

# 2nd Variable KV Power Supply Construction Notes

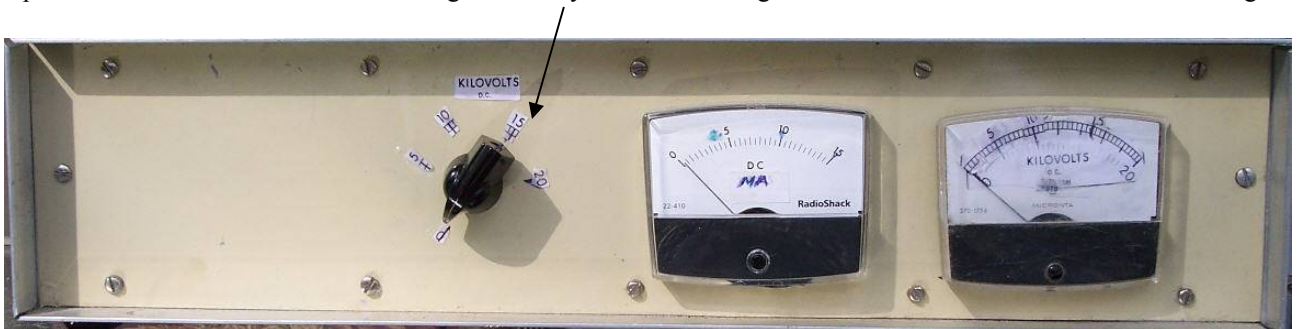
7 Apr 11

By Vaughn P. McDowell

The purpose is to document my very handy general purpose second variable HV power supply ( see photo below) built several years ago featuring analog KV and ma meters. Most of my newer designs use the TL 494 controller; this one being older uses the NE555 and TL082 op AMP . Some of the components had to be estimated due to being potted and not visible to verification. I tried to be thorough regarding this documentation however this is my first attempt. The original roughly sketched notes have been lost so I had to retrace the circuit.



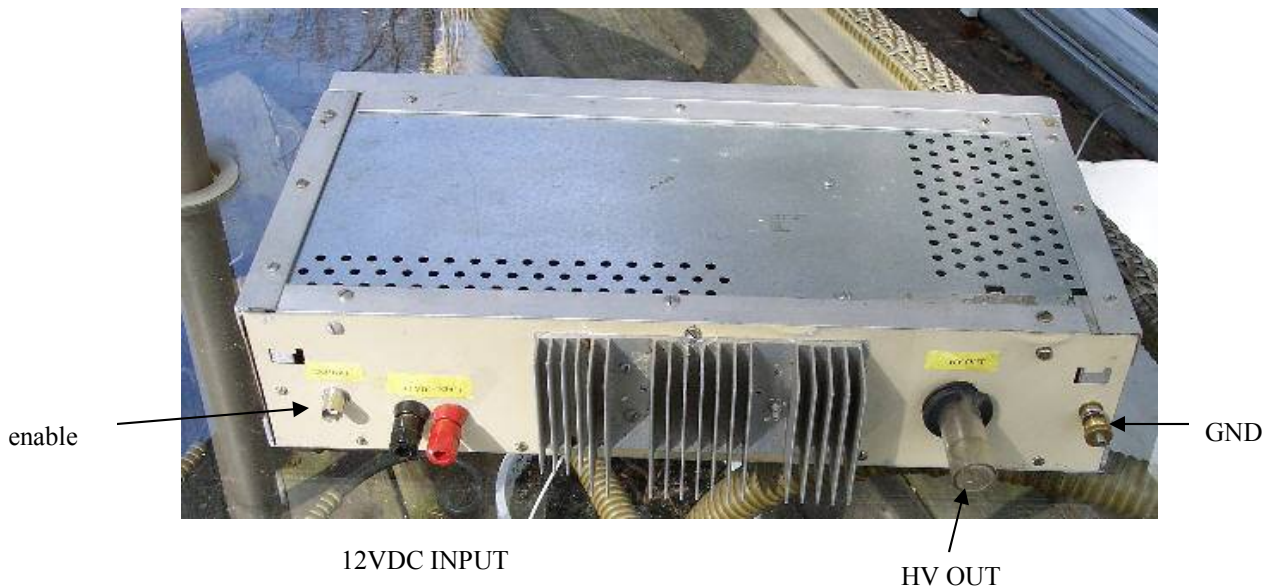
The photo below shows the front view having a manually controlled voltage knob at the left and the two meters at the right.



