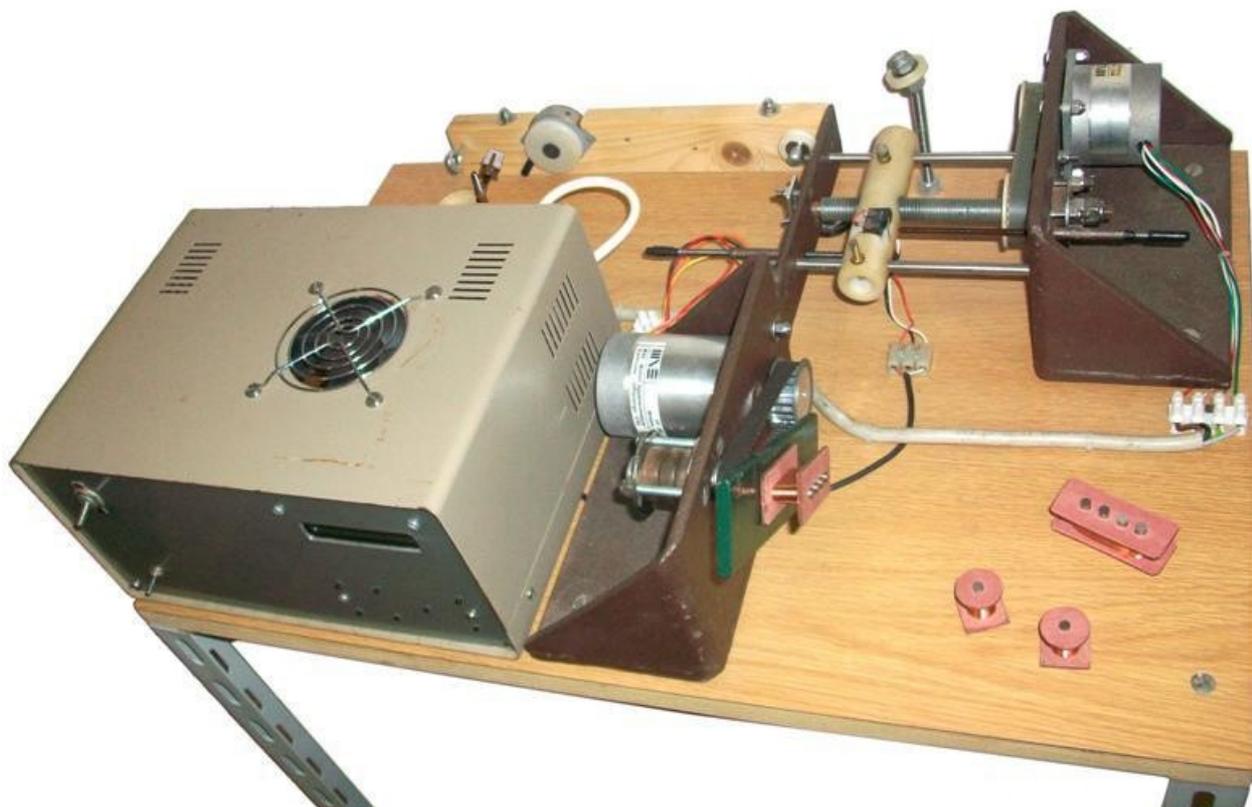


# Lab Liuteria Antonio Buccafusca CNC Pickup Winder Electronics Kit

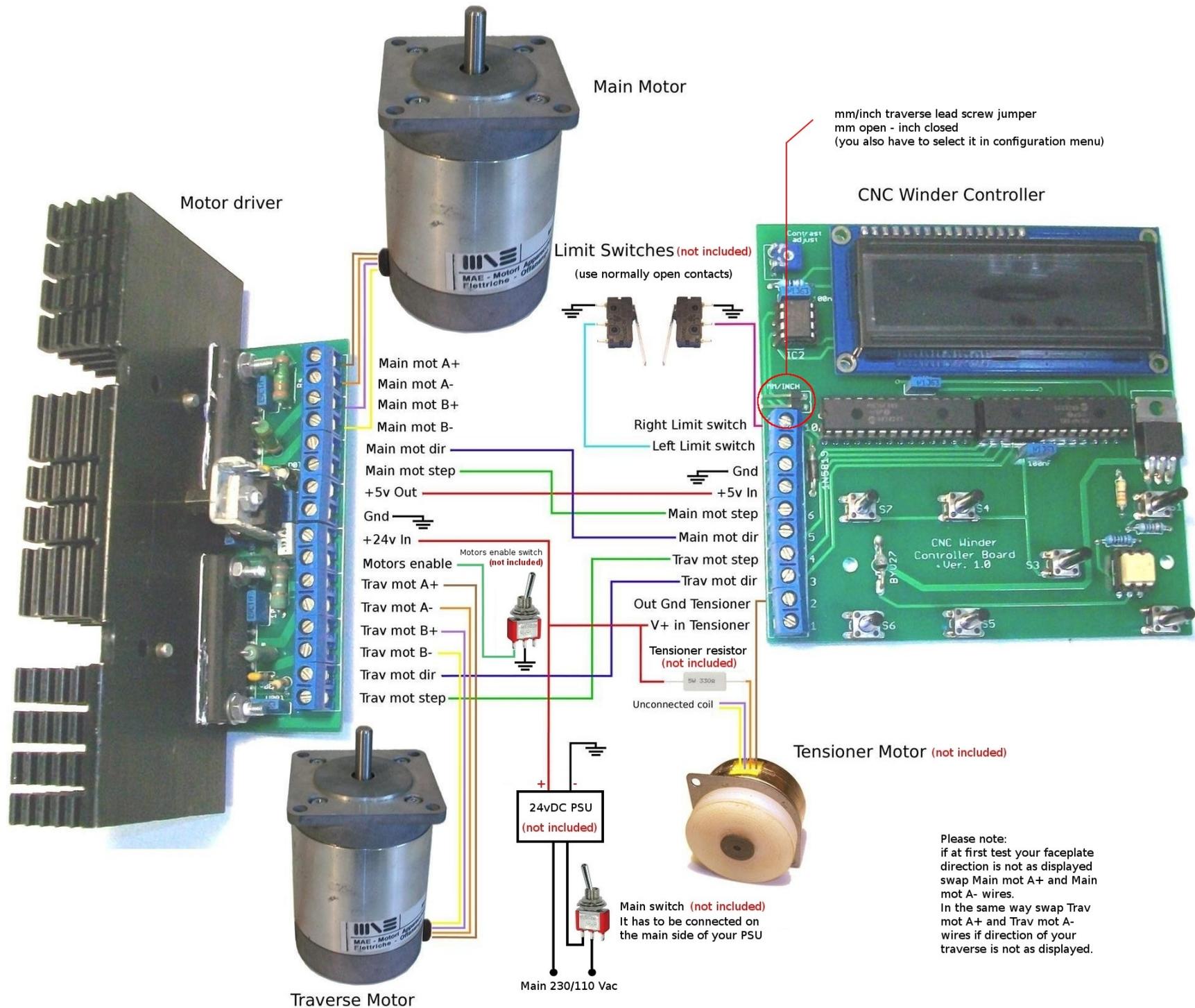
[www.labguitars.com](http://www.labguitars.com)



## features:

- 1-30000 clockwise or counterclockwise turns
- Pause - resume and emergency stop functions during winding
- 0.01-1 mm synchronized auto traverse in single pitch mode, random mode (between programmable min and max pitch values) and alternate mode (2-10 programmable pitch values rotating in layers)
- Values displayed in mm, inch and TPL
- Programmable traverse travel with limit switches and measuring function
- Max speed programmable in 10 steps from 200 to 2000 rpm (max speed depends on your mechanics configuration and on motors included in your kit)
- Programmable acceleration and deceleration
- 1mm,2mm,4mm,20tpi,10tpi and 5tpi pitch lead screw traverse and 1:1 – 2:1 and 4:1 pulleys ratio faceplate/main-motor transmission supported
- PWM output for tensioner (**experimental feature**)

# Cnc Winder kit wiring



Please note:  
if at first test your faceplate direction is not as displayed swap Main mot A+ and Main mot A- wires.  
In the same way swap Trav mot A+ and Trav mot A- wires if direction of your traverse is not as displayed.

