



## **Motor Mind B Control Software**

Motor Mind B Test Software System

- \*Windows Environment
- \*Motor Mind B Interface
- \*Intuitive and Easy to Use

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# **MINIATURE ENGINEERING MODULES**

# Motor Mind B Control Software

## For Windows 98/2000/NT

The Motor Mind B is a DC motor controller with a simple command set. Access to its features is based on a serial communication protocol. Because there are no external components necessary for use, the Motor Mind B is an extremely easy device to use. The Motor Mind B Control Software is an integrated Windows environment designed specifically for interfacing to the Motor Mind B. The software allows users to execute all Motor Mind B commands, create scripts of commands and plot frequencies. This enables the Motor Mind B to be rapidly tested in a prototype environment. Because of the Windows nature of the product, the user interface is intuitive and easy to use.

### System Requirements

The Motor Mind B Control Software requires an IBM PC or compatible computer running Windows 98/2000/NT (Windows 98 users will need to download a different application than users of Windows 2000 or Windows NT). The Motor Mind B Control Software communicates to the Motor Mind B via a COM port on the computer. As such, one free serial port is necessary to use the software. The COM port can be selected in the Options area of the Control Software. Because a COM port sends and receives data at RS-232 voltage levels, a level converter is necessary to convert the RS-232 voltage levels of the computer to and from the TTL voltage levels of the Motor Mind B. The Solutions Cubed Motor Mind B Serial Test Board (MMBSTB) is one such device. This document assumes the use of a MMBSTB throughout, so reference to the MMBSTB data sheet would be helpful.

### Loading the Software

After ensuring the computer meets the requirements for the Motor Mind B Control Software, the software may be loaded onto the computer. Use the following steps to load the software. The software must be installed using the SETUP program, which is included in the distribution package. To install the Motor Mind B Control Software:

1. Run Windows.
2. Insert the MOTOR MIND B Development Kit CD into the CD-ROM drive, or unzip the downloaded software.
3. From the START Menu select "Run".
4. Use the "Browse" button to find the CD-ROM drive or directory where you unzipped the software.
5. Double click on the "SETUP" icon.
6. The path to the "SETUP" program should be in the path box of the Run window. If it is not, repeat steps 4 and 5. If that still does not work, manually type in the path to the setup program.
7. Click the "OK" button in the Run window.
8. Follow the instructions on the screen.
9. The Motor Mind B Control Software has now been successfully loaded onto your computer.
10. To run the software, click on the "The Motor Mind B Control Software" icon located in the "START → Programs" menu.

### Hardware Schematic

The connection diagram below (Figure 1) depicts a Motor Mind B using the MMBSTB as a communications interface. This is the easiest and simplest way to use the Motor Mind B. Information on using the Motor Mind B with other interfaces is provided in the Applications section of the Motor Mind B data sheet, which is available from our web site.

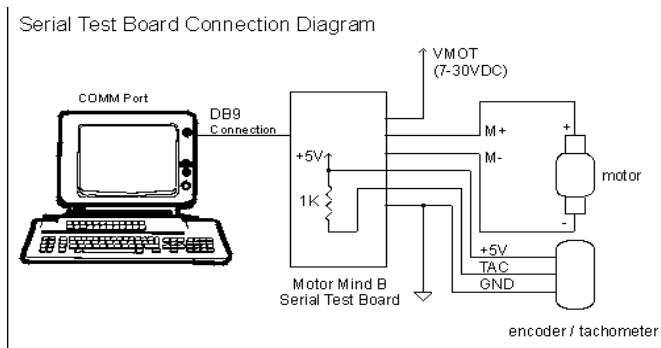


Figure 1 Basic connection diagram

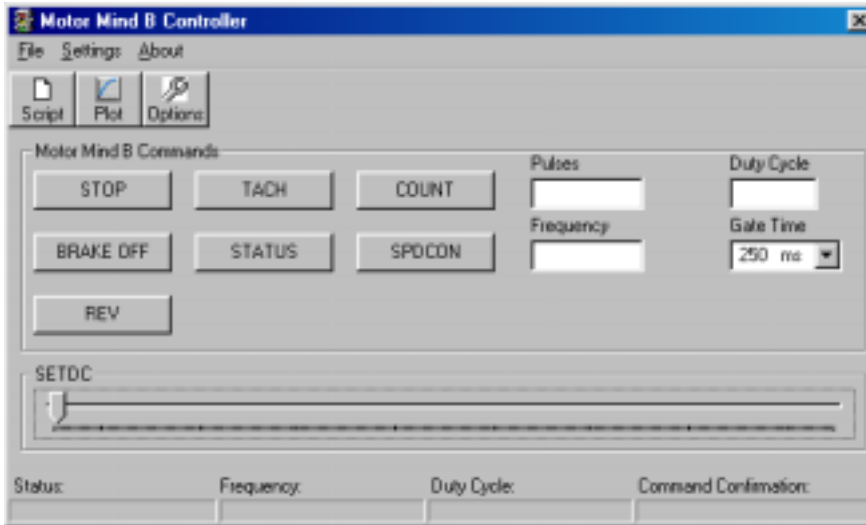
### Hardware Schematic (continued)

