Hardware Manual

CNC720

Revision 5 19 March, 2020

Released

History:

Revision	Date	Author
1	22-5-2017	AB
4	4-7-2019	AB
5	19-mar-2020	AB

Revision overview:

Revision	Remarks
1	Initial version.
2	Textual updates
3	Removed Probe max input voltage comment, swapped CN1/CN2 indications for pinout
4	Textual updates, update Leadshine connection overview, added troubleshoot overview.
5	Added timing info about Charge Pump

Table of contents

1 Introduction

1.1 Purpose

This manual describes the hardware of the CNC720.

The CNC720 is a 4-axis CNC controller with Ethernet interface. The basic specification is:

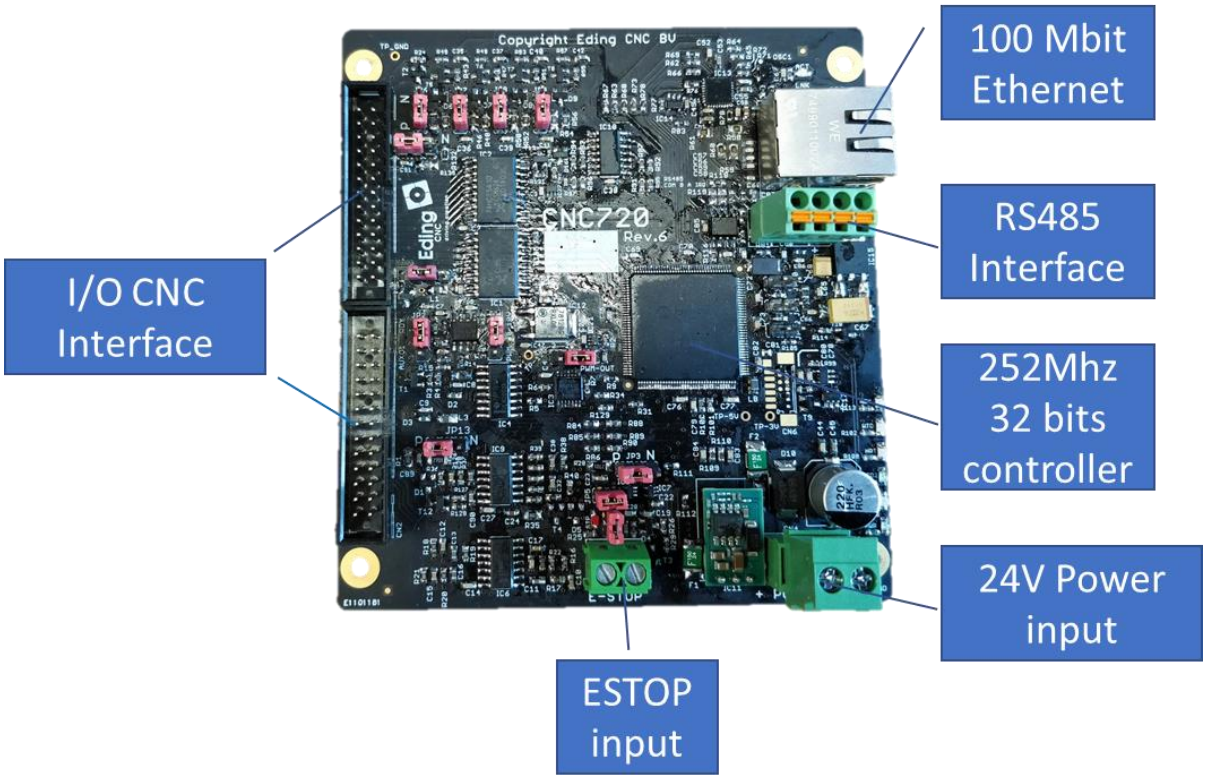
4x axis controller interface	Puls/Direction	5V (max. 400Khz)
	Enable	5V or open-collector (max. 24V)
	Alarm	24V
4x digital HOME inputs	24V	
1x digital outputs	Open collector (max. 24V)	
2x analog inputs	0-3.3v (12 bits)	
1x analog outputs	0-10V	
2x cooling outputs	Open collector (max. 24V)	
1x PWM outputs	Open collector (max. 24V)	
Safety relay I/O	Output System Ready	Output for safety relay (Watchdog) Open Collector
	Input External Error	24V
	Input E-Stop	24V
1x Length detection input (Probe)	24V	
1x Spindle encoder input	5V input	
1x RS485 interface	RS485, MODBUS compatible (for connecting extra I/O or functionality, cable length up to 20m)	
Handwheel interface (Pendant)	2x digital input	5V
	2x MPG input	5V
	2x analog input	0-3.3V
Interface	100Mbit Ethernet	
Power Supply	24VDC	
Dimension	100x107mm (suitable for DIN rail mounting)	
Others	Firmware upgradable through network connection	

1.2 Scope

This document describes the hardware of the CNC720.

2 Board overview

The image below shows an overview of the CNC720.



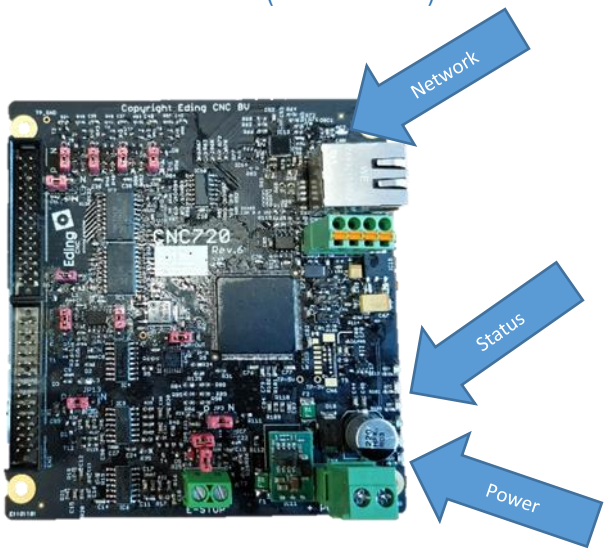
3 Board jumpers and indicators

3.1 JP10, JP11, JP12

With these jumpers, several settings can be forced:

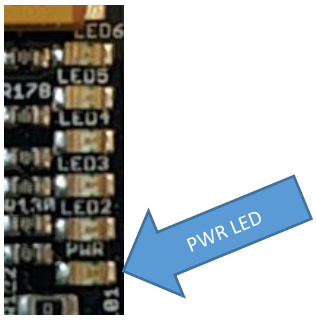
JP10	Reserved
JP11	Startup with default IP address 172.22.2.100
JP12	Skip bootloader

3.2 LED indications (LED2-LED6)



The board uses several LEDs indicating activity.

LED1: indicates that the external power is connected.



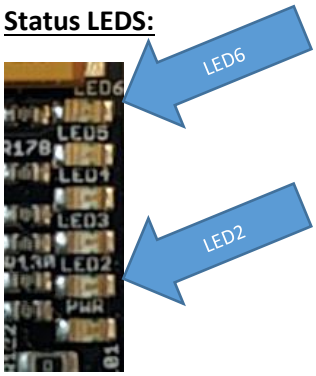
PWR: this LED indicates that the power for the processor is available (3.3V).

Network LEDs:

Green = Network activity (ACT)

Yellow = Network connection (LNK)

Status LEDS:



LED6	GREEN	SYSREADY, indicates when CNC system is ready for operation. Can be used in cooperation with safety relay.
LED5	YELLOW	WATCHDOG charge pump, indicates operation of the watchdog circuitry
LED4	YELLOW	Controller 'heartbeat' indicating the board is active
LED3	GREEN	Indicates 'Machine On'
LED2	YELLOW	Flashing when application is starting up. After startup, will be switch ON if E-STOP occurred.

Please note, when in bootloader mode LED2 and LED3 will toggle to indicate this.

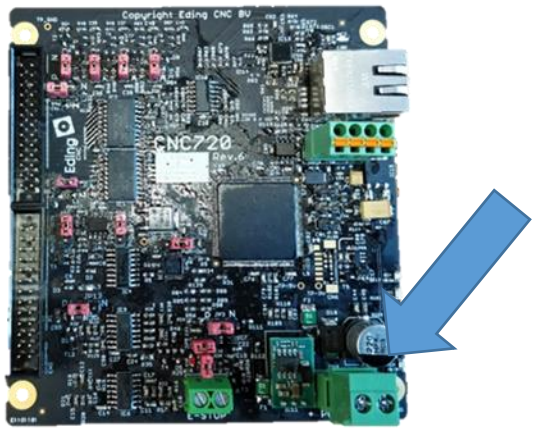
4 Connectors

4.1 Power

The voltage of the supplied power is 24V DC.

Warning: Due to a protection diode at the input the 24V that is available on a number of connectors will be a bit lower, please check when connecting 24V devices to that connector if they will operate correctly.

Warning: Although the 24V is also available on the boxheader connectors, it is advisable to use separate wiring for powering 24V devices that exceed 50mA required current.