## ...Some tips for the winder mechanics....

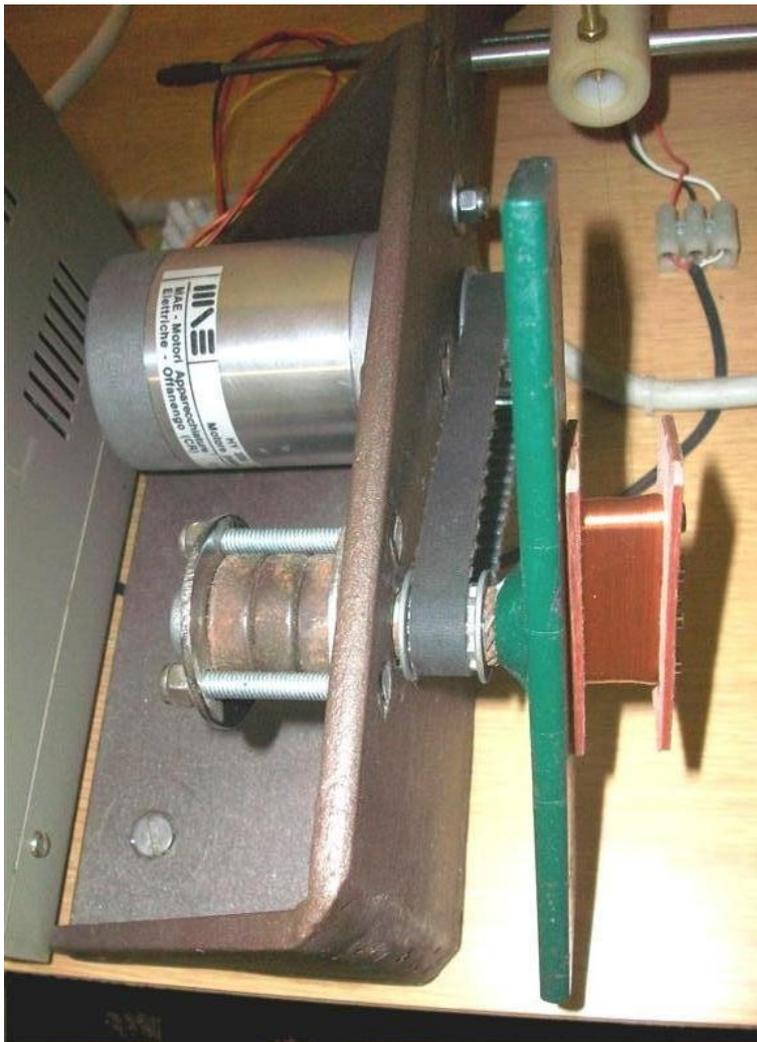
The kit does not include any mechanical part so everyone has to find and/or build what is needed to complete the winder.... This is not too simple then make sure you are capable of that. Below there are some tips and pictures but anyone can adapt building for his own skills, tools and imagination.....

### Main motor and faceplate assembly

The Main motor and faceplate must be fixed on metal or wood frame... The stepper motors are generally not very fast so it's better to speed up faceplate with a toothed pulleys/belt transmission. Supported transmission ratios by the controller are 1:1 - 2:1 and 4:1. (the bigger pulley on motor shaft).

The images below show the building of the my main motor assembly. It is built with soldered iron to reduce unwanted vibrations (but for an easier construction could be also made of screwed wood ). My pulleys/belt transmission has a 2:1 transmission ratio (20 teeth pulley on motor and 10 teeth pulley on faceplate).

The shaft of the faceplate has been made with a bolt and kept in place by three bearings.



