BrainMaster^{tm} System
Type 2E Module & BMT Software for Windows^{tm}

Setup & Control Program

"BSetup.exe"

For EEG Biofeedback (Neurofeedback) Protocols

Caution: Federal law restricts this device to sale by or on the order of a biofeedback practitioner.

BrainMaster System
Setup & Control Program "BSetup.exe"

What this manual covers

This manual describes the Setup & Control program "BSetup.exe". It is used to set up BrainMaster protocols and displays, thus providing the ability to use the BrainMaster for EEG biofeedback training. When used with this software module, the BrainMaster "Master.exe" program becomes capable of being configured for a variety of EEG biofeedback protocols.

When used for clinical biofeedback (neurofeedback), federal law restricts this product to sale to or on the order of a biofeedback practitioner.

To use this program, execute the file "BSetup.exe" that is in the directory c:\brainm.20. This can be run from the desktop shortcut that should have been created when the software was installed.

This program typically controls all BrainMaster functions, including the "Master.exe" program and the "BReview.exe" program. To run this program, either use the Windows File Manager or Windows Explorer to locate the file \brainm\bsetup.exe and double-click on it, or double-click on the icon that was created when you dragged the file "BSetup.exe" into a program group.

This manual is intended only to provide the technical information necessary to use the Bsetup software module. It does not provide any information specific to EEG measurement, or applications. For this information, you may refer to a variety of sources including books, videos, personal instruction, and certification training programs.

Statement of Intended Use, Indications, Contraindications

Intended Use

The BrainMaster provides visual and/or auditory feedback based on parameters derived from spectral analysis of the electroencephalogram (EEG) signal.

Indications

The BrainMaster is indicated for relaxation training using alpha EEG biofeedback (Neurofeedback). In the protocol for relaxation training, the BrainMaster provides a visual and/or auditory signal that corresponds to the user's increase in alpha activity as an indicator of achieving a state of relaxation.

Additional Benefits

Reducing Theta brain waves while simultaneously raising Alpha waves enhances concentration resulting in:

1. Reduction of errors
2. Greater attention to detail
3. Increased self control
4. Sustained attention to tasks
5. Ability to shut off environmental distractions

Increasing the percentage of Alpha brain waves enhances creativity providing:

1. Increased decision making capabilities
2. Increased new idea generation
3. Improved accuracy
4. Improved general relaxation

WARNINGS and Contraindications

The BrainMaster is contraindicated in individuals with the following conditions:

1. Individuals who are unwilling or unable to understand the general principles and goals of the feedback used. This includes individuals with excessive behavioral problems or low IQ.
2. Individuals who experience anxiety or an unpleasant feeling associated with EEG biofeedback (Neurofeedback) training.
3. In epilepsy, there may be a casual relationship between EEG training of certain EEG frequencies, and incidence of seizure.

Certain individuals may be unable to learn to control the EEG through biofeedback (Neurofeedback). Therapy should be discontinued if periodic monitoring of theraputic progress indicates that the individual is not learning despite adequate review of instructions for feedback.

Frequency and Duration of Treatment

Duration of treatment ranges from 1 to 50 sessions and frequency from 1 to 14 times weekly, depending on the needs of the individual.

Effects of Training

During an EEG training session, the user should relax, allowing the system to teach when the EEG shows the desired amount of brainwave energy, and when it does not. The EEG system does nothing to the brain directly. All beneficial effects are a result of the learning your brain will experience as a result of the visual and/or auditory signals that are provided. *The trainee should not "try" to relax.* The effort of "trying" may defeat the beneficial effects that are desired. The trainee should simply relax and allow the brain to learn. It may take from 1 to 10 sessions for this learning to begin.