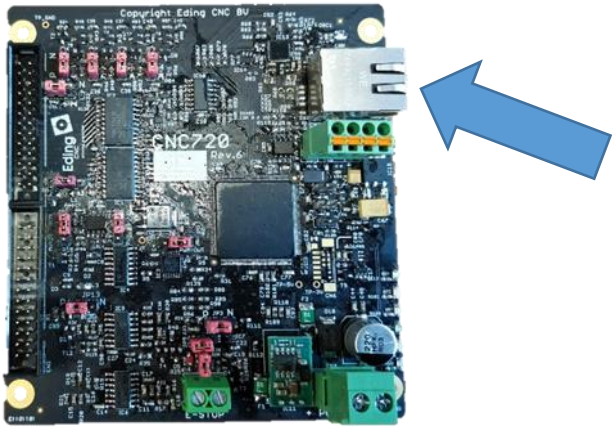


The image below shows the power connector.

Warning: Check the polarity of the power, damage to the board may occur if the polarity is reversed.

4.2 Network

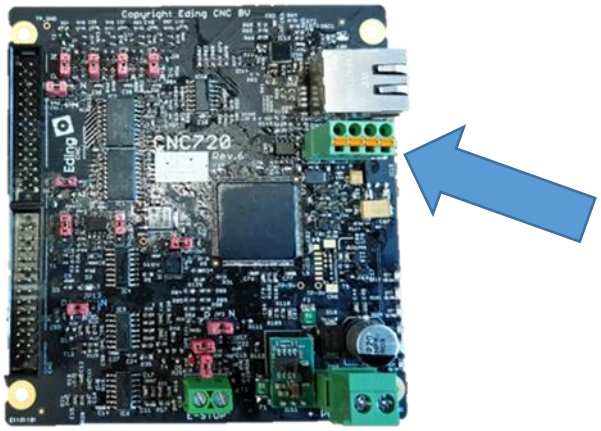
The board needs to be connected via *cross* cable of type CAT5 or CAT5E. We advise to use properly shielded network cables type SF/UTP. The default IP address is 172.22.2.100.



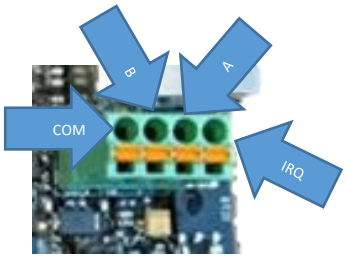
Note: Make sure that the PC that the board is connected to is correctly setup and has the correct IP address, make sure there is no IP address conflict.

4.3 RS485

Via the RS485 connector external hardware can be connected. RS485 is a balanced signal, this decreases susceptibility to interference. The protocol that is used is MODBUS RTU.



The image below shows a close up of the connector.

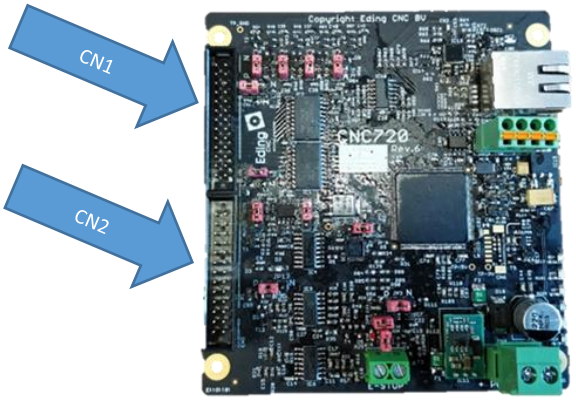


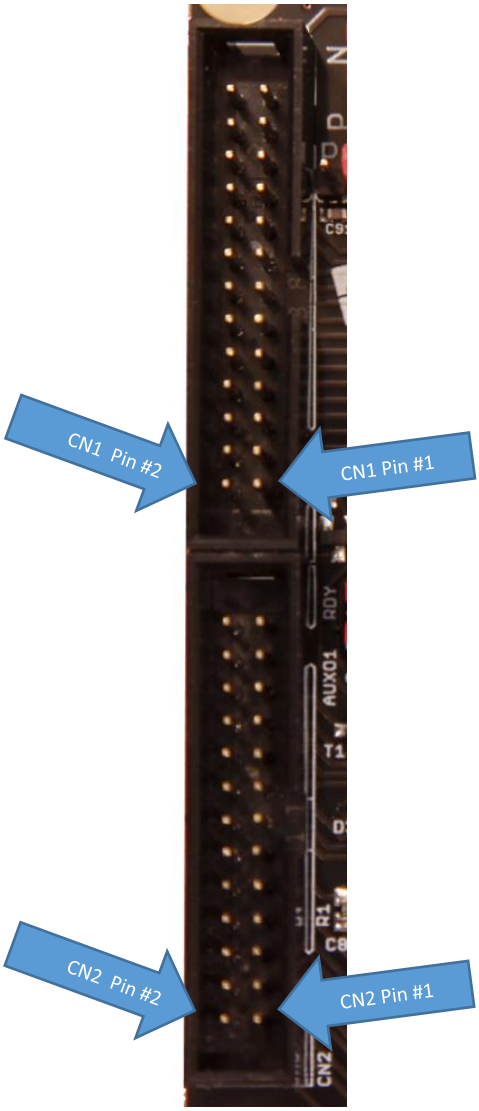
The connector consists out of 4 signals:

COM	Common	
B	Balanced signal	
A		
IRQ	IRQ	Input for external interrupt (currently not used)

4.4 I/O CNC Boxheader connectors

These connectors contains all the relevant signals of the board.





Below an overview of all connections of this connector:

I/O Connector CN1:

Pin #	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	GND		Ground			
2	+5V		Power		+5V	
3	STEP1	OUT	DIGITAL		+5V	
4	DIR1	OUT	DIGITAL		+5V	
5	ENABLE1	OUT	DIGITAL		+5V	
6	STEP2	OUT	DIGITAL		+5V	
7	DIR2	OUT	DIGITAL		+5V	
8	ENABLE2	OUT	DIGITAL		+5V	
9	STEP3	OUT	DIGITAL		+5V	
10	DIR3	OUT	DIGITAL		+5V	
11	ENABLE3	OUT	DIGITAL		+5V	
12	STEP4	OUT	DIGITAL		+5V	
13	DIR4	OUT	DIGITAL		+5V	
14	ENABLE4	OUT	DIGITAL		+5V	
15	HOME1	IN	DIGITAL		Max. input Voltage 24V	
16	HOME2	IN			Max. input Voltage 24V	
17	HOME3	IN			Max. input Voltage 24V	
18	HOME4	IN			Max. input Voltage 24V	
19	GND		Ground			
20	DRVALM	IN	DIGITAL	Drive Alarm	Max. input Voltage 24V	
21	Reserved					
22	Reserved					
23	Reserved					
24	NO_ESTOP	OUT	Open Collector	Indicates no E-stop is active		
25	GND		Ground			
26	+24V		Power			

I/O Connector CN2:

Pin #	Name	Direction	Type	Function	Electrical Spec.	Remarks
1	GND					
2	+5V				5V	
3	RUN	IN	Digital	RUN switch	Max. Input Voltage 5V	Active low
4	HW-A	IN	Digital	Handwheel A input	Max. Input voltage 5V	
5	PAUSE	IN	Digital	PAUSE switch	Max. Input voltage 5V	Active low
6	HW-B	IN	Digital	Handwheel B input	Max. Input voltage 5V	
7	AN1	IN	Analogue	Analogue input 1	Max. Input voltage 3.3V	12 bits
8	AN2	IN	Analogue	Analogue input 2	Max. Input voltage 3.3V	12 bits
9	GND		Ground			
10	AVDD		Power		3.3V	
11	EXT-ERROR	IN	Digital	Extern Error	Max. input voltage 24V	
12	ESTOP	IN	Digital	Emergency Stop		
13	SPINDLE-X	IN	Digital	Spindle position		
14	Reserved					
15	PROBE	IN	Digital	Probe/toolsetter		
16	Reserved					
17	TOOLON	OUT	Open Collector	Switch tool ON (eg. Spindle)	Max. rating 50V/500mA	
18	SYSREADY	OUT	Open Collector	System Ready	Max. rating 50V/500mA	System Ready, indicates that system is ready for operation.
19	COOL1	OUT	Open Collector	Coolant1 signal	Max. rating 50V/500mA	
20	COOL2	OUT	Open Collector	Coolant2 signal	Max. rating 50V/500mA	
21	CHARGEPUMP	OUT	Open Collector	Watchdog signal	Max. rating 50V/500mA	Pulsed signal 10Hz
22	ENABLE_OC	OUT	Open Collector	Drive enable	Max. rating 50V/500mA	
23	PWM_VOLT	OUT	Open Collector or Analogue	PWM or 0-10V	PWM mode: Max. rating 50V/500mA 0-10V mode: Max. 100mA	
24	AUXOUT1	OUT	Open Collector	Generic output	Max. rating 50V/500mA	
25	GND		Ground			
26	+24V		Power		24V	

5 Using the I/O input signals

5.1 HOMEx inputs

The HOME inputs are required for the machine to be able to detect the 'home' position.

