**CPU5B**
- 125 KHz step frequency.
- Full 6 axes interpolation.
- Euro card size 100x160mm.
- 5 status LED's.
- 6 Standard CNC outputs (Tool, Tool direction, TOOL PWM, Flood coolant, Mist coolant, Charge PUMP for external watchdog)
- 9 Standard CNC inputs (6 Home inputs, Probe, Spindle sensor, 2 x E-Stop, External ERROR, Run, Pause, Hand wheel).
- 9 general purpose digital outputs (tool-changer).
- 2 Extra PWM outputs for motor speed or temperature control.
- 6 Extra digital Inputs (tool changer).
- 3 Extra analogue Inputs 3. The extra IO is controlled by M54, M55, M66.
- Interface to PC is USB2.0.
- Optional 100 Mbit Ethernet.
- On board Power supply, input +9 – 24 Volt.
- Field upgradable firmware.
- **USBCNC Software included.**
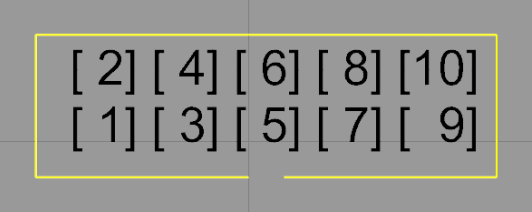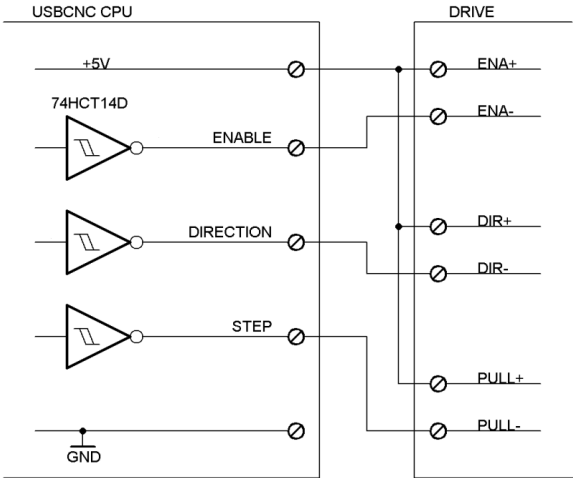- Windows XP, Windows 7.
- Runs on single core Atom PC.
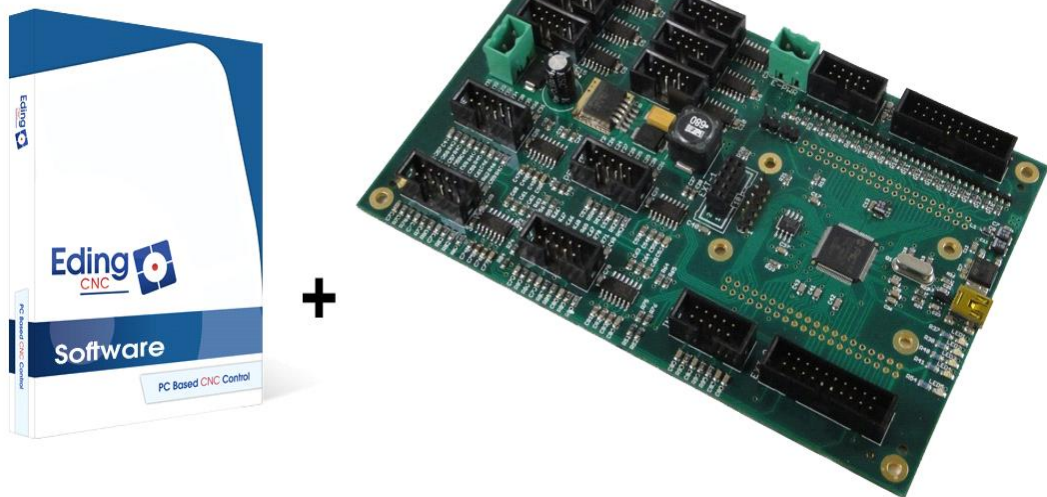


