

Kora Explorer 90SI

Reviewed by Charles Hansen

Kora Electronic Concept, 81 Chemin de Fenouillet, 31200 Toulouse, France, +33 (0) 5-62-72-43-13, FAX +33 (0) 5-62-72-43-14, kora@wanadoo.fr, www.kora.net. Dealer list is at www.kora.net/distribu.html. Price: \$750 US. Dimensions: 420mm W × 260mm D × 90mm H; net weight: 7kg, 15.4 lbs. Warranty two years, tubes 90 days.

The Kora Explorer is the first tube/MOSFET hybrid in the Kora product line, and is rated for 60W RMS into 8Ω and 90W into 4Ω. *Photo 1* shows the front panel, which has an operate switch, two LEDs, an Alps volume control, pushbutton switches for the tape loop and external A/V processor, and a five-position Alps rotary switch. The latter selects any of five line-level inputs (CD, tuner, and three other line inputs). The plastic logo plate above the LEDs has a clear section that allows one of the ECC81 tubes to show through.

The amplifier is nicely constructed of heavy gauge steel, with a 3mm-thick black anodized aluminum front plate. The top

and bottom covers have cooling slots for the MOSFET heatsinks. The top is held in place with eight flat-head cap screws and is rattle-free.

The rear panel (*Photo 2*) has the IEC power receptacle with integral fuse and power switch, 16 high-quality gold-plated Teflon™-insulated RCA jacks, and two pairs of high-quality gold-plated speaker binding posts, which are located on US 0.75" spacings, so you can use cables with dual banana plugs.

Photo 3 shows the amplifier with the cover removed. The left side is dominated by a hefty custom toroidal power transformer with a 230V AC, a 6V AC, and two 26V AC secondary windings. There is very little hand wiring in this unit, with

all the electronic parts on a single large PC board.

High-quality components are used throughout the amplifier. The elegant epoxy PC board uses 1% metal-film resistors, polypropylene caps, ceramic tube sockets, and Alps pots and switches. Most chassis-mounted components (input jacks, volume control, LEDs, and switches) are soldered directly to the PC board.

Each of the output MOSFETs is mounted on its own heatsink, with a driver FET in close proximity. A trimpot located near each heatsink provides adjustments for output device bias and DC offset. Speaker protection fuses are mounted between the heatsinks in green plastic holders.

The unit is furnished with a heavy power cord. The power transformer primary is factory-connected for either 115V or 230V mains. The third pin of the IEC power receptacle is connected to the chassis. The Explorer sits on four small elastomer dots, which makes finger space under the unit a bit tight. However, the amplifier is not all that heavy and is easy to lift.

TOPOLOGY

A schematic was not furnished with the unit, but the ten-page user's manual has an explanation of the circuitry in the Design Philosophy section. During the conception period the design philosophy called for each component to be given the role that suits it best—voltage amplification for the tubes and current amplification for the MOSFET transistors.

The unit was furnished with two matched Philips JAN ECC81/12AT7 tubes. A "tweak" section in the manual describes the difference in sound if you substitute 12AX7 or 12AV7 tubes.

When you operate the AC power switch on the rear of the unit, the red LED immediately comes on. The operate switch on the left front panel controls only the MOSFET power-supply relay, whose driver transistor also illuminates the orange LED. When you release the

PHOTO 1:
Explorer front view.



PHOTO 2: Explorer rear view.

operate switch, the power amplifier turns off (standby), while the tube sections of the amplifier remain energized and ready for action.

The selected stereo input is connected to the grids of the first 12AT7 through the tape monitor switch. The plates are then capacitively coupled to the volume control. The tape out jacks receive the selected input signal directly from the selector switch, with no active buffer or intervening resistors.

The volume-control wipers are

connected to the grids of the second 12AT7 through the processor switch. When you press the processor switch, the A/V stereo input is connected to the grids of the second tube, bypassing the input selector, tape loop, and volume control.

