Motor Board

Brain Board

File: Motor_Board.kicad_sch

File: Brain_Board.kicad_sch

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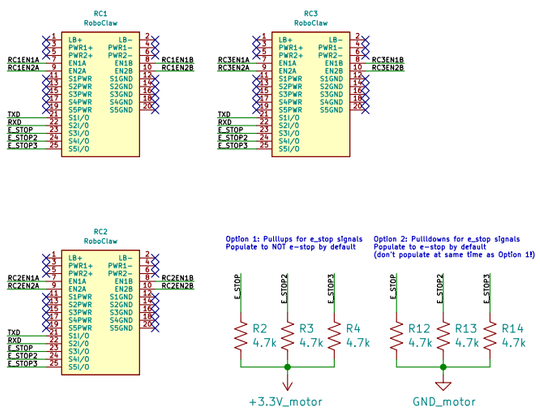
File: Control_Boards.kicad_sch

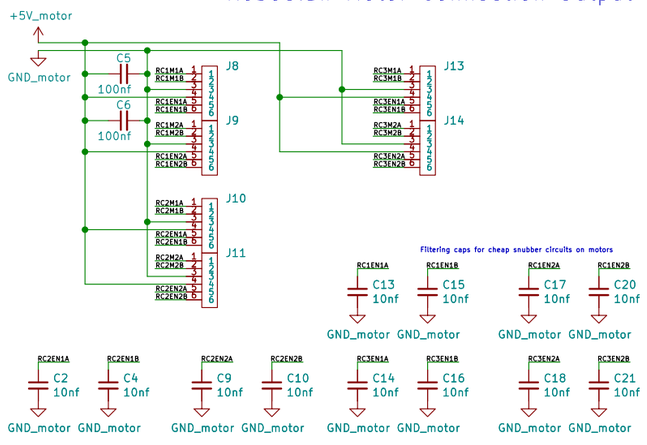
Title:

Size: A3	Date:	**Rev:**
KiCad E.D.A. kicad (6.0.11-0)		Id: 1/3

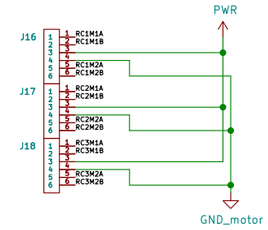
RoboClaw Pin Header



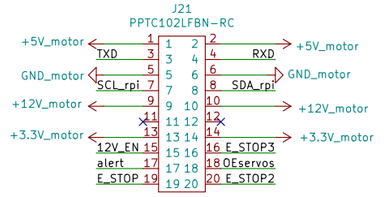
Roboclaw Motor Connection Output



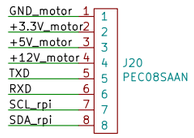
Roboclaw Power BUS



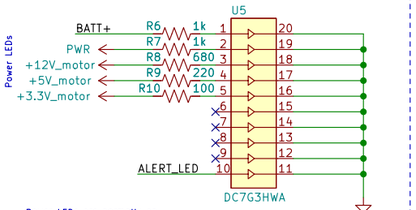
Inter-Board Connection



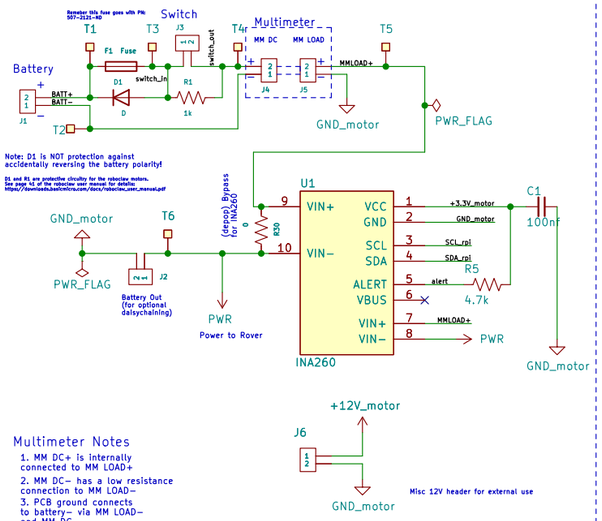
Test Pin Header



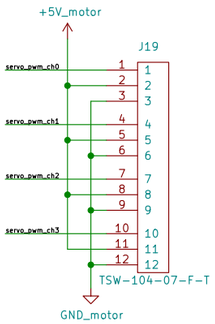
Motor LEDs



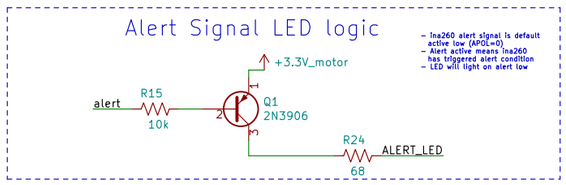
Power Distribution



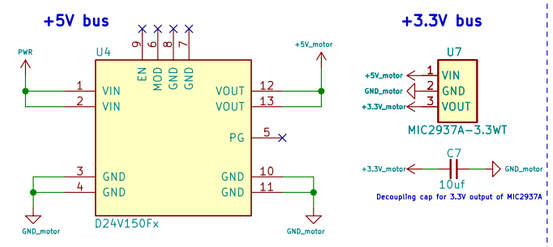
Corner Steering Servos Header



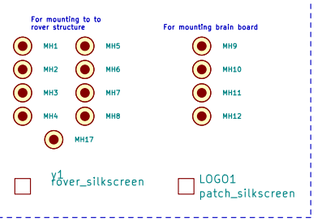
Alert Signal LED logic



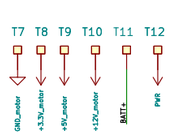
Voltage Regulators



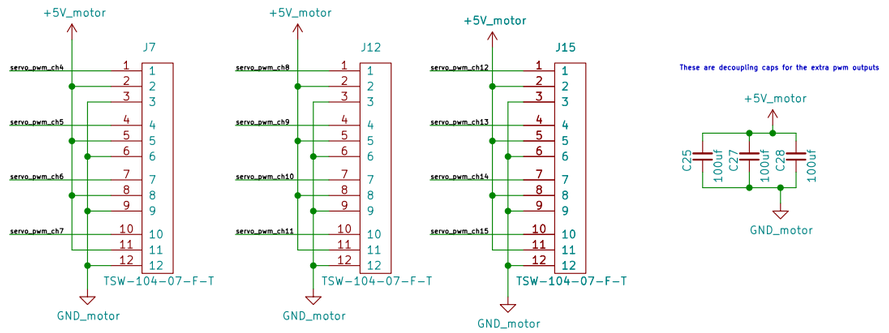
Miscellaneous



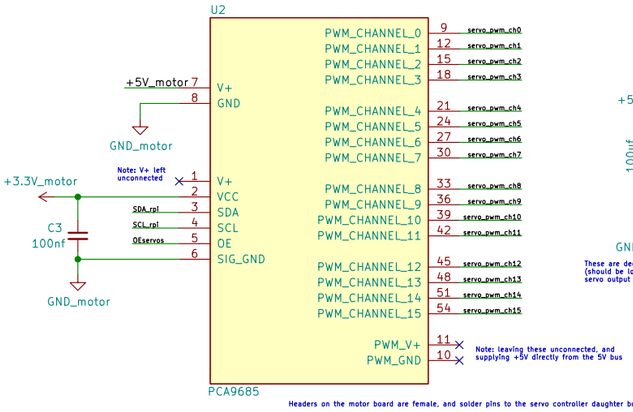
Power Test Points



Extra PWM Outputs Headers



Roboclaw Motor Connection Output



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Raspberry Pi breakout

Either J22 or J23 is equally valid for connecting rpi. The unconnected header can be used for signal monitoring if needed

J22
S9175-ND_rpi_breakout

J23
S9175-ND_rpi_breakout

C32
100nf

GND_brain

R31 4.7k
R11 4.7k
+5V_brain
+3.3V_brain
pull-ups

R32 4.7k
R33 4.7k
R34 4.7k
R35 4.7k
+3.3V_brain
pull-ups so LEDs will be off at RPI startup

RXD is pulled to 5V based on roboclaw application example, see page 62 of the roboclaw user manual for details: https://downloads.basicmicro.com/docs/roboclaw_user_manual.pdf

