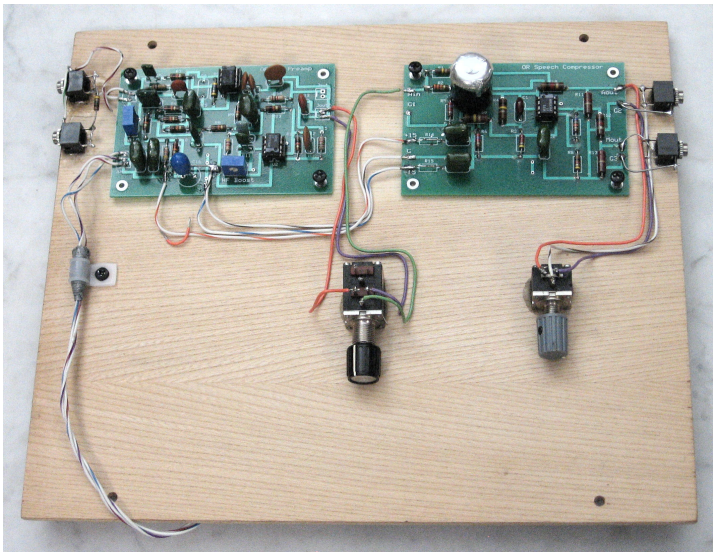
Speech Processing:
Some New Ideas



as presented to the

Oak Ridge (Tennessee)
Amateur Radio Club

on October 12, 2015

by Jim Tonne W4ENE

Some Examples of Processors:

Food Processors
Word Processors
Speech Processors

Speech Processors
can alter the **frequency response**
can increase the **average volume**

We are are going to process only the audio itself and we are going to use only linear techniques

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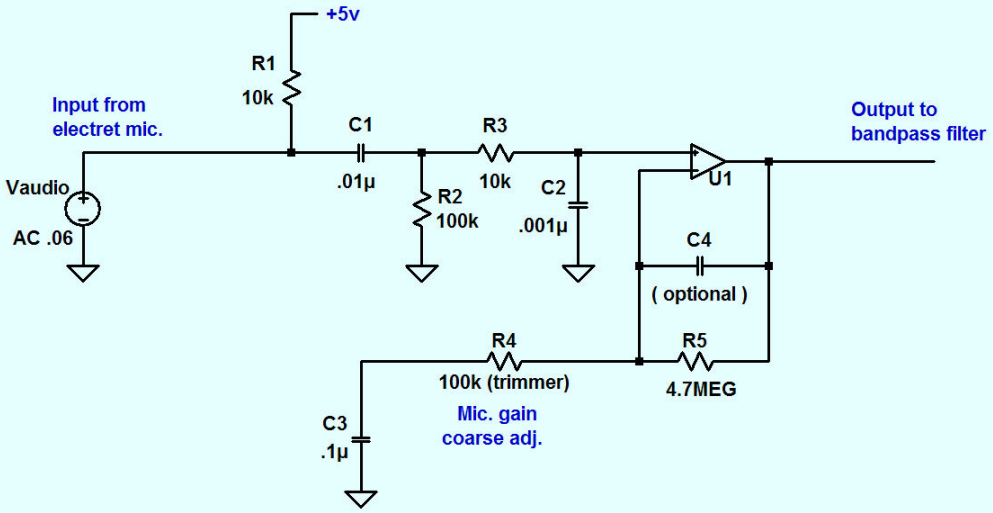
Preamplifier



The microphone signal is first applied to a preamplifier to increase its level and to shape its response somewhat

