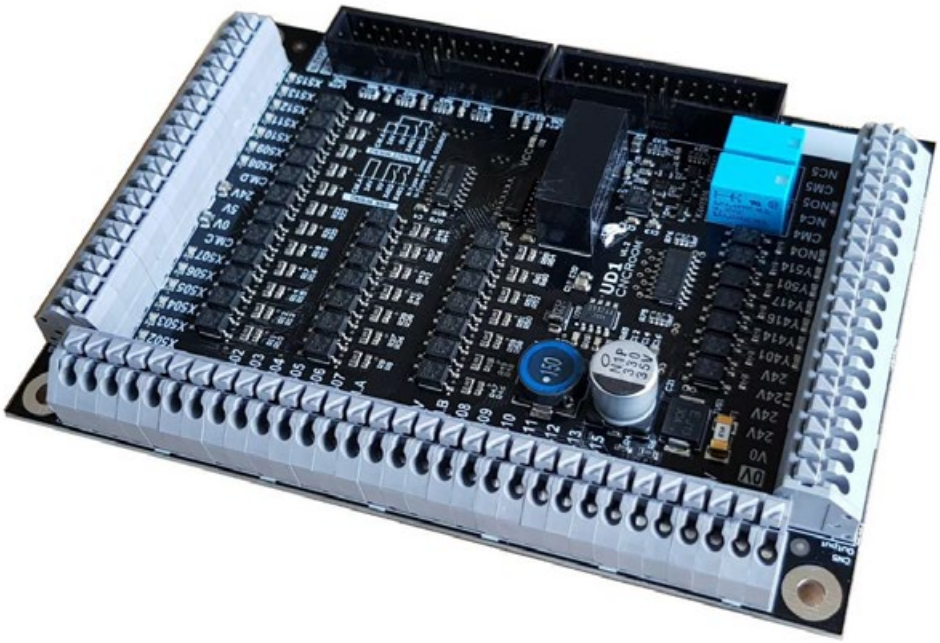
UD1

Owner's manual



Doc E1.2R1 (3/22/2018)
for PCB ver 1.2

Introduction

The UD1 is a daughter input board for the UB1 and CNCdrive's 5LPT motherboard. It utilizes parallel input port LPT4 and LPT5 of both motherboards. Since the UD1, UB1 and 5LPT follows the standard PC parallel port for their pin layout, the UD1 can also be used as an isolation input board for those products that follow standard PC parallel ports as well.

The UD1 comes in 2 versions: The universal input type (U-Type) and the NPN input type (N-type). The U-type able to handle various types of inputs including source (PNP) and sink (NPN), at 5V and 24V DC voltage. It also can be used with AC voltage as well. On the other hand, The N-Type is limited to connect with sink (NPN) at 5V and 24V DC voltage only.

Specification and Features

- (U-Type model) 26 isolated inputs which are separated into 4 groups. Each group has its own common connection point for selecting PNP/NPN, 5/24V, DC/AC.
- (N-Type model) 26 isolated inputs which are separated into 4 groups. Each group has its own common pin for selecting NPN type for 5V, 24V DC voltage.
- 6 transistor sink outputs, which accept both high and low active initial state from motherboards.
- 2 onboard relays with NO/NC contacts.
- A charge-pump circuit is provided. This helps the user to form a safety interlock condition between controller and devices.
- A single 24Vdc power supply is required. There is a 5Vdc isolated and a non-isolated dc2dc converter on board, thus saving installation space and wiring.
- LED status for all inputs and outputs. Makes it much easier to diagnose and trouble shoot.
- Isolated power and ground between the PC, UC300ETH and I/O, which eliminates crossover noise and ground loop problems.
- Polarity and over voltage protection (in conjunction with a fuse) for the 24Vdc power supply.
- Spring terminals for quicker connecting and disconnecting of cables. They are resistant to vibration, so no more screws which have rattled loose and no more forgetting to tighten.

Precaution

- Remember to static discharge before touching any part of UD1. Ground your body by wearing a grounding strap or frequent touching an earthed metal chassis to release electrostatics.
- Make sure that there is no high voltage leak from your soldering iron when soldering the solder-bridge – the safest way is to unplug your soldering iron from the mains power when it has reached a high enough temperature to melt the solder. High voltage leakage from a cheap soldering iron can potentially damage the integrated circuit (IC) on the UD1 board.
- The UD1 board is **Fragile**, do not drop, as it could badly damage the electronics components.
- In certain circumstances, it could be possible for the UD1 board to build up excessive heat if many of the inputs and outputs are active at same time over an

extended period. It is therefore advisable to install a good quality cooling fan to ventilate the cabinet.

