

**Motor Mind B
Serial Test Board**

- Motor Mind B Evaluation System
*Easy To Use Software Interface
*Screw Terminal Motor Connection
*Test Points / LED Indicators

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MINIATURE ENGINEERING MODULES

Motor Mind B Serial Test Board

FEATURES

- ◆ Software provided accesses all Motor Mind B functions
- ◆ 5V output for open-collector tachometers
- ◆ Screw terminal for motor interface
- ◆ 9 test points, 3 status LEDs
- ◆ Tachometer vs. time plotting
- ◆ Manual BRAKE pin

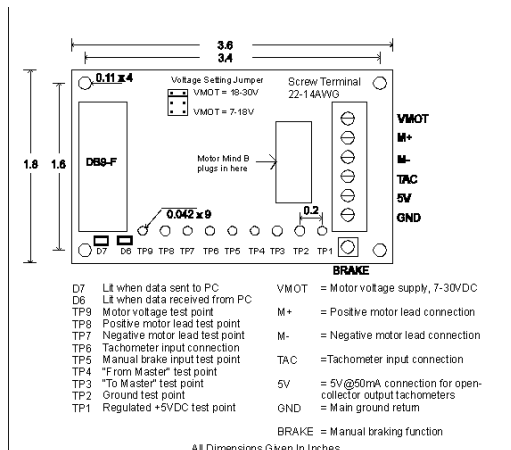
DESCRIPTION

The Motor Mind B Serial Test Board (MMBSTB) has been developed to aid in functional testing of the Motor Mind B. This test board, in conjunction with the supplied software, can speed designs utilizing the Motor Mind B into production. Evaluation of the Motor Mind B, and its use with application specific mechanical systems, can be streamlined with the inclusion of the MMBSTB into the test process.

The MMBSTB provides quick connectivity between the Motor Mind B, an RS232 serial interface, and the motor to be controlled. Screw terminals simplify connections between the Motor Mind B, the motor system, and the system power supply. Nine test points allow for quick access to signals to and from the test board and can be used as oscilloscope probe points or voltmeter connections.

Solutions Cubed has provided free software for use with the MMBSTB that allows access to all of the features available in the Motor Mind B.

MECHANICAL SPECIFICATIONS



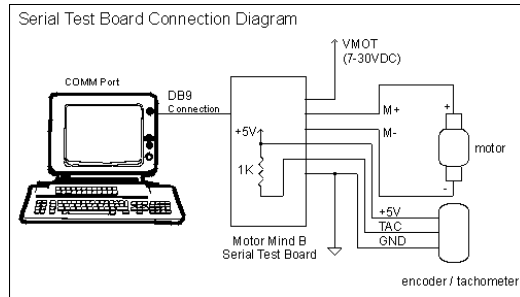
MOTOR CONNECTION

The MMBSTB should be connected to the motor and motor voltage supply through the screw terminal located on the right-hand side of the MMBSTB circuit board.

The Motor Mind B can be used to read encoder or tachometer signals, and therefore connections are available on the MMBSTB screw terminals for these signals. However, the MMBSTB does not require an encoder or tachometer connection in order to perform many of the motor-control functions available in the Motor Mind B.

In general, any system not using the COUNT, TACH, or SPDCON functions of the Motor Mind B do not require a tachometer input.

Many motor encoders have "open-collector" type outputs. This means that they need to be pulled to +5V by a resistor in order for the encoder output to be driven high by the motor encoder circuit. A 1K-ohm resistor (R7) is included on the MMBSTB in order to accomplish this. If this resistor adversely effects your encoder's output it can be removed from the MMBSTB.



GETTING STARTED

To use the MMBSTB follow the following simple steps.

1. Install the provided software on your PC
2. Connect a DB9 serial cable between your PC COM port and the MMBSTB
3. Connect your motor to the MMBSTB
4. Connect your power supply to the MMBSTB (with power supply off)
5. Set the voltage setting jumper on the MMBSTB for the correct voltage (this is marked on the PCB)
6. Insert a Motor Mind B into J2 where it is labeled "ENTRY", plug the Motor Mind B into the top set of entry holes
7. Turn on your power supply, the "Power On" LED, D4, should light
8. Run the software provided with the MMBSTB, and select the appropriate COM port

You should now be able to execute commands and control your motor with the MMBSTB system.

