Microstep Driver Manual

Version 6/13/2006

EAS Microstep is our single axis microstepping chopper driver board for stepper motors. It is based on the National Semiconductor LMD18245 3amp 55volt full bridge motor driver.

Specifications:
Microchip PIC microcontroller based.
Drives 4,6 or 8 wire bipolar/unipolar stepper motors up to 3amps at 55volts per phase.
Can be flash programmed to support half/full steps plus 4,8 or 10 microstep modes.
Adjustable chopper current drive.
Standard TTL step and direction inputs.

Power connections.
The EAS Microstep driver board has a 55Volt maximum input voltage for powering stepper motors. Power leads must be connected to correct terminal screw. Do not reverse the power input or exceed 55volts, the LMD18245 drivers can be damaged by this.

Connect your stepper power supply to the MOT PWR screw terminal located on the right side of the board. Positive supply input connects to screw terminal labeled +.

If stepper motor power supply is far away from driver board, connect a 470uf 65volt capacitor directly to MOT PWR screw terminals.

The driver board also requires a separate supply to power the low voltage section of the driver board. Connect an 8-12volt supply to the screw terminals labeled PWR and GND. The PWR terminal is +positive supply input. This terminal is located near the front right side of the board. You can use the 12volt computer disk drive cable connector to supply power to the board. This is the recommended way to hook up power to the onboard 5volt regulator.

Always turn on the low voltage power supply/Computer before turning on the higher voltage stepper motor power supply.

Motor Power Supply
A standard 24volt AC transformer works well. This is approximately 35volts DC after diodes and filtering caps are added to complete the power supply. We recommend using an unregulated linear power supply and not a switching type supply. If using a switching type supply, place a large capacitor (10,000uf or more) on the output terminals. A 3amp/phase stepper motor will only require a 2amp power supply. For multiple stepper motors, add up all the current/phase required and multiply by 2/3 to calculate the minimum power supply current rating needed. Do not connect or disconnect any stepper motor leads while motor supply is connected and turned on. This may damage the LMD18245 driver chips.

The LMD18245 driver chip is rated at 55volts maximum DC input. When using a power supply that is over 45volts, there will be some motor back EMF, induced by stepper

motor deceleration, which may cause the voltage to rise above the rated 55volt limit. For added protection, place a correctly rated zener diode to help clamp the voltage below 55volts. We also recommend placing a fast blow 2.5amp fuse on the motor supply input connector for each driver board.

Step/Direction connections.
If you are using the parallel port Breakout Board, connect the step, direction and ground terminals to the corresponding step/dir/GND screw terminals on the Microstep driver board.

If the Breakout Board isn't used, you will need to connect the appropriate step and direction I/O pins from the PC parallel port to the Microstep driver board. You will also need to connect the parallel port ground, pin 25, to the terminal labeled GND on the driver board. Please read the TurboCNC or MACH2 manual for more info on correct step and direction pin I/O assignments.

The step and direction signals should be set to "Active Low" pin state with a pulse width atleast 2 microseconds. Some external parallel port optoisolation boards invert the step and direction signals. If this is the case, set the pin state to "Active High".

The maximum step frequency rate is 45Khz. With 8 microstep mode, this is approximately 1700rpm with a standard 1.8degree/step motor.

Brake Connection
One of the design features of the LMD18245 driver is a brake terminal pin. This can be used to disable power to the stepper motors. A high signal will enable braking and will stop the stepper motors. Normal operation, the brake terminal is low or grounded. If this feature isn't needed, you can solder the jumper pad J4 labeled BRAKE. This will permanently ground the brake signal to disable it. If you do not plan to solder J4, the BRAKE screw terminal should not be left floating. Use a short wire to connect this terminal to one of the ground (GND) connectors.

RB6/RB7 JP2 Jumpers
You will need to place jumpers on these header pins. If you do not plan to in-circuit FLASH program the PIC microcontroller, you can solder wires directly to the pads. These jumpers must be installed or the driver board will not operate correctly. The 6 pin program header JP1 does not need to be installed if you do not plan to program the microcontroller.

