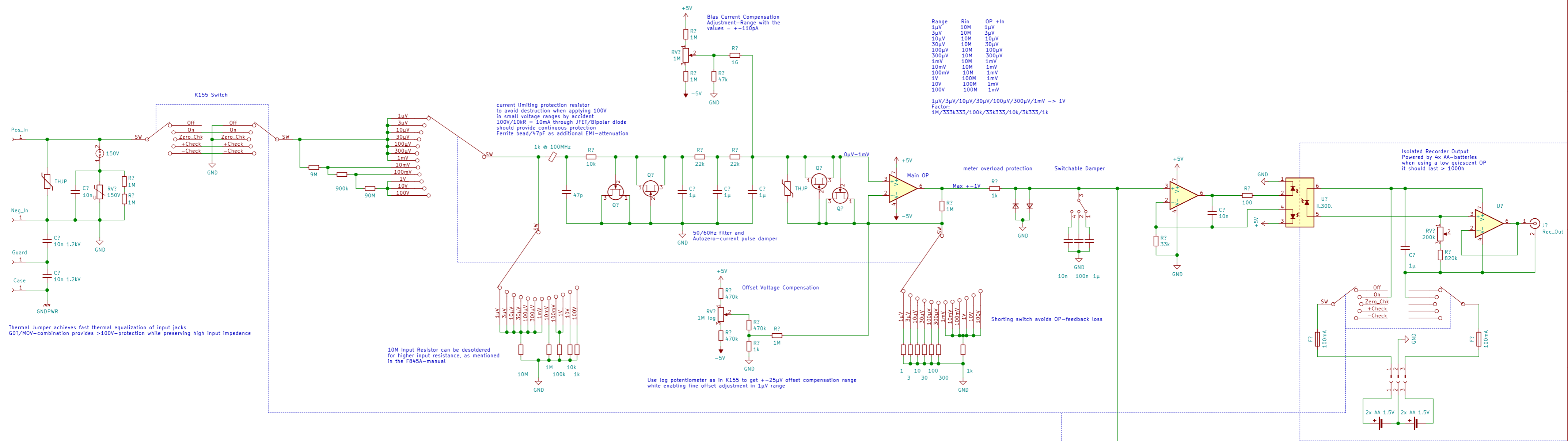
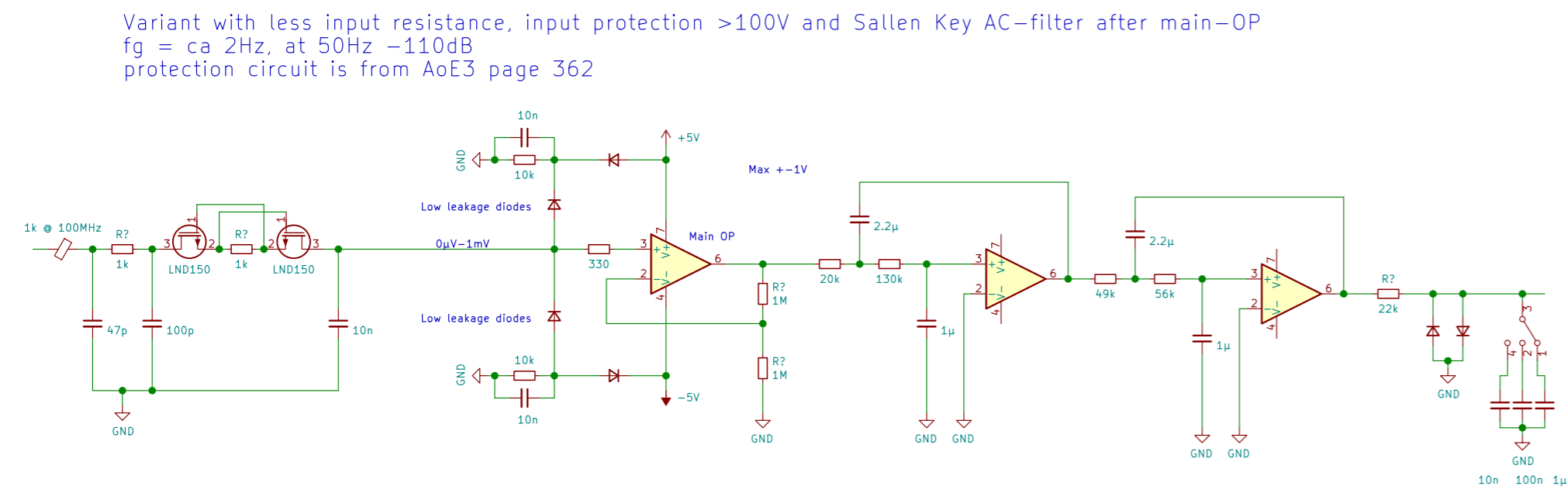


Use either a proven good (Clock Feedthrough/Current Input Spikes) Autozero-OP or a very good JFET-OP like OPA140/ADA4625-1, with temperature coefficient-compensation. Thermal jumper across input pins pretty much eliminates symmetrical routing necessity for the AZ-OP I presume

