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HAFLER DH-220 POWER AMPLIFIER

Manufacturer's Specifications

Power Output: 115 watts per channel, 8-ohm loads, 20 Hz to 20 kHz.

Rated THD: 0.02%.

Frequency Response: 6 Hz to 60 kHz, +0, -0.5 dB; 2 Hz to 160 kHz, +0, -3 dB.

SMPTM IM: 0.005%.

S/N: 100 dB, referred to rated output.

Damping Factor: 300 at 1 kHz, referred to 8 ohms.

Input Impedance: 47 kilohms.

Input Sensitivity: 1.55 V for rated output into 8 ohms.

Slew Rate: 30 V/ μ S.

Rise-Time: 2.5 μ S.

Channel Separation: Greater than 85 dB at 1 kHz; greater than 65 dB at 20 kHz.

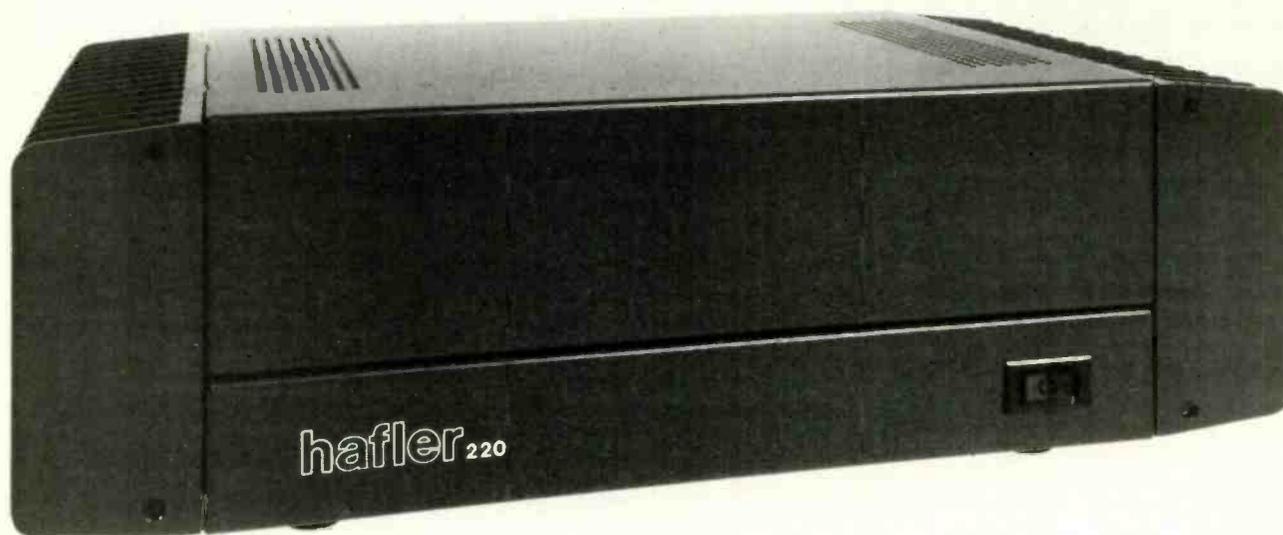
Power Consumption: 125 VA, quiescent; 580 VA at rated output.

Dimensions: 16 in. (40.6 cm) W x 5 $\frac{1}{8}$ in. (13 cm) H x 10 $\frac{1}{2}$ in. (26.7 cm) D.

Weight: 26 lbs. (11.8 kg).

Price: \$449.95, wired; \$349.95 in kit form.

Company Address: 5910 Crescent Blvd., Pennsauken, N.J. 08109.
For literature, circle No. 91



David Hafler is one of the true pioneers of the high-fidelity industry. Since I've been around audio for about as long as he has, I can well remember Mr. Hafler's noteworthy contributions in the field of output transformer design (when output transformers were needed to couple power

from vacuum tubes to loudspeakers), quadraphonic sound, and, perhaps most noteworthy of all, the popularization of audio kit-building in the United States. Long-term readers of *Audio* will remember the superb kits offered years ago by Dynaco, which was founded by none other than Dave

Hafler. More recently, Mr. Hafler was an owner of the Ortofon Company of Denmark, whose moving-coil and moving-magnet phono cartridges are among the world's most highly respected.

After selling Ortofon some years ago, it might have seemed that Mr. Hafler, having enjoyed two successful careers in the audio business, would perhaps retire, but that was never Dave Hafler's style. Just as soon as he was able, he formed the David Hafler Company, located it in a suburb of Philadelphia not far from where he had founded Dynaco, and began turning out one great product after another at prices which make it possible for not-so-affluent audio enthusiasts to own top-performing equipment. To those of us who remember the "good old days," Hafler's products are, in many ways, reminiscent of some of the early Dynakit. The major difference, of course, is in the advanced solid-state technology employed by Hafler, but the similarities are in the ease with which it is possible to assemble a Hafler product from its kit version, the high-quality component parts used, and the outstanding performance and reliability offered by his products, whether purchased in wired or kit form.

The only control on the front face of the DH-220 power amplifier is an on-off rocker switch. The amplifier modules themselves consist of tapered heat-sink structures (onto which output transistors as well as low-level signal p.c. boards are mounted internally). The heat-sinks are neatly fitted to the left and right ends of the amplifier chassis to form handsome side panels. The rear of the amplifier chassis is equipped with a pair of phono-type input jacks; color-coded, five-way speaker terminals, and left- and right-channel speaker fuse-holders. The fuse-holders are initially supplied with 2-ampere fuses, though 5-ampere fuses are supplied as alternatives; a quick calculation showed that I had better install them if I was going to measure continuous maximum power-output capabilities of the amplifier.

