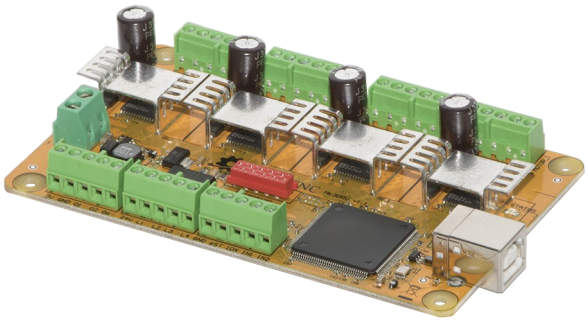
PlanetCNC

Mk3DRV controller user manual

2018/01/09



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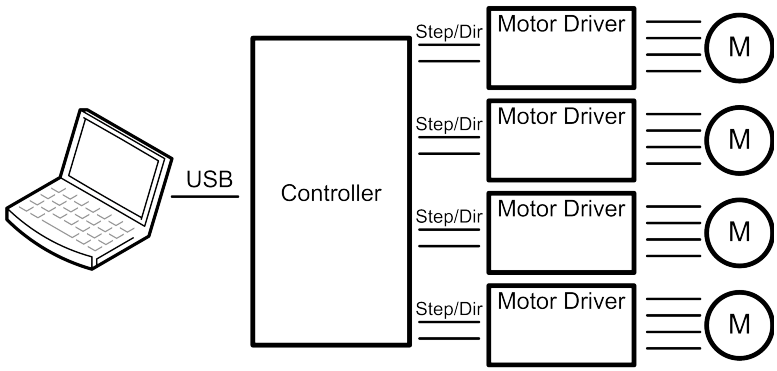
1 Introduction

1.1 Overview



The PlanetCNC series of USB CNC motion controllers is link between a personal computer and motor drivers supporting step/direction control. 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

Mk3DRV - 4 axes USB CNC controller

- 4 axes controller for stepper motors
- 4 integrated 2.5A stepper drivers, stepper motors are connected directly to controller motor outputs
- USB connection
- 3 digital outputs on board
- 3 PWM outputs with selectable frequency (10Hz to 500kHz)
- 3 outputs with support for RC servo motors
- 4 limit switch inputs protected with optocoupler
- 4 digital inputs, filtered and protected
- 2 digital inputs on board, filtered and protected with optocoupler
- spindle index signal support for spindle synchronisation
- control external devices with I2C and UART protocol
- homing procedure
- tool change procedure
- tool length sensor support
- sensor for capturing and measuring support
- digitizing probe support
- transformation matrix
- soft limits
- slave axes
- backlash compensation
- API
- 110 kHz maximum step frequency, 25 us minimum pulse width, 50% duty cycle at higher frequencies

