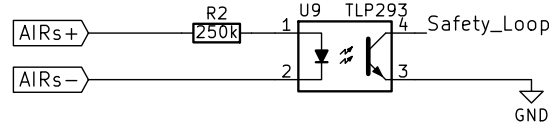
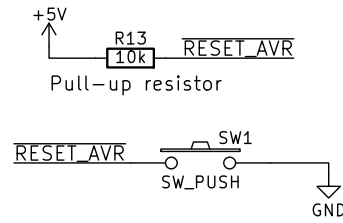


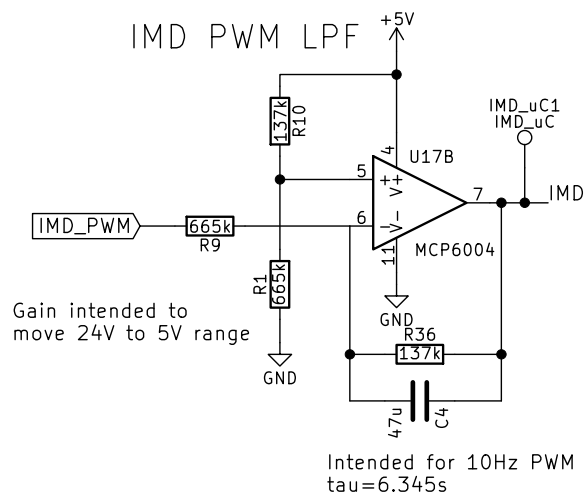
### AIRs Measurement



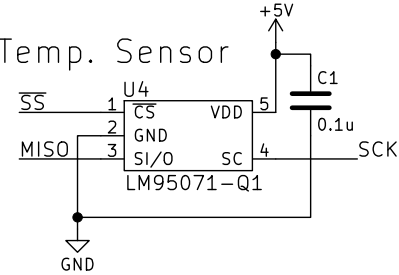
### Reset



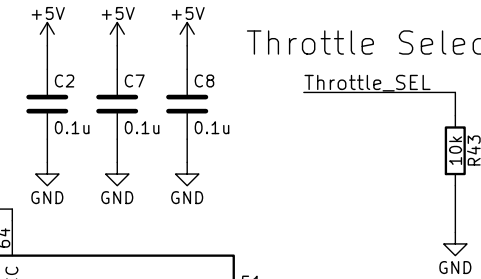
### IMD PWM LPF



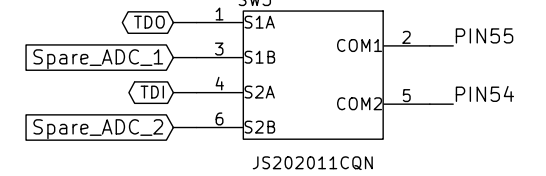
