

BrainMaster[™] System
Type 2E Module & BMT Software for Windows[™]

Popup Display Windows
for Master.exe

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U.S. Patent Number 5,899,867

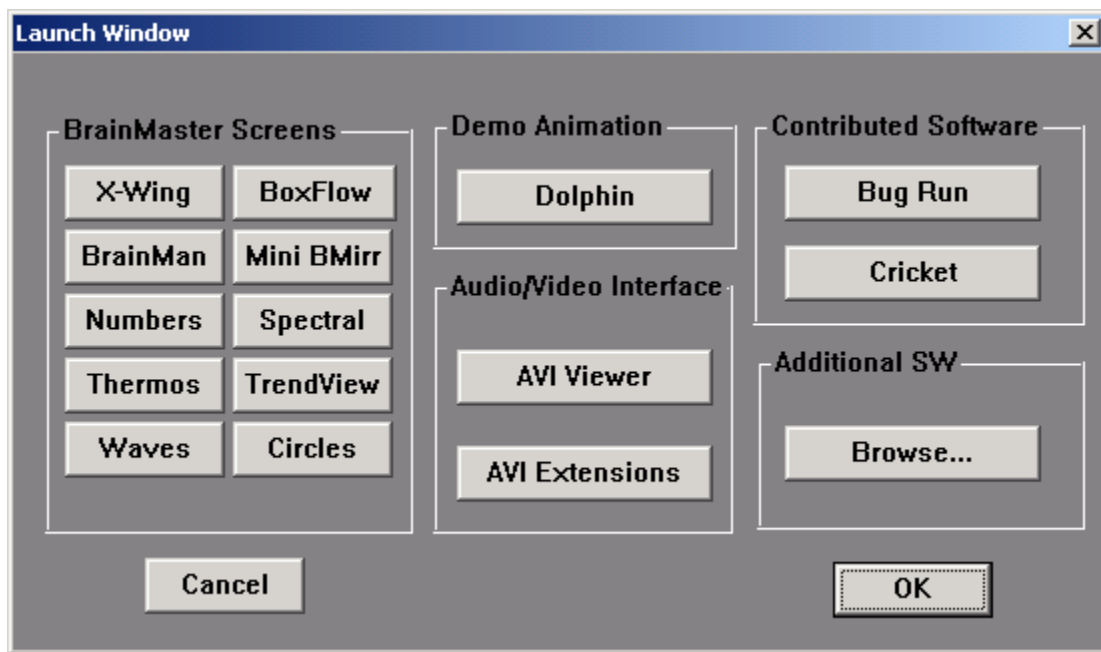
1. Accessory Windows

This section describes the accessory “windows” that can be launched from the BrainMaster training screen. These are independent windows that can be resized, minimized, maximized, and moved. They can even be dragged onto a second (or third) display monitor on computers that are equipped with more than one monitor.

These programs are written using the BrainMaster “DLL” interface. They provide examples of the types of programs that can be written to this interface. We are also happy to show users how to write their own programs of this type. Most display windows can have their scale changed by using the “+” and “-“ keyboard keys. This will change the display scale to make the features larger or smaller, but will not change the EEG processing.

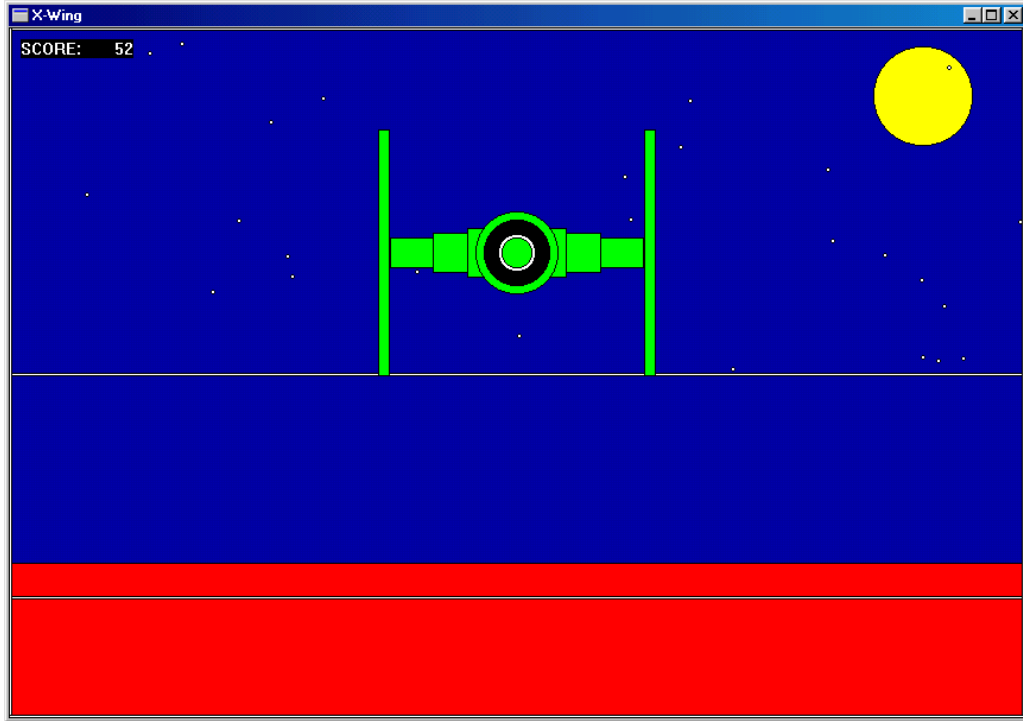
Most display windows also accept typing input to adjust thresholds, in the same manner as the Training Screen. For example, “t” will increase the Theta threshold, and “T” will decrease it. They will not adjust the “targets” when using autothresholding, but will always adjust the thresholds themselves. They are useful for making temporary changes in thresholds, even when autothresholding is used. Simply type the appropriate key while one of the accessory windows is the “current” (top) window, to use this feature.

All Windows can be activated using the Windows button on the Training Screen. This will bring up the Launch Window control:



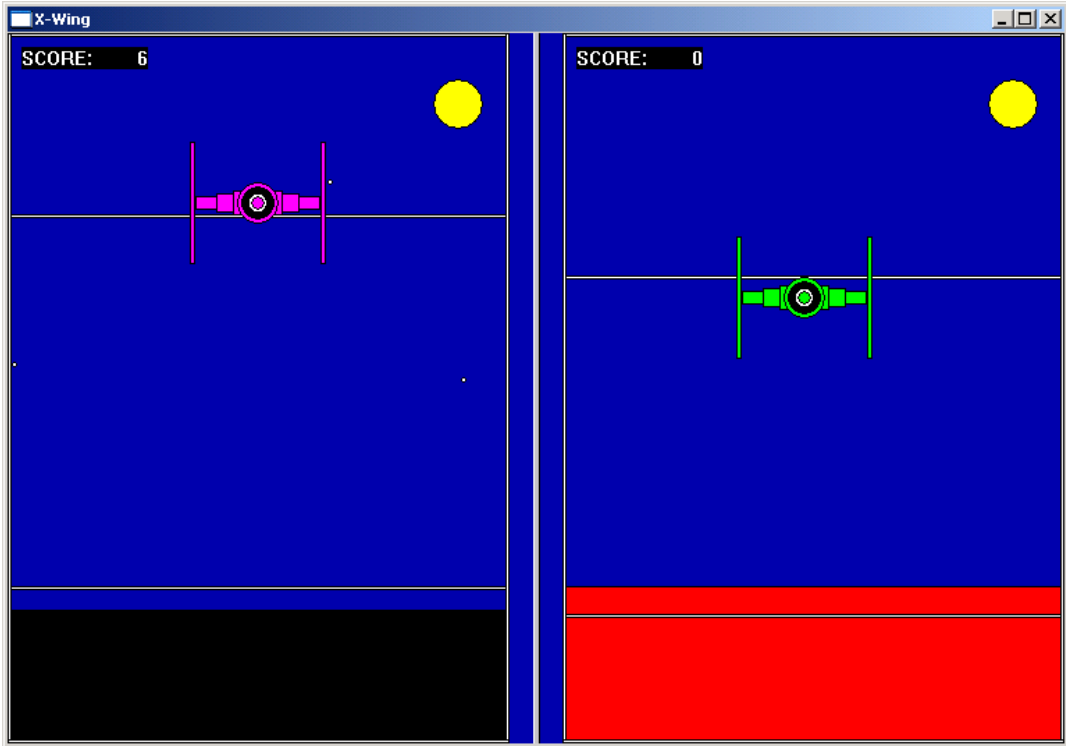
1.1 Xwing Window

This window shows the “Xwing” game screen.



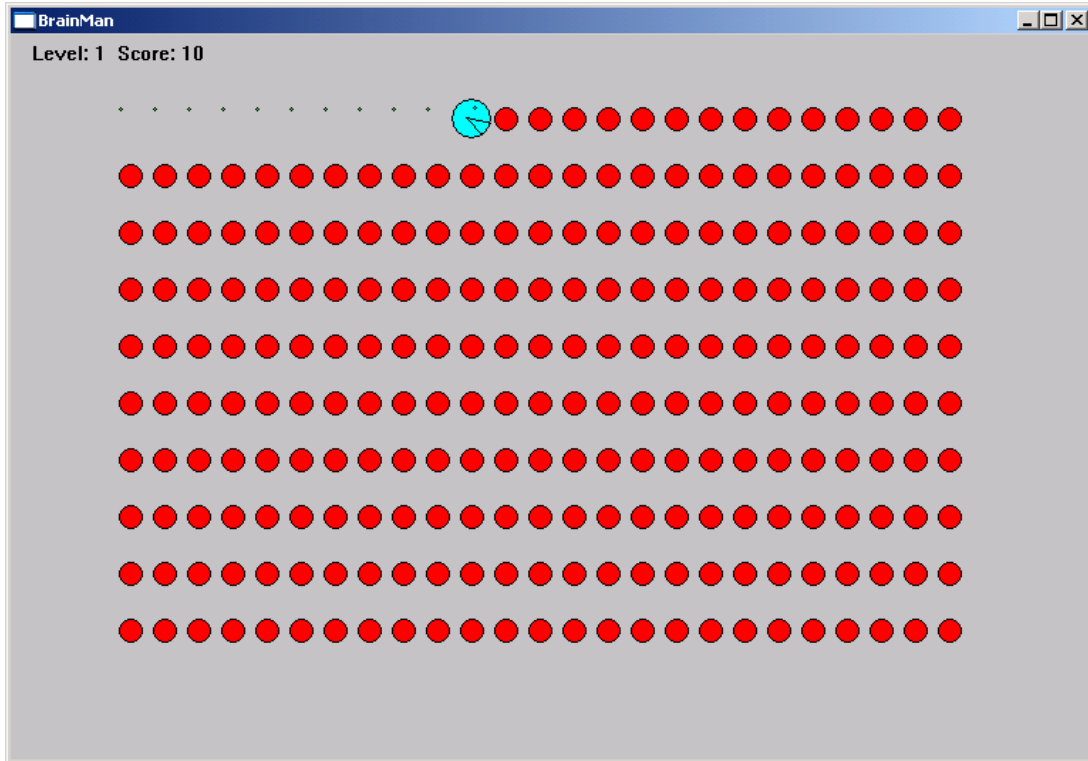
The space ship will rise when the reinforced component (e.g. lobeta or beta) is high, and the ground will rise when the inhibited component (e.g. theta) is high. Both thresholds are shown as lines on the screen. When a point is scored, the spaceship will briefly turn red, and the point will be registered in the indicator area.

When two channels are trained, this window shows two space ships, with the left panel showing channel 1, and the right panel showing channel 2, as shown:



1.2 BrainMan Window

The following is the BrainMan training window.



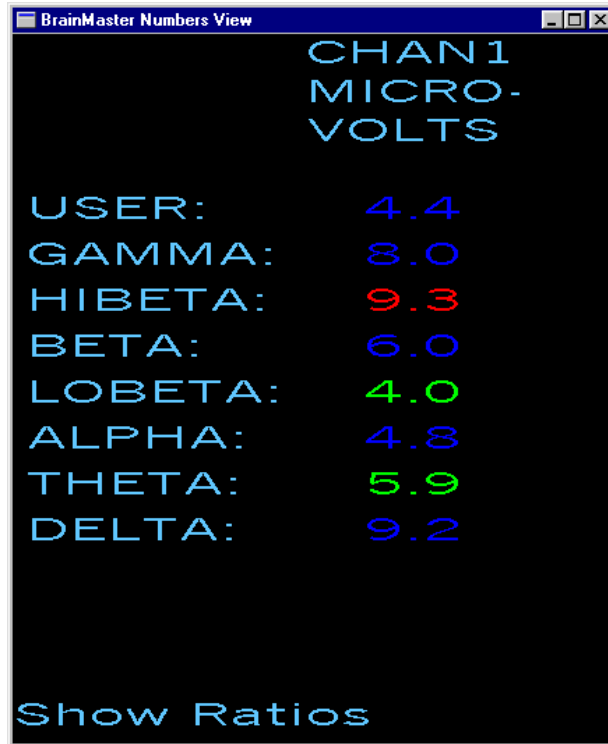
The Brain-Man game runs in its own window, independent of the training screen. This window can be resized or moved. It can be moved to a second (or third, etc) monitor on a Windows 98 system that is equipped with multiple monitors.

Brain--man will advance 1 point for each target "hit." Since the what constitutes a "hit" is determined by the setup of the Thermometer system, the exact criteria for causing the pac-man to move can be set up in any desired fashion, such as alpha-wave reinforcement, beta-wave reinforcement, etc.

Whenever an inhibited component is over its threshold (such as theta), the Brain-Man will turn blue, signaling the trainee.

1.3 Numbers Window

This window shows the current values of the components.



This screen shows numeric values for each component. “Go” components are shown in green, “stop” components are shown in red, and others are shown in blue. The values are “damped” so they do not change too quickly. Thus provides a very useful display, for monitoring ongoing progress. This window can be sized to any desired size and shape.

