UCSB single port breakout board user's manual

Contents

1. Features

The UCSB is a single port signal breakout board making the wiring and connections to 1 standard pinout LPT port on a motion controller easy.

The IDC-26 port has a pinout of a standard LPT port.

The exact pinout of the port is described in details in this manual.

The board has a total of 12 outputs and 5 inputs.

All I/Os are optically isolated with fast 10Mbit/sec speed optocouplers.

The outputs are capable to drive 24V voltage levels and upto 1Amps of current with integrated N-channel power mosfets.

The inputs are also optically isolated with fast 10Mbit/sec speed optocouplers and are capable to interface to outputs of sensors and switches with NPN, PNP, push-pull and line driver outputs.

2 Dimensions

The UCSB board can be mounted with the 6pcs of 3.5mm dia drills with 7.5mm plating.

The mounting drills and plates are all isolated on the board.

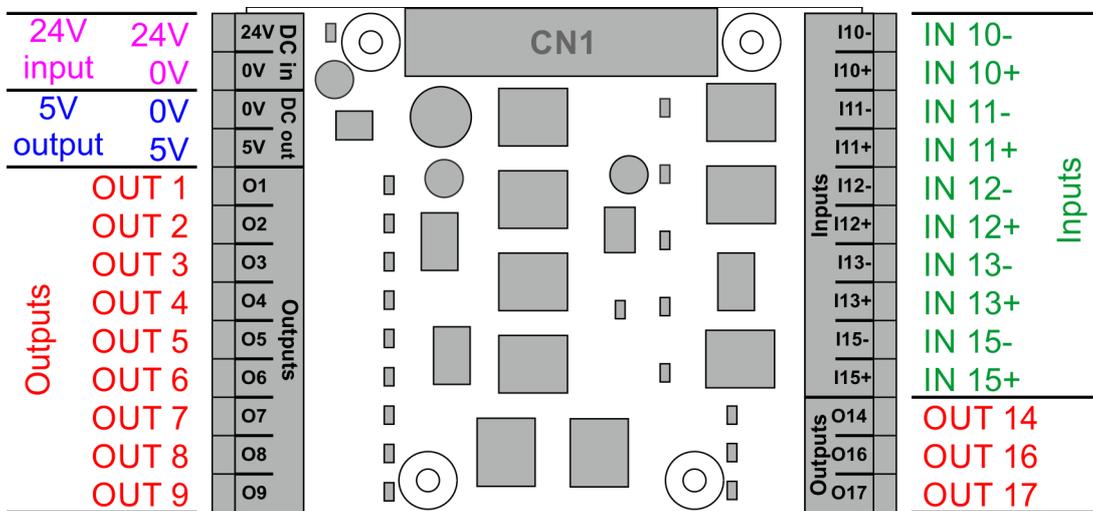The following image shows the dimensions and the mounting drills placements:
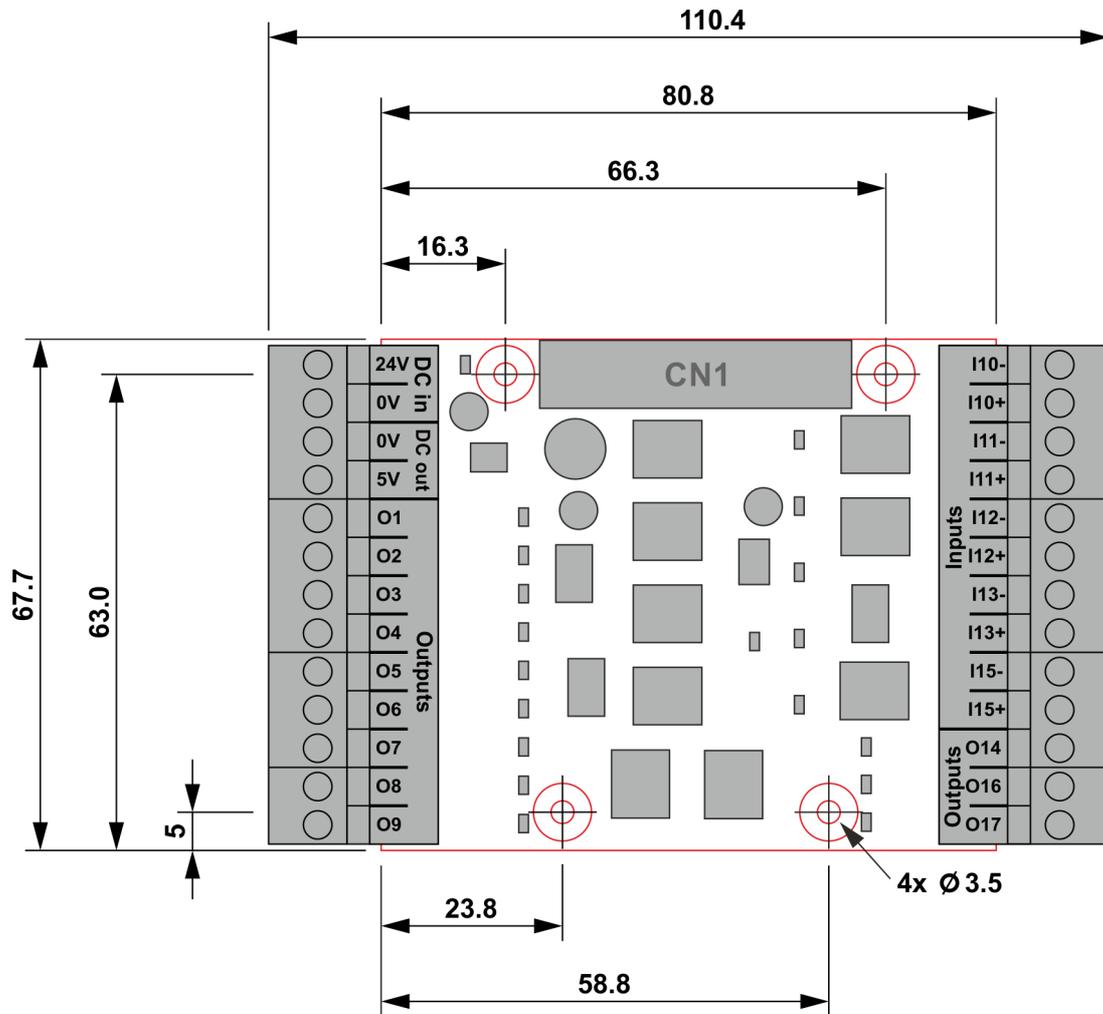
3 Connectors

