Subject: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Sun, 10 Aug 2014 13:22:50 GMT
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Hi, using my first post seeking information on a 200 B1 that is/was blowing fuses. Amp serial number is 59412, no tremolo or reverb. Power amp board is PC703 but I haven't pulled either preamp board so I haven't yet determined exactly which boards they are.

The amp had been sitting for years and was blowing fuses upon power up. Found a shorted driver transistor (38736 = RCA 40409) and was able to source some NOS replacements for all the driver transistors, RCA 40409 and 40410.

There is at least one output that is shorted, so I want to just refurbish the power board and both preamp boards while I have it open. I plan to use 2N3055 replacements unless there is a better choice these days. Please don't suggest the NTE130MP because they cost 20X what I'd have to pay for the 2N3055s.

The main filter caps are good, but I do want to swap out all the tantalum caps on all the boards and all the driver and output transistors, plus the 1 ohm 5 watt resistors. Is there a definitive parts list for these amps, or does someone have parts suggestions for a solid, basic circuit overhaul without going too far overboard? I just want to make the amp functional and reliable.

Any parts suggestions or technical recommendations are welcome.

Thanks in advance.

-Stan

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Sun, 10 Aug 2014 15:50:38 GMT
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We just had a good string going on a output section repair , if you go to the comment section and slip down to the "more power from a a Frank head" posting you will get a lot if info from that string! One if the main things you want driver transistor and output transistor wise in that they are matched as this determines the max clean output, how much of the hard to listen to cross over distortion takes place and how much idle hum the amp has aside from if the two main filters are good or not!
Recapping the whole amp while you got it open is what I would do also and be done with it!

Subject: Re: Kustom 200 B1 blowing fuses
Posted by daveobergoenner@gmail.com on Sun, 10 Aug 2014 16:51:46 GMT
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Stan:

If you look down near the bottom of the topic Steve suggested ("more power from a Frank head") you will see my detail of the refurbishment of my K200 last week. This includes a full parts listing of the transistors used, and some other parts. The last two posts in that thread give all the details.

I used MJ15015 output transistors, which are heavy duty, industrial versions of the 2N3055. (see the data sheet from ON Semi for the details...
http://www.onsemi.com/pub_link/Collateral/2N3055A-D.PDF

I happened to have a bunch of them in stock. I'm a broadcast engineer, and those transistors are used as modulators in AM transmitters. The main advantage to using such a heavy duty transistor in a K200 is that they are also very closely matched. Besides, I now know I'll never need to replace them ever again. They are rated at 180 watts each.

NTE has a version of these. Newark has them in stock for $3.65 each. You will only need 4. Be very careful about buying them from other cheap sources like fleabay. This transistor is frequently counterfeited! A relabeled 2N3055 might work for a while in a transmitter, but will fail eventually...and we've seen a bunch of them.

Clearly your problem is on the power amp board. Have you changed all the electrolytic caps yet? Kustom used very high quality parts in these amps, but carbon comp resistors can go way out of tolerance after 45 years. I found some on the output board that were as much as 250% of the value they should have been. I replaced about 80% of the resistors on that board...and a lot of them on the pre-amp boards in mine.

Dave O.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Sun, 10 Aug 2014 19:03:57 GMT
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Hey Stan, welcome to the place. These circuits are very basic, and nearly any power transistor with sufficient ratings will work. I've used 2N3055 and the MJ15000 series transistors in the past with no problems. The only problem could come from a transistor with too low of a gain rating. In a few cases some tweaking is needed to stop some unwanted oscillations, but not too often.

Dave points out a very real problem with counterfeit transistors. Try and buy whatever you use from reputable sources.

Any 40 year old amp will have problems, but these amps are easily brought back to 100%.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Sun, 10 Aug 2014 20:32:16 GMT
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Thanks for the replies so far.  Just so I don't come across as more competent than I really am, I'm not a trained tech, I'm more of a hobbyist with a fair grasp of the basics and all the tools and test equipment I need.

No, I haven't changed any electrolytics yet.  I have a stubborn set screw on one of the preamp control knobs so I'm waiting on the oil to penetrate so I can peel the preamp boards back.  I need to ID each preamp board and try to ID values for the tantalum capacitors.

I think I am settled on driver and power transistors.  I sourced some original RCA 40409 and 40410 drivers complete with original heatsinks.  I am familiar with the suggested MJ15015 but plan to beef the outputs up to MJ21196, which are still cheaper than the NTE part and far more robust.