Ratios to theta can be shown by selecting the bottom text with the mouse:

	CHAN1 MICRO- VOLTS	RATIO
USER:	5.1	1.2
GAMMA:	9.2	0.6
HIBETA:	9.6	0.6
BETA:	5.7	1.0
LOBETA:	4.8	1.2
ALPHA:	4.8	1.2
THETA:	5.9	1.0
DELTA:	8.3	0.7

Hide Ratios

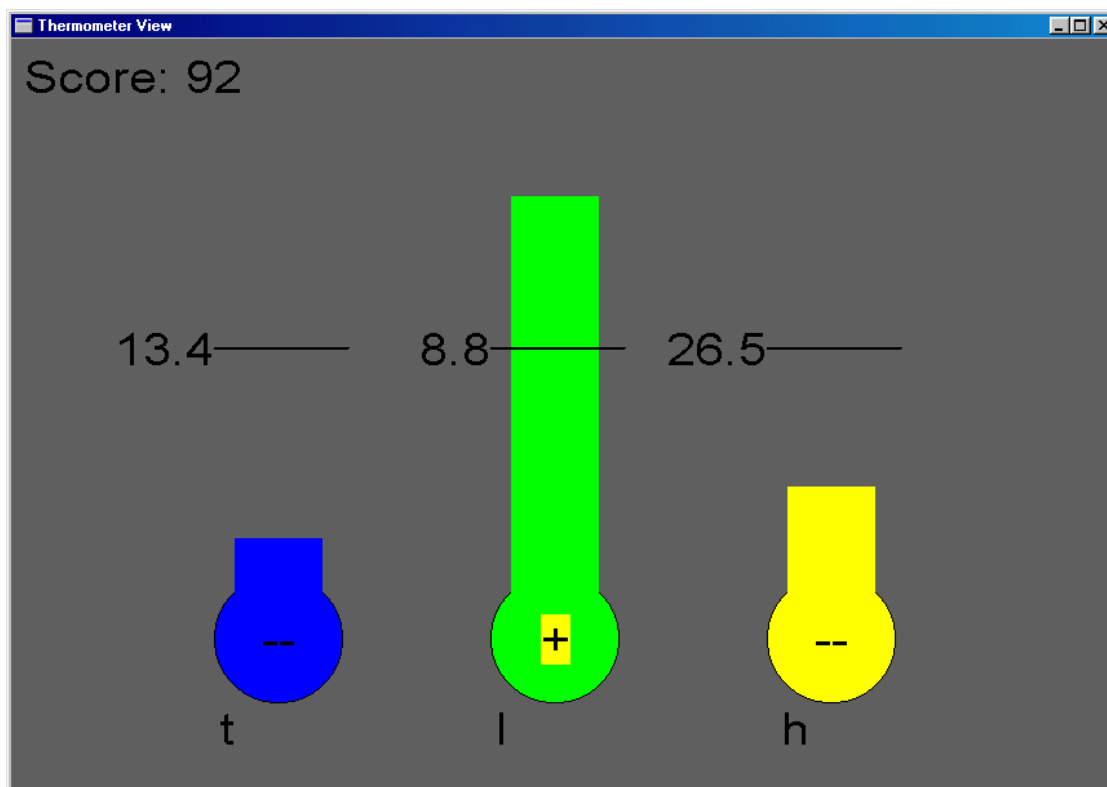
In 2-channel mode it shows both channels:

	CHAN1 MICRO- VOLTS	CHAN2 MICRO- VOLTS	COHER- ENCE
USER:	8.5	6.5	0.0
GAMMA:	9.1	8.7	0.0
HIBETA:	7.9	6.6	0.0
BETA:	4.2	4.8	0.0
LOBETA:	3.4	3.4	0.0
ALPHA:	4.8	6.0	0.0
THETA:	5.8	5.0	0.0
DELTA:	6.9	6.7	0.0

Show Ratios

1.4 Thermometer Window

This window shows enlarged thermometers with threshold information:



This window shows each of the major EEG component intensities as a bar graph with real-time response. This window is the foundation of the biofeedback reward method. Whether or not this window is being viewed, the thermometers and their associated controls define the operation of the biofeedback subsystem. Note that untrained (“ignored”) components will not appear in this window.

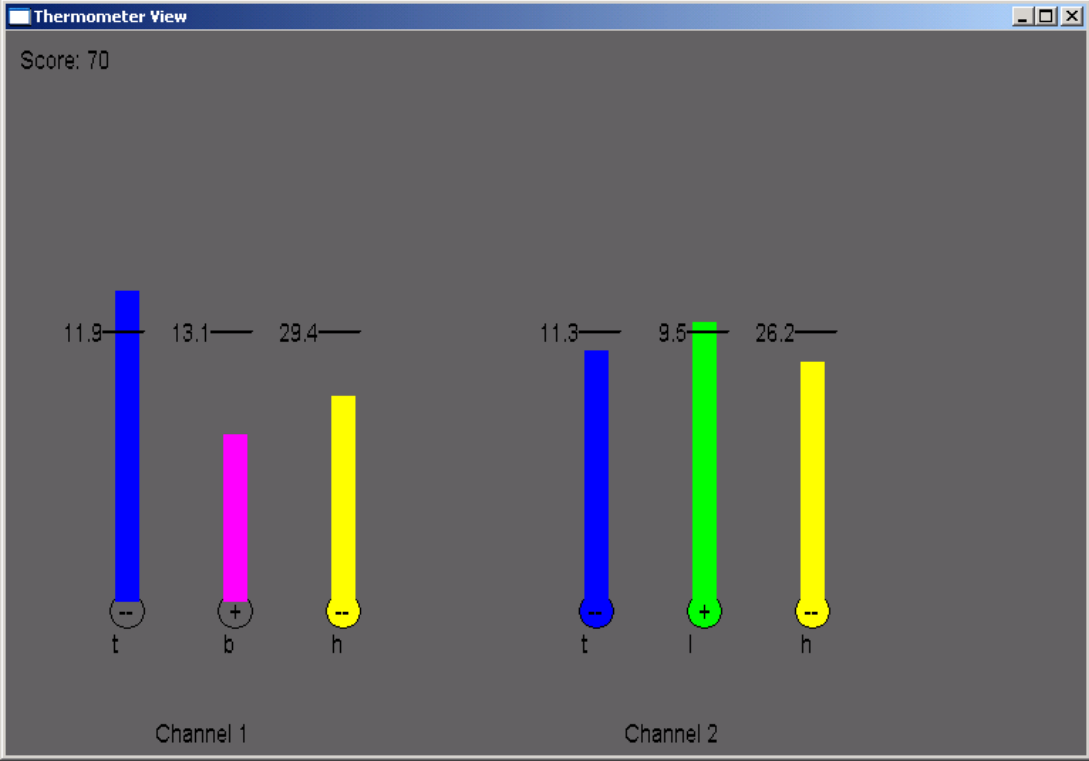
The frequency bands are adjustable using the “Bsetup” program. Currently, they are set to the most accepted and useful ranges. **The “temperature” of each thermometer reflects the amount of energy in the filter output for the respective frequency component.**

In addition to displaying the EEG energy in each band, the thermometers are used to set up the biofeedback paradigm, which includes which components to reward, or to discourage, and the threshold levels at which to elicit biofeedback signals. Each thermometer has a tic mark superimposed on it, with a number to the right. This mark and label indicate the current threshold for the detection of activity in that band.

