

# *Variable Gm D.C. Voltage Readings* *And Calibration Procedure*

Rev. 2 – Dec. 14, 2010.

## **Warm-up**

Power on the unit and let it warm for about 20-30 minutes, so that all circuitries stabilize.

## **A.C. Check**

With a DMM (Digital Multi Meter) check that the A.C. mains line actually output 230Vac on the power strip with the Variable-Gm on, take the reading on an adjacent empty socket.



Fig.1

## **D.C. Voltage Readings**

All DC readings are taken with respect to ground (GND).

Use the DMM, secure the **black tip** to the ground, i.e. a metallic point of the chassis. The **RED** tip to the points of interest.

### 1. Heater Supply

Check for the correct 6V ( $\pm 0.2V$ ) heater (filament) supply.

Ref. in the figure below.



fig.2

### 2. V1 readings:

Check for the Anode, Grid, and Cathode readings (A, G, K) for **V1** tube (**6BA6/5749**):

anode (pins 2, 6, 5) ..... + 60V ( $\pm 15$ v)  
 cathode (pin 7) ..... + 1.5V ( $\pm 0.3$ V)  
 grid (pin 1) ..... 0 V

Alternatively, you can take the readings on the empty **V10** (6386) socket.

Please refer to the picture below.

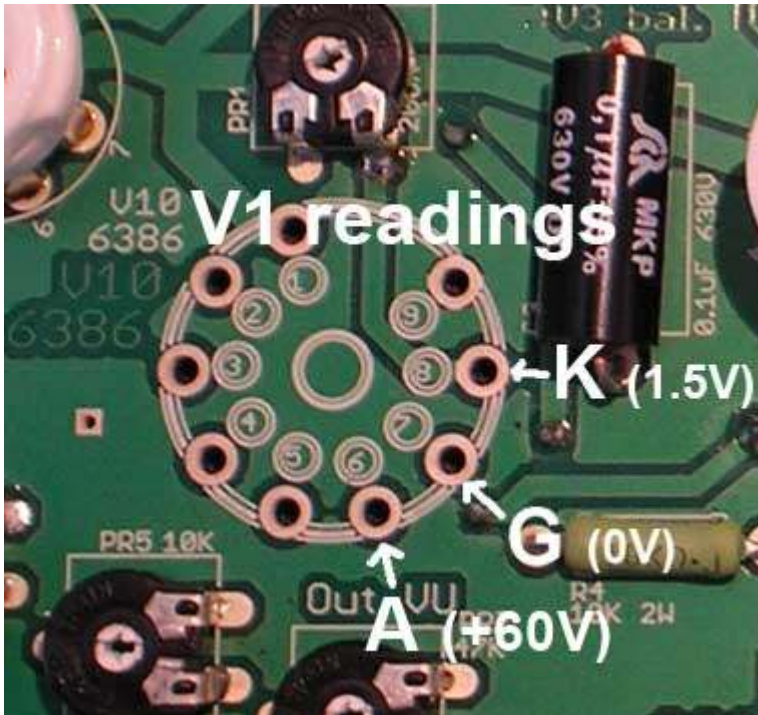


Fig. 3

### 3. *V2 Readings.*

The same readings for **V2** with these points on the V10 empty socket:

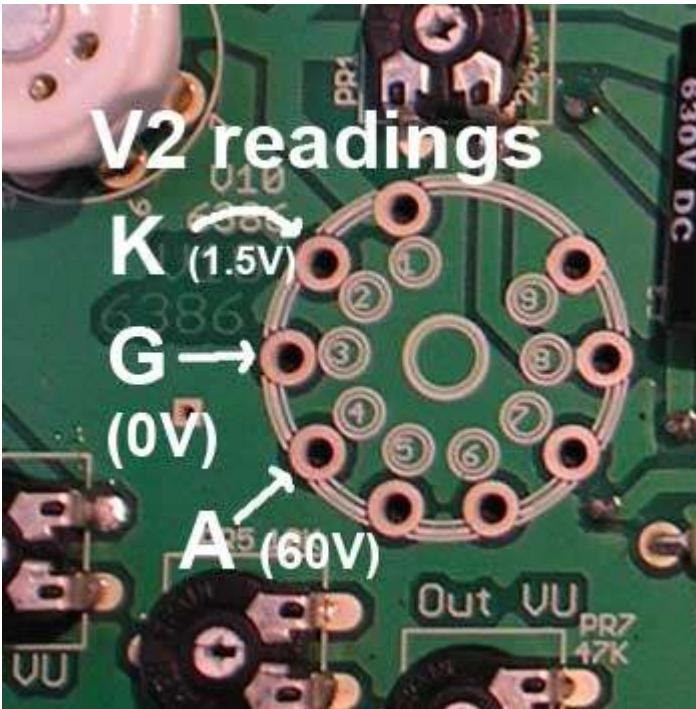


Fig. 4

4. *V3 (12AT7) readings.*

- anodes (pin 1 and 6) ..... + 173V ( $\pm 5V$ )
- cathodes (pins 3 and 8) ..... + 2.5V ( $\pm 0.45V$ )
- grids (pins 2 and 7) ..... 0V

more easily, you can take the readings on the following points (refer to fig. 5 below):

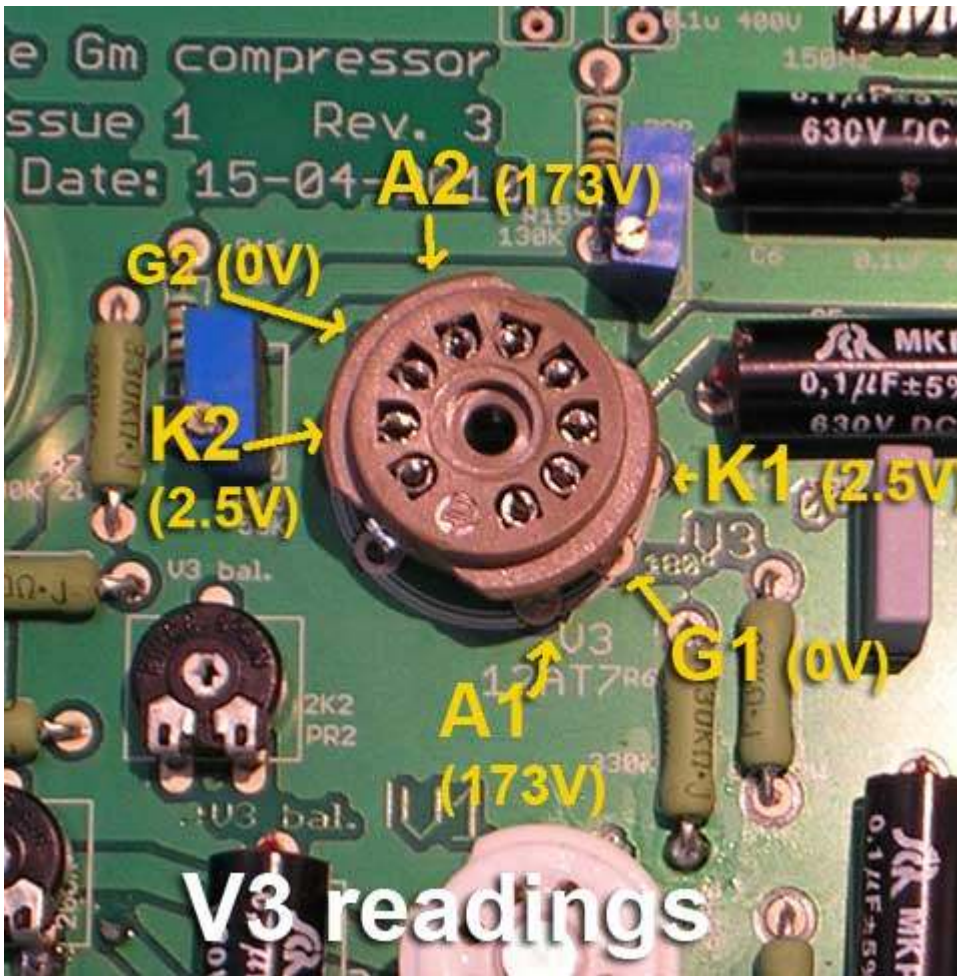


Fig. 5

### 5. *V4/V5 Readings.*

6V6 tubes

- anodes (pin 3) ..... + 295V ( $\pm 15$ V)
- cathodes (pin 8) ..... + 12V ( $\pm 1.5$ V)
- control grids (pin 5) ..... 0V
- screen grids (pin 4) ..... + 199V ( $\pm 3$ V)

