BASCOM H. KING

QUICKSILVER AUDIO V4 MONO AMPLIFIER

Mike Sanders of Quicksilver Audio has outdone himself. With the V4, he has created a mono tube power amplifier that's sonically superior to his state-of-the-art M135 yet costs considerably less. (I reviewed the M135 in the December 1993 issue.) The V4 is very attractive. A black rectangular cover for the transformers and the power supply's four main filter capacitors occupies the rear half of the chrome chassis, while six tubes and a meter take up most of its front half. Rebecca Sanders was largely responsible for this visual design—nice job!

The four largest tubes are KT88s, yielding rated output power of 120 watts into 4- or 8-ohm loads; other output tubes (such as 6L6s, 6550s, or EL34s) can be used instead. Adjusting the output tubes' bias is simplicity itself. To find out a particular tube's plate current, you just push a button next to that tube and its current will appear in the meter. To adjust plate current, you use a screwdriver to turn a pot near the tube in question.

Construction of the V4 is simple, elegant, and traditional. The wiring is point to point (and commendably neat). The chassis serves as the ground bus; many circuit points are tied to it through ground lugs that have serrated contact areas to ensure good connections. And lots of high-quality parts are in evidence. All in all, a very nicely made amp.

Measurements

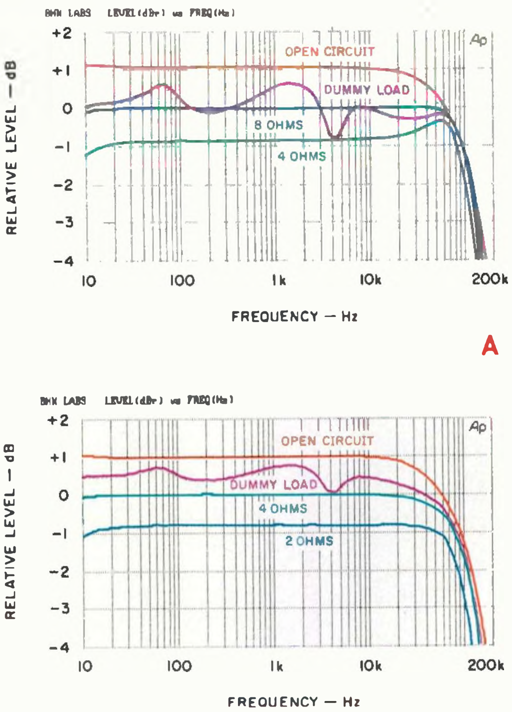
I received two Quicksilver V4 mono amps; unless otherwise noted, reported results are for one of them, which I designated as the left channel. I set each output tube's plate current to 40 milliamperes, as Quicksilver recommends.

Figure 1A shows frequency response at the V4's 8-ohm tap for open-circuit, 8- and 4-ohm resistive loading, and a dummy speaker load. Figure 1B shows response on the 4-ohm tap with open-circuit, 4-ohm, 2-ohm, and dummy loads. On each output tap, the curves for the two resistive loadings differ a bit from about 20 kHz up. This is because of differences in high-frequency coupling between the output windings and because the global negative feedback is taken from the 8-ohm output tap. The results indicate a midband output impedance of about 1 ohm at the 8-ohm tap and 0.5 ohm at the 4-ohm tap, yielding a damping factor of about 8. The frequency response deviation with the dummy speaker is quite acceptable, about ±1 dB on the 8-ohm output tap and about half that on the 4-ohm tap.

Figure 2 shows the Quicksilver amp's square-wave responses. There's a slight overshoot in the top trace, which was made with 8-ohm loading on the 8-ohm tap. Overshoot increased when the tap was loaded with 4 ohms and decreased a bit for 4- and 2-ohm loads on the 4-ohm tap. These results correlate with the frequency responses of Fig. 1. The ringing exhibited for a 2-microfarad capacitor paralleled across the 8-ohm load (middle trace) is in the normal range. The 40-Hz square wave (bottom trace), however, has somewhat more tilt than I've seen in other tube power amps. Square-wave rise and fall times at an output level of ±5 volts into an 8-ohm load on the 8-ohm tap were 2.4 microseconds.

