

## PLEASE READ COMPLETE DATASHEET BEFORE USE

(follow specific setup instructions (ref. 2.1))

### FEATURES:

- Two phase bipolar (chopper) pulse width modulating technology
- 1/8, 1/4, 1/2, or full step selectable via 3 pos **DIP** switch for each individual axis
- Individual axis enable/disable via 3 pos **DIP** switch for each individual axis
- Adjustable PFD (percent fast decay) via **VR1, 2, and 3**
- Adjustable stepper motor current via **VRX, Y, and Z**
- Full access to all unused DB25 port pins via direct terminal block
- +5v logic output for the use of limit switches, digitizing probe, etc...
- **VBB OUT**put for the use of cooling fans and the like
- Remote **EN**abling of individual axis'
- Maximum 30VDC @ 2.5 amps/phase motor output

### 1.1 DIP SWITCH FUNCTION:

| FUNCTION    | DIP POS 1 | DIP POS 2 | DIP POS 3 |
|-------------|-----------|-----------|-----------|
| ENABLE AXIS | ON        | ----      | ----      |
| 1/8 STEP    | ----      | OFF       | OFF       |
| ¼ STEP      | ----      | ON        | OFF       |
| ½ STEP      | ----      | OFF       | ON        |
| FULL STEP   | ----      | ON        | ON        |

### 1.2 CONNECTING POWER SUPPLY TO DRIVE BOARD:

- Connect suitable power supply at **VBB IN** terminal (please note polarity)
- 24vdc @ 2-6amp switching power supply recommended
- 12vdc min. (risk of overheating at lower voltages)
- 30vdc max. (although driver is rated up to 35vdc, power supplies over 30vdc are not recommended due to variations in output)

### 1.3 SELECTING STEPPER MOTORS:

**WARNING: INCORRECT WIRING OF THE STEPPER MOTOR TO THE DRIVE BOARD CAN LEAD TO IMMEDIATE DAMAGE OF DRIVE BOARD - DO NOT CONNECT OR DISCONNECT MOTORS WHILE POWER IS ON**

4 Wire, 6 Wire, and 8 Wire stepper motors can be used with stepper motor drive

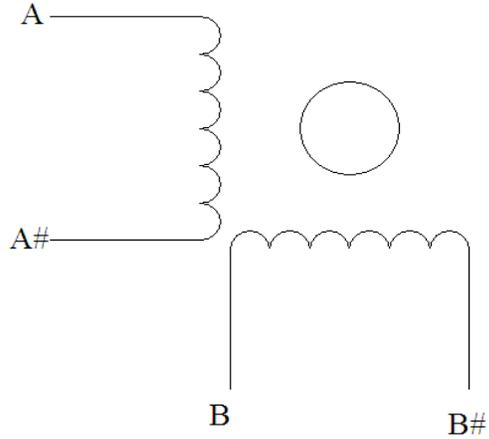
4 Wire motors are recommended as they are by their manufacture true bipolar motors and easier to properly connect to stepper motor drive

2.5 (or less amps) / phase stepper motors will yield the best performance

It is critical to obtain a proper motor coil diagram of any motor you wish to utilize (making cross connections between the two coils will destroy the control circuitry)

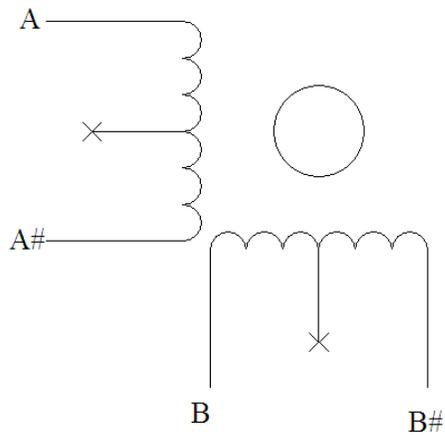
1.8 deg per step resolution is the industry standard for most automation grade stepper motors and is recommended for most applications

#### 4 WIRE STEPPER DIAGRAM



Each wire is connected to its corresponding terminal block location (i.e. A# wire is connected at **XA#** location).