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

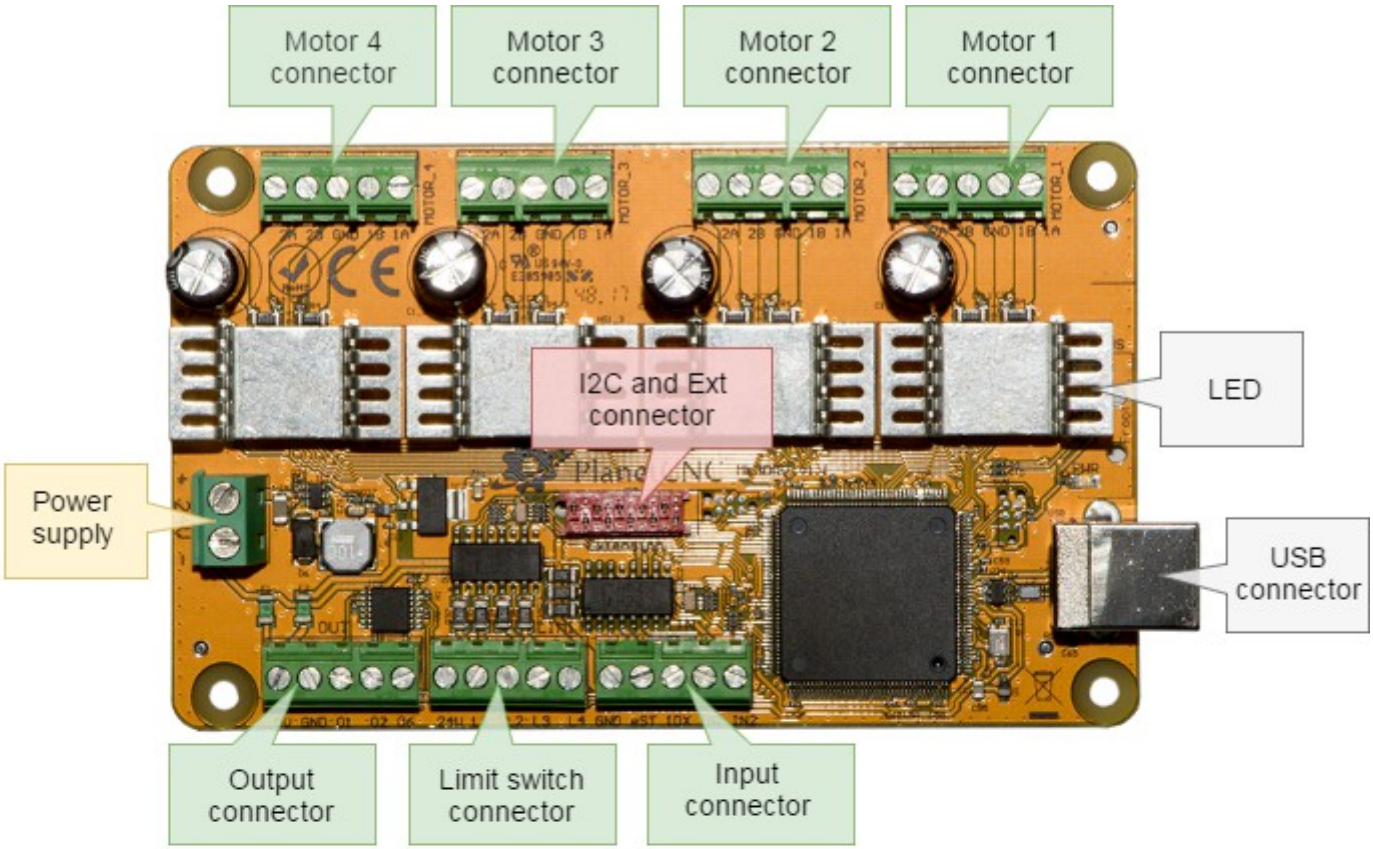
2 Hardware

2.1 Installation

Installation of PlanetCNC motion controller requires a USB equipped PC, 24VDC power supply and stepper motors.

IMPORTANT:
Mk3DRV 4 axis controller is compatible only with PlanetCNC TNG motion software!
Mk3DRV 4 Axis controller requires external 24V DC supply! (Power supply should be at least 100W)
Wrong power supply voltage will permanently damage controller!

2.2 Mk3DRV - 4 axis CNC USB controller connector description



Output connector

- Output 6
- Output 2
- Output 1
- GND
- 5V

Limit switch connector

- Limit 4
- Limit 3
- Limit 2
- Limit 1
- 24V

Input connector

- Input 2
- Input 1
- Spindle index
- E-Stop
- GND

Motor connector

- 2A
- 2B
- GND (Shield)
- 1B
- 1A

Power supply connector

- GND
- 24VDC

I2C and Ext connector

- EXT SEL1
- EXT CLK
- EXT MOSI
- EXT MISO
- I2C SDA
- I2C SCL
- UART RX
- UART TX

2.2.1 Mk3DRV power supply connector

Controller should be powered with an external power supply.
Mk3DRV - 4 Axis controller hardware requires 24DC supply.
Power supply should be at least 100W.

2.2.2 Mk3DRV *USB* connector

The Mk3DRV USB CNC controller connects to computer via the USB port. The port uses the USB 2.x standard.

2.2.3 Mk3DRV LED indicators

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

POWER: Lights when the controller is powered.
DATA: Indicates controller functions.
STATUS: Blinks to indicate controller function is ‘good’.

3 Connection diagrams

Further chapters will describe connection of motors, limit and input switches with Mk3DRV controller.

3.1 Wiring of limit switches

Mk3DRV controller has 4 designated limit switch inputs. This means that 'Single Input' method of wiring must be used.

