Thought Technology for a technical note on identification and remediation.

MAINTENANCE AND CALIBRATION

- Wipe encoder with a clean cloth.
- Factory testing and calibration ensure equipment accuracy and frequency response. The user may invoke a self-calibration function that will recalibrate certain device parameters (see section in hardware manual). Contact Thought Technology for factory recalibration if necessary.

STORAGE

- Store in its original case.
- Temperature -23 to +60C (-9.5 to 140F)
- Humidity (Non-condensing) 10% to 90%
- Atmospheric Pressure 70 to 106 Kpa

TRANSPORTATION

- Transport in its original case.
- Temperature -23 to +60C (-9.5 to 140F)
- Humidity (Non-condensing) 10% to 90%
- Atmospheric Pressure 70 to 106 Kpa

Guidance and manufacturer's declaration - electromagnetic emissions		
The Infiniti system is intended for use in the electromagnetic environment specified below. The customer or the user of the Infiniti system should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The Infiniti system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The Infiniti system is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Not applicable	

Manual No. SA7966 Version 6.1, (February 2016)
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Introduction

Welcome to the manual for Z-score 6 suite. This manual provides information intended to help you get the most out of your system.

The manual is organized into chapters as follows:

- **Installation and System Requirements** lists the computer and software requirements recommended for running the BioGraph Infiniti software and the Z-score 6 suite.
- **First Time Run** explains how to start the software and verify its settings prior to using it for the first time.
- **Hardware Setup** provides general information about the encoder, sensors and accessories included with the system. It also shows how to connect the hardware elements.
- **Software Overview** introduces the main functions of the BioGraph Infiniti software: recording, replaying, and reviewing sessions. It discusses the analytical processes of impedance checking, artifact rejection, statistics calculation, and report generation.
- **Z-Score Assessment and Training** introduces the concept of z-score biofeedback and provides details about each of the components of the suite, including scripts, screens and Quick Start favorites. It includes a description of the Z-score instrument.

The remaining sections of the manual provide a list of **Hardware Specifications**, and information about the **Warranty**, obtaining **Technical Support**, and **Returning Equipment** for repair if necessary.

Note: *Important safety information about operating the equipment is provided in the front matter of the manual starting on page i.*

Installation and System Requirements

Before You Begin

There are three software products you will need to fully benefit from z-score biofeedback assessment and training. These are BioGraph Infiniti version 6.1, the latest Z-Score 6 Suite, and the Z-Score Biofeedback Add-on.

- BioGraph Infiniti version 6.1 is the main software engine of all Thought Technology Ltd systems. It must be installed first.
- Z-Score 6 Suite provides the computations, screens and scripts required for z-score assessment and training.
- The Z-Score Biofeedback Add-on contains the NeuroGuide Z-Score functionality from Applied Neuroscience Inc., and requires a key code license to fully install and operate.

The z-score biofeedback computations can be accessed, screens can be loaded, and sessions can even be recorded and reviewed, but no z-score values will be displayed until the Z-Score Biofeedback Add-on is installed and the key code is entered. For more information, check the FAQ section of the Thought Technology website or contact our Technical Support.

Requirements

Please refer to *IS7915 – BioGraph Infiniti PC System Requirements* for a detailed list of requirements for running BioGraph Infiniti 6.1.

First Time Run

Once the software is installed, you have to configure your system. This takes only a few minutes.

Starting the Program

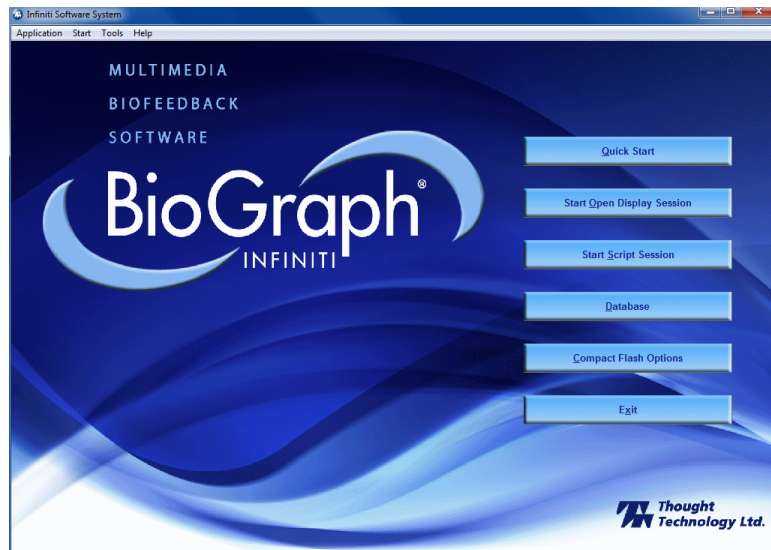
To start the program, simply double-click on the BioGraph Infiniti icon on the Desktop.



The program always starts by showing the Main Menu screen.

From here you can set global settings that affect the performance of BioGraph Infiniti.

Note: *Global settings remain in effect unless you change them.*

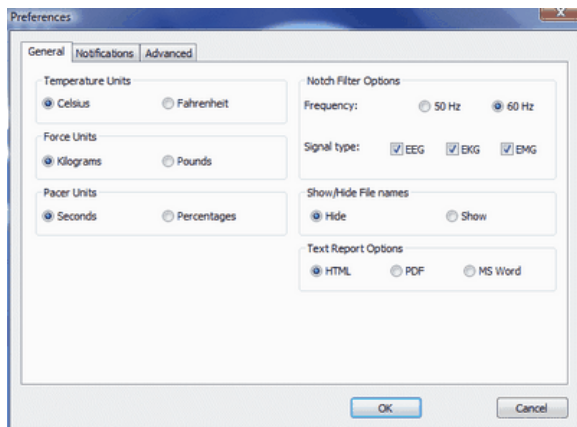


Select **Preferences** from the **Tools** menu in the Main Menu Screen. In the **General** tab you will configure notch filter settings and text report options.

Notch Filter

A notch filter removes the specific frequency caused by electrical interference from a raw signal. The signals that are susceptible to electrical interference are EEG, EKG and raw EMG. Notch filter settings affect all signals of the selected type and work with any channel set.

In **Notch Filters**, select the EEG **Signal type** and set **Frequency** to **50Hz** or **60Hz**, depending on the transmission frequency used in your country (60Hz for North America, for instance). Then click **OK**.



Text Report Options

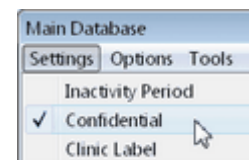
You can generate text reports in one of three different formats, **HTML**, **PDF**, or **Microsoft Word**. Select your preferred format here.

Note: *Microsoft Word, a PDF reader, and a web browser **must** be installed on your system for these functions to work. You print and save text reports using the **Print** and **Save** functions of the appropriate software.*

Confidential Setting

Optionally, enable the **Confidential** setting. This helps protect the privacy of your clients by masking their names in the client database.

- Click **Database** to open the Main Database window.
- From the **Settings** menu, select **Confidential**. The check mark indicates that the setting is enabled.
- If you need to disable the **Confidential** setting, repeat these steps to remove the check mark.



Clients:	
Full Name	ID Nu...
Ballance, Tara	1
Dorimond, Florian	3
Florimond, Dorlan	2
Keyes, Florida	8
Shores, Lajolla	4

With the **Confidential** setting disabled

Clients:	
Full Name	ID Nu...
Ba*****, T***	1
Do*****, F*****	3
Fl*****, D*****	2
Ke***, F*****	8
Sh****, L*****	4

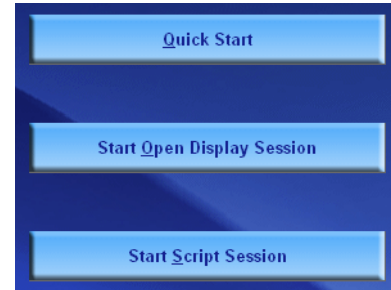
With the **Confidential** setting enabled

Entering Key Codes

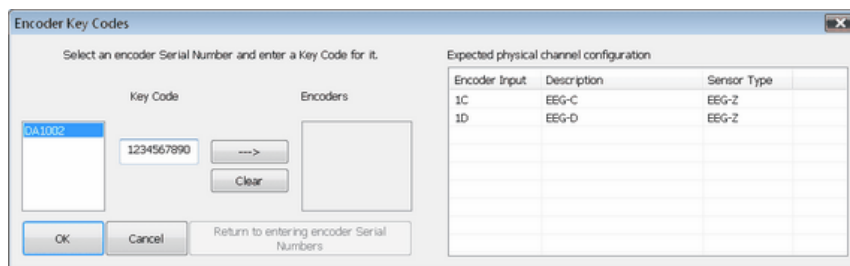
The first time you start to record a session with BioGraph Infiniti, the software will check for the key codes and ask you to enter them.

There are three ways to start recording a session. They are described fully in the chapter [Software Overview](#) beginning on page 18.


- **Quick Start:** Click this option to record a Favorite session (page 19). This is the preferred method for recording sessions.
- **Start Open Display Session:** Click this option to record an unscripted session using your own selection of feedback screens (page 21).
- **Start Script Session:** Click this option to record a script session (page 19).



1. Click **Quick Start**, select a name from the **Clients** list and a protocol from the **Favorites** list, and then click **OK**.
2. The **Encoder Key Codes** dialog box opens.
3. Click to highlight your unit's serial number in the left table (in this example, DA1002; this is the same number as on the back of the unit).



The serial number is found on the back of the encoder.

4. Enter the **Encoder Key Code** (found inside the encoder battery compartment) in the **Key Code** text box.
5. Click  to move the serial number from the left table to the right table. The serial number should now appear in the **Configuration Table**.
6. When done, click **OK**.
7. Now the **Application Key Code** dialog box opens.
8. Enter the **Application Key Code**.
This number is found in the battery compartment with the encoder key code.
9. When done, click **OK**.



Note: Even if you are using more than one encoder, you need to enter only one Application Key Code.

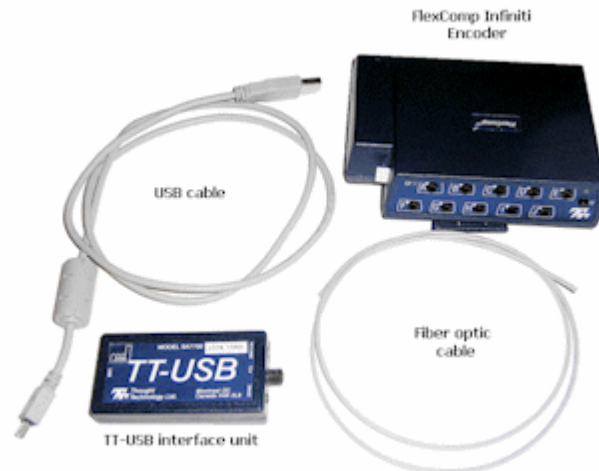
If the key codes have been entered properly and there is no problem with your encoder setup or your sensor connections, the recording screen will open.

Hardware Setup

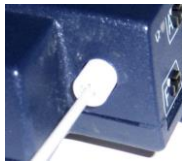
Before you can start recording a session, you have to set up your hardware. The following section describes how to connect a FlexComp Infiniti encoder but the process is similar when using other encoders. For more information on using your particular encoder, please refer to the device's hardware manual.

The Encoder

Connecting TT-USB and the encoder



Unconnected hardware components



Insert one end of the fiber optic cable carefully into the fiber optic port on the encoder. Tighten the nut gently so that the cable won't slip out.



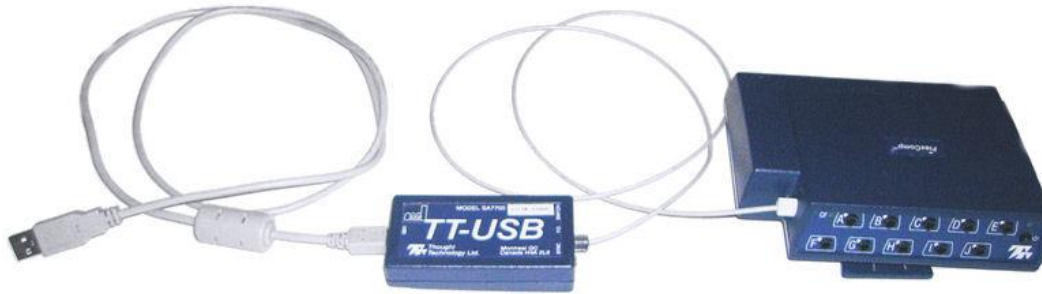
Do the same with the other end of the fiber optic cable and the fiber optic port of the TT-USB interface unit.



Insert the small connector of the USB cable into the USB port on the TT-USB interface device.

Insert the large connector of the USB cable into the USB port of your PC.





Connected hardware components

USB ports on a PC are generally located at the back of the base unit. You may also find a USB port at the front of your base unit; you can connect the other end of the USB cable to it. On a laptop, USB ports are usually located at the side or the back of the laptop. It is recommended to always use the same USB port for connecting the TT-USB to your computer.

Battery placement

Opening the compartment

Looking at the underside of the encoder, you will see a long door in the plastic enclosure. Holding the encoder with the connectors facing you and with the door up, push lightly down and back with your thumbs on the door to slide it open.

Attention: *The internal workings of the encoder are not intended to be opened for repair except by qualified service personnel. The tamper-evident seal under the batteries in the battery compartment should not be removed or broken. Thought Technology may refuse to honor the unit's warranty if the seal is broken.*



Polarity

When the compartment cover has been slid out, place four AA batteries in the slots, observing the correct battery polarity as embossed on the inside surface of the compartment.

Closing the compartment

Slide the door back into the encoder case, gently pushing it in until you feel the click of the locking mechanism.

Keeping an eye on the battery level

Since each sensor draws a small amount of power from the batteries when connected to the encoder, it is better to connect only the sensors that are going to be used for a session before you start recording; this will ensure maximal battery life. Most Thought Technology software applications will display a battery power indicator; we recommend that you replace the batteries as soon as this indicator falls below about 50% of the battery power.

Caring for the fiber optic cable

A fiber optic (FO) cable is used for transmitting the sensor data to the computer. Although this technology provides maximal electrical isolation, signal fidelity and freedom of movement, some care has to be taken when handling the fiber optic cable, as it is much less flexible than a regular electric wire.

Be careful not to bend it sharply or wind it in a loop smaller than 4 inches in diameter.



Electromagnetic electrical interference

When performing a biofeedback session, it is best to **avoid placing the encoder near the computer, display monitor or any other electrical device**, where it can be exposed to electromagnetic fields.

Sensors and Accessories

The instrumentation system includes a group of sensors used for the various protocols. Before a session can be recorded, the correct sensors must be connected to the encoder.

Electromagnetic interferences

The EEG sensors are capable of detecting very tiny electrical signals (millionths of a Volt) generated by muscle activity. Therefore they are very sensitive to electromagnetic fields generated by other devices in the exam room, such as radio transmitting devices, computer monitors, medical devices (for example x-ray machines), and fluorescent, halogen or neon lights.

These devices should be turned off, if they are not needed for the examination. If the situation arises, keep the instrumentation 10 feet away from radio transmitting devices and 3 feet away from electronic devices (including monitors) and fluorescent, halogen or neon lights.

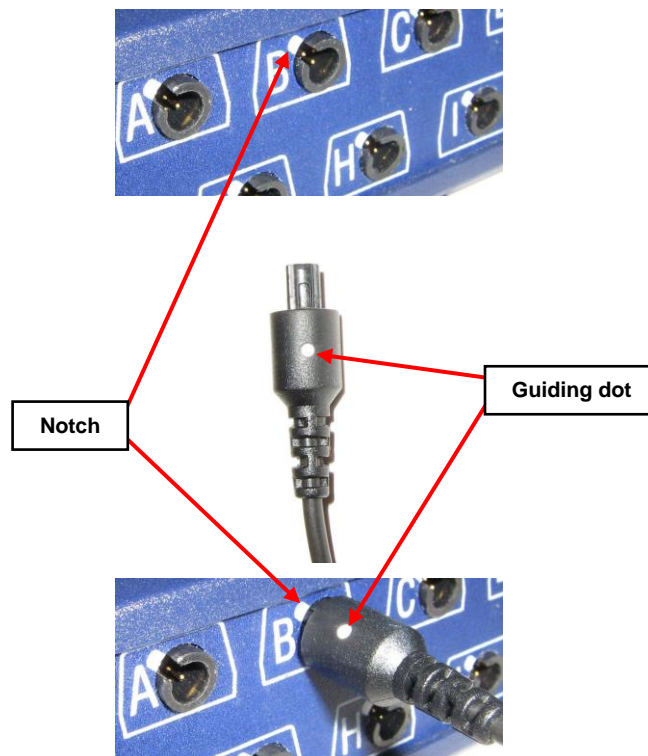
Disconnect all the unused sensors from the encoder. If not connected to the examinee, they may act as antennas and capture unwanted signals that would corrupt the signal being recorded.

Electrostatic discharges

To prevent static discharge from damaging the sensor and/or encoder, use antistatic mats or sprays in your working area. A humidifier may also be used to help prevent static environments by conditioning hot, dry air.

Connecting the sensors

When connecting a sensor to the encoder, make sure to properly line up the guiding dot on the top of the plug with the notch in the device's input socket.

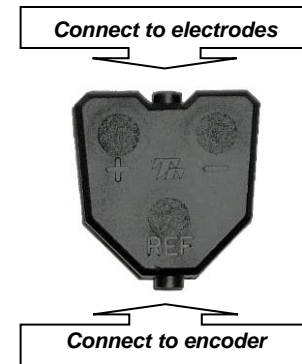


Forcing the plug into the jack in any other position may damage your equipment.

Correct orientation of sensors

The EEG Flex/Pro and EEG-Z sensors have removable cables and two input entrances. It is important to orient these sensors to the encoder correctly so that the physiological signal is properly received.

The EEG sensor is correctly oriented to the encoder when the cable joining them is connected to the bottom entrance of the sensor. The extender cable with electrodes should be connected to the top entrance of the EEG sensor.



EEG-Z Sensor (P/N: SA9305M)

The following is an overview of the EEG sensors and electrodes used with the system for Z-score assessment and training.



The EEG-Z is a preamplified electroencephalograph sensor with built in impedance sensing capabilities. This sensor can be toggled to record regular EEG or monitor skin impedance (both the reactive and resistive elements) to help optimize electrode hookup.

Used for:

- Assessment
- EEG biofeedback

Note: The EEG Flex/Pro sensor can also be used with this suite but the EEG-Z is recommended because of its ability to measure impedance.

Each EEG-Z sensor comes with a monopolar/bipolar electrode kit (shown).

Other electrode kits are also available separately.

Note: To perform 2-channel and 4-channel Z-score biofeedback most efficiently, the multi-channel connectivity kits are recommended (T8760: 2-channel connectivity kit; T8761: 4-channel connectivity kit).

These kits also include the necessary cables for linked ears reference, which is required for z-score biofeedback.



Monopolar/bipolar electrode kit (T8750)

Connecting and placing EEG-Z sensors

10-20 electrode placement system

The ten-twenty (10-20) electrode system of the International Federation is the standard for electrode placement. It is used to place surface EEG electrodes in a repeatable way independent of inter-patient anatomical variability. Called 10-20 because of the way distances between electrode sites are computed. The distances between certain anatomical landmarks are segmented at increments of 10% and 20% of their value, and electrodes are placed at these points.

