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From: **JWK** (*jkilmer@usadatanet.net*)

Date: ☑ 6/11/2002 4:40 PM

Subject: **Hybrid cathode/fixed bias question.**

I rebuilt an old cathode bias amp and made it fixed bias. I made a lot of necessary changes to keep it practical, but the bottom line is that a lot of the magic is gone. I'm thinking *some* of what I liked could be the cathode biasing and I want to try the hybrid approach to see what happens.

Two 6L6 tubes
UL connection, no NFB
B+ to the plates about 450v

Suggestions for resistor values to try. I was thinking 100 ohm would be great since it would also give me a convenient biasing adjustment. I just don't know if this would be enough. The original resistor was 350 ohms shared by both.

Any general guidlines for this? Thanks for any suggestions.

John

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From: **Ambrose Chapel** (*ambrose_chapel@hotmail.com*)

Date: ☑ 6/11/2002 4:46 PM

Subject: **Re: Hybrid cathode/fixed bias question.**

Why not just switch back to straight cathode biasing?

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From: **Ian Anderson** (*velatones@aol.com*)

Date: ☑ 6/11/2002 5:10 PM

Subject: **Re: Hybrid cathode/fixed bias question.**

The 50W Laney Supergroup (JTM50 ripoff) amp I used to have shared a 22ohm resistor for that cathode/fixed bias thing.

I have another Laney supergroup head that used a 75ohm resistor, but it was running a bit hot so I just turned it to completely fixed bias.

Hope that helps.

... Ian 

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From: **JWK** (*jkilmer@usadatanet.net*)

Date: ☑ 6/11/2002 5:36 PM

Subject: **Re: Hybrid cathode/fixed bias question.**

I have heard that the hybrid arrangement gives you the response of fixed at lower volume and cathode at higher volume. I never liked the lower clean

type playing when it was cathode biased, but I loved the way it cranked. I thought it would be worth a try. I figured there must be a decent balance value for the cathode resistors so you don't get too much of the cathode bias response. Also, the logistics of integrating adjustments for bias and balance was far more involved than just putting in two fixed bias pots. It's sort of a continuous project for me.

John

From: **Geoff Gross** (*gdgross@hotmail.com*)

Date: ☑ 6/11/2002 6:29 PM

Subject: **Re: Hybrid cathode/fixed bias question.**

Anyone care to enlighten us poor souls who don't know what hybrid cathode biasing is? Some combination of fixed and cathode bias, i assume?

thanks,
geoff

From: **markh** (*mark@mhuss.com*)

Date: ☑ 6/12/2002 9:44 AM

Subject: **Re: Hybrid cathode/fixed bias question.**

Yes, hybrid means part of the bias voltage (that seen between grid and cathode) comes from the voltage dropped across a cathode resistor (with its attendant local NFB) and the rest is supplied via negative volts to the grid.

It would be interesting if this could be varied, but you'd need a 20 watt pot or something for the cathode resistor (unless you wanted to get into the evils of solid state...)

--mark

From: **Dave B.** (*the3burns@earthlink.net*)

Date: ☑ 6/12/2002 1:20 PM

Subject: **Re: Hybrid cathode/fixed bias question.**

There is one boutique amp builder that simply adds a cathode resistor to the power amp to make his 50W amps into a 35W model. So it sounds like a matter of tweaking with the cathode resistor values and the neg. bias value to get the tone you're looking for. Easily switchable too.

DB

From: **Wild Bill** (*wildbillcostello@sympatico.ca*)

Date: ☑ 6/12/2002 2:11 PM

Subject: **Re: Hybrid cathode/fixed bias question.**

Hi John!

100 ohms might be a bit much. I use 47 ohms, like in all those old Vox amps with combination bias.

Like you, I liked cathode biased when cranked but fixed at lower volumes. The Vox circuit bugged me - why did they bother? After a few beer it became clear.

The 47 ohm resistor in each cathode only gives a volt or two of extra bias and then only when things start to really crank. You can choose some plate current values and easily calculate how much extra voltage you get. At low volumes it's trivial.

If you set the fixed bias a little on the low side of the bias current range that extra volt or so will make a significant difference on high current peaks. In effect, the circuit is a mild compressor! Just like regular cathode bias but only on peaks!

I've found that Mr. Vox choose well with 47 ohms. Probably after much trial and error. Any lower and there's no effect, any higher and you're approaching continuous cathode biasing. Going to 100 ohms will give you 2-4 extra volts and that's probably too much over the fixed bias point. The tube will probably cut off. Then again, it's all taste!

You don't really need 2 fixed bias pots but it's nice for balancing tubes. For rock and roll who wants perfect balance anyway? I just wire it up with a regular bias pot and stick a 47 ohm on each cathode. I like to keep biased cathodes on separate resistors anyway. It lets each tube level itself.

I suspect we have similar musical taste, John! Teenage Head and the Ramones, or maybe Neil Young?

---Wild Bill

From: **JWK** (*jkilmer@usadatanet.net*)

Date: ☑ 6/12/2002 7:23 PM

Subject: **Some thoughts**

Wild Bill,

I first thought about this a while ago when I looked at the schematics for the AC30 amps. There is mention of it in TUT1, but no values for the cathode resistor are given. So the thought came up again when I thought of tweaking this amp. You've given me a lot to think about, and once again I suffer from option overload.

I'm thinking of doing an AC50 type amp with a Traynor Mark2 that I have. Tell me what you think.