Threshold adjustment can then be accomplished by using the keyboard, typing for example, “t” to raise the theta threshold and “T” to lower it. The other components use their corresponding key letters, as shown below the thermometers.

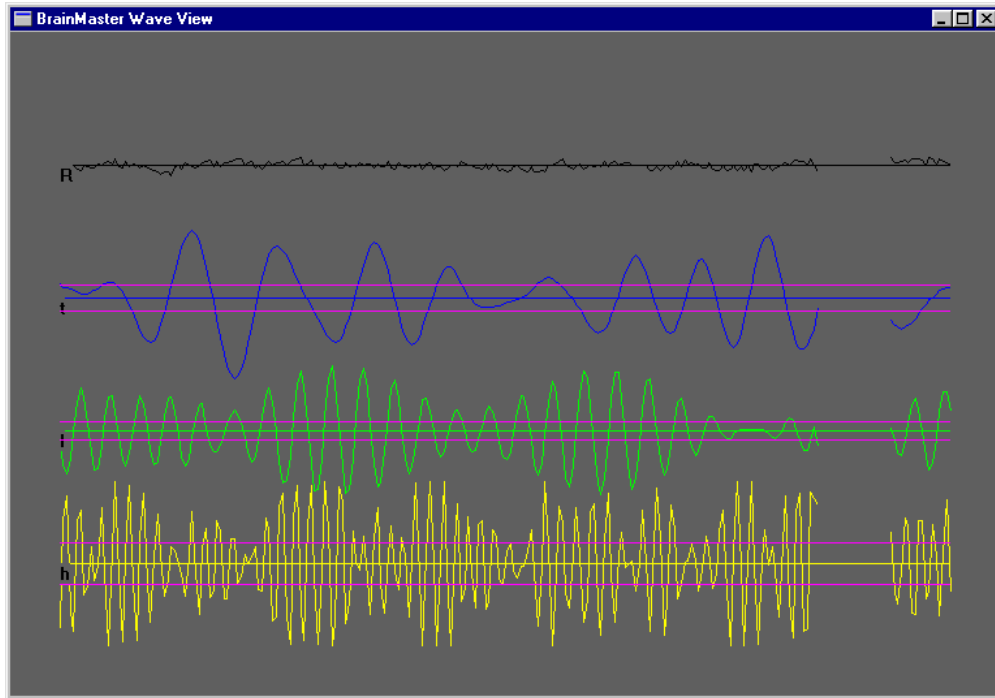
A “+” will appear in the lower center of the center bar, when a point is scored.

When two channels are used, two sets of thermometers appear, as shown:

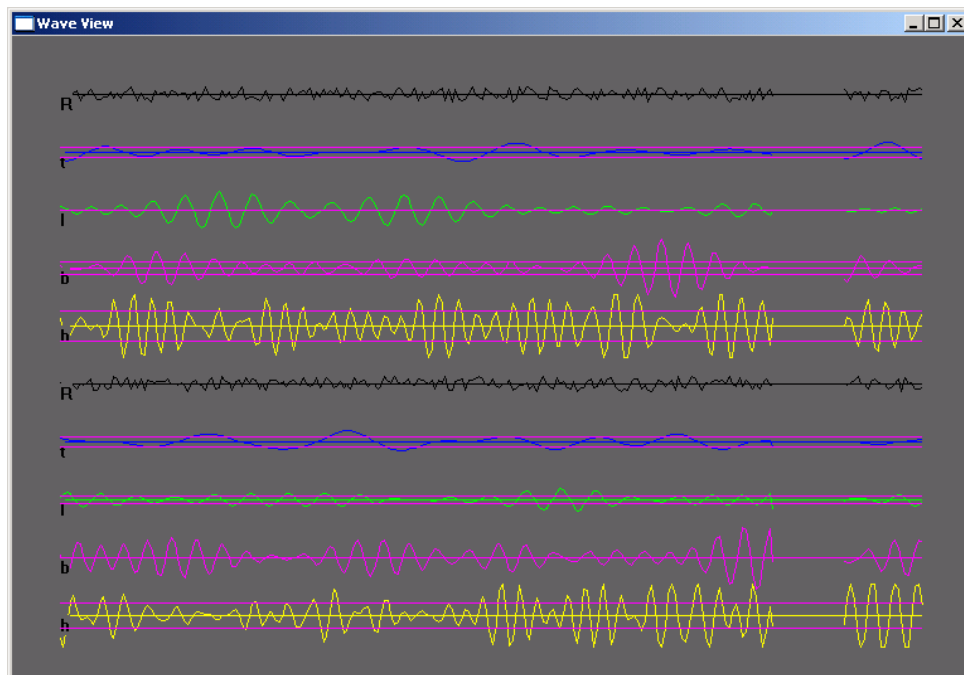


1.5 Waves Window

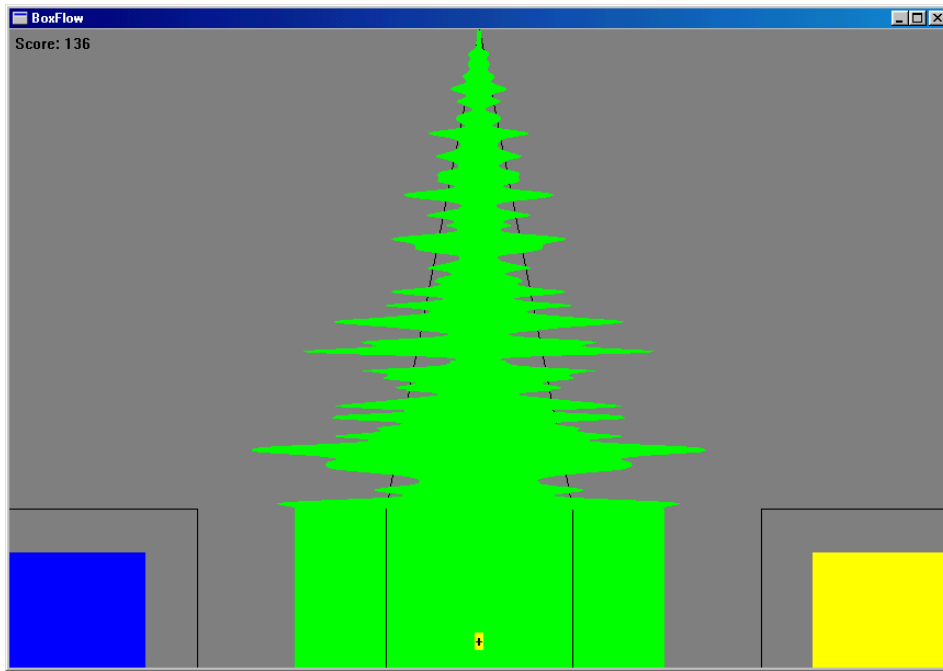
This window shows the raw and filtered EEG waves in a resizable window:



The display scale can be changed using the “+” and “-“ keys, as usual. When two channels are used, both channels appear, as shown:



