

LOW-NOISE TRANSISTORS

I read Wayne Torrey's letter ("Head Amp Design," p. 48) in the Nov. Xpress Mail with interest because it caused me to return to Paul Rossiter's article, which I had somehow overlooked—odd, because I usually read *aX* cover-to-cover. It turns out we had built a very similar preamp for moving coil pickups back in the 70s at dbx. It used complementary low noise low rbb' overlay transistors (2N5109 and 2N3688, if I remember correctly) with which I had been familiar from work with broadband RF preamps.

I wanted to make you aware of a good place to buy Japanese transistors: www.bdent.com. Unfortunately, the Toshiba 2SC3329 is no longer available although its complement, the 2SA1316, is. Hitachi also made similar parts: 2SA1084 and 2SC2546 (also not available.) The best now available are Sanyo 2SA1016K and 2SC2362K. If you have trouble getting these, I have a few dozen of each I'd be willing to sell.

René Jaeger
rene@jaegeraudio.com

Wayne Torrey responds:

Thanks very much for the information you provided. I have found a couple of places that advertise some of the 2SC3329s, but have yet to confirm their claims. I will try to buy some, but failing that will contact you regarding the devices you mentioned.

Paul Rossiter's design of a low noise MC head amplifier is impressive. He has taken an old circuit concept and modernized it with state-of-the-art performance. Amazingly, his design is little more complicated than Dr. Marshall Leach's current mirror MC preamp.

The article is an excellent tutorial on low noise audio design. I highly recommend the classic Low Noise Electronic Design (Motchenbacher and Fitchen,

Wiley, 1973) to those wanting to learn more on this subject. The 1993 edition is the latest, but it's expensive and the theory of low noise audio design hasn't changed since 1973. The 1973 edition is available on the Internet for about \$20.

I was wondering whether Mr. Rossiter tried other input transistors such as the Zetex ZT650 and ZT750 or the 2SA970 and 2SC2240. These transistors were used as the first stage in some old MC preamp designs.

Ray Futrell
Great Falls, Va.

Paul Rossiter responds:

I thank Ray for his interest in the article and for mentioning the excellent book by Motchenbacher and Fitchen, which is indeed available in the 1973 version for around \$20 on the Internet.

I haven't tried the transistors mentioned and am not familiar with the Zetex devices. I expect that the 2SA970/2SC2240 would operate fine in the circuit, though with a slightly inferior noise performance, maybe around 2dB higher noise, which would place them between the recommended 2SA1316/2SC3329 and the 2N4401/4403 combination in noise performance.

I have some questions regarding Paul Rossiter's MC pre-preamp design in the September 2006 issue of *aX*. Marsh's pre-preamp of 1982 (*TAA* 1/82) had similar design goals with inspiration from an article by Moncrieff in *IAR* which might be of interest to him. I mention this because it wasn't one of his references. Also, John Adelsbach described a simple beta measuring circuit that might be helpful for matching the transistors.

And, would the 2SC1316/2SC3329 transistors be an enhancing substitute for the 2N4401/03 in circuits such as Marsh's Pooge-3? In other words, could

they replace them in circuits to good effect?

Mark Henschel
mhenschel@quadrangle.ca

Paul Rossiter responds:

Thank you for your interest in the article and additional references, which I am sure will be of interest to readers. My preamp was originally developed in the late 1970s (inspired by Marshall Leach's preamp published in 1978) and a number of them then built and used by friends and colleagues.

I am unable to comment upon the substitution of 2N4401/3 by the 2SC1316/2SC3329 in other circuits in general. While the lower base resistances of the 2SC devices will provide the potential for better noise performance, any differences in high frequency parameters could lead to issues with stability, particularly if large amounts of feedback are involved.

SAFETY NOTE

In Dennis Colin's "FET Standby Switch" (*aX* 12/06), the stator in S1b is connected to a lethally high voltage. In ham radioland, where high voltage is used for our kilowatt amplifiers, a relay is used to prevent accidental contact. Colin's method introduces an element of lethal risk that could be avoided by the use of a relay.

