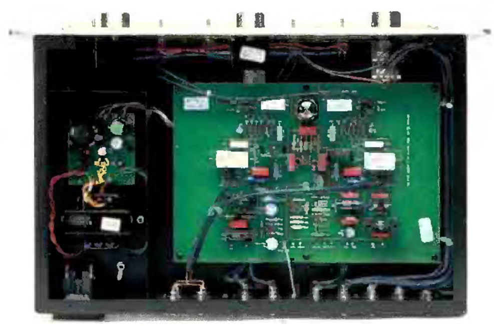
SONIC FRONTIERS SFL-1 LINE PREAMP AND SFS-40 AMP

The first time I saw a Sonic Frontiers product, about four years ago, I was impressed by the brushed stainless-steel finish of its chassis and the fact that yet another company was starting to make tube amplifiers. Since then, I've watched their product line expand from that first amp to include an absolutely first-rate switched attenuator and other high-quality parts, and a variety of tube amps and preamps. (A forthcoming Sonic Frontiers D/A converter looks really interesting, too.)

The SFS-40 is currently the smallest power amp in their line, and the SFL-1 is their first preamplifier. Starting with the SFL-1 preamp, the front panel is an unusual design that uses a gold-colored trim panel partially covering the stainless steel main panel, which creates a rather striking look. Three rotary knobs handle input selection, balance, and volume control. Below these knobs are toggle switches for "Direct/Normal" input selection, the tape monitor, "Mono/Stereo," and muting. A fifth toggle switch, below and to the right of the volume control, is for power "On/Off." On the rear panel are an IEC a.c. power cord socket and fuseholder and the signal input/output connectors. There is no ground post.

Chassis construction of the SFL-1 is rather simple, consisting of a single bent-

up piece of steel that forms bottom, sides, rear, and front subpanel. Another piece of steel is used for the top cover. Internally, the majority of the space is taken up by a thick, double-sided p.c. board for the signal circuitry. About 20% of the internal volume is partitioned off by a steel shield for the power supply. Within it is the power transformer and a small p.c. board for rectifier bridges and filter capacitors. Another p.c. board is mounted to the rear panel to serve as mounting and ground interconnection of the chassis-mounted Tiffany input/output phono jacks. The main signal circuit board is populated with high-



quality parts, including three MIT Multicap film capacitors per channel; other capacitors are by Solen and Wima, and resistors are by Vishay and Holco. Wiring from input/output jacks is with Kimber cable. The selector switch is a high-quality unit by Elma, with gold-plated contacts. Balance and volume controls are laser-trimmed and are made by Alps. All in all, the SFL-1 is a solidly constructed preamplifier with excellent build quality.

The chassis of the SFS-40, in contrast to the SFL-1, is built of stainless steel and is bent up to form the completed shape. Inside corners are welded, and the outside surfaces are polished and grained. A separate plate of stainless is screwed to the bottom of the chassis. Like the SFL-1, the front of the amplifier has a gold-colored trim panel for visual contrast. A rocker-type power switch is located near the left edge of the front panel. In the middle of the panel is a 100-mA meter for indicating individual output-tube plate currents. A rotary switch for selecting the output tubes to meter is on the top surface of the amplifier, along with individual bias adjustments for each output tube. Two pairs of Edison Price Music Post speaker connectors are on the rear panel of the amp, along with a captive a.c. line cord, a.c. line fuse, and a pair of signal-input RCA jacks. The three transformers (two output, one power) and the output-tube sockets are mounted to the top surface of the unit. Underneath, a thick, double-sided p.c. board serves as mounting for the input-tube sockets and the rest of the components, including the main power-supply filter capacitors. As in the preamplifier, this p.c. board is populated with an abundance of high-quality parts.

SPECS

Preamplifier

Frequency Response: 5 Hz to 100 kHz, ±0.5 dB.

THD + Noise: 0.01%.

IM: 0.01%.

Gain: 20 dB.

Input Impedance: 40 kilohms; "Direct" inputs, 80 kilohms.

Channel Separation: 50 dB.

Power Requirements: 10 VA, maximum.

Dimensions: 19 in. W × 4½ in. H × 11 in. D (48.3 cm × 11.4 cm × 27.9 cm).