1.6 BoxFlow Window



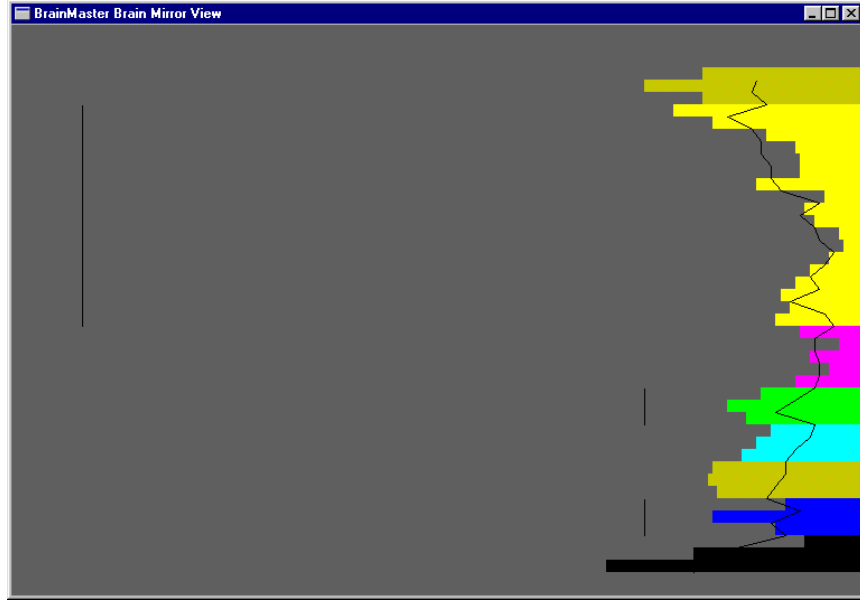
Similar to that used in other common displays - theta, SMR, and beta as 3 colored bars. The center bar is proportional to SMR, the left bar is proportional to theta, and the right bar is proportional to beta. Rectangular lines surrounding the boxes indicate the current threshold values.

A "+" will appear in the lower center of the center bar, when a point is scored. When two channels are used, two "boxflows" appear, as shown:

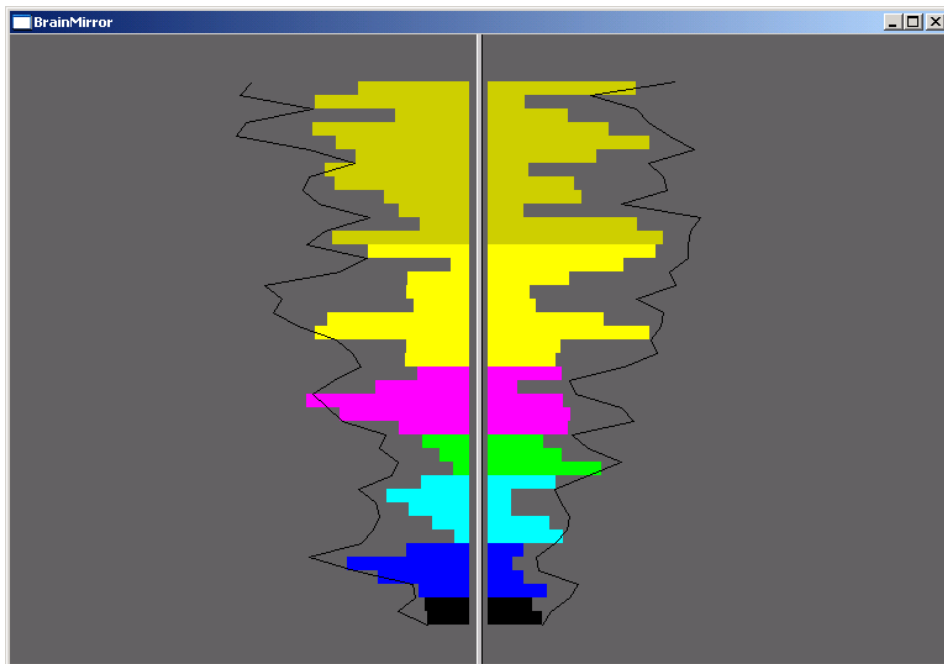


1.7 BrainMirror Window

This window shows the BrainMirror in a resizable window. It uses the FFT to show the current EEG component values. Thresholds are also shown by the thin black lines.

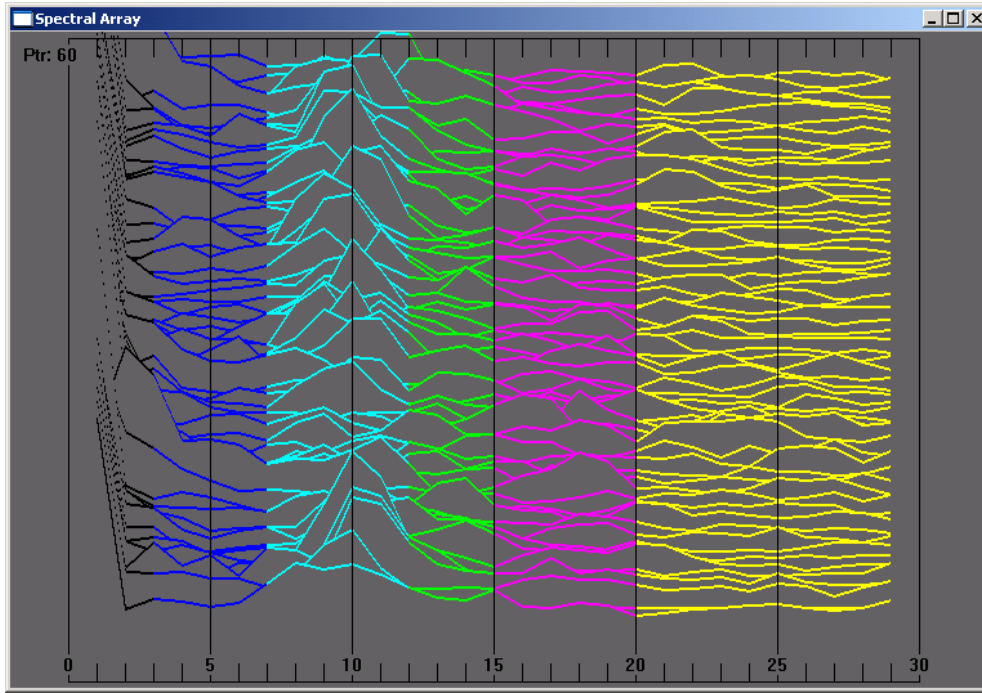


The BrainMirror window also works in 2-channel mode:



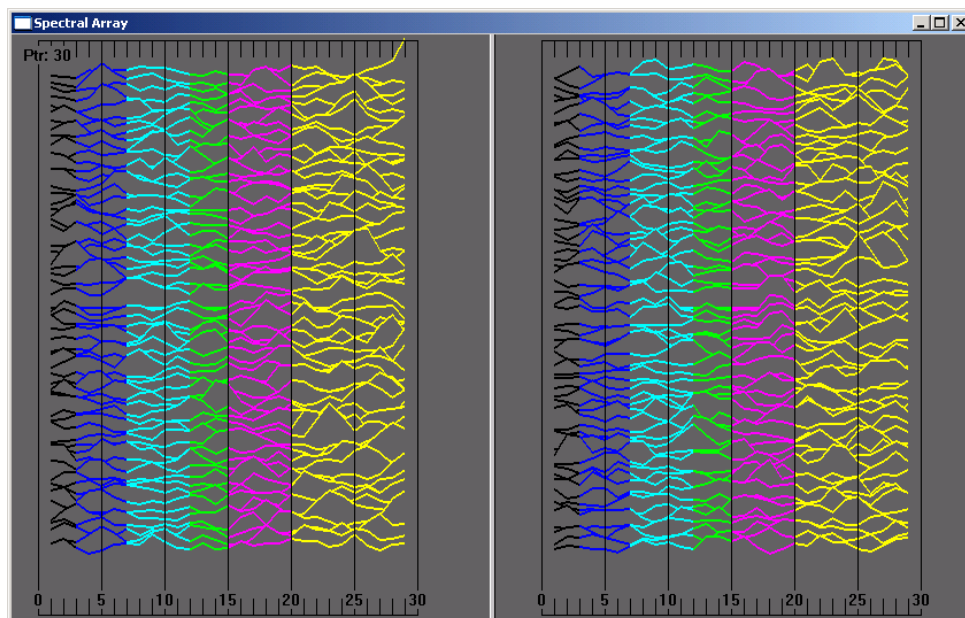
1.8 Spectral Window

This window shows a “compressed spectral array”



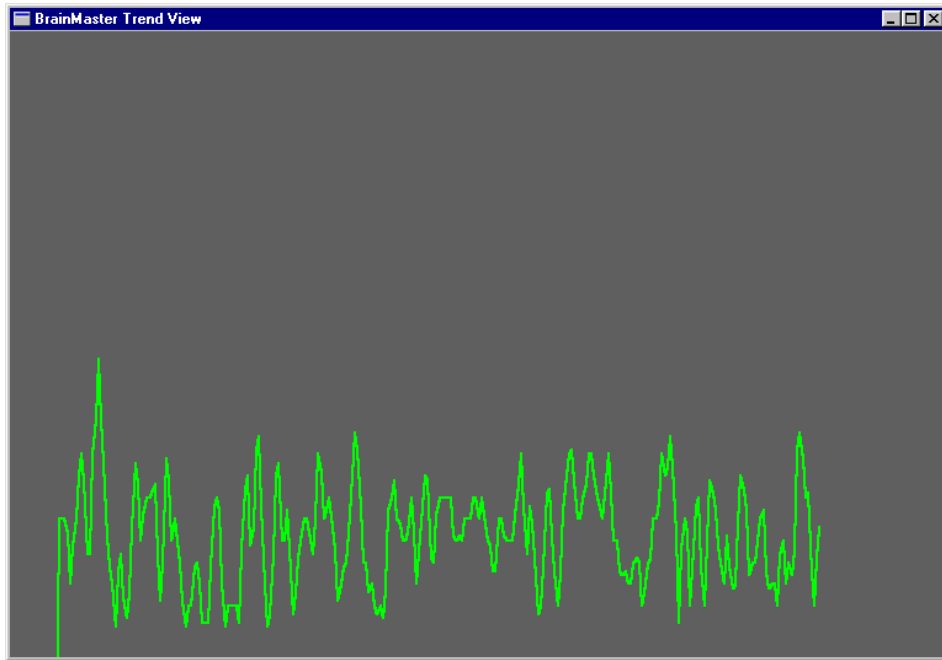
This provides a **cascade of past FFT spectra**, covering the previous 1 minute of activity.

Each frequency band is colored according to the frequency ranges selected. This coloring is the same as used on the FFT and the BrainMirror displays. There are tic marks and labels to identify the frequency coordinates of the display. When two channels are used, two spectra are shown:

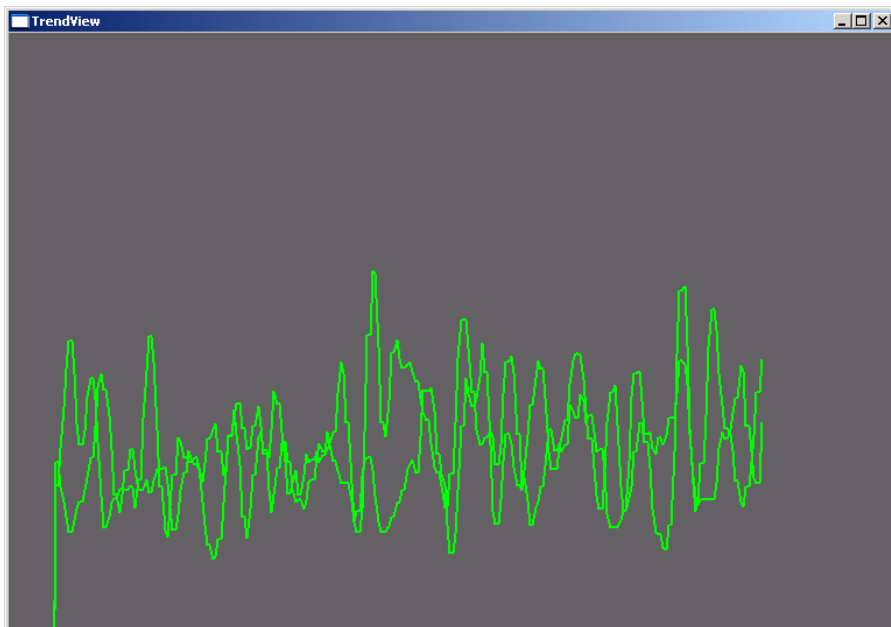


1.9 TrendView Window

This shows the current and past activity of a component, in a **plot of value vs. time**, over a period of 60 seconds. After the plot reaches 60 seconds, it clears and redraws. The plot window displays only those components that are currently selected, i.e. that would be displayed in the “thermometer” window.

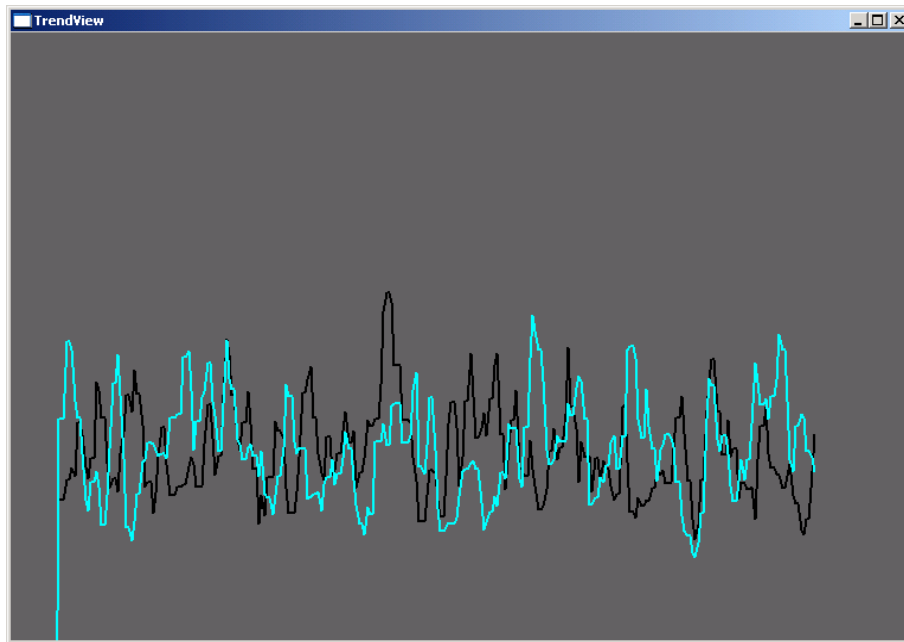


When two channels are used, both appear on the display:



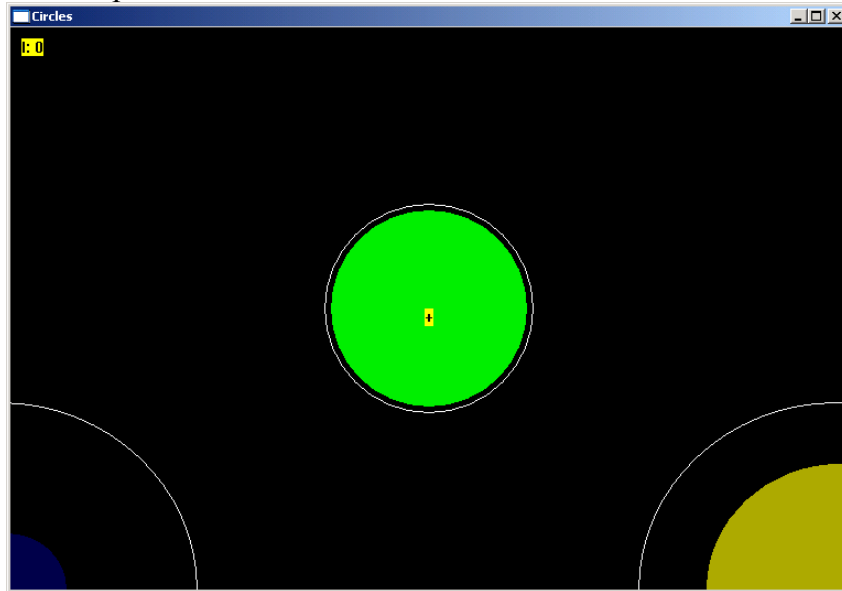
NOTE: When an asymmetry protocols is used, in which the same component is trained up (go) on one channel, and down (stop) on the other, this window will automatically show the

downtrained component in black, and the uptrained component in its normal color. The following display shows this window during alpha asymmetry training (“Asym” built-in protocol):

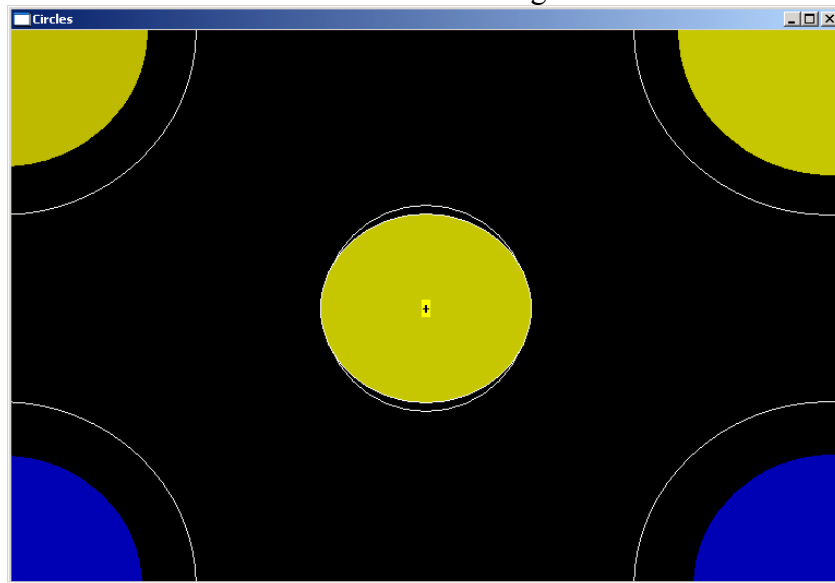


1.10 Circles Window

The Circles Window is similar to the Thermometers or BoxFlow, in that the center feature shows the main “uptrained” component, while the outer features show the high and the low “inhibits”. The amplitude of each component is shown by the size, and the color depth, of the respective circle. Threshold values are shown a white circles, which will be covered up (obscured) by the training circle, when it exceeds the threshold. The following screen shows this display window when using the “focus” protocol:

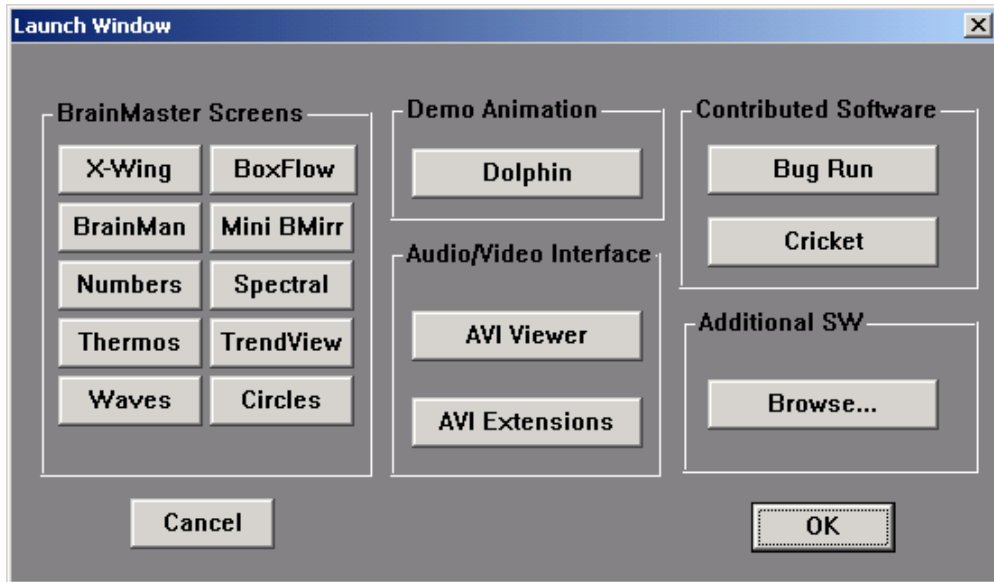


When two channels are used, this window adapts, to show the two “uptrained” components as an ellipse (width represents channel 1, and height represents channel 2. In addition, the total of 4 inhibits (2 each for the 2 channels) are shown at the corners. The channel 1 inhibits are shown on the left, and the channel 2 inhibits are shown on the right.

