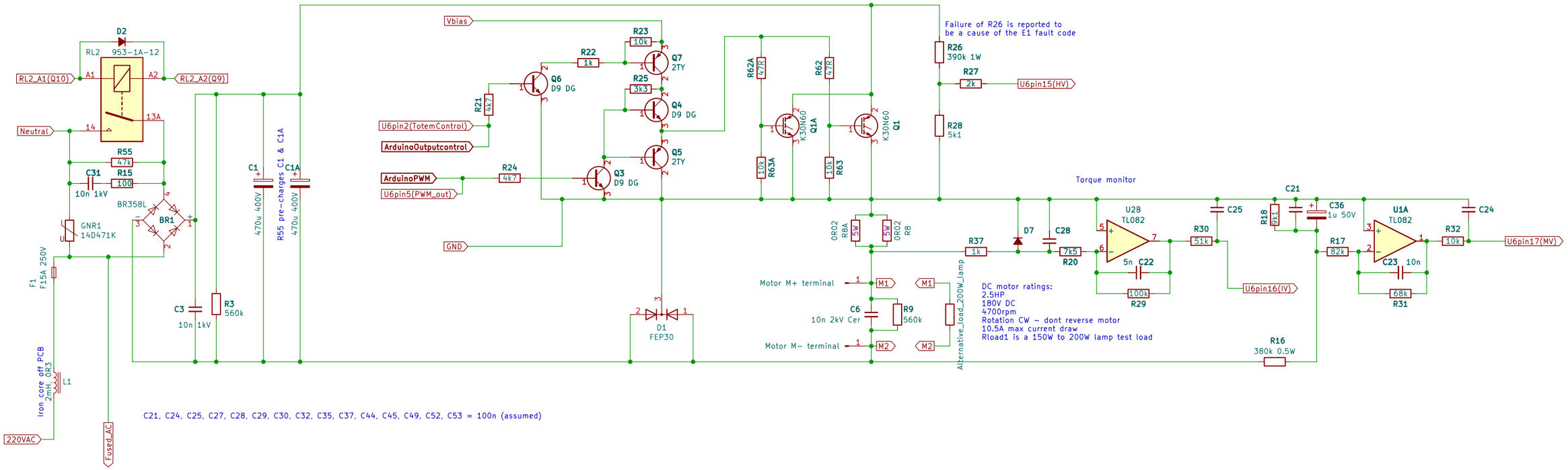
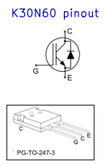


C21, C24, C25, C27, C28, C29, C30, C32, C35, C37, C44, C45, C49, C52, C53 = 100n (assumed)

K30N60 pinout



Modelling indicates motor current range of 0 to 24A
gives an output (IV) voltage range of 0 - 3.2V
(Motor rated 0-10.5A)

Similarly, MV ranges 0- 3.6V for
voltage range of 0 - 200V
(Motor rated for 180V)

Note for a DC motor speed (rpm) is proportional to supply voltage
and current is proportional to motor torque

Motor control and protection :-
Power turned on, charges caps through R55.
SMPS controller starts providing power to PIC and treadmill user control panel
HV voltage increases to 3.6V as caps charge (ie to ~320V DC or caps fully charged)
PIC allows RLA2 to close through PIC pin 10
User clicks power switch which causes RLA2 to close its contacts and PIC reads this through PIC pin 9
PIC starts motor PWM based on user selected speed, measures RPM, HV, IV and MV.
If MV > 180V - trip motor (excess voltage ie speed)
if MV < 0V - trip motor as motor is generating
If HV > 3.6V - trip motor as excessive input voltage
If HV < 3.6V - trip motor as excessive current being drawn or something wrong with the incoming supply

If IV > 2V then motor overloaded as motor current > 10.5A
IV may exceed 2V to 3.2V (24A) for brief periods - say when a large user steps onto the treadmill belt so IV should have a 1s or so
time delay before it trips the motor If the treadmill belt is heavily loaded the PWM duty cycle is high, then the user suddely steps off,
the motor will speed up instantly, so IV suddenly falls but the RPM rises quickly

