# BrainMaster

# Basic Modules for Training (BMT)

# Version 2.0SE (Second Edition)

# QUICKSTART INSTRUCTION MANUAL

To get up and running quickly, read this manual first.

# Refer to the User's Manuals for reference, and for advanced information

# Contents

*We have tried to follow the KISS (Keep It Sweet and Simple) method in making this Instruction Manual as simple as possible.  If you have any suggestions to simplifying it further, or any way to lessen confusion, please feel free to let us know.*

If you follow the steps outlined below carefully, and in order, you should be up and training within an hour.  We also recommend that you watch the BMr video, and read the other manuals for background information and advanced applications.

**Sit down and watch the BMr videos**.  This first watching is just to familiarize you with the basic principles and at least some of the operation.   The video will give you good basic information, and demonstrate much of the software.  Please view these before you call for assistance.

**Use the BMr User's Manuals for reference.**  It contains detailed information for experienced users. Use this Manual, and when you are all set up and running, then you may find more useful information in that Manual.  Please read the manuals before you call for assistance.

# Installing The Software

If you have a CD version, simply insert the CD into your computer and follow the onscreen instructions. If you do not see anything onscreen, the double-click on"My Computer" and select the CD drive, and right-click on it to get to the menu item "Open".  Opening the CD will get you to the instructions.


The CD will attempt to make a shortcut to the BrainMaster software on your PC "desktop".  If this does not appear, follow the procedure below:

**1) Double-click on "My Computer"**
**2) Double-click on C:\\**
**3) Double-click on the folder BRAINM.20 in C:\\**
**4) Locate the file "bsetup.exe" in this folder**
**5) Right-click "bsetup.exe" and select "<u>C</u>opy"**
**6) Right-click on your desktop and select "Paste <u>S</u>hortcut"**


NOTE: BMT Version 2.0 uses different files and directories from Version 1.9A, and BOTH versions can be installed and used on the same computer.  If you have 1.9A already installed on your PC, the shortcut for 1.9A can remain along with the new shortcut for 2.0.  You may wish to rename the shortcut for 2.0 to "BrainMaster 2.0" so that is it easily recognized (use the right mouse button to access the "rename" menu selection to rename the icon). Trainee folders and setups used in 2.0 will be entirely separate from those used in 1.9A.  Therefore, you can install and work with 2.0 without disturbing any of your existing trainees or work that is already begun using 1.9A.

# Connecting The Module To Your Computer

**NOTE: The most common solution as of 2004 is the USB to serial adapter.  We recommend the Keyspan USB to serial adapter, and it has worked in most situations we have encountered.  The information below pertains primarily to older PC's with integrated COM (serial) ports, and will still be useful to many users**

**If you are able to connect and operate the BrainMaster on your serial port without any difficulties, you can skip these sections**.  This section has details helpful to guide users who are unfamiliar with serial ports, or who may have difficulty with their connections.

The BrainMaster 2E module connects to a serial port on your computer.  This procedure is daunting to some computer users, and it can become complicated due to the many different way computers are built and configured.  However, the following will make it simpler for you, even if you don't know anything about electronic connections.

We supply one 9-pin female to 25-pin male serial cable.  The 25-pin connector is for the BrainMaster.  The 9-pin connector is for your PC.  This should allow you to connect the BMr machine to your serial port.  If your computer has a 25 pin connector, you will need a 9-pin to 25-pin adapter, or you can use a different cable (25-pin female to 25-pin male "AT" adapter).  We can supply you with this alternate cable if this is your situation.

The first step is to look carefully at the connectors on the back of your PC computer.  All PC computers have basic connectors that are standardized, so the wrong plug cannot plug into the wrong connector.  These connectors only plug in one way as well, so look at it to see how it fits.  They will include the following:

A power cable that plugs into the 115VAC power.

A FEMALE 15-pin connector used to connect the monitor video cable.

**A MALE 9-pin connector that is (usually) COM1 serial port (the mouse may use this).**  *On laptops, this may be the only 9-pin male, and may be COM1, COM2, or another.*

**A MALE 25 pin connector that may be the Com2 serial port.**  *Note that serial ports use MALE connectors, and these are the* **ONLY** *connectors we're interested in.*

A FEMALE 25 pin connector that is the printer Parallel Port**.  Do NOT try to use this.**

A round connector for the keyboard. This may be either fairly large (1/2") or small (1/4"). If small, it's likely that the mouse connector is also small (IBM and a few others).

A USB ("Universal Serial Bus") connector which is a flat, square hole about ½" wide and ¼" high, with a plastic insert used to guide the plug into the hole.  There may be two of these next to each other on your PC.  If your PC does not have a serial port but only has the USB port, you will be able to use the USB port as described below.

There are probably others such as the telephone connectors for an internal modem and the sound card outputs, but these are not useful to us for this connection.

There are several different serial port connections possible. The following are in order of their complications:

**You have a small round connector for your mouse**.  If this is the case, you have a "bus connected" mouse, and your PC likely has a spare serial port to use.  It is also likely that a built-in modem is using one of the ports.  A modem is present if you have a telephone connector on your PC, used typically for your internet connection.  All you have to do is find which COM port your modem (either external or internal) uses and set the BMr to use the other one.  This is the case with almost all laptops. You can try either the 9 pin male or the 25 pin male in turn for this.

**Mouse uses Com1 and an external modem is on Com2.**  On some older PC's, Com1 is used for the mouse, and Com2 can be used for an external modem.  If there is an external modem, then you'll have to switch the BMr with the modem to make it work.  (Unplug the modem, and plug in the BMr. - you don't have to switch off the computer to do this.)  No real problem, just some inconvenience, as you can't be on line while training.  Since this is the simplest setup, it's one of the easiest.

**The computer uses the mouse on the 9 pin Com1 port.**  Try connecting to the 25 pin Male connector. (That should be set on Com2, but try setting the software to Com1 if it doesn't work.)  If it doesn't work, we recommend unplugging your computer, taking just the actual computer chassis ("tower") to a computer expert, and telling them what your problem is.  Tell the technician that the BMr machine is the same as an external modem for their information.

**The computer has an internal modem that is set up on Com2.**   In most cases, the modem and the BMr can't share the serial port.  If your internal modem is connected on COM2 and your mouse is on COM1, then there is no free serial port, and you may be unable to connect using a serial port.  See if this is the case by connecting, and see if the BMr comes up.  If you get an "error opening COM2", it is likely that the internal modem software has "taken" COM2.  If so, then you will have to re-configure your PC to put the modem on Com4, or a higher IRQ (10-12).  This is difficult to do, and it is recommended that you unplug your computer and take it to a service shop.  If you are very familiar with Windows 95/98, you may be able to do it yourself. *(If you do decide to go to a computer tech, be sure to tell them that you need to set up a device the same as an "external" modem on either Com1, Com2, Com3, Com4, Com5, Com6, Com7, or Com8.*

**If your computer has no serial port** (being a newer model), **it will likely have a "USB"** or "Universal Serial Bus" connector.  This is not exactly a serial port.  However, you can get a "USB to Serial Convertor" that plugs into this connector, and then provides a serial port.  We recommend the Dlink, Purple, or Delta (NOT Belkin) DSB-25 USB to Serial Convertor (about $40 US).  When you plug this adapter into your computer, the computer should automatically prompt you for the disk that contains the special adapter software that comes with the adapter.  After the software installs, the computer will automatically "map" the new serial port to COM1, COM2, or some other number.  You can use the "Control Panel" as described below to inspect your Windows settings and find out which port Windows has assigned this adapter.  If the COM port is not 1, 2, 3,  4, 5, 6, 7, or 8, you will need to change it to one of these.  Use the "Advanced" control in the Control Panel for the port to change the COM port number. Note that the port number may change if you remove and re-install the adapter.  Unfortunately, we have

no control over how Windows handles this interface adapter in your computer, so you will have to determine the port number and assign the correct port in the BrainMaster software as described below.

**We also suggest using a PCMCIA Serial adapter, if you have a laptop computer with no serial port, and cannot or prefer not to use a USB to serial adapter.** We have had poor experiences with some USB to serial converters, primarily performance problems. If you cannot find a PCMCIA serial adapter, check: www.computers4sure.com and purchase the SL0700-004 Socket Communications Inc. PCMCIA2 Serial I/O Adapter and install it on your laptop.