3.1 Screw terminals

The UCSB has plug type screw terminal connectors on 2 sides of the board. The screw terminals have 5.08mm pitch and can be plugged and unplugged in sections of 4 terminals.
The pinout of the screw terminals is shown on the following image:

3.2   IDC port

There is one IDC26 port on the board to interface the UCSB breakout board to one standard LPT ports or to one standard pinout port on the motion controller.
The port has standard LPT port pinout and can connect to a standard LPT port or a standard pinout port of a motion controller, for example to a UC100, UC300, UC300ETH-5LPT, UC400ETH.
The following image shows the pinout of the IDC port of the UCSB breakout board:
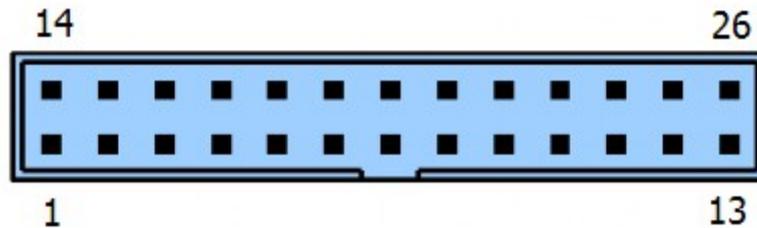
Pin number	Signal type
1	Output 1.
2	Output 2.
3	Output 3.
4	Output 4.
5	Output 5.
6	Output 6.
7	Output 7.
8	Output 8.
9	Output 9.
10	Input 10.
11	Input 11.
12	Input 12.
13	Input 13.
14	Output 14.
15	Input 15.
16	Output 16.
17	Output 17.
18-25	Ground
26	5 Volt output

3.3   Powering

To power the breakout board a 24Volts DC power supply is required with at least 500mA of current capability. The powersupply has to be connected to the screw terminals 1. and 2. with the polarity shown on the next drawing in this manual.
The board has a reverse polarity protection for the input power, so reverse polarity connection on the power supply will not damage the board, but the board will not work if the power supply is reverse polarity connected.

The same 24V powersupply used to power the device can be used to power the externally connected devices like the limit and home sensors, e-stop button etc. and relays and other devices connected to the board for I/O functions.When sizing the powersupply these externally connected device's power consumptions should be also taken into account and should be counted with.

An 5Volts is generated onboard by the UCSB board which 5Volts is accessible on the screw terminals 3. and 4.
This 5Volts can be used to drive for example the step and direction signals of the stepper or servo drives connected to the UCSB in the control box if they require 5Volts voltage levels.

The board also requires an 5Volts power to drive it's internal logic circuits.
When using a motion controller like the UC300ETH-5LPT then the UCSB board gets this 5Volts power from the motion controller via the 26.pin of the IDC connector.
When using an LPT port insteat of a motion controller then the 5V power has to be connected to the 2 pin nylon pin connector located below the IDC connectors.
The following image shows the connector and the proper polarity of the connection.
Make sure to use the proper polarity and the proper 5V voltage level, because incorrect polarity connection and/or overvoltage can damage the board.
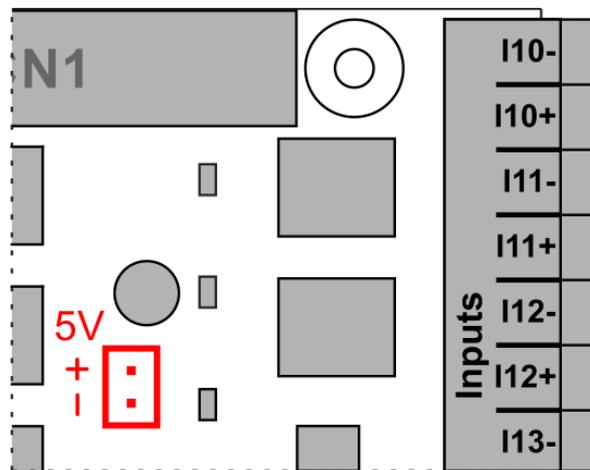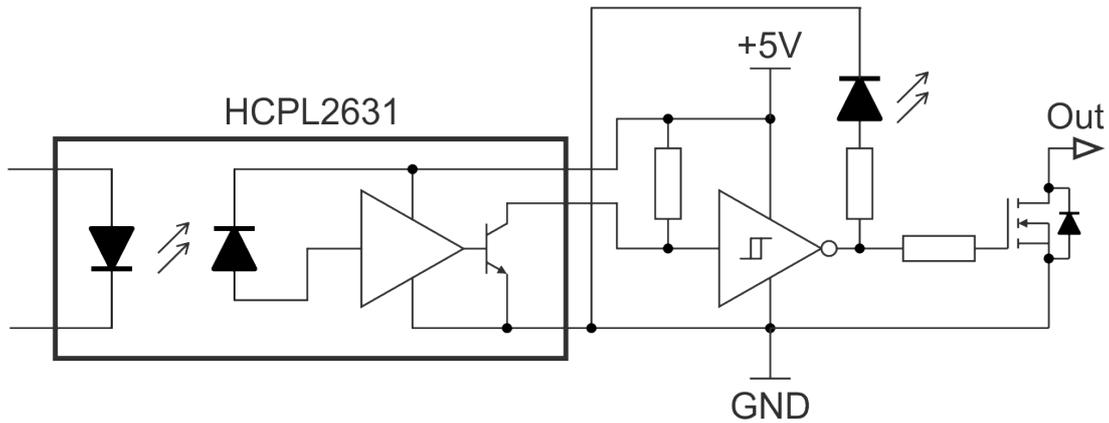