So HV and IV are analog inputs and MV can be analog or an interrupt

RPM is not sensed by an interrupt capable pin, but it is an input to a comparator on the Plc.
The comparitor generates an interrupt on match, and is used to count the pulses

LTspice model indicates (resistive load)
- IV rises with rising load current - 2V @10ohm, 1.3V @ 30ohm
- MV rises decreasing load current - 4.5V @ 30ohm, 2.8V @ 10ohm
- HV rises with increasing load current - 4.2V @ 10ohm, 2V @ 10ohm

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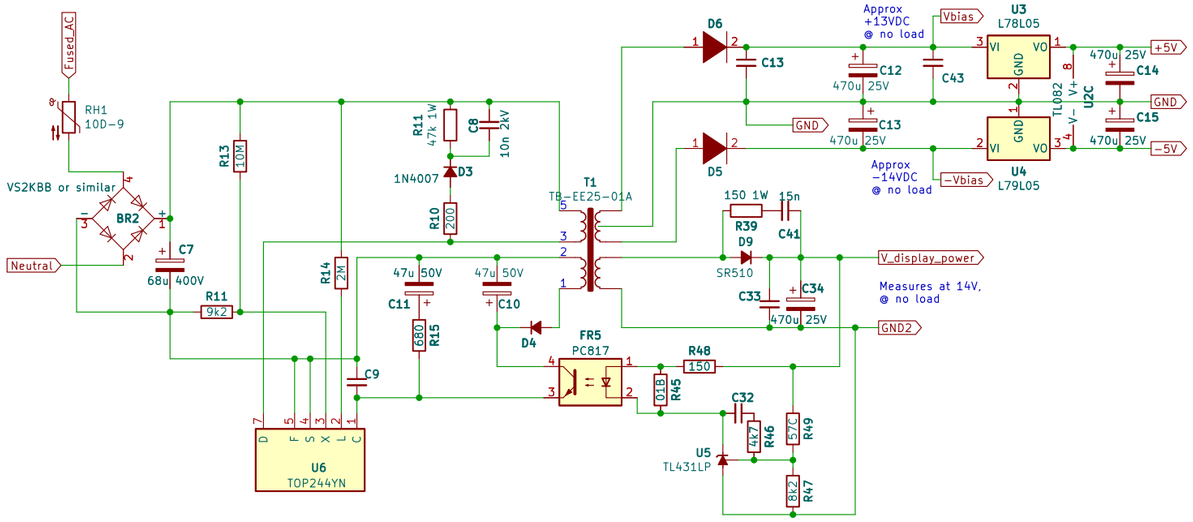
Sheet: /
File: copy redrawn pf906 dc motor driver board.kicad_sch