Quick Reference

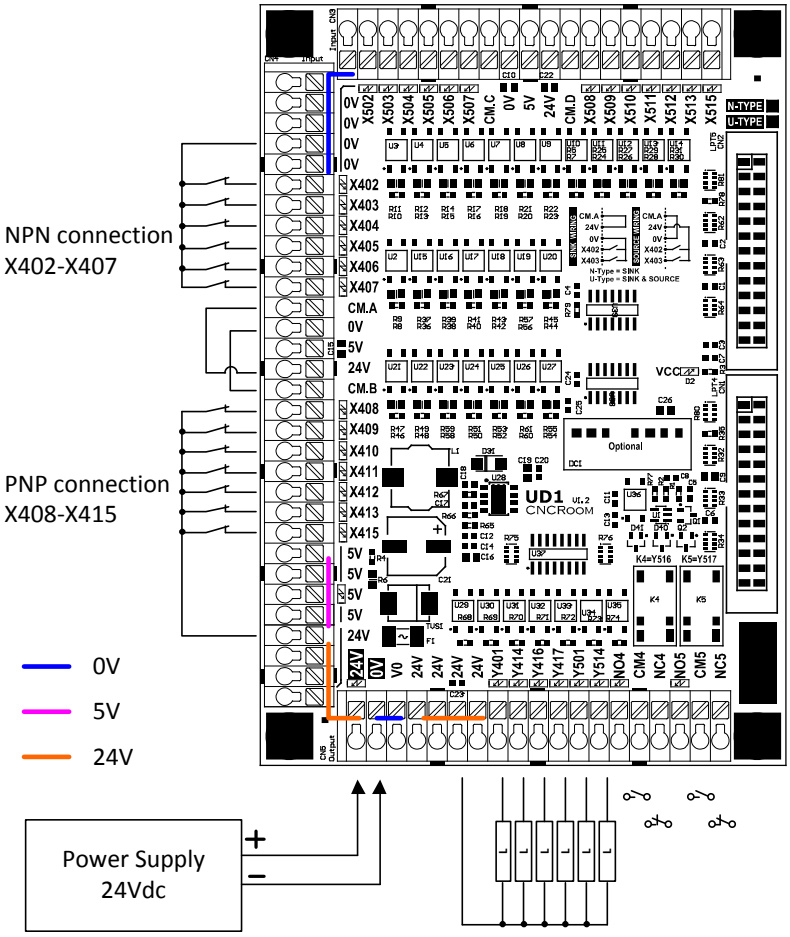


Figure 1, The UD1 Overview Connection

Port4			
Pin	I/O	Term Name	Description
1	O	Y401	Sink output
2	I	X402	Input, CM.A1
3	I	X403	Input, CM.A1
4	I	X404	Input, CM.A1
5	I	X405	Input, CM.A2
6	I	X406	Input, CM.A2
7	I	X407	Input, CM.A2
8	I	X408	Input, CM.B1
9	I	X409	Input, CM.B1
10	I	X410	Input, CM.B1
11	I	X411	Input, CM.B2
12	I	X412	Input, CM.B2
13	I	X413	Input, CM.B2
14	O	Y414	Sink output
15	I	X415	Input, CM.B2
16	O	Y416	Sink output
17	O	Y417	Sink output
CM.A1 = **C**ommon group **A**, sub group **1**			

Port5			
Pin	I/O	Term Name	Description
1	O	Y501	Sink output
2	I	X502	Input, CM.C1
3	I	X503	Input, CM.C1
4	I	X504	Input, CM.C1
5	I	X505	Input, CM.C2
6	I	X506	Input, CM.C2
7	I	X507	Input, CM.C2
8	I	X508	Input, CM.D1
9	I	X509	Input, CM.D1
10	I	X510	Input, CM.D1
11	I	X511	Input, CM.D2
12	I	X512	Input, CM.D2
13	I	X513	Input, CM.D2
14	O	Y514	Sink output
15	I	X515	Input, CM.D2
16	O	NO4,(Y516)	Relay Contact
17	O	NO5,(Y517) 2nd CP	Relay Contact
CM.D2 = **C**ommon group **D**, sub group **2**			

Table 1, Ports and Pins Reference Tables

Figure 1 shows the general connection of inputs, outputs and power input.

Table 1 is a summary of the Ports and Pins and their corresponding reference numbers. All pin numbers preceded by an "X" are inputs and those preceded by a "Y" are outputs. Using X410 as an example. The "X" means it is an input. The first digit "4" is the port number, the last 2 digits "10" are the pin number.

UD1 Layout

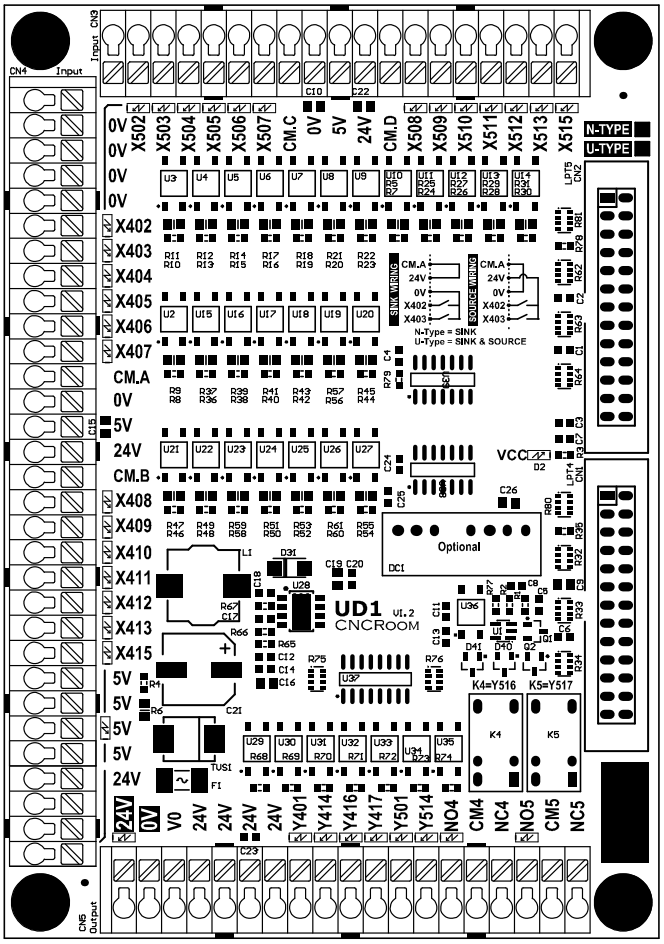


Figure 2, The UD1 version 1.2

LPT4, LPT5 (CN1, 2) – 26 pin header for interfacing to motherboard UB1, 5LPT.

Input (CN3, 4) – Input terminals, consisting of 4 groups. Each input group has their own common terminal for selecting type of connection whether NPN or PNP depending on sink in or source out power supply.

Output (CN5) – Output terminals, consisting of 6 isolated NPN sink outputs, 2 Relay's NO/NC.

UD1 inter- connection

The UD-1 includes a free PCB Linker, which allows you easily connect it to a UB-1.