Current Resistor Setting
The maximum driver current output is set by resistor R2 and R8. The LMD18245 can drive stepper motors up to 3amps per phase. Higher current rated stepper motors can be used but maximum listed torque will not be achieved. You must attach the LMD18245 driver chips to a large heatsink for them to operate properly. There is a small hole on each tab for a screw to help mount them to a heatsink securely. Use white

silicon heatsink compound for better heat transfer. The tabs on the LMD18245 is the same as ground, do not let bare wires touch the heatsink or driver chips.

We use a 6"x6"x1.5" thick heatsink and mounted 3 Microstep drivers on it. The current setting is set to 3amps on all drivers and the heatsink does a good job cooling them. A fan blowing directly on the heatsink is recommended if a smaller heatsink is used.

The current sense resistor can be calculated by the following formula:

18,750 / A = R
R value is in ohms
A value is in amps

Resistor R2 and R8 typical values:
R=18.75K   1amp
R=9.38K   2amp
R=7.5K   2.5amp
R=6.25K 3amp
Use 1/4 watt resistors and do not use lower than a 6.25K value.

Both LMD18245 driver chips must be set to the same output current limit. Use the same resistor value for R2 and R8. Do not set the drivers to output more than 3 amps, they will fail.

Optional variable current output can be had by removing resistor R2/R8 and installing the two 25K pots, R10/R11. The set resistance value must not be lower than 6.25K. We recommend users to install R2 and R8 instead of the variable pots.

Header JP5 Full/Half step jumper.
At this time JP5 does not have any affect and does not need to be installed.

J3 Ground solder point.
You must solder together jumper J3 on the driver board or the board will not function. This connects the analog ground to the digital ground. It is located in the center of the board, silkscreened labeled SHORT.

Stepper motor driver connections.
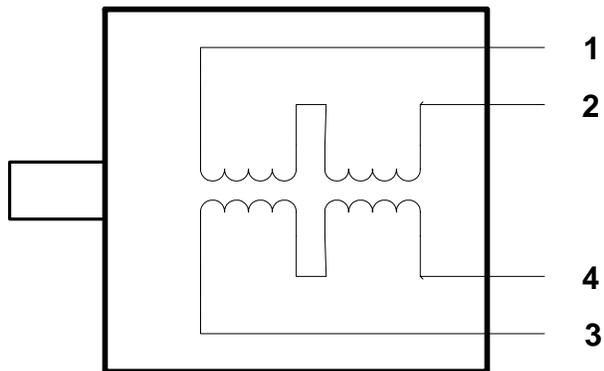
4 wire stepper motor connection.

Wire 1 connects to M A1 terminal
Wire 2 connects to M A2 terminal
Wire 3 connects to M B1 terminal
Wire 4 connects to M B2 terminal

Adjust drive current setting to no more than motor rated current specification.

6 wire stepper motor, half winding connection.

Wire 1 connects to M A1 terminal
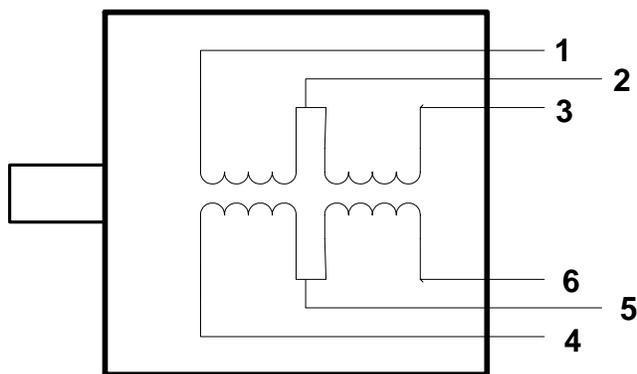Wire 2 connects to M A2 terminal
Wire 3 not connected
Wire 4 connects to M B1 terminal
Wire 5 connects to M B2 terminal
Wire 6 not connected

Adjust drive current setting to no more than motor rated current specification.

This is the preferable way to hook up a 6 wire stepper motor to the driver. 6 wire half winding mode has lower inductance than 6 wire full winding. The stepper motor will be able to spin faster.

6 wire stepper motor, full winding connection.