### Temp. Sensor



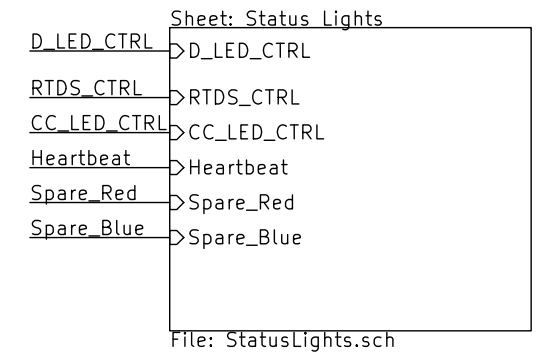
### Throttle Select Pulldown



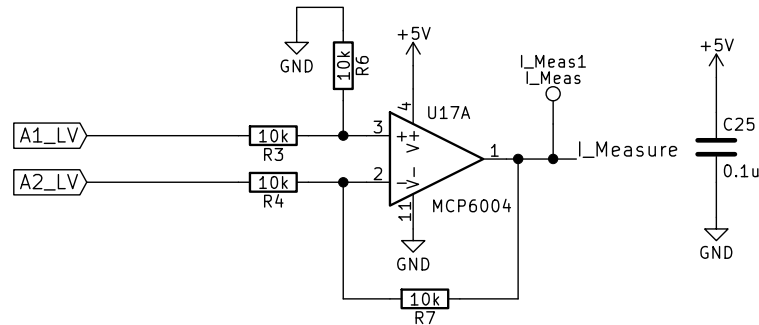
### Spare ADC Switch



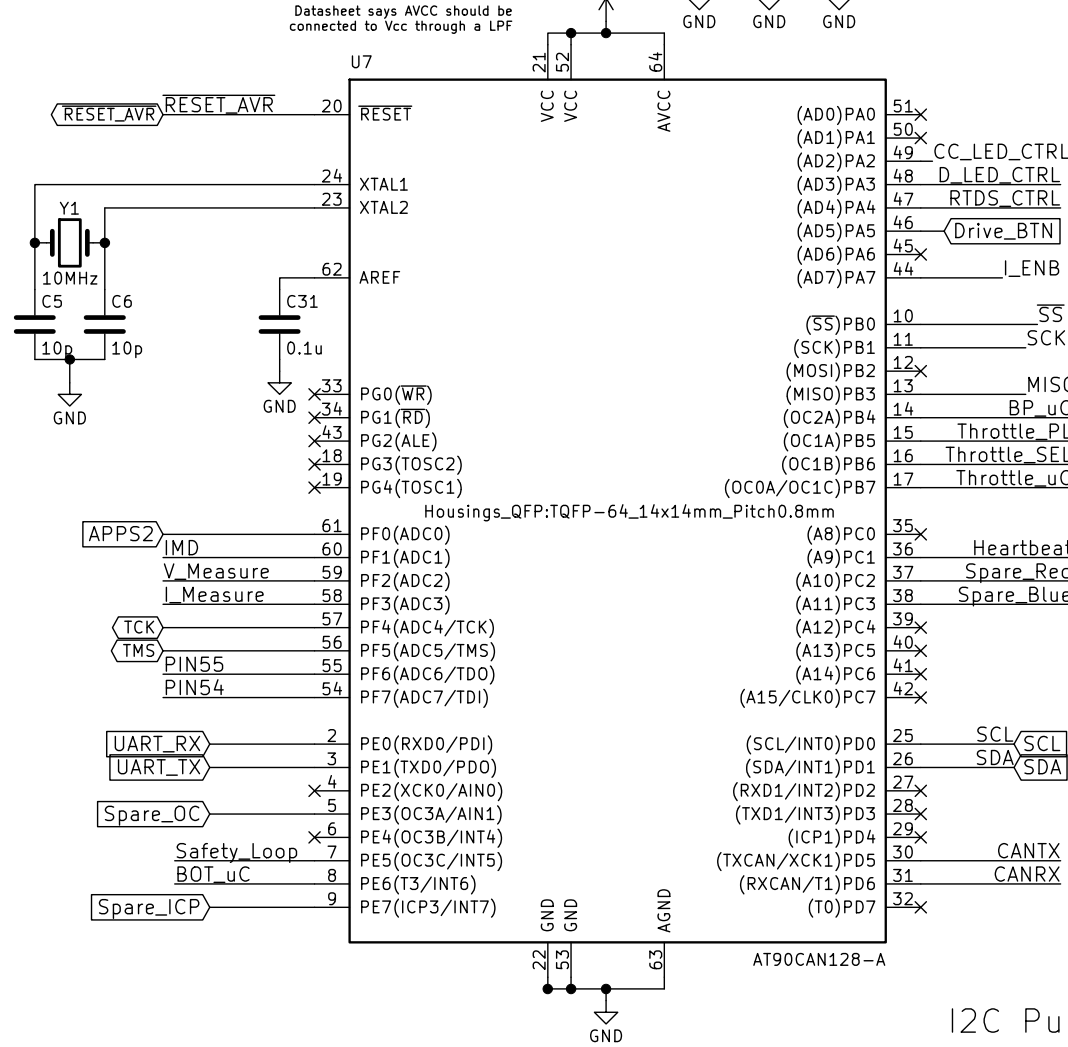
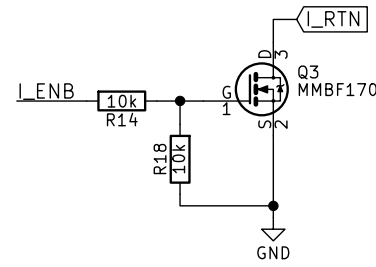
### Status Lights



