CNC530 Manual

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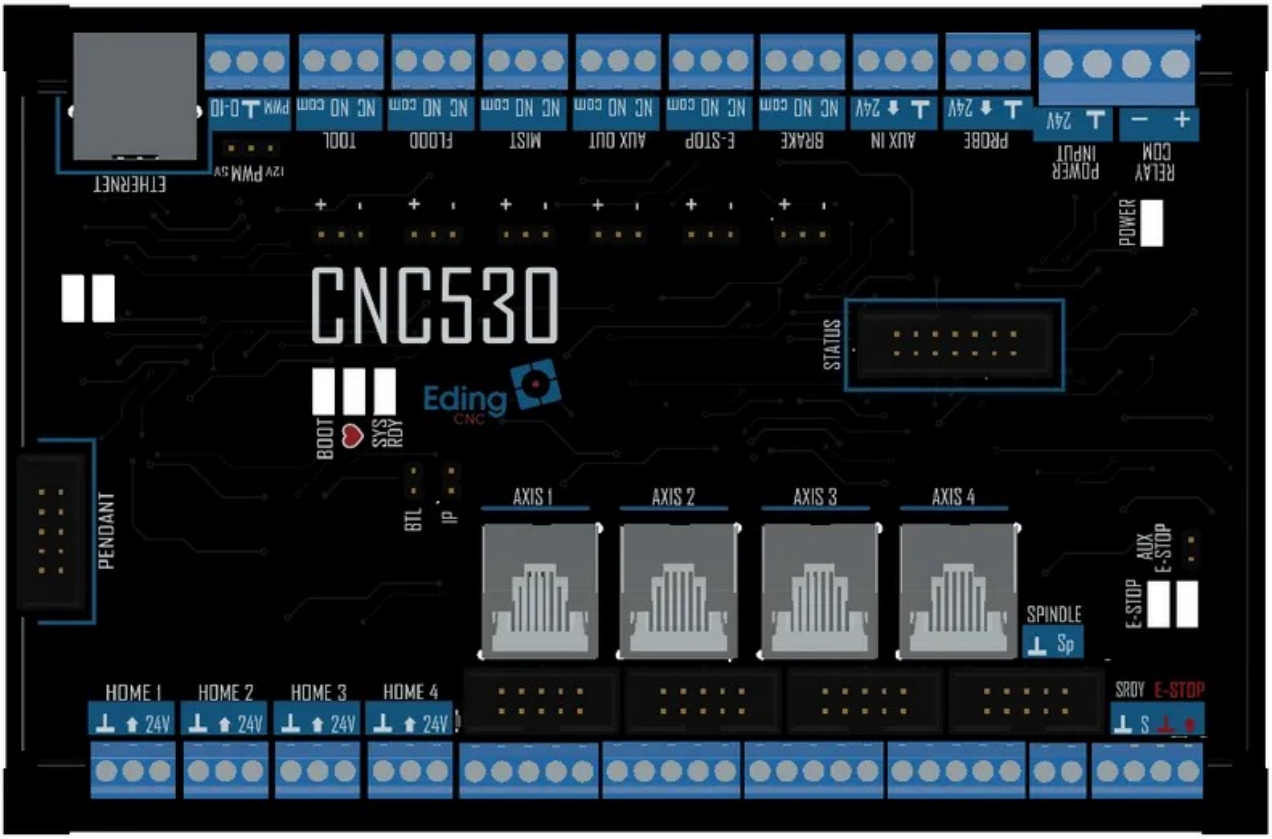
Before starting with the CNC530, it's essential to take notice of several things:

1. Safety first, an E-stop switch needs to be connected. This needs to be a normally closed version. Without this, the outputs will remain switched off. Please also refer to <TODO, E-STOP>

2. Safety first again, once the E-stop switch is connected only by pressing the 'RESET' button in the software, the outputs will be enabled. This means after an E-stop, you need to enable the outputs again actively

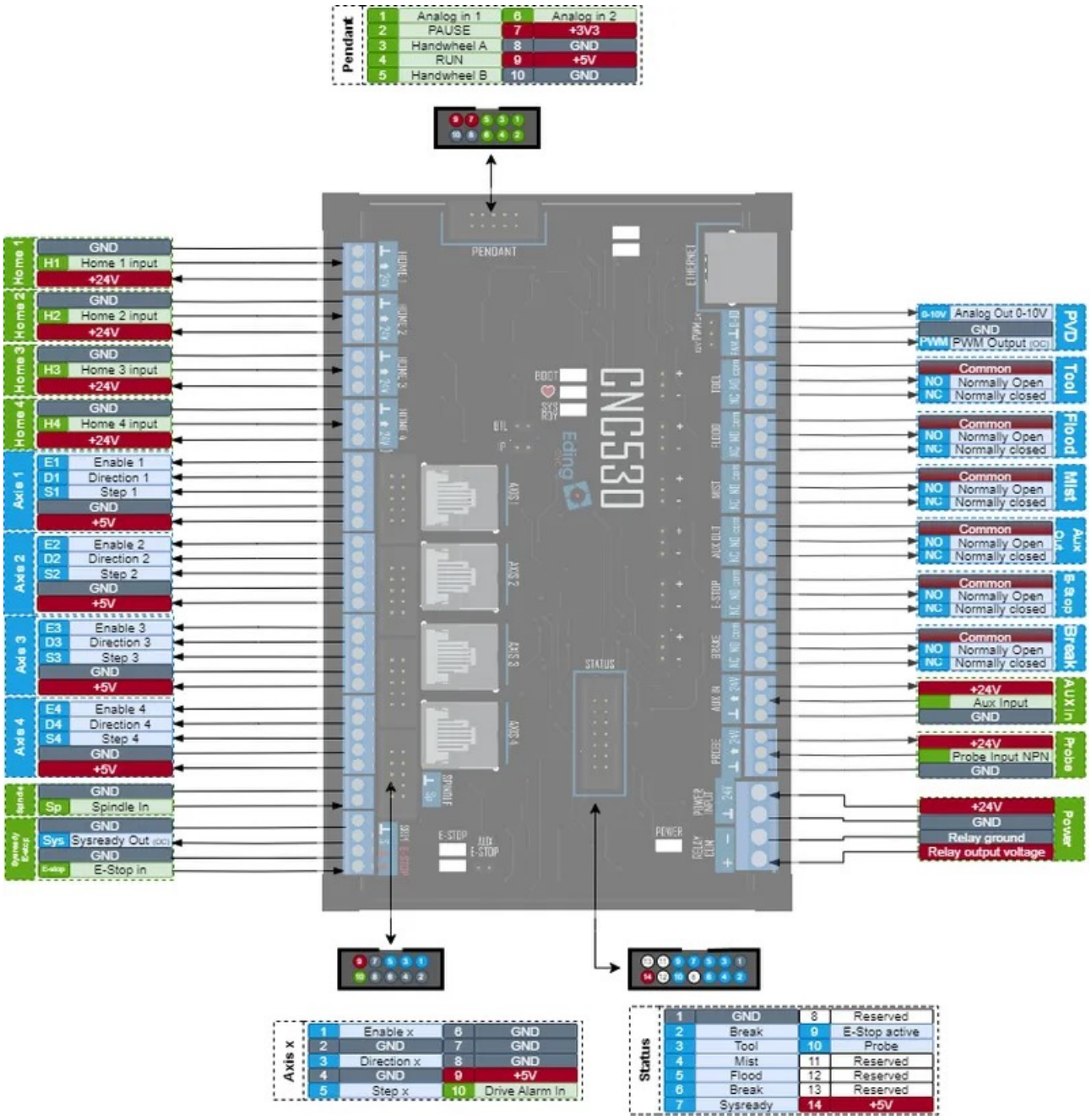
3. Familiarize yourself with all I/O of the board.
4. ...



- 4 Axis controller interface
    - Step / Direction: 5V (max. 125kHz)
    - Enable: 5V
-
- 4x HOME inputs: 24V (NPN)
- 1x Analog output: 0-10V
- 1x PWM output (selectable pull-up resistor)

- 6x On-board Relay otputs; Tool, Flood, Mist, Aux, E-stop, Break.
- 1x AUX Input (NPN)
- 1x Probe input (NPN)
- 1x Spindle encoder input
- Pendant interface (handwheel)
    - Start
    - Pause
    - Handwheel
    - 2 Analog Inputs
-
- Interface: 100Mbit Ethernet
- Power supply: 24V DC, Relay output power (0-30V DC)
- Dimensions: **xx** mm

The image shows an overview of all connections of the CNC530.



Connection overview

The CNC530 features several indicators that show the status of the board. Additionally to these indicators, an extra connector is available to show the status of outputs. For that connector, an extra board is included. See also **<TODO>**

Green LED indicating that 24V is connected to the board.

This LED indicates that the board is connected by ethernet. Please note this does not mean that communication is also possible. Things like incorrect network settings can prevent communication.

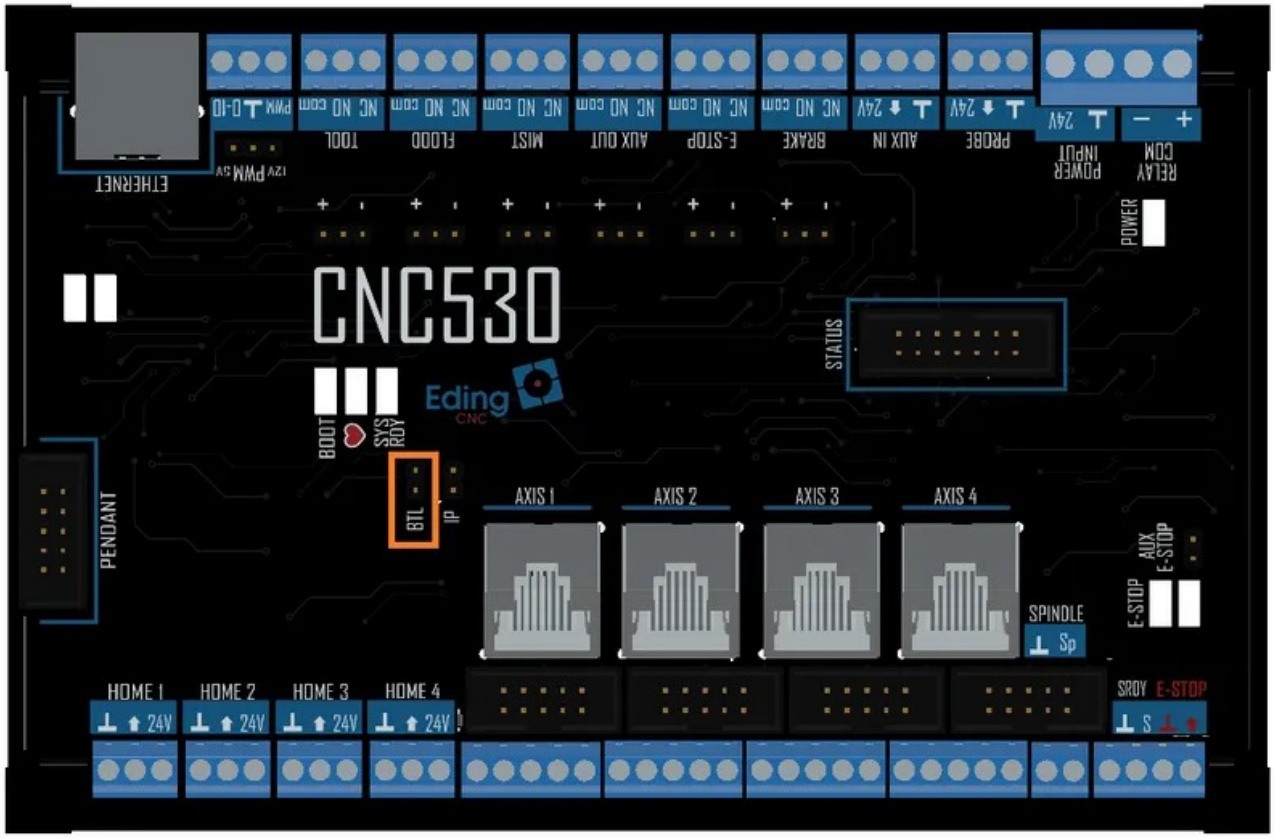
When data is transferred through the network interface, this indicator will blink.

This indicator is active when in bootloader mode

Show the board is active.

Indicate the CNC system is active.

This jumper forces the board into bootloader mode after power is applied. This mode will hold for 5 seconds; if the bootloader does not notice communication, it will automatically continue in normal operation mode.

