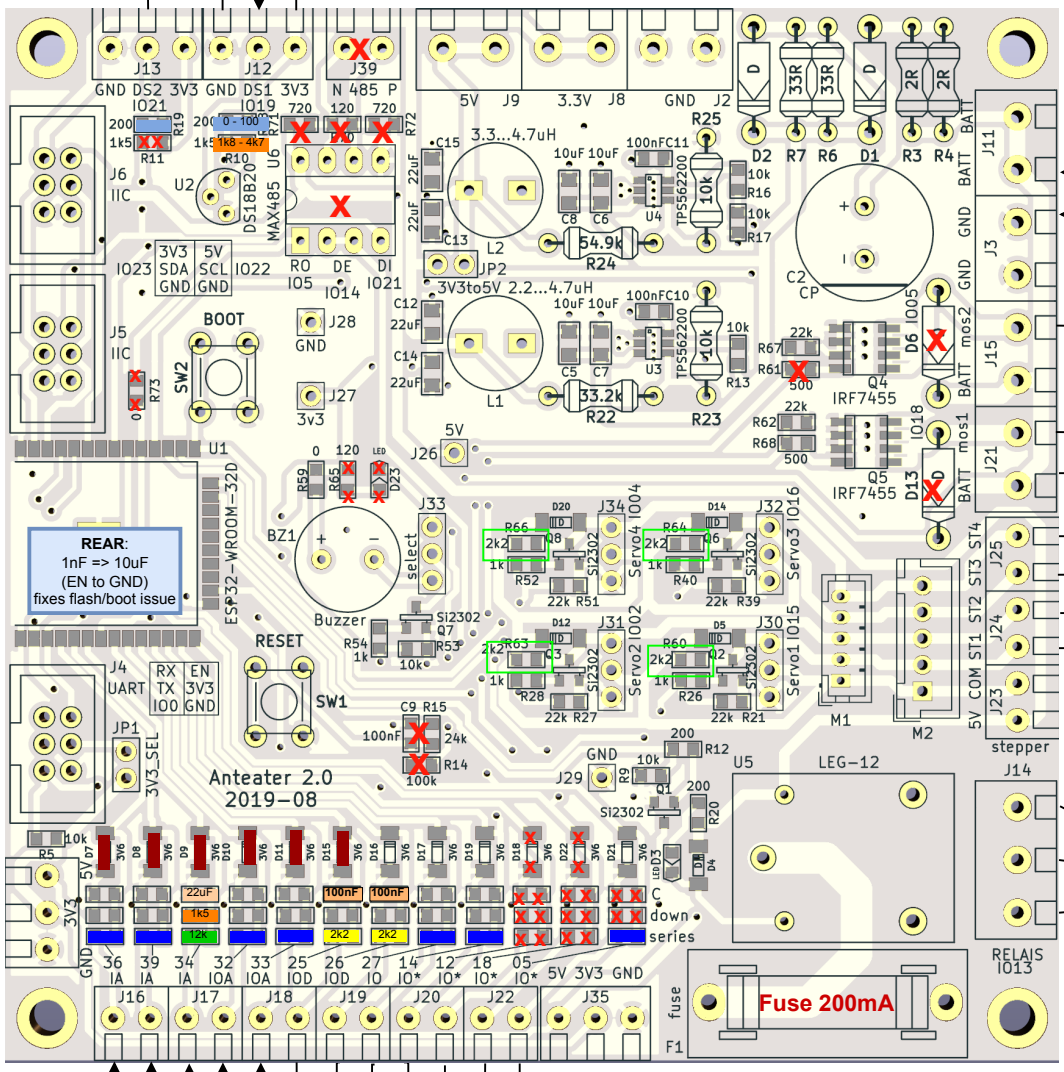
Connection plan V2.2

09.09.2023

- single board
- 1x sabertooth driver
- modified board 'motorctl' from V2.1

gpio19: 3x ds18b20
OWB bus temp sensors
(driver, motors)