There are two main effects of EEG biofeedback training that can be seen. The first is that the number of points that can be scored during a training session may increase over many sessions. The second is that the levels of the EEG signals (as reported in the "Breview" software) may increase. It is not necessary to see these increases, in order for the benefits of training to occur. The effects of EEG biofeedback training are primarily in the improvement of relaxation in the individual over the course of the EEG training sessions.
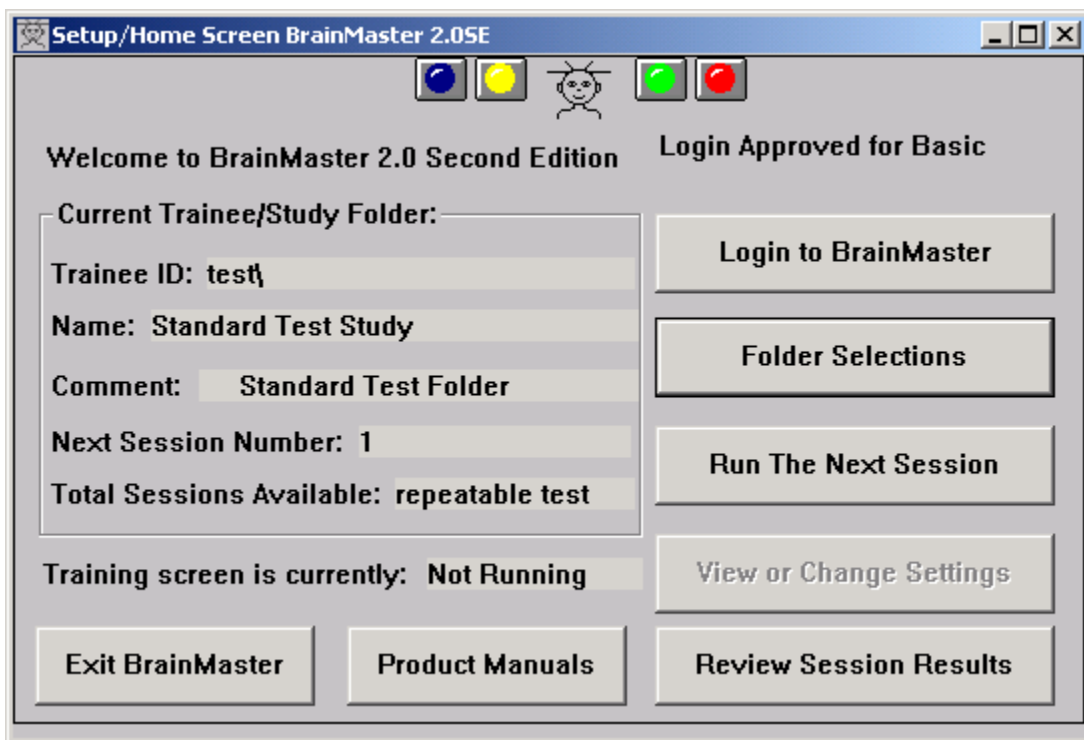
Configuring and running the software

To start using the BrainMaster software for EEG training, you run "BSetup", either by

1) Using File Manager or Windows Explorer, double-clicking on the file "BSetup.exe" in the directory c:\brainm.20,

-OR-

2) Click on the shortcut you created for "BSetup.exe" on the desktop.

The following setup control menu will be displayed:

The Setup Screen is usually located at the top of your display. It provides five main choices, "Run the Next Session," "Folder Selections," "View or Change Settings," "Review Session Results," or "Exit BrainMaster Program." Note that the "View of Change Settings" button will be usable only if you are logged in with "clinical" permissions. Home and other remote users may have this button disabled (greyed out), and are thus unable to use this control.

Folder Selections
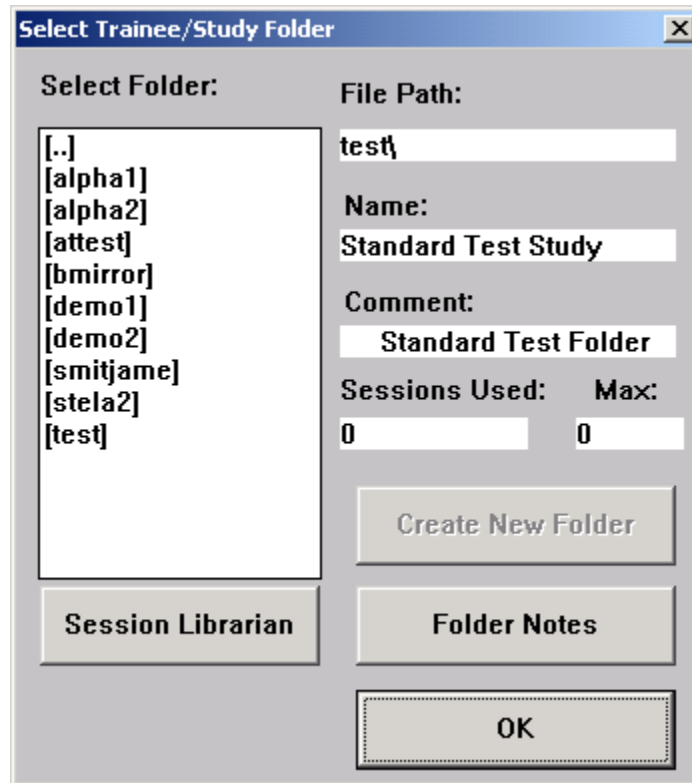
This screen allows the user to select the current folder and also provides the ability to create a new folder. A folder can be selected by scrolling in the list below the "Select Folder" label and clicking on a desired trainee. The trainee's name and directory are immediately displayed. This trainee is automatically selected and will automatically default as the current trainee the next time the "Master" program is run.

To create a new training folder, click on Create New Folder and follow the dialogs. Note that only clinical users have the "Create New Folder" control enabled. For home or other remote users, it will be disabled (greyed out), and thus cannot be used.

NOTE: The Training Screen will only load the trainee name and settings when it is started. If the trainee is changed, you must exit and restart the Training Screen for the new trainee to be used.

