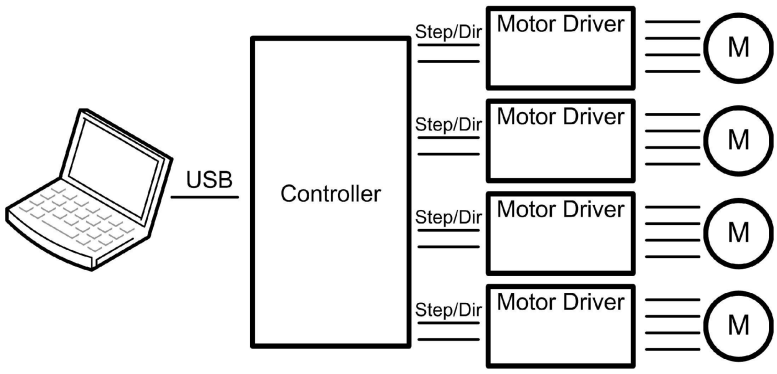
1 Introduction

1.1 Overview



The PlanetCNC series of USB CNC motion controllers is link between a personal computer and motor drivers supporting step/direction control. PlanetCNC series of motion controllers are compatible with most motor drivers. The controllers use the USB port, available on all modern computers and laptops. They can serve as direct replacement or upgrade for many parallel port break-out boards.

PlanetCNC controllers provide a complete, fully integrated software/hardware solution. Additional machine control software is NOT required. The USB CNC Controller software is a dedicated application, designed to fully exploit the features of the purpose-built hardware. It has many advanced features to assist day-to-day CNC machine operation.

1.2 Features and specifications:

- USB (V2.x) from PC/Laptop running Windows XP, Vista, Windows 7, 8 or 8.1 (32 bit or 64bit)
- motor driver connector pin-out is compatible with 10 pin open source interface (Linistepper, PICStep)
- controller works with most step/dir stepper and servo motor drivers available on the market
- buffered IO for maximum performance
- advanced interpolation algorithms
- start, stop, pause and resume execution of program on your machine
- standard RS274/NGC G-code (EMC2 and LinuxCNC compatible)
- advanced G-codes - G40, G41, G42 (Cutter Radius Compensation) supported
- advanced G-codes - G43, G49 (Tool Length Offsets) supported
- advanced G-codes - G54, G59.3 (Coordinate System Origins) supported
- tested with SolidCAM, MasterCAM, ArtCAM, Vectric, CamBam, MeshCAM ... generated G-code
- Profili 4-axes and 3-axes G-code supported
- import toolpath from DXF files
- import toolpath from PLT/HPGL files
- import toolpath from image files
- import toolpath from NC-Drill (Excellon) files
- import toolpath from Gerber (RS-274X) files
- toolpath simulation
- automatic homing procedure
- advanced toolchange procedures
- automatic tool length measuring
- export toolpath to G-code
- export toolpath to DXF
- SDK (software developers kit) is available
- works on MacOS with virtual machine emulating Windows

Mk2 - 4 axes USB CNC controller

- 9 axes controller for stepper and servo motors
- USB connection
- 100 kHz maximum step frequency
- 12 us minimum pulse width, 50% duty cycle at higher frequencies
- 7 digital outputs on board
- jogging keyboard support
- 8 limit switches with shift feature
- 5 inputs
- MPG pendant support(3-axis)
- spindle encoder and index signal support for spindle synchronization
- SD card support for running g-code without computer
- control external devices with I2C and UART protocol
- homing procedure

tool change procedure

- tool length sensor support
- sensor for capturing and measuring
- digitizing probe support
- transformation matrix
- soft limits
- slave axes
- backlash compensation
- API
- Resolution 1、1\2、1\8、1\16 micro stepping output.
- Four(or three) channles 3.5A adjustable output current for 2/4 phase bipolar stepper driver.

