

Use of HEG with BrainMaster 2.5SE and 3.0

The March 10 release of the 2.5SE software supports the following functions with HEG from Biocomp Research Institute or Carmen Laboratories:

From Training/Control Screen:

Recording HEG data 120 or 256 samples/second

Display Text values of HEG sensor data and HEG value

Display scrolling trend window of HEG data (using Event Wizard)

Play MIDI sounds using selected voice, note plays when HEG rises 0.1 unit

Using popup windows:

Display 30 second “wiping” trend of HEG data with variable scale and offset

Display 30 minute “wiping” trend of HEG data with variable scale and offset

Control of MMP Multimedia player using animations, sound files, or CD's

Control of Flash Player, using BrainBars, BrainMan, and BrainCell games adapted for HEG.

Control of contributed games (Puzzle, Space, Cricket, and Bug Run all work with HEG)

Ability to program new protocols using Event Wizard, using built-in starting files.

To operate the system with these capabilities, use the new built-in settings file in a new or existing Trainee/Study Folder.

To use an existing folder, select “View or Change Settings” then select “HEG with Trend Graph and MMP and Flash and Games Working”. From the “Read/Write Settings File” control panel and press “Read in settings from this file”.

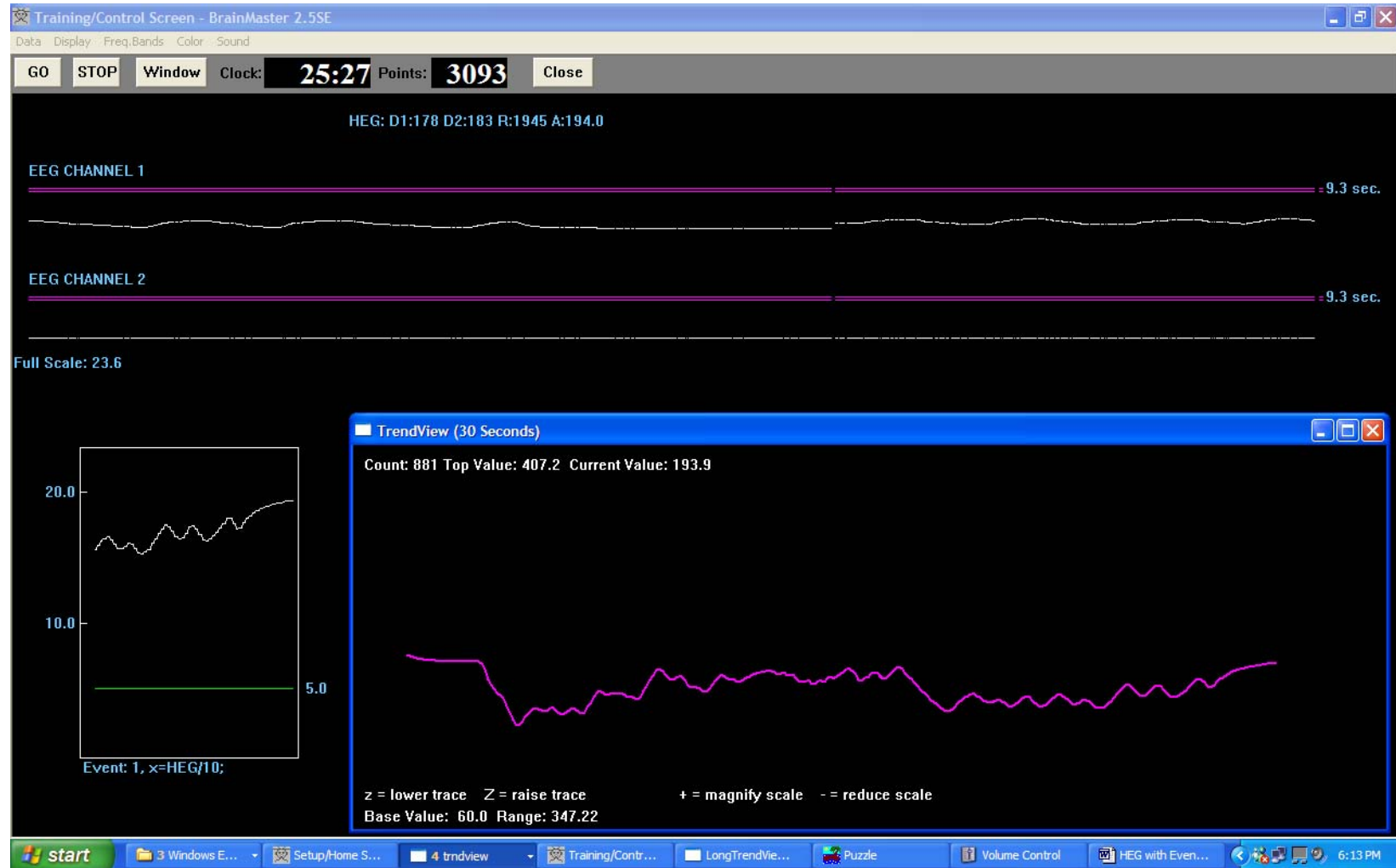
To use a new folder, first create a “working” folder using “Folder Selections” and then select the above settings file when prompted by the New Folder – Select a Settings File control. The settings file is “HEG with Trend Graph and MMP and Flash and Games Working”

Once you start the training screen and get the system running, you can select panels from the “Display” menu pulldown, and you can launch windows from the “Window” control panel. The two raw traces on the EEG panel are the LED data from the HEG headband, and can be monitored to ensure that they are clean and stable.