An EL34 tube with 70mA of current running through it (this would be about max, no?) is going to dissipate 7 watts of power with a 100 ohm resistor. This is about as far as I would want to go, I think. I would think that 47 ohms is a good low point, for reasons you stated. I would think that the "amount" of cathode biasing effect you get is going to be pretty much a straight line function, so I could try 47, 75 and 100. I suppose I could even go up to 300 ohms and buy some of those 25 watt resistors, but that might involve mounting them on top of the chassis because of the heat.

On top of getting the compression, wouldn't you also get some of that negative feedback without the bypass cap? Would this not reduce gain of the output and help stabalize/linearize the output stage? So you could experiment with different values to adjust your gain/feedback to various degrees to see what you like.

The higher the resistor, the more power I lose but I don't care since the PT puts out 540 volts to the plates when SS rectified. No problem losing some of that

Full cathode bias on with voltage like this would have to be close to 1.5K. I would think anything up to about 300 ohms would just be a matter of adjusting the bias voltage. I mean if you reduce the negative voltage enough, the tube shouldn't cut off.

Just some rambling thoughts. I don't know much, so if I have some of this wrong, someone please jump in and slap me.

I like balancing the DC current in the tubes with unmatched pairs. You eliminate that hum but still get some of that even order distortion since one tube will be working harder than the other. At least that's the way it was explained to me in TUT. Seems to work, anyway.

Yes, we share some musical likes. I'm getting more into jazz these days, but still like that older stuff I grew up with. Regardless of musical complexity, I still don't like anything too slick and overly produced. I'm liking live recordings more and more.

Thanks for the input.

John

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

Date: ☑ 6/12/2002 11:24 PM

Subject: **Re: Some thoughts**

john,

figure out what you'd like to bias the tubes at. how hot are you going to run them? i assume that the value of 1k5 for Rk is when you're fully cathode biased?

if that's it, you can easily determine how much range your fixed bias adjustment will have. if you want 50% control (ie fixed bias), then halve the Rk and assume you will to supply the rest to the grids. the actual bias voltage isn't changing, just its reference to ground. if you go down to 300 ohms, you're going to have to be feeding the grids some fairly -ve DCV, and the "cathode bias" effect will be minimized.

the unbypassed Rk will not cause degeneration as long as the tubes aren't cutting off... as long as you're in class A the amp is (assumedly) balanced, and there should be no signal across the Rk to degenerate the input. as soon as you leave class A though you will lose some gain.

you could bypass it if you wanted to. if you don't you will have a quicker recovery from transients, since there won't be any time constant involved with the cathode circuit, and less tendency to draw grid current. if you use a small cap you could goose the highs, etc.

ken

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From: **Wild Bill** (*wildbillcostello@sympatico.ca*)

Date: ☑ 6/13/2002 3:00 AM

Subject: **Re: Some thoughts**

John, I read Ken's post and he's right on the money, as usual! Still, he's dealing with the technical aspects and I would consider the situation more from a taste perspective: just what kind of sound am I trying to achieve?

We already agreed that we liked fixed bias at low volumes and the compression of cathode bias when we're crankin' it! This necessarily forces us into a range of appropriate amounts of cathode resistor. Too little and there's no high volume effect. Too much and we'll be in cathode biased territory all the time.

As I had said, 47 ohms seems appropriate. At that amount of voltage drop a 1 watt resistor is more than enough. Degeneration or whatever is trivial with such a value. Get it up to 100 ohms and over and you'll have to think about big resistors, bypassing and again - you lose the low volume tone.

Ken mentioned Class A but I don't think that's the desired tone to strive for. If you set the fixed bias to put you continuously into Class A then how could you get any difference between driving the tubes with high and low signals? The Vox circuit is still AB1 and is tried and proven.

With a pair of EL 34's you're getting at least 100 ma in each tube on peaks. With a 47 ohm resistor that's 4.7 volts of extra bias! If you look at a tube bias/plate current graph you'll see that's a LOT! 100 ohms is over twice that. Think about setting a fixed biased amp to desired idle and then cranking the trimpot up another 10 volts...

But then again, I'm a Teenage Head/Ramones fan.. 

---Wild Bill

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From:	**Steve A.** (steve_ahola@yahoo.com)
Date:	☑ 6/13/2002 5:05 AM
Subject:	**Re: Hybrid cathode/fixed bias question.**

Wild Bill:

I like to keep biased cathodes on separate resistors anyway. It lets each tube level itself.

On an AC-30, Bruce Collins came up with an interesting theory based on scope observations: when you crank it up you seem to be getting some negative feedback through the shared cathode resistor. (And we thought that Vox was just being cheap with a single cathode resistor...)

In one of his articles Dan Torres mentioned the old tube hi-fi trick of floating both of the cathodes of a fixed bias amp on top of a single 10 ohm resistor. I tried that in one of my amps- I really couldn't tell the difference because I didn't wire up an A/B switch for real time comparisons, but left it in any way. Supposedly it helps the balance between the two tubes...

Getting back to hybrid bias amps, I'll have to try out the 47 ohm resistors you mentioned! You could also use them to measure bias current, only divide the voltage readings by 47— right? BTW what resistor values would you use for all of the common output tubes (like 6L6, EL34, 6V6, EL84)? I sounds like a good experiment to try in any amp and it could be wired up to a DPDT switch for A/B-ing the effect.

--Thanks!

Steve Ahola