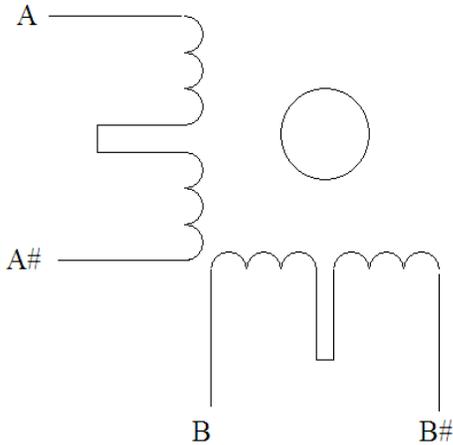
#### 6 WIRE STEPPER DIAGRAM (SERIES WIRING)



Center wire of each coil not connected (insulate termination)

Remaining wires are connected to their corresponding terminal block location (i.e. A# wire is connected at **XA#** location).

### 8 WIRE STEPPER DIAGRAM



2 center wires of each coil connected (insulate connection)

Remaining wires are connected to their corresponding terminal block location (i.e. A# wire is connected at XA# location).

### 1.4 SETTING STEPPER MOTOR CURRENT:

Stepper motors must **NOT** be connected when adjusting motor current

Each individual axis current may be adjusted utilizing variable resistor potentiometers (**VR X**, **VR Y**, and **VR Z**)

Current adjustment is made with the aid of voltmeter at test points (**TP X**, **TP Y**, and **TP Z**). Be sure to make contact with COM probe at COM connection point at **VBB IN**put.

Formula for proper Vref at said **TP s** = (1.25 x desired current value)  
(i.e. stepper motor current rating of 2 amps = Vref of 2.5 vdc)

VREFs higher than 2.5vdc require the use of external cooling device such as a fan blowing directly over the driver board. (**DO NOT EXCEED A VREF OF 3.125 VDC ON ANY GIVEN AXIS**)

If using 6 or 8 wire motors, connected using series wiring method, reduce labeled amperage rating by **50%**  
(i.e. a motor rated at 4 amps should thus be considered now rated at 2 amps)

A conservative motor current (50-75%) of stated motor rating (bi-polar motor) will often give excellent results, often making the use of external cooling system unnecessary (as long as Vref is less than 2.5vdc)

Overheating is evidenced by the loss of torque and or loss of steps while in use (thermal shutdown). Prolonged overheating may permanently damage driver board.

### 1.5 SETTING PFD:

For the vast majority of setups a PFD Vref value of 2.5vdc will provide excellent performance from the stepper motors

PFD values are adjusted in the same manner previously described for Stepper Motor Current, at appropriate VR s (**VR1, VR2,VR3**) and corresponding TP s (**TP1, TP2, TP3**)

### 1.6 CONNECTING BOARD TO COMPUTER

All signals are Active Low

#### DB 25 PIN USAGE:

| DB 25 Pin Number | Current Usage / Access          |
|------------------|---------------------------------|
| 2                | Step x                          |
| 3                | Dir x                           |
| 4                | Step y                          |
| 5                | Dir y                           |
| 6                | Step z                          |
| 7                | Dir z                           |
| 8                | Not Utilized (access provided)  |
| 9                | Not Utilized (access provided)  |
| 10               | Not Utilized (access provided)  |
| 11               | Not Utilized (access provided)  |
| 12               | Not Utilized (access provided)  |
| 13               | Not Utilized (access provided)  |
| 14               | Not Utilized (access provided)  |
| 15               | Not Utilized (access provided)  |
| 16               | Not Utilized (access provided)  |
| 17               | Not Utilized (access provided)  |
| 18-25            | Signal ground (access provided) |
| 1                | Not Utilized (access provided)  |

It is critical that the connection between computer parallel port and motor drive board be direct without the use of adapters (If your computer does not feature a DB25 outlet, you must install one, (these can be achieved via PCMCIA cards on laptop computers))

The use of adapters and hubs is not advisable and most likely will not work

### **1.7 REMOTE ENABLING:**

It is possible to remotely enable each individual axis via the use of cam software, a (LOW) output signal via one of the unused output pins connected individually or as group to (**EN X, EN Y, EN Z**) - will result in the enabling of said axis/axis'.

Access is given to each axis enable function via onboard terminal block (in order to utilize this function, individual axis enable must be turned **OFF** at individual axis(') **DIP** position 1)

When signal at **EN X, EN Y, or EN Z** is connected to ground it will become enabled, thus one has the ability to add simple external switches to remotely activate given axis.

