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PRODUCTS REVIEWED

# SET-300B

*Reviewed by Charles Hansen*

***Sonic Frontiers is that remarkable Canadian firm with feet planted in both the high end and kit building worlds. Here we review their 300B SE 8W/channel amplifier.***


PHOTO 1: Amplifier front view.

*Sonic Frontiers International, 2790 Brighton Road, Oakville, Ontario, Canada L6H 5T4; www.sonicfrontiers.com. Kit $799 US, assembled $999 US. Signature Parts upgrade $299 US; you supply two 300Bs. Dimensions: 17″ W × 8.5″ H × 13.5″ D; net weight: 23kg, 50 lbs. Limited two-year warranty.*

The Assemblage SET-300B is an 8W RMS per channel single-ended triode (SET) stereo power amplifier. *Photo 1* shows the front panel, with its push-button power switch and cool-blue power-on LED.

## CONSTRUCTION

The amplifier is extremely rugged, constructed of heavy-gauge sheet steel, with a ¼″ aluminum front bezel. While the SET-300B was furnished to me factory-assembled, its 27-page kit assembly and operation manual is extremely well written, with lots of photos to guide you through the kit-building process.

The rear panel (*Photo 2*) has the IEC power receptacle, high-quality Teflon™-insulated RCA input jacks, an input mute switch, and two pairs of high-quality gold-plated five-way speaker binding posts on standard 0.75″ spacings. With only two binding posts per channel, you need to prewire the output for 4, 8, or 16Ω. The third pin of the AC receptacle is connected to the chassis. You can add an input level control or switched attenuator of your choice in a knock-out provided between the left input jack and the left speaker connectors.

PHOTO 2: Amplifier rear view.

You can also operate the SET-300B as a 16W monoblock. This requires a permanent change to the internal wiring. You connect the two inputs in parallel and install one of the input jacks, and connect the output transformer windings in series, each wired for half the desired output impedance. Only the R-channel output is grounded, with the L-channel output totem-poled in series.

The circuitry is constructed on five double-sided epoxy PC boards, with plated-through holes and solder mask. Below the prominent power-supply choke are mounted the large main circuit board, the main power-supply filter board, and the left- and right-channel power-supply filter boards. A long rod serves as the power-switch extension that connects to the AC switch on the PC board.

The top of the chassis has cooling slots located between tube sockets to promote convective cooling air flow. The bottom is also vented with slots.

The unit is furnished with a heavy power cord. You can connect the power transformer primary for 120V, 200V, 220V, or 240V mains. A line fuse is located in a drawer in the IEC power receptacle.

The review sample arrived wired for stereo operation with 8Ω speakers. Based on the capacitor types on the main PC board, it appeared that the test unit had the optional Signature component upgrade. A 50k Alps Black Beauty volume control was also installed.

## TUBE-POLOGY

Each input stage is composed of half a 6SN7 dual triode, with the input signal direct-coupled to the grid. When you activate the mute switch, the inputs are shorted to ground. The plate of the 6SN7 is direct-coupled to the grid of one section of a 6BX7 dual triode, which is, in turn, direct-coupled to

the grid of the second 6BX7 section. Each 6BX7 cathode is positive-clamped to the preceding stage plate by a high-voltage SF4007 diode. The third 6BX7 stage is a cathode follower that is capacitively coupled to the grid of a 300B output tube.

Four parallel filament/cathode resistors set output-tube fixed bias. Global feedback is not used in this amplifier. Local feedback is provided at each stage by capacitor-bypassed cathode resistors.

The high-voltage power-supply winding is full-wave rectified by a pair of dual GZ-37/CV378/5AR4/5U4G rectifier tubes. The plates of each individual rectifier tube are connected in parallel and drive a capacitor-input choke filter. The 300B output-tube plate supply is a well-filtered +445V DC. The plate supplies for the 6SN7 and the two stages of 6BX7 are divided down to +327 and +420V DC, respectively.

The heater for the 6SN7 is supplied with rectified and filtered DC from a dedicated winding. The two 6BX7 heaters are connected to a single 6V3 AC winding which also operates the power-on LED. Each 300B has its own dedicated rectified and filtered DC filament winding with a hum-control pot.

The Parts Connection supplied the following tube complement with the SET-300B:

- A Sovtek 6SN7GT, matched with two G.E. NOS 6BX7GTs marked left and right.
- Two Valve Electronics CV378KBs
- Two Valve Art 300B-C60s

(300Bs are not normally supplied with the SET-300B amplifier since many listeners have a preference for a specific manufacturer's tubes.)

