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Description:	Smiths Interconnect Hypergrip® is a well known, patented and proven series of high reliability circular connectors specifically designed for the medical industry.		Download Datasheet

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June 01, 2022, 02:22:46 pm

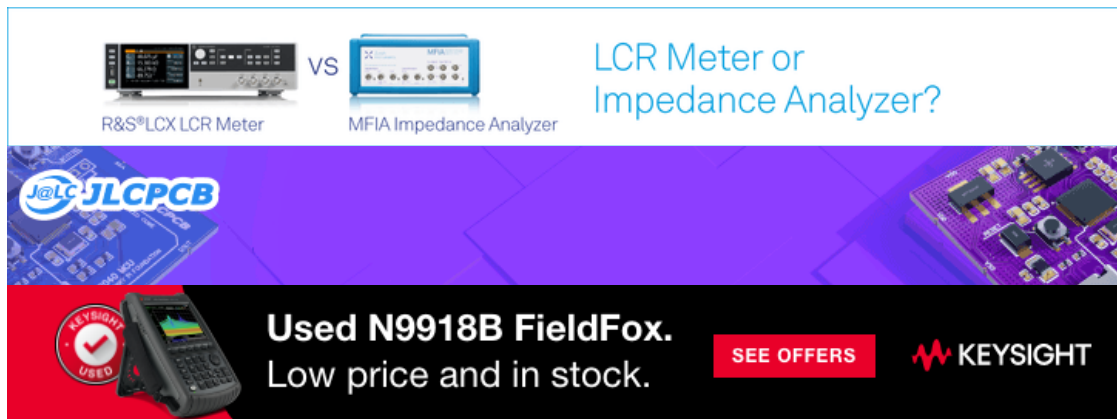
This topic

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EEVblog Electronics Community Forum » Products » Test Equipment » Keitley 238 restoration



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 Author

Topic: Keitley 238 restoration (Read 6640 times)

volvo_nut_v70 and 0 Guests are viewing this topic.

Ice-Tea

Super Contributor



Posts: 2728

Country: 



 **Keitley 238 restoration**

« on: August 13, 2017, 07:21:42 pm »

[Say Thanks](#)

[Reply](#)

[Quote](#)

I acquired one of these (amongst a lot of other stuff), it was labelled as dead.

First attempt: well, yeah. It's dead. So what would be the second step? Yep. Check the fuse. Can't be *that* easy, right? But the fuse is broken. So, toss in a new one. It boots! Huzah! Display lights up, everything normal. Well, maybe not everything. The fan is making a ruckus.

Everything? What's that smell? Burning electronics, that's what it is! So, turning it off, popping it open. Couldn't see it right away, so I turned it on again for a fraction. A small string of smoke escaping from a large resistor told me all I needed to know. That's one large resistor that puked its internals out. Checked the service guide, 15K resistor in the -15V supply rail. Farnell to the rescue, FFWD a few days, popped in the new resistor.

Still boots (yay!) No longer pukes anything out (yay!) So now I can check the output. Something comes out of it (yay!). It's off by a *LOT*.

Oh noes. What now? Well, what I should have done from the start. Check that zener. Which acts like a 3-ohm resistor. That might be in its job description somewhere, but it seems to miss a few other points. Farnell again!

And voila. Functional now. Checks out against my Keysight 1252B. Haven't checked the entire range quite yet (need to install a new fan first) but there it is: restored Keithley 238. Ready to serve once

more, probably in an eBay outlet near you shortly!

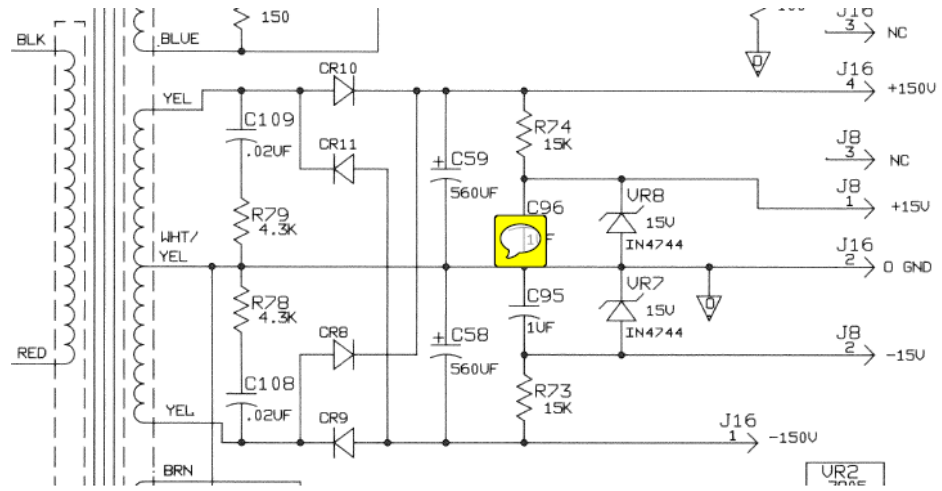
I'll post a few picks over the entire range later.



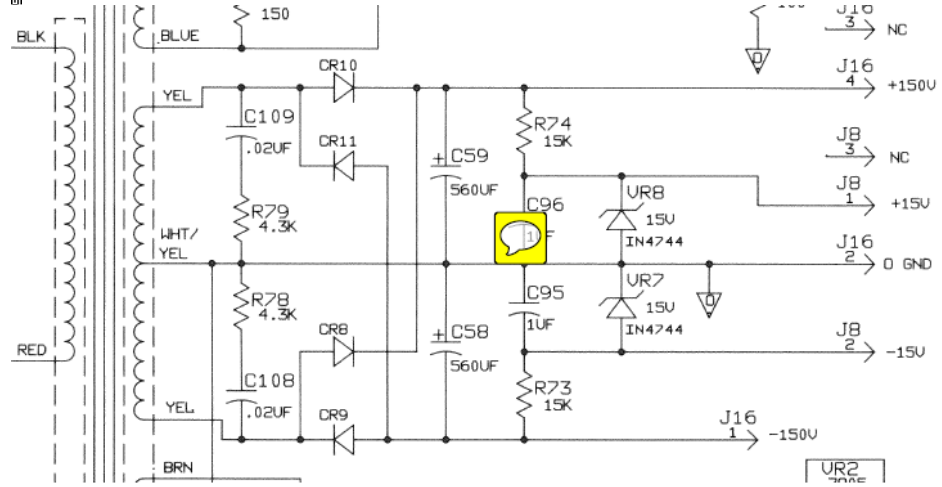
IMG_9914.JPG (96.64 kB, 1240x827 - viewed 762 times.)