Weight: 22 lbs. (10 kg).

Price: $1,395.

Amplifier

Power (With 40-mA Bias, One Channel Driven): 45 watts rms per channel, 20 Hz to 20 kHz; 50 watts rms at 1 kHz.

Frequency Response: 5 Hz to 40 kHz, ±0.5 dB; at 1 watt into 8 ohms, 4 Hz to 90 kHz, ±3 dB.

Input Impedance: 100 kilohms.

Input Sensitivity: 0.8 V rms at 1 kHz for 40 watts out.

Power Requirements: 250 VA, maximum.

Dimensions: 16 in. W × 7 in. H × 12½ in. D (40.6 cm × 17.8 cm × 31.8 cm).

Weight: 36 lbs. (16.5 kg).

Price: $1,695; tube cage, $100.

Company Address: 760 Pacific Rd., Unit 19, Oakville, Ont., Canada L6L 6M5.

For literature, circle No. 92

Circuit Description

Four line-level inputs ("CD," "Tuner," "AUX 1," and "AUX 2") pass through the SFL-1 preamp's rotary input selector, tape-monitor switch, and balance control (and branch off to the tape output jacks) to the "Normal" position of the "Direct/Normal" switch. The fifth, "Direct," input goes directly to this switch, bypassing the tape and balance circuitry. The switch's output goes into the volume control, the output of which drives the input of the line-amplifier circuit.

THE SFL-1'S LINE AMP IS AN INTERESTING CIRCUIT USING A J-FET, A VACUUM TUBE, AND A MOS-FET IN EACH CHANNEL.

The circuit of the line amplifier is interesting both in its topology and in its use of a J-FET, a vacuum tube, and a MOS-FET in each channel. Signal input is applied through a film coupling capacitor to the gate of a P-channel J-FET connected as a source follower with its drain terminal grounded. The source of this input FET is connected through a small resistor up to the cathode of the triode tube. Plate output of the tube is direct-coupled into the gate of the output N-channel MOS-FET connected as a source follower. A novel negative-feedback loop, which consists of a three-resistor voltage divider, connects the output of the source follower back to the tube's grid. The first tap on the divider is connected to the grid through a high-value resistor and establishes the tube's d.c. grid voltage. The second tap down on the divider is connected to the control grid through a film capacitor and sets the amount of a.c. feedback. Overall d.c. operating point of the output is set by the gate voltage on the input J-FET, which is provided by a voltage divider fed from the operating B-plus supply to the line amp.

Power-supply circuitry for the SFL-1 starts out with three full-wave-rectified, capacitor-input raw supplies fed from three secondary windings on the power transformer. The lowest voltage of these supplies is regulated down from about 12 V to 6.3 V d.c. for the tube heater by a three-terminal regulator. The second of the three unregulated supplies develops about +340 V and is Darlington Zener followed down to a lower voltage and further regulated down to +270 V by an LM317 adjustable three-terminal regulator. The third unregulated supply develops a regulated 15 V, the positive terminal of which is tied through a small resistor to the regulated +270 V. The negative terminal of this third supply is then sitting at +255 V. Further regulation takes place for each signal channel by an interesting scheme: A pair of op-amps is powered by the difference between the 270- and 255-V power-supply rails. A voltage divider between the 270- and 255-V rails sets up a midpoint voltage of 262.5 V that is applied to the positive input of these op-amps. Then, NPN emitter followers, connected at the output of these op-amps, supply the actual current to the line amplifiers. The emitters of the emitter followers are tied back to the negative inputs of the op-amps, thus making the output voltage to the line amps essentially that of the midpoint divider or +262.5 V. Film bypass capacitors are used liberally throughout the power-supply circuitry. Wow! This is regulation taken to a high point! (I wonder what the SFL-1 would sound like with an all-tube, high-voltage regulator instead of all that solid-state regulator stuff that is really in the signal path of the line amplifiers.)

The unregulated +12 V heater supply and an NE555 timer work with the muting relay to provide a turn-on delay. (For manual muting, the front-panel "Mute" switch opens the connection from the timer chip to the relay coil.) Contacts in the muting relay short the signal feed to the main output jacks. The switchover from warm-up to full operation is also shown by a color change in the front-panel pilot indicator, which consists of two LEDs fed by a three-transistor circuit.

