Solid state version of the classic LA-2A Leveling Amplifier

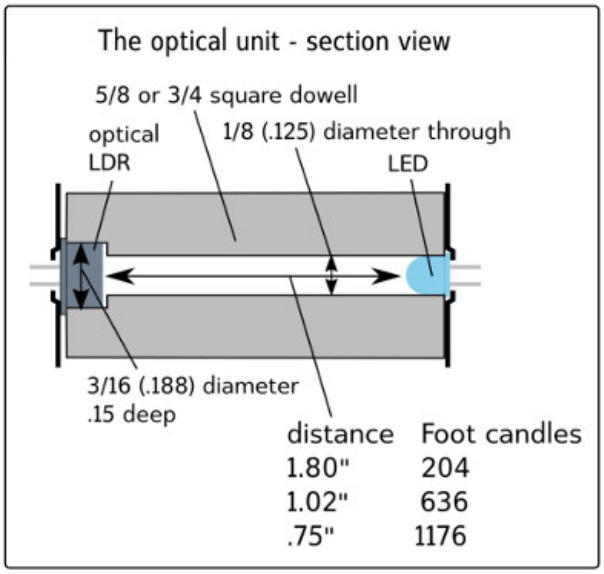
While looking through a copy of the 1969 edition of The Audio Cyclopedia I came across a schematic and description of the 1966 version of the LA-2A originally developed to allow 100% modulation for AM radio stations. Then I saw that Universal Audio was selling a re-creation of this unit for $5,000.

Going through the schematic I thought it may be possible to make a simple solid state version. The key to its operation is "light dependent resistor", a photocell that changes resistance value when exposed to light.

The original version works by applying a 100 volt AC audio signal to a phosphor coated glass plate that is the light source for the LDR.

Working with much lower voltages I would need to use an LED and make a mechanical fixture to hold both LED and LDR. Both parts are inexpensive.

Below are complete details for constructing this device.



My front panel - multi-purpose unit in rack

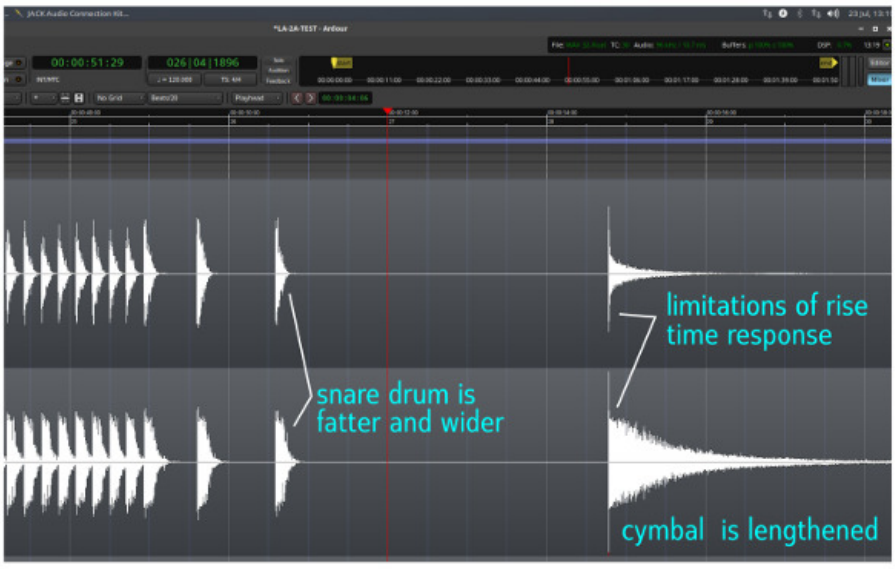
Optical unit test for three versions
LED current vs LDR resistance

Current	Resistance	Resistance	Resistance
ma	1176fc	636fc	204fc
22.69	200	300	393
16.14	237	360	469
11.26	284	439	567
6.60	379	600	774
4.46	474	756	989
2.70	644	1084	1408
1.83	821	1425	1840
.45	2370	4650	5900

Actual attenuation depends on the relationship between the series resistor, the 100k pot that the LDR is in parallel with and the lowest resistance value of the LDR. For the 1176fc version the theoretical max. attenuation would be about 40db but this wold require a signal high enough to drive the side chain to produce maximum light output from the LED.

When a high signal actuates the side chain it is immediately reduced by the LDR so the attenuation is momentary like a limiter with instant release.

The amplifier is after the LDR so gain can be added to modify the waveform.