I want to shotgun all the electrolytics on all three boards without even testing them.  Besides checking the CC resistors for excessive drift, is there anything else in the amp that needs scrutinizing?

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Sun, 10 Aug 2014 20:47:31 GMT
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OK, here is what I have.

PC703 power board (KEI 1)
PC203 (KEI 1)
PC105 (KEI 1)

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Sun, 10 Aug 2014 22:25:08 GMT
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The only other thing you may want to replace would be the round cased bridge rectifier .

In regards to getting the knob set screw loose try setting a well fitting  screw driver in there that you can tap the end of with a medium amount of force while some one else supports the knob. Many times I have been able to jar the threads loose in this manor with no lube.
I do however on every amp I work on remove each set screw and lube them up with some form of grease!
At times I have had to snap the plastic section of the knob off with line mans plyers and then use a small cut off disc in a Dremel tool cut thru the brass center section of the knob.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Sun, 10 Aug 2014 22:52:07 GMT

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I should have mentioned that the first thing I replaced was the rectifier, with a 100V/15A model. The set screw was rusted and tapping it with a hammer had no effect. Finally got it to break loose and got all the boards ID'd and tantalum caps counted.

I reconciled the number of tantalums on the PC703 and PC105 boards, but I physically count 9 on the PC203 board but only see 7 on the schematic. Every schematic I've seen indicates "PC203 With Boost" but this one doesn't have a boost that I can see.

What gives?

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Sun, 10 Aug 2014 23:10:43 GMT
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A none effects preamp channel on a k200 B head has 4 knobs, the top right knob being a brite switch .
The pot and brite / boost switch layout at the bottom center of the pc203 schematic has these parts in the wrong location even when viewed from the rear of the board.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Mon, 11 Aug 2014 02:34:53 GMT
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OK Steve, what about Q714 and Q718? They are also RCA 36892 and I already have 6 BJTs in the cart. Replace em or not?

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Mon, 11 Aug 2014 12:20:52 GMT
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Those are the T03 types for the positive and negative regulator sections and are not under a heck of a lot of load by any means, although I have seen them go, but most times when that takes place at least one other transistor in that section is gone and that voltage spike due to that takes out the electrolytic caps in that section.
If yours are good that do what you want with the extra two you have on order, place then in the regulator circuit, or play around some and sub them in the output stage to try and get a better match on those 4 transistors for less DC voltage off set on the amps output.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 13 Aug 2014 19:08:58 GMT
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Ordered all new output transistors and all new electrolytics.  I'll check back in once the parts get here.

Subject: Re: Kustom 200 B1 - still has dead short after overhaul
Posted by Tone Meister on Tue, 23 Sep 2014 14:01:01 GMT
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OK, finally got around to going through this 200 B1 and still have a dead short when connecting the RED wires for Q704 and Q708 to Q1 and Q2 respectively.  No issues with connecting RED wires of Q705 and Q709 to Q3 and Q4 when Q1 and Q2 are disconnected from the power board.

Here is a list of what was done.

1) Replaced shorted bridge rectifier
2) Replaced all 4 outputs with MJ15015 and used Q-Pad insulators
3) Replaced Q714 and Q718 regulators with 2N3055 (one was shorted)
4) Replaced CR700 and CR701 diodes (one was shorted)
5) Replaced every tantalum capacitor in the amp with high quality electrolytics
6) Replaced all out of spec carbon comp resistors
7) Replaced all drivers with original RCA parts 40409 and 40410
   Replaced all 1 ohm 5 watt resistors

Tested all remaining capacitors, diodes, and transistors for shorts but can't pinpoint the source of the dead short.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Tue, 23 Sep 2014 20:12:53 GMT
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Please explain dead short. Do not connect a load to the amp until you get it stable. If you have a light bulb limiter, use it.

Have you checked the mounting for Q1 and Q2? Check to be sure that there is no connection from the chassis to the collectors.

You said that you replaced the two bias diodes, what about the chassis mounted one, is it okay?

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Tue, 23 Sep 2014 20:43:16 GMT
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Dead short = dead short.  I know well enough not to load the amp and I am using a lightbulb limiter connected to a variac until the amp is stable.  When Q1 or Q2 red wires are connected my 150 watt light bulb lights fully.  I can connect Q3 and Q4 red wires and there is no short as long as Q1 and Q2 are disconnected.  I've tested all remaining diodes including the clip-mounted one, caps, and transistors and thus far cannot pinpoint the short.  I've checked all my work sites for solder bridges and for other conditions that could cause a physical short.