Table I—Gain and sensitivity, SFL-1 preamp.

	Gain, dB			
	LEFT		RIGHT	
	Instr. Load	IHF Load	Instr. Load	IHF Load
"Normal" or "Direct" to Main Out	21.12	20.7	21.11	20.68
"Normal" to Tape Out	0	0	0	0
	IHF Sensitivity, mV			
	LEFT		RIGHT	
"Normal" or "Direct" to Main Out	46.11		46.2	
"Normal" to Tape Out	500.0		500.0	

Table II—Output noise of SFL-1 preamplifier for full clockwise and counterclockwise positions of volume control. IHF S/N was 80.0 dB for the left channel and 77.6 dB for the right.

	Output Noise, μV			
	LEFT		RIGHT	
Bandwidth	CCW	CW	CCW	CW
Wideband	76.0	276.0	70.0	392.0
22 Hz to 22 kHz	34.0	152.0	38.0	214.0
400 Hz to 22 kHz	26.9	55.0	30.0	74.0
A-Weighted	23.0	52.5	26.5	70.0

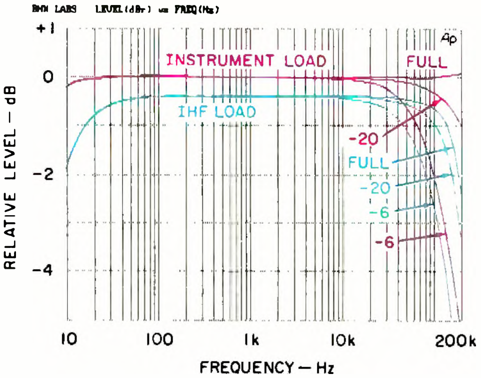


Fig. 1—Frequency response of SFL-1 preamp vs. volume setting and load.

Signal circuitry in the SFS-40 amplifier is also a bit out of the ordinary in a number of respects. The front-end of the amplifier is a cascoded differential amplifier using two 6DJ8 tubes. Cathodes of the lower tube pair are tied together, with no feedback resistors, and go to ground through an NPN bipolar-transistor current source. The plates of the lower input-tube pair are direct-coupled to the cathodes of the upper pair through small bias resistors. These plates are also coupled, through high-value resistors, to the grids of the upper tubes, the upper grids being bypassed with film capacitors to ground. The foregoing constitutes a self-biasing arrangement for the upper tubes. More usual is a fixed voltage divider to set the potential at the upper tube grids.

Push-pull outputs of the upper tube plates are capacitor-coupled to the output-tube grids. Another interesting twist is a set of summing resistors from the upper tube plates that feed down to the base of the constant-current transistor that feeds the lower tube cathodes. This is a feedback loop that would tend to remove common-mode signals at the two output plates and stabilize the operating point.

The output stage is pentode-operated with fixed bias, as are a number of new tube power amplifier designs of late. Pentode operation means that the output-tube screen grids are operated from a fixed potential, as opposed to being tied to a tap on the primary winding of the output transformer (as in UltraLinear operation). Usual consequences of the pentode-mode output-stage configuration are higher power output, higher output impedance, higher stage gain, and higher distortion than UltraLinear or triode operation. Cathode current is sampled for the meter circuit via 5.1-ohm resistors from the cathodes to ground. Overall negative feedback is taken from the positive output terminal back to the inverting input of the input differential amplifier. This design doesn't have separate connections brought out for 4-, 8-, and 16-ohm matching as is usual in most tube power amplifiers. Instead, the output transformer secondary can be strapped for 3.5-, 8.0-, or 14.5-ohm impedance matching. The reviewed amp was set up for the 3.5-ohm connection.

The power supply in this amplifier is fairly elaborate, as in the preamplifier. Starting with the simple stuff, a heater winding supplies 6.3 V a.c. to all the tube heaters. The center tap of the winding goes to ground through a 0.1-μF film capacitor. This method of grounding the heater supply lets the heater windings float up toward whatever tube that has the leakiest heater-to-cathode interface.