Before you leave this screen, make sure that the desired trainee is selected from the list, and appears in the text area alongside the list. This is the folder that the training program will use to save summary and EEG data.

Setup Options

When the "View or Change Settings" menu is selected, the following screen will appear:
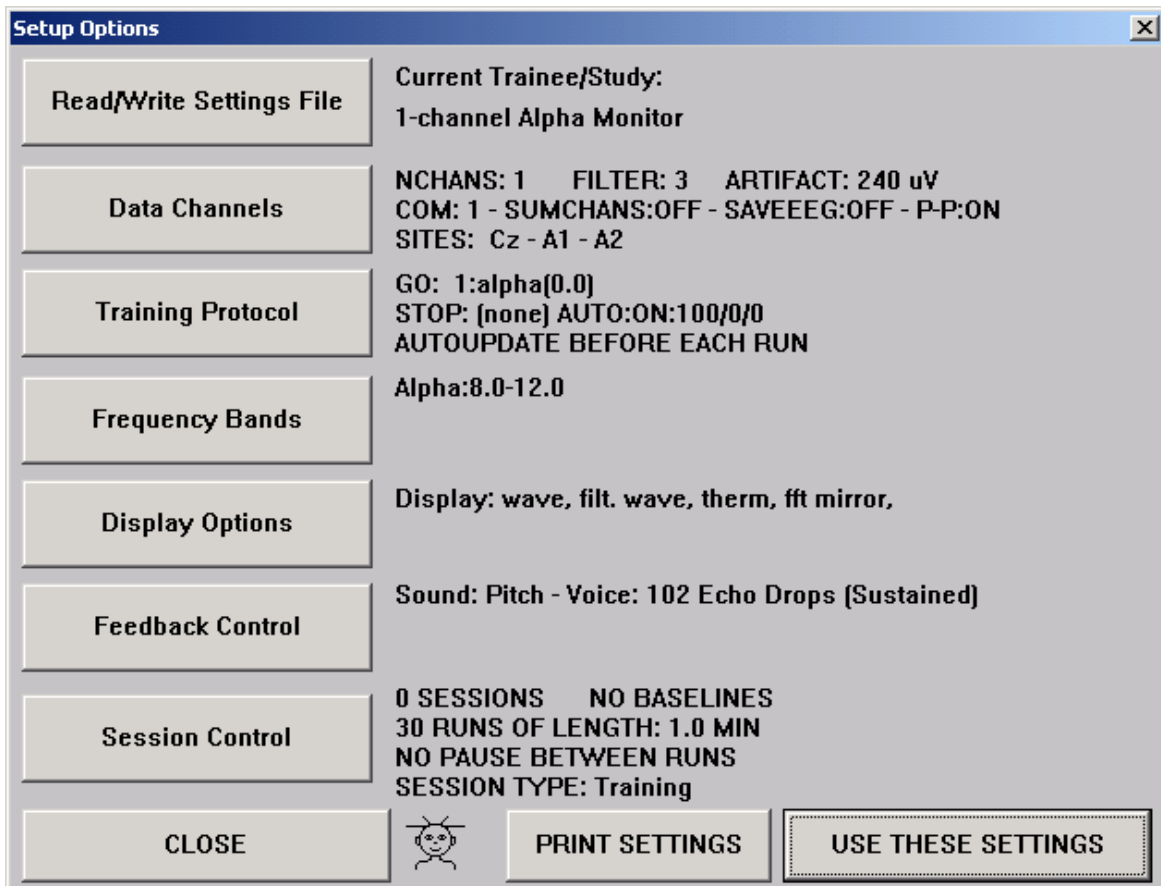
This is the main setup screen. The buttons on this screen give the user the ability to modify the various controls geared toward their specific needs. It displays a summary of all the settings to the right of each box. Please note that changes can be made either at the beginning of a session or while the training screen is running. Use the appropriate button at the bottom to proceed with the training, depending on whether the training screen is running and if the user chooses to save the changes.

Each button activates its corresponding setup window, which will appear on the screen, giving you access to the controls. For details of each setup window, see the appropriate sections in the manual, as follows.

Read/Write Settings File:

When you click on "Read/Write Settings File," the following dialog box will appear. This allows you to read and write settings from built-in settings files, and to create your own settings files. These files are intended only to store settings. They are not general-use "folders" that can be used to run training sessions.
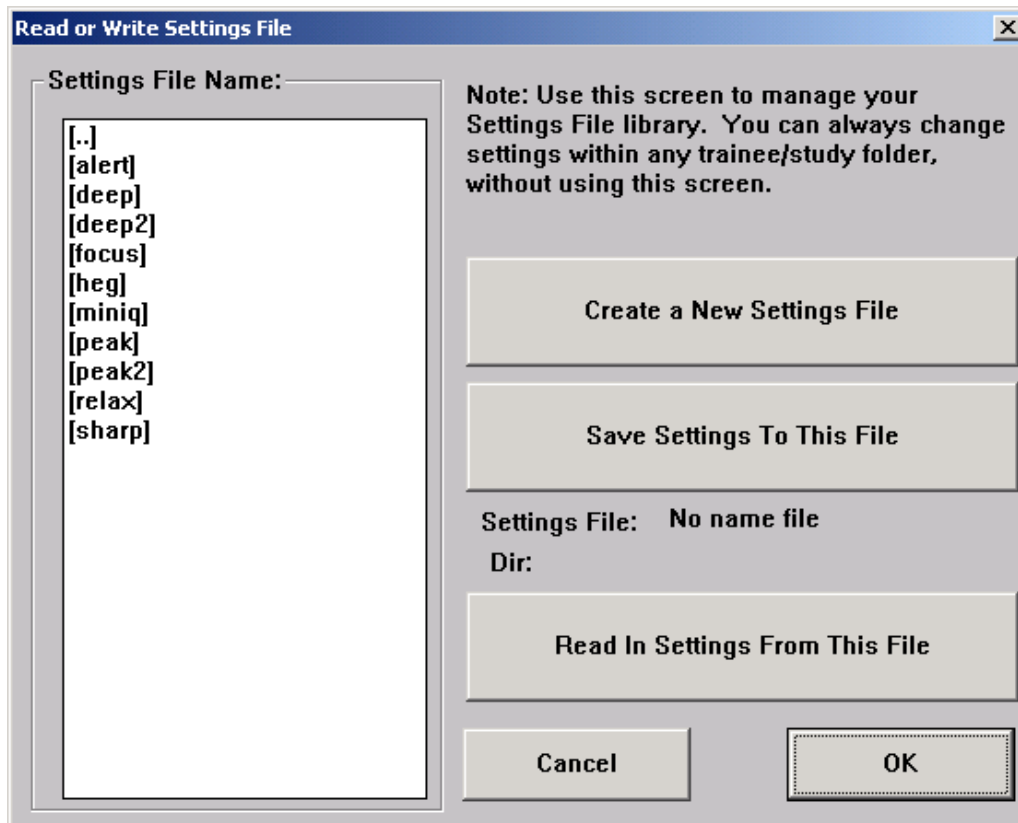
Built-in Protocols

The following standard settings files are included, and can be selected from the setup program.

Name	Use	Possible Benefit	Recommended leads	Displays	Training
Alert	increase beta suppress theta	Focus, Alertness (Sterman, Lubar)	**C3 (blue)** **left ear (yellow)** **right ear (black)**	waveform, filtered wave, thermometers, filtered mirror	beta "go", theta "stop", hibeta "stop", others "ignore"
Asym	Increase right alpha, suppress left alpha	Mood (Rosenfeld, Baehr)	**F3 (blue)** **Cz (yellow, green)** **F4 (red)** **A1 (black)**	Waveform, filtered wave, thermometers, Thermos and TrendView Windows	Right alpha "go", left alpha "stop"
Deep	Increase alpha increase theta	Deep Relaxation (Penniston)	**Cz (blue)** **right or left ear (yellow)** **other ear (black)**	waveform, thermometers, filtered mirror	alpha "go", theta "go" Note: use with caution, watch for possible abreaction
Deep2	2-channel protocol similar to "deep"	Deep Relaxation (Penniston)	**C3 (blue) left ear (yellow)** **C4 (red) right ear (green)** **Cz (black)**	waveform, thermometers, filtered mirror	alpha "go", theta "go" Note: use with caution, watch for possible abreaction
Focus	increase lobeta suppress theta	Concentration, Focus (Lubar, Sterman)	**C4 (blue)** **right ear (yellow)** **left ear (black)**	waveform, filtered wave, thermometers, filtered mirror	lobeta "go", theta "stop", hibeta "stop", others "ignore"
Peak	alpha coherence	Peak performance (Fehmi/Hardt/ Kamiya)	**C3 (blue) left ear (yellow)** **C4 (red) right ear (green)** **Cz (black)**	waveform, thermometers	alpha coherence "up"
Peak2	2-chahnel peak performance	Peak performance (Combined Lubar/Sterman)	**C3 (blue) left ear (yellow)** **C4 (red) right ear (green)** **Cz (black)**	Waveform, thermometers	beta "go" channel 1, lobeta "go" channel 2, theta "stop" both channels, hibeta "stop" both channels, others "ignore"
Relax	increase alpha	Relaxation (Classic alpha protocol)	**Cz (blue)** **either ear (yellow)** **other ear (black)**	waveform, filtered wave, thermometers, filtered mirror	alpha "go", hibeta "stop", others "ignore"
Sharp	"squash"	Mental fitness (Maust, others)	**Cz or Fz (blue)** **either ear (yellow)** **other ear (black)**	waveform, thermometers, fft mirror	theta "stop", alpha "stop", lobeta "stop", beta "stop

To use one of these protocols, select the protocol name from the select list on the "Read/Write Settings File" popup box. Then press the "Read in Settings From this File" button. The settings will be loaded into the folder for the current Trainee/Study ID.

