Subject: I let the smoke out!
Posted by daveobergoenner@gmail.com on Wed, 21 Dec 2022 04:18:01 GMT
View Forum Message <> Reply to Message

Things have been going SO well on my K200 A5 (used for bass) since ChicagoBill came up with a solution to the amp going into protection early on one rail. That was August of 2014, and it's been reliably cranking out 110 watts into 4 ohms ever since. This K200 has been greatly refurbished with new low noise transistors, and much beefing up of the power supply. Most parts on the output board have been replaced with hand-matched replacements. Outputs are now MJ15015s (industrial-strength 2N3055s).

So, a few days ago, I'm merrily enjoying the K200 playing into my 2x15 JBL T&R cab. Suddenly, the bass almost goes away. A few seconds later, lots of distortion, a few seconds later, loud pop, lots of hum, and smoke starts coming out. I've never had smoke from a Kustom, and I've been playing them since 1971 (K400 then the present K200).

I pull the chassis, and clearly the negative side transistors are turning on full-bore as soon as power is applied. The neg supply pulling down to about 15 volts A few seconds after turn-on, the 1 ohm 5 watt resistor above the transistors closest to the power transformer starts smoking. The other neg side 5 watt is open. I also have about 8 volts DC on the output jack into an 8 ohm load. Not a good day!

Sounds (and smells) like a bias issue to me. I know there are 3 diodes in series that set-up the bias to the last two stages. One on the chassis. Should I shot-gun those, and the 5 watt resistors, and see what happens? Does something like this ever take-out the driver transistors too? I guess I'll need to improvise on the chassis mounted one...or is there a new suggestion?

Just looking for input from those more experienced with these amps here.

Thanks!
Dave O.

Subject: Re: I let the smoke out!
Posted by daveobergoenner@gmail.com on Wed, 21 Dec 2022 04:38:26 GMT
View Forum Message <> Reply to Message

BTW....
This post gives the details on what was done to this K200 back in 2014...

http://www.vintagekustom.com/FUDforum/index.php?t=msg&th
=3860&goto=21175&rid=599&S=39ad0843c1f74a8f65ec4 bbe1bc9e870#msg_21175

Dave O.

Subject: Re: I let the smoke out!
Posted by stevem on Wed, 21 Dec 2022 12:08:09 GMT
View Forum Message <> Reply to Message

Don't assume anything.

Pull out the 4 driver and output Transistors to test them, yank out the 3 remaining 5 watt emitter resistors to test there tolerance, and of course test the bias diodes.

Subject: Re: I let the smoke out!
Posted by daveobergoenner@gmail.com on Wed, 21 Dec 2022 16:38:27 GMT
View Forum Message <> Reply to Message

Yep, with DC coupled stages "don't assume anything" has become a moto!

I have 10 of the 5 watt resistors coming from Mouser. I'll hand-match 4, and just change them all. Pretty sure I have some matched pairs of NTE128/129 drivers. I'll likely change all of those as well. Those worked fine for the past 8 years.

The output transistors will be pulled, and measured on my transistor tester. Hopefully there's no leaks that only show up with 40 volts on them. Coming up with a matched quad of MJ15015's didn't come cheap. Those can usually take quite a beating.

Other than the chassis mounted temp sensing bias diode, I assume (there I go, assuming again) that the board mounted ones aren't anything special.?. In stock here I have 1N914 and 1n4148 glass ones. Do you have a preference there? I've had diodes leak on me too when they get more voltage than my FLuke meter tests with in the diode/transistor mode.

As to the chassis mounted one...Has anyone tried just using two leads of a silicon transistor?

Shouldn't the current limiting be kicking in to keep the 1 ohm resistors from smoking? I was really surprised. Guess I better check those transistors and diodes as well.

Or...I could just drop in a 200 watt IcePower amp block and be done with it. But that wouldn't be much fun. :)

Dave O.

Subject: Re: I let the smoke out!
Posted by daveobergoenner@gmail.com on Thu, 22 Dec 2022 21:40:33 GMT
View Forum Message <> Reply to Message

Todays update...

I finally got my K200 A5 to the point where nothing is smoking when powered-up!

One driver transistor was shorted.
One driver transistor was open.
One of the protection transistors was open.
One 1 ohm 5 watt resistor was open. (all above replaced)
The chassis mounted bias diode was open. (I think this may have been the beginning of the problems)
Chassis bias diode temporarily replaced with 1N4148...just to get things running without smoke.
All output transistors test good on both my transistor tester and with the Fluke diode function. (hard to blow MJ15015s)

Now on power-up, the voltage rails stay put at very near +/-40VDC.
This is tested at both the + side collectors (red), and - side emitters (yellow). All output transistors have normal PS voltages.
Not completely sure if bias is correct on the PAs. Gotta probe around some more.
There is now NO DC on the output tab either...Yeah!

So, progress in the right direction at last.

What's still not right is that the amplifier is VERY VERY distorted at its output! Tons of clipping. So something is clearly still not right. Yes, I keep an 8 ohm load on the output at all times when testing. I'll start to probe through it with the scope later today or tomorrow, and see where things go down the toilet. I'll be house-bound for a day or so with the winter storm. I don't dig white-out and -25 windchill, which is where we are now.

At least now I can leave it on for more than a few seconds without smoke coming out, so I can do some more in depth testing.
I wish I could print out the PC702 output board schematic clearly. That seems to be what's in this K200.

Still need to figure out a more permanent solution for the chassis mount bias diode. I may experiment with using a transistor in place of that diode. The test will be to see if I can keep bias in the ballpark when the output transistors heat up...running at full power into 4 ohms. Might take trying a few different ones...thermally connected to the chassis.

Dave O.

Subject: Re: I let the smoke out!
Posted by daveobergoenner@gmail.com on Fri, 23 Dec 2022 20:24:41 GMT
View Forum Message <> Reply to Message

Todays update on my K200 A5...

Part of the extreme clipping noted yesterday was my own fault.
In my vast ignorance, I installed the positive protection transistor (which had been open) backwards.
So, there was virtually no positive going part of the waveform, as it was "protecting" all the time.

Now that that's installed correctly (with a new transistor just in case), I do have both halves of the waveform...but distortion is setting in, rounding off the tops of the sine waves above about 1 watt of output.

I was suspicious of the first stage on this power amp board, but I pulled the transistor, and tested it, and it tests very well. No leakage at the low levels of my transistor tester, and good gain.

On the output side, the bias to the output transistors seems right on what's spec'd on the schematic. Nothing is overheating anywhere.

Next I'll move on to the next stages. Now that I can leave it on without smoke coming out, trouble-shooting is ever so much easier!

Dave O.
