Parametric equalizer improves Baxandall tone control

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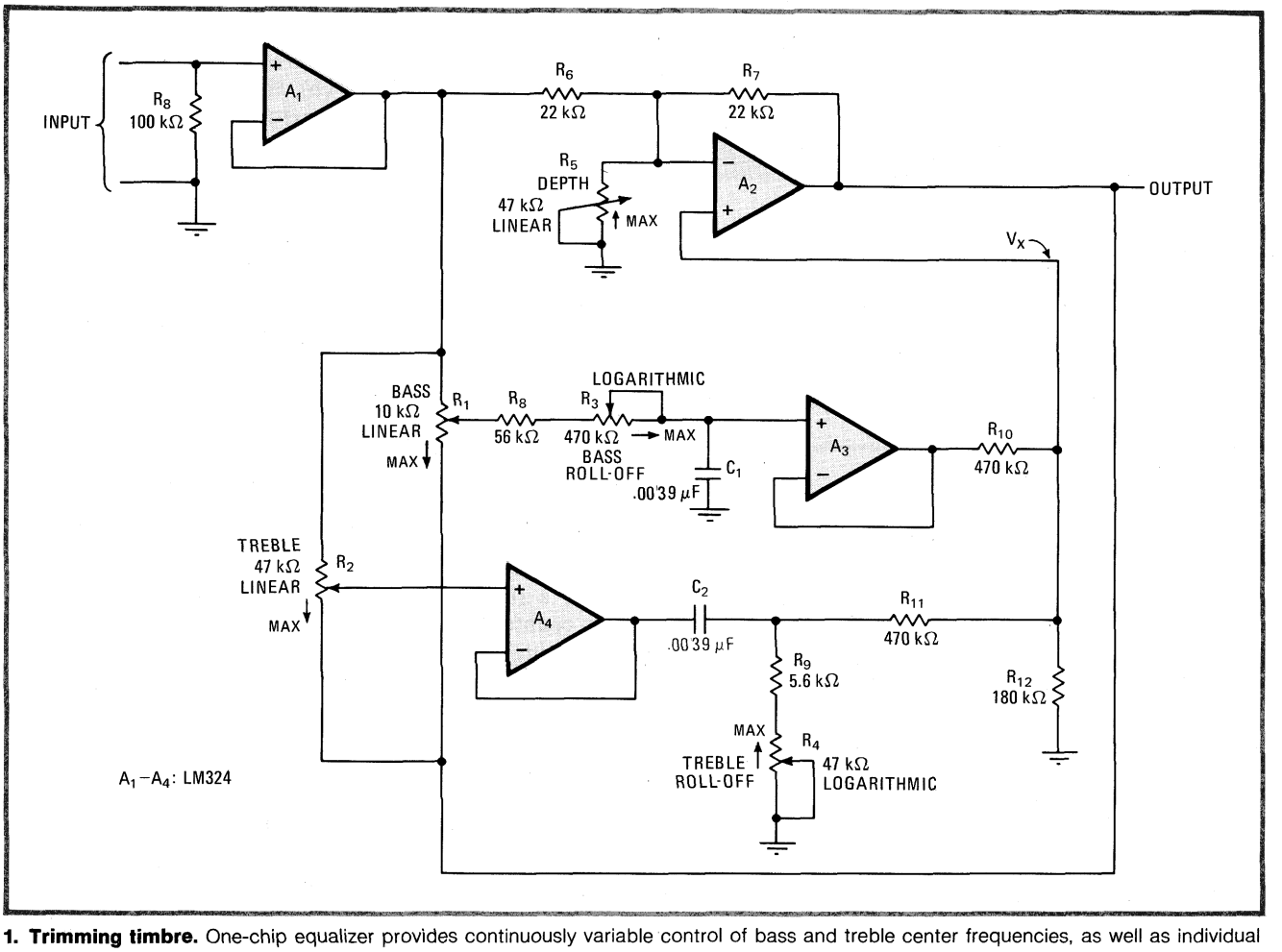
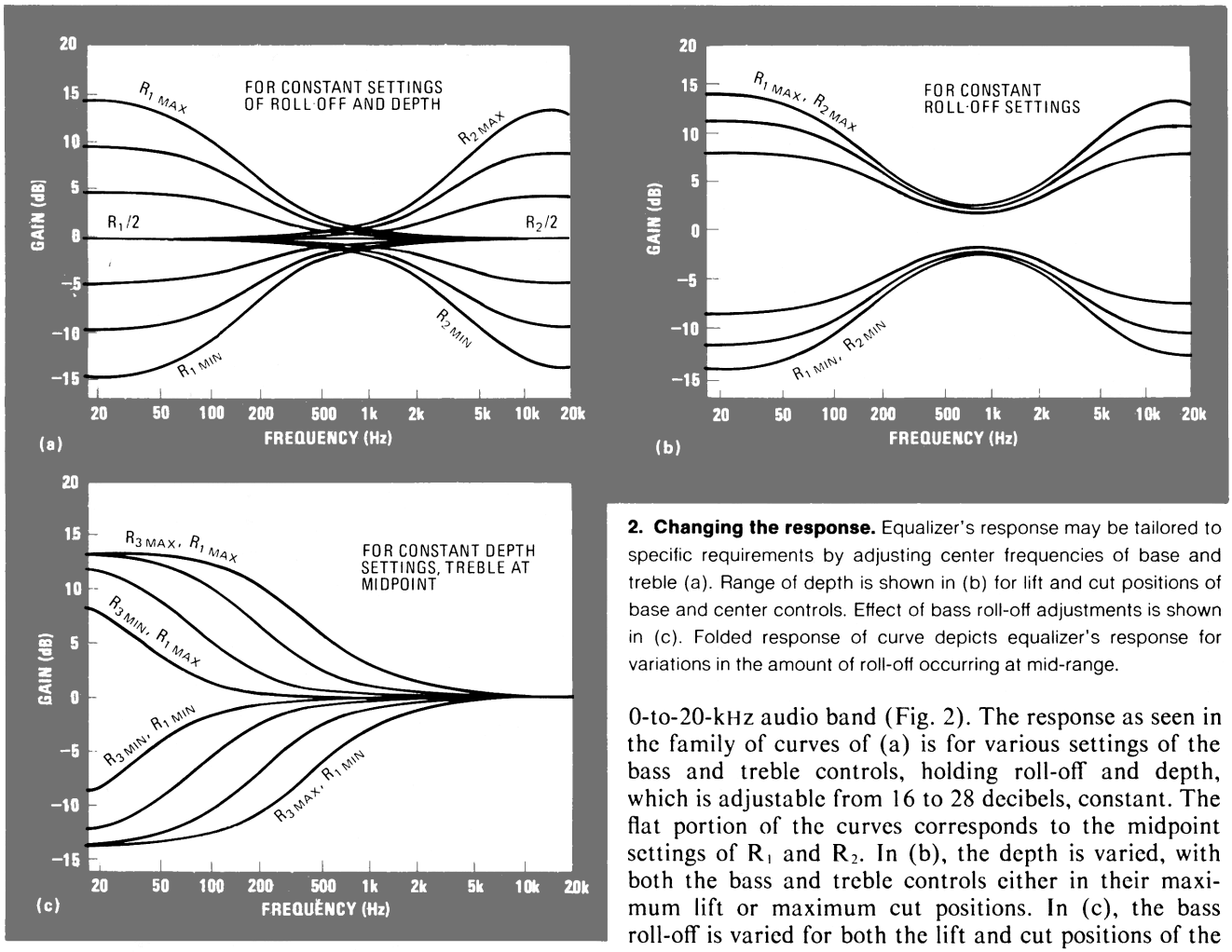
Simple active filters are used here to build a continuously adjustable parametric equalizer having the same general response as the popular Baxandall circuit, which utilizes a switch-selectable scheme for bass and treble equalization. Center frequencies for both upper and lower bands, as well as their individual roll-off characteristics, may be independently controlled, and the depth of the equalization is also adjustable.