**If you use a Palm Pilot, cellular phone, or other serial-connected accessory, you may have problems using the serial port.** The most common error will be "error opening port." The software for your accessory may be taking up the port as soon as you turn on your computer, making it unavailable to the BrainMaster. If this is the case, you need to turn off or disable the accessory software in order to use the BrainMaster. Generally this can be done by clicking on the small icon on the side of the "task bar" at the bottom of your Windows screen, that activates the accessory software, and then allows you to select an option to disable it or turn it off until it is needed.

# Operating The Module On The Serial Input

This is a chicken and egg sort of thing. You need to have the BMr module connected in order to operate and troubleshoot the port. On the other hand, until you get it all to work together, you will not know exactly where a problem may lie. The candidates for difficulties include how your PC hardware is configured, whether your PC hardware works correctly, how Windows is configured, whether Windows works correctly, whether any other software is active, where the cable is plugged in, whether the cable is the correct type, whether the cable is good, and finally, whether the BrainMaster is functioning properly. The BrainMaster is shipped fully charged and tested. Therefore, initial connection setup problems usually lie elsewhere. All possible causes must be investigated and eliminated, before it makes sense to consider that a brand new BrainMaster may be defective.

Turn on the BrainMaster module using the switch on back.
The LED on the front panel should turn on.

Run BSetup from the desktop shortcut. Login as "basic". Refer to the section below on Logging on, if necessary.

Make sure that the "Current Trainee/Study Folder" area shows that the current trainee ID is "test\", as it will be for a freshly installed system.

Click once (left mouse button) on "Run the Next Session".
The "Preparing to Begin Session" dialog will appear. Click on "OK".
The "Begin Training Session" dialog will appear. Click on "OK".

The Training Screen will appear. You can now find the proper COM port to use. The system installs with COM2 selected, because this is the most commonly used port.

Click once (left mouse button) on the "GO" button, and watch what happens.

There will now appear a "Ready to Start" dialog. Click "OK." The software will attempt to communicate with the BrainMaster module and take data. In the "report" area below the "GO" and "STOP" buttons,

watch the text change.  You will see messages such as "Programming Module", and you should expect to see a series of "x's" that will show up one at a time.

If a dialog box appears that says "Module is running!," then the connection works, and you can proceed to the next section.  If it does not, proceed as follows:

Click on "Source" on top left of menu line, then click on "Use COM1", then click on the "GO" button to start the BMr module. Proceed as in the previous paragraph.  After a short time, one of several popup dialog boxes will appear.  If you use the wrong COM port, you will get either a "Module is not responding" dialog or an "Only 1 char seen" dialog, or an "Error opening port" dialog".  Next, click on "Source" again, and click on "Use COM3", then click on "GO" again.  If this fails, try COM4.  If this fails, you will need to troubleshoot the problem until you find a setup that provides a "Module is running!" dialog along with a waveform display seen moving ("wiping") across the training screen, as shown below.

If you see a "No respose on COM port", message when using a port you know to be correct, any of several things could be wrong.  Check that the module is turned on.  If so, then you may have a bad connection between the computer and module.   Try to find it.  It could be a bad cable, a bad COM port on the motherboard, etc , or even a wrong IRQ for the module.  You can check on this by using the Windows Device Manager  (Right click on My Computer, click on properties, click on Device Manager). Now, with "computer" (top line) highlighted, click on "properties" at bottom. You will see a list of device names and associated properties.  Check to be sure that a Com port is identified.  Generally, this will be either COM1, COM2, COM3, or COM4.   If the Com port appears, double click on the entry and look for an indication that says "This device is working properly".  If you see this, Windows thinks the port is OK. You may still have a bad motherboard, or cables.  Several times, we have seen PC's with the internal cable disconnected, so that the COM port could not work.  If you do not see a valid COM port in Device Manager, consult your computer supplier or technician.  You may also need to remove the communications port in Windows, then re-install it with "Add New Hardware".

If a waveform shows up that moves in a fish-bone shaped pattern (as shown) or any kind of wiggly line and the clock is ticking once per second, then the BrainMaster is communicating with the PC, which is the first necessary step.  As long as some kind of waveform is seen "wiping" across the screen, the system is working.  If you do not reach this point, you must continue to find what is wrong with the COM port connection.  The troubleshooting instructions in the BrainMaster User's Manual may help.
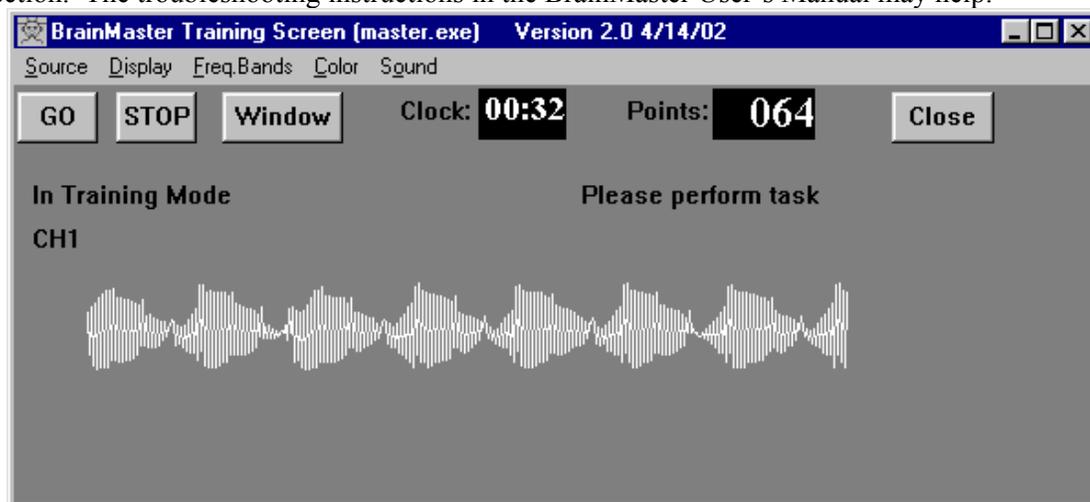
**If you have continued difficulty connecting and using your BrainMaster, refer the Troubleshooting section at the end of the User's Manual.**

**You can always call BrainMaster for assistance at (440) 232-6000.**

# Logging On

The BrainMaster system is sent out with some built-in working folders already set up, and the battery charged.  The following steps will get you up and running in very short order.   The first thing you need to do is to log into the BrainMaster software.

Double-Click on the icon to start the program.  You will see the following Home Screen:



## Basic User Level:

As a "basic" user, you have the following abilities:

- Selecting trainee/study folders
- Running built-in demonstration simulations
- Running unlimited demo sessions on any BrainMaster 2E module
- Running the built-in folders described below, such as "Brain Mirror" and others.
- Using Session Librarian to send and receive session folders.

This startup screen will allow you to run demo folders, and use the built-in folders described below.  To use clinical features (create and set up protocols, etc) or to do home training using clinical folders provided to you, you will need to log in (see below).

To log in to the BrainMaster System, Press the "Login to BrainMaster" button.  You will see the following dialog.  Note that this dialog indicates that you are already authorized as a "basic" user, which is how the software starts up.

## Client User Level:

To run the software as a user under clinical supervision, type your module serial number into the "ID:" field, as shown: Then enter the password (contact your clinician to get your password).



Hit "OK" or the <Return> key, and you will see something like the following:

Clicking on "OK" or pressing <Return> will then return to the home screen, as shown.
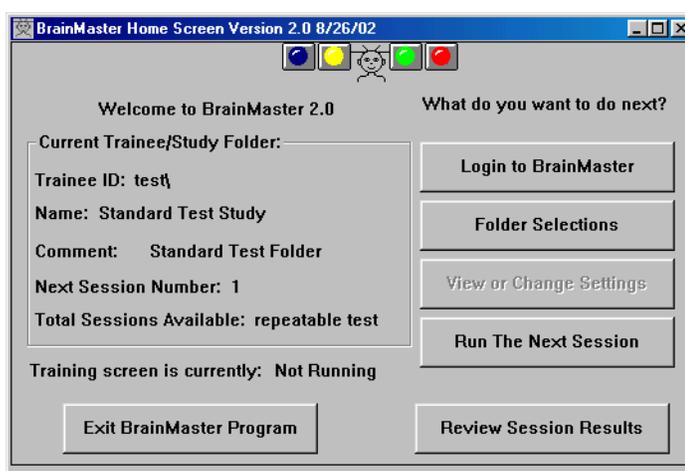


As a registered user, you will have the following abilities:

- Selecting trainee/study folders
- Running built-in demonstration simulations
- Running unlimited demo sessions on any BrainMaster 2E module
- Running the built-in folders described below, such as "Brain Mirror" and others.
- Using Session Librarian to send and receive session folders.
- Running folders sent to you by a clinician

## Clinical User Level:

If you are a clinician or other professional intending to use the BrainMaster in your office, or to remotely supervise clients, you must get a "Clinical" login from BrainMaster Technologies.  You will be given an ID and a password for your practice.  Optionally, include your personal information:
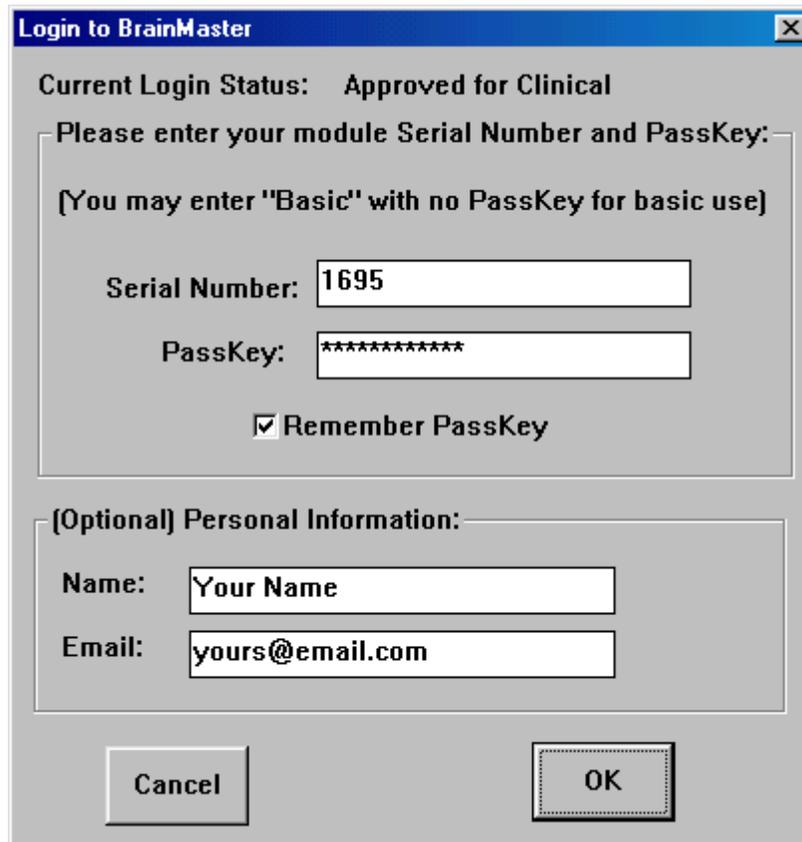
Hit "OK" or the <Return> key, and you will see the following:



Clicking on "OK" or pressing <Return> will then return to the home screen, as shown:
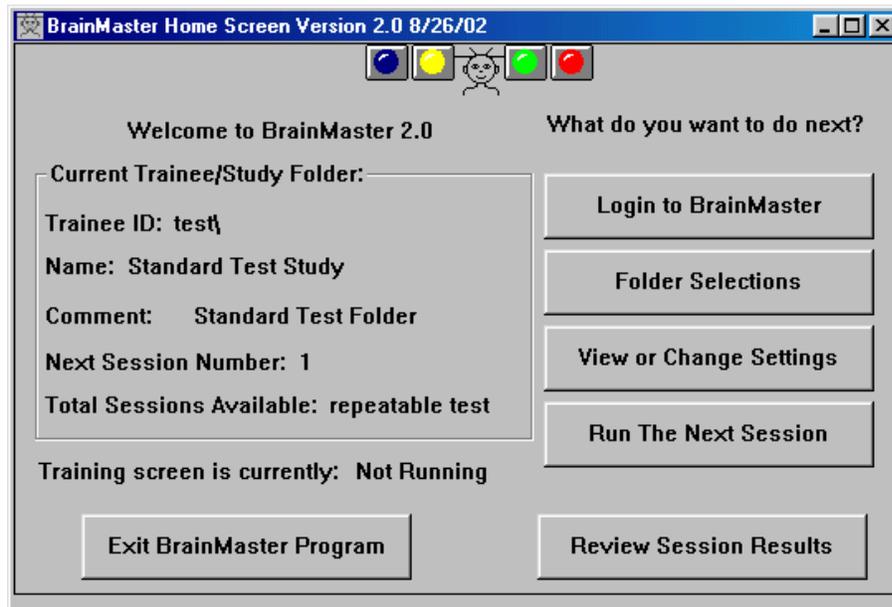
As a clinical user, you have full capabilities to use all the BrainMaster functions describe above, plus the following advanced capabilities:

- Viewing and changing settings for training folders
- Creating new Trainee/Study Folders
- Creating new Training Protocol Files
- Using the Session Librarian to send and receive folders
- Running unlimited sessions on any BrainMaster 2E module, using your PC.

Note: If you are a clinician and you wish to give your home users some access to training settings (frequency bands, etc), please contact BrainMaster Technologies. We can arrange for you to give these abilities to your home trainees on a selective basis.

# Getting and Using Folders

Your clinician may send you training folders that were created using Session Librarian. These files will be recognizable because they have a suffix "bmz", for example "smitjohn.bmz". You may receive these files on floppy disk, via Email, or some other method. However, you receive them, simply double-click (or right click and select "open") on the file icon. This will automatically call up the Session Librarian. Answer the prompts, and the session folders will be installed into your BrainMaster system automatically.

# Software Operation For Initial Use

The "Current Trainee/Study Folder" will be the last folder used. In a fresh installation, it is the "Standard Test Folder." You can immediately click "Run the Next Session" to run the Standard Test Folder. This will allow you to operate the equipment to make sure it works properly. Or, you may select one of the built-in folders as follows:

Click on on "Folder Selections".

You will see the built-in folders ready to select. These have been designed ready for use, and do not require (or permit!) any changes in the settings. Each built-in folder can be used an indefinite number of times, and will never run out of sessions to use. This is indicated by the value "0" in the Total Sessions Available. This is an indicator that the BrainMaster software will allow the user to use this folder repeatedly, re-using "Session 1", so that the folder never "fills up" with session data.
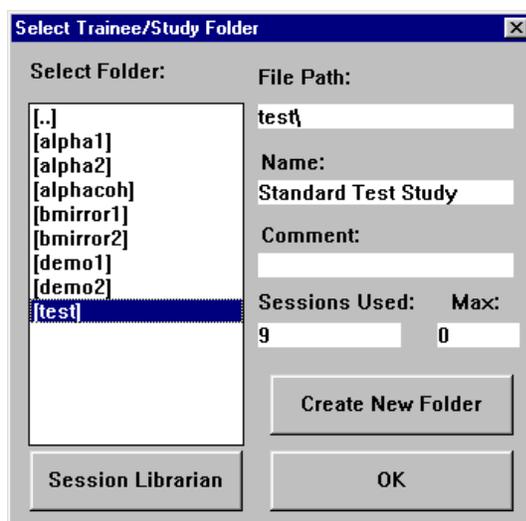


| Name | Use | Suggested leads | Description |
|------|-----|-----------------|-------------|
| Alpha1 | **1-channel alpha uptraining** | **Cz (blue)** <br> **Left ear (yellow)** <br> **Right ear (black)** | **Increases alpha waves while lowering theta. General relaxation.** |
| Alpha2 | **2-channel alpha uptraining** | **C3 (blue) Left ear (yellow)** <br> **Cz (black)** <br> **Right ear (green) C4 (red)** | **Increases alpha waves while lowering theta. General relaxation.** |
| Bmirror | **2-channel frequency spectral display** | **C3 (blue) Left ear (yellow)** <br> **C4 (red) right ear (green)** <br> **Cz (black)** | **Displays EEG spectrum for trainee to view. General self-awareness** |
| Demo1 | **1-channel demonstration** | **(none – simulated EEG)** | **Demonstrates software with no trainee or BrainMaster module attached.** |
| Demo2 | **2-channel demonstration** | **(none – simulated EEG)** | **Demonstrates software with no trainee or BrainMaster module attached** |
| Test | **1-channel System Testing** | **(none or any)** | **Tests system with 1-channel EEG** |

Select a folder to your preference (alpha1 is suggested for starting) by clicking on it with the left mouse button. Then click on "OK". This dialog box will disappear.

The Home Screen will now appear with the selected folder shown in the "Current Trainee/Study Folder" area.