Title: PF906 treadmill DC power schematic

Size: A3	Date: 2022-12-27	**Rev: 3a**
KiCad E.D.A. kicad (6.0.10)		Id: 1/8



Auxiliary power schematic

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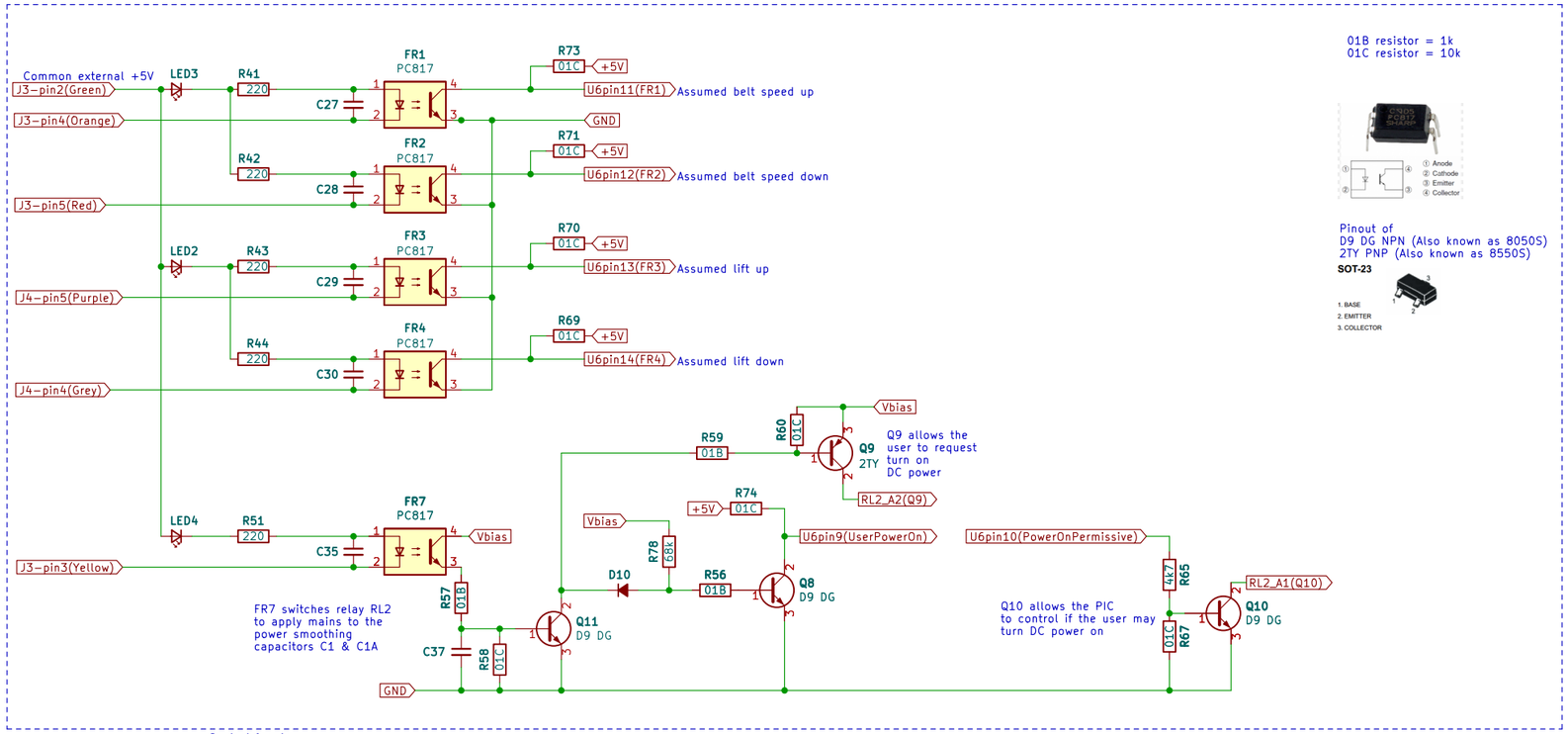
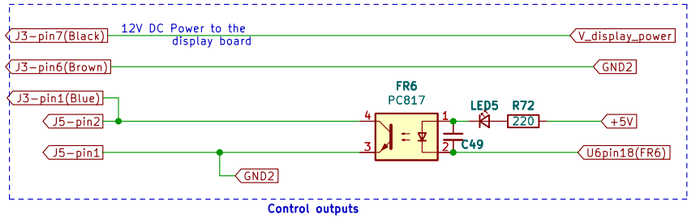
Sheet: /2 Aux power/
File: Aux power.kicad_sch