A main high-voltage winding has a tap for the output-tube bias supply and another set of taps for the main output-tube screen supply. The outside ends of the winding provide the highest voltage for the output-stage plate supply and are full-wave-rectified into two 1,700-μF/300-V electrolytic filter capacitors connected in series for an effective filter capacitance of 850 μF/600 V. Additional film bypass capacitors, of 5.1 μF and 0.1 μF, are connected from the supply rail to ground. This supply, of course, is connected to the center tap of the two output-transformer primary windings. The screen taps of the main high-voltage secondary windings are full-wave-rectified into a 10-μF/450-V capacitor. A series filter resistor and a final 10-μF capacitor feed the filtered voltage to the screen regulator's series pass-transistor collector.

Another regulator circuit, similar to that used in the SFL-1 to supply regulated voltage to the output amplifier signal circuitry, is used here in the amplifier to supply regulated voltage to the front-end/phase-inverter circuit. A voltage divider, from the output of this regulator to ground, supplies a reference voltage to the screen-regulator circuit, which will provide this same voltage (+320 V) at considerable current capacity to the output-stage screen grids.

A third secondary winding on the power transformer is half-wave rectified into appropriate amounts of voltage for an op-amp error amplifier. The aforementioned screen reference voltage of 320 V is applied to the floating "ground point" of the screen regulator op-amp circuitry and, through a series resistor and shunt capacitor to ground, to the positive input of the error op-amp. The output of the op-amp goes through an emitter-follower NPN bipolar transistor and into the base of the series pass NPN transistor that supplies the output-tube screens; 100% feedback is taken from the output back to the negative input of the error op-amp.

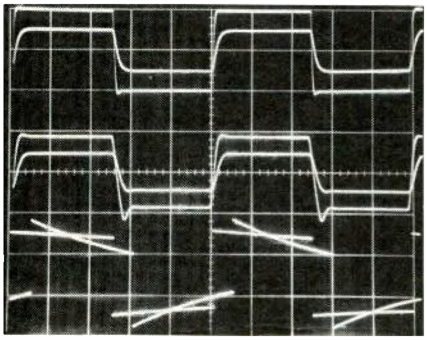


Fig. 2—Square-wave response of preamp; see text.

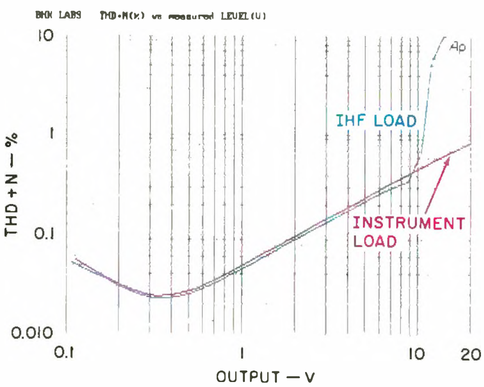


Fig. 3—THD + N at 1 kHz vs. output level.

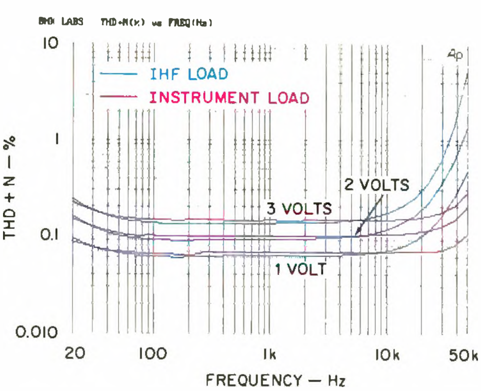


Fig. 4—THD + N vs. frequency and output level.

Measurements

I must be honest at the outset and report that I had a problem with the SFL-1. I blew the output MOS-FET transistors in both channels by connecting signal inputs to the unit with the volume turned on. Replacement devices got the preamp up and running with no further problems. Sonic Frontiers assured me that they have had very low failure rate in the field with customer units. I therefore chalk this situation up to bad lab practice on my part, although I haven't had this happen with other models.