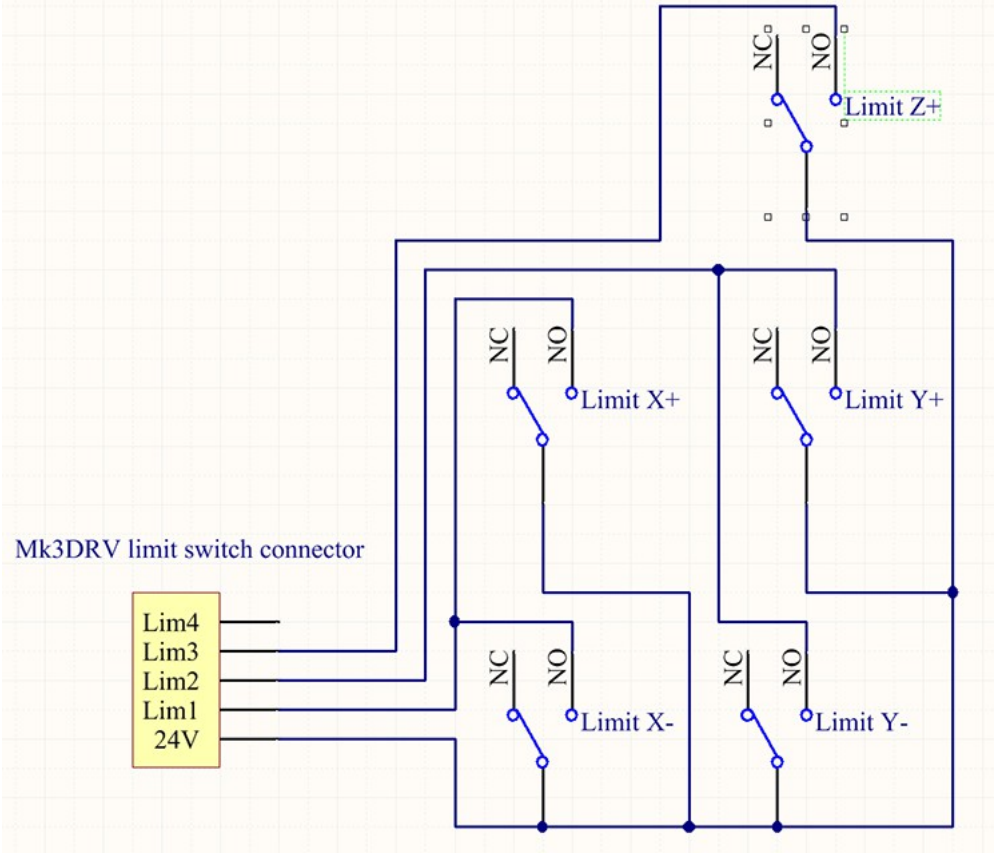
When 'Single input' method is used, both limit switches are connected to one limit pin. Depending on normally closed or normally opened

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.