Data Channels
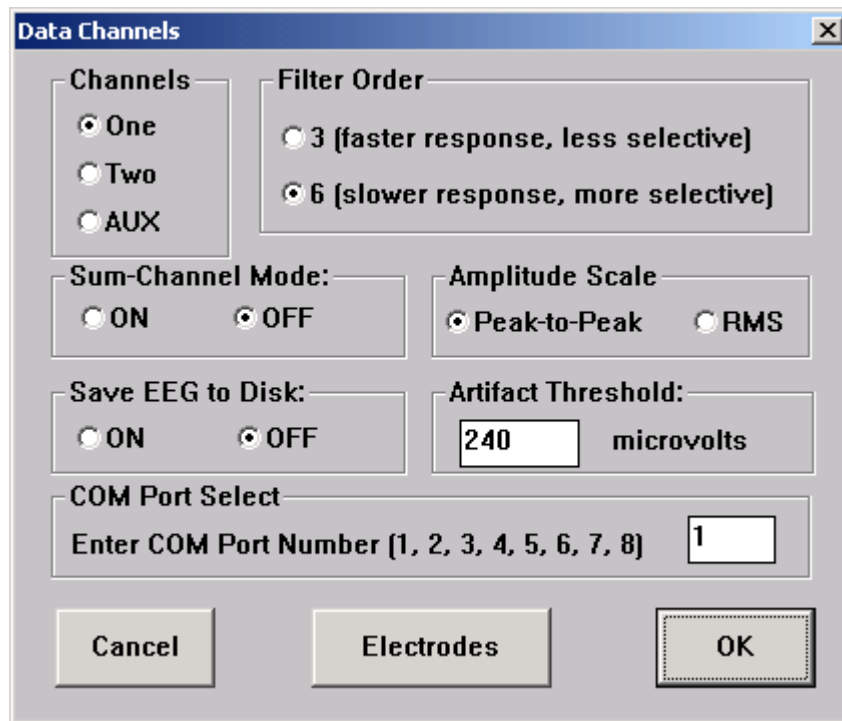
The Data Channels screen allows the user to configure the following items:

- The number of channels used (1 or 2), or an AUX device.
- The filter order (type of response). Order 3 provides a faster response, but the filters are less selective. Order 6 provides a slower response, but the filters are more selective. Choice of filter order is a matter of your taste, and goals with the EEG training. Typically, order 3 may be used on beginners and children, with order 6 being used on experienced trainees, adults, meditators, etc.
- Sum-Channel Mode on or off.
- Amplitude scale for Peak-to-Peak (larger values) or RMS (smaller values) P-P is typical of Lexicor, Neurocybernetics; RMS is seen on Neuropathways, Biograph, others.
- Save EEG to Disk on or off. (Use with caution – Some PC's may not keep up)
- Artifact Reject Threshold, which is nominally set at 240 microvolts
- Selection of COM port (1, 2, 3, 4, 5, 6, 7, or 8).
- Access to the Electrode Selector Dialog

The synchrony or similarity between two EEG channels can be fed back by using the "sum" mode. This is turned on by using the button marked "Sum-Channel Mode" on the control panel. When this mode is selected, the first display channel will be the sum of the two EEG channels, and the second display channel will be their difference. This mode can be used to train EEG components when they are large (or small) in both channels.

Electrode Selection
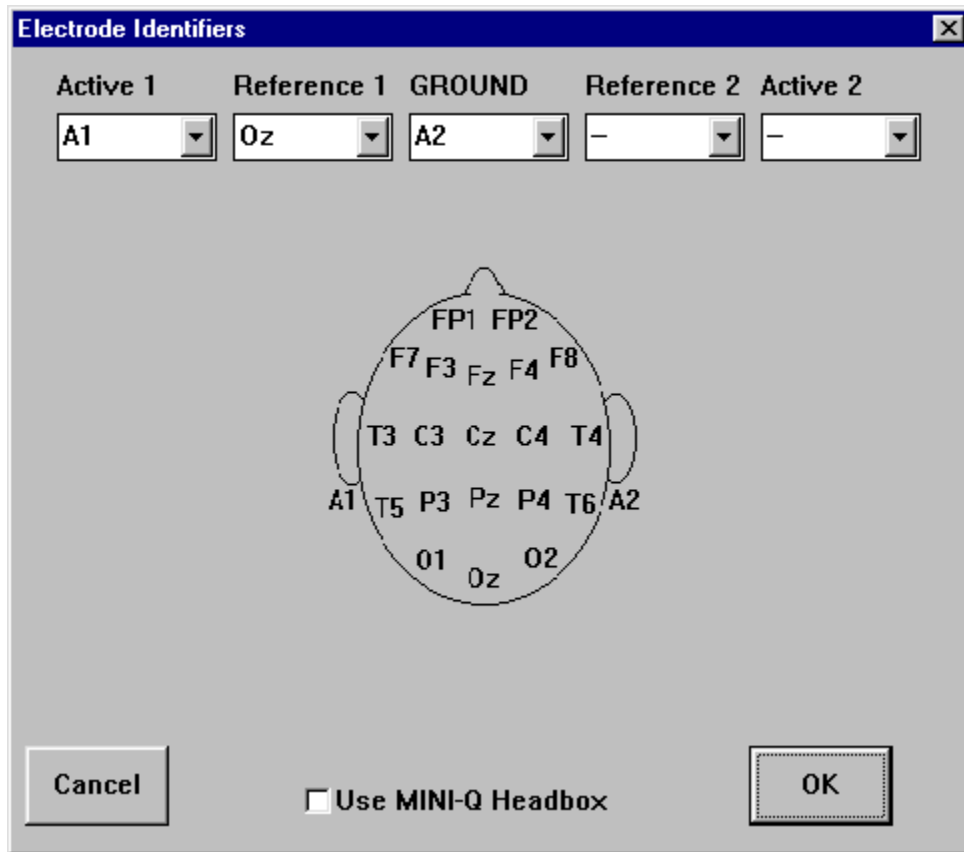
Use this dialog to select the electrode connections. The chosen connections will appear on a prompt when the session begins, and can also appear on reports.