A letter is used to indicate over which area of the brain the site is located. Sites are identified as follows:

Frontal lobe - F

Central sulcus - C

Parietal lobe - P

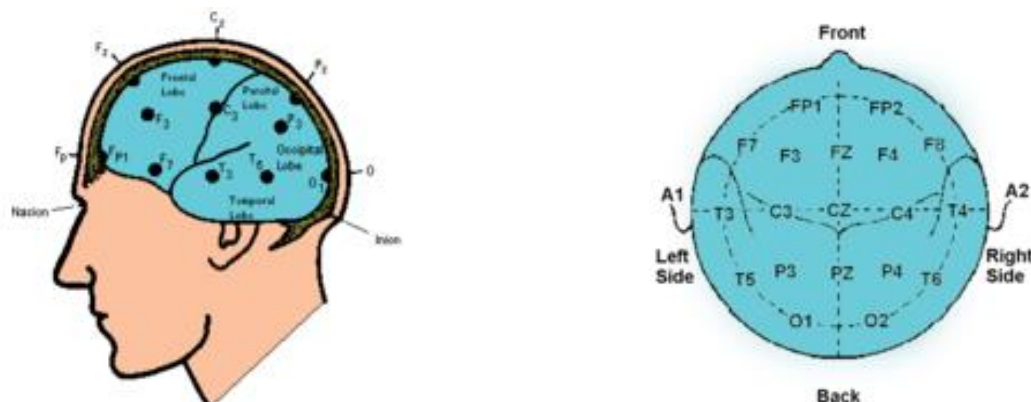
Frontopolar area - FP

Temporal lobe - T

Occipital lobe - O

Other miscellaneous labels are used for the ears (A) and other reference sites (for example, M for mastoid process, G for ground, etc.). The letter Z indicates the central line along the interhemispheric fissure.

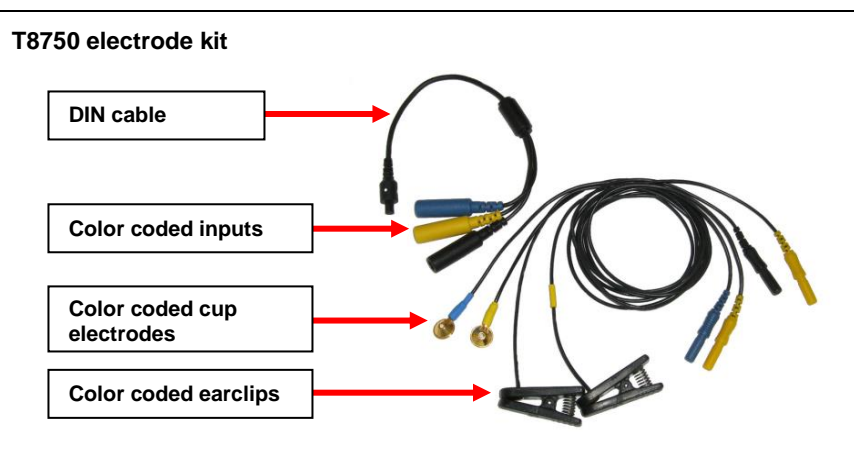
Numbers are used to indicate the position in reference to the central line (Z). Number value increases the further away a site is from the central line. Odd numbers are on the left. Even numbers are on the right



For example, along the line joining sites A1 and A2: to the right of A1, at 10% of the overall A1-A2 distance is electrode site T3. This is followed by C3 (20% further), Cz (20% further), C4 (20% further), and T4 (20% further). Site T4 should fall 10% to the left of A2.

EEG electrodes

As mentioned above, each EEG-Z sensor comes with a monopolar/bipolar electrode kit. The kit is composed of the following components:

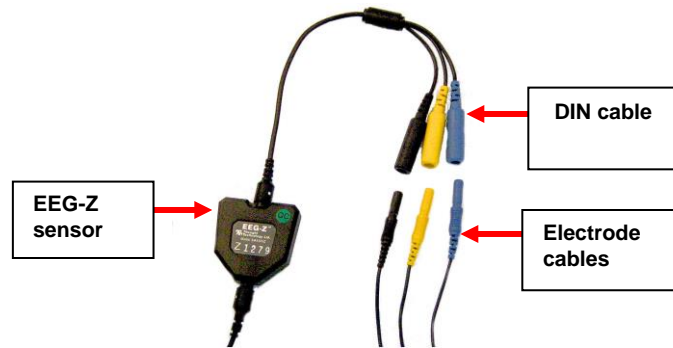


Instructions for 1-channel EEG:

Connect the blue active electrode to the blue DIN cable input.

Connect the yellow ear clip to the yellow DIN cable input, and the black earclip to the black DIN cable input.

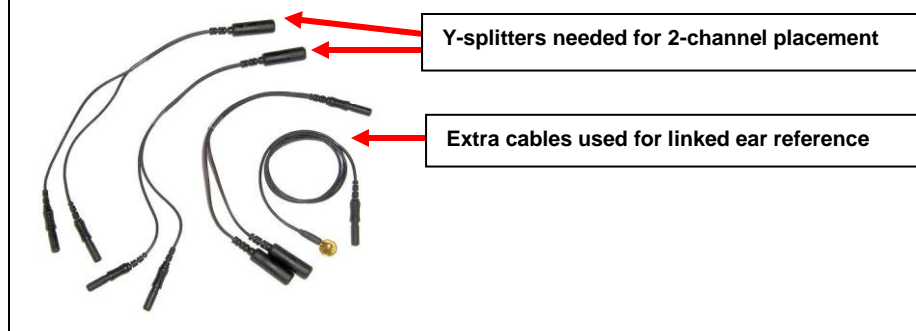
The other end of the DIN cable plugs into the input of the EEG-Z sensor.



Note: The yellow cup electrode can replace the yellow ear clip for bipolar placement.

For two channel applications, using two EEG-Z sensors simultaneously, the 2-channel connectivity kit is used.

T8760 2-channel connectivity kit



Instructions for 2-channel EEG:

Using two T8750 packages, start by connecting the blue active leads to the blue sockets in the DIN cables.

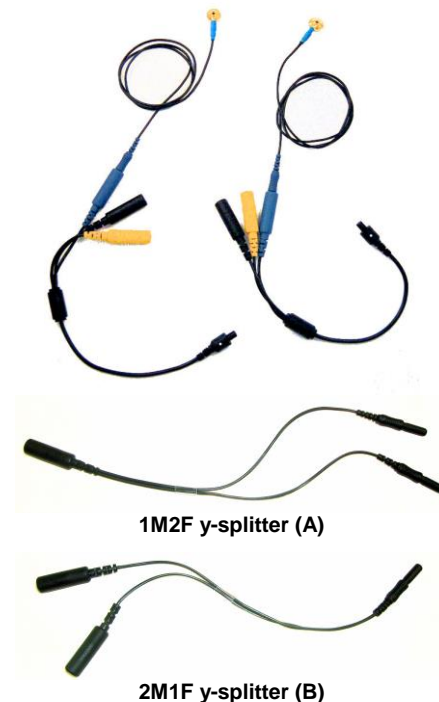
Take 1 y-splitter of each type from the T8760 package.

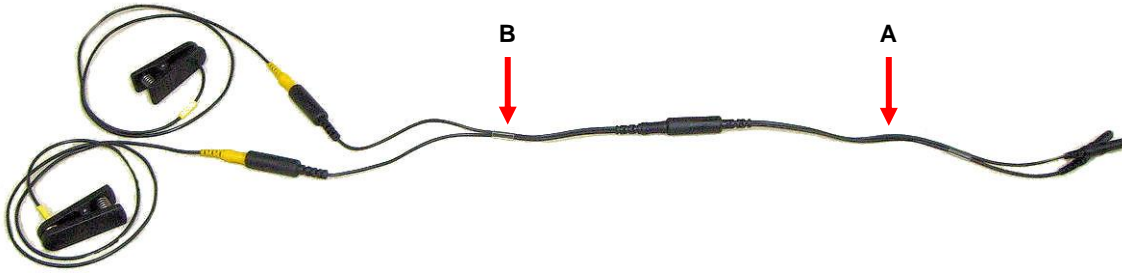
Connect the single output connector of B to the single electrode connector of A.

Note: There are two of A in the kit, and only one of B.

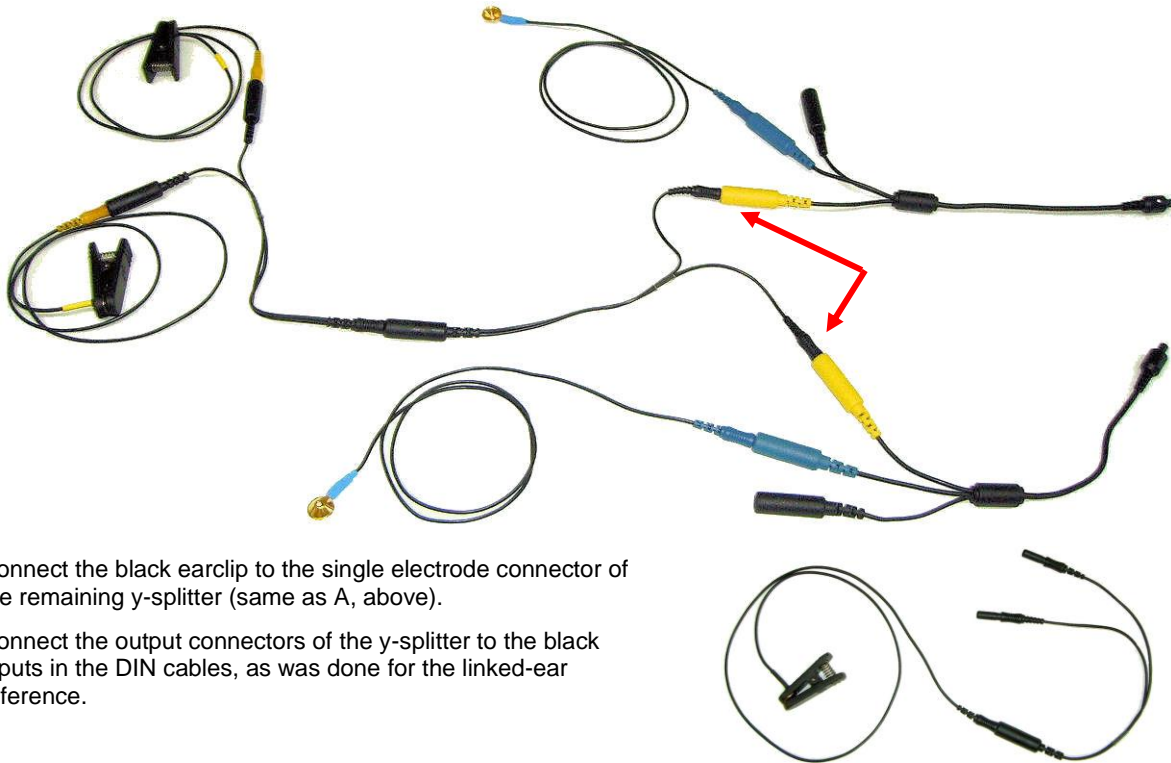
Connect a yellow earclip to each electrode connector of B.

The completed linked-ears reference is shown below.





Connect the output connectors of A to the yellow inputs in the DIN cables as indicated.



Connect the black earclip to the single electrode connector of the remaining y-splitter (same as A, above).

Connect the output connectors of the y-splitter to the black inputs in the DIN cables, as was done for the linked-ear reference.

Final result: Two linked yellow earclips are connected to the yellow input of both sensors, a single black earclip is connected to the black input of both sensors, and individual blue cup electrodes are connected to their respective blue input on each sensor.

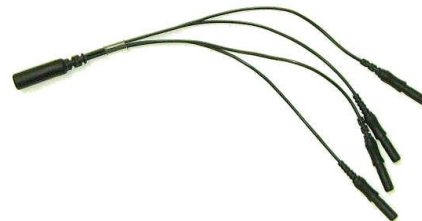
Instructions for 4-channel EEG:

The four-channel configuration is essentially the same as the two-channel configuration described above. The main difference is that a 4-channel splitter (provided in the 4-channel connectivity kit, T8761) is used in place of the 2-channel splitters described above.

Using four T8750 packages, start by connecting the blue active leads to the blue sockets in the DIN cables.

Take 1 y-splitter of each type from the T8761 package.

Connect the single output connector of B to the single electrode connector of C.

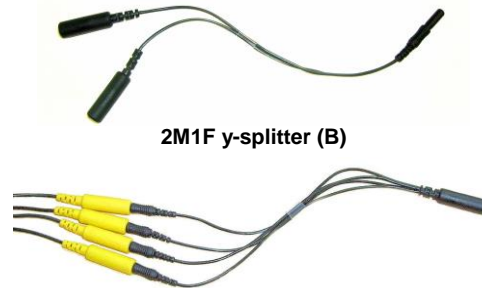


1M4F y-splitter (C)

Note: There are two of C in the kit, and only one of B.

Connect a yellow earclip to each electrode connector of B.

Connect the output connectors of C to the yellow inputs in the DIN cables.



Connect the black earclip to the single electrode connector of the remaining y-splitter (same as C, above).

Connect the output connectors of the y-splitter to the black inputs in the DIN cables, as was done for the linked-ear reference.

Final result: Two linked yellow earclips are connected to the yellow input of four sensors, a single black earclip is connected to the black input of four sensors, and individual blue cup electrodes are connected to their respective blue input on each sensor.

EEG electrode placement technique:

Proper site preparation and electrode placement are essential for clean, trouble-free recording of the EEG signal. The following steps describe how to achieve a secure connection in an efficient, repeatable way. They should be followed closely every time EEG is recorded. This may seem daunting at first, but the technique is easily learned and the user will quickly become accustomed to it and will certainly appreciate the benefits.

Locate the required electrode site(s)

For 1-channel EEG biofeedback protocols, a common site to use is CZ. This site is located, prepared and fixed with an electrode in the example below. For 2-channel protocols, there will be two electrode sites, for example, C3 on the left and C4 on the right, also shown below. Similarly, 4-channel protocols require placement of electrodes at four sites.

The actual electrode locations to be used will depend upon the z-scores being assessed and trained.

Locate the inion.

On the posterior base of the skull, where the spine meets the skull, there is a small protrusion called the “inion”. It can be found by running the finger up the spine towards the skull.

There is a small crevice between the spine and skull in which vertebrae can no longer be felt. Just above that area, the inion of the skull can be found.



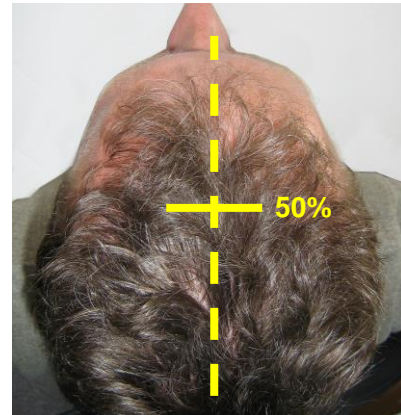
Locate the nasion.

The depression on the bridge of the nose, just below the brow and directly between both eyes, is called the “nasion”.



The line between these two points runs along the interhemispheric fissure of the brain (the space that separates the left and right sides of the brain, i.e. right down the middle).

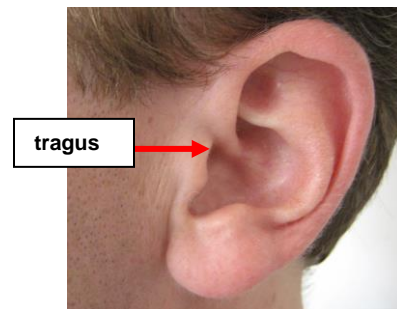
Mark a spot located at 50% of the distance between the nasion and the inion.



Locate the mandibular notch.

Anatomy revisited: To locate the mandibular notch, place a finger against the tragus, just anterior to the ear, and ask the subject to open their mouth. Your finger should find its way into a cavity, resting superior to the mandibular notch.

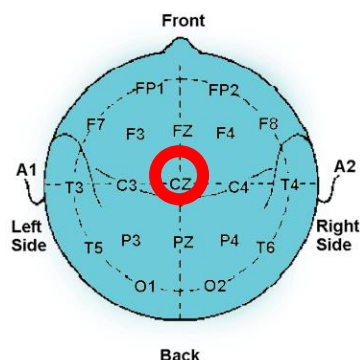
Find this spot on both sides of the head.



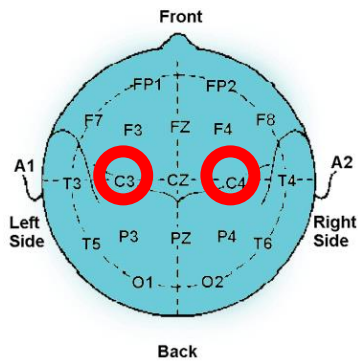
The line that connects the left and right mandibular notches runs along the central sulcus of the brain (the space that separates the frontal and parietal lobes).

Mark a spot located at 50% of the distance between the left and right mandibular notches. It should intersect directly with the mark made between the front and back of the head.

The intersection of these two lines is electrode location CZ, also sometimes referred to as *the vertex*.



Along the line between the mandibular notches, 20% of the total distance towards the left is location C3, 20% towards the right is location C4, for example. The remaining sites are found in a similar way.



Note: Electrode location CZ can always be approximated instead of explicitly measured following the procedure described above. It is the top middle of the skull. Imagine if the subject were to hang perfectly straight from a string tied to the top of their heads, this is where the string would have to be fixed. The other sites described in the above example, C3 and C4, can simply be estimated to be a certain distance away from that top middle point towards the left and right ears, respectively. Still, to ensure repeatable measurements, especially when comparing across sessions, it is recommended that the electrode locations be explicitly measured as described.

Prepare the scalp

The scalp must be prepared before an electrode can be fixed. This involves slightly abrading the skin to remove dead skin, sweat and other contaminants to the EEG signal.

The following steps should be followed for all electrode location sites.

Scoop up a small quantity of NuPrep™ skin prepping gel on a cotton swab or tissue.



With the thumb and index finger of one hand, separate the hair around the electrode site that was previously found and marked.



Run the gel in the direction of the natural line formed along the scalp by the split hair. Some light force must be used, enough to redden the scalp slightly, but not enough to break the skin.



Wipe away the excess prepping gel with a dry, lint-free cloth. Care should be taken to keep the hair parted and to keep track of the site after wiping clean.

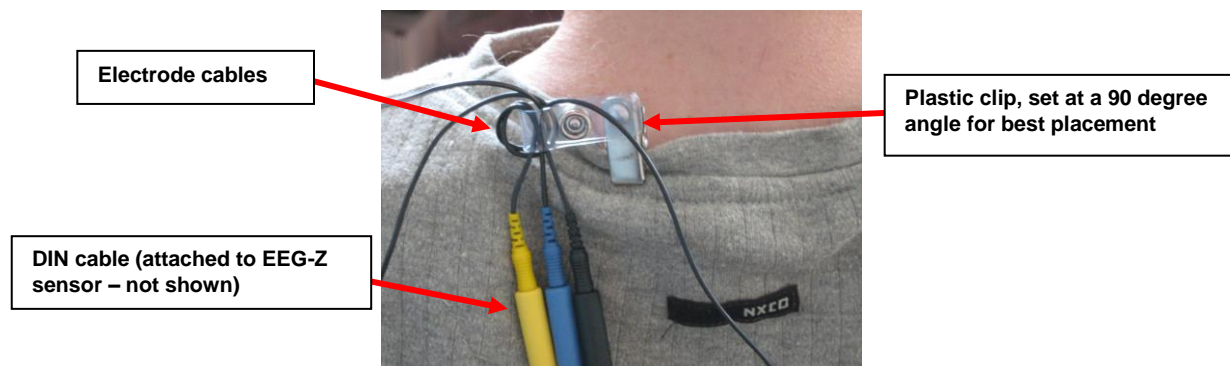
Helpful trick: A small amount of Ten20™ Conductive paste should be smeared on the newly prepared site. This has the combined effect of keeping track of the site, keeping the hair neatly out of the way, and acting as a landing pad for the electrode once it is ready to fix.



