

READERS REACT

I read the latest (Sept.) *audioXpress* and it is apparent that times are tough for a lot of industries. I took your idea of getting new subscribers and subscribed for a friend of mine as a gift. If every one of us who subscribes could do the same thing, I imagine it would help *audioXpress* a lot.

The second thing that I am going to do is not accept money for any submission I make. I realize this is a small amount of money, but every little bit helps. I do not want *audioXpress* to fold!

Bruce Brown
TuninFork@aol.com

You can tell your advertisers I went right out and bought a Sony XDR-F1HD radio tuner after reading the review in the August issue and checking K6sti's website. I doubt it will resurrect WQXR (NYC classical station) after it switches over to whatever dismal fate is ahead, but it'll give me a fighting chance with the remaining suspects.

J.G. Owen
Huntington Station, NY

I have recently begun using one of your advertisers as a supplier—PCBCart. The first occasion was boards for Stuart Yaniger's Impasse preamplifier (Feb. '09) which were distributed via DIYAUDIO as a group buy. Just yesterday I sent along another order for power supplies boards for the same. I was pleasantly surprised with the quality.

Jack Walton
jdwalton@comcast.net

After reading the editorial in *aX* Sept. 2009, I was very unpleasantly surprised with the reality you described. Could it

be true that the bloody crisis could eject the only audio magazine existing now? Maybe that means that the Asian electronic factories won the war, by surviving, and all the rest of the manufacturers will disappear?

I express my support and my solidarity in all your efforts to give us the best news, and for my part, I'll try to help as much as I can. I will renew my subscription for two more years. And I will find some new subscribers here in Greece and in Poland or in Romania. Anyway, if this year things do not get better, I intend to close my little laboratory, too. I shall send some prototype amps to my son in Poland, make some presents to my friends, and continue to write my memories. Sad but true!

Alex Arion
Athens, Greece

SOUND DIFFERENCES

I read and enjoyed the editorial in the July issue, "Amplifier Differences and Lack of Tests." I will pass along some recollections I have going back to the 1940s that may be of interest to other hobbyists. I agree that listening tests should not be the sole criterion in judging equipment, particularly the electronics, despite the fact that listening is what we finally do.

Going back to the vacuum tube days, audio buffs often said triodes sounded different from pentodes as power amplifiers. They usually did. The pentode characteristically has a very high AC plate resistance compared to that of the triode. This accounts for most of the difference because they were usually employed (without feedback).

Without feedback, there is a noticeable difference in speaker damping and significant variation in output frequen-

cy response due to speaker impedance variations versus frequency, especially pronounced with pentodes. Feedback largely corrects these problems when properly applied. Slightly greater power output can usually be obtained from pentodes rather than triodes of the same plate dissipation rating.

Single-ended versus push-pull. When the tubes are balanced, either triode or pentode, push-pull operation will result in waveform symmetry, thus eliminating even-order harmonic distortion. Greater power output also occurs with push-pull operation due to two tubes delivering power and a little due to the waveform improvement itself. The push-pull configuration allows a more power-efficient class of operation—AB or B—than A (A is often preferred, however). Feedback provides the same benefits in push-pull as in single-ended operation.

Transistors versus tubes. Transistors share some qualities with tubes. Bipolar transistor collector current, analogous to tube plate current, is controlled by its base current, analogous to the tube grid voltage. Field-effect transistor drain current, analogous to tube plate current, is controlled by its gate voltage, analogous to the tube grid voltage. The bipolar transistor is current controlled, whereas the field-effect transistor is voltage controlled, as are vacuum tubes. Both transistor types have characteristics resembling the pentode, in that the collector or drain current is nearly independent of voltage and its current is controlled by the base or gate.

Some hobbyists believe that their systems sound better without feedback and also that single-ended sounds better than push-pull. I agree that such a system would sound *different*, but *better* is

a subjective term. No doubt there would be significant distortion, including even-order, and the frequency response somewhat ragged.

My listening experiment using a function generator as the signal source is that a pure sine wave has pitch but no timbre and is not particularly pleasant; a pulse also has pitch but can be pleasant depending on pulse shape. A pulse is rich in harmonics. This raises the question: Is a little distortion a good thing? To these hobbyists it must be.

In the design of all professional audio equipment, and most current quality consumer gear, it is evident that low distortion, flat frequency response, and low noise are paramount. Since the 1950s, LP records have been mastered with feedback cutters, pioneered by the Westrex cutter. The advent of the elliptical playback stylus made a contribution, too. As far as I know, all other forms of recording material—from microphone to the recorder—have employed feedback electronics.