The second 12AT7 serves as the voltage amplifier for the MOSFET output stages. Each plate is R-C coupled to the gates of complementary-pair driver MOSFETs. Trimpots in their gate circuits set

**TABLE 1
MEASURED PERFORMANCE**

PARAMETER	MANUFACTURER'S RATING	MEASURED RESULTS
Power output (RMS)	2 × 60W, 8Ω 2 × 90W, 4Ω	61W 8Ω, 1% THD 40W 4Ω, fuse limited
Slew rate	1μs	
Signal to noise ratio	-100dB	
Frequency response	7Hz-40kHz, -3dB	3Hz-47.5kHz, -3dB
Total harmonic distortion	N/S	0.95%, 60W, 8Ω
IMD—CCIF (19 + 20kHz)	N/S	0.28% CCIF, 8Ω
MIM (9 + 10.05 + 20kHz)	0.075% MIM, 8Ω	
Line input impedance	100k, 330mV	98k2
A/V input impedance	47k, 1.4V	47k6
Noise	0.8mV	1.2mV
Gain	N/S	38dB line input, 8Ω 19dB A/V input, 8Ω
Power requirements	200W maximum	
Output impedance	N/S	0.69Ω 1kHz 0.71Ω 20kHz

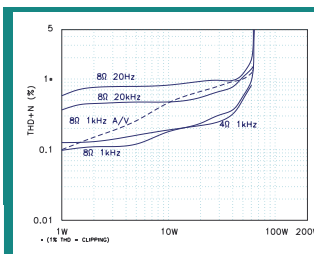


FIGURE 1: THD+N versus output.

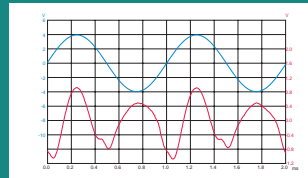


FIGURE 2: Residual distortion, line input.

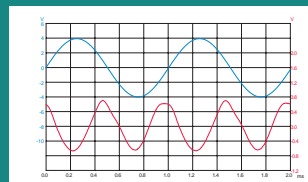


FIGURE 3: Residual distortion, A/V input.

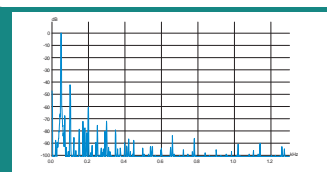


FIGURE 4: Spectrum of 50Hz sine wave, line input.

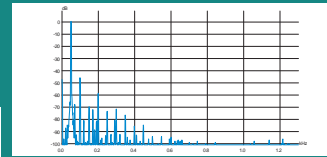


FIGURE 5: Spectrum of 50Hz sine wave, A/V input.

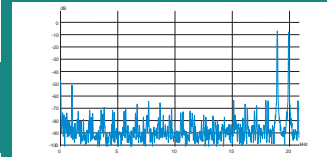


FIGURE 6: Spectrum of intermodulation distortion.

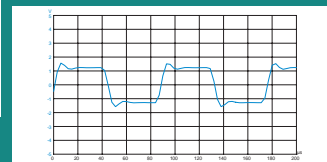


FIGURE 7: Square-wave response, 10kHz 2.5V p-p 8Ω in parallel with 2μF.



PHOTO 3: Explorer interior view.

the bias and DC offset in the output MOSFETs.

Since MOSFETs require about 6V gate-source voltage, the output devices have diode-capacitor peaking networks in their gate drive circuits that hold the gate voltage at the peaks of the power supply to increase gate drive. The output MOSFETs in each channel are also a complementary pair—IRFP150 and IRFP9140—which are connected to the speaker binding posts through source resistors and a speaker protection fuse. Overall feedback is a low 6dB.

The power supply reflects the complexity of a hybrid design. The MOSFETs receive power from the 26-0-26V AC windings, full-wave rectified to about ± 36 V DC. The 10,000 μ F caps provide power-supply filtering for each rail. The operate switch time-delay relay connects the AC windings to the rectifier.