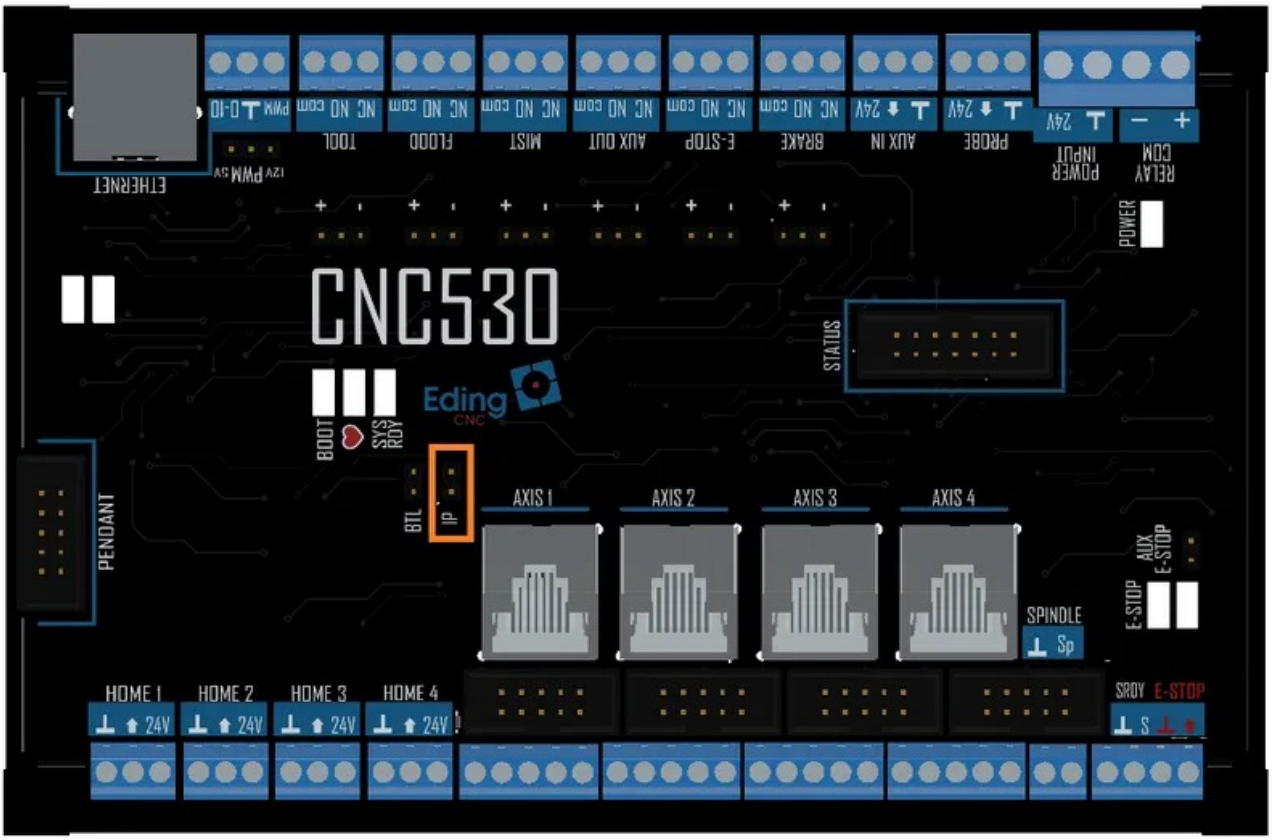


BTL Jumper

Without this jumper, the bootloader will always be skipped.

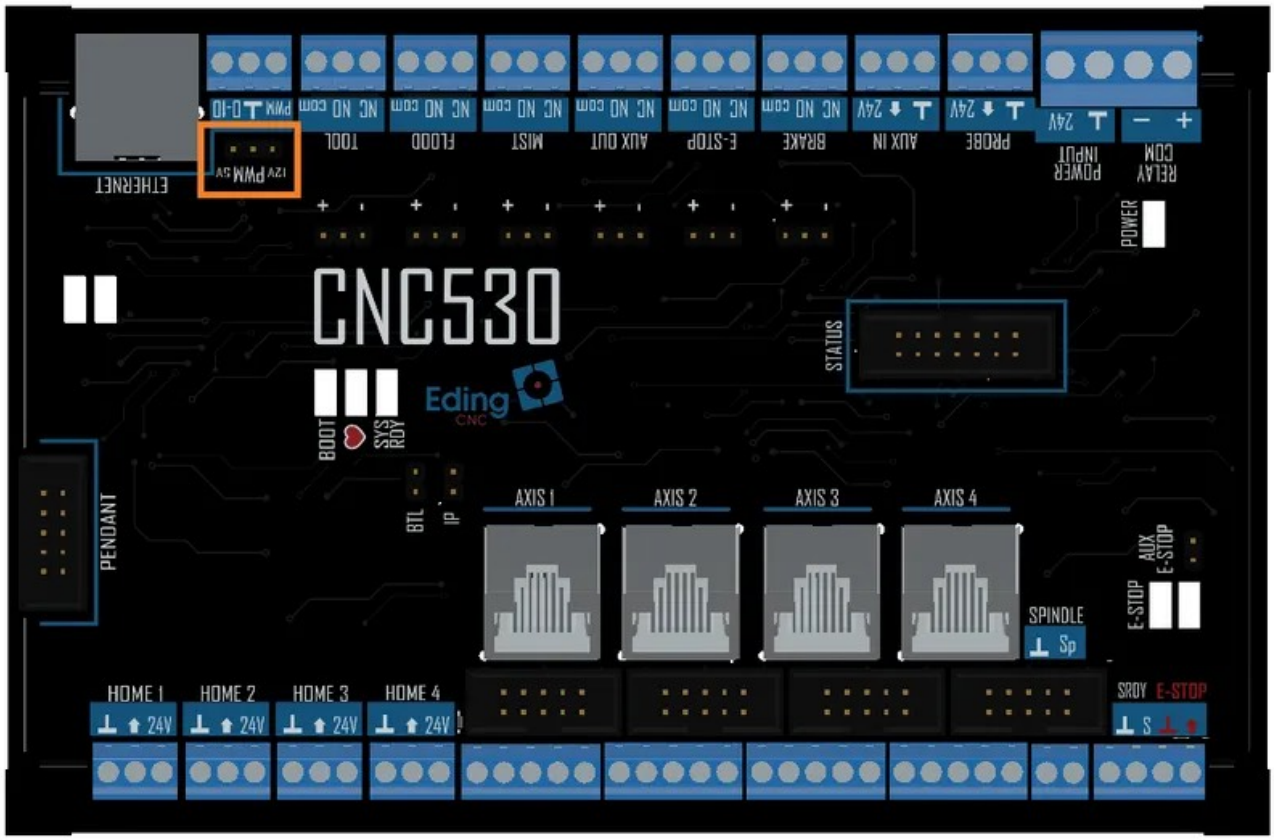
IP - Use Default IP Address

It is possible to change the default IP address. Placing this jumper forces the use of the default IP address 172.22.2.100. Without the jumper the use-set IP address is used.



PVO - Selectable PWM Pull-up

The PWM output is default an open-collector. This jumper offers to select a 5V or 12V PWM output.

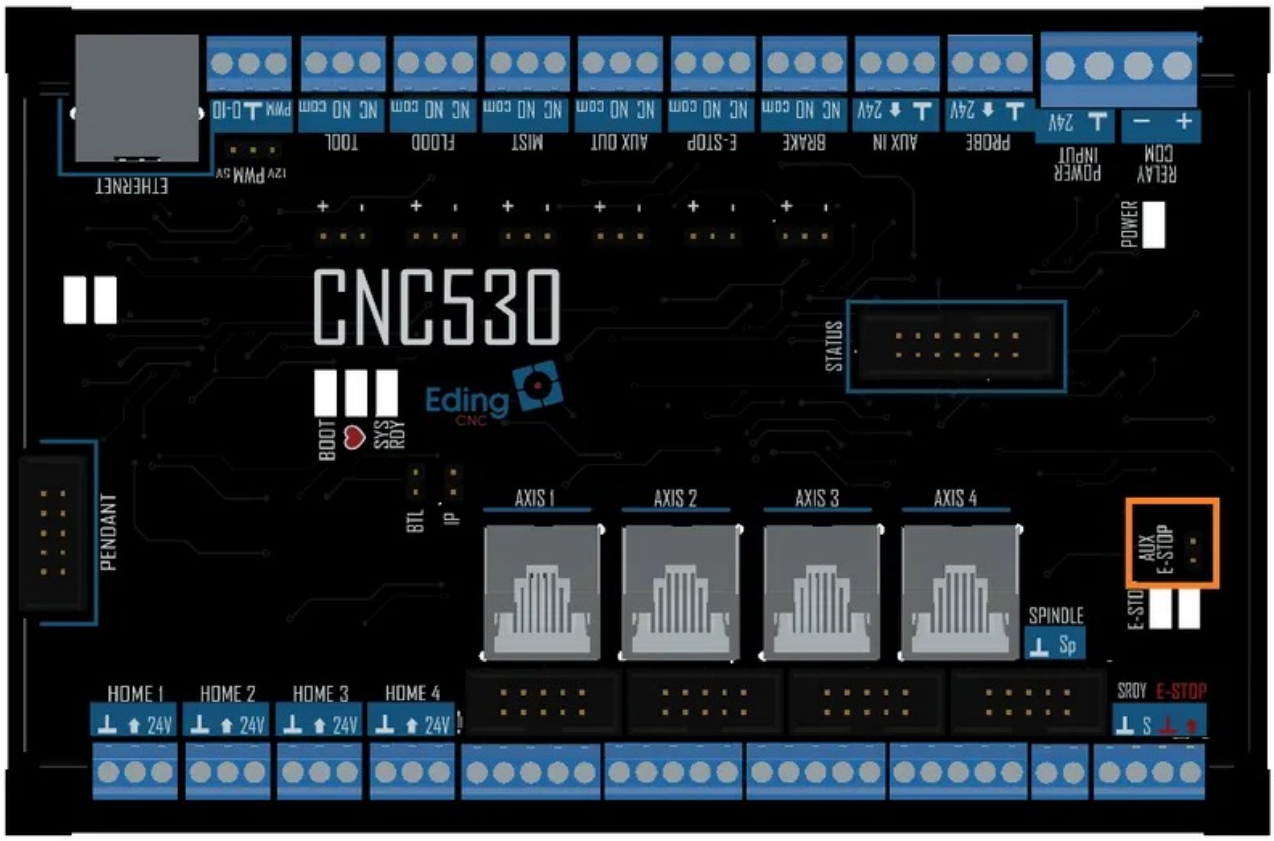


PVO Jumper

Placing the Jumper on 5v -> The PWM output is connected with an internal (10K) pull-up resistor to +5VDC. Placing the Jumper on 12V -> The PWM output is connected with an internal (10K) pull-up resistor to +12VDC. Not placing a jumper -> The PWM output can be used as desired.

AUX E-Stop - Connect E-stop with AUX out

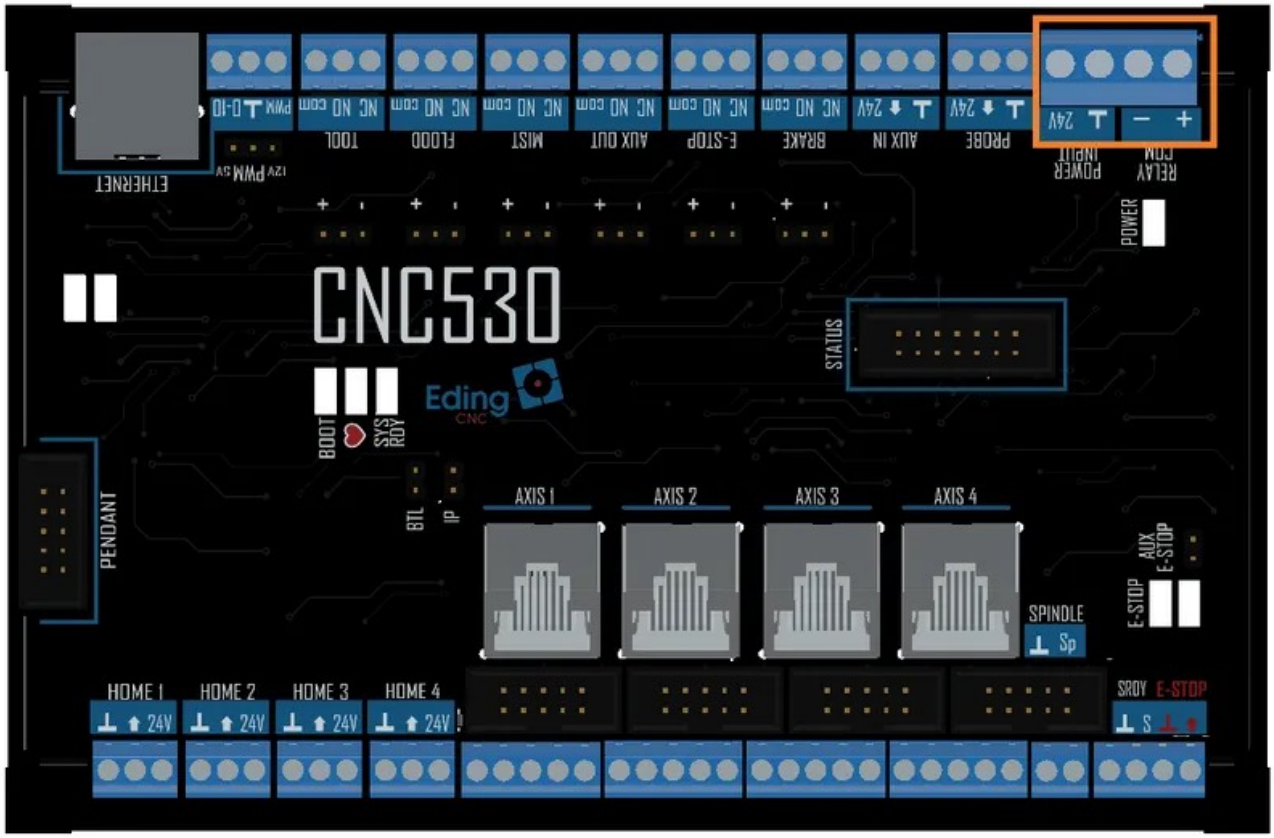
Normally, all outputs are disabled in case of an E-STOP condition. With this jumper it is possible to select whether the AUX output is also disabled on that condition.



AUX E-Stop jumper

Placing the Jumper -> 'AUX out' ignores the E-Stop status. Not Placing the Jumper -> 'AUX out' will switch off when an E-stop is triggered.

The board is powered by 24V. We recommend using at least a 1A power supply. Although the board does not use much power, the power it uses depends on things tha are connected to it.