1.3 System Requirements

Minimum system requirements:

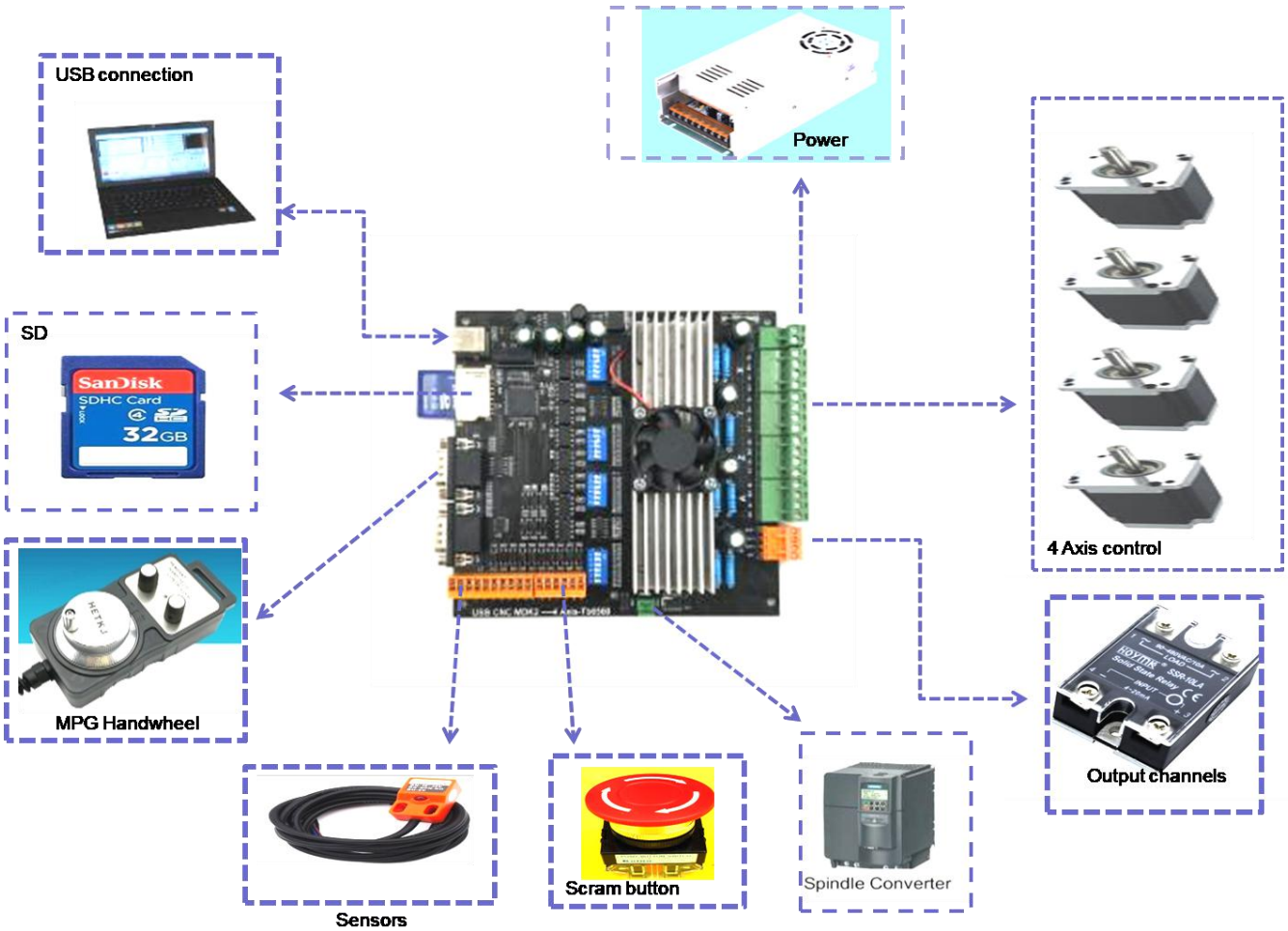
- 1 GHz or faster processor
- 512MB RAM
- 500 MB available hard disk space
- Graphics with OpenGL support
- USB 2.0 port
- .NET Framework 3.5 SP1

Recommended system requirements:

- 2 GHz or faster processor
- 2GB RAM
- 500 MB available hard disk space
- Graphics with OpenGL support
- USB 2.0 port
- .NET Framework 3.5 SP1

2 Hardware

2.1 Installation



Installation of PlanetCNC CNC USB Controller requires a USB equipped PC or laptop along with motor drivers appropriate to the motors in use. The USB CNC controller is compatible with the vast majority of motor drivers that use step/direction signals.