## MEASUREMENTS

The unit arrived with the left-half of the 6SN7 inoperative, and The Parts Connection supplied a replacement matched set of the 6SN7 and two 6BX7s.

I operated the SET-300B at 2W into 8Ω for one hour. Since the distortion was slightly higher in the left channel, I present this test data here and summarize it in *Table 1*. There was absolutely no hum, hiss, or other noise with my ear against the speaker. There was also no noise during powerup or shutdown.

The SET-300B does not invert polarity. Input impedance was 46k for both channels at the minimum level control setting, and 31k at maximum level. (It would have been the specified 100k without the optional level control installed.) The input sensitivity at full volume for 2.83V RMS into 8Ω was 24.7dB. The level control tracked very well. The maximum

TABLE 1: MEASURED PERFORMANCE

| PARAMETER | MANUFACTURER'S RATING | MEASURED RESULTS |
|---|---|---|
| Power output (RMS) | 8W, 4, 8, or 16Ω stereo<br>16W, 8 or 16Ω mono | 8.45W into 8Ω<br>Not tested |
| Frequency response, 8W, 4Ω | 20Hz–0.7dB,<br>20kHz–0.9dB | 20Hz–0.5dB,<br>20kHz–0.8dB |
| Total harmonic distortion | Typically <3% at 8W,<br>20–20kHz, both channels driven | 3% at 7.41W,<br>1kHz, both channels driven |
| | Typically <0.9%, 1kHz, 1W | 0.68%, 1kHz, 1W |
| IMD-CCIF (19 + 20kHz) | N/S | 0.95% CCIF (see text) |
| MIM (9 + 10.05 + 20kHz) | | 0.32% MIM |
| Input sensitivity | 0.55V RMS for 8W | 0.47V RMS for 8W 8Ω |
| Input impedance | 100kΩ (mute, 0Ω) | 31k–46k (see text) |
| Hum and noise | –89dB, rated power, IHF-A | |
| Gain (voltage) | 23dB (Av = 14) | 24.7dB |
| Power requirements | 200VA maximum | |
| Output impedance | N/S | 3.5Ω 20Hz, 8Ω<br>3.57Ω 1kHz, 8Ω<br>3.8Ω 20kHz, 8Ω |
| Crosstalk, 100Hz (L-R)<br>1kHz<br>10kHz<br>20kHz | N/S | –41dB<br>–49dB<br>–30dB<br>–27dB |

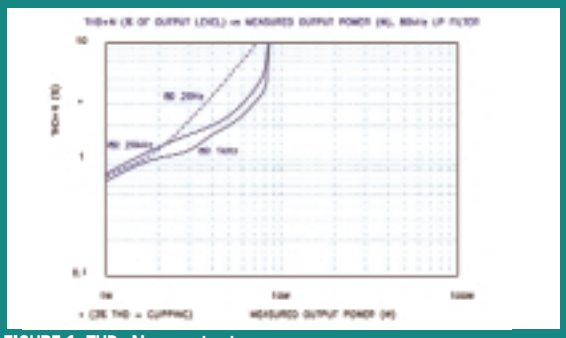

FIGURE 1: THD+N vs. output power.

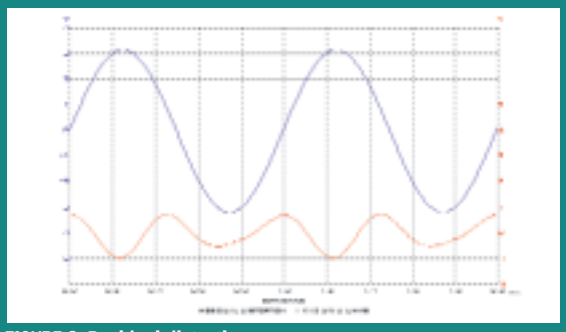

FIGURE 2: Residual distortion.

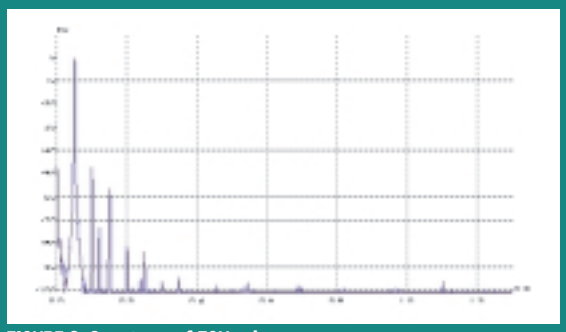

FIGURE 3: Spectrum of 50Hz sine wave.