Now click on the "Run the Next Session" button.
The Training Screen will appear.  Click on "GO."

You will see a "Ready to Start" dialog.  This will indicate the recommended electrode placement.  Now is a good time to place the electrodes (see below).

When the electrodes are ready, Click on "OK"

Since you have already set up the BrainMaster, things should go smoothly, and the next dialog box should say "Module is Running."  If it does not, it will contain suggestions about what to do to get everything running properly.

At this point, you can inspect the EEG waveform, adjust electrodes, make sure the trainee is comfortable, and so on.  The clock is not running, and the software is not using up any of the allotted session time.  After you are satisfied that everything is working properly and you are ready to begin the session for real, Click on "GO."

The session now begins.  If there is a baseline period, the command text will indicate this.  After any baseline is complete, the software will go into "training" mode.  The trainee will be able to hear sound feedback, receive points, and perform the EEG training.

**It is now possible to select alternate display windows using the "Window" button** and popup dialog.

**It is also possible to pause and restart the session at any time, by pressing the space bar**.  Pressing the space bar once will pause the session, and pressing it again will restart the session.  This allows the trainee to take rest breaks, leave the room, etc.  During pauses the clock stops, and the system waits until the space bar is pressed again, restarting the session.

# Usage Instructions

Now that you've got the BMr machine connected and turned on, we're ready to start actual use.   The next thing is to place the electrodes.  This should be done using the procedure your clinician provides.  If you use gold disks, they will be affixed to the prepared head area using 10-20 paste.  If you use FlexTrodes, a brief summary of the recommended method is as follows:

NOTE: For simplicity, the following instructions assume you are using a "C3" or "C4" placement.  Use the placement that your clinician recommends for your training use.

 For correct measurement and placement of sensors, refer to the illustrations below.
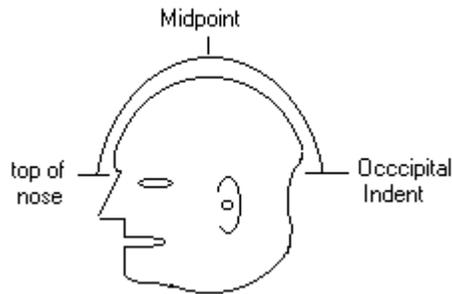
Using your hands, estimate the distance from the top of the nose to the occipital indentation on the back of the head. The illustration shows this clearly (not great artistry, but it does the job). The Midpoint is halfway between these two other points. This is where the cross-strip will go. *Note the desired electrode positions and part the hair, exposing the scalp over the desired locations. You may also clean the scalp with Nu-prep at this time, scrubbing lightly to clean the skin surface.*
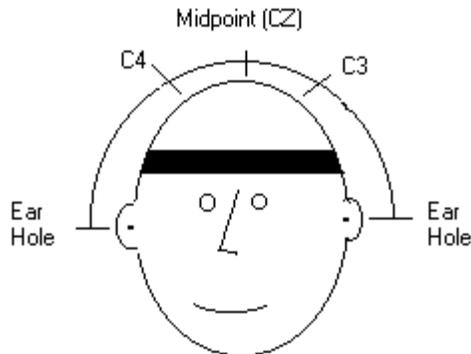


Observe that C3 and C4 lie between Cz and the ears. They are each approximately 1/3 of the way down the head, on either side. These access the "sensorimotor strip", where much EEG training is commonly done. As long as you are within 2 cm (2/3 inch) of these locations, EEG training will be appropriate.

Place the FlexTrode headband as shown, with the Velcro facing outward. Make it snug but comfortable, so that it goes across the forehead, above the ears, and connects at the back of the head, making a snug coverage of the "occipital" area on the back of the head, so that it is secure and will not ride up.

Place the FlexTrode cross-strip on the head, Velcro facing inward, and attach the Velcro to the headband, so that the FlexTrode retaining rings maintain the parts in the hair, so that exposed scalp is visible within the retaining rings. (Cz, C3, and/or C4 in the illustration). Press down to set the retaining rings onto the scalp, and then press down the cross band sides onto the headband.

The FlexTrode headband and cross-strip can be used to reach approximately the positions of Cz, C3, and C4 by attaching the cross-strip to the headband. The exact locations are not so critical, so that the provided cross-strip will work for most adolescents and adults.

Clean the exposed scalp using Nuprep. This can be done using a finger tip or Q-tip.

Insert the soaked FlexTrode electrode assemblies into the retaining rings. The trainee should feel the wetness contacting the scalp.

It is recommended to braid the leadwires together, to provide a single wire lead.  This makes the wires less susceptible to movement or other artifact, and avoids having stray wires draped over the trainee's head and shoulders.

If you are careful, you can use the headband over and over without changing  or marking anything from here on.  Just take it off and on with reasonable care.

# Connecting Sensors

If conventional electrodes are used, prepare the scalp area by scrubbing briefly with NuPrep gel.  Then apply a pea-sized ball of paste to the cup of the electrodes, taking care not to stress the electrode mounting collar.  Press the electrode onto the scalp using a cotton ball to press it down, and "shimmy" it slightly to ensure a secure connection to the skin.

If FlexTrodes are used, before putting on the headband, wet the felt liners by soaking electrodes in the FlexTrode solution provided.  You may wish to unroll the liners and squeeze them in the solution in the cup provided, to ensure complete wetting.  Standard salt water is not recommended as it is not as conductive and produces a salty crust over time. Our solution is designed for electrode applications, wets the electrodes well, and is not messy.

Next, clean the ear lobes using Nu-prep, using the thumb and forefinger to scrub the skin.  Carefully scoop a pea-sized ball of 10-20 paste into each cup of the earclip.  Clip the ear clip to lobe of either ear.  Make sure the electrode cups "float" on a blob of 10-20 paste, and do not touch the skin directly.  The 10-20 provides an important conducting layer that must be preserved.  The yellow input is for the "reference" electrode.  To train on the right, use a right ear reference.  To train on the left, use a left ear reference.  Plug in the wires from the sensors to the connectors on the front of the BMr, using the appropriate colors for each lead. You're ready to proceed!

# Actual Training

Now turn on the BrainMaster.  The actual training is not difficult to understand. What we are training is the brain. This training concentrates on  gradually getting the brain to increase the level (amplitude) of particular components, and/or to reduce others. The keyword here is "gradually", as it usually requires 40-60 sessions. The real key is to learn flexibility and appropriateness of brainwaves.  There may be some noticeable changes after 10 sessions or so.  Don't be discouraged if changes are small, or take time to occur.  They will increase with more sessions.

For example, one particular frequency range of 8-12 Hz is called alpha, and if the amplitude of this component is increased, certain mental characteristics such as relaxation can be improved.  This is trained "up" in the BrainMaster folders called "alpha1" and "alpha2".  Another frequency associated with efficient thinking is the beta band, 15-20 Hz.  This is trained up in the "beta1" built-in folder.

Changing the brain by training the EEG is the primary objective of EEG biofeedback. Because body movements and muscle signals are also picked up by the very sensitive sensors, and these may appear to increase alpha (or another trained component band), a trainee might learn to increase their score by

simply blinking or wrinkling the forehead. To make sure that these muscle signals (called EMG artifacts by professionals) are not counted, we use the Theta Band, and the HiBeta band as stop bands. As a result, in the "beta1" settings, for example,"hits" can only result when the Theta and HiBeta are low, and the beta is high.  In addition, there are other benefits of reducing Theta and HiBeta, including relaxation and reduced tendency for distraction.

Initially, you can try the "alpha1" protocol.  In this the object is to train the EEG so that a simultaneous increase of alpha above the set range, along with the Theta below a set level, rewards the trainee with sounds generated by the MIDI synthesizer in your PC.  As the session progresses, the software will adjust threshold, so that you learn to produce good amounts of alpha, while keeping theta down.  The higher tone responds to increases in alpha, while the lower tone responds to reductions in theta.

Initially, the settings are sufficient to see displays, in particular, the blue display that shows the alpha - the band we are most interested in. If not, make sure that the sensor sponges are wet enough for good conductivity, and that all connections are correct.

The machine sets up an initial amplitude (alpha level required to hear the tone), and modifies it at the beginning of each run as the learning occurs. By recording each session, the operator can see the progress of each amplitude. As amplitudes change, and as the percent time over threshold changes, thresholds are adjusted accordingly.

Since there is the factor of individuality involved, there is no guaranteed way to chart progress. Some trainees show immediate progress with only a few sessions. Others may take as many
as 30-40 sessions before showing any real progress either in EEG values or in perceived benefits. However, if EEG values are steadily increasing, there is real progress.  Patience is really a virtue in this training.