The CPU is delivered with software.
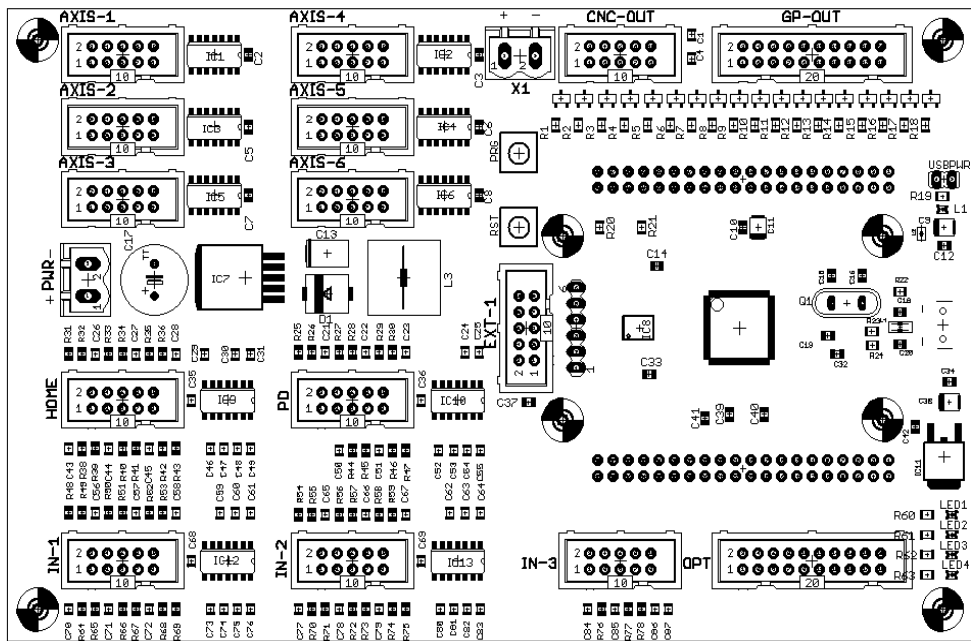
Features

- Shortest possible CNC production time, especially 3D work, depending on the product, USBCNC can be up to 2 times faster . This is thanks to the advanced Look Ahead Feed Algorithm that works for all motion segments, lines and circles by looking at their curvature and reduce speed only when absolutely necessary.
- Simple one screen operation, UI designed for and by professional CNC operators.
- Array mode execution for multiple production.
- Optimized tooltip feed calculations for 4th axis milling, no tool breakage due to wrong tool-tip feed.
- Feed Override control while running 0-300%.
- Easy start half way in g-code file, using search method
- Slave axes, for systems with dual motors (tandem) on X, Y or Z axis.
- Special homing sequence for tandems, sets tandem straight.
- Tangential knife, you need to program only X.Y coordinates and the tangential knife follows, also in circles and lifts automatically up when needed.
- Backlash compensation.
- Spindle proportional ramp-up time.
- Collision detection when g-code job is loaded prevents machine damage.
- Running time estimation when job is loaded.
- Thread cutting (Lathe).
- OpenGL graphics allows real-time PAN/ZOOM/ROTATE
- G-code is EMC compatible, RS274NGC, can be used with all CAM software's so far.
- G-code extensions with IF..THEN, WHILE..ENDWHILE, SUB ENDSUB, GOSUB.
- Super long file mode allows endless files, tested with 100.000.000 lines g-code.
- User interaction from G-Code with DlgMsg command and a lot more.
- Automatic tool change can be programmed entirely in G-code.
- Pause, Jog away, resume run in middle of g-code run.
- Hand wheel jog with position and velocity mode.
- Build in 2D CAM for drilling, engraving, profiling and pocketing, reads DXF and HPGL.
- SDK for building customized UI's.