3.4   Outputs

There is a total of 12 optically isolated outputs on the UCSB board.
All outputs are electrically identical and all of them using high speed 10Mbits/sec optocouplers and an N-channel power Mosfet with 50Volts voltage and 2Ampers current rating.
Any of the outputs can be used to drive a step or direction signal of a stepper drive or to drive an external relay coil or an input LED of a solid state relay.
All outputs are capable to drive any voltage levels upto 24Volts and we recommend driving loads with upto 1Ampers of current.

3.5 Inputs

There is a total of 5 optically isolated inputs on the UCSB board.
All inputs are electrically identical and all of them are using high speed 10Mbits/sec optocouplers.
The inputs were designed to work within the 12V to 24V input voltage range with the 2.2kOhms onboard resistors in series with each input.
Due to the high speed optocouplers used on all inputs therefor they are capable to even interface incremental encoders or other high speed devices.
Because both sides of the optocoupler are wired out this makes it possible to interface sensors with NPN or PNP or push-pull or even line drivers.
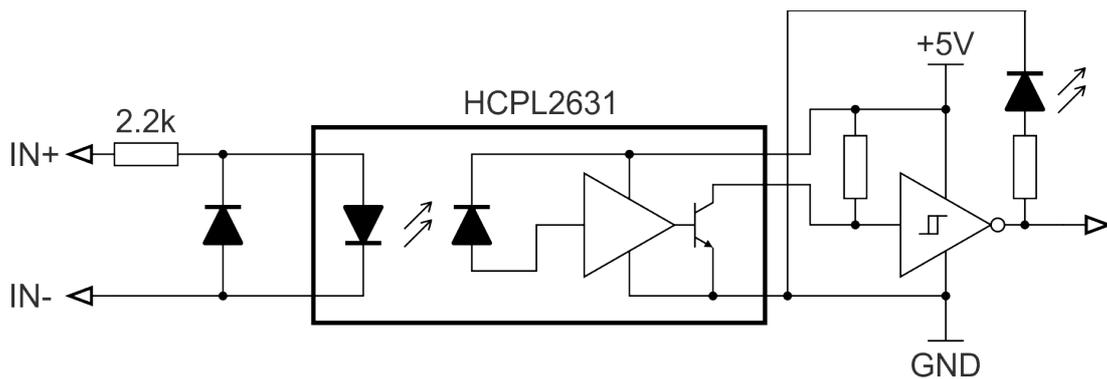

4 LED indicators

There are LED light indicators on all I/Os of the UCSB board and there are also LEDs indicating the internal 5V power and the 24V input voltage.
The LED LP1 is for the 24V input voltage and the LED LP2 is for the 5V internal power.
The LEDs marked with LI indicates the logic state of the inputs and the LEDs marked with LO indicates the logic state of the outputs.
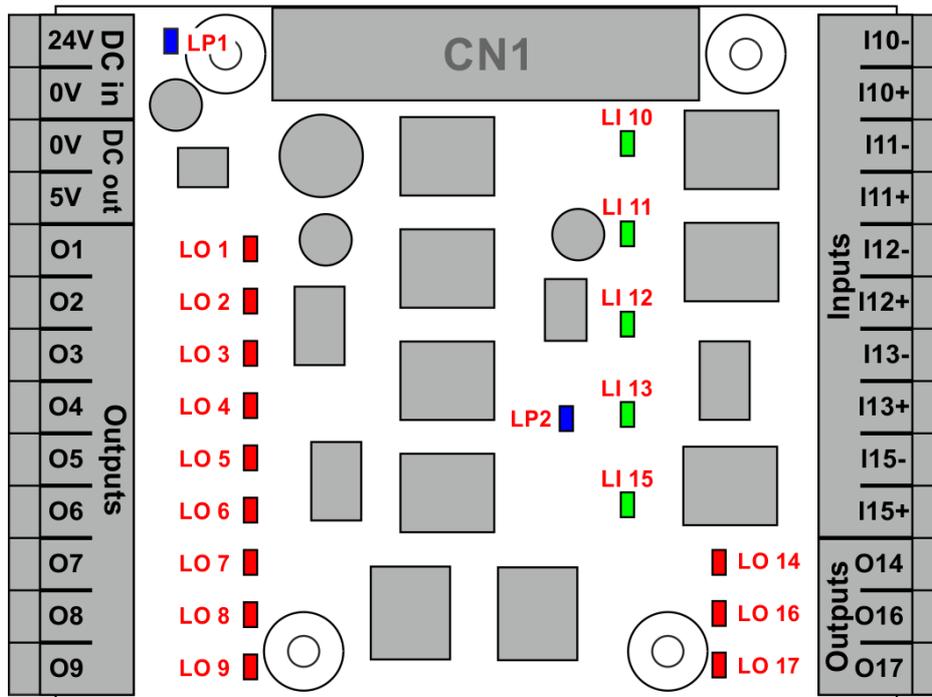
5 Example connections
5.1 Connecting different devices to outputs
5.1.1 Connecting a mechanical relay

To connect a mechanical relay to the output is simple. When the mechanical relay coil rated voltage is 24Volts DC then the powersupply powering the USBB board can be used to power the relay. Connect the 24Volts of the power supply to the positive side of the relay coil and connect the negative side of the relay coil to the screw terminal of the output.