The system will begin to activate the training protocol and provide feedback automatically.  If there is a baseline programmed, the software will take data during this period, and calculate appropriate starting thresholds, then apply them just as the first training "run" begins.

Adjust the thresholds manually or automatically using the procedures that follow.

# Adjusting Thresholds

Previous software used manual control of thresholds.  This is still possible.  However, autothresholding is now available, and is more likely to be used. Both methods are described here.

Existing BrainMaster users will note that in 2.0, the "Lrn" mode has been removed.  This is because the 2.0 software has "autothresholding" in which the software finds new thresholds based on the past EEG data (approximately 10 seconds worth), and can adjust thresholds automatically or manually, at any time during the session.  Autothresholding now does not require the old "Lrn" control.  When autothresholding is turned on, the software continually updates its estimate of the best next threshold.  This threshold then can be copied into the live threshold ("updating") either manually or automatically.

If authresholding is turned on, you will see two sets of numbers, black on the left and red on the right.  Black are the "actual" values, and red are the "auto" numbers.  If autothresholding is used, the keyboard commands to the training screen will change the percent targets, not the actual thresholds.

When autothresholding is used and there is a baseline run defined (usually 1 minute), the baseline period is used to gather normative data from the EEG, and to find the next appropriate thresholds.  Then, when the baseline period concludes, the new threshold values are automatically copied into the "live" values, and training begins.  Thresholds can also be updated between runs, if this option is selected in  the setup.  This scheme replaces the old "Lrn" and "Ply" modes in the 1.9A software.

The built-in folder "alpha1," for example, uses autothresholding.  This means that the software automatically finds appropriate thresholds, and resets them periodically.  The software will seek a "target" percentage, which is the percent of time that the component (alpha in this case) is above threshold (also referred to as "in band").  These folders use 1-minute "runs" and are set so that the threshold will be adjusted between runs, which means once per minute.  They also have a 1-minute baseline period, during which operating thresholds are chosen.  Watch the screen prompts to see that the software is taking the baseline.  After the 1-minute baseline, the software will enter "training" mode, sounds will be heard, and points will be awarded.

When autothresholding is on, the keyboard can be used to adjust the "target" percentages, not the actual threshold values.  For example, typing "a" will increase the alpha target, visible in the red number above the alpha "thermometer" (below).  Typing "A" will decrease the target.  Similarly, "t" and "T" raise and lower the "theta" target, respectively.  In practice, if you change the target percentage, watch the changes in the calculated threshold.  It should be seen to increase or decrease gradually, as appropriate to the new target percentage.  You may then either use the "y" key to update the threshold, or simply wait for the software to perform an autoupdate, if it is configured to do so.

The autothresholding algorithm works as follows:  The average values for each component are saved for every second, for the last 30 seconds.  By inspecting this set of the last 30 values of the component, the autothresholding program finds a threshold that would have provided the target percentage, if it had been used over that 30-second interval.  This is a good estimate of what threshold will be needed in the future, as well.  However, since the EEG is continually changing, this autothresholding "next" threshold is continually updated, as new data are acquired.  So this estimate is continually refreshed, as the system finds the threshold that is appropriate for the most recent 30-second interval.

In the example screen below, theta is currently running 77% time over the current threshold of 5.0. Therefore, the software has chosen a threshold of 12.7 to better approach the desired percent of 20%. Lobeta is currently 80% of the time above the threshold of 34.0. The desired percent is 60%, and the software has chosen 7.8 as the new threshold.
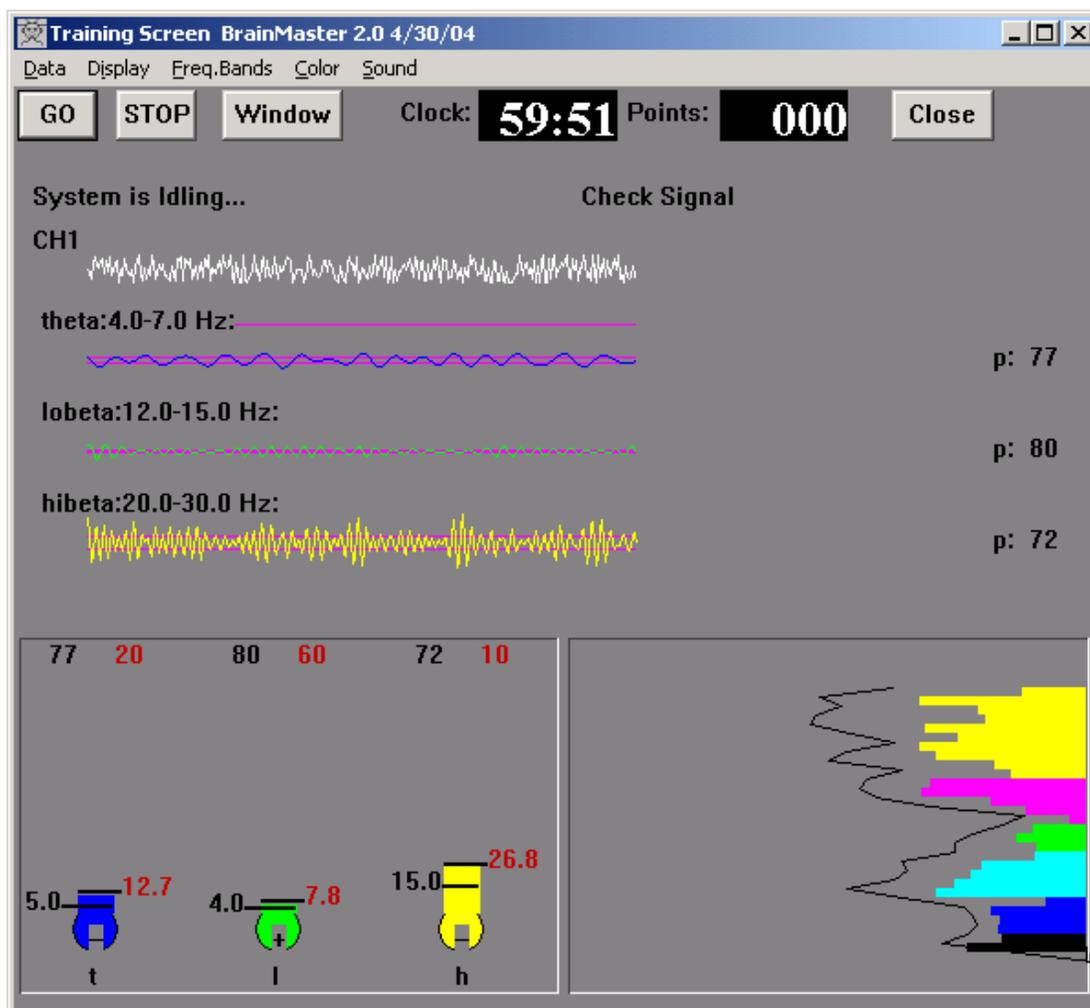


The autothresholds can be manually updated at any time by pressing "y" on the keyboard. Otherwise, they will automatically update according to the program, for example, before each run.

If you are using manual threshold adjustments, the following considerations hold:

The built-in settings folders all have starting threshold values. These are about right for most people, but if you use manual thresholds (autothresholding "off"), you may want to adjust the thresholds during training, to make the rewards come faster or slower, as appropriate. To do this, look at the "thermometer" display window. There will be thermometers in it, with either "+" or "-" or "0" indicated in the "bulb" of the thermometer. Use the keyboard keys to adjust the thresholds so the trainee gets an adequate level of rewards, without making the training too easy.

Depending on the type of feedback used, there will be appropriate targets for percentages.  If you are using a single "reward sound" when all criteria are met, the following will generally hold:  For components with a "+" in the thermometer, the "p" value should be between 50 and 80.  For "-" components, it should be between 20 and 50.

When autothresholding is off, you can adjust the threshold values using the keyboard keys ("t" to raise theta, "T" to lower, etc), and this should be done during the session, to optimize the training.

If you are using a combined feedback mode (such as "pitch" sounds), you will use different target percentages.  This is to avoid providing too much sound feedback.  With this sound mode, typically, "go" components will want "p" values between 20 and 40%, so that their sound is heard only occasionally.  "stop" components will want "p" values between 60% and 80%, so that their sounds are also heard only occasionally.

