Subject: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Wed, 10 Mar 2021 03:47:42 GMT
View Forum Message <> Reply to Message

Hey all, I'm back again for more info on a project. I have a nice white sparkle tuck and roll model 200 b-5, 4 channel PA head that is having some serious hum/hiss issues. I can't quite pin it down as 120Hz, but that sounds pretty close. I read elsewhere on the site that some hiss in normal in these amps, but this seem excessive. I've tried it on every cab I have, at friends houses, etc. It is there with no input, with input, it is unaffected by any of the preamp controls (vol, bass, treble), and is still there with the reverb tank disconnected. I have already replaced the cord with a 3 prong grounded. Using my crappy oscilloscope I've narrowed down the hiss to where the 50V positive and negative supply hits the output transistors. To me that points to the filter caps. I don't have a multimeter that can measure the 4500uf to see if they are still on value (I just can't bring myself to spring for a fluke). Is there another test I could to do see if they are leaky? I have already ordered some 4700uf 50V radial EL caps to test with, if that fixes it I'll spring for some higher voltage big honkin' can caps, but while I'm waiting for them to ship I thought I would ask if there is anywhere else in the amp I should take a look at. The one weird thing is if I lift the tip of the grounded reverb footswitch jack, the volume of the noise decrease by about half, but there is still noise. Which is very weird, because the noise as seen on the scope isn't in the signal path on that circuit board.
Can anybody point me in the direction of other things to test?

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Thu, 11 Mar 2021 12:11:47 GMT
View Forum Message <> Reply to Message

Ok, let's set up some basic common terms, because I am not sure what you are talking about as the main issue your hearing!

Hiss is a normal result of gain in a semiconductor, but of course this can be excessive if the semiconductor has a problem, or if certain resistors in the circuit have gone south and are making hiss and adding it into the audio stream.

I liken hiss to the sound of a small amount of air leaking passed your tire valve when your filling up your car tire.
This then is not like a hum or a ground buzz noise.
There is also a noise present called noise hash that is made up of the sound of the diodes in the rectifier bridge switching on and off, and this noise will be found through the amps audio stream , be it can be reduced or largely eliminated.

Hum issues can be 60 hz AC voltage related, or 120 hz AC ripple voltage related which can only be made after the diodes.

You seem to think that your issue is on the pc 703 board mounted on the rear wall of the amp. This board is both the driver board for the output section and has the 8 volt positive and 8 volt negative regulator circuit on it.
One way to fully confirm your finding is to disconnect the blue wire(s) that feed the audio signal

into it from the pc803 reverb board.
I would also check the 8 volt + and - from this board because if these two voltages that all the other circuits in the amp run on is not pretty well balanced then there will be a hum in the output of the amp.

In this regulator circuit the negative voltage output tracks the positive, so if the positive is not at the correct voltage, neither will the negative.
There are small size tan electrolytic caps in this circuit that go leaky, of flat out bad.

Also if the four TO3 output transistors are not closely enough matched there will be a DC off set voltage on the speaker output which will make for a hum being heard.

In terms of the stock diode bridge you can up grade it by installing four 01uf 200 volt or better ciramic disc cap across the terminals of the rectifier bridge .
A far better thing to do to get the noise hash out of the audio stream is to get some terminal strips and four modern fast type recovery diodes like UF5404 types and just make a whole new bridge for the amp.

Your strange issue you report with the jack in the reverb circuit I will have to put done thought into and get back to you, but now I think you have a few other things to go fourth and check and report back on.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Thu, 11 Mar 2021 14:51:54 GMT
View Forum Message <> Reply to Message

Thank you this is all very excellent advice and information. I'll run through the things you recommend and report back.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by chicagobill on Thu, 11 Mar 2021 17:06:09 GMT
View Forum Message <> Reply to Message

Lifting the ground of the footswitch jack turns off the reverb, so I would assume that the noise that goes away is being generated in the reverb circuit.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Thu, 11 Mar 2021 18:21:31 GMT
View Forum Message <> Reply to Message

I suppose I should mention that I have the reverb tank disconnected for all this testing. While I won't say that the noise isn't on the reverb board, when I put the oscilloscope on the input or output signal path of that board, it is totally clean. It doesn't show up until after Q702 on the power amp board. which is what made me think it was a power filtering issue. I'm going to run through

the things stevem suggested when I have time later. but I'll take a closer look at the reverb board too. Thanks!

