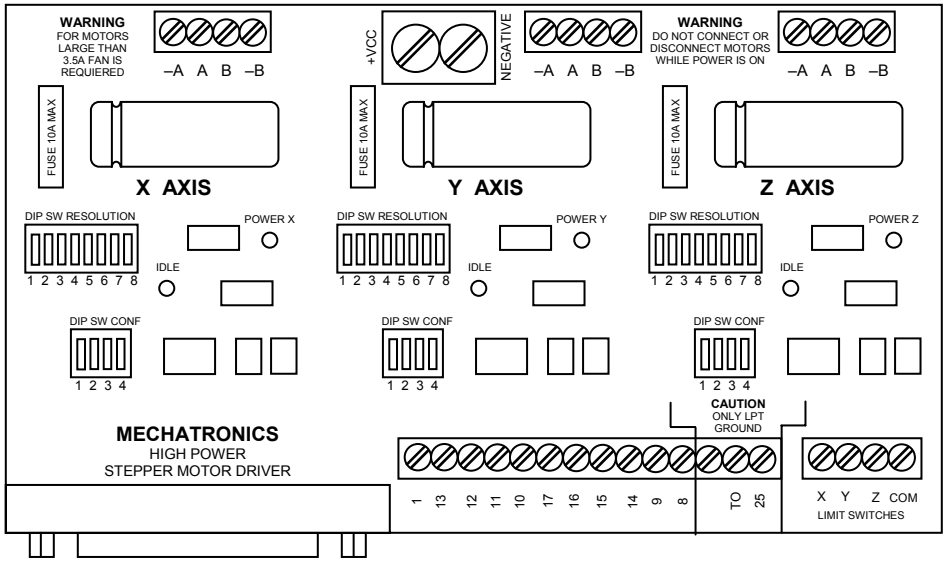
MECHATRONICS

3 AXIS@10A MICRO STEPPER MOTOR DRIVER DATASHEET



FEATURES

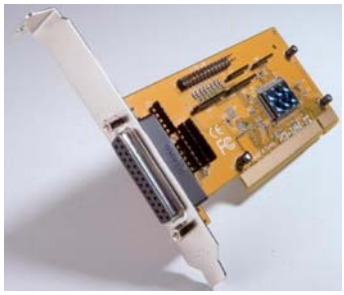
- Two phases bipolar driver (PWM Technology)
- Resolution: Full, 1/2, 1/4, 1/16, selectable via DIP switch per axis, you can get 3200 steps per revolution with a 1.8º common stepper motor
- Individual disable **via hardware**, using optocoupler input terminal (it can be used as axis limit switch), per axis
- 12 Adjustable levels for stepper motor current, via DIP switch on board
- 4 Adjustable levels for PFD (Percent Fast Decay), via DIP switch on board
- DB25 male connector on board for PC parallel port
- All inputs signals are optocoupled for PC parallel port protection
- Full access to all unused DB25 port pins via terminal block
- 24VDC to 48VDC input voltage
- Mounted in aluminium clamping plate, you can screw it in a big heatsink if you are using large stepper motors
- For stepper motors large than 3.5A extra heat sink and fan is required
- **Automatic current reduction, when the driver doesn't receive any control signal, it decrease the current to 40% of the selected, it helps to avoid motor's overheating when it doesn't turn**
- 4 Wire, 6 Wire and 8 Wire (NEMA17, NEMA23, NEMA34 and NEMA42) stepper motors can be used with this driver board
- Fuse per axis integrated for driver board protection
- 1.2A/phase per axis as minimum and 10 A/phase per axis as maximum

PARALLEL PORT CONNECTION TO DRIVER BOARD

A DB25 male-female Straight-Through Cable can be used to interconnect the driver board to your PC; in this connection **you do not have to use any adapter, like hubs, USB to Parallel cables**. This is because most of the CAM software requires the original input/output (I/O) ranges of 378, 278 or 3BC and these adapters do not work as CAM software needs.

If your computer is a laptop it is probably you do not have access to a parallel port, if that is the case you must install a **parallel PCMCIA card**. If your computer is desktop you have to install a **PCI-parallel bus card**. You can purchase them in a Computer Store. See pictures below.