# Changing The Screen Display

As set up originally, the screen display will be in several parts.  The actual waveform as it occurs (real time), and below that there may be a thermometer display, a "Brain Mirror" spectral display, or other display frames, if they are selected.

*Note: The BrainMaster User's Manual shows pictures of all the important controls, and is useful for the following discussion.   Also, the BMr Manual Display Screen Descriptions is very useful in describing all possible screens.  Be aware that the BMr machine is a general-purpose device, suitable for psychologists, technicians, and researchers as well as for clinical and home training, and has more features than are really needed for any one purpose.  Some of the screens and displays may not be what you want or need. You are encouraged, however, to experiment with all displays.*

The main portion of the screen (below any waveform signal) is usually split into two vertical sections.  This is used for double displays for professionals, and two channel recording (both sides of the head separately).  You can use the training screen to show several different displays at once, per your need and interests.

All the menu items are "toggle" switches, that is, click once, and it's turned on, click again, and it's turned off, next click turns it on again.  A "check mark" on each menu item shows the current state of the selection.   This is the method to select the components or display "panels" on the training screen.

There are also 9 "auxiliary" screen display windows.   They can all be resized, moved, and placed on a second (or third…) display monitor if desired.  Where appropriate, the display scale of a window can be adjusted by using the "+" and "-" keys on the keyboard.  Pressing "+" will make the displayed features larger, pressing "-" will make them smaller.

Note the colors used to code for the EEG components as well.  For example, theta features are always in dark blue (waveforms, thermometer, etc).  Alpha is in light blue.  Each component has its distinctive color, and this is used uniformly in all display frames and windows.

| Window | Behavior | Comment |
|---|---|---|
| X-Wing | Spaceship game – ship is "go" component, earth is low "stop", sun in sky is high "stop". | In 2-channel mode, shows 2 spaceship scenes. |
| BrainMan | Head moves forward and "eats" when a point is awarded. Head turns blue when theta goes above threshold. | No difference in 2-channel mode. Does not support typing thresholds into this window. |
| Numbers | Shows current values numerically. Color indicates whether meeting criterion. Ratios to theta (beta/theta, etc) also visible if selected in window. Shows all components | In two-channel mode, shows 2 columns, plus coherence |
| Thermos | Shows large thermometers with thresholds | In 2-channel mode, shows 2 sets of thermometers. |
| Waves | Raw and filtered EEG in a 2-second "wiping" display. Shows selected components. | In 2-channel mode, shows 2 sets of waveforms. |
| BoxFlow | "Boxes" display with history scrolling upward. Adapts to show "GO" and two "STOP" components in proper color. | In 2-channel mode, shows 2 sets of boxes. Thresholds visible numerically on screen. |
| BrainMirror | Shows spectral display (FFT) in vertical format. Also shows thresholds. | In 2-channel mode, shows bilateral display. |
| Spectral | Compressed Spectral Array of FFT values in "waterfall" style. | In 2-channel mode, shows 2 sets of waterfall plots. |
| TrendView | Shows trend in real-time, with 60 seconds of data across window. Shows selected components. | In 2-channel mode, superimposes both channels on display. |

When any auxiliary window is activated, a separate Windows window appears. This has the standard Windows controls including resize, minimize, maximize, and the ability to move the window. In addition, a control button will appear on the "task bar" (usually on the bottom of your screen), and can be used to minimize or restore any of these windows.

You can also type into these windows, to change thresholds. Note that typing into an auxiliary window always changes the threshold, never the target percentages. This provides a handy way to temporarily change a threshold, while still allowing the software to use the existing percentage values for updates. If you want to change the target percentages, type into the Training Screen.

These are the displays you can switch to during a session. You should experiment with all of these just to get a feel for the machine. Don't worry about messing up the machine. You can switch from one to another just by clicking on the task bar on the bottom of your screen, even while in session easily, and without harm. The ones that most home trainers will use are listed below.

These are the screens that you will probably be using most often. You are encouraged to experiment with the rest, but you will not use most of them. Don't worry about it if they confuse you. Remember that the BMr machine is very sophisticated, but EEG biofeedback for simple training is not difficult. Read the additional BMr Manuals to get more information if you are interested.

# Checking Your Progress

Once you have run the training screen for a while, you can get a report of your EEG progress at any time. Go back to the BrainMaster Setup Screen (just click on its "title bar" or on the button on the task bar at the bottom of your Windows display) and then click on "Review Session Results."

Then hit the "Select" button and use the popup list to select a session number. The sessions are automatically numbered starting with 1. To select a session, click on the directory entry on the right, e.g. "SUM00001" for session 1.

You should see a screen like the following. This contains a graphical summary of your EEG components and their changes, plus the "grand averages" for the session. You may print this report for each session, and see the progress. In addition, the "Show All" button will provide a bar graph of your sessions in sequence. Note that the built-in folders ("alpha1", etc.) re-use session 1 over and over, so they will only show one session. This display can also be printed to your Windows printer.
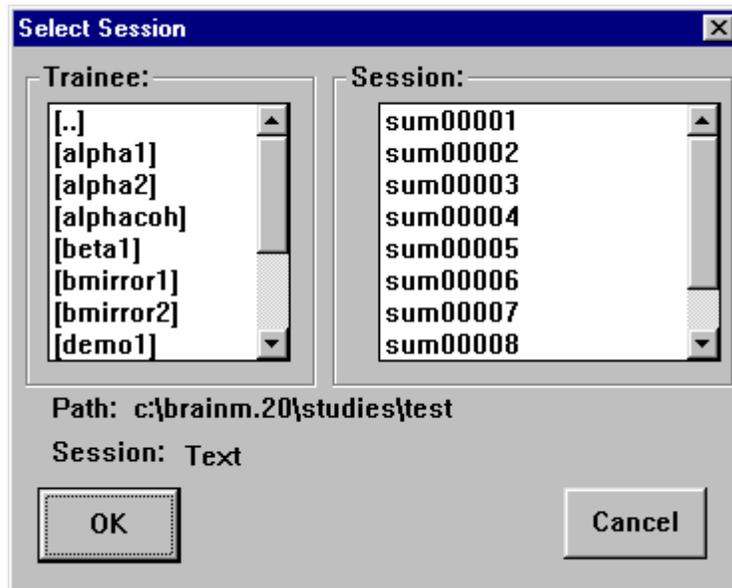
You can change the settings for this display by pressing the "Settings" button and working with the dialog box that appears. You can change the selected components, scale, channels, and other items by choosing the appropriate selections, and then pressing "OK".
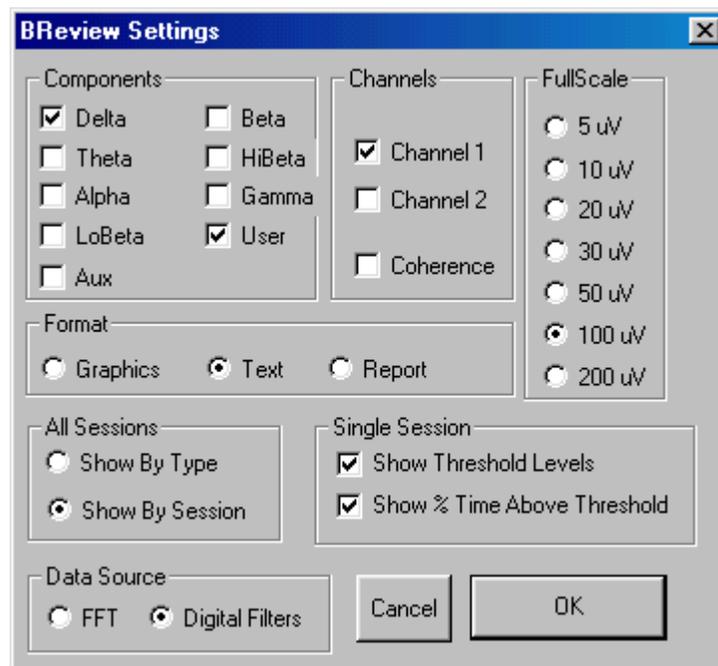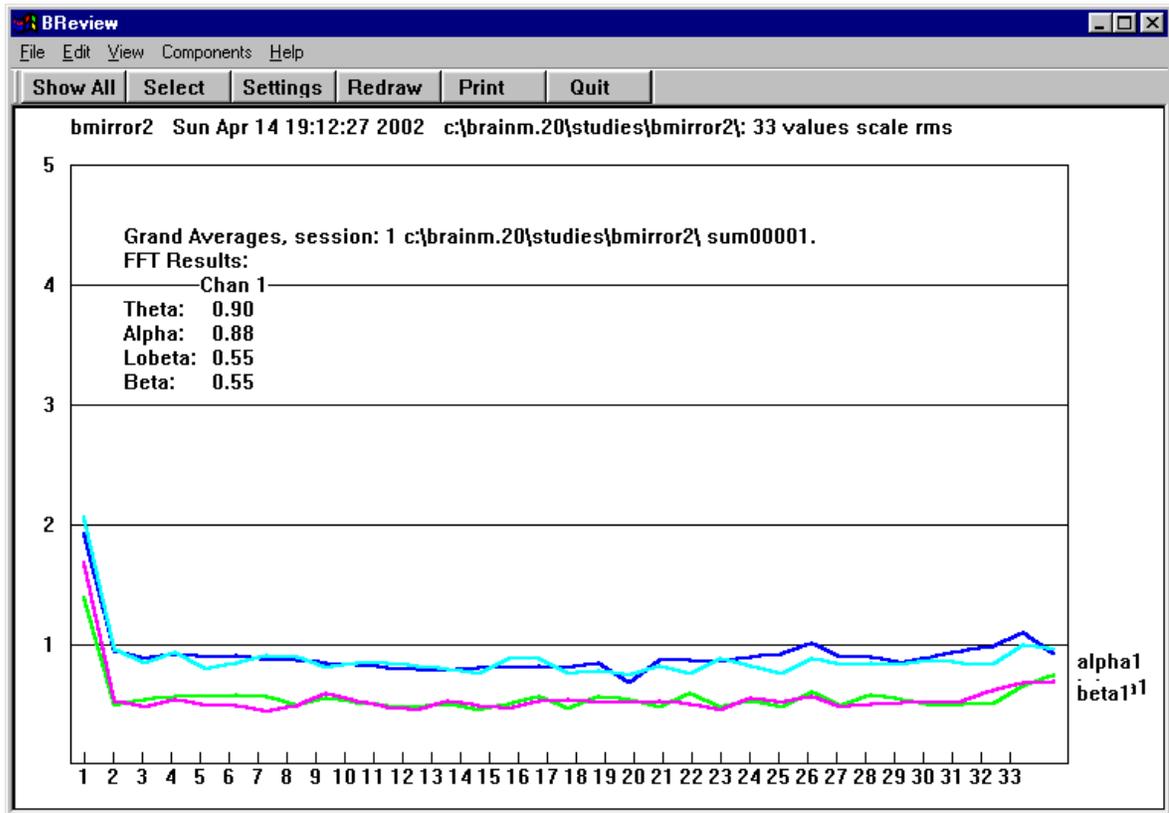
# Creating New Trainee Folders

