

Rotel RB-980BX Stereo Power Amplifier

HPR LAB &
LISTENING
TEST

By Martin Forrest

This unit delivers — and at a price you may find hard to believe

Ever a high-fidelity component name could be categorized as being a truly "global" one, Rotel certainly qualifies. Here is a company that is essentially based in Japan. Yet, design engineers who create and develop Rotel's newest products are based in Great Britain where, since the early 1980s, they have been engaged in designing products based on what they call the "Rotel Balanced Design Concept." What that amounts to is producing high-quality audio products that, unlike some high-end products, are also affordable. Finally, as far as U.S. consumers are concerned, the Rotel products are distributed by Rotel of America, a subsidiary of the company based in Canada but addressable at a Buffalo, New York, P.O.B. number.

Rotel's entirely new line, consisting of 17 new models, all part of the 900 series, includes three power amplifiers, two control amplifiers, three integrated amplifiers, a pair of CD players, two cassette decks, two tuners, a tuner/preamp and two integrated receivers. Judging by published specifications, we decided that the company's powerful RB-980BX stereo power amplifier would be a good one to test and audition. It is not Rotel's most powerful amplifier (that distinction belongs to Model RB-990BX, rated at 200 watts per channel), but its 120 watts per channel legitimate rating coupled with its amazingly affordable suggested price of only \$599.90 make it one of the most attractive power amplifier products we have encountered in quite some time. For those who require more power, we might

almost recommend buying a pair of these handsome amplifiers and using each one in its bridged, mono mode, under which operating condition each amplifier can pump a full 360 watts into an 8-ohm load, thanks to the high-current capacity (80 amperes of peak current) embodied in its design.

Rotel's attractive product brochure mentions the designer's philosophy. It states that "we use technology which makes products sound better. Often it is specially chosen components sourced from around the world, careful attention to layout and minimizing controls. We use computers to check performance, meters to measure voltages, scopes to see waveforms and most important of all, we use our ears to hear." We were struck by the fact that the last sentence of this statement corresponds almost exactly with the philosophy employed by *High Performance Review*. For our listening tests, we elected to couple our CD player to the Rotel RB-980BX via the company's matching control amplifier, Model RC-980BX. While we did not bench-test this control amplifier, we were quite impressed by the combination's wide dynamic and frequency range as well as by the affordable price of this component pair. (The control unit

has a suggested price of only \$499.90, so that one could assemble the amplifier and the control unit for under \$1,100.00.)

First Listening

To maintain as close to a "straight wire" signal path as possible, my first listening tests employed my reference CD player (Sony Model CDP-650ESD), the aforementioned Rotel control unit (which is, happily, devoid of any tone controls), the Rotel RB-980BX stereo power amplifier (the subject of this report) and my reference KEF 105-II speaker systems. I first played a recently acquired Telarc CD of Gilbert & Sullivan's *The Mikado* (Telarc CD-80284). The performance is by the orchestra and chorus of the Welsh National Opera under the direction of Sir Charles Mackerras. Hearing these familiar tunes "come alive" via this well-designed component combination was truly a revelation. Voices were clean and crisp, with not the slightest bit of raspiness or screeching — characteristics I had heard when playing the same disc through a more "basic" portable CD player when I first acquired this disc.

I also played bits and pieces of an unusual disc issued under the Elektra/Nonesuch label of Warner Communications (979165-2). Entitled *Le Mystere des voix Bulgares*, this disc features the Bulgarian State Radio and Television Female Vocal Choir. The Bulgarian folk music, by its very nature, would have tended to be somewhat irritating to Western ears if it were reproduced with anything but distortion-free, high-frequency content. Frankly, when I first heard this disc played on a lesser component system I was repelled by it. Listening to the glistening voice of the female chorus as reproduced by this Rotel amplifier and control unit completely altered my perception of

the disc and its contents. It took on subtle vocal shadings that had previously been lost to me. And I was able to listen for the music and not for the technical imperfections of the recording or the equipment.

Control Layout

The front panel of the RB-980BX is equipped with only a single push-button control — the power on/off button. To its right are three indicator lights. The uppermost of these illuminates when power is applied. The middle light, designated as the protection indicator, illuminates briefly when power is first applied and remains lit in the event that abnormally high temperatures are built up inside the unit. The lowest indicator light illuminates when using the amplifier in its bridged (mono) mode.

The rear panel of the amplifier is equipped with two pairs of color-coded 5-way speaker binding posts. When using the amplifier in the bridged mode, a single speaker is connected between the terminals marked with a "+" symbol. Unbal-

anced phono-type input jacks are centered along the upper edge of the rear panel, and nearby is a slide switch that selects stereo (normal) or bridged (mono) operation. Nearby is a line fuseholder containing an 8 ampere line fuse.

