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<b>From:</b>	<b>Jellohead Page</b>
<b>Date:</b>	7/23/2002 4:27 AM
<b>Subject:</b>	<b>Mesa Mesa - Brutal Distortion Question</b>

How does Mesa's Dual Recifier and triaxis amps achieve their "brutal distortion" sound? Mesa uses this tone description in their sales literature to describe these amps, and I have to admit these amps sound very brutal. They seem to have a lot of low end without too much fartiness, although I would not claim these amps to have a lot of definition. Can this sound be achieved using an effects box, driving let's say a fender or old marshall? If so how.

The brutality tone thing is not really my bag but might come in handy under the right circumstances.

Your pal,  
Jellohead

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<b>From:</b>	<b>PeteR</b> ( <a href="mailto:valveart@zipworld.com.au">valveart@zipworld.com.au</a> )
<b>Date:</b>	7/23/2002 8:22 AM
<b>Subject:</b>	<b>Obithree kinobe</b>

I've been messing around with a Boss ODB-3 bass overdrive pedal. It gives a pretty brutal, metal type tone using Fenders and cleanish Marshalls. It has a mix (wet/dry) control which is cool and has tone controls for highs and lows.

I'm with you in not being into tone brutality, but when I have to this gadget does the stuff - especially when using drop D and the like. Have a play with one if you get the chance.

HTH

PeteR 

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<b>From:</b>	<b>Percy</b>
<b>Date:</b>	7/23/2002 11:28 AM
<b>Subject:</b>	<b>Re: Mesa Mesa - Brutal Distortion Question</b>

I really like that sound. It's so brutal! Anyway, a SansAmp pedal will give you that sound (especially with a solid state amp). Then you can use a POD into an amp. MOSFET based distortion boxes can sound close too, there's not many commercially made MOSFET distortions.

It will not sound exactly like a Dual Recto, but close.

Percy

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<b>From:</b>	<b>SLObrain</b>
<b>Date:</b>	7/23/2002 9:18 PM
<b>Subject:</b>	<b>Re: Mesa Mesa - Brutal Distortion Question</b>

The Dual recto is a ripoff of the Soldano SLo in the beginning gain stages but they changed up the circuit and cap values in the power section.

These amps sound gritty to my ears. The real SLO can get brutal if you mod the power amp section right and change to a different power tubes.

SLB

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<b>From:</b>	<b>km</b> ( <a href="mailto:solrizzo@hotmail.com">solrizzo@hotmail.com</a> )		
<b>Date:</b>	7/24/2002 12:52 AM		
<b>Subject:</b>	<b>Re: Mesa Mesa - Brutal Distortion Question</b>		

i agree- i think the dual recto sounds "scratchy"-lots of gain but no TONE.--try a jmp1 or a jcm800(with a tube screamer pedal) or even a jcm2000. better tone-less money.

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<b>From:</b>	<b>EW</b> ( <a href="mailto:worxdesigninc@yahoo.com">worxdesigninc@yahoo.com</a> )		
<b>Date:</b>	7/25/2002 12:14 AM		
<b>Subject:</b>	<b>Re: Mesa Mesa - Brutal Distortion Question</b>		

I thought that Mesa's products were more of a hot-rodded Fender while the Soldano's were more of a hot-rodded Marshall (Which, of course, also has Fender family ties). Is this wrong? Feel free to correct me, as I find that I am mistaken quite a bit. 😊

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<b>From:</b>	<b>Matt</b>		
<b>Date:</b>	7/25/2002 4:26 PM		
<b>Subject:</b>	<b>Re: Mesa Mesa - Brutal Distortion Question</b>		

I think most of the earlier designs through the Mk IV were more Fender based (early tone stack, no cathode follower?) while the DR/DC series is more Soldano/Hot-rodded Marshall (cathode follower driven tone stack just before PI). But hey, I'm mistaken quite a bit two!

That reminds me of a sort of trivia question: What's a sentence in English that can be spoken correctly but not written correctly?

There are many but here's one:

There are three ways to spell the word "to"; t-o, t-o-o, and t-w-o.

Matt

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<b>From:</b>	<b>dutch</b> ( <a href="mailto:pylot@aztec.asu.edu">pylot@aztec.asu.edu</a> )		
<b>Date:</b>	7/26/2002 1:09 AM		
<b>Subject:</b>	<b>Re: Mesa Mesa - Brutal Distortion Question</b>		

*But hey, I'm mistaken quite a bit two!*

Oooh--bad pun, no biscuit! 😊

You are correct about the topology differences between the Mk. series and the Recto series, though....

C ya,  
Dutch

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<b>From:</b>	<b>dan mccue</b> ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	7/24/2002 1:52 AM		
<b>Subject:</b>	<b>Re: Mesa Mesa - Brutal Distortion Question</b>		

hi j.h. i found the key to that style of dist is a mix of v gain w/ a lot of transistor/tube current.

dan mccue

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<b>From:</b>	<b>Kursad K</b>		
<b>Date:</b>	7/27/2002 2:05 PM		
<b>Subject:</b>	<b>the key is... a resistor in series with the coupling cap</b>		

A large resistor (470K - 1M) in series with the coupling caps keeps the blocking distortion away without needing to reduce the bass. This may alter the tone of that gain stage and make it less tubey, also.

Kursad

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<b>From:</b>	<b>Kursad K</b>		
<b>Date:</b>	7/27/2002 5:22 PM		
<b>Subject:</b>	<b>Re: the key is... a resistor in series with the coupling cap</b>		

In fact, if you happen to look at Mesa schematics, that's exactly what they do.