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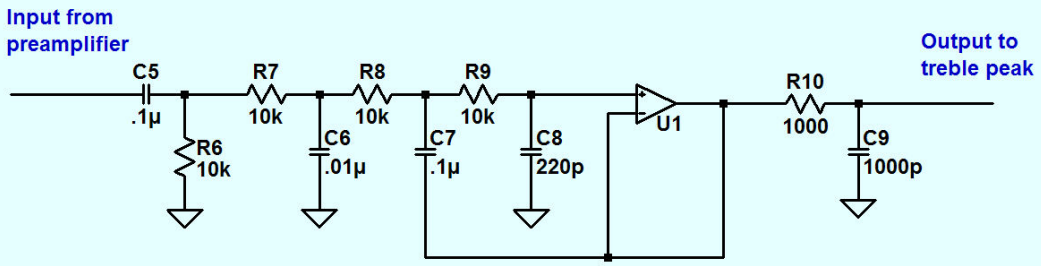
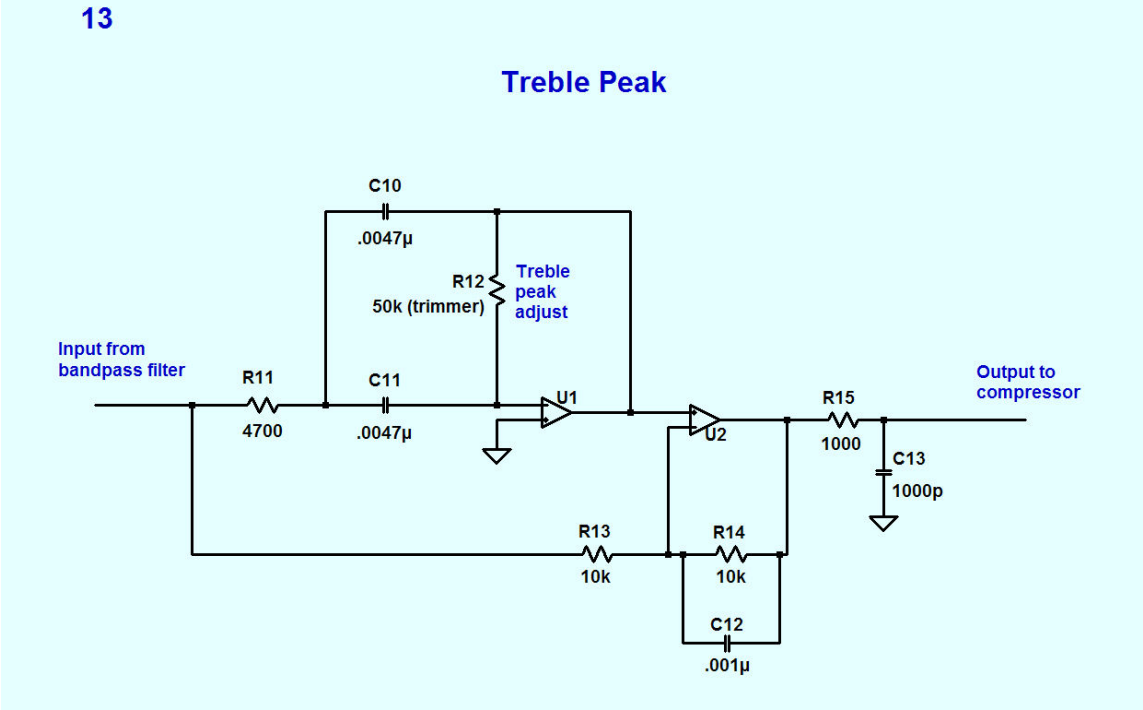
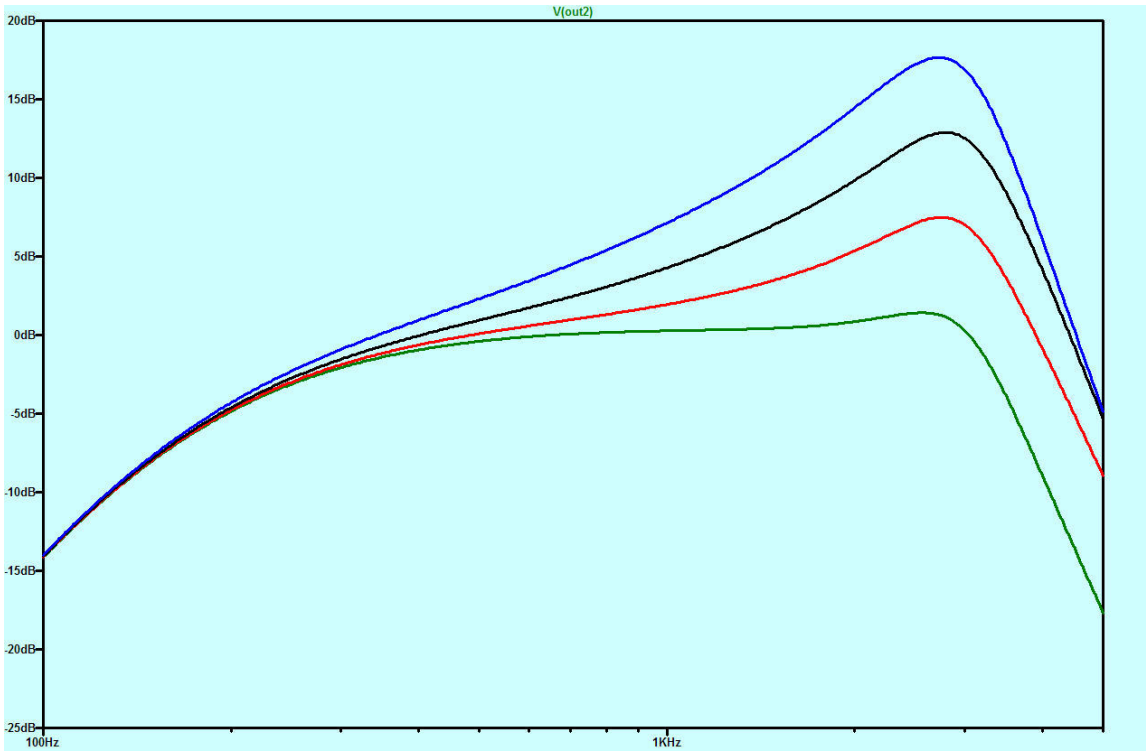
Bandpass filter
(200 - 3000 Hz)



After the preamp is this bandpass filter to get a more desirable (narrower) passband response

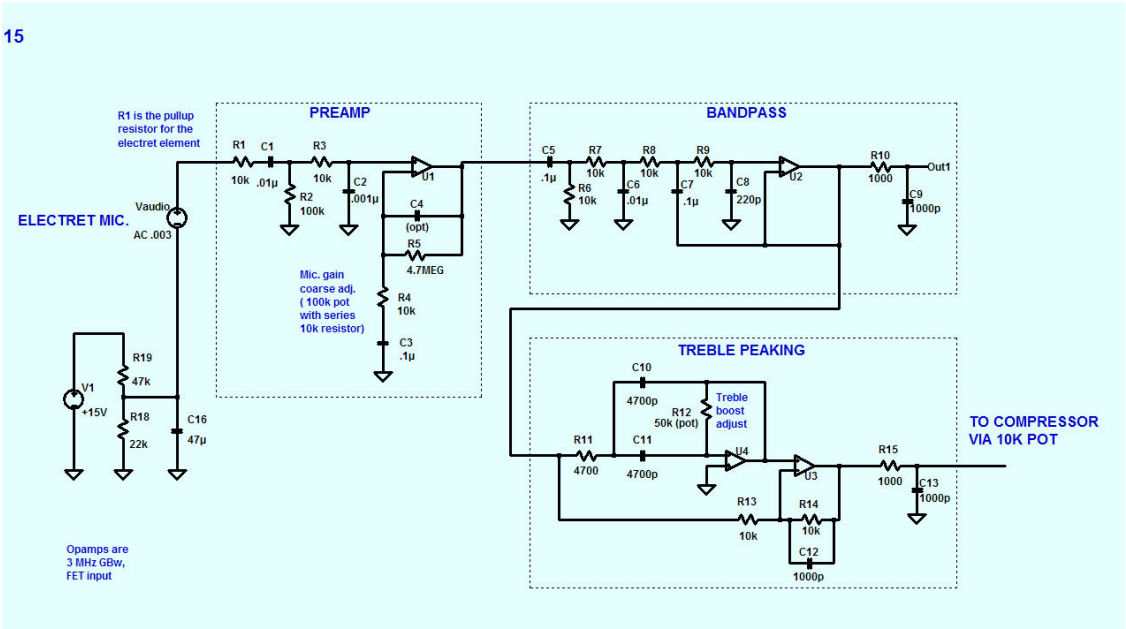


Following the bandpass filter is this treble boost circuit with an adjustable peak in its response.