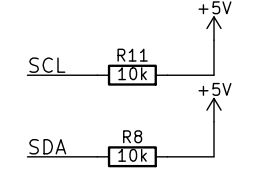
### Current Measurement



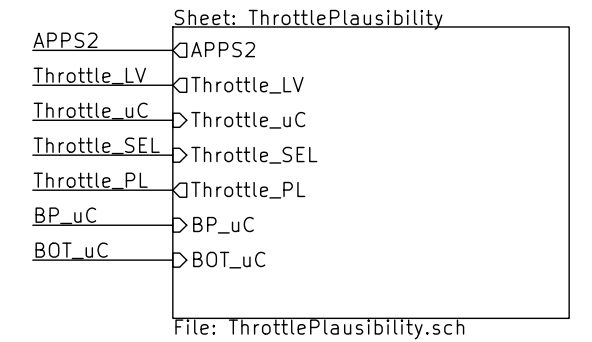
### Current Enable



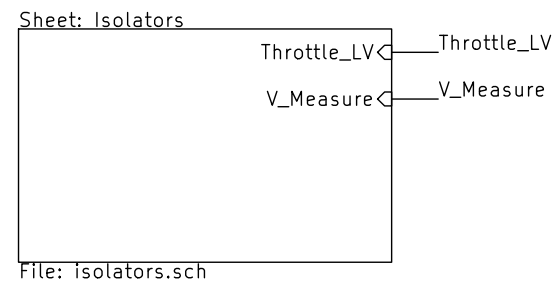
### I2C Pullup



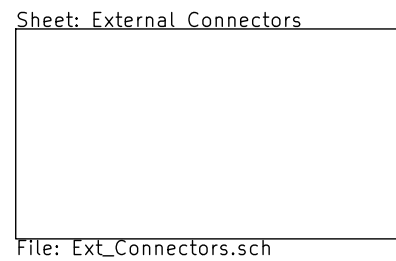
### Throttle Plausibility



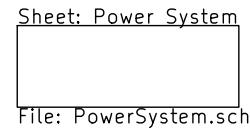
### Isolators



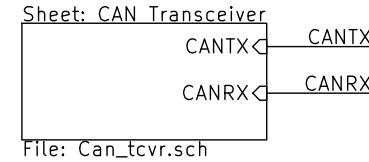
### CONNECTORS



### DC DC Converters



### CAN TRANSCEIVER



### DEVELOPMENT ONLY

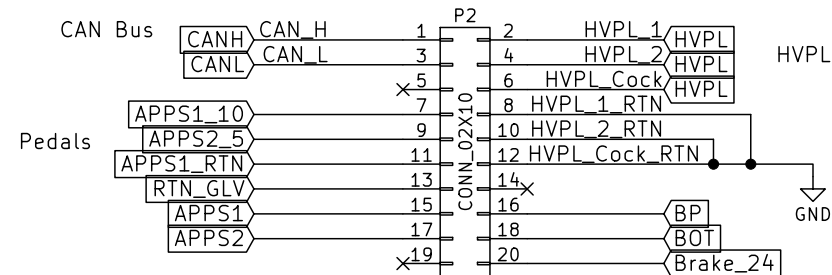
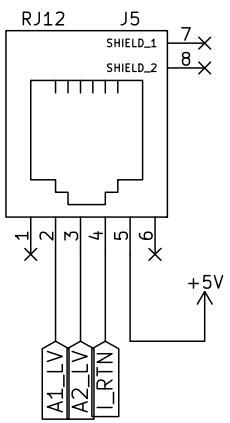
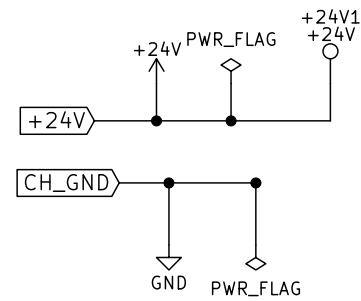
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Spring 2017  
Lafayette College

Sheet: /  
File: Circuit\_layout.sch

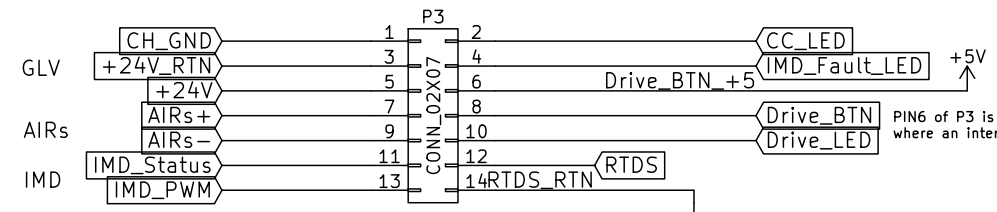
### Title: Tractive System Interface

Size: USLegal Date:  
KiCad E.D.A. kicad 4.0.6

Rev: 0.0  
Id: 1/7



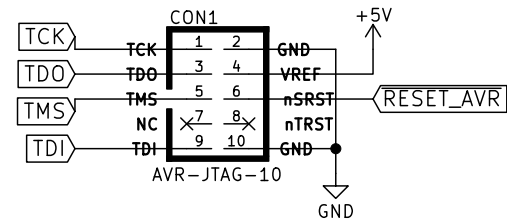
On current board PIN19 is tied to PIN20 of P2.  
This due to BOT and BP needing +24V.



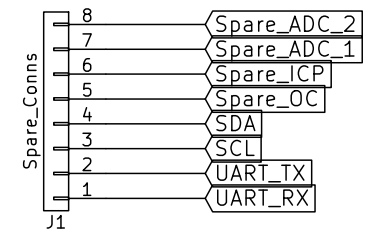
PIN1 and PIN3 tied, due to voltage regulator used (LM7810).  
See note on Throttle Plausibility sheet.

Note on P2 and P3:  
Both of these connectors are ordered in less-than-ideal ways if ribbon cables are used.  
Additionally, the ribbon cable used is too small of gauge.  
This DOES NOT mean using screw terminals.

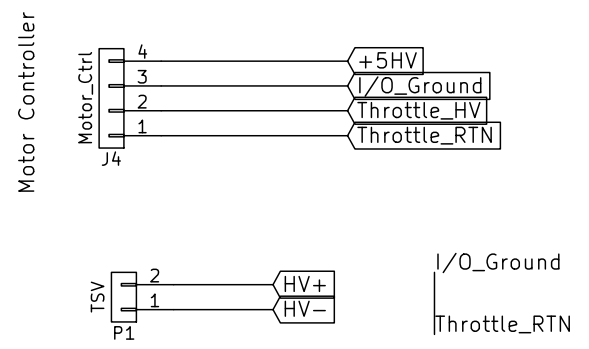
Consider using completely different connectors.  
Also, the footprints do not accurately portray this plastic layout of the  
connectors themselves. Remeasure/redraw.