Kursad

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<b>From:</b>	<b>Jean</b> ( <a href="mailto:fourquet@hormail.com">fourquet@hormail.com</a> )		
<b>Date:</b>	7/28/2002 9:04 PM		
<b>Subject:</b>	<b>Re: the key is... a resistor in series with the coupling cap</b>		

where???? in wich circuit they do this??

do you have an example??

""""  
In fact, if you happen to look at Mesa schematics, that's exactly what they do.  
""""

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<b>From:</b>	<b>Tracy</b> ( <a href="mailto:jasutami@msn.com">jasutami@msn.com</a> )		
<b>Date:</b>	7/29/2002 3:38 AM		
<b>Subject:</b>	<b>Re: the key is... a resistor in series with the coupling cap</b>		

Hi  
My experience that the lower value grid load resistor to ground lowers the bass response.  
The resistor in series between stages with no bypass cap takes off some of the highs.  
They both have an effect on the gain, but thats the way I think about it.

What I noticed about boogie amps and experimented with was polypropelene foil coupling caps  
and tantylum cathode bypass caps in the preamp.

I first noticed this inspecting a mesa Son of Boogie amp.

use those components in a higain preamp and you will get that exploding dual recto sound

Tracy

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<b>From:</b>	<b>Kursad K</b>		
<b>Date:</b>	7/29/2002 4:09 AM		
<b>Subject:</b>	<b>Re: the key is... a resistor in series with the coupling cap</b>		

Have a look at:  
[http://www.geocities.com/kkax84/boogie\\_nomad55.pdf](http://www.geocities.com/kkax84/boogie_nomad55.pdf)

Page 5/10, between v4a and v3b, there is a 1M resistor in series with the coupling cap (.01)

Kursad

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<b>From:</b>	<b>Jean</b> ( <a href="mailto:fourquet@hormail.com">fourquet@hormail.com</a> )		
<b>Date:</b>	7/29/2002 8:35 AM		
<b>Subject:</b>	<b>Re: the key is... a resistor in series with the coupling cap</b>		

the link dont work

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**From:** Kursad K  
**Date:** 7/29/2002 5:43 PM  
**Subject:** it does work, but...

Click with the right mouse button on the link and then select "Save Link As..." command from the menu, and save the file to an empty folder and then open it. If it still doesn't work you don't have Adobe Acrobat Reader installed in your machine, if so, download and install it from [www.adobe.com](http://www.adobe.com)

Kursad

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**From:** Jean ([fourquet@hormail.com](mailto:fourquet@hormail.com))  
**Date:** 7/29/2002 6:35 PM  
**Subject:** Re: the key is... a resistor in series with the coupling cap

good its working

interesting do you know the purpose off the 20pf capacitor

just eight after the 1 m resistor

the 20pf is from ground true grid of v3b and connected to the resistor

Jean

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**From:** Kursad K  
**Date:** 7/29/2002 7:00 PM  
**Subject:** Re: the key is... a resistor in series with the coupling cap

I dont know its purpose but it lowers the cutoff frequency of the lowpass filter composed of that 1M resistor and grid-cathode capacitance of the tube. That means less treble and more bass before clipping. I dont know the amount of leakage capacitance between grid and cathode, but ignoring it and just considering that 20pF cap, the cutoff frequency of the lowpass filter is around 8Khz.

Kursad

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**From:** dan mccue ([badgersil@aol.com](mailto:badgersil@aol.com))  
**Date:** 7/29/2002 11:00 PM  
**Subject:** Re: the key is... a resistor in series with the coupling cap

k, when i seid the "key" i ment a general term to the many ways mesa makes that sound.if i remember right the q was for a rect sound, the nomad is a poor example of the mesa embodiment, but one way. not all use that style of gain reduction. the last duel rect i had in the shop was full of fet`s. so once again in general terms the mesa sound done in different ways, almost allways includes lots off gain AND current. also a high bass freq roll-off. this does not include the very early stuff.

Dan McCue

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**From:** kg ([ride5000@ride.ri.net](mailto:ride5000@ride.ri.net))  
**Date:** 7/30/2002 2:58 PM  
**Subject:** Re: the key is... a resistor in series with the coupling cap

dan, i should interject here that low Ip can lead to some very good high gain tones on its own... take for example the soldano SLO circuit, which has a plate loaded stage running with a 39k cathode resistor (iirc). my sp77 soldano preamp had exactly the same gain stage in it, so clearly mike thought it added something special to his lead channel. the low current pushes the THD order up, leading to a more thinned out, saturated sound. the rest was eq (which incidentally sucked balls on the sp77 so i used an external geq).

ken

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**From:** Jean ([fourquet@hormail.com](mailto:fourquet@hormail.com))  
**Date:** 7/30/2002 4:16 PM  
**Subject:** Re: the key is... a resistor in series with the coupling cap

for real the 39k resistor cathode is for adding distortion??? i always thought it was for keeping bloking distortion away

interesting mesa dual recto use the the same things

they rip from Soldano

a lala



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**From:** oskar ([tscreamers@hotmail.com](mailto:tscreamers@hotmail.com))  
**Date:** 7/30/2002 7:33 PM  
**Subject:** Re: the key is... a resistor in series with the coupling cap

....and Mike Soldano rip it from Marshall 2203 that has 10k cathode resistor in the second stage (the 39k resistor is the same but more exaggerate ) nothing new under the sun.

Oskar.

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**From:** Kursad K  
**Date:** 7/30/2002 7:54 PM  
**Subject:** Re: the key is... a resistor in series with the coupling cap

As you know, Marshall plexi has a cathode follower driven tonestack which in turn drives the PI. This is another way of supplying the current that a

clamping circuit demands. The result is more DC offset accumulation across the coupling caps, higher risk of going into blocking, and more asymmetrical distortion(duty cycle asymmetry, deviation from %50 on/(on+off) ratio), which in spite of the common "even order harmonics sound fatter" myth, actually sounds somewhat thinner, but whatever there is tubey about tubes, is about that phenomenon, IMO. Mesa circuits reduce it by using large resistors in series with the coupling caps, but at the same time, this reduces the asymmetry of clipping at that stage, in turn makes it more solidstate-like, but also more immune to blocking. Well, at least, that's my understanding.