Parallel PCMCIA card



PCI-parallel bus card

Also is important you know that a single parallel port is able to control 4 axes as maximum, if your application needs to control more axes or you want to use an attached encoder each motor you have to install an extra parallel bus card. The DB25 connector pin description of the driver board is the following:

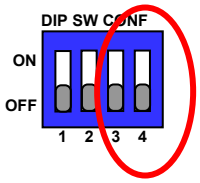
DB25 MALE CONNECTOR PIN NUMBER	USE IN DRIVER BOARD	USE IN PROTOTYPING TERMINAL BLOCK
1		Strobe
2	Step X	
3	Dir X	
4	Step Y	
5	Dir Y	
6	Step Z	
7	Dir Z	
8		Data 6
9		Data 7
10		ACK
11		Busy
12		Paper Empty
13		Select
14		Auto Feed
15		Error
16		Init
17		Select in
18-to-25	Ground for Step and Dir	LPT Ground

DIP SWITCH RESOLUTION SELECTION

The switches 3 and 4 of the DIP switch configuration on board are used in the driver step resolution configuration. i.e., If you have a 1.8º stepper motor and select full step you will get 200 steps each 360º turn, with a 1/16 step resolution you will get 3200 steps each 360º turn.

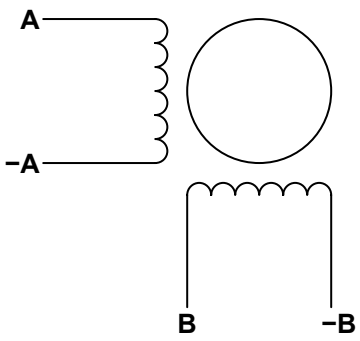
You can change the step resolution when the power is ON or OFF without fear of risk the driver board.

Resolution	DIP Switch Position		Steps number per 360º turn
	3	4	
Full step	OFF	OFF	200
1/2 step	ON	OFF	400
1/4 step	OFF	ON	800
1/16 step	ON	ON	3200



STEPPER MOTOR BASIC SCHEMATICS

4 LEADS STEPPER MOTOR



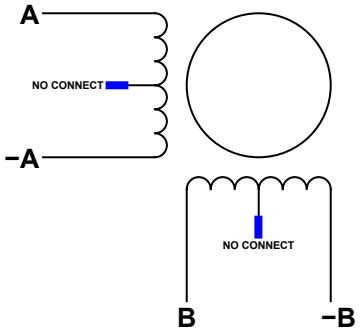
Connect each lead to the terminal block as shows you. i.e., The **–B** lead of the stepper motor must be connected to the **–B** screw in the terminal block.

6 LEADS STEPPER MOTOR (SERIAL WIRING)

Do not connect the central tap of each coil; do not forget to insulate all connections and central tap.

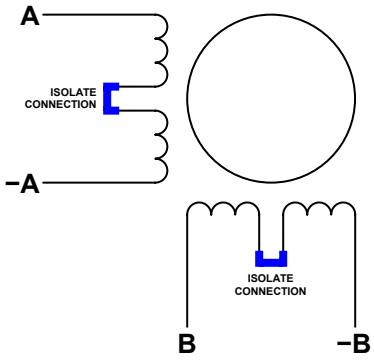
In this way the stepper motor will need half of the nominal current.

For example, if a 1.2A/phase stepper motor with 6 leads is wired in serial way the motor's current will be half, it means 0.6A/phase. Do not forget to insulate all connections.



Connect each lead to the terminal block as shows you. i.e., The **–B** lead of the stepper motor must be connected to the **–B** screw in the terminal block.

8 LEADS STEPPER MOTOR (SERIAL WIRING)



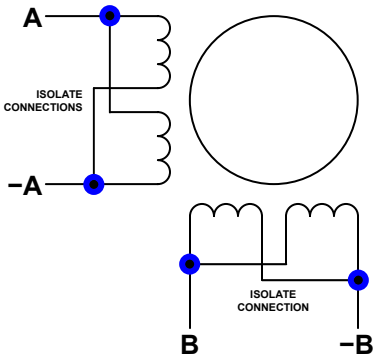
One extreme lead of each two coils must be joined with the other; you will get one pair of 'two serial coils'. In this way the stepper motor will need half of the nominal current.

