Subject: Kustom III PA
Posted by Autoharp on Sun, 19 Apr 2015 04:02:43 GMT
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I am working on this amp for Daf, it appears that the biggest issue is very dirty pots - I can handle that - but the output transistors seem to be running very hot. There is no forced cooling and the heat sink looks inadequate. Any thoughts? It seems to work fine otherwise.

Subject: Re: Kustom III PA
Posted by chicagobill on Sun, 19 Apr 2015 06:48:53 GMT
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Welcome to the place. Not really that familiar with that model, but I assume that the power amp is a 120-130 watt model.

Is it heating up at idle or when you run it hard? If it's at idle check the bias string diodes. You may need to change them out to get the idle bias down to a cooler level.

Subject: Re: Kustom III PA
Posted by stevem on Sun, 19 Apr 2015 10:55:40 GMT
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The paIII uses a output stage who's schematic can be found in this sites techical section, it a PC 5029 board schematic and like Bill posted check those 3 diodes and in peticular check CR3 as that is the diode that is suppose to be clipped in tight in the center of the output transistor heat sink.
Make sure this diode is clipped in tight and that it leads although insulateded do not touch that metal clip it resides in!
It's normal for the bottom of the amp to feel warm after it's been on for a hour or so in this area, but not hot if the amp has only been idling!

Subject: Re: Kustom III PA
Posted by Autoharp on Mon, 20 Apr 2015 16:10:41 GMT
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Thanks for the help. Right now I have it torn apart - I have all six input modules out, the graphic EQ module and the reverb / master module. I have cleaned all 33 pots and now to put it back together and try it.

I have been driving it with my electric Autoharp - the amp does sound good but the noisy pots were a killer.

Subject: Re: Kustom III PA
Posted by stevem on Mon, 20 Apr 2015 16:41:37 GMT
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What you used to clean the pots was also a lube I hope, if not break out the WD-40 spray while it's all apart!

Subject: Re: Kustom III PA
Posted by Autoharp on Tue, 21 Apr 2015 13:10:26 GMT
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Specifically for cleaning and lubricating. They definitely move smoother now.

Subject: Re: Kustom III PA
Posted by Autoharp on Tue, 21 Apr 2015 13:20:31 GMT
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The PC 5029 schematic does not seem to be entirely correct - that shows six large output transistors and this unit only has four. I'm going to put the eight modules back in that I have out (6 input, the reverb / master and the graphic EQ, retry it and take the PA module out, see if there is a schematic for it and if not, reconcile the 5029 with the board that I have. I suspect that what circuitry is on mine is on the 5029 completely, just that the 5029 has some that is not on mine.

Subject: Re: Kustom III PA
Posted by chicagobill on Tue, 21 Apr 2015 15:24:47 GMT
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All of the Kustom power amps are based upon the same basic design. There are a few differences, but one basic schematic will help you fix any of them.

Once you remove the board for the power amp you will probably find the pc number etched in the foil side, then you can look up the correct schematic. Let us know what you find.

Subject: Re: Kustom III PA
Posted by stevem on Tue, 21 Apr 2015 17:05:01 GMT
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Sorry for the wrong info, but when I found the PA III only the5029 was on the schematic for the power section!

Subject: Re: Kustom III PA
Posted by Autoharp on Tue, 21 Apr 2015 18:03:28 GMT
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It's a PC 3065 or 5065, can't tell which...

Subject: Re: Kustom III PA
Posted by chicagobill on Tue, 21 Apr 2015 18:11:18 GMT
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PC5065 is a 125 watt power amp board. There are two versions in the technical section. See if that matches your power amp.

Subject: Re: Kustom III PA
Posted by Autoharp on Wed, 22 Apr 2015 02:42:51 GMT
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It sure looks like it. The two versions look the same except that one shows the power supply (which is still not entirely correct as this one has an off / polarity switch, and the other has a tape out jack (one 100k resistor), I'll ignore that difference.

Replacing many missing screws in the case, now I start reassembly.

Wish I could find schematics for the other three modules:

PC 5128 - Input Module (six of them)
PC 5130 - Reverb / Master
PC 5144 - 7-band Graphic EQ

I don't see them in the technical section.