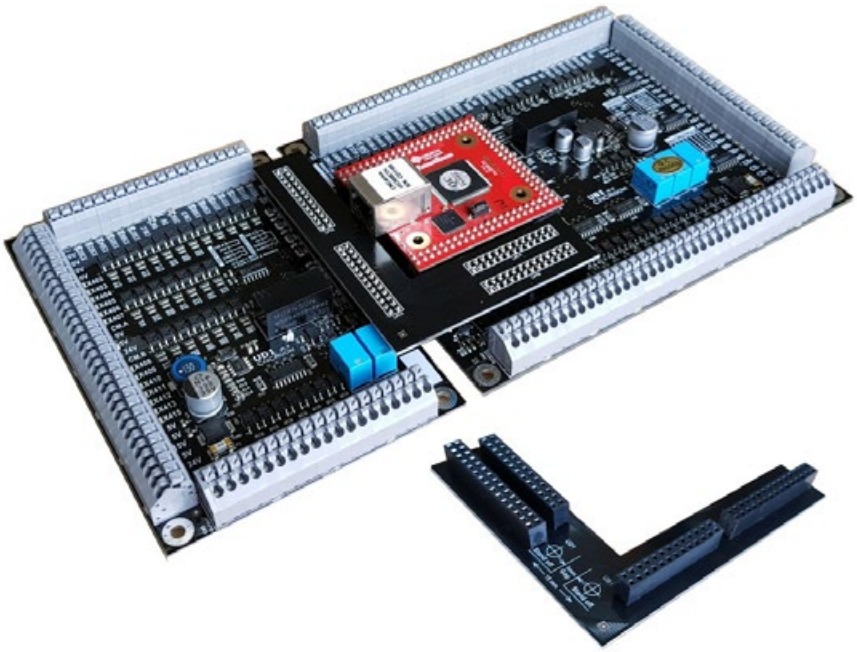


Figure 3, The UD1 connect to UB1 with PCB Linker

You also can use female IDC 26 pin ribbon cables to make a connection between UD1 to motherboard as shown in picture below. To insure a quality logic signal, please make sure that the length of the cable does not exceed 1 foot.

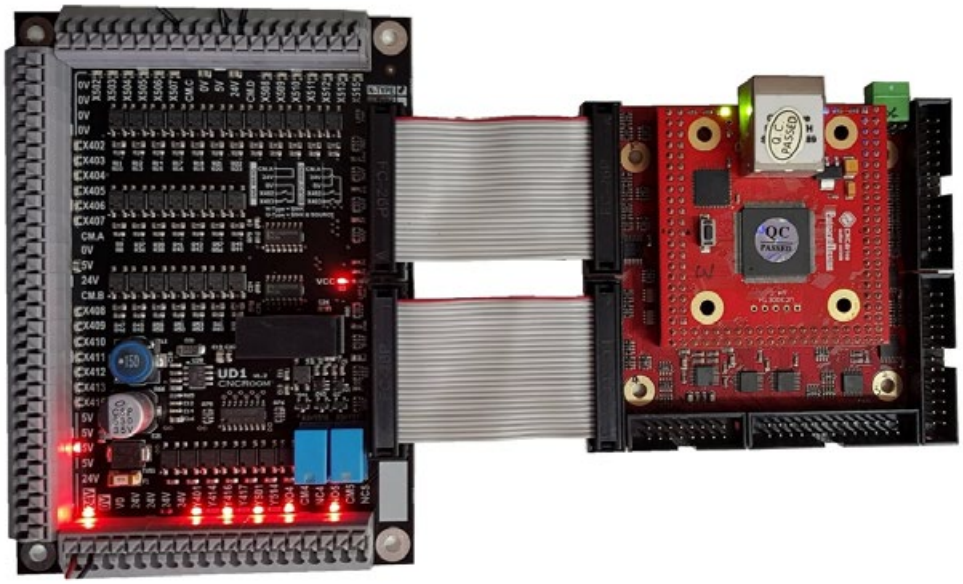


Figure 4, The UD1 connect to CNCdrive 5LPT with female IDC 26 pin ribbon cable

Hardware

Power Supply

The UD1 requires only a single 24Vdc 500mA power supply to power the board. However, a 24Vdc 3Amp power supply is recommended for general usage. **Figure** 5 shows the power input for 24V and 0V with highlighted label on the lower left hand side terminal.

There is a step-down switching regulator that converts 24V (18-28Vdc) down to 5V to supply most parts of the circuit, including the inputs and outputs.

There is also a special isolated DC2DC module 5Vdc 600mA on board. If using the UD1 with a 5LPT motherboard, this DC2DC module is able to supply power for both the 5LPT and UC300ETH. However, if additional devices consume more power than the DC2DC module can supply, it will temporarily stop working. In this case you need to use an external 5Vdc power supply by connecting it to the green power terminal of 5LPT board. You also need to de-solder a power supply solder-bridge [1] which located right under the DC2DC module.

There are many power distribution terminal points, which are labelled in 0V, 5V, 24V. The user can use these as the power source for external devices and circuits.

The 5V-0V can supply up to 500mA and the 24V-0V can supply up to1000mA. It is recommend setting up an external terminal for power distribution points if many connection points are required.

On board there is also a small fuse for protection against over voltage and polarity reversal.