IMG_9915.JPG (68.89 kB, 1240x827 - viewed 506 times.)



sch1.png (46.44 kB, 778x383 - viewed 479 times.)



sch2.png (63.28 kB, 778x383 - viewed 390 times.)

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cncjerry

Supporter



Posts: 1124



Re: Keitley 238 restoration

« Reply #1 on: August 14, 2017, 02:11:07 am »

Say Thanks Reply Quote

I've wanted one of these for a while. I have a 4 quadrant sink/source that's good up to 100w. It's great for cycling batteries as it can be a load and then programmable charger, within limits. It's a keithley 228.

You got lucky with yours I think. Mine has had a few problems since I got it but it is working great now for a few years.

Jerry

Report to moderator Logged

alm

Super Contributor



Posts: 1635

Country:



Re: Keitley 238 restoration

« Reply #2 on: August 14, 2017, 05:45:39 am »

Say Thanks Reply Quote

I have seen the same issue on a 237: shorted zener and dead 15k power resistor. Haven't looked into why. The resistor looked like it got hot and damaged the insulation of the nearby electrolytic.

« Last Edit: August 14, 2017, 06:03:26 am by alm »

Report to moderator Logged

Ice-Tea

Super Contributor



Re: Keitley 238 restoration

« Reply #3 on: August 14, 2017, 07:06:02 am »

Say Thanks Reply Quote

No damaged caps here.

My guess is that the fan gave way first, leading to the overheating -15V stage.

Report to moderator Logged



Posts: 2728
Country:

alm
Super Contributor

Posts: 1635
Country:

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Re: Keitley 238 restoration
« Reply #4 on: August 15, 2017, 05:53:45 am »

Say Thanks Reply Quote

I recall the resistors in the 237 having about 180 V across them. 150 V across 15k is about 2 W. They looked like more than 2 W resistors. So I would not expect the resistors to overheat without a fan. Not sure about the 238.

Report to moderator Logged

Ice-Tea
Super Contributor

Posts: 2728
Country:

Re: Keitley 238 restoration
« Reply #5 on: August 15, 2017, 06:02:05 am »

Say Thanks Reply Quote

EH, sch2 was supposed to be the BOM, is listed as 2W. But you're right. Gonna look forward something beefier.

Report to moderator Logged

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Ice-Tea
Super Contributor

Posts: 2728
Country:

Re: Keitley 238 restoration
« Reply #6 on: August 17, 2017, 09:59:11 am »

Say Thanks Reply Quote

It's actually a 150V rail (gonna doublecheck, but that's what's on the schematics).

So $150-15 = 135/15k = 9mA$ for 1,215W. The resistor I put in was rated for 3W (the original BOM has a 2W part even though it looks bigger than the 3W part).

The "new" resistor runs at 170°C. The old at 120°C. The new one is rated up to 235°C, so that actually makes sense but it's still way too high for my taste. Within operating limits or not, I won't have it. Ordered two of these:

<http://be.farnell.com/webapp/wcs/stores/servlet/ProductDisplay?catalogId=10001&langId=32&urlRequestType=Base&partNumber=1174440&storeId=10154>

I'll be replacing the non-broken original resistor for the +15V rail as well.

Report to moderator Logged

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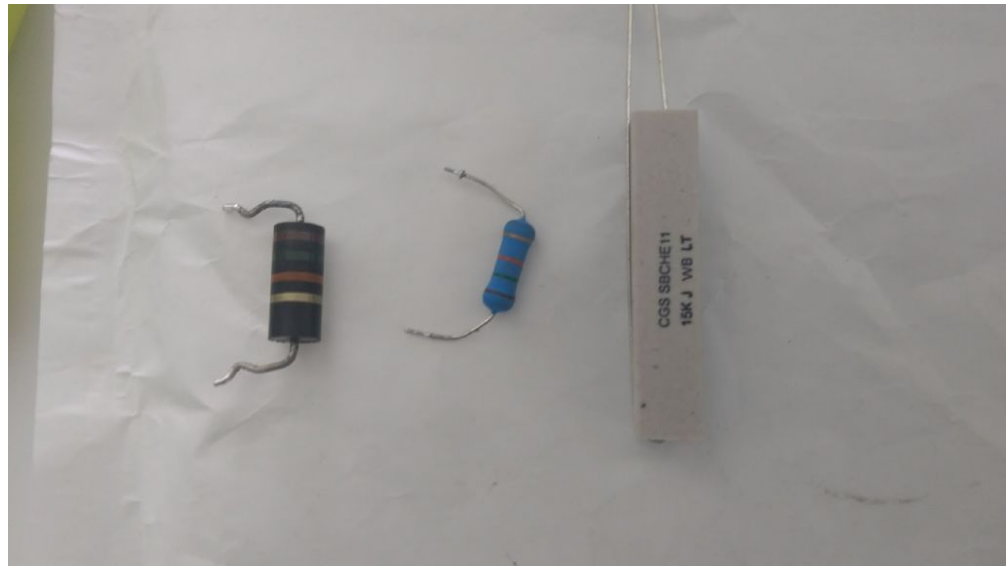
Ice-Tea
Super Contributor

Posts: 2728
Country:

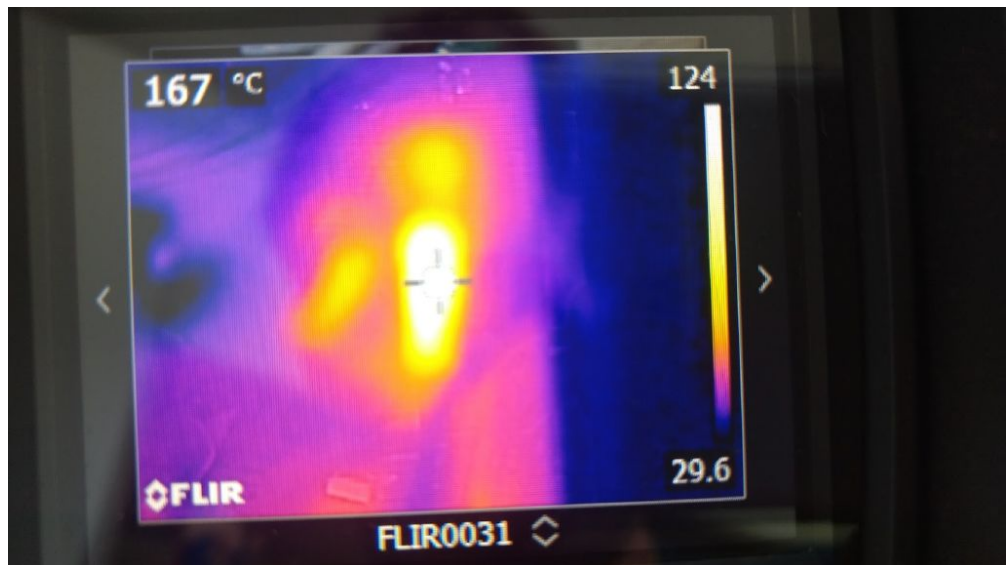
Re: Keitley 238 restoration
« Reply #7 on: August 21, 2017, 02:35:41 pm »