Training/Control Protocols

Control Protocol and Threshold Values ☒

Delta:
⊙ Go ⊙ Stop ⦿ Ignore `0.0`

Beta:
⊙ Go ⊙ Stop ⦿ Ignore `0.0`

Theta:
⊙ Go ⦿ Stop ⊙ Ignore `5.0`

High Beta:
⊙ Go ⦿ Stop ⊙ Ignore `8.0`

Alpha:
⦿ Go ⊙ Stop ⊙ Ignore `3.0`

Gamma
⊙ Go ⊙ Stop ⦿ Ignore `0.0`

Lo Beta
⊙ Go ⊙ Stop ⦿ Ignore `0.0`

User-defined Band:
⊙ Go ⊙ Stop ⦿ Ignore `0.0`

Channel Select
⦿ 1   ⊙ 2

Use this control panel to define the training protocol and set the threshold values. You may set each channel separately.

Autothreshold Options

Use the button at left to view and change Autothresholding Options
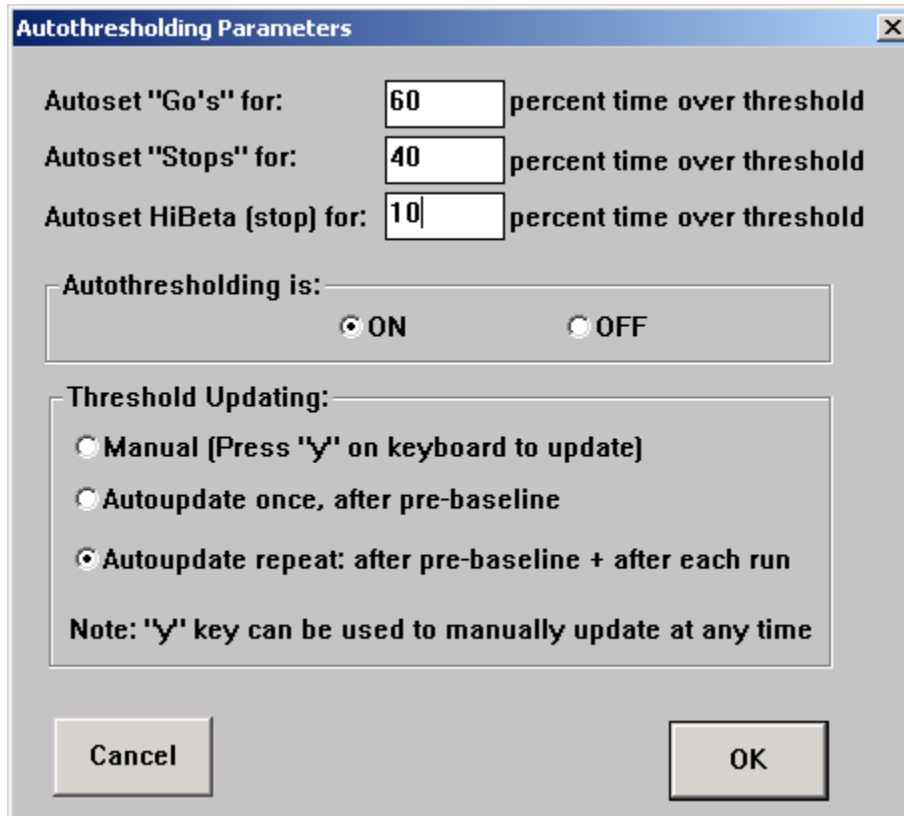
OK

This screen is used to customize the protocol so that the EEG signal can be used to control the computer. Each of the frequency components can be set to either "Go", "Stop", or "Ignore." The user may select the desired combination of control rules by using the "radio" buttons associated with each component. If a study protocol has been selected from the trainee/study screen using the "Restore Settings" button, then the screen will display the preset information.