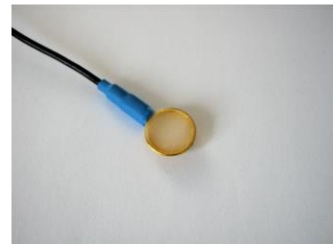
Prepare the electrodes

Start by securing the electrode cables to the patient.

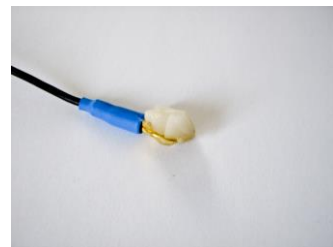
Helpful trick: Loop the three electrode cables around the plastic clip provided with the EEG-Z sensor. Attach the clip to the back of the shirt collar as shown below. Keep the heavy DIN cable and EEG-Z sensor underneath the clip, and the light electrode cables above it.



Fill the electrode cup with Ten20™ conductive paste so that no air bubbles exist in the cup.



Add more Ten20 paste onto the cup electrode, just enough to form a ball on the cup, not so much that it spills over the edge. Shown is the ideal amount of paste.



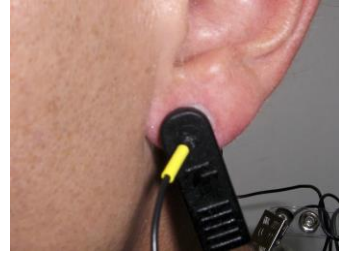
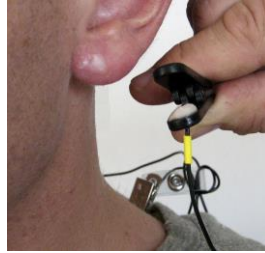
Place the cup face down on the landing pad previously prepared. Gently push the electrode down to fix it to the scalp. A little bit of paste should run out along the edge of the cup to form a thin ring around it.

Helpful trick: Place the electrode so that the direction of the cable does not place undue stress on the cup (so that it gets pulled, lifted or twisted off). The cable should hang naturally and towards the plastic clip (as shown). Leave enough slack in the cable to allow for comfortable head movement as well.



Reference sites

Repeat the above preparation and placement steps on the ear lobes. Do not put too much paste on the ear clip electrode, but ensure that the gold disc is completely covered.

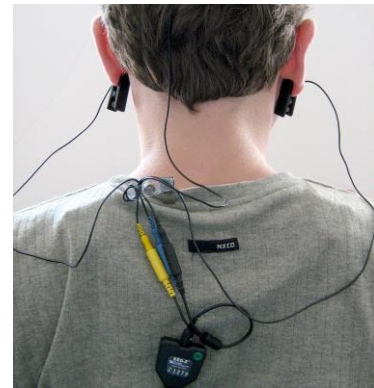


Leave enough slack in the cable to allow the patient to turn their head easily, but not too much that it can get caught. Think about the angle of the cable from the ear clip to the neck clip, so that no extra tension is placed on the ear clip.

Viewed from behind, the final configuration should look similar to this.

A single channel setup is shown for clarity. Note the position of the clip, the direction of the cables and the slack left to provide mobility.

For two- and four-channel setups, use a separate clip for each channel, and for maximum stability, attach the clip just above the sensor.



Software Overview

This chapter provides you with a rapid overview of the main functions of the BioGraph Infiniti software. Refer to the on-line help manual for a more detailed description of all the functions and features of the program.

To open the on-line help, press the F1 function key, on your keyboard, from any dialog box in the program. Because the on-line help manual is designed to provide contextual information, it will automatically open at the section that discusses the dialog box from which the help was called.



The information in this chapter is of a general nature. Each protocol chapter explains how to record, review and report upon data using that particular protocol.

Client Database

The Z-score 6 suite requires the client's date of birth in order to correctly compute z-scores. You may need to add this information to existing client files, and you must include it when you create new ones.

If the client's date of birth is missing, when you try to record a session, you will get an error message. You will have to modify the client file before you can proceed.

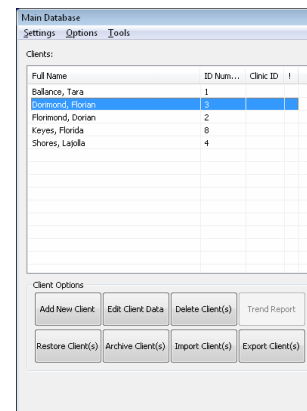
Client files are created or modified from the **Main Database** window. You open this window by clicking the **Database** button in the main menu screen.

1. To create a new client file, click **Add New Client**.

This opens the **Client Data** screen where you enter information about the client. Minimum required information is the client's **First Name**, **Last Name** and **Date of Birth**.

2. To modify an existing client file, select the name of the client from the **Clients** list and click **Edit Client Data**.

This opens the **Client Data** screen so you can add the client's date of birth to the information already in the file.



Recording Sessions

With the BioGraph Infiniti software, two types of sessions can be recorded: **Open Display** and **Script** sessions. Both types of session can be recorded with BioGraph Infiniti.

- **Scripts** are predefined protocols that group together varied types of activities with specific display screens. They are used for evaluation and assessments because they produce statistics that can be used to determine the type of exercise and/or practice that is needed by the patient. These statistics can be trended across sessions to reflect patient progress.
- **Open Display** sessions are used for biofeedback training, when flexibility is important and you need to be able to rapidly change the session parameters, depending on the client's reactions. The kinds of feedback include various types of audio, such as music, tones, sounds and voice prompts. There are also visual media, such as animations, and different graphs that change color when the signals pass their threshold markers.

Start the program

After making the necessary connections described in the previous chapter, turn on your encoder and start the BioGraph Infiniti software.

Starting a session from a Favorite

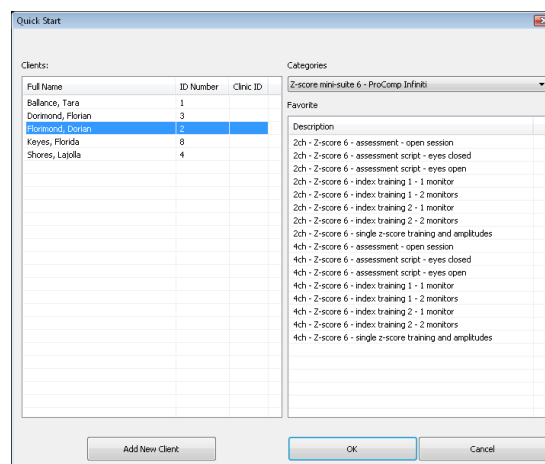
A **Favorite** is a predefined session configuration that contains all the settings you need for recording, replaying, and reviewing a session. Depending on the session type (script or open display), these settings include scripts, channel sets and screens, statistics for session reports, auto-rejection settings for review mode, and Excel report options. Favorites simplify and standardize the process of recording and reviewing sessions.

The Z-score 6 suite includes a Favorite for every protocol. You find them listed in the Favorites table when you click the **Quick Start** button on the main BioGraph screen.


To start a session from a **Favorite**:

1. Click the **Quick Start** button on the main screen.
2. Optionally, click **Add New Client**, in the **Client Data** screen enter at least the person's first and last name, and click **OK**.
3. Select a name from the list of **Clients**.
4. Choose **Z-score 6 - ProComp Infiniti** (or another encoder) from the **Categories** list. Only favorites belonging to the selected category will display.
5. Select a **Favorite** from the list.
6. Click **OK**.

If there is no problem with your encoder or sensor connection, the recording screen will open.

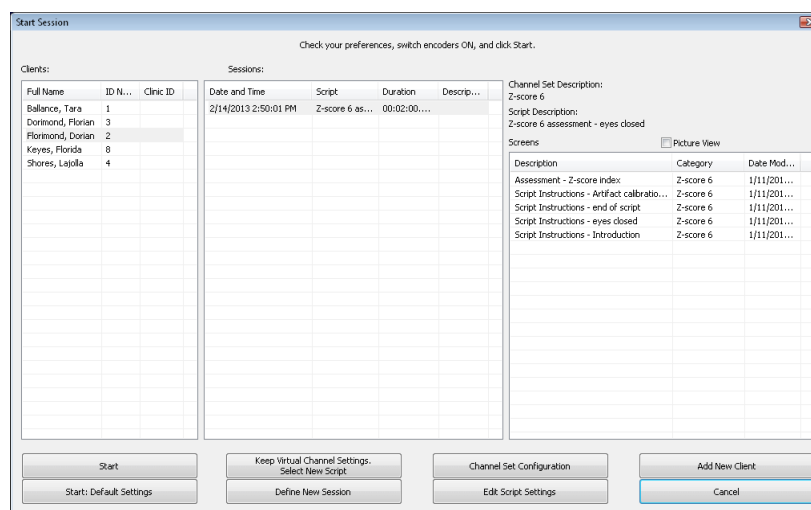


Note: If this is the first time you are recording a session, at this point the system will prompt you to enter key codes. See page 4 for more details.

7. Start recording by clicking on the **Start** button  in the toolbar.

Starting a script session

Select **Start Script Session** from the Main Menu screen. This opens the **Start Session** screen where you go through the process of selecting a client file and script, setting up session parameters, and launching recording mode.



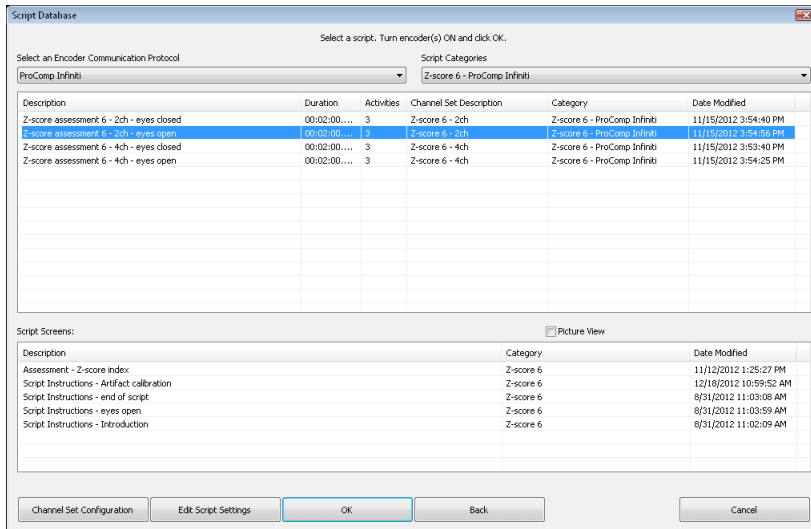
Start Session

To record with a new script:

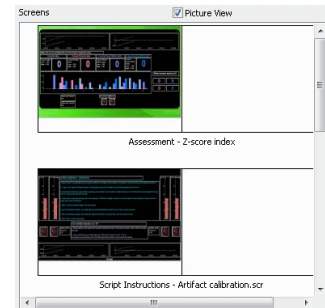
1. Select an existing **Client**.
2. Optionally, select a previously recorded script session from the **Sessions** list.
3. Click one of the following **New Script** options:

- **Define New Session** to select a new script.
- **Keep Virtual Channel Settings. Select New Script** to keep the client's channel set and settings but select a different script.

The **Script Database** window opens.




Script Database



To see thumbnail images of the screens used in the chosen script, select **Picture View**.

4. Select **ProComp Infiniti** (for Procomp5 and ProComp Infiniti) or **Legacy** (for ProComp2 encoder) as the encoder communication protocol from the drop-down list at the top.
5. Optionally, select a Z-score 6 category from the **Script Categories** drop-down list. Only the scripts belonging to the category will display.
6. Select a script from the list, and click **OK**.


Note: If this is the first time you are recording a session, at this point the system will prompt you to enter key codes. See page 4 for more details.

7. When the recording screen opens, start the script by clicking on the **Start** button , and follow the on-screen instructions.

To record with a previously recorded script:

1. Select an existing **Client**.
2. Select a previously recorded script session from the **Sessions** list.
3. Click one of the following **Start** options:
 - **Start** to rapidly start a new session with the same display screens and script settings as the selected session. These include any changes you made to the client settings.
 - **Start: Default Settings** to start a new session with the default channel set settings instead of any changes you made to the client settings for the selected session.

Note: If this is the first time you are recording a session, at this point the system will prompt you to enter key codes. See page 4 for more details.

4. When the recording screen opens, start the script by clicking on the **Start** button , and follow the on-screen instructions.

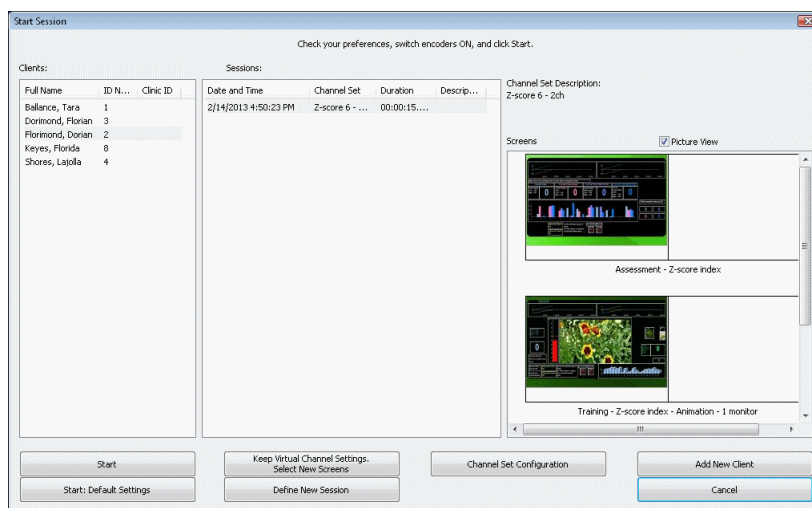
To record with a new client:

1. Click **Add New Client**, in the **Client Data** screen enter at least the person's first name, last name, and date of birth (required for Z-score biofeedback), and click **OK**.
2. Select the new **Client** from the list.

- Click **Define New Session** and when the **Script Database** opens, follow the remaining steps to record with a new script.

Starting an open display session

Select **Start Open Display Session** from the Main Menu screen. This opens the **Start Session** screen where you go through the process of selecting a client file and channel set, setting up session parameters, and launching recording mode.

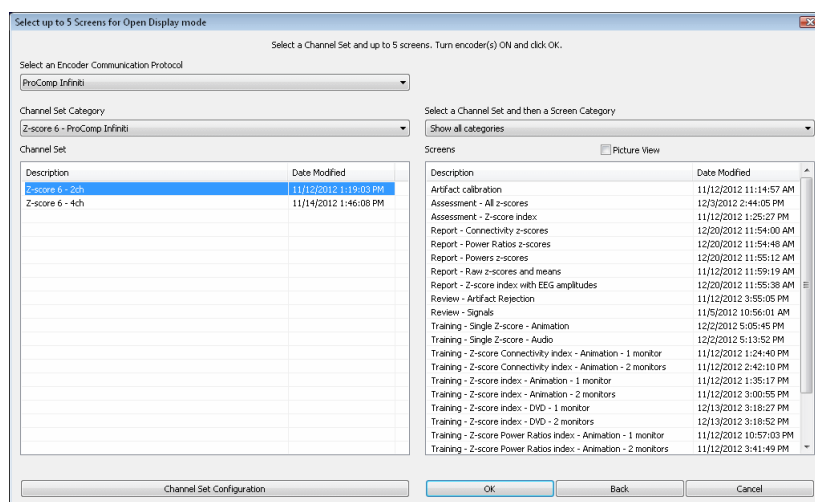


Start Session

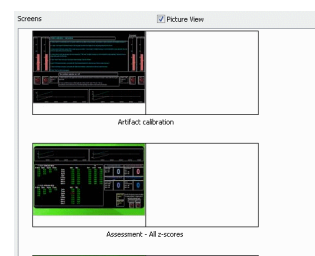
To record a new session:

- Create a new client as described above, or select an existing client from the list.
- Select **Define New Session** to open the window.

The **Select up to 5 Screens for Open Display Mode** window opens.



Select up to 5 Screens for Open Display Mode




To see thumbnail images of the screens available for the chosen channel set, select *Picture View*.

- Select **ProComp Infiniti** (for Procomp5 and ProComp Infiniti) or **Legacy** (for ProComp2 encoder) as the encoder communication protocol from the drop-down list at the top.
- Optionally, select a Z-score 6 category from the **Channel Set Category** dropdown list. Only the channel sets belonging to the category will display.
- Highlight a **Channel Set** on the left.

6. Optionally, choose a **Screen Category** from the drop-down list. Only the screens belonging to the category will display.
7. Choose one to five **Screens** from the list, and click **OK**.

To select more than one screen, press down the CTRL key while clicking with the left mouse button.

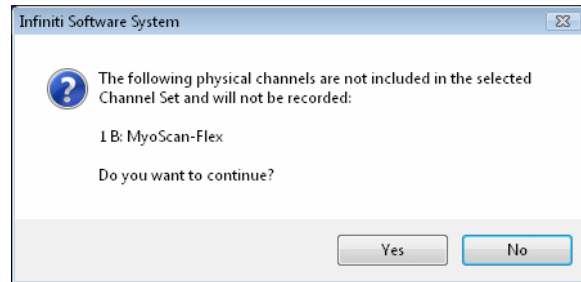
Note: *If this is the first time you are recording a session, at this point the system will prompt you to enter key codes. See page 4 for more details.*

8. When the recording screen opens, start recording by clicking on the **Start** button .

Sensor connections

If there are problems with your sensor connections, the program will report them prior to accessing the recording screen. If, for example, you have sensors that are connected but are not required for this channel set, you will get a warning message.

You can remove the sensor if you want, or continue recording by clicking **Yes**. Keep in mind that no data is recorded for sensors that are not defined in the channel set.

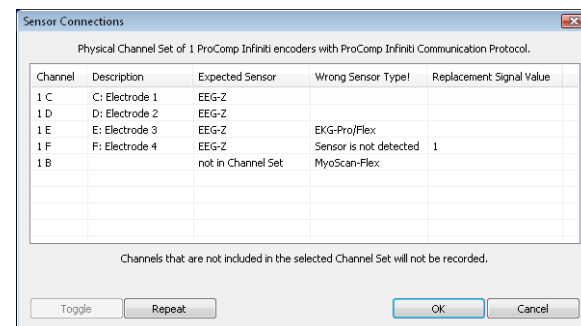


Note: *If there are sensor connection problems in addition to extra sensors, this information won't appear as a separate message. It will display in the **Sensor Connections** window.*

If you have connected wrong sensor types, you will see the **Sensor Connections** window. All the sensors that are expected will be listed in the **Expected Sensor** column.

The **Wrong Sensor Type** column shows which sensor type was actually detected. You can remove the wrong sensor or replace it with the right one.


Click **Repeat** to check the sensor connections again until the system no longer detects a wrong sensor type. The program will not allow you to record a session with the wrong sensors.



Note: *If the **Wrong Sensor Type** column is empty, the correct sensor has been connected.*

If you do not connect all the sensors that are required for the selected channel set, the message "Sensor is not detected" appears in the **Wrong Sensor Type** column. When a sensor is not connected, the program replaces its signal value by a constant value of 1. You can record a session when some sensors are missing, but the corresponding signal will be a flat line. Any calculations based on that signal will not reflect real physiological changes.

Stopping a Session

No duration is set for an **Open Display** session. It must be stopped manually by clicking the **Stop** button .