The circuit (see Fig. 1), an adaptation of an idea proposed by Thomas,[1] utilizes positive feedback and/or feed-forward principles to achieve the type and amount of equalization required. Five potentiometers set the aforementioned parameters, with the circuit operating on all simultaneously.

The center of the low-frequency passband is set by R_1. If the wiper of the bass control is moved towards the input operational amplifier, A_1, more of the low-frequency components of the input signal will pass through low-pass filter $C_1R_3R_8$ and appear at V_x, with potentiometer R_3 determining the roll-off. Because op amp A_2 inverts the signal, partial cancelation of the low-frequency components occurs and the total bass content is reduced at the output. As R_1 is moved in the opposite direction, a positive feedback loop around op amps A_2 and A_3 is formed, and the bass gain increases. In similar



1. Trimming timbre. One-chip equalizer provides continuously variable control of bass and treble center frequencies, as well as individual roll-off characteristics. Depth of audio-band equalization is also adjustable. Unit costs little more than standard switch-selectable devices.



2. Changing the response. Equalizer's response may be tailored to specific requirements by adjusting center frequencies of base and treble (a). Range of depth is shown in (b) for lift and cut positions of base and center controls. Effect of bass roll-off adjustments is shown in (c). Folded response of curve depicts equalizer's response for variations in the amount of roll-off occurring at mid-range.

fashion, the center of the high-frequency passband may be set by R_2, buffer amp A_4, and filter $C_2R_4R_9$. In either case, trimming potentiometer R_5 controls the amount of negative feedback to op amp A_2, thereby setting the depth of response.

The performance of the circuit can be seen from measured curves taken by an X-Y plotter over the 0-to-20-kHz audio band (Fig. 2). The response as seen in the family of curves of (a) is for various settings of the bass and treble controls, holding roll-off and depth, which is adjustable from 16 to 28 decibels, constant. The flat portion of the curves corresponds to the midpoint settings of R_1 and R_2. In (b), the depth is varied, with both the bass and treble controls either in their maximum lift or maximum cut positions. In (c), the bass roll-off is varied for both the lift and cut positions of the bass control, with the treble control at its midpoint and the depth control held constant. These curves, if folded back on themselves, would depict the equalizer's response for a variable mid-range roll-off, for various lift and cut settings of the treble control, with the bass control at its midpoint and the depth held constant. □

References

1. M. Thomas, "Tunable audio equalizer," Wireless World, September 1978, pp. 58-63.