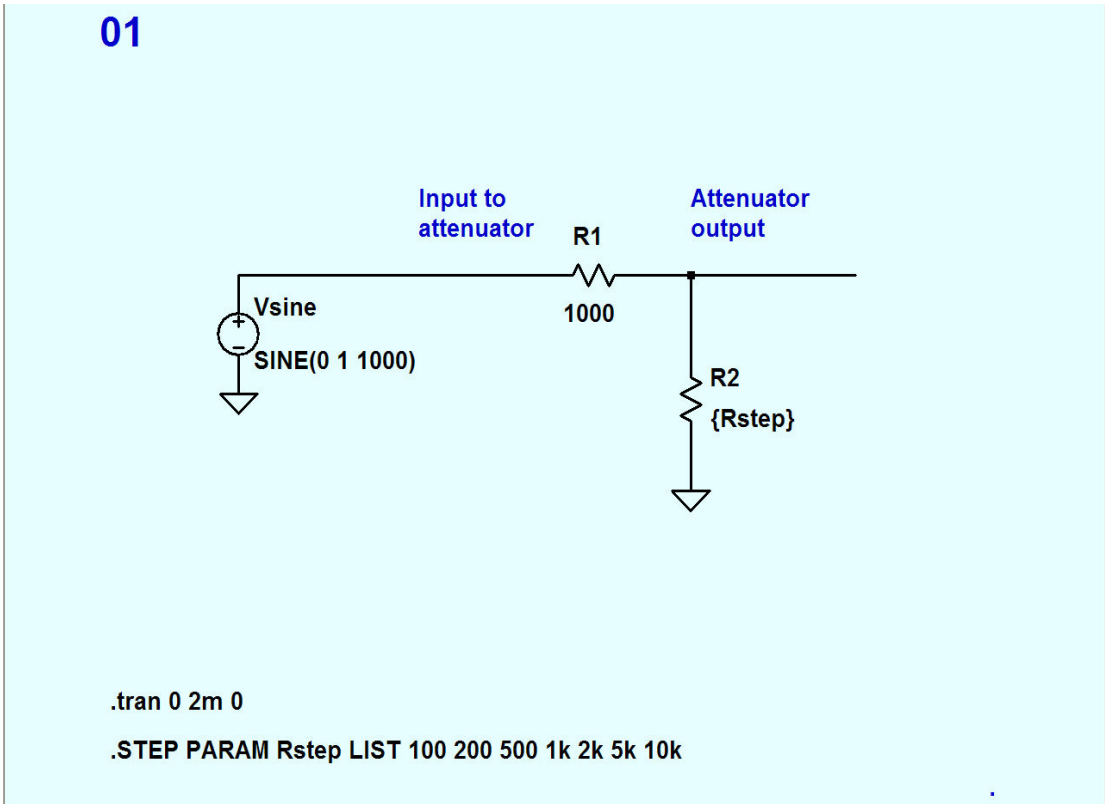


The bandpass filter plus the treble peaking circuit yields this family of response curves.

Overall bandwidth is always restricted.

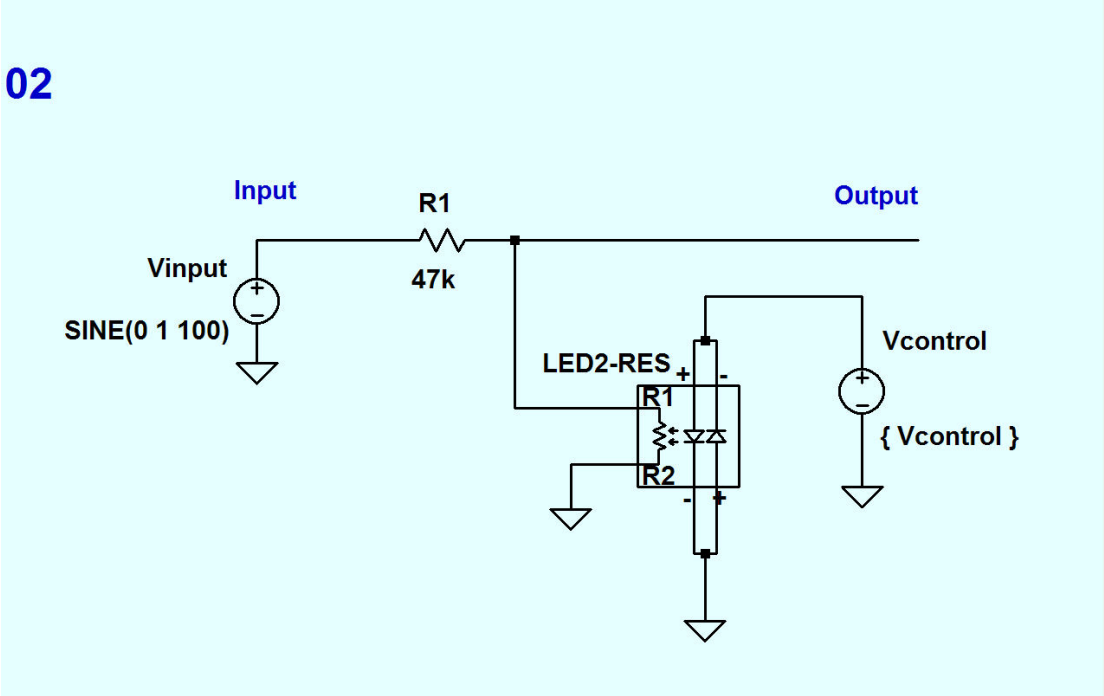


Here are those three blocks (preamplifier, bandpass and treble peaking) all together



A signal is applied at the input to a divider and by changing the value of resistor R2 at the output, the output voltage can be changed.

Next we substitute a Cadmium Sulfide (CdS) “photo cell” for resistor R2:



Instead of changing that “R2” we change the conductance of the CdS cell by changing the light from the pair of LEDs.

