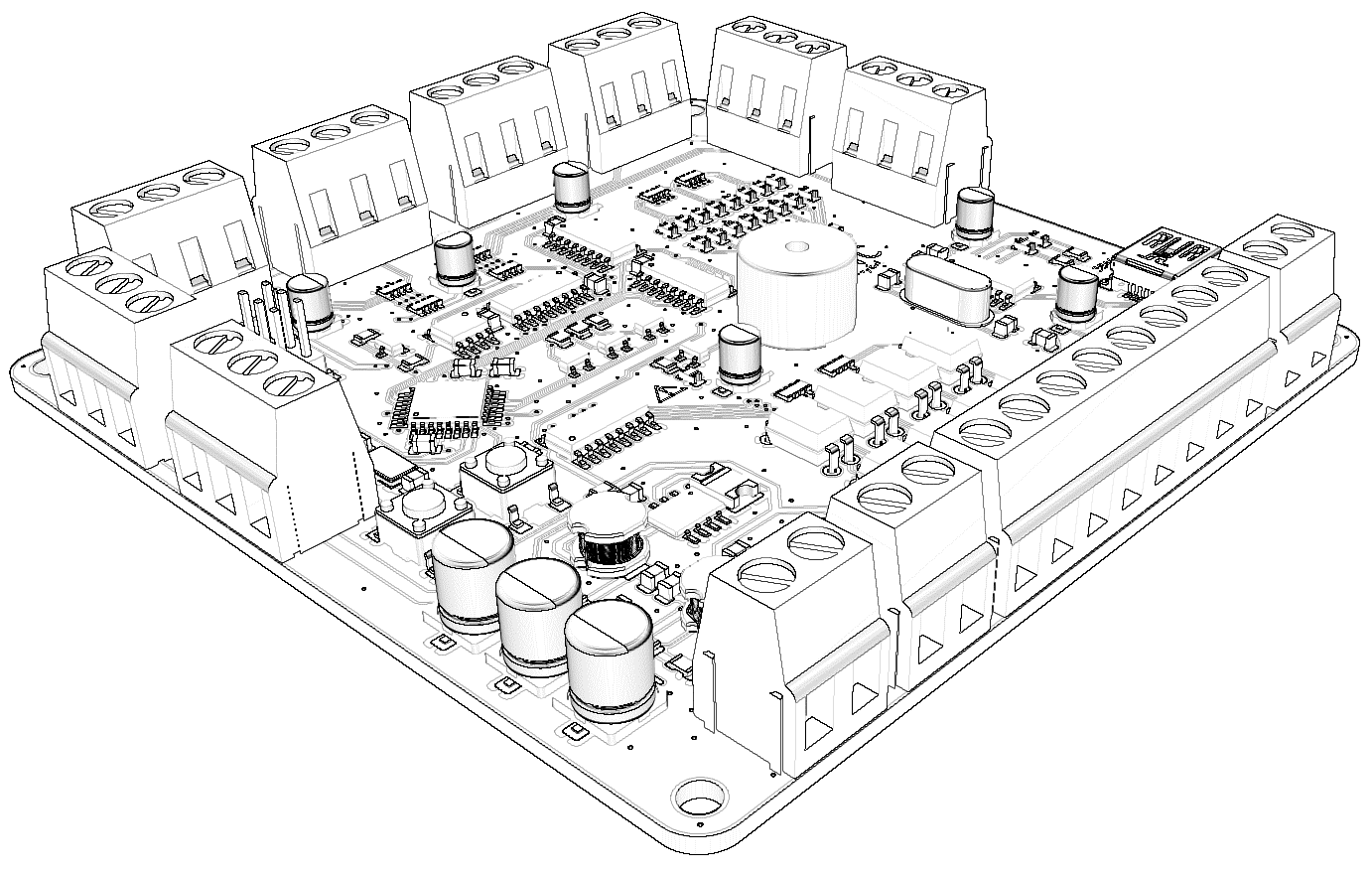
USER GUIDE



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