gpio21: UI: Button



gpio 36: ADC UI: Joystick Y
gpio 39: ADC UI: Joystick X
gpio 34: ADC Battery voltage (stepdown) [29.4 -> 3.27V]
gpio 32: ADC driver: Current sensor motor-left
gpio 33: ADC driver: Current sensor motor-right
gpio 25: driver: RS232 RX 2x60A Sabertooth driver
gpio 26: UI: Encoder A
gpio 27: UI: Encoder B
gpio 14: [RS485] optical encoder right axle
gpio 12: [LED/BUZZER]
gpio 18: [MOS1] **FREE**
gpio 05: [MOS2] optical encoder left axle

cable configuration

control-box => driver-box

Oelflex 12x0.5

gn: GND
01. 5V (reserve)
02: 3V3

03: RX/S1 Sabertooth driver
04: S2 Sabertooth driver (reserve)

05: current-sensor left
06: current-sensor right

07: fan 12v from relay
08: ds18b20 owb

09: GND (reserve)
10: GND (reserve)
11: GND (reserve)

optical-sensor axle => control-box

2 cables (one for each axle):
Oelflex 5x0.5

gn: GND
01: 3V3 [unused]
02: 5V
03: Sensor out (drain) / pulses
04: [unused]
05: [unused]

control-box => UI-arm

D-Sub 9 pin

green: GND
red: 3V3

brown: Joystick X
purple: Joystick Y

yellow: encoder A
blue: encoder B
black: encoder switch

gray: display SDA
orange: display SDC

Joystick pinout

JST connector 5 pin

(pins stick order left to right)

red: VCC (3V3)
orange: GND
brown: X (analog 0-3V)
white: n.c.
black: Y (analog 0-3V)