The installation instructions for the HEG hardware and software can be found at the end of this document.

NOTE: This device should be used by or under the supervision of a biofeedback clinician.

HEG with 2.5SE and 3.0 software



BrainMaster HEG with “Event Trend” panel (lower left) and TrendView 30-second Window (lower right)

NOTE: *This device should be used by or under the supervision of a biofeedback clinician.*

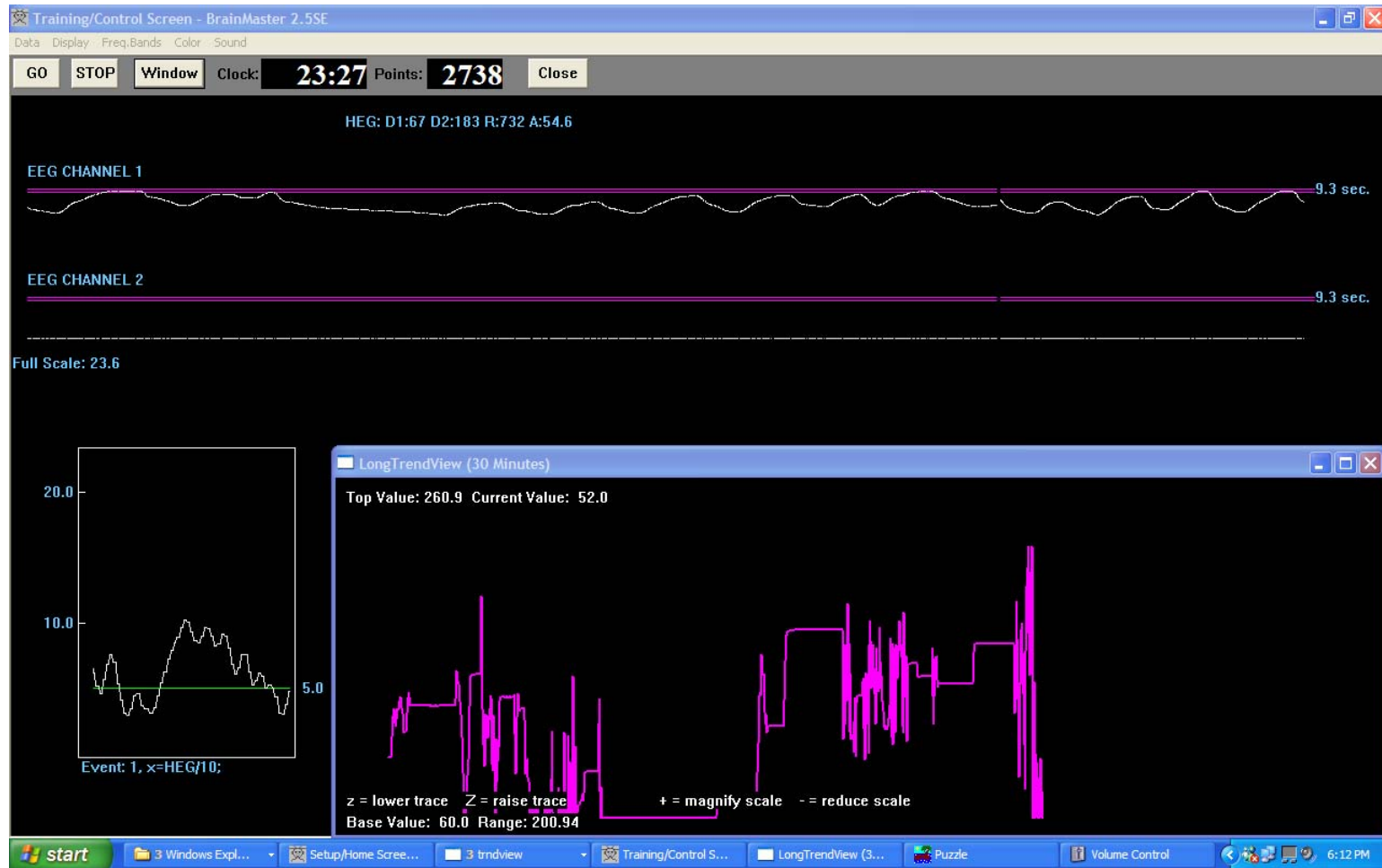
HEG with 2.5SE and 3.0 software



BrainMaster HEG with MMP Multimedia Player. Animation moves and music plays whenever signal rises.