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

note: These are stress ratings only. Stresses above those listed below may cause permanent damage and/or affect device reliability. The operational ratings should be used to determine applicable ranges of operation.

Storage Temperature	-55°C to +150°C
Operating Temperature	-20°C to +85°C
Supply Voltage(VMOT)	+7.0V to +30.0V
Voltage on TM, FM, GND, /BRAKE pins	-0.6V to +5.6V
Voltage on VMOTOR, MOTOR+, MOTOR-, TACH_IN pins	7-30V
Motor Current Load	3.5A peak / 2A continuous

DC ELECTRICAL CHARACTERISTICS

At $T_A = 25^\circ\text{C}$ and VMOT = 12.0V unless otherwise noted.

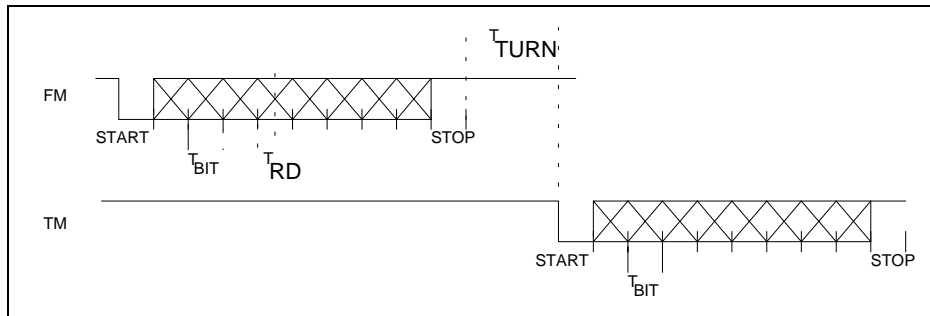
Characteristic	Symbol	Min	Typ	Max	Unit	Notes
Supply Voltage	Vcc	7.0		30.0	V	
Vcc rise time to ensure good reset	SVdd	0.05			V/ms	If this is not met, the Motor Mind B may start up in an unknown state and may not communicate correctly.
Supply Current	Icc	15	70	110	MA	Current increases as motor speeds increase, highest current occurs when /BRAKE is low.
FM Input Low Voltage	VIL	GND		0.2Vcc	V	
FM Input High Voltage	VIH	2.0 0.2Vcc+1V		Vcc	V	4.0<Vcc<5.0 Full Vcc range User may use better of two specs.
TM Output Low Voltage	VOLTM			0.6	V	
TM Output High Voltage	VIHTM	Vcc			V	TM is open collector
TM Output Pull Up current	ITMPU	2.5	5.0	5.5	MA	TM open collector is tied to Vcc with a 5% 1kΩ resistor.
/BRAKE pin disable motor voltage	VBRK			1.2	V	Low on /BRAKE disables motor, but not communication.
/BRAKE pin current sourced when pulled low	IBRK	2.5	5.0	5.5	MA	/BRAKE is tied to Vcc with a 5% 1kΩ resistor

note: "Typ" values are for design guidance only and are not guaranteed

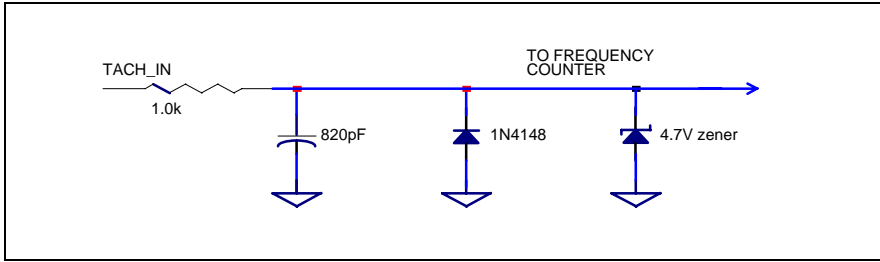
AC ELECTRICAL CHARACTERISTICS

At $T_A = 25^\circ\text{C}$ and $V_{MOT} = 12.0\text{V}$ unless otherwise noted.