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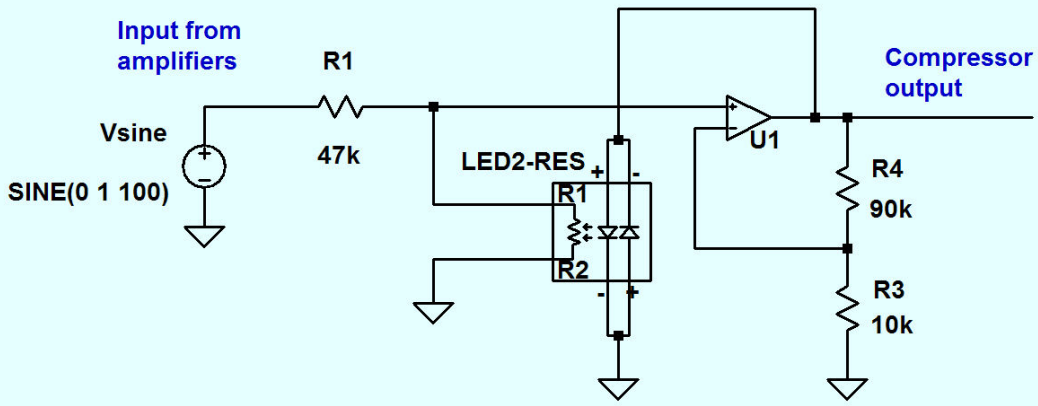
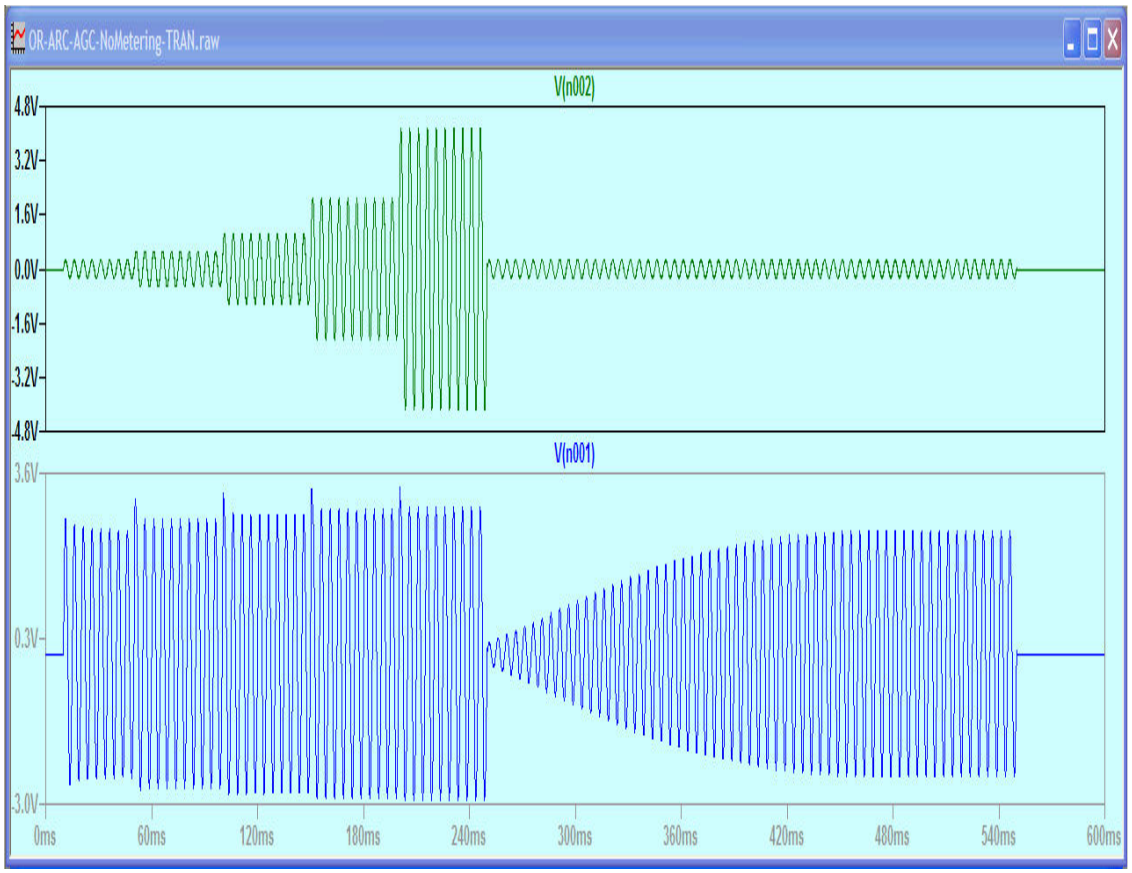


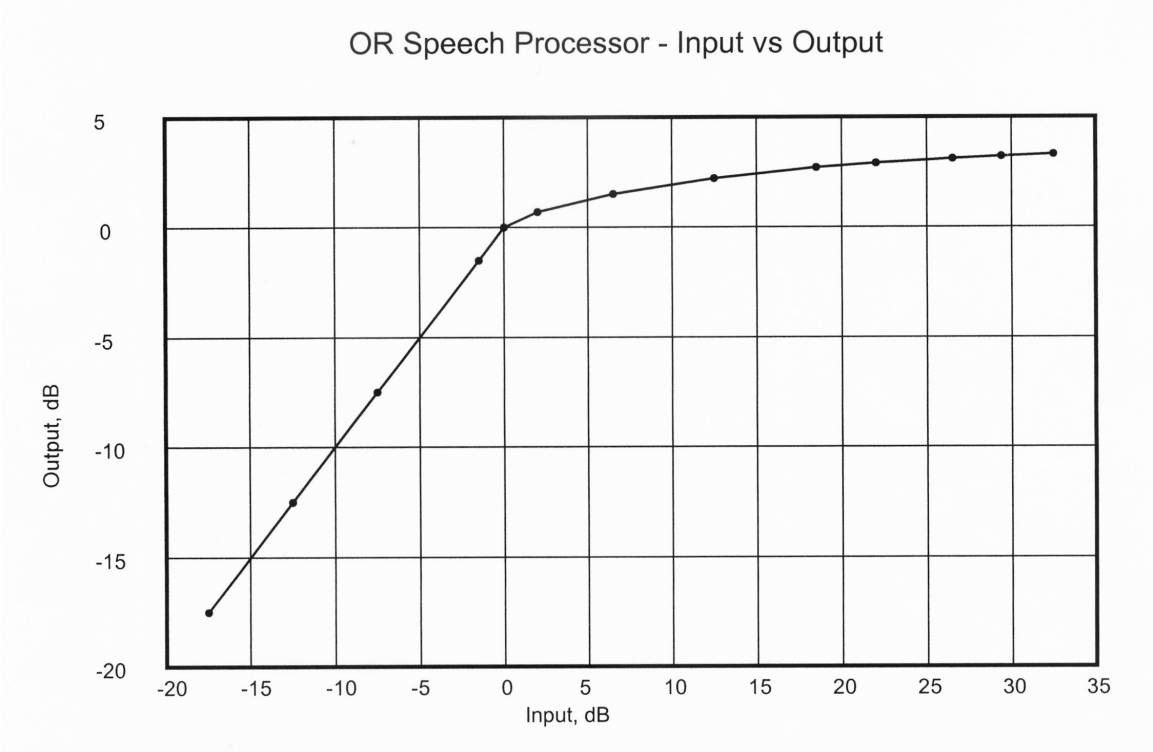
Add an amplifier whose output drives the LEDs.