Kursad

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<b>From:</b>	<b>Kursad K</b>
<b>Date:</b>	7/30/2002 7:41 PM
<b>Subject:</b>	<b>Re: the key is... a resistor in series with the coupling cap</b>

To what part of the circuit are you referring to with "lots of current"? I guess lots of plate current? But then again, Mesa amps seem to have 100k or 150k plate resistors which are the usual values, so where's lots of current?

Kursad

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<b>From:</b>	<b>Jean (<a href="mailto:fourquet@hormail.com">fourquet@hormail.com</a>)</b>
<b>Date:</b>	7/30/2002 11:50 PM
<b>Subject:</b>	<b>Re: the key is... a resistor in series with the coupling cap</b>

very interesting

anybody out there have a url with more information about this cathode resistor???

i really dont know why i imagined the inverse  
smaller resistor give more distorton

my brain is not well biased LOL

Jean

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<b>From:</b>	<b>kg (<a href="mailto:ride5000@ride.ri.net">ride5000@ride.ri.net</a>)</b>
<b>Date:</b>	7/31/2002 1:16 PM
<b>Subject:</b>	<b>Re: the key is... a resistor in series with the coupling cap</b>

jean,

in and of itself, the high value  $R_k$  does reduce stage gain. if it is well bypassed with a cap this does not have to be so, but in the soldano circuits it is not. the plate resistor of that stage was (again, iirc) a common 100k. the max gain from the stage is approx.  $R_p/R_k$ , or about 2.5x, which is not very much. just because the stage gain is low doesn't mean there's not a lot of clipping though.

there are a couple of different things going on here. the higher value unbypassed  $R_k$  does reduce blocking distortion due to the degeneration across the  $R_k$ ... as  $V_{g1}$  goes +ve, the cathode tends to follow, thus a larger  $V_{g1}$  +ve excursion can be handled before  $V_{gk} = 0$  and grid current flows. if there's no grid current, there's no blocking distortion.

the other effect, and one that i think is just as important, is the offset bias of the stage. with such a high value  $R_k$ , the plate current is very low. let's assume an average of about 3vdc of cathode voltage... that means the plate current is 3vdc/39k, or about 77uA of current. yes, MICROamps! this plate current develops a voltage of only 7vdc across the plate load resistor. so if  $b+$  is 300vdc for that stage, the plate voltage is about 293vdc.

what does this do? well, it severely limits the +ve excursion of the plate to only 7v, after which it clips HARD into the b+ rail. the -ve excursion is quite free to reproduce the waveform cleanly (esp. considering the degeneration across the unbypassed Rk), so you get a huge asymmetric clipping out of this stage.

ken

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<b>From:</b>	<b>dan mccue</b> ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	7/31/2002 5:14 AM		
<b>Subject:</b>	<b>class B ken?</b>		

hi ken, thats interesting about the low Ip, i will have to look at it closer, but would`nt the high Kr bring the tube to a cut off neg swing? that was another point i was going to add. i don`t have a rect in the shop to check, but some of the new sound i think might be added by the pre tubes going into a class B or at least a clipped signal if class of operation is to be argued. cut the bass and highs and leave the mids chopped and grainy(sound familiar?)

kursad, if you have been in a rect latly, schem or not, its loaded w/ fet`s. some for switching even with relay blocks(no more ldr`s thank god), and some for current if i remember right. the warm and hot are then reintroduced to the clean stage, the current keeps the signal moving though the stages with out all the bass that shows up in an over amplified signal that carries alot of bass inherent w/ the many times increased signal. i dont remember seeing the 470k with a 47pf in the duel rect, so wheres your schem that shows it?

"so where's lots of current?"

if you are going to an older schem anyways, why not pull out the .22? the first 12ax7 is wired in parralel for CURRENT.

Dan McCue  
Lustone Amplifiers

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<b>From:</b>	<b>Kursad K</b>		
<b>Date:</b>	7/31/2002 7:16 PM		
<b>Subject:</b>	<b>another explanation.</b>		

1) Higher plate current only makes sense if it is obtained by lower grid bias voltage, which means lower clipping threshold value, thus more "perceived gain". It's just a way of increasing "gain", not an interesting thing, other than that.

2) Have a look at [http://www.blueguitar.org/schem\\_mb.htm](http://www.blueguitar.org/schem_mb.htm), dualrec1.gif, there are 470K resistors in series to the coupling caps, without treble injection caps across them. That's how one keeps a gain stage away from blocking without needing to reduce bass. If you want to understand why this makes the gain stage distort the signal more like a solidstate component, think of why tubes distort asymmetrically first: it works because of the voltage that accumulates across the coupling caps-the same reason with the reason of blocking distortion. For a clearer explanation, Let  $\sin(w*t)$  be a sine wave source( $w$ :frequency,  $t$ :time), and  $\text{clip}(x)$  to be a symmetrical hard clipping function, with lots of gain( $x$ :amplitude).

$\text{clip}(\sin(w*f))$  is a perfectly symmetrical square wave with a duty cycle of %50, wheras,  $\text{clip}(\text{ofs}+\sin(w*f))$  (where ofs is a constant, representing the voltage accumulation across the cap), is a rectangular wave whose duty cycle is not %50. If you want to see what's happening, try these formulas with Microsoft Excel.

3) Nowhere in this thread I've mentioned 47pF caps.