Optional support hardware can be employed to customize installation to suit user requirement. Use of a screw terminal adapter makes connection to the type of drive in the image much easier. A DB25 adapter is available, for motor drivers requiring this form of input, with male or female DB25 connector.

For maximum flexibility in controller layout, a ribbon cable and plug kit is available. This aids the construction of longer cables and ensures plug-in connections correspond to the USB CNC Controller pin outs.

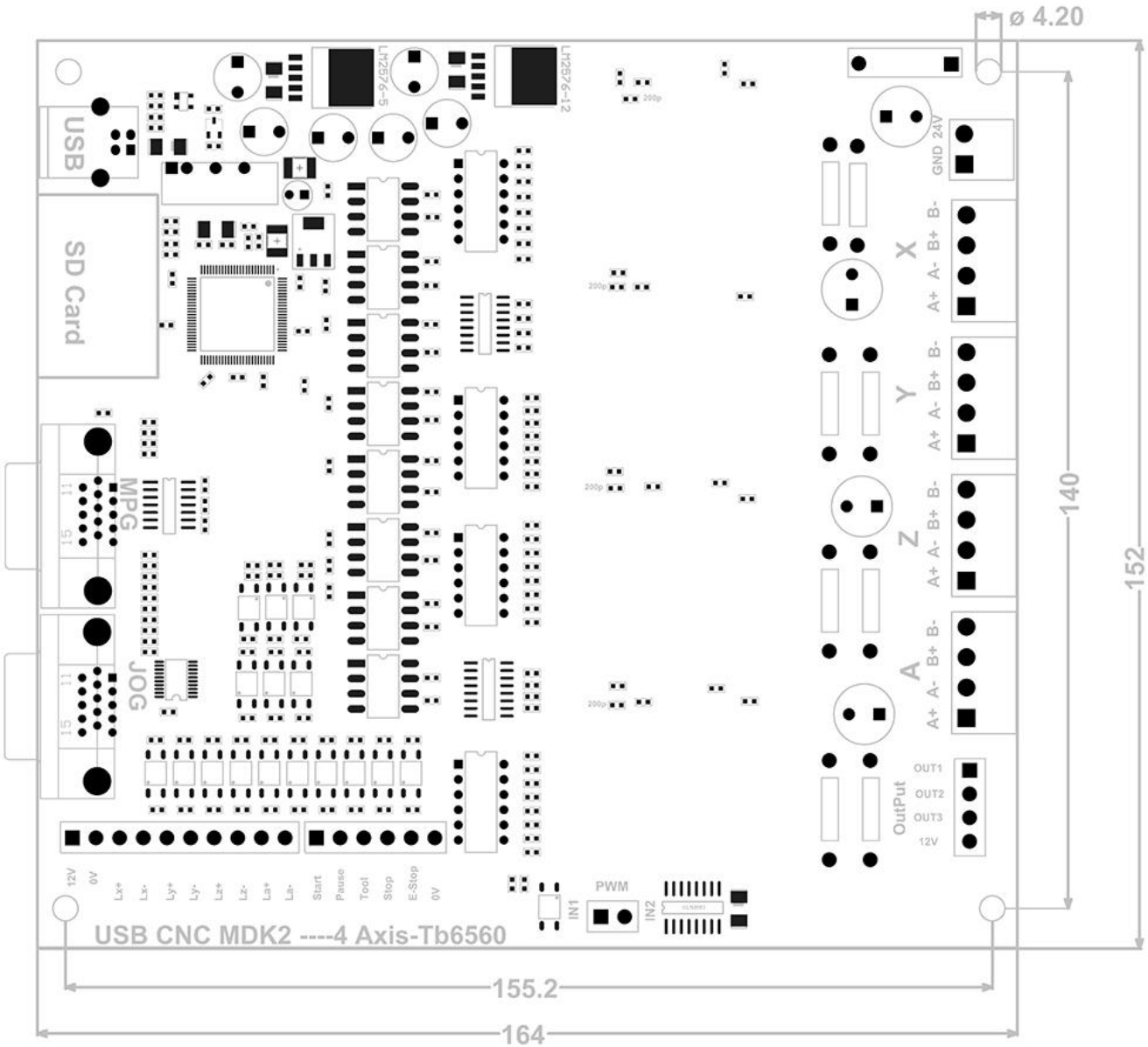
IMPORTANT:

The controller should be powered with an external power supply.

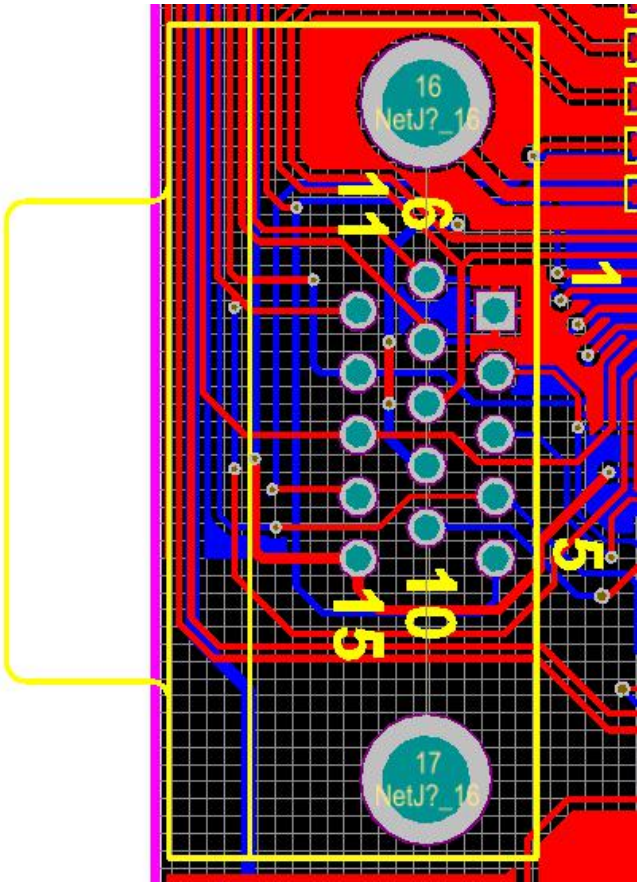
Mk2 - 4 Axis controller hardware requires 24V DC supply.

Power supply should be at least 8A.

2.2 Mk2 -4 axis CNC USB controller description



2.2.3 Mk2 *JOG* connector



Switched operation of JOG 1-8 controls manual jogging.

Jogging keyboards can use a ‘SHIFT’ key, allowing Mk2 controller users to jog additional axes or toggle the option of jog ‘step’ mode. ‘SHIFT’ key function is defined in settings, as is the ‘step’ value for each key press.

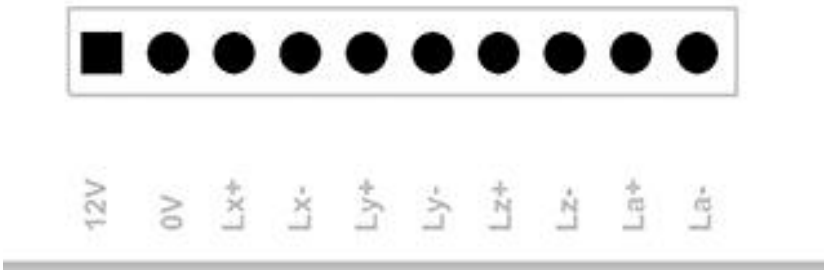
Jogging directions and axis assignment can be defined in 'settings'.