refer to the fig. 6 below for pin placement:

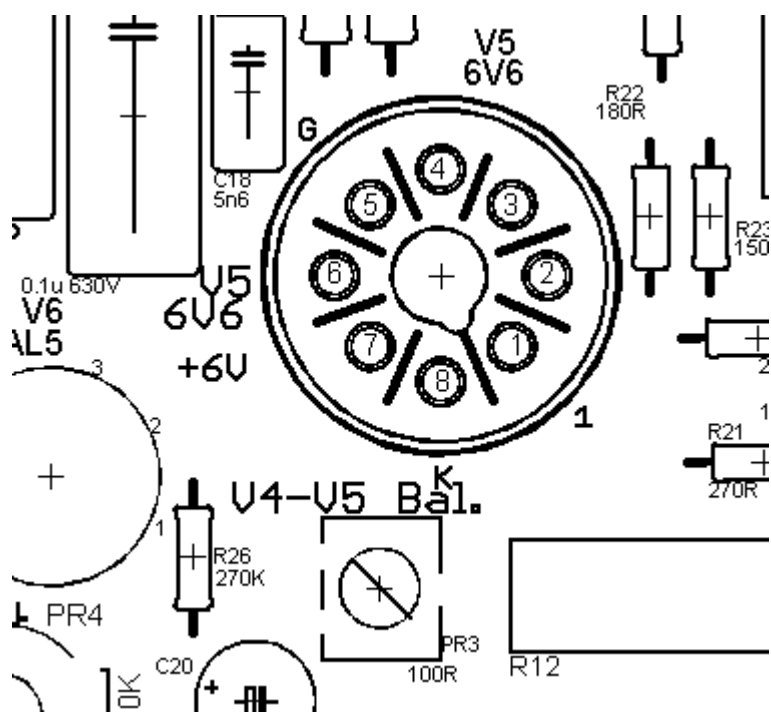


Fig. 6

### 6. PR4, R5, R41 readings

**PR4** (threshold adjust trimmer):

wiper ..... + 95V ( $\pm 3V$ )

**R5** (7.5K, 2W):

lower side ..... + 195V ( $\pm 3V$ )

upper side ..... + 125V ( $\pm 3V$ )

**R41 A.O.T.** (120 ohm 10W):

pin facing C14 (6.800u 16v) ..... + 310V ( $\pm 15V$ )

pin facing C12 (0u47 tantalum).. about 10/11V less than other pin

Check fig. 7 below



Fig. 7

## 7. IC1 readings

Check the Input and Output pins:

**X11** (IC1 connector on main board):

In ..... +10V ( $\pm 1.5V$ )

Out ..... + 6V ( $\pm 0.25V$ ) usually 5.8/5.9V

Refer to Fig. 8 below:

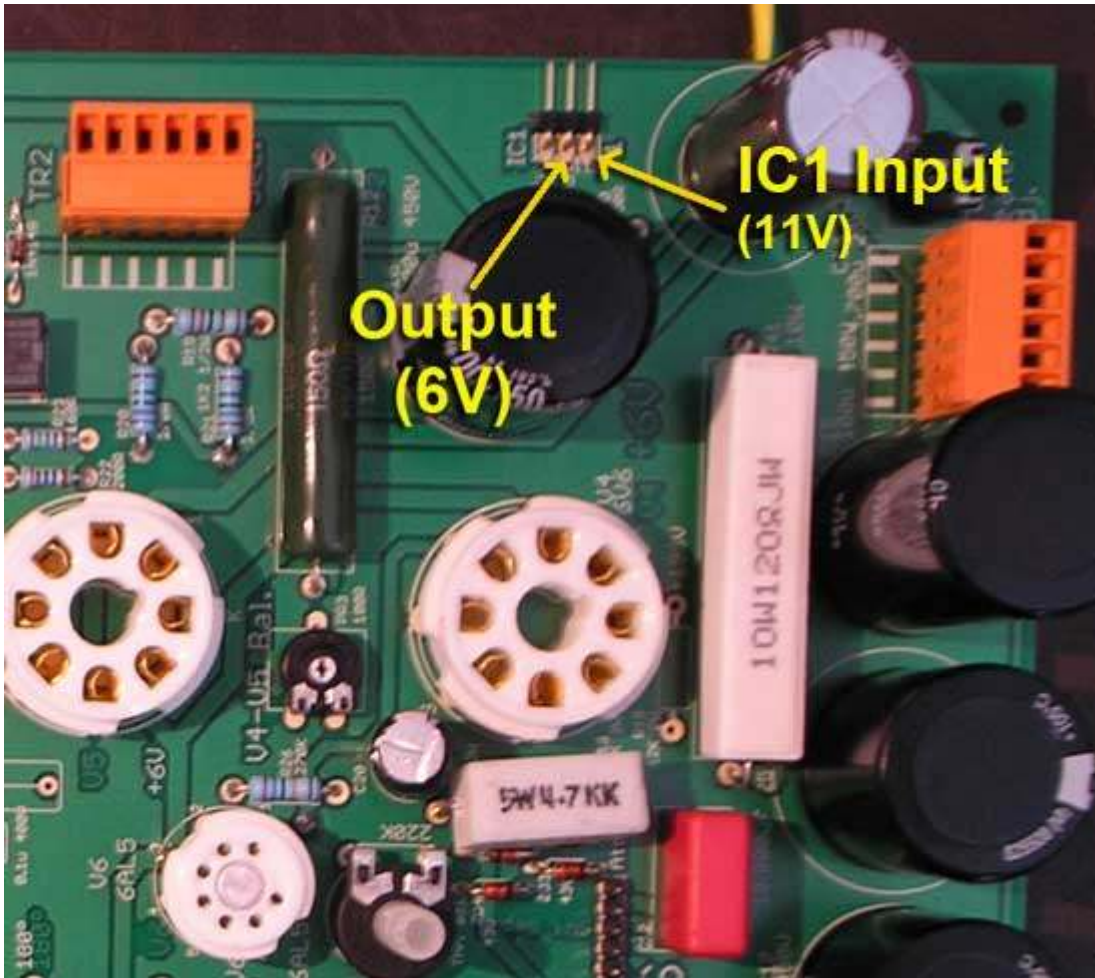


Fig. 8

## B. Calibration Procedure.

### 1. Warm-up time

If cold, let the unit warm up for about 20~30 mins. Confirm power supply, by checking the DC readings (please refer to the previous section).

### 2. Trimmers to adjust.

The preset pots to adjust are the cathode balancing pots:

**PR1** (V1/V2 bal., 200R), **PR2** (V3 bal., 2K2) and **PR3** (100R, V4/V5 Bal.).

They interact one with the other, so you must re-adjust until proper balance is achieved. Please refer to fig. 9 below to locate the preset pots on the boards.