The 230V AC winding is full-wave rectified and filtered to about +340V DC. This high voltage goes to a source-follower MOSFET B+ regulator, whose output voltage is determined by a zener reference string. The gate circuit has an R-C startup time delay that allows the tubes two minutes to heat up before B+ is applied.

The 6V AC winding powers the 12AT7 heaters. This winding is also rectified to power the LEDs and the MOSFET power-supply time-delay relay.

MEASUREMENTS

I operated the Explorer at 10W per channel into 8 Ω for one hour. There was no speaker noise during

power-up or shutdown. At full volume, with my ear against the speaker, there was a fair amount of 120Hz buzz that varied with the volume-control setting.

I set the volume level so the line-input gain equaled that of the A/V input. The line-input noise was quite a bit higher than that of the A/V input when I toggled between them with the processor switch. The scope waveform showed high levels of diode commutation spikes on the 120Hz ripple. Despite all this, the amplifier was quiet from my listening position.

The Explorer uses two cascade tube stages in its design. The five line inputs and the tape inputs are amplified by both tubes and have normal polarity. However, the A/V processor input is connected to the grid of the second tube, and this inverts the input polarity as seen at the speakers.

Overall line-input gain for 2.83V RMS output with the volume control at maximum is 37dB into 4 Ω , and 38dB into 8 Ω . The A/V input had a fixed gain of 18.3dB into 4 Ω , and 19dB into 8 Ω . The line-input gain equaled the A/V input gain when the volume control was one dot below 12 o'clock.

Line-input impedance for both channels measured 98k Ω at 1kHz, independent of the volume-control setting, while the DC resistance at the selected input jack was over 1M. This suggests there is negative feedback around the first preamplifier tube, since there are no input coupling capacitors. Similarly, the A/V input impedance at 1kHz, with the processor switch on, measured 47k Ω , with a

DC resistance of 1M.

The amplifier output impedance was 0.69 Ω at 1kHz, and 0.71 Ω at 20kHz, which is quite flat for an amplifier with only 6dB of feedback. The amplifier frequency response is not likely to be affected by speaker impedance variations.

The frequency response for the Explorer was within +0, -3dB from 3Hz to 47.5kHz, with 0dB defined as 2.83V RMS at 1kHz into 8 Ω . It was -1dB at 4Hz and 18.3kHz. With a 4 Ω load, it was a bit flatter at the top end, being -1dB down at 20kHz, with the -3dB point essentially the same. The HF gain rolled off smoothly to -8dB at 100kHz.

When I connected a load of 8 Ω paralleled with a 2 μ F cap, the HF -1dB point moved out to 36.5kHz, with -3dB at 65kHz. There was no peaking at higher frequencies with the capacitive load, and no evidence of ringing or instability. The amplifier handled the IHF simulated speaker load, which has an impedance peak at 50Hz, very well. The response was only 0.4dB higher at this frequency.

Channel separation measured -73dB at 100Hz, -53dB at 1kHz, and -33dB at 10kHz L-R. The input signal traces run right next to each other for the full depth of the PC board, and the selector switch is fairly small, so there is ample opportunity for capacitive coupling between channels. Volume-control tracking across the entire rotational range was excellent, as you can usually expect from Alps controls.

The distortion was a bit higher for the left channel, so I present

its test data here and summarize it in *Table 1*. THD+N versus frequency (line input) showed a fairly high level at 20Hz, just under 1% up to 60W, and pretty much independent of power level or load. THD dropped with frequency up to about 1kHz, then increased again gradually up to 20kHz. With the A/V input, the THD+N at 10W into 8 Ω was essentially constant at about 0.4% from 20Hz to 20kHz.

Figure 1 shows THD+N versus output power using the line inputs: into 8 Ω at 20Hz, 8 Ω at 20kHz, 4 Ω at 1kHz, and 8 Ω at 1kHz (solid lines top to bottom at 5W). The dashed line is the A/V input at 1kHz and 8 Ω . The 4 Ω and 8 Ω 1kHz lines cross at about 13W.