Readers should be warned.

Jack Walton
jdwalton@comcast.net

Dennis Colin responds:

Thank you for expressing your concern about safety. The switch stator terminal is connected to a maximum of 518V through a 10k resistor, so over 50mA is available. This is enough to electrocute someone. In order for the metal switch handle to become charged to the HV, two things would have to fail: the stator would need to short to the handle, and the handle, encased in

grounded metal, would need to lose all contact with that ground.

In over 40 years I've never had this type of toggle switch fail in either mode—I've tested hundreds of such switches—and for both failure modes to occur together would (if UL approved) have a probability of one in billions. However, I agree that all possible safety measures should be employed. Of course, a relay coil could short to its HV contacts too, but it's another step in reducing the odds of (extremely unlikely) combined failure mechanisms.

A far more likely possibility for electrocution exists in the vast number of AC line switches; people tend to take "only 120V" for granted—but there are many electrocutions (one is too many) from 120V AC.

But because 500V is much more lethal, and many tube amps use panel switches for HV control, I recommend covering toggle switch handles, if metal, with a thick plastic sleeve, or two layers of heat-shrink tubing. In fact, I just this minute did this on my amp.

A relay is a good idea. In my high-power (250W) "Mad Katy" amp (*aX* June '06), I found that interrupting 500V DC at 1A made a $\frac{1}{2}$ " arc that would melt most relays, contacts and all. The FET switch handles it fine. But, of course, a relay can be used to switch the FET.

In that article, I warned readers that the Plitron chassis (PAT-CASE-22) came with black anodized screws, which did *not* connect the anodized chassis parts together—one short could mean 500V on the whole front panel!

I appreciate your letter; we all need to consider safety first and always.

CIRCUIT REDUX

Since 1953 I have been familiar with the Van Scoyoc circuit, which Joseph Marshall used in series amplifiers (the so-called Golden Ears, published in *Radio Electronics* in 1953 and 1954). I built these a long time ago one with exceptional results.

The article in *audioXpress* of November ("Improving the Cross-Coupled Inverter," pp. 40-41) did give me immediately the impression of "déjà vu," and it is indeed an exact copy of the one published by Nicholas Pryor in *Radio and TV News* October 57 p. 112.

It was, however, a good idea to bring the excellent Van Scoyoc circuit to the

attention of younger readers, but reference should have been made to Nicholas Pryor.

It is also important to know that many investigators—among them David Hafler and Joseph Marshall—found that increasing the input tubes cathode loads and the inverter section (about 7000 and 2400 Ω) considerably improved the results. Ref: *Radio-Electronics*, August 1956: Laboratory Golden Ear, p. 42.

F. Derom
Ghent, Belgium

COMFORT FOOD

Mr. Dell's editorial ("Undernourished Ears," *aX* 11/06) was music to these ears!

The Acoustic Research showroom at Grand Central Station has a lot to answer for. As a newcomer to high fidelity reproduction, I made a point of visiting that audition booth on each visit to New York, and although I didn't import AR speakers to Europe, I did buy Dynaco kits for building equipment which I had first auditioned there. These introduced me to a lifetime of interest in audio elec-

tronics which continues to this day. The Dynaco equipment, now in much upgraded form, is still in daily use both in my main listening room and in my study.

Your own publications also greatly helped—I have the complete sets of *Audio Amateur* and *Speaker Builder* and continue to be a subscriber to *audioXpress*. It is always an instructive pleasure to read, *inter alia*, Charles Hansen's contributions—long may he continue to inspire your readers to create and rejuvenate test and audio equipment through the descriptions of his work.

I do have an MP3 player for use out of doors, and agree with you that it is sad that through it many people may miss the opportunity to hear high-end audio. At least members of Ed Dell's and Charles Hansen's families don't fit into that category!

Bravo! Thank you and best wishes for your continued success.