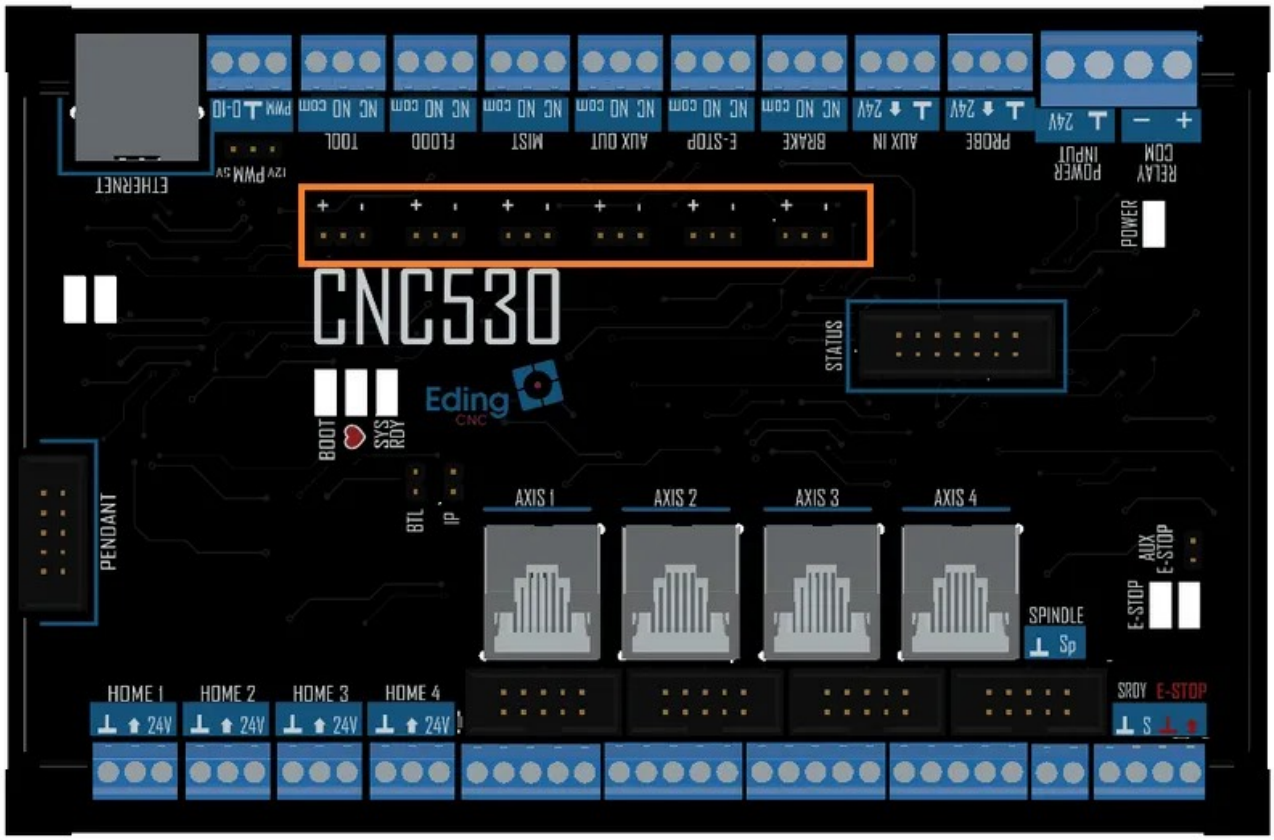


Power connector

Pin	Name	Type	Function	Electrical Spec.	Remarks
1	RELAY PWR	Power	Relay output	0- 30VDC, 1.5A max.	
2	RELAY GND	Ground	Relay output		
3	GND	Grou	Board		
4	+24V	Power	Board Power	Input Voltage +24VDC, 500mA	

The relay outputs are Normally Open, Normally Closed, and Common, which means you can wire the outputs as you see fit.

We have also added an extra option. An external power supply can be connected to 'Relay COM'.



Relay +/- jumpers

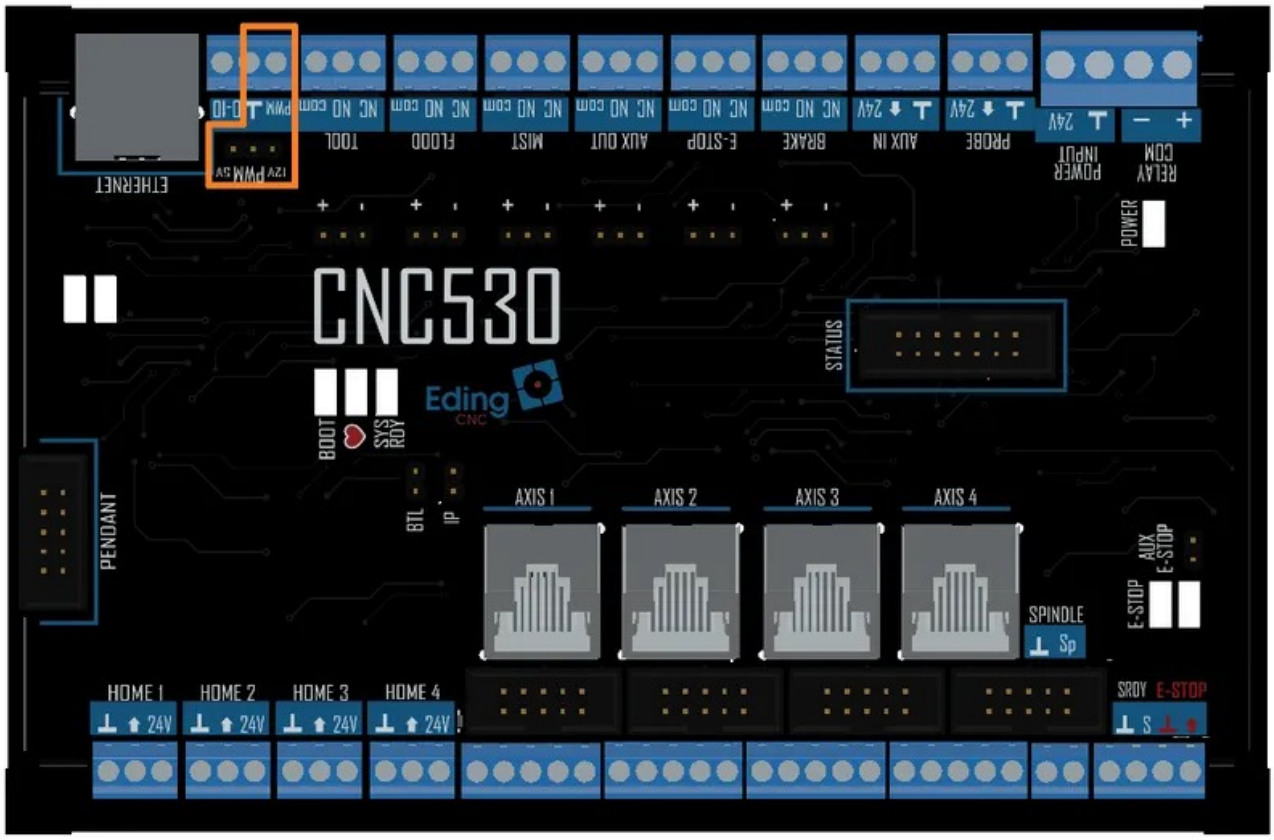
This setting can be made for the relevant relay outputs, and it makes it more convenient to make, for example, 5V or 24V outputs of the relay outputs.

Placing the Jumper on + -> Corresponding Relay 'COM' connected to 'Relay power'. Placing the Jumper on - -> Corresponding Relay 'COM' connected to 'Relay ground'. Not placing a jumper -> Corresponding 'COM' is floating and can be used as desired. An external power source can be used.

Please note the relay outputs are not intended to switch 'heavy'' equipment.

The CNC530 controller can simultaneously provide a PWM signal and an analog 0-10V signal. Both signals have the same source and can not be controlled individually.

This output is marked PVO, which stands for **P**WM—**V**OLTAGE—**O**UT.

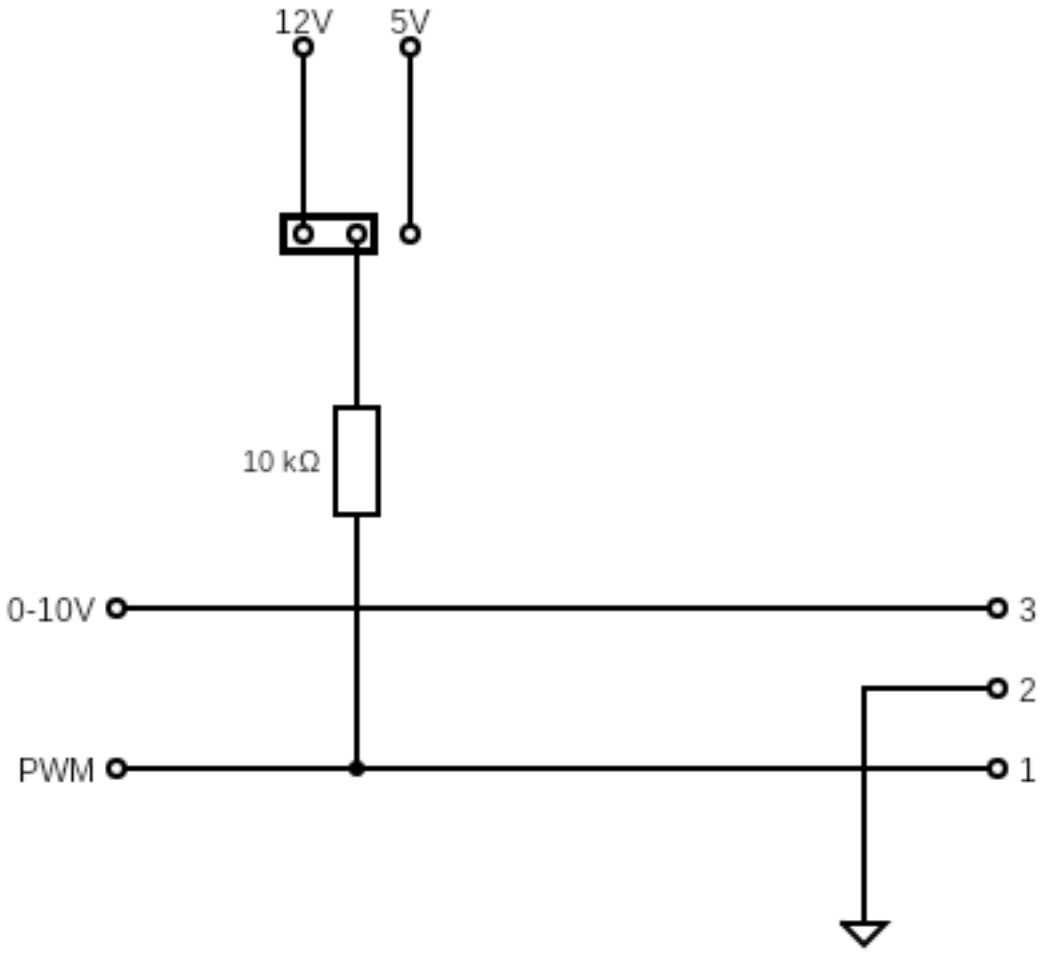


Pin	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	PWM	OUT	Open Collector		Max. 50V/ 500mA	Selectable onboard pull-up resistor (10K) to
2	GN	OUT	Groun			

3	0-1	OUT	Analo			

The PWM output is the default so-called ***open-collector output***. This means an external resistor is needed for the signal to be high. If you need a 5V or 12V PWM output signal, you can use a jumper to select either of the built-in resistors. The image below illustrates this.

The jumper only works in combination with the PWM output signal.



Defining a 12V or 5V PWM output signal

The CNC530 features 3 ways to connect a motor (driver) to the controller:

- Screw terminal
- IDC/Boxheader
- RJ45

Our controller features three important signals.

Step: This output will generate a pulse for the stepper motor input

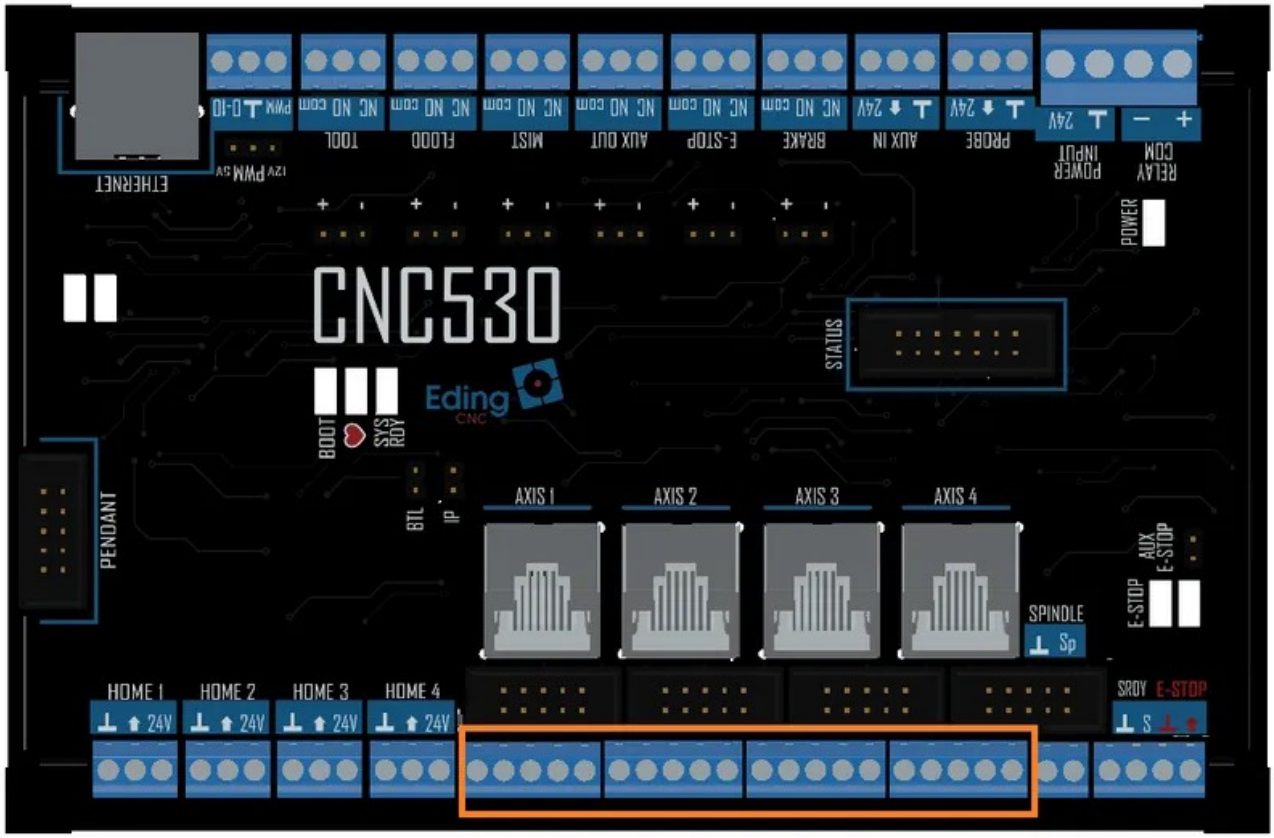
Direction: This signal indicates whether a motor driver needs to rotate the motor Clock-Wise (CW) or counter-clockwise (CCW)

Enable: This signal indicates when the motor driver needs to power the motor. Typically, if the driver does not have an enable signal with the correct level, you can move or rotate a motor by hand, but this is not possible when the motor is enabled.