Title: PF906 treadmill DC power schematic

Size: A3	Date: 2022-12-27	**Rev: 3a**
KiCad E.D.A. kicad (6.0.10)		Id: 2/8





Colours on connectors match cable colours and colors on the display board

Control input/output schematic

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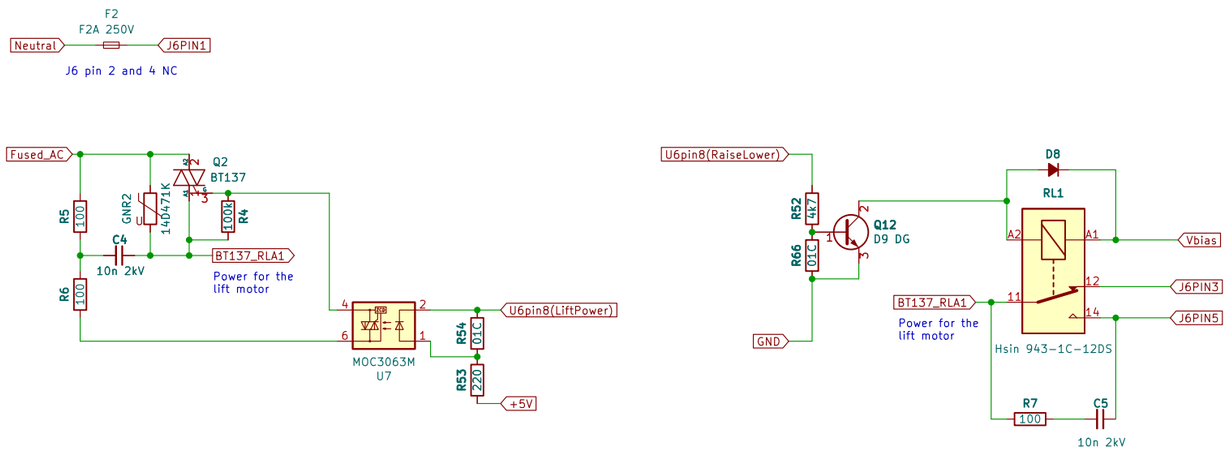
Sheet: /3 Control IO/
File: Control IO.kicad_sch

Title: PF906 treadmill DC power schematic

Size: A3	Date: 2022-12-27	**Rev: 3a**
KiCad E.D.A. kicad (6.0.10)		Id: 3/8



Lift motor power schematic

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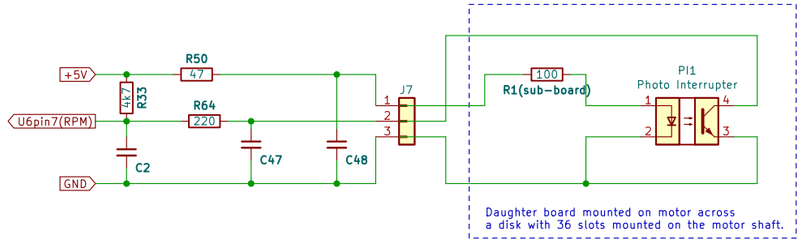
Sheet: /4 Lift Motor Control/
File: Lift Motor Control.kicad_sch

Title: PF906 treadmill DC power schematic

Size: A3	Date: 2022-12-27	**Rev: 3a**
KiCad E.D.A. kicad (6.0.10)		Id: 4/8

RPM sensor



Max motor speed is 4700RPM so max pulse rate is 4700*36/60 = 2820Hz

So considering PWM frequency, it may be best to use a PWM frequency >> 2820Hz
so say 30kHz. Im not sure if thats relevent.

RPM is not sensed by an interrupt capable pin, however it does connect to the inverting input of either Comparator 1 or
Comparator 2 of the PIC chip. Either comparator can generate an internal interrupt.

Consider that when a hole in the disk moves to expose the LED. As the hole approaches the light level increases, reaches a peak then drops
again. Much like a a typical day, where the sun rises at dawn and sets at dusk but its niot an abrupt light level change. Pushing the light
signal through a compartor therefore makes sense to square off the wave and trigger on the rising or falling edges of the wave.

Counting the pulses from this wave is thus simplified by using a comparator and its interrupt in the PIC.