Looking at measurements for the SFL-1 first, gain and IHF sensitivities are listed in Table I. Gains are the same in both the modes, because there are no series resistors in the signal chain with the "Stereo/Mono" switch in the stereo position and because the balance control is a "silvered" type. This kind of balance control has one-half of the track covered with high-conductivity material and the other half covered with the normal resistive material used for variable-resistance control functions. When one turns the control to the right, for instance, the right-channel wiper travels on the high-conductivity part of the path while the left-channel wiper travels down its regular resistance material; this attenuates the left channel but leaves the right channel with no attenuation through the control at all. Of course, this works similarly when turning the balance control to the left.

Frequency response under a number of conditions is plotted in Fig. 1 for the left channel. Results are shown for volume at full clockwise and at 6-dB attenuation and 20-dB attenuation, for instrument and IHF loads. The curves at the 0-dB level are for the instrument load, and the curves with about 0.4-dB attenuation are for the IHF load. The greatest high-frequency attenuation is for the –6 dB volume-control setting and the least for volume full up; the remaining curves are with the volume at –20 dB. The effect of the size of the output coupling capacitor on the 10-kilohm load is evident in the IHF loading curves as low-frequency roll-off. To put the high-frequency effects in perspective, even in the worst case, 6-dB attenuation, the bandwidth (–3 dB point) is still greater than 100 kHz, and the control will probably be used more in the vicinity of the –20 dB position, with greater high-frequency bandwidth. The right channel's behavior was similar but with a slightly higher bandwidth. Rise- and fall-time, with an instrument load at an output of ± 2 V, was about 0.7 µS with the volume control full up. Rise- and fall-time, of course, will be lengthened at the –6 dB position and with IHF loading.

CAPACITANCE HAS LITTLE EFFECT ON THE SFS-40'S RESPONSE, MAKING IT A GOOD CANDIDATE FOR DRIVING ELECTROSTATICS.

Figure 2 illustrates the SFL-1's square-wave behavior under various conditions. In the top traces, a 20-kHz frequency is shown for instrument loading with the volume control clockwise (largest signal) and with the volume down 6 dB. The effects of IHF loading are shown in the middle traces for the same volume-control positions as in the top traces. Some slewing is in evidence in the top traces and assuredly in the middle traces. My usual test amplitude for preamps, ± 5 V, was a bit much for this circuit; consequently, the 2-V peak level was used. In the bottom trace, the frequency is 20 Hz with instrument and IHF loads. The greater tilt is seen, of course, for the IHF loading.

In attempting to measure distortion and noise in this unit, I encountered a greater than normal intrusion of my computer monitor's horizontal scan frequency into the measurements. It seemed that it was coming in on the inputs, as the interference went away when the volume control was turned down. Later, when measuring noise, I found that even with the unused inputs terminated with 1-kilohm resistors, this noise was still getting in with the volume up. The noise was much less with the "Direct" input; I don't know why.

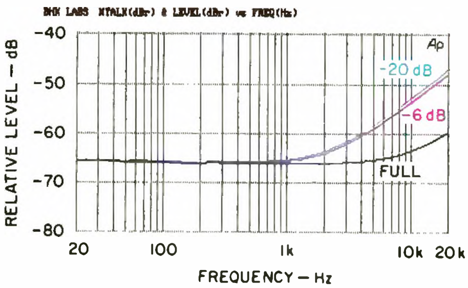


Fig. 5—Crosstalk vs. volume setting.

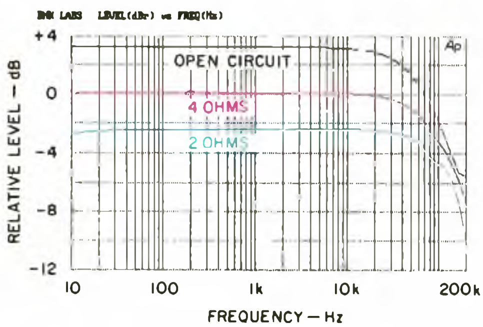


Fig. 6—Frequency response of SFS-40 amplifier.

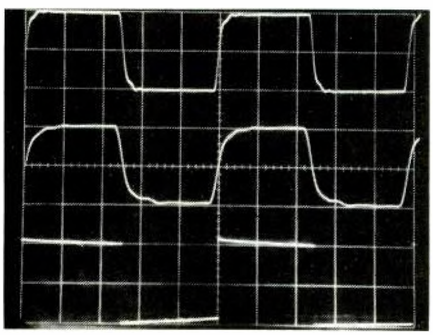


Fig. 7—Amplifier square-wave response; see text.