NOTE: *This device should be used by or under the supervision of a biofeedback clinician.*

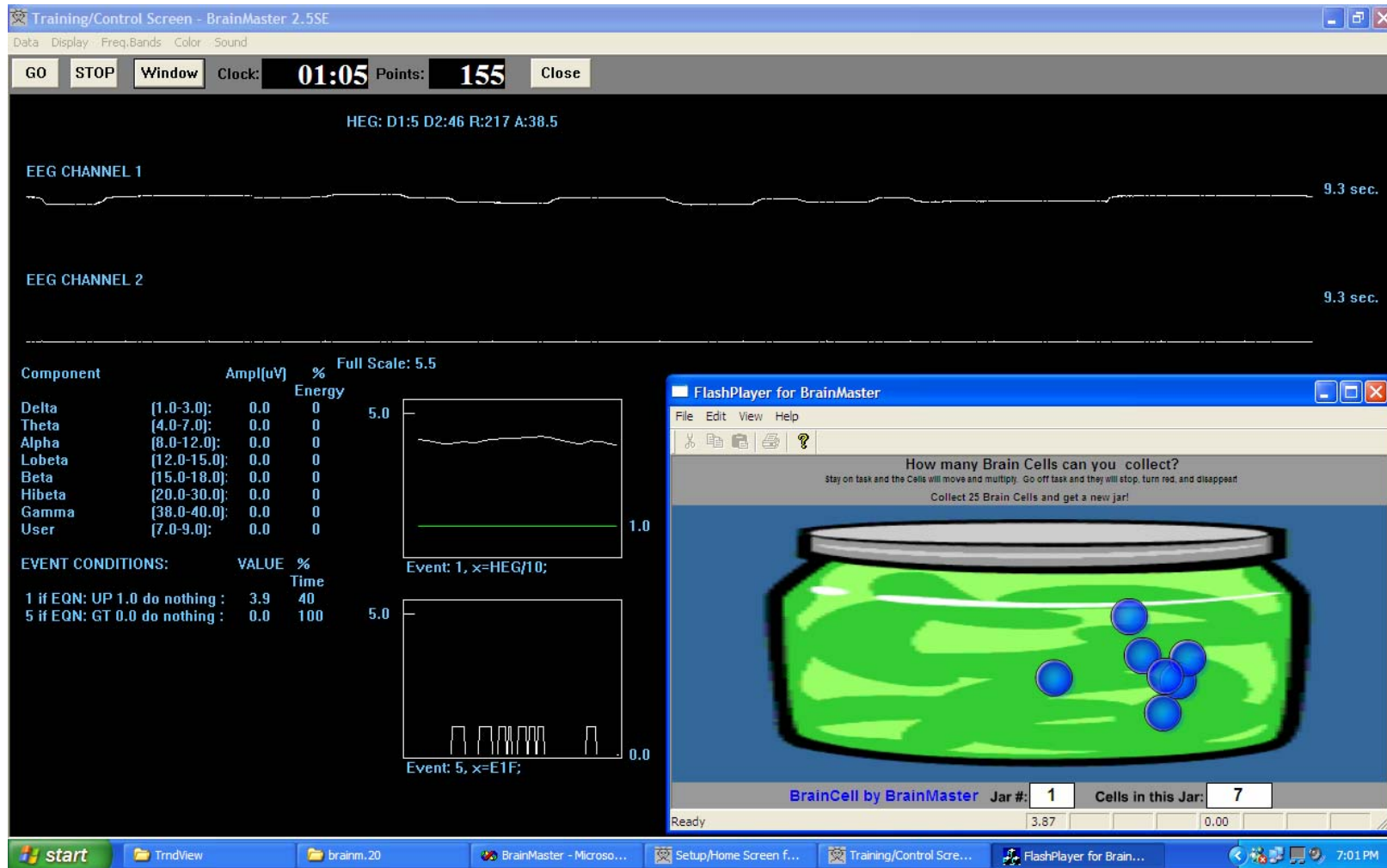
HEG with 2.5SE and 3.0 software



BrainMaster HEG with “Event Trend” panel (lower left) and LongTrendView 30-minute Window (lower right)

NOTE: This device should be used by or under the supervision of a biofeedback clinician.