driver configuration

DIP switches:
"simplified serial, 9600 Baud"
101011

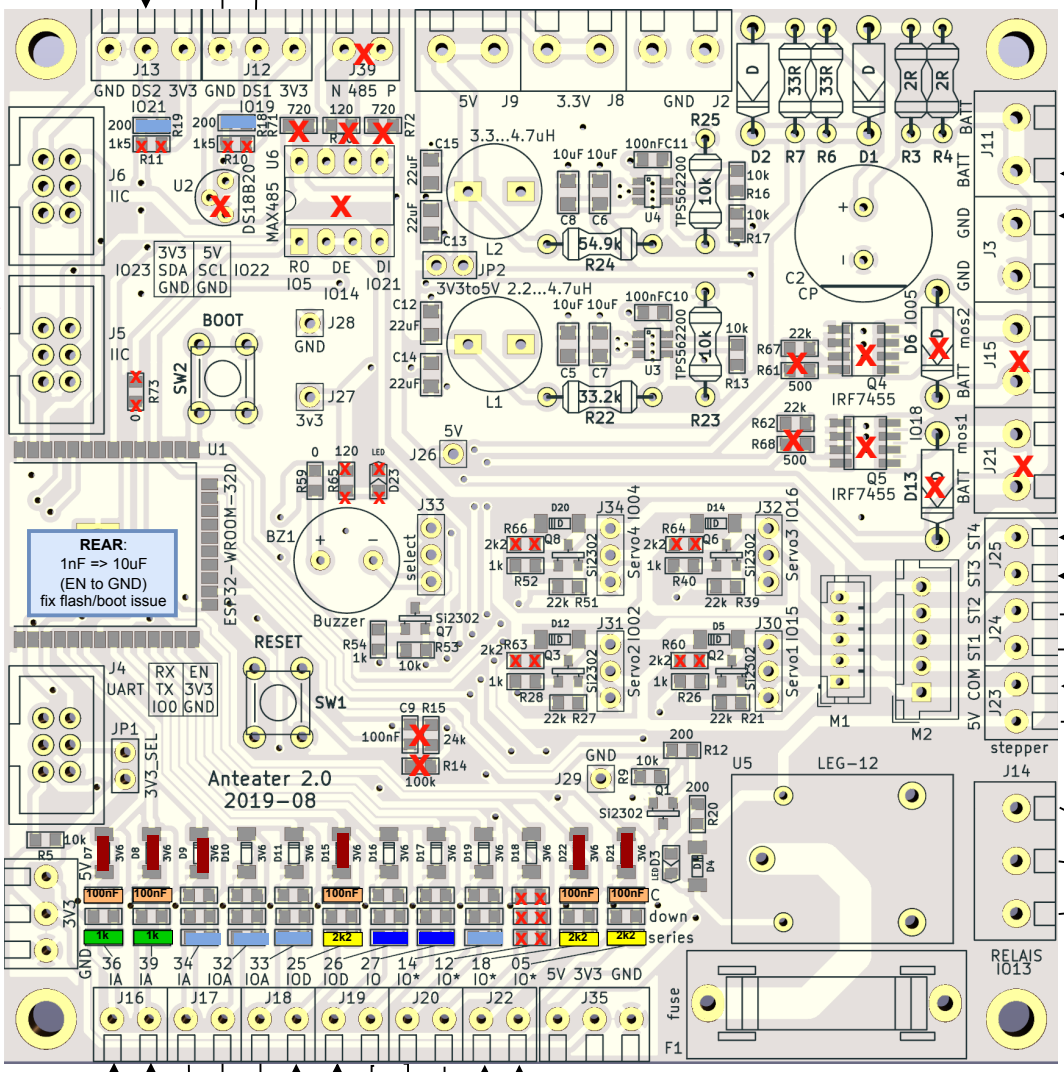
Legend pcb

- 0 Ohm Resistor
- 3v3 Z-Diode
- 0 Ohm Optional
- [xxx] Conflicting Component
- xx nopop

V2.1 Board 2: control

09.09.2023

UART => motorctl pcb
IO21:RX - IO19:TX - GND



UI: Display
IO23: SDA
IO22: SCL
3V3
GND

UI: Display
3V3
GND

12V from pcb motorctl
GND from pcb motorctl

gpio 04: **FREE**
gpio 16: **FREE**
gpio 02: **FREE**
gpio 15: **FREE**
5V (signal pullup)

gpio13 Relay
NC:
COM: **FREE**
NO:

gpio 36: ADC UI: Joystick Y
gpio 39: ADC UI: Joystick X
gpio 34: ADC **FREE**
gpio 32: ADC **FREE**
gpio 33: ADC **FREE GPS?**
gpio 25: UI: encoder switch
gpio 26: UI: Display SCL
gpio 27: UI: Display SDA
gpio 14: [RS485] **FREE**
gpio 12: [LED/BUZZER]
gpio 18: [MOS1] UI: encoder B
gpio 05: [MOS2] UI: encoder A

note: esp32 internal
pullup = 10k - 100k

Legend pcb

- 0 Ohm Resistor
- 3v3 Z-Diode
- 0 Ohm Optional

[xxx] Conflicting Component
xx nopop

cable configuration

control-box => UI-arm

D-Sub 9 pin

green: GND
red: 3V3

brown: Joystick X
purple: Joystick Y

yellow: encoder A
blue: encoder B
black: encoder switch

gray: display SDA
orange: display SDC

Joystick pinout

JST connector 5 pin
(pins stick order left to right)