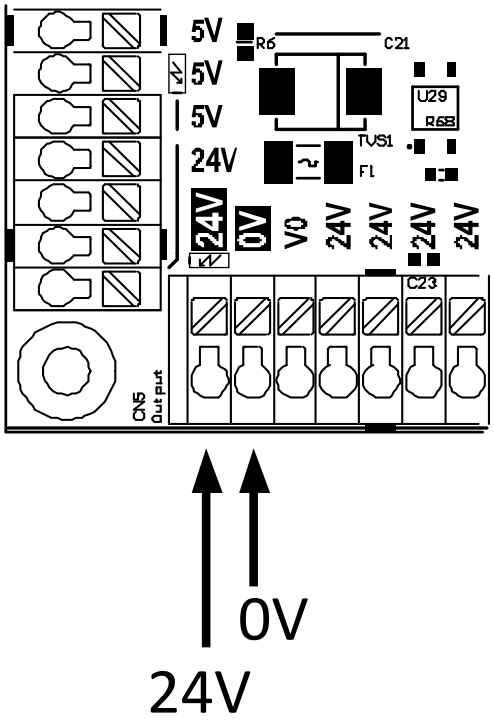
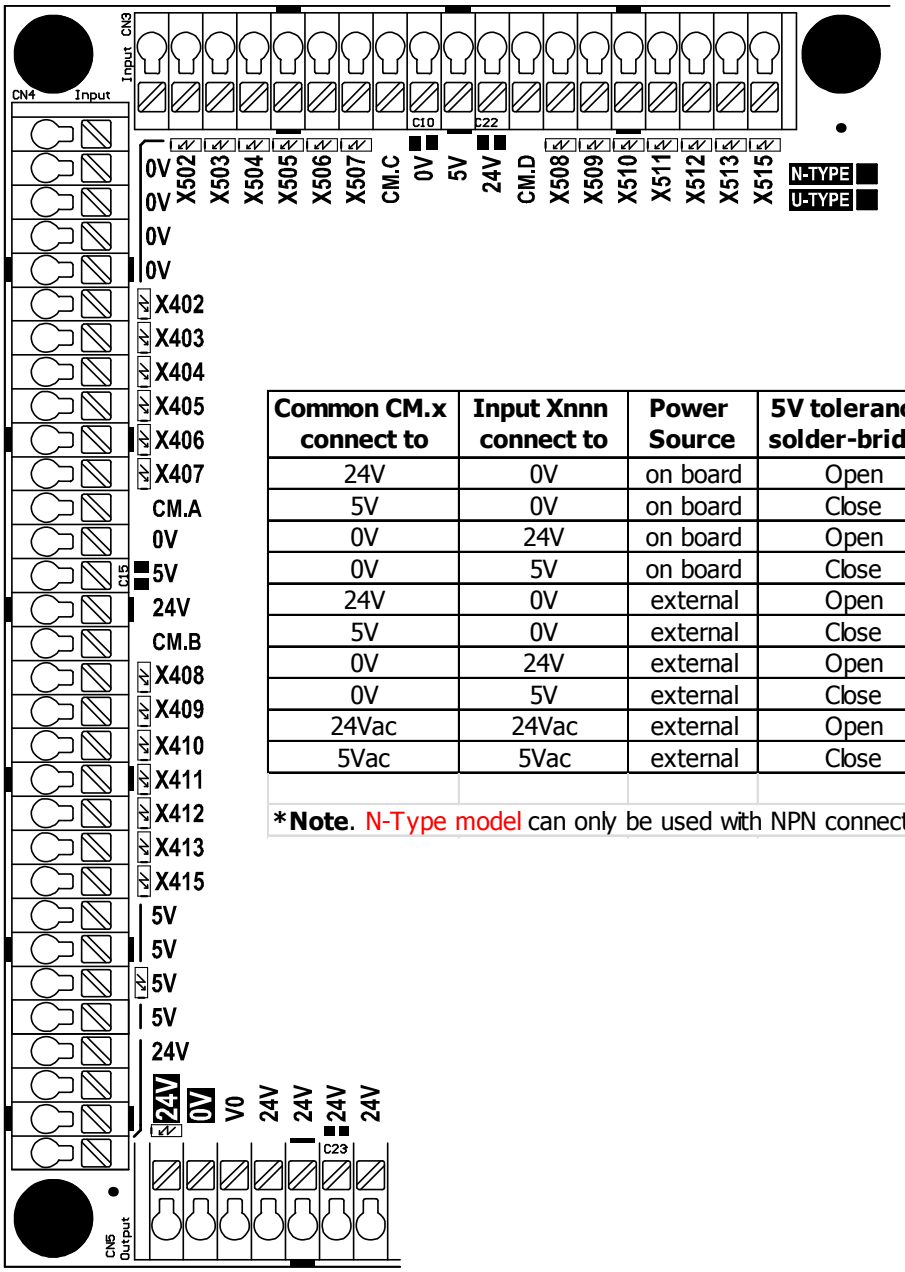


Figure 5, Power supply connection

Inputs

The UD1 uses a new method of making connection to its inputs. The input commons are used to select the type of input whether NPN or PNP. The table below shows the input type and its combination.



Common CM.x connect to	Input Xnnn connect to	Power Source	5V tolerance solder-bridge	Connection Type*
24V	0V	on board	Open	NPN
5V	0V	on board	Close	NPN
0V	24V	on board	Open	PNP
0V	5V	on board	Close	PNP
24V	0V	external	Open	NPN
5V	0V	external	Close	NPN
0V	24V	external	Open	PNP
0V	5V	external	Close	PNP
24Vac	24Vac	external	Open	AC
5Vac	5Vac	external	Close	AC

***Note**. N-Type model can only be used with NPN connection type

Figure 6, Input terminals

All inputs are separated into 4 groups, with each group having its own common. These are: CM.A, CM.B, CM.C and CM.D. There are also sub groups available for the users to modify as their preference via solder-bridge [5].