## Traverse assembly

The traverse is the the most complex assembly in the winder. The traverse moves on two rails and is driven by a leadscrew. The controller supports 1 – 2 and 4 mm, and 20 – 10 and 5 Tpi leadscrew pitch.

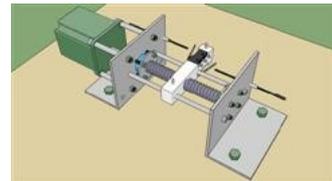
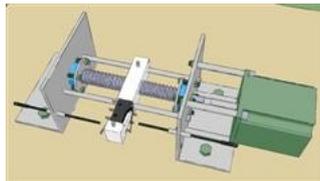
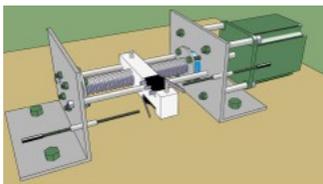
The leadscrew can be connected to the motor shaft by a pulleys/belt transmission as in my winder or directly as shown on the render images below.

The best solution to have a most fast traverse is to have 4mm (or 5tpi) pitch leadscrew with 1/1 (directly or same pulleys) transmission, but equivalent configurations are 2mm pitch leadscrew with 2/1 transmission or 1mm pitch leadscrew with 4/1 transmission (bigger pulley on motor shaft).

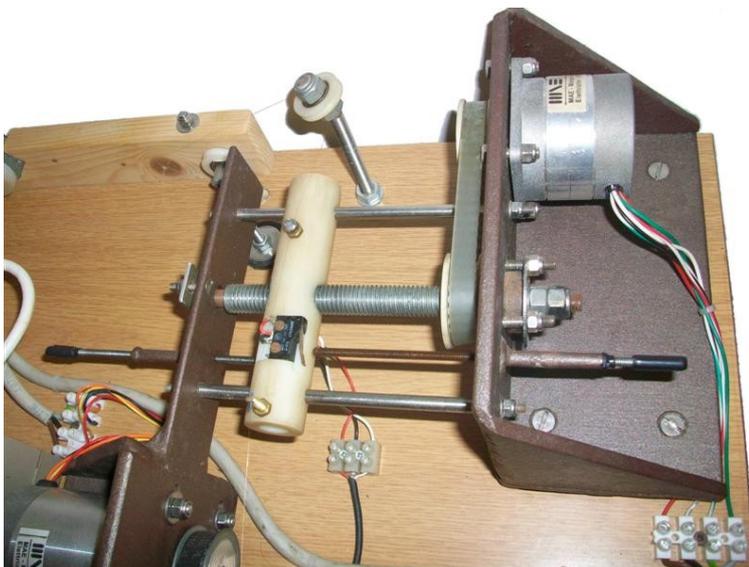
Other supported combining are shown in the table at page 7.

The traverse moves between two limit switches that toggle direction and permit to adjust the travel. To have travel adjusting, limit switches have to be pushed by two adjusting screws. You can see my arrangement in the picture of my winder and in the render images below.

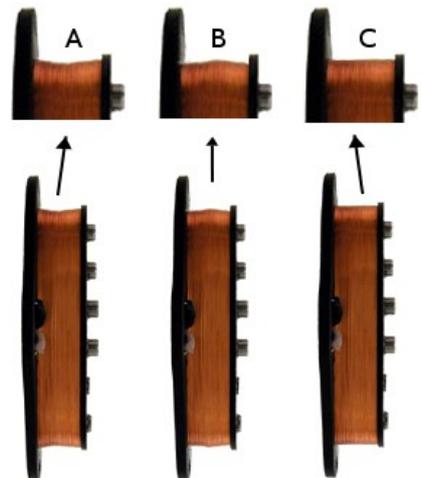
In the image below you can see a pickup wound with: (a) limit switch too far off (b) limit switches too closer and (c) limit switch placed exactly at pickup bobbin height.....