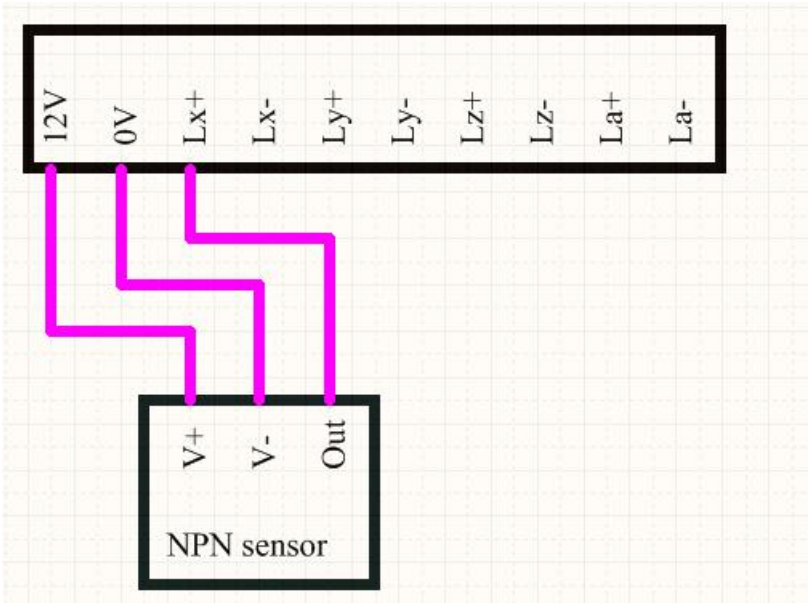
CONNECTOR PIN DESCRIPTION:

A typical use might be as below:

PIN 1: **GND.**
PIN 2: **E-STOP.**
PIN 3: **Pause.**
PIN 4: **Start.**
PIN 5: **NO use.**
PIN 6: **Jog Axis 4 in negative direction.**
PIN7: **Jog Axis 4 in positive direction.**
PIN8: **Jog Axis 3 in negative direction.**
PIN9: **Jog Axis 3 in positive direction.**
PIN10: **Jog Axis 2 in negative direction.**
PIN11: **Jog Axis 2 in positive direction.**
PIN 12: **Jog Axis 1 in positive direction.**
PIN 13: **Jog Axis 1 in negative direction.**
PIN 14: **NO use.**
PIN 15: **+5V.**

2.2.4 Mk2 *LIMIT* connector





LIMIT 1-8 connects limit switches. It's recommended that a 100nF capacitor is connected directly across switch terminals.

The 'SHIFT' key toggles limit options using one of two possible configurations. The chosen configuration determines hardware connections.

Limit switches can be connected in 'Normal' method or 'Single input' method. In software, you can set this in *File/Settings/Limit*. If you are using 'Normal' method, 'Single Input' feature must be disabled.

To pause all axes, if certain axes limit switch has been activated, you enable 'Lock Other Axes'.

NORMAL: Each switch is connected to its own pin.