4) Explanations without clearly stated reasons are not complete, therefore, I couldn't understand your theory. I hope mine makes sense to you.

Kursad

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**From:** dan mccue ([badgersil@aol.com](mailto:badgersil@aol.com))  
**Date:** 8/1/2002 3:07 AM  
**Subject:** Re: another explanation to whom?

ok kusad, i will take them in order, as i only got a chopped reply of your response.

"clipping threshold value, thus more 1) Higher plate current only makes sense if it is obtained by lower grid bias voltage, which means lower "perceived gain"."

i dont know how you perceive "gain". headroom can be achieved by an operation closer to a pure class A operation. yup the lower the grid bias value the more current (irrelavent of biasing, unless you are talking grid leak wrtc, then your wrong), the more current (in the same circuit application) the closer to replicating the peaks of the neg and pos swing of the sign wave. as for it only makes sense is to increase current that way, your wrong there too, tie two plates together, as the .22 cal i already mentioned.

by the way, just because there is little current in one stage does not mean there can't be high current in others, its called staggering current, and it does change the sound of the whole amp, as it usually has more than one stage.

after the last virus went around my computer does not open zip files anymore, but my exp w/ the duel rect is hands on, not just a schem, oh by the

way, have you ever noticed a company using a schem different from the actual lay out? 😊

but thats not the way one keeps from blocking dist! thats just one way, and that way happens to reduces v gain. oh ya, ever heard of ohms law, what happens when v is reduced in the same circuit application, thats right, it is inverse corralation to CURRENT.

as for blocking dist, when a tube grid draws current of its own it activates the cap to seal/block all v. that has to do with a tube getting driven into a class b, in this case incured by the v gain bringing a too high neg & pos swing.

, "think of why tubes distort asymmetrically first: it works because of the voltage that accumulates across the coupling caps-the same reason with the reason of blocking distortion."

kursad, i beleve you are just plain wrong about that, tubes clip asymetrically because on the little lines called the plate curve, you will notice All tubes are non-linear, there might be very linear portions of the curve, but all tubes are non-linear. when a tube is operated at different v's you are operating on different portions of the v curve. when the ac component changes the grid bias value the tube responds correspondingly by replicating the sign wave as it can on this non linear line. presto, asymetrical clipping. tubes 101. hope you learned something.

as for your trig, math is not my forte', but thats not the reason why a clipped tube can sound like ss. a pos & neg clipped sign wave from a tube resembles a ss square sign wave caused by distortion. look at the sim's on a scope. the high peaks and the low peaks are both "chopped", similar sound.

as for the rest, the reply section only brought up this above. however, i do remember your 47pf response, the grim truth is i did not care enough about your response to go back and look.

kursad, i was nearly add ing my exp to a q the writer could care less to(jh, you could chime in if you dissagree 😊). my statement was very general, and ment to help, if you wanted a pissing contest that is your choice , i dont have time to write stuff that is not helping anyone, and it is realy not my idea of a good time either. if you want to challange basic electron ballistics, lets do it in another thread with out the snyde or condensation. mine is a result of yours.

so, if you want to further this, i will see you on another thread 😊

Dan McCue  
Lustone Amplifiers

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<b>From:</b>	<b>Kursad K</b>		
<b>Date:</b>	8/1/2002 3:23 AM		
<b>Subject:</b>	<b>Re: another explanation to whom?</b>		

*your wrong there too, tie two plates together, as the .22 cal i already mentioned.*

I didn't say that there's no other way to increase current. I've just said that this one is the only that seems to make sense. Well I could also say that decreasing the output impedance of that stage will alter the next one's distortion, but as long as there is a huge resistor in between, in series with the coupling cap, this does not seem to be Mesa's case.


*by the way, just because there is little current in one stage does not mean there can't be high current in others, its called staggering current, and it does change the sound of the whole amp, as it usually has more than one stage.*

Yeah right, but you still didn't explain what "high plate current" does to the signal.

*"think of why tubes distort asymmetrically first: it works because of the voltage that accumulates across the coupling caps-the same reason with the reason of blocking distortion."  
kursad, i beleve you are just plain wrong about that,tubes clip asymmetrically because on the little lines called the plate curve, you will notice All tubes are non-linear, there might be very linear portions of the curve, but all tubes are non-linear*

Yeah,right, nonlinearity in plate curves turns out to be inadequate considering the amount of gain each preamp stage has. Another case someone who isn't careful enough would be fooled.

*101. hope you learned something.*


Yep  That was a nice try.

Kursad

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<b>From:</b>	Jean ( <a href="mailto:fourquet@videotron.ca">fourquet@videotron.ca</a> )		
<b>Date:</b>	8/1/2002 4:00 AM		
<b>Subject:</b>	Re: another explanation to whom?		


well finaLY i need to bias my brain i think LOL  
cause now i am a little bit confusing with so many explanation out there  
but its interesting i will try to understand it

i will concentrate on the reading

thanks a lots guys ))

Jean

<a href="#">START NEW THREAD</a>	<a href="#">REPLY</a>	<a href="#">PREVIOUS</a>	<a href="#">LIST</a>
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<b>From:</b>	dan mccue ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	8/1/2002 4:17 AM		
<b>Subject:</b>	Re: another explanation to whom?		

hi again kursad. to bad i did not see you on another thread .

as for a tec explanation for what high current does for the sound i made the orig comment to the sound. the mesa sound remember? explain the sound dif between class a and a/b, a little hard to put into words? if you want to build your amps with out knowledge of this area, go a head, it realy wont bother me either way. do you even build?


as for the non-linearity of the plate curve, i think you are being ignorant(or at least another case of someone being ignorant), and only fooling yourself careful or not, what do you think makes up the different neg swing wrt the pos swing?

if you want to argue with mcgraw-hill(electical & electronic engineering series), be my guest. i can find the page for you tomorrow. it is past midnight here in nh, so it will have to wait. i guess you feal like pissing.

i always try to learn something here, do you? hope to see you on a new thread kursad.