*Click thumbnails to enlarge in your web browser*



*...my traverse assembly...*



*...pickup wound with different traverse travel setting ...*

## Tensioner (Experimental)

The controller has an adjustable PWM output to drive a tensioner built with a small stepper motor. (If a DC current flows in a coil of a stepper it causes a breaking torque proportional to it).

This Feature is labeled as “experimental” because the motor is not included in the kit (you can find a small stepper motor for free in any broken pc printer or on ebay at few euros) and also you have to find the right pulley dimension and right series resistor for your motor.

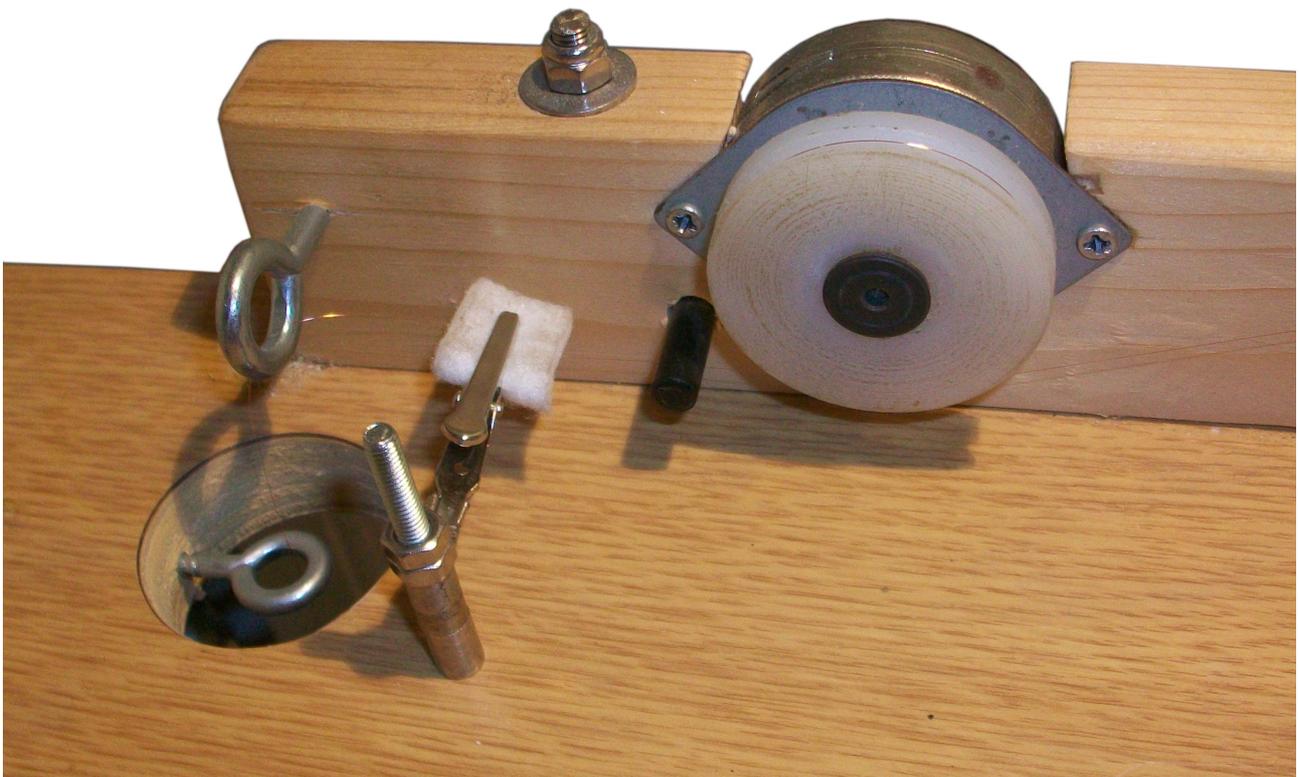
In my tensioner I turn a nylon pulley on lathe with an outer diameter of 40mm. I think it should be the right diameter for any small stepper motor.

A stepper motor can have 4, 5, 6 or 8 wires then you have to find the two wires of a coil... choose a wire and with a ohmmeter find the other one.... it is the one with the lower resistance value. Leave the other wires unconnected.