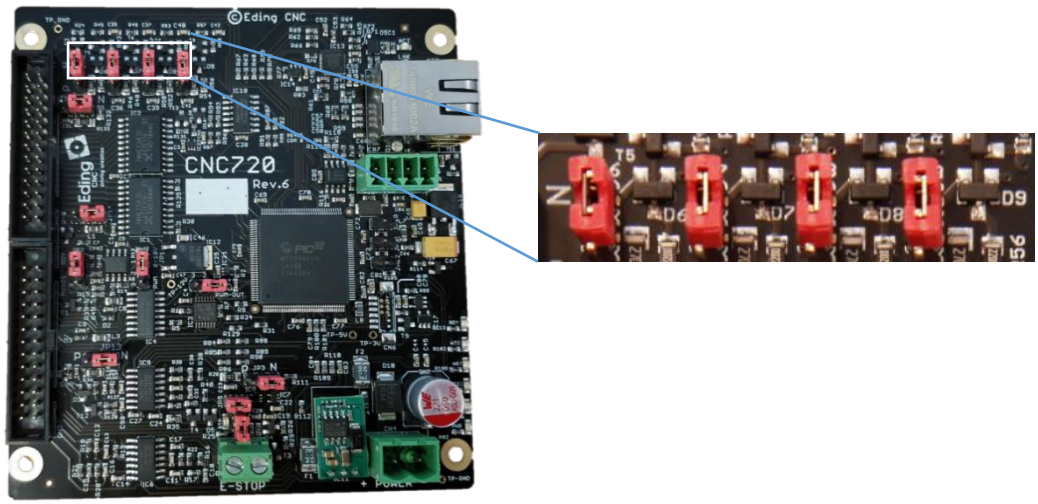
The home-input can be configured into two modes, each mode describes what type of switch or sensor is connected. If the switch or sensor is activated, it means that it will switch either to ground (0V) or to a voltage, in this case 24V. A switch or sensor that switches to 0 (negative) is called NPN, a switch or sensor that switches to 24V (positive) is called PNP.

PNP = Input should be 'HIGH' (24V) to detect the switch/sensor being activated.

NPN = Input should be 'LOW' (0V) to detect the switch/sensor being activated.

*Please note, that ALL home inputs are **EITHER** NPN or PNP. Currently it is **not possible** to mix the inputs types. The software expects one type of input to be used and will not work correctly if the jumpers are set differently.*

This mode selection is done via several jumpers:



Each jumper corresponds to an input:

Jumper	Input
JP6	HOME1 mode NPN or PNP
JP7	HOME2 mode NPN or PNP
JP8	HOME3 mode NPN or PNP
JP9	HOME4 mode NPN or PNP

The image below shows how the input operates.

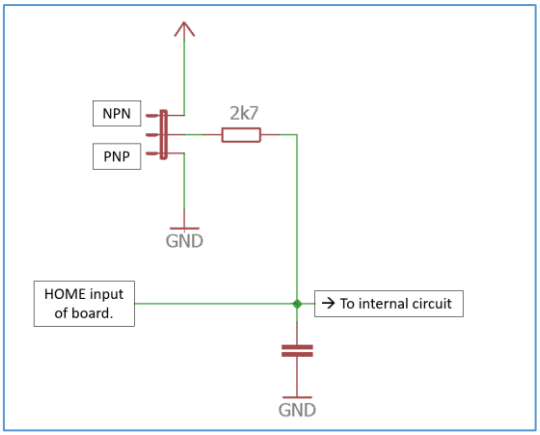


Figure 1 Input circuit of HOME input.

Switching in NPN mode:

When in NPN mode the input needs to switch to ground to be activated.

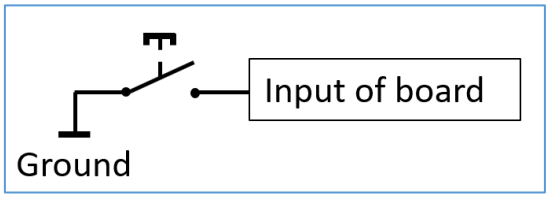


Figure 2 Switching HOME input in NPN mode.

Switching in PNP mode:

When in PNP mode the inputs need to switch to +24V to be activated.

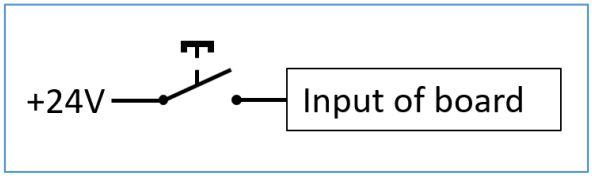


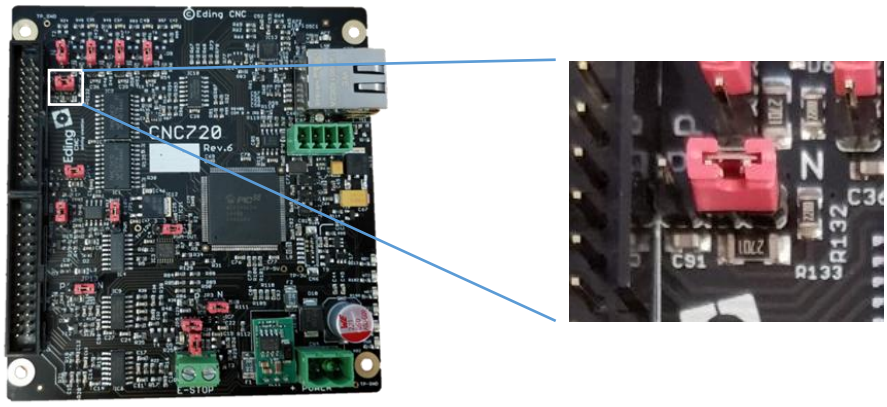
Figure 3 Switching HOME input in PNP mode.

5.2 DRVALM input

The DRVALM can be used to report problems with the motor driver. There is only a single input, normally the outputs of the motor driver can simply be combined to this input.

The input can have two modes, either NPN or PNP. This means either it will react when this input is switched to ground (NPN), or the input signal goes to the positive power supply (PNP).

This mode can be set via a jumper:



Jumper	Input
JP15	DRVALM mode NPN (default) or PNP

The image below shows how the input operates:

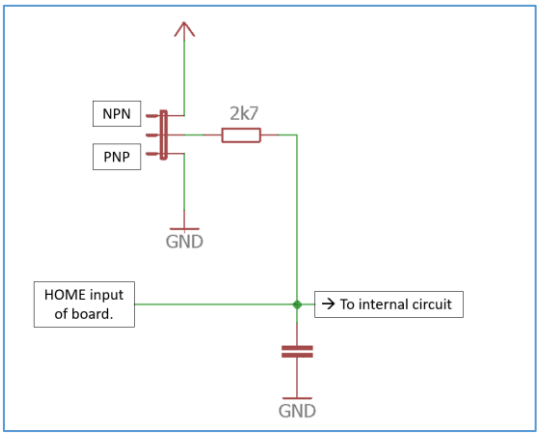


Figure 4 Input circuit of DRVALM input.

All alarm outputs of the motor driver need to be wired together. If the alarm outputs of the drives are open-collector outputs, so that the alarm outputs of all drives can be coupled together, and each output can pull the alarm input low to generate an alarm. The input of the DRVALM input can be set to NPN.

Please note, check that the motor driver ALARM output is truly configured to be 'open' if not active.

The image below shows such a setup.

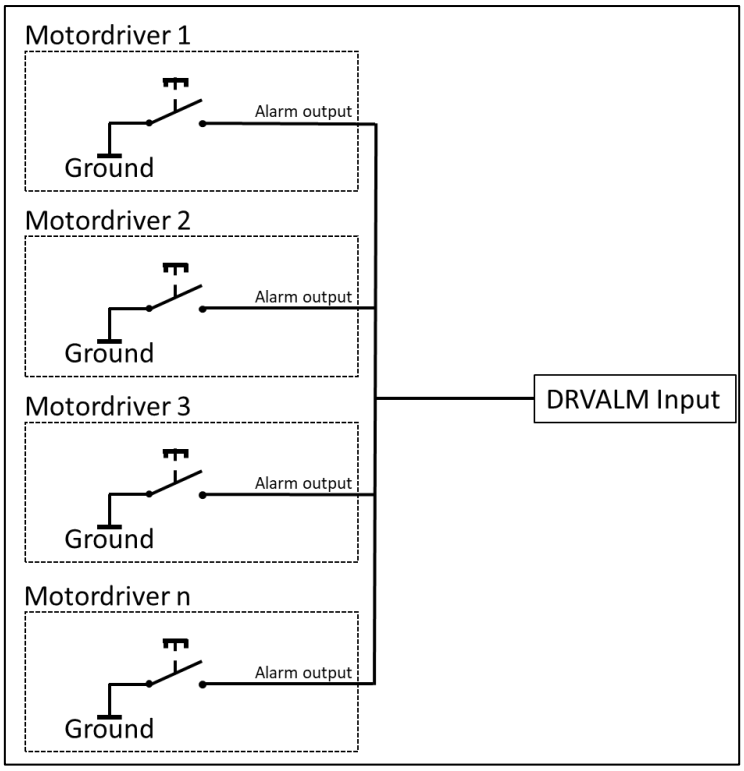


Figure 5 Combining open collector outputs of drivers.

Each drive can generate an alarm that will switch low the DRVALM input, resulting in detection of this alarm.

Warning: Make sure you test the alarm input before start to use it.