Note: It is possible to save and use different control settings for each of the two channels, providing simultaneous training of two different brain sites.

This screen also allows the user to view and change the thresholds for each component, for each channel. Thus, up to 16 different thresholds can be used.

Autothreshold Options

Autothresholding Parameters

Autoset "Go's" for: [60] percent time over threshold

Autoset "Stops" for: [40] percent time over threshold

Autoset HiBeta (stop) for: [10] percent time over threshold

Autothresholding is:
 ○ ON   ○ OFF

Threshold Updating:
 ○ Manual (Press "y" on keyboard to update)
 ○ Autoupdate once, after pre-baseline
 ● Autoupdate repeat: after pre-baseline + after each run

Note: "y" key can be used to manually update at any time

[Cancel]   [OK]

This dialog allows the user to set up the autothresholding options.

The "Autoset" numbers set the percentage of time that the system will try to keep the component(s) above their respective thresholds. This "sets the bar" for subsequent training runs. The system will computed thresholds that will provide the desired percentages, as a target. The algorithm uses the previous 30 seconds of EEG data, to figure out where the thresholds should be set.

The "Autothresholding is" control allows the user to turn autothresholding on or off. When it is off, the system uses entirely manual thresholds, which can be set in the "Training Protocol" control dialog, and can also be set using keyboard commands (for both channels together when 2-channel training is used), when running the training.

The "Threshold Updating" control allows the user to decide when the computed thresholds are applied (copied into) the working thresholds. This allows the system to continually compute updated thresholds, but only apply them at specific times, when desired. The updating can be manual or automatic. If an automatic method is used, thresholds can still be manually updated at any time by using the "y" key on the keyboard. This will cause the computed thresholds to be copied into the working thresholds.

Frequency Bands

This is the Frequency Bands control screen. It sets the frequency range of the digital filters, and the FFT analysis, by setting the low and high cutoffs for each defined band.

The control indicates the **current range of each frequency band**, and allows the user to change the upper and lower limits of each. Altering these settings will change the upper and lower edges of the passbands for each frequency component. This effects both the digital filters and the FFT frequency band calculations. **These changes will be reflected in the FFT Frequency Spectrum and in the Brain Mirror**, as changes in the range that is assigned each color. In the thermometers, and in all training protocols, the chosen bands will be used for all displays and controls.

The "Standard Settings" button can be used tor estore the standard settings used in BrainMaster, which are shown in the example window

Note: The user band is normally set at 30.0 to 35.0 Hz, providing an additional high beta band. The user should set this band per their requirements.

Note that filters settings must be a minimum of 1.0 Hz wide, e.g. 9.0-10.0, 4.0-5.0, etc are minimum width bands.

Note that the minimum low frequency cutoff of any band is 1.0 Hz. Do not use low frequency cutoff values of 0.5 or 0.0 Hz.

Display Options
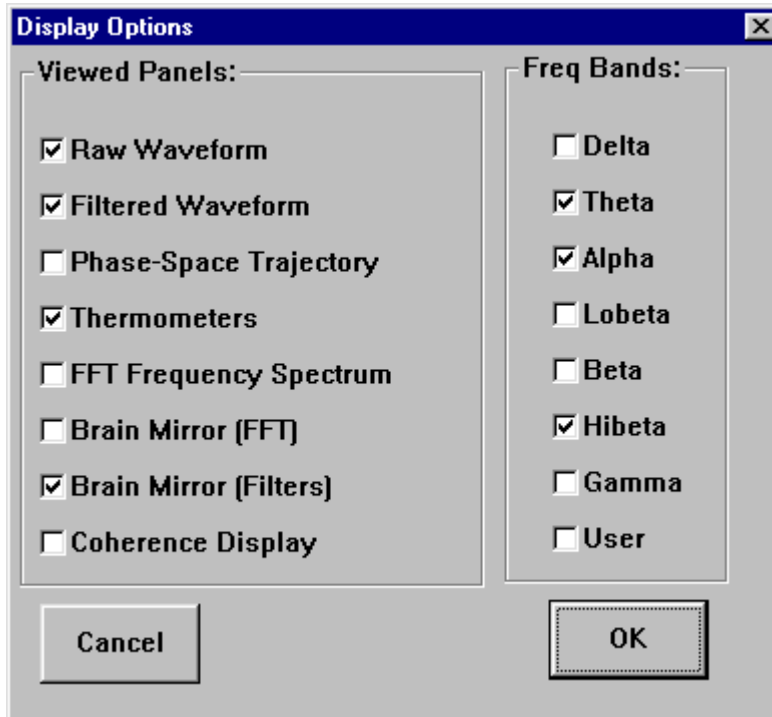
This screen selects the various screens that will appear in the "client area" of the "Master" program. These settings are saved and restored to the sessions file, and are sent to the "Master" module through the DLL interface. In addition to each display window, it is possible to select which frequency bands are reflected in the thermometers, plots, and other displays.