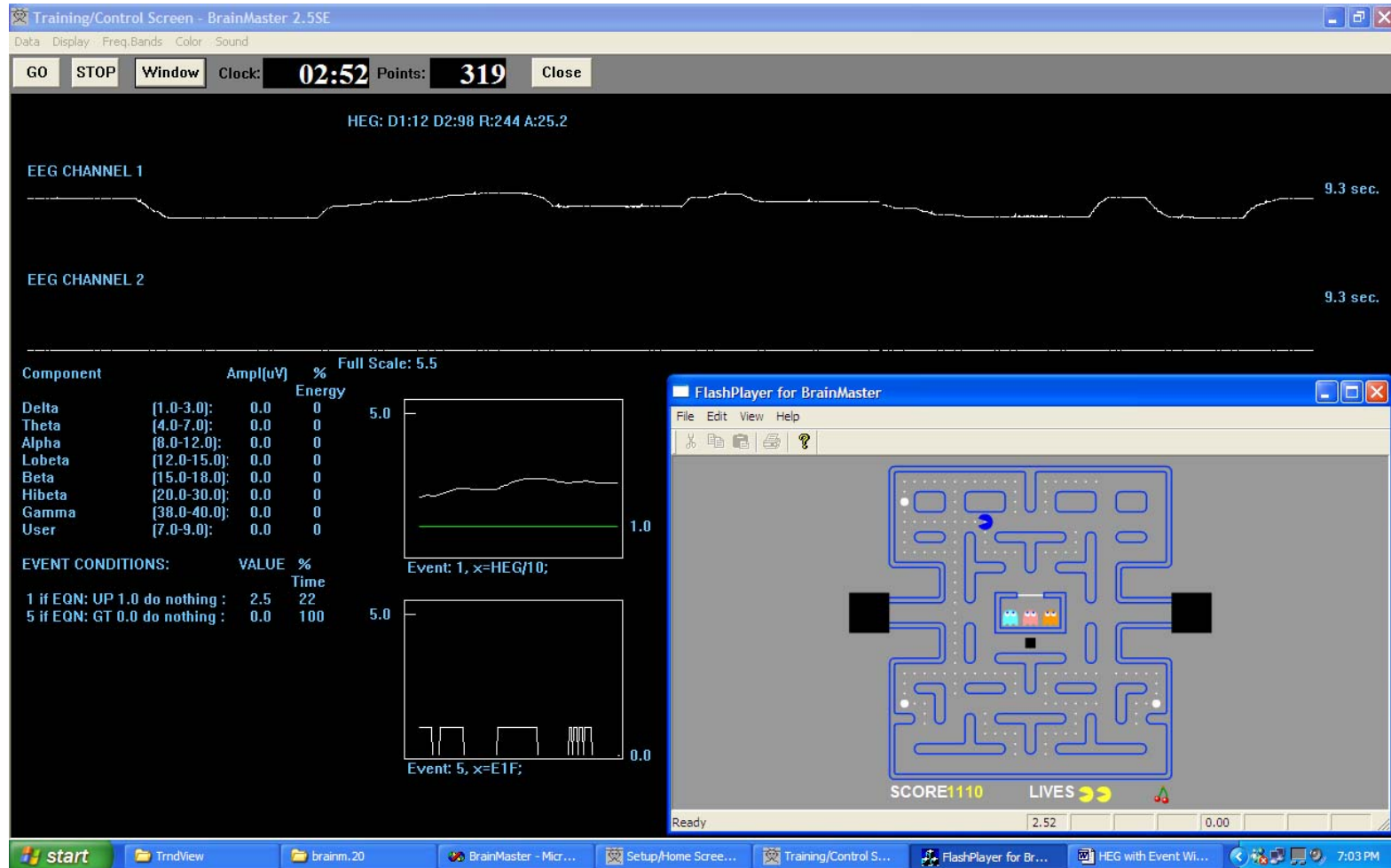
HEG with 2.5SE and 3.0 software



BrainMaster HEG with TextStats and EventTrend panels (lower left) and BrainCell game (lower right). BrainCells automatically grow and move whenever the HEG signal rises.

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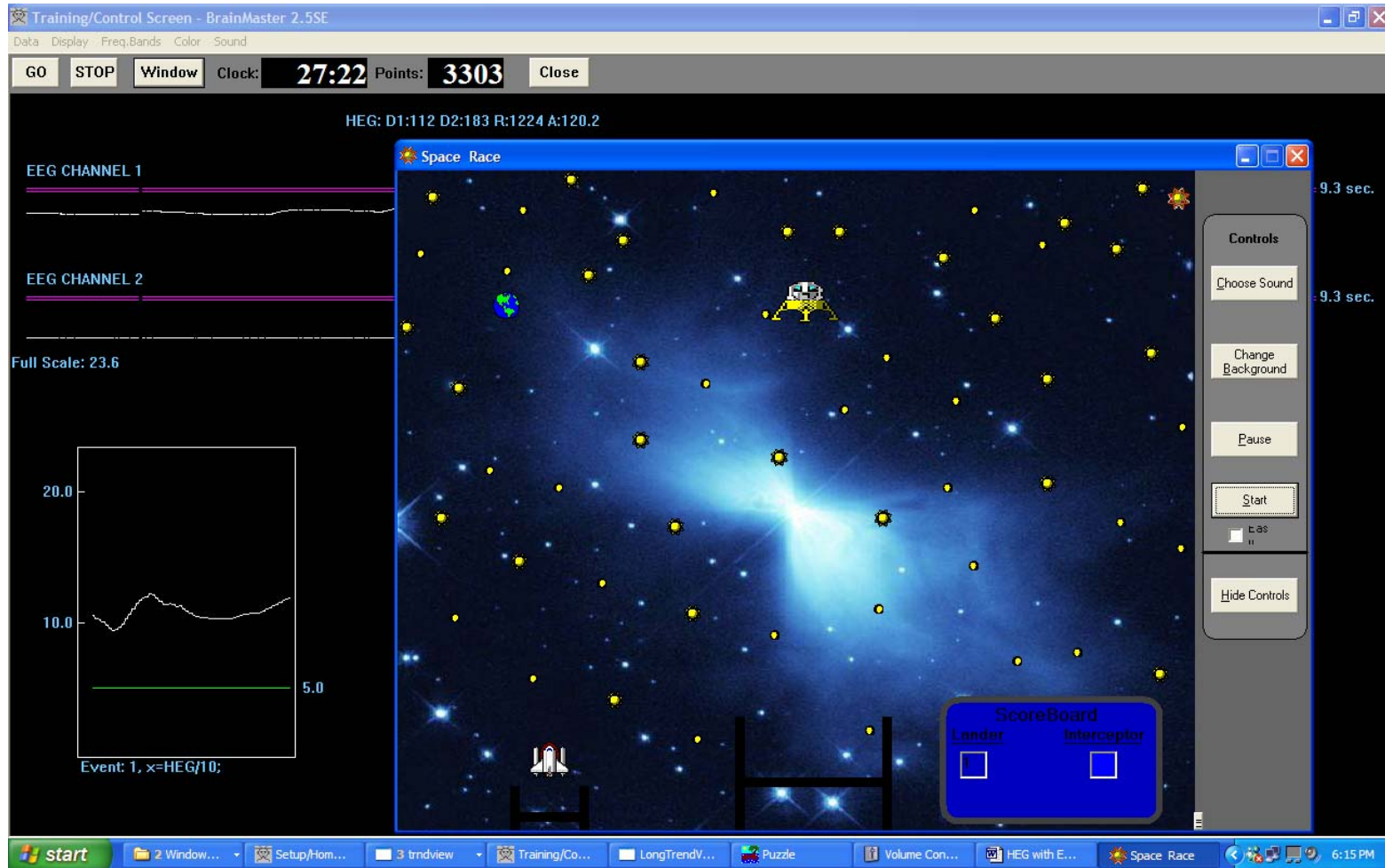
HEG with 2.5SE and 3.0 software