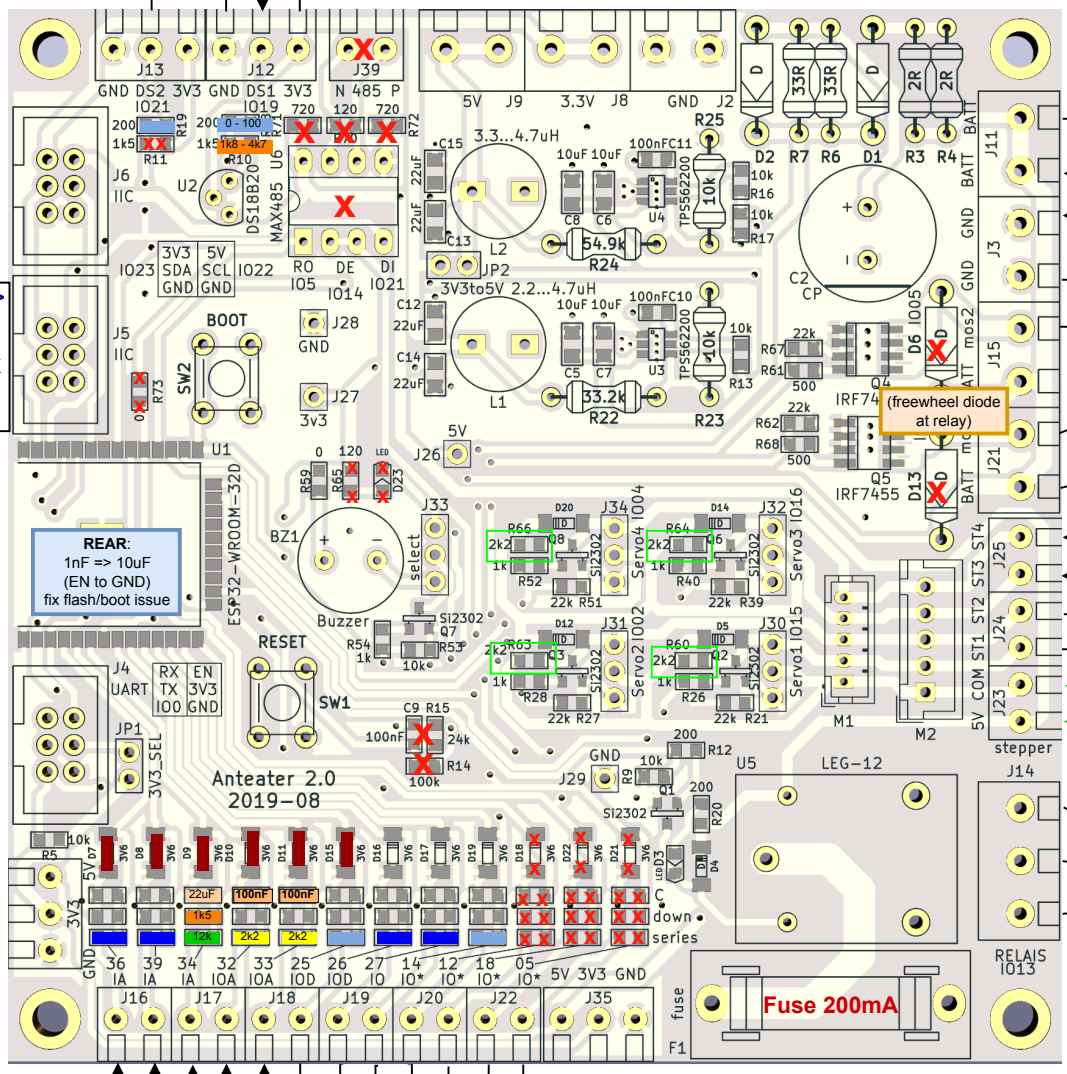
red: VCC (3V3)
orange: GND
brown: X (analog 0-3V)
white: n.c.
black: Y (analog 0-3V)

V2.1 Board 1: motorcontrol

09.09.2023

gpio19: 6x ds18b20
OWB bus temp sensors
(drivers, motors, brakes)

gpio21: **FREE**



12V to pcb control
12V from stepdown
GND from stepdown
GND to pcb control
brake relay left (24V)
brake relay right (24V)
12V to Relay COM
gpio 04: driver: motor-left A
gpio 16: driver: motor-left B
gpio 02: driver: motor-right A
gpio 15: driver: motor-right B
5V (signal pullup)
2k2 pullup required for driver
gpio13 Relay
NC:
COM: 12V ("Batt" / stepdown)
NO: driver: 2x fan

gpio 36: ADC driver: Current sensor motor-left
gpio 39: ADC driver: Current sensor motor-right
gpio 34: ADC Battery voltage (stepdown) [29.4 -> 3.27V]
gpio 32: ADC encoder left axle
gpio 33: ADC encoder right axle
gpio 25: FREE
gpio 26: driver: motor-left PWM
gpio 27: driver: motor-right PWM
gpio 14: [RS485]
gpio 12: [LED/BUZZER]
gpio 18: [MOS1] [brake relay right]
gpio 05: [MOS2] [brake relay left]