At this point we have an **A**utomatic **G**ain **C**ontrol system.

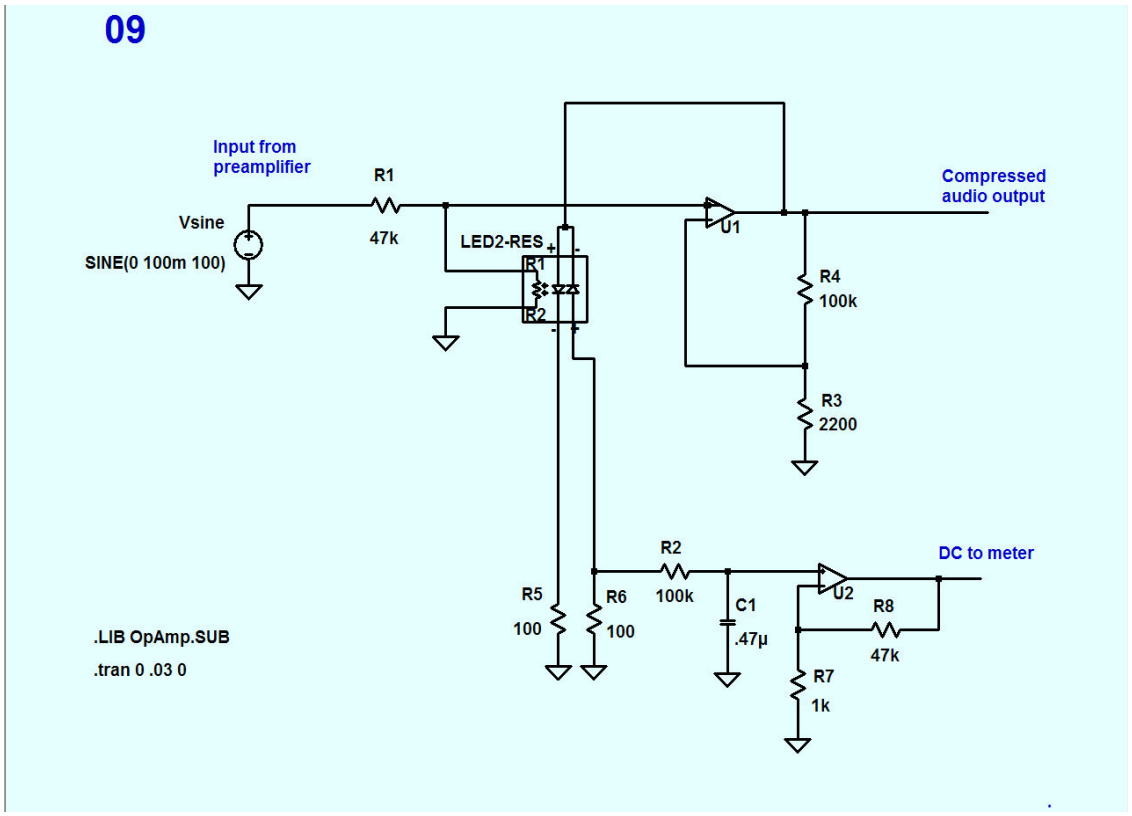


Compressor transient performance - input signal in 6 dB steps (top) and output signal (bottom).

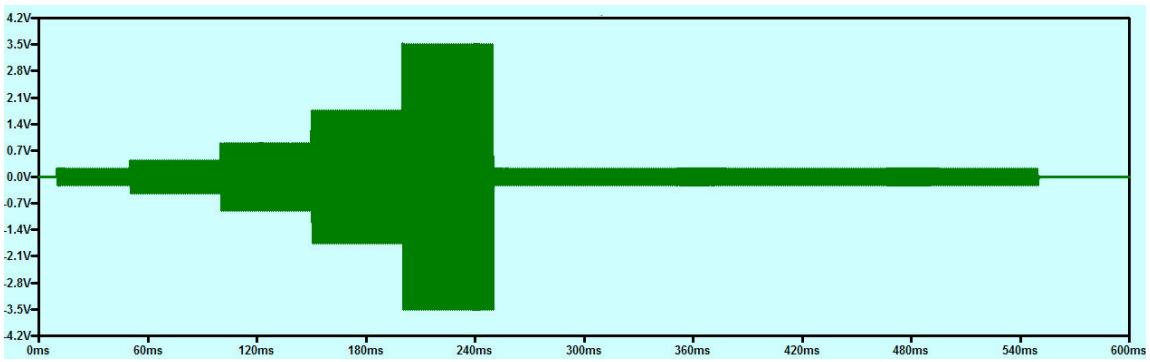
24 dB input level variation is essentially wiped out.