The CNC530 features 3 ways of connecting the controller to a motor driver:

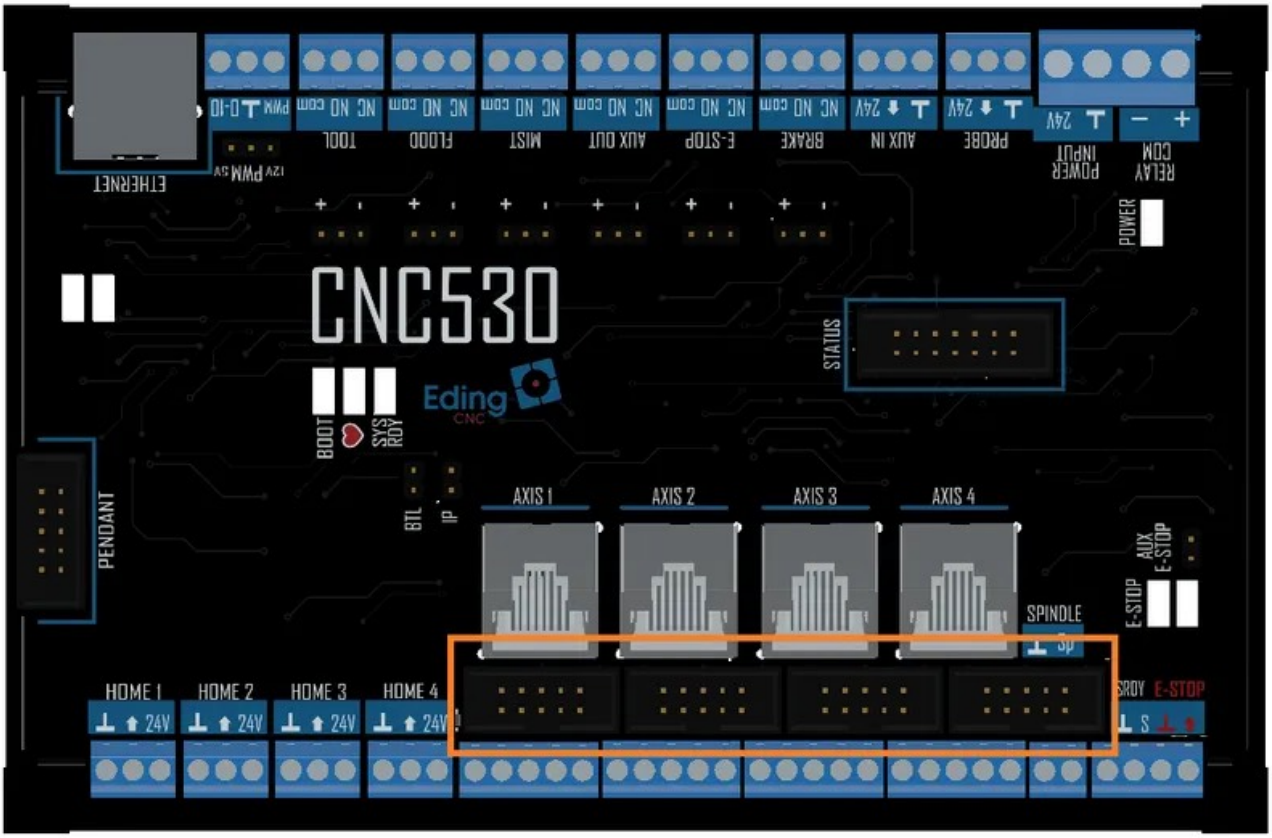
- Screw terminal
- IDC/Boxheader
- RJ45

This way, you can use the connection that you prefer.

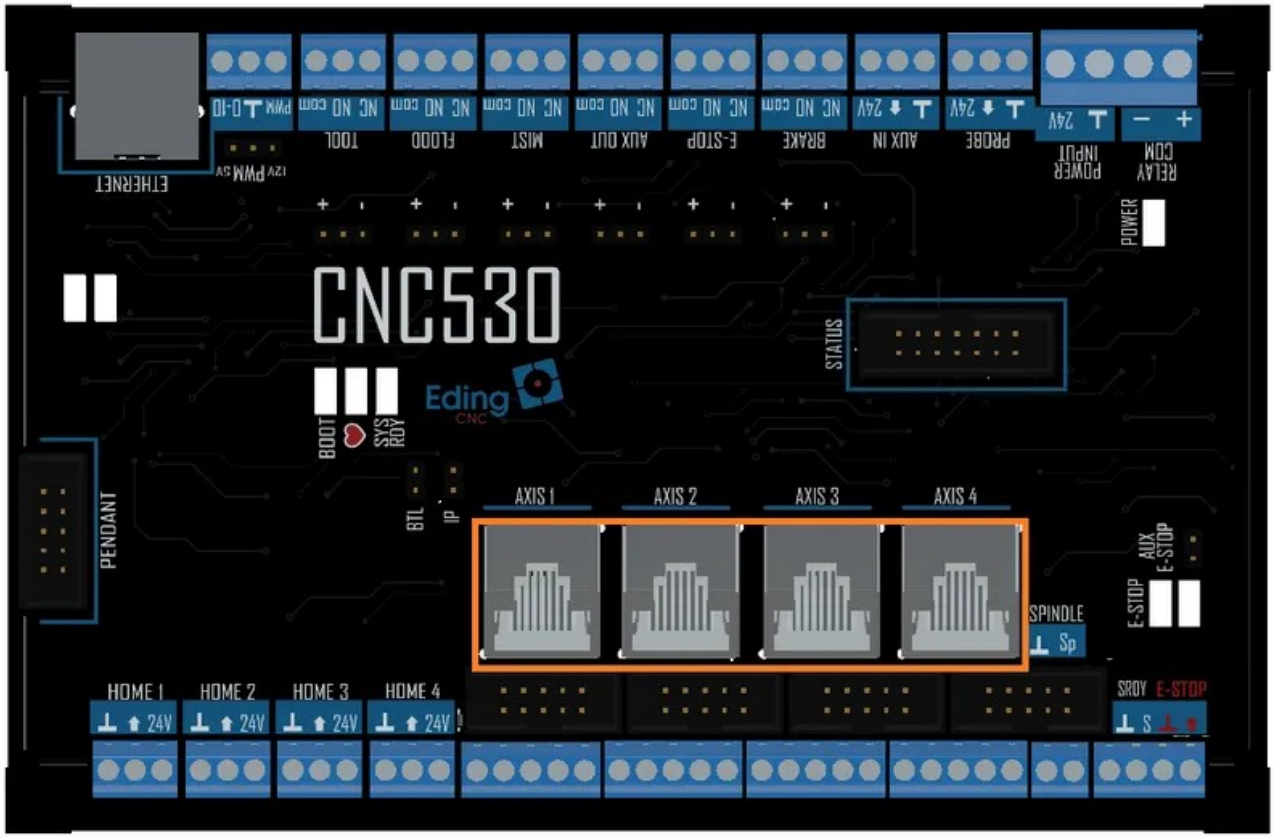


Axes terminals

Pin	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	ENA	Out	Digital	Enable	5VDC	
2	DIR**x**	Out	Digital	Directio	5VDC	
3	Step	Out	Digital	Step	5VDC	
4	GND		Groun			
5	5V		Power		5VDC	



Pin	Name	Direction	Type	Function	Electrical	Remarks
1	EN	Out	Digit	Enabl	5VDC	
2	GN		Grou			
3	DIR	Out	Digit	Direct	5VDC	
4	GN		Grou			
5	ST	Out	Digit	Step	5VDC	
6	GN		Grou			
7	GN		Grou			
8	GN		Grou			
9	5V		Pow		5VDC	
10	ALM+	In	Digital	Driver Alarm	5VDC	All axis drive alarms are



Axes (RJ45)

Pin	Name	Direction	Type	Function	Electrical	Remarks
1	EN	Out	Digital	Enable	5VDC	
2	GND		Ground			
3	STP	Out	Digital	Direction	5VDC	
4	5V		Power		5VDC	
5	DIR	Out	Digital	Step	5VDC	
6	5V		Power		5VDC	
7	ALM+		Digital	Driver Alarm	5VDC	All axis drive alarms are
8	ALM-		Ground			

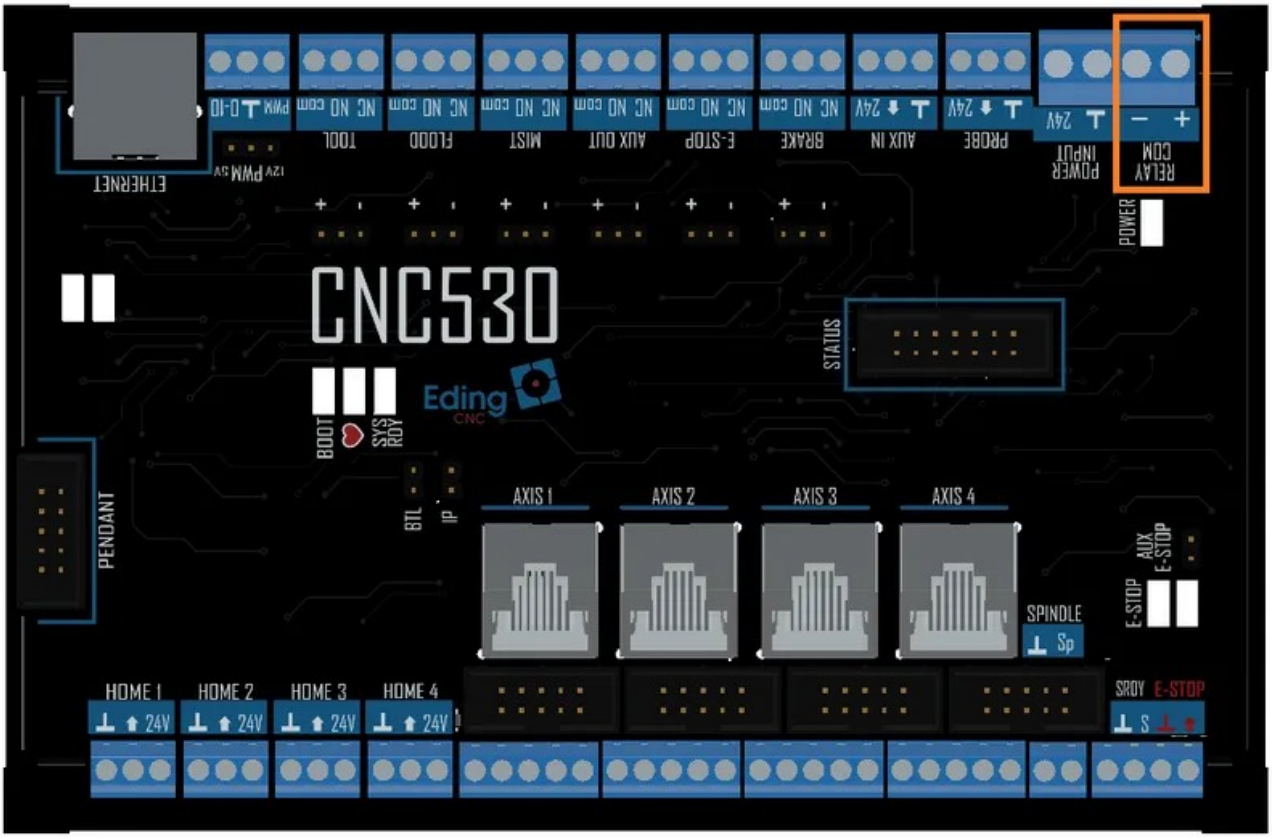
The following outputs are potential free, due to the use of a relay output:

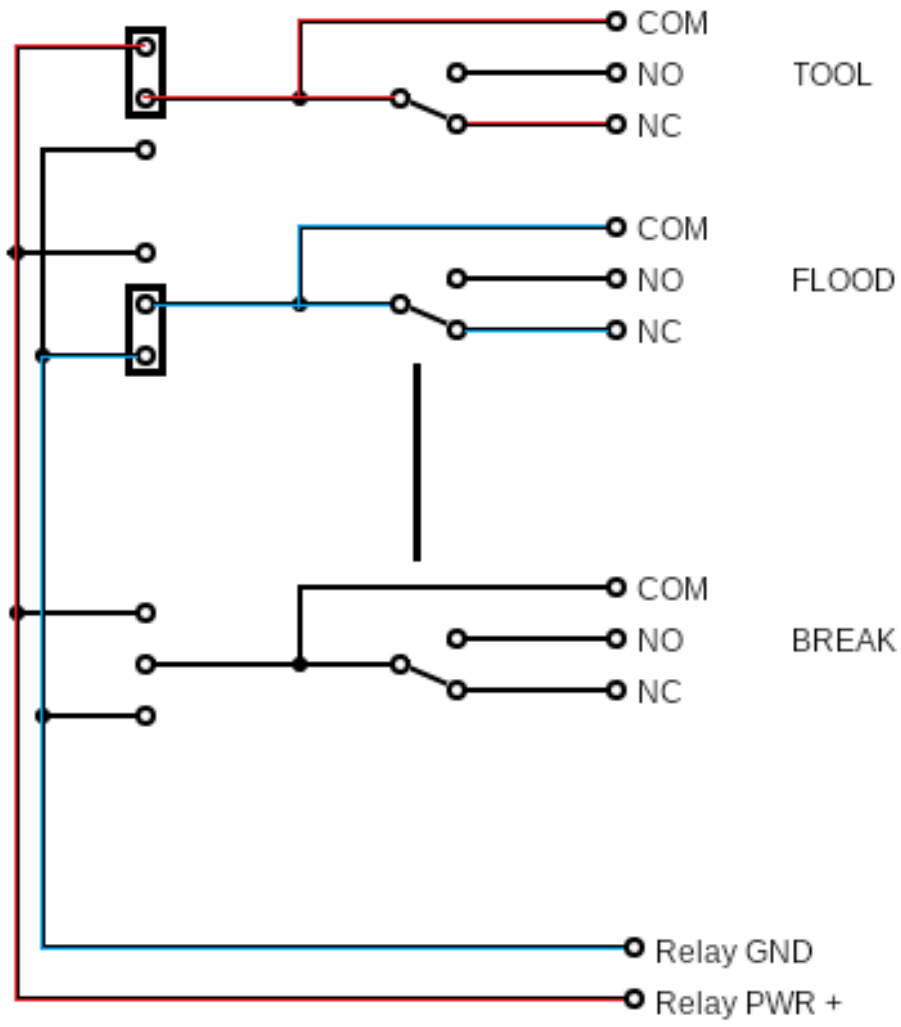
- Tool
- Flood
- Mist
- Aux Out
- E-Stop
- Break

Each output consists of three pins:

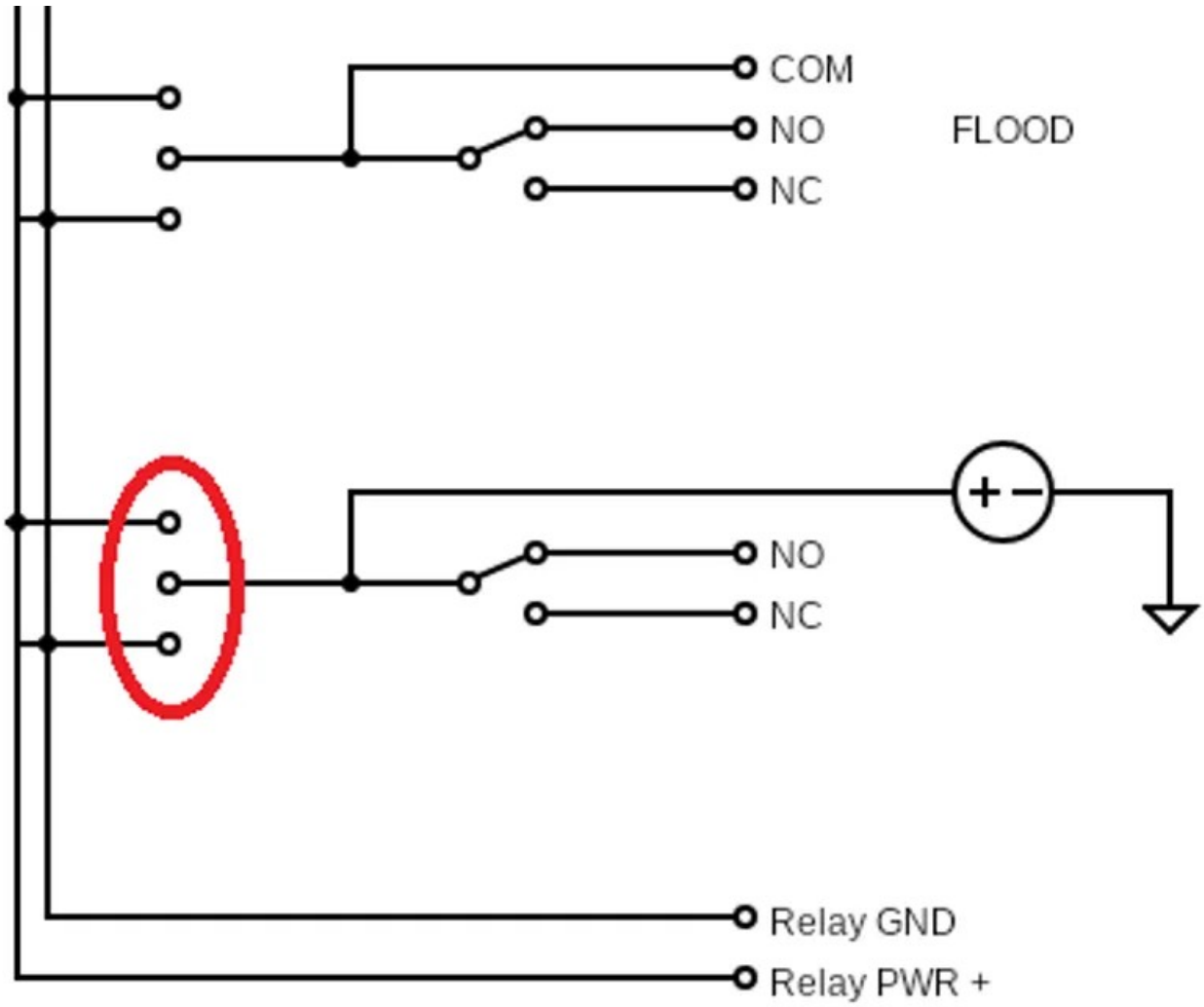
- **COM** - Common
- **NO** - Normally Open
- **NC** - Normally Closed

The relays can be connected to a secondary power supply.

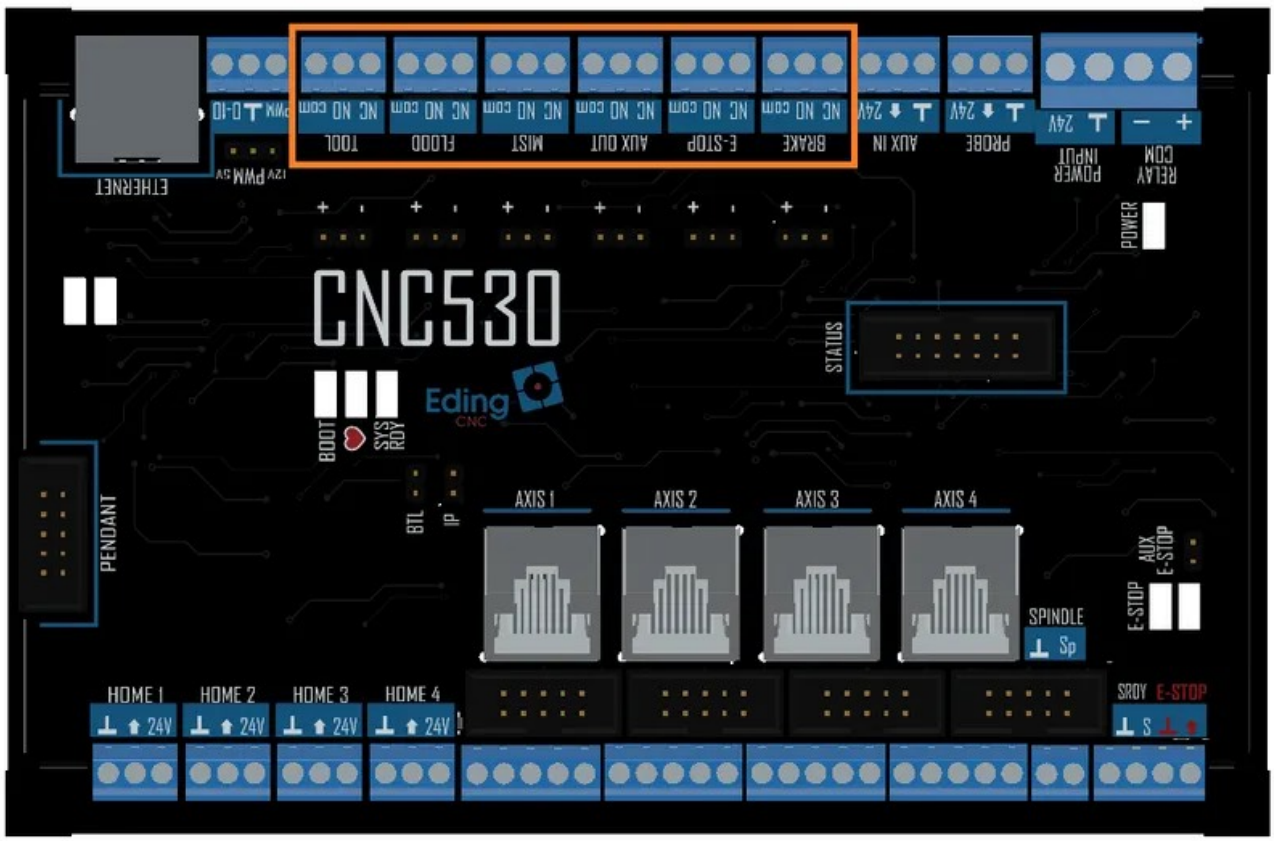

CNC530
Eding
CNC
ETHERNET
PWM 5V
12V
PWM 0-10
TOOL
FLOOD
MIST
AUX OUT
E-STOP
BRAKE
AUX IN
PROBE
POWER INPUT
RELAY COM
NC NO com
24V
POWER
STATUS
BOOT
SYS RDY
BTL
IP
PENDANT
AXIS 1
AXIS 2
AXIS 3
AXIS 4
SPINDLE
Sp
AUX E-STOP
E-STOP
HOME 1
HOME 2
HOME 3
HOME 4
24V
SRDY
E-STOP
S



As seen in the picture above, the relay output voltage can be controlled by using jumpers. You can use the relay if you don't use a jumper as needed.



When using the 'COM' terminal of an individual relay, **do not use a jumper!**



The G-code M3 controls the tool output. It switches a tool on. This output is often connected to the input for switching the spindle on through the VFD. The actual speed of the spindle is most of the time controlled by a 0-10V signal.

Pin	Name	Type	Function	Electrical Spec.	Remarks
1	NC	Normally closed	Tool	Max. 1A, 30VDC	Relay
2	NO	Normally open	Tool	Max. 1A, 30VDC	Relay
3	COM	Common	Tool	Max. 1A, 30VDC	Relay

The G-code M controls the flood output. it switches this output on.

Pin	Name	Type	Function	Electrical Spec.	Remarks
1	NC	Normally closed	Flood	Max. 1A, 30VDC	Relay
2	NO	Normally open	Flood	Max. 1A, 30VDC	Relay
3	COM	Common	Flood	Max. 1A, 30VDC	Relay

The G-code M controls the flood output. it switches this output on.

Pin	Name	Type	Function	Electrical Spec.	Remarks
1	NC	Normally closed	Flood	Max. 1A, 30VDC	Relay
2	NO	Normally open	Flood	Max. 1A, 30VDC	Relay
3	COM	Common	Flood	Max. 1A, 30VDC	Relay

The AUX output can be used for any purpose. It's controlled throug G-code **M5?**.

Pin	Name	Type	Function	Electrical Spec.	Remarks
1	NC	Normally closed	Aux out	Max. 1A, 30VDC	Relay
2	NO	Normally open	Aux out	Max. 1A, 30VDC	Relay
3	COM	Common	Aux out	Max. 1A, 30VDC	Relay

The E-stop output is an extra output that will automatically be activated when the E-stop input is activated. It can trigger other devices, e.g., to control a power relay for switching power to the motor drivers. It can not be manually controlled.

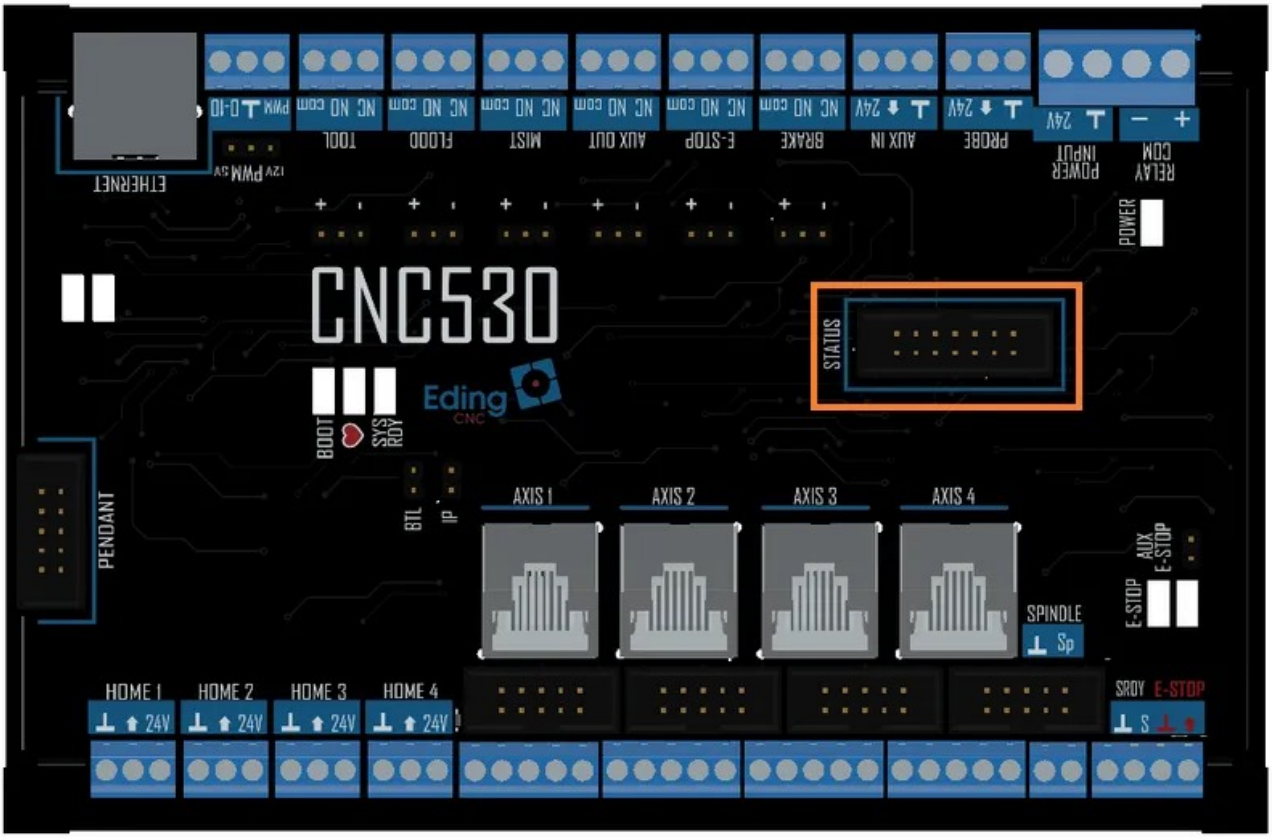
Pin	Name	Type	Function	Electrical Spec.	Remarks
1	NC	Normally closed	E-Stop	Max. 1A, 30VDC	Relay
2	NO	Normally open	E-Stop	Max. 1A, 30VDC	Relay
3	COM	Common	E-Stop	Max. 1A, 30VDC	Relay

The brake output is an output that is automatically activated when the motor drivers are disabled.