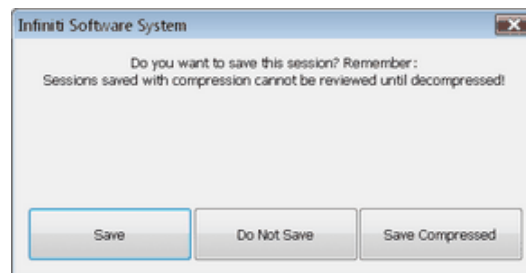
The duration of a **Script** session is set at the time the script is defined. When the script reaches its end, recording will automatically stop.

When the session ends, the following series of message prompts will appear and guide you through the process of saving data, adding notes to the session file, and, optionally reviewing the data or recording another session.

1. **Save session data:**

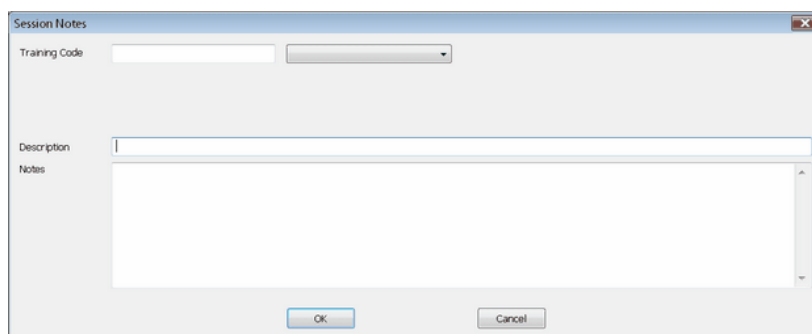
You can save the session in compressed format but, unless your hard drive has very little space available or you do not need to review the saved sessions, we recommend that you always **Save**, which uses non-compressed format.

Compressed files can't be replayed, reviewed or trended until they have been decompressed.



2. **Enter Session Notes:**

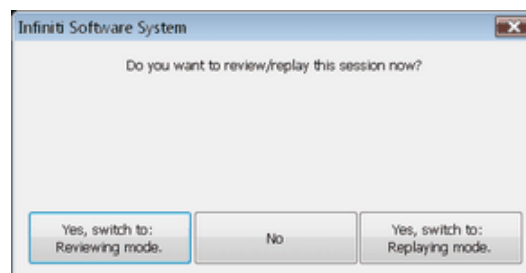
Here you can enter, if you want, a treatment code, a session description and some notes. Click **OK** to continue.



3. **Review or replay the session:**

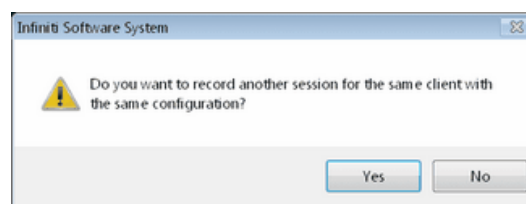
You have the option to analyze the session data at this point. You can switch to review mode or replay mode.

After you review the data and close the viewing screen, the program displays the next message prompt.



4. **Record another session with the same settings:**

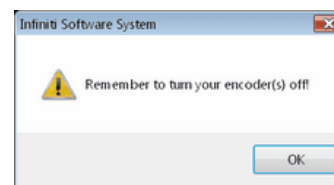
- If you selected **No** at the previous message, the program asks if you want to record another session with the same settings.
- If you select **Yes** at this point, the recording screen will reopen.



5. **Turn off your encoder:**

If you selected **No** at the previous message, the program prompts you to turn your encoder off.

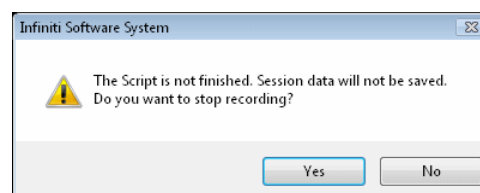
Click **OK** to return to the Main Menu screen.



You can also manually stop recording a script session by clicking the **Stop** button .

In this case, you are prompted to confirm the command.

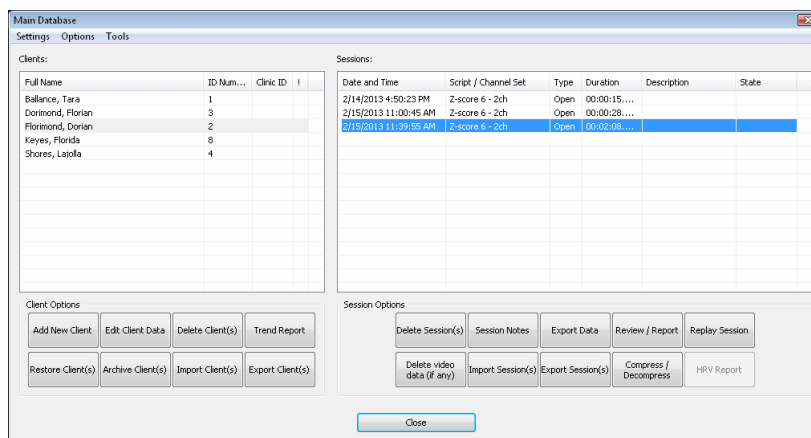
- If you select **No**, the script continues recording normally.
- If you select **Yes**, no data is saved for the session, and you are prompted to record another session with the same settings (message 4, above).



Replaying Sessions

Replaying a session allows you to play back a recorded session like a movie. This is useful if you have recorded video data. You can replay the session from any point in time and skip to event markers or script activities and steps.

1. Select **Database** from the Main Menu screen.
2. In the **Main Database** window select the client whose session you want to replay.
3. Select the session from the right-hand table.
4. Click on **Replay Session** at the bottom.



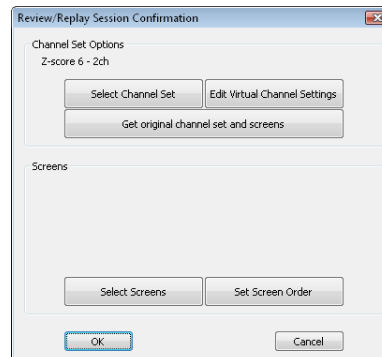
Main Database

5. The next step depends on whether you selected a **Script** session or an **Open Display** session to replay.
 - If you selected a **Script** session, the main frame screen opens in replaying mode.
 - If you selected an **Open Display** session, the window **Review/Replay Session Confirmation** opens.

To replay the session using different screens from those used to record it, click **Select Screens** to open the **Select Screens** window. Select up to 5 screens and click **OK** to return to **Review/Replay Session Confirmation**.

Click **OK** to enter replaying mode.

6. Click on the **Start** button  to replay the session.



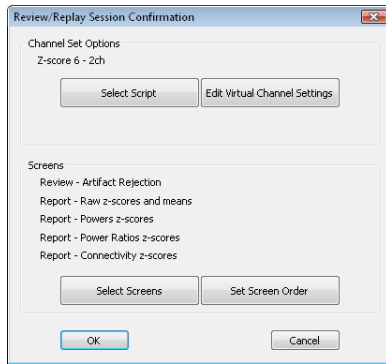
Review/Replay Session Confirmation

Reviewing Sessions

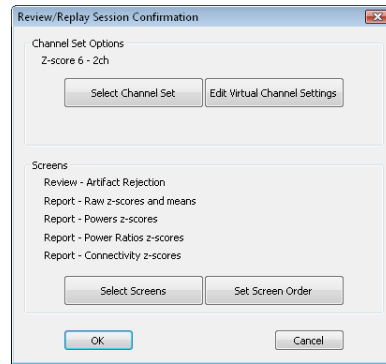
After recording a session you can analyze the data by going into review mode. This mode allows you to scroll through the graphs, look at statistics, and print out a report displaying the data in graphical and/or statistical form.

1. Select **Database** from the Main Menu screen.
2. In the **Main Database** window select the client whose session you want to review.
3. Select the session from the right-hand table.
4. Click on **Review/Report** at the bottom.

The **Review/Replay Session Confirmation** window opens.



For a Script session



For an Open Display session

5. If you are reviewing a session that was recorded using a Favorite, then review screens will already be selected by default, and you can click **OK** to enter review mode.

Otherwise, to select review screens, do the following.

- a. Click on **Select Screens**.
- b. From the **Screen Category** drop-down list, select **Z-score 6**.

Only screens from the selected category will be listed. Screens designed specifically for review contain either "Artifact Rejection" or "Report" in the screen name. (See page 29 for more information about [Report Screens](#).)

- c. Select up to 5 screens and click **OK** to return to **Review/Replay Session Confirmation**.
- d. Click **OK** again to enter review mode.

Rejecting artifacts

Artifact is signal distortion generated by something other than the source of the physiological sign being monitored. It is sometimes called signal interference or signal noise.

There are several types of artifact, and different methods of dealing with each. For example, electrical interference (50 Hz in North America, 60 Hz in Europe) can be offset by the use of an appropriate notch filter in BioGraph Infiniti. High impedance levels can be mitigated by proper skin preparation and electrode placement. Client cooperation can reduce movement artifacts.

The Z-score 6 suite provides the capacity to remove artifacts from raw data during recording and before it is used to calculate feedback. When this artifact rejection is enabled, when raw EEG values go over or under specified limits, the feedback calculation is paused until the values return within the valid range. This results in real-time artifact rejection which affects screen activity, feedback, and statistical calculation.

During review and analysis of a recorded session, artifacts recorded with raw data can skew the resulting statistics. BioGraph Infiniti provides automatic and manual methods for rejecting signal artifacts prior to statistical calculation.

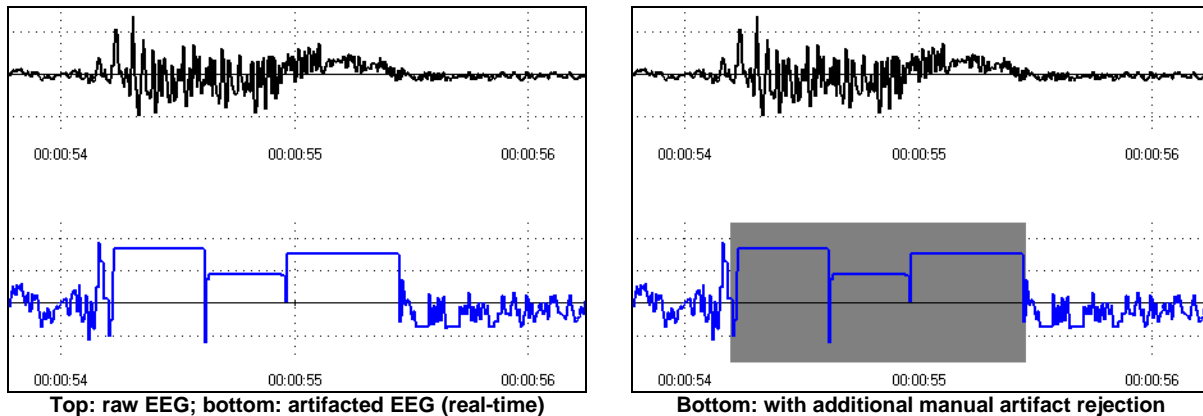
Real-time artifact rejection

Z-Score 6 suite provides this method for handling artifacts in real time.

At the start of session recording, the [artifact calibration screen](#) (described more fully on page 44) is used to set the rejection limits. The screen includes instructions on how to do this. The function also can be toggled on or off (if you prefer to reject artifacts only in review mode, or if you have trouble finding thresholds that work well for a given client), and again, the screen includes the necessary instructions.

Recording screens show two signal traces, raw EEG and artifacted EEG. Each time that the raw EEG signal value exceeds the rejection limits, the artifacted EEG trace displays the last good EEG signal value. This displays as a flat line until the raw EEG signal value returns within the rejection limits.

To ensure that feedback and statistics are minimally affected by artifact, feedback is paused and recorded data is excluded from statistical calculations when artifacts occur. Flat lines in the artifacted EEG signal trace indicate those places in the recording where artifacts have occurred.



When real-time artifact rejection is used, review mode artifact rejection becomes optional. This depends upon whether the real-time rejection is judged to be sufficiently accurate. An [artifact rejection screen](#) (described more fully on page 44) is provided to facilitate this.

In the artifact rejection screen, the raw EEG signal and artifacted EEG signal are displayed together, as shown above left. Flat segments on the artifacted EEG signal are excluded from statistical computations. During review you can place additional rejection segments on the raw and artifacted EEG signal traces, as shown on the right, using the automatic and manual artifact rejection functions of BioGraph Infiniti.

The artifact review screen includes instructions for clearing the rejection limits used for real-time rejection.

Artifact rejection in Review mode

Rejecting artifacts can be performed while reviewing sessions. Artifact rejection can be performed **automatically** by the software, or **manually** by the person reviewing the data. If you have not used real-time artifact rejection, you will need to use one or both of these methods to remove artifacts.

If you have used real-time artifact rejection, you may want to refine the rejected data by using one or both methods.

Once artifact rejection segments have been placed where required, you can generate statistics and print a session report.

Automatic rejection of artifacts

In order to perform automatic rejection of artifacts, you must define **Review Mode Auto-Rejection Settings**. They identify the artifact rejection method to use during review. Depending on the signal types that your channel set includes and whether it includes the proper Boolean virtual channels, you can use **Boolean Rejection** and **Physical Channel Rejection**.

Note: *If you are using the artifact calibration screen to reject artifacts, you don't need to use **Review Mode Auto-Rejection Settings**, but you may choose to use it to refine real-time artifact rejection, if necessary.*

1. From the **Edit** menu, select **Review Mode Auto-Rejection Settings**.
2. Select the check box **Reject automatically when switching to Review**.
3. Select a **Rejection Type**.
4. Select a channel for auto-rejection.
 - If you selected **Boolean Rejection**, select a **Boolean state for rejection** and click **Set**.
 - If you selected **Physical Channel Rejection**, enter a **Rejection Threshold** value and click **Set**.
5. Click **OK** and then record the session.

Review Mode Auto-Rejection Settings

☐ Reject automatically when switching to Review

Rejection Type

☒ Boolean Rejection

☐ Physical Channel Rejection

Select channel(s) for auto-rejection and save corresponding settings

Channel	Description	Condition	Scope	State
V17	C: Eye movement threshold	On	Ch...	Set
V18	C: EMG noise threshold			
V19	D: Eye movement threshold			
V20	D: EMG noise threshold			
V25	Artifacts on C			
V26	Artifacts on D			
V31	Artifacts			
V32	No artifacts			
V34	Artifact on/off: Channel C			
V35	Artifact on/off: Channel D			
V40	Artifact on/off (bool OK)			
V45	Eye movement artifact			

Boolean state for rejection (Condition)

☐ Off ☒ On

Scope

☒ Channel Dependent ☐ Global

Set Clear

Edit Boolean channel settings

OK Cancel

Boolean Rejection

Review Mode Auto-Rejection Settings

☐ Reject automatically when switching to Review

Rejection Type

☐ Boolean Rejection

☒ Physical Channel Rejection

Select channel(s) for auto-rejection and save corresponding settings

Channel	Description	Condition	Value	State
1C	C: Electrode 1	Bipolar	16.00	Set
1D	D: Electrode 2			

16 Rejection Threshold (negative values will be made positive)

Set Clear

Edit Boolean channel settings

OK Cancel

Physical Channel Rejection

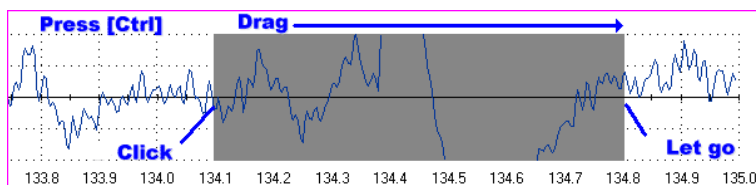
After you finish recording, when you switch to review mode, the program scans the whole session and automatically places rejection segments over all the sections that fit the definition. If you save the data without switching to review mode, when you do open the session for review at a later time, automatic rejection will be performed using the levels you set here.

Note: If you modify auto-rejection level or rejection segments during review, the system saves your modifications.

Manual rejection of artifacts

First review the session to determine where the recording is most affected by noise. Then place artifact rejection segments at these locations, by following these steps.

1. Select the line graph containing the segment to be rejected. The selected graph will display a magenta border.



2. Press and hold the **[Control]** Key.
3. Place the cursor over one end of the rejected segment.
4. Click and hold the left mouse button. (You can release the **[Control]** key at this point.)
5. Drag the cursor across the segment to be rejected. The selected segment is highlighted in gray.
6. At the end of the segment, release the mouse button.

Note: You can place artifact rejection segments only on single-line graph instruments. If you get an error message, you have to select a different screen for reviewing.

Calculating statistics

1. To calculate statistics for a session, click the **Show Statistics** button  in the tool bar and select **Calculate statistics for the whole session**.

A message confirms that the program is processing session data and then the **Statistics** window opens.

2. Click **Close** to close the window.

Activity Statistics						
Activity	Activity Description	Step	Step Description	Statistic Description	Value	
2	Recording	1		C: NG Delta amplitude mean	399.36	
2	Recording	1		D: NG Delta amplitude mean	190.03	
2	Recording	1		C: NG Theta amplitude mean	157.32	
2	Recording	1		D: NG Theta amplitude mean	138.25	
2	Recording	1		C: NG Alpha amplitude mean	79.80	
2	Recording	1		D: NG Alpha amplitude mean	71.10	
2	Recording	1		C: NG Beta amplitude mean	65.49	
2	Recording	1		D: NG Beta amplitude mean	81.24	
2	Recording	1		C: NG High Beta amplitude mean	28.89	
2	Recording	1		D: NG High Beta amplitude mean	41.21	
2	Recording	1		C: NG Beta 1 amplitude mean	46.46	
2	Recording	1		D: NG Beta 1 amplitude mean	46.19	
2	Recording	1		C: NG Beta 2 amplitude mean	35.57	
2	Recording	1		C: NG Beta 3 amplitude mean	38.01	
2	Recording	1		D: NG Beta 3 amplitude mean	51.32	

Rejection Durations						
Activity	Activity Description	Activity Duration	Channel	Channel Description	Rejection Durations	Rejection Durations (%)
2	Recording	120.00			00:00:00.00	0.00

Close

Note: This is the Statistics window for a script session. The Statistics window for an open display session is similar, but does not display a list of rejection durations for individual activities.

Generating session reports

In review mode BioGraph Infiniti 6.1 can generate two types of session report.

- **Excel reports** have been predefined and customized especially for a given suite. An Excel report transfers session statistics from the session data file into a Microsoft Excel workbook and subjects them to further analysis. Excel reports can be saved or printed using the Excel functions.



Note: *The analytical complexity provided by Excel reports is not required for the Z-score 6 suite and no such reports are included.*

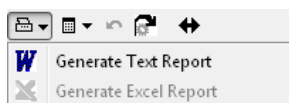
- **Text reports** include general information about the session as well as optional information (session notes, statistics, markers) that you select. A text report can be generated from any screen which includes line graphs or trend graphs. Text reports are preferred for open display sessions, but they can also be generated for script sessions.

They are generated in one of three different formats, **HTML**, **PDF**, or **Microsoft Word**, depending on the [configuration selected](#) in **Preferences**, and are printed or saved using the **Print** and **Save** functions of the appropriate software.

To generate a session report, enter review mode either immediately after recording a session (see [Stopping a Session](#) on page 22), or from the Database window by selecting the session from the database and clicking on **Review/Report** (see [Reviewing a Session](#) on page 24).