Spare connections to uC



### High Voltage



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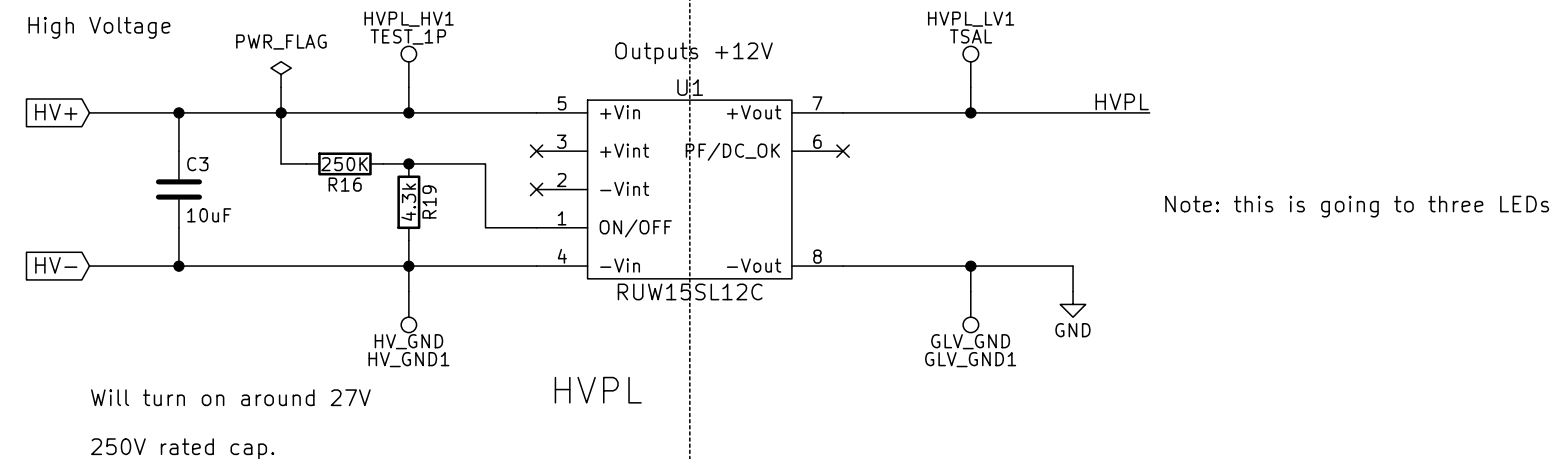
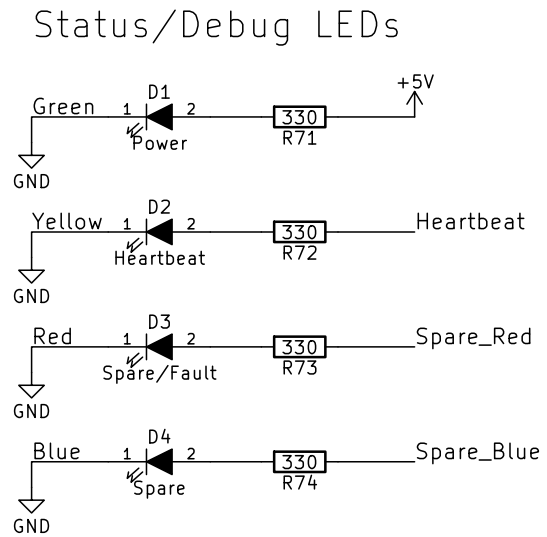
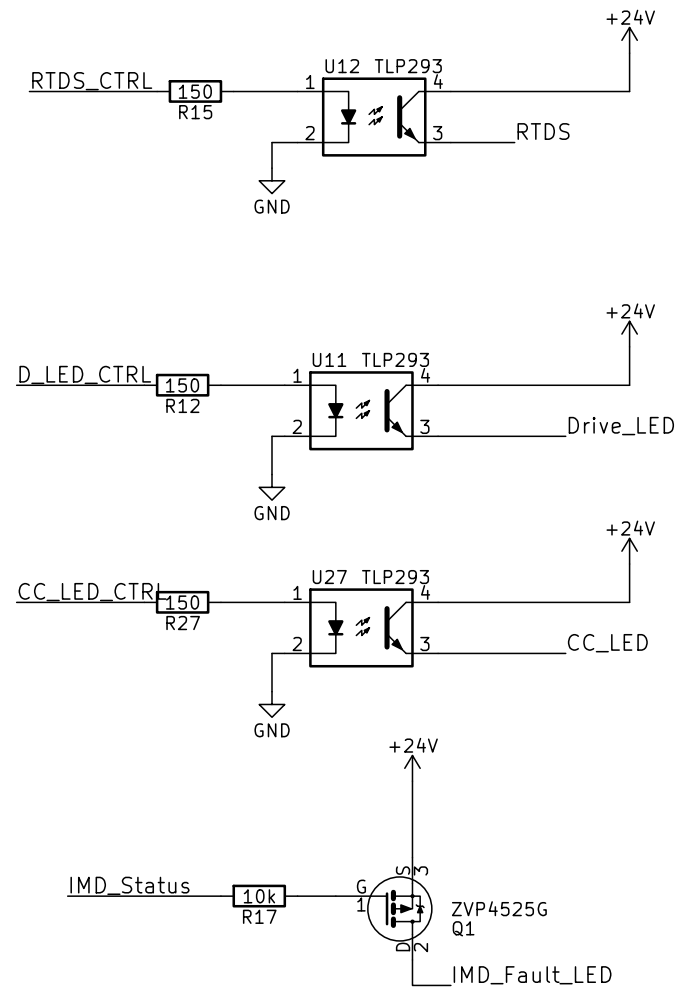
Sheet: /External Connectors/  
File: Ext\_Connectors.sch

