TUBE FACTORY UPDATE

Since the publication of our lead article on the rebirth of the Blackburn tube company ("New Approach to Tube Design," *aX*, Nov. 2009, p. 6), we've received reports that the factory has closed its doors. The historic—now bankrupt—outfit (formerly Mullard and once the largest tube assembly plant in the world) had planned to produce a series of tube replacements for audio amplification. As further details about the status of the company become available, we will post them on our website (www.audioXpress.com).—Eds.

REVIEWS

I just finished reading the Sept '09 issue for the second time and frankly don't get the change in direction toward more "reliable reviews," which took up 13 of 48 pages. I also don't "understand" the Pioneer X-20 review (but more on that later).

I understand that times are tough, but I also think you must (re)examine where you want to go. Your enterprise was established to serve home constructors. Along the way, for some reason, you got into product reviewing. Nothing wrong with that, if the reviewed products in some way had a tie-in to the home constructor. Please show me some home-constructor tie-in to a $1800 Pioneer compact stereo system—will there be a followup tweak article? (I did appreciate the Echo Buster review and there *is* a tie-in here.)

I don't see *audioXpress* competing or attracting new subscribers with an enhanced review presence. There are already too many entities, especially online, trying to review things. In fact, if your trend continues, I would be prompted to stop subscribing. Unless, maybe, your actual idea is to use *audioXpress* as a forerunner of some new publication like *$ensible Sound* with the intent to ditch constructors if the review magazine is successful.

Regarding the Pioneer review: what I read was some kind of "engineering overview" of some kind of product that I doubt *any* reader would ever even *entertain* the thought of purchasing. There were no comparisons to other equipment, nor any suggestion as to why I might want to "rush right out and buy it." And I did not come away with any sense that it fits in your characterization of "reasonably priced, quality audio equipment"—compared to what? A *complete* waste of my time—and valuable *space* in your magazine.

Charles King
Stellavox1@aim.com

I really enjoyed David A. Rich's review of the Sony XDR-F1HD FMHD tuner in *aX* August 2009. He really lays it all out.

Many tuners and receivers have been manufactured that sound great, but unfortunately don't perform well as they age. In his article, David points out the XDR-F1HD runs hot. This is the case with most tuners and receivers. The resulting heat causes the components to fail in time. Over the years I've owned several tuners and receivers, and thus far, none have enjoyed what most would consider a long life.

The failures I've experienced include everything from the audio going mute after several minutes, to loss of the stereo multiplex. I own one that lost its ability to store stations in its eight presets.

The one thing these troublesome tuners and receivers have in common is that they are AC powered units containing a handful of TO-220 style voltage regulators, which run super hot, and raise the temperature inside considerably. With this in mind, perhaps David might try running the XDR-F1HD with an outside (or external) power supply and report to us the difference in operating temperature. My belief is that if you can equip a tuner with a cool running power supply, it will perform as well and as long as a car radio. I am in total agreement with the reviewer in that car radios blow home radios out of the water when it comes to performance and reliability. How many folks out there have had to throw out their car radio?

Neal A. Haight
Tracy, Calif.

RCA POWER SUPPLY

It's not surprising that Aren van Waarde experienced overheating of potentiometer R9 in his high-voltage regulator (**Fig. 1**, "Regulated Power Supply for Tube Projects," *audioXpress*, 8/09). I'll bet R5 is also hot when R9 (which is connected as a rheostat) is set near its minimum resistance.

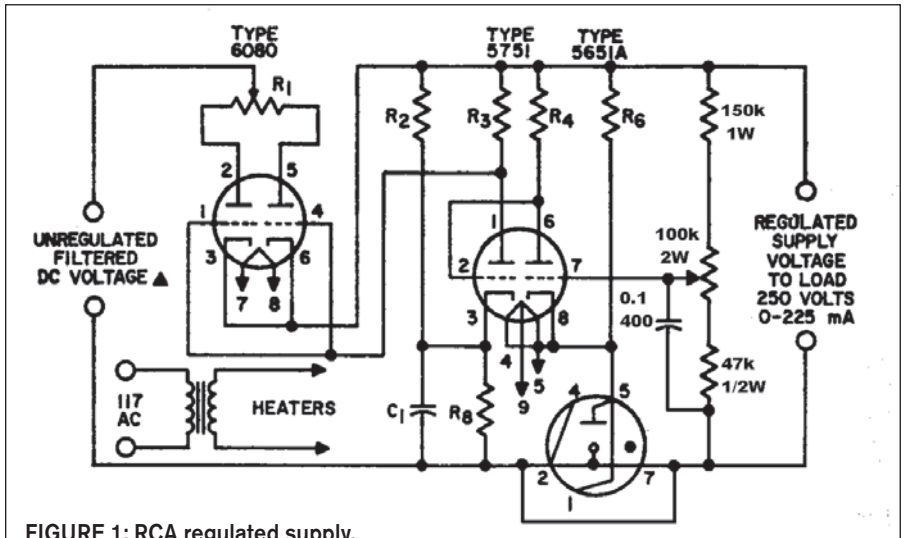

FIGURE 1: RCA regulated supply.

