

THREE-WAY TONE CONTROL

Although tone control is not desirable in good-quality audio equipment, there are still instances, such as when playing well-used records, when it is. Such an add-on tone control should enable the frequency response to be altered to taste, have no detrimental effect on the audio equipment, and be fairly compact. The circuit proposed here meets these criteria.

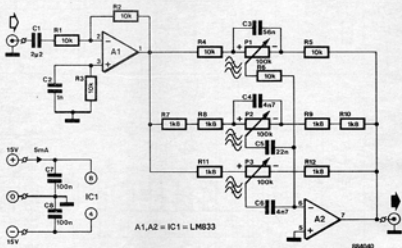
It is based on National Semiconductors' LM833. This dual operational amplifier has a very low noise factor ($4.5 \text{ nV}/\sqrt{\text{Hz}}$), a high gain-bandwidth product (15 MHz), and a slew rate of $7 \text{ V}/\mu\text{s}$.

The tone control circuit consists of three ranges, so that a presence control at around 1 kHz is possible.

The opamp at the input, A₁, is connected as an inverting buffer. Its non-inverting input is connected to a 10 k resistor to equalize the direct currents at both inputs (with respect to the bias currents). This is necessary to keep the output of A₁ near enough at 0 V because of the d.c. coupling to A₂.

The second opamp has in its feedback loop a simple three-way tone control, whose cross-over points are determined by the value of the four capacitors.

If desired, a capacitor may be added to the output of A₂, because the d.c. output of this opamp varies somewhat with the setting of the potentiometers.



The cross-over points of the low-frequency and high-frequency controls lie at about 200 Hz and 2 kHz respectively. The presence control operates at around 1 kHz.

Maximum attenuation is about 16 dB.

With all potentiometers at the centre of their travel, the signal-to-noise ratio is better than 90 dB at a bandwidth of 1 MHz. The gain is 0 dB but can be altered by changing the value of R₂.