It will be tomorrow morning before I can get back to the amp, but I will definitely check the mounting for Q1 and Q2.  I made sure that each mounting screw has the plastic insulating grommet and I used Q-Pads and didn't over-tighten the mounting screws.  Perhaps I should remove Q1 and Q2 and fire up the amp to see if I can isolate the problem to the power board or those transistors?

What do you think?

-Stan

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Tue, 23 Sep 2014 21:39:57 GMT
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So I take it that what you mean is that the amp is drawing a lot of current when the two top output transistors are connected to the circuit.

To me a dead short would be like there was a metal screwdriver  directly across the power supply or something. Like a component has fused internally and is like a direct wire from supply to ground.

I will assume that when the amp is powered up without the transistors connected, there are normal power supply voltages present. With the limiter installed, they will be lower than normal, but they should still be there. Is there any voltage on the output terminal?

So check your output transistors. Have they shorted? Has a pad or screw insulator failed allowing the case/collector to touch the chassis? Do you have the plug on B-E connectors plugged on correctly? Did you install the bias diodes with the correct polarity? Have you installed the new drivers in the correct positions?

Please don't take offense to the questions, I have no idea as to your skill set. And even old pros can still get something wrong.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 24 Sep 2014 15:34:08 GMT
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No offense taken Bill.  The amp is (was) drawing more than 1A of current with no load, so I

consider that a short.

I'm still a novice when it comes to solid state circuits, even the basic ones such as this, but I can follow directions. I have the skills and all the tools and test equipment to do the job with a little guidance here and there. I appreciate forums like this one where folks can offer specialized knowledge on a single line of amplifiers.

Diodes are oriented correctly, B-E plugs were never connected. Drivers are in the correct position (Q704, Q708 = 40409) (Q705, Q709 = 40410)

Q2 is shorted to chassis when mounted, so my mounting failed in some way. The pad looks good and the transistor is still ok, so I will have to mount it more carefully this time.

I'm gonna try re-mounting Q2 and power it up again, and if it powers up ok, then I'll post back here shortly. I hope that is the only short.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Wed, 24 Sep 2014 15:58:47 GMT
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Be sure to confirm that the red wire on each output transistor checks clean from ground be for you power the baby back up!

You can also drop the rating of the fuse by half just for testing with out signal being applied to the amp, if something is wrong this could save ya some transistors !

It sounds like you found your repair issue though and it all should fly now!

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 24 Sep 2014 16:06:51 GMT
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The red wires aren't shorted to ground Steve. I have the amp on a light bulb limiter which is connected to my Staco 1520 variac, so I can power the amp on safely.

I've re-mounted Q2 and its collector is no longer shorted to ground. I should be able to fire it up in a few minutes and will post back then.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Wed, 24 Sep 2014 16:30:01 GMT
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I've never used Q-Pads, but I have used other silicon thermal insulators. Even with the mess of the silicon grease, I still find it works best for me.

If the pads are okay, look at the plastic shoulder washers that keep the mounting screws centered in the chassis holes. Sometimes they can crack or thin out and allow the screw to contact the chassis.

As long as you are using the light bulb limiter, there is no real reason to lower the fuse rating. The light bulb will work faster than the fuse and will save your new parts.

The reason for the other questions was to make sure that the two halves of the amp were working in balance. The top and bottom half of the power amp are basically at odds with each other. When the signal comes in, the top half pulls and the bottom half pushes. When there is no signal the amp should center itself waiting for the input signal to tell it what to do.

When one half is not working correctly, then the two halves can both push at the same time. This is when the amp draws too much current and starts the avalanche of shorting transistor junctions. This will continue until the fuse blows.

The bias string of diodes is what keeps the two halves in sync. It tells the top half when to push and when to pull. If the string opens then the communication is lost and both halves turn on at the same time and the amp shorts out.

So in your case I didn't know if there was the physical short causing the current draw or if it was an imbalance of the power amp doing it.

Keep us informed as to your progress.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 24 Sep 2014 17:21:51 GMT
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OK, re-installing Q2 has not solved the problem yet, but it did eliminate an E-B short that was there before.  All eight of the mounting screws on all four output Qs are shorted to the chassis somehow some way.  I'm gonna pull them all and take a real close look to find out why.  I think I may have some of those washers on hand and will replace them all if I do

Solid voltages are present from all the driver transistors.