Power (Vcc) must be supplied to the Motor Mind B from either a master processor or an external supply. When communication is taking place between the master and the Motor Mind B, both the host's ground and the Motor Mind B's GND pin must be at the same potential. As the diagram shows, the TM pin on the Motor Mind B provides the

communication path to the master from the Motor Mind B; while the FM pin on the Motor Mind B provides the communication path from the master to the Motor Mind B.

### Using the Motor Mind B Control Software

The Control Software is capable of executing commands individually, running scripts of commands, and plotting frequencies. Upon program startup, the Splash Screen opens, which will indicate if an available COM port has been found. The Splash Screen also indicates if any Motor Mind B modules have been found on these COM ports.



**Figure 2** Command Console

After the Splash Screen disappears, the Command Console (Figure 2) is loaded, which allows the user to issue Motor Mind B commands. From the Command Console, the user can launch the Plot Frequency or Script Consoles by selecting Plot or Script from the pull-down File menu, or by clicking their icons on the toolbar.

### Command Descriptions

There are eight basic Motor Mind B commands. SPDCON and COUNT require user inputs. All input must be in decimal form.

#### BRAKE

When BRAKE is on, the Request To Send (RTS) outgoing flow control signals are disabled, which asserts the external BRAKE connection low, and the Motor Mind B halts motor movement. Communications with the Motor Mind B is still available, but sending a COUNT command is not recommended, as the Control Software may enter an endless loop (COUNT function will not receive status bytes back). This may cause the Control Software to freeze up, in which case the user should stop the control software, and reset communications with the Motor Mind B.

#### STOP

Resets the motor speed to the lowest duty cycle (0.39%). In the Motor Mind B 800 revision, which entered production in February of 2001, the STOP command also asserts the BRAKE pin on the Motor Mind B itself.

#### REV

The reverse command changes the direction that the motor is rotating. The Control Software first reads the current duty cycle by executing a STATUS command. The REV command is sent, followed by a delay (in seconds) which can be set in the EMF Spike panel in Options. The EMF delay is .5 seconds by default. Upon delay completion, the former duty cycle is sent via the SETDC command. Care should be taken not to reverse large motors while at high speeds.

#### TACH

The TACH command causes the Motor Mind B to read the TACH\_IN pin. The Control Software displays this value below the frequency label located on the status bar.

#### SETDC

SETDC adjusts the motor's speed by sending a positive duty cycle value to the Motor Mind B. This value can be 0 - 255. This command can be issued via a slider bar in the Command and Plot Consoles, or by inserting a SETDC entry into a Script.

#### SPDCON

This command adjusts the motor speed until the desired frequency is read in from the TACH\_IN pin. If executing the command from the Command Console, the user has the option of entering the frequency as two bytes or a whole number. This preference can be set in the Options area.

The SPDCON mode is exited in one of two ways. The user can click on the EXIT SPDCON command located below the SPDCON button. It will appear when a SPDCON command is executed. If a user presses on another command while the Motor Mind B is in SPDCON mode, the Control Software attempts to exit SPDCON mode. This is accomplished by pulling the FM pin low for a period of time greater than the gate time. The latter method is used in the Script Console, so the user should enter a time delay after scripted SPDCON commands.