5.3 RUN/PAUSE inputs

The RUN and PAUSE inputs can be used to externally start or stop a job. However, they are also used when you want to connect a wired external pendant. If the software is in JOGWHEEL modus these inputs are used for zeroing the position (START) or selecting the axis (PAUSE).

Using the PAUSE or RUN input is simply connecting a push button to it, with one side connected to GROUND and the other to the input of the board.

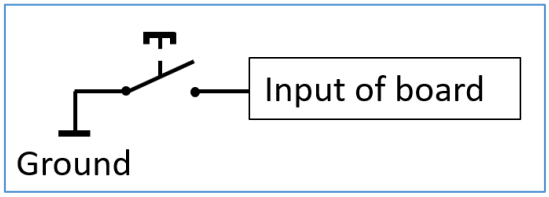


Figure 6 Connecting switch to PAUSE or RUN input.

In the image below is a schematic of each ***digital*** input:

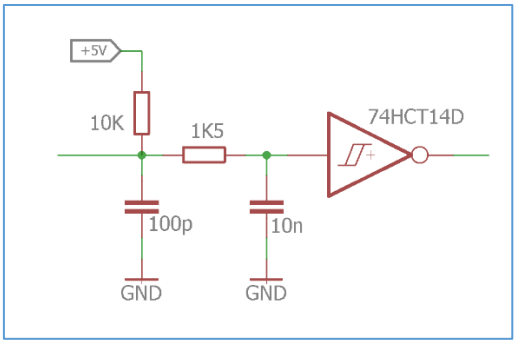


Figure 7 RUN/PAUSE digital inputs schematic.

See also chapter "*9 Connecting and setting up a wired handwheel*" for more info how to use these inputs as part of a wired pendant.

Warning: The PAUSE and RUN inputs have a *maximum* input level of 5V and will be damaged if 24V is applied.

5.4 HW-A/HW-B inputs

The HW-A/HW-B inputs can be used to connect a handwheel for exactly setting the position of an axis or changing the feedrate. The position of the axis can only be changed if the software is in JOGWHEEL modus.

The image below shows how a pendant can be connected to these inputs.

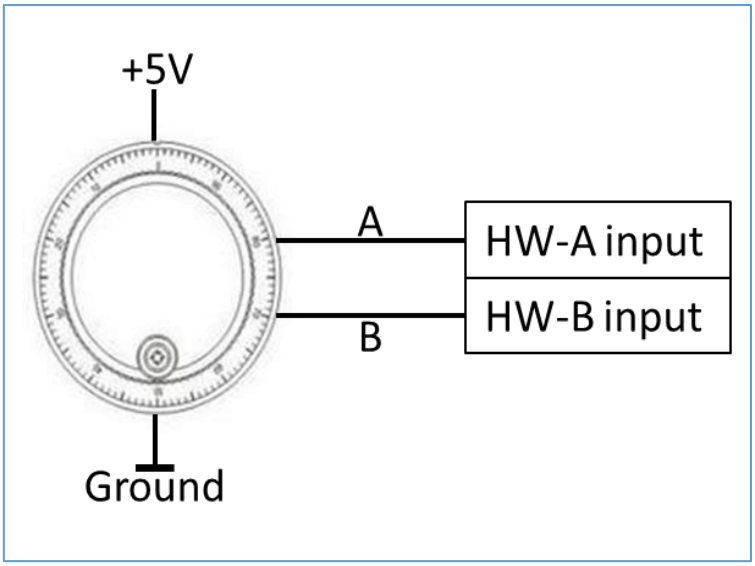


Figure 8. Connecting a pendant to the HW-A/HW-B inputs

See also chapter "9 Connecting and setting up a wired handwheel" for more info how to use these inputs as part of a wired pendant.

In the image below is a schematic of each ***digital*** input:

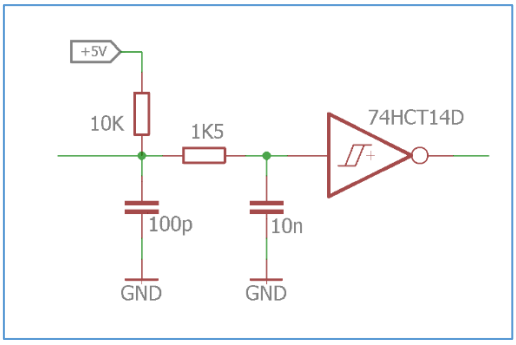


Figure 9 HW-A/HW-B digital inputs schematic.

Warning: The HW-A/HW-B inputs have a *maximum* input level of 5V and will be damaged if 24V is applied.

5.5 AN1/AN2 inputs

The analogue inputs can have several functions:

- Reading external values for control
- Controlling the feedrate
- Selecting an axis or multiplier in a wired pendant application

Warning: The analogue inputs have an input range of 0-3.3V, applying voltages that exceed this voltage will damage the inputs and even lead to failure of the controller.

For this application the 3.3V (AVDD) is made available on pin #10 of connector CN2. Do not use this voltage for other applications!

If you want to test this input, a simple 10k potentiometer can be used as shown in the image below.

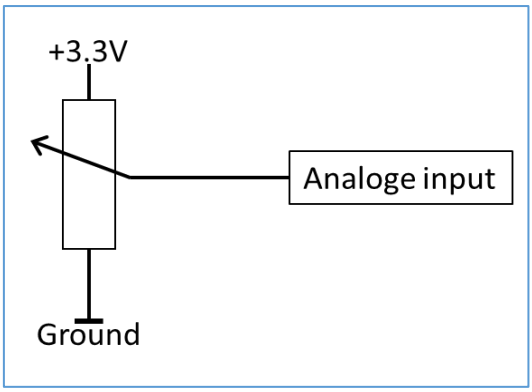


Figure 10. Connecting a potentiometer to the analogue input.

Using this potentiometer to control the feedrate can be changed in the application setup it should be indicated that an analogue input is used. In this case either ‘Analog 1’ or ‘Analog 2’.

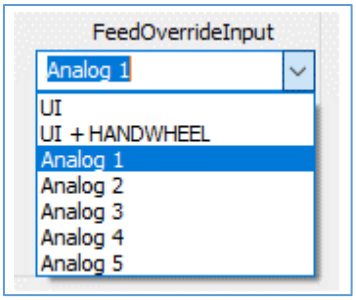


Figure 11. Setting up the analogue control of feedrate.

For more info about reading the input please have a look at the manual about writing macros and reading I/O’s.

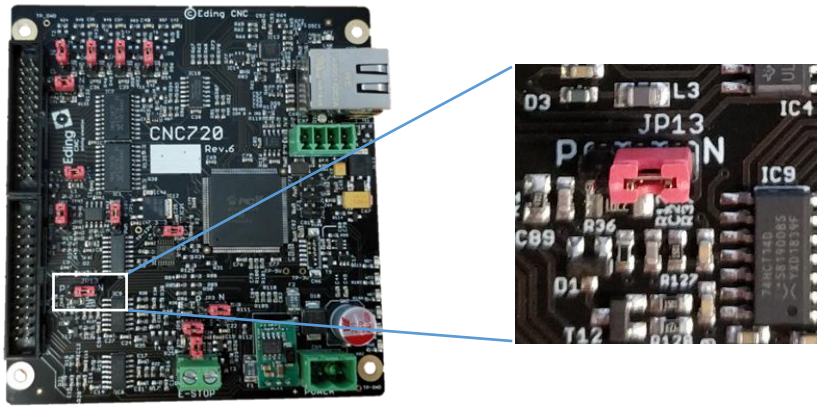
For more info about how to use the analogue inputs for a wired pendant have a look at chapter “9 Connecting and setting up a wired handwheel”.

5.6 EXT-ERROR input

The EXT-ERROR input can be used for indicating any external ERROR has occurred. The behavior of this input can be indicated in the setup of the application.

The input can have two modes, either NPN or PNP. This means either it will react when this input is switched to ground (NPN), or the input signal goes to the positive power supply (PNP).

This mode can be set via a jumper:



Jumper	Input
JP13	EXT-ERROR mode NPN or PNP

The image below shows how the input operates:

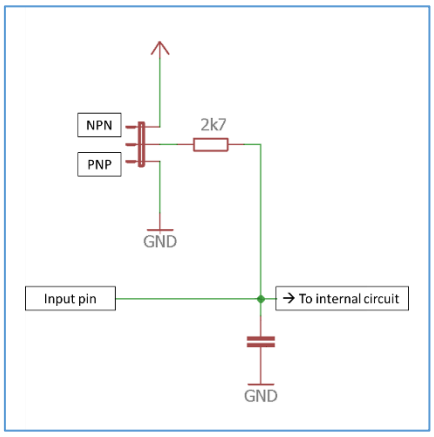


Figure 12 Input circuit of EXT-ERROR input.