mA

KV

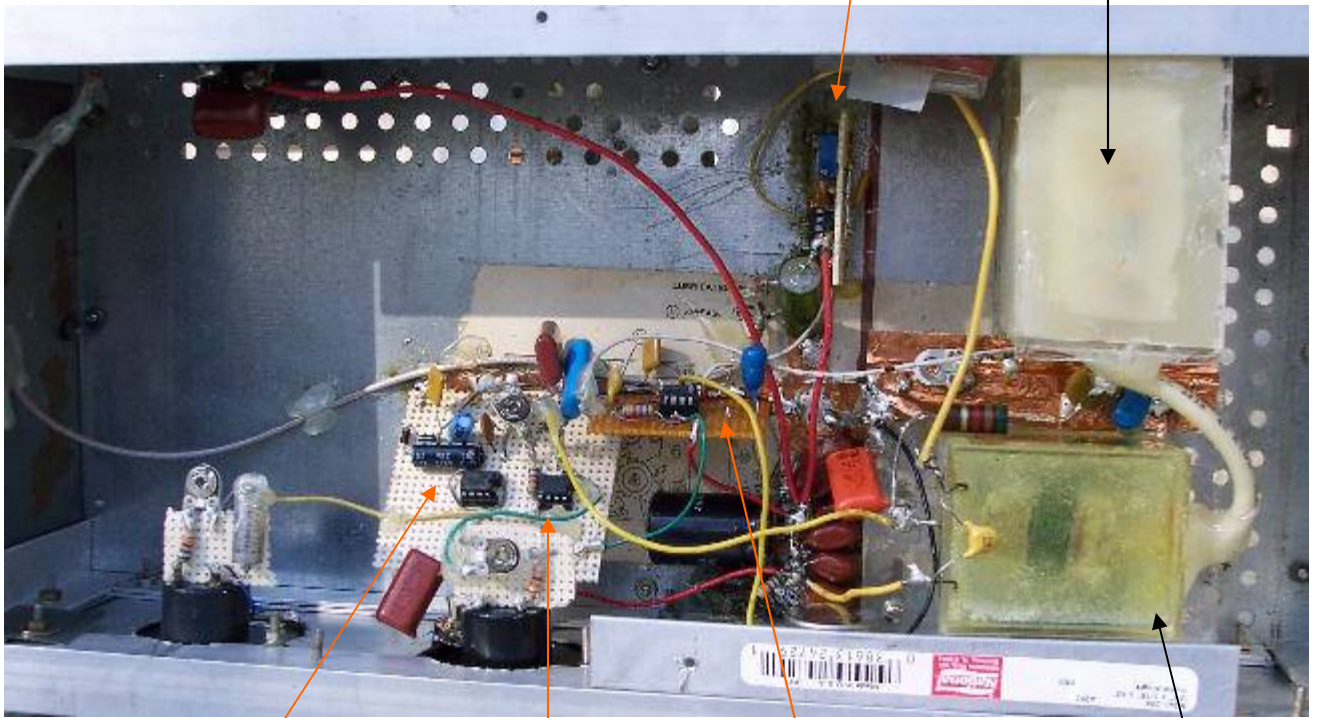
The next photo shows the rear view



12VDC INPUT

HV OUT

Inside View



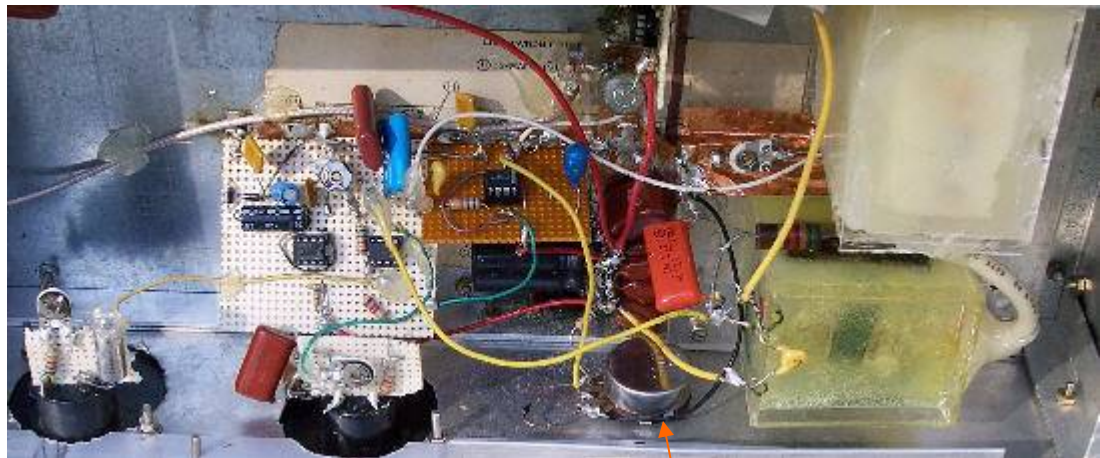
- 12VDC PS

Meter drivers

Voltage regulation sense

HV Transformer

For OP Amps - Vcc



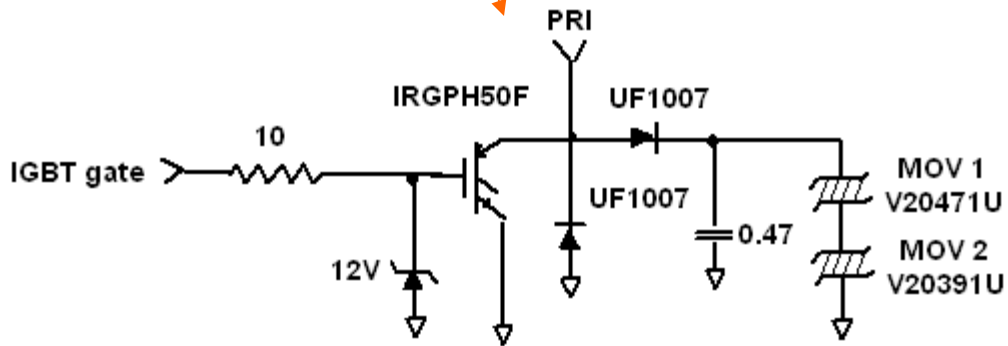
KV manual adjust