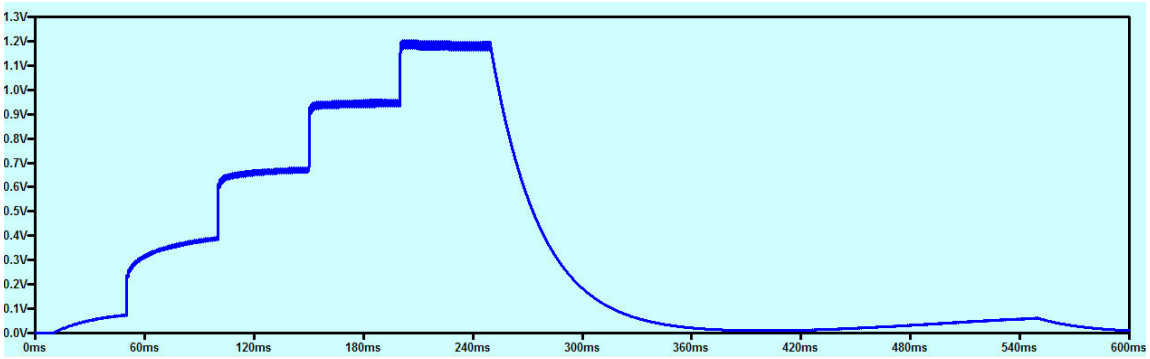


Static input variation of 30 dB is reduced to an output variation of less than 3 dB

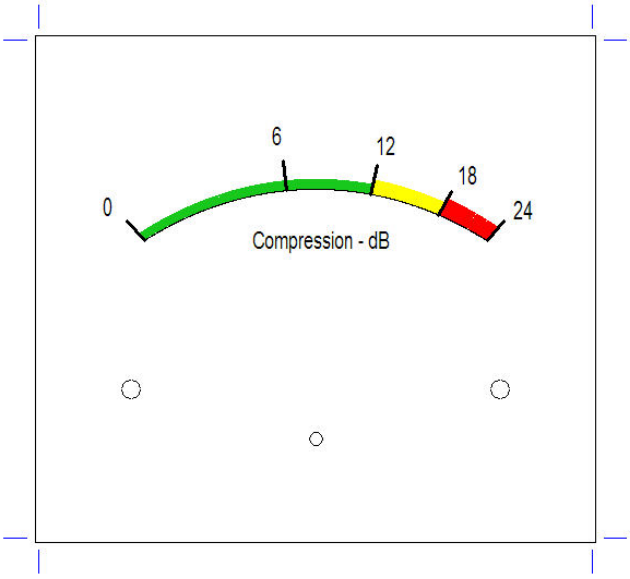


The current through the LEDs can be measured to give an indication of gain reduction.

