parametric equalizer

Straightening the frequency characteristic of an audio system is possible by either of two types of equalizer: graphic and parametric.

A graphic equalizer consists of a series of tuneable active filters, normally one for each frequency band. In spite of the complexity of this type of equalizer, it only provides adjustment of the amplification or attenuation in a given band. Also, however carefully the filters have been computed, in practice, the final characteristic never coincides with the positions of the potentiometers on the control panel.

A parametric equalizer normally consists of far fewer filters. Moreover, not only the amplification/attenuation of these filters is variable, but also their central frequency and *Q*-factor.

In the present circuit, the central frequency is set with P_2 in each of the three frequency bands (20–200 Hz, 200–2000 Hz, and 2–20 kHz), selected with S_1.

The *Q*-factor is set with P_1 in the range 0.25–2.5. This factor determines the slope of the skirts of the frequency characteristic.

The amplification/attenuation is set with P_3 over a range from –12 dB to +12 dB.

The curves in the lower diagram show various settings of the equalizer, starting with the upper curve: (a) maximum amplification, lowest *Q*; (b) maximum amplification, highest *Q*; (c) maximum attenuation, highest *Q*; (d) maximum attenuation, lowest *Q*.

The circuit in the diagram can provide only one dip or peak in each frequency curve. If this is not sufficient, a number of circuits per channel may be necessary. This is one of the reasons that it is advisable to use a simple buffer amplifier at the input. Another is that the input impedance of the filter varies appreciably during the setting-up process.

A few notes on the construction. Circuits IC_{1a} and IC_{1b} simulate a tuneable *LC* circuit in parallel with S_1 and P_2. The design is such that the reactances of the simulated inductance and capacitance hardly vary over the range of central frequencies that can be set with P_2. This makes independent setting of the *Q*-factor with P_1 possible.

The output voltage of the filter is buffered by IC_{2a}, after which it is mixed with the signal originating from the emitter of T_1 in a ratio determined by the setting of P_3.

The complete filter can be shorted out with S_2 to enable a quick comparison to be made with a guaranteed straight frequency characteristic.

The circuit needs an input signal of 75–100 mV, which is below the standard line level.

Since the equalizer draws a current of only 25 mA, the supply voltage may be obtained from the preamplifier with which the equalizer is used.

The total harmonic distortion plus noise (THD + N) is ≤ 0.008 per cent at a frequency of 1 kHz (P_3 at the centre of its travel).

The value of R_{15} is not a standard one and the resistor must, therefore, be made from several others. A similar problem occurs with C_7, although its value is standard in the (often difficult to obtain) E24 series. This capacitor may, therefore, also have to be made from several others.

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