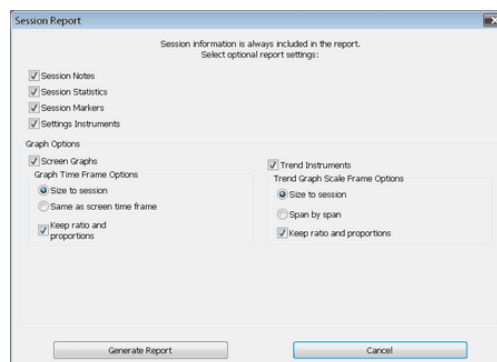
Select review screens, and then follow these steps:

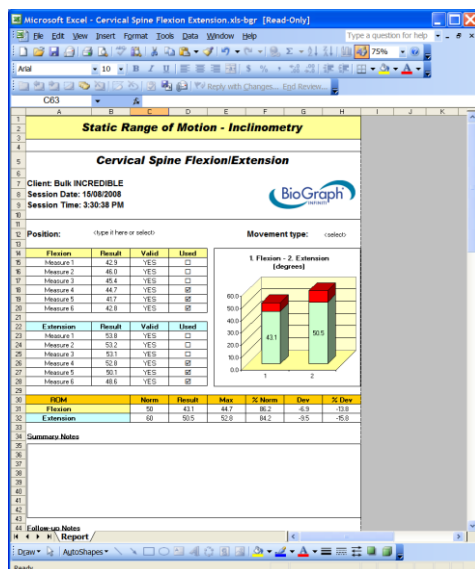
1. If this is an open display session, from the **Options** menu select **Set Open Display Statistics** and choose the channels for which statistics should be calculated.
2. If necessary, perform [artifact rejection](#) on the recorded data.
3. Click the **Recalculate** icon  in the tool bar to recalculate the statistics.
4. If you have loaded more than one screen, open the screen from which you want to generate the report. Different screens can generate different reports.
5. Click the **Session Report** icon  in the tool bar and select the type of report that you want to generate.



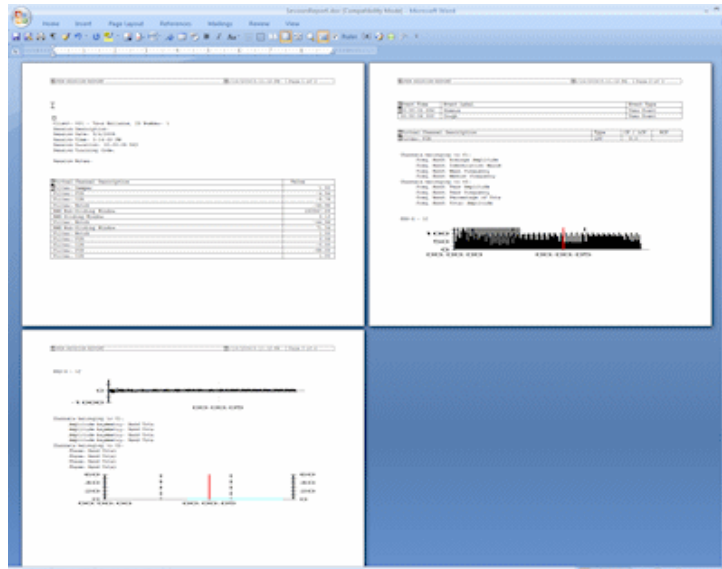
- If you select **Generate Excel Report**, Microsoft Excel opens and displays your report as a workbook. You can print or save the report using Excel's **Print** and **Save** functions.
 - If you select **Generate Text Report**, the **Session Report** window opens, and you must continue to the next step.
6. Select report components by placing a check mark in the desired boxes.
 7. Click **Generate Report** to generate the report. The document opens in the selected format.

Note: *Microsoft Word and Excel, a PDF reader, and a web browser **must** be installed on your system for these functions to work.*





Excel-generated session report



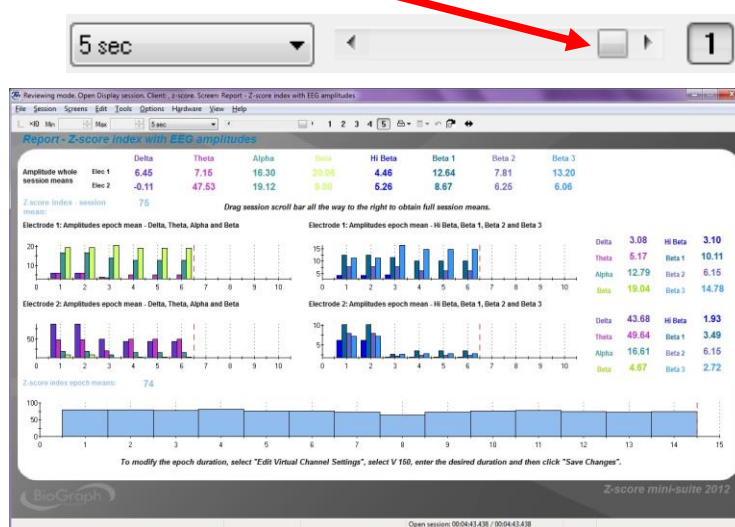
Word-generated session report

Report screens

An alternative way to report session activity is using BioGraph Infiniti **Report Screens**. Report screens are simply BioGraph Infiniti screens designed to display session statistics and trends. They have been predefined and customized for the Z-score 6 suite and are available within the set of existing screens.

To use a report screen, enter review mode either immediately after recording a session (see [Stopping a Session](#) on page 22), or from the **Database** window by selecting the session from the database and clicking on **Review/Report** (see [Reviewing a Session](#) on page 24).

1. Select up to 5 screens labeled "Report" and click **OK**.
2. After the screens have loaded, move the session scroll bar to the far right. This ensures that the report screen displays statistics for the full session.



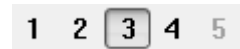
Report screen loaded in BioGraph Infiniti

Tool Bar Options

While recording, replaying or reviewing an open display session there are certain options that are available on a tool bar found near the top of the display screen. To learn more about the tool bar, refer to the online help by pressing F1.

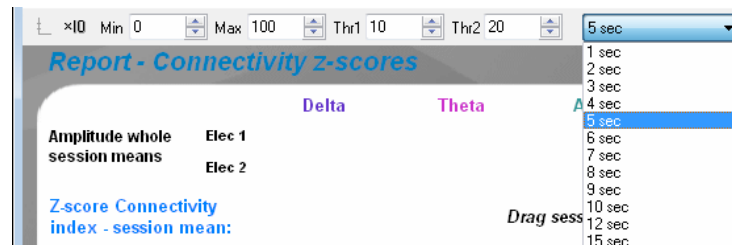
Toggling between screens

If you have chosen more than one screen you can view each one by clicking on the numerical buttons on the toolbar at the top. Up to five screens can be viewed (in the example below, there are four, where the third screen is currently on display).




Adjusting scales and threshold

By clicking on a graph instrument you can enable any of the scale and threshold options on the toolbar shown below.



- **Vertical scale:** The minimum and maximum scale values can be changed by clicking on the spinner arrows on the boxes labeled **Max** and **Min**.

The numbers increase or decrease by 0.1, but when you click on the button , the numbers change by 1. (You can also type the desired value into the box and then click anywhere on the screen to save the change.)

- **Multi line-graph Y1 and Y2 axes toggle:** The multiple line graph has a left and a right vertical scale that can be adjusted independently of each other by clicking on the toggle button.



Left vertical scale enabled.



Right vertical scale enabled.

- **Threshold:** The threshold line on a bar graph, line graph and animation scale can be adjusted in the same way as the vertical scale. The spinner box labeled **Thr1** is for single threshold graphs, or for the first threshold on graphs defined with dual thresholds while **Thr2** is for the second threshold.
- **Time scale:** The default time for all the screens is 30 seconds. You can select a new time scale by clicking on the drop-down menu.

Impedance Check

Before recording a z-score session, it is essential to check impedance values for all EEG channels. These values indicate the quality of contact between the electrodes and the skin. You do this in the BioGraph Infiniti recording screen before starting to run the protocol.

Because of differences between the ProComp2 encoder and the Infiniti encoders, different procedures are used for checking impedance for the two types of encoders.

ProComp Infiniti, ProComp5 Infiniti, and FlexComp Infiniti encoder

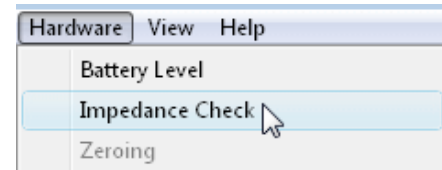
1. Connect the EEG extender cables to the EEG-Z sensors, and connect the sensors to the correct encoder inputs for the protocol.
2. Place the electrodes on the client, turn on the encoder, start BioGraph Infiniti, and start the session.

Do not start recording.

- From the **Hardware** menu of the Recording Screen, select **Impedance Check**.

This opens the **Impedance Check** window.

- Trigger impedance checking from your Infiniti encoder.



To do this:

- Ensure that the encoder's **power light** is on.
- Press and hold down the **power button** for about 3 seconds, or until the power light starts blinking.

When the power light begins to blink, impedance checking mode is active, and the window displays impedance values.

[Impedance Check window](#) on page 32 explains how to read impedance values.

- As necessary, adjust electrodes on the client until you are satisfied with the displayed values.
- To exit impedance checking mode, press the power button and hold it down for about 3 seconds, or until the power light stops blinking.

After you have checked impedance for all inputs, you can start recording the session.

Important: When checking impedance for EEG-Z sensors that are connected to an Infiniti encoder, do not unplug the sensors from the encoder. If this accidentally happens, reconnecting the sensor will not reinitialize impedance checking. You must close the **Impedance Check** window and reopen it.

ProComp2 encoder

- Place the electrodes on the client.
- Connect the first EEG extender cable to Input A of the ProComp2 encoder.
- Connect the second EEG extender cable to an EEG-Z sensor and connect the sensor to Input B of the ProComp2 encoder.
- Turn on the encoder, start BioGraph Infiniti, and start the session.

Do not start recording.

- From the **Hardware** menu of the Recording Screen, select **Impedance Check**. This opens the **Impedance Check** window.
- First, read impedance values for the electrodes connected to Input B:
 - Disconnect the EEG-Z sensor and then reconnect it.
The sensor goes into impedance checking mode and the window displays impedance values. [Impedance Check window](#) explains how to read impedance values.
 - As necessary, adjust electrodes on the client and then repeat the preceding step until you are satisfied with the displayed values.

The integrated EEG sensor (Input A of the ProComp2 encoder) does not have impedance-checking capabilities. To check impedance for the electrodes connected to Input A, do the following:

- Remove the EEG extender cable from the EEG-Z sensor connected to Input B, and replace it with the EEG extender cable from Input A.
- Repeat Step 6 to read the impedance values for the electrodes.
- Return the EEG extender cables to their original inputs.

After you have checked impedance for both inputs, you can start recording the session.

Impedance Check window

The impedance measurements are read from all the EEG-Z sensors that are connected to the encoder and shown in the table at the bottom of the dialog box.

If there is only one sensor connected (ProComp2 encoder), the same values will also be shown in large color-coded numbers on the right half of the dialog box.

If there is more than one sensor connected (Infiniti encoders), the color-coded numbers correspond to the sensor that is selected in the list. You can select another sensor by clicking on another line in the list.

Impedance Check

To enter impedance checking mode, press and hold the encoder's power button until the power indicator blinks twice (2 seconds), then let go. The power indicator keeps blinking until the encoder is taken out of impedance checking mode. To exit impedance checking mode, press and hold the encoder's power button until the blinking stops (1 second).

Electrode Colors

☒ + is blue, - is yellow, ground is black
☐ + is blue, - is white, ground is black

Calculation Type

☒ Resistive ☐ Total

Representation Type

☒ Individual ☐ Pairs ☐ Both

Thresholds (kOhms)

Individual Pairs

0 kOhms

Set Default Apply

0.22 0.54 0.34

Sensor	Channel	Description	+	-	Ground	+ Ground	- Ground	+ -
EEG-Z	1C	C: Electrode 1	0.22	0.54	0.34	0.56	0.88	0.76
EEG-Z	1D	D: Electrode 2	0.64	1.94	0.32	0.96	2.26	2.58

Close Generate Report

- Green indicates a low value.
- Orange indicates a medium value.
- Red indicates a high value.

Ideally, all three measurements should display in green.

As necessary, adjust electrodes on the client until you are satisfied with the displayed values, close the impedance check window and end the impedance checking session.

For detailed information about impedance checking, press F1 to consult the on-line help.

Z-Score Assessment and Training

Overview

Z-score Biofeedback involves real-time comparisons of EEG data to the normative database compiled and maintained by Applied Neuroscience Inc. (<http://www.appliedneuroscience.com/QEEGNF.htm>). This initiative brings together Applied Neuroscience Inc, the creators of NeuroGuide QEEG analysis software, with manufacturers of biofeedback equipment to allow the same real-time normative data functionality across all neurofeedback systems.

The z-score deviation of a value from a set is defined as the difference between that value and the mean of the set. It is reported in multiples of the standard deviation of the given set. In other words, the z-score tells us how many standard deviations a value is from the mean of a group of values.

From two or four channels of raw EEG, the NeuroGuide Z-Score Biofeedback algorithm calculates the z-score deviations of the following metrics from the NeuroGuide normative database.

- **6 metrics:**
Relative Power (REL); Absolute Power (ABS); Coherence (COH); Phase (PHA); Amplitude Asymmetry (ASY); and Power Ratios
- **computed for 8 bands:**
Delta; Theta; Alpha; Beta; High Beta (H Beta); Beta 1; Beta 2; Beta 3
- **and 10 band ratios:**
Delta/Theta; Delta/Alpha; Delta/Beta; Delta/High Beta; Theta/Alpha; Theta/Beta; Theta/High Beta; Alpha/Beta; Alpha/High Beta; Beta/High Beta

This results in 76 different output values for two channels of EEG, and 248 for 4 channels.

1: C3 (C: Artifacts EEG)					1-2				
I/H Beta	I/Beta	I/Alpha	I/Theta		ABS	REL	ASY	COH	PHA
0.00	0.00	0.00	0.00	Delta	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00		Theta	0.00	0.00	0.00	0.00	0.00
0.00	0.00			Alpha	0.00	0.00	0.00	0.00	0.00
0.00				Beta	0.00	0.00	0.00	0.00	0.00
				H Beta	0.00	0.00	0.00	0.00	0.00
				Beta 1	0.00	0.00	0.00	0.00	0.00
				Beta 2	0.00	0.00	0.00	0.00	0.00
				Beta 3	0.00	0.00	0.00	0.00	0.00
2: C4 (D: Artifacts EEG)									
I/H Beta	I/Beta	I/Alpha	I/Theta		ABS	REL			
0.00	0.00	0.00	0.00	Delta	0.00	0.00			
0.00	0.00	0.00		Theta	0.00	0.00			
0.00	0.00			Alpha	0.00	0.00			
0.00				Beta	0.00	0.00			
				H Beta	0.00	0.00			
				Beta 1	0.00	0.00			
				Beta 2	0.00	0.00			
				Beta 3	0.00	0.00			

Z-Score Screen instrument showing values for 2 EEG channels.

This suite will allow the user to perform assessment and training with these variables in two ways: using the z-score value itself, or using a metric (called the z-score index) which is indicative of the state of a group of z-scores.

The z-score index tells us at a given moment how many of a preselected group of z-scores are within a certain threshold range. This threshold range is user-definable and can be modified on the fly. The user also has the choice of which z-scores to include, and can do so easily at any time during the session.

The Z-score 6 suite includes 4 preset z-score indices. These are:

- z-score index (includes all z-scores)
- z-score powers index (includes only the power z-scores, for all channels)
- z-score power ratios index (includes only the power ratio z-scores, for all channels)
- z-score connectivity index (includes only the coherence, phase and amplitude asymmetry z-scores, for all channel pairs).

To paraphrase Dr Robert Thatcher of Applied Neuroscience Inc., often in the z-scores that come from the Z-score Biofeedback Library, an abnormality will show a high, fairly steady z-score while the other z-scores tend to vary more but with lower magnitude. The steady deviations that do not vary much are the same ones that contribute most to the FFT z-scores in the NeuroGuide report, and reflect a chronic or continuous deregulation which can be modified by neurofeedback. When using the real-time z-scores, the ability to keep track of mean z-scores, both overall and at discrete intervals, to show the trend in the session, allows this type of assessment to be possible.

This suite includes brief assessment protocols for recording baselines under both eyes open and eyes closed conditions, screens for single z-score training, z-score index training, z-scores with standard EEG band amplitudes in parallel, as well as reports showing session trends and means for all these metrics.

Session configurations have also been designed using the very powerful, very practical feature of BioGraph Infronti: [Quick Start Favorites](#).

Z-Score Screen Instrument

The Z-Score Instrument is a specialized text instrument that displays NeuroGuide Z-Scores and Array Statistical calculations taken from NeuroGuide Z-Score virtual channels. The Z-Score virtual channel can be defined for either 2 channels or 4 channels of EEG input.

1: C3 (C: Artifacts EEG)							1-2			1-3			1-4		
/H Beta	/Beta	/Alpha	/Theta		ABS	REL	ASY	COH	PHA	ASY	COH	PHA	ASY	COH	PHA
0.00	0.00	0.00	0.00	Delta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00		Theta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00			Alpha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				Beta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				H Beta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2: C4 (D: Artifacts EEG)							2-3			2-4					
/H Beta	/Beta	/Alpha	/Theta		ABS	REL	ASY	COH	PHA	ASY	COH	PHA			
0.00	0.00	0.00	0.00	Delta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00		Theta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00			Alpha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				Beta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				H Beta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3: F3 (E: Artifacts EEG)										3-4					
/H Beta	/Beta	/Alpha	/Theta		ABS	REL				ASY	COH	PHA			
0.00	0.00	0.00	0.00	Delta	0.00	0.00				0.00	0.00	0.00			
0.00	0.00	0.00		Theta	0.00	0.00				0.00	0.00	0.00			
0.00	0.00			Alpha	0.00	0.00				0.00	0.00	0.00			
0.00				Beta	0.00	0.00				0.00	0.00	0.00			
				H Beta	0.00	0.00				0.00	0.00	0.00			
				Beta 1	0.00	0.00				0.00	0.00	0.00			
				Beta 2	0.00	0.00				0.00	0.00	0.00			
				Beta 3	0.00	0.00				0.00	0.00	0.00			
4: F4 (F: Artifacts EEG)															
/H Beta	/Beta	/Alpha	/Theta		ABS	REL									
0.00	0.00	0.00	0.00	Delta	0.00	0.00									
0.00	0.00	0.00		Theta	0.00	0.00									
0.00	0.00			Alpha	0.00	0.00									
0.00				Beta	0.00	0.00									
				H Beta	0.00	0.00									
				Beta 1	0.00	0.00									
				Beta 2	0.00	0.00									
				Beta 3	0.00	0.00									

Z-Score Screen instrument showing values for 4 EEG channels.

Interpreting the Z-Score instrument

2: C4 (D: Artifactual EEG)			
/H Beta	/Beta	/Alpha	/Theta
0.00	0.00	0.00	0.00
0.00	0.00	0.00	
0.00	0.00		
0.00			

3: F3 (E: Artifactual EEG)			
/H Beta	/Beta	/Alpha	/Theta
0.00	0.00	0.00	0.00
0.00	0.00	0.00	
0.00	0.00		
0.00			

EEG channels connected to the instrument are identified as **1** and **2** (for 2 channels) and **1**, **2**, **3**, and **4** (for 4 channels).