+40.5V DC on the Red wires at Q1 and Q2
-40.7V DC on the Yellow wires of Q3 and Q4

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 24 Sep 2014 22:08:41 GMT
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Ok, amp is fine and off the light bulb limiter.  The +40/-40 voltages at Q1-Q4 are right on the

money.  The amp produces sound but it is very weak through a known good speaker.

I do not have +8/-8 volts at the Red and Green wires.  I can measure +40V at Q712 but less than 1V at Q710 and Q713.  I can measure -40V at Q716 but less than 1V at Q715 and Q717.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Wed, 24 Sep 2014 22:24:28 GMT
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Fix the positive regulator and the negative should fix itself. The negative side tracks the positive side so if the pos is low so will be the neg.

Was Q714 the one that was dead? How do the schematic voltages on the rest of the transistors compare to what you have?

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Wed, 24 Sep 2014 22:43:18 GMT
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Sorry I did not know you had a light bulb limiter when I posted the thing about the fuse!
Your at the home stretch now , get that positive 8 volts back and you groovin!

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 25 Sep 2014 13:44:43 GMT
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Bill,
I marked the bad Q but failed to take note which one failed.

-41V at Q716
-2.3V at Q715
-2.3V at Q717

0.00V at Q711

+41V at Q712
+0.33V at Q710
+0.34 V at Q713

---

Subject: Re: Kustom 200 B1 blowing fuses

Posted by chicagobill on Thu, 25 Sep 2014 17:13:47 GMT
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It doesn't matter, I was just wondering. Depending upon how is went bad, it could have taken out some other transistors as well.

I don't understand your numbers are these voltages at the collectors? As I mentioned before the positive regulator is what you should focus on, so Q710-Q714.

Q714 is the main output pass transistor, so there should be +40 volts on the collector, about +9 volts on the base and +8 volts on the emitter. The +9 volts on the base controls and turns on the transistor enough to make it pass +8 volts to the emitter.

The control voltage at the base of Q714 comes from the emitter of Q712 which in turn is controlled by the voltage at its' base that is set by Q710 and Q711.

I have to assume that you have meter tested all of the transistors in the regulators, but if you haven't done so please do. Did you change the tantalum caps in the regulators when you did the audio circuits?

Edit: I got so caught up in the regulator theory, I forgot to ask if you have tried unloading the circuit by disconnecting the preamp circuits from the output of the regulators? Maybe there's a short in one of the preamp boards.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 25 Sep 2014 17:23:39 GMT
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OK, this is weird all of a sudden. I have made no changes to the amp since my last post.

Just came back to the amp and now the voltages are much different.

Red Wire = -9.4V
Green Wire = -26.3V
Q1-Q4 still have correct +/- voltages

Q712
C = +41V
E = -9.3V
B = -9.3V

Q710
C = -9.3V
E = -0.003V
B = -9.1V

Q713

C = -9.3V
E = -9.3V
B = -9.3V

Q711
E = 0.00V
B = -0.003V

Q716
C = -40.2v
E = -26.4v
B = -27.1v

Q715
C = -27.1v
E = 0.00V
B = -21.5V

Q717
C = -27.1V
E = -26.3V
B = -26.4V

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 25 Sep 2014 17:25:39 GMT
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I changed every tantalum capacitor on all 3 boards Bill, using good quality electrolytics. I will wait for your reply before disconnecting the preamp boards.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 25 Sep 2014 18:55:16 GMT
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Pulled Q710-Q717 and tested all of them out of circuit with a Fluke 87 and most have problems.

Q710
C-B = 0.3V
B-C = 0.3v

Q711
SHORTED

Q712
COMPLETELY OPEN, all directions

Q713
C-B = SHORTED
B-C = SHORTED

---
Q715
OPEN B-E

Q716
B-C = .6V
B-E = .6V
E-C, C-E = OK

Q717
B-C - .6V
C-B = .6V
E-C, C-E = OK

In looking for replacements, I came across Bill's semiconductor replacements post.  Are these still the preferred replacements?

SE4002 = 2N5088, 2N5099
FZ952 = ????? (ZENER?)
2N3567 = NTE123 (is there an alternative to NTE?)
2N3568 = ?????

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Thu, 25 Sep 2014 20:45:15 GMT
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If you haven't put the limiter back on yet, please do so until you get this sorted out.

Did you test the new 2n3055 replacements as well? You've had a catastrophic failure of the low voltage power supply regulators. There are three basic transistors that you need to replace, 2N3567 NPN, 2N3638 PNP, and SE4002 NPN.