Furthermore, the socket wiring of the 5651/85A2 voltage reference tube as given in the RCA schematic (**Fig. 1**) is such that removing that tube opens the connection to the output ground terminal, while at the same time the regulator pass tube is no longer controlled, allowing the maximum supply voltage to reach the positive output terminal. Not only could the attached equipment receive excessive voltage from the now-unregulated supply (with a ground return path possibly being established via three-wire grounded power cords and the building's power ground system), but a potential shock hazard exists if an *ungrounded* power cord is used on either the supply or the attached powered unit—a person touching both chassis simultaneously could complete the high voltage ground return path through his or her body. This design seems questionable, but the following suggestions should eliminate these problems.

One thing about potentiometers or other variable resistors: Their power rating is for the *entire* resistance element; that is, between the end points. When used as a rheostat where only part of the resistance element is in the circuit (i.e., from one end point to the slider), the power rating must be reduced to the percentage of the total resistance actually being used. For example, if only half of the resistance is in the circuit, the power capacity is reduced to half of what it would be if the entire element was in the circuit; one-tenth the resistance, one-tenth the power capacity, and so on. Unawareness of this has resulted in many a fried pot or adjustable resistor! Unfortunately, the RCA regulator design confronts Aren with this very problem.

Power dissipation in smaller variable resistances may be minimized by using them as true potentiometers instead of as rheostats. This can be accomplished in the RCA circuit by moving the 5651/85A2 regulator tube from the grid of the first triode (right side) of the 5751 amplifier to its cathode (replacing R9), and moving the output adjustment control to the grid circuit. A few circuit changes are necessary in order to do this:

1. Remove R9 (10k pot), R5 (12k, 2W), and R7 (1M, ½W) from the circuit and put them in your junkbox. Be sure pins 4, 5, and 8 of the 5751 remain connected together. Use an ohmmeter to measure between these pins and chassis ground—you should read an open circuit. The filaments in the supply must float above ground and be isolated from all external circuits.
2. Connect anode pin 5 of the 5651/85A2 reference tube to cathode pin 8 of the 5751, leaving R6 (68k, 1W) in place (aside from providing a stable reference voltage for the regulator, this tube also places a +85V bias on the filaments, thereby reducing the potential for cathode to filament breakdowns).
3. Install an external jumper between pins 2 and 7 of the 5651/85A2. This removes the potential shock hazard mentioned above, provided a ground connection exists between the supply and the attached equipment.
4. Construct a voltage divider using three resistances connected in series between the positive regulated output

line and ground, as follows:

a. Connect one end of a 150k, 1W resistor to the positive regulated output line. Connect the other end of this resistor to the right-most terminal (as viewed from the rear) of a 100k, 2W potentiometer (Mouser 785-53C1100K, about $7). Other quality pots rated at ½W or more may also serve.
b. Connect the center terminal (slider) of the potentiometer to grid pin 7 of the 5751. Bypass this pin to ground with a 0.1µF, 400V capacitor.
c. Connect the left-most terminal of the potentiometer to one end of a 47k, ½W resistor. Connect the other end of this resistor to ground.

Everything should now be cool with the possible exception of the 68k resistor when the output is around 300V, although it will still be within its power rating. I might be inclined to use a 75k, 2W resistor here if I had one. If the desired output range is not spread across the full rotation of the 100k pot, change the two fixed resistors in the divider as necessary while keeping the total divider resistance in the vicinity of 300kΩ.

Note that removal or failure of the 5651/85A2 reference tube will now cause the output of the supply to drop to its minimum value.

Keith Kunde
Independence, Ohio

Aren van Waarde responds:

Thanks for your warning regarding potentiometer ratings and your concern for the good health and electrical safety of the readership of *audioXpress*. In my homemade copy of the RCA psu, I used an ungrounded power cord and a cabinet made of insulating material. Thus, it is not possible to touch the PSU chassis directly. Moreover, the output meter will provide a warning sign if the output voltage turns to maximum because of catastrophic failure of the 85A2 voltage regulator tube.