Lx+: **Axis 1 positive limit.**

Lx-: **Axis 1 negative limit.**

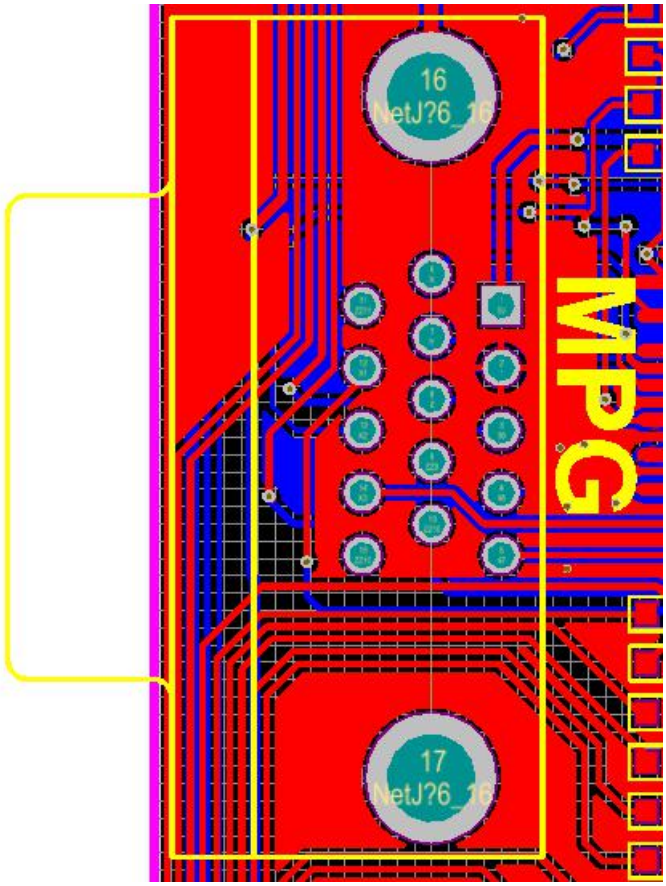
Ly+: **Axis 2 positive limit.**

Ly- :	**Axis 2 negative limit.**
Lz+ :	**Axis 3 positive limit.**
Lz- :	**Axis 3 negative limit.**
La+ 7:	**Axis 4 positive limit.**
La- :	**Axis 4 negative limit.**
12V:	**Sensor's positive power.**
0V:	**Sensor's negative power (GND).**

NOTE: If 'normally open' (NO) type switches are used, wiring must be done in parallel method, if 'normally closed' (NC) type switches are used, wiring must be done in serial method.

Software 'Invert' options allow use of 'normally closed' or 'normally open' switch hardware. This feature can be set in *File/Settings/Limit/Invert*

2.2.5 Mk2 MPG connector

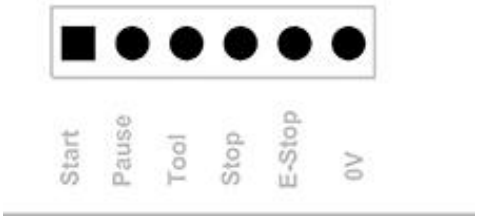


This connector provides inputs for use of MPG pendant devices.
GND pins provide ‘Ground’ or common connections.

CONNECTOR PIN DESCRIPTION:

PIN 1: **5V.**
PIN 2: **GND.**
PIN 3: **NC.**
PIN 4: **Encoder-A.**
PIN 5: **Encoder-B.**
PIN 6: **X axis select.**
PIN7: **Yaxis select.**
PIN8: **Z axis select.**
PIN9: **NC.**
PIN10: **NC.**
PIN11: **NC.**
PIN 12: **X1 select.**
PIN 13: **X10 select.**
PIN 14: **X100 select.**
PIN 15: **NC.**