IGBT circuit

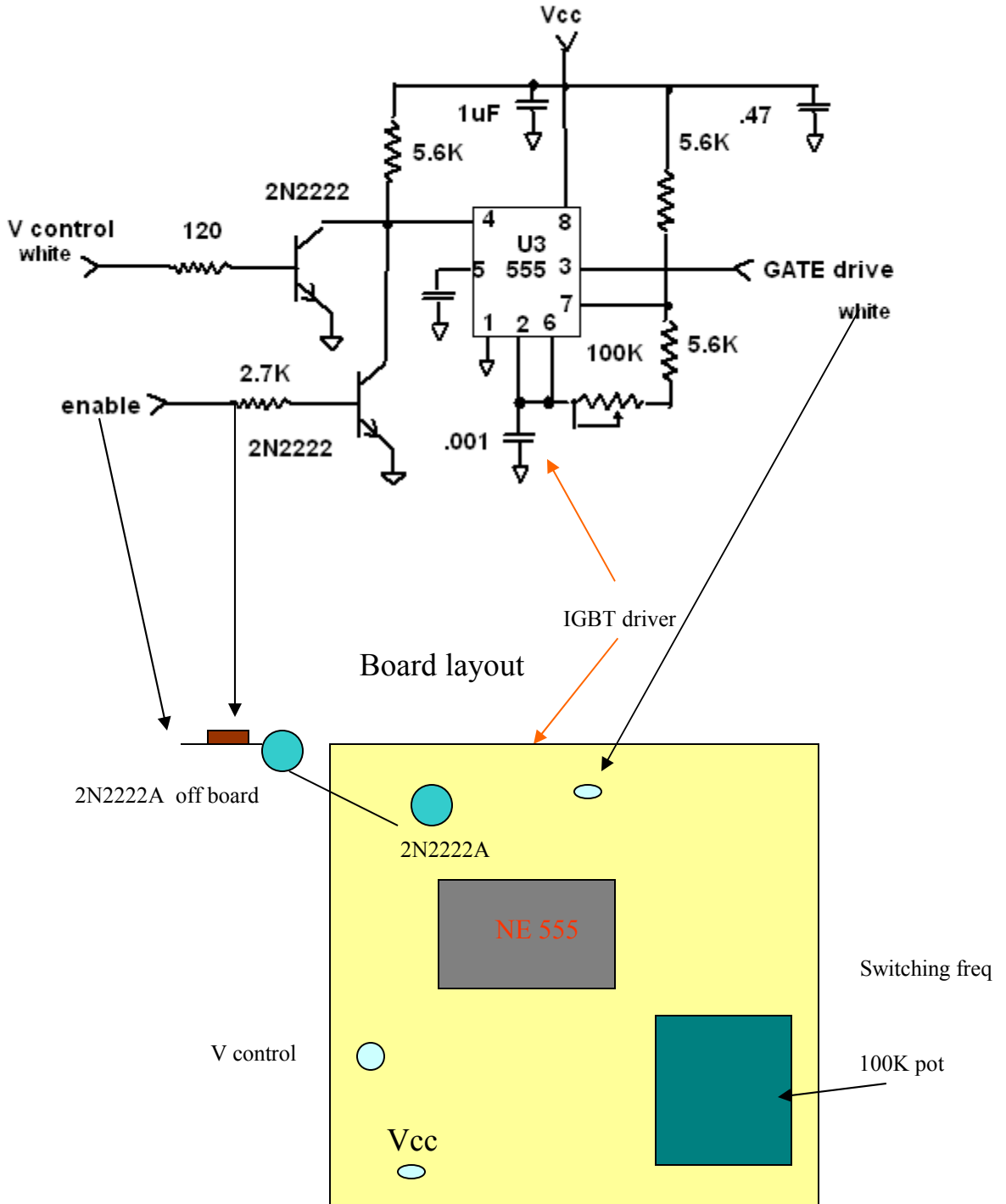
12 VDC INPUT

ENABLE



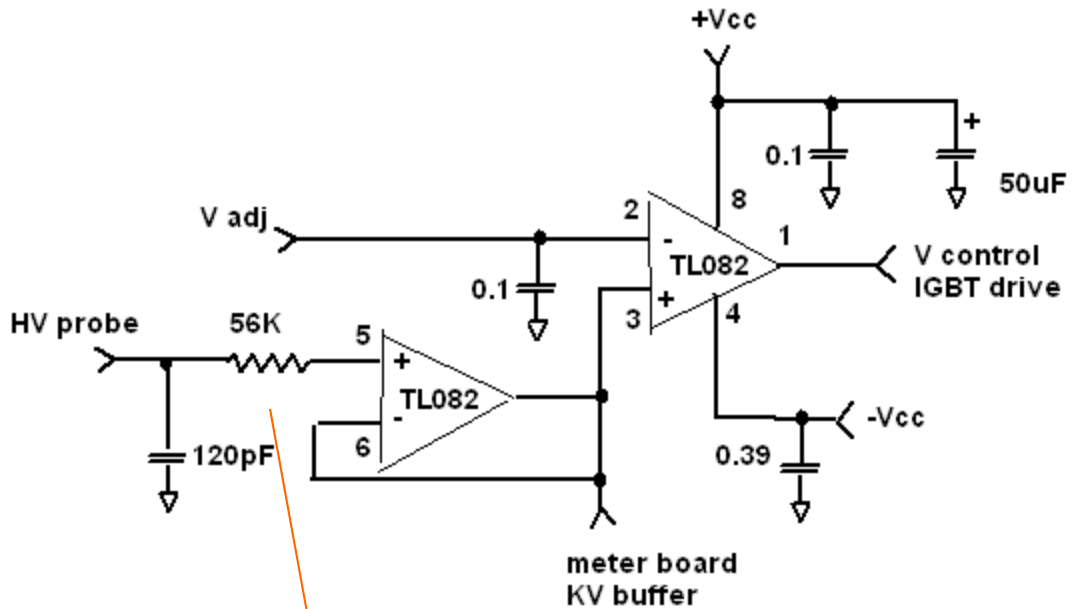
Note the 12 volt Zener diode is used to protect the gate from voltage spikes; and the MOV components protect the IGBT from over voltage. The gate is driven by the gate drive circuit (see next page)