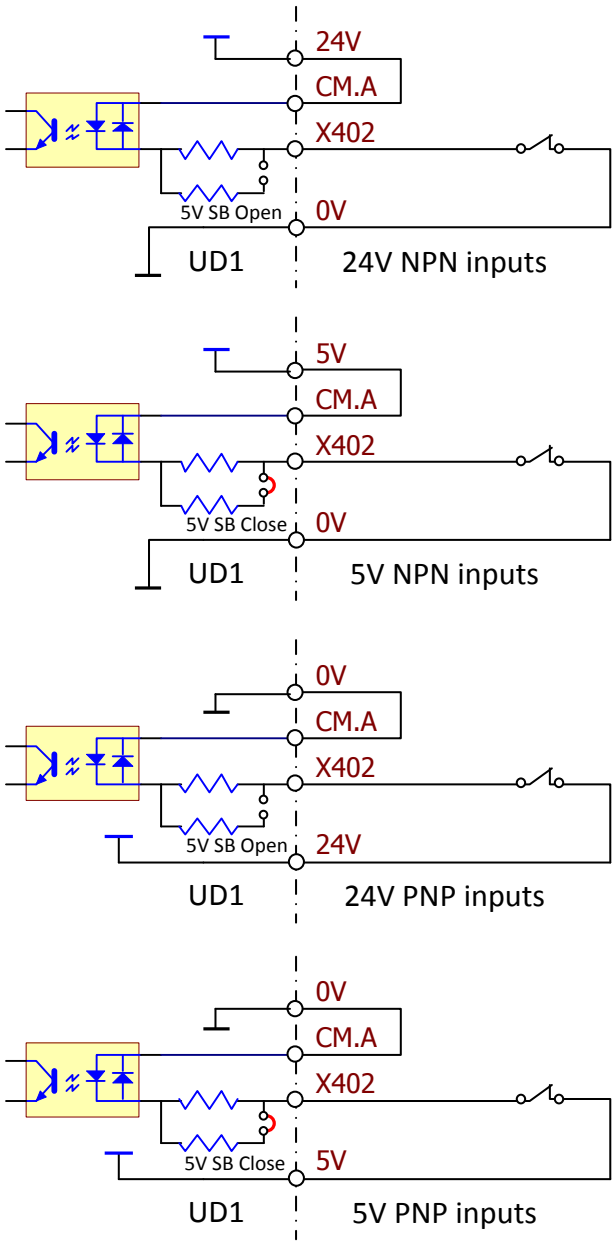


Figure 7, Input types and voltage tolerance with on board power source

Figure 7 shows Input types of switches connection with on board power supply. Notice that, 5V tolerance solder-bridge for each input. The user needs to close or solder across solder-bridge if 5V devices connected to this input.

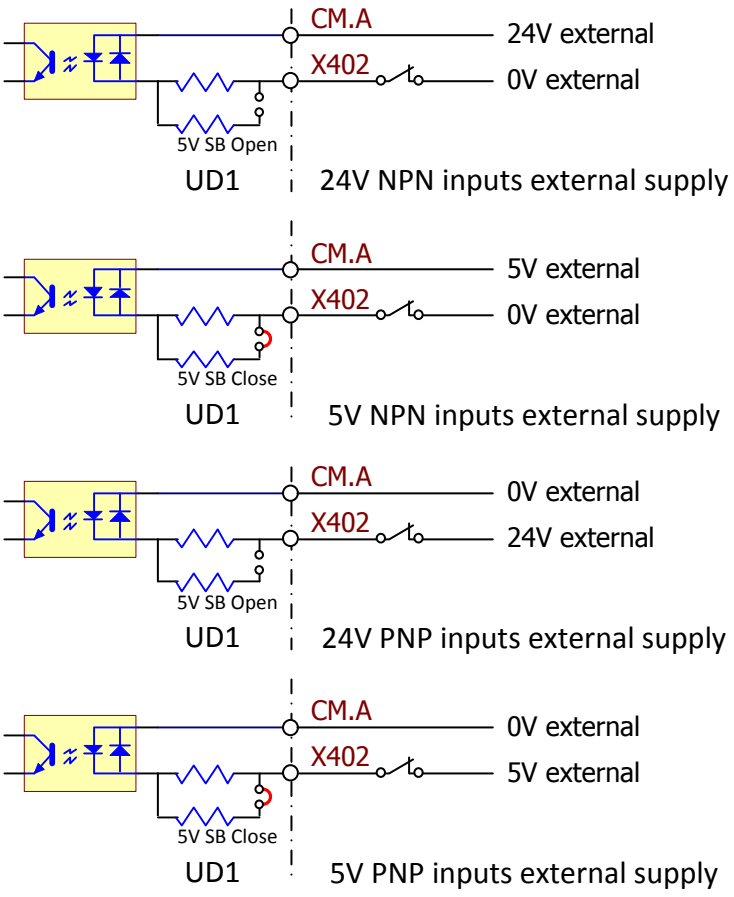


Figure 8, Input types with external power supply

Figure 8, shows input types connect to switches with external power supply. Notice that, there is a 5V tolerance solder-bridge for each input. The user needs to close or solder across solder-bridge if 5V devices connected to this input.

Sensors Connection

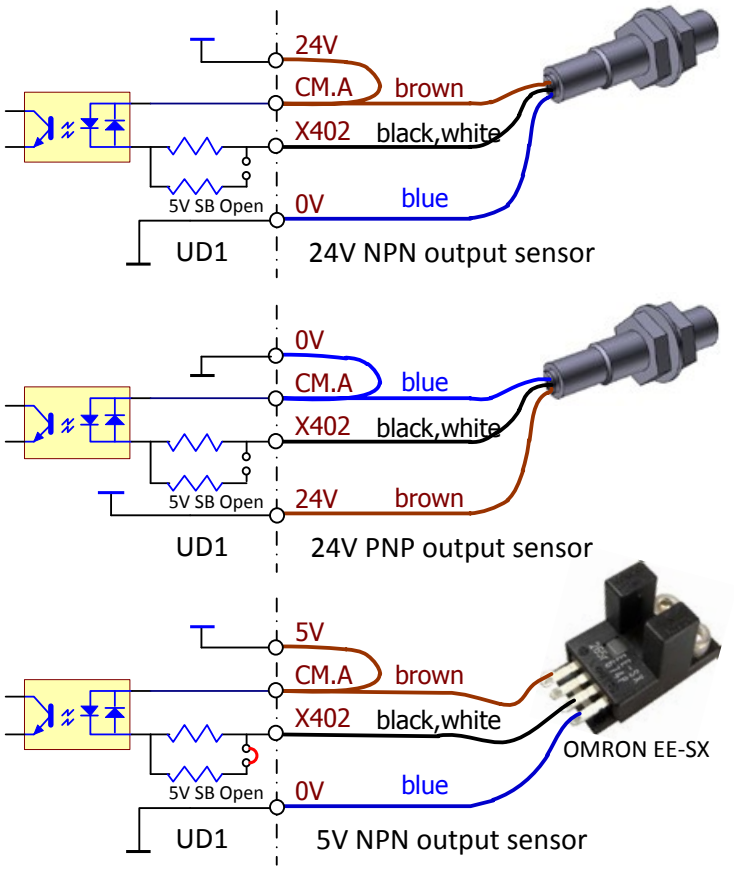


Figure 9, Sensors connection

Figure 9 shows NPN and PNP output type of sensors connect to input terminals of UD1. Notice that 5V tolerance SB is closed when connect to 5V sensor.