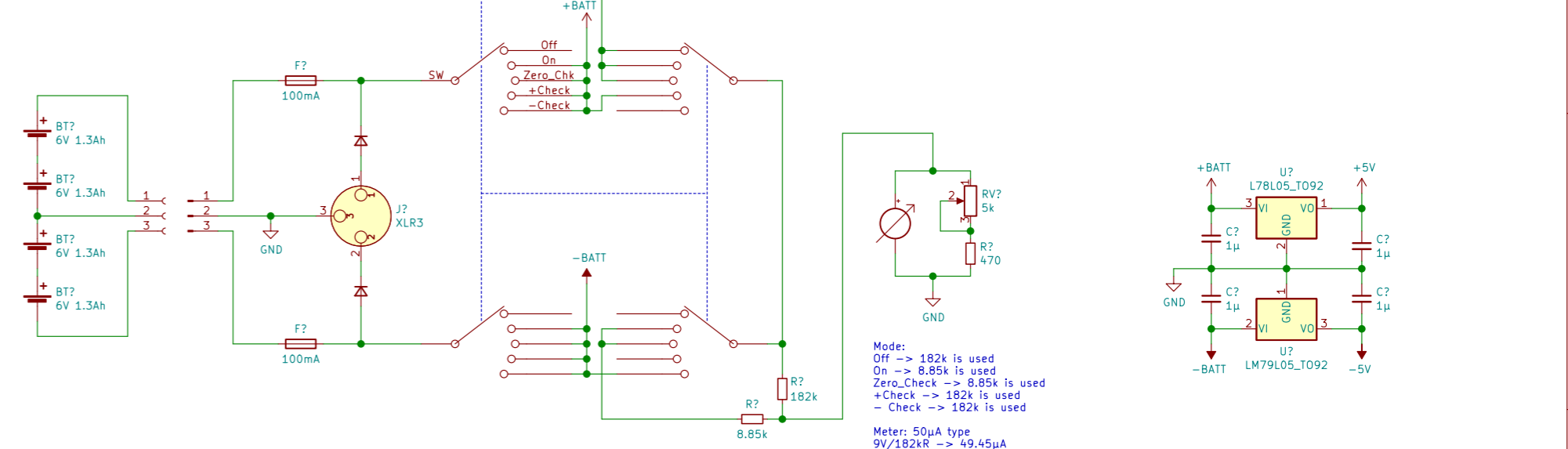


Range	Rin	OP +In
1µV	10M	1µV
3µV	10M	3µV
10µV	10M	10µV
30µV	10M	30µV
100µV	10M	100µV
300µV	10M	300µV
1mV	10M	1mV
10mV	10M	10mV
100mV	10M	100mV
1V	100M	1mV
10V	100M	10mV
100V	100M	100mV

Factor: 1M/333k333/100k/33k333/10k/3k333/1k



Variant with less input resistance, input protection >100V and Sallen Key AC-filter after main-OP
 $f_g = ca\ 2Hz$, at 50Hz -110dB
 protection circuit is from AoE3 page 362



Schematicparts blatantly stolen from:
 Keithley 155: Input Function Switch, RC-Filter
 Fluke 845AB Range Switch, allows for 10M-desoldering if desired
 Datron 1045: Bias/Offset-Compensation and Bootstrap-Supply-Variant, Range Switching
 BurrBrown-AppNote "BOOST INSTRUMENT AMP CMR WITH COMMON-MODE DRIVEN SUPPLIES": Bootstrap-Supply-Variant
 HPAK34401: Input Protection GDT/MOV-Combination as explained in AoE3 X-Chapters

Own parts:
 IL300 is used for galvanically Isolated Recorder Output, with suitably good linearity. Just a tad much current consumption.
 Photoislator is used to power the recorder-output OP
 Uses 6V 1.3Ah lead acid batteries instead 9V Blocks, since the circuit current consumption will be higher than K155.
 Charging is done via the 3pin XLR-jack

<https://www.eevblog.com/forum/projects/very-low-bias-current-op-amp-to-buffer-a-kelvin-varley-divider/msg694586/#msg694586> <- Datron 1045
<https://www.ti.com/lit/an/sboa014/sboa014.pdf?ts=1672294945275> <- Bootstrapped Variant
<https://download.tdk.com/manual/290310/Model55.pdf> <- K155 manual
https://xdevs.com/doc/Fluke/845AB/fluke_845a_ab_sm.pdf <- F845A manual

K155 uses 4x 9V Block, claiming to achieve >2000h operation time with it and >1000h while using the 1mA recorder output.
 AlkaliMangan-batteries have about 600mAh, Carbon Zinc even less...that equates to about <=300µA quiescent current for the K155

Improvements to be made and Thoughts:
 IL300 is used for galvanically Isolated Recorder Output, with suitably good linearity. Just a tad much current consumption.
 One may use a V->I converter instead like done in the Valhalla 2720G5-nullimeter...

LDO-section needs to be improved for increased battery lifetime, general supply-voltages determined and maybe add battery management/protection

Bootstrapping is used to hold the Common mode Voltage constant and therefore the OP bias current, while also improving CMRR/PSRR and enabling the bias/offset-compensation.
 Bootstrapvoltages are PRL_HI and PRL_LO
 Bootstrapping supplies are produced from the +In-side, since this should omit main OP-stability problems (see TI-Appnote)

Suitable rotary switches with 3x 19poles, that withstand 1kV and arent leaky are difficult to find/expensive, probably should use less voltage ranges at least for the high voltages that arent of much concern here
 Ib temp. compensation transistor attached to the main OP might be used for Vos temp. compensation when using a JFET-OP
 All component values arent yet correct, most are just copied from the original works and need to be correctly determined.

Changelog for this version:

- 12-pole switch instead of 19pole switch omits the unnecessary 3x Ranges above 1mV. These rotary switches are also better available.
- 100V max input range chosen:
- decreases the diode current limiting protection resistor and therefore resistor thermal noise/OP-current noise * resistor
- few rotary switches are capable of 1kV-switching
- Overvoltageprotection changed: GDT and MOV-value adapted to 100Vmax input range
- Isolated Recorder Section is now powered by batteries instead of photoislator, switched on with input-switch for convenience
- Switchable capacitors after the main-OP allow for additional damping/slower response
- Bias current compensation changed to +-110pA, deleted TC-transistor, as that depends on main-OP-choice

The necessary 50Hz/60Hz input filter with the rather big caps/resistors is still a limiting factor