On the Test Bench

Only a limited number of bench measurements are needed to evaluate the performance of a power amplifier and to verify the specifications claimed by its manufacturer. Figure 1 shows how frequency response varied over the range from 10 Hz to 100,000 Hz. At the lowest frequency of our sweep, response was down about 0.35 dB while at 100 kHz it was down only 2.7 dB as against 3.0 dB claimed by Rotel.

Figure 2 shows how harmonic distortion plus noise varied with test frequencies, while input level was carefully regulated to maintain constant rated output (120 watts/channel, both channels driven into 8-ohm loads). THD plus noise remained well below the rated 0.03% over most of the audio frequency range tested.



The Rotel RB-980BX power amp (below) coupled with the RC-980BX control amp

only approaching the rated THD plus noise figure at the two frequency extremes.

Looking at the power output capability of this amplifier in a slightly different manner, we next ran a sweep of power output versus audio frequencies in which the regulated variable was the distortion plus noise, set to the rated 0.03%. Results are shown in Fig. 3, and over much of the center frequency range we can see that the amplifier was able to produce considerably more than its conservatively rated 120 watts per channel. For example, at 1 kHz, output reached a level of 127 watts per channel before the 0.03% distortion plus noise level was attained.

Using still another approach, in Fig. 4 we plotted harmonic distortion plus noise versus power output for three key frequencies: 1 kHz, 20 Hz and 20 kHz. Results of these three plots are shown in Fig. 4. Even for the worst-case condition (20 kHz), distortion plus noise remained well below the rated 0.03% until the amplifier was driven into clipping. The three previously cited graphs all combine residual distortion with residual noise. In order to isolate the actual harmonic distortion components from any residual noise, we next employed the Fast Fourier Transform spectrum analysis capabilities of our Audio Precision test equipment to plot the actual harmonic components of a 1 kHz signal used to drive the amplifier to its rated output. The 1 kHz signal is filtered out and, by acquiring the FFT results 16 times, random noise is effectively removed from the picture as well, leaving only the actual harmonic components visible in Fig. 5. In this graph we note that while there is some 2nd order harmonic distortion as well as higher order harmonics, the major contribution to the overall THD figure is the 3rd harmonic component, which measured some -82 dB below rated out-

put. Translating that to a THD percentage yields an approximate number of 0.008%, or even lower than the results obtained using the graph of Fig. 2.

Intermodulation distortion is considered by most experts to be far more audibly offensive than "simple" harmonic distortion. Accordingly, we measured the SMPTE-IM distortion level of this amplifier as a function of equivalent power output, using the usual combination of 60 Hz and 7000 Hz in a 4:1 ratio. Results, again using 8-ohm loads, are shown in Fig. 6. IM distortion remained well below the rated 0.03% claimed by Rotel until overload and clipping was reached. A single reading of overall SMPTE IM distortion at rated output of 120 watts/channel yielded a reading of 0.028%.

Rotel claims an A-weighted signal-to-noise ratio for this amplifier of 120 dB. We suspect that they are referencing this S/N figure to the rated output, which is not quite the way the accepted EIA standard for amplifier measurements recommends. In the case of a power amplifier that is not equipped with an input level control, there is no great problem converting our S/N reading to the reference used by the manufacturer. The EIA standard calls for a reference level of only 1 watt output. Under those conditions, the A-weighted signal-to-noise ratio measured 96.5 dB. However, 120 watts (the rated output

of the amplifier) represents a reference level that is 20.8 dB higher than our 1 watt reference level. Adding 20.8 dB to our reading of 96.5 dB, we therefore come up with a signal-to-noise ratio of 117.3 dB — a bit short of the 120 dB claimed by Rotel, but still an outstandingly low noise level for an amplifier of this type.

A spectrum analysis of the residual noise, plotted against frequency using a 1/3 octave filter and again, referring to a 1-watt reference level is shown in Fig. 7. Note that the primary source of even this low level residual noise is not from any random noise, but rather from the

Fig. 1: Frequency Response at 1W Output

Fig. 2: THD+N v. Frequency

Fig. 3: Power Levels v. Frequency

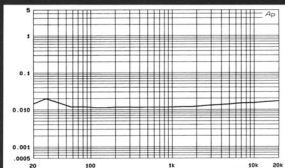
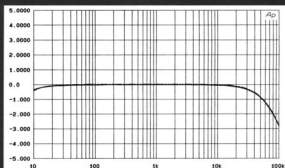
Fig. 4: THD+N v. Power Output

Fig. 5: Harmonics of 1kHz Signal

Fig. 6: SMPTE-IM distortion v. Power Output

Fig. 7: Spectrum Analysis

Fig. 8: THD+N v. Frequency in Bridged (Mono) Mode



power line frequency (60 Hz) and its harmonics (120 Hz and 180 Hz).