### **1.8 VBB OUT:**

The primary purpose of the **VBB OUTlet** is as a power connection point for appropriate cooling device (if required), which should be rated at same Vdc as chosen power source.

Do not use this as a connection point for additional stepper motor drive boards (no daisy chaining), additional boards should be directly connected to power source. (ref 2.3)

### **1.9 ADDITIONAL TERMINAL ACCESS INFORMATION**

**+5V LOG** - is to be used as logic voltage source only, not to be used to power external devices (typically only used to create HIGH signal line).

**SIG GND** (signal ground) - access to pins 18-25 of DB25 connection, which are used specifically as a signal ground

**GND** - VBB ground (COM)

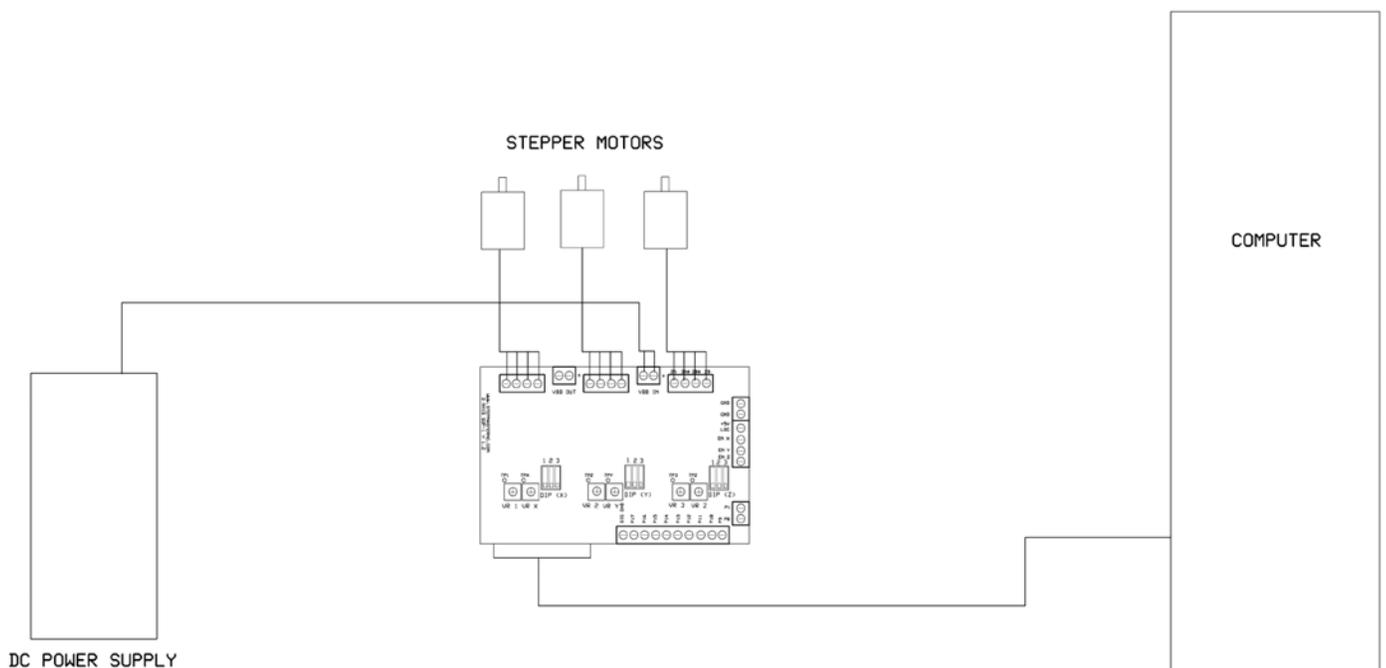
### **2.0 ADDITIONAL SAFETY NOTES:**

Always properly ground oneself when handling stepper motor drive board

It is highly recommend that the stepper motor drive board is properly enclosed in an instrument case before use (contact with debris may damage board).