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Fri, 12 Mar 2021 01:30:23 GMT
View Forum Message <> Reply to Message

So I checked the +/-8v circuit, and it is off, but only a little. I don't know how much is grounds for concern. +7.9v and -7.79v. to me that seems close enough. I also don't see and small tan electrolytics on the power board. Only orange drops and tan ceramics. Next up I'll try adding some caps to the rectifier, but to clarify your saying 0.01uf @200v caps, and they should go across all the terminals? like one for every diode of the rectifier? I don't have any UF5404 diodes on hand, would something like a 1n4007 work? I think those are the highest voltage I have on hand. I would try and check the output transistors but I am nervous about removing them. As for matching them, would I just be trying to get Hfe matched?
Thanks again for the help.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by chicagobill on Fri, 12 Mar 2021 05:38:21 GMT
View Forum Message <> Reply to Message

The diodes that Steve suggested are high speed diodes rated I think at 3 amps. The 1N4007 diodes are normal recovery diodes that are rated at 1 amp. They are not interchangeable.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Fri, 12 Mar 2021 12:23:24 GMT
View Forum Message <> Reply to Message

Ok, let forget the diode and the.01 uf cap thing for now and let's do this , turn them on , turn all the controls down and hook up a meter set for D.C. Volts across either speaker jack and the report back with what you read.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Fri, 12 Mar 2021 17:40:46 GMT
View Forum Message <> Reply to Message

DC reading from tip to ring of the speaker jack reads 17.5mV.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Fri, 12 Mar 2021 19:04:44 GMT

View Forum Message <> Reply to Message

Are all the 4 output transistors on the bottom of the amp the original RCA brand part number 36892?

Also was this DC voltage you tested a positive, or a negative?

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Fri, 12 Mar 2021 19:59:04 GMT
View Forum Message <> Reply to Message

Yes all 4 output transistors are RCA 36892.

Voltage reading was positive. This was under no load and all controls at 0.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Mon, 15 Mar 2021 22:02:17 GMT
View Forum Message <> Reply to Message

So after some more investigation I think ChicagoBill's initial suggestion of the reverb board being the issue is correct. I desoldered the input wire from the reverb board to the power amp board and the noise was gone completely. I reconnected the power amp and disconnected all the preamp boards from the reverb board and the noise was back. I went ahead and measured voltages at all the transistors on the reverb board against the schematic and the only thing that was drastically different is the collector of Q801. The schematic has it as -0.9v and it measured at +3.3v I checked the surrounding components, and the 1k and 220k resistors were out of spec but not but too much. 1.1k and 240k. I replaced them regardless. the 10uf coupling cap was right on the money, so it stayed. the transistor itself seems to be fine, none of the junctures failed a diode test, though I might just throw in a 2n3904 to be safe.

In an effort to be thorough I'll go take voltages on the power amp board, and continue testing components on the reverb board too.

Any other recommendations on what to look at? you guys have been invaluable so far, I can't say thank you enough.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Wed, 17 Mar 2021 10:04:29 GMT
View Forum Message <> Reply to Message

Hi!
Q801 is part of the reverb pan driver circuit and I think you have said that your testing has been done with the pan not being hooked up.
If indeed this is the case then no issue that may be with any of the circuit on that input side of the

pan could be getting into the audio stream.
That being said, unless your testing with a transistor tester that needs 3 of its test leads to be hooked up and is powered by a 9 volt battery then there is no guarantee that the Transistor you have tested is not going leaking in circuit when its powered up, and in turn passing some level of positive power supply voltage into the audio stream.

Also when you state that caps you have tested are right on the money uf rating wise you need a dedicated cap tester to test for leakage, you have not stated that your test out does that, if it does then all is good.
For instance, if C805-806 or especially 807are leaky then power rail voltage would be getting into the audio stream.

All of these caps a just mentioned are coupling caps which separate circuits into separate areas. If for instance you lift the down stream end of c805 up off the board, then the whole 2 Transistor reverb return amp circuit is out of the picture for being a cause of your problem .

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Sun, 21 Mar 2021 22:09:32 GMT
View Forum Message <> Reply to Message

Thanks Steve, I did all of the reverb circuit testing with the reverb pan hooked up and the controls at max, as per the schematic notes. The testing I've been doing so far has just been with a generic digital multimeter. using the capacitance setting for caps, and using a diode test on each juncture of the transistors to see if any have failed. I just bought a cheap transistor and esr tester on amazon. I'll re-test all the components and see if anything is way out of wack. I know these are not super accurate or reliable testers but I'm hopeful it will give me a ball park. I'm about to go test all the mentioned components in the reverb circuit.