For this usage, I would recommend you use 2N4401 NPN and 2N4403 PNP. I'd also suggest that you disconnect the red and green 8 volt supply wires from the preamp boards until the regulators are fixed. I don't know if there was any damage done to the preamps, but better to be safe than sorry.

Q711 was originally a reverse biased 2N3638 transistor. Later it was a 6.2 volt Zener diode. I don't know what your board had, but either will work.

What was the problem with the output transistor mounting?

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 26 Sep 2014 01:25:18 GMT
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Bill,

This amp had been sitting for many years and was brought to me for resurrection. It had a blown fuse when I got it, so it had never been off the limiter until yesterday. Any damage done would have happened eons ago because I've been careful not to exacerbate the existing problems. Basically, the entire power supply and output section was toasted. The power supply caps are still in great shape, ESR less than 1/4 ohm and capacitance of ~5600uF each, so I kept those.

I had already disconnected the Red and Green wires to the preamp before pulling all the small signal transistors in the regulator section.

I have a 1N4735 Zener (6.2V 1W) on hand that I'll use at Q711 but I'll have to get the 2N4401 and 2N4403 tomorrow at the local Rat Shack - they have 15-packs of both NPN and PNP that include 5 each of the ones I need, so that will save me from having to order. I have gazillions of semiconductors in stock but nothing that will replace the toasted ones in this amp.

The 2N3055s at Q714 and Q718 are still fine. I never ran the amp without the limiter until I was certain there were no more shorts.

The problem with the outputs shorting was that I had used just the Q-Pads and no other insulator. I had never used the pads before and somehow had it in my mind that was all I needed. Wrong! I added new insulators and new shoulder washers and problem solved.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Fri, 26 Sep 2014 16:53:27 GMT
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Interesting about the Q-Pads. I've never seen them so I read the literature and find that they are, as you well know, non-insulating.

I've used the gray Silpads before and they do not require insulators, but they do not like being squeezed too much. I've seen a few of them fail, causing the transistor to short to the heatsink. I guess that's why I stick with the old mica insulators and silicon compound.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Fri, 26 Sep 2014 18:36:42 GMT
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I prefer the mica also as. If the edge of whatever transistor you are bolting down to a pad is not rounded over enough you can pinch through a pad type and have that short nightmare take place! That will never happen with a mica unless it's already cracked!

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 02 Oct 2014 18:07:29 GMT
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I have made a mistake of some kind and have smoked Q716 and Q717 for sure, maybe other transistors. I used 2N4403 to replace the all the 2N3638 PNP and used 2N4401 to replace the 2N3567 and SE4002 NPN. Also, I used a 1N4735 Zener (6.2V 1W) at Q711 instead of a reverse bias transistor but I'm not sure if I oriented it correctly, or not.

I powered up the amp using the limiter and Q716 and Q717 blew in short order, but the lamp did not light at all so at least there are no larger shorts.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 02 Oct 2014 18:22:32 GMT
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Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Thu, 02 Oct 2014 21:05:16 GMT
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All your transistor chooses look good but did you confirm that what you used had the same EBC configuration as the stock transistors did?

The replacement for Q711 can even be a 2n3638 or it's NPN equivlent it just needs to be installed the right way!

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 02 Oct 2014 21:20:21 GMT
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Yes Steve, I made sure before installing the new transistors that the pinouts were oriented the same, at least according to the datasheets. However, I will double check that. Bill recommended those substitutes so I was confident in stalling them.

Is that zener oriented correctly?

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Thu, 02 Oct 2014 22:05:04 GMT
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The diode looks like it is installed correctly. The transistor in the photo looks like it is in wrong though. Most of those transistors are EBC looking at the flat face, is that one marked?

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 02 Oct 2014 22:12:54 GMT
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The transistor in the picture is Q710, a 2N4401 NPN that should be EBC looking at the face. I believe the NPNs are installed correctly and that I may have installed the PNPs backwards.

Looking at the datasheet for the 2N3638 in a TO-105 case, it appears that it also should be EBC, which is the way I installed them.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by pleat on Thu, 02 Oct 2014 22:49:29 GMT
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I have to ask. How do you post a photo directly to this site? I'm sure there are a lot of other people besides myself that would love to know how you did it.
pleat

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 02 Oct 2014 22:51:21 GMT
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I used a FREE image hosting site (Photobucket) and copied and pasted the IMG code into the text area.