If you have the clinically enabled version of the 2.0 software, you can create new folders for use in your office or remotely, and you can also pack these folders up using "Session Librarian" for easy transfer to others.  The procedure is as follows:

Select "Folder Selection"
Click on "Create New Folder"
You will see the following:
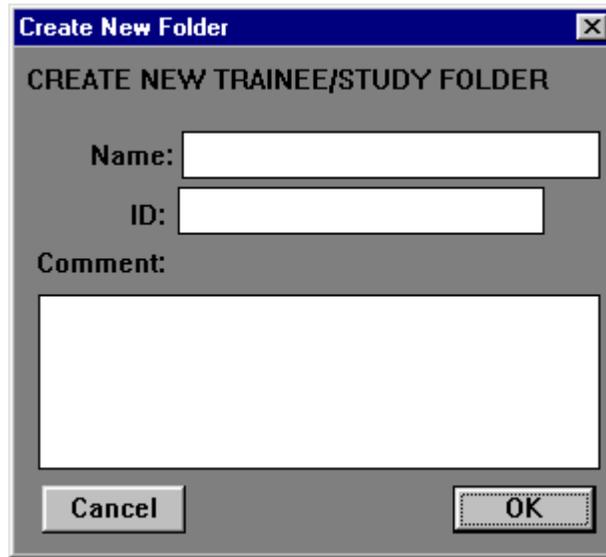
**Create New Folder**                                           ☒

CREATE NEW TRAINEE/STUDY FOLDER

    Name: [                          ]

      ID: [                      ]

Comment:

[                                                ]

[ Cancel ]                              [ OK ]

Type a name into the Name: field.  The system will begin to create a suggested Trainee ID.  You may also type in a comment for this folder:

**Create New Folder**                                           ☒

CREATE NEW TRAINEE/STUDY FOLDER

    Name: [James Smith               ]

      ID: [SmitJame              ]

Comment:

[James Smith Test Folder                        ]

[ Cancel ]                              [ OK ]

Click on "OK."

Inspect the "confirm" dialog box that appears.  If the information is OK, click on "OK".  You can also make changes at this time if you wish.

**Confirm New Folder**

Text

Name: James Smith

ID: SmitJame

Comment:

James Smith Test Folder

Cancel     Text     OK
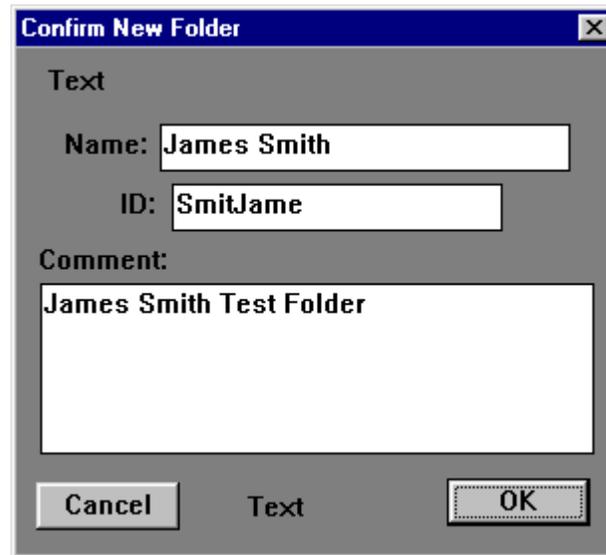
Click on "OK"

You will now see a box providing a choice of built-in settings to use:

**New Folder - Select a Settings File**

[..]
[alert]
[deep]
[deep2]
[focus]
[heg]
[miniq]
[peak]
[peak2]
[relax]
[sharp]

Select a file to provide the initial settings for the new folder

OK
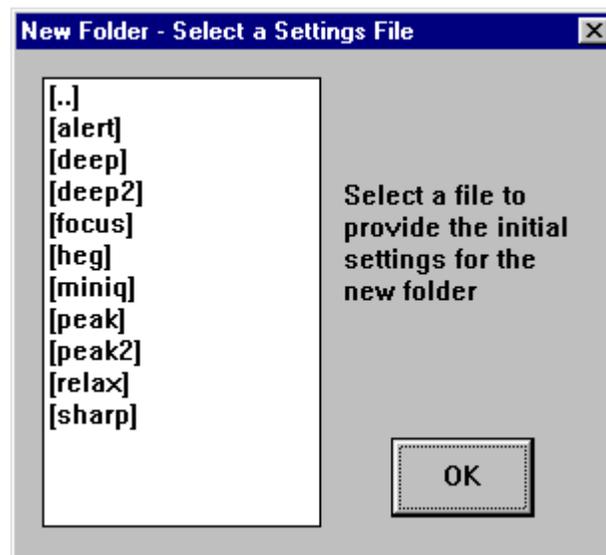
# Built-In Settings Descriptions

| Name | Use | Possible Benefit | Recommended leads | Displays | Training |
|------|-----|------------------|-------------------|----------|----------|
| **Alert** | increase beta suppress theta | Focus, Alertness (Sterman, Lubar) | **C3 (blue)** <br> **left ear (yellow)** <br> **right ear (black)** | waveform, filtered wave, thermometers, filtered mirror | beta "go", theta "stop", hibeta "stop", others "ignore" |
| **Deep** | Increase alpha increase theta | Deep Relaxation (Penniston) | **Cz (blue)** <br> **right or left ear (yellow)** <br> **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)** <br> **C4 (red) right ear (green)** <br> **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)** <br> **right ear (yellow)** <br> **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)** <br> **C4 (red) right ear (green)** <br> **Cz (black)** | waveform, thermometers | alpha coherence "up" |
| **Peak2** | 2-chahnel peak performance | Peak performance (Combined Lubar/Sterman) | **C3 (blue) left ear (yellow)** <br> **C4 (red) right ear (green)** <br> **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)** <br> **either ear (yellow)** <br> **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)** <br> **either ear (yellow)** <br> **other ear (black)** | waveform, thermometers, fft mirror | theta "stop", alpha "stop", lobeta "stop", beta "stop |

In the software distribution, there are also settings for the MINI-Q headbox, and for AUX channel uses, such as HEG (hemoencephalography).  These may be used with new folders for trainees who will be using these capabilities.