Wire 1 connects to M A1 terminal
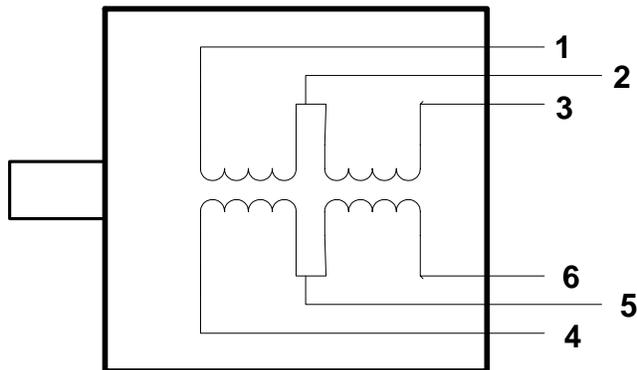Wire 2 not connected
Wire 3 connects to M A2 terminal
Wire 4 connects to M B1 terminal
Wire 5 not connected
Wire 6 connects to M B2 terminal

Adjust drive current setting to half of the motor rated current specification. Please check actual stepper motor datasheet for current setting, it may be slightly higher.

6 wire full winding mode can be used for stepper motors that have high nameplate current specification. It will maximize the available torque at the expense of motor RPM due to increased winding inductance.

8 wire stepper motor, half winding connection.

Wire 1 connects to M A1 terminal
Wire 2 connects to M A2 terminal
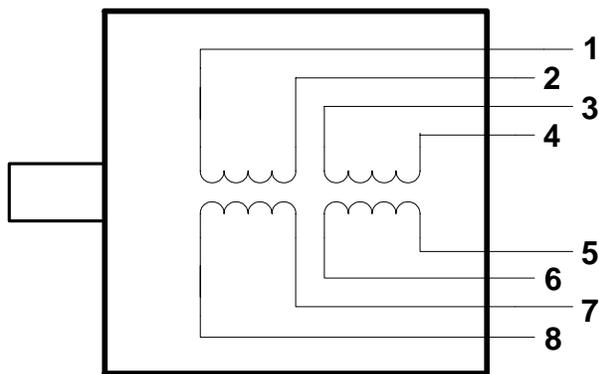Wire 3 not connected
Wire 4 not connected
Wire 5 not connected
Wire 6 not connected
Wire 7 connects to M B2 terminal
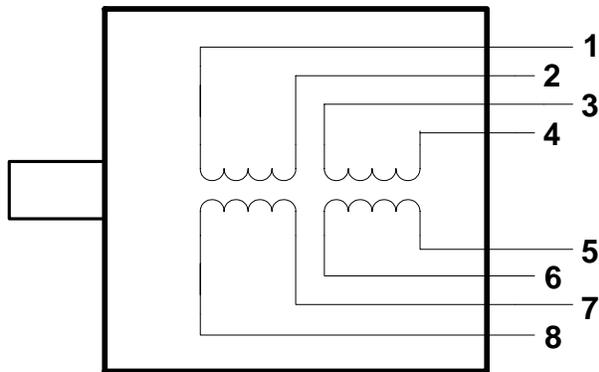Wire 8 connects to M B1 terminal

Adjust drive current setting to no more than motor rated unipolar current specification.

8 wire stepper motor, full winding connection. Also known as serial connection.

Wire 1 connects to M A1 terminal
Wire 2 connect wires 2 and 3 together
Wire 3
Wire 4 connects to M A2 terminal
Wire 5 connects to M B2 terminal
Wire 6 connect wires 6 and 7 together
Wire 7
Wire 8 connects to M B1 terminal