2: C4 (D: Artifactual EEG)				
/H Beta	/Beta	/Alpha	/Theta	
0.00	0.00	0.00	0.00	Delta
0.00	0.00	0.00		Theta
0.00	0.00			Alpha
0.00				Beta
				H Beta
				Beta 1
				Beta 2
				Beta 3

3: F3 (E: Artifactual EEG)				
/H Beta	/Beta	/Alpha	/Theta	
0.00	0.00	0.00	0.00	Delta
0.00	0.00	0.00		Theta
0.00	0.00			Alpha
0.00				Beta

Power Ratios are tabulated to the left. The column contains the frequency bands used in the numerator and the row contains the frequency bands used in the denominator.

The top row of values, therefore, reading from right to left, contains power ratios for the **Delta/Theta**, **Delta/Alpha**, **Delta/Beta**, and **Delta/H Beta** band ratios.

The next row contains power ratios for the **Theta/Alpha**, **Theta/Beta**, and **Theta/H Beta** band ratios.

The third row contains power ratios for the **Alpha/Beta** and **Alpha/H Beta** band ratios.

The bottom row contains the power ratio for the **Beta/H Beta** band ratio.

1: C3 (C: Artifactual EEG)					ABS	REL
/H Beta	/Beta	/Alpha	/Theta			
0.00	0.00	0.00	0.00	Delta	0.00	0.00
0.00	0.00	0.00		Theta	0.00	0.00
0.00	0.00			Alpha	0.00	0.00
0.00				Beta	0.00	0.00
				H Beta	0.00	0.00
				Beta 1	0.00	0.00
				Beta 2	0.00	0.00
				Beta 3	0.00	0.00

Absolute Power (**ABS**) and Relative Power (**REL**) for each channel are tabulated to the right by frequency band.

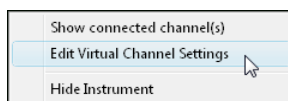
Amplitude Asymmetry (**ASY**), Coherence (**COH**), and Phase Difference (**PHA**) for each channel pair are tabulated to the right by frequency band.

Channel pairs are identified as **1-2** (for 2 channels) and **1-2**, **1-3**, **1-4**, **2-3**, **2-4**, and **3-4** (for 4 channels).

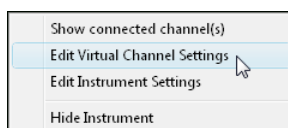
1: C3 (C: Artifactual EEG)					1-2			1-3			1-4		
/H Beta	/Beta	/Alpha	/Theta		ASY	COH	PHA	ASY	COH	PHA	ASY	COH	PHA
0.00	0.00	0.00	0.00	Delta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00		Theta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00			Alpha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				Beta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				H Beta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Beta 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Right-click menu options

Place the cursor over the Z-Score Instrument and click the right mouse button to access these options.



Recording and Replaying



Reviewing

- Select **Show connected channel(s)** to list the virtual channel connected to the Z-Score Instrument.
- Select **Edit Virtual Channel Settings** to open **Edit Channel Set Settings for Current Client**, where you can modify the Z-score settings (**Eyes Open** or **Eyes Closed**, **Electrode Location**).
- Select **Edit Instrument Settings** to open the **Instrument Settings** window, where you can modify the upper and lower threshold values. When recording a session, modify instrument thresholds from the **Tool Bar**.
- Select **Hide Instrument** to temporarily hide the instrument. To unhide a hidden instrument, select **Hide Instruments** from the **View** menu and in the **Current Screen Instrument List**, remove the check box next to the instrument name.

General Procedure

Starting a session

The preferred method for starting to record a Z-score session is to use one of the predefined configurations called **Favorites**, which are accessed by clicking the **Quick Start** button on the main menu screen of BioGraph Infiniti. Instructions in this section of the manual are based upon the use of **Favorites**.

If you want to choose a different set of screens for an Open Display session or edit script settings for a Script session, the chapter **Software Overview** describes how to run a session manually. See page 19 for information about [running a Script session](#), and page 21 for information about [running an Open Display session](#).

Software Overview also contains information about [reviewing and replaying sessions from the Main Database](#) on page 24.

Important: Before you start recording, ensure that:

- Correct channel settings are used for every session, including:
 - condition of eyes (opened or closed);
 - electrode locations.
 - Date of Birth of the client is correctly entered in the BioGraph Infiniti client database and the session is recorded and saved under the correct client file.
 - A linked-ears reference configuration is always used, whether you are measuring 1, 2 or 4 channels of EEG.
-

Linked ears reference

Instructions for [creating a linked ears reference](#) are provided on page 11.

The illustration shows a linked ears reference configuration for 2 channels of EEG.



Client database

The client's date of birth is required in order for the z-score to be correctly computed. If it is missing, you must add it to the client file before you can record a session.

Instructions for [creating and modifying client files](#) are provided on page 18.

Verifying channel settings

Z-Score virtual channel

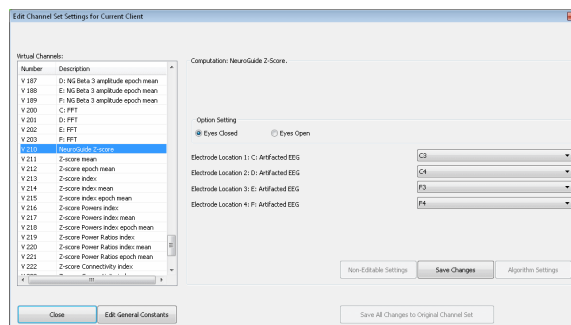
The first step in running any Z-score session is to verify these settings in the **Edit Channel Set Settings for Current Client** window.

Select the virtual channel where you want to verify the settings.

- 2 - channel: virtual channel V210.
- 4 - channel: virtual channel V210.

Here you confirm that the correct eyes condition is selected (**Closed Eyes** or **Opened Eyes**) and choose electrode locations from the drop-down lists.

- 2 - channel: 2 electrode locations.
- 4 - channel: 4 electrode locations.



Edit Channel Set Settings for Current Client
Z-score virtual channel
4-channel configuration

Opening **Edit Channel Set Settings for Current Client** varies slightly depending on whether the session is open display or script.

Script

- **AFTER** you click the **Start** button, the script opens an instruction screen and then, after a brief pause, automatically opens the window.
- Make necessary modifications and then click **Save Changes**.
- Click **Close**.

The script continues to the next step.

When you are running a script session, **DO NOT** close the window before you have changed the Z-score channel settings. The script starts running automatically as soon as the window is closed. If there is an error in the eyes condition or the electrode locations, you must stop the script and start over.

Open Display

- **BEFORE** you click the **Start** button, manually open the window by selecting **Edit Virtual Channel Settings** from the **Edit** menu.
- **ALTERNATIVELY**, if the recording screen includes a z-score instrument, right-click on the instrument and select **Edit Virtual Channel Settings**.
- Make necessary modifications and then click **Save Changes**.
- Click **Close**.

To start recording, you must click the **Start** button.

Z-score Index virtual channels

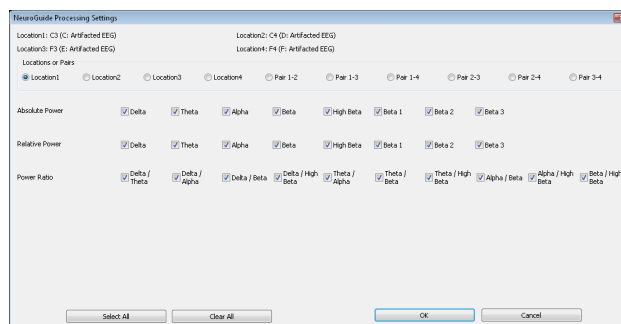
Each z-score index has a threshold range, which is the number of standard deviations that the z-score may vary from the NeuroGuide normative database.

A z-score is defined by the combination of a specific metric and either an electrode location or an electrode pair. Each index virtual channel is composed of a group of z-scores.

The z-scores that make up the index are selected in the NeuroGuide Processing Settings window. Each check box in this window represents all the bands or band ratios for the particular metric and location/pair.

For example, **Absolute Power Location 1** includes the absolute power z-scores for all 8 frequency bands of the signal measured by electrode 1.


	2-channel	4-channel
Z-score index	V213	V213
Z-score Powers index	V216	V216
Z-score Power Ratios index	V219	V219
Z-score Connectivity index	V222	V222

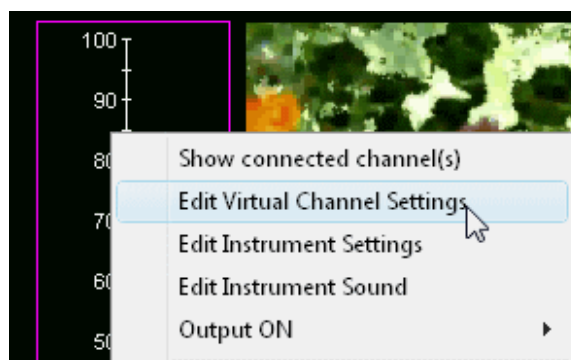


NeuroGuide Processing Settings window

Both the threshold range and the combination of z-scores making up the index can be modified while a session is being recorded. Recording must be paused in order to change the z-scores used to compute the index. The [threshold range can be modified](#) while recording is active (see page 38).

The **NeuroGuide Processing Settings** window is accessed through **Edit Channel Set Settings for Current Client**.

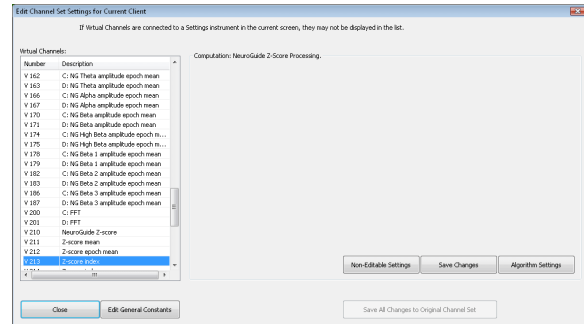
1. Click the **Pause** button  on the toolbar. This pauses the recording.
2. Place the cursor over the Index bar graph and click on the right mouse button.
3. From the right-click menu, select **Edit Virtual Channel Settings**.



- When **Edit Channel Set Settings for Current Client** opens, the Index channel is selected by default.
- Click the **Algorithm Settings** button to open the **NeuroGuide Processing Settings** box.
- Select and clear check boxes to create the combination of z-scores (all bands and band ratios) that you want to include in the index.
- Click **OK** to accept the modifications and return to **Edit Channel Settings**.

Optionally, you can select another Index channel from the list of **Virtual Channels** and modify its settings in the same manner.

- Click **OK** to return to the recording screen.
- Click the **Pause** button to resume recording the session.



Edit Channel Set Settings for Current Client
Z-score index virtual channel
2-channel configuration

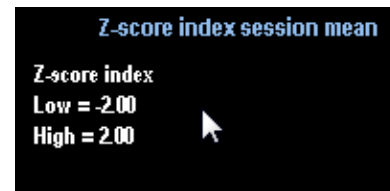


NeuroGuide Processing Settings
Default selection for 2-channel Powers index

Default limits of the threshold range for the index are -2 and 2. These values can be modified while recording is active.

- Place the cursor over the Index limits and click on the right mouse button.

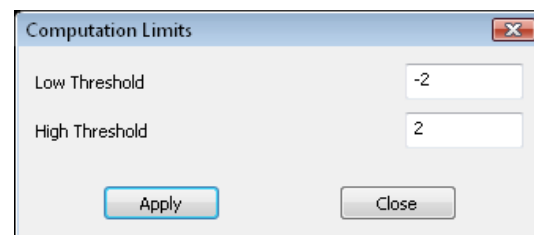
This opens the **Computation Limits** box.



- Enter new values for the upper and lower limits of the threshold range and click **Apply**.

The **Low Threshold** can accept values from -20 to 0, and the **High Threshold** can accept values from 0 to 20.

- Click **Close** to return to the recording screen.

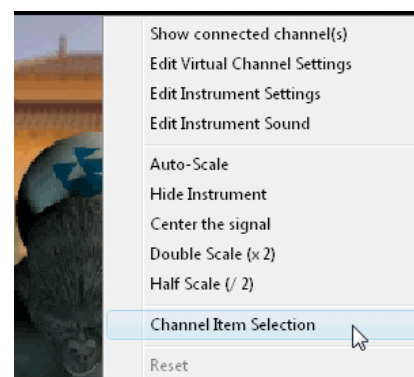


Single Z-score item selection

Single z-score training screens allow you to choose a specific z-score metric upon which the training will be focused. The screens contain brief instructions on how to do this.

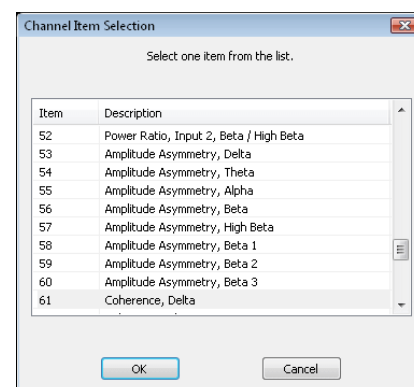
Select the z-score metric before you click the **Start** button.

1. Place the cursor over the screen instrument and click on the right mouse button.
2. From the right-click menu, select **Channel Item Selection**.
This opens the **Channel Item Selection** box.
3. Select a z-score metric from the list and click **OK**.
4. Click the **Start** button to begin recording.



You can switch to a different metric during the session.

1. To do this, first click the **Pause** button to pause recording, and then follow steps 1-3 above.
2. Click the **Pause** button again to resume recording.



Suggested Usage Scenarios

The predefined Favorites (accessible by clicking the **Quick Start** button) are the simplest way to start a z-score recording session. The usage scenarios that follow refer to the descriptions of the appropriate Favorites. However, you can define session settings and run the session manually if you prefer. See page 19 for information about [running a Script session](#), and page 21 for information about [running an Open Display session](#).

These scenarios are suggested guidelines for the use of the Z-score 6 suite elements - scripts, screens, reports. They are not clinical strategies and are not intended to serve as detailed clinical procedures.

Assessment

You can perform an assessment by running a script or an open session. The script definition controls the screens that are displayed, and script duration is exactly 2 minutes long. If you want a more flexible assessment, such as a variable length, run an open session.

Script:

- Run one (or both) of the 2-minute assessment script Favorites, **Z-score 6 - assessment script - eyes open** and **Z-score 6 - assessment script - eyes closed**.
- Configure the suite's real-time artifact rejection with the [Artifact Calibration screen](#), or toggle 0 to turn it off.
- After the script ends, the Favorite automatically loads the artifact rejection and report screens and switches to review mode.
- Real-time artifact rejection displays as flat sections on the **Artifacted EEG** screen graphs in the [Artifact Rejection screen](#). If necessary, use manual or automatic rejection to refine the rejected areas, and review the results displayed in the report screens. Optionally, generate and print a session report.

Open session:

- Run the open session assessment Favorite, **Z-score 6 - assessment - Open session**.

- Configure the suite's real-time artifact rejection with the [Artifact Calibration screen](#), or toggle 0 to turn it off.
- You can switch from one screen to another while the session is being recorded. When you are satisfied that you have adequate data, end the session.
- After the session ends, the Favorite automatically loads the artifact rejection and report screens and switches to review mode.
- Real-time artifact rejection displays as flat sections on the **Artifacted EEG** screen graphs in the [Artifact Rejection screen](#). If necessary, use manual or automatic rejection to refine the rejected areas, and review the results displayed in the report screens. Optionally, generate and print a session report.

After reviewing the report screens (and optional session reports), select a training approach based on the results of the assessment.

Training

Training sessions are generally run as open sessions. The Z-score 6 suite does not include training scripts.

- Run a training Favorite (see below for choices).
- Configure the suite's real-time artifact rejection with the [Artifact Calibration screen](#), or toggle 0 to turn it off.
- You can switch from one screen to another while the session is being recorded. When you are satisfied that an adequate period of training has elapsed, end the session.
- After the session ends, the Favorite automatically loads the artifact rejection and report screens and switches to review mode.
- Real-time artifact rejection displays as flat sections on the **Artifacted EEG** screen graphs in the [Artifact Rejection screen](#). If necessary, use manual or automatic rejection to refine the rejected areas, and review the results displayed in the report screens. Optionally, generate and print a session report.

Approaches to training:

o Single z-score

<i>Favorite</i>	<i>Screen</i>
Z-score 6 - single Z-score training and amplitudes	Artifact calibration Training - Single Z-score - Animation Training - Single Z-score - Audio Training - Z-scores with EEG amplitudes

You can [select a z-score to be trained](#) and switch to a different z-score during the session (see page 39).

o Z-score index

<i>Favorite</i>	<i>Screens</i>
Z-score 6 - index training 1 - 1 monitor	Artifact calibration Training - Z-score index - Animation - 1 monitor Training - Z-score index - DVD - 1 monitor
Z-score 6 - index training 2 - 1 monitor	Artifact calibration Training - Z-score Power index - Animation - 1 monitor Training - Z-score Power Ratios index - Animation - 1 monitor Training - Z-score Connectivity index - Animation - 1 monitor
Z-score 6 - index training 1 - 2 monitors	Artifact calibration Training - Z-score index - Animation - 2 monitors Training - Z-score index - DVD - 2 monitors
Z-score 6 - index training 2 - 2 monitors	Artifact calibration Training - Z-score Power index - Animation - 2 monitors Training - Z-score Power Ratios index - Animation - 2 monitors Training - Z-score Connectivity index - Animation - 2 monitors

When using z-score index screens for training, optionally, you can customize an index by modifying the [selection of z-scores included in the index](#) (see page 37) or, if you prefer, you can use the 4 preset indices.

	2-channel	4-channel
Z-score index	V213	V213
Z-score Powers index	V216	V216
Z-score Power Ratios index	V219	V219
Z-score Connectivity index	V222	V222

Reviewing/Reporting

- Select the recorded training session from the Main Database and click **Review/Report**.
- Select the report screens. If you want to review automatic artifact rejection or perform manual artifact rejection, select the artifact rejection screen at this time.
- Reject artifacts, if necessary, or toggle on/off automatic artifact rejection, and review the results displayed in the report screens. Optionally, generate and print a session report.

Screens

Z-score 6 suite display screens are described according to the type of task they are designed to help accomplish:

- **Training screens:** The training screens are designed for biofeedback and implement both AVI animation and DVD playback control as feedback. Some are based on single z-score metrics, others on the z-score index metrics, and some include standard EEG amplitude data as well.
- **Artifact rejection:** These screens can be used to review recorded data for removal of artifacts. Rejected segments will exclude the data they contain from computations such as full session means and other statistics. These screens can also be used to refine the real-time artifact rejection performed using the values set in the artifact calibration screen, and, if relevant, to edit automatically rejected data segments created by the [Review Mode Automatic Rejection Settings](#) feature described on page 25.
- **Report screens:** Report screens are designed to facilitate session reviewing and for generating session reports. They include full session means for certain metrics as well as trend graphs of epoch means.
- **Instruction & Script:** These screens are used as part of the assessment and training scripts.

Scripts

The Z-score 6 suite includes 4 assessment scripts that can be used to obtain 2-minute baseline recordings of all z-scores. Two scripts are designed for 2-channel configuration and two for 4-channel configuration. For each configuration, one script measures the **Closed Eyes** condition and the other script, the **Opened Eyes** condition.

Connect the electrodes in the configuration - 2-channel (see page 11) or 4-channel (page 12) - required for the assessment.

- Connect sensors to the encoder as follows:

Input Encoder	A	B	C	D	E	F	G	H
ProComp Infiniti 4-channel			EEG-Z	EEG-Z	EEG-Z	EEG-Z		
ProComp Infiniti 2-channel			EEG-Z	EEG-Z				
ProComp5 Infiniti			EEG-Z	EEG-Z				
ProComp2	(EEG)	EEG-Z						

- Turn the encoder on.
 1. Click **Quick Start**.



- From **Categories**, select the **Z-score 6** for your encoder.