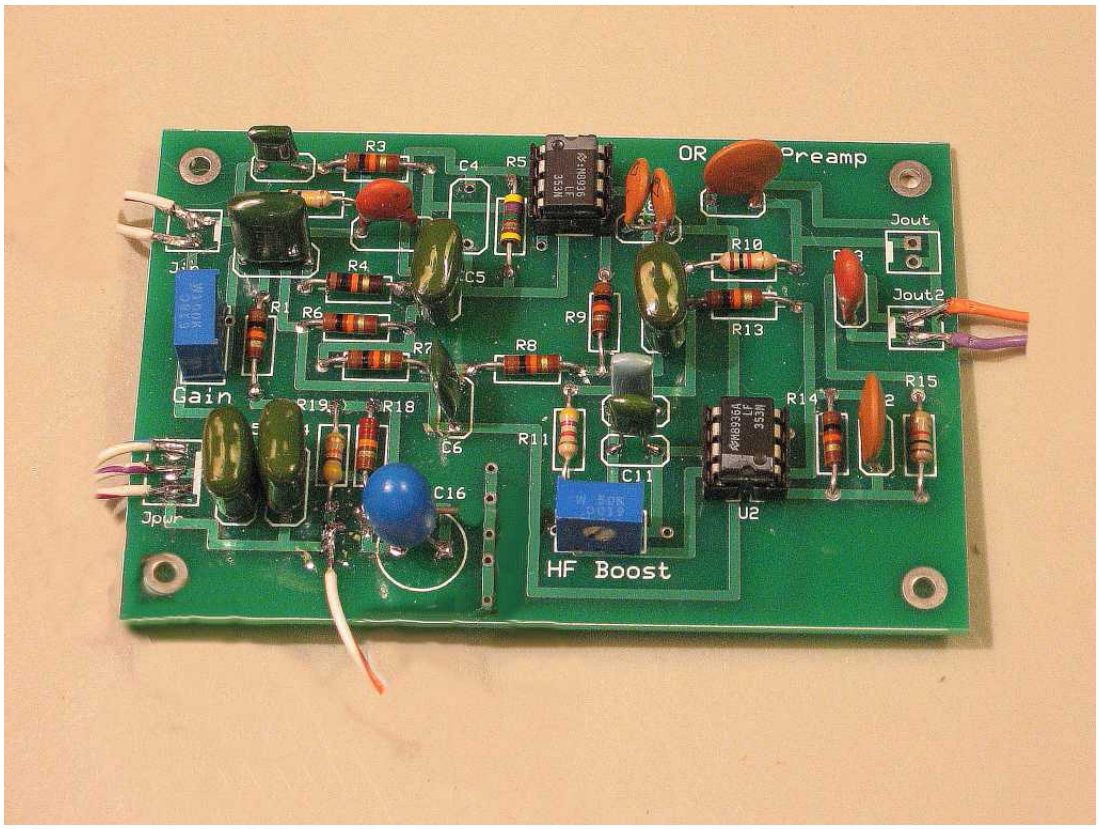




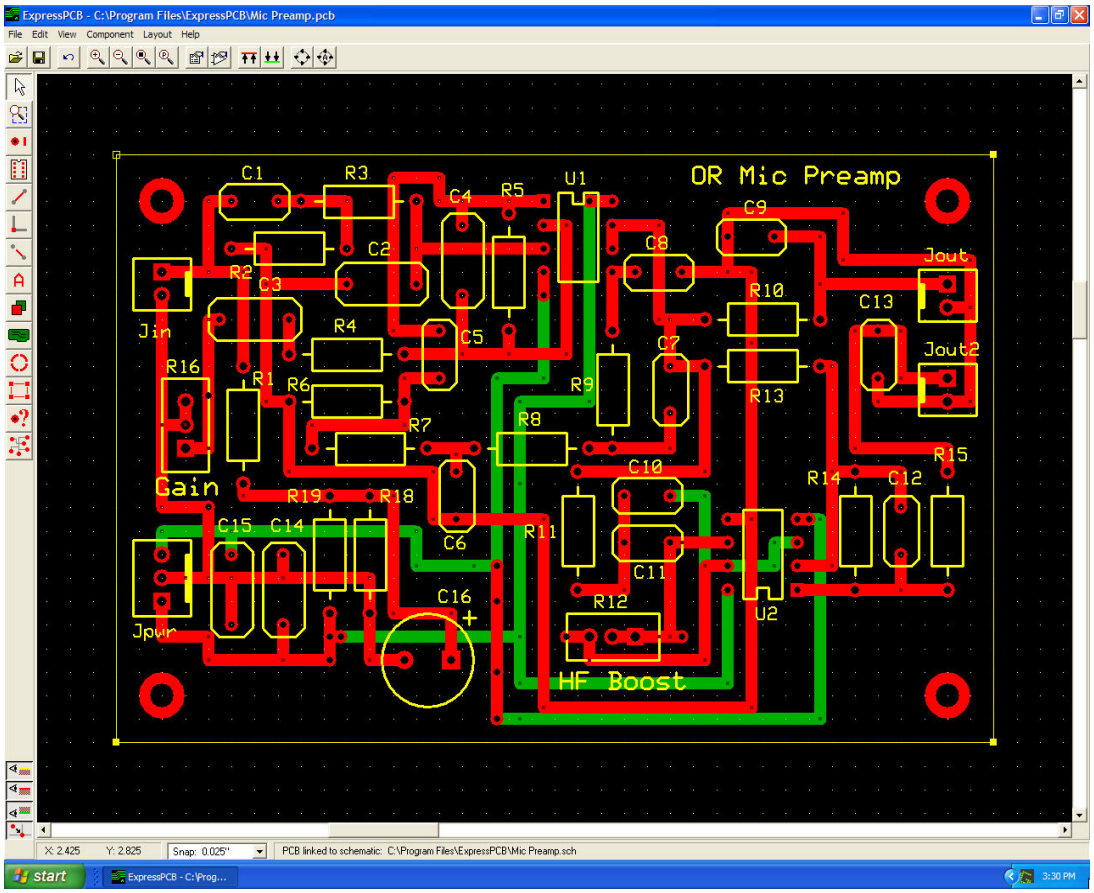
Input to AGC system varied in 6 dB steps (top) versus meter voltage (bottom)



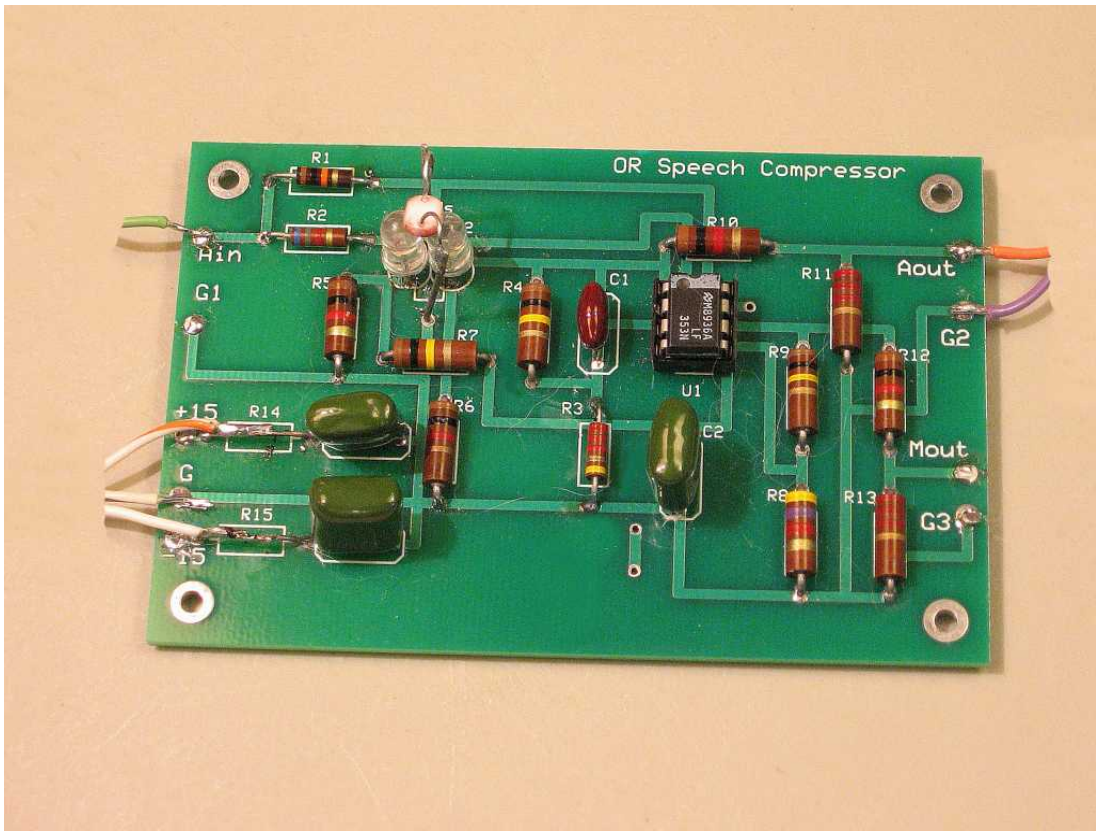
The meter scale with calibration ticmarks in dB of gain reduction (compression)