For example, if a 3.8A/phase stepper motor with 8 leads is wired in serial way the motor's current will be half, it means 1.9A/phase. Do not forget to insulate all connections.

Connect each lead to the terminal block as shows you. i.e., The **–B** lead of the stepper motor must be connected to the **–B** screw in the terminal block.

8 LEADS STEPPER MOTOR (PARALLEL WIRING)

The extremes of two coils must be wired in parallel way, you will get one pair of 'two parallel coils' as you can see in the diagram. In this way the stepper motor will need twice the nominal current.



For example, if a 4A/phase stepper motor with 8 leads is wired in parallel way, you will use one pair of 'two coils' and the motor's current will be twice, it means 8A/phase. Do not forget to insulate all connections.

Connect each lead to the terminal block as shows you. i.e., The **–B** lead of the stepper motor must be connected to the **–B** screw in the terminal block.

It is suggested you must have the diagram of the stepper motor that you are going to use; this will help you to avoid short circuits, damage the board or something similar.

Do not worry if you have not the diagram, you can get the properly configuration with a multimeter, in the ohm section (Ω), take a wire as reference, then, measure the resistance between this and the other wires, when you get a smaller resistance (less than 10 ohm) you have found a coil (Most of the stepper motors has a resistance lower than 10 ohm per coil).

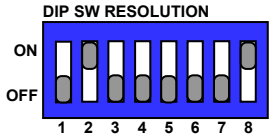
WARNING !
DO NOT CONNECT OR DISCONNECT ANY MOTORS OR ANY MOTOR'S LEAD WHILE POWER IS ON, THE DRIVER BOARD CAN BE DAMAGED IMMEDIATELY

ADJUSTMENT OF THE STEPPER MOTOR CURRENT

For every axis you have to adjust the motor current using the DIP switch resolution according to the following configuration table:

DIP Switch Position								Motor Current [**A**]
1	2	3	4	5	6	7	8	
OFF	OFF	OFF	OFF	OFF	**ON**	**ON**	OFF	10
OFF	OFF	OFF	OFF	**ON**	OFF	**ON**	OFF	9
OFF	OFF	OFF	**ON**	OFF	OFF	**ON**	OFF	8
OFF	OFF	**ON**	OFF	OFF	OFF	**ON**	OFF	7
OFF	**ON**	OFF	OFF	OFF	OFF	**ON**	OFF	6
ON	OFF	OFF	OFF	OFF	OFF	**ON**	OFF	2.5
OFF	OFF	OFF	OFF	OFF	**ON**	OFF	**ON**	5
OFF	OFF	OFF	OFF	**ON**	OFF	OFF	**ON**	4.2
OFF	OFF	OFF	**ON**	OFF	OFF	OFF	**ON**	3.8
OFF	OFF	**ON**	OFF	OFF	OFF	OFF	**ON**	3.2
OFF	**ON**	OFF	OFF	OFF	OFF	OFF	**ON**	2.9
ON	OFF	OFF	OFF	OFF	OFF	OFF	**ON**	1.2

As you can see the DIP switch resolution has 8 mini switches, the ON position is up and the OFF position is down. e.g. The configuration for a 2.9A stepper motor is, mini switches 2 and 8 are ON, the others are OFF.



If your motor has different current, you have to adjust it to the nearest low current configuration. e.g. For a 3.5A stepper motor the nearest low configuration is 3.2A, then the mini switches position are: pins 3 are 8 ON, the others are OFF.

This board has an automatic current reduction, if the driver does not receive any control signal in one second, it decrease the current to 40% of the selected, it helps to avoid motor's overheating when it doesn't turn. When the IDLE led is ON you will notice this is working.

By default the fuses installed on the board are 10A, if your motors are less than 5A we suggest you to change the fuses to keep them according to the load, every board includes an extra kit of 5A fuses for this.