Legend pcb

- 0 Ohm Resistor
- 3v3 Z-Diode
- 0 Ohm Optional

[xxx] Conflicting Component
xx nopop

cable configuration

control-box => driver-box

Oelflex 12x0.5

gn: GND
~~01: 5V~~
01: 3V3

02: bridge-left A
03: bridge-left B
04: bridge-left PWM

05: bridge-right A
06: bridge-right B
07: bridge-right PWM

08: current-sensor left
09: current-sensor right

10: fan 12v from relay
11: ds18b20 owb

optical-sensor axle => control-box

2 cables (one for each axle):
Oelflex 5x0.5

gn: GND
01: 3V3 [unused]
02: 5V
03: Sensor out (drain) / pulses
04: [unused]
05: [unused]

control-box => Brake Relays

Oelflex 9x0.5

gn: GND
01: 3V3 (temp sensors)
02: 24V (BATT -> relays)
03: Brake Relay left (MOS / GND)
04: Brake Relay right (MOS / GND)
05: ds18b20 OWB resistors

Wiring-plan V2.1 (2 boards)

09.09.2023

WIP

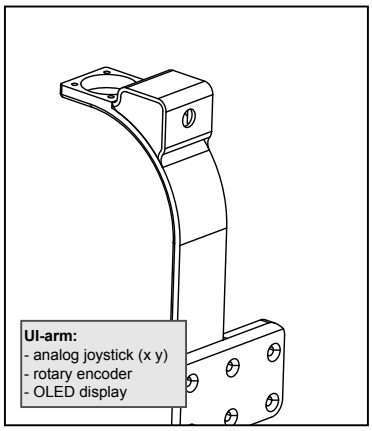
todo add photos of 2 pcbs?

Li-ion Battery
Samsung INR18650-35E 3500mAh 3,7V
7S 15P
150A BMS

120A connector

Main power switch

charging port (50A connector)



UI-arm:
- analog joystick (x y)
- rotary encoder
- OLED display

Fusebox

50A connector

armchair: control box for electric-adjustment

2x 2.5mm2
24V (2A fuse)

4x 2.5mm2
- 2x gnd
- 1x 24V (40A fuse)
- 1x 24V (40A fuse)

USB Cable
(fw upload)

12x 0.5mm2

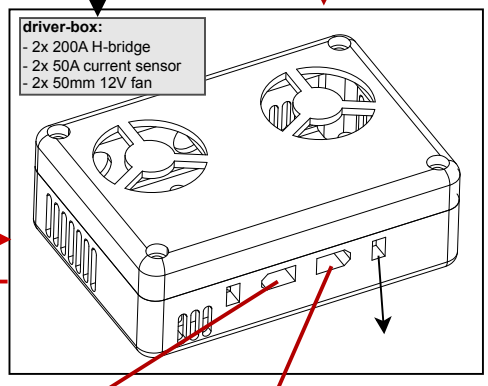
9 pin sub-d connector

Board "control"

UART

Board "motorctl"

control-box:
- dc-dc step down 24V to 12V
- fuseholder 12V supply (2A)
- board control
- board motorctl
- esp32 breakoutboard (UART to USB)



driver-box:
- 2x 200A H-bridge
- 2x 50A current sensor
- 2x 50mm 12V fan

2x 2.5mm2
driver -> relay

2x 2.5mm2
relay -> connector

Motor left
straight: negative
angular: positive

Motor right

Note: inverted direction of right motor already accounted in the driver box
-> motors with connectors are interchangeable