In the meantime I have done a little playing around with the head, just to hear how its performing, ignoring the noise. I can play over it with out too much issue. But I've run into some other concerns. the overall volume of the amp is much lower than I would expect for a 100w head. With the volume at noon and it plugged into my 2 8ohm 1x15 peavey cabs, its only about bedroom volume. My 15w orange head is louder than that with vol at 9 o'clock into the same two speakers. If I turn the volume up past 3 o'clock, it get very distorted. the volume gets quite on the attack, then fades back up as the note decays. It sounds like a transistor distortion pedal that's biased poorly.
I realize this is a PA head, and isn't really meant to be dimed like this, but I still expect more volume than this. Distortion at high volumes is desirable, but this isn't usable distortion. its the same on all 4 channels so I'm not convinced its in any of the preamp boards. Is this an issue of impedance matching? I'm aware of how tube amps react, but I'm not as familiar with solid state. I've taken voltage readings at all 4 of the RCA 36892 output transistor leads and the voltages are pretty close to the values on the schematic. I don't expect them to be perfect on an amp this old. I'd like to take voltages on the 4 RCA 38736 transistors in heatsinks on the board, but I've got to find a way to do that without shorting anything out. After that I might need to remove them to try and get a reading on this new tester. I'll see if I can find the datasheets for value reference.

sorry this keeps becoming more and more of a rabbit hole every time I post, but I really appreciate

the help.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Mon, 22 Mar 2021 11:00:52 GMT
View Forum Message <> Reply to Message

Since you do not have a Oscilloscope, and in terms of checking your amps outout level I will need to dive into one of my amps to figure out a way for you to corrolate wattage output against the power supply rail voltage drop that takes place as the amp is driven .

Give me a day or two to do this.

Just to be clear, your two Peavey cabinets when wired together do check out resistance wise at a hair less then 5 ohms right?

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Mon, 22 Mar 2021 18:55:21 GMT
View Forum Message <> Reply to Message

Actually, I do have an oscilloscope. Albeit an older, funky CRT. I should able to get measurements out of it, if not super accurate ones. If you'll tell me what parameters to set up/ what I'm looking for I can run some tests. I've got a signal generator too. I'm not super knowledgeable about using it for specific measurements, I mostly use it to find noise, and look at waveform clipping in the guitar pedals I build. But I can always hit up youtube university if I need more info.
regardless any audio testing will have to wait for Thursday. I desoldered Q703 yesterday to test, and one of the legs fell off. So that could have been causing some issues. I'll have a replacement nte108 here then. I also picked up uf5404 diodes for a new rectifier, cause why not.
The Peavey cabs in parallel measure, surprisingly, 4ohms exactly.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Mon, 22 Mar 2021 21:16:58 GMT
View Forum Message <> Reply to Message

Ok it's great you have the O-Scope, now its time for a 4 ohm 100 watt heat sinked load resistor, or two 50 watt 8 ohm ones then we can see for sure how healthy the amp is.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Mon, 22 Mar 2021 21:30:48 GMT
View Forum Message <> Reply to Message

alright. I've only got 2 4ohm @ 50w resistors on hand, so I'll get some on order.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Thu, 25 Mar 2021 20:50:00 GMT
View Forum Message <> Reply to Message

Ok, I am good to go for testing. q703 has been replaced with a nte108. I have a 4ohm 100w resistor at the ready to go across the output. I'm guessing I'll be testing along the lines of the test diagram in the technical section?

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Fri, 26 Mar 2021 10:12:56 GMT
View Forum Message <> Reply to Message

Hi!

No we are going to test a bit differently and I will post up details tonight after testing my 200B-5 to get the numbers to post up.

So for starters you want to hook up your scope across you test out resistors.

If you have two meters then you want one hooked up across the resistor also, and you want it set to read AC volts.

For a input test tone I pump in 1K at .150 volt, which you can set by feeding that first into one of your voltmeters set for AC once again.

You second meter if you have one will be for testing D.C. Volt levels inside the amp.

Ok, I will get back to you later.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Fri, 26 Mar 2021 20:45:07 GMT
View Forum Message <> Reply to Message

Ok, here's what I have for you, but first some notes!

1) my wall voltage during these test was 117.5.

2) my dummy load resistor checks out at 4.5 ohms.

3) I had to do these test on my 200B-2 amp (just 2 channels) because I forgot that my Brother has my 200B-4 head.
This means that your amp will be drawing a bit more power supply current then mine so your peak power wattage will not be quite what mine was.