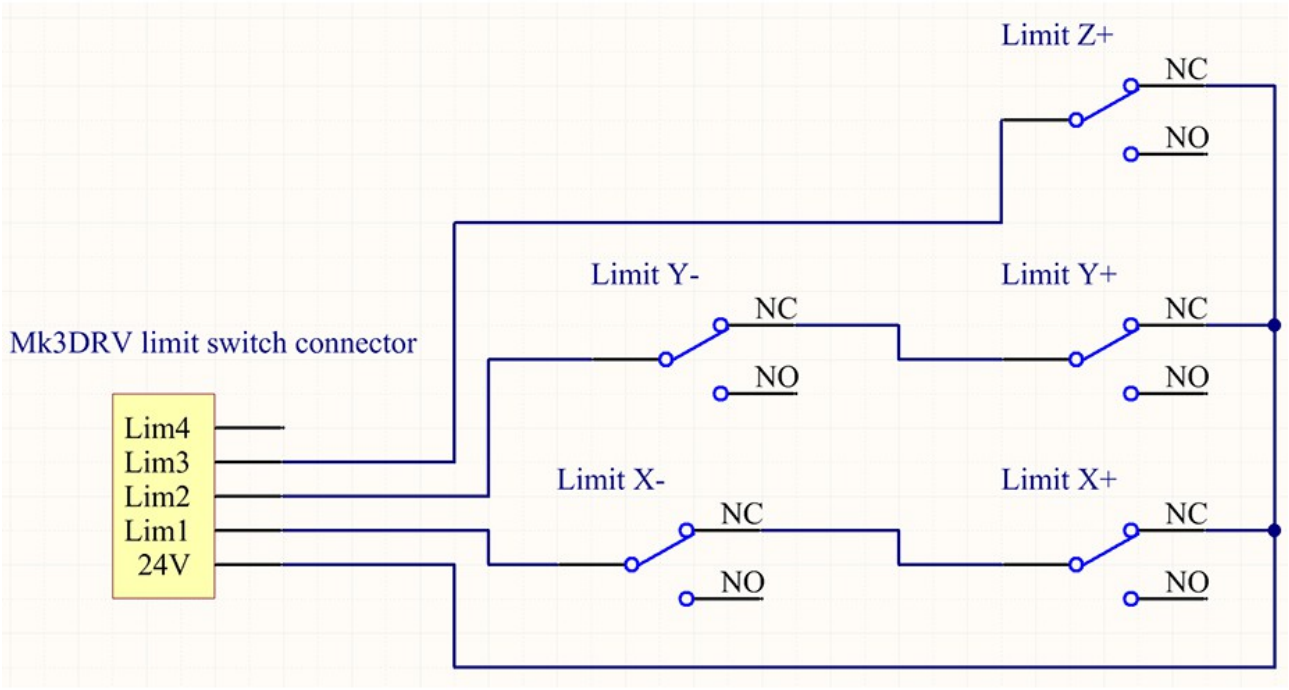
Software 'Invert' options allow use of ‘normally closed’ or ‘normally open’ switch hardware. This feature can be set in File/Settings/Limit/Invert

3.1.1 Single input wiring methods:

3.1.1.1 Parallel wiring of NO type switches:

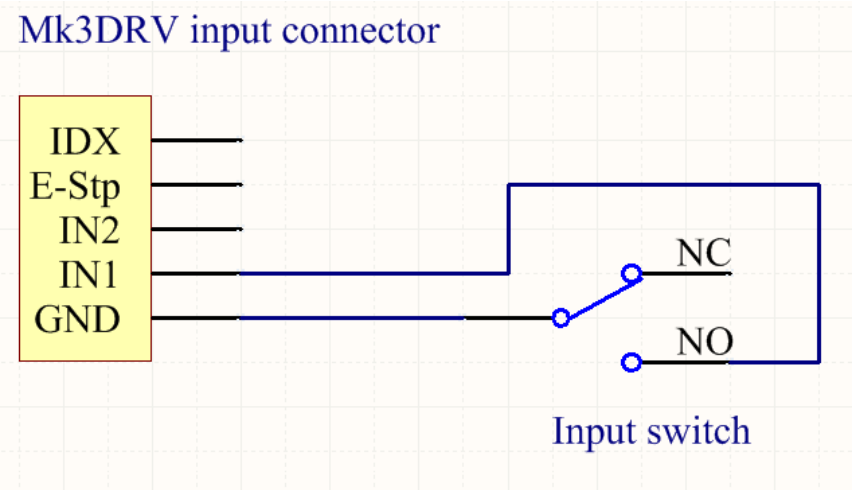

NC
NO
Limit Z+
NC
NO
Limit X+
NC
NO
Limit Y+
Mk3DRV limit switch connector
Lim4
Lim3
Lim2
Lim1
24V
NC
NO
Limit X-
NC
NO
Limit Y-

3.1.1.2 Serial wiring of NC type limit switches:



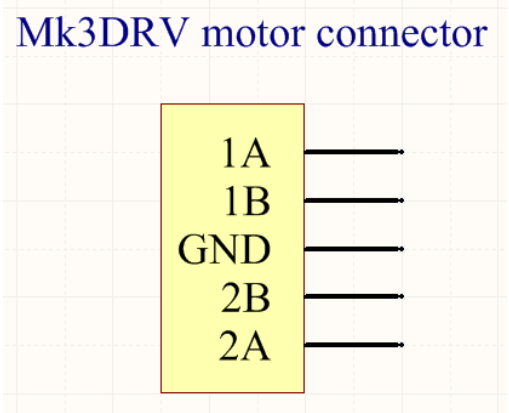
3.2 Wiring of inputs

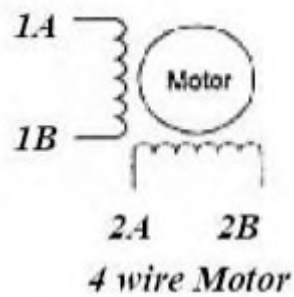
Mk3DRV controller has IDX, E-Stop and 2 assignable inputs. Bellow is example of wiring of switch connected to Mk3DRV assignable input. Inputs function is assigned in settings.