Say Thanks Reply Quote

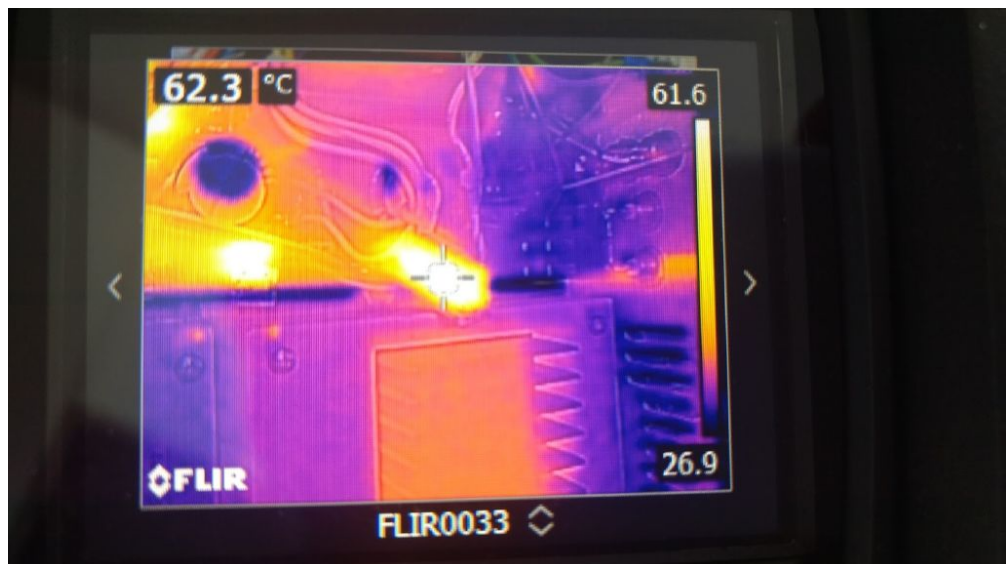
From left to right: the old one, the rejected replacement and Mr. Right (yes, size does matter).



Old temperature:

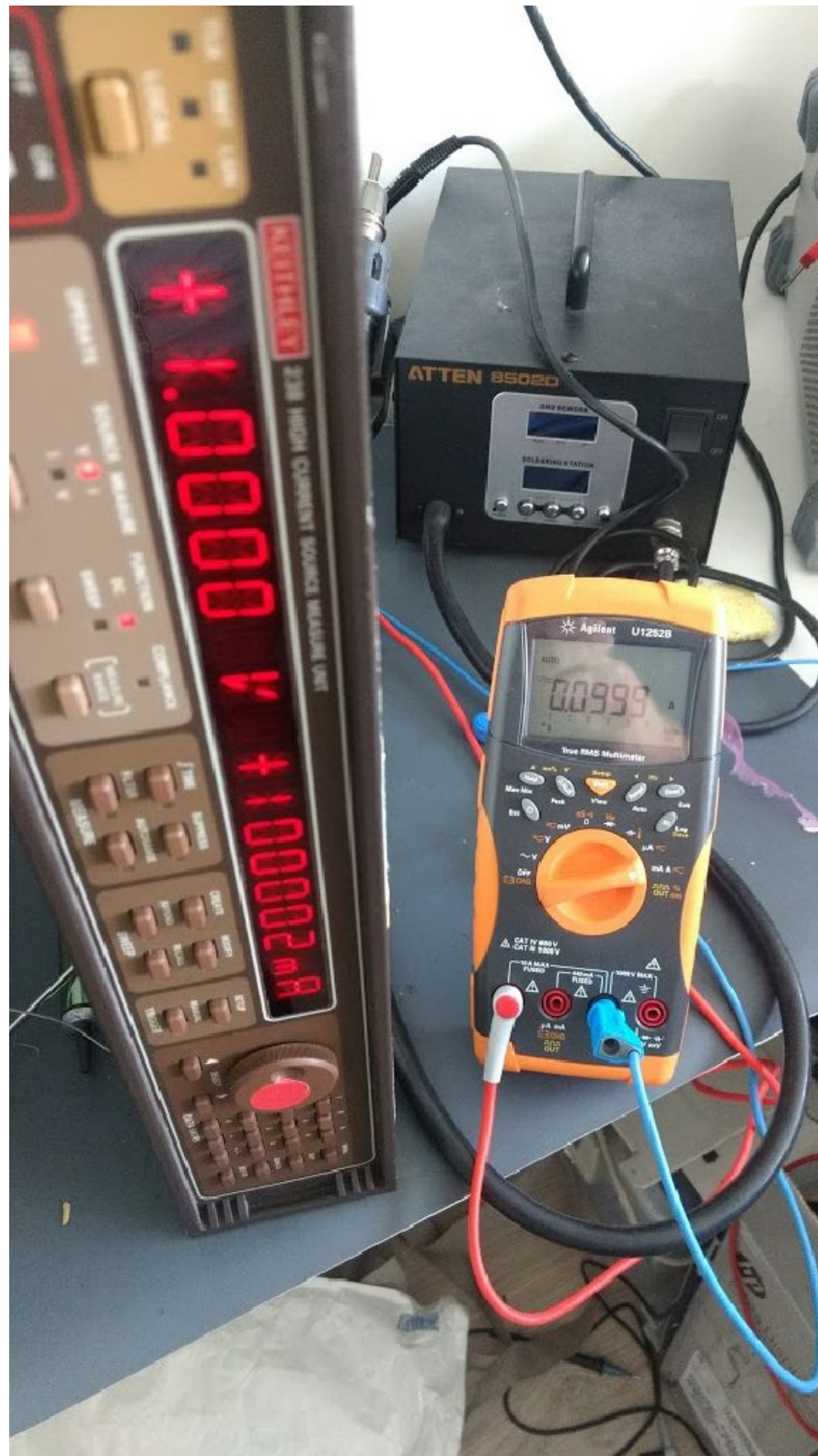


New (both resistors in view):



Accuracy is pretty good...





... but as can be seen in the picture, open loop current is off by about 10uA. Which seems like a lot. As calibration is supposed to be over the 488 interface and I have no gear for it, I'm going to close her up "as is". If anyone is interested in her, let me know!