**Title: Tractive System Interface**

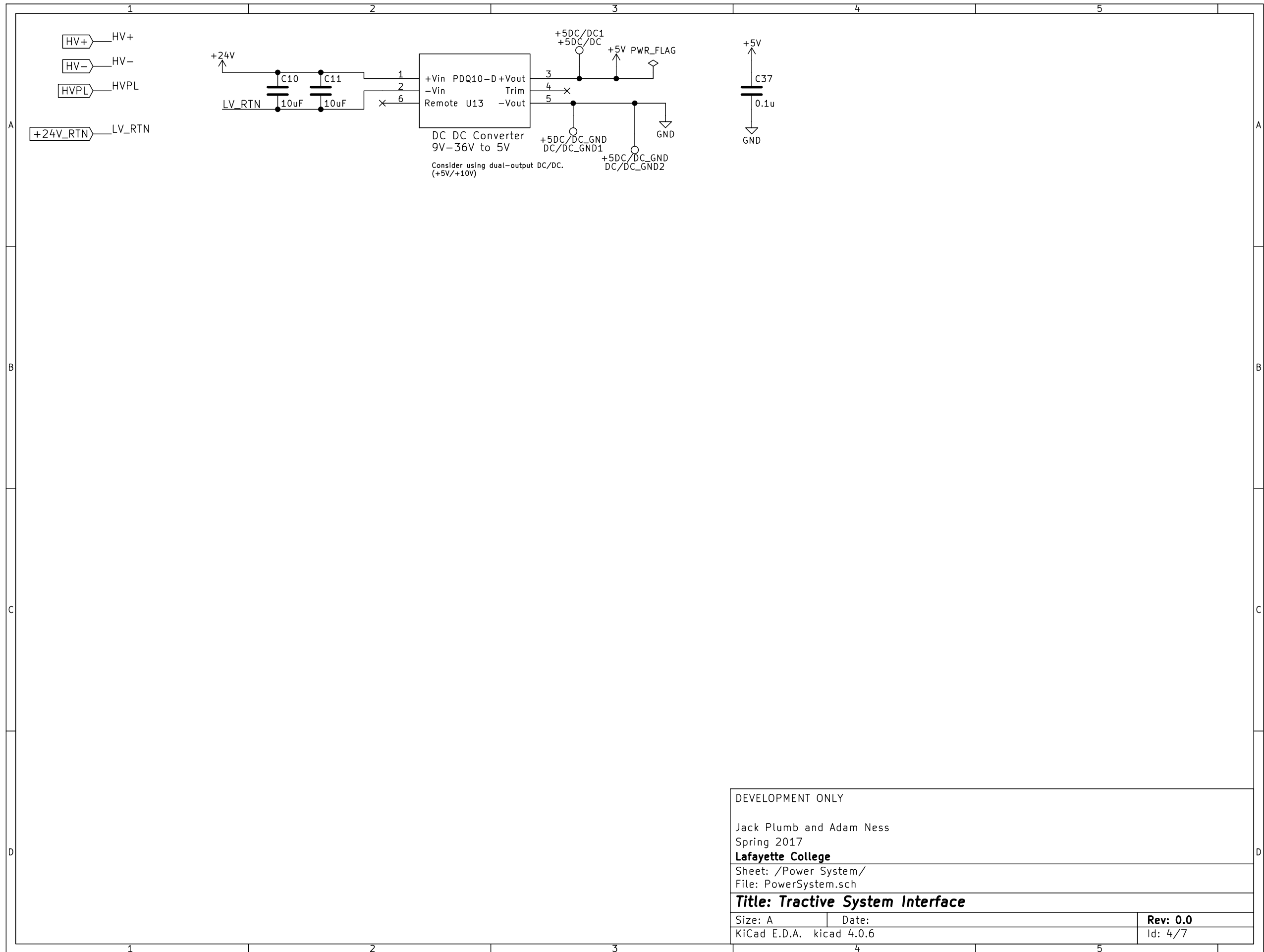
Size: A Date:  
KiCad E.D.A. kicad 4.0.6

Rev: 0.0  
Id: 2/7

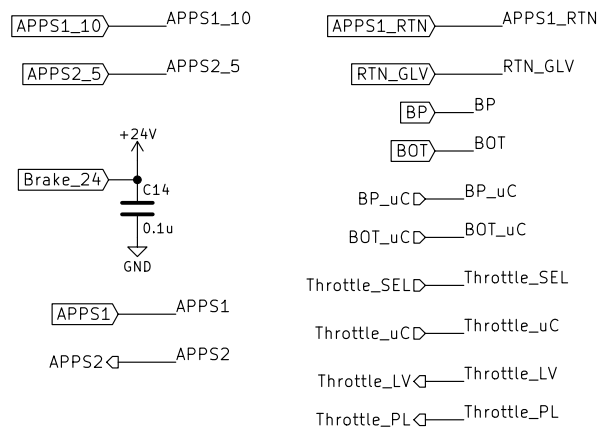
- RTDS → RTDS
- Drive\_LED → Drive\_LED
- CC\_LED → CC\_LED
- IMD\_Fault\_LED → IMD\_Fault\_LED
- IMD\_Status → IMD\_Status
- HVPL → HVPL
- RTDS\_CTRL → RTDS\_CTRL
- D\_LED\_CTRL → D\_LED\_CTRL
- CC\_LED\_CTRL → CC\_LED\_CTRL
- Heartbeat → Heartbeat
- Spare\_Red → Spare\_Red
- Spare\_Blue → Spare\_Blue



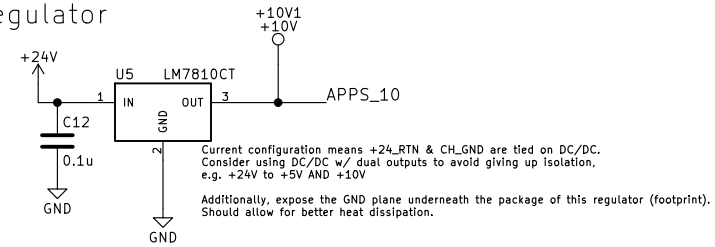
DEVELOPMENT ONLY		
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Sheet: /Status Lights/ File: StatusLights.sch		
<b>Title: Tractive System Interface</b>		
Size: A4	Date:	Rev: 0.0
KiCad E.D.A. kicad 4.0.6		Id: 3/7