Motor RPM sensor

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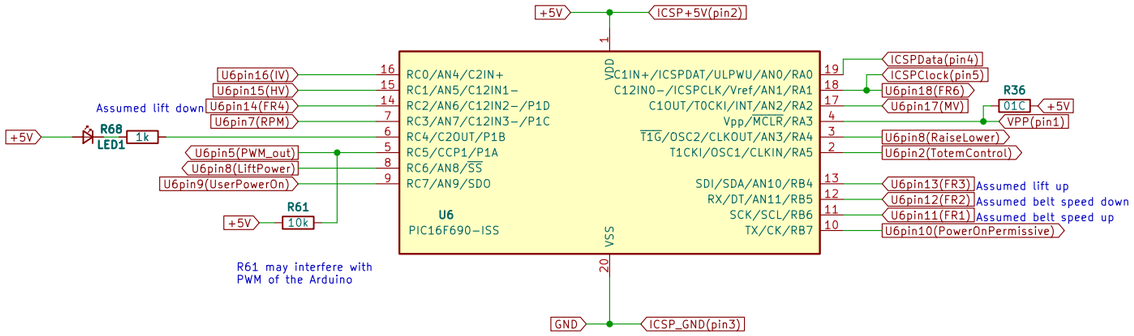
Sheet: /5 RPM /
File: RPM.kicad_sch