In the schematics I have seen of 1930s and 1940s radios, I do not recall any of them having feedback, although feedback was then known, but I believe was mostly employed in the telephone system. Many of the radios had pentode output stages. Tabletop radios usually had single-ended outputs, and most of the consoles had push-pull outputs, some with triodes. The radios always seemed to be deficient in the higher audio frequencies. I recall some people saying such radios had a “mellow sound” which they liked.

I don't think it matters whether tubes or transistors are used as regards listening quality if the design is well done. Transistors have an edge as regards cost; they generally cost less for a given dissipation rating, and output transformers can be avoided, for a couple of reasons. To our friends who might like a little distortion, this could be arranged by inserting something in the signal chain having a square law transfer characteristic to provide even-order harmonics.

*J.L. Markwalter, Jr.
Port Charlotte, Fla.*

I would like to respond to the interesting editorial by Kent Smith. I believe I

have a rational explanation for the differences in sound that he noted between tube and transistor amplifiers.

One difference is due to different frequency responses. Both amplifiers may have a flat frequency response when measured with a resistive load, but loudspeakers are seldom resistive. With a loudspeaker there will be a different frequency response with an amplifier that has a high source impedance (tube amplifier) as compared to an amplifier with a low source impedance (transistor amplifier). The tube amplifier with a high source impedance will have more output when the loudspeaker impedance is high than when it is low.

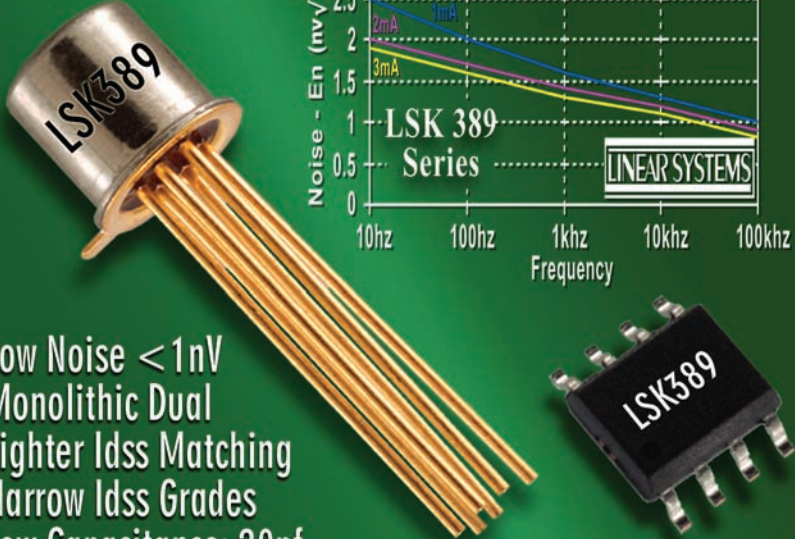
Consider the woofer in a two-way loudspeaker. At low frequencies (60–120Hz) the woofer has a resonance that makes its impedance high, and this will result in increased output with the tube amplifier. At higher frequencies (near crossover), the woofer will have increased impedance due to the woofer voice coil inductance, again resulting in increased output from the tube am-

plifier. These increases in output will vary depending upon the source impedance, but can be as high as 6dB. Such increases are easily heard, and may be interpreted as “cleaner and more detailed.”

This is not an unknown phenomenon. John Atkinson (of *Stereophile* magazine) comments on the impedance of a loudspeaker in the June 2009 issue (p. 60), “The impedance is significantly higher in the region covered by the latter two drivers. . . which means that the speaker will sound tilted-up at higher frequencies when used with a tube amplifier having a high source impedance.”

An easy way to test for this phenomenon is to put an equalizer before the tube amplifier and equalize the frequency response of the tube amplifier (with the loudspeaker connected) to be the same as the transistor amplifier. It will be difficult to achieve perfect equalization, but variations of 1dB are OK. Then listen to the tube and transistor amplifiers and see whether the differences have largely disappeared. In my

1nV Low Noise Dual JFET



Low Noise <1nV
Monolithic Dual
Tighter Idss Matching
Narrow Idss Grades
Low Capacitance: 20pf
Functional Replacement for 2SK389

www.linearsystems.com 800-359-4023

Noise - En (nV/√Hz)

Frequency

LSK 389 Series

LINEAR SYSTEMS

Frequency (Hz)	1nA	2mA	3mA
10Hz	2.5	2.0	1.5
100Hz	2.0	1.5	1.0
1kHz	1.5	1.0	0.5
10kHz	1.0	0.5	0.2
100kHz	0.5	0.2	0.1

experience, the frequency response differences are more readily heard than other causes.