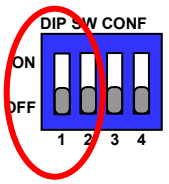
If you use 6 or 8 wire motor use the series wiring, it reduces the amperage rating in 50%. i.e., A 3A motor wired in this way should be considerate as 1.5A motor.

If your motor is large than 3.5A is needed to screw the clamping plate in a big heat sink or in a case, also a fan is required to avoid overheating. Every axis can give you 10A per phase as maximum.

ADJUSTMENT OF PFD VOLTAGE

The Percent Fast Decay (PFD) voltage manage the output current decay when the PWM circuit switches the control current, using the mini switches 1 and 2 of the DIP switch configuration you can adjust the PFD voltage value in order to decrease the resonance noise in the stepper motor.

DIP Switch Position		PFD
1	2	
OFF	OFF	0%
ON	OFF	8%
OFF	ON	26%
ON	ON	100%



It is normal that you hear a little resonance noise in the motors, this is caused by the current pulse control, in fact, is imperceptible in high quality motors. We suggest you to use 0% of the PFD, this a good reference to make any adjustment if you have any trouble.

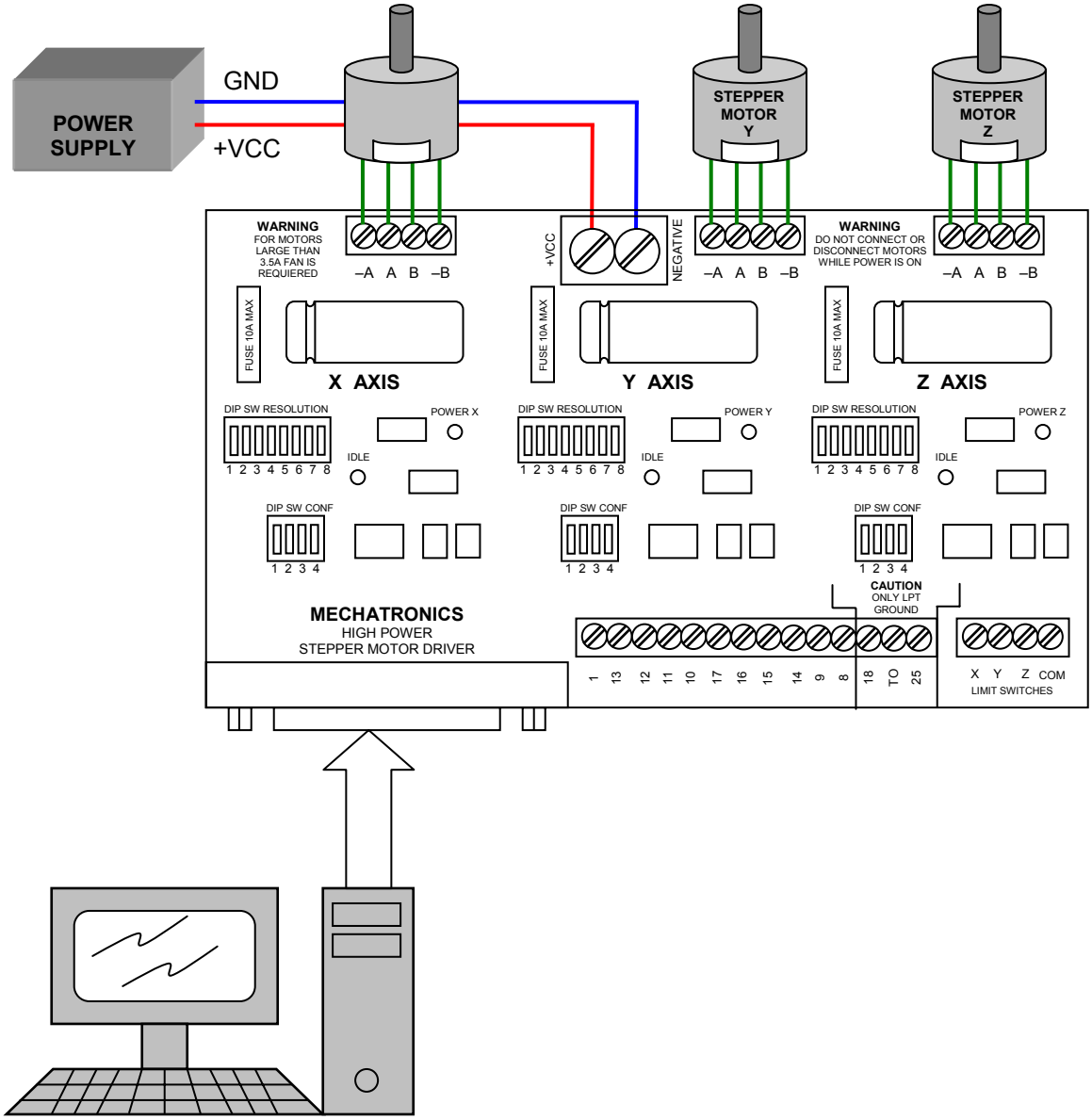
There is no risk of damage if you adjust the PFD voltage when the power is on and the stepper motor is connected to the board.