Title: PF906 treadmill DC power schematic

Size: A3	Date: 2022-12-27	**Rev: 3a**
KiCad E.D.A. kicad (6.0.10)		Id: 5/8



PIC 16F690 controller schematic

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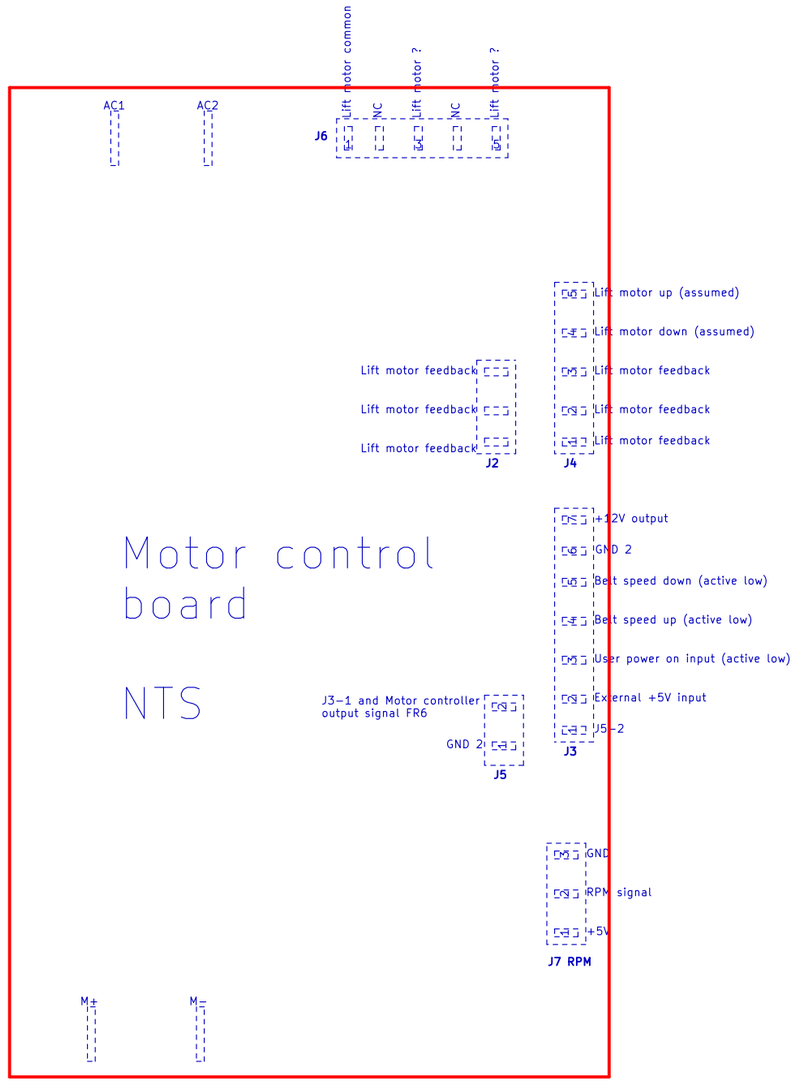
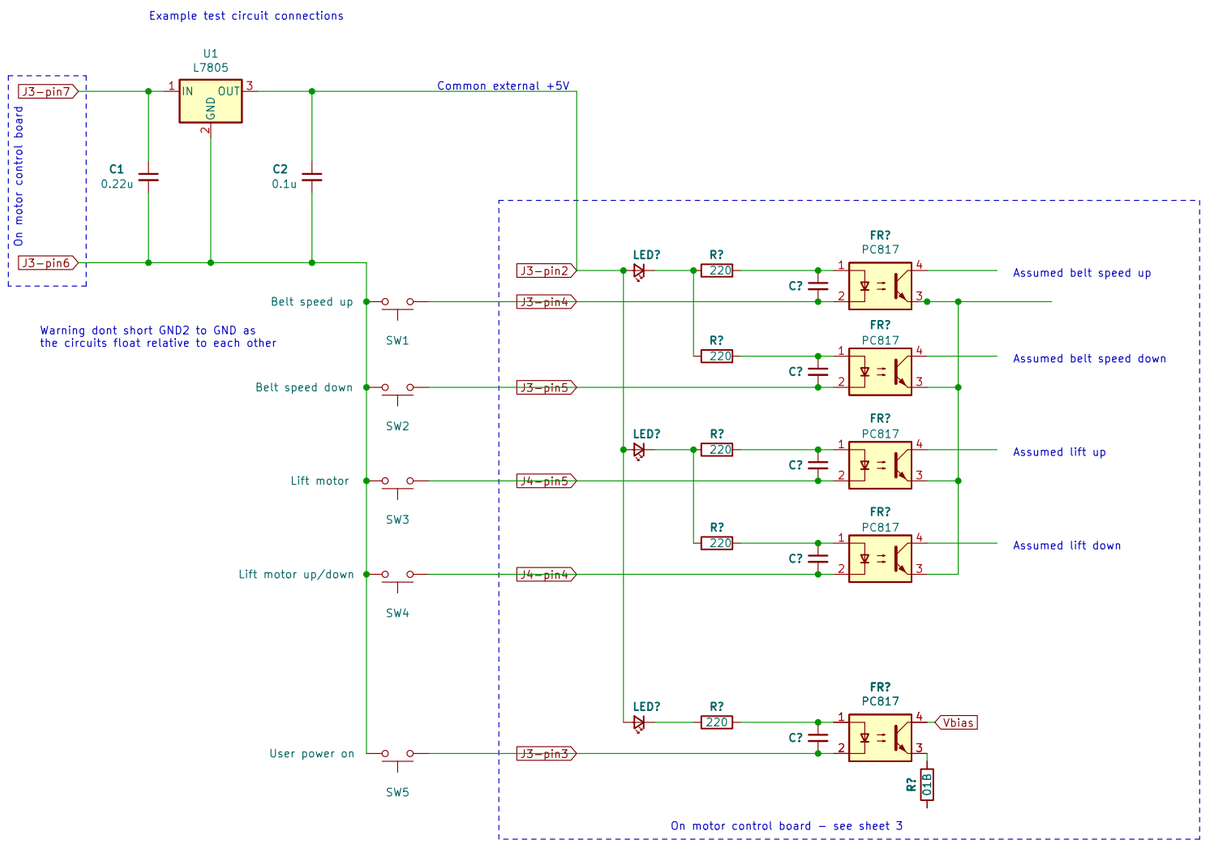
Sheet: /6 PIC 16F690 Controller/
File: PIC 16F690 Controller.kicad_sch

Title: PF906 treadmill DC power schematic

Size: A3	Date: 2022-12-27	**Rev: 3a**
KiCad E.D.A. kicad (6.0.10)		Id: 6/8



Example test circuit connections



PF906 external connector layout and pin descriptions and test circuit

Sheet: /7 Connector layout/	
File: conn_layout.kicad_sch	
Title: PF906 treadmill DC power schematic	
Size: A3	Date: 2022-12-27
KiCad E.D.A. kicad (6.0.10)	Id: 7/8

Rev: 3a

BLANK – for future use

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Sheet: /PJ code Testing/
File: testing.kicad_sch

Title: PF906 treadmill DC power schematic

Size: A3	Date: 2022-12-27	**Rev: 3a**
KiCad E.D.A. kicad (6.0.10)		Id: 8/8