« Last Edit: August 21, 2017, 02:37:41 pm by Ice-Tea »

Report to moderator  Logged

[eBay shop with all the gear you need!](#)

 **alm**
Super Contributor

 **Re: Keitley 238 restoration**
« Reply #8 on: August 22, 2017, 06:15:28 am »

Say Thanks Reply Quote



Posts: 1635
Country:

**Ice-Tea**

Super Contributor



Posts: 2728
Country:

**HalFET**

Frequent Contributor



Posts: 488
Country:

**Ice-Tea**

Super Contributor



Posts: 2728
Country:

**HalFET**

Frequent Contributor



Posts: 488
Country:



I agree that a larger resistor that gets less hot is better. 10 uA on the 100mA range is within the +/- 20 uA sourcing and +/- 6 uA measuring spec if my quick glance at the data sheet was correct.

Report to moderator

Re: Keitley 238 restoration

« Reply #9 on: August 22, 2017, 07:29:49 am »

Say Thanks Reply Quote

You are probably right, but it doesn't feel great if it measures 10uA (which is two digits) when there's nothing going on. Then again, I'm trying to sell this thing so: yeah, totally normal, nothing to see here folks! 😊

Report to moderator

[eBay shop with all the gear you need!](#)**Re: Keitley 238 restoration**

« Reply #10 on: November 09, 2017, 10:15:02 pm »

Say Thanks Reply Quote

So I actually bought this one from Ice-Tea. Luckily I do have access to the equipment necessary to calibrate it.

Current game plan is quite simple:

1. Replace the wirewound resistors with a cermet with characteristics similar to the replaced carbon composite resistors. (Suggestion from a friendly Keithley/Tek service engineer)
2. Clean up a few dirty spots on the board with a good IPA rinse. (Think there are some leakage currents that could use IPA + blast of nitrogen.)
3. Calibrate

I'll also try to post the calibration part, since I figure that might actually interest people slightly more.



Report to moderator

Re: Keitley 238 restoration

« Reply #11 on: November 10, 2017, 06:51:15 am »

Say Thanks Reply Quote



So, you'll replace the replacement? Why? Just a series resistor in a library PSU?

Anyway, good to know Shell be Well taken care off!

Report to moderator

[eBay shop with all the gear you need!](#)**Re: Keitley 238 restoration**

« Reply #12 on: November 10, 2017, 07:29:48 am »

Say Thanks Reply Quote

Quote from: Ice-Tea on November 10, 2017, 06:51:15 am

So, you'll replace the replacement? Why? Just a series resistor in a library PSU?

Anyway, good to know Shell be Well taken care off!

Two reasons actually, carbon comp resistors have very low self inductance, given that similar wirewounds were already available at that point I can't help but figure keithley had a reason to go for this type. Especially if you consider how noisy they are, and Keithley's complete disregard for the concept of compromise. The second reason is safety. The 2W resistors blow because something is drawing very high currents. If I'd leave the 10W in there it'd be something down the line that self-widlarizes instead next time. So there is method to this madness! (And a third reason is that I'm worried they're flapping around a bit, so I'd have to silicone them down a bit.)

But still got to inspect the board completely, I think I saw signs of a previous repair attempt in the measurement section, but didn't yet have time to lift the cover off that one.

HalfET

Frequent Contributor



Posts: 488

Country: 00

 **Re: Keitley 238 restoration**

« Reply #13 on: November 11, 2017, 09:48:02 am »

Say Thanks

Reply

Quote

Quote from: Ice-Tea on November 10, 2017, 06:51:15 am

So, you'll replace the replacement? Why? Just a series resistor in a library PSU?

Anyway, good to know Shell be Well taken care off!

It's not going to be as quick of a fix as I had hoped, it's actually a small miracle that it worked after having inspected the board thoroughly. Found a few bodes and unclean repairs, took a gentle IPA scrub and touches of the iron left and right. And apparently the 15V zener there was simply pressed against the pads, the solder cracked and connection was intermittent. Someone seems to have snipped it off with side cutters and then tried to place it back on the board in a bodge fashion. I repaired the bodge as good as possible with some desoldering braid for now, going to order new zener diodes on Monday.

And just out of curiosity, where did you get the schematic if I may ask?

Report to moderator Logged

 Ice-Tea

Super Contributor



Posts: 2728

Country:

 **Re: Keitley 238 restoration**

« Reply #14 on: November 11, 2017, 10:07:22 am »

Say Thanks

Reply

Quote

Quote from: HalfET on November 10, 2017, 07:29:48 am**Quote from: Ice-Tea on November 10, 2017, 06:51:15 am**

So, you'll replace the replacement? Why? Just a series resistor in a library PSU?

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Two reasons actually, carbon comp resistors have very low self inductance, given that similar wirewounds were already available at that point I can't help but figure keithley had a reason to go for this type. Especially if you consider how noisy they are, and Keithley's complete disregard for the concept of compromise. The second reason is safety. The 2W resistors blow because something is drawing very high currents. If I'd leave the 10W in there it'd be something down the line that self-widlarizes instead next time. So there is method to this madness! (And a third reason is that I'm worried they're flapping around a bit, so I'd have to silicone them down a bit.)

But still got to inspect the board completely, I think I saw signs of a previous repair attempt in the measurement section, but didn't yet have time to lift the cover off that one.

Well, not sure if you'd have to worry too much about noise on a carbon vs wirewound resistor in a linear zener PSU but then again: I don't get to design nA PSUs, so there...

As for the reason why it blew: my guess is these run hot anyways and rely on airflow to stay alive. When the fan gave way, so did the resistor. That, or the zener blew first, essentially overloading the resistor further.

As for the bodge on the zener: that may have been me. I may have done a quick repair to see if it works at all and forgot to clean it up after. My appologies in that case. Honnently can't remember, it was quite some time ago (and late too, at the time).

As for the flapping: you have a point. At some point, I figured I'd strap it to the elco next door but I don't think it would have liked such a hot neighbor

As for the schematics: a few posts down this thread:

<https://www.eevblog.com/forum/testgear/keitley-236-teardown-and-review/>

Also: I posted from my phone before. Library PSU should be linear. Obviously.

Report to moderator Logged

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 HalfET **Re: Keitley 238 restoration**

« Reply #15 on: November 11, 2017, 11:17:58 am »

Say Thanks

Reply

Quote

Frequent Contributor



Posts: 488

Country:

**Quote from: Ice-Tea on November 11, 2017, 10:07:22 am**

Well, not sure if you'd have to worry too much about noise on a carbon vs wirewound resistor in a linear zener PSU but then again: I don't get to design nA PSUs, so there...