**STATUS**

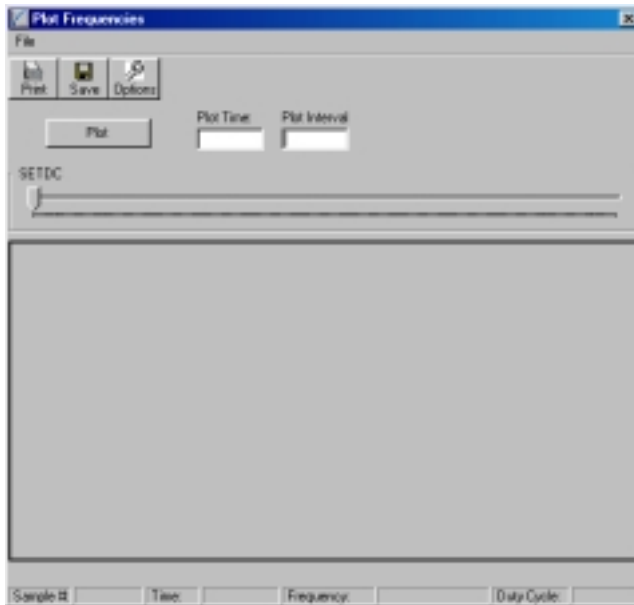
The Motor Mind B returns two bytes when the Control Software issues the STATUS command. The first byte indicates motor direction and/or a processor reset. The direction (or reset) is displayed on the status bar to the left of the Status label. The second byte indicates the motor's duty cycle, which is displayed below the "Duty Cycle" label on the status bar.

**COUNT**

This command requires the user to input the number of pulses to be counted, as well as the desired duty cycle. The Motor Mind B will count an even number of rising edges until the number of pulses has been reached. Communication with the Motor Mind B is not allowed until the Count command has finished execution. Low duty cycles might result in the motor not reaching the desired number of pulses, causing the Control Software to become unresponsive. In this case, the user may have to power down the unit to reset communications.

**Plotting Frequencies**

The Control Software is able to collect, graph and save TACH data. To create graphs of frequencies, open "File → Plot Frequency" in the Command Console (or press on the plot icon on the toolbar). A window similar Figure 3 will appear.



**Figure 3** Plot Console

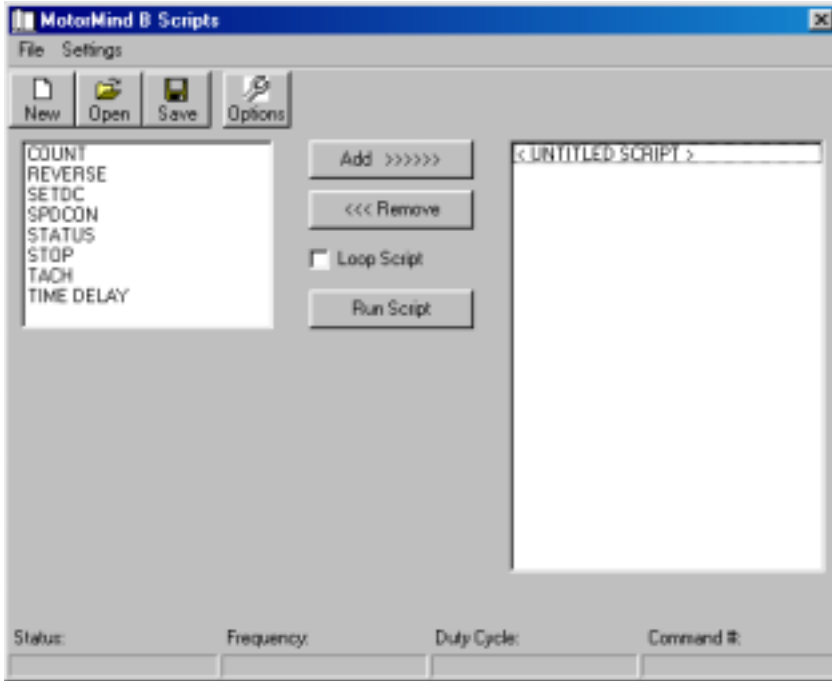
The user has the ability to plot motor frequencies for varying lengths of time and at variable read intervals. The total plot time must be greater than the read interval. The minimum read interval is .5 second. The slider located above the graph area can be used to set the motor's duty cycle via the SETDC command. The duty cycle can be set before and during plot creation. Once the plot has been created, the user has the ability to save the data in the form of a \*.csv file, which can be read by spreadsheet programs such as Microsoft's Excel. Once a graph has been created, the user has the ability to print the data. The print function will print the graph and the corresponding numerical data.

**Creating and Using Scripts of Motor Mind B Commands**

The Motor Mind B Control Software can be used to sequence Motor Mind B commands. To create a script, select "File → Script" from the Command Console, or click on the script icon located in the toolbar. A window similar to Figure 4 will appear.

Available commands are located on the left. Highlight one and press "Add >>>>"; the command should be added to the script window on the right. The commands SPDCON, SETDC, TIME DELAY, and COUNT require user input. All input must be in decimal form.

