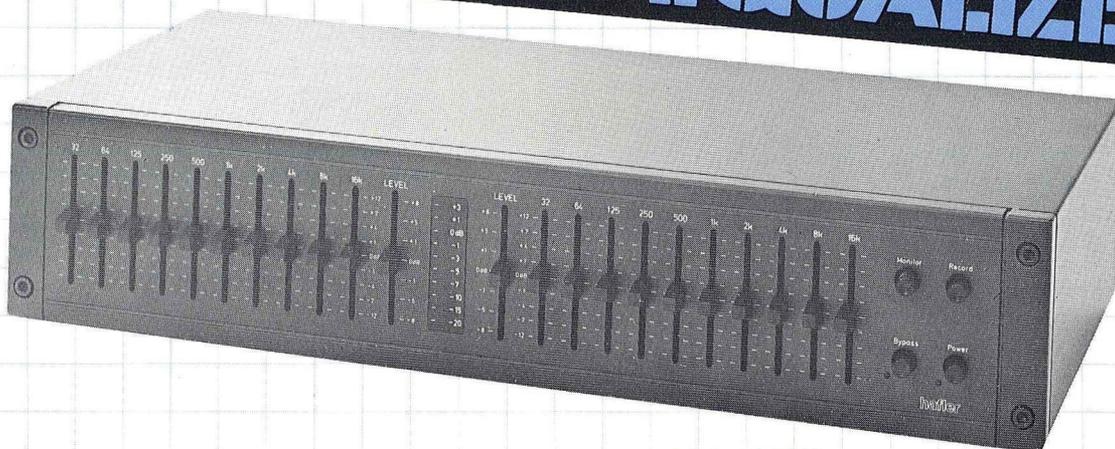


THE HAFLER 160 GRAPHIC EQUALIZER



EASY ROOM AND SYSTEM CORRECTION WITH PROFESSIONAL ACCURACY

The virtues of equalizers are well established in smoothing frequency response to correct for disparities in source material, speakers, or room conditions. What has discouraged many perfectionists from regular equalizer use has been apparent noise, distortion or coloration imposed by even the best current designs. And, achieving their potential has not been easy, so some consider them exotic toys for the gadgeteer.

The Hafler 160 succeeds where others have not, in providing exceptional performance with exceedingly low noise and distortion at all slider positions. It has impressive freedom from tonal coloration, a true "straight wire" bypass, and a simple and practical system setup option.

While an equalizer offers the opportunity to provide special effects such as highlighting a vocalist or suppressing a particular range, its primary application is to provide a semi-permanent selective correction for frequency balance irregularities so that you may hear your system at its best. Semi-permanent, because once identified for your usual listening circumstance, the settings rarely change. Selective, because when you want electrically flat amplification, they may be easily bypassed, singly, or as a whole.

A fine equalizer can help a system of the very best components achieve greater realism. But first, its basic amplifier circuitry must achieve the audio neutrality demanded of the finest preamplifiers. Then it must be able to make the desired corrections without reducing headroom, causing shifts in balance, or adversely affecting imaging. Just as a 1dB change in left/right balance can move the apparent center, so small inaccuracies between frequency bands can alter the emphasis and timbre of instruments. Most corrections in a good music system will be small deviations from center. The Model 160 provides better resolution in this expanded area, with a true center-out detent on each slide control for accuracy. It is now possible to use an equalizer as a scalpel, not a hatchet, to reveal the subtleties of the signal and achieve more perfect playback.

The critical listener often has had to determine the appropriate slider positions solely by ear, trusting to his own sense of musical balance. As a significant aid to the serious user, the Hafler 160 provides an optional microphone and a test disk of band-limited test tones. The microphone plugs into the equalizer, which provides a front panel LED readout of level as each band is played, enabling correction of each, independently for each channel, at the listening position.

The Model 160 provides a ± 12 dB of correction capability at the center frequencies of the 10 octaves which encompass the musical spectrum. For matching the output between "equalized" and "bypass" modes, ± 8 dB of overall level adjustment is provided. Each of the high quality slide controls is center tapped to ground in the 'flat' position, so that all frequency selective networks are balanced out of the signal path. Care has been taken so that only a minimum of switch contacts are in the signal path in the 'bypass' mode—no audio stages whatsoever.

In addition to the inclusion of a 'tape monitor' function, a 'Record' switch enables the equalizer to be inserted into either the record or the playback path of the tape machine connected to the monitor. The ten-LED front panel display provides standard increments from -20 to $+3$ dB, a switch on the back panel selects proper sensitivity for metering either the microphone input or the overall output level on the LED display.