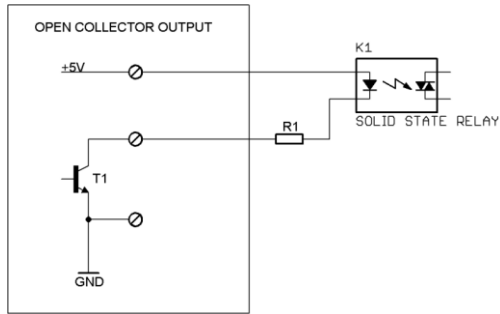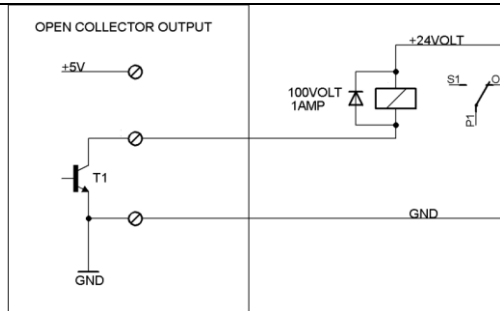| Connector PWR	Connector E-PWR
The CPU needs external power 24V/0.5A This is the power connector for the CPU. + : +24V - : GND The CPU has protection for reversal polarity.	This E-PWR power connector is routed to the home and CNC-OUT and GP-OUT connector. It is just for convenience to have power on the home connecters for home sensors. It has further no function on the board.
Connector AXIS-1 – AXIS-6 [2] [4] [6] [8] [10] [1] [3] [5] [7] [9] 1: AMP-ENABLE 2: GND 3: DIRECTION 4: GND 5: STEP 6: GND 7: GND 8: GND 9: +5V 10: GND 74HCT14 outputs 17 mA per output source or sink.	Example Connection Preferred connection for Leadshine and compatibles:
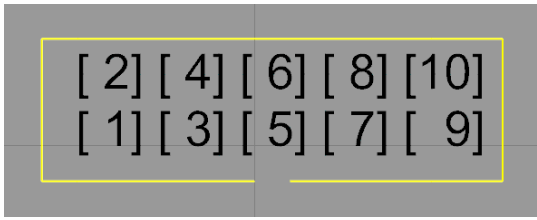
| Connector CNC-OUT	Example Connection
[2] [4] [6] [8] [10] [1] [3] [5] [7] [9] 1: PWM1 2: OUT-1 3: TOOL 4: TOOL-DIRECTION 5: MIST COOLANT 6: FLOOD COOLANT 7: +V-EXT (From E-PWR) 8: CHARGE PUMP 9: +5V 10: GND Open collector transistor outputs 100 mA max current. PWM frequency 5 Khz Charge-pump frequency 10 Hz (LED4)	OPEN COLLECTOR OUTPUT +5V K1 SOLID STATE RELAY R1 T1 GND Example OPEN COLLECTOR OUTPUT +5V +24VOLT 100VOLT 1AMP S1 O1 P1 T1 GND GND Example

Connector OUT (AUX OUTPUTS)	Example, same as CNC-OUT
[2] [4] [6] [8] [10] [12] [14] [16] [18] [20] [1] [3] [5] [7] [9] [11] [13] [15] [17] [19] 1: GND 2: GND 3: GND 4: GND 5: OUT-8 6: OUT-9 7: OUT-6 8: OUT-7 9: PWM-2 10: PWM-3 11: OUT-5 12: PWM-1 (pin 1 of CNC-OUT) 13: OUT-3 14: OUT-4 15: OUT-1 16: OUT-2 17: +V-EXT (From E-PWR) 18: +V-EXT (From E-PWR) 19: +5V 20: +5V Open collector transistor outputs 100 mA max current. PWM frequency 5 Khz	

Connector PENDANT

[2] [4] [6] [8] [10]
[1] [3] [5] [7] [9]
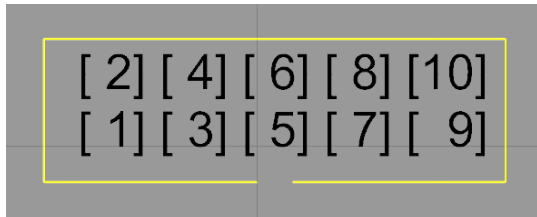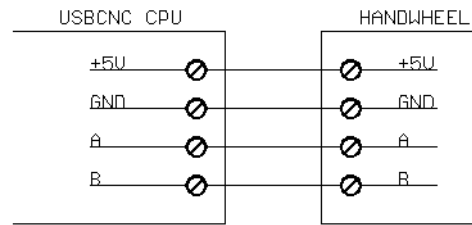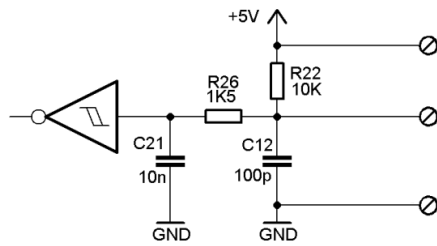
1: -
2: PAUSE
3: HANDWHEEL-A
4:RUN
5: HANDWHEEL-B
6: ESTOP
7: +5V
8: GND
9: +5V
10: GND