2a) my amp still has its original main rail power supply filters from 1969 So who knows maybe your new filters will off set the higher current draw of your amps added two preamp boards and

reverb board.
I guess you could unpower two preamp boards if you cared to do you would test out closer to my amp.

At idle I had 39.6 volts on the positive rail and 39.4 on the negative rail.

At idle one 8 volt rail was +8.37 volts, the other rail was - 8.23 volts.

My amps max RMS output voltage was 19.6 for a wattage of 85.3 .
This reading was taken at the very onset of clipping seen on my scope and I found I had better control of that setting point by also adjusting the Treble knob.

At this wattage output my main plus rail was down to 34.1 volts, the negative rail was 34.1 also.

Peak output voltage was 25.16 for a wattage of 140.6 .
At this power level the main plus rail was down to 32.3 and the negative was 32.2.
The regulated power rails where + 8.34 and the other was -8.19.
If your amp test out close to these numbers then your power supply is heathy and we then can look deeper for the source of your issue.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Fri, 26 Mar 2021 23:01:59 GMT
View Forum Message <> Reply to Message

Ok, Long story short, my amp does not test anywhere close to yours. here are the details.
set up the same test parameters as you: 4ohm across the output, ac volt meter and o'scope on load resistor. DC volt meter for internal checks. Test signal set to 1khz, measured at 0.150v AC on meter.
few other notes. I never fully installed new filter caps, I just mocked them in to see if it got rid of hum. when there was no change, I hooked back up the stock.
I have replaced the stock rectifier with 4 uf5404, and I have replaced a few resistors on the power amp board that tested more than 10% off value. I can give a specific list if necessary. haven't checked all, but the ones I've replaced with 1w 1% metal film resistors.

wall voltage read 120 before the fuse.
load resistor was 4.1ohm

Voltage rail at Idle
+39.4v and -38.9v
8v rail (tested at the red and green wires leaving the power amp board)
+8.06v and -7.93v

the output read -20.8mV dc, 0.01Vac with signal, but volume at 0.

With test signal on, volume increased to highest voltage reading
Output AC reading
1.269v

Rails +39v and -38.6
with volume at full clockwise
Output AC reading
0.29V
Rails
+39.2v and -38.9v

So I'm not sure how to calculate wattage from these numbers, but it is clear that I'm way off.
Should I start tracking down some replacements for the output and/or heatsink transistors?

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Sat, 27 Mar 2021 01:46:56 GMT
View Forum Message <> Reply to Message

Your high current power amp section is not working , or either not being driven with enough drive signal TO work !
Set your audio generator up to output 1 volt if you can an and send that into the RCA jack on the rear of the amp, does your output to your resistive load go up way
Higher then what you tested it at?

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Sat, 27 Mar 2021 11:40:04 GMT
View Forum Message <> Reply to Message

By the way, if the rest of the amp before the output board is working right and you do the test out and crank the volume to full you should have very close to 3 volts of signal coming OUT of that RCA jack on the rear of the amp.

If you do not then your issue is still likely to be on the 803 board I would say.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Sat, 27 Mar 2021 18:36:41 GMT
View Forum Message <> Reply to Message

With 1khz @ 1v signal at the monitor jack, I read 5.38v across the load resistor. Rails at =37.6v and -37.3v.
With the 1khz @ .5v signal at the input and volume at full, the monitor jack reads 0.014v ac.
On a whim I tried all the channels. 1+4 are the same, channel 2 is a little lower, 0.012v. but channel 3 is very low, 0.006v. But I'll come back to that later, once the other stuff is working.
So it looks like I need to nail down board 803. I'll start testing all the components in the next day or two.
I'll update as I go. thanks again Steve.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Sat, 27 Mar 2021 19:50:30 GMT
View Forum Message <> Reply to Message

I just tested mine and with a .960 volt drive signal into the RCA jack I got 8.2 volts into my load resistor, so I would have to say that your 703 output board pretty much looks ok and whatever is wrong with the 803 board is not only messing things up, but loading down the power supply some also,or your load resistor might test out higher then mine does at 4.5 ohms.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Sun, 28 Mar 2021 02:09:47 GMT
View Forum Message <> Reply to Message

Success!! not total, but some major improvements.
It ended up being q804 that was bad. Once I replaced it with a 2n3904, I got all the volume back. I could hear the test signal across the load resistor with no speaker. I did not end up with super accurate voltage reading because I never properly heat-sinked the resistor, melted some plastic and singed my desk! oops. what I got before I realized I was melting probes was 16.8V at the output. Woohoo!