Subject: Re: Kustom III PA
Posted by Autoharp on Wed, 22 Apr 2015 13:37:03 GMT
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I've got it back together. The output stage is running hot, even at zero signal. There are two bias diodes clipped in the heat sink, there is a 33 ohm resistor that has had one end clipped and an additional 10 ohm resistor installed in series (43 ohms total). Not sure what other monkey business is happening, I'm just going to pull the 5029 module out along with the heat sink, reconcile it to the print and figure out what is what (de-engineer it).

Subject: Re: Kustom III PA

Posted by chicagobill on Wed, 22 Apr 2015 17:22:58 GMT
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Returning it back to original would be the smart thing to do. These amps are normally so stable, fixing it should get it working right again.

Subject: Re: Kustom III PA
Posted by Autoharp on Wed, 22 Apr 2015 20:11:31 GMT
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Pulled the 5065 module out...interesting...

It shows the bias diodes as the two clipped in on the heat sink and a third on the board - but the one that BELONGS on the board is not there; it is where the 33+10 ohm combination is. I have lots of diodes here, I just need to figure out what a generic type is that will work in its place.

AND - the emitter lead is broken off (at the connector) from one of the output transistors. This can't be good either.

So I have someplace to start...

Subject: Re: Kustom III PA
Posted by chicagobill on Wed, 22 Apr 2015 21:29:04 GMT
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Almost any diode will work there, 1N914, 1N4148, 1N4001, etc.

Just make sure to install it in the right polarity or you can blow up the power amp. Also handle the leads of the two diodes mounted to the heat sink with extreme caution, as they will break of at the case.

You may want to test the output transistor that is unhooked before turning the amp back on. There may or may not be a reason that it was disconnected.

If you have a lightbulb limiter available you might want to use it when you power up the amp again.

Subject: Re: Kustom III PA
Posted by Autoharp on Thu, 23 Apr 2015 19:05:52 GMT
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The reason it is disconnected is that the lead seems to have simply broken off. And I stand corrected, it was the base, not the emitter.

I've also gone over the board, I'd post pictures if I was allowed to. The 10 ohm / 33 ohm resistor mashup is in place of diode CR1. Interestingly enough, the schematics for the 5065 and 5029 modules all agree - CR3 (1N3754) is mounted in a clip on the heat sink and CR1 and CR2 (1N3193) are mounted on the board, but actually CR2 & CR3 are 1N3754 and are mounted in clips on the heat sink and CR1 should be mounted on the board but it has been swapped with the resistors.

So I am going to replace the resistors with a 1N4148 (I have lots of them), test the 1N3754s, test the output transistors, fix the broken base lead, put it back together, then tune for maximum smoke. (just kidding on the last part)

I'll let you guys know how it goes.

Subject: Re: Kustom III PA
Posted by chicagobill on Thu, 23 Apr 2015 19:32:06 GMT
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In most cases, there is only one diode mounted to the heat sink and there are two on the board.

Having two on the heat sink would allow for a little bit better thermal control, especially if there are two separate heat sinks or the output transistors are mounted apart from each other.

Subject: Re: Kustom III PA
Posted by Autoharp on Fri, 24 Apr 2015 02:27:28 GMT
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To answer a question from earlier, the four output transistors are in TO-3 cases and they are mounted on a single heatsink that resembles a piece of #1 DIN rail about 6" long I'm going to refer to the basic amplifier as having a "positive side" and a "negative side". The input and output sections are (roughly) between them, and the temperature sensing diodes are between the positive and negative output transistors.

I also decided to use a 1N4004 diode rather than a 1N4148, see how that works out.

Eventually I'll get to post pictures here

Subject: Re: Kustom III PA
Posted by chicagobill on Fri, 24 Apr 2015 05:10:20 GMT
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I think what you are describing is the standard Kustom mounting rail, that turns the entire chassis into the heat sink.

Subject: Re: Kustom III PA
Posted by stevem on Fri, 24 Apr 2015 10:18:24 GMT
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If you do not have a light bulb limiter than I would derate the fuse by 50% to try and help keep the smoke in!