Yet, your suggestions for improvement of the RCA schematic are most welcome. The figure which you have added indicates clearly which amendments you propose. I have not yet tried this modification (because of the fact that my junkbox does not contain a 100k 2W potentiometer), but I expect that the modified circuit will work well.

TURNTABLE TESTING

I think that the turntable-strobe devices reviewed by Gary Galo (*aX* 7/09, p. 24) represent overpriced foolishness. The classic solution to this problem is, of course, a printed cardboard strobe disc, which used to be available in the US for about a dollar, plus a cheap neon lamp and resistor on an AC cord, costing perhaps another dollar. Galo observes more or less correctly (although, see below) that the lamp and turntable motor can both be affected by line-frequency variations, but exactly how big are these? Unless you listen to records using a dodgy backyard diesel generator, the answer seems to be: not big enough to matter.

Years ago, I became curious enough to chat up the chief engineer of my local electric power utility (I then lived in a large midwestern metropolitan area) who told me that prevailing US electric utility standards then called for regulating the frequency within ±0.3%. Note that there's only one significant digit of accuracy in this figure. It amounts to

slightly more than ±0.2 rpm in a nominally 78 rpm turntable, and it's less than the variation in standard tuning pitch (the frequency of "A" above middle "C") used by many of the world's major orchestras. Unless your sense of pitch is acute, a listener is unlikely to notice such a small difference. Of course, rapid pitch changes ("wow" or "flutter") are a different story, but stroboscopes can't cure those anyway.

This engineer pointed out to me that there are at least two good reasons to keep the power line frequency under reasonably tight control:

1. When a generator is switched on or off a power grid, which happens more often than you might think, its frequency and phase must be closely matched to the grid in order to avoid a huge switching transient. History has shown that a small error can trigger a big, expensive disaster!
2. The US power grid still supports an enormous number of clocks and timers powered by synchronous motors, many of which are operated by the utilities themselves, so they can't allow much drift. If the line frequency is low for a period of time, then it must be run high for an equal period in order to cancel the error. Practically speaking, the goal is to keep these averaging periods short enough (just a few minutes) that a human with an electric clock won't notice the difference.

If your turntable has a reasonably heavy platter and well-oiled bearings, it should have enough inertia to maintain adequately constant speed over such periods of a minute or two, so I think that readers should save their money for some other hi-fi non problems!

Scott B. Marovich
East Palo Alto, Calif.

Gary Galo responds:

I disagree with Mr. Marovich regarding the KAB Speed Strobe being overpriced. At $99 I consider it to be a fair value for what it offers, particularly the ability to measure the 12 most common "78-rpm" speeds. No other currently available strobe that I'm aware of offers this capability. There are a number of 78-rpm turntables available that do not offer digital readouts, so the only way to get repeatable settings is with the KAB Speed Strobe.

Regarding the unimportance of a 0.3% error, to musically sensitive listeners with acute pitch sensitivity, such an error is audible. There's more to be concerned with than just pitch. For those who collect historic vocal recordings, even very small changes in pitch can affect the timbre of a singer's voice. A 0.3% error represents the difference between A = 440Hz and A = 438Hz (European vocal recordings made early in the 20th century often have a pitch reference a bit lower than A = 440). Many serious vocal collectors, and I count myself among them, will tell you that such a difference is not without consequence.

If an expensive amplifier sounds the same to you as a cheap amplifier, by all means purchase the cheap one. If a conventional strobe illuminated with the AC supplied by your power company is accurate enough for your needs, don't spend another dime. But, if the additional accuracy offered by the KAB makes a difference to you and/or you have the need to measure common "78-rpm" speeds, the KAB is fairly priced, in my opinion.

SOUND DIFFERENCES (CONT.)

Kent Smith owes the AES an apology for his cheap shot in "Amplifier Differences and Lack of Tests (*aX* 7/09, p. 5)." There are no secrets being withheld from the common masses except for the willfully ignorant cheapskates choosing not to become members. I presume Mr. Smith pays for *audioXpress*, and he should expect to pay the membership fee that supports the publication of AES research papers.

Furthermore, musicians often are the worst judges of audio performance because they hear their instruments from a drastically different proximity and direction in comparison to the audience's perspective that recordings attempt to capture. A drum up close produces ear-damaging painful transients that cause tension for the listener that could trigger a stapedius response that partially mutes the sound. Perhaps the clipping in his grossly underpowered amp simulates the same effect at a comfortable loudness, but it is not surprising that he would prefer the softer clipping of the tube amp. On the other hand, compressed music with vastly more of the music at the maximum level would be most damaged by a lack of amplifier power, so it is no surprise that the 60W IC would beat a 2W tube.