If the relay coil is rated to a different voltage not 24Volts then a second powersupply is required to power it. Common the 0Volts output of the second power supply with the 0Volts output of the powersupply which powers the UCSB board to have the second powersupply referenced to the same 0Volts potential. Connect the positive powersupply voltage to the positive side of the relay coil and connect the negative side of the relay coil to the output screw terminal of the output. The following image shows how to connect a mechanical relay:
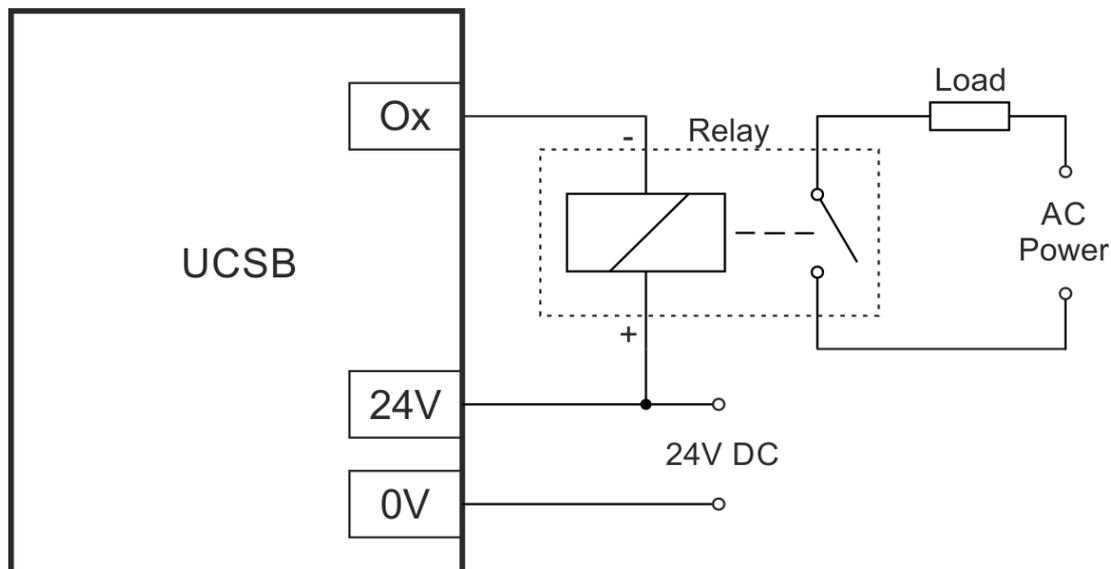
5.1.2   Connecting a solid state relay (SSR)

Solid state relays (SSR) are non-mechanical type relays where the switching circuit inside the relay is an electric circuit mostly with a Mosfet or IGBT or Triak.
These kind of relays having an optocoupler with LED on their inputs and they can be driven similar way as a standard LED. A series resistor often has to be connected in series with the LED anode of the SSR. This series resistor is used to limit the LED current to a value adviced in the SSR's datasheet. If a series resistor is required and for the recommended value of the series resistor please see the used SSR's product manual.
The shematics of the SSR connection to the UCSB board is shown below:
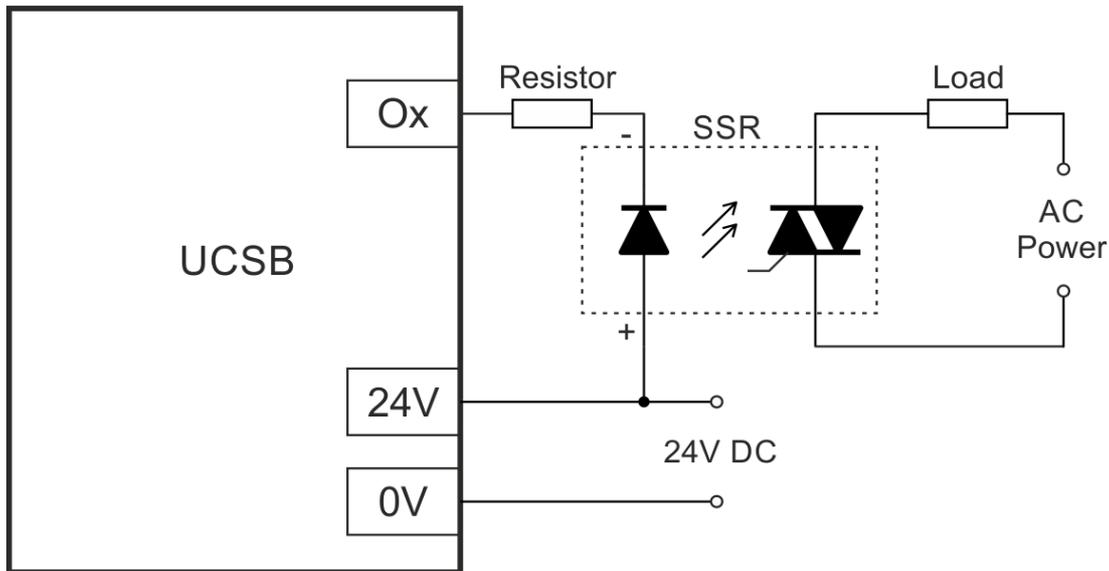