The curves in Fig. 3 are for SMPTE IM distortion with an 8-ohm load at the 8-ohm tap and for total harmonic distortion plus noise (THD + N) for a 1-kHz signal with three different loads at the 8-ohm tap. Power transfer from the 8-ohm tap is greatest

Rated Output: Continuous power, 120 watts into 4 or 8 ohms, 22 Hz to 40 kHz; peak power, 180 watts at 1 kHz.
Dimensions: 16¾ in. W x 7⅞ in. H x 16¾ in. D (42.5 cm x 20 cm x 42.5 cm).
Weight: 51 lbs. (23.1 kg).
Price: $1,900 each.
Company Address: 5635 Riggins Court, #15, Reno, Nev. 89502; 702/825-1514; fax, 702/825-1552.
For literature, circle No. 92



B

Fig. 1—Frequency response as a function of loading on the 8-ohm tap (A) and 4-ohm tap (B).

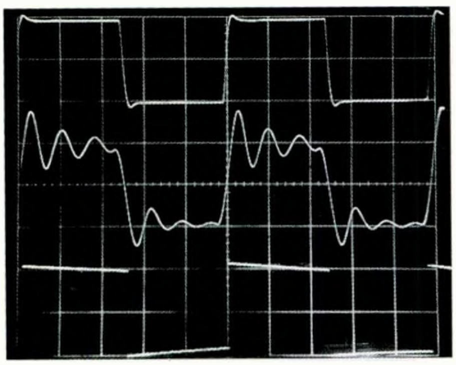


Fig. 2—Square-wave response for 10 kHz into 8-ohm load (top), 10 kHz into 8 ohms paralleled by 2 µF (middle), and 40 Hz into 8 ohms (bottom); all tests made at 8-ohm tap.

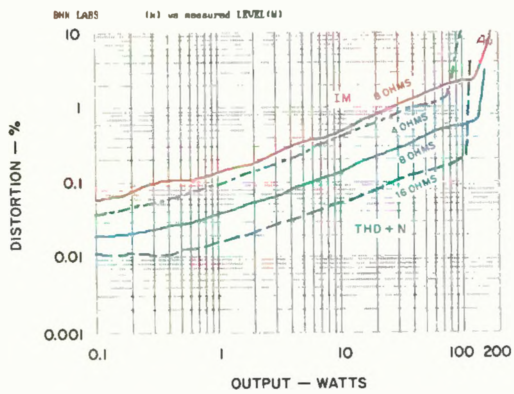


Fig. 3—THD + N at 1 kHz and SMPTE IM distortion vs. power output, at 8-ohm tap.

with an 8-ohm load; it diminishes less with 16 ohms (twice the nominal load) than it does with 4 ohms (half the nominal load). Therefore, connecting an 8-ohm speaker to the 4-ohm tap would cause a slight power loss but would double the damping, which might tighten the speaker's bass.

Figure 4 shows THD + N versus frequency at several power levels with 8-ohm loading on the 8-ohm tap. In Fig. 5, a spectrum of the distortion residue from a 1-kHz signal at 10 watts into 8 ohms on the 8-ohm tap, higher-order harmonics quickly decay to very low levels. The other V4 amplifier produced less THD + N because its push-pull circuitry was better balanced and did a better job of canceling the second-harmonic component.

Although damping factor in the midband is, as I mentioned, 8 on the 8-ohm tap, it rolls off considerably below 100 Hz and rises above about 2 kHz (Fig. 6). The rolloff at the low end is presumably due to a decrease in feedback-loop gain caused by the output transformer primary's inductance and by the high-frequency cutoff of the RC time constant of one interstage coupling. (On the 4-ohm tap, the results were essentially the same.)

Dynamic power with an 8-ohm load on the 8-ohm output tap was 175 watts at the beginning of the 20-millisecond tone-burst test and 162 watts at its end. Taking the 175-watt figure yields a dynamic headroom of 1.6 dB. Steady-state power at the visual onset of clipping (about 0.75% distortion) was 140 watts, so clipping headroom was 0.7 dB.