The clipping level at the line input where THD+N reached 1% occurred at 61W into 8 Ω . At 65W into 4 Ω , the left-channel-speaker protection fuse blew. I opened the cover and removed a T2A fuse (two amps time delay), which would certainly not allow the full-rated 90W at 4 Ω . I was surprised it held at 60W, which is almost 3.9A RMS into 4 Ω , but the Littelfuse type 219 time-current curve (www.littelfuse.com) shows a maximum of two minutes is available at 210% of rating. The replacement fuse let go at 45W (3.35A), so I have no THD data above 60W—highly variable, these fuses!

There is no mention of the fuses or their ratings in the manual. I reported the fuse openings to Kora, thinking perhaps that they used smaller fuses for the trade show where the amplifier was shipped to me. However, T2A is the proper rating, since Kora wishes to keep a dynamic reserve of 6dB at 90W (around 23W average). My tests show the output stage is capable of much more power. If you have problems because your speaker impedance is too low or you listen to high volume "compressed" music, you can increase the fuse to a maximum of 4A. I decided to finish my tests with the 2A fuses, since that is the value the factory ships with the Explorer.

With my 8 Ω test loads, I could get the full-rated 60W at 1kHz,

Reviewed by Duncan and Nancy MacArthur

The Explorer is a relatively uncomplicated integrated amplifier capable of producing a musical sound with most recordings. Few amplifiers we've reviewed have inspired us to listen to CD after CD just to hear the music. To our surprise (given its modest price tag), the Explorer belongs to this small group. This amplifier produces strong, well-defined bass and clean, extended highs.

The biggest problem that we had with the Explorer was inconsistency. Don't misunderstand—this amplifier always sounded good. But occasionally it sounded very good indeed. We couldn't correlate this change with any external effect: power fluctuations remain a possibility.

On the downside, the Explorer sometimes sounded slightly hard and "glassy" at high volumes. Most other defects were subtractive rather than additive in nature. The imaging was good but not outstanding, and the Explorer lacked that last sparkle of "aliveness" that characterizes the best amplifiers (albeit at a much higher price).

AESTHETICS AND OPERATION

Like most components nowadays, the Explorer is a black box. While the Explorer is finished well enough that it won't detract from the rest of your equipment, it isn't a component that demands to be shown off.

One of the preamplifier tubes is mounted behind a small clear window in the front panel. Duncan sees this design as a marketing ploy meant to "prove" that there are tubes in the amplifier. He can't imagine that any of the signal paths have been improved by placing this tube at the front of the chassis. However, he appreciates seeing that the filament is operating. Nancy, on the other hand, likes the tube window. She thinks it looks like the window of a glowing furnace room in a doll's house.

In the process of changing the output fuses, we had an opportunity to examine the construction quality of the Explorer. The top cover is thick, well painted, and attached with machine screws rather than the more common (and cheaper) sheet-metal screws. All the components, except the power transformer and output jacks, are mounted on a single large printed-circuit board.

The input connectors are mounted directly to this PCB, but, because the source selector switch is mounted directly behind the front panel with no shaft extension, this amplifier has multiple long PCB traces at the amplifier input. All the components are securely mounted, with the exception of the four heatsinks, which are supported only by the leads of the output MOSFETs. Supporting the heatsinks in this fashion cannot be good for the long-term reliability of the amplifier.

We experienced some quirks in interfacing the Explorer into our system. The speaker connectors are large "thumbscrew type" binding posts that ensure good connections but cause a couple of minor problems. The left-channel output connectors are located so that the speaker wire must pass directly over the input jacks. If your speaker cables are relatively stiff or you use large connectors on the end of your speaker cable, then these connectors and cable will block

access to the A/V inputs and perhaps the tape inputs and outputs. Large connectors must be insulated to avoid short circuits to the shield connection on the A/V jacks.

Also, although we use oversize "spade" connectors for speaker attachment, and these spades fit around every speaker output post we've encountered, the posts on the Kora are marginally too large for our connectors. To achieve proper connection we needed to use some force.

