CORRECTIONS

In my article "The Venue Loudspeaker" (Nov. *aX*), there are two errors: on p. 17, top: "3. 1.1kHz dip (L3, R3, C3)" should be (L3, R2, C3); and on p. 18, right: "0.34g/15µS = 23kHz" should be 0.349.

Dennis Colin,
Gilmanton I.W., NH

The graphs in *Figure 3* and *Figure 4* of my article "Build a Flat Panel Speaker" (*aX* 11/06) are switched. The graph with the title "Radiator 'A'" should be with the *Figure 3* caption: Traditional loudspeaker in free space and with boundary. The graph with the title "Radiator 'B'" should be with the Figure 4 caption: DML in free space and with boundary.

Daisuke Koya
dkoya@mac.com

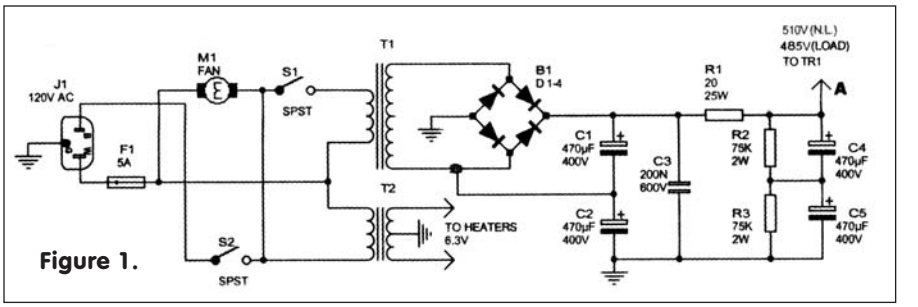

Figure 1.

I've long enjoyed Joseph Norwood Still's excellent and practical tube amp articles, including "Two SE Power Amps. . ." (*aX* Nov. '06). However, the power supply (*Fig. 2*, p. 31) has an error: the junction of C1/C2 will charge to the negative peak of half the transformer secondary voltage, destroying C2. He describes it as a FW bridge voltage doubler; T1 is listed as 200V AC output. If this is for each half, then there'd be 565V DC (less diode drops) across C1, if the center top weren't grounded.

Also, the heater transformer is listed as 12.6V AC, but the schematic shows 6.3V heaters—the tubes would light up like a Christmas tree, for two seconds!

Regardless, I commend you for proving that you can have your cake (SE amp) and eat it too (low distortion)! Thanks for the excellent articles.

Dennis Colin
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Joseph Norwood Still responds:

Thank you for your comments. Although the heater voltage in the parts list states it is 12.6V, it is actually 6.3V—per Hammond P.N. P-T 16656A. So if you order P.N.P.-T 166 S6, you will have a 6.3V transformer and not a 12.6V transformer and all is well.

The C.T. of high voltage transformer T1 is shown as grounded. This is incorrect. The center-top should be shown as ungrounded (see **Fig. 1**). I should have caught these errors when I reviewed the page. Unfortunately, I didn't! Again thank you, Mr. Colin, for doing my job for me.

QUICK CHECK

I enjoyed reading Charles Hansen's article on a phase-meter tester (*aX* 11/06). In fact, I have enjoyed all the articles he has written.

I thought readers might appreciate this circuit (**Fig. 2**) used by Hewlett-Packard for checking the accuracy of the HP3575A Phase-Gain Meter. It provides a very accurate 90° phase shift at 10kHz. Of course, matched silver mica capacitors and high-quality resistors will ensure a high degree of accuracy.

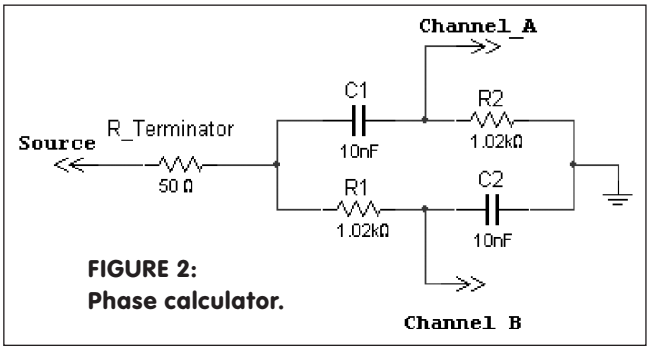

FIGURE 2:
Phase calculator.

Jack Walton
Short Hills, NJ

INVERTER DESIGN

My thanks to Robert Bennett for his response (*aX* 10/06) to my questions regarding his article "An Improved Split-Load Phase Inverter" (*aX* 7/06). His comments were well thought out and clearly presented.

While the actual drive "connection" into his inverter stage from the preceding pentode stage can be debated, we both agree on the outcome of the design: The effect of the bootstrap connection does increase the gain of the preceding pentode stage rather dramatically, as I originally suggested. Furthermore, as Mr. Bennett has now shown, this gain in-

crease can be "modified" by the bootstrap connection to help reduce the splitter's ill effects if the cathode channel should become momentarily shorted. Taken as a whole then, it does, in fact, represent an "improved" phase splitter design.

Robert's reminder to consider the circuit as a whole is right on target. My original "red flag" centered on his statement that the pentode's gain is unaffected by the bootstrap connection, when in fact it is. However, I did not take my analysis further to consider the circuit in total under shorted cathode channel operation as he did. I will explain why in a moment, but for now, I thank Mr. Bennett for his reminder and analysis of his circuit under that condition.