The V4's wideband output noise was 1.6 millivolts for the left amp and 1.4 millivolts for the right; A-weighted noise was 165 and 195 microvolts, respectively. The IHF signal-to-noise ratio (A-weighted noise relative to 1 watt into 8 ohms) was 84.7 dB for the left amp and 83.3 dB for the right. Most of the noise was 120-Hz power-supply ripple and its harmonics. This amount of hum might be audible on very efficient speakers.

The two amplifiers had almost identical voltage gain, 27.06 dB for 8-ohm loading on the 8-ohm tap. The corresponding IHF input sensitivity for 1 watt into 8 ohms was 125.5 millivolts. The amps each drew about 1.56 amperes from the AC line at idle and 3.5 amperes at 140 watts out.

Use and Listening Tests

I have recently changed my listening setup when using B&W 801 Matrix Series 3 speakers, moving them quite a bit farther

ASSOCIATED EQUIPMENT USED

Equipment used in the listening tests for this review consisted of:

CD Transport: PS Audio Lambda Two Special

CD Electronics: Genesis Technologies Digital Lens anti-jitter device, Classé Audio DAC-1 D/A converter, and DGX Audio DDP-1 preamplifier (see text)

Phono Equipment: Kenwood KD-500 turntable, Infinity Black Widow arm, and Audio-Technica ML150 moving-magnet cartridge

Additional Signal Sources: Nakamichi ST-7 FM tuner, Nakamichi DR-3 cassette deck, Denon DMD1300 MiniDisc recorder, and Technics 1500 open-reel recorder

Preamplifiers: Sonic Frontiers Line-3 and Ayre Acoustics K-1

Power Amplifiers: Sonic Frontiers Power-3 and Quicksilver M135 mono tube amplifiers, Ayre Acoustics V-3, and Audio Note Ongaku single-ended tube amp

Loudspeakers: Genesis Technologies Genesis Vs and B&W 801 Matrix Series 3s

Cables: Digital interconnects, Illuminati DX-50 (AES/EBU balanced); analog interconnects, Transparent Cable MusicLink Reference (balanced) and Tara Labs Master and Music and Sound (unbalanced); speaker cables, Transparent Cable MusicWave Reference and Tara Labs RSC Master Generation 2

TECHNICAL HIGHLIGHTS

The Quicksilver V4's first and second stages share a 12FQ7 twin-triode tube. The first stage is a common-cathode input amplifier whose plate output is directly coupled to the grid input of a split-load phase-inverter second stage. (A split-load phase inverter has cathode and plate resistors of equal values.) The plate current, which carries the signal, is common to the plate and cathode resistors, and the plate and cathode signals are out of phase. Thus, equal but oppositely phased output signals are generated at the plate and cathode. The two signals from the phase inverter are capacitor-coupled into the next stage, a push-pull common-cathode driver. It uses a 12BH7 twin triode, whose plate outputs are capacitor-coupled to the output stage.

The four KT88 output tubes are pentode-connected, with a nominal 600-volt supply to the center tap of the output transformer and 300 volts on the screen grids. Each output tube has an adjustable negative supply to set its plate current.

There are two feedback loops. Push-pull high-frequency feedback from the output tube plates to the driver cathodes, via low-value capacitors, provides high-frequency stability and lowers high-frequency drive impedance to the output transformer. The overall feedback loop runs from the output transformer's secondary to the input tube's cathode.

Separate secondaries on the power transformer feed three separate high-voltage DC supplies, a low-voltage negative DC bias supply for the output tubes, and AC for the tube heaters. For the main high-voltage supply, the main secondary winding feeds a full-wave rectifier bridge and a capacitor-input filter formed by two 1,100-microfarad, 300-volt filter capacitors in series, with the winding's center tap connected to the junction of the two capacitors. The output stage's B+ supply is taken across the ends of the filter, and the screen grid supply (about half the B+ voltage) is taken from the junction and one end of the filter. A third transformer winding feeds high voltage to the input through driver circuits via a bridge rectifier, another capacitor-input filter, a series filter choke, and a final filter capacitor. This use of multiple high-voltage supplies is an important part of the V4's design and is partly responsible for this amp's sonic character. *B.H.K.*

into the room than before. I connected a DGX Audio DDP-1 preamplifier, which has digital equalization specifically for these speakers, between my CD transport and a Genesis Digital Lens anti-jitter device. The overall sound had been very good with this setup through my reference power amplifiers, and connecting the Quicksilver Audio V4s quickly revealed that these were very good-sounding amps indeed. Space, delicacy, transparency, and overall musical believability were of high order.