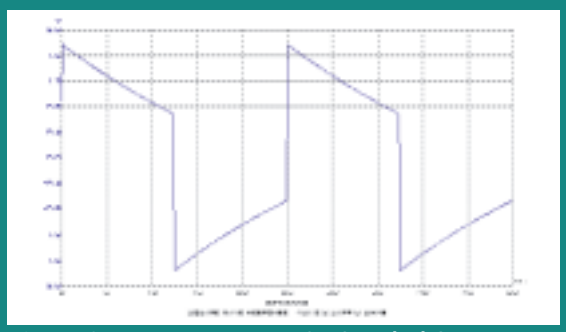

FIGURE 4: Square-wave response, 40Hz 2.5V pk-pk 8Ω.

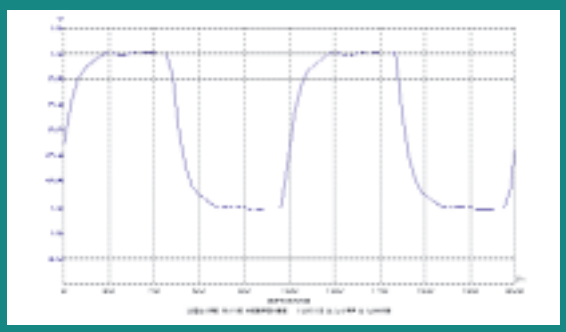

FIGURE 5: Square-wave response, 10kHz 2.5V pk-pk 8Ω.

deviation was at 12 o'clock, where the right channel was 0.5dB higher.

The frequency response for the SET-300B was within ±3dB from 7Hz to 32.7kHz at an output of 2.83V RMS (1W) at 1kHz into 8Ω. When I connected a load of 8Ω paralleled with a 2µF cap, the amplifier was totally behaved, with no evidence of any instability. There was no sign of any high-frequency peaking.

Without global feedback, the output impedance is a high 3R5 to 3R8Ω. The SET-300B's frequency response in an audio system will be very sensitive to speaker impedance variations.

THD+N versus frequency with 1W into an 8Ω load was 0.72% at 20Hz, 0.68% at 1kHz, and 0.74% at 20kHz. Distortion with 2µ2 in parallel with 8Ω reduced the 20kHz distortion to 0.54%.

The clipping level is normally defined as that power where THD+N reaches 1%. However, the baseline distortion in tube amplifiers is fairly high at low power levels, so the generally accepted practice is to use 3% THD+N as the clipping point.

*Figure 1* shows THD+N versus output power into 8Ω at 20Hz, 1kHz, and 20kHz. Since the 4Ω and 16Ω taps were not available, I limited my measurements to the 8Ω load. The clipping level was 7.4W with an AC line voltage of 118V AC.

While I could hear the test signals emanating from the output tubes and transformer, there was absolutely no strain right up to and slightly beyond the 8W maximum power. The amplifier never really hits brick-wall clipping. The clipping was gradual and softly rounded, typically tube-like in its character, with the positive peaks clipping first. After these tests, the power transformer was quite hot, while the output transformers were barely warm.

The distortion waveform for 2W into 8Ω at 1kHz is shown in *Fig. 2*. The upper waveform is the amplifier output signal, and the lower waveform is the monitor output (after the THD test-set notch filter), not to scale. This distortion residual signal shows mainly the second and third harmonics, with no evidence of any noise or fuzz.

The CCIF 19kHz+20kHz intermodulation distortion was fairly high. At 12V pk-pk amplifier output, my standard test level, the amplifier generated a 1kHz intermodulation product that drove the IMD meter bandpass filter into clipping. I reduced the test signal so the output was just below clipping at 11V pk-pk, and the IMD was 0.95%. I further reduced the test signal so the amplifier output was only 6V pk-pk, which produced a CCIF IMD output of 0.45%.

The amplifier performed better with the MIM 9kHz + 10.05kHz + 20kHz test signal. Here the IMD at 12V pk-pk amplifier output was 0.32%.

The spectrum of a 50Hz sine wave at 2W into 8Ω is shown in *Fig. 3*, from zero to 1.3kHz. The THD+N measured 0.47%, and the predominant harmonics are the second and third, at –48dB and –56dB. All subsequent harmonics were below –80dB. You can also see a –73dB artifact of the power-supply rectification at 120Hz.

The 40Hz 2.5V pk-pk square wave showed considerable tilt *(Fig. 4)*. The 1kHz square wave (not shown) was almost perfect. The square-wave response at 10kHz (*Fig. 5*) was both rounded and had some damped ringing. This did not change when 2µF was added in parallel with the 8Ω load.