# GATWE DRIVE CIRCUIT

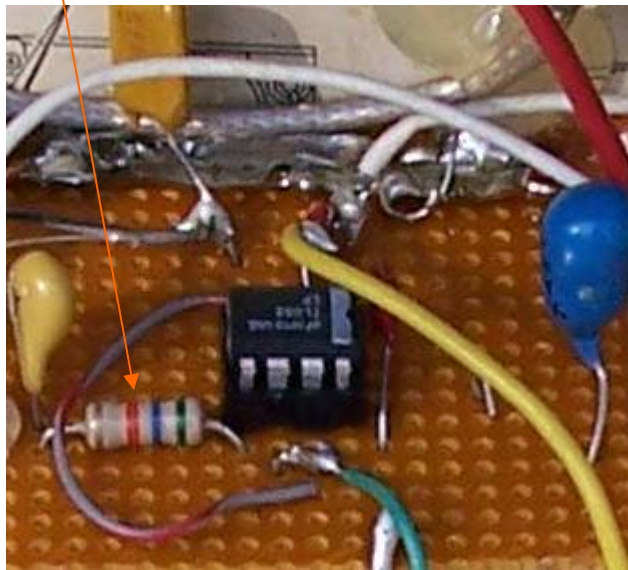


Note that the V control input is connected to the V CONTROL BOARD (next page); the gate drive is shut down when the desired voltage is reached. The enable input connects to one end of the internal shielded wire; the other end connects to the external BNC ENABLE connector via 580 ohm resistor connected in series at the BNC center connector.

## V CONTROL BOARD



V control board

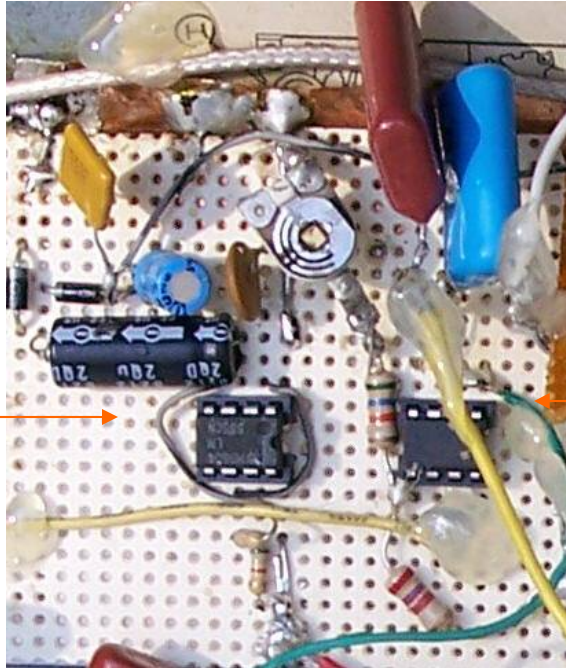


The V adj input connects to the wiper of an 5 Meg ohm potentiometer used at the front panel for manually controlling the output voltage. One of the potentiometer terminals connects to GND and the other to + Vcc via 5.7K resistor connected in series.

The HV probe input is connected to the HV probe (see HV assembly).

The “meter board KV buffer” output connects to the circuit shown on the next page. This analog signal is used not only for driving the TL082 pin 3 input but also for the analog voltage meter.

# Meter Buffer/ Neg 12 VDC PS Board

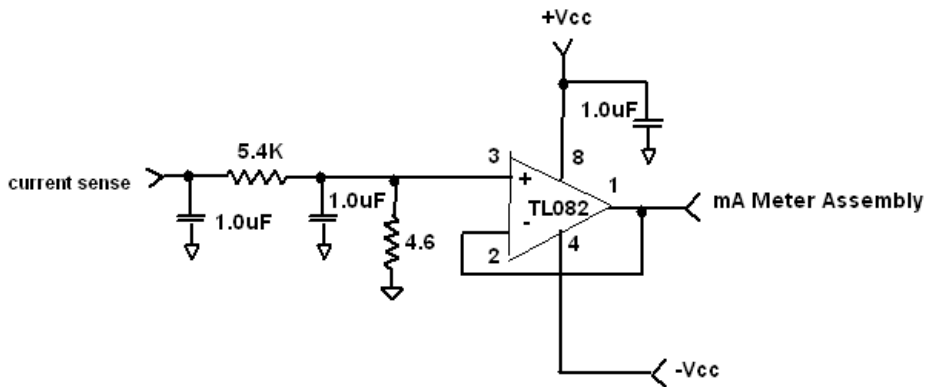
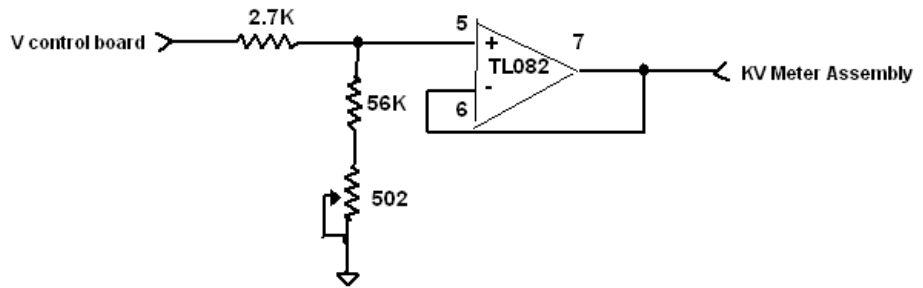