Dan McCue  
Lustone Amplifiers

---


Yep  That was a nice try.

Kursad

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<b>From:</b>	<b>Jean</b> ( <a href="mailto:fourquet@videotron.ca">fourquet@videotron.ca</a> )		
<b>Date:</b>	8/1/2002 4:00 AM		
<b>Subject:</b>	<b>Re: another explanation to whom?</b>		


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Jean

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<b>From:</b>	<b>dan mccue</b> ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	8/1/2002 4:17 AM		
<b>Subject:</b>	<b>Re: another explanation to whom?</b>		

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Dan McCue  
Lustone Amplifiers

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<b>From:</b>	<b>Randell Smith</b>		
<b>Date:</b>	8/1/2002 12:49 PM		
<b>Subject:</b>	<b>Re: You guys don't have a clue</b>		

Im the only expert here on this subject so both of you need to go back to school!!!

BTW, No one can build a Dual recto like I can so Pllllllzzzzzzzzst.

R.S.

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<b>From:</b>	<b>dan mccue</b> ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	8/1/2002 2:37 PM		
<b>Subject:</b>	<b>c`mon randell</b>		

hay randell, i never claimed to be an expert(or to have a clue for that matter), nor do i want the stigma attached. i just want to be a happy little amp maker in nh, who helps people out on ampage once and a while. not limited to the bean counting cheap parts for profit, and "make due" materials, because it is easier to wark with.

why would i want to build a duel rect. the only time i see them is on my repair bench!i do old school lug term p2p wiring, hows your circuit board randell?

i will give it this, for versatility, you cant beat seven six way relay blocks and an ic chip, but then again thats if you want those in your amp. now if you want to address any thing that was poasted here i would be happy to entertain. other wise there is no need for childish remarks, i am realy trying to take the high road here.

by the way, i am willing to put my \$ where my mouth is. i have an amp that sounds harder then a duel rect, with cleans that would leave it in the dust, all done with no relays/fets/ic chips or other crap(imho) you normaly see in a computer. lets meet randall! are you game?

Dan McCue  
Lustone Amplifiers  
Rochester NH  
(603)-335-0947

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<b>From:</b>	<b>dan mccue</b> ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	8/1/2002 2:42 PM		
<b>Subject:</b>	<b>then school away</b>		

oh ya, thats right you are the only expert here, well where were you when the orig q was asked? ok then. i DONT know everything,or even close, but i am always wanting to learn more, if your the expert, the explain! don`t worry, its allready been patented 😊

DM

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<b>From:</b>	<b>Jean</b> ( <a href="mailto:fourquet@videotron.ca">fourquet@videotron.ca</a> )		
<b>Date:</b>	8/1/2002 2:56 PM		
<b>Subject:</b>	<b>Re: then school away</b>		

amazing just for a stupid resistor

hahahahaha i cant belive it

funny LOL

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**From:** OTP  
**Date:** 8/1/2002 3:32 PM  
**Subject:** Re: c`mon randell

You may know amps but you obviously don't know when your being trolled.

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**From:** dan mccue ([badgersil@aol.com](mailto:badgersil@aol.com))  
**Date:** 8/1/2002 4:08 PM  
**Subject:** tnks opt

sorry opt,my internet experience is limited, thank you for the heads up 😊

jean, it was a res & cap 📺  
dm

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**From:** Kursad K  
**Date:** 8/1/2002 4:57 PM  
**Subject:** end of the argument

*i guess you feal like pissing.*

I can no longer argue with someone who says something like this. There's more information available about the topic, but you should better be left uninformed about it and stay ignorant.

Kursad

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**From:** dan mccue ([badgersil@aol.com](mailto:badgersil@aol.com))  
**Date:** 8/1/2002 11:03 PM  
**Subject:** sad bow out kursad :(

fine, end it is. if you cant back up your statements mabey you should look at dynamic transfer chararistics`s some more. i asked if you intentionally wanted a pissing contest. and asked if you would kill the cynicism and snyde behavior and meet me on another thread to discuss basic electron ballistics, as we have left the original topic. i then(when you wrote on the same thread thread, with taunt) wrote you must feal like pissing. if you cannot suport your argument, fine, but what a sad display of bowing out like this when your comments were as equily antagonistic. as i promised

McGraw-hill, electrical and electronic engineering series chapter six(concepts usefull in v-t-circuit analysis 6-10/6-11. dynamic transfer characteristic for a triode.

but if that is not enough.

Ghirardi, modern radio servicing. ch 15. dia 15-16, shows a diagram of a dtc with asymmetrical distortion in a harmonics generation.

one more

electronic and electrical fundamentals, v3. vacume tube and semiconductor fundamentals. starting with fig 4-12 determination of dynamic charistics almost a whole chapter!

kursad, even when clipping, the conductive part of the swing operates on a non-linear curve. you cannot argue that, with out taking on all the previous writers!!

once again, if you want to have a civil discussion, i am all for it, just dont be disrespectfull to me and i will gladly return the like. more gets acomplished that way anyways 😊

Dan McCue  
Lustone Amplifiers

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<b>From:</b>	<b>Kursad K</b>		
<b>Date:</b>	8/2/2002 3:55 AM		
<b>Subject:</b>	<b>Re: sad bow out kursad :(</b>		

*if you cant back up your statements mabey you should look at dynamic transfer chararistics`s some more*

I can. But I'll leave the task of finding them among the AX84 BBS archieves to you, because I dont quite feel like posting them to here, anymore.