MPG Connection

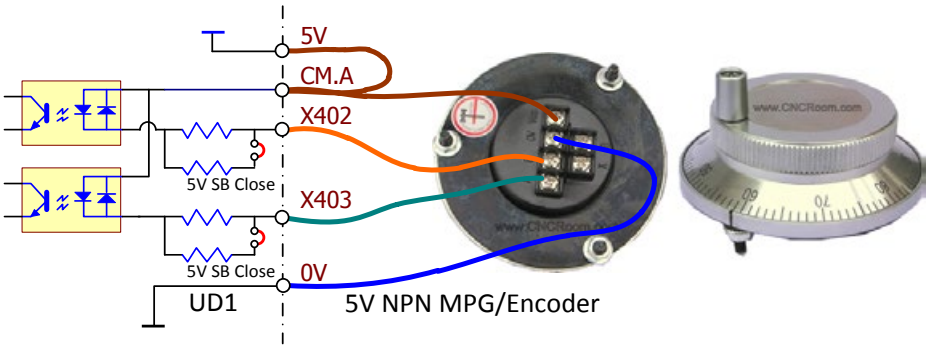


Figure 10, MPG connection

Figure 10 shows MPG 5V connection. The open collector output of MPG need be connected with NPN input style. Notice that 5V tolerance SB is closed when connect to 5V devices.

Outputs

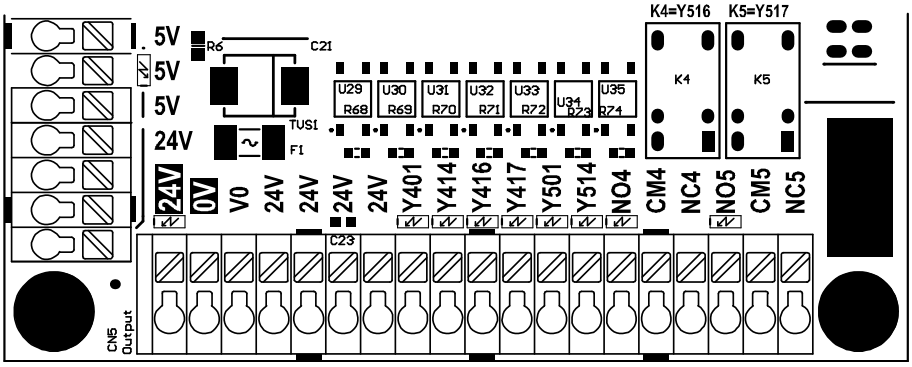


Figure 11, Output terminals

Figure 11 shows the UD1 output terminals. It consists of 6 transistor sink output and 2 relays NO/NC contacts.

Transistor Sink Output

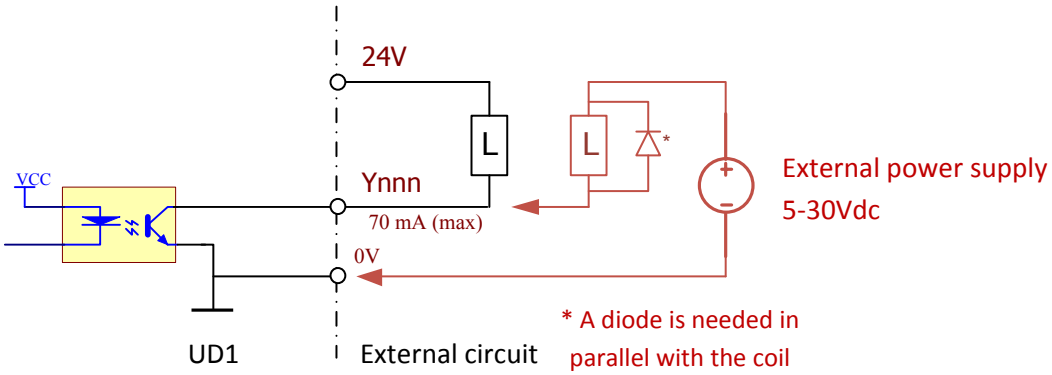


Figure 12, Connecting loads to a "Y" output

Warning! There is NO short circuit protect for transistor outputs. The over current or short circuit will damage driver chip.

Relays

The UD1 comes with 2 on-board relays, K4 and K5 provide both NO and NC contacts.

By default, the K5 Relay is dedicated for charge pump circuit. However the user can disable this function by closing solder-bridge [3] which makes the relay K5 become as normal on/off by command thru Y517 output.

Warning! These 2 relays are signal relays and should never be used as power relays. They are intended to convey signals such as forward and reverse to a VFD (Variable Frequency

Drive) to control motor rotation of a spindle or similar. They can be used for other purposes as well, and the user needs to map them in software accordingly. However, please take care, as the contacts of these relays can carry a maximum current of only 0.5 Amps at 120VAC, or 1 Amp at 24Vdc. The user must use an external relay if the load requirements of the device will exceed the aforementioned current rating.

Modification

Solder-Bridges

The UD1 has a number of places where the user can conduct modifications. Instead of using pin jumpers, solder-bridges have been implemented to save cost and space. The user needs to solder or de-solder these bridges to achieve their purpose.

(*Note: the below sub heading numbers, *1 to *6 relate to the printed numbers on the under-side of the UD1 board.)*