Double-click the picture I posted and you'll see what I mean.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Fri, 03 Oct 2014 01:30:49 GMT
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Looking at the hole pattern in the board it looks to me like the collector and the emitter leads have been reversed. Check the schematic, the emitter of Q710 connects to the 4K7 resistor, does it? The collector should connect to the 10K resistor, does it? I would go back and double check all of the transistors that you have replaced and be sure that they have been installed correctly.

If you look at the all of the original round plastic transistors, there will be a flat spot along the

outside edge. The lead closest to the flat spot is the emitter.

What is the new resistor that just out of frame, 10 ohms? I also notice that your R743 is 1K2, it should be a 1K8.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 11:23:40 GMT
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Good eye, Bill on spotting that 10 ohm resistor. It's actually three 10-ohm Rs in parallel to make up the 2.7-ohm R that was there in the regulator. I actually replaced both R745 and R751 this way.

Looks like I am gonna have to take a real close look at all 6 of those transistors I replaced. All the transistors in the negative rail blew (Q715, Q716, and Q717) but everything seems ok on the positive side. I'll meter test them all this morning and find out for sure.

My buddy who owns this amp is driving down tonight from VA and I'd like to send this back with him in the morning. He'd be thrilled if it works the way it should. He's the original owner ...

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 11:55:44 GMT
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chicagobill wrote on Thu, 02 October 2014 21:30... I also notice that your R743 is 1K2, it should be a 1K8.

Bill,
I'm not sure which schematic you're looking at, but my board is a PC-703 and on the schematic I have R743 is 10K and connects to the base of Q711. In fact, I don't see a 1K2 or a 1K8 resistor anywhere in the regulator section of my schematic.

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Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Fri, 03 Oct 2014 12:35:50 GMT
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It would seem that Bill is looking at rev 2 of that 703 board.

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Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Fri, 03 Oct 2014 16:02:13 GMT
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On your schematic R742 is 1200 or 1K2 ohms.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 16:09:00 GMT
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stevem wrote on Fri, 03 October 2014 08:35It would seem that Bill is looking at  rev 2 of that 703 board.

I believe my board is a first revision (KEI-1) and that I'm working from the right schematic.

Looks like Bill is absolutely right and that I have reversed every one of the new transistors. Looking at the flat spots on both types of NPN and the PNP, all the old transistors are oriented CBE and the new 2N4001 and 2N4003 are both oriented EBC.  Apparently I misinterpreted the datasheets.

Can someone double-check that Zener one more time for correct orientation?

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 18:13:32 GMT
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Got all the 2N4001 and 2N4003 transistors installed correctly, I believe.

Now the dawgone 1N3754 (CR702) has broken the leads right at the body.  I plan to replace it with a 2N3440 (TO-39 case) using the BE junction and snapping the body into the original chassis clip.  Does anyone see a problem with that?  Here is the datasheet.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Fri, 03 Oct 2014 19:18:52 GMT
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With those factory Type 2n3638 round case transistors when you hold them leads up and with the lead gap facing away from you the configuration from right to left is EBC.
In regards to the 6.2 volt diode, it appears it's in correct .

Also the schematic you posted that you are working from does not show that new cap that you have across that  diode?

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Fri, 03 Oct 2014 19:37:28 GMT
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If you hold one of the plastic cased TO-whatever with the legs down and the base is closest to you, then it is ebc. The legs are in a triangular pattern.

Be sure to retest all of your new transistors before reinstalling them.

Edit: I just saw your post about the compensation diode replacement idea. I guess it would work. I just use a 1N4148.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 19:47:28 GMT
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Bill said the leg closest to the flat spot is the emitter, so that drawing above depicts that.  In observing that orientation, every one of mine were installed with B and E reversed.

I've wired in the 2N3440 for the 1N3754 and am about to fire up the amp on the limiter.

That cap across that diode replaced a tantalum of the same value that was there before.  There are actually separate holes there for the cap and the diode.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 20:27:06 GMT
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OK, There is now 7.4V DC at the RED wire and -7.5V DC at the green wire and that voltage is getting to the preamp.  Voltages at Q1-Q4 are good.  Still very low output with either channel through a known good speaker. Measured 0.00V DC at the speaker jack.

660mV DC at the anode and 15mV DC at cathode of the 2N3440 that I installed in place of the 1N3754.

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Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Fri, 03 Oct 2014 21:34:27 GMT
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Good, you got the low voltage supplies up and running. Having no voltage on the power amp output is a good thing. Now that all of the power supplies are working, you need to find out what sections are working and which ones are not.