As for the reason why it blew: my guess is these run hot anyways and rely on airflow to stay alive. When the fan gave way, so did the resistor. That, or the zener blew first, essentially overloading the resistor further.

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As for the schematics: a few posts down this thread: <https://www.eevblog.com/forum/testgear/keitley-236-teardown-and-review/>

Also: I posted from my phone before. Library PSU should be linear. Obviously.

Well, depending on where it's located it could influence it, I'm more worried about the power rating though 😊

Nah, I don't think you did the zener, the lead that was snipped was actually the one at the side away from the resistor 😊

Thanks!

Report to moderator Logged

 alm

Super Contributor



Posts: 1635

Country:

**Re: Keitley 238 restoration**

« Reply #16 on: November 12, 2017, 11:04:10 am »

Say Thanks Reply Quote

Quote from: HalFET on November 10, 2017, 07:29:48 am

Two reasons actually, carbon comp resistors have very low self inductance, given that similar wirewounds were already available at that point I can't help but figure keithley had a reason to go for this type. Especially if you consider how noisy they are, and Keithley's complete disregard for the concept of compromise.

Not sure how a little inductance would affect this circuit since this circuit is pretty much all DC. There is a component in the power supply that is often used as noise generator, and it is not the carbon comp resistor 😊. So I can't imagine noise being much of a consideration either way.

Quote from: HalFET on November 10, 2017, 07:29:48 am

The second reason is safety. The 2W resistors blow because something is drawing very high currents. If I'd leave the 10W in there it'd be something down the line that self-widlarizes instead next time.

Make sure to get a fusible resistor, which is guaranteed not to catch fire when overloaded. The one thing I'd be worried about is cooking the nearby electrolytics. Which is where a lower thermal resistance (larger physical size) might help.

Report to moderator Logged

 HalFET

Frequent Contributor



Posts: 488

Country:

**Re: Keitley 238 restoration**

« Reply #17 on: November 12, 2017, 11:43:54 am »

Say Thanks Reply Quote

Haven't seen the complete schematic, so no idea! But these should fail open, hence why I replaced it with these. Might add some kapton foil in between the resistors and nearby circuitry as an extra fail safe now that I think about it.

But overall there were a few bodes so I'll just fix up the board completely.

Report to moderator Logged

 HalFET

Frequent Contributor



Posts: 488

Country:

**Re: Keitley 238 restoration**

« Reply #18 on: November 14, 2017, 06:51:35 pm »

Say Thanks Reply Quote

Current status: Fixed the solder bodes, cleaned the digital board with IPA, gave the analog boards a blast of nitrogen, installed the new zener and resistors.

The leakage current is up to 400 μ A now, but I'll calibrate it later. The fan Ice-Tea installed is only rated 115V, and while these Sunon fans in theory can run of 230V I'm not quite willing to trust it. (This one will be running unattended for prolonged periods at home.) Sadly you have to take almost the entire thing apart to get to the fan. Lets just say I'm not a fan of this unit's construction. Additionally I'd like a fan that pushes a lot more air through there considering how hot this thing is

running, compared to the noise of the R&S CMU200 and SMH it won't even be audible 😈 Also have to laser cut some polyimide foil to slip underneath the resistors to shield the components and the board from them in case they do decide to go boom. So much work, so little time to do it all.

And the new resistors are running rather hot (130°C), as expected, but they're rated up to 220°C so still got 90°C margin there:



More worried about what it'll do to the PCB underneath since I did mount them down on the board, might go in again and lift them slightly off the board if I do open it up to install another fan. I'll also give the triax connectors a rubbing with methanol then.

« Last Edit: November 14, 2017, 07:52:56 pm by HalfET »

[Report to moderator](#) Logged

Ice-Tea

Super Contributor



Posts: 2728

Country:



HalfET

Frequent Contributor



Posts: 488

Country:



Re: Keitley 238 restoration

« Reply #19 on: November 14, 2017, 09:12:17 pm »

[Say Thanks](#) [Reply](#) [Quote](#)

Sure about the fan? My guess is you'll measure 120v on the leads...

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Re: Keitley 238 restoration

« Reply #20 on: November 14, 2017, 09:30:38 pm »

[Say Thanks](#) [Reply](#) [Quote](#)

Sorry, my bad, read the schematic incorrectly. 😞

Still think I'll have to go for something with slightly higher air flow though. I'll actually run a test with a few thermocouples and a polycarbonate sheet on top to see how hot it runs.

Note to self: don't attempt to read schematics with transformers on 5 hours of sleep.

tagchen

Contributor

Posts: 23

Country:



Re: Keitley 238 restoration

« Reply #21 on: January 16, 2020, 10:08:22 am »

Say Thanks

Reply

Quote

Hi,

i have three defect 238. 1. transformer going hot and smokes 2. no action 3. start, but not check. new transformer cost 390euro 🤔, so i will repair the other first.

in 1. the resistors between transformer was very hot, can by other defect more.



238.jpg (616.89 kB, 1366x1076 - viewed 144 times.)

Ice-Tea

Super Contributor



Posts: 2728

Country:



Re: Keitley 238 restoration

« Reply #22 on: January 16, 2020, 10:37:15 am »

Say Thanks

Reply

Quote

1) If the trafo goes hot, chances are something is drawing a *lot* of power somewhere? If you can get hold of thermal camera, see if anything else heats up real fast..

2) Stating the obvious: check the fuse 🤔

[eBay shop with all the gear you need!](#)

tagchen

Contributor

Posts: 23

Country:



Re: Keitley 238 restoration

« Reply #23 on: January 16, 2020, 11:27:31 am »

Say Thanks

Reply

Quote

Quote from: Ice-Tea on January 16, 2020, 10:37:15 am

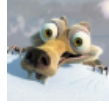
1) If the trafo goes hot, chances are something is drawing a *lot* of power somewhere? If you can get hold of thermal camera, see if anything else heats up real fast..

thanks,


i think its not a problem from drawing power, more the transformer has eh short circuit. i will little open it and with acrylic lacquer and vacuum sealer press better inside. The 2. think can by the same problem.

 **MiDi**

Frequent Contributor



Posts: 548

Country:  **Re: Keitley 238 restoration**« **Reply #24 on:** March 08, 2020, 04:32:36 pm »

Say Thanks

Reply

Quote

Quote from: tagchen on January 16, 2020, 11:27:31 am

Quote from: Ice-Tea on January 16, 2020, 10:37:15 am

1.) If the trafo goes hot, chances are something is drawing a *lot* of power somewhere? If you can get hold of thermal camera, see if anything else heats up real fast..