74HCT14 inputs.
Pull-up to +5V with 10K
Filtered with R/C filter
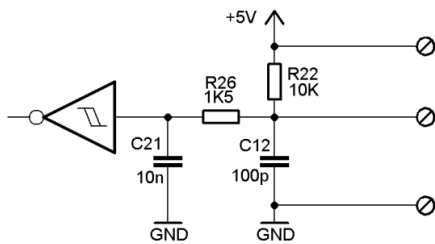
USBCNC CPU   HANDWHEEL
+5U   +5U
GND   GND
A   A
B   B

+5V
R26   R22
1K5   10K
C21   C12
10n   100p
GND   GND
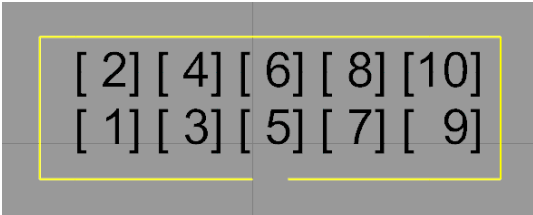
Connector Home
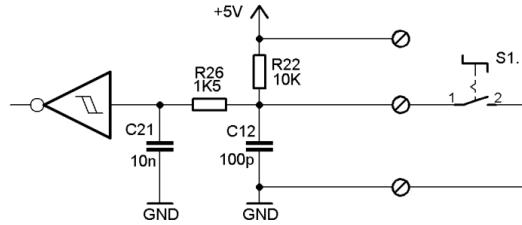

1: HOME-1
2: HOME-4
3: HOME-2
4: HOME-5
5: HOME-3
6: HOME-6
7: +V-EXT (From E-PWR)
8: GND
9: +5V
10:GND

Example:

Connect a switch
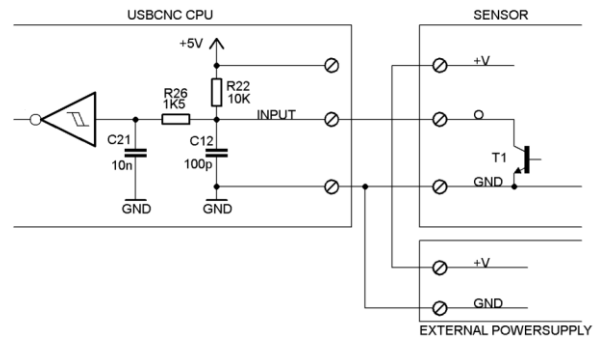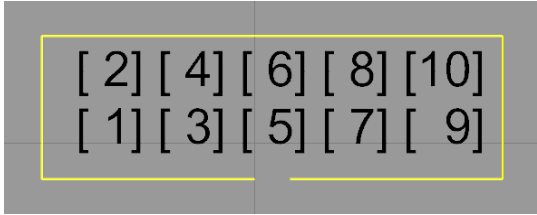
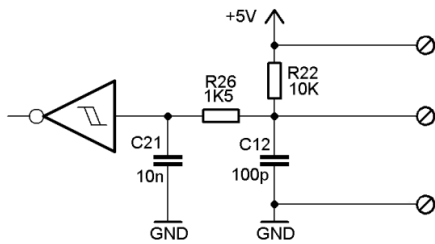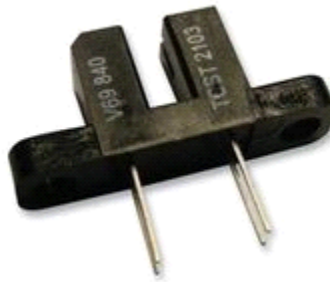| Connector IN-1	Example Spindle Pulse sensor
[2] [4] [6] [8] [10] [1] [3] [5] [7] [9] 1: PROBE 2: SPINDLE PULSE (LATHE) 3: ESTOP 4: EXTERN ERRROR 5: AUX-IN-6 6: AUX-IN-5 7: +5V 8: GND 9: +5V 10: GND 74HCT14 inputs. Pull-up to +5V with 10K Filtered with R/C filter +5V R26 1K5 R22 10K C21 10n C12 100p GND GND	Vishay TCST2103 LED Side (+ and E): Connect + of Led with 82 Ohm to +5V [7] or [9]. Connect E to GND [8] or [10] Output transistor side (D and +): Connect D (Emitter) to GND [8] or [10] Connect + (Collector) to CPU input spindle pulse [2]
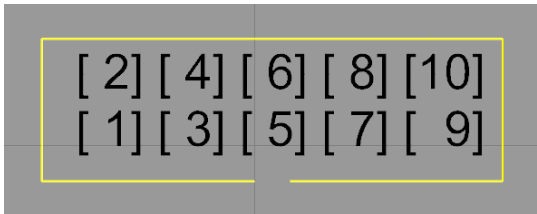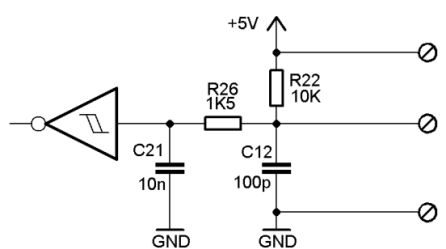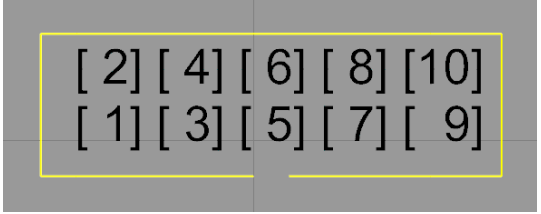
Connector IN-2	Examples, the same as with the HOME connector
[2] [4] [6] [8] [10] [1] [3] [5] [7] [9] 1: AUX-IN-4 2: AUX-IN-1 3: AUX-IN-2 4: AUX-IN-3 5: HW2A 6: HW2B 7: +5V 8: GND 9: +5V 10: GND	