Finally, as mentioned in the instruction manual, the front panel "operate" switch does not completely remove power from the Kora. Reaching behind the amplifier is required in order to turn it off fully. Although you may be tempted to use only the front panel switch and leave the Explorer in continuous standby mode, we do not recommend this type of operation. We noticed a slight negative correlation between the length of time the filament had been powered and the overall quality of sound. This effect only occurred after several weeks of continuous filament power, so don't worry about keeping it turned on all day.

Our sample of the Kora Explorer 90SI had been shipped several times in the same box prior to its arrival here. The packaging, which consisted of a single-layer cardboard box with several internal cardboard spacers, was insufficient to protect the amplifier throughout this process. In particular, one corner of the front panel was slightly damaged.

A TALE OF TWO FUSES

During our initial auditions, the Explorer sounded quite musical, but the imaging bordered on unacceptable on many recordings. After an e-mail exchange with Jeff Starrs at Kora, we opened the Explorer and examined the output fuses. One channel used a 2A fast-acting fuse and the other a 2A slow-blow version.

Further discussion with Jeff established that slow-blow fuses should have been used in both positions. Using a pair of 2A slow-blow fuses greatly improved the imaging. Unfortunately, some of the musical magic that had been present earlier was lost.

With slow-blow output fuses, the Explorer sounded slightly "rounded off" in all respects. The transient response was good but not great. Ditto the dynamics. The highs seemed slightly rolled-off, which was a boon with poorly recorded CDs but did nothing for the sound of well-recorded ones.

We made another trip to Radio Shack to purchase fuses. (As you might expect, the fuses in the Explorer are 5mm by 20mm metric packages.) Using two 2A fast-acting fuses in the Explorer's outputs produced some sonic improvement. The sound was more musical and the imaging at least as good as that achieved by using a pair of slow-blow fuses.

If you own the Kora Explorer or contemplate buying one, consider purchasing a pair of fast-acting fuses. The difference is significant. Replacement fuses are clearly the

best \$1.99 (for four fuses) investment you could make.

An exception to this advice might occur if you regularly play the Explorer at high volume with inefficient speakers. The slow-blow fuses will allow a higher peak output. We never blew the fast-acting fuses, even when auditioning at higher than normal levels. In addition, you could use the slow-blow fuses as a subtle "tone control" to tame the obnoxious highs on some CDs. The remainder of this review (unless explicitly stated otherwise) refers to the Explorer with fast-acting fuses installed.

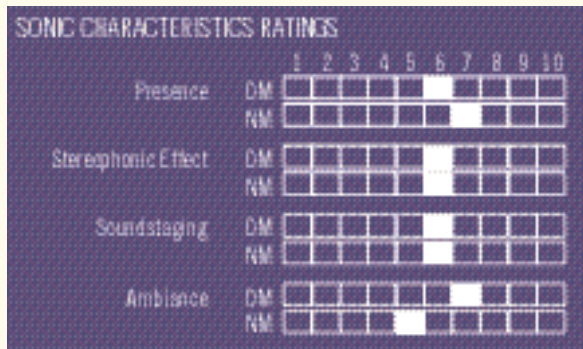
DETAILED LISTENING RESULTS

All our auditioning was done using Genesis 400 speakers. These three-way floor-standing systems (not bi-amplified) are rated at 89dB/W efficiency but are 4W designs with a fairly difficult impedance curve. We compared the Kora directly with an all-tube integrated amplifier, the Manley Stingray. This comparison is patently unfair because the Manley costs three times as much as the Kora. And no, the Kora doesn't surpass the Manley, but it performs remarkably well for an amplifier in its price range.

Although the sound of the Explorer did not improve noticeably during our month-long listening period, we wouldn't draw any conclusions about required break-in. Apparently our sample had been to CES prior to coming to us and would have had ample opportunity to break in there. As mentioned above, we do not recommend leaving the tube filaments constantly powered; we routinely played the amplifier for at least one hour before doing any serious listening.