3.3 Wiring of stepper motors

Stepper motor is connected to controllers Motor connector output pins: 1A, 1B and 2A, 2B. Terminal GND is meant for connection of motor cables shield.

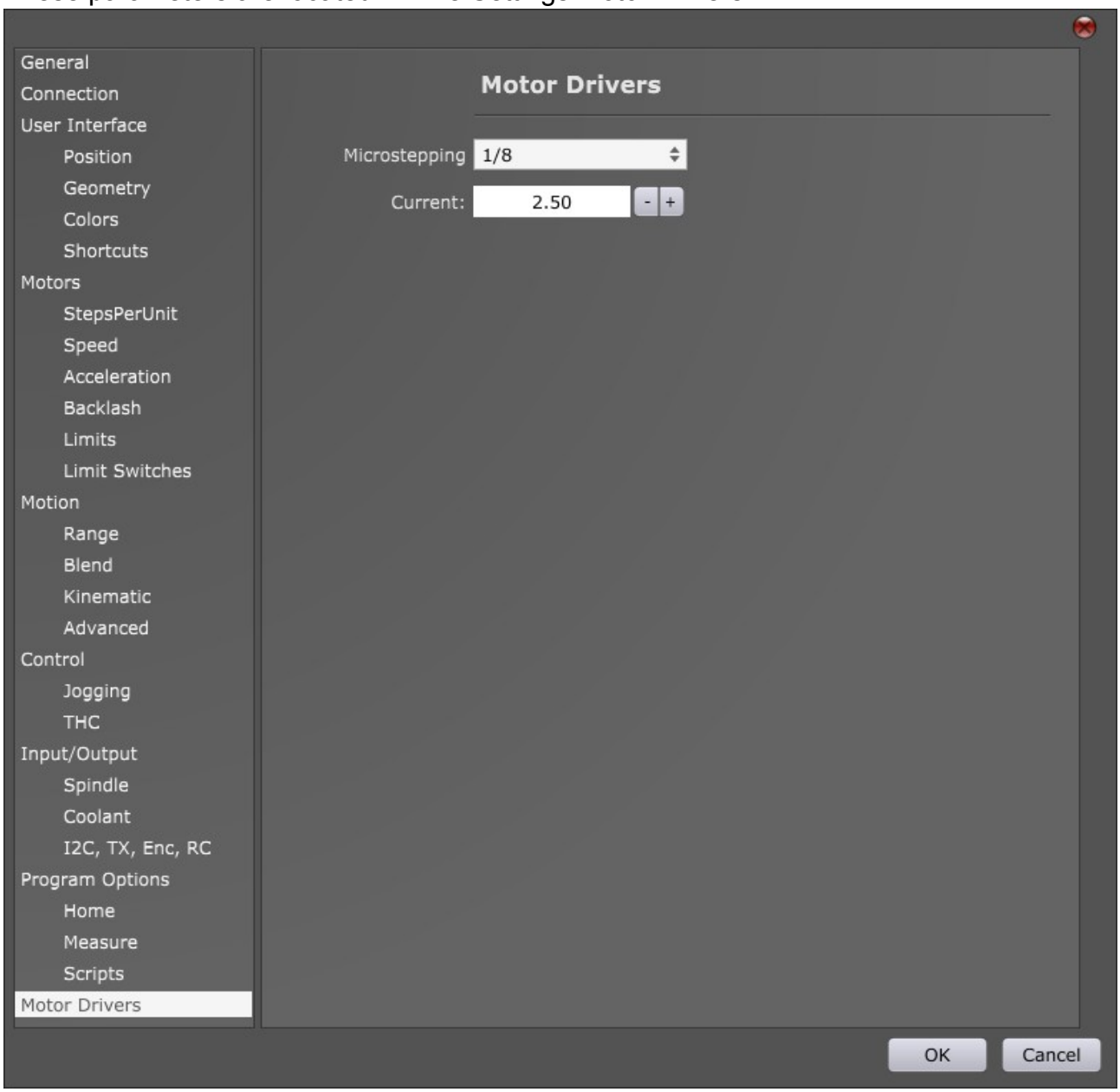




4 Microstepping and current configuration of stepper motor drivers

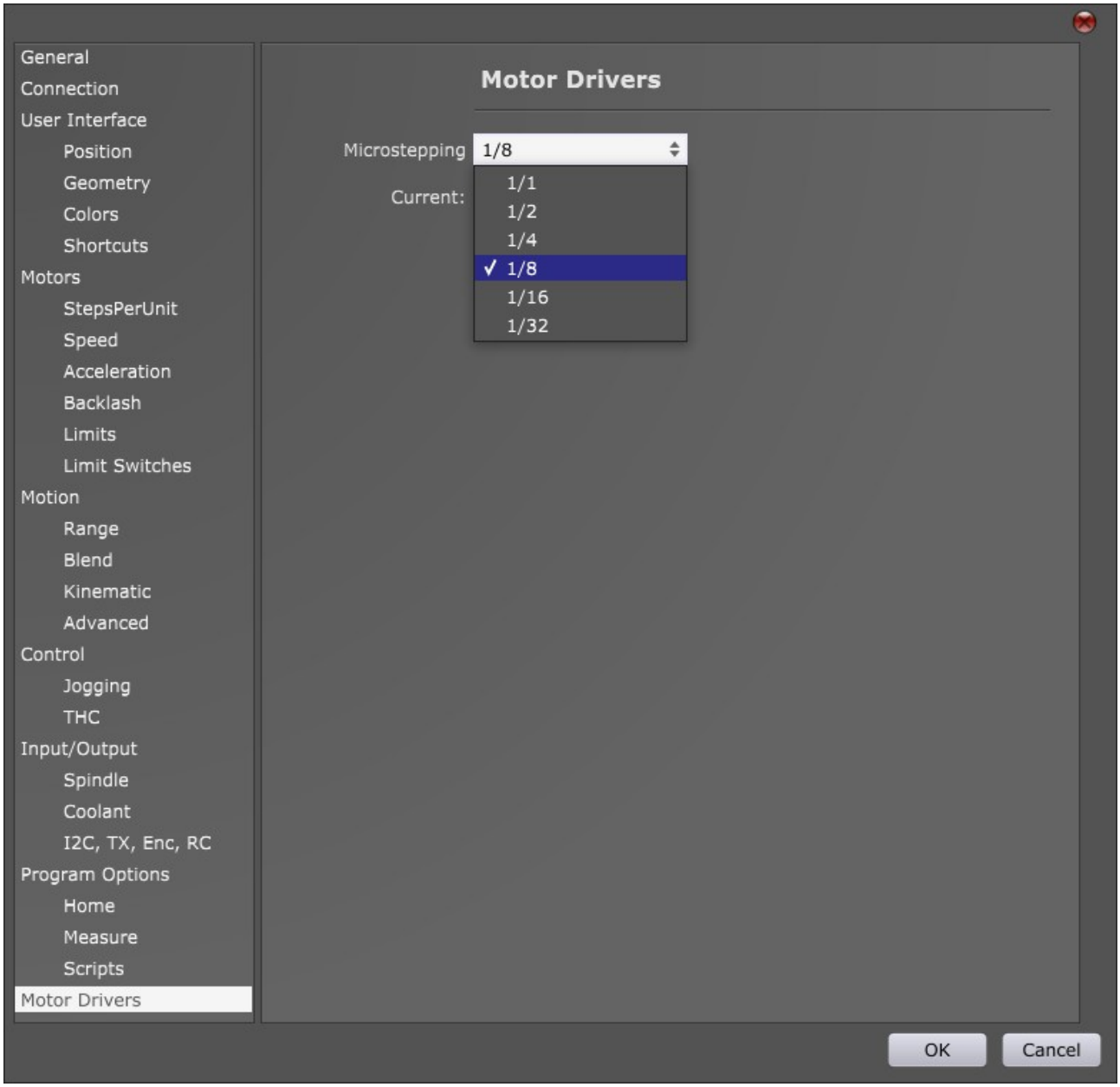
Both parameters are set trough PlanetCNC TNG software settings.