Usually 0.25 Ampere is enough for the maximum current of the tensioner... to have this value you have to connect a resistor in series to the stepper motor coil. A 100 ohm 7watt resistor should be the right value for any small stepper, but you can decrease this value (**not less than 47ohm**) if max tensioner holding torque is not enough or increase this value if the the range of tensioner is too wide and the useful range is confined in a narrow range of the settable controller values.

When you switch on the tensioner for the first time, start from value 0 and increase it checking the holding torque and the motor temperature... For the the pickup wires the tensioning should be adjustable between 0 and 30gr

To avoid that the wire slides around the tensioner pulley it is necessary to wind it 2 turns and also it is necessary to add a small felt pre-tensioner as shown in picture.....



# Controller User Guide

At start up display shows firmware version, then you have to select the **operating mode**, they are:

- winding
- configuration
- jog control



you can select operating mode with buttons 4 & 5 and confirm with ok (button 3)

## Jog mode

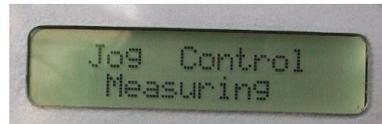
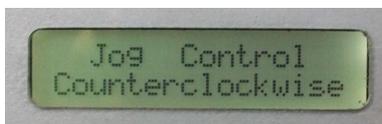
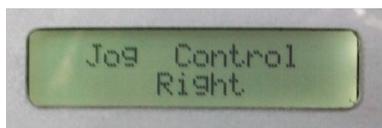
jog mode is useful for motors movement test and for measuring the traverse travel between limit switches

buttons 4 & 5 move traverse

buttons 6 & 7 move main motor

button 1 starts traverse movement for travel measuring.... at finish value will be shown

button 2 returns to operating mode selection



## Configuration mode

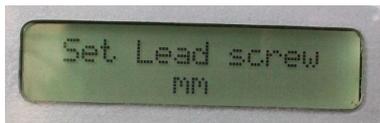
Configuration mode allows you to set in order: lead screw units (mm or inch) and pitch, motors pulley ratio and default values of tensioner, speed and ac-deceleration....

### Lead screw units

buttons 4 & 5 select mm or inch units for your traverse lead screw ....(but you have to select it with jumper on the controller board too)

button 3 stores selection and skips to gear ratio setting

button 2 returns to operating mode selection without storing



### Gear ratio

buttons 4 & 5 select motors gear ratio for main and traverse motor

button 3 stores selection and skips to default tensioner setting

button 2 returns to operating mode selection without storing



for main motor (faceplate motor) this value depend just on number of teeth of your pulleys.... possible values are 1/1 2/1 and 4/1

eg.

if you have a 15 teeth pulley at motor and a 15 teeth pulley at faceplate you have to select 1/1

if you have a 20 teeth pulley at motor and a 10 teeth pulley at faceplate you have to select 2/1

if you have a 48 teeth pulley at motor and a 12 teeth pulley at faceplate you have to select 4/1

for traverse motor the value depends on pulleys ratio and pitch lead screw too.... refer to the table below.

Lead screw pitch and pulleys ratio used (motor/screw)	Option to select
1mm or 20 Tpi pitch with 1/1 pulleys ratio	1/1
1mm or 20 Tpi pitch with 2/1 pulleys ratio	2/1
1mm or 20 Tpi pitch with 4/1 pulleys ratio	4/1
2mm or 10 Tpi pitch with 1/1 pulleys ratio	2/1
2mm or 10 Tpi pitch with 2/1 pulleys ratio	4/1
4mm or 5 Tpi pitch with 1/1 pulleys ratio	4/1

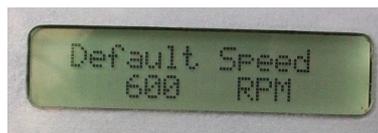
### Default tension

buttons 4 & 5 select default tensioner value with +1 or -1 steps  
buttons 6 & 7 select default tensioner value with +100 or -100 steps  
button 3 stores value and skips to default speed setting  
button 1 powers on/off tensioner (useful for test)  
button 2 returns to operating mode selection without storing