## CONCLUSION

While these measurements may seem only just acceptable, they are fairly typical of low-power single-ended triode amplifiers. Fans of this topology will undoubtedly continue to enjoy their SET listening. ❖

## CRITIQUE

Reviewed by Nancy and Duncan MacArthur

When the letter from Ed Dell asking us to review tube equipment for *Glass Audio* arrived, I panicked. "We can't," I told Duncan. "We're so busy. I haven't finished other articles for *Speaker Builder*."

"Amplifiers," said Duncan with a maniacal gleam in his eye. "Preamps. CD players. Speakers."

We agreed to do the reviews.

### FIRST EXPERIENCE

Operationally, the SET-300B is very easy to use. The review amplifier never produced any pops or thumps on start-up or shutdown. The SET-300B is so quiet, both mechanically and through the speakers, that discerning whether the amplifier was on was sometimes difficult. Although the smaller tubes glow during operation, the light from the 300Bs is hardly visible.

Early in the review process this characteristic resulted in a frantic phone call to Duncan. "I killed the big tubes," I told him. "I'm not sure what I did, but they aren't glowing." "Put your hand near them," said Duncan. "If they're still working, you'll feel the heat." He was right: the 300Bs produce little light but intense heat.

### THE WEREWOLF AMPLIFIER

We did our auditioning using Genesis 400 speaker systems. These three-way floor-standing systems (not biamplified) are rated at 89dB/W efficiency but are 4Ω designs with a fairly difficult impedance curve.

The SET-300B requires a long break-in period. We listened to it casually for about 200 hours before sitting down for serious listening. During the first 50 hours the sound was mediocre, although it provided a few hints of better sound to come. Most sound improvement took place during the first 150 hours.

Partway through the listening process, we started calling the SET-300B "the werewolf amplifier." Under different circumstances its behavior changes drastically, and its true personality only emerges at night.

As supplied by Assemblage, the SET-300B was strapped for 8Ω output impedance. Imaging and localization of instruments were very good in this configuration, and reproduction of ambient detail was excellent. But the midrange was mushy, and the bass was present but underdamped and anemic. The 8Ω Assemblages just couldn't supply enough power to drive our 4Ω speakers effectively.

Changing the output transformers to 4Ω strapping made a significant difference. The good imaging, localization, and ambiance were still present; the bass was a bit better; and the midrange sounded more alive. Percussion was not realistic; although the sound wasn't obnoxious, it lacked the crispness of real cymbals or the depth of drums.

Listening to the SET-300B in this configuration during the daytime was enjoyable, but it still suffered from an inadequate dynamic range. The volume range between clear definition and clipping is small. If overdriven, the amplifiers sound closed-in and lose much of the realism and localization that characterize lower-level listening.

We each noticed a dramatic difference when listening to this amplifier in the evening, almost as if we'd switched to a larger amplifier. All the good features remained and both dynamic range and midrange clarity were much improved. (Percussion remained a problem.)

As an 8W/channel amplifier, the SET-300B still cannot cope with earsplitting levels, but the range between clear definition and clipping is much larger.

All system components including the SET-300B are plugged into a Monster Cable HTS-2000 power-line filter; no other amplifier we have used has exhibited this extreme day/night dichotomy. (The "sonic characteristics" charts were generated at night.)

### FINAL THOUGHTS

NM: The Assemblage SET-300B is not suitable for owners of inefficient speakers, although it performed surprisingly well with ours. It is also not for percussion fans. For people with efficient speakers who listen at night or live in an area with clean daytime electrical power, it may be a bargain. Check it out.
DM: If you listen mainly to vocal and chamber music and are willing to listen at night, the Assemblage SET-300B is well worth a listen (remember the long break-in period). The imaging was outstanding at low or moderate volumes. But if your tastes include loud or deep music, the SET-300B will require efficient speakers.

SONIC CHARACTERISTICS RATINGS
Assemblage SET-300B

| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Presence | DM | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ■ | ❑ | ❑ | ❑ |
| | NM | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ■ | ❑ | ❑ | ❑ | ❑ |
| Stereophonic Effect | DM | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ■ | ❑ | ❑ | ❑ |
| | NM | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ■ | ❑ | ❑ | ❑ |
| Soundstaging | DM | ❑ | ❑ | ❑ | ❑ | ❑ | ■ | ❑ | ❑ | ❑ | ❑ | ❑ |
| | NM | ❑ | ❑ | ❑ | ❑ | ❑ | ■ | ❑ | ❑ | ❑ | ❑ | ❑ |
| Ambiance | DM | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ■ | ❑ | ❑ | ❑ | ❑ |
| | NM | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ■ | ❑ | ❑ | ❑ | ❑ |