Table III—Output noise of SFS-40 amplifier. The A-weighted IHF S/N ratio was 85.0 dB for the left channel and 94.0 dB for the right.

	Output Noise, μV	
Bandwidth	LEFT	RIGHT
Wideband	360.0	323.0
22 Hz to 22 kHz	300.0	316.0
400 Hz to 22 kHz	150.0	53.0
A-Weighted	140.0	50.0

Figure 3 shows 1-kHz THD + N versus output voltage with instrument and IHF loading. This data is for the CD input in the "Normal" input group. When going through the "Direct" input, the portion of the curve below about 0.5 V simply is lower because of lower noise. (The data for this and the following preamp curves is shown for the right channel unless otherwise noted, as both channels measured very close to each other in distortion.) Distortion was essentially all second harmonic. This circuit can put out a healthy amount of output into the IHF load; note that the distortion below about 9 V is little different between IHF and instrument loading, a good result.

The THD + N versus frequency and load for output levels of 1, 2, and 3 V are plotted in Fig. 4. With the lower capacitance of the instrument load, which is more or less typical of 1-meter interconnects, the distortion is refreshingly constant across the audio band. With the IHF load's extra 1,000 pF of capacitance, the distortion starts to rise more in the audio band. What is interesting is that the distortion rise with either load, and the slight rise at the low-frequency end, are independent of output level in the range covered.

Noise measurements are listed in Table II for various bandwidths, for a "Normal" input and for the "Direct" input. Table entries are for output noise and are not referred to the input. The aforementioned computer monitor noise interference is part of the measurement amounts (note the lower values for the "Direct" input), and good old internally generated line harmonics (hum!) are also present, as reflected in the difference between the 22- and 400-Hz high-pass filtering.

Interchannel crosstalk was not very good in the low and middle frequencies, and deteriorated further at the high-frequency end of the audio band. Figure 5 shows left-to-right crosstalk with the volume control at maximum, –6 dB, and –20 dB; right-to-left crosstalk was very similar. Volume-control tracking, however, was extremely good, being within 0.5 dB down to –80 dB.

A few remaining comments on the SFL-1: The a.c. line draw was about 200 mA at 120 V, low enough to let you leave the unit on continuously for best sound without worrying about the electric bill. Output resistance, computed from the gain data in Table I, was about 500 ohms.

For the SFS-40 amp, voltage gain and IHF sensitivity (8-ohm loading and input voltage for 1-watt output) were 28.5 dB and 105.8 mV, respectively.

Frequency response at a nominal 2.83-V output for open circuit, 4-ohm, and 2-ohm output loading is shown in Fig. 6. As can be seen, the output changes quite a bit in level with loading; this translates to a low damping factor, as will be seen when that actual measurement is discussed. Bandwidth is quite good for a tube amplifier, 3 dB down at about 100 kHz. The little aberrations in the response beginning at about 60 kHz occurred in the left channel (shown in the figure) but not in the right. Square-wave response is shown in Fig. 7 for the left channel, which looked a little worse than the right. Frequency for the top and middle traces was 10 kHz; loading was 8-ohm resistive for the top trace and 8 ohms in parallel with 2 μF in the middle trace. Of particular note here is the response shape with the 2-μF loading, which is about as little affected as I have seen in a tube power amplifier. This is a good result and would make this amp a good candidate for driving an electrostatic speaker without any degradation of treble response. Low-frequency tilt in the bottom trace is minimal but noticeable and relates to the good low-frequency response seen in Fig. 6.

EVEN THE WORST-CASE FREQUENCY RESPONSE OF THE SFL-1 PREAMP EXTENDS PAST 100 kHz.