So now that I'm at working volumes again, I've still got serious noise issues. It is both the power amp and the reverb still. I disconnected the input from power amp, and it sounded like 60hz hum. I reattached the reverb, tank and all, disconnected the preamp boards (realized channel 3 was not properly soldered after the last time I did this.) the noise now sounds different, and is louder. If I unground the reverb footswitch, the noise goes back to just 60hz hum, with some artifacts, like quite pops and clicks. So I'll start working through the remaining components on the board and see what I find.

Is there a way to test the reverb pan itself? I still get reverb sounds out of it. so much so if I move anything near it the crash is massive. its very sensitive.

I'm also wondering about the replacement transistor I put in for q703 on the power amp. one of the legs fell off when I removed it for testing. It was a metal can RCA, either 38735, 36735 or 35735. The second digit is very hard to read. The schematic says it should be a pet1075, power amp board 900 has a 38735 in this same spot. I replaced with at NTE108, which I saw recommended elsewhere on this forum as a pet1075 equivalent. I think the hum in the power amp board started after this replacement.
anyway, a huge improvement, Thanks so much!!

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Sun, 28 Mar 2021 12:11:14 GMT
View Forum Message <> Reply to Message

Hi!
First off the only place in the amps signal chain where 60 hz hum can get in is my means of the power transformer magnetically coupling into the output side coil / transducer of the reverb pan.

Any in the amp, circuit wise after the rectifiers can only be 120 hz ripple voltage making for hum issues getting into the audio stream.

There was a factory fix for 803 board noise and feedback problems in amps made before April 4th 1969.

The fix is this.
R836 is changed to 82k.

R837 is changed to 82k.

R830 is changed to 47 ohms.

R848 is changed to 15k.

The reverb pan should test out ohms wise at about 175 on both the input and output side.

If you have the correct reverb pan for the amp then only the output side of the pan should be grounded to the main case of the pan and to the output RCA jack on the pan, and of course on back thru that RCA cable to the 803 board.
The input side of the pan should not be grounded to the main case of the pan.

If the output side of the pan is hooked up and mounted or sitting near the PT and the reverb is turned up you will get a lot of 60 hz heard thru the output.

Pops and clicks in the audio stream sound like the case of a noisy transistor to me!

Q703 is a 38735 which crosses to a NTE108.

Maybe that broken off lead has caused other components around q703 to go bad if the amp was powered up like that.

For continued trouble shooting I would disconnect and unpower all but the one preamp board that seems to work normal!

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Wed, 07 Apr 2021 22:48:41 GMT
View Forum Message <> Reply to Message

apparently during some desoldering, the leads to the offboard diode broke, and I blew a fuse. So while I wait for that to show up, I'm desoldering and testing more components.

How do I tell if a transistor if noisy or bad aside from it being full blown non functioning? Should I be trying to nail down values to the data sheets?

For example I tested Q708 at hFE56, Ube669mV and Ic 6.1. The data sheet for nte128 says hFE

should be between 100-300. I think. I'm having a hard time telling which value to use.

I'm just unsure of what I should be looking for.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by stevem on Thu, 08 Apr 2021 09:54:58 GMT
View Forum Message <> Reply to Message

Well lets first confirm you do not have any blown output Transistors fromt that critical bias diode going open on you, because that's what likely took out the fuse.

By the way when I work on the output stage of the amp I like to lower the rating of the fuse by 25 to 50 % so that it blows faster if I do something wrong or something goes south on me.

You just need to of course remember to replace it when making a full output wattage test.

Subject: Re: 200B 5 PA head hum/hiss issue
Posted by Drjones1106 on Sat, 10 Apr 2021 00:54:14 GMT
View Forum Message <> Reply to Message

A lower wattage fuse is a good call. I should have been plugged into my light bulb current limiter but like a dumbass I was plugged into the wall.

All the transistors test out fine. I took q1-4, q704/5, q708/9 and tested them all on my transistor tester. they all registered as working. though my last question about relative hFE values still stands. I get volume out of the amp. I tried a guitar and its pretty loud. I couldn't do a full vol test, so I set up a load test (same as last time) to get a voltage reading, and got some strange results. It peaks around 10v ac at around 11 o'clock volume, but then drops to around 3v after 12 o'clock. at full clockwise it comes back up to around 7v.
I didn't hook up the oscope, so I'll do that later and get some more qualitative info.
At least it powers up and isn't blowing fuses. still has a wicked noise floor. I'll also be doing more work on that front. I intend to disconnect all but one preamp, and bypass the reverb board, straight to the poweramp to see what kind of noise is there.