When the total circuit *is* considered, then a relative value can be placed on the improvement the bootstrap connection makes in splitter operation under adverse conditions. Using his own figures (with which I generally agree), Robert's complete circuit *without* the bootstrap connection has a total gain of about 207 from input to either splitter output. If the cathode channel becomes shorted in this configuration, the total gain from input to splitter plate output rises over 16 times to nearly 3500, because the splitter stage is now providing active gain rather than a loss. With the bootstrap in place, the total gain starts at nearly 1100.

When the cathode channel is shorted in this condition, the total gain to the splitter plate output rises to nearly the same 3500 as before, but in this case, it is only an increase of about three times as opposed to that of over 16 times before. Hence the improvement, all as Mr. Bennett suggests. While the improvement is significant, it is still well short of eliminating the effect as suggested. But the question is, can the improvement really help?

It's understood that this discussion deals with a phase splitter that is directly driving a class AB1 push-pull output stage, which is the most likely configuration in which an overload of the following (output) stage can cause a shorted cathode channel condition at the splitter stage in the first place. So assuming an overload signal of sufficient length and the splitter stage itself does not overload, let's see what happens in this configuration when the output stage does.

On the first positive going cycle presented to the phase splitter that's capable of overloading the output stage, the cathode channel will drive its output tube to a zero bias condition, and basically clamp the splitter's cathode signal at that point to prevent any further increase during this cycle—although the setup for R/C "blocking" in this channel is already beginning. As the overload signal continues to increase beyond this point at the splitter's input, the splitter's plate channel will continue to drive its output tube further negative, but now multiplied (in Mr. Bennett's design) by a factor of three because of the splitter's cathode clamp.

But so what? This tube was already cut off when the cathode channel's output tube reached its zero bias point by definition. Then the overload cycle to the splitter goes negative, and problems start to develop real quickly. This time, the cathode channel output tube's operating point will start to drift negatively because the blocking effect previously set up in this channel has started to kick in, cutting the tube off earlier.

The channel will continue to drive this output tube further negative, but again at this point, so what? The tube was already cut off when the plate channel's output tube reached its zero bias point, so what does a little more cutoff matter? The plate channel has driven its output tube to a zero bias condition during this cycle, but this time without the aid of any extra amplification by the splitter stage because its cathode was not clamped during this cycle—although the setup for blocking in this channel is now beginning as well. Therefore, on the second consecutive positive overload cycle into the splitter, the plate channel output tube's operating point also starts to drift negatively, with the process repeating itself on each cycle until the overload is removed.

So once again, blocking is the main culprit in this configuration at overload (it usually is when R/C coupling is used into the output stage), as realistic shorted cathode channel operation at the splitter causes it to misbehave in a sort of half wave benign way per say, and is the reason I did not consider it in my original letter. However, the bootstrap connection in Mr. Bennett's splitter does help to control overload in the splitter itself when its cathode does become clamped. This minimizes needless excessive cur-

rent flow through the stage during positive going overload cycles presented to it, and therefore works to contain (but hardly eliminate) the overload blocking effect in the cathode channel, were it not in place. I would add that using cathode bias in the output stage and minimizing any global feedback will help to soften the overall blocking effect if this configuration is used.

Ultimately for me, the beauty of Mr. Bennett's design is the increased gain it provides under normal operating conditions, without the necessity of an additional gain stage to achieve it. As for the phase splitter itself, I choose to all but eliminate its potential misbehaviors through its location and design, in relation to the associated circuits it interacts with. You can then decide for yourself how to best apply the merits of Mr. Bennett's design to your own projects. I thank Mr. Bennett for putting his idea forth, the time to prepare it into article form, and for his thoughtful response to me.

David Gillespie
Atlanta, GA

Robert Bennett responds:

Mr. Gillespie again raises some interesting points in his latest letter. With the bootstrap circuit, there is a tradeoff between the gain and the symmetry of output impedances. By making the pentode's load resistor very small in comparison to its anode resistance, the output impedances approach the same value, but the gain is less. The values given in my article are a compromise, but lean more toward high gain. It might be possible to get both features by running the pentode at very low screen voltage, but I suspect that attempts to get much higher gain from the circuit would result in hum and distortion problems.

The second point of Mr. Gillespie's is one that I had not considered. I think he is correct that cutoff of the output valves reduces the effects of an overload. It is an interesting thought that a Class AB1 amplifier could have a smoother overload or less distortion than a Class A one.

Once again, I would like to thank Mr. Gillespie for his very interesting analysis and comments. *aX*

aX Online Review

SONY CD/DVD PLAYER MODEL DVP-NS55P

By Jesse W. Knight

Many months ago I took a few DVDs to Radio Shack and Tweeter to test them on better equipment. My Toshiba 19″ TV with built-in DVD player was giving poor performance (via the headphone jack) on discs that had received good reviews for sound quality. Many critics who review DVD are picture-oriented, and to put it mildly, are not audiophiles. I wanted to perform my own tests using studio monitor headphones. I was not surprised to find that a Cinevision 1000 player costing $300 sounded much better than the TV. Better still was using a Rotel home theater amplifier costing $1200 to do the sound decoding, rather than depending on the DVD player's two-channel analog output.

Needless to say, I was overjoyed to find a Sony player for only $70 that delivers excellent sound from both Dolby 2.0 and LPCM formats with any good stereo amplifier. For DTS or Dolby 5.1 you will need a home theater amp. Better still, it performed well on every disc in my collection, including two that I thought were hopeless. ■

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Grand Prize winner of the five CDs:

Michael F of Arden, NC

Runners-Up (Winner of one of the five CDs of their choice):

Bert B of Brooklyn VIC, Australia

Terrence F. of Portland, OR

Kevin F. of Apalachin, NY

Donald T. of APO, AE

Luut S. of Vriezenveen, The Netherlands

Congratulations to our winners and thank you to all who participated!