Since the amplifier's output-transformer secondary was set for a nominal 3.5-ohm matching, I measured THD + N at 1 kHz as

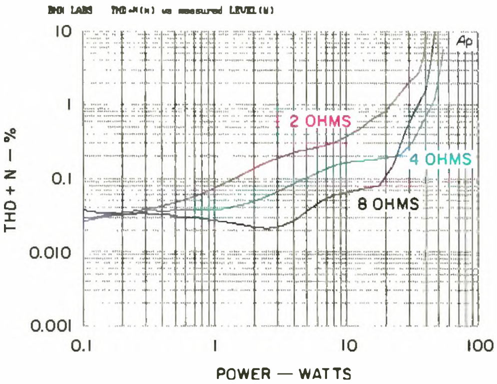


Fig. 8—THD + N vs. power output.

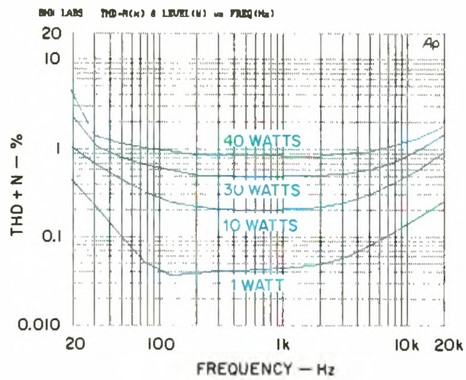


Fig. 9—THD + N vs. frequency.

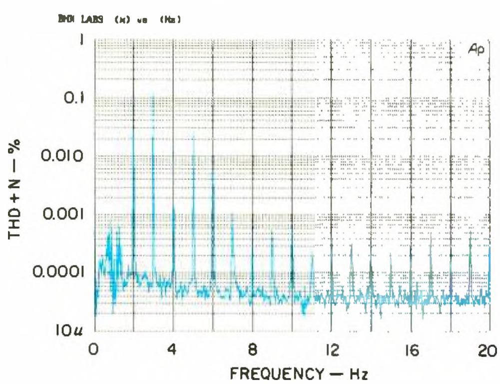


Fig. 10—Distortion spectrum of 1-kHz signal at 10 watts into 4 ohms.

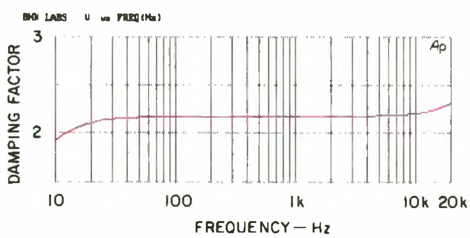


Fig. 11—Damping factor vs. frequency.

a function of power output for 8-, 4-, and 2-ohm loads (Fig. 8). As is usual with a tube power amplifier, power delivery falls off on either side of optimal loading, and distortion is higher with lower loads. The SMPTE-IM distortion (not shown) was about four to five times higher than the 4-ohm harmonic distortion levels shown in Fig. 8 over most of the output range.

Total harmonic distortion versus frequency at several power outputs is shown in Fig. 9 for the left channel. Rise in distortion at low frequencies and lower power levels was not as pronounced in the right channel. A spectrum of the harmonic-distortion residue for 10 watts out at 1 kHz is shown in Fig. 10 for the left channel. Principal harmonics are second and third, but a significant amount of fourth, fifth, and sixth are present. A whole string of harmonics above the sixth at a much lower level is also present. Not a simple spectrum, this.

Output noise levels, along with IHF signal-to-noise ratios, are enumerated in Table III. The left channel had more line harmonics than the right, hence the poorer IHF signal-to-noise ratio. It has recently come to my attention that some readers don't understand the true relationship of the IHF S/N ratio to the S/N quoted by many manufacturers. It is simple: The IHF S/N shows the difference, in dB, between the A-weighted noise level and a 1-watt output into 8 ohms. Most manufacturers relate noise to rated power output (usually with no weighting or filtering specified), a difference of some 20 dB for a 100-watt amplifier. (The difference would be greater for amplifier power levels above 100 watts.) Making reference to a fixed power output is more meaningful in noise comparisons.

Interchannel crosstalk in the left-to-right direction was more than 110 dB down from 20 Hz up to about 2.7 kHz, rising at 6 dB per octave to about −93 dB at 20 kHz. Crosstalk in the right-to-left direction was obscured by noise at about −105 dB and rose to about −95 dB at 20 kHz. There is very low crosstalk in this amp.