With the V4s, bass power, definition, and impact were quite good. At high volume, the sound held together very well. I had recently heard a pair of V4s on my 801s in somebody else's home and was very impressed with the sound quality. The low bass was better, and the region from the upper bass to the lower midrange was smoother than in my room with the 801s, but overall transparency and space are superior in my own setup.

I then paired Genesis V speakers with the Quicksilver V4 amps. These speakers are quite fussy about the power amps that drive them. It is somewhat of a guessing game as to how a particular amplifier is going to sound with them; an amp that sounds very good on other speakers may sound less than great on the Vs. The problem is not in the bass, since the Genesis V's own servo amplifier handles everything below about 90 Hz, and the speaker's rising impedance from 150 to 90 Hz unloads your system's amp and relieves it of producing power at bass frequencies. With the V4s driving these speakers, the sound was again spacious and detailed but there was noticeable high-frequency edginess on some recordings. I preferred the sound of some of my other amplifiers to the V4s on the Genesis speakers. However, the V4s did sound good when driving the B&W 801s, which are more representative of the speakers they're likely to be mated with.

The V4s performed flawlessly in the lab and in my listening system. Plate currents were stable throughout the review period and needed little tweaking to stay at 40 milliamperes.

The V4s are a significant addition to Quicksilver's line of electronics and continue that company's tradition of well-designed, reliable, affordable, and excellent-sounding gear. I enjoyed the V4s and recommend that you go out and listen to a pair. A

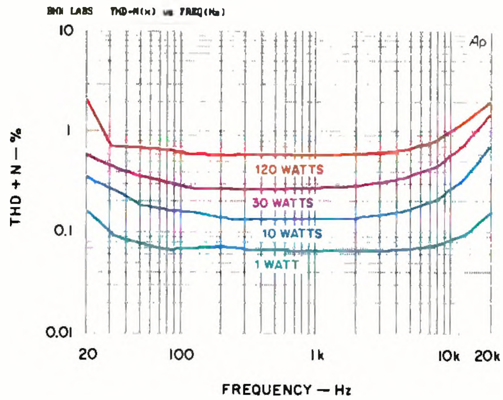


Fig. 4—THD + N vs. frequency, 8-ohm load at 8-ohm tap.

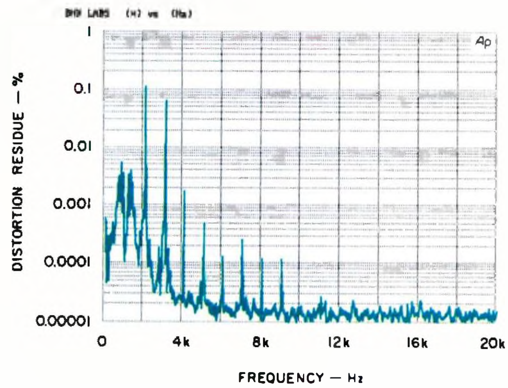


Fig. 5—Spectrum of harmonic-distortion residue for a 1-kHz signal at 10 watts out into 8 ohms on 8-ohm tap.

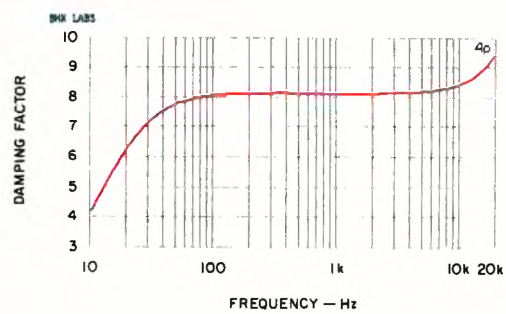


Fig. 6—Damping factor on 8-ohm tap.