BrainMaster HEG with TextStats and EventTrend panels (lower left) and BrainMan game (lower right). BrainMan automatically moves whenever the HEG signal rises.

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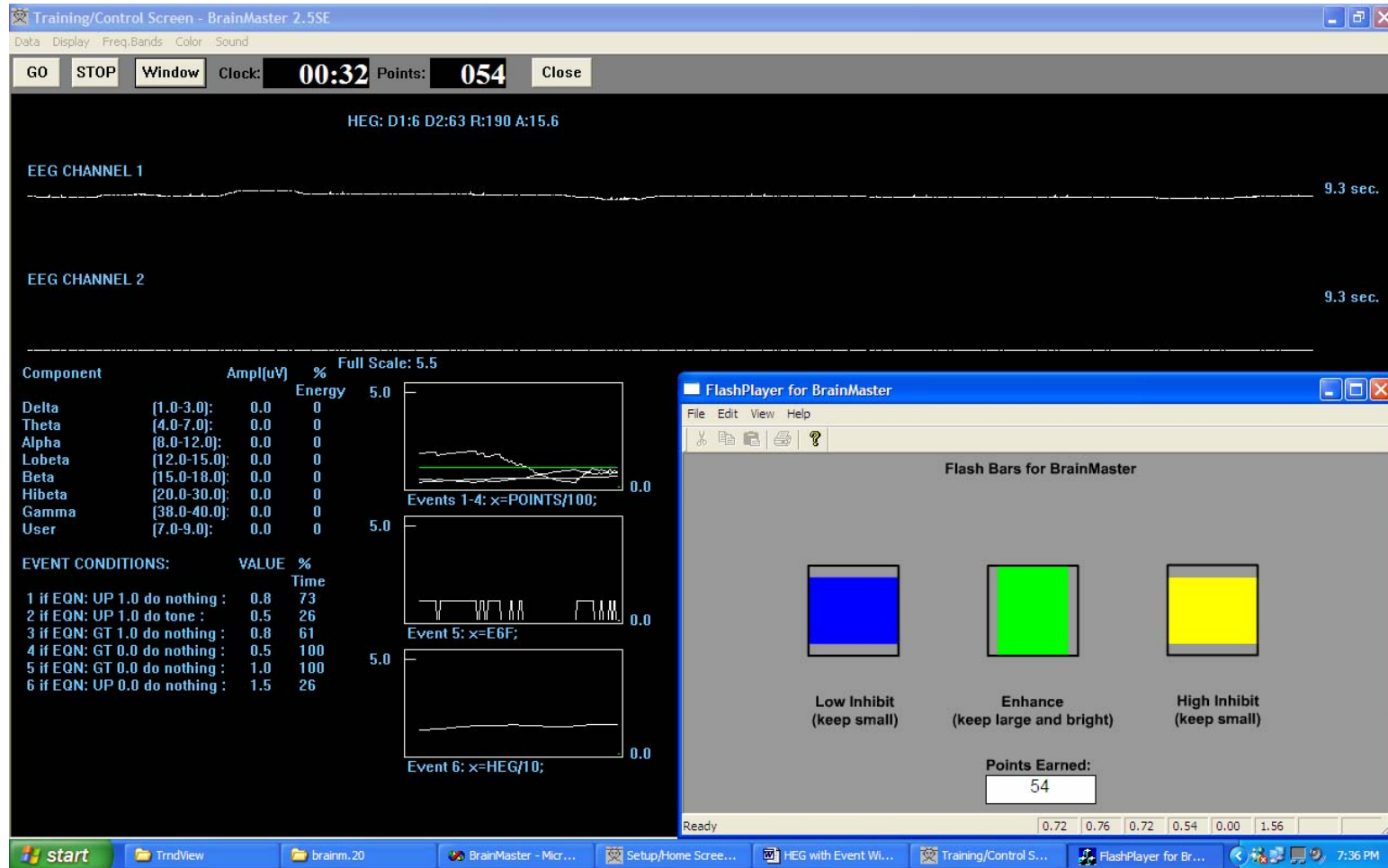
HEG with 2.5SE and 3.0 software



BrainMaster HEG with Event Trend panel (lower left) and George Martin's Space game. The spaceship rises when points are being earned (the HEG signal rises), and the interceptor rises when points are not being earned.

NOTE: This device should be used by or under the supervision of a biofeedback clinician.