Layout and Circuit Highlights

The DH-220 amplifier circuit, according to Hafler, is a refinement of their DH-200 design. It employs MOS-FET output stages, a huge power transformer (relative to its rated output) and bridge rectifier, and a fully complementary, symmetrical, push-pull circuit, which is direct-coupled throughout, except at the input. Basic protection circuits provide security against damage to the amplifier or speakers. The amplifier contains a.c. line fuses, B+ (power supply) fuses, thermal breakers and the loudspeaker fuses previously referred to.

Although I did not build the unit from a kit, I learned from the owner's manual (which is also the kit assembly manual) that the left- and right-channel audio modules come pre-assembled and pretested. Besides making the remaining job very simple for even a novice, the modular design also makes it possible to operate one channel if the other should ever require service, avoiding the need to return the entire amplifier to the factory. Hafler makes accessories available for special applications, such as bridged monophonic use (with rated output of 350 watts), a panel for standard 19-inch rack mounting, and even an alternative power transformer for international a.c. line voltages.

Measurements

The Hafler DH-220 is conservatively rated. On my test bench, it delivered 138 watts per channel at mid-frequencies before reaching its rated THD of 0.02%. At its rated power-output level of 115 watts per channel, with both channels driving 8-ohm resistive loads, THD was only 0.005% at 1 kHz and only 0.008% at 20 Hz. The nominal rating of 115 watts per channel may have been governed by the fact that, at 20 kHz, the amplifier reached its rated distortion level at about 120 watts per channel. Figure 1 plots THD versus power output for the three key test frequencies of 1 kHz, 20 Hz and 20 kHz. SMPTE IM, though somewhat higher than claimed, was certainly low enough to cause no problems; it measured 0.017% at rated output.

Frequency response measured flat, within 1 dB from 10 Hz to 40 kHz and within 3 dB from 4 Hz to 130 kHz. Dynamic headroom for short-term music signals measured just a bit more than 1.0 dB, which translates to a 145 watt-per-channel, short-term power-output capability without clipping. CCIF-IM distortion, using a twin-tone test signal, measured

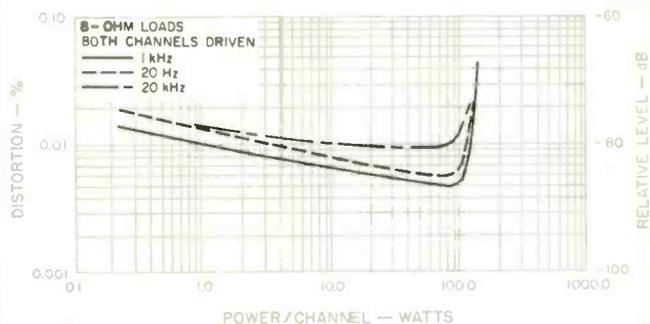
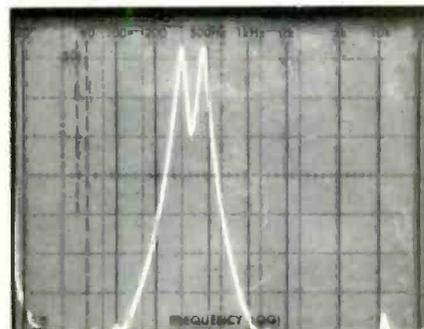


Fig. 1—Power output vs. THD.

Fig. 2—Twin-tone IHF-IM measurement.



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a very low 0.002%—or just about the residual distortion of my test instrument. I was able to detect just a bit of IHF-IM distortion, using spectrum analysis and sweeping linearly from 0 Hz to 20 kHz (see Fig. 2). The small "blip" at the right of the screen in Fig. 2 combines with the smaller blips just above and below the two test tones, seen at center-screen, adding up to a net IHF IM of 0.038%—hardly anything to get upset about.

Input sensitivity for 1-watt output into 8-ohm loads measured 140 mV. Signal-to-noise ratio, referenced to 1-watt output and using an A-weighting network, measured 83 dB. To translate that to an S/N number referenced to rated output (and therefore to Hafler's published specification) requires adding 20.6 dB (the difference between 1 watt and 115 watts, in dB), for an S/N rating of 103.6 dB compared with Hafler's claimed 100 dB.

The DH-220 amplifier proved to be stable under all load conditions to which it was subjected, including operation into 4- and 2-ohm resistive loads as well as operation into inductive and capacitive loads. I was unable to verify Hafler's claimed damping factor of 300 at mid-frequencies, perhaps due to the resistance of the 2-foot lengths of 14-gauge wire connecting the amplifier output terminals to the inputs of my test setup. Even so, I measured a damping factor of more than 150 at 50 Hz, still quite high.

Use and Listening Tests

I was very favorably impressed, not only by the sound quality delivered by this moderately priced amplifier but also by its very rugged design, conservative major ratings, and its ability to deliver high peak-power levels close to its rated level for long periods of time without becoming overly hot or shutting down. Bass reproduction, using my reference loudspeakers, was tight and unmuddied. Transient response during passages containing sharp attacks (from Compact Discs, of course) didn't strain the amplifier's high-speed performance at all.

Designers of components intended for kit construction must always make certain that their units will hold up—even if the kit-builder constructs a finished product that's a bit sloppier than the factory-assembled version. This means wiring layouts must not be terribly critical, the possibility of hum pickup must be minimized, etc. There have been many small companies who thought they could get into the audio kit business but failed after a short time. Hafler's success, two times running, proves that he and his staff understand what's needed in audio kit design. In its wired version, the DH-220 amplifier represents unusually fine value. If you are not afraid to spend an evening or two building the kit version, the cost per watt goes down considerably, making it an even better bargain.

Leonard Feldman

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