Note: You can also change these settings on the "Master" main screen.

Feedback Control

This screen allows the user to choose the audio feedback method used.

"Reward Sound" produces a single sound (click, beep, etc) whenever ALL training criteria are met. Typically one sound every 3-5 seconds is optimal. Threshold should be set so that the trainee has a chance to meet all criteria combined, a suitable percentage of the time. For example, the "alert" and "focus" protocols use this feedback mode.

"Component Sound" produces a sound (bird, frog, water, etc) whenever ANY component meets its training criterion. Thus, there may be a sound for alpha, a sound for theta, etc. When using this mode, thresholds should be set harder, so that fewer sounds are heard.

"MIDI" sets up a musical note for each component, which is heard when ANY component meets its training criterion. In addition, the note can be modulated by amplitude or pitch, providing additional auditory information.

"Coherence" sets up a musical note for each component, which is heard when ANY (visible or enabled) component meets the coherence criterion (above threshold for "up" and below threshold for "down".

"Phase" sets up a musical note for each component, which is heard when ANY (visible or enabled) component meets the phase criterion (above threshold for "up" and below threshold for "down". "Complex" sound provides a MIDI note superimposed on a background sound. The background sound is based on which component is currently larger, and is taken from the sounds "sloalpha.wav", "slotheta.wav", and so on.

"Complex" sound combines the MIDI tones with the Reward Sound, for more complex options.

Session Control

The Session Control screen is used to set up the session timing, and design. First, there is an option to have baselines pre- and post- the session. These can be any number of seconds but values on the order of ½ minute, etc., are preferred, e.g. 20, 30, 60 seconds, etc. Do not use a baseline or run length of only 1 or 2 seconds, as this will cause extreme amounts of data processing, as the system will compute complex statistics every second, for example. The system will acquire EEG data and compute new thresholds (if autothresholding is used) during the pre-baseline, but will not provide feedback or compute rewards. After the pre-baseline is complete, the system will automatically go into training mode, during which feedback and rewards are provided. The length and number of training "runs" (or "trials") are set using the "Run Length" and "Number of Runs" selections, until all runs are completed. Then, a final baseline will be run, without rewards, if baseline is selected.

Note that a baseline length of zero means that there are no baselines. Runs can be any number of minutes long, and there can be any number of runs. Note that a run length of zero means "run indefinitely"

This control also sets the number of sessions to be used in this folder. Once the full number of sessions has been used, the system will not conduct any more sessions in this folder. Instead, the system will prompt the user to use Session Librarian to send the sessions back to a clinician, if desired.

"Session Type" selects the type of session. "Assessment" is for gathering EEG data, and expects that no training protocol will be used. "Training" is a training session, with rewards and points computed, and feedback provided. "Simulation" uses synthetic (random noise) EEG, and is intended for demonstration and testing purposes. "Playback" can be set with a folder that has previously had EEG data recorded (using "Save EEG"). It will set the folder so that the "Go" button on the training screen will bring up a file selection tool, for playback of data. This is useful for sending folders to others, with the primary purpose of viewing the EEG waveform data.

Simple Method to run a series of subjects

Start system:
  1. Shortcut: BrainMaster Setup (bsetup.exe)
  2. Check entry in "Current Trainee/Study Folder". If OK, proceed to step 15
  3. If you want a different folder, click on "Folder Selections"

If Existing Subject:
  4. Select Subject from list
  5. Click on "OK"

If New Subject:
  6. Click on "Create New Folder"
  7. Enter first & last name into "Name" area. ID will be filled in automatically
  8. Click on "OK"
  9. Inspect new name and ID. Make changes if desired
  10. Click on "OK"
  11. Select desired starting settings from list
  12. Click on "OK"
  13. Inspect settings, make changes if desired
  14. Click on "Use These Settings"

Run Training Screen
  15. Click on "Run the Next Session"
  16. Training Screen appears; Click on "GO"
  17. Watch progress, ensure module is authorized.
  18. View "Ready to Start" dialog; place electrodes; turn on module; click on "OK"
  19. System will start running per protocol and settings
  20. Follow instructions as training begins
  21. Use "Window" control to create new display windows if desired
  22. To pause, press <Space> bar. Press <Space> bar again to resume

End Training Screen:
  23. After session is complete, press "Close" button

Review Result:
  Raise Setup/Home Screen by clicking on title bar, task bar, etc.
  24. Menu: Review Screen
  25. Button: Select (selection box appears)
  26. Select Session by number from selection box.
  27. Button: OK
  28. Stats (view result on screen)
  29. Button: Print (prints detailed summary)

Remove electrodes, turn off module