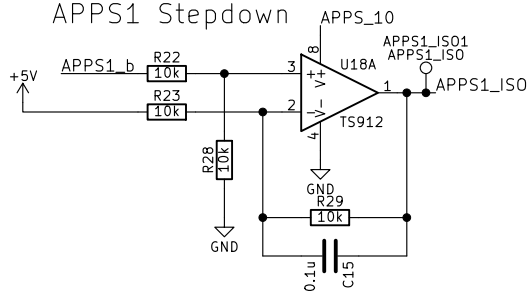
DEVELOPMENT ONLY		
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Sheet: /Power System/ File: PowerSystem.sch		
<b>Title: Tractive System Interface</b>		
Size: A	Date:	<b>Rev: 0.0</b>
KiCad E.D.A. kicad 4.0.6		Id: 4/7



10V Regulator

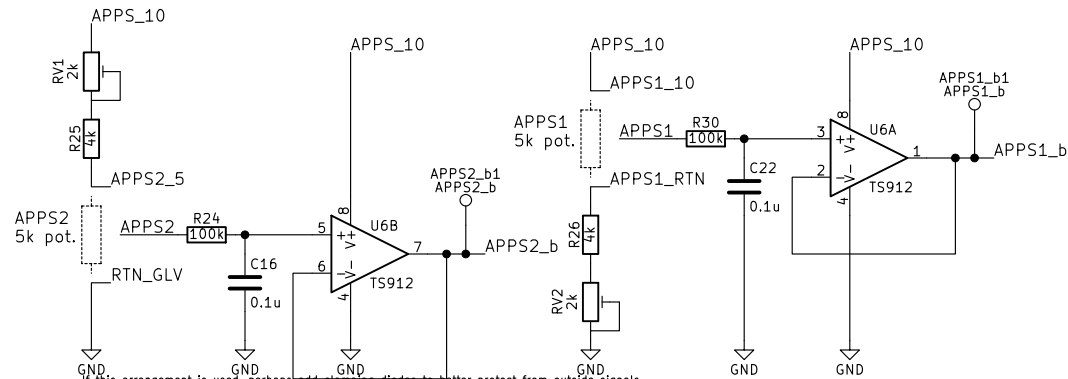


APPS1 Stepdown



Brings the 5-10V biases APPS1 signal down to 0-5V

APPS 5V Offset Bias



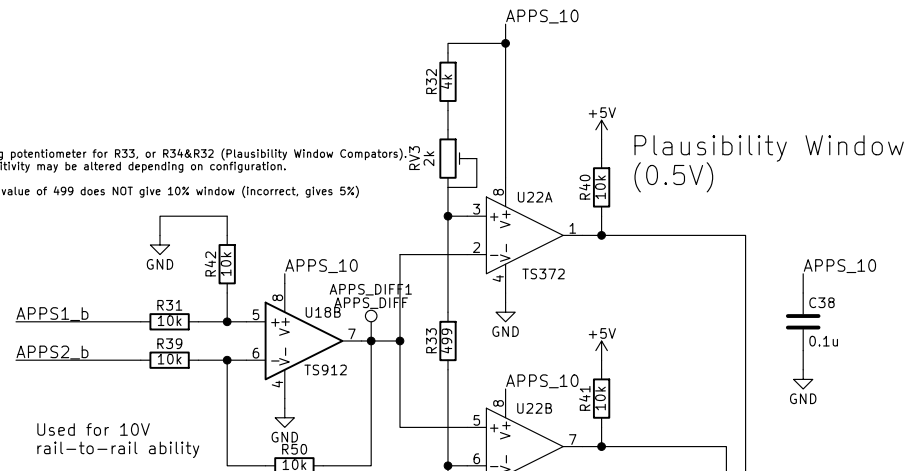
If this arrangement is used, perhaps add clamping diodes to better protect from outside signals. With the clutter of the box, it is easy to connect wires incorrectly.

R25 and R26 could be replaced by potentiometers, so that tuning to the pedal cluster can be more accurate.

R25 and R26 are also incorrectly sized. Their size was based upon the potentiometer datasheet, which is incorrect. They were replaced on the board with values closer to the measured values ( APPS1-5k, APPS2-4.75k)

Additionally, the pedal potentiometers need to be wired inverted from their diagram, so that the wiper tracks as expected.

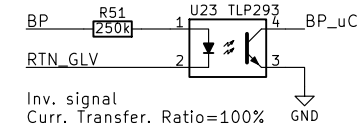
Consider using potentiometer for R33, or R34&R32 (Plausibility Window Comparators). This way sensitivity may be altered depending on configuration. Note: Current value of 499 does NOT give 10% window (Incorrect, gives 5%)



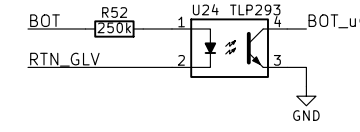
Used for 10V rail-to-rail ability

Plausibility Window (0.5V)