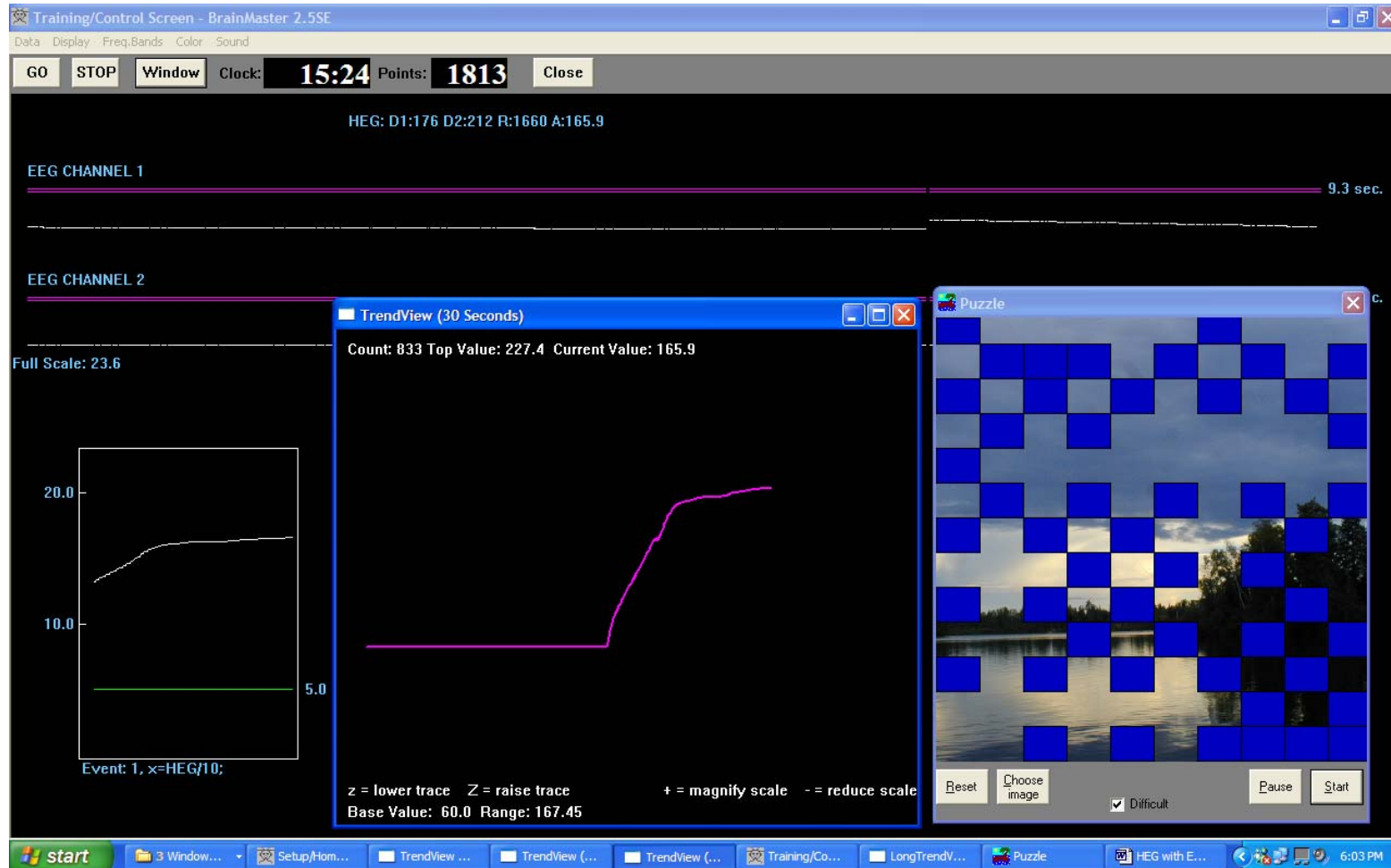
HEG with 2.5SE and 3.0 software



BrainMaster HEG with Flash game BrainBars working. The center bar grows, and the side bars shrink, whenever the HEG signal increases

NOTE: This device should be used by or under the supervision of a biofeedback clinician.