Please note that the motor drivers need to be controlled by the CNC530; using a break when the motor drivers are always enabled can damage the machine.

Pin	Name	Type	Function	Electrical Spec.	Remarks
1	NC	Normally closed	Brake	Max. 1A, 30VDC	Relay
2	NO	Normally open	Brake	Max. 1A, 30VDC	Relay
3	COM	Common	Brake	Max. 1A, 30VDC	Relay

The status output offers the possibility of connecting the external status PCB.

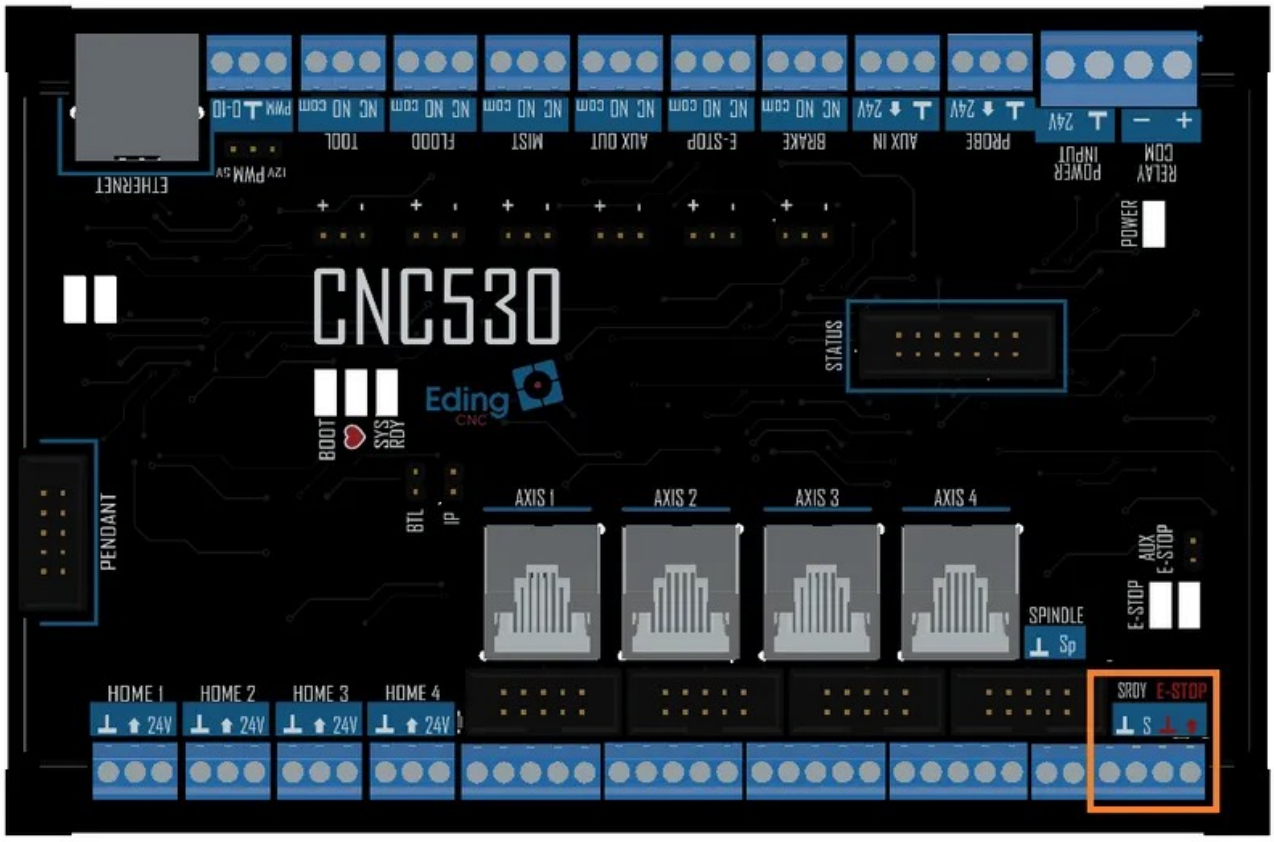


Status indicator connector pin numbers

Pi	Name	Directi	Type	Functi	Electrical	Remark
1	GND		Grou			
2	Break	Out	Digit			Low
3	Tool	Out	Digit			Low
4	Mist	Out	Digit			Low
5	Flood	Out	Digit			Low
6	Break	Out	Digit			Low
7	SysReady	Out	Digit		5VDC	
8	Reserved					
9	E-Stop	Out	Digit		5VDC	

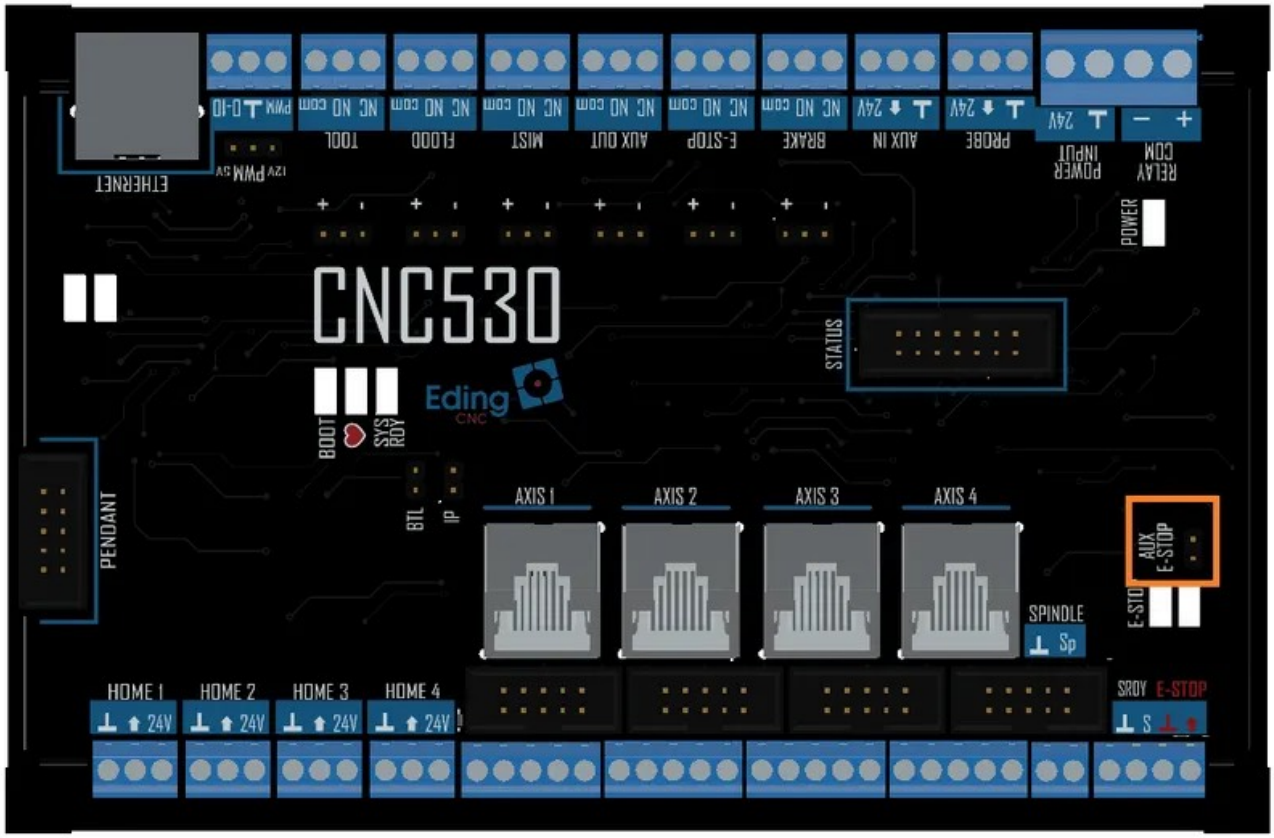
10	Probe	Out	Digit		3V3	
11	Reserved					
12	Reserved					
13	Reserved					
14	5V		Pow			

SysReady Output & E-stop input



Pin	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	GND		Ground			
2	SYS	OUT	Open Collector	System Ready	Max. 24VDC	
3	GND		Ground			

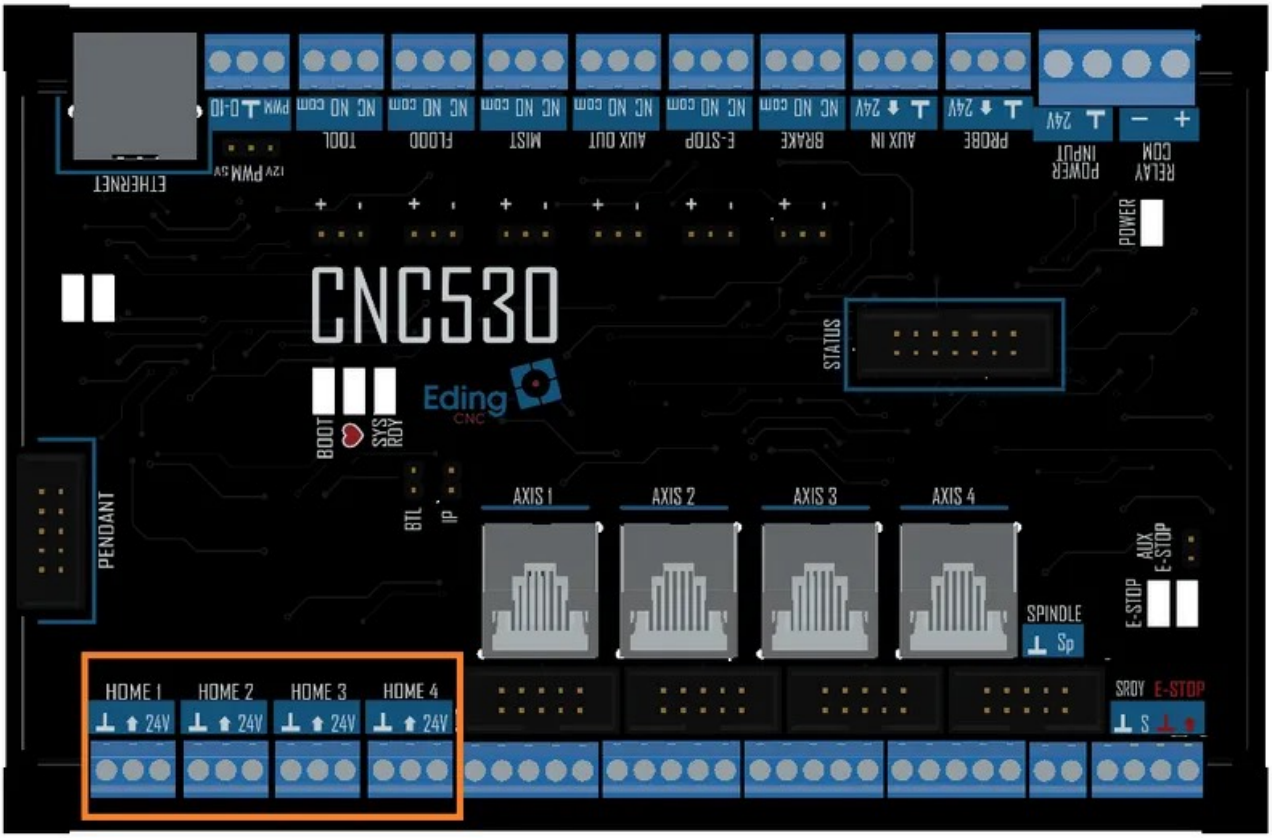
4	E-sto	IN		Emergency stop	5VDC	



The E-STOP input indicates an emergency. To use E-STOP, the input signal needs to switch to ground; in the image below, this is shown.

Please note that an emergency stop needs to be a 'normally closed' type switch. Multiple switches can be used in series. Using a 'normally closed' will also cause an E-stop if a wire breaks.