Arguments that include words like "Just a resistor, WOW", "pissing" are not my cup of tea.

Kursad

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<b>From:</b>	<b>dan mccue</b> ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	8/2/2002 4:59 AM		
<b>Subject:</b>	<b>grow up!</b>		

kursad, you have not backed up a word, if you want to make something productive of this i am game! however your quoting me out of context is waisting my time.

but to clarify AGAIN. "not just a resistor, but a cap too" was my responce to jean`s coment about "all this because of JUST A RESISTOR, WOW". JEAN WROTE THAT

are you going to insult jean now for your lack of knowledge?

the pissing contest comment was explained in the last post of mine.

as for the ax84 site i dont go there, so you can feal safe.

now if you want to talk about asymetrical distortion on the pos swing (not clipping) that can be caused by the grid drawing current. however the duel r(remember thats what we started with?) does not have the ability to operate in a class b, blocking happens. there for no asymetrical distortion from grid current in a mesa.

this is a place to be productive, if you want to take your time quoting out of text so you can go look for supporting evidence from somebody, then knock your self out(ops are you going to take that out of text too?), but its ok not to know something. thats why most of us are here. unfortunetly, you are making look even worse for yourself by not addressing the q`s at hand, just prodding.

lets be productive, or quit waisting my time

Dan McCue  
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Rochester NH  
(603)-335-0947

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**From:** kg ([ride5000@ride.ri.net](mailto:ride5000@ride.ri.net))

**Date:** 8/2/2002 12:51 PM

**Subject:** Ig1

*now if you want to talk about asymmetrical distortion on the pos swing (not clipping) that can be caused by the grid drawing current. however the dual r(remember that's what we started with?) does not have the ability to operate in a class b, blocking happens. there for no asymmetrical distortion from grid current in a mesa.*

dan,

class b does not necessitate grid current.

grid current will flow when the grid voltage approaches the cathode's voltage. it does not have to sound good, or be what was intended, but the current will flow. it is PURELY a matter of voltages.

even if there is an enormous series resistor (i.e. a very high driving impedance), if  $V_{gk}=0$  then the tube will draw some grid current. by the action of the grid current working against the series resistance the grid will not venture BEYOND  $V_{gk}=0$ , but the grid current is what CAUSES the voltage to be clamped to  $0V_{gk}$ ; without that current the grid could soar to arbitrarily high voltages. during  $V_{g1} > V_k$  the cathode to grid can be considered EXACTLY like a vacuum diode, since it IS one-- electrons will flow from the hot cathode to the cold grid, but not the other way around. likewise, if  $V_g < V_k$  (the conditions in a "normally" biased tube) then no current will flow, just as in a diode.

asymmetrical distortion can be caused by a number of things. one is, as you've said, the natural exponential plate current characteristic of the tube, which can't easily be dispensed with. this distortion is INHERENT in the tube.

another is, as i've said in another post, running out of OUTPUT headroom, when the +ve swing of the plate runs into the b+ rail (which happens with a non-inductive load), or the -ve swing bottoms out due to the dropoff of  $I_p$  from insufficient  $V_{ak}$ .

yet another asymmetric distortion can occur at the INPUT of the tube, at the grid. if the driving impedance is non-zero (and of course it always is) and the instantaneous grid voltage approaches the cathode's voltage, then  $I_{g1}$  will flow, and you have a situation where the INPUT signal at the grid no longer perfectly tracks or follows the driving signal. since this only occurs on the +ve  $g1$  excursions, you have asymmetric distortion. the only way to prevent this distortion is to prevent the input signal from driving  $V_{g1}$  anywhere close to  $V_k$ , iow limiting the input signal swing.

since this is pretty much NEVER done in tube guitar preamps, i have to say that grid current DOES flow in MANY guitar preamps. in fact, you can see it for yourself, as i have done, with an oscilloscope. the series "stopper" resistor will reduce the EFFECTS of grid current (primarily the effect of grid blocking, where the electrons which appear at  $g1$  by virtue of the diode effect cause a buildup of -ve charge at the coupling cap, increasing the -ve bias and pinching off plate current) but it does not prevent it from happening.

ken

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**From:** dan mccue ([badgersil@aol.com](mailto:badgersil@aol.com))

**Date:** 8/2/2002 2:50 PM

**Subject:** Re: Ig1

hi ken, glad to get some positive information rolling. 😊

ok, as one indicator to class b, operation, the grid draws current through part of the swing.

i understand the pos swing reaches 0 wrc brings the operation of the tube similar to a grounded grid, just like a diode. but how does a typical guitar amp with out the circuit designed for the pos swing to draw current (ie cath fol, intrstg x-frmr), then draw current with out a leak?  $v_{g1}$  swinging into  $v_k$  range will certainly cause, or try to cause current on the grid, and an asymmetrical sign wave, but as the current flows, does`nt the cap in series block the draw when the charge is built up? and the grid stopper is acting nothing more than a v drop for the v gain. one way of tapering the swing. is the something else going on there?

thanks for some of the clear up, i really would like something pos to come out of this

Dan McCue

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**From:** kg ([ride5000@ride.ri.net](mailto:ride5000@ride.ri.net))**Date:** 8/2/2002 3:51 PM**Subject:** Re: Ig1

*ok, as one indicator to class b, operation , the grid draws current through part of the swing.*

nope. grid current is NO indicator of class of operation. all the grid current will tell is whether or not to put a "1" or a "2" after the class, be it A, AB, B, or C (i've never heard of a class D tube, amp, but there's no reason why there can't be). often times the "1" is omitted and is understood to be the "default."

the ONLY indicator of class of operation is the plate current duration.