This is not to say that other causes do not exist. But first, try to get the frequency responses of the amplifiers the same.

*Dick Crawford
Germantown, Md.*

Kent Smith responds:

I think Mr. Crawford's suggestions are great. I am glad that someone has tried to use EQ to level the field and observe the results. I am a little mystified about the results he mentions, because none of the tube amps I have built give more bass than a transistor amp; in fact, they all sound as though they are putting out less bass.

I have tried SE triode, PP triode, and PP pentode UL with similar results. I do understand the technical reason why they should put out more into a high Z. I do know that transformers have more reactance at their frequency extremes, and this could combine to affect response—yet another subject I have not seen any information on! I don't have any EQ equipment, so I hope someone else can verify this and send the results to *audioXpress*.

I should mention that I don't have any "audiophile" transistor amps, nor have I built any of Nelson Pass' designs, though I plan to. I recognize that designing for low distortion before adding a little feedback could produce much better results. Along those lines, I designed a little test.

I had ordered some MOSFETs for an amplifier that I never got around to, and discovered some PA/speaker transformers that had a low enough turns ratio to match the output of a single MOSFET. This allowed me to build the same Class A SE transformer coupled amplifier in both MOSFET and triode. Because the frequency response of the transformers were not far off, I expected pretty similar sound, which was the case.

But after a minute, some small differences started to stand out. The overall balance was the same, but the MOSFET just wasn't quite as lively. Of course, this is very subjective, and I prefer the sound of the triode, but I don't know which is more accurate.

While I won't say from this that a MOSFET can't sound as good as a triode; one way or another, it probably can (maybe as a source follower?). It just looks as though it's easier to get the best results from a triode, at least for a home builder like me with minimal equipment. I would not be surprised to hear now that some of the best audiophile amps are as good as tube amps. I just can't afford them!

But my question remains, where is the data? Have we proven what distortions (and levels) are audible, and therefore, important? Do we know what happens to the response and distortion levels when a reactive load is hooked up to highly damped amp, an impedance matched amp, or a transformer?

Hearing other people's impressions is nice, but seeing good data and proven explanations is even better. Anyone game?

Having written many articles about my experiences with circuit design, sound recording, as a band musician, and doing tons of listening, I found Kent Smith's editorial fascinating and appropriate to the need for new amplifier testing methods. First, I'd like to mention my relevant *aX* articles:

1. Intrinsic Fidelity Testing (Nov.'07).
2. An AB/I Switch (June '07).
3. Mad Katy (June/July '06)—a purist 250W tube amp.

The Intrinsic Fidelity Test (direct, precise level-matched sonic comparison of an electronic component's input versus output signals, *real-world loaded*) is extremely sensitive *and* removes taste preferences, and source quality degradation (be it good or bad sounding) is listened to.

With my Mad Katy amp, reactively loaded, I could hear *no* input/output difference (and my hearing has recently been tested to be very good). This agrees with my live versus reproduced voice and bell tests with Mad Katy and solid-state amps—the sounds were very natural with the tubes, but somehow "constricted" and "electronic" with solid-state.

Somewhere in *aX* I once suggested using a large number (9 or more) of log-spaced test sine tones for a stimulus, *and*

(as you said) a real-world reactive load, with power amp testing.

My experiences with clean acoustic music agree completely with yours. One comment I have is about your suggestion of an over-damped response: First, it's an *under*-damped response that prolongs tones. But more important, a power amp can't be "over damped." An *infinite* damping factor (DF) simply means zero output impedance, which would drive the speaker with a perfect frequency and transient waveform signal (constant voltage), assuming all else was perfect in the amp.

Most speakers (the good ones, at least) are designed for constant-voltage (versus frequency) drive. Of course, a high amp output impedance (such as from a SET) might *sound* good because its high Zout makes the speaker's input response follow the speaker's impedance—this adds a narrow boost at the speaker's resonant bass impedance rise, plus other variations that just *might* perceptually "liven up" a dry, compressed recording.