Meticulous attention to design details provide superior sound quality, outstanding reliability, and make the Model 160 a serious contender for professional applications and incorporation in 'purist' systems. Employing both Bi-FET and bipolar technology, it uses low distortion, high gain, low noise operational amplifiers in the Class A mode. Class A operation provides the wide bandwidth and high output drive required to synthesize the tuning inductance of the gyrator circuitry, and improved response on musical transients.

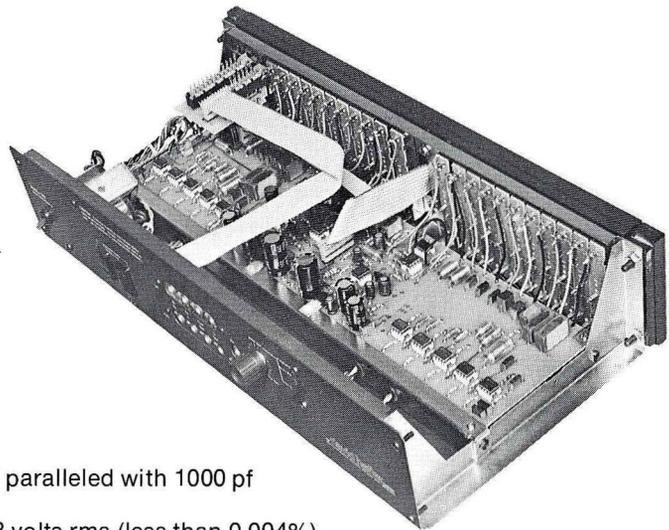
Because the purity of a capacitor is reflected in audio quality, and they are required in the signal path of any processor, we have chosen close tolerance premium polypropylene, polycarbonate and polyester types for their low dissipation factor and low dielectric absorption. The single non-polarized electrolytic which is required as an output blocking device is bypassed with a polypropylene value to preserve the extreme highs.

Imaging—the localization of sound sources—is one of the most difficult aspects of high fidelity reproduction to maintain through an equalizer. The Model 160 preserves this ability by maintaining maximum channel separation in a layout which is essentially two independent equalizers with a common power supply. Painsstaking attention to details, and an advanced design low impedance power supply using low-ESR electrolytics with polycarbonate capacitor bypassing maintains high isolation. Both in-phase and out-of-phase crosstalk has been kept to a minimum in an arrangement that preserves independent power supply, signal

and shield ground returns to a single common location.

This equalizer shows the benefits of Hafler's continuing research into the correlation of subjective listening and analytical measurement. It requires a different perspective—moving beyond the traditional 'static' tests for harmonic and intermodulation distortion, to employing test signals which more closely approximate music. We have employed a differential measurement technique in conjunction with such signals, and with music, to evaluate components in the signal path. Correlation has been observed between such differential measurements and listening tests, particularly in evaluating the audibility of capacitor dielectric materials. This has led directly to the selection of specialty types of considerably higher cost whenever the results so dictated.

We believe that if you will take the opportunity to try the Hafler 160 in your own music system, you will find that it can do more to make your music REAL, and with less effort, than you imagined.



SPECIFICATIONS

(measured with all controls flat)

Equalizer Range: ± 12 dB (± 0.5 dB) at

octave intervals from 32 Hz to 16 kHz $\pm 5\%$

Level Control: ± 8 dB (± 0.5 dB)

Maximum Output: 8 volts rms

Frequency Response: 4 Hz to 80 kHz +0, -3 dB
20 Hz to 20 kHz +0, -0.3 dB.

Measured into 10k ohm load paralleled with 1000 pf

Rise/Fall Time: 2.5 usec to 10 volts peak to peak

Total Harmonic Distortion: More than 88 dB below 3 volts rms (less than 0.004%)

IHF Intermodulation Distortion: More than 90 dB below 8 volts rms (less than 0.003%)

Input Impedance: 68 Kohms in parallel with 300 pf

Output Impedance: Less than 600 ohms to 25 kHz

Hum and Noise: 115 dB below 8 volts rms with 'A' weighting

Channel Separation: Greater than 80 dB @ 1 kHz;

Greater than 55 dB @ 20 kHz

Meter Display Range: -20 dB to +3 dB; 0 dB level adjustable with rear panel level control

Meter Frequency Response: @ 0 dB, 20 Hz to 20 kHz +0, -1 dB

Microphone Input Frequency Response: +0, -0.5 dB from 20 Hz to 20 kHz

Microphone Input Sensitivity: 1.8 mV rms for 0 dB meter indication with microphone gain at maximum

Line Monitor Sensitivity: Adjustable, 80 mV to beyond 8 V rms for 0 dB meter indication

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