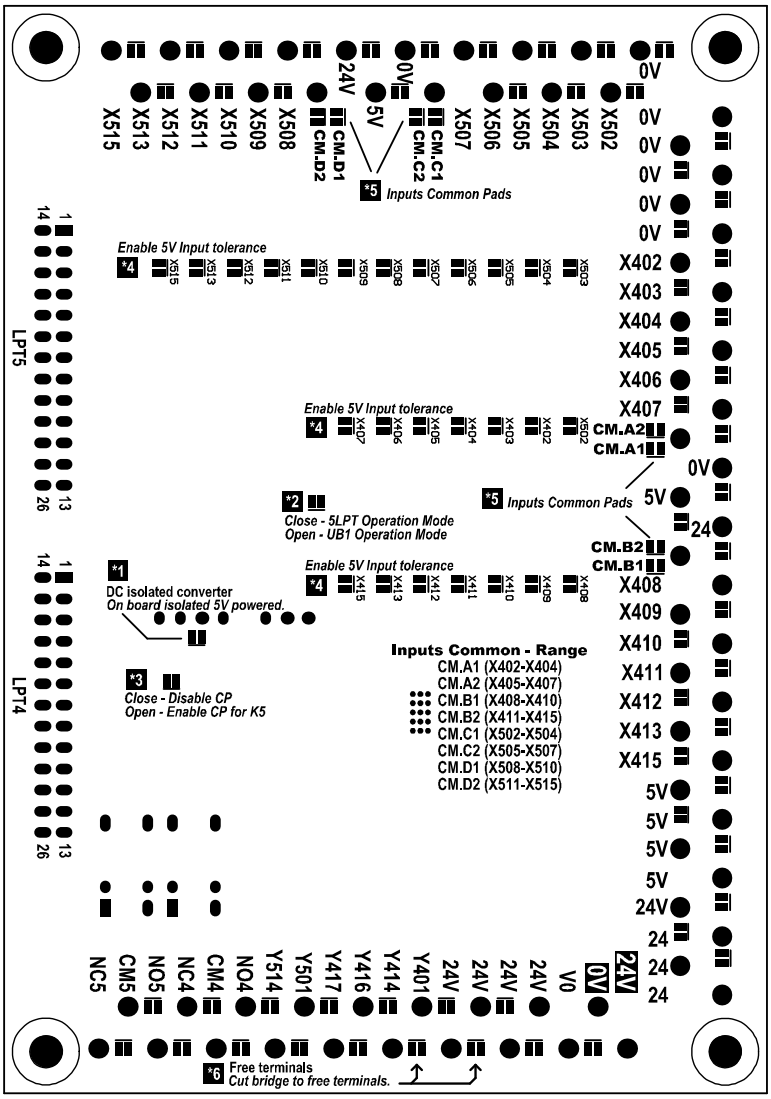


Figure 13, The bottom layout of the UD1

*1. DC Isolated Converter

There is an option to not use the default onboard 5V isolated DC2DC converter. Because this on-board converter can only supply a limited current, in some cases it may be necessary to use an external 5V power supply. The existing bridge has to be de-soldered, and then the user can connect an external 5V power supply to motherboard power input.

*2. Operation Mode

By default, this solder-bridge is **opened** and it works in UB1 operation mode for high active initial state. Close or solder across this solder-bridge for 5LPT for low active initial state operation mode.

*3. CP function for K5

By default, this relay is designed to be a second charge-pump of the system. However, relay K5 can be used as normal on/off relay if this solder-bridge is soldered across.

*4. 5V input tolerance

By default, all inputs accept 24V power from external devices. However, the user can make these inputs to accept 5V by closing the solder-bridge for each input.

*5. Input sub common

By default, inputs common are divided into 4 groups. Each group has 6-7 inputs that tied together. However, the user can break or isolate fewer inputs apart from the original group and wire it up with other group as their preference. The remain fewer inputs may be used for external AC voltage or high noise source. In short, the sub common is designed for trimming or expanding inputs from the existing group.

*6. Free Terminals

In some circumstances, the user may need a few extra terminals for their work. This can be achieved by cutting or de-soldering one or more of the bridges at the respective terminals. These free terminals are only meant for use with low voltage, nothing over 24V.

Software

In general, software setting or I/O mapping of UD1 is done in the same way as UB1 motherboard. More detail in setup, please refer to UB1 manual.

Second Charge Pump

Physically, the relay K5 is defined as a charge pump output. However the port 5 and pin17 in software need to be set accordingly in configuration of UCCNC and Mahc3 below.

However, if normal ON/OFF function for K5 is preferred, the port and pin of charge pump 2 must be clear to 0 and solder-bridge [3] must be closed.