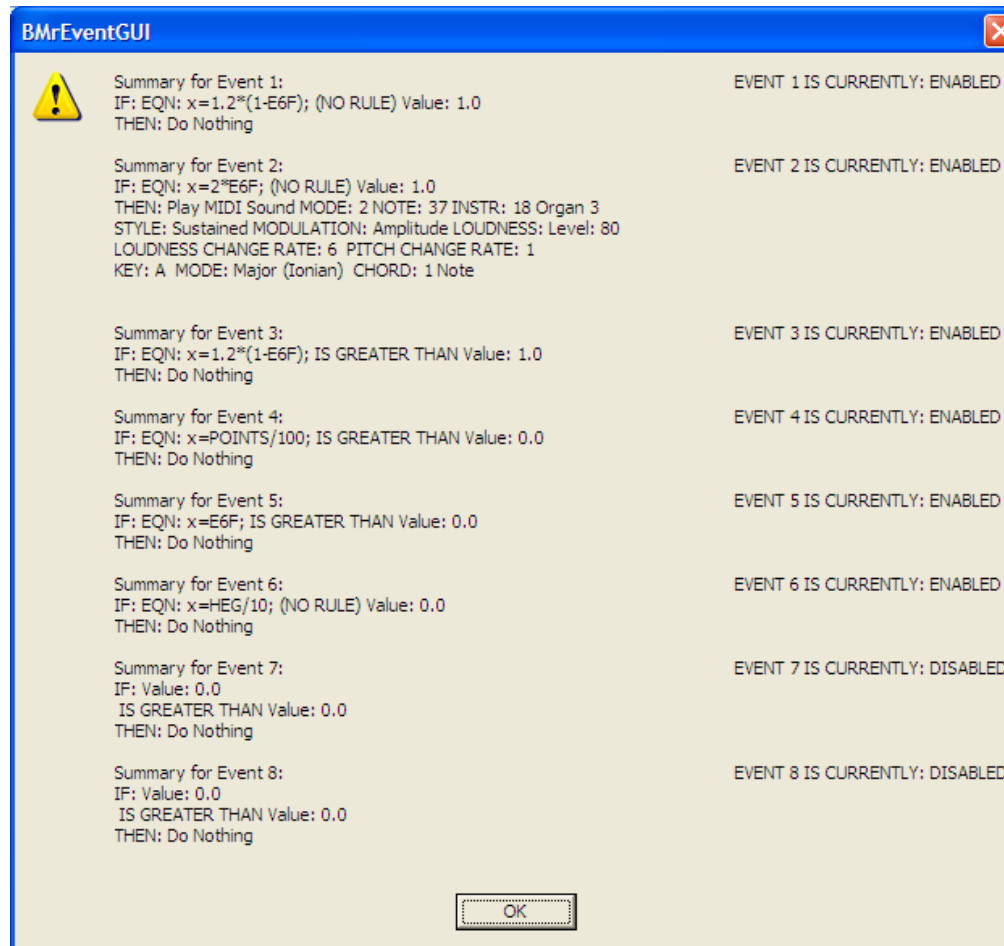
HEG with 2.5SE and 3.0 software



X

BrainMaster HEG with George Martin's Puzzle game. A new square is earned whenever a point is awarded (the HEG signal rises).

NOTE: This device should be used by or under the supervision of a biofeedback clinician.



Event Wizard design for HEG to control the Flash Games. Event 6 is used to bring in the HEG data. Events 1, 2, and 3 control the BrainBars game by creating appropriate variables based upon Event 6's state. Event 4 brings in the score for display in BrainBars. Event 5 is used as a switch to control BrainMan and BrainCells.

NOTE: This device should be used by or under the supervision of a biofeedback clinician.

AUX/HEG Interface Installation Instructions

Introduction

The following is the procedure for using the AUX interface of the BrainMaster, when used with the HEG (hemoencephalograph) equipment provided by the Biocomp Research Institute (Los Angeles, CA), or Carmen Research (Manlius, NY) in conjunction with the BrainMaster 2E module. The BrainMaster 2E module must be factory modified to work with this equipment. Equipment modified in this way is capable of normal EEG operation, and is also capable of use for AUX measurement and feedback. Note that only one mode may be used at a time. In other words, at any given time, either EEG or AUX may be used, but not both at the same time.

Note: The BrainMaster used in this way is **only providing an interface**, via the AUX port, to the Biocomp HEG equipment. The software support to provide the measurement and feedback has been developed in accordance with specifications provided to BrainMaster by the HEG providers. This is intended as an adjunct or assistive technique to conventional EEG feedback training. BrainMaster makes no specific claims or warranties relative to the use or effectiveness of the HEG measurement.

NOTE: This device should only be used by or under the supervision of a biofeedback clinician or professional health care provider.

Manner of Use

This interface requires the BMT (“Basic Modules for Training”) version 2.5SE or later software. The 3.0 release with the latest updates is recommended.

In order to use the AUX/HEG capability, follow the following procedure:

Install the BrainMaster software on your PC.

Attach the HEG equipment to the BrainMaster 2E module using the connector and cables supplied by BioComp. The HEG system connects via a special adapter that is plugged into the serial connector on the rear panel of the BrainMaster 2E module. This provides both a connection to the HEG system, and the connection to the computer.

NOTE: This device should be used by or under the supervision of a biofeedback clinician.

HEG with 2.5SE and 3.0 software

Place the HEG headset on the head as directed by your clinician.

Arrange the cable in a convenient fashion, so that it leads from the headset to the equipment without being in the way of your face, the keyboard or mouse, etc.

Start the BrainMaster software in the normal manner using the BSetup shortcut on your computer Desktop.

Click on the “Folder Selections” button.

On the Select Trainee/Study Folder dialog, select the folder named “test” on the list.

Press the “OK” button.

The Current Trainee/Study should now show “Standard Test Study” as the name.

Press “View or Change Settings”

Press “Read/Write a Settings File”

Scroll down and select a settings file that begins with “HEG”

Press “Read Settings from This File”

Press “Use These Settings”

Press the “Run the Next Session” button.

On the “Preparing to Begin Session” dialog, press “OK”.

On the “Begin Training Session” dialog, press “OK”.

The BrainMaster Training Screen will appear.

Press the “GO” button.

On the “Current Date” dialog, press “OK”.

On the “Ready to Start” dialog, press “OK”.

NOTE: This device should be used by or under the supervision of a biofeedback clinician.

The BrainMaster software will now attempt to establish communication with the module, and begin data acquisition. You will see some summary text on the BrainMaster screen, while this occurs. If this is successful, you will shortly see a dialog that says:

“System is Running!”.