If you plug a signal into the monitor jack on the back do you hear it through the speaker? If you take a signal out from the same monitor jack and listen to it through another amp do you hear the output from the preamp?

As a warning, if the amp still has the original two wire power cord, you need to make certain that the two amps (the test amp and the listening amp) are grounded correctly before plugging in the audio cable between the two amps. I use a meter set to read ac volts and put one lead on the ground of the first amp and then the second lead to the ground of the second amp. With both amps plugged in and turned on there should be no voltage reading on the meter. If there is, then change the polarity setting of the power switch on one of the amps to make the voltage go away.

I use a battery powered headphone amp to check the monitor output, so there are no ground problems with that.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 22:01:41 GMT
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Feeding a 1K signal into the input and using my homemade probe into a small amp I am able to get strong output from the preamp (BLUE WIRES) at the power board.  Can pick up a very strong signal at the MONITOR output and can pick up strong signal from Q700-Q703, but it starts getting weaker at Q706 and Q707.

Measure 33mV at the cathode of CR702 bias diode

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 22:06:08 GMT
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I am using a DC powered amp for probing the circuit using this homemade probe which has a 630V capacitor inside.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Fri, 03 Oct 2014 22:34:07 GMT

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With a 150mV 1K signal into the MONITOR jack, I get zero output from the speaker. However, with a 50mV 1K signal into the preamp input, I can get a weak signal from the speaker, but I can pick up the signal strong at the MONITOR jack.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Sat, 04 Oct 2014 00:22:32 GMT
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I just did a test for you on one of my 200B heads!
When I drive the normal channel with .152 volts @ 1K and show at the amps output into a 4 ohm load 18.95 VRMS ( clipping) the AC signal level I read with my voltmeter at the monitor jack is15.9 volts.

When I drive the monitor jack with that same .152 volt test signal I show at the output 2.62 VRMS into that 4 ohm load.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Sat, 04 Oct 2014 01:23:18 GMT
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Nice numbers Steve.

Now we know that the problem is in the power amp. Q706 and Q707 are the protection circuit transistors don't look for the signal there. Better to look at the drivers Q704, 705, 709 and 709.

If the signal is strong at the collector of Q703, then see what happens at the bases and collectors of Q704-709. Oh and nice signal tracer probe.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Sat, 04 Oct 2014 15:57:08 GMT
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Yes, thanks for those numbers Steve. I'll use those for comparison once I get this power section sorted out. I'm gonna poke around and take some readings as Bill directed and will report back. I would love to get this sorted out this morning.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Sat, 04 Oct 2014 16:09:39 GMT
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The signal is VERY strong at the collector, emitter, AND base of Q703. Signal is very weak at bases and collectors for Q704, Q708 and Q705, Q709. I tested for that signal at the appropriate RED, BLUE, and YELLOW wires at Q1-Q4 connectors.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Mon, 06 Oct 2014 23:23:25 GMT
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Any ideas? Picking up strong signal at Q703 EB and C but it gets weak after that.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Tue, 07 Oct 2014 11:04:45 GMT
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I may have some time to dive into one of my amps tonight and probe around for you !

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Tue, 07 Oct 2014 11:38:30 GMT
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Thanks Steve. Don't know where to proceed from here.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Tue, 07 Oct 2014 16:45:38 GMT
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Q703 is the pre-driver, after that the the signal goes to Q705 and Q704. It can be that the signal path is broken or that the driver transistors are dead or are not turning on. Odds are against all four drivers being dead, so I'd look to see if the signal is getting to Q705.

Check R718 is it 470 ohms? Is there continuity from the resistor to both the collector of Q703 and to the base of Q705?

Next start taking voltage readings on the driver transistors. The schematic shows that Q705 should have -.7 vdc on the base, -.1 on the emitter and probably -38 volts on the collector. What voltages do you get? What are the voltages on Q704, Q708 and Q709?

I don't remember what transistors do you have in there for the drivers? Have you tested them with your meter?

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 08 Oct 2014 15:20:50 GMT
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Driver transistors are NOS RCA 40409 and 40410. Pulled all driver transistors and all test good out of circuit

Q704, Q708 = 40409 (NPN)
Q705, Q709 = 40410 (PNP)

R718, R719, and R702 were out of spec enough so I changed all this morning.