Neg Voltage PS

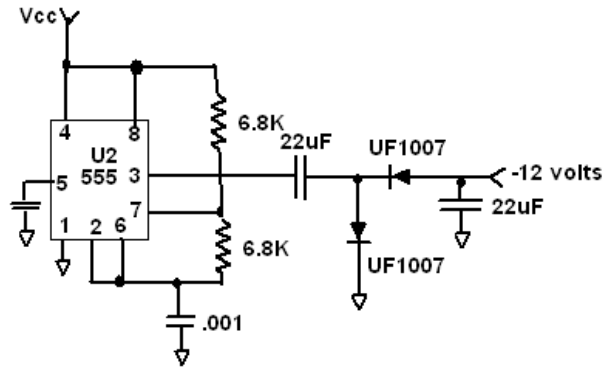
Meter Buffer Circuit

Next page for schematic

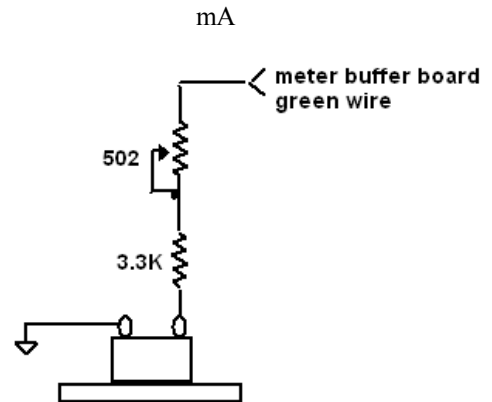
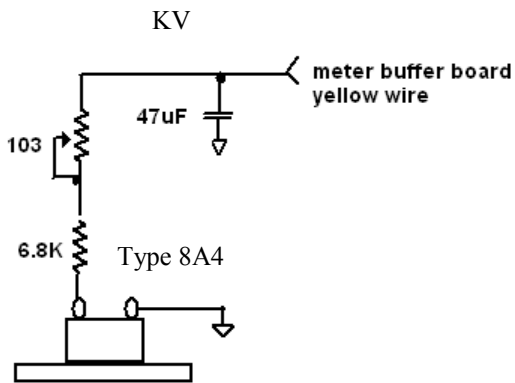
## Meter Buffer Circuit



The usage of the NE555 for generating negative 12 volts from positive 12 VDC power has been around for quite some time ( see <http://english.cxem.net/power/power33.php> ); the purpose is to provide negative Vcc to the TL085 amplifiers so that its inputs can function in the near zero volt range.



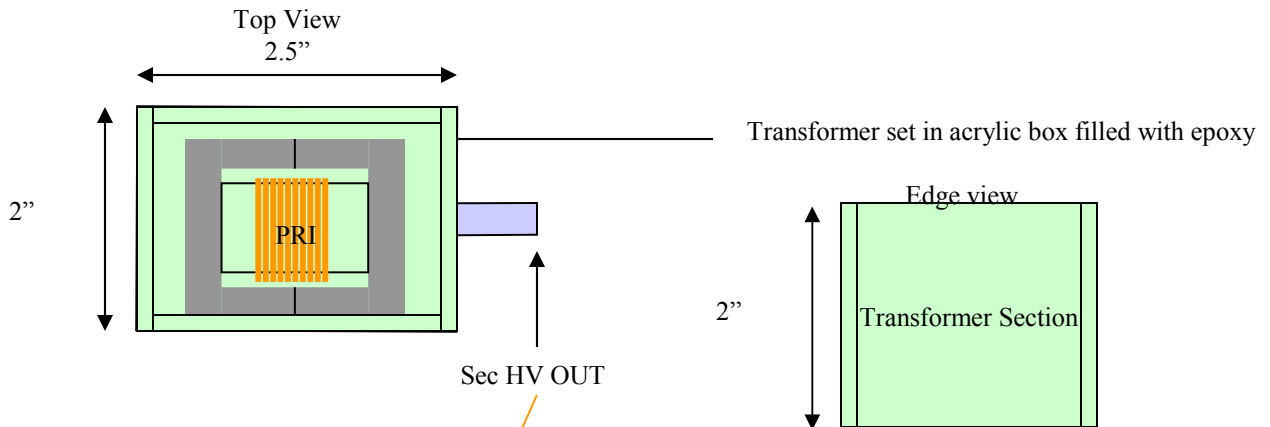
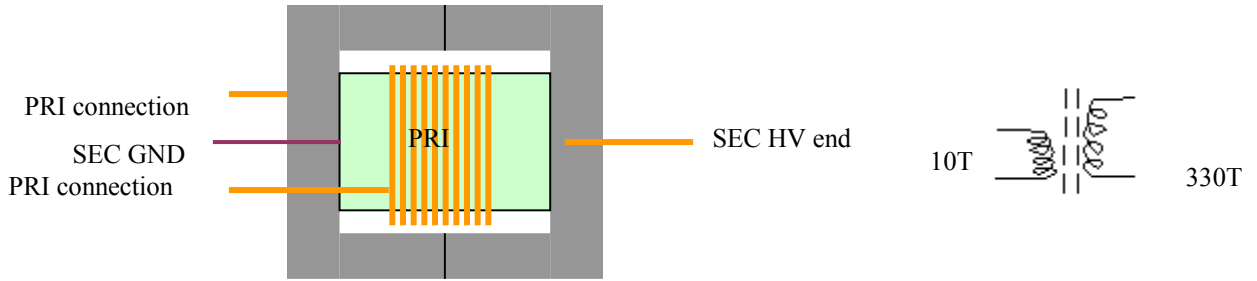
## METER ASSEMBLIES



