

+V\_int is an intermediate voltage, after the battery but before the voltage regulator. It can rise because any significant clamping currents are directed to it. It is clamped so it doesn't exceed approximately 4.7 V.

The bottom set of jumpers allows switching the 2 V range between attenuation and amplification, and the top set allows switching the 20 V range to use the resistor string of the 2 V range when the 2 V range is set for amplification.

The unspecified resistor values above should be calculated using the spreadsheet "voltage divider values.ods" to be optimised for resolution of the primary ADC.

The op-amp models here are not actually important, just some of their characteristics. The four input op-amps (and the in-amp) need to be fairly low noise, otherwise it'll show up in the output - the Vin op-amp is probably least important in this regard as it is only used on higher voltage ranges. The Vin amplifier especially needs a very low bias current due to a 10M input resistance. The initial LV amp also needs to have a fairly low bias current. The output op-amps need to be able to drive a capacitive load via a 1.8 - 2 k ohm resistance, which most should - and they also need to survive being shorted temporarily. The other two aren't particularly critical.

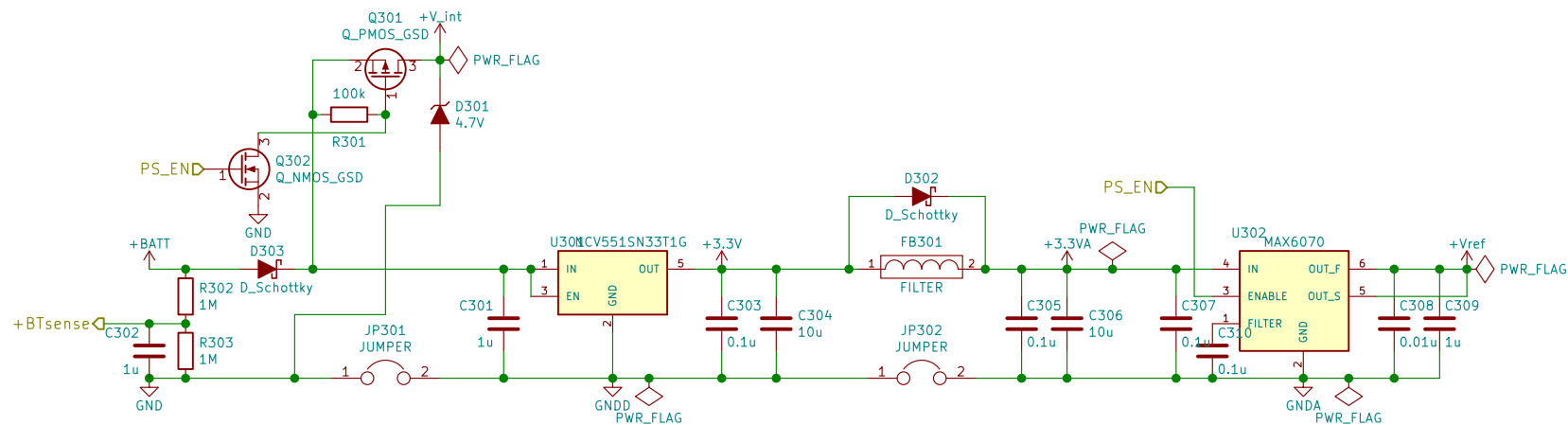
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Sheet: /Main Input / Output/  
File: Main IO.sch

Title: Main I/O

Size: A4 Date: 2016-07-02  
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Rev: 0.6  
Id: 2/5



Connect across these jumpers after routing - their purpose is to put the grounds on different nets.

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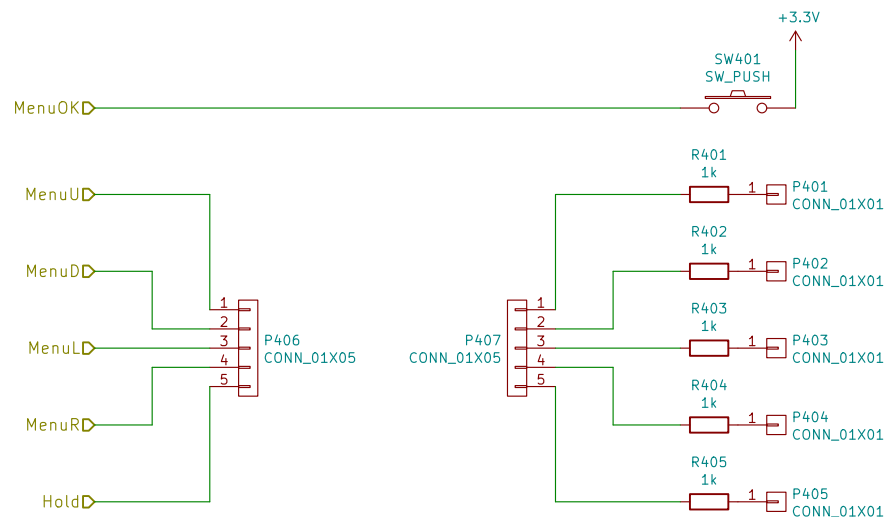
Sheet: /Power Supply/  
File: Power Supply.sch

**Title: Power supply**

Size: A4 Date: 2016-07-02  
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**Rev: 0.6**  
Id: 3/5

The touch buttons are on their own board that is in contact with the case (or the underside of the case itself).



Capacitance  
Resistance / diode / continuity (select with Range)

LCR

Voltage - AC/DC, RMS, DC offset, peaks, frequency, duty cycle

Current, as for voltage

Power, power factor, voltage, current, much as for voltage (probably can't fit all at once; select connection style with Range)

Could probably auto-detect voltage, current, power, but that conflicts with manual ranging. Power always does though, because it has both current and voltage.

Power has four connection styles, although two are the same from the point of view of power: Current and Common on negative / neutral or on positive / live (positive or negative voltage readings, respectively), and Current upstream or downstream of Common for each of the previous two (positive or negative current readings, respectively). Combining both negative shows positive power, but negative components unless known.

Combining one of each shows one component negative, but also shows negative power, unless known. We need to know because negative power is very real - the "load" is actually a source, and would be useful for things like batteries where power flows in both directions.

Range +/-: Increase or decrease through possible ranges - probably don't wrap, but not sure yet. Both returns to auto-ranging.

Rel: Relative measurement. For voltage or current, also has long-term max and min - however, they could have problems with a zero reading, for instance when changing measurement terminals.

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Sheet: /Controls/

File: Controls.sch

### Title: Interface inputs

Size: A4

Date: 2016-07-02

Rev: 0.6

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