5.7 E-STOP input

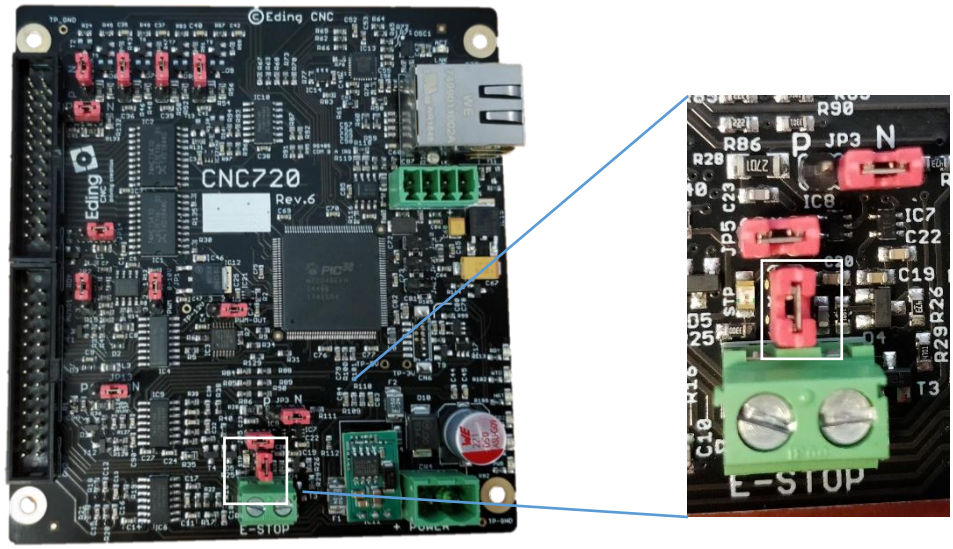
The E-STOP input is used for indicating an EMERGENCY. The CNC720 is equipped with a hardware features that can shut down the outputs if an E-STOP occurs, this is in addition to the software behavior in case of an E-STOP condition.

The hardware E-STOP functionality shuts down the following outputs:

- DIRx/STEPx/ENABLEx
- TOOLON
- COOL1
- COOL2
- PWM/0-10V (configurable)
- AUX01 (configurable)

The board features a connector to which the E-STOP switch needs to be connected.

Please note that jumper JP4 needs to be removed if an external switch is used.



This pin is also available on connector CN2 on pin #12.

The E-STOP inputs needs to be connected with a ‘normal closed’ (NC) switch. As a result, if the E-STOP cable has a broken wire this will automatically trigger an E-STOP condition.

Figure 13 shows a schematic how this basically works.

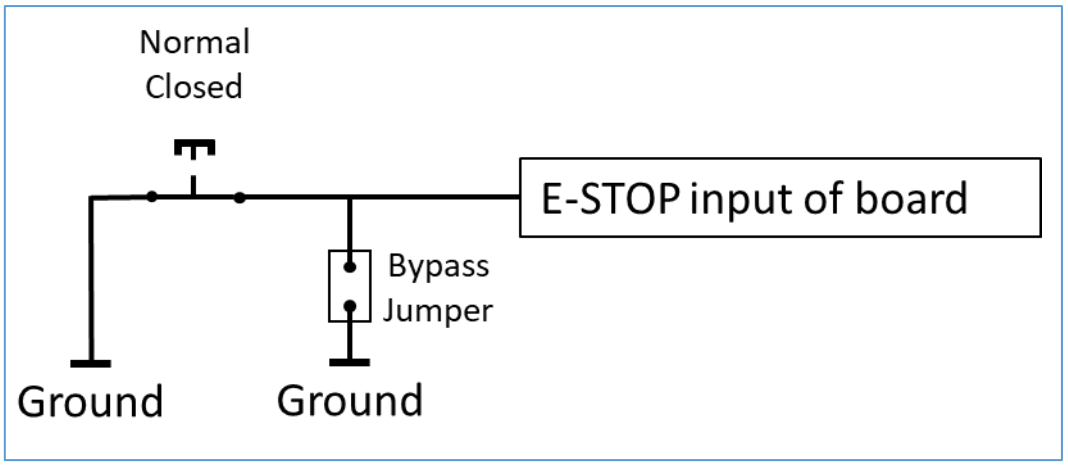
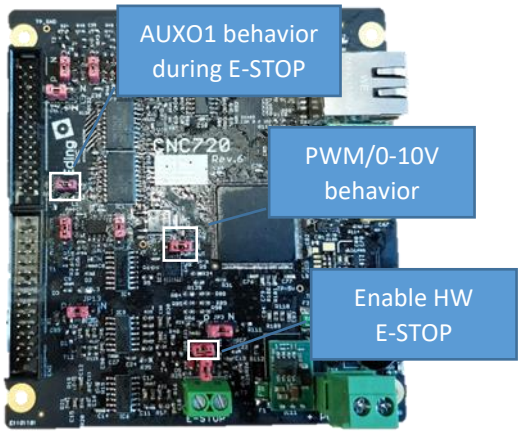


Figure 13. Connecting external E-STOP switch.

It's important to understand that the external E-STOP is by default disabled through bypass jumper JP4. With the jumper mounted the user will be able to use the board if no external switch is applied.

The software behavior of the E-STOP can be defined in the software setup. The hardware behavior of the E-STOP is through several jumpers. These jumpers are indicated below:



If you don't want to use the hardware shutdown, please remove the jumper that enables this feature.

5.7.1 PWM/0-10V Behavior during E-STOP

The PWM/0-10V output will by default be shutdown if an E-STOP event occurs, if the application needs this signal to remain the same the jumper can be set in the opposite position, in that case the output signal will not be shutdown in case of an E-STOP event.

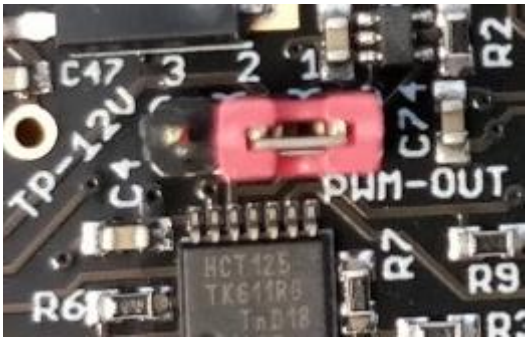


*Figure 14. PWM **stops** on E-STOP (default).*

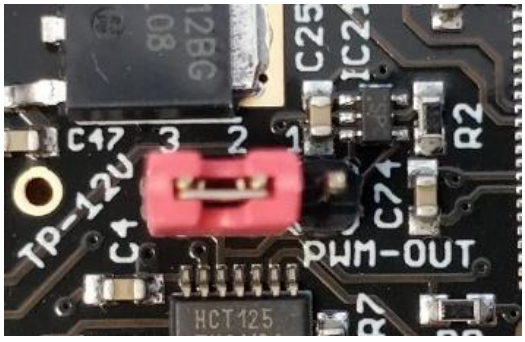


*Figure 15. PWM **continues** in case of E-STOP.*

5.7.2 AUX01 Behavior during E-STOP

The AUX01 output will by default be shut down if an E-STOP event occurs, if the application needs this signal to remain the same the jumper can be set in the opposite position, in that case the output signal will not be shut down in case of an E-STOP event.

*Figure 16. AUX output **shuts down** on E-STOP (default).*

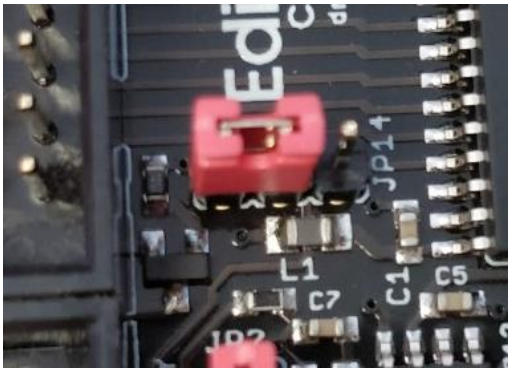


*Figure 17. AUX output **unchanged** at E-STOP.*

5.8 SPINDLE-X input

The SPINDLE-X input can be used to connect an external sensor that indicates the rotation of the spindle or used in case of tapping when used in a lathe application.

The SPINDLE-X has a *maximum* input level of 5V and will be damaged if 24V is applied.

Below the input circuit is shown for the SPINDLE-X input:

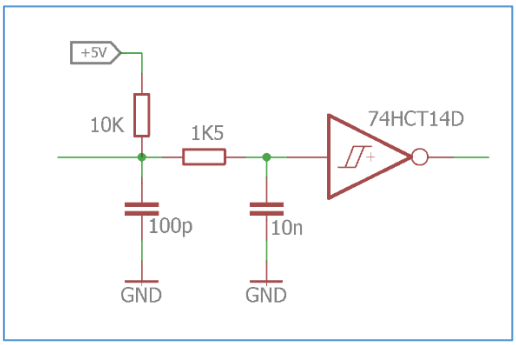


Figure 18 Input circuit SPINDLEX.

To use the SPINDLE-X the input signal needs to switch to ground to be active. The image below shows this.

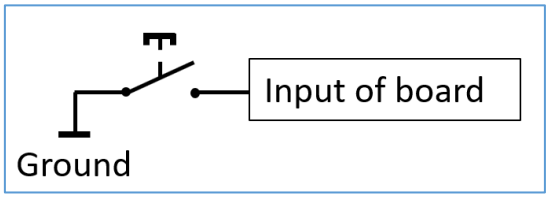


Figure 19 Input signal for SPINDLE-X.