# Construction Note \ Transformer

The technique for the flyback transformer construction is described at:

([http://vaughns\\_page.50webs.com/HV/transformer/flybk\\_A/flybk\\_a.html](http://vaughns_page.50webs.com/HV/transformer/flybk_A/flybk_a.html)) The Fair-Rite core type is similar to type 77; the core itself is ETD part # 9577440002 or similar. The primary is 10 T of # 20 magnet wire; the secondary about 330 T # 30 magnet wire.

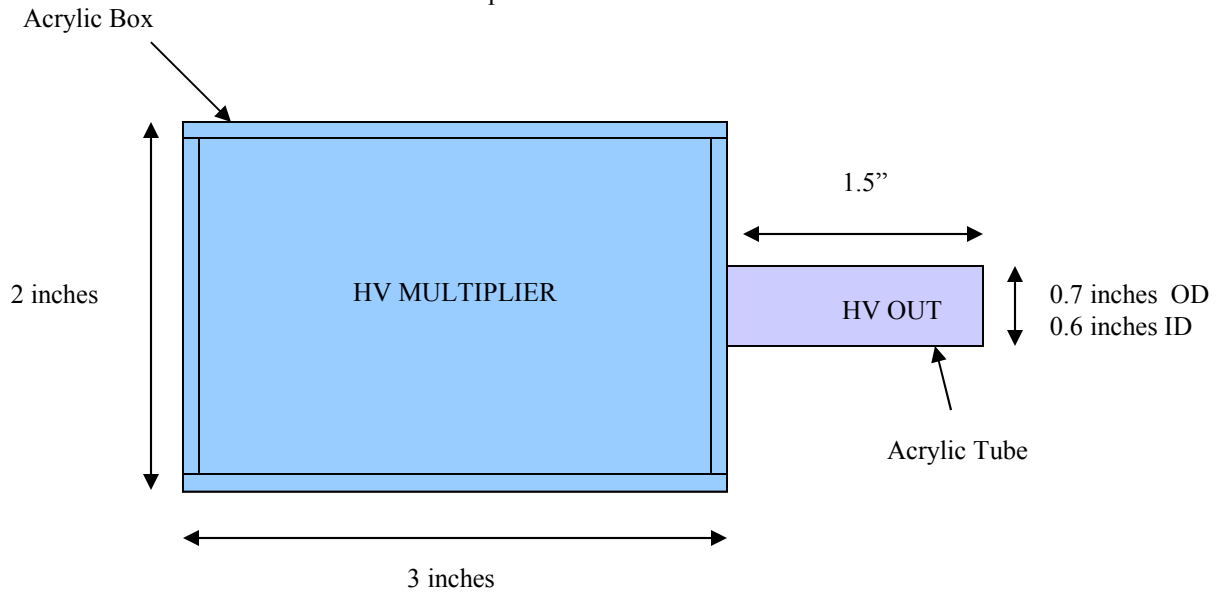


Panasonic ceramic HV Cap 330pF @ 3KV

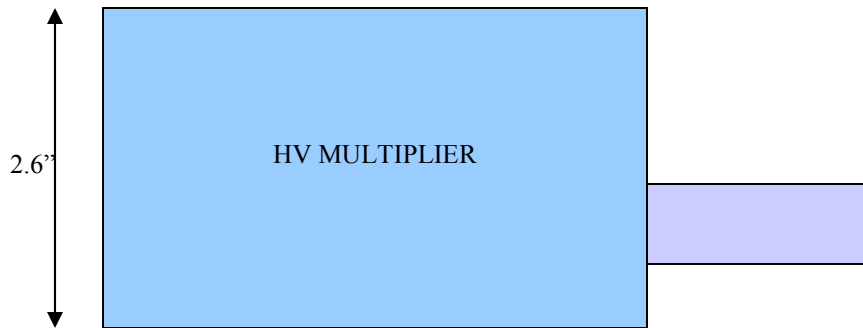


# Construction Note \ HV Multiplier

Top View