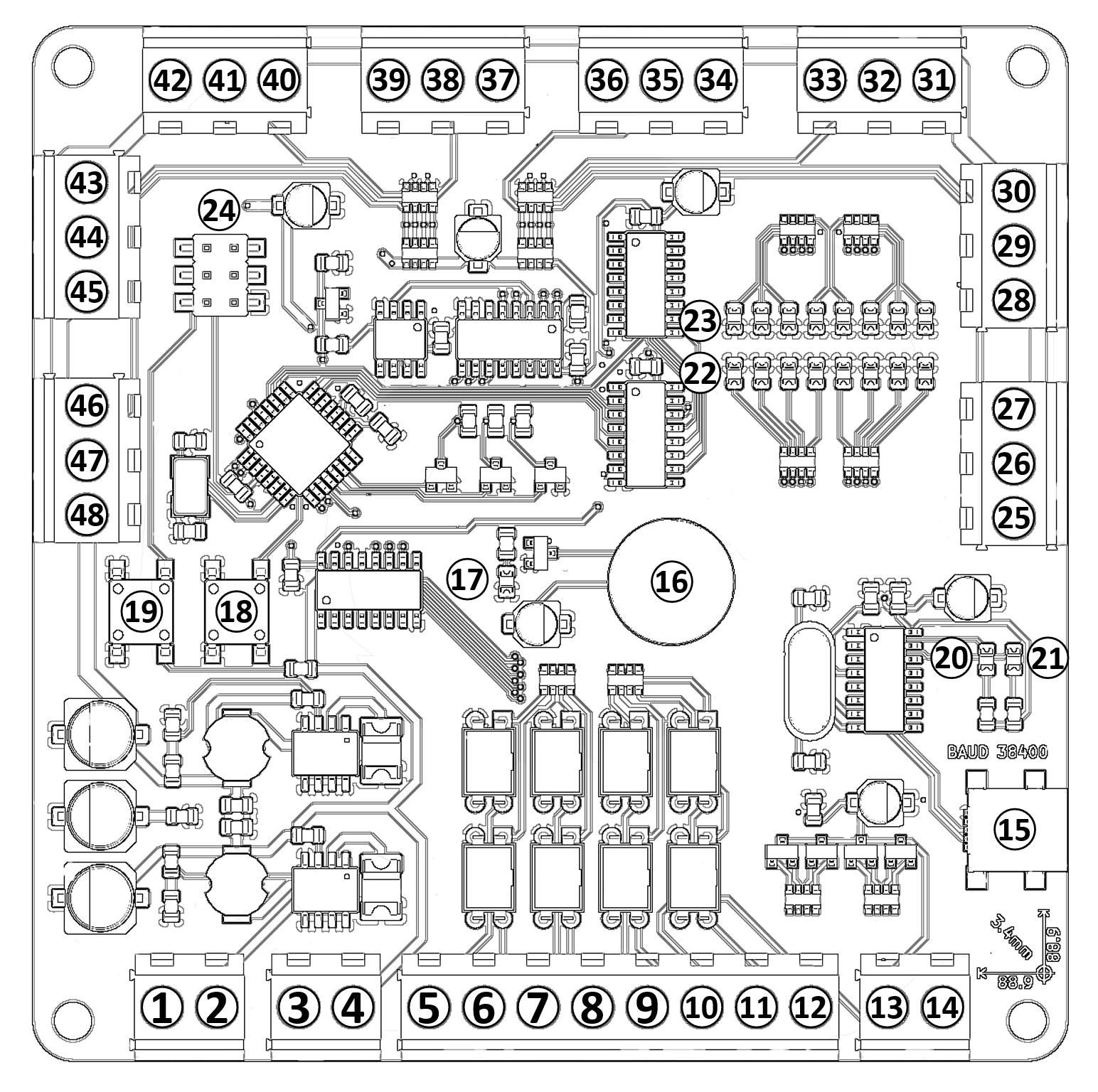
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# Features