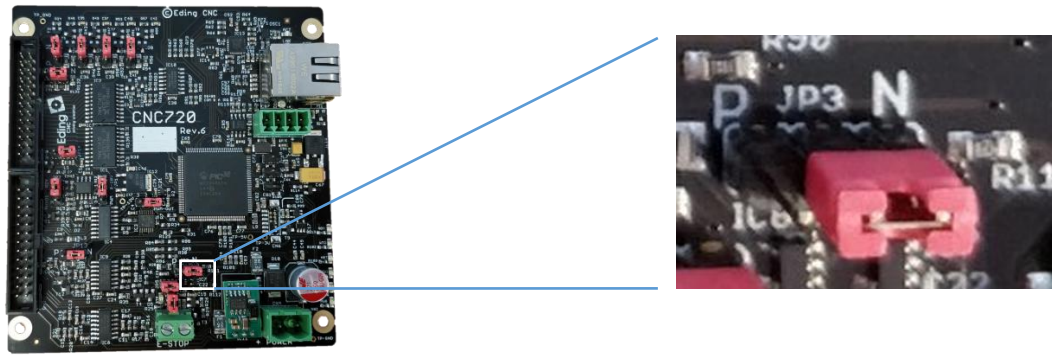
Warning: The SPINDLE-X input has a *maximum* input level of 5V and will be damaged if 24V is applied.

5.9 Probe input

The probe input has a dual use. It can be used for the tool measurement, measuring the height 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.

The input can have two modes, either NPN or PNP. This means either it will react when this input is switched to ground (NPN), or the input signal goes to the positive power supply (PNP).

This mode can be set via a jumper:



Jumper	Input
JP3	PROBE mode NPN or PNP

The image below shows how the input operates:

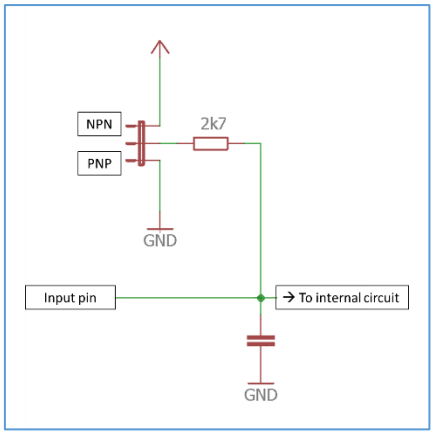


Figure 20 Input circuit of PROBE input.

6 Using the I/O output signals

6.1 Using open collector outputs

Numerous outputs are so called ‘open collector’ outputs. Understanding how to use those is important to avoid damage to the controller.

An open-collector output means it switches the connected wire to GND. This enables the user to switch devices that do not need the same voltage rating as the controller has.

In the image below such an output is shown.

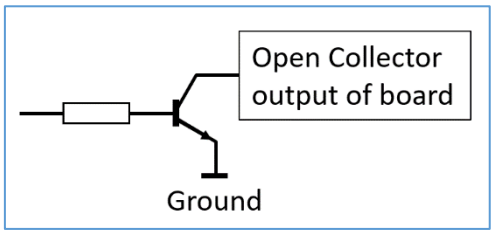


Figure 21 Open collector output.

This output can directly be used, for example, to switch a relay. If a logic signal is needed a pull-up resistor is required.

Please note, an open-collector output *can not* be measured with eg. a multimeter, to test an output connect a 10k resistor between output and +5V or 24V, now you should be able to measure this output switching.

Warning: Connecting an open-collector output directly to a positive voltage eg. 24V will cause a short-circuit damaging the board.

The drawing below shows how an open-collector output connector can be used to create different output signal levels by using a pull-up resistor. The value of this resistor can vary depending on the load of the output. Typical values are 4.7k or 10k.

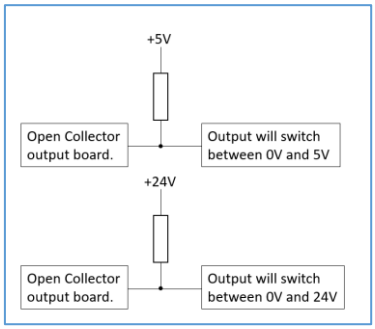


Figure 22 Creating different output levels with open-collector output.

With open-collector output it is very simple to use a relay in order to switch bigger loads. Connecting a relay is shown in the drawing below.

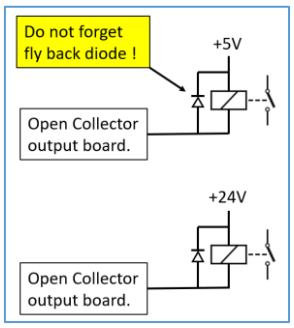
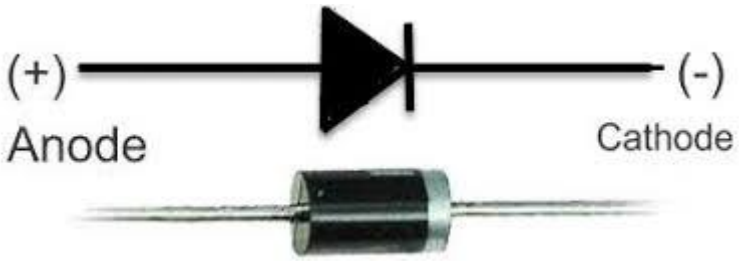


Figure 23 Connecting a relay to an open collector output.

In the above example a 5V relay and 24V relay is used, both will switch. However please consider that a 5V relay will need more current to switch. This can limit the total number of used relays because of the maximum total current that can be switched.

VERY important: in the case a relay is used, a fly back diode MUST be connected as shown in figure 23. This is necessary to limit spikes that occur when switching a relay. A typical diode that is used is e.g. 1N4007. Note that the diode is polarized and should be connected the right way or damage could occur to the output of the CNC720. Below is an image showing the connection of a diode.



6.2 STEPx/DIRx/ENABLEx outputs

These outputs can control up to 4 axes simultaneously. Each output has an output level of 5V and can sink or source around 20mA per output. The maximum step frequency is 400Khz.

Please note, the ENABLEx output is simultaneously switched for all axis at the same time. Depending on how the E-STOP hardware behavior is configured these outputs can be switched off in case of an E-STOP condition.

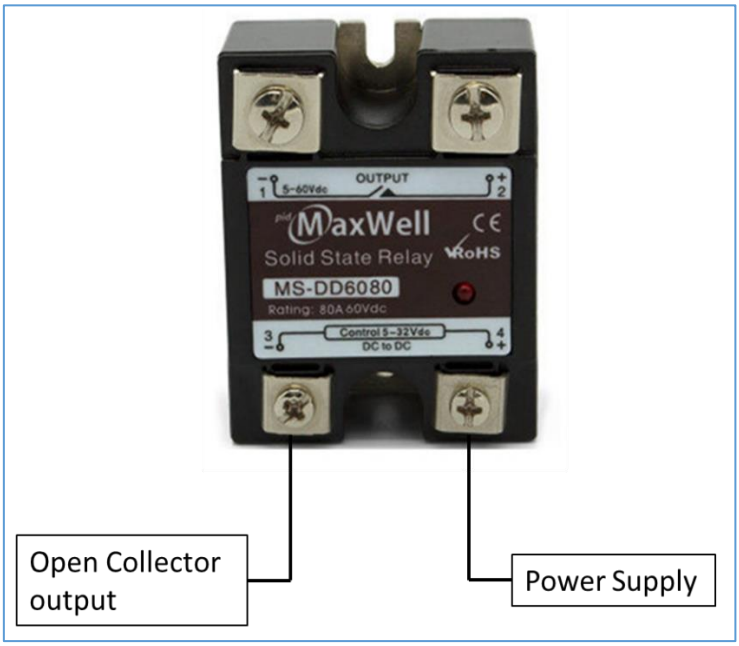
For your information, in the software the ENABLE behavior can be inverted depending on the drivers that are used.

Not all motor drivers are capable of support step frequencies up to 400Khz. If you notice that the motors are not moving at all or show erratic movement, try to lower this frequency. Also consult your motordriver datasheet for the supported frequency.

6.3 TOOLON output

The TOOLON output is used to activate the tool that is used in the application. This output is an open-collector output. To learn more about these kinds of outputs have a look at chapter “6.1 Using Open Collector outputs”.

It is advisable to use a solid-state relay to switch on heavy loads like a spindle motor because this will also optically isolate this input again external interference signals.



Depending on how the E-STOP hardware behavior is configured this output can be switched off in case of an E-STOP condition.

6.4 SYSREADY output

The SYSREADY indicates that the system is active. This output is an open-collector output. To learn more about these kinds of outputs have a look at chapter “6.1 Using Open Collector outputs”.

6.5 COOL1/COOL2 output

The COOLx output is an output to control the flow of any coolants that might be used.

These outputs are open-collector output. To learn more about these kinds of outputs have a look at chapter “6.1 Using Open Collector outputs”.

Depending on how the E-STOP hardware behavior is configured this output can be switched off in case of an E-STOP condition.

If a large load is switched it is also here advisable to use a (solid-state) relay as described in chapter “6.3 TOOLON output”

6.6 CHARGEPUMP output

The CHARGEPUMP signal is a signal that is toggled around 10Hz with a duty cycle of about 50%. It is internally used for resetting a watchdog systems that checks that the board is still alive; that circuit will generate the SYSTEM READY signal. Absence of this signals shows that the controller is no longer responsive. Also, the SYSTEMREADY output will deactivate.