5.1.3   Connecting a step and direction signals

To connect the step and direction signals to stepper or servo drives any of the 16 outputs can be used. Most stepper drives have an optocoupler on these signals with a series resistor fitted in series with the LED of the optocoupler. Mostly the series resistor's value fits a certain voltage level or voltage range, usually it is around 5Volts. With these drives the 5Volts from the screw terminals 3. and 4. can be used to drive the step and direction lines of the drives as shown on the following picture:
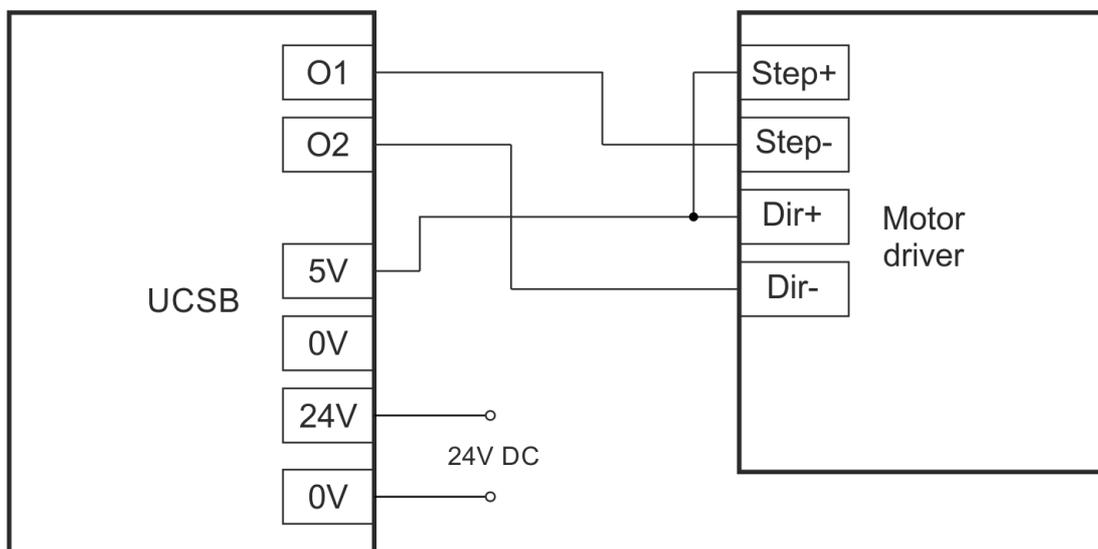
Higher voltage may be also used to drive the step and direction lines, but in this case a series resistor may be required with the signal which series resistor will limit the current flowing into the LED of the optocoupler. The resistor value depends on the voltage used and the optocoupler in the drive and the series resistor installed into the stepper drive. Usually a 2200 Ohms resistor is a proper value when 24V is used, but to make sure that the installed resistor has a proper resistance please check the stepper drive's manual for details on the step and direction circuitry.
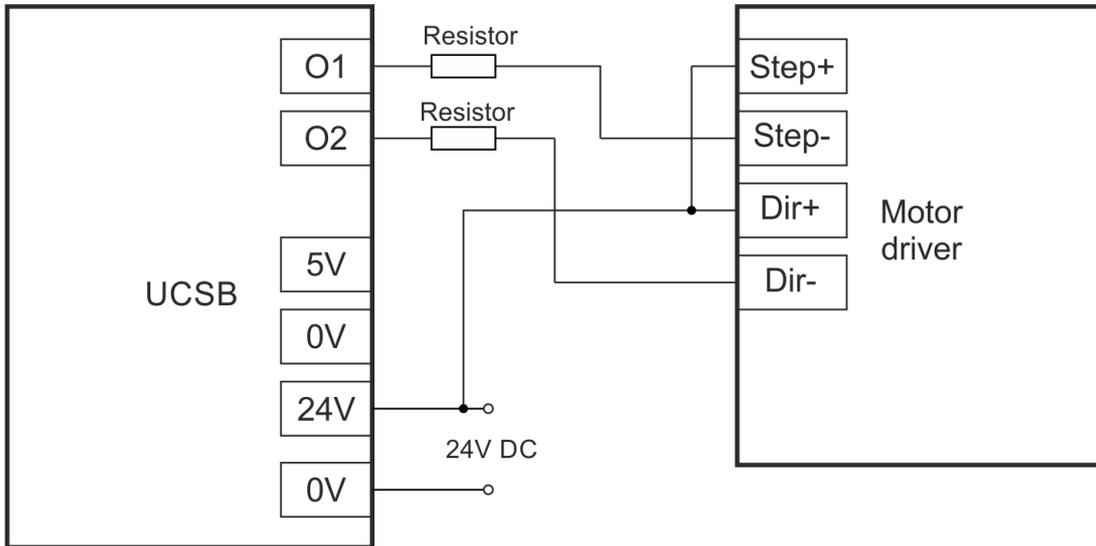
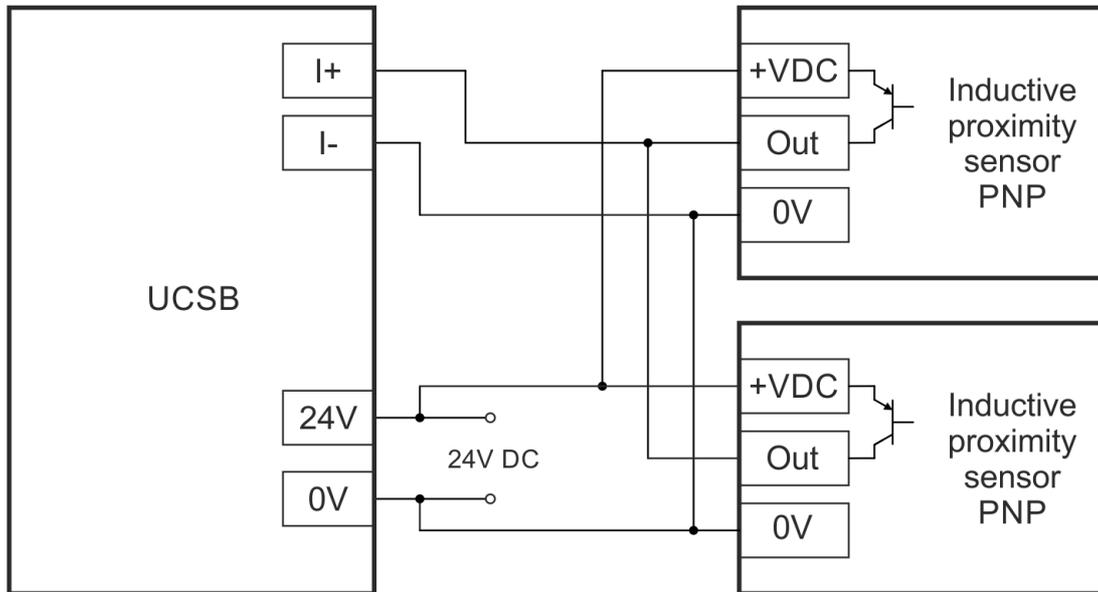## 5.2 Connecting switches and sensors to inputs
5.2.1 Connecting NPN switches