Characteristic	Symbol	Min	Typ	Max	Unit	Notes
Communication bit period 2400 baud	TBIT	413	416	419	μS	The bit period is determined by an on-board oscillator, and is temperature sensitive
Offset when a bit is read 2400 baud	TRD	180	200	220	μS	This is used to ensure a bit is valid when read. A bit must be valid for at least this long in order for the communication to not be erroneous
Time for a command from master to be responded to	TTURN	450	500	550	μS	This time is used to allow for a master to change from transmission mode to reception mode
Baud generator error	BGE		2	6	%	
Bit period temperature coefficient	BPTEMPCO	-1.8	-1.6	-1.7	$\text{nS}/^\circ\text{C}$	Therefore at higher temperatures, a slower baud rate may be necessary at the master
PWM duty cycle resolution	TDC	0.39		99.61	%	Speed control is in 254 discrete steps of $\sim 0.39\%$
PWM frequency	TPWM	57	61	65	Hz	64Hz for TACH and SPDCON commands
Saturation voltage of H-bridge's drivers	VCESAT	0.9	1.2	1.8	V	Increased saturation voltage requires higher power dissipation for module
Thermal shutdown temperature	TJ		165		$^\circ\text{C}$	Thermal shutdown has a hysteresis of 15°C
Max peak motor current	IPK		3.5		A	Peak motor current must not exceed spikes of 20us duration
Max continuous motor current	ICON		2.0		A	
Max continuous motor current no cooling	IHS	1.2	1.3	1.4	A	Maximum current to load without external cooling devices(fans, etc.)
Tachometer frequency	FTACH	0		65,535	Hz	See frequency section page 5 for limitations
Tachometer read time	TTACH	15.63		2000	ms	Read time based on TACH gate time value
Tachometer input voltage	VTACH	5		30	V	Square wave inputs are ideal, however signals of uneven symmetry will work.



Communication Timing Diagram



Motor Mind B Tachometer Circuit

The Motor Mind B TACH_IN circuit is provided for reference. Make sure that your motor's tachometer or encoder is not adversely effected by the circuit above. The tachometer signal level should be between 5-30V. The tachometer circuit reads in values from 0-65,535Hz. Measurement errors are typically +/-5%. Signals such as sine waves and square waves with uneven symmetry will work. The ideal input for this circuit is a logic level square wave with even symmetry, but many signal types will yield accurate frequency measurements. A tachometer signal is necessary in order to use the automated speed control and counting functions (SPDCON, TACH and COUNT).

Firmware revision 298 in the Motor Mind B provides for a tachometer gate time value to be sent with the TACH and SPDCON commands. Omitting the gate time value causes the Motor Mind B to default to a 250ms gate time with a resolution of 8Hz. The Motor Mind B will not default to this 250ms gate time if a gate time value has been included with any previous TACH or SPDCON command. Omitting the gate time value throughout your program makes the Motor Mind B revision 298 firmware backward compatible with all code written for earlier firmware versions.

Gate Time Value	Gate Time(time spent reading tachometer, T_{TACH})	Duty Cycle Updates per second(SPDCON)	Resolution (TACH)
'80'h	2000ms	1 every 2 seconds	1Hz
'40'h	1000ms	1 every second	2Hz
'20'h	500ms	2 every second	4Hz
'10'h	250ms	4 every second	8Hz
'08'h	125ms	8 every second	16Hz
'04'h	62.5ms	16 every second	32Hz
'02'h	31.25ms	32 every second	64Hz
'01'h	15.625ms	64 every second	128Hz

Table of gate time values for TACH and SPDCON firmware revision 298

PC Serial Port Interface

PC Signal	MMBSTB Signal	DB-9
TX	FM	3
RX	TM	2
GND	GND	5

Distributors

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