DAW wave forms- top snare drum and cymbal hits - bottom LA-2A processed

Full schematic on second page

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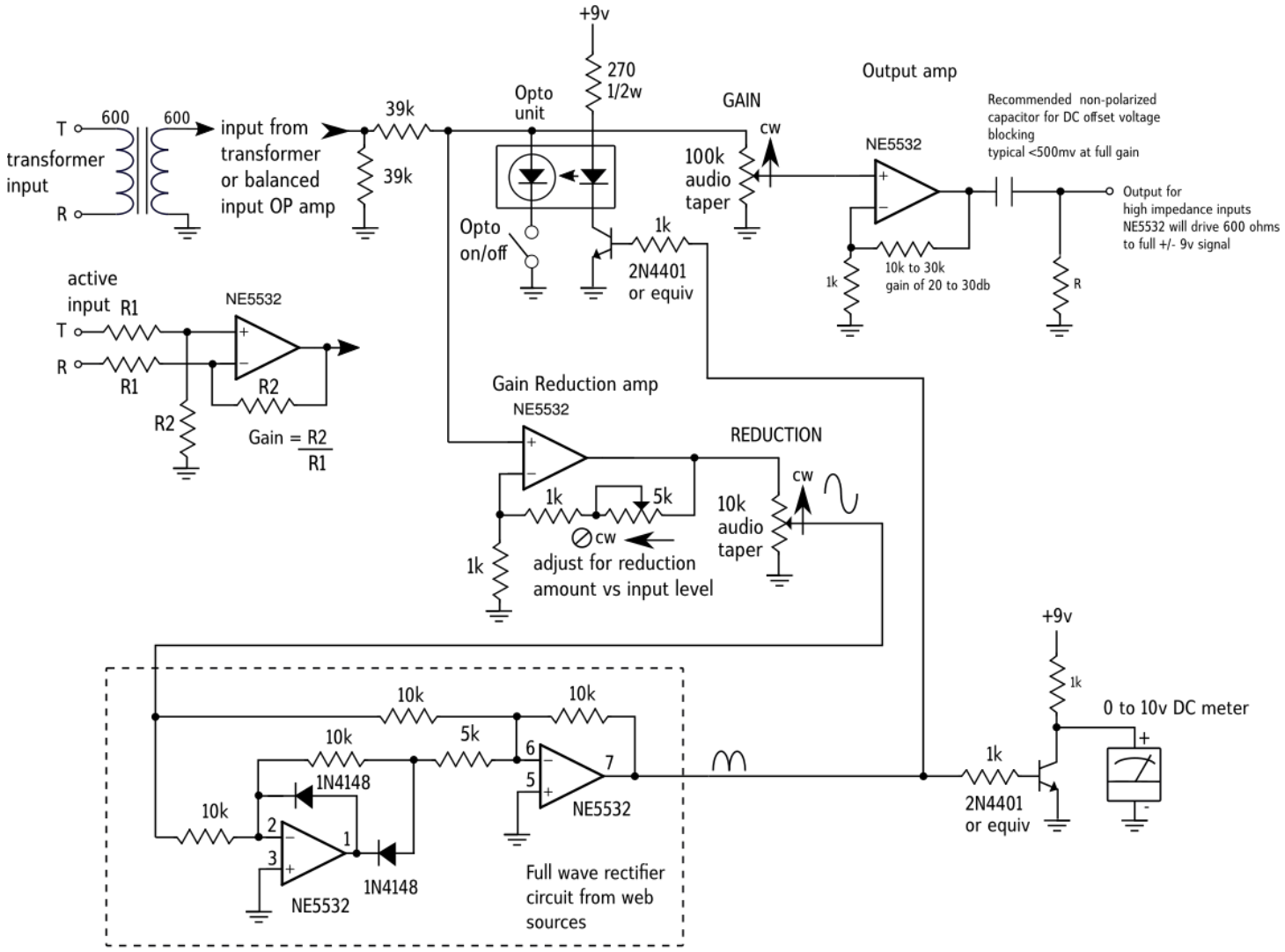
Complete schematic



Circuit description

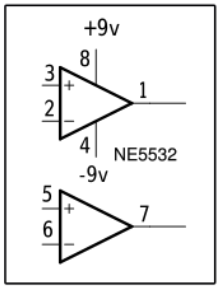
The line level input signal enters across two 39k resistors and is routed to the 100k signal GAIN pot and the Gain Reduction amplifier. The GR amp trim pot is adjusted for reduction amount vs signal level and has a minimum gain of 2.

The output of the GR amp drives a 10k REDUCTION pot that sets the amount of reduction. This signal is routed through a full wave rectifier circuit that drives two transistors. The first supplies current to the Opto LED and the second supplies voltage. to the meter.

The Opto LDR is connected in parallel across the 100k GAIN pot and reduces the audio signal to the Output amplifier by acting as a voltage divider between the 100k pot and the 39k series resistor.

During operation due to the instantaneous action of the LDR the meter will move very little. By turning the opto switch OFF the meter will show a drop in voltage relative to how much current is supplied to the opto LED and give you a rough idea of how much reduction is applied to your signal. When the meter drops to less that 1 volt the Opto LED would be full on. (See chart of resistance values on the first page).

The OUTPUT AMPLIFIER has a gain of 20 to 30 db, controlled by the GAIN pot, and is independent of the reduction. This feature allows envelope modification and many interesting effects .



Power supply
+/- 9v dual voltage
circuit will run on two
9v batteries

LDR Advanced Photonix NSL-5150
$3.00 small qtys.
LED white 10-2603.3178K or equiv.
4600 mcd light output 3.2 V at 20ma
available from Mouser Electronics

OP AMP NE5532 <$1.00
Resistors, diodes available from
Amplified Parts.com

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