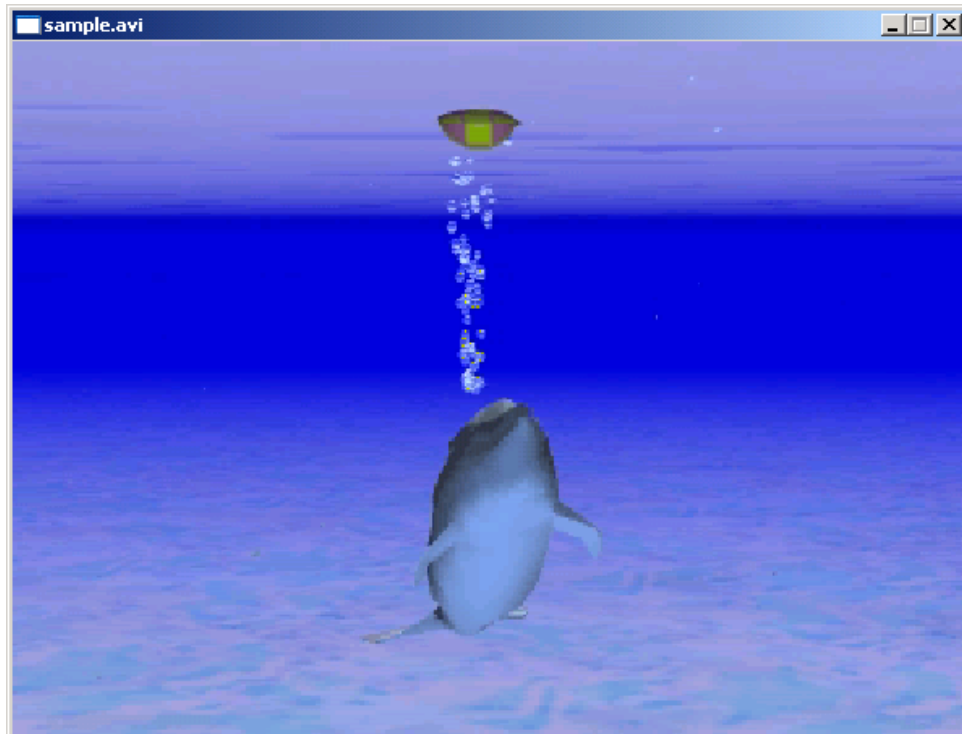


1.11 Dolphin Animation:

The dolphin animation is included in 2.0 as a standard window. Press the “dolphin” button on the Windows control to activate this screen:

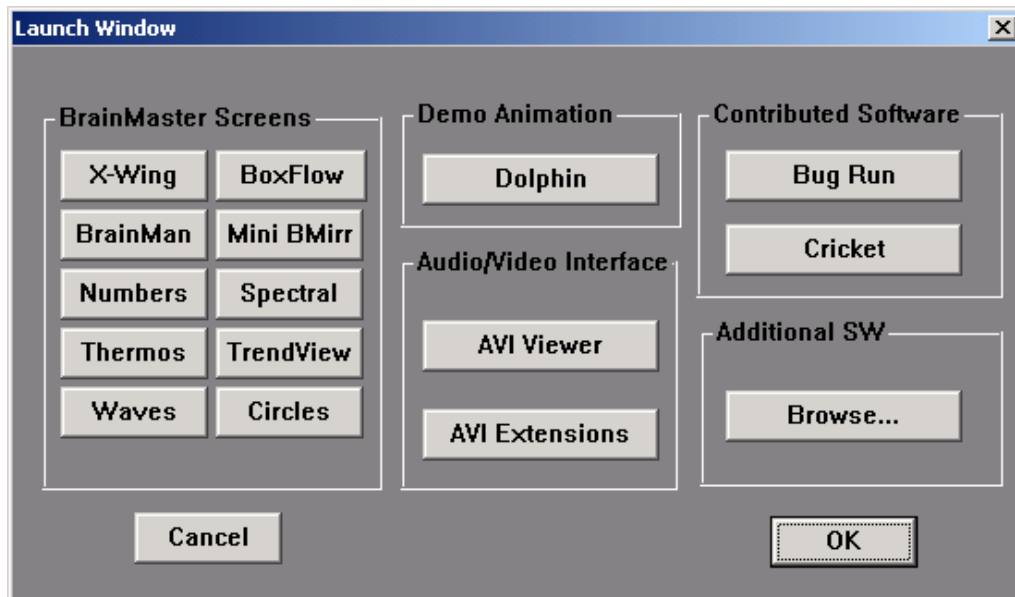


You will see the swimming dolphin. The dolphin will swim faster, the better the trainee is meeting the criteria:



1.12 Optional Animations:

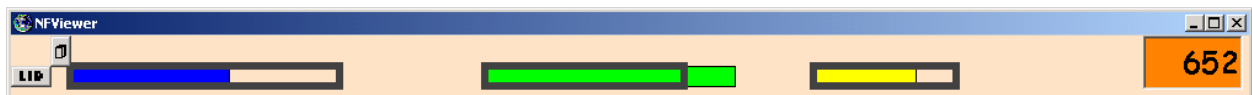
There are also a variety of optional animations. All animations are controlled using the NFViewer control bar. This bar will appear whenever you use the “Dolphin” start button, or the “AVI Viewer” start button, on the Launch Window control panel:



The AVI control panel is shown as follows:

NOTE: the “browser” button with the folders shown may look different on your version of Windows. It will still function as intended, even if it looks different on the control panel.

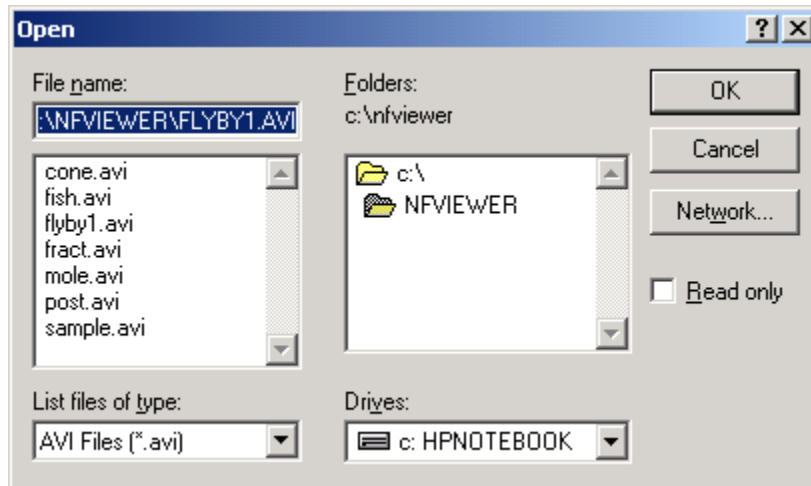
Location of “browser” button



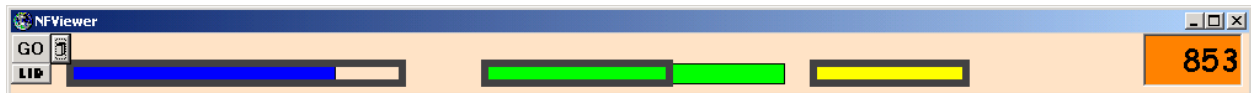
If you have optional animations, you will have the “browser” button at the top left of this control.

It is located to the right of where the “GO” button appears, as shown in the following example.

If you press the “browser” button, you will see a selector control as follows:



Select the animation you want to see, and then press “OK”, then press the “GO” button that will appear on the control tool:



The following is an example of one of the additional animations, “flyby1”.