74HCT14 inputs. Pull-up to +5V with 10K Filtered with R/C filter, same as IN-1 Connector. +5V R26 1K5 R22 10K C21 10n C12 100p GND GND	
Connector IN-3 [2] [4] [6] [8] [10] [1] [3] [5] [7] [9]	Analogue Input
1: Analog In 3 2: GND 3: Analog In 2 4: GND 5: Analog In 1 6: GND 7: +3.3Volt 8: GND 9: +3.3Volt 10: GND	Connect a potentiometer of 4K7 (value not critical) between GND and +3.3V. Connect the wipe of the potentiometer to the analogue input. The analog inputs can be used to control the feedOverride, SpeedOverride and selection of axis and multiplication factor for a Pendant. (Form Software Version 4.01). A full schematic of a Pendant is on the last page of this document.
Opt Connector	For connection with the RLY8 IO card

LEDS

The board has 2 pieces of software, 1. Bootloader 2. CNC firmware. The bootloader allows to update the CNC firmware using the PC application "CPU5 Configurator"

When the board is powered by +5V, it starts in bootloader mode. After 5 seconds the CNC firmware starts.

When the CPU5 Configurator contacts the board in the first 5 seconds after power on (by pressing get version in the app). Update of the CNC firmware is possible.
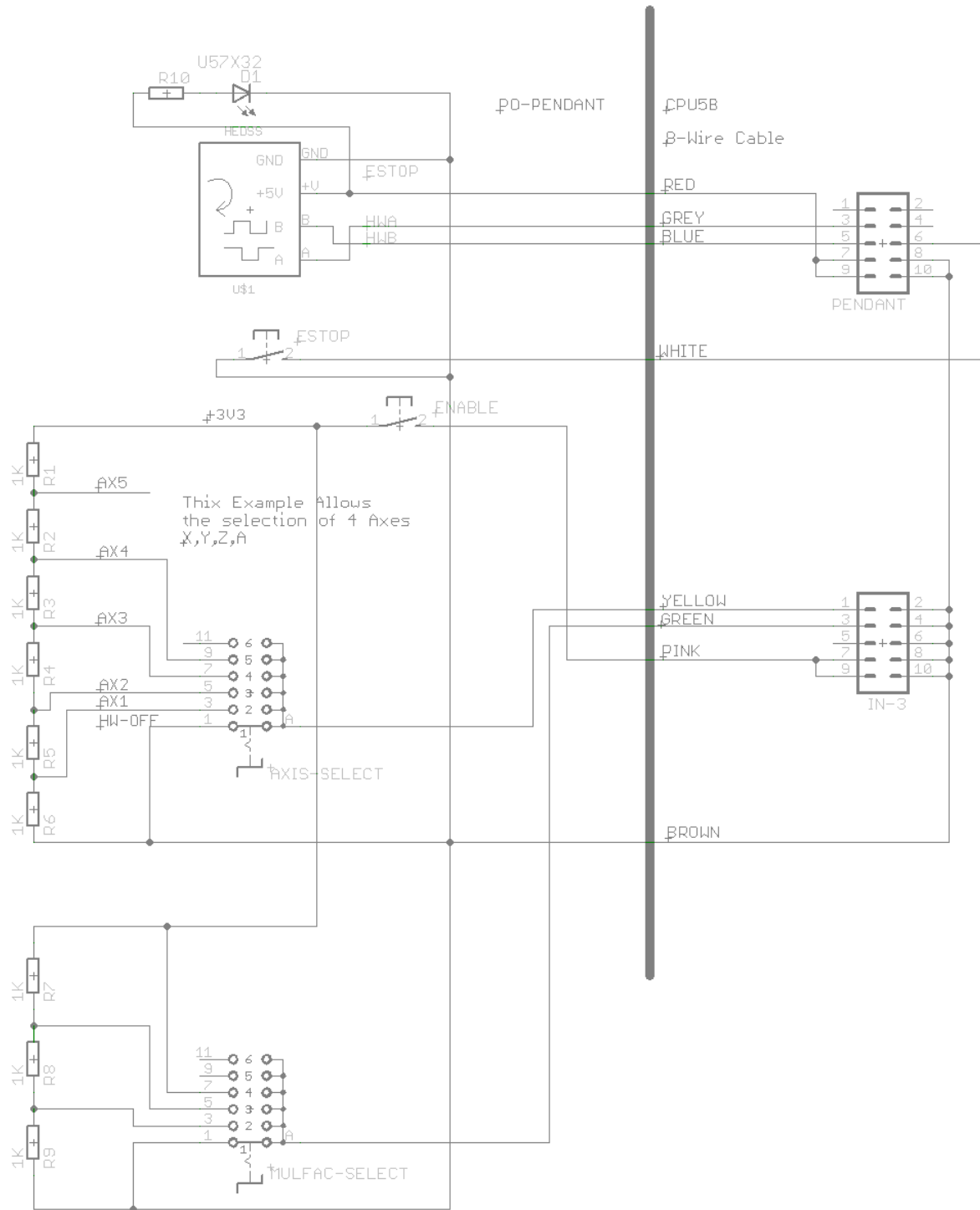When this does not happen, the bootloader will start the CNC firmware.
The bootloader can also be skipped by setting JMP1 jumper, this makes that the CNC firmware starts immediately.