### Default speed

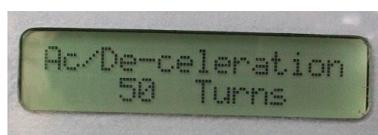
buttons 6 & 7 select default speed value with +200 or -200 steps  
button 3 stores value and skips to default ac-deceleration setting  
button 2 returns to operating mode selection without storing



### Default ac-deceleration

buttons 4 & 5 select default ac-deceleration value with +1 or -1 steps  
buttons 6 & 7 select default ac-deceleration value with +100 or -100 steps  
button 3 stores value and returns to operating mode selection  
button 2 returns to operating mode selection without storing

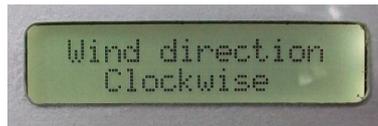
(eg. value of 20 means that the main motor goes from 0 to full speed and vice-versa in 20 turns...)



## Pickup winding mode

### wind direction

buttons 4 & 5 select wind direction  
button 3 confirms and skips to turns setting  
button 2 returns to operating mode selection



### turns setting

buttons 4 & 5 select turns value with +1 or -1 steps  
buttons 6 & 7 select turns value with +100 or -100 steps  
button 3 confirms and skips to traverse travel measuring  
button 2 returns to operating mode selection

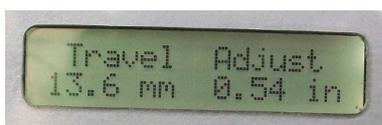


### travel measuring

controller performs a measuring of traverse travel between limit switches and shows value... for a perfect winding it have to be same at your pickup height bobbin...(besides controller needs this measure for TPL calculation too)

your options:

button 1 restarts measuring  
buttons 4 & 5 move traverse.... (useful if you want adjust limit switches position)  
button 3 confirms and skips to traverse mode selection  
button 2 returns to operating mode selection



## traverse mode

there are 3 modes for traverse movement:

- single pitch: enter a pitch for all layers in your pickup
- alternate pitch: you can enter from 2 to 10 pitch values and the traverse rotates them in pickup winding layers
- random pitch: you enter min and max values.... traverse rotates in layers random values between min and max

buttons 4 & 5 select mode

button 3 confirms

button 2 returns to operating mode selection



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if you select **single pitch**

buttons 4 & 5 select pitch value with +1 or -1 steps

buttons 6 & 7 select pitch value with +10 or -10 steps

button 3 confirms and skips to tensioner setting

button 2 returns to operating mode selection



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if you select **alternate pitch**

**enter number of pitch values** you want rotate in layers

buttons 4 & 5 select number of values +1 or -1 steps

button 3 confirms and skips to pitch values setting

button 2 returns to operating mode selection



## pitch values setting

select values like in "single pitch" but for n times



if you select **random pitch**

select values like in "single pitch" but for min and max



## tensioner value

display shows default value

buttons 4 & 5 modify tensioner value with +1 or -1 steps

buttons 6 & 7 modify tensioner value with +100 or -100 steps

button 3 confirms and skips to speed setting

button 1 powers on/off tensioner (useful for test)

button 2 returns to operating mode selection



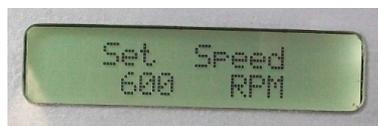
## speed value

display shows default speed

buttons 6 & 7 modify speed value with +200 or -200 steps

button 3 confirms and skips to "ready to start"

button 2 returns to operating mode selection



## ready to start.... and run

with button 1 start-pause winding (go or stop with ac-deceleration)

with button 2 emergency stop winding (without deceleration) and if you push again returns to operating mode selection

buttons 6 & 7 modify tensioner value with +1 or -1 step

During winding display shows turns - tpl and tensioner value.....