TIME DELAY should be used to run certain commands for a length of time (enter as seconds). It is useful following a SETDC command, and necessary for the full execution of a SPDCON command. The SPDCON mode is exited when the next command is executed.



**Figure 4** Script Console

Users have the ability to add or remove commands anywhere in the script. Click on the command that is located just before the location where the new command should be placed. Select the desired command from the command window on the left. Click on “Add >>>>>” to insert the command into the script. When the new command is added, it will be placed into the right window just after the currently highlighted command. In order to remove a command, highlight the unwanted command and press “<<<< Remove”.

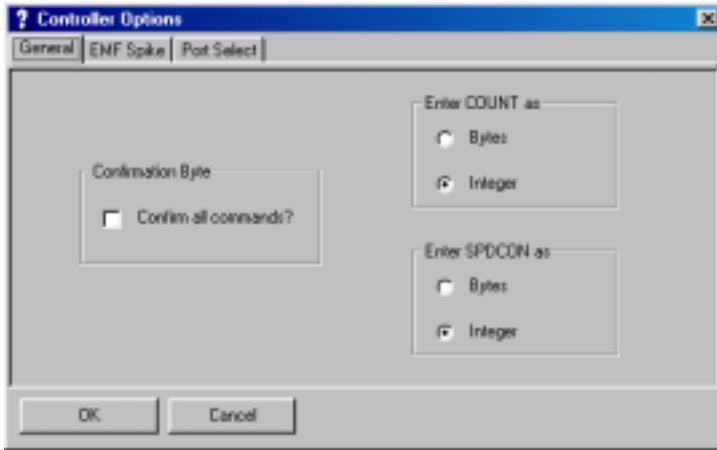
To run a script, click on the first command to be executed. Pressing “Run Script” will initiate script execution. When no command is highlighted, the script will start on the topmost command. To loop the execution of a script, check the “Loop Script” option prior to running a script.

To save a script, select either the drop down menu or the icon labeled “Save” on the toolbar. A dialog box will appear; the saved file will have a “.mmb” extension. The Control Software saves scripts as ASCII text, which the user should not edit outside of the Control Software’s Script Console interface.

General options are disabled in the scripting area, but the user is able to modify the EMF Delay and the COM port settings.

### **Control Software Options**

The options console can be accessed from any of the other three consoles. Launch the Options Console (Figure 5) by opening “Options → Settings” from any console. The General Options can be set only if the user is executing commands from the Command Console.



**Figure 5** The Options Console

### General Tab

The user can confirm all commands sent to the Motor Mind B from the Command Console (Figure 1). If the user checks the box "Confirm all commands?", the Control Software will send all command bytes with the highest bit set. The Motor Mind B will send a confirmation byte on the TM pin with the value 'AA'h. The Control Software will display a "Confirmed" message for a brief period of time in the status bar. If a confirmation byte is not received, then a "Command Failure" message will appear.

Values for SPDCON and COUNT command can be entered either as two bytes, or a whole number. Pulses and Frequencies, entered as whole numbers, must range from (0-65,535). If entered as separate bytes, the values must be (0-255).

### EMF Spike Tab

The EMF Spike Avoidance Setting can be set from any of the Consoles. It is a delay used in the REVERSE command, and it can prevent a Motor Mind B unit from experiencing a potentially damaging back EMF. Use longer EMF Spike Delays when reversing motors at high duty cycles.

### Port Select Tab

The Control Software attempts to establish communications with a Motor Mind B by finding open COM ports on a system. The open COM ports are probed for the presence of a Motor Mind B, via a STATUS command. If communications cannot be established, the user is warned that there is an error. If this error occurs, the Control Software will not issue commands to the Motor Mind B until the COM port is reset in the Options area.

It may be necessary to change the COM port. Select the "Options → Port Select" tab from the Initial, Plot or Script consoles. There are two commands in the Port Select area: "Select Port" and "Debug". The Select Port command will issue a STATUS command on the user-selected COM port. If a Motor Mind B is found, the message "Communication Established with Motor Mind B" is displayed. If the STATUS command does not receive data from the Motor Mind B, an error message will be displayed in the Debug window. The Debug command performs the initial port scanning operation, and checks for the presence of a Motor Mind B on each valid port. The availability of ports and the presence of a Motor Mind B will display in the Debug window.

If all else fails, you can debug your hardware resources by clicking "System Info" from the Version Console, which is accessed from the "About → Version" menu item in the Command Console.

## Distributors

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