Categories

Z-score 6 - ProComp Infiniti

- From **Clients**, select a name.

Clients:

Full Name	ID Number	Clinic ID
Ballance, Tara	1	
Dorimond, Florian	3	
Florimond, Dorian	2	
Keyes, Florida	8	
Shores, Lajolla	4	

- From **Favorites**, select the desired Z-score assessment script.
- Click **OK**.

Favorite

Description

2ch - Z-score 6 - assessment - open session

2ch - Z-score 6 - assessment script - eyes closed


2ch - Z-score 6 - assessment script - eyes open

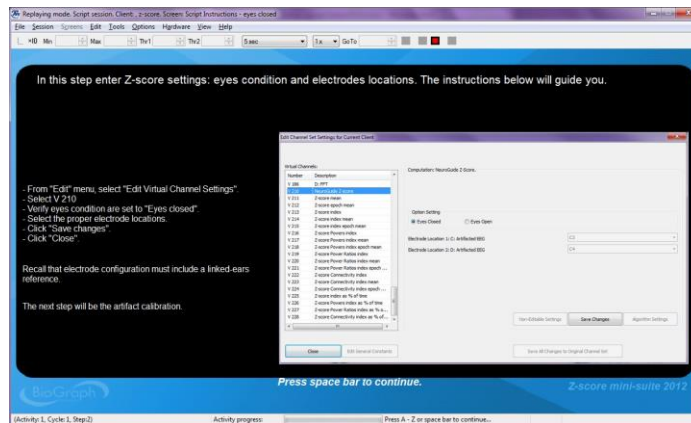
2ch - Z-score 6 - index training 1 - 1 monitor

2ch - Z-score 6 - index training 1 - 2 monitors

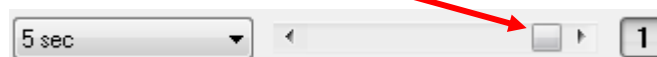
2ch - Z-score 6 - index training 2 - 1 monitor

Note: When BioGraph Infiniti is not open, you can also run a Favorite from your computer desktop by double-clicking its icon in the program group.

- Click the **Start** button  and read the instructions on the screen.



- When the **Edit Channel Set Settings for Current Client** window opens, make any necessary changes to the settings **BEFORE** you close it. (See [Verifying channel settings](#) on page 36 for a detailed explanation.)
- At the end of 2 minutes, the script session will end. Then a series of message prompts guides you through the process of saving data, adding notes to the session file, and switching to reviewing mode so that you can generate a session report. (A full explanation of this process is provided in [Stopping a Session](#) on page 22.)
- After you switch to reviewing mode, the system calculates session statistics from the data and loads screens for artifact rejection and reporting.
- To display statistics for the full session, drag the scroll bar to the extreme right.



Open Session Assessment

Connect the electrodes in the configuration - 2-channel (see page 11) or 4-channel (page 12) - required for the assessment.

- Connect sensors to the encoder as follows:

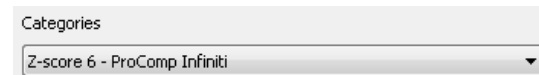
Input Encoder	A	B	C	D	E	F	G	H
ProComp Infiniti 4-channel			EEG-Z	EEG-Z	EEG-Z	EEG-Z		
ProComp Infiniti 2-channel			EEG-Z	EEG-Z				
ProComp5 Infiniti			EEG-Z	EEG-Z				
ProComp2	(EEG)	EEG-Z						

- Turn the encoder on.

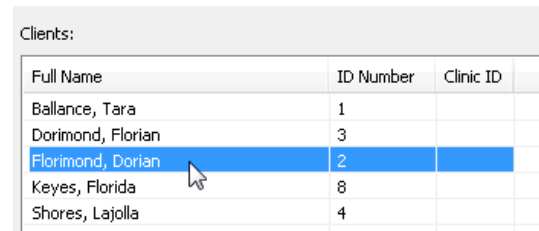
- Click **Quick Start**.



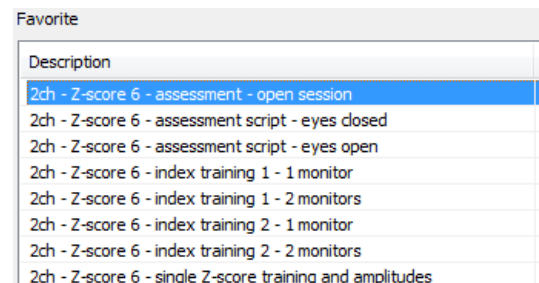
- From **Categories**, select the **Z-score 6** for your encoder.



- From **Clients**, select a name.



- From **Favorites**, select the desired Z-score assessment open session.

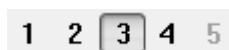



- Click **OK**.

Note: When BioGraph Infiniti is not open, you can also run a Favorite from your computer desktop by double-clicking its icon in the program group.

- Click the **Start** button .
- If necessary, [modify settings for the z-score index](#) (see page 37).

If you have chosen more than one screen you can view each one by clicking on the numerical buttons on the toolbar at the top. Up to five screens can be viewed (in the example below, there are four, where the third screen is currently on display).



- To stop the session, click the **Stop** button: .

- Then a series of message prompts guides you through the process of saving data, adding notes to the session file, and switching to reviewing mode so that you can generate a session report. (A full explanation of this process is provided in [Stopping a Session](#) on page 22.)
- After you switch to reviewing mode, the system calculates session statistics from the data and loads screens for artifact rejection and reporting.
- To display statistics for the full session, drag the scroll bar to the extreme right.

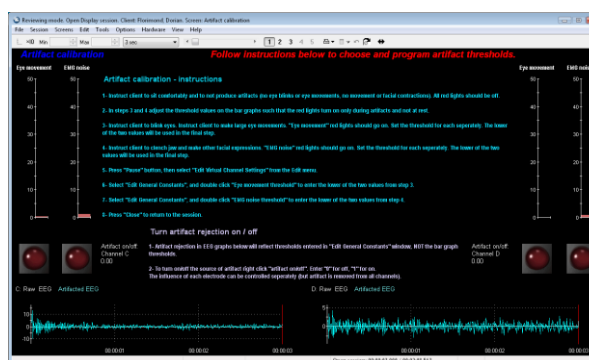


Artifact calibration screen

Artifact calibration

To be used for real-time artifacting during recording. This screen provides instructions guiding you through calibration of eye movement and EMG noise for the client. For each electrode, you determine the value of the threshold for each artifact type. Then set the lowest of the values as the session threshold by entering it as the corresponding general constant. (Follow the on-screen instructions.)

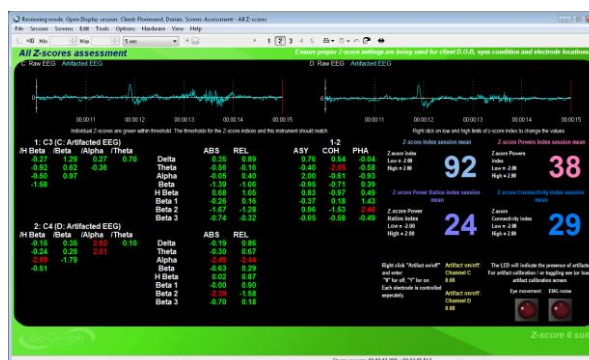
There are also instructions for toggling artifact rejection on or off for one or more electrodes. However, as long as artifact rejection is enabled for one electrode, all EEG signals will be artifacted. This allows you to control the source electrode while applying the artifacting to all channels.



Assessment screens

Assessment - All z-scores

This screen provides visual feedback on all z-scores simultaneously, as well as all 4 z-score indices. Z-instrument change color when individual z-scores are outside of the hard-coded range of -2 .. 2 (red outside, green inside). Computation range for z-score indices are adjustable (via edit virtual channel menu item), and should be set to -2 ... 2 to match color-coded on-screen feedback provided by individual z-scores. The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and the artifact toggle can be managed using setting instruments (one for each Electrode)



Assessment - Z-score index

This screen provides instantaneous values of all 4 z-score indices, as well as epoch and full session means for each. Range settings for each index are available via settings instrument. The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and the artifact toggle can be managed using setting instruments (one for each Electrode)



Training

Connect the electrodes in the configuration - 2-channel (see page 11) or 4-channel (page 12) - required for the training.

- Connect sensors to the encoder as follows:

Input Encoder	A	B	C	D	E	F	G	H
ProComp Infiniti 4-channel			EEG-Z	EEG-Z	EEG-Z	EEG-Z		
ProComp Infiniti 2-channel			EEG-Z	EEG-Z				
ProComp5 Infiniti			EEG-Z	EEG-Z				
ProComp2	(EEG)	EEG-Z						

- Turn the encoder on.

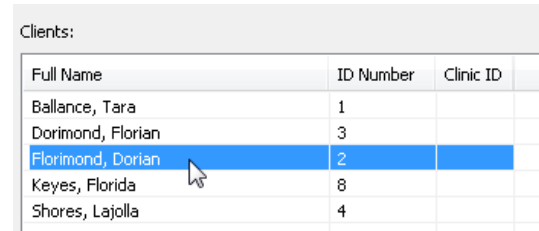
- Click **Quick Start**.



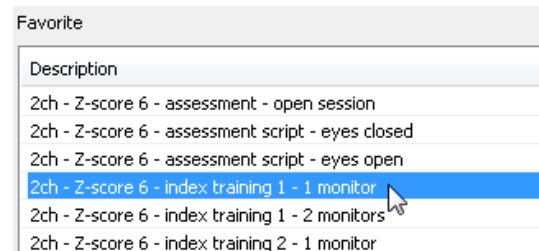
- From **Categories**, select the **Z-score 6** for your encoder.



- From **Clients**, select a name.



- From **Favorites**, select the desired Z-score training protocol.
- Click **OK**.

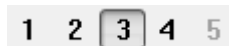



- If necessary, do one of the following:

- [Modify settings for the z-score index](#) (see page 37).
- [Select a z-score metric as a training focus](#) (see page 39).

- Click the **Start** button .

If you have chosen more than one screen you can view each one by clicking on the numerical buttons on the toolbar at the top. Up to five screens can be viewed (in the example below, there are four, where the third screen is currently on display).

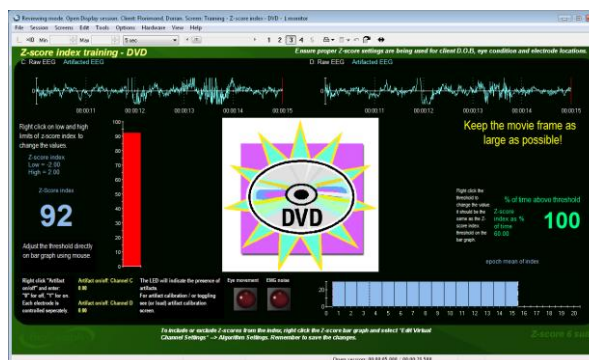


- To stop the session, click the **Stop** button: .

Training screens

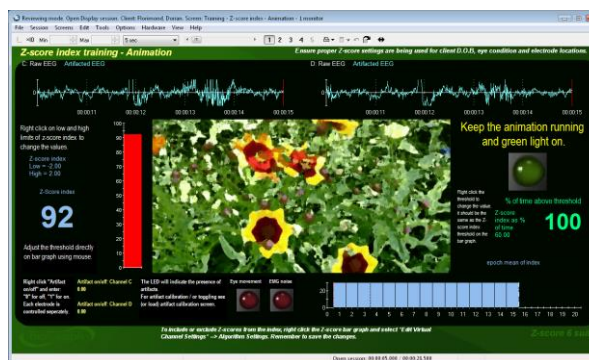
Training - Z-score index - DVD - 1 monitor

This screen provides DVD feedback related to z-score index. Bar graph provides color feedback (red below threshold, light blue above) and DVD grows with reward, shrinks otherwise (index below threshold and/or artifact rejection on and artifacts present). Epoch means of z-score index are trended. Range settings for z-score index are available via settings instrument. The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently).



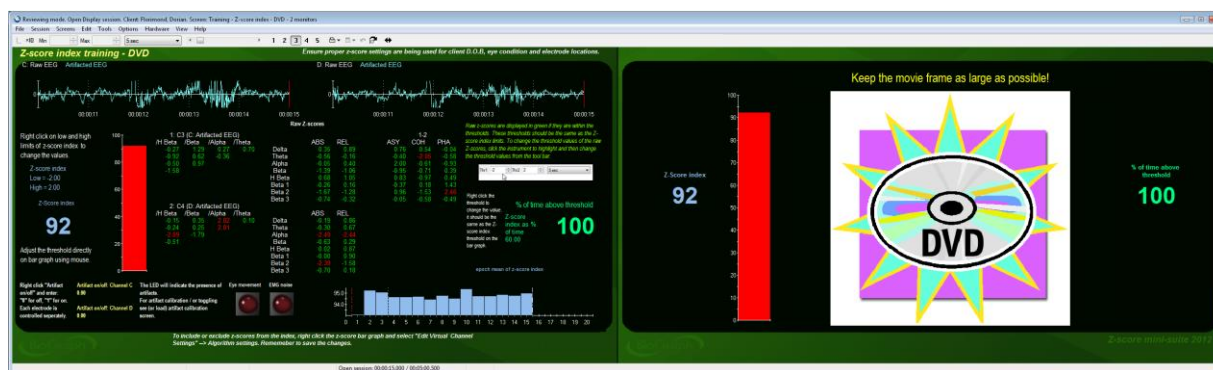
Training - Z-score index - Animation - 1 monitor

This screen provides animation feedback related to Z-score index. Bar graph provides color feedback (red below threshold, light blue above), animation cycles and green light goes on with success, otherwise it remains off (index below threshold and/or artifact rejection on and artifacts present). Epoch means of z-score index are trended. Range settings for z-score index are available via settings instrument. The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently).



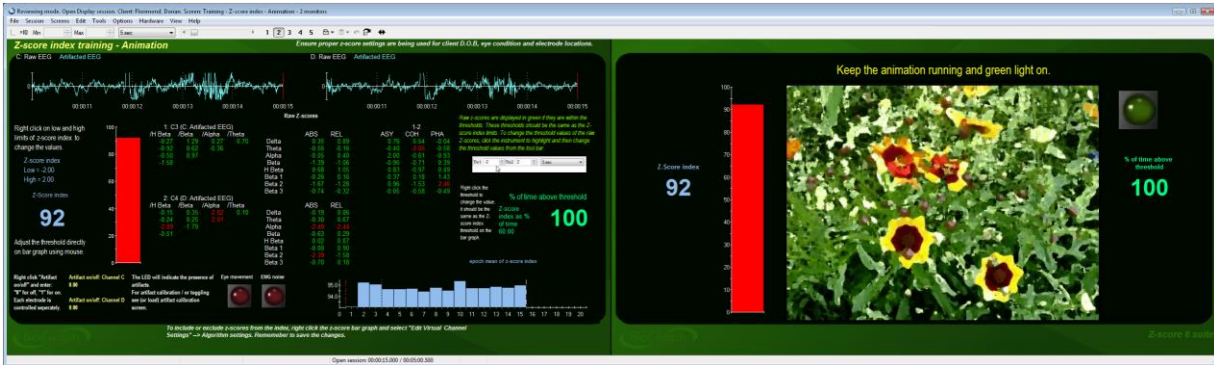
Training - Z-score index - DVD - 2 monitors

This is the two monitor version of the z-score index DVD screen described above. The same functionality is spread over a dual monitor display, to allow feedback to be displayed to the subject independently of the control items of the screen.



Training - Z-score index - Animation - 2 monitors

This is the two monitor version of the z-score index animation screen described above. The same functionality is spread over a dual monitor display, to allow feedback to be displayed to the subject independently of the control items of the screen.



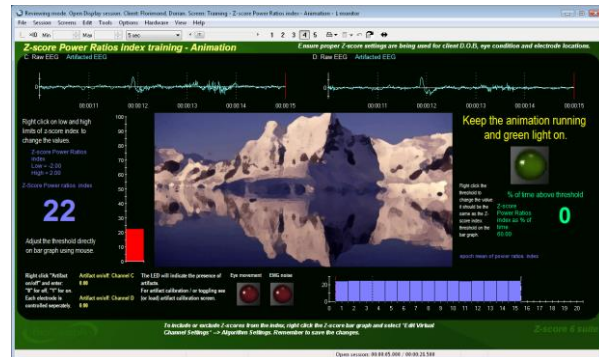
Training - Z-score Powers index - Animation

This screen provides animation feedback related to the Z-score Powers index. Bar graph provides color feedback (red below threshold, pink above), animation cycles and green light goes on with success, otherwise it remains off (index below threshold and/or artifact rejection on and artifacts present). Epoch means of z-score powers index are trended. Range settings for z-score powers index are available via settings instrument. The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently).



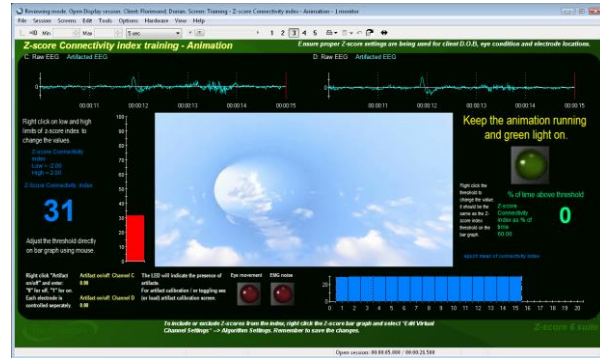
Training - Z-score index Power Ratios - Animation

This screen provides animation feedback related to Z-score Power Ratios index. Bar graph provides color feedback (red below threshold, light blue above), animation cycles and green light goes on with success, otherwise it remains off (index below threshold and/or artifact rejection on and artifacts present). Epoch means of z-score power ratios index are trended. Range settings for z-score power ratios index are available via settings instrument. The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently).



Training - Z-score Connectivity index - Animation

This screen provides animation feedback related to Z-score Connectivity index. Bar graph provides color feedback (red below threshold, light blue above), animation cycles and green light goes on with success, otherwise it remains off (index below threshold and/or artifact rejection on and artifacts present). Epoch means of z-score Connectivity index are trended. Range settings for z-score Connectivity index are available via settings instrument. The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently).



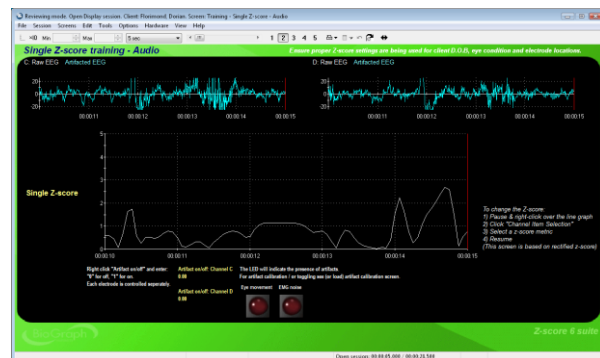
Training - Single Z-score - Animation

This screen provides animation feedback related to a single Z-score metric. The animation responds to the z-score value (0 is middle, -5 and 5 are edges). The metric can be changed on the fly (user instructions are described on screen). The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently).



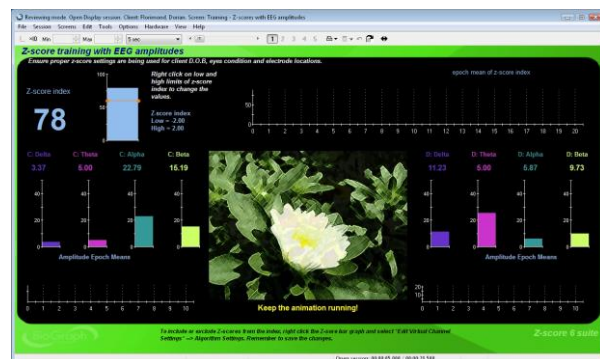
Training - Single Z-score - Audio

This screen provides audio feedback related to a single rectified Z-score metric. The volume is to be as loud as possible when the metric is close to zero, and it fades away the further metric is away from zero. The metric can be changed on the fly (user instructions are described onscreen). The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently).