This output is an open-collector output. To learn more about these kinds of outputs have a look at chapter “6.1 Using Open Collector outputs”.

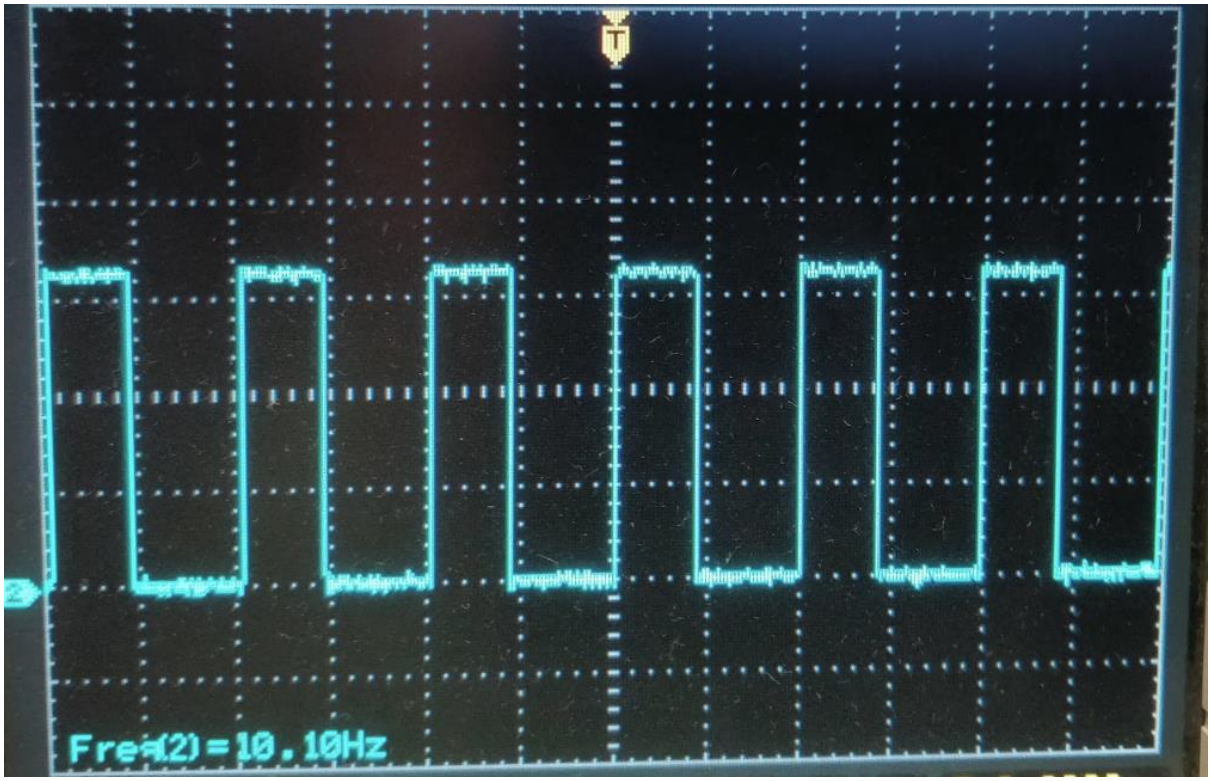


Figure 24 Charge Pump signal.

Please note, the frequency of this signal can vary if the controller is moving axis. In that case the frequency can go down to about 7.3 Hz.

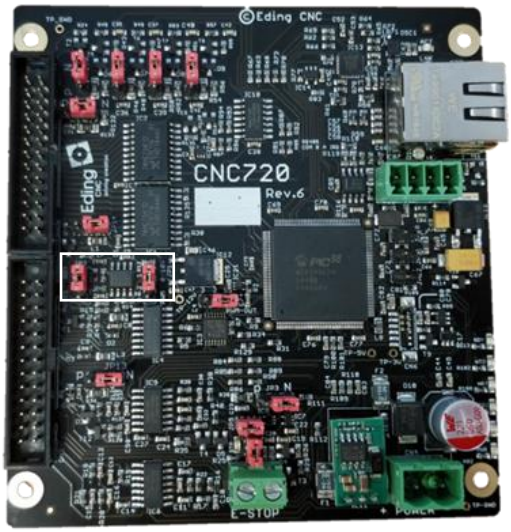
The use of this signal is not recommended, instead we integrated a hardware solution which is the SYSTEM READY signal. This solution uses the Charge Pump signal so will also indicate when the controller is active. However, it is not influenced by activity of the controller. Since the SYSTEM READY signal is generated in hardware instead of software it is safe to use that signal to indicate that the system is operational. So even if the board somehow would stop working the circuitry will switch off this output

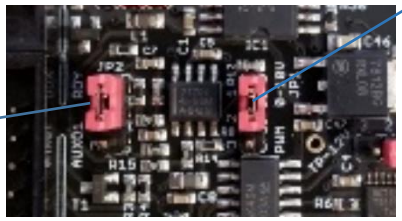
6.7 ENABLE_OC output

This output can be optionally used if the standard axis enable signal can not be used. It is the same signal, except it features an open-collector output. To learn more about these kinds of outputs have a look at chapter “6.1 Using Open Collector outputs”.

6.8 PWM_VOLT output

The CNC720 board contains one 0-10V output, this output is combined with a PWM output. So, this output can only have one kind of signal. There are 2 jumpers for that can be used to configure the behavior of this output.





Output selector:

0-10V or PWM

Output controlled via SYSTEM READY or AUXO1

Output signal type:

The right jumper selects what signal is present on the output. Either 0-10V, which is default, or the standard PWM signal. If the PWM output is selected this output will be an open-collector output.

Please refer to chapter “6.1 Using Open Collector Output" to understand how an open-collector output needs to be used.

Output enable behavior:

The left jumper selects whether the output is enabled when the ‘SYSTEM READY’ is available, the default behavior, or that it is controlled via the AUXO1 output.

Please note that if the AUXO1 is used, that output can not be used for other applications.

Depending on how the E-STOP hardware behavior is configured this output can be switched off in case of an E-STOP condition.

6.9 AUXOUT1 output

This output is a generic output that can be used for any application. This output is an open-collector output. Please refer to chapter “6.1 Using Open Collector Output" to understand how an open-collector output needs to be used.

Depending on how the E-STOP hardware behavior is configured this output can be switched off in case of an E-STOP condition.

6.10 NO_ESTOP output

This output indicates when there is NO E-STOP condition. If operates hardware based and is not SYTEMREADY related.

An application example might be is using it is to switch the power of parts of the machine automatically off when a E-STOP condition occurs.

7 Getting started

Before installing the board it's a good idea to validate that the board is operational.

Validate the board

Step 1. The first step is to validate the board is operational. Connect the network cross cable to the board and the PC. Make sure you have set the correct IP address on the PC. For a description on how to setup the PC please refer to the software manual.

Step 2. Connect the power, as a result the blue power LED should turn on. And observe that the status LEDs indicates that the board is active, indicated by the 'heartbeat'.

Step 3. Try to connect to the board.

The board should now able to communicate with the application software.

Check for motion

Now the board is operational the next step is to check whether the machine and home switches work correctly. We start with the homing switches. Make sure that the power is off.

Step 1. The first step is to determine how to configure the jumpers. For now, the most important ones are the jumpers for the home inputs. Set these jumpers to the correct position based on the type of the home switches used.

Step 2. Power up the board and connect.

Step 3. By using the I/O screen of the application validate that the switches are correctly detected; if you need to invert the signal do this in the setup of the software. If this is done, power down the board.

Step 4. Connect the drivers to the board, you can choose to connect all motors at once or just one at a time. Please check the manual of the driver on how to connect it to the controller, also check that the enable signal is connected correctly; direct or via the open-collector output. Some drivers will automatically be enabled when this input is not connected, and than power up.

Step 5. DOUBLE check all connections.

Step 6. Power up the board and driver(s) and connect to the board.

Step 7. Normally with the default settings of the software you should be able to get some motion. If not please check the following:

- Are all signals correctly connected?
- Do some signals need to be inverted (eg. ENABLE) ?
- Is the step frequency ok, some drivers only accept lower frequencies, so start with a low step frequency.

TIP: By using the software I/O screen you can manually check the enabling of the drivers. When the drive is not enabled you will be able to move it by hand, if it is enabled this should not be possible.

If all went ok, your machine has now a basic setup. From here you can continue to connect more I/O to the board, please check all I/O via the software; also check whether inversion is required.

Please note that the system will need to be tuned to each specific machine. This means that machine parameters as speed/acceleration etc. will need to be changed to get optimum performance. Please make sure you know who to do this, and f not request support.

And finally perform each part of the setup step by step, so you know where to look in case something does not work immediately.

8

The image below shows an example on how connect the CNC720 to a Leadshine DM556 motor drivers.