Other specifications confirmed during our bench testing of the amplifier included confirmation of its very high damping factor (and therefore, low internal impedance) and its extremely high short-term current capacity. Our test setup would not permit full confirmation of a 1000 damping factor, simply because even a few inches of heavy gauge wire between the amp and our loads would introduce enough series resistance to upset such a high reading. Still, the fact that we obtained a reading in excess of 600 suggests

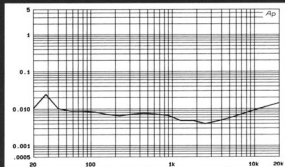
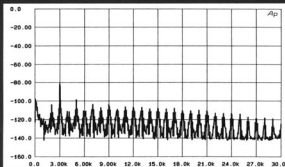
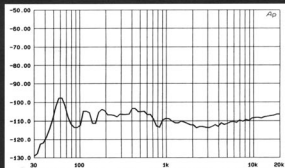
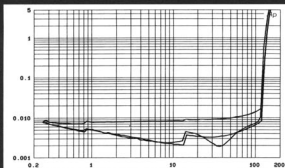
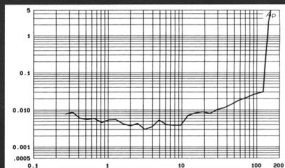
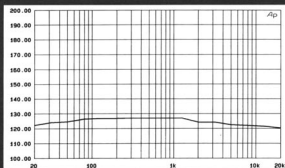
that Rotel is probably correct in publishing a damping factor of 1000. We simply wonder how they measure it! As for the high current capacity, this was confirmed in the stereo mode by reducing the load impedance to 2 ohms, while driving the amplifier to high power level with no ill effects.

Before returning to more serious and final listening tests, we decided to check out one more specification claimed by Rotel — the power output capability of the RB-980BX amplifier when it is operated in the “bridged” or mono mode. Making the appropriate changes in our load con-

nections, we ran another plot of harmonic distortion plus noise versus frequency while carefully regulating the input level to maintain a constant power output of 360 watts into an 8 ohm load. Results are shown in Fig. 8 and once again, THD plus noise was considerably lower than the 0.03% specified by Rotel in its published specifications.

Additional Listening Tests

Telarc recently issued a second volume CD (CD-89102) featuring 17 selections from previous recordings — sort of a compendium of the best sounding recordings made by that



company. Selections come from the worlds of classical, pop and jazz, affording a critical listener the opportunity to sample a wide variety of orchestral and vocal material. It took only a few selections from this disc to convince us that our measurements were fully consistent with what our ears heard. For example, the Robert Shaw Festival Singers in an excerpt from Rachmaninoff's "Vespers" exhibited a breadth of stereo imaging and a clarity of vocal sound that is rarely heard these days. For a more intimate live sound, we played a cut of Bobby Short singing "Tea For Two" in what was obviously a live club environment in which audience applause and ambience was as realistic as anything of that sort I'd heard reproduced electronically.

We know that the recorded sounds of brass instruments easily betray even minor defects in audio equipment and so, we were pleased to find that the trumpet sounds of Rolf Smedvig, playing the Allegro from



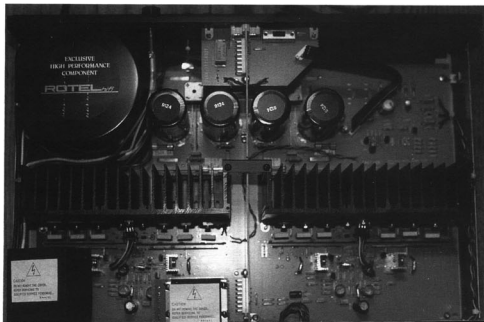
The power amp (above) has a bridged mono input for use with a second power amp, each driving 360 watts into an 8-ohm load at 0.05% THD

Bellini's Concerto in E-flat were fully reminiscent of many a live trumpet solo performance I have heard without the benefit of electronic amplification or augmentation. The piano, too, brings out the worst (or the best) in an audio system, and in the case of the Rotel RB-980BX, John O'Connor's rendition of the Presto movement from Beethoven's Sonata No. 6 in F sounded as if the piano

and O'Connor were in the listening room with me. There was none of the veiled sound sometimes associated with piano music reproduced by electronic means.

Rotel has definitely found its direction after some earlier years of drifting in the American marketplace. Readers would do well to audition this amplifier as well as the other components in Rotel's 1992 "900 Series." All the items in this new line are very affordably priced and we suspect that Rotel of America (distributed by the same folks who handle the prestigious B&W speaker systems) will finally capture a significant share of the audio component market in the months and years ahead.

Mirror-image circuitry inside the RB-980BX features star earth grounding



Associated Equipment

Sony CDP-650ESD CD Player.
Rotel RC-980BX Control Amplifier.
KEF 105 Mk. II Loudspeakers.

Test Equipment

Audio Precision System One, Dual Domain (DSP) Test System.
Northgate 386/33 MHz Computer.
Hewlett-Packard HP-IIP Laser Printer (for graphs).
Pacific Data: Plotter-In-A-Cartridge.
Hameg: HM-204-2 20 MHz Dual Trace Oscilloscope. □