Training - Z-scores with EEG amplitudes

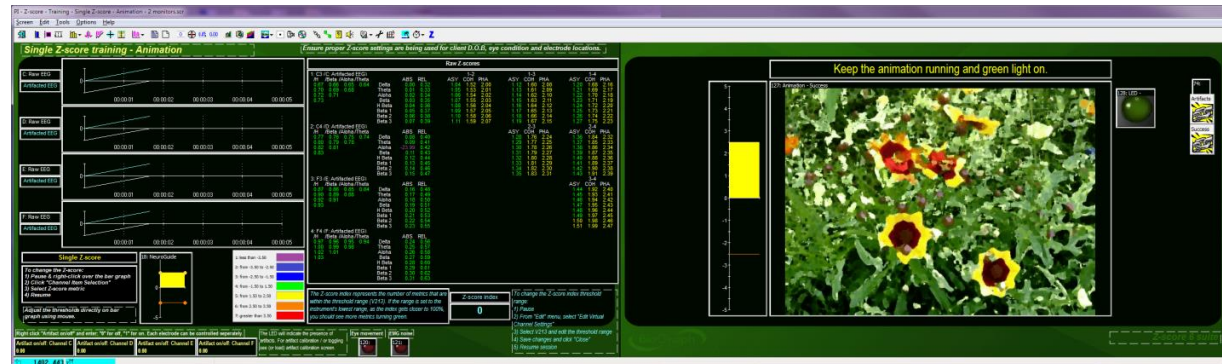
This screen provides animation feedback related to Z-score index. Bar graph provides color feedback (red below threshold, light blue above), animation cycles with success, otherwise it stops (index below threshold). Epoch means of z-score index are trended. Range settings for z-score index are available via settings instrument. EEG amplitudes (bar graphs) and epoch means (trend graphs) for 4 standard bands, for both electrodes are also included.



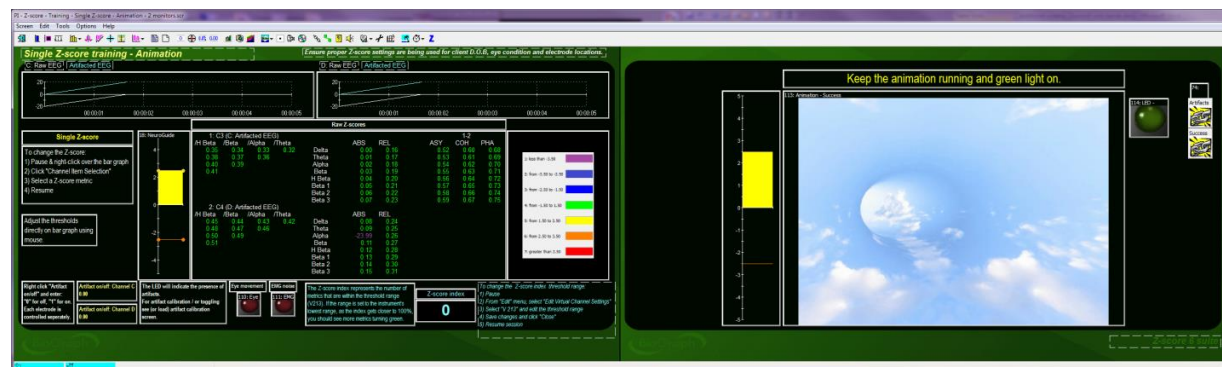
Training – Single Z-score – Animation – 2 monitors

This screen provides animation feedback related to a single Z-score metric. The animation responds to the z-score value (within threshold range ex -2.5 and 2.5). Bar graph provides color feedback (red outside threshold range, yellow inside the range). The metric can be changed on the fly (user instructions are described on screen). The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently). The Z-score instrument will display the values in different colors based on how far these values are from the norm (there is a color code available on screen).

4 channels



2 channels

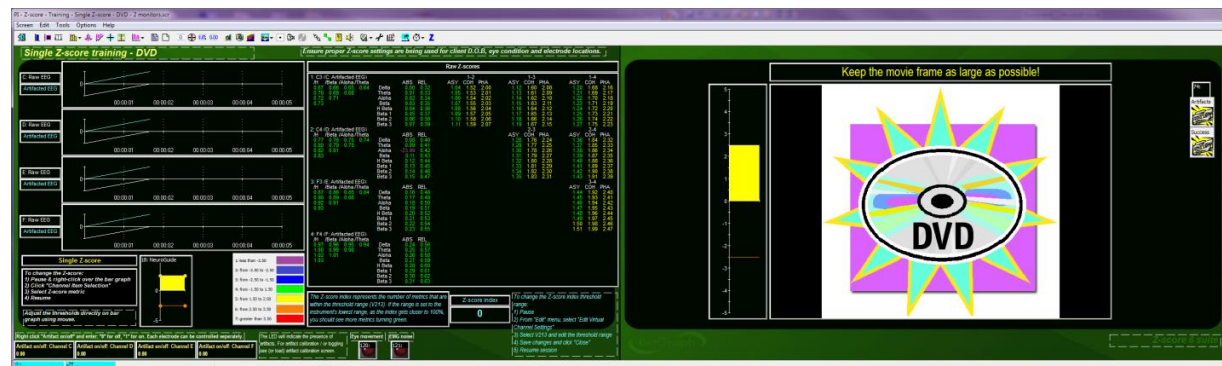


Training – Single Z-score – DVD – 2 monitors

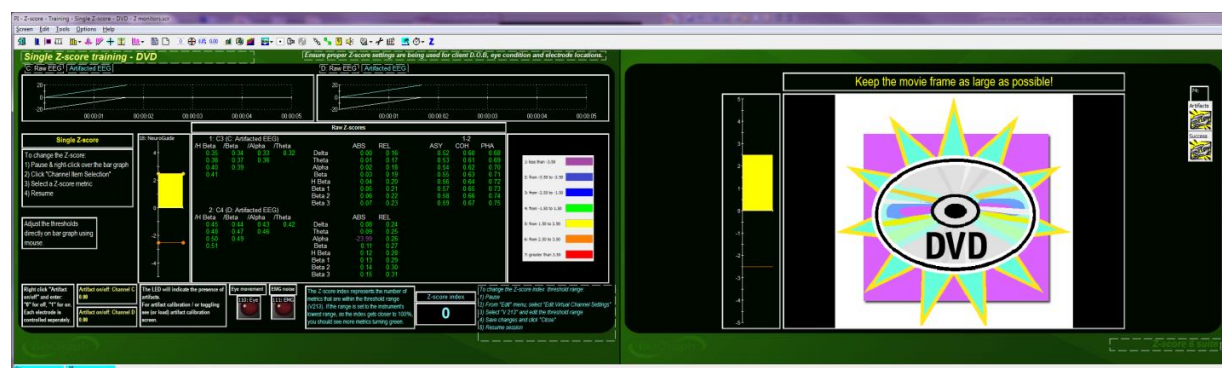
Same as previous screen with the exception that Green LED is removed.

This screen provides DVD feedback related to a single Z-score metric. The DVD grows with reward when the z-score value within threshold range ex -2.5 and 2.5 and shrinks otherwise. Bar graph provides color feedback (red outside threshold range, yellow inside the range). The metric can be changed on the fly (user instructions are described on screen). The two red LEDs on the screen will indicate the presence of artifacts (eye movement, EMG noise), and artifact rejection can be turned on or off in the lower left corner of the screen (for each electrode independently). The Z-score instrument will display the values in different colors based on how far these values are from the norm (there is a color code available on screen).


4 channels



2 channels

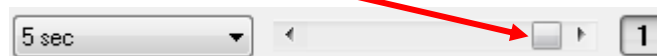




Reporting

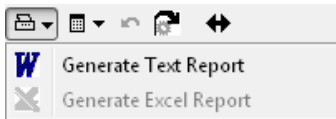
- After a script session ends or after you click the **Stop** button  to end an open session, a series of message prompts guides you through the process of saving data, adding notes to the session file, and switching to reviewing mode so that you can generate a session report. (A full explanation of this process is provided in [Stopping a Session](#) on page 22.)

Note: Instructions for [reviewing a session](#) by accessing it from the database are provided on page 24.

- After you switch to reviewing mode, the system calculates session statistics from the data and loads screens for artifact rejection and reporting.
- To display statistics for the full session on the **report screens**, drag the scroll bar to the extreme right.



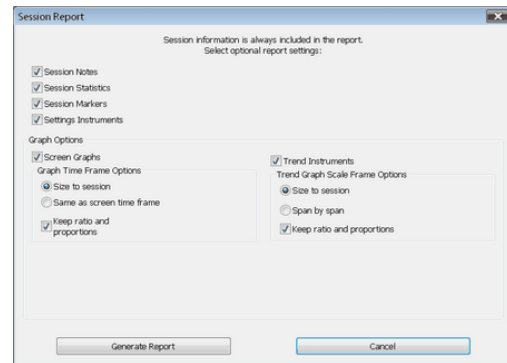
- To generate a session report in Microsoft Word, do the following:
 - If necessary, either perform [manual artifact rejection](#) on the recorded data or, if you have used the review mode [auto-rejection feature](#), verify the auto-rejected segments.
 - Optionally, if this is an open display session, from the **Options** menu select **Set Open Display Statistics** and choose channels for which statistics should be calculated.
 - Click the **Recalculate** icon  in the tool bar to recalculate the statistics.
 - If you have loaded more than one screen, open the screen from which you want to generate the report. Different screens can generate different reports.
 - Click the **Session Report** icon  in the tool bar and select **Generate Text Report**.



This opens the **Session Report** window, where you select components to include in the report for the selected session.

6. Select **Session Statistics** and other report components by placing check marks in the appropriate boxes.
7. Click **Generate Report** to generate the report. The document opens in the selected format.

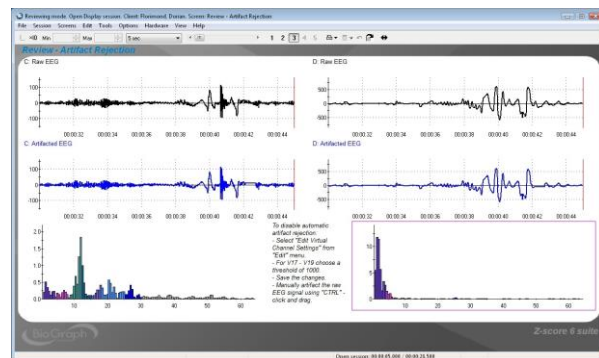
Note: *Microsoft Word and Excel, a PDF reader, and a web browser **must** be installed on your system for these functions to work.*



Report screens

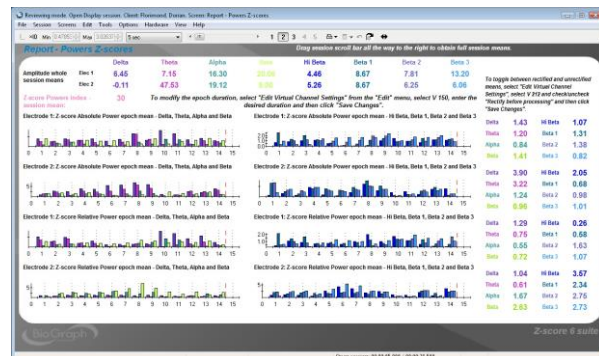
Artifact Rejection

This screen gives instructions on how to remove real-time artifact rejection and allows the user to reject segments that may be related to artifacts. Raw EEG, and artifacted EEG are displayed on single line graphs. 2D spectrum display available for each electrode.



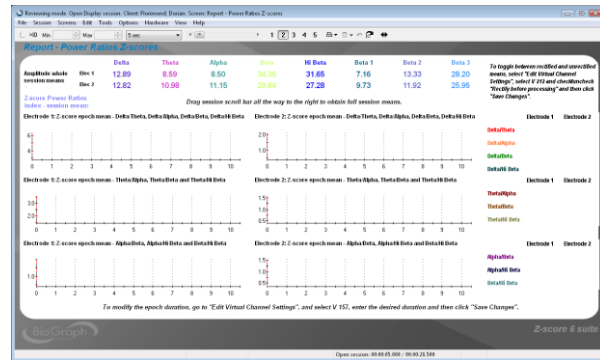
Report - Powers z-scores

This report screen includes trends of epoch means for all powers z-scores (relative, absolute, all bands, both electrodes), and their digital display, as well as session mean of powers z-score index. Full session means of EEG amplitudes are also included.



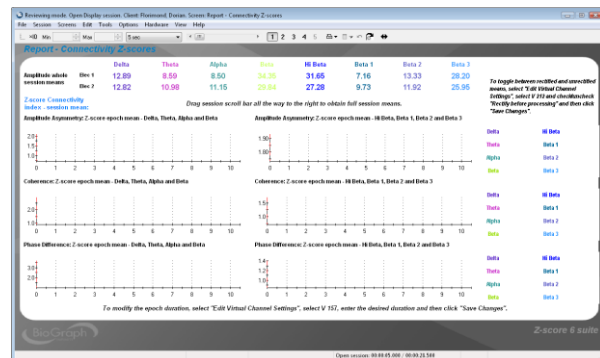
Report - Power Ratios z-scores

This report screen includes trends of epoch means for all power ratios z-scores (all ratios, both electrodes), and their digital display, as well as session mean of z-score power ratios index. Full session means of EEG amplitudes are included.



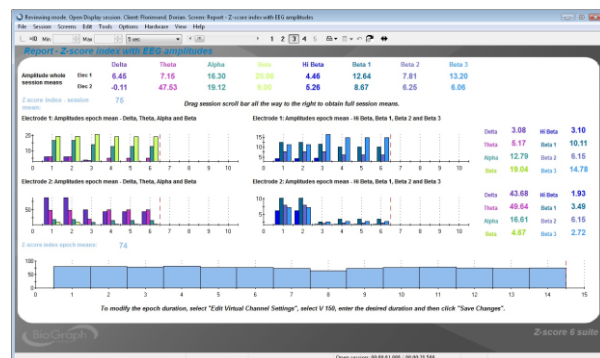
Report - Connectivity z-scores

This report screen includes trends of epoch means for all connectivity z-scores (all bands, coherence, phase and AA), and their digital display, as well as session mean of z-score connectivity index. Full session means of EEG amplitudes are included.



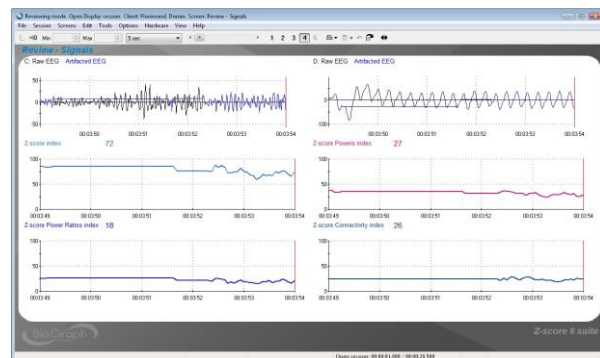
Report - Z-score index with EEG amplitudes

This report screen includes trends of epoch means for all EEG amplitudes (all 8 bands, both channels), and their digital display, as well as session mean of z-score index. Z-score index epoch means are also included on a trend graph.



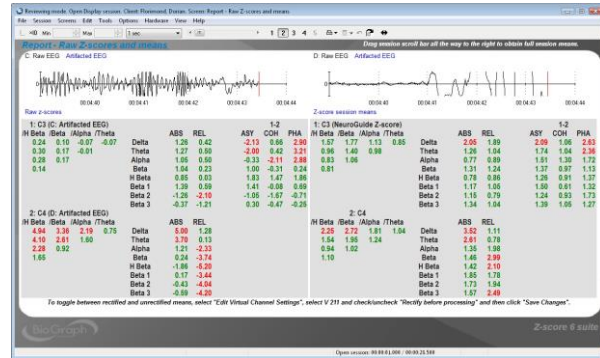
Review - Signals

This review screen includes multi-line graphs of raw EEG and artifacted EEG of each electrode. Four line graphs of z-score indices and numeric are also included.



Report - Raw Z-scores and means

This screen includes multi-line graphs of raw and artifacted EEG of each electrode. Two z-instruments displaying raw z-scores and rectified z-scores session means. The color change when the z-scores are not within the range (-2,..2) green inside the threshold and red when the values are outside. If the rectified means are not desired, instructions are available on how to uncheck this option.



Specifications and Support

Hardware Specifications

EEG-Z Sensor (SA9305Z)



Size (approx.)	37mm x 37mm x 12mm (1.45" x 1.45" x 0.45")
Weight (approx.)	25g (1oz)
Input impedance	10G Ω in parallel with 10pF
Signal input range	0 -200 μ V
Sensitivity	<0.1 μ VRMS
CMRR	>130dB
Channel bandwidth	2Hz - 1kHz
Accuracy	\pm 0.3 μ VRMS, \pm 5% of reading @10°C to 40°C

Placing Orders

Outside USA

Tel: 1-514-489-8251

Fax: 1-514-489-8255

In USA Toll-Free

Tel:1-800-361-3651

E-Mail: mail@thoughttechnology.com

Or contact your local authorized distributor.

Technical Support

Outside USA

Tel: 1-514-489-8251

Fax: 1-514-489-8255

In USA Toll-Free

Tel: 1-800-361-3651

E-Mail: techsupport@thoughttechnology.com

Or contact your local authorized distributor.

Warranty

The hardware (encoder and sensors) is guaranteed to be free from defects in material and workmanship for 1 year from the date of purchase.

In the unlikely event that repair is necessary, contact Thought Technology Ltd. to receive a Return Authorization number. Then send the unit back by a traceable method. Thought Technology will not be responsible for items not received. We will repair or replace your unit(s) that are still under warranty free of charge.

This warranty does not apply to damage incurred through accident, alteration, or abuse.

This warranty does not cover damage to the Infiniti encoder or the EEG-Z sensor caused by obvious mechanical mistreatment of the system.

Returning Equipment for Repair

Before returning the equipment, please contact first our service department and get an authorization number (RA number).



Canada and International +1 514 489-8251



USA 1-800-361- 3651



service@thoughttechnology.com

Then fill in the return form (the form can be found at the end of the manual). You must provide a detailed description of the problem you are experiencing, and your telephone/fax number and e-mail.

The unit(s) must be sent **postage prepaid** and **insured**, with proof of purchase to one of the addresses below.

All customs and duties charges will be billed to the customer if incurred by sending the unit to the **wrong** address.

In the USA, ship insured to:

Thought Technology Ltd.
Cimetra LLC
8396 State Route 9
West Chazy, New York
12992, USA

In Canada, ship insured to:

Thought Technology Ltd.
8205 Montreal/ Toronto Blvd. Suite 223
Montreal West, Quebec
Canada H4X 1N1

For international:

- Package must be marked "**Broker: Livingston International - 133461**".
- Ship insured to:
Thought Technology Ltd.
8205 Montreal/ Toronto Blvd. Suite 223
Montreal West, Quebec
Canada H4X 1N1

Repair Return Form

Be sure to call for authorization before returning any equipment!

Copy and complete this form and include it with the unit(s).

Include a copy of original invoice and return to the address in the **Returning Equipment** section.

Name

Company

Address

Phone No.

Fax No.

Date Purchased

From Whom

Model Name

Serial No.

Problem