But I digress—your editorial calls for a real need, I believe. Incidentally, regarding your perception of sub-1% higher harmonics, audio researchers have long established that the hearing threshold of harmonics becomes more and more sensitive as the order number is increased regarding the 2nd harmonic. Now factor in the *thousands* of spectral components in real music—fundamentals, harmonic and other overtones, transient spectra (a dense continuum) plus modulation sidebands (tremolo and vibrato)—trying to make that poor amp follow this into a reactive load—and it's no wonder that our present tests are far too primitive to correlate with sound!

*Dennis Colin
dcolin@worldpath.net
aX*

SHOW REMINDER

The third international Burning Amplifier Festival will be held October 18 at the Presidio Yacht Club in San Francisco/Sausalito. For more, visit www.burningamp.com.

The Munich High-End Show 2009

By Ward Maas

Crisis? What crisis?

The CES in Las Vegas at the beginning of the year showed a significant decline in the number of visitors and exhibitors. The media, constantly looking for any indicators of a global economic crisis, saw this as an omen. Figures from the Munich High-End Show, however, reflect an improving trend—248 exhibitors (230 in the previous year) from 26 countries.

The show featured the introduction of many new products. There were many re-polished current products with a “new” sticker, but also a few products that showed that some development departments have been rather busy.



PHOTO 1: High-End logo.

PRODUCTS ON DISPLAY

This audio fair hosted a sea of expensive amplifiers, loudspeakers, and other related gear. It seems that only large, huge, and ridiculously huge are the keywords when it comes to quality audio reproduction, as manufacturers vie for the number one crown. For example, the Toruspower (www.toruspower.com) mains conditioner, with a Plitron toroidal transformer, beat everything I have seen for the last years (Photo 2). At the Angstrom research booth, a grand-piano-shaped turntable with a turntable arm made of a violin bow (Photo 3).

To continue reading

Visit www.audioXpress.com

What's New on the aX website?

Web-exclusive content

“The Munich High-End Show 2009,” by Ward Maas.

Measurement tips for Mark Williamsen's Dipole Microphone (aX 6/09).

“Rebuilding a Cheap Chinese EL84 Amp,” by Merlin Blencowe (aX 7/09).

Circuit Boards from Tom Perazella's “Maintaining Your Balance, Part 2” (aX 8/09).

Construction Guide from Jan Didden's PaX, Part 2 (aX 9/09).

Articles from Past Issues:

NEW! Reliable Reviews:

Pioneer X-Z9 Compact Stereo System, Pt. 1, By David A. Rich (aX 9/09).

Echo Busters Decorative Acoustical Treatments, By Tom Lyle (aX 9/09).

THIEL SCS4 Loudspeakers, By James T. Frane (aX 8/09).

Grado iGrado and SR-80i Headphones, By Tom Lyle (aX 8/09).

Sony XDR-F1HD, By David A. Rich (aX 8/09).

“Design and Measurement of a Dipole Microphone,” by Mark Williamsen (aX 6/09).

Review of *The Guitar Player Repair Guide*, by Chuck Hansen (aX 5/09).

“Building the Occam Audio MTM 4 Kit,” by Bill Fitzmaurice (aX 3/09).

For information on these and others, visit www.audioXpress.com. And don't forget to check out the links to our other magazines, *Voice Coil* and *Multi Media Manufacturer*!

audioXpress

Home
Magazines
audioXpress
Voice
Multi Media
Manufacturers
Directories
Loudspeakers
Sourcebook
World Tube Directory
Resources
Yard Sale
Classifieds
Advertising
NEW Audio Marketplace
Advertiser Links
Shopping
Reviews
Clubs
Track Listings
Back Issues
audioXpress
Audio Amateur
Glass Audio
Speaker Builder
Web Material
Web-exclusive Articles
Penpals
More - Click Here

Current Issues
audioXpress
March 2007

Ed Simon examines speech intelligibility 1 of his article
Part 3 of 'A Flexible Subwoofer Amp'
Avalon/MOSFET amp rebuild
Product Reviews
- Terk VR-1 TV Regulator
- PNF Audio C
- Plus
- Xpress Mail
- New Products

Voice Coil
Voice Coil February Celebrating 20

VISIT US online

www.audioXpress.com

GENERAL CIRCUITS CO., LTD

QUALITY PCB & SERVICE PROTOTYPE TO PRODUCTION

instant online quote

shopping cart ordering system

China competitive prices

free electrically test



WWW.PCBCART.COM