WARNING!

- **DOUBLE CHECK ALL CONNECTIONS BEFORE TO CONNECT TO POWER SUPPLY, THEN, TURN ON THE POWER SUPPLY**
- **DO NOT CONNECT OR DISCONNECT ANY MOTOR OR ANY MOTOR'S LEAD WHILE POWER IS ON, THE DRIVER BOARD CAN BE DAMAGED IMMEDIATELY**
- **MINIMUM POWER SUPPLY:**
  24VDC@5A
- **MAXIMUM POWER SUPPLY:**
  48VDC@30A
- **RECOMMENDED FUSE 10AMP MAX.**

- **LTP GND AND POWER SUPPLY GND ARE INDEPENDENT, FOR ANY REASON THESE TERMINALS SHOULD NOT BE INTERCONNECTED**

BASIC CONNECTION



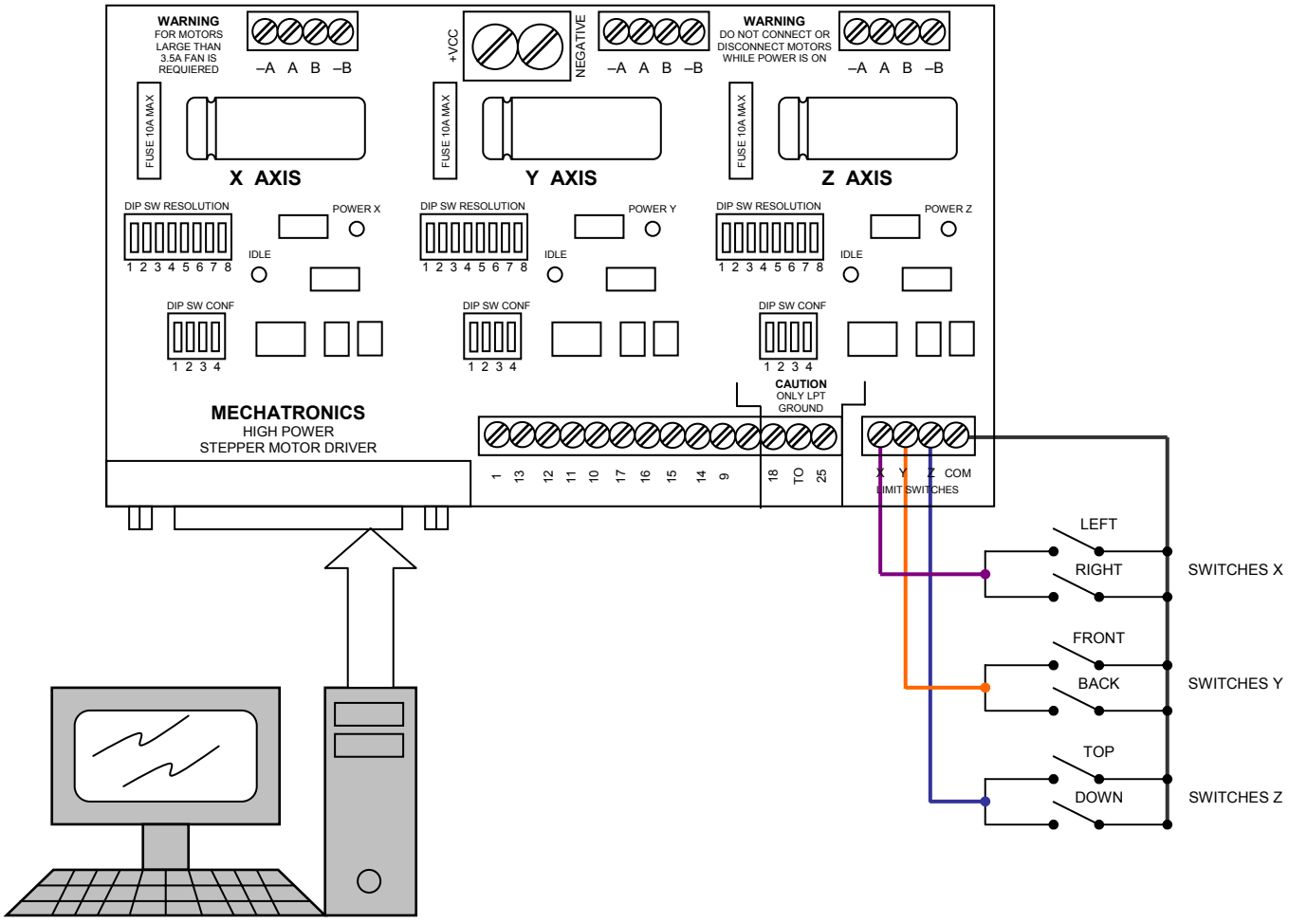
DISABLE SWITCHES VIA HARDWARE

These switches can be used to disable the electrical current in the stepper motor; this is a safe way to avoid incidental damages in your machine if the computer fails or gets down. You can wire them each one to a mechanical switch in your machine.

They are placed in both extreme of each axis, if the mechanical system active one of these switches the corresponding motor will be automatically disabled, you need to deactivate the switch to move again the motor.

Keep in mind that these limit switches has been implemented **via hardware**, is not possible to control them via software, if you want to enable/disable them via software you have to check your favourite CAM software for this.

Note: The power supply GND disable the limit switches, for any reason this terminal should not be interconnected to the LPT GND.