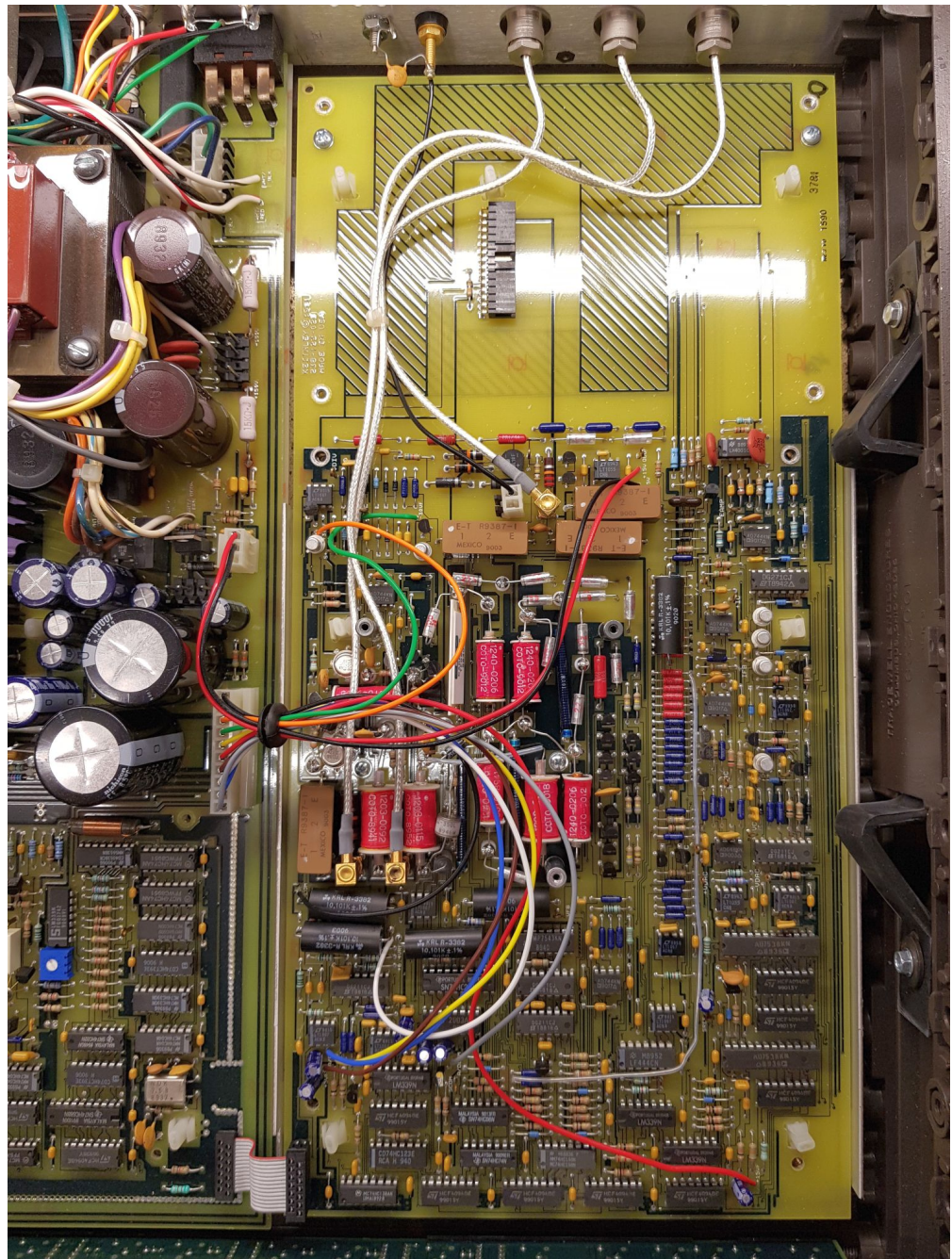
thanks,

i think its not a problem from drawing power, more the transformer has eh short circuit. i will little open it and with acrylic lacquer and vacuum sealer press better inside. The 2. think can by the same problem.

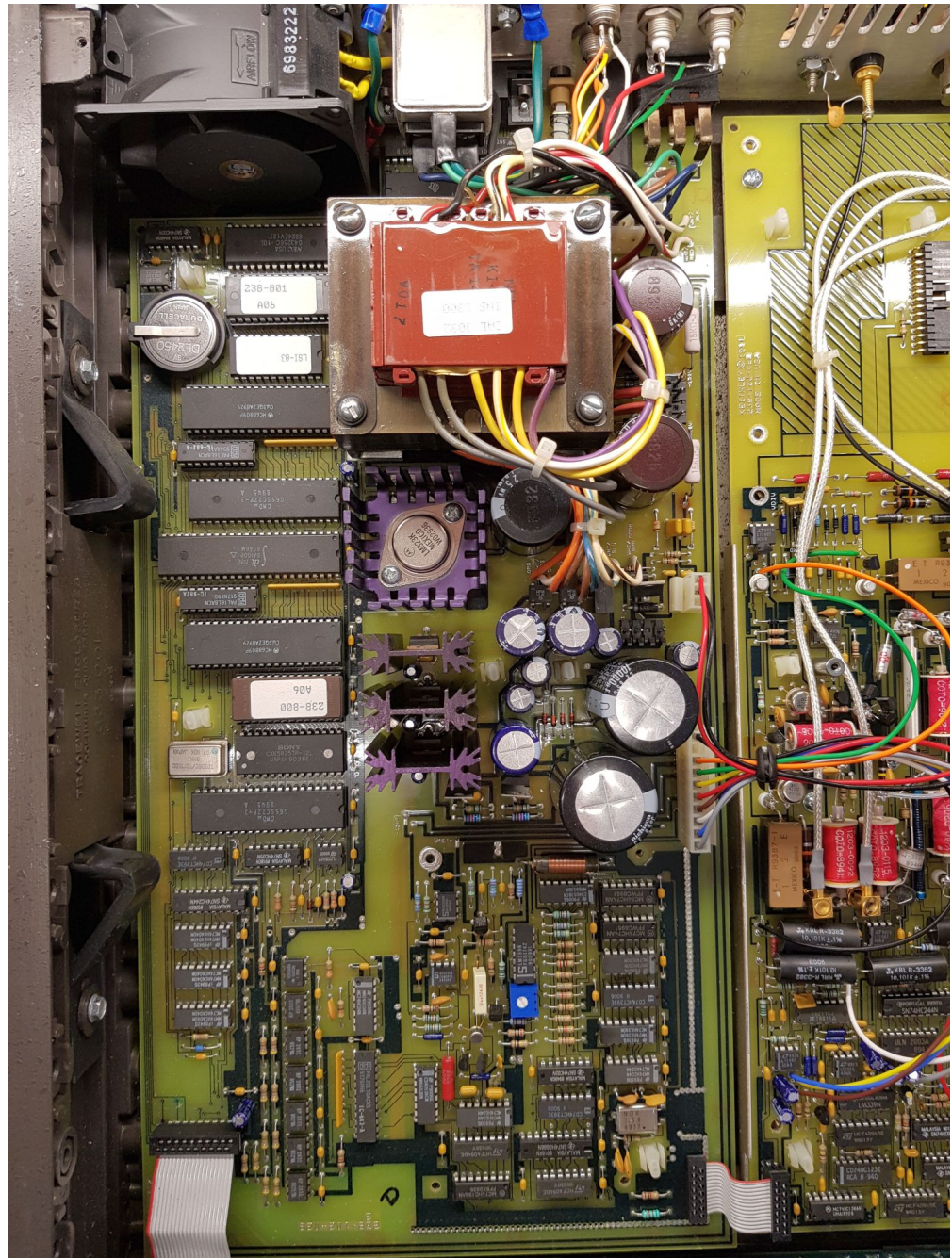
I had hot transformer in my 237, as it turned out it was the Japan version (different transformer marking).