For GPIO avilability, see worksheet here:
https://www.notion.so/GPIO-Pins-Worksheet-9ebb23e9beee4172a7b114ba388c0c59

Inter-Board Connection

PWR_FLAG
+5V_brain
GND_brain
PWR_FLAG

J26
WM6548-ND

+5V_brain 1
TXD 3
GND 5
SCL_rpi 7
+12V_brain 9
+3.3V_brain 13
12V_EN 15
alert 17
E_STOP 19
2 +5V_brain
4 RXD
6 GND
8 SDA_rpi
10 +12V_brain
14 +3.3V_brain
16 E_STOP3
18 OEservos
20 E_STOP2

PWR_FLAG +12V_brain
PWR_FLAG +3.3V_brain

Note: laid out the pins on this connector so that it wouldn't be disastrous if the direction was accidentally switched (but please don't try it)

ESTOP LED logic

- Roboclaw ESTOPs active low (emergency stop when pulled low)
- When enabled by SW1, pull an ESTOP_in_ signal low to cause ESTOP
- LEDs on when estop'ed (nominal off)

SW1
CT206124-ND

ESTOP_in_1_pi
+3.3V_brain
ESTOP_in_2
+3.3V_brain
ESTOP_in_3
+3.3V_brain

T13 E_STOP
T14 E_STOP2
T15 E_STOP3

R36 10k
R37 10k
R38 10k

Q4 2N3906
Q5 2N3906
Q6 2N3906

R18 68 ESTOP_LED_1
R19 68 ESTOP_LED_2
R20 68 ESTOP_LED_3

+3.3V_brain

Note that two adjacent odd numbered pins MUST be connected together, due to the implementation of the switch array

LED R sizing:
(V_in - collector emitter saturation voltage - LED forward voltage) / desired current = resistor value

Secondary ESTOP header

Roboclaw S4 Breakout
ESTOP_in_2 1
GND 2
J27
PPTC021LFBN-RC

Roboclaw S5 Breakout
ESTOP_in_3 1
GND 2
J28
PPTC021LFBN-RC

Corner Servo Output Enable Breakout
OEservos 1
GND 2
J29
PPTC021LFBN-RC

Serial TXD/RXD LED logic

LED lights up when TXD / RXD low (low when sending bits)

TXD
D8 1N4148
C33 10nf
+3.3V_brain
R16 10k
Q2 2N3906
R22 68 TXD_LED

RXD
D9 1N4148
C34 10nf
+3.3V_brain
R17 10k
Q3 2N3906
R23 68 RXD_LED

Test Pin Header

GND 1
+3.3V_brain 2
+5V_brain 3
+12V_brain 4
TXD 5
RXD 6
SCL_rpi 7
SDA_rpi 8
J30
PEC08SAAN

Voltage pins can be used to test for good connectivity brain <-> motor board

RPI mounting holes
For mounting brain board to motor board
M1 Mounting_Holes
MH13
MH14
MH15
MH16

RPi I2C Header

SDA_rpi 1
SCL_rpi 2
GND 3
SDA_rpi 4
SCL_rpi 5
GND 6
SDA_rpi 7
SCL_rpi 8
GND 9
SDA_rpi 10
SCL_rpi 11
GND 12
J25

4 redundant I2c connections, for talking to arbitrary peripherals

Brain LEDs

U6
DC7G3HWA

TXD_LED 1
RXD_LED 2
+3.3V_brain 3
+3.3V_brain 4
+3.3V_brain 5
+3.3V_brain 6
+3.3V_brain 7
ESTOP_LED_1 8
ESTOP_LED_2 9
ESTOP_LED_3 10
20
19
18
17
16
15
14
13
12
11

R25 82 RPI_LED_1
R26 82 RPI_LED_2
R27 82 RPI_LED_3
R28 82 RPI_LED_4
R29 82 RPI_LED_5

GND_brain

LED forward voltage = 2 to 2.45 V
Choose R to target 15mA current

LED R sizing:
(V_in - LED forward voltage) / desired current = resistor value

Arduino Communication

J24
+12V_brain
+5V_brain
GND
SCL_rpi
SDA_rpi

Y2
over_silkscreen
LOGO2
patch_silkscreen

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