These parameters are located in: File/Settings/Motor Drivers



4.1.1 Microstepping

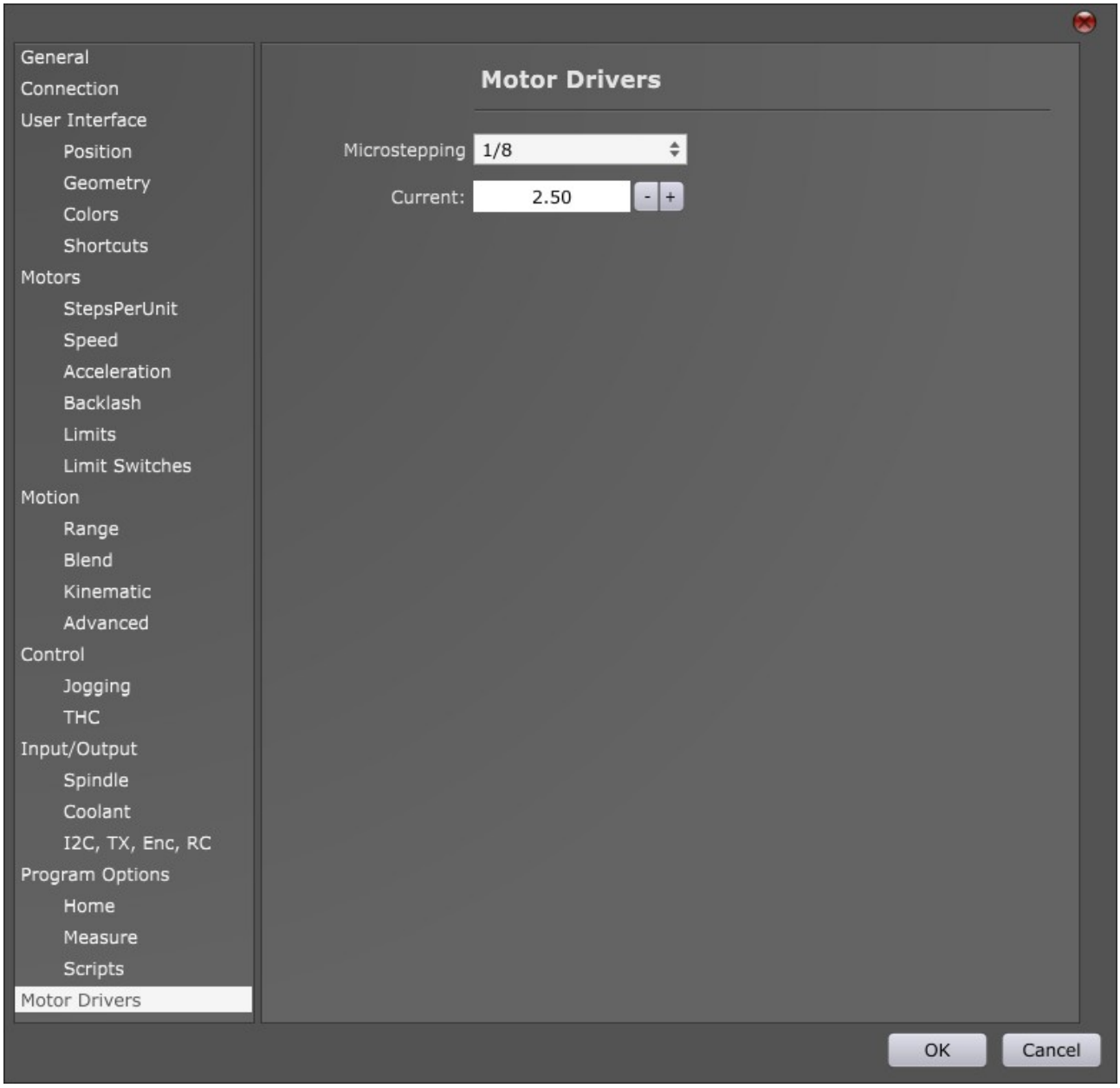
User can choose between 1/1 step mode (full step) and 1/32 step mode (32 micro steps).



4.1.2 Current

User can set motor drivers current value using “+” or “-” buttons or typing current value directly into “Current” window.

Minimal recommended value is 0.5A, maximal value is 2.5A.



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