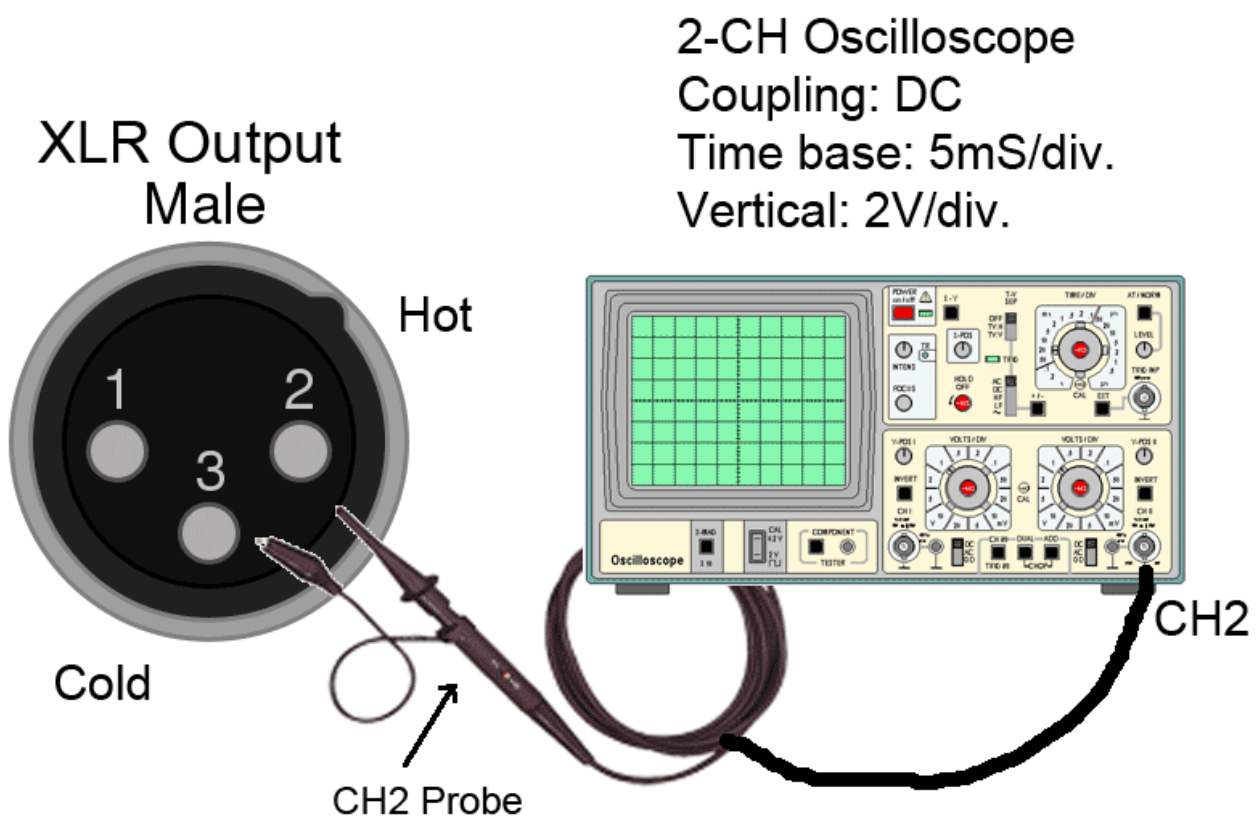


fig. 9

### 3. Calibration

Start with PR1 first, then PR2 and PR3. Set all the pots in center position, to start.

Connect an oscilloscope to the XLR output of the channel to calibrate. Connect the probe as follows: tip to XLR pin 2 (hot), clip to pin 3 (cold). Ref. to fig. below.



CH1 Probe: tip not connected, clip to GND

#### *Oscilloscope settings:*

Vertical (Y axis): 2 volts/division

Horizontal (X axis): 5 mSec./div.

Coupling: DC, BW limited to 20MHz (if your scope has this feature).

Connect your DAC balanced outputs (+4dB) to the Inputs of the Variable Gm. Now apply a Tone Burst (pulsed) signal. This should be a pure 10kHz sine wave with the burst on for 50 cycles, worth of 10kHz at an amplitude of +4dB. Burst low should be 150 cycles worth of 10kHz at an amplitude of -20dB. This gives a repeating waveform of 200 cycles worth of 10kHz sine wave with two different amplitudes in it. Your oscillator's output impedance should be low (50  $\Omega$  are ok, you can use your DAC's output). The tone burst may be found in the file "[cal.wav](#)". Play it in loop. Set 'dual mono' mode, both inputs and outputs knobs to about mid position, so that the system gain is about 5/6 dB. Then advance the *Threshold* control for a 3/4dB of gain reduction. If the cathodes are unbalanced, your picture should look like the following:



Fig. 10

Turn the *Threshold* control to out, then adjust the preset pots to achieve good cathode balance, common mode rejection, CV rejection (no thumping when limiting) and symmetrical audio signal.