The preamplifier board photo

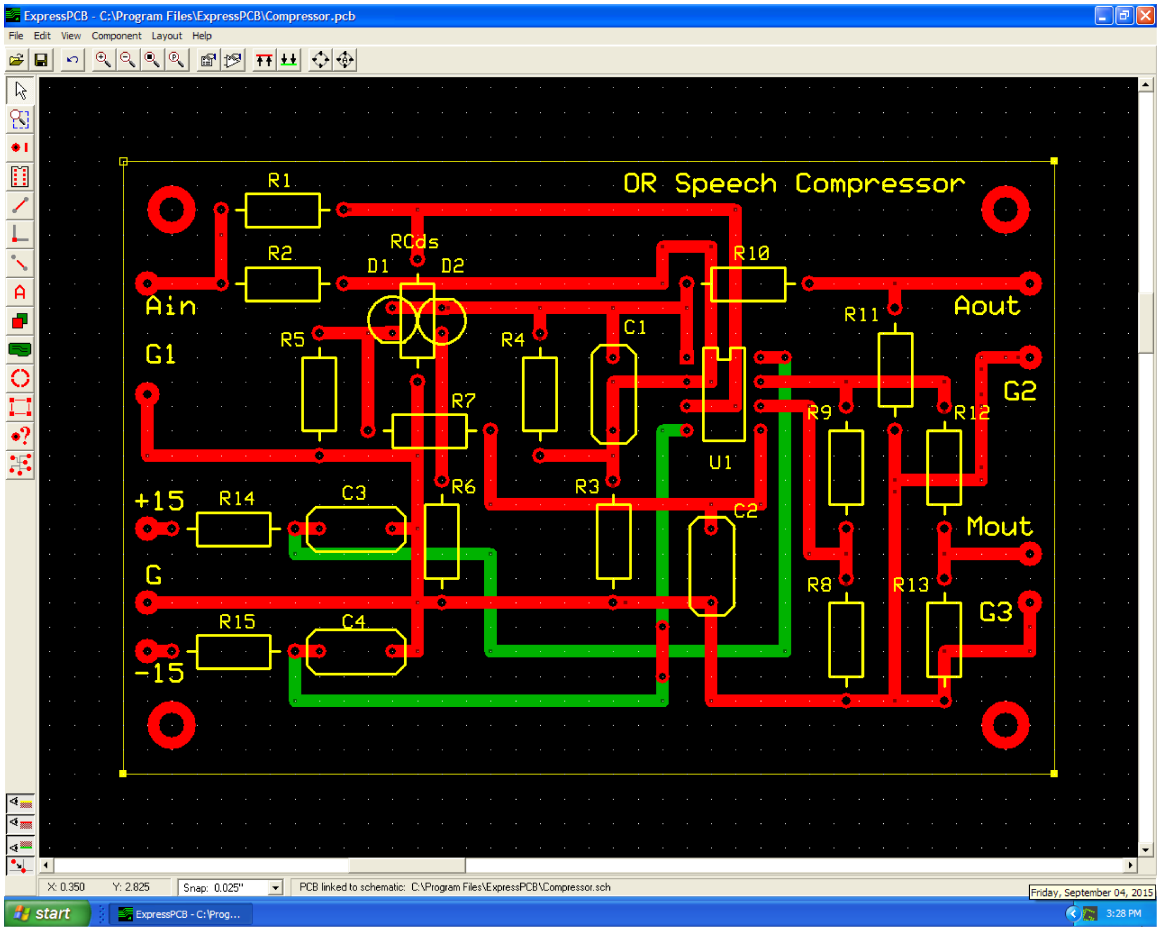


The preamplifier artwork during layout



The compressor board photo

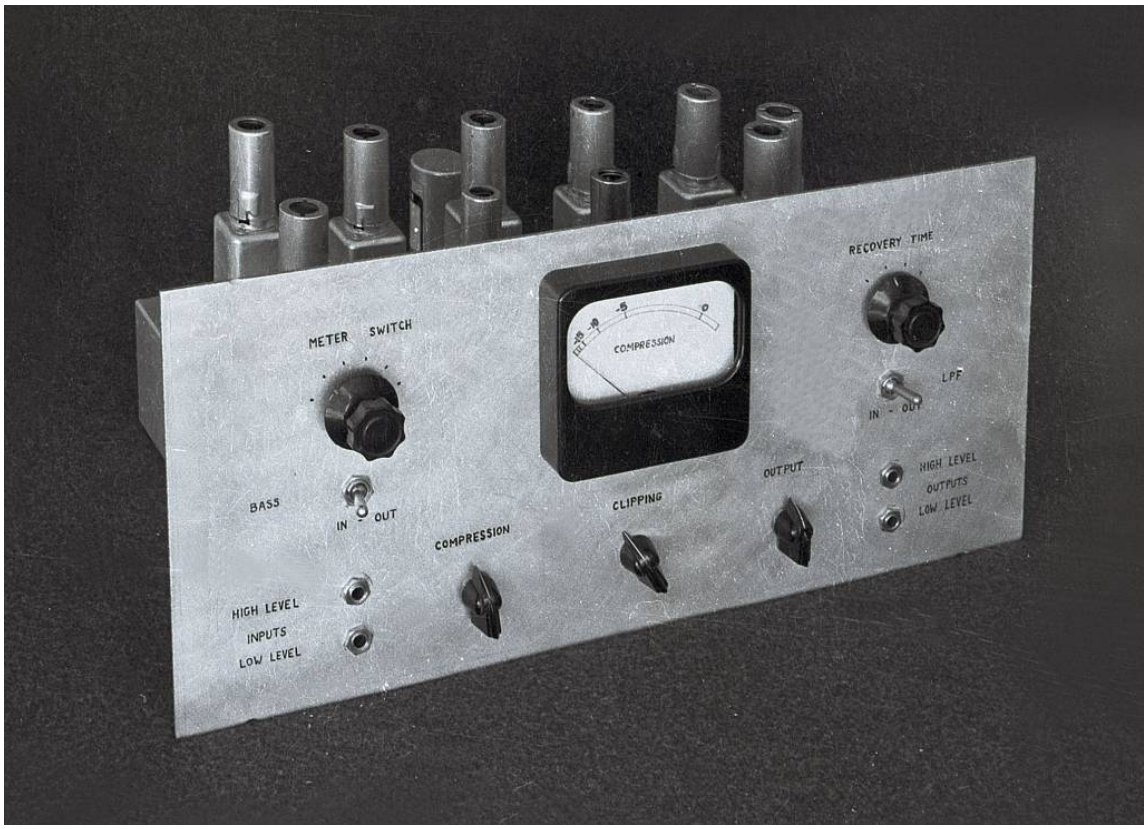
In the upper left corner is the CdS cell facing down toward the pair of LEDs pointing up.



The compressor artwork during layout

Package of night-lights with their little CdS cells looking out the front

A flashlight using a group of LEDs, a pair of which are removed for use in our processor



The grandfather of this unit

See “Compression and Clipping”, James L. Tonne, W5SUC, *QST*, September 1956.