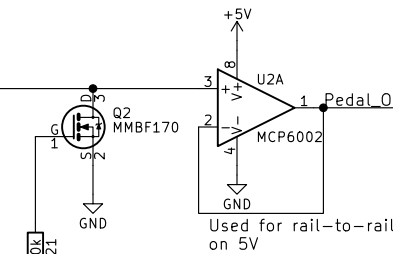
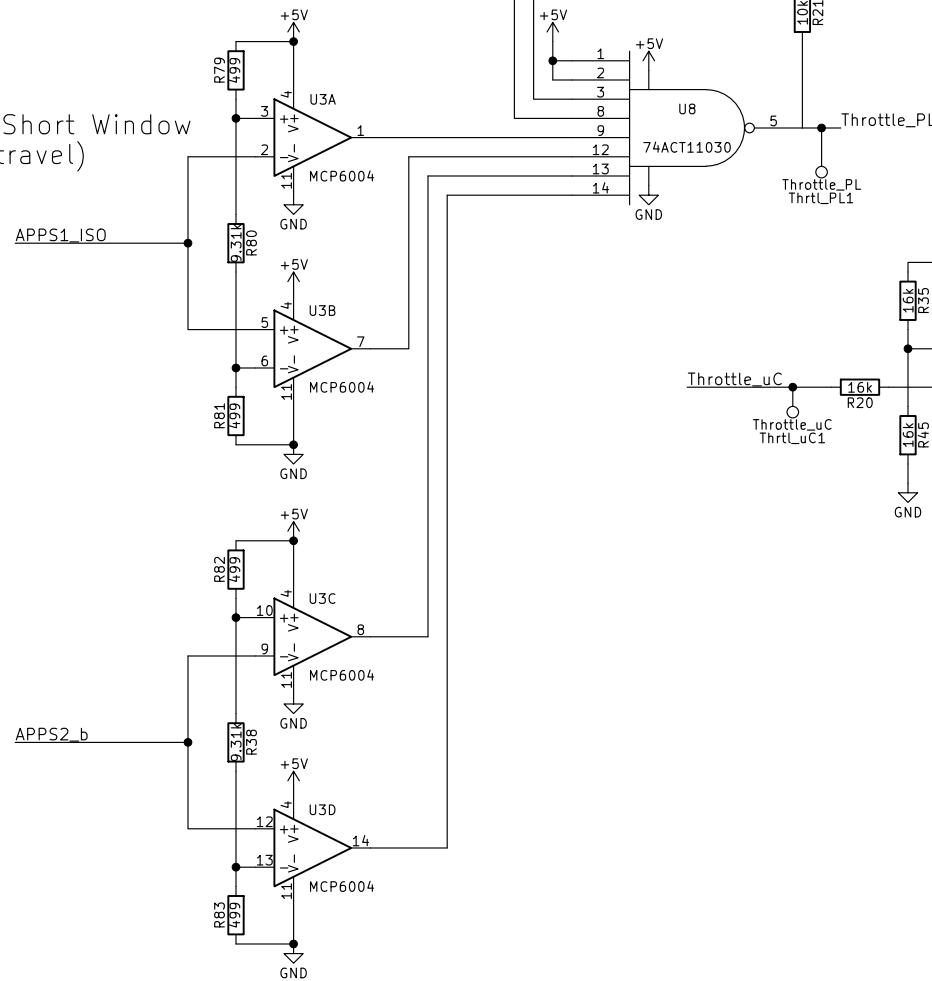
Brake Pressed



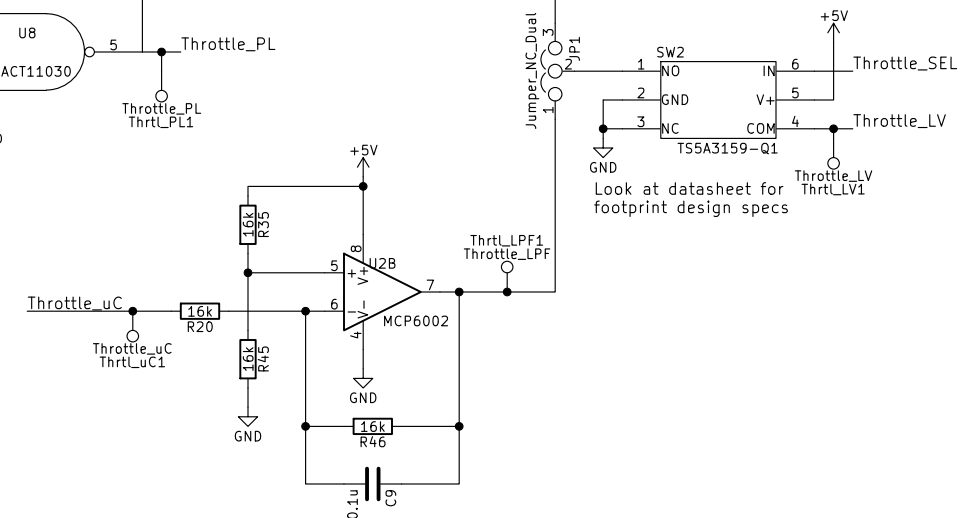
Brake Overtravel



Open/Short Window (90% travel)