IP 65

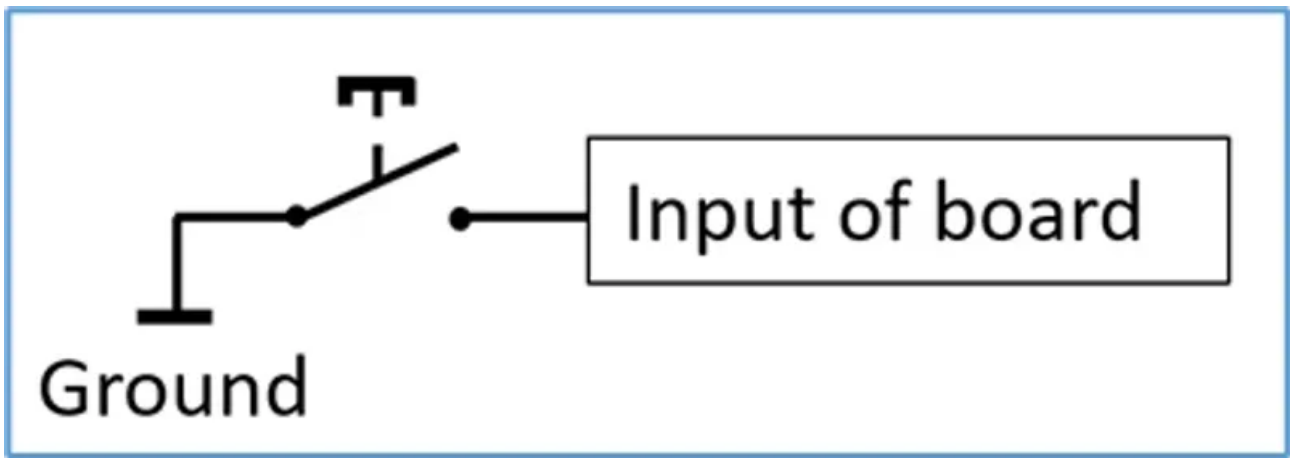


The HOME inputs are required for the machine to detect the ‘home’ position.

There are multiple different types of homing switches. They can be PNP or NPN and either Normally Open (NO) or Normally Closed (NC). The CNC530 supports only NPN, both NO and NC.

NPN means that the signal gets switched to the ground if the switch is activated. When using a regular switch, connect one terminal to the ground and the other to the corresponding home input.

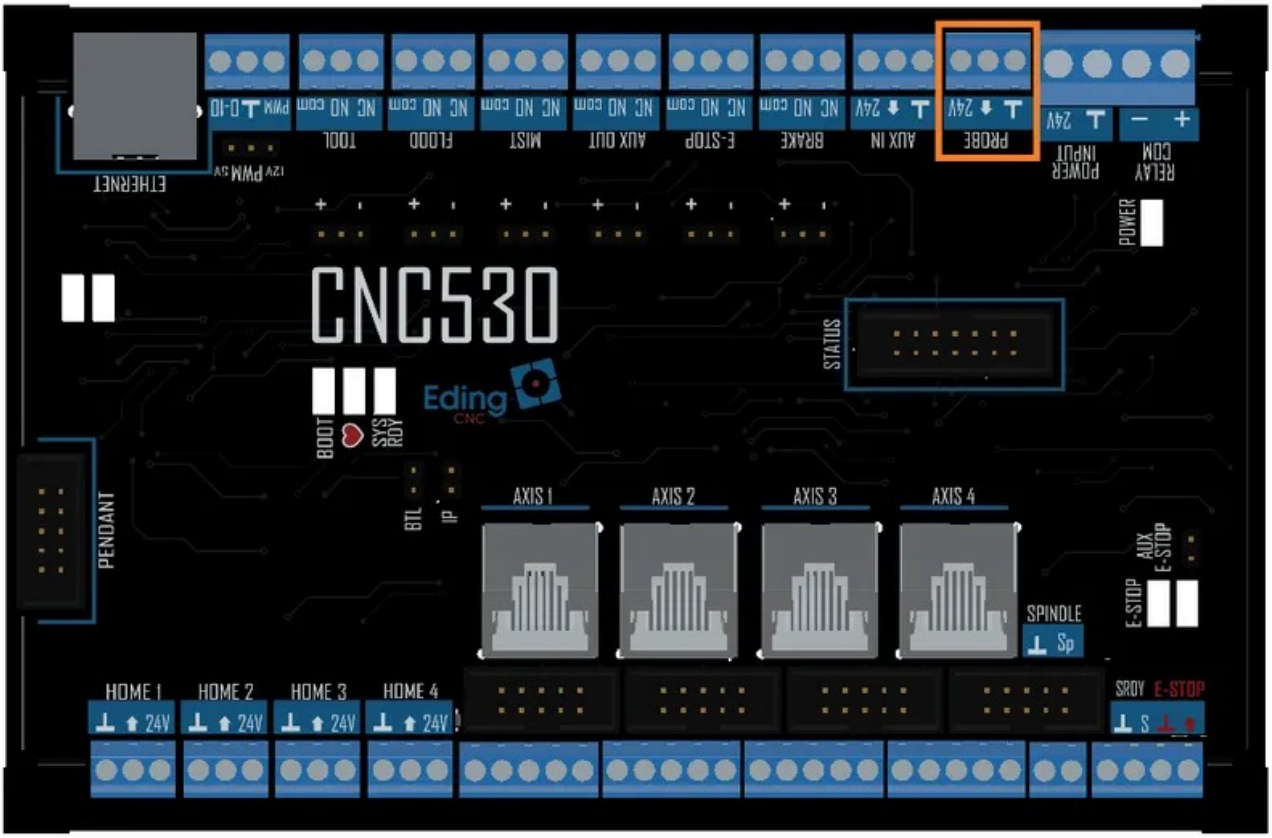
NPN means that the signal gets switched to the ground if the switch is activated. When using a regular switch, connect one terminal to the ground and the other to the corresponding home input.



Switching HOME input in NPN mode.

Do **NOT** connect a PNP-type switch to the CNC530's HOME Hx input. Doing so will damage the CNC530.

Pin	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	GND		Ground			
2	H**x**	IN	Digital	Probe	Input Voltage	NPN
3	+24V		Power			



Probe input

The probe input has a dual use. It can be used for tool measurement, measuring the length of a tool, or it can be used for probing an object. If both tools are used, they can be connected together to this input. However, make sure that they both use the same kind of output signal.

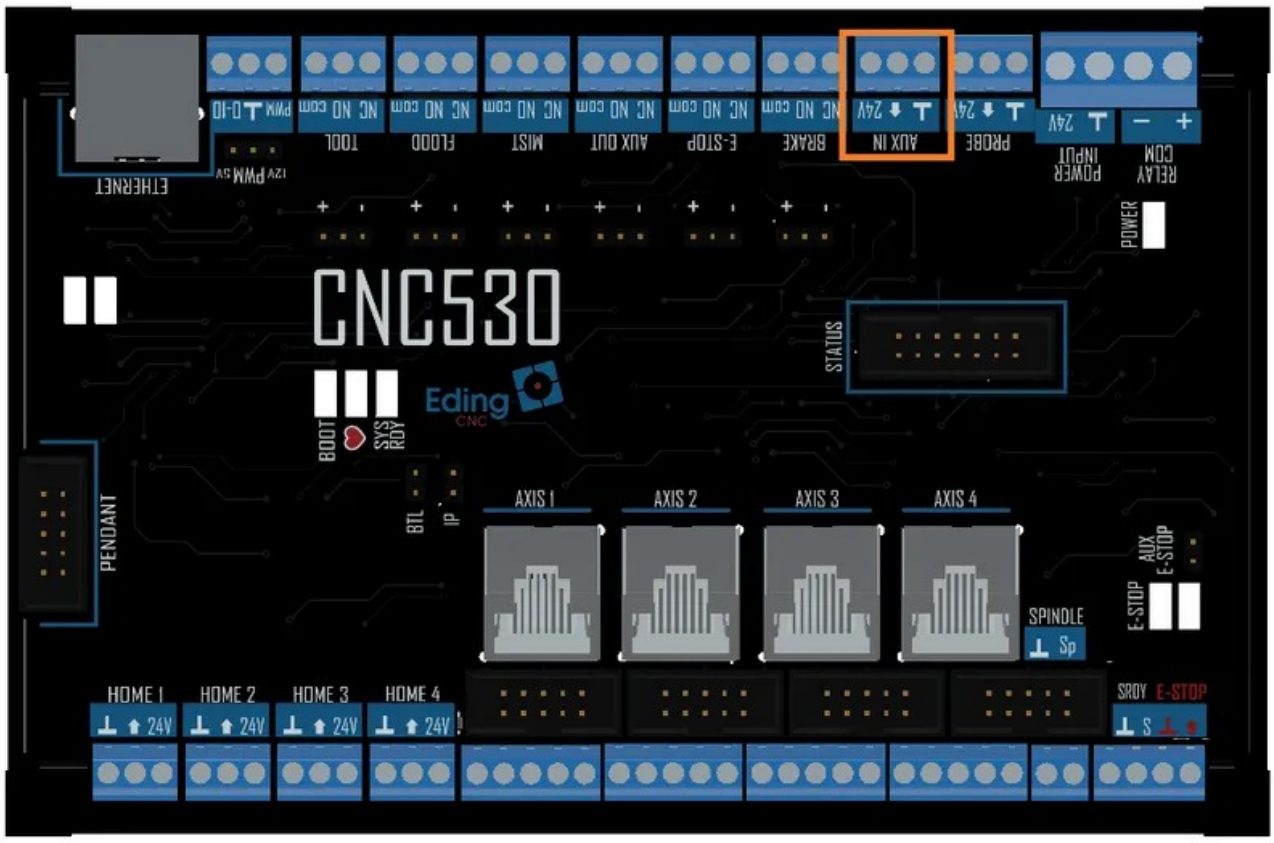
In case multiple sensor types can be of use, please consider our sensorHUB

Pin	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	GND		Ground			
2	PRB	IN	Digital	Probe	Input Voltage	NPN
3	+24V		Power			

Using toolsetter, probe etc.

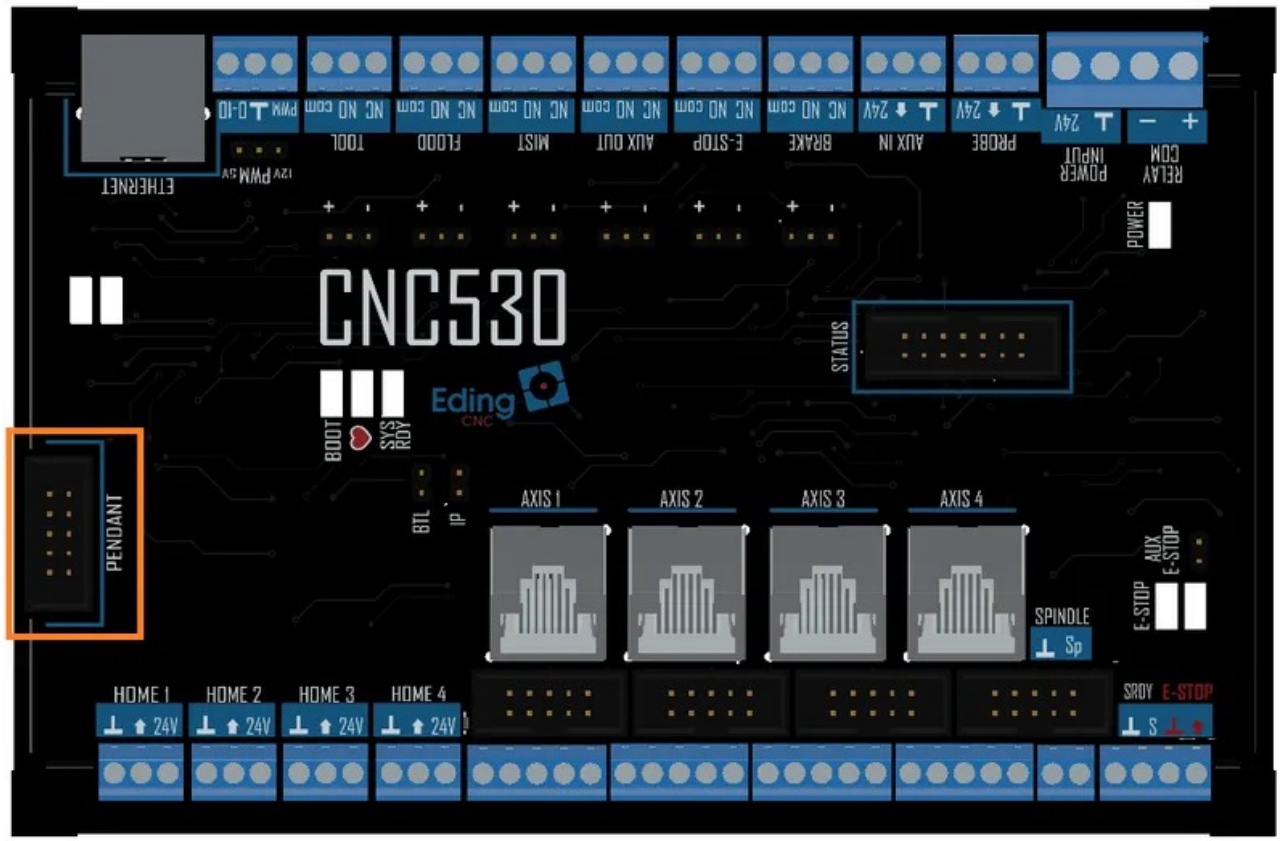
The AUX input is a dedicated input that can be used for numerous applications:

- Reading status for in macro
- Extra error input
- ....