ds18b20 sensor motor
red: 3V3
black: GND
yellow: owb

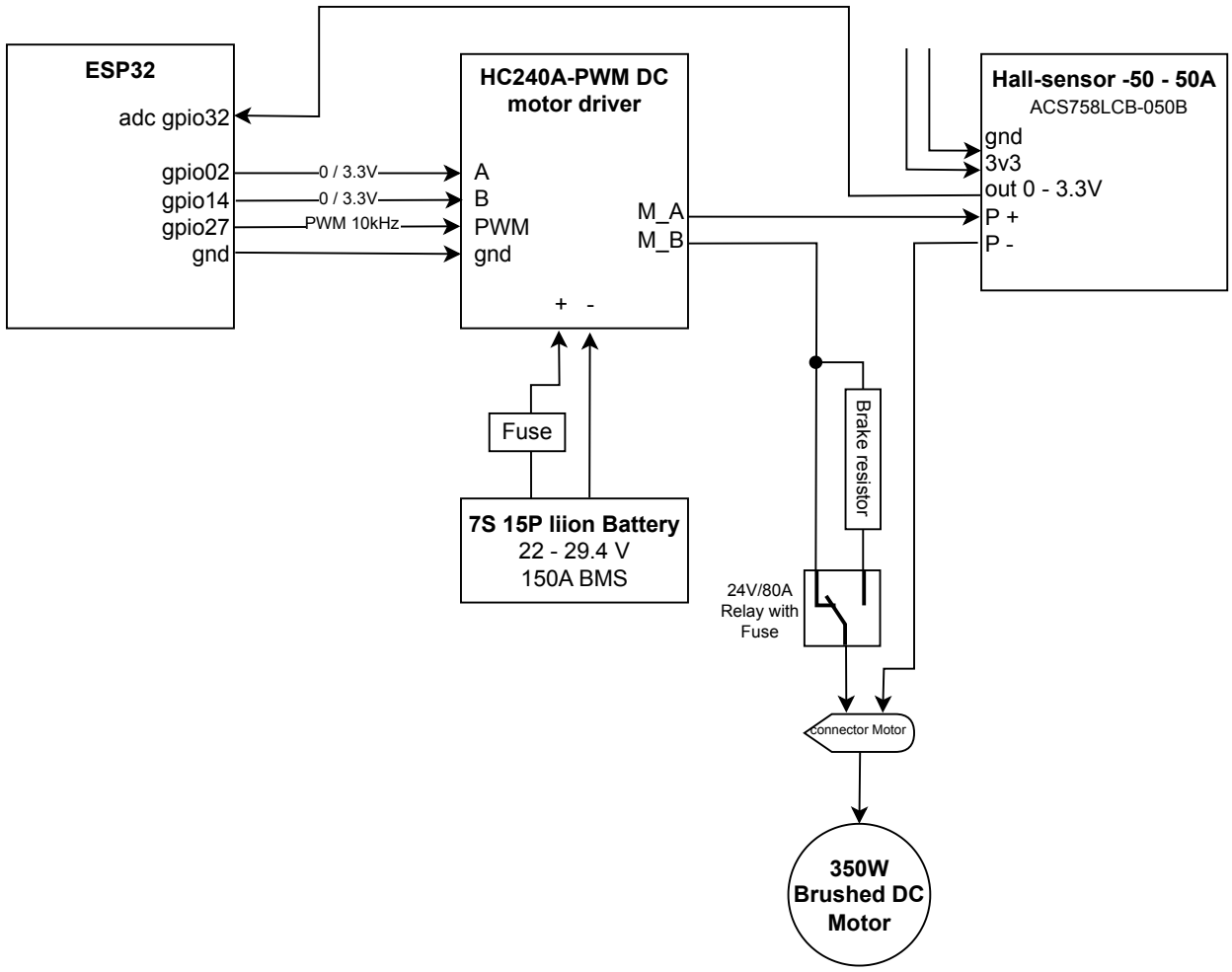
optical sensor left axle

optical sensor right axle

9x 0.5mm2

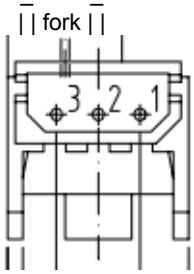
Brake-Plate
- 2x 1Ohm 100W Brake resistor
- 2x 80A 24V 5-pin relay
- 2x ds18b20 sensor

Driver box overview



Sensor Axle

Transmissive Optical Sensor
TCYS5201



1: GND
2: out
- low when not interrupted
- floating when interrupted
=> pullup needed
3: (2.9V) - 5.5V