* Supports 12V NPN/PNP Proximity sensors, NO/NC switches, 0-12V analog signals
* Optically isolated active Low/High open collector outputs
* Simple programmable Boolean logic
* Remappable outputs
* Programmable input threshold and hysteresis
* Acoustic signals and alarms
* +12V and +5V outputs with up to 2A each
* Simple serial interface
* 10 Kilohertz sampling rate per input
* Isolated configuration and run modes

# Board overview



## Connectors And Indicators

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | +16 to +24V | 25 | GND |
| 2 | GND | 26 | Input: A |
| 3 | +12V | 27 | +12V |
| 4 | +5V | 28 | GND |
| 5 | Output: A | 29 | Input: B |
| 6 | Output: B | 30 | +12V |
| 7 | Output: C | 31 | GND |
| 8 | Output: D | 32 | Input: C |
| 9 | Output: E | 33 | +12V |
| 10 | Output: F | 34 | GND |
| 11 | Output: G | 35 | Input: D |
| 12 | Output: H | 36 | +12V |
| 14 | Ext. Voltage | 37 | GND |
| 14 | Ext. Ground | 38 | Input: E |
| 15 | USB Mini-B Serial | 39 | +12V |
| 16 | Buzzer | 40 | GND |
| 17 | Alarm | 41 | Input: F |
| 18 | Config | 42 | +12V |
| 19 | Reset | 43 | GND |
| 20 | RX | 44 | Input: G |
| 21 | TX | 45 | +12V |
| 22 | Output Indicators | 46 | GND |
| 23 | Input Indicator | 47 | Input: H |
| 24 | ISP header | 48 | +12V |

# Powering the board

The board can be powered with 16V to a maximum of 30V (1), the total current draw for all input sensors should not exceed 2A. If the 12V output is used to power external devices their current must be summed with the current of all inputs.   
TL;DR A 2A 18V or 24V power supply should work in most cases.

# Connecting Sensors

## Proximity Sensors

NPN

PNP

## Switches

NC

NO

## Other

# Connecting Outputs

## Self-Powered Target

## Board-Powered Target

# Serial Connection

A serial connection can be established via the USB Port (15), on Windows this requires the correct driver to be installed.

## Serial Configuration

|  |  |
| --- | --- |
| Chip | CH340G |
| Baud rate | 38400 |
| Data | 8bit |
| Parity | None |
| Stop bits | 1 |
| Flow Control | None |
| Connector | USB Mini B |

The serial connection is only enabled if the board is powered. When powered the TX Indicator (21) should light up briefly, even if the board is not connected to a PC or other device.

Compatible driver: CH341SER.   
Compatible terminal software: [Tera Term](https://ttssh2.osdn.jp/), [Putty](https://www.putty.org/), etc.

# Serial Commands

After powering up the board will immediately switch into run mode and not respond to normal serial commands. There are 2 ways to switch into configuration mode.

1. Enter “$C” and confirm with enter
2. Push config (18)

All valid changes are saved immediately and take effect after the next power cycle, reset or mode switch.

## Command overview

|  |  |  |  |
| --- | --- | --- | --- |
| **$** | Show help | - | R |
| **$P** | Switch to run mode | - | R |
| **$C** | Switch to configuration mode | - | R |
| **$$** | View settings | - | R |
| **$S** | View input status | - | R |
| **$RST** | Reset | $,S,I,O,E | W |
| **$100** | Serial output | 1/0 | RW |
| **$101** | Buzzer | 1/0 | RW |
| [**$2N0**](#_I/O_control) | Input N threshold | 0-100 | RW |
| [**$2N1**](#_I/O_control) | Input N hysteresis | 0-100 | RW |
| [**$2N2**](#_I/O_control) | Input N inverted | 1/0 | RW |
| [**$3N0**](#_I/O_control) | Output N active | 1/0 | RW |
| [**$3N1**](#_I/O_control) | Output N expression | Expr. | RW |

## System Commands

### Help “$”

Displays a list of commands and examples.