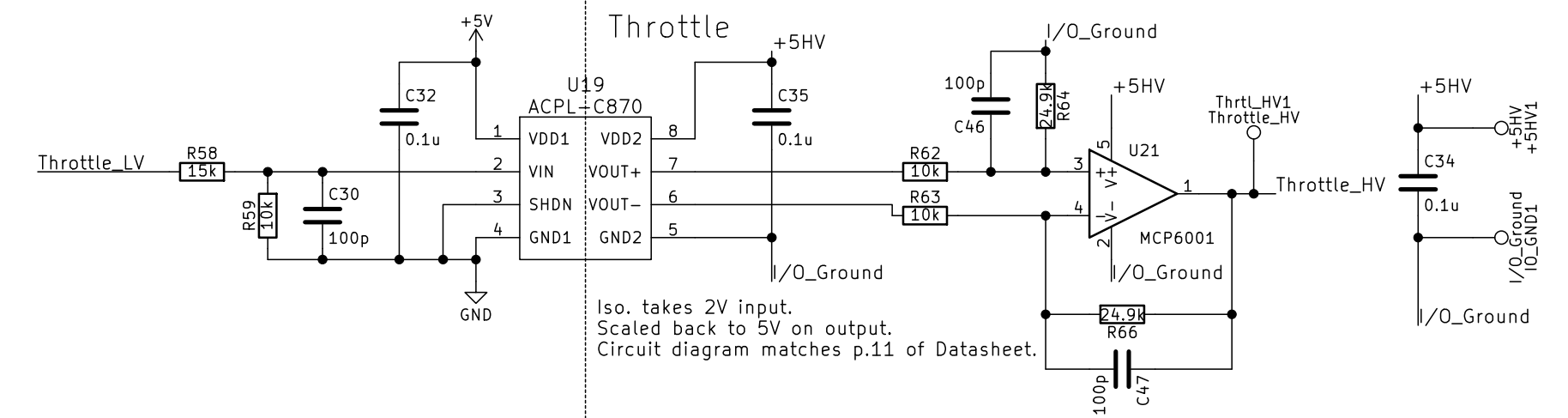


Throttle Select Switch

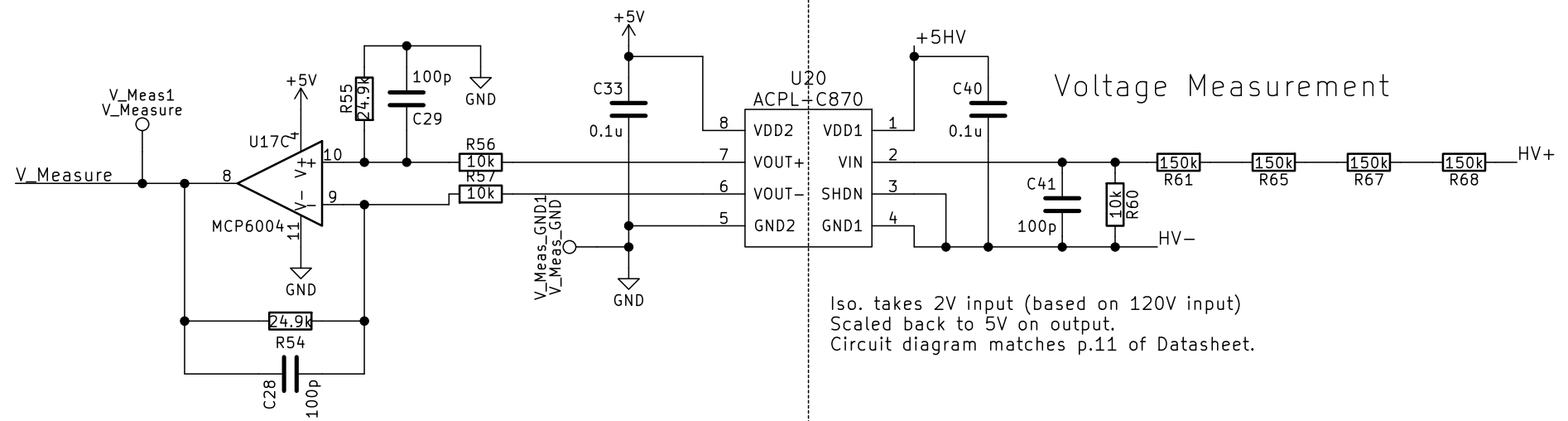


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Sheet: /ThrottlePlausibility/ File: ThrottlePlausibility.sch	
<b>Title: Tractive System Interface</b>	
Size: B	Date: 2017-02-13
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Throttle\_HV Throttle\_HV  
 Throttle\_RTN I/O\_Ground  
 +5HV +5HV  
 I/O\_Ground I/O\_Ground  
 HV+ HV+  
 HV- HV-  
 Throttle\_LV Throttle\_LV  
 V\_Measure V\_Measure



**Throttle**  
 Iso. takes 2V input.  
 Scaled back to 5V on output.  
 Circuit diagram matches p.11 of Datasheet.



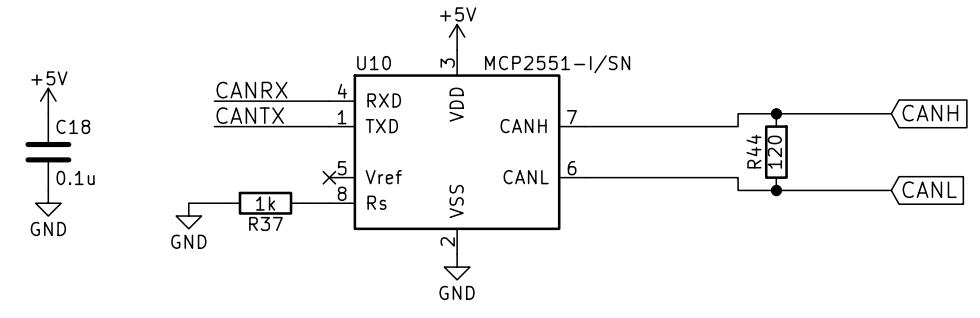
**Voltage Measurement**  
 Iso. takes 2V input (based on 120V input)  
 Scaled back to 5V on output.  
 Circuit diagram matches p.11 of Datasheet.

LOW VOLTAGE      HIGH VOLTAGE

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Sheet: /Isolators/ File: isolators.sch	
<b>Title: Tractive System Interface</b>	
Size: A4	Date:
KiCad E.D.A. kicad 4.0.6	Rev: 0.0
	Id: 6/7

CANTX ← CANTX  
 CANRX ← CANRX

### CAN Transceiver



NOTE: DO NOT populate R44.  
 R44 provides the ability to use this board as a terminating CAN node in development only.

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Sheet: /CAN Transceiver/ File: Can_tcvr.sch		
<b>Title: Tractive System Interface</b>		
Size: A4	Date:	<b>Rev: 0.0</b>
KiCad E.D.A. kicad 4.0.6		Id: 7/7