2.2.6 Mk2 *INPUT* connector

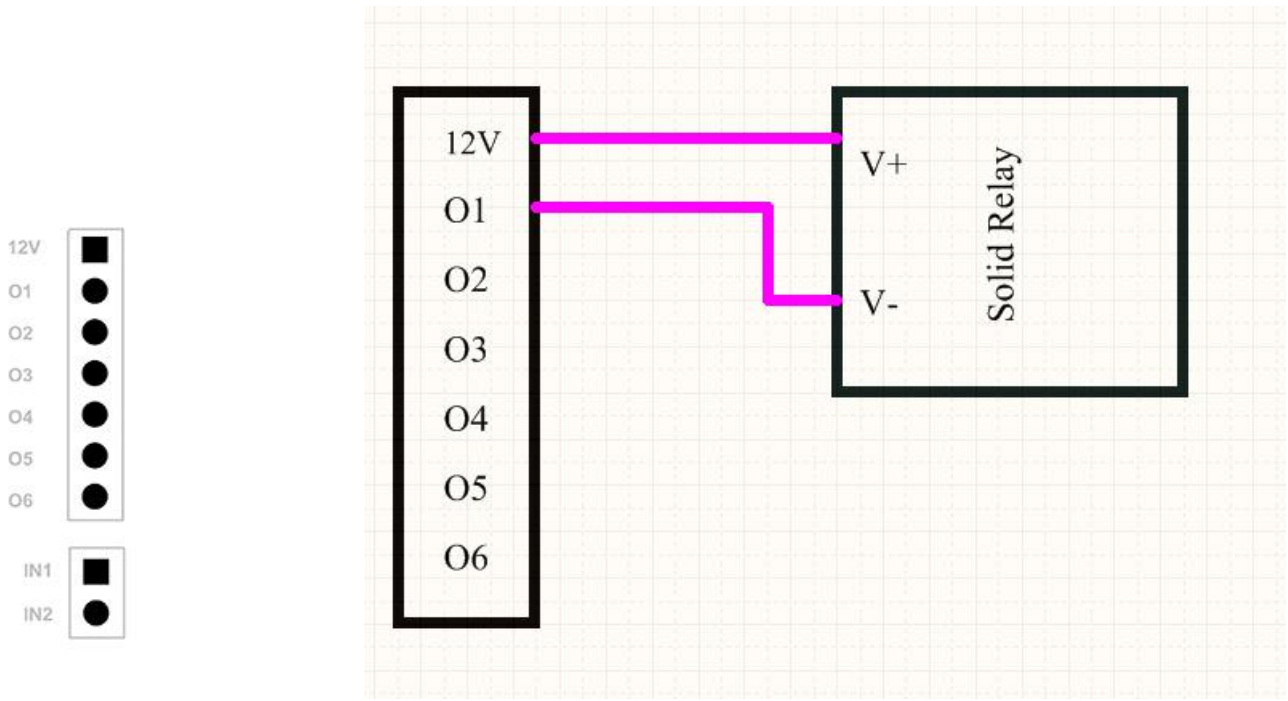


This connector provides input for user-assigned functions.

CONNECTOR PIN DESCRIPTION:

INPUT1: Start
INPUT2: Pause
INPUT3: Tool
INPUT4: Stop
INPUT5: E-Stop
GND: Ground connections

2.2.7 Mk2 *OUTPUT* connector



This connector provides 6 digital outputs for control of external devices.
The optional 'Output board' links to the Mk2 controller using this connector.
Output assignment is controlled in software.

CONNECTOR PIN DESCRIPTION:

OUT 1 -6: Digital Output
OUT 7: PWM out for inventer

12V: 12V supply.

2.2.10 Mk2 *USB* connector

The Mk2 USB CNC controller connects to computer via the USB port. The port uses the USB 2.x standard.

2.2.11 Mk2 *Power* terminal

The controller should be powered with an external power supply.
Mk2 - 9 Axis controller hardware requires 24V DC supply
Power supply should be at least 200mA

2.2.12 Mk2 *LED* indicators

The user is provided with helpful feedback and live ‘status’ information via on-board LED indicators.

There are four indicators.

Power: Lights when the controller is powered.
USB Conn: Lights when controller is connected to a USB Port
USB Up: Lights when USB signal is ‘good’.
Status: Blinks to indicate controller function is ‘good’.

3.config for drivers:

3.1 Current settings:

Torque Settings				
Current	3A	2.25A	1.5A	0.6A
S1	OFF	OFF	ON	ON
S2	OFF	ON	OFF	ON

3.2 Subdivision

Subdivision				
Sub.	1	2	8	16
S3	OFF	OFF	ON	ON
S4	OFF	ON	ON	OFF

3.3 Decay

Decay				
Decay	0%	25%	50%	100%
S5	OFF	OFF	ON	ON
S6	OFF	ON	OFF	ON