The firmware start can be recognized by 10 fast flashes of the first led besides the USB connector.

| LED's from left to right	Bootloader Mode	CNC mode
Blue	+5 Volt and CPU 3.3Volt present.	
Red	Error during programming.	Watchdog reset signal, Fast flash pulse, starts when RESET is pressed in the software.
Yellow	Alternating flash indicate boot loader active and communication with USB working.	FLASH=> ETHERNET OR USB COMMUNICATION ACTIVE
Green		MACHINE ON or System Ready. After Reset is pressed.
Orange	Capture status, if on boot loader remains active. See also CPU5 configurator tool.	10 pulses at startup to show CNC firmware starting. On if E-Stop activated. Off if no E-Stop activated.

Example of Connecting a pendant with axis selection and multiplication rotation selection button via analog inputs. This is supported from software version V4.01

R10 U57X32 D1
HED55

PO-PENDANT CPU5B
8-Wire Cable

GND GND
+5V +V ESTOP RED
B B HWA GREY
A A HWB BLUE

PENDANT
1 2
3 4
5 6
7 8
9 10

U$1

ESTOP
1 2 WHITE

+3V3 ENABLE
1 2

1K R1
AX5 Thix Example Allows
1K R2 the selection of 4 Axes
AX4 X,Y,Z,A
1K R3
AX3 YELLOW
11 6 GREEN
9 5
7 4 PINK
1K R4
5 3
AX2 3 2
AX1 1
1K R5 A

HW-OFF
1K R6

IN-3
1 2
3 4
5 6
7 8
9 10

AXIS-SELECT

BROWN

1K R7

1K R8
11 6
9 5
7 4
5 3
3 2
1K R9 1
A

MULFAC-SELECT

For more explanation, see Chapter "Hand wheel Setup" in the Manual.

