'130V Greinacher Quadrupler CCS Generator Jul 15, 2012
.tran 0 500m 0

Vin
C1 {CS}
D1C
D2 1N4007
SW1 Swap Polarity
+VCell

V1
SINE(0 {Vpk} 60)

D1 1N4007

VN

C2 {CS}
R2 100k
R4 100k

D5

NE-2H L1

U1C
U1 U1B
TL431

Q1 2N5550

D6 1N4007

R1 1k
R6 100k

Cell {RCell}

NE-2H L2
-VCell

SW2 Measure Current

V-

D3 1N4007
R5 100k
C3 {CS}

V-

R3 {RSet}

C4 {CS}
D3A
D4 1N4007
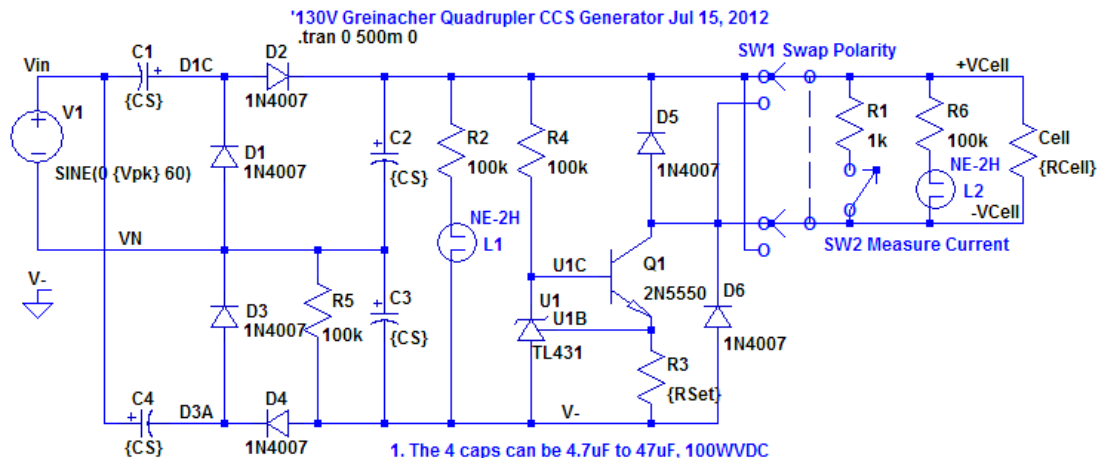
.include tl431.sub
.param CS = 4.7uF
.param RSet = 2.5V / 0.5mA
.param Vpk = sqrt(2) * 24VXfrmr
.param RCell = 150k

1. The 4 caps can be 4.7uF to 47uF, 100WVDC
2. Resistors are 1/4W
3. V1 is a small 24VAC transformer, $6.99 or less on eBay.
4. SW1, DPDT, swaps polarity at the desired point in the brew
5. SW2, SPST, allows you to measure the current without
   having to break the connections. (I = E / 1e3, 0.5V = 0.5mA)
6. Leave the circuit floating to minimize risk of shock if Q1 shorts due to ESD.
7. L2 should go out when you connect the cell. If it stays lit, then Q1 is probably
   shorted due to an ESD event.