We listened carefully to several tracks on the *Hi-Fi News and Record Review* disk III (track 2: Parry's "Jerusalem," track 4: Vivaldi's trumpet concerto, tracks 5 and 6: excerpts from Prokofiev's "Peter and the Wolf," track 7: Purcell's "Welcome, Welcome Glorious Morn," track 10: a Corkhill percussion piece, and track 14: Rio Napo RSS demo). We also listened to a wide variety of other CDs.

The Explorer 90 sounded good with music ranging from The Modern Jazz Quartet (*Blues on Bach*, Atlantic compact disk, 1652-2) through Jethro Tull (*Aqualung*, DCC, GZS-1105) to Beethoven (*The Complete Piano Sonatas*, Robert Silverman, Orpheum Masters KSP 830). Although the Explorer did sound natural as evidenced by the clear reproduction of both the voices and harpsichord on "Welcome, Welcome Glorious Morn," the good sound of the Explorer wasn't completely attributable to naturalness.



Nor was the Explorer's good sound attributable to traditional "tube" sound. The highs were extended and clean—the jingling coins on Pink Floyd's "Money" (*Dark Side of the Moon*, Mobile Fidelity, UDCD 517) sounded like real coins. Similarly, the bass was solid, deep, and well defined: the bassoon and tympani on the "Peter and the Wolf" tracks sounded authentic.

The Explorer's sound remained uncongested and listenable even on heavy orchestral pieces such as the Brahms Symphony #4 (The Royal Philharmonic, Fritz Reiner, Chesky compact disk CD-6).

We don't mean to imply that the Explorer sounded 100% natural. Speech, including the narrator on "Peter and the Wolf," sounded slightly muffled; the applause on "Jerusalem" was a bit "off" (i.e., it sounded more like wind over the microphone than hands clapping). The Explorer lacks the extreme clarity and detail given by certain more expensive amplifiers.

The dynamics and transient response were very good when the fast-acting fuses were used. With slow-blow output fuses, these characteristics were still present, but the amplifier lacked the "startle" factor that is produced by better electronics. Similarly, the dynamic contrasts on the Corkhill percussion pieces were impressive with the replacement fuses installed. The individual drumbeats in the RSS

demonstration were well-defined, fast, and solid.

At higher volumes some glare became apparent on midrange instruments such as horns. The Vivaldi trumpet concerto was sometimes difficult to listen to at high volume, although it was fine at our normal listening levels.

The Explorer was capable of reproducing plentiful ambient information, particularly with the fast-acting fuses. On the recording of "Jerusalem," the space around and above the choir was clearly audible. Some ambient information, such as the applause on "When the Saints Go Marching In" (The Weavers, *Reunion at Carnegie Hall 1963*, Analogue Productions, APFCD 0005), was rendered slightly less impressive by the imaging uncertainties. Installation of the slow-blow fuses resulted in a small impairment of the ambient recovery.

The Explorer produced stable, distinct images. The individual instruments on The Modern Jazz Quartet disk mentioned earlier were well defined; however, these images were always confined to the space between the speakers.

We never managed to solve the inconsistency problem. The sound seemed slightly more natural when the filaments were not continuously powered, but the effect was subtle enough that we could not draw a definitive conclusion.

FINAL THOUGHTS

NM: I enjoyed the natural, musical sound of the Kora Explorer 90SI. In fact, I thought the Explorer sounded better than other amplifiers I've auditioned which cost twice as much. I haven't heard anything yet in its price range with a more appealing sound.

If I had rated the Explorer while using the fast-acting fuses, the presence score in the sonic characteristics ratings would have been one point higher and the ambient recovery score two points higher. Exchanging the fuses would not have changed the other sonic characteristics ratings.

DM: With the Explorer 90SI, I think that Kora has attempted to meld the best characteristics of vacuum tubes and transistors. They have succeeded in most areas. The bass is strong and well-defined, the highs are extended and clean, and the overall sound is natural and very listenable at reasonable volumes. At this price point, it's difficult to see how the sound could be much better.