Any number of NPN type outputs can be wired in parallel to a single input as shown on the below schematics drawing:
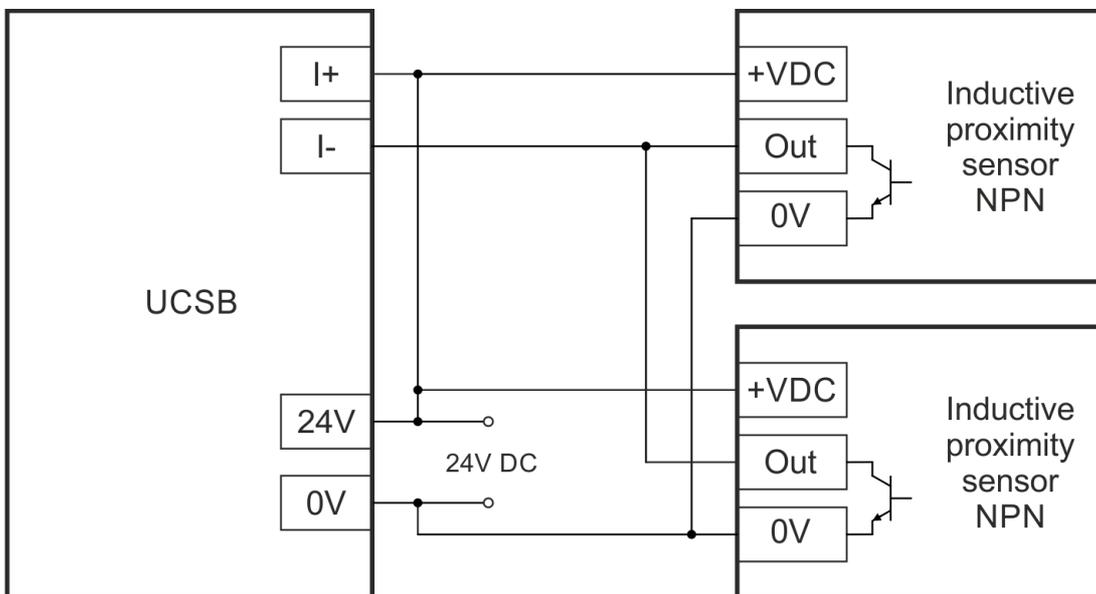
5.2.2 Connecting PNP switches

Any number of PNP outputs can be wired in parallel to a single input as shown on the below shematics drawing:

5.2.3   Connecting mechanical switches

Normally open switches can be connected to the input in a parallel connection and normally closed switches can be connected to the input in a series connection.

It should be noted that for safety signals like the limit and e-stop switches it is recommended to use NC type switches, because with the NC switches if there is an accidental wire cut or a contactor failure of the switch is detected as an open circuit which triggers the safety function, because it is the same action as if the switch is pressed in and the contactor releases.