Damping factor for the right channel is shown in Fig. 11; results for the left channel were substantially identical. As can be seen, the damping factor is rather low. Incidentally, the damping factor is computed relative to 4 ohms, as the single available output-transformer tap had been strapped at the factory for approximately that value.

OF ALL THE SIMILARLY POWERED TUBE AMPS I'VE REVIEWED RECENTLY, I LIKE THE SFS-40 BEST.

Dynamic power output, using the IHF tone-burst signal, yielded an output power of 60.5 watts with a 4-ohm load. This translates to a dynamic headroom figure of 1.3 dB. Steady-state power output at the visual onset of clipping was about 50 watts, yielding a clipping headroom of 0.46 dB.

A.c. line current at 40 mA per output tube was 1.6 amperes. I noticed that the amount of indicated plate current on the meter would slowly drift down with time. If current was about 50 mA after a few minutes of operation, the long-term value would be 40 mA.

Use and Listening Tests

Ancillary front-end equipment used to evaluate the Sonic Frontiers units included an Oracle turntable fitted with a Well Tempered Arm and Spectral Audio MCR-1 Select moving-coil cartridge; Krell MD-10 and Theta Digital Data CD transports feeding Theta DSPro Generation III, Counterpoint DA-10, PS Audio UltraLink, and several experimental D/A converters; a Nakamichi ST-7 tuner and 250 cassette recorder, and a Technics 1500 open-reel recorder. Other preamplifiers used were First Sound's Reference II, a Quicksilver Audio, and a Forssell tube line driver. Power amplifiers used for comparison were a pair of Quicksilver M-135s, a Crown Macro Reference, McIntosh MC1000s, Marantz Model

9s, and an Arnoux Seven digital switching unit. Speakers used were B & W 801s and Win Research SM-10s.

I hooked up and listened to the SFS-40 first. My thoughts at that time were that it generally sounded pretty good but was just a bit forward and hard. I felt that some more operating time would mellow it out. Accordingly, I lent it out to a friend for a while. My friend reported that the amp was thought to be okay by a number of observers but was nothing special. Getting the amp back and listening again, I felt that it had indeed broken in and that it sounded better overall than in my first listening. One thing that I noticed at this time was that the imaging did not appear to be as far back on the sides as with the Crown Macro Reference. After measuring the units, I again listened to the amplifier and honed in on its sonic character. I felt that it still had a trace of hardness and had some lack of air and resolution. Bass seemed a little weak on some material but more or less normal on other selections. Bass quality and damping seemed good despite the low measured damping factor. At times I was surprised at the potency of some of the bass whacks that came out of the speakers. Also, the amp could play fairly loudly without obvious breakup. Plate currents were going through wild excursions and the woofers were displacing in one direction, a sure sign of clipping, but it didn't really sound very bad. I guess what I am saying is that the amp has reasonably graceful overload characteristics! Of the 35- to 50-watt stereo tube amps that I have recently reviewed, I think I like this one the best overall.

TOGETHER, THE UNITS SOUNDED MUSICAL, WITH GOOD DIMENSION AND TONAL BALANCE.

When I tried out the SFL-1 line preamp, I just put it in my system; much to my surprise and amazement, I found certain aspects of the sound to be better than I was used to by using a passive attenuator—namely bass impact and overall definition. This naturally prompted me to try all the preamps I had on hand. After I had listened to the other units listed above, I concluded that the SFL-1 was a little on the additive side of being articulate but had a fairly low amount of irritation and edginess in its sound. All in all, I used the preamp quite a bit and liked its sound and especially enjoyed the feel of the controls.

When I finally paired the units up together, I found the sound to be musical, with good space, dimension, and tonal balance. Again, on some of my favorite material, there was a hint of hardness and of the sound being closed in a bit compared to some of the other equipment I use. A definite plus was the general lack of high-frequency edginess and irritation that I get with so much equipment.

No operational hitches were encountered except the amp's propensity to have the plate current decrease, as mentioned in the "Measurements" section.

In conclusion, I enjoyed my stay with the Sonic Frontiers equipment and would encourage prospective amp and preamp buyers to give these pieces a listen.

Bascom H. King