Pin	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	GND		Grou			

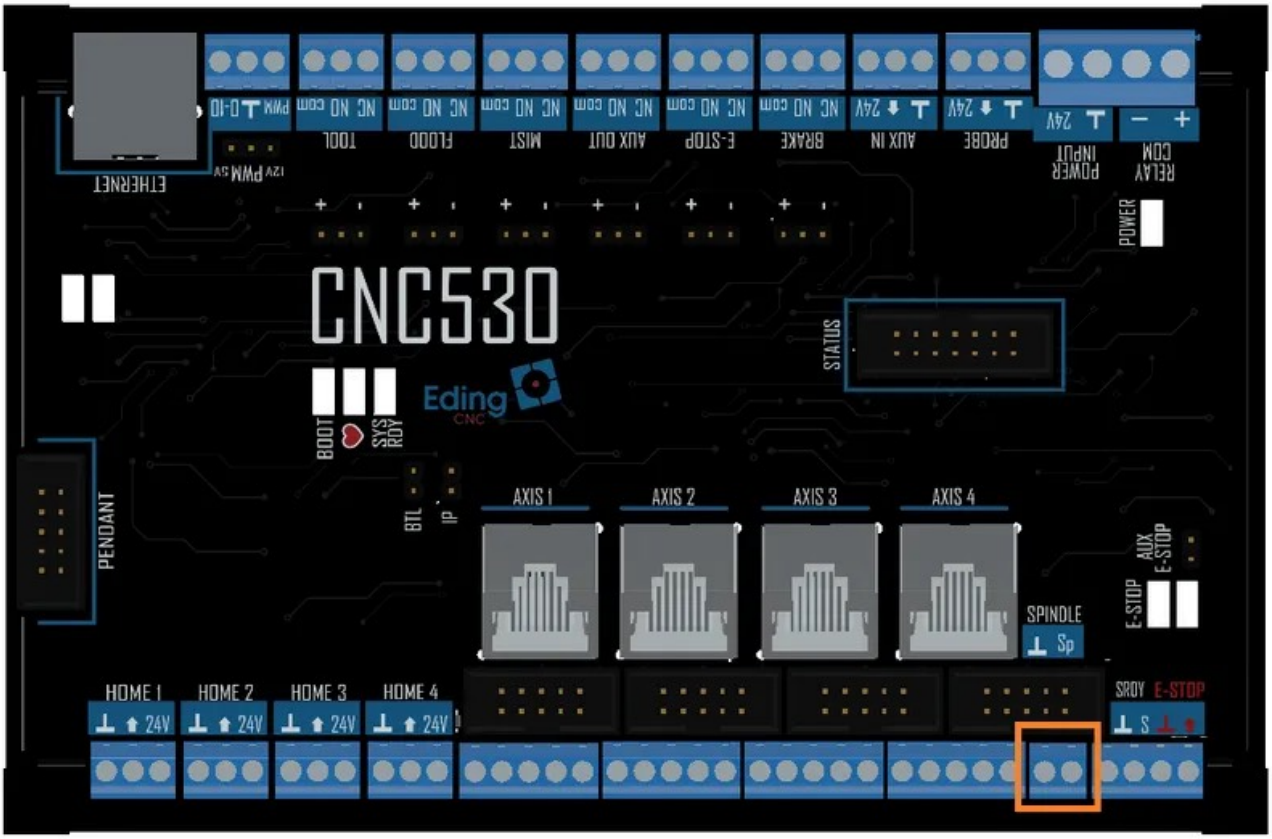
2	AUX IN	IN	Digital	Generic Input	Input Voltage +24VDC	NPN
3	+24V		Pow			



Pendant connector pin numbers

Pin	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	AN1	IN	Analo	Analog in	0 - 3V3	
2	PAUSE	IN	Ground	Pause job	5VDC	
3	HWA	IN	Digita	Handwhe	5VDC	
4	RUN	IN	Digita	Run job	5VDC	
5	HWB	IN	Digita	Handwhe	5VDC	

6	AN2	IN	Analo	Analog in	0 - 3V3	
7	+3V3		Powe		3V3	
8	GND		Grou			
9	5V		Powe		5VDC	
10	GND		Grou			



Pin	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	GND		Groun			
2	Sp	IN	Digital	Spindle	max. 5VDC	

Stepper driver connection examples

The step and direction signals must be connected to control an actual stepper or servo motor. Many stepper

motor drivers will have similar connection names, as is shown below:

Singnal names on motor driver

The most common names are:

Pul = **Pulse**, we also like to call this a the 'step' signal since a pulse on this input will cause the connected motor to move one position

Dir = **Direction**, this indicates whether the motor has to turn Clockwise (CW) or Counter Clockwise (CCW)

ENA = **Enable**, this input powers the motor. If the motors are not enabled, you can often simply rotate the axes by hand. When the motor is enabled this will no longer be possible. Please note, some drivers will automically enable the motor when this input is not activly controlled. This save

Example motor driver connection.

Below is an image that shows how a controller can be connected in two ways:

- Common-Anode (left image)
- Common-cathode (right image)

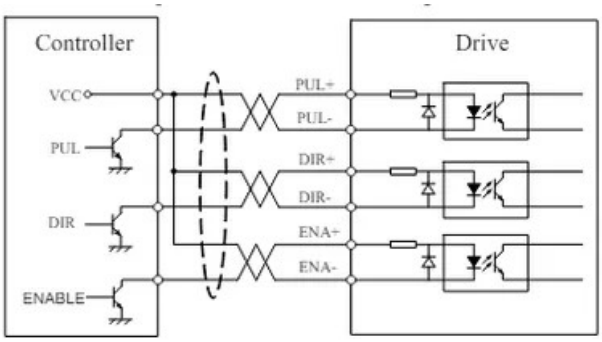


Figure 2: Connections to open-collector signal (common-anode)

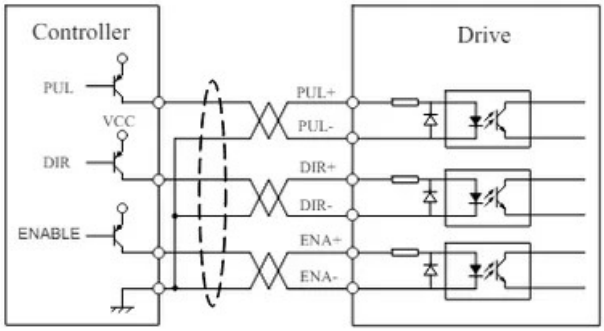


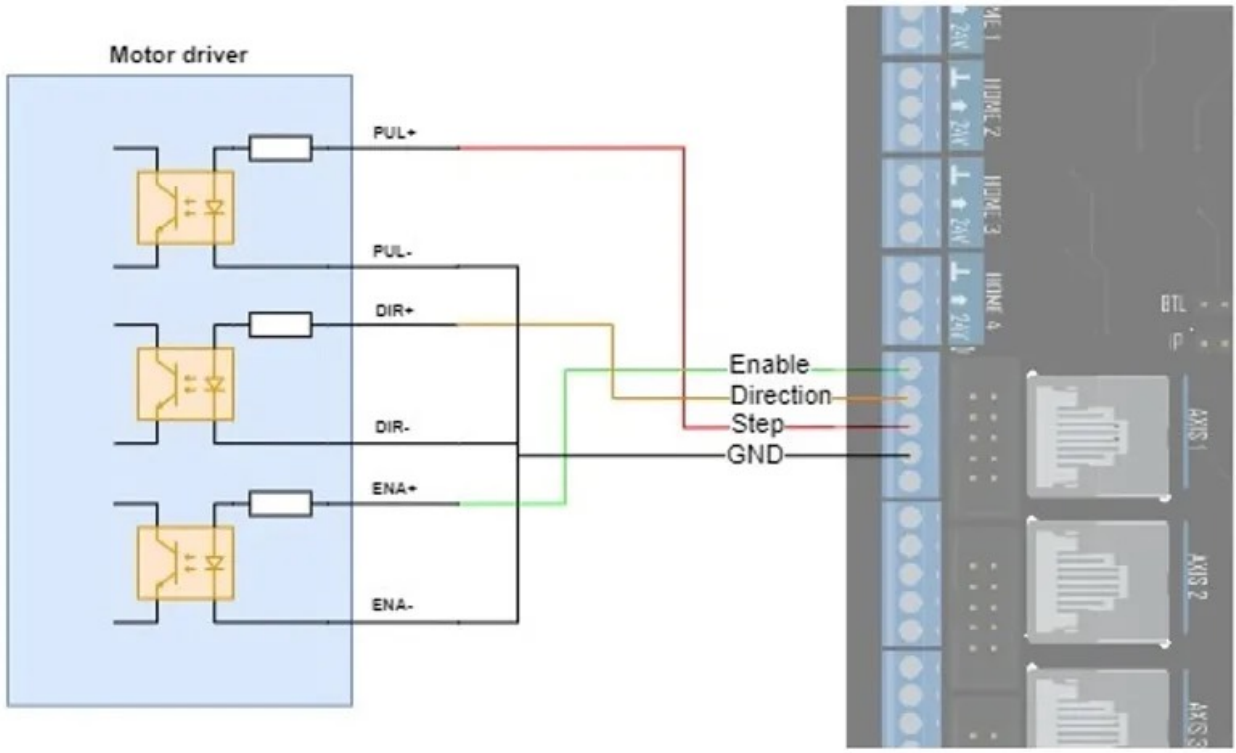
Figure 3: Connections to PNP signal (common-cathode)

Ways to connect controller to driver

Check the datasheet that the maximum signal of the driver does not exceed 5V since more that this will damage the CNC530.

In this case, the minus (-) wires control the motor driver by the CNC530. The signals are connected as follows:

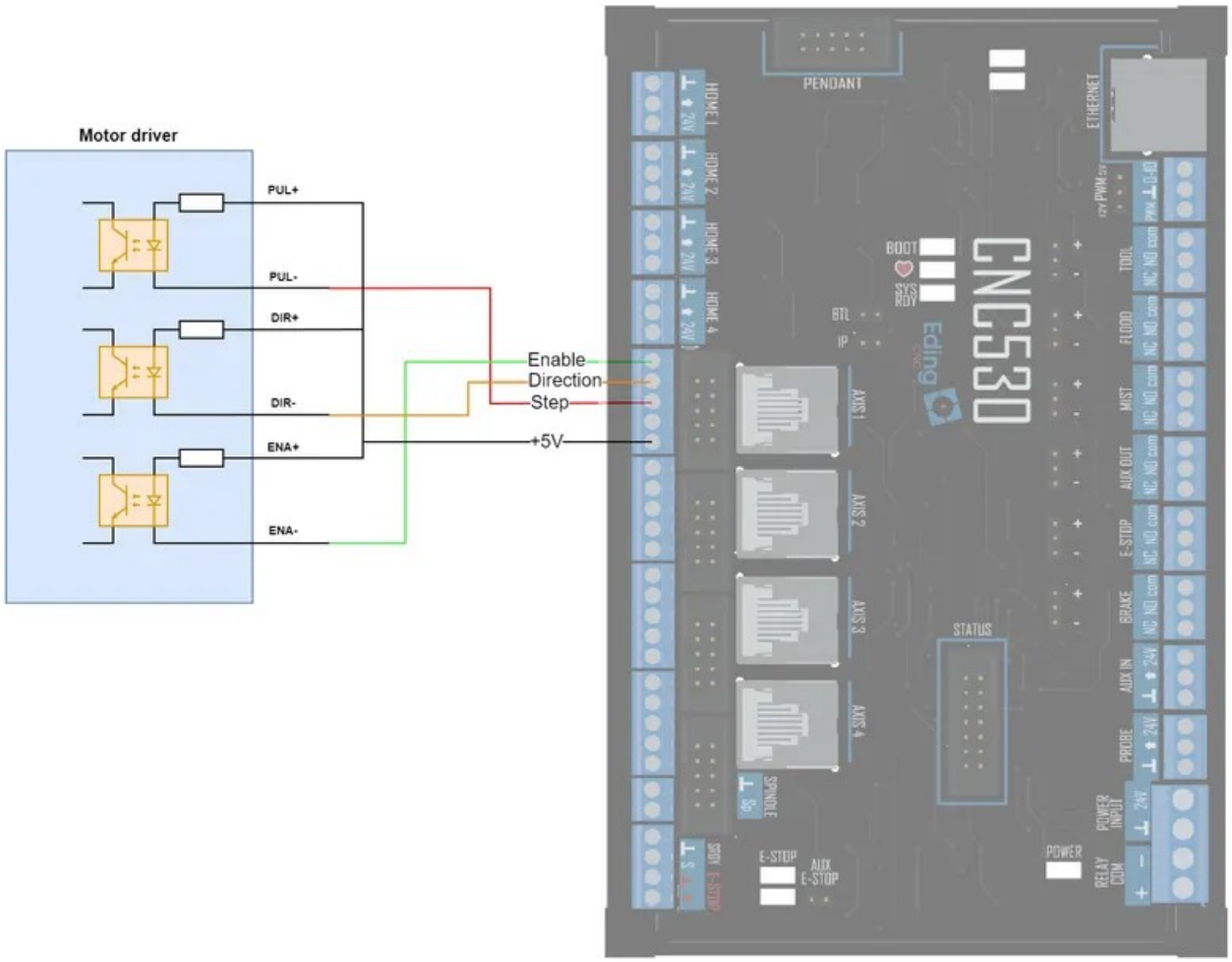
Driver signal	CNC530 Signal
PUL+	**Step**
PUL-	GND
DIR+	**Dir (Direction)**
DIR-	GND
ENA+	**En (Enable)**
ENA-	GND



Common +5V connection

The first method is the most common. However, it is possible to control the motor driver with a command of +5V.

Driver signal	CNC530 Signal
PUL+	+5V
PUL-	**STEP**
DIR+	+5V
DIR-	**Dir (Direction)**
ENA+	+5V
ENA-	**Ena (Enable)**



The JMC motor in this example has the motor driver integrated into the motor. The signals are very similar as in the Leadshine example. However, this features an extra signal. It features an alarm output.

For some JMC motor we have a special adapter board that enables you to use a network cable to make simply a connection between the motor and the CNC530.

For more info please have a look here. **<TODO> ADD IMAGE JMC adapter Board + link to manual**

Connecting the CNC530 to a VFD

Using the status indicator board