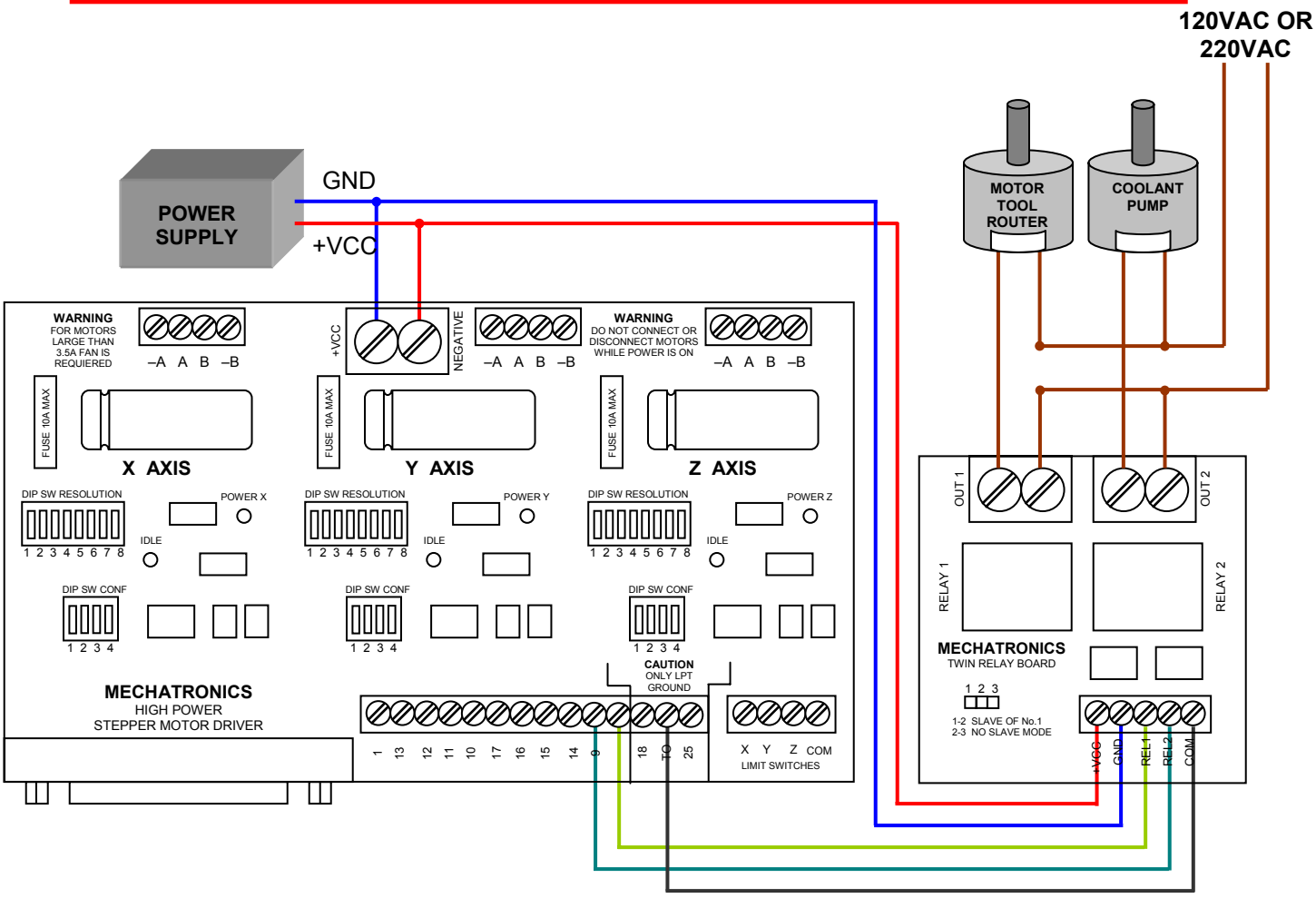


RELAY BOARD CONNECTION WITH 3 AXIS@10A BOARD

The relay board is used to operate (from the PC with your favourite CAM program) tools that work at 120VAC or 220VAC as a motor tool router, coolant pumps, etc. Without any fear of risk the PC parallel port, because this connection is totally optocoupled.

The CAM software sends a trigger signal through the DB25 breakout terminal blocks to the relay board. The relay board optocouplers switches on the relay that works as 120VAC or 220VAC circuit switches.