class A, is, of course, a situation where the plate current NEVER cuts off. class AB is where the current does cut off, but for less than half the period. to strictly adhere to the class B moniker you must have plate current that flows for exactly half the period of the waveform. class C is where the plate current is off for MORE than 50% of the period. nowhere in the descriptions of class does grid current enter the picture. nor does the topology, either single ended or push pull, enter the picture. you may have a class A2 PP amp, or a class C1 SE amp.

believe it or not, the effect of a grid stopper (or any influence that increases the effective driving impedance as seen right at the tube's grid) is to HARDEN the clipping characteristic. if the tube's grid were driven by a perfect voltage source then there would be no clipping AT ALL at the grid circuit. there would be no sharp corners (i.e. high order harmonics) on the output waveform.

all that would happen as the grid passed through the  $V_{gk}=0$  point is that it would collect some fraction of the total space current that leaves the cathode enroute to the plate. this is why when you look at plate curves that are given for +ve  $g_1$  voltages they actually begin to curve BACKWARDS, i.e. they have a slope (which IS the  $\mu$  of the tube) that DECREASES as plate current increases. this is due to the fraction of total  $I_k$  that becomes  $I_{g1}$  instead of  $I_p$ . in contrast, the plate curves for -ve  $g_1$  voltages are all curved the opposite direction, corresponding to the exponential three-halves (aka child's) law.

now it is important to note at this point that clipping at the grid is a distortion that is EXTERNAL to the tube. this jives with what i've just said, which is essentially given a low enough driving Z there will be NO clipping at the grid circuit, regardless of input voltage swing.

*but how does a typical guitar amp with out the circuit designed for the pos swing to draw current(ie cath fol,intrstg x-fmr), then draw current with out a leak?*

well, it does draw current, but it is usually very small. it can be approximated by the voltage across the grid stopper using ohm's law.

assume you have a perfect voltage source driver. if you've got a 10k grid stopper, and, during a large +ve input swing you've got 20v across that stopper, well then you're drawing 20/10k or 2mA out of the grid. the grid current is what holds or "clamps" the actual  $V_{gk}$  to 0. as the voltage across that stopper increases, so too does the grid current.

now, assume you DIDN'T have that stopper installed. assume also that you had the same perfect voltage source driving the grid, but this time you cap coupled it to the grid. as usual, you still need a grid return path, so you put a traditional 1M from  $g_1$  to k. now what happens when the input signal swings +ve?

the grid begins to conduct heavily, collecting electrons. these electrons tend to make the grid more -ve, but there's a certain amount of time that their charge will simply be sucked up by the coupling cap. remember ELI the ICE man? it means that current leads voltage in capacitors. before the voltage across that cap changes current MUST flow either into or out of it. in addition to the electrons appearing at the grid, there are also electrons being pulled up through the 1M grid return resistor. the grid's impedance is MUCH less than 1M though, so a majority of the charge comes from  $g_1$ .

consequently, during the time that the cap is sucking up electrons, the voltage differential across it (which started at zero, no DC bias) is increasing. after a sufficiently long length of time (which is a matter of the coupling cap's value along with the grid return resistor's value and the dynamic impedance of the grid itself), the grid side of the coupling cap has become so -vely charged that there is effectively no longer a +ve  $V_{gk}$ . it will come

to an equilibrium at  $V_{gk}=0$ . the charge across the cap will be approximately equal to the original +ve signal swing. the tube's plate current is still high, but it isn't as high as it was when time = 0. it has sagged.

so now what happens when we remove the +ve voltage on the other side of the coupling cap and return it to ground?

remember that all caps need current to flow before the voltage across them changes. the charge that was built up before remains across the coupling cap, therefore the grid is now pushed -ve, probably biasing the tube so cold as to cut off all plate current. this is where the "blocking" comes in. the only way for current to flow into the cap is through that 1m grid return resistor, which will SLOWLY bleed off the surplus electrons back to ground, decreasing the voltage across the cap. we see that the charge and discharge paths are different--during the charge, when it is +vely biased, the tube's grid is present, but during discharge the only path is through the grid return resistor. the time constant for DIScharge is only a matter of the coupling cap and the grid return resistor.

this is grid blocking, and if you noticed it happened with a PERFECT voltage source driver. what is the cause? it's the large time constant formed by the coupling cap and the grid return DCR.

to prevent grid blocking during grid conduction you need a low DCR path from g1 to ground. to have grid conduction ONLY requires that  $V_{gk}$  be zero or positive. the degree to which you drive the grid +ve depends on the Z of the driver. to actually drive the grid +ve AND prevent grid blocking you need both the low DCR path to ground AND a low enough driving Z.

hth,  
ken

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<b>From:</b>	dan mccue ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	8/3/2002 12:58 AM		
<b>Subject:</b>	Re: Ig1		

ken, thats fantastic, i am glad something good came out of this, i thought it had to do with the transit time of electrons, but it was not as "instantaneous" as that. the charge and discharge cycle sounds very similar to a grid leak biasing cycle. we can cover class a/b for a single tube another time, since it has been through the post before. to the original q, mesa only employes this as ONE of the ways to avoid prob, w/ high ac swings. since I do not use high value grid stoppers in my designs & i get beyond satisfactory high gain results with out, it is something though i need to be more aware of.