I strongly suggest placing the Explorer on your short list of good prospects if you are considering an amplifier purchase in this price range (and if you exchange the output fuses). I enjoyed listening to it, but, as always, you should audition any amplifier in your own system before making a final decision.

with 1% THD occurring at 61W. The power available at 20Hz and 1% THD+N was 41W. At 20kHz I measured 45W into 8Ω at 1% THD. The maximum power available at 1kHz was 65W into 8Ω.

Switching to the A/V input, which bypasses the preamp tube and volume control, I saw 1% THD at 50W, with a maximum output of 63W at 3% THD. The clipping was symmetrical and quite rounded for a solid-state output stage ($\pm 32V$). The designers have some flexibility in where the clipping occurs—tubes or FETs—with a hybrid design.

After these tests, the amplifier chassis was hot. The heatsinks, which do not come into contact with the chassis, were too hot to touch, as I found out while changing fuses. The fuse is located between each pair of heatsinks, so I needed to use a DIP IC removal tool to pull the fuse holder.

The distortion residual waveform for 10W into 8Ω at 1kHz (line input) 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 is an asymmetrical second-

order harmonic, with no evidence of any noise or fuzz. The distortion residual waveform for the A/V input at the same point is shown in Fig. 3, where the second harmonic has better symmetry.

The spectrum of a 50Hz sine wave at 10W into 8Ω, again with the line input, is shown in Fig. 4, from zero to 1.3kHz. The THD+N measured 0.74%, with the second, third, fourth, and fifth measuring $-42dB$, $-79dB$, $-60dB$, and $-75dB$, respectively. Higher-order harmonics are also prominent.

There are also power-supply harmonics at 120Hz ($-85dB$) and 180Hz ($-77dB$). I can't explain the two spikes at 70Hz and 170Hz, since they are not related to the input signal or the 60Hz power line, and disappear from the spectrum analyzer display when the input signal is removed.

The 50Hz sine-wave spectrum using the A/V input is shown in Fig. 5, where THD+N was lower at 0.54%. The second, third, fourth, and fifth here measure $-46dB$, $-72dB$, $-59dB$, and $-73dB$, respectively. The second has decreased, the third has increased, and the power-line-related harmonics are a bit lower. Those curious 70Hz and 170Hz spikes are

identical to those of the line-input analysis.

Figure 6 shows the Explorer's output spectrum reproducing a 12V p-p combined 19kHz + 20kHz CCIF intermodulation distortion (IMD) signal into 8Ω, using the line input. The 1kHz IMD product is a high 0.28%. Repeating the test with a multi-tone IMD signal (9kHz + 10.05kHz + 20kHz, not shown) resulted in a 1kHz product of 0.075%. I repeated the test using the A/V input (not shown here), and the IMD was reduced to 0.021% and 0.041%, respectively. This would point toward preamp stage nonlinearity as the source of the intermodulation.

The 2.5V p-p square wave into 8Ω at 40Hz showed a fair amount of tilt using the line input, while it was much better with the A/V input. With either input, the 1kHz square wave was excellent, and the 10kHz square wave showed a slight rounding on the leading edge. When I connected 2μF in parallel with the 8Ω load (Fig. 7), the leading edge of the square-wave response showed some peaking, which is consistent with the extended HF response with this load.

Manufacturer's Response:

Thank you for the review of the Explorer 90SI. We are happy to let you know that we have anticipated some of the remarks raised in the review with the following improvements:

- *The fuses have been replaced by fast blow types as you recommended.*
- *The carton has been reinforced and foam added for better protection during transport.*
- *The front plate is now 8mm thick.*
- *The PCB has been reviewed to ensure a direct welding of the radiators in order to increase mechanical resistance and to protect the pins of the transistors.*

Me, I like to see the tube behind the window! Don't you? Thanks again. ❖

*François Philibert
Designer*