Adjust drive current setting to half of the motor rated parallel current specification.
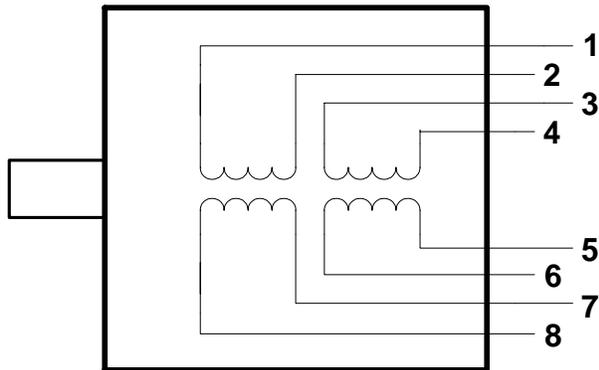
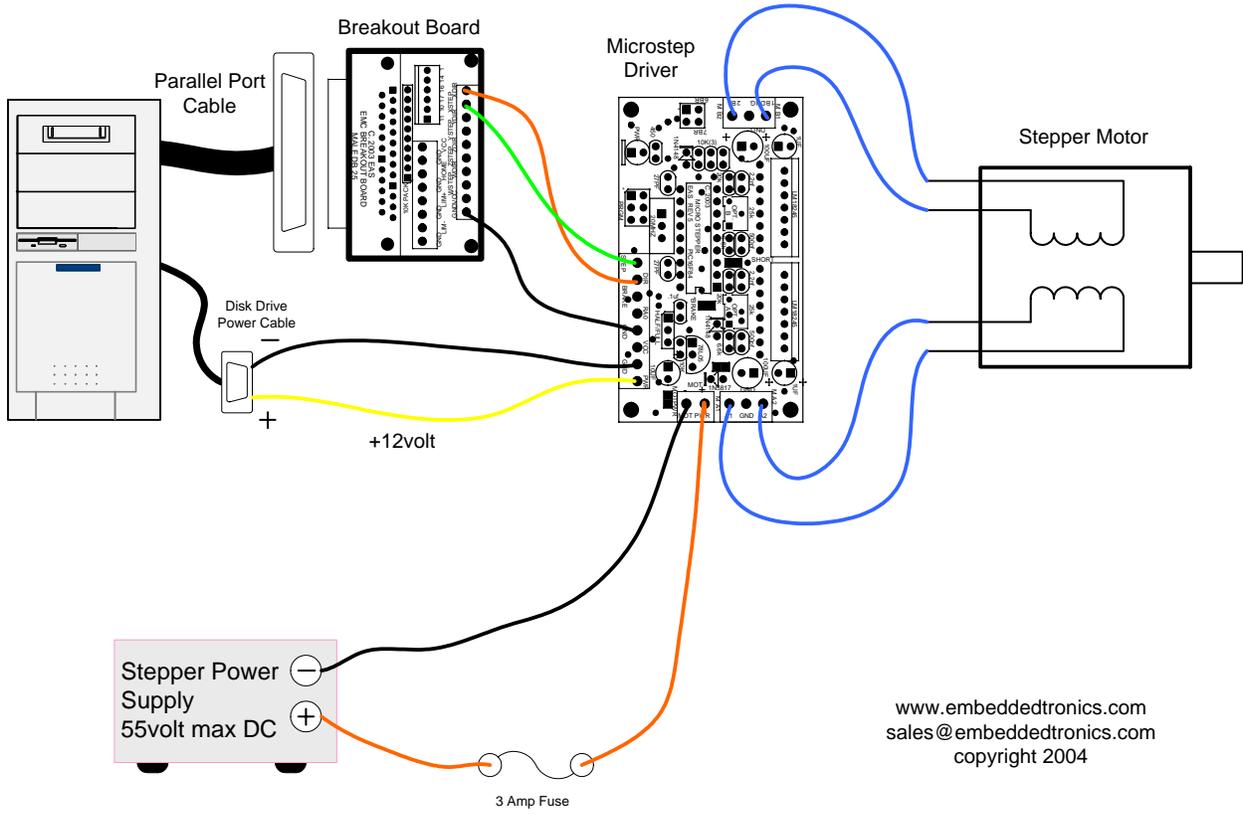8 wire stepper motor, parallel winding connection.

Wire 1 connects to M A1 terminal
Wire 2 connects to M A2 terminal
Wire 3 connects to M A1 terminal
Wire 4 connects to M A2 terminal
Wire 5 connects to M B2 terminal
Wire 6 connects to M B1 terminal
Wire 7 connects to M B2 terminal
Wire 8 connects to M B1 terminal

Adjust drive current setting to the motor parallel rated current specification.

8 wire parallel winding requires more current and may not be suitable for hookup to the microstep driver board due to the 3 amp maximum current limitation.

Microstep Driver
Single Axis Wiring Diagram

Breakout Board

Parallel Port
Cable

Microstep
Driver

Stepper Motor

Disk Drive
Power Cable

+12volt

Stepper Power
Supply
55volt max DC

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3 Amp Fuse

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