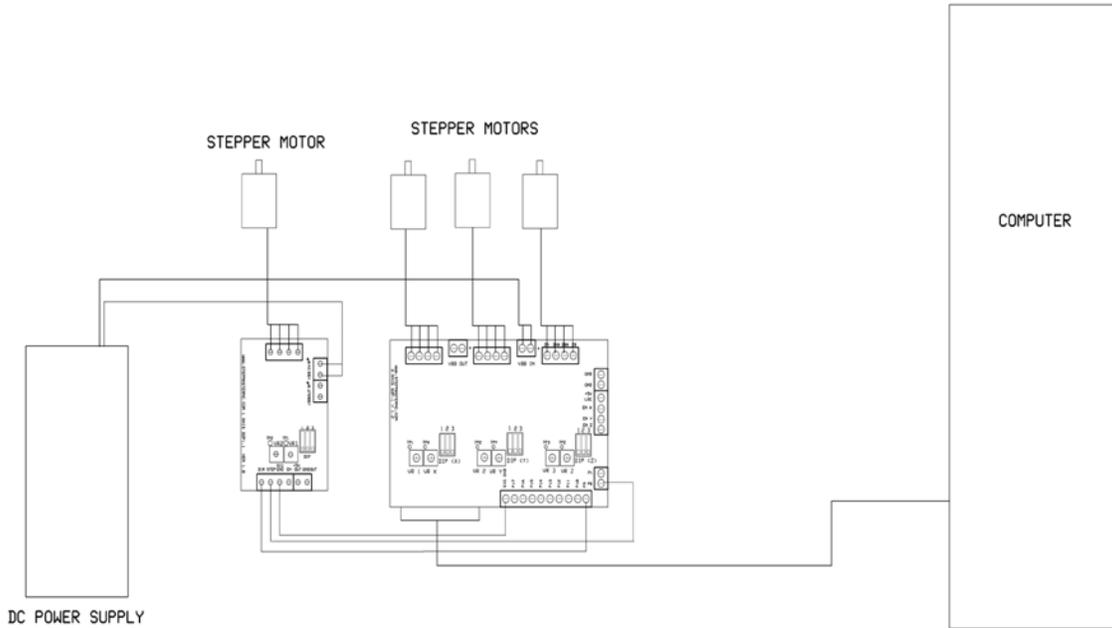
## 2.1 SETUP CHECKLIST (FOLLOW EXPLICITLY)

- Ground yourself with the use of grounding wrist band. (ref. 2.0)
- Setup output pin configuration on chosen control software. (ref. 1.6)
- Enable axis' you wish to use (at DIPs). (ref 1.1)
- Set micro step resolution (at DIPs). (ref 1.1)
- Connect power supply to stepper board (turn power on if switch is connected to power supply). (ref 1.2)
- Adjust Stepper Motor Current. (ref 1.4)
- Adjust PFD. (ref 1.5)
- Disconnect power (turn power off)
- Connect 1 Stepper motor. (ref 1.3)
- Turn power on to confirm correct connection of stepper wires - motor should lock up (if not re-examine stepper motor wiring diagram and re-wire)
- Turn power off
- Connect remaining stepper motors
- Connect Parallel cable between computer and drive board
- Turn power on
- Attempt to jog each axis with software (if axis turns in opposite direction of desired direction - attempt axis rotation reversal via software- if unable to do so switch 2 wires for one coil (i.e. switch A with A#, do not switch wires between coils)
- You are now done and able to begin using your new stepper motor drive
- If you find that after prolonged use stepper motors begin loosing steps or loosing torque - reduce current for given stepper motor or add external cooling device (cooling fan) - as this is a sure signal that drive has entered thermal shut down



## 2.2 BASIC SETUP LAYOUT

## 2.3 CONNECTING ADDITIONAL STEPPER MOTOR DRIVES



Note: Additional stepper motor driver is connected directly to original power source (no daisy chaining)

DB25 pins 1,2,3,4,5,6,7,8,9,14,16,17 are typically reserved solely as output pins, therefore step and dir signals must each be connected to one of these unused pins (you have the option of pins 1,8,9,14,16, or 17 - in this depicted example pins 8 and 9 have been utilized).

Depicted example utilizing StepMasterNC 1 axis SOP-1 Stepper Motor Drive, information applies equally for StepMasterNC 2 axis SOP-1 Stepper Motor Drive with minor addition (both available directly at [www.stepmasernc.com](http://www.stepmasernc.com))