Enabling a CPU or an Option for a CPU

This is special for CPU5 series, select CPU-OPT in the Setup of the Software
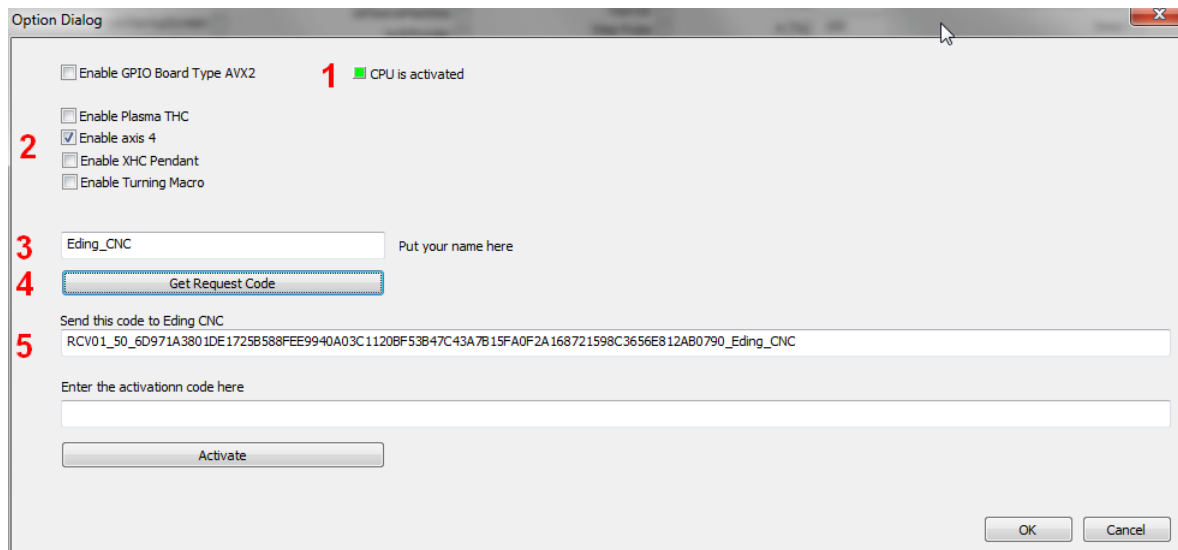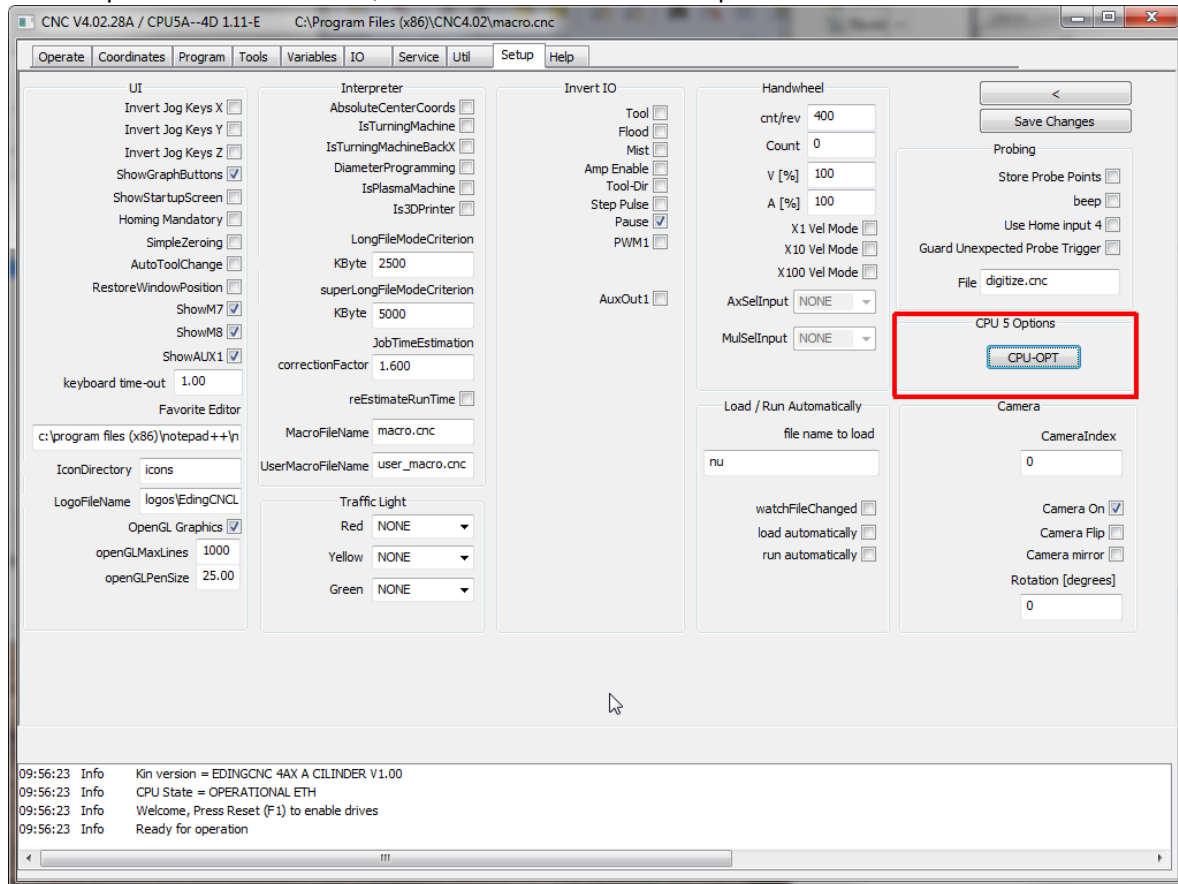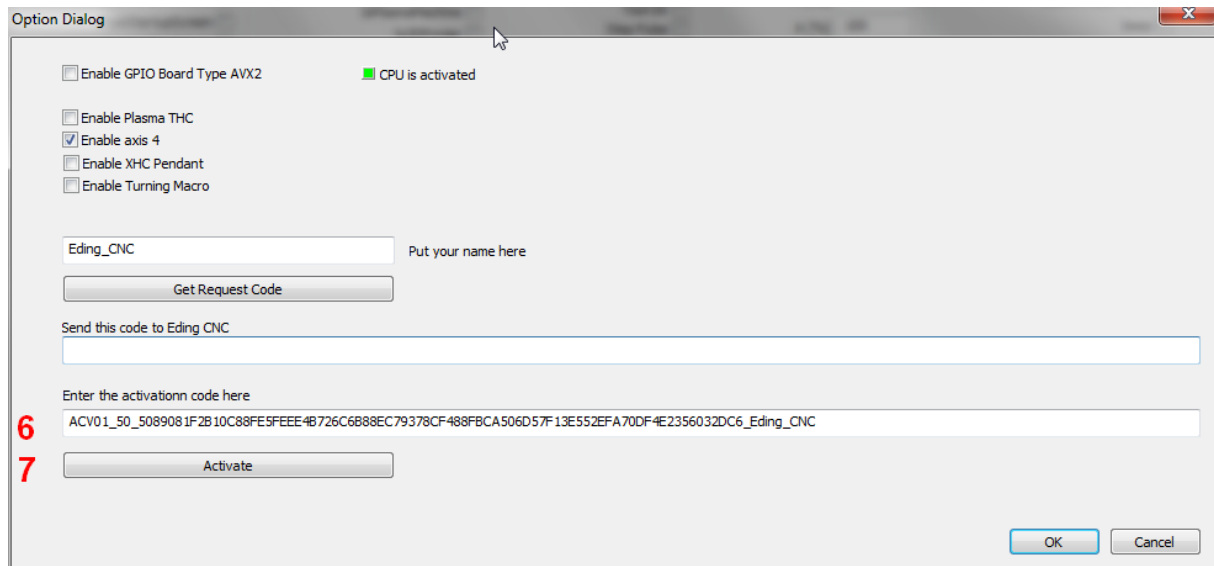

1 you see if the CPU is activated or not, green is enabled, red is not enabled.
2 you check the option that you wish to obtain, if the CPU is not enabled and you wish only to enable it, no selection here is needed.
3 Put Your name here.
4 Press the button "GetRequestCode".
5 Copy and paste the request code in your email and send it to the supplier.

Your supplier will send you back an activation code.

Option Dialog

☐ Enable GPIO Board Type AVX2   🟩 CPU is activated

☐ Enable Plasma THC
☑ Enable axis 4
☐ Enable XHC Pendant
☐ Enable Turning Macro

Eding_CNC   Put your name here

Get Request Code

Send this code to Eding CNC

Enter the activationn code here

6 ACV01_50_5089081F2B10C88FE5FEEE4B726C6B88EC79378CF488FBCA506D57F13E552EFA70DF4E2356032DC6_Eding_CNC

7 Activate

OK   Cancel

6 Copy and paste the activation code from the email that you received from the supplier.
7 Press the button Activate".

Done, you CPU or Option is now enabled, close and restart the software.