Seems there are no hi-res pictures of 238, attached a collection of my 90s 238.
In idle it takes ~40W.

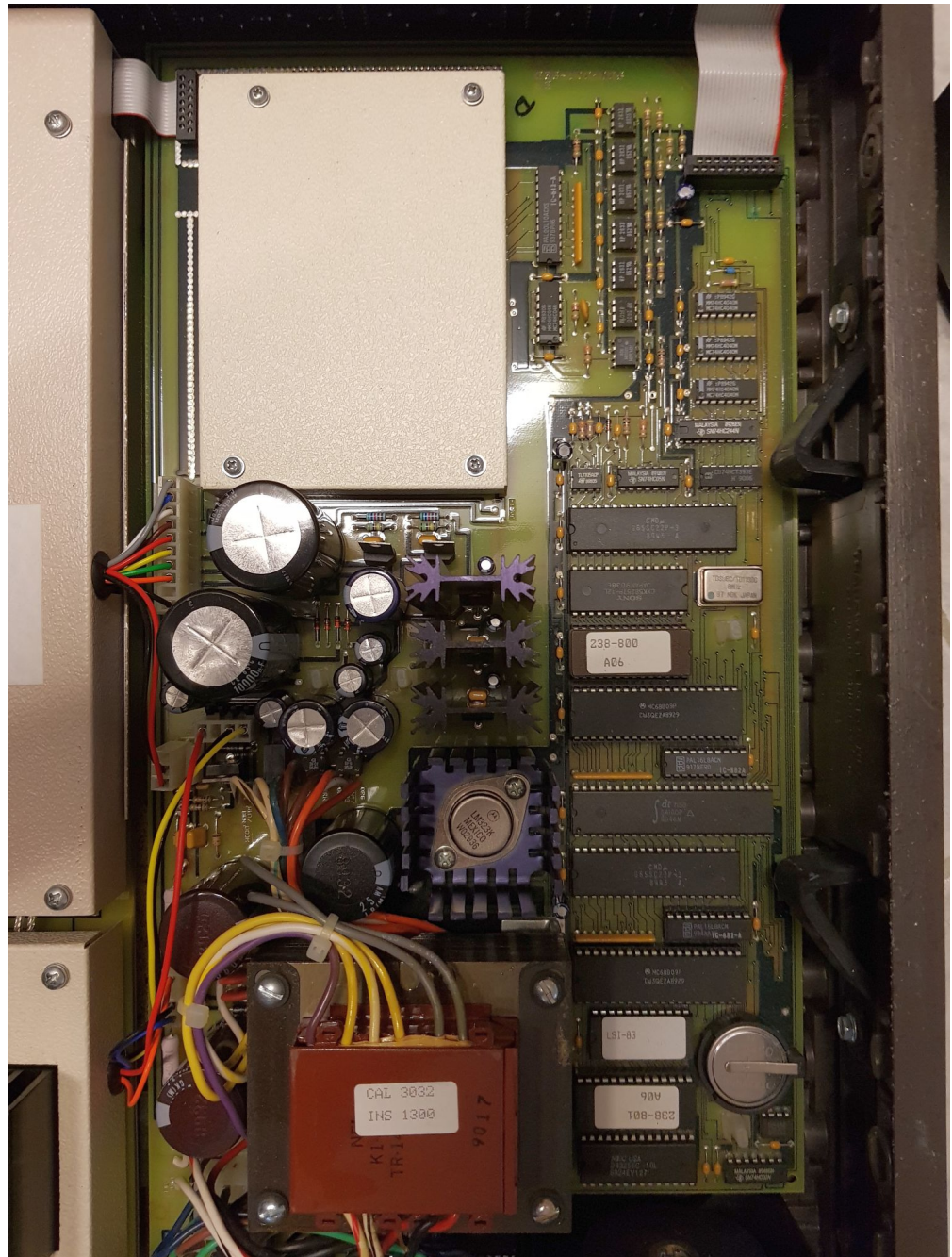
There is Firmware rev A06 installed, is this the latest release?
Would be nice if you could tell what revs there are (it tells fw rev on power up).



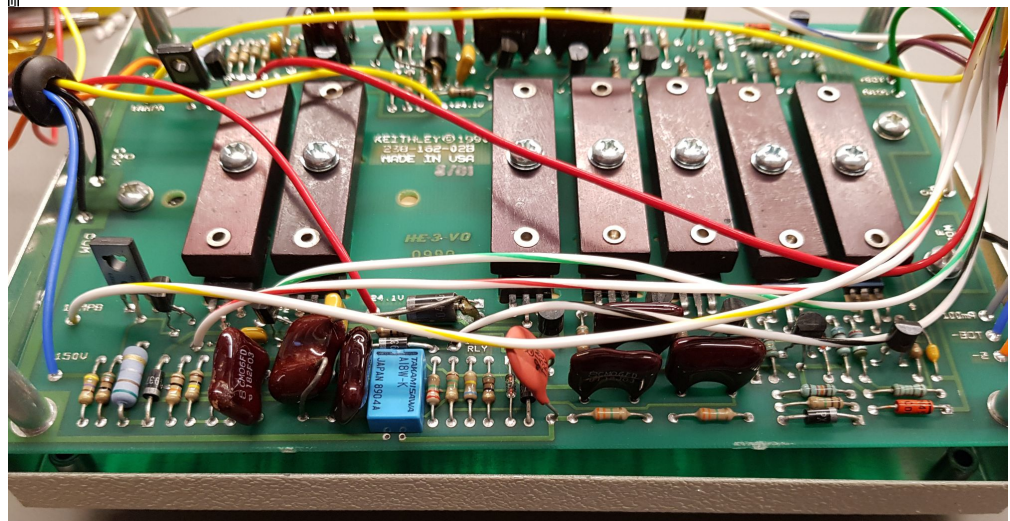
K238 - Analog Board Top Overview.jpg (691.54 kB, 1512x2016 - viewed 154 times.)