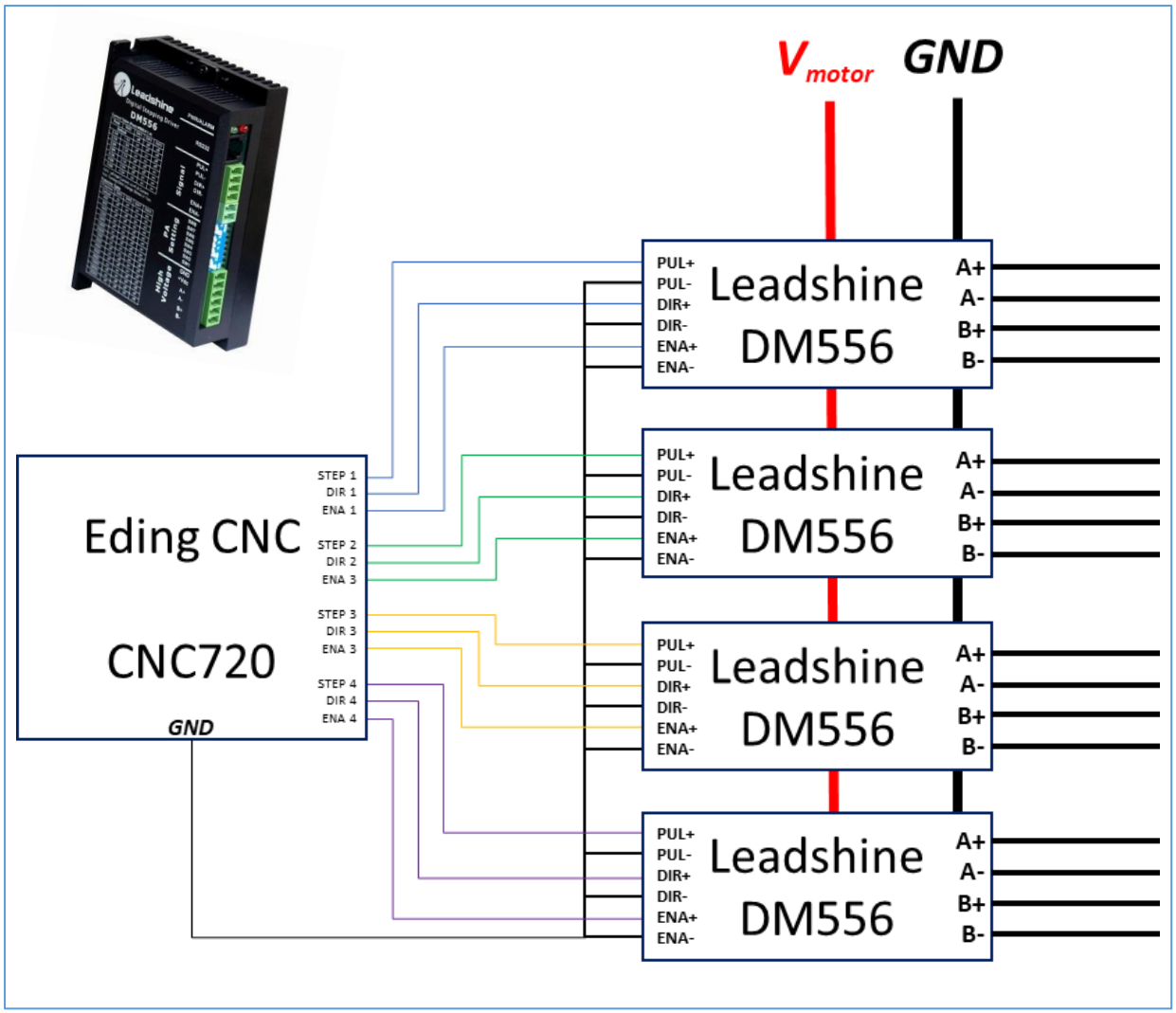


Figure 25. Diagram connecting CNC720 to Leadshine DM556 driver.

9 Connecting a wired pendant

Each board can be connected to a wired pendant for controlling the axis position. Connecting the handwheel is described in chapter “5.4 HW-A/HW-B inputs”.

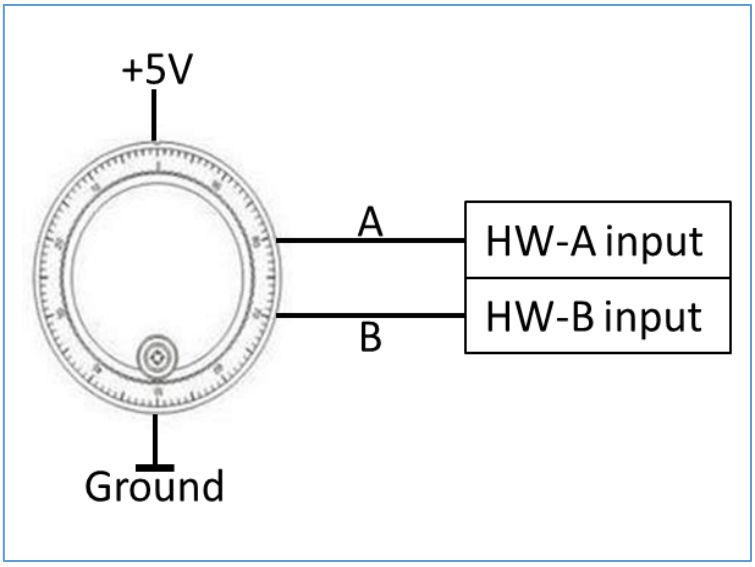


Figure 26. Connecting a handwheel.

Beside the handwheel there are several ways of selecting axis. Either through using the PAUSE button as described in chapter “5.3 RUN/PAUSE inputs”. However, by using the analogue inputs it is possible to (de)select axis directly. For this several resistors are used to construct a selectable voltage divider. The software will use the selected divider resulting voltage to determine if and which axis is selected.

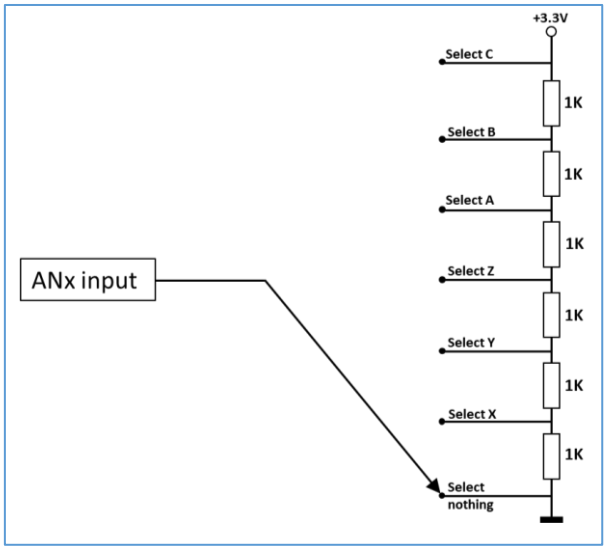


Figure 27. Selecting axis through an analogue input.

In the software it needs to be indicated that this is used.

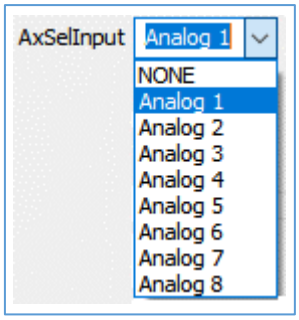


Figure 28. Selecting the analog input for the axis selection

Another possibility is setting the 'multiplication factor' of the handwheel externally. This is done in the same way.

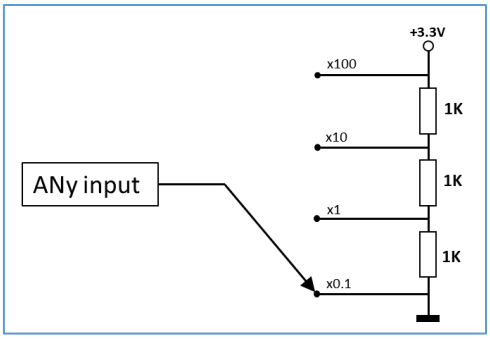


Figure 29. Selecting multiplication factor through an analogue input.

Again, of course the correct setup needs to be done to have the software

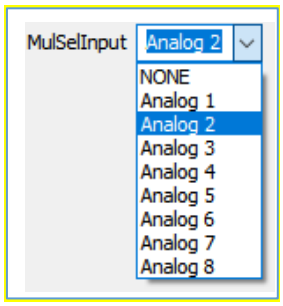


Figure 30. Selecting the analog input for the multiplier selection.

Of course, you must make sure that different analogue inputs are used for this.

10 Troubleshooting the CNC720

Problem	Possible Solution
The software cannot find the board	Try to ping the board with “ping 172.22.2.100” to see whether the PC is correctly connected to the controller
	Make sure that in the Setup tab the ‘Ethernet interface’ is enabled.
No motor movement	Check that the maximum step frequency of the motor driver. The CNC720 can go up to 400kHz. Lower the step frequency if necessary.
	Check that the enable signal might need to be inverted. See page 2 of the setup tab. To check whether the motor is enabled try to move it manually. Normally if a motor is enabled it will not easily be moved by hand.
	Make sure that the motor driver is supplied with power for the motors.
	Check that E-STOP is not active. The red LED on the board will be turned on in case of an E-STOP condition. Please note that the E-STOP circuit is also implemented in hardware. The E-STOP can be disabled to setting the appropriate jump
	Check that the controller is not in bootloader modus. By turning the board off, wait for 5 seconds and re-apply the power, and wait until the board has skipped the bootloader and try to reconnect with the software.

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