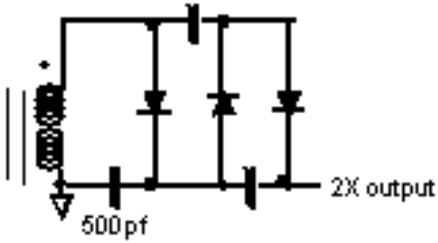


Side View

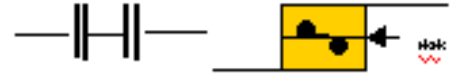


# Construction Note \ HV Multiplier (continued)

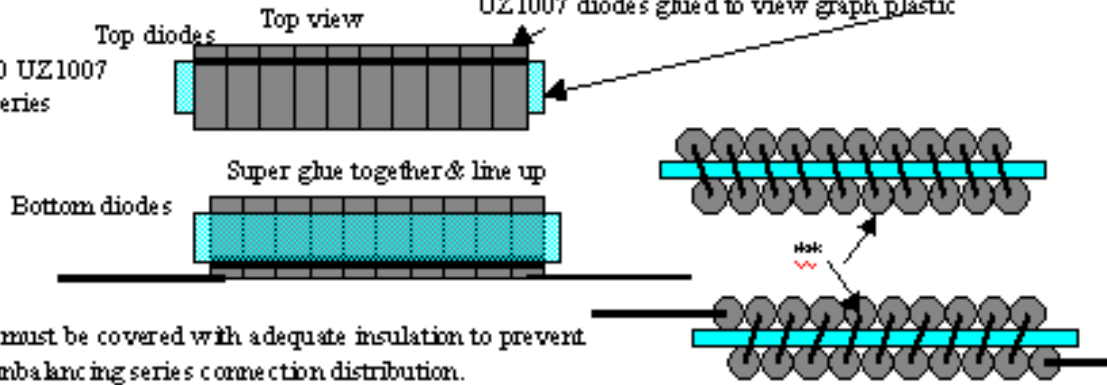
Voltage Multiplier:



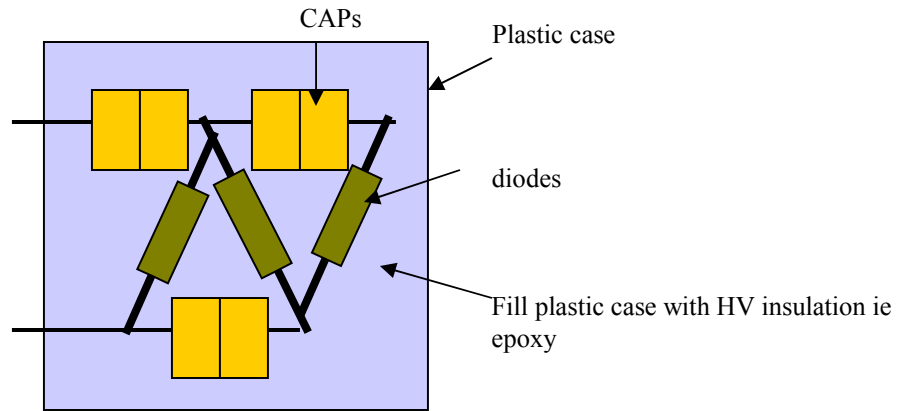
Ex. Capacitor Philips Series DD High Voltage Disc Ceramic Type DD 60-102 1000pf @ 6KV; two ea connected in series



Ex. Diode = 20 UZ1007 connected in series

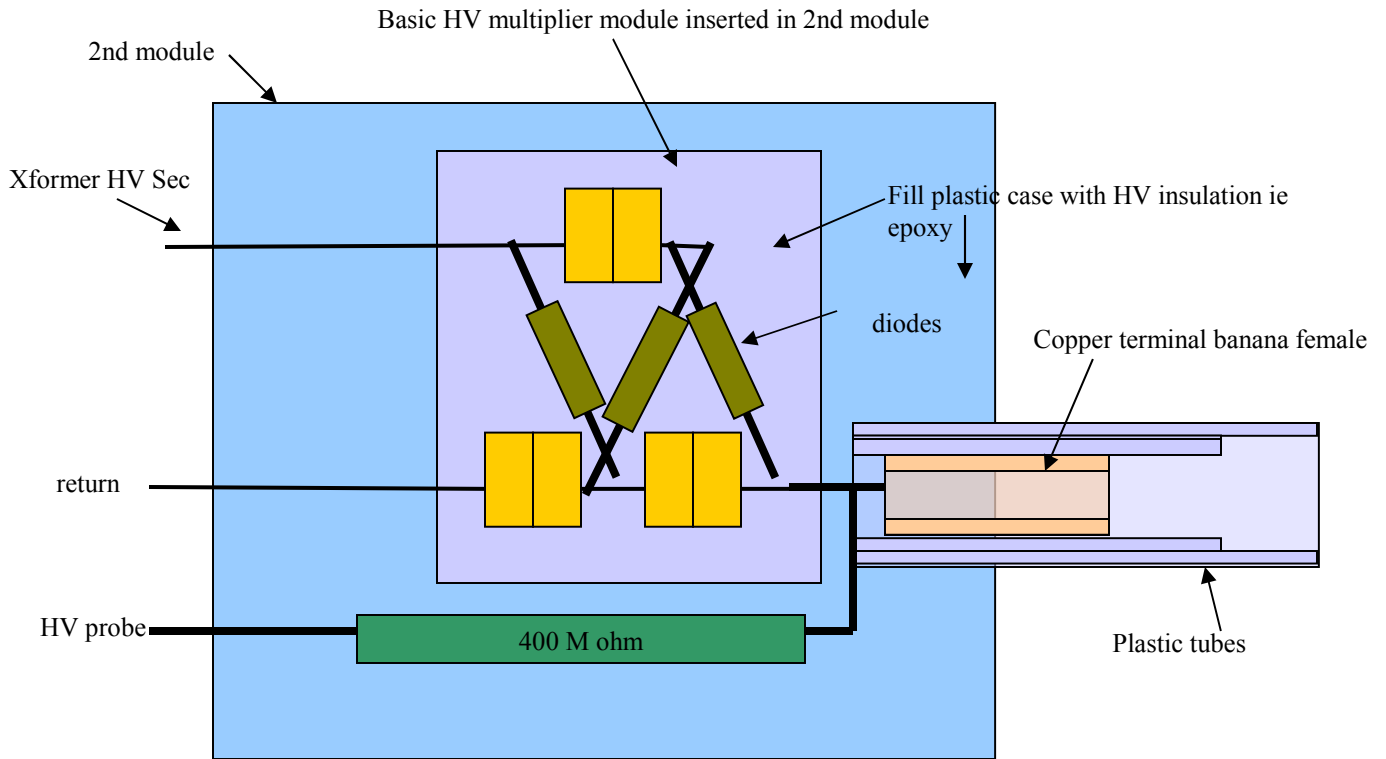


\*\*\*Note: surfaces must be covered with adequate insulation to prevent corona unbalancing series connection distribution.