Jim Whittaker
Var, France

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The graph shows Noise - En (nv/√hz) on the y-axis (0 to 3) versus Frequency on the x-axis (10hz to 100khz). Three curves are plotted for 1mA, 2mA, and 3mA bias currents. The 1mA curve is the highest, followed by 2mA, then 3mA. All curves show a decrease in noise as frequency increases. The LSK 389 Series is identified, and the LINEAR SYSTEMS logo is present.

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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*!

TRIED 'N' TRUE

In the December issue of *aX*, Keith Howard's "Sonic Shakedown" (p. 56) brought to mind a problem I have encountered with CDs and DVDs.

People have brought me numerous units that have quit playing CDs and DVDs. After much head scratching, mental anguish, and a monoscope [a hand-held inspection microscope], I have discovered airborne fibers, hair [human and pet], and carpet embedded in the mechanical mechanism (slides and gearing), which slows/stops jumps the tracking assembly.

Also, I have discovered such particles in the laser focus mechanism, as well as static cling on the discs themselves and on the lens systems. For these reasons (and the ones mentioned in the article), I do not buy CDs, DVDs, or equipment that uses this new medium.

I prefer vinyl or my "old" reel-to-reel tape players. I purchased some of my equipment in the early 1960s, and it is still in working condition—after replacing a few tubes and caps. A cotton swab and alcohol cleans most problems. There's no need for a complete new mechanism.

*Dale Patterson
Dassel, Minn.*

P.S. Besides, I do not want to repurchase audio tracks I already own.

KR TUBES

I found an article in the Dec. '01 issue of *audioXpress* about the Revenge KR842VHD tube amplifier written by Mauri Pännäri. I would like to know more about this amplifier. Is there a comparison of the KR842VHD amplifier and an amplifier that uses EL84 tubes? Is there a monoblock version? Where can I listen to the KR842VHD? Is this amplifier sold ready-made? What is the price? (I am not a DIYer.) Thank you for your help.

*E.A.M. Gussenhoven.
elgussenhoven@hetnet.nl*

Mauri Pännäri responds:

Handmade KR842VHD triode tubes and usual industrial EL84 pentode tubes are totally different animals, and straight amp

comparison, as you put it, is not fair.

This amplifier was a self-made tribute to excellent KR tubes, the KR842VHD being in prototype phase when I received them during my trip to the KR factory in 2001. So this was purely a do-it-yourself construction project and initially a stereo version.

The amplifier as such is not then readily sold anywhere. But you can perhaps listen to a commercial KR842VHD single-ended stereo integrated amplifier, KR Antares 320, which has a solid-state driver circuitry but 842 triode end tubes giving over 15W/channel. I listened to a prototype at KR during my trip, and liked what I heard: dynamics and volume. You can check for a local dealer by contacting KR at www.kraudio.cz/ and see some data about KR tubes and amplifiers.

I have used this amplifier for about two to three hours daily in my living room since 2001, so I can verify thousands of tube-life hours. And this is worth no soft heater startup or delay in anode supply circuitry, supporting what I stated in my original article. And I have not yet needed a better amplifier.

EXPANDED MARKET

The service you provide to the electronic enthusiast is indeed incalculable. To open the individual to an awakening of his intellect and to the process of exploratory thinking is what your magazine is all about. Because your magazine is the sole avenue for an individual's self-expression, it is a great outlet for the reader and, of course, the author. I'm sure it imports enjoyment and stimulation to many electronically oriented minds. I cannot imagine a world where the free association of ideals this magazine presents would not be available. I applaud you for making this possible!

With a magazine that offers so much for the development of the individual, would it be possible to extend your advertising to companies not directly associated to the general philosophy of your magazine? For example: Xerox, Hewlett-Packard, General Electric, Rockwell Collins, Apple, Microsoft, Dell, Northrop Grumman, Boeing, Lockheed, and so on. I would hope they would want to contribute to your enterprise. **aX**

*Joseph D'Appolito
Wolfeboro, NH*