### Switch to run mode “$P”

This command causes the board to unload the current context, reset and to switch into run mode.  
Only available while in configuration mode.

### Switch to configuration mode “$C”

This command causes the board to unload the current context, reset and to switch into configuration mode.   
Only available while in run mode.

### View Settings “$$”

Displays current configuration values.

### View input status “$S”

Reads all input pins and displays their current state in a semicolon separated list.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D | E | F | G | H |
| 100; | 100; | 100; | 100; | 100; | 100; | 100; | 100; |

### Reset “$RST”

Resets the selected configuration.

$ - Restore global defaults and reboot

S - Restore system defaults and reboot

I - Restore input defaults and reboot

O - Restore output defaults and reboot

E - Restore expression defaults and reboot

After resetting the board will start in run mode.

### Serial debug output “$100”

Enables the continues serial output of input states.  
This option is only meant for debugging and will affect performance drastically.

### Acoustic signals “$100”

Enable acoustic feedback whenever an output is triggered.

## I/O commands

|  |  |  |  |
| --- | --- | --- | --- |
| $20X | Input: A | $30X | Output: A |
| $21X | Input: B | $31X | Output: B |
| $22X | Input: C | $32X | Output: C |
| $23X | Input: D | $33X | Output: D |
| $24X | Input: E | $34X | Output: E |
| $25X | Input: F | $35X | Output: F |
| $26X | Input: G | $36X | Output: G |
| $27X | Input: H | $37X | Output: H |

I/O commands control the behavior of each input or output.  
The first digit of an I/O command describes the port, the second the target pin and the third digit the selected register. All I/O registers are read/write meaning they can be individually written to or read back.

Operation: “$310=1” Enable output B  
Port: Output  
Pin: B  
Property: active  
Parameter: 1  
Response: OK

|  |  |  |
| --- | --- | --- |
| $310=1 | | |
| 3 | 1 | 0 |
| Output | B | Active |
| OK | | |

Operation: “$310” Get the status of output B  
Command: $310  
Port: Output  
Pin: B  
Property: active   
Response: 1

|  |  |  |
| --- | --- | --- |
| $310 | | |
| 3 | 1 | 0 |
| Output | B | Active |
| 1 | | |

### Input threshold “$2N0”

Get or set the input threshold of a specific input pin.  
The default value of 70% is set up for normally open switches connected to +12V.

|  |  |  |
| --- | --- | --- |
| $200=1 | | |
| 3 | 0 | 0 |
| Input | A | Threshold |
| OK | | |

### Input hysteresis “$2N1”

Get or set the hysteresis of a specific input pin.  
The default value of 10% should cover most sensors and switches.

|  |  |  |
| --- | --- | --- |
| $211=5 | | |
| 3 | 0 | 0 |
| Input | B | Hysteresis |
| OK | | |

### Input inverted “$2N2”

Get or set if a specific input pin should be inverted internally. This is useful for NC switches and sensors.

|  |  |  |
| --- | --- | --- |
| $232=0 | | |
| 3 | 0 | 0 |
| Input | C | Inverted |
| OK | | |

### Output active “$3N0”

Enable or disable an output pin completely.

|  |  |  |
| --- | --- | --- |
| $300=1 | | |
| 3 | 0 | 0 |
| Output | A | Active |
| OK | | |

### Output expression “$3N1”

Get or set the logic expression specific to an output pin.

|  |  |  |
| --- | --- | --- |
| $301= ($A & !$B) | (!$A & $B) | | |
| 3 | 0 | 1 |
| Output | A | Expression |
| OK | | |

|  |  |  |
| --- | --- | --- |
| $301 | | |
| 3 | 0 | 1 |
| Output | A | Expression |
| ($A & !$B) | (!$A & $B) | | |