If NO switches are used then a wire cut or a contactor failure is not causing the safety function to trigger, but instead it causes the switch not to trigger the input when pressed and the safety function can't be triggered which is a safety hazard.
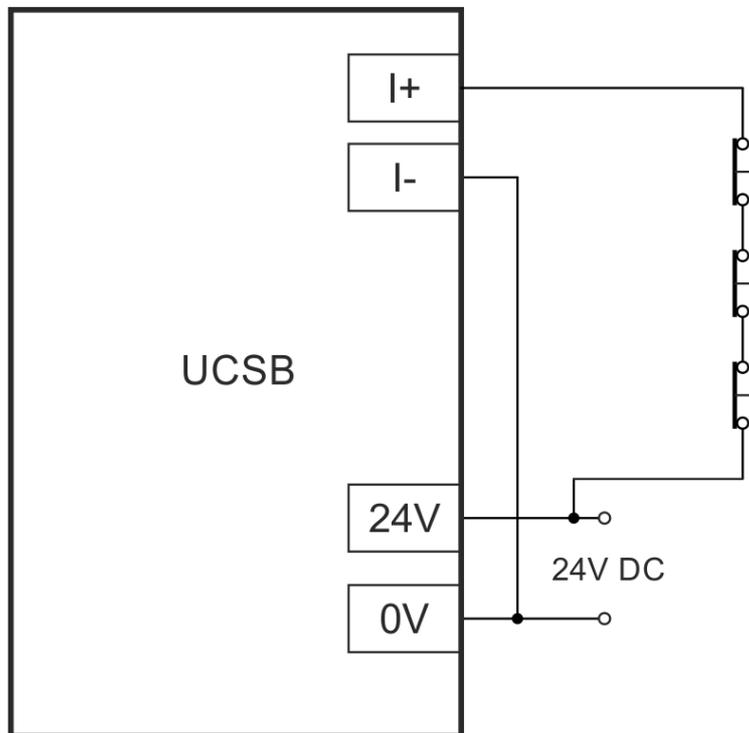
5.2.3.1   Connecting normally closed (NC) switches

Any number of mechanical NC contact switches can be wired in series to a single input. There are two ways of connecting mechanical NC type switches to the inputs. One way is to connect the positive power supply rail (12 to 24V) to the positive input screw terminal and connect the 0Volts to one side of the NC switch and connect the other side of the switch to the negative input screw terminal of the UCSB. The following image shows the connection:
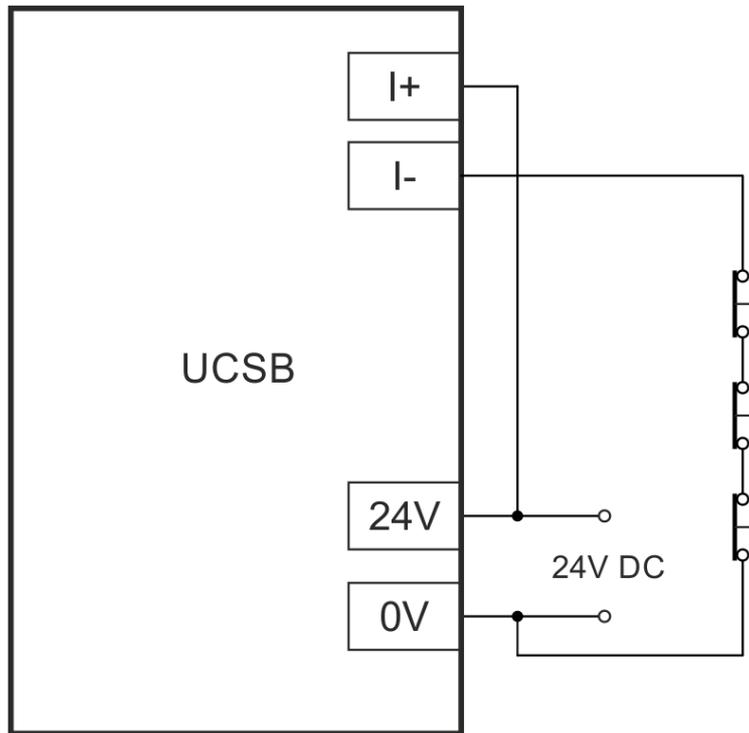
The other way is to connect the positive power supply rail (12 to 24V) to one side of the NC switch and connect the other side of the NC switch to the positive input screw terminal of the UCSB and connect the 0V to the negative input screw terminal of the UCSB.
The following image shows the connection:

### 5.2.3.2 Connecting normally open (NO) switches

Any number of mechanical NO contact switches can be wired in parallel to a single input. There are two ways of connecting mechanical NO type switches to the inputs. One way is to connect the positive power supply rail (12 to 24V) to the positive input screw terminal and connect the 0Volts to one side of the NO switch and connect the other side of the switch to the negative input screw terminal of the UCSB.
The following image shows the connection:
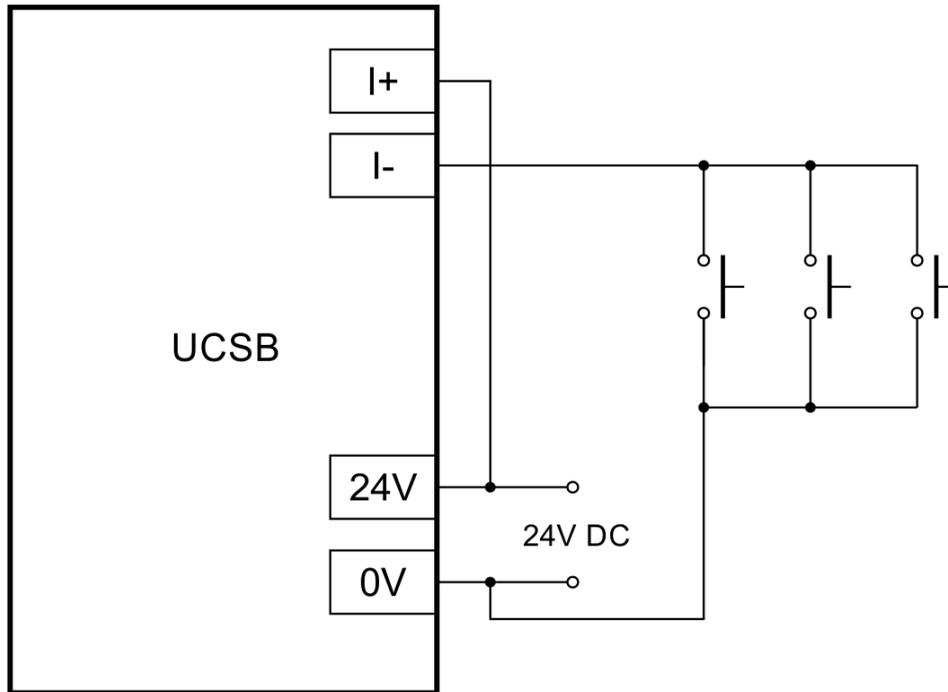
The other way is to connect the positive power supply rail (12 to 24V) to one side of the NO switch and connect the other side of the NO switch to the positive input screw terminal of the UCSB and connect the 0V to the negative input screw terminal of the UCSB.
The following image shows the connection:
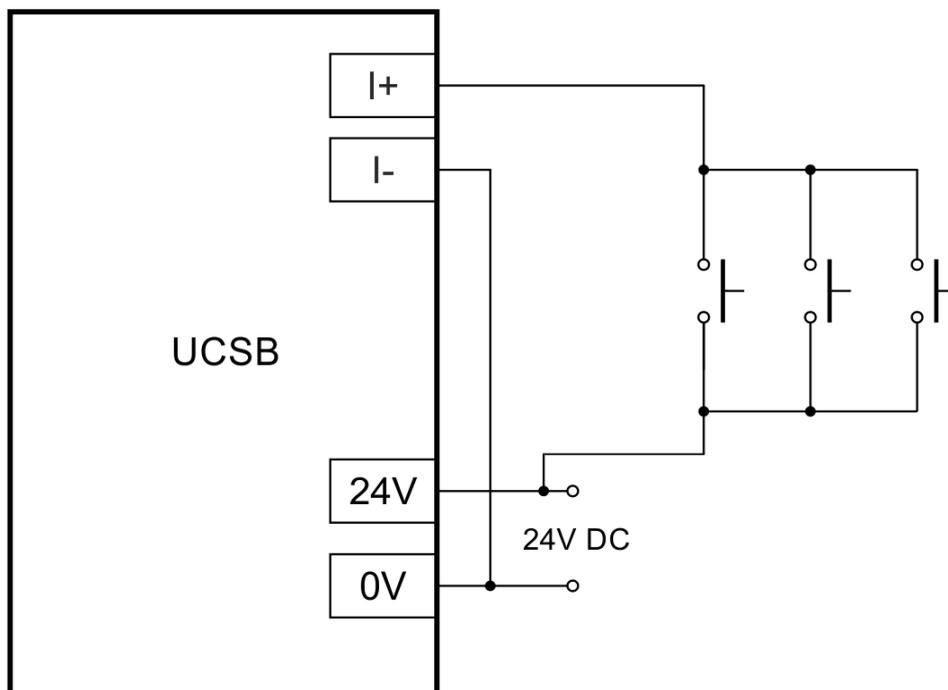
5.2.4　Connecting line drivers

Connecting line driver transmitters to inputs of the UCSB board is possible because there is a reverse polarity connected diode with the series resistor on each input.
This diode opens and protects the LED when the line driver's channels switches to the reverse polarity to the LED's driving polarity.
To connect a line driver like a 26LS31 or similar there is a need to connect a terminating resistor or snubber close to receiver which is the input of the UCSB board. For exact resistor and/or snubber values please refer to the line driver IC or sensor's manual. Usually a 100 to 120 Ohms resistor is adequate.
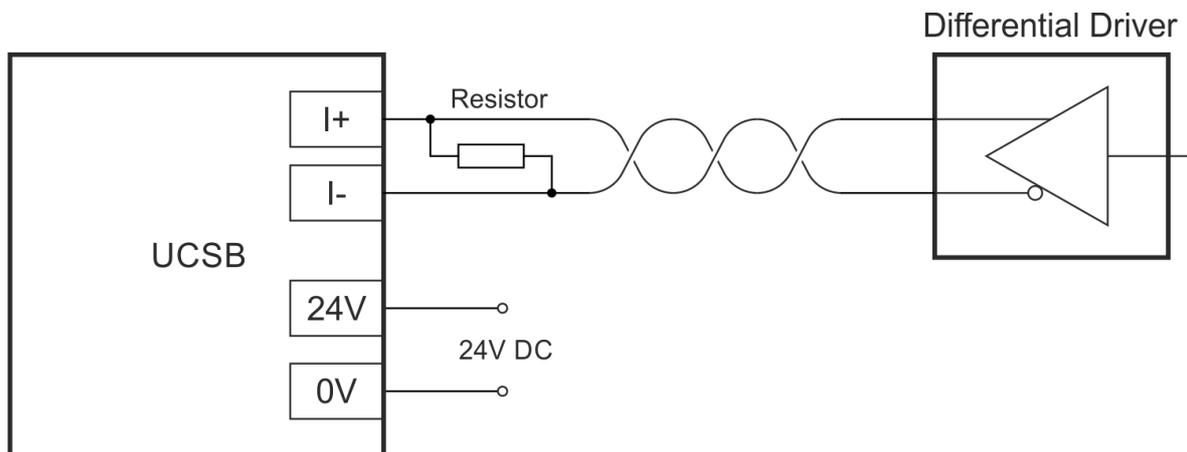
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