The following picture shows a satisfactory balance (threshold out):

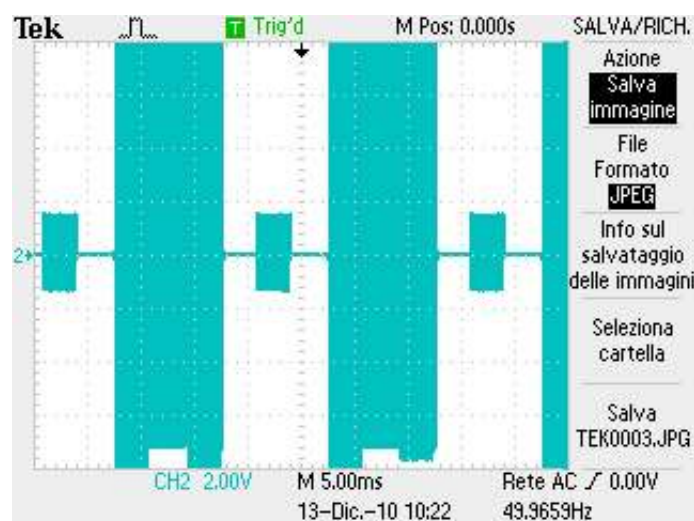


Fig. 11

Advance the *Threshold* control to achieve about 3~4 dB of Peak reduction, adjust the preset pots to achieve a stable image on the oscilloscope, so to null or 'level' the tone bursts, no slant between the tone bursts, the adjustment is for a *straight line* on the center of the oscilloscope (you will see a shark-fin looking control voltage, as in fig. 10 : null it).

Check for proper balance for any position of the *Threshold* knob.

Refer to fig. 12 below, threshold set for 4dB GR.

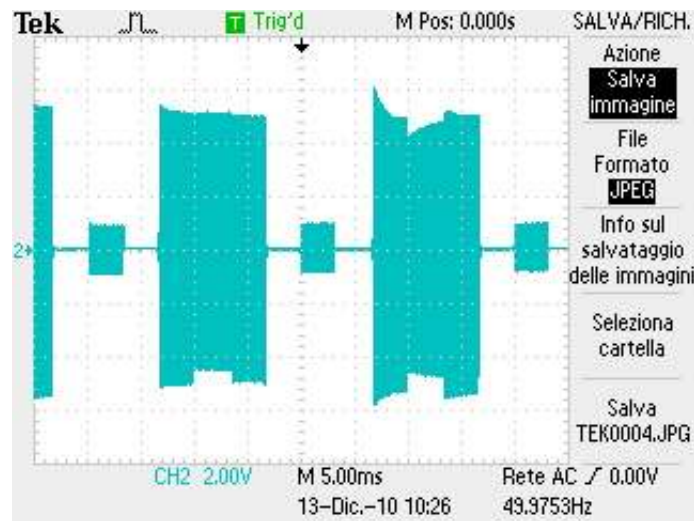


Fig. 12

#### 4. *Level matching between channels.*

Feed both the compressor Inputs with a pure sine wave, by using a Signal Generator from your DAW (Pro Tools, Logic, etc.), set the frequency to 1kHz, amplitude to -30 dBFS. Set both channels 'Input' and 'Output' controls to Max. position (fully clock-wise), 'Threshold' to out. 'Dual Mono' mode.

Now monitor the Output XLR (between pins 2 and 3) through a precision True RMS Volt Meter, symmetrically set PR9 and PR10 preset pots so that you can read exactly the same signal amplitude for both channels. (I.E. if you make one turn cw on PR9, do the same for PR10, if you need to turn ccw on PR9, do the same on PR10, etc.).

Please refer to fig. 13 below to locate the pots on the board.



Fig. 13