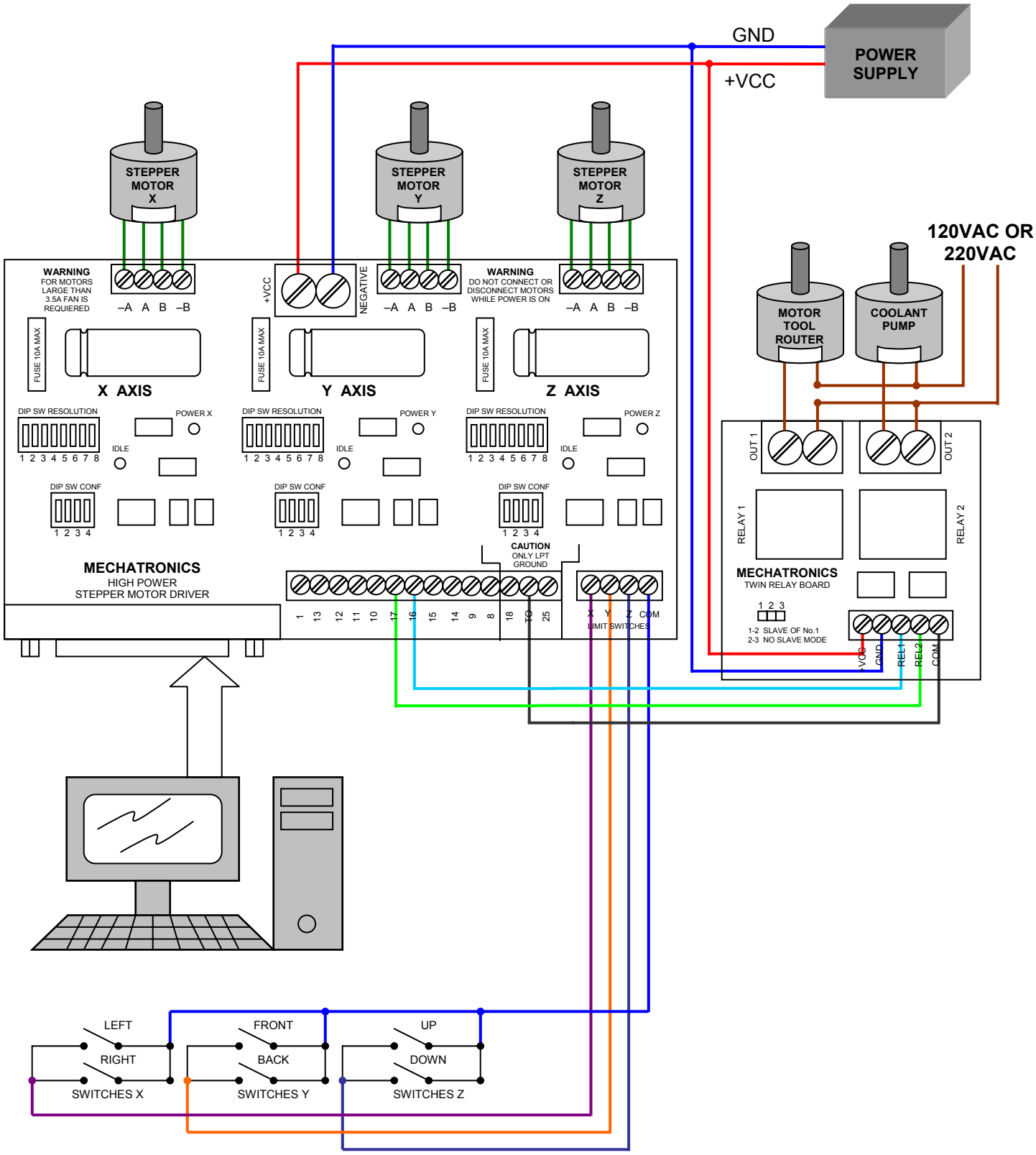
Every relay can close electrical circuits at 125VAC@15Amp or 250VAC@10Amp as maximum.



The relay board power supply can be the same of the driver board's power supply; otherwise you can use an independent power supply from 12VDC to 35VDC, as maximum, to feed the drive board.

For further information about how to connect the Relay Board, check the Relay Board Datasheet available in our website.

COMPLETE SYSTEM: 3 AXIS@10A DRIVER AND RELAY BOARDS



BEFORE TURN ON THE POWER!!!

Once you have finish to wire your driver board it is important to check the following things to get results as you desire:

- Double check ALL connections.
- Good connections in the output motor terminal per axis. Non strong connections and short circuits will damage the board.
- Correct polarity of the power supply.
- If your motors has large cable to the driver board make sure ALL polarities are okay. Do not forget to insulate ALL leads connections.
- Plug the DB25 male/female Straight-Through Cable between the driver board and your computer.
- Turn ON the power supply.
- Power LEDs must be ON.
- All motors' shaft must be in hold state, you can not move them with your fingers.
- As the motors do not receive any control signal the IDLE LEDs are ON.
- Configure your favourite CAM software; you can download our Quick Start Guides for Mach2, Mach3 and KCam from: www.easy-cnc.com

MOUNT IN A BIG HEATSINK WITH FAN

This is a good example of an appropriate cooling system if you are using stepper motors great than 3.5A/phase, the fuses on board are 10A as default, if your motors are less than 5A we suggest you to change the fuses to keep them according to the load, every board includes an extra kit of 5A fuses for this.

In this example the board with clamping plate is screwed in a big heatsink, in the fins' side a fan is screwed. You can hold the heatsink with some screws.