I have def learned something, as i seid, i don't know everything, but i do want to. 😊  
now to move one to see whats up with kursads post

Dan McCue  
Lustone Amplifiers

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<b>From:</b>	dan mccue ( <a href="mailto:badgersil@aol.com">badgersil@aol.com</a> )		
<b>Date:</b>	8/3/2002 2:06 AM		
<b>Subject:</b>	Re: Ig1		

oh, ken, as ffer the indicator of class b, that was a legitimate brain fart, i was just not thinking strait. i use it sometimes coming out of A prime(a/b1) to mark a/b2.

as i am wrong alot, this was a slip 😊  
Dan McCue

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**From:** Kursad K  
**Date:** 8/2/2002 4:28 PM  
**Subject:** **pspice simulation results, and the proof.**

In the pictures below you can see the effects of grid current. How much clipping asymmetry you can get from a direct coupled gain stage shows how much asymmetry that nonlinearity in the plate curves cause. In the experiment a marshall gain stage was compared with a Mesa gain stage, one with that resistor, effect of using a very small coupling cap is examined, and results are also compared to the distortion of diode pairs. The conclusion is that direct coupled gain stage is very similar to diode pairs, it generated very little even order harmonics, and almost perfectly symmetrical clipping. Thus you have the proof, nonlinearity in the plate curves are not that important for the tone of preamp gain stages. (BTW; Greetings to kg, seems like he was able to understand (or perhaps he already knew) what you couldn't understand, because of your attitude). Another thing- the relevant thread at AX84 is <http://www.ax84.com/bbs/dm.code?id=34195>, and relevant part starts at <http://www.ax84.com/bbs/dm.code?id=34288>. Never go there, because at AX84 we dont like snake-oil caps, golden solder, mysterious stuff (like the word CURRENT in capital, without further explanation) and other tube amp myths.

Marshall-vs-Mesa comparison circuit:  
[http://www.geocities.com/kkax84/1\\_cir\\_marshall\\_vs\\_mesa.gif](http://www.geocities.com/kkax84/1_cir_marshall_vs_mesa.gif)

Mesa-vs-Smaller coupling cap comparison circuit:  
[http://www.geocities.com/kkax84/2\\_cir\\_smallcap.gif](http://www.geocities.com/kkax84/2_cir_smallcap.gif)

Frequency spectrum of diode distortion:  
[http://www.geocities.com/kkax84/3\\_spec\\_diode.gif](http://www.geocities.com/kkax84/3_spec_diode.gif)

Wave shape of diode distortion:  
[http://www.geocities.com/kkax84/4\\_wave\\_diode.gif](http://www.geocities.com/kkax84/4_wave_diode.gif)

Frequency spectrum (Marshall-vs-Mesa):  
[http://www.geocities.com/kkax84/5\\_spec\\_marshall\\_vs\\_mesa.gif](http://www.geocities.com/kkax84/5_spec_marshall_vs_mesa.gif)

Frequency spectrum (Mesa-vs-Small cap):  
[http://www.geocities.com/kkax84/6\\_spec\\_smallcap.gif](http://www.geocities.com/kkax84/6_spec_smallcap.gif)

Wave shapes(Marshall-vs-Mesa):  
[http://www.geocities.com/kkax84/7\\_wave\\_marshall\\_vs\\_mesa.gif](http://www.geocities.com/kkax84/7_wave_marshall_vs_mesa.gif)

Wave shapes(Mesa-vs-Small cap):  
[http://www.geocities.com/kkax84/8\\_wave\\_smallcap.gif](http://www.geocities.com/kkax84/8_wave_smallcap.gif)

Wave shape of a direct coupled tube gain stage:  
[http://www.geocities.com/kkax84/9\\_wave\\_directtube.gif](http://www.geocities.com/kkax84/9_wave_directtube.gif)

Frequency spectrum of that:  
[http://www.geocities.com/kkax84/10\\_spec\\_directtube.gif](http://www.geocities.com/kkax84/10_spec_directtube.gif)

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Kursad

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<b>Date:</b>	8/2/2002 6:41 PM		
<b>Subject:</b>	<b>Re: pspice simulation results, and the proof.</b>		

*what you couldn't understand, because of your attitude)*

*Never go there, because at AX84 we dont like snake-oil caps, golden solder, mysterious stuff (like the word CURRENT in capital, without further explanation) and other tube amp myths.*

Is there any reason you are being an absolute asshole? You are just as much to blame if not more for this stupidity. Grow up.

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oh well, I'm sorry for replying in the same style. I apologize for that.

Kursad

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But besides apology, I should also state that if someone does not respect me, I cant respect him. It's that clear.

Kursad

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<b>Date:</b>	8/3/2002 1:48 AM		
<b>Subject:</b>	<b>Re: pspice simulation results, and the proof.</b>		

kursad, the respect would have been there, if you had not started by stomping on my "key", every bit of disrespect i gave you was only in reply to yours, as your attitude through this has been dispicable, i even offered to bury the hatchet a few times and get something accomplished by good means, i guess this shows what type of person you are. i should have seen something coming, you were obviously looking for conflict. i will give you this, it seems you have done your homework on this subject, albeit all on sim, ever notice how all those digital models sound exactly like the real ones? 😊

i will give you a difference between us,(i am sure you and i could think of a few more) i know i dont know every thing, but seeing you rant on about your "thus i presume it can only conclude" (yah, since few have gone over the data to check). is that you must think you do.

kursad, i am glad you have pspice and know how to use some of it, the rest of us snakeoil guys will just have to deal with real circuits a scope and some experience.

i see you brought ken into it, it might be nice to ask ken if that is what he ment rather than telling us what he ment,(sounds like your ax84 post rant) your data(incompleat) touched by subjects he talked about, but what i read from ken was not on your data sheats other than the hard clipping.

and last, as for non-linear plate curves, the euradic nature of high gain swings will conduct on more of the curve than lower gain swings, i can't believe you can't see that, or mabey you do? you did say your self

"BTW, the distortion of the Mesa circuit turns out to be different from diodes (I dont know the reason yet, perhaps nonlinear plate curves.)."

or did you not think i read your links. since you did not write the books i read from, i guess that leaves all us people on ampage with snakeoil 😊

Dan McCue