You may also see other settings files that have been provided with the software, or by others.  Your choices are not limited to the built-in settings shown above, and you may also create your own settings files for future use.

See below for more details on the use of the MINI-Q.

For information on using AUX devices, refer to the separate instructions for the AUX device.

After selecting a settings file (such as "alert") and clicking on "OK", you will see the Setup Options dialog with all the settings summarized:

**Setup Options**

| Button | Settings |
|---|---|
| Read/Write Settings File | Current Trainee/Study:<br>Demonstration 1 |
| Data Channels | NCHANS: 1    FILTER: 3    ARTIFACT: 240 uV<br>COM: 1 - SUMCHANS:OFF - SAVEEEG:OFF - P-P:ON<br>SITES:  Cz - A1 - A2 |
| Training Protocol | GO:  1:lobeta(4.0)<br>STOP: 1:theta(5.0) 1:hibeta(15.0) AUTO:ON:60/20/10<br>AUTOUPDATE BEFORE EACH RUN |
| Frequency Bands | Theta:4.0-7.0 LoBeta:12.0-15.0 HiBeta:20.0-30.0 |
| Display Options | Display: wave, filt. wave, therm, fft mirror, |
| Feedback Control | Sound: Reward Sounds |
| Session Control | 0 SESSIONS    NO BASELINES<br>60 RUNS OF LENGTH: 1.0 MIN<br>NO PAUSE BETWEEN RUNS<br>SESSION TYPE: Simulation |

CLOSE        PRINT SETTINGS        USE THESE SETTINGS

At this time you can make changes to the settings.  When you are finished, click on "Use these settings". You may print the settings by pressing the "Print Settings" control button.  You will then see:

**BSETUP**

Print Settings File:

/brainm.20/studies/SmitJame\/settings.txt?

Yes        No
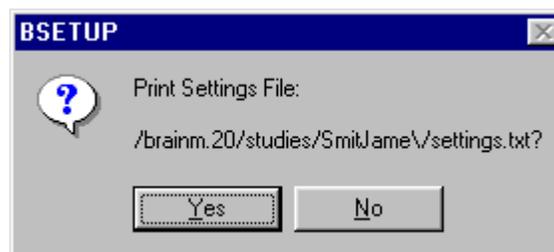
If you select "Yes," you will be presented with a Windows Printer dialog as follows, depending on your version of Windows and printer:

**Print**

| | |
|---|---|
| Printer: | Default Printer (HP DeskJet 930C Series #3 on LPT1:) |

OK

Cancel

Setup...

Print range
- ● All
- ○ Selection
- ○ Pages
  - From: 0  To: 0

Print quality: Medium ▼    Copies: 1

☐ Print to file    ☐ Collate copies
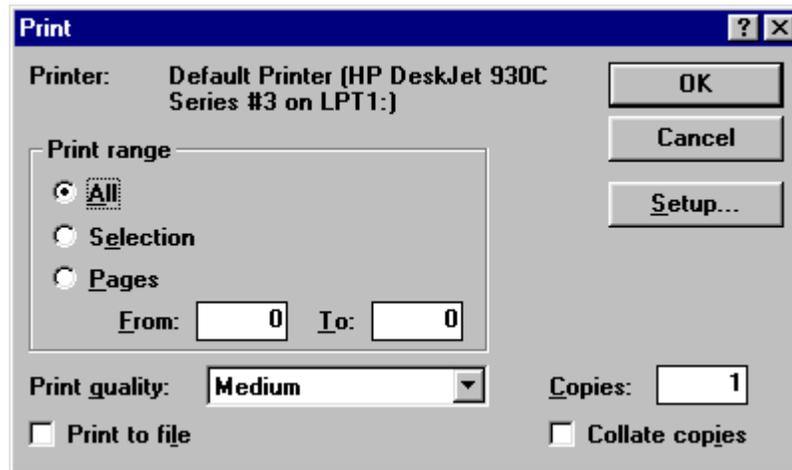
Once you make your printing selection, this dialog box will disappear, leaving you with the Home Screen and your new folder as the current trainee.

**BrainMaster Home Screen Version 2.0 4/14/02**

Welcome to BrainMaster 2.0

What do you want to do next?

Current Trainee/Study Folder:

Trainee ID: SmitJame\

Name: James Smith

Comment:

Next Session Number: 1

Total Sessions Available: 40

Run The Next Session

Folder Selections

View or Change Settings

Training screen is currently: Not Running

Exit BrainMaster Program

Review Session Results

The new trainee folder is now ready to use. Session results will be posted to that folder, and the folder can also be packed up using the "Session Librarian" to be sent via. Floppy disk or email, and unpacked at the destination for use by your client/trainee.

# Session Librarian

The Session Librarian is a program that packs and unpacks Trainee/Study Folders for transport via disk or email, and use on other computers.  This can be used to pack up freshly created folders with the settings and session controls specified by the clinician.  It can also be used by the client or trainee to pack up folders with session results and EEG data, to be analyzed by the clinician or a consultant.

To use the Session Librarian, select "Folder Selections" and press the button marked "Session Librarian".  Then follow the instructions.  You will use the Session Librarian either to pack up folders (to send settings home, for example), or to unpack folders (for example, to set up folders for home use).  To unpack a file you have received, double-click (or "open") the file, and the software will take over.  Follow the instructions as appropriate.

Generally, you will use a floppy disk to store and retrieve packed session files.  If you do not use a floppy disk, the "browser" built into Session Librarian will go to your desktop.  If the files are not there, you can use the browser to go to the directory normally used for storing library files, which is: c:\brainm.20\archive.

If archive files are placed on the PC "desktop" or left in the archive directory, it is possible to use email to transfer them.  Simply use your emailer as usual, and attach the archive files the way you would attach any file for transfer.  Once sent to their destination, files can be saved to the desktop or a floppy disk, then unpacked using the Session Librarian on the destination PC.  Note that by using Session Librarian to send prepared folders to an end-user, it is now possible to set up a client for EEG training, without their having to access any of the setup screens.  Trainees can also use Session Librarian to pack up their folders after a certain amount of training, so that the clinician can unpack them on the office PC to review results.

# Using the MINI-Q

The MINI-Q is a headbox that is used with a commercial Electro-Cap $^{tm}$ , and allows you to acquire EEG channels in pairs, under control of a switch.  It is possible to set up a session that uses the MINI-Q and automatically pauses, prompting the user to change the switch settings as appropriate, and creating data files appropriate for analysis.  To access this function, set up a new folder.  If you have installed the MINI-Q support package, there will be a selection for a settings folder called "miniq" in the settings selection.  Choose this setting.

Note that the alpha software release also contains a built-in folder named "testmini."  This may be used to take one session of MINI-Q data.  Note that this folder will continually re-use session 1.  This is intended for test purposes, not for actual use with a trainee.

To set up for the MIN-Q manually, use the Bsetup dialogs as follows:  In the Data Channels dialog, select "Save EEG."  In the Setup dialog for "Data Channels/Electrodes", select "Use MINI-Q Headbox" on the bottom of the display.  In the Session Control dialog, select "Assessment" as session type.  Choose no baseline (0 minute baseline), 1-minute runs, 6 runs.  Select "pause between runs".

When you run a session set up in this way, use the Electro-Cap $^{tm}$  electrode cap, and start with the MINI-Q switch all the way counterclockwise.  When prompted, set the MINI-Q switch one turn clockwise for each run.  In this way, you will be able to measure EEG from the successive pairs of electrodes, while saving the EEG to disk.

After the MINI-Q session is complete, you can use Session Librarian to pack up the folder and email it to an appropriate recipient for data analysis.

You can also use Excel to see the "Quick-File" file created for the session, which will have a name such as "QAT00001.txt."   This file is accessible directly from the BReview review screen.  This file will contain EEG results for each minute, including asymmetry and ratio data for your inspection.  See the BReview manual for further details.

# Troubleshooting

The BrainMaster User's Manual provides details on troubleshooting for a variety of issues.  If this does not work, please call us.  We are available to help with all types of problems.  You can call BrainMaster at (440) 232-6000 or email us at support@brainmaster.com or info@brainmaster.com .