optical-sensor axle => control-box

2 cables (one for each axle):
Oelflex 5x0.5

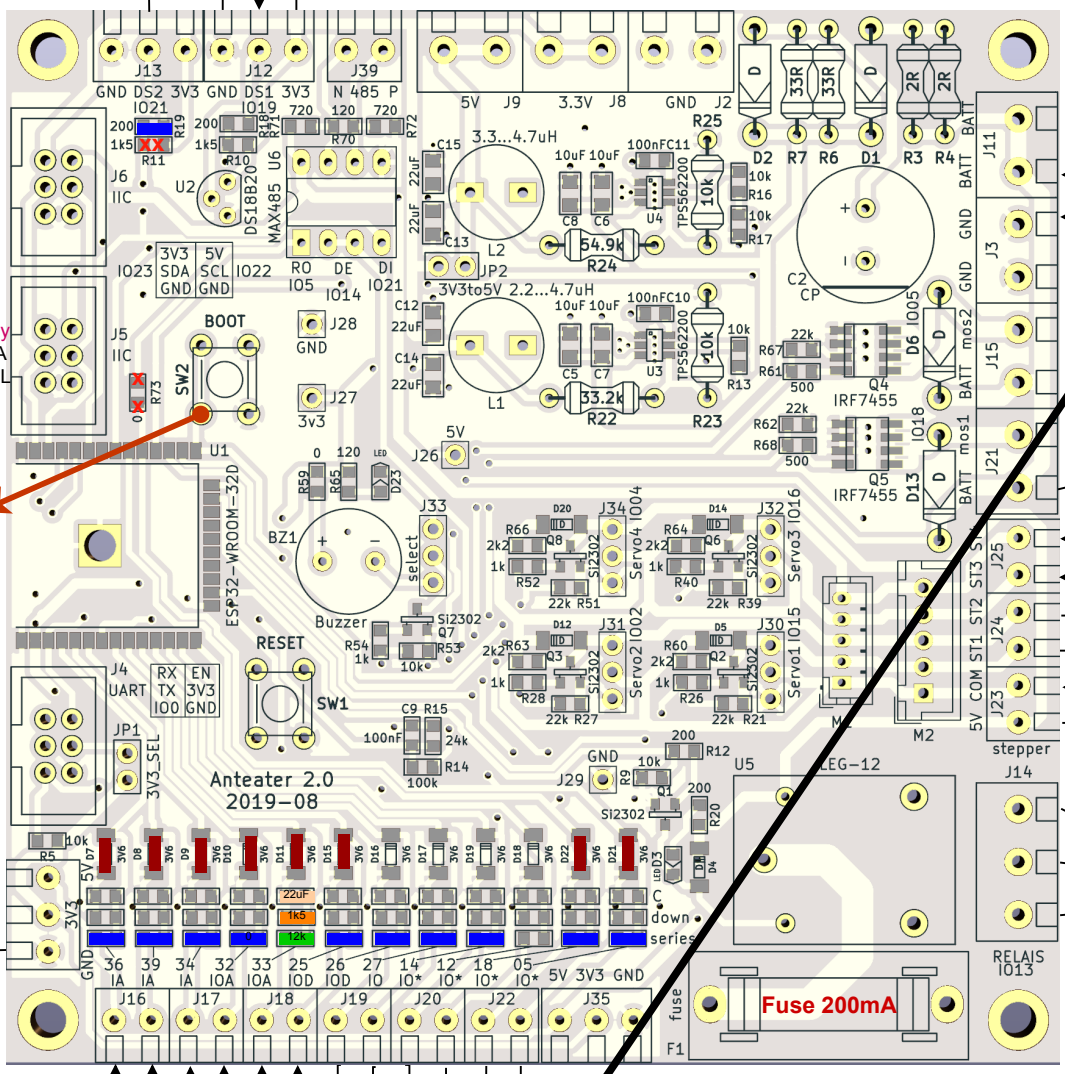
gn: GND
01: 3V3 [unused]
02: 5V
03: Sensor out (drain)
04: [unused]
05: [unused]

Connection plan V2.0 (single board)

22.08.2023 [dropped]

gpio19: 4x ds18b20
OWB bus temp sensors
(drivers, motors)

gpio21: **FREE**



UI: Display
IO23 SDA
IO22 SCL

12V from stepdown
GND from stepdown
12V to Relay COM
gpio 04: driver: motor-left A
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gpio 02: driver: motor-right A
gpio 15: **FREE**
5V (signal pullup)

gpio13 Relay
NC:
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NO: driver: 2x fan