There is no lack of material from AES regarding amplifier overload, but it becomes moot if you use an adequately powerful amplifier. Frankly, I find the comparison of two inadequate amplifiers about as exciting as a drag race between a Smart Car and a Tata. I've been doing live recordings (including the Ypsilanti Symphony) for many years with a coincident pair of AKG C414B-ULS microphones and no signal doctoring, and my recordings always sound most accurate when the amplifier is not clipping. Since my budget is not unlimited, a test for Watts per Dollar will do in most cases.

Dennis L. Green
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Kent Smith responds:

I would like to thank Mr. Green for the invitation to join AES. For some reason, I had the idea years ago that the AES was only for degreed professionals who worked in audio. I assumed I wasn't qualified until I looked at their website. Truth is, they appear very interested in including us all as Associate Members! For this, I do indeed apologize to the AES and to Mr. Green personally as well. It does not appear to be the secret society I once thought it was. But I must admit I'm cheap; I'm still thinking about whether I want to spend over $200 to get the membership and access to the e-library for one year.

Of course, I agree with Mr. Green's other comments as well. I know some musicians with horrible playback systems, and I'm still amazed how they can hear subtle differences that I notice only when they point it out to me. I guess quality isn't everything! Fortunately, my son is only 23 and hasn't blown his ears out yet.

Of course, when doing a comparison listening test, we avoided levels that would clip the amplifiers, kept the gain about the same, and used a listening level that was below where ear distortions begin, so maximum power levels of the amplifiers are of no consequence, of course. The 2W amp into my high-efficiency

two-ways (Eminence Pro 8″ in vented box at 50Hz and Hi-Vi Planar tweeter) produces up to 95dB at 1m, which is quite adequate for me (I don't like loud anymore). Most important, this little amp produces acoustic instruments correctly, including the timpani (I go to classical concerts), where the LM3886 chip does not. So I must stand by my other non-AES-related comments.

Weird, huh? Sometimes, I still can't believe that I have become one of those weird tube people. Would the AES still welcome me?

TUBE CALCULATIONS

Regarding the article by Pierre Touzelet ("A Graphical Evaluation of Harmonic Distortion in Valves," July '08, p. 42), it is possible to determine up to the fourth harmonic with this method:

$$\%2^{nd}\text{ harmonic} = \frac{300(A + B - 2P)}{4(A + C - D - B}$$

$$\%3^{rd}\text{ harmonic} = \frac{50(A + 2D - 2C - B)}{(A + C - D - B)}$$

$$\%4^{th}\text{ harmonic} = \frac{25(A + 6P - 4C - 4D + B)}{(A + C - D - B)}$$

It is also possible to use this method for a class A push-pull amplifier. Let A C D B P be the anode current for a single tube. Let A' = A – B, B' = B - A, C' = C – D, D' = D – C, P' = 0. Put in the values for A' B' C' D' P' in the formulas above and you get the distortion from a class A push-pull amplifier.

It is also possible to use this method for a class AB push-pull amplifier. A' = A, B' = -A, C' = P, D' = -P, P' = 0. Put in the values for A', B', C', D', P' in the formulas above and you get the distortion from a class AB push-pull amplifier.

Of course, you can also use the formula for transistors or different combinations of transistors. The A B C D P must not be a current, it can also be a voltage. For example: Calculate the distortion from an MJE 340 emitter follower with a 1kΩ emitter resistor. Input voltage swing 20Vpp:

Vb	Ve
5V	A = 4393.7mV
10V	C = 9373.9mV
15V	P = 14362.8mV
20V	D = 19355.0mV
25V	B = 24349.1mV

$$\%2^{nd}\text{ harmonic} = \frac{300 \times 17.2}{4 \times 29936.5} = 0.043\%$$

$$\%3^{rd}\text{ harmonic} = \frac{50 \times 6.8}{29936.5} = 0.011\%$$

$$\%4^{th}\text{ harmonic} = \frac{25 \times 4}{29936.5} = 0.0033\%$$

Rickard Berglund
Sweden

HELP WANTED

I'm trying to replace a speaker design book that I bought at a walk-in Heath (kit) store. I think it was published by McGraw-Hill. It had "classic" old designs such as Paragons, corner Klipschs, and so on. My copy ended up in a box that went to a group known as "Friends-of-the-Library."

Is it possible that someone may remember the title? This book, with designs from the 50s and 60s, and printed in the 80s, is most likely out of print.

Austin M. Gillette
La Pine, Oreg.
aX