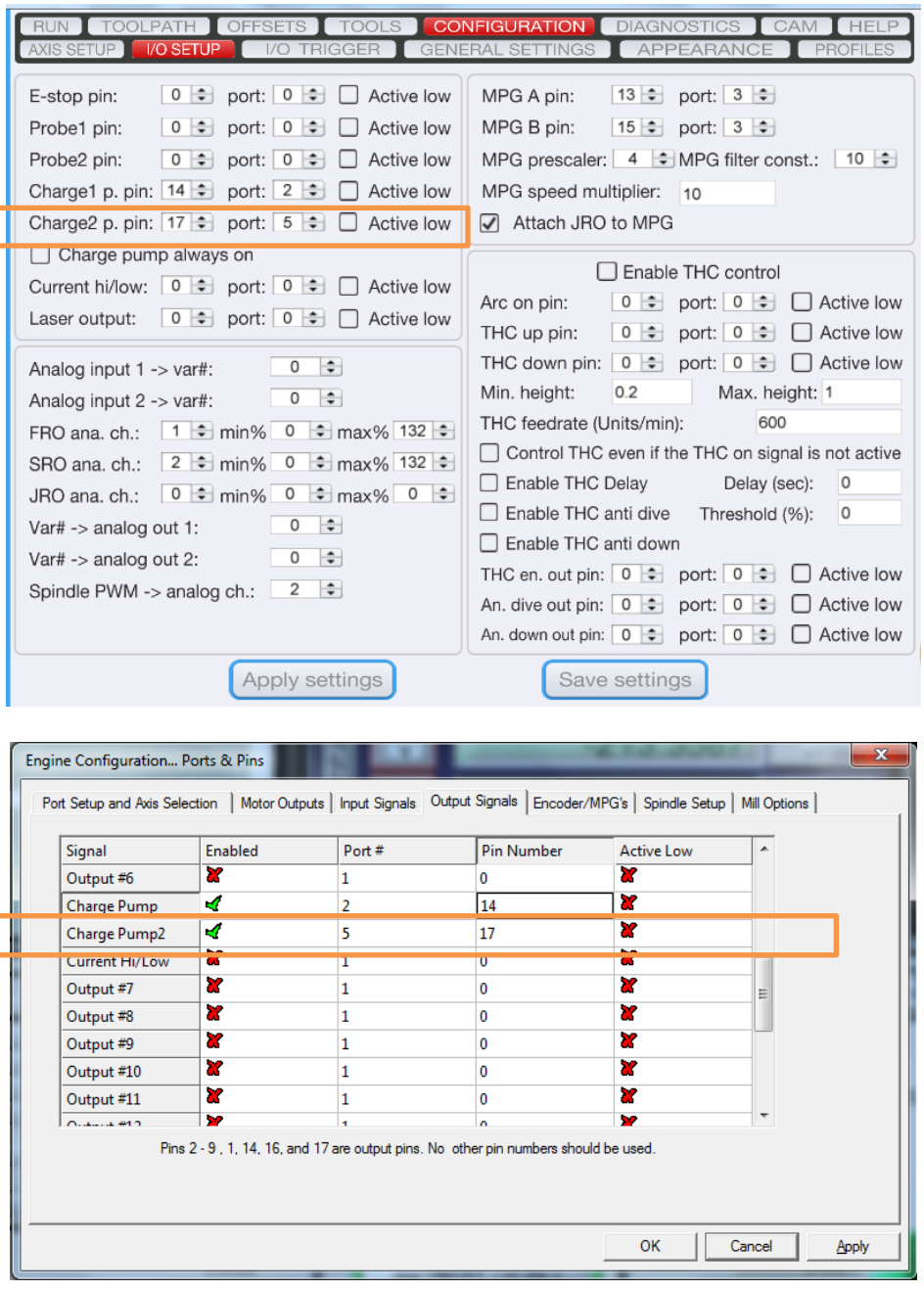
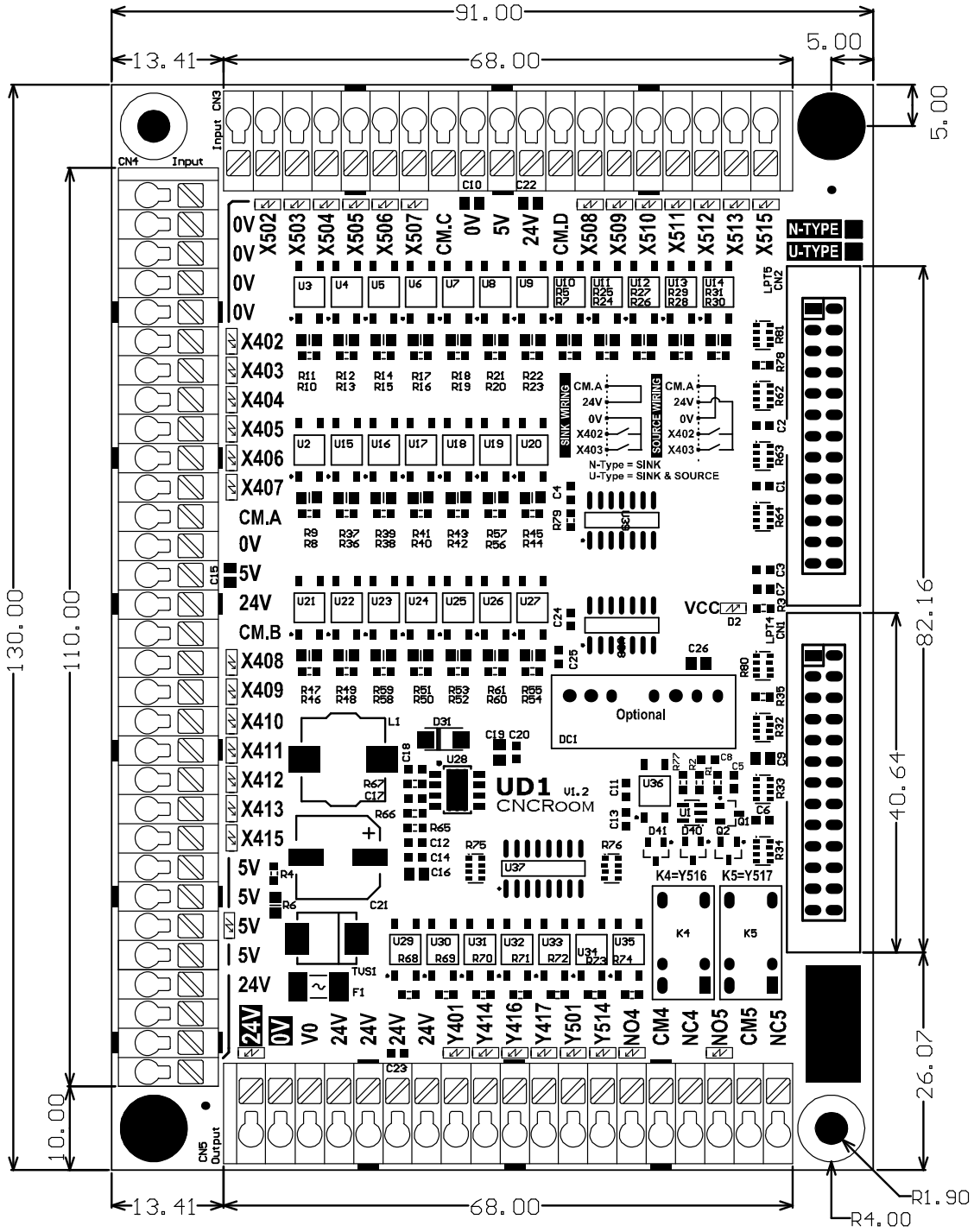


Figure 14, Second Charge pump in both UCCNC and Mach3

Appendix I UD1 Specifications

Dimensions	130 x 91 mm (height x width)
Supply voltage	24V 500mA (18-28Vdc), recommended 3A for general usage.
Supply voltage ripple	≤ 5%
Outputs	NPN, Sink 5-24Vdc, 70mA Max
Relay contact	0.5A 120Vac, 1A 24Vdc
Inputs (U-Type model)	NPN/PNP, DC/AC, 24/5V
Inputs (N-Type model)	NPN, DC 24/5V
Ambient operating temperature	0-40°C

Appendix II UD1 Board Dimensions



Appendix IIV Figure and Table references

Figures

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Table