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gpio 25: UI: encoder switch
gpio 26: driver: motor-left PWM
gpio 27: driver: motor-right PWM
gpio 14: [RS485] driver: motor-right B
gpio 12: [LED/BUZZER]
gpio 18: [MOS1] UI: encoder B
gpio 05: [MOS2] UI: encoder A

cable configuration

control-box => driver-box

Oelflex 12x0.5

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~~01: 5V~~
01: 3V3

02: bridge-left A
03: bridge-left B
04: bridge-left PWM

05: bridge-right A
06: bridge-right B
07: bridge-right PWM

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control-box => UI-arm

D-Sub 9 pin

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purple: Joystick Y

yellow: encoder A
blue: encoder B
black: encoder switch

gray: display SDA
orange: display SDC

Joystick pinout

JST connector 5 pin
(pins stick order left to right)

red: VCC (3V3)
orange: GND
brown: X (analog 0-3V)
white: n.c.
black: Y (analog 0-3V)

Legend pcb

- 0 Ohm Resistor
- 1.5k Ohm Resistor
- 3v3 Z-Diode
- 12k Ohm Resistor
- 1k5 Ohm Resistor

[xxx] Conflicting Component
xx nopop

Wiring-plan V2.0 (single board)

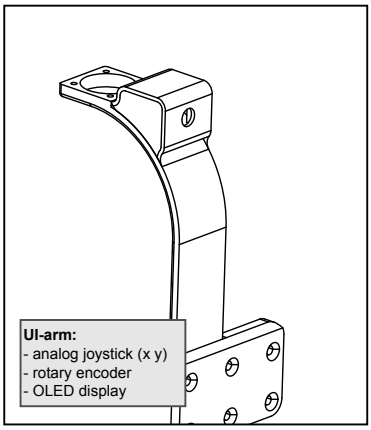
22.08.2023 [dropped]

Li-ion Battery
Samsung INR18650-35E 3500mAh 3,7V
7S 15P
150A BMS

120A connector

Main power switch

charging port (50A connector)



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- analog joystick (x y)
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50A connector

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control box for electric-adjustment

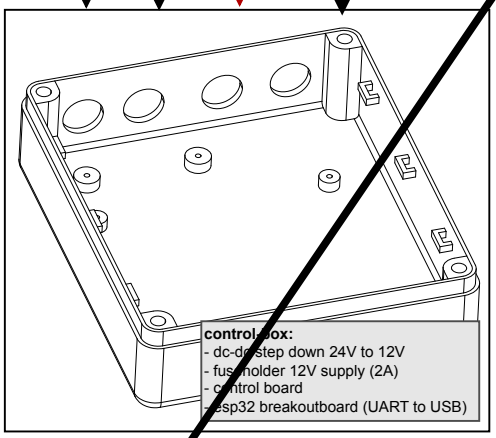
2x 2.5mm2
24V (2A fuse)

4x 2.5mm2
- 2x gnd
- 1x 24V (40A fuse)
- 1x 24V (40A fuse)

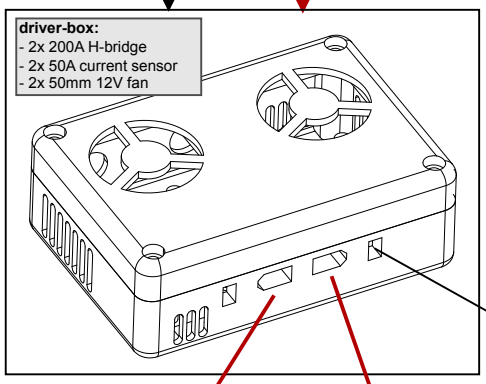
USB Cable
(firmware upload)

9 pin sub-d connector

12x 2.5mm2



control-box:
- dc-dc step down 24V to 12V
- fuse holder 12V supply (2A)
- control board
- esp32 breakoutboard (UART to USB)



driver-box:
- 2x 200A H-bridge
- 2x 50A current sensor
- 2x 50mm 12V fan

ds18b20 sensor motor
red: 3V3
black: GND
yellow: owb

Motor left **Motor right**
straight: negative
angular: positive

Note: inverted direction of right motor
already accounted in the driver box
-> motors with connectors are interchangeable