Subject: Re: Kustom III PA
Posted by Autoharp on Fri, 24 Apr 2015 20:54:50 GMT
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It runs on smoke and if the smoke leaks out it won't work.

Seriously...Good news / bad news

Good news is that it appears that the correction of the bias diodes has made it run MUCH cooler.

Bad news is that now it seems to not want to produce any real volume. I've got hum, I've got white noise, but no serious loudness from it like I had when I started. Put the reverb tank back in, turn the reverb volume up, tap on the tank and you get the familiar "boing". The graphic EQ, if you turn the two lowest bands down you can pretty much kill the hum.

Getting frustrated...but I WILL find the problem.

Subject: Re: Kustom III PA
Posted by stevem on Sat, 25 Apr 2015 10:54:56 GMT
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So let's go back to square one, your first issue was dirty pots and the amp at that time had good / normal volume but for being intermitant due to the pot issue?
Do you have good signal coming into Q1 on that power amp board?

Subject: Re: Kustom III PA
Posted by Autoharp on Mon, 15 Jun 2015 01:05:05 GMT
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Due to a number of issues I've had to let it sit; I've gotten back to it today. Aside from the THUMP from the speakers when the power is turned on, there is nothing from it. It isn't running hot like it was when I started, warm for sure but not hot. I will see if I can set up some sort of a signal tracer or generator. It would really be helpful if I could get a print on the PC5126 preamp board. I did manage to find the PC5144 7-band equalizer and PC5130 Master & Reverb. I did find schematics for the PC5127, PC5128 and PC5129 preamps but they are wrong (although the PC5127 may be useful. The 5127/28/29 all use ICs but the 5126 is all discrete with no ICs, and it has no "bright" switch.

With all the controls up tapping the reverb tank does not make noise however there is make/break static in the speaker when plugging the *input* to the tank.

At least now I have prints for the master and EQ and I'll likely find my problem there, or at least have a better idea where to look.

Subject: Re: Kustom III PA
Posted by Autoharp on Mon, 15 Jun 2015 03:54:38 GMT
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I just drew a block diagram for it, I can start doing serious troubleshooting tomorrow.

Subject: Re: Kustom III PA
Posted by stevem on Mon, 15 Jun 2015 10:26:26 GMT
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rig up a way to pump signal into pins 2 and 3 of the input connector on you 5065 or whatever driver board to confirm that at least that end of the amp is working.
Do not pull that connector as the amp needs the ground, so just tack solder to the board .
The turn on thump is a good sign that the output stage is working!

Subject: Re: Kustom III PA
Posted by Autoharp on Wed, 17 Jun 2015 06:16:07 GMT
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Problem solved! It works great!

I was totally frustrated. Injecting signal, signal tracing, nothing was happening...until...

I started measuring voltages on the 741 op amp on the graphic equalizer...pin 4, supposed to be -12 volts - measured -13.2, no big deal. Pin 7, supposed to be +12, measured -5.4 What the hey? Checked the power supply to the board - -13.5 instead of -12, close enough, but -5.4 instead of +12

Went back to the zener diodes in the power supply, + and - 13.5 - that's OK, I'm on to something!

Power goes to a Molex connector on the master / reverb board, then comes out from other terminals to the graphic EQ then daisy-chained to the preamps.

Correct voltage in, bad voltage out. Pulled the board out again for the umpteenth time and looked at the solder on that connector...there was my problem. Very little solder, taking the harness connector off to remove the board did it in.

Used some 26 gauge bare copper wire and made figure 8's around the 3 triplets and soldered it good, put it back together - presto! It's awesome!

Combination of idling and playing my instrument through it for two hours. Output transistors are toasty but not super hot like they were.

Band practice is Thursday, and they have a gig Saturday afternoon. I think it will work!

Thank you everyone for your help! I'll be doing photography for their gig, so I'll report back.

And cleaning the controls fixed that noise problem too!

Subject: Re: Kustom III PA
Posted by stevem on Wed, 17 Jun 2015 10:17:45 GMT
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You can un-bolt the thermal circuit breaker mounted inbetween the output transistors and heat it up with a hair dryer to confirm that it opens, if it does then the amp will not blow up if the output stage is running too hot at the gig but just shut down.