Confirmed continuity from R718 to C of Q703
Confirmed continuity from R718 to B of Q705

VOLTAGES

Q704_____Q708 <-------- (RCA 40409 NPN)
B = 1.9V_____B = 1.9V
E = 1.4V_____E = 1.4V
C = 40.0V_____C = 40.0V

Q705_____Q709 <---------(RCA 40410 PNP)
B = -0.06V_____B = -0.05V
E = +0.05_____E = +.05V
C = -39.4V_____C = -39.4V

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Wed, 08 Oct 2014 17:06:12 GMT
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For some reason the voltages on Q705 and Q709 are off and I'm trying to figure out why. Do you have the protection circuits Q706 and Q707 hooked up right now? Did you replace these two transistors?

Right now, I guess most important is the circuit around Q707. Did you test/replace diode CR704?

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 08 Oct 2014 18:42:02 GMT
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I did not replace Q706, CR703 or Q707, CR704. Just tested CR703, CR704 diodes again and they test fine (in circuit).

Pulled Q706 and Q707 and tested them just now.  Q707 (2N3638) tests fine, but Q706 (2N3567) is open from B-E.  Gonna swap in a 2N4401 and see what we have.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 08 Oct 2014 20:32:17 GMT
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OK, subbed in a 2N4401 at Q706 and no change in signal strength.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Wed, 08 Oct 2014 21:54:23 GMT
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You have replaced all of the diodes CR700-CR701-CR702. CR702 is a transistor and the other two are what diodes? Try replacing the transistor with a generic 1N4148 diode.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 08 Oct 2014 23:16:08 GMT
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chicagobill wrote on Wed, 08 October 2014 17:54You have replaced all of the diodes CR700-CR701-CR702. CR702 is a transistor and the other two are what diodes? Try replacing the transistor with a generic 1N4148 diode.

Yes, I have replaced CR700, CR701, and *CR702. The schematic calls *CR702 a diode, but what the hey.  I only have 1N4448 here and will make the swap and see what happens.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Wed, 08 Oct 2014 23:46:45 GMT
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Good call on CR702, Bill.  Replaced the 2N3440 with a 1N4448 and she's up to full power now. So, apparently subbing in a 2N3440 (B-E junction) for the 1N3754 is not the way to go.

Subject: Re: Kustom 200 B1 blowing fuses
Posted by chicagobill on Thu, 09 Oct 2014 00:56:48 GMT
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Great news! And I bet that the voltages on the drivers are back to normal too.

I started to experiment with mounting 1N4148 diodes into short pieces of aluminium tubing as replacements for those temperature compensating diodes. I never got around to heat testing them in circuit though. Maybe this Fall that can be one of my to dos.

Anyway, glad to hear that it's back up to volume again.

---

Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Thu, 09 Oct 2014 01:14:22 GMT
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Yeah, and thanks Bill and Steve for your help and patience.  This amp likely took a lightning strike or was run on an inferior generator at some point in its life.  It had been sitting for 15 years or more in my friend's basement, so who knows.

Thanks guys!

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Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Thu, 09 Oct 2014 10:18:08 GMT
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That's great news and pat yourself on the back for stickin with it!

On all of my amps , Kustom or not I place a 130 MOV across the AC line input just in case the over volt potential nightmare takes place !

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Subject: Re: Kustom 200 B1 blowing fuses
Posted by Kustom_Bart on Sat, 11 Oct 2014 06:28:57 GMT
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Don, open an account at photobucket.com and you can upload pics (just one or multiple at a time)right from your computer to your photobucket account, then it will give you different options for links to use, ie hold your mouse over the pic you want to share and it will bring up a little gear looking icon, it will bring up a drop down menu and click on "Share links" then it gives you 4 different options of link types. The bottom link is the one you want for forums, when you click the link, it automatically copies it , come to your post and right click and click paste and you are done and submit your post. You will have your pic in your post. If you want multiple pics, do it multiple times.

This should be made a sticky post in a HOW TO Section of the forum.

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Subject: Re: Kustom 200 B1 blowing fuses
Posted by Tone Meister on Sat, 18 Oct 2014 14:04:57 GMT
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My buddy picked up his 200 B1 a few days ago and called me yesterday with a report. He wasn't specific about the speaker cab and speakers he's using, but said the amp sounds great with a Strat. But he went on to rave about the tone with an SG plugged in. Instant John Fogerty - CCR tones and very quiet!

Many thanks to Bill and Steve for their patience in helping me sort out the multitude of small problems I encountered in the amp. Basically, it was a complete circuit restoration and the end result exceeded expectations.

-Stan

Subject: Re: Kustom 200 B1 blowing fuses
Posted by stevem on Sat, 18 Oct 2014 21:54:37 GMT
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Great to hear!