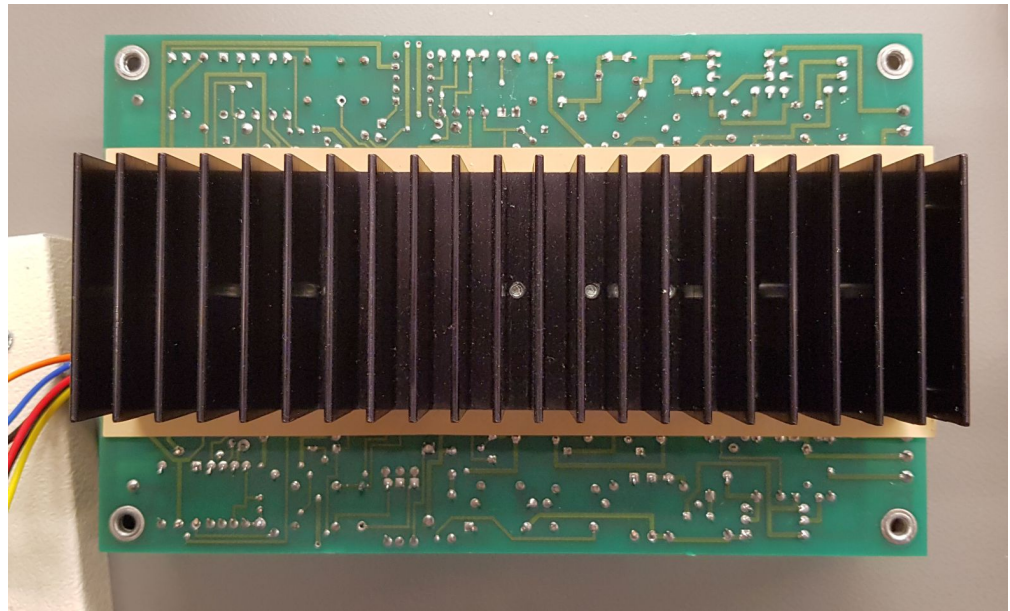
K238 - Digital Board Top Overview ADC.jpg (688.17 kB, 1512x2016 - viewed 122 times.)



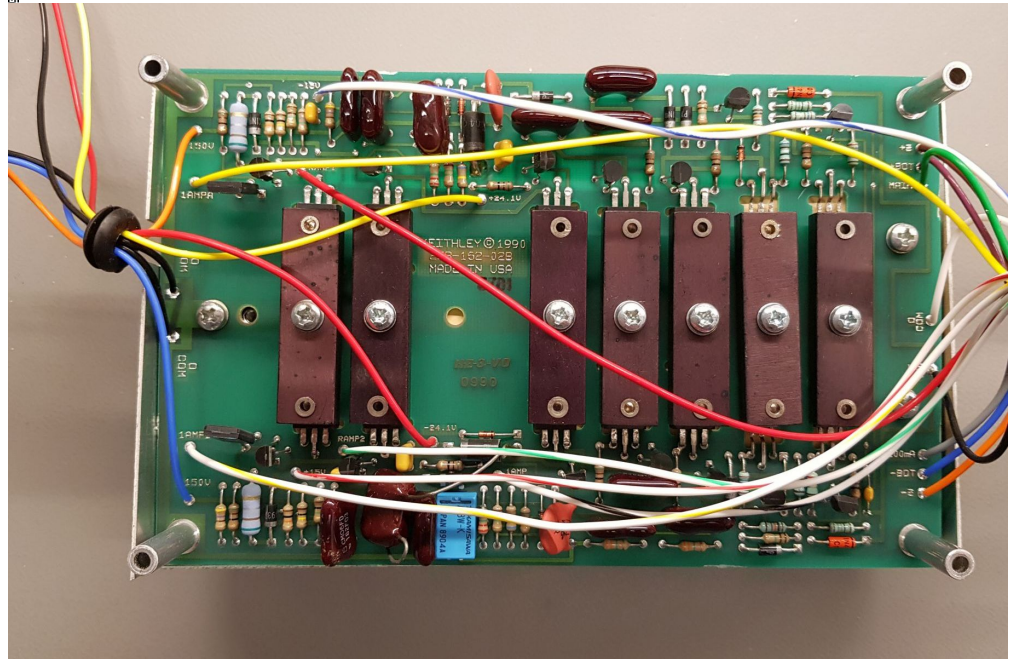
K238 - Digital Board Top Overview.jpg (477.48 kB, 1512x2016 - viewed 116 times.)



K238 - Output Stage Bottom CS Relay.jpg (358.35 kB, 2006x1034 - viewed 115 times.)



K238 - Output Stage Top HS.jpg (185.41 kB, 1571x956 - viewed 116 times.)



K238 - Output Stage Bottom CS.jpg (317.24 kB, 1827x1205 - viewed 126 times.)



K238 - Fan NMB 3115FS-12T-B30 115V 9W.jpg (273.03 kB, 1506x1717 - viewed 83 times.)

« Last Edit: March 08, 2020, 04:48:08 pm by MiDi »

Report to moderator Logged

JxR

Supporter



Posts: 352

Country:



Re: Keitley 238 restoration

« Reply #25 on: April 22, 2020, 07:34:38 am »

Say Thanks Reply Quote

Quote from: MiDi on March 08, 2020, 04:32:36 pm

There is Firmware rev A06 installed, is this the latest release?
Would be nice if you could tell what revs there are (it tells fw rev on power up).

I have attached the A10 firmware for the Keithley 238 to this post. This firmware was pulled from my own unit. I do think A10 is the latest FW, although I'm not 100% sure.

« Last Edit: November 20, 2020, 02:42:29 am by JxR »

Report to moderator Logged

The following users thanked this post: alm, MiDi, leighcorriganl

leighcorriganl

Frequent Contributor



Posts: 393

Country:

Re: Keitley 238 restoration

« Reply #26 on: August 22, 2020, 06:24:59 pm »

Say Thanks Reply Quote

Quote from: MiDi on March 08, 2020, 04:32:36 pm

Seems there are no hi-res pictures of 238, attached a collection of my 90s 238.

Hi MiDi,