# Construction Note \ HV Multiplier (continued)

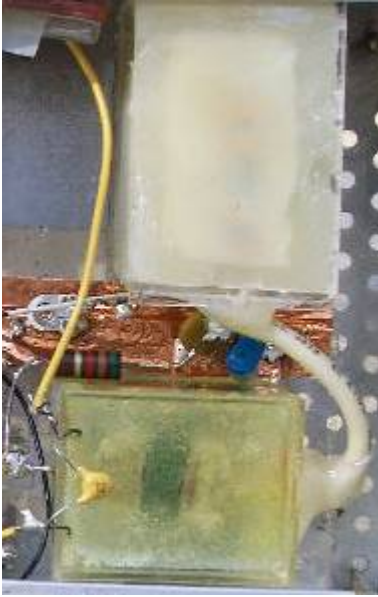
Side View



## Comments:

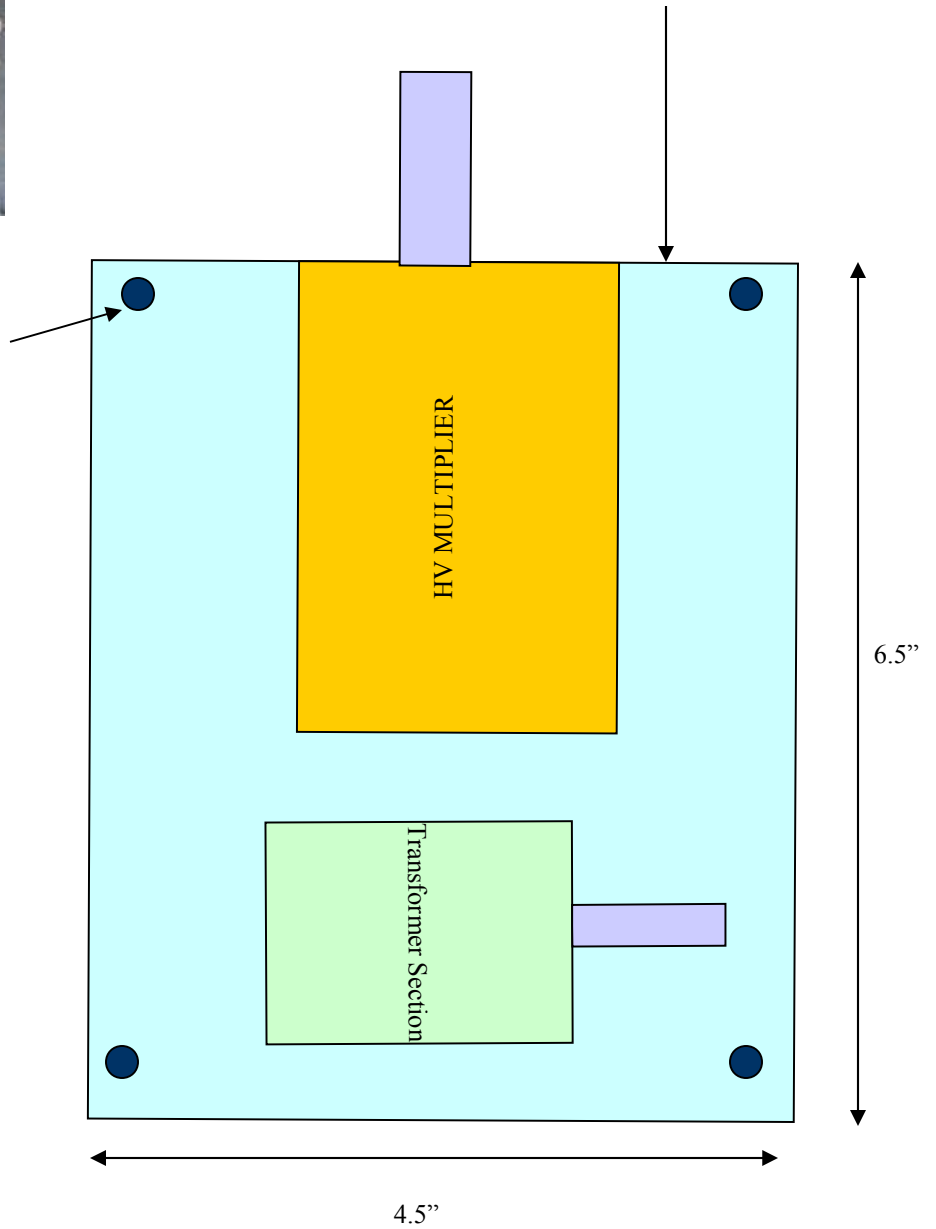
The voltage multiplier was constructed some time ago and shelved; most of the components are not visible being immersed in HV insulation (epoxy and hot glue). The circuit diagram shown below ( for documentation purposes) is my best guess .

# Construction Note \ HV Assembly



HV Transformer and Multiplier glued to Acrylic Sheet

Mounting Holes to attach to the HV Power Supply's top Lid





Current Sense/HV Multiplier RTN & HV Transformer SEC RTN

HV PROBE