If the system is not able to communicate with the module, you will see a popup dialog that describes the problem.

Note that since this is a “demo” folder, it will rerun session 1 each time you use the software. Thus, it will not save the sessions in a row, allowing you to compare sessions.

If you want to set up a folder for your HEG work that will save session, you must create a new folder using the Folder Selections dialog. Then, when selecting the protocol, choose “HEG” and it will load in settings suitable for HEG. Go to Session Control and change the number of sessions to what you want, e.g. 40. This will set up a folder that will save the sessions in a row, allowing you to review you results.

Troubleshooting Problems

If it says “Module is not Responding,” there may be any one (or more) of several possible problems, including the module, the cable, the selection of the proper COM port, the Windows configuration, etc.

If the dialog says “Error opening port,” then there are possible problems including the Windows configuration, the presence of other software (such as Palm Pilot or other software), or other issues. Please contact Biocomp Research Institute or BrainMaster if you are not able to easily get your system operational to this stage.

In either of the above cases, it makes sense to change the COM port selection and attempt to use a different COM port number. Every PC is different, and we do not know your PC’s COM port number. It is most likely COM1 through 8. It can be changed by using the menu selection under the “Source” menu on the top of the Training Screen. Try using other COM port numbers to see if you can identify and use the correct port number.

We recommend that you use the “Find COM Ports on this PC” control that is on the “Data Channels” control panel. This panel can be accessed via the “View or Change Settings” control panel, by pressing the “Data Channels” button.

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Once the BrainMaster is operating the HEG system, you will see two lines “wiping” across the screen. These are not for the user to use for training, but only show the raw data that the HEG system is sending to the PC. These lines should be smooth and possibly changing in a stepwise fashion. They should not be jerky or erratic. If they are jagged, then there is some problem with the data acquisition.

Forms of Feedback

The BrainMaster software is set up to provide three forms of useful feedback for AUX/HEG users, per clinical guidance. These are text, graphics and sound, as described below.

Text: IN the “report” area located beneath the “Points” counter and “Close” button on the Training Screen, there will be an ongoing textual display of the HEG data. This display will be formatted as in the following example:

D1: 240 D2: 40 R: 125 A: 125

The two values D1 and D2 are the readings from the LED’s (light emitting diodes) in the Thinking Cap. These are provided for help in testing, and verifying that the equipment is working as intended. The value “R” is the ratio between them, scaled to provide HEG units. The number after the “A” label is the averaged HEG value. This is intended to show the current useful HEG value, and should be between 80 and 140. The user can watch this number, to see the current level of HEG, and see the rising and falling of the value in real time.

Sound: The BrainMaster “hegtest” folder is designed to provide a percussive “xylophone” sound that goes up in pitch as the HEG value increases. It is also designed to only play notes when the HEG is rising. The user should thus hear a series of notes that always step upward in pitch, and indicate the rising levels of HEG values.

Graphics: The HEG graphic display is accessed as follows:

When the Training Screen is running and HEG is working, press the “Window” button.
Press the “TrendView” button.

You will see a Trend Graph that runs from left to right across the screen, with a 1-minute duration. It shows the HEG is a live (real-time) display with time as the “x” axis and HEG value as the “Y” axis. It starts its display at the value 60. Per your clinician’s instructions, you may use the “+” and “-“ keys to increase or decrease the display scale. Press “+” until the moving line is near the top of the screen, thus providing maximum display resolution. If the line moves off the top of the display window, press “-“ until it is again visible.

NOTE: This device should be used by or under the supervision of a biofeedback clinician.

Application Considerations

For details of the HEG measurement, refer to material provided by Biocomp Research Institute, including:

Toomim, H. (2002) Neurofeedback with Hemoencephalography (HEG), Explore! Vol. 11 No. 1.
Product and training material available from Biocomp Research Institute

Clinicians advise that trainees should use a combination of listening to the sounds, watching the text value, and observing the Trend Graph, in the course of HEG training. Follow the clinician’s instructions to use this system, as a form of biofeedback that is sensitive to the HEG value, for the benefits described by your clinician.

There is a “damping factor” that can be adjusted, by changing the value of the “artifact threshold” in the Data Channels popup dialog. This factor is a number that determines the proportion of the previous HEG average, that is computed into the new value. The formula combines the “old” value with the “new” value, to produce the new “average” value. This factor is used as follows:

“Artifact Threshold”	Formula for new HEG “A” value
0	$A = \text{new}$
1	$A = (\text{new} + \text{old}) / 2$
2	$A = (\text{new} + 2 \times \text{old}) / 3$
3	$A = (\text{new} + 3 \times \text{old}) / 4$
10	$A = (\text{new} + 10 \times \text{old}) / 11$
100	$A = (\text{new} + 100 \times \text{old}) / 101$
n	$A = (\text{new} + n \times \text{old}) / (n + 1)$

From this it can be seen that a larger value of Artifact Threshold will produce a more damped response, thus making the A value more stable, but also slower to change. Typically, values between 10 and 100 are recommended for this control.

The software reads and updates the values 30 times per second. This determines the speed of the response. Due to the update formula, the system will have an “exponential” response, so that it gradually approaches the final value. Experiment with various values of this threshold to find one that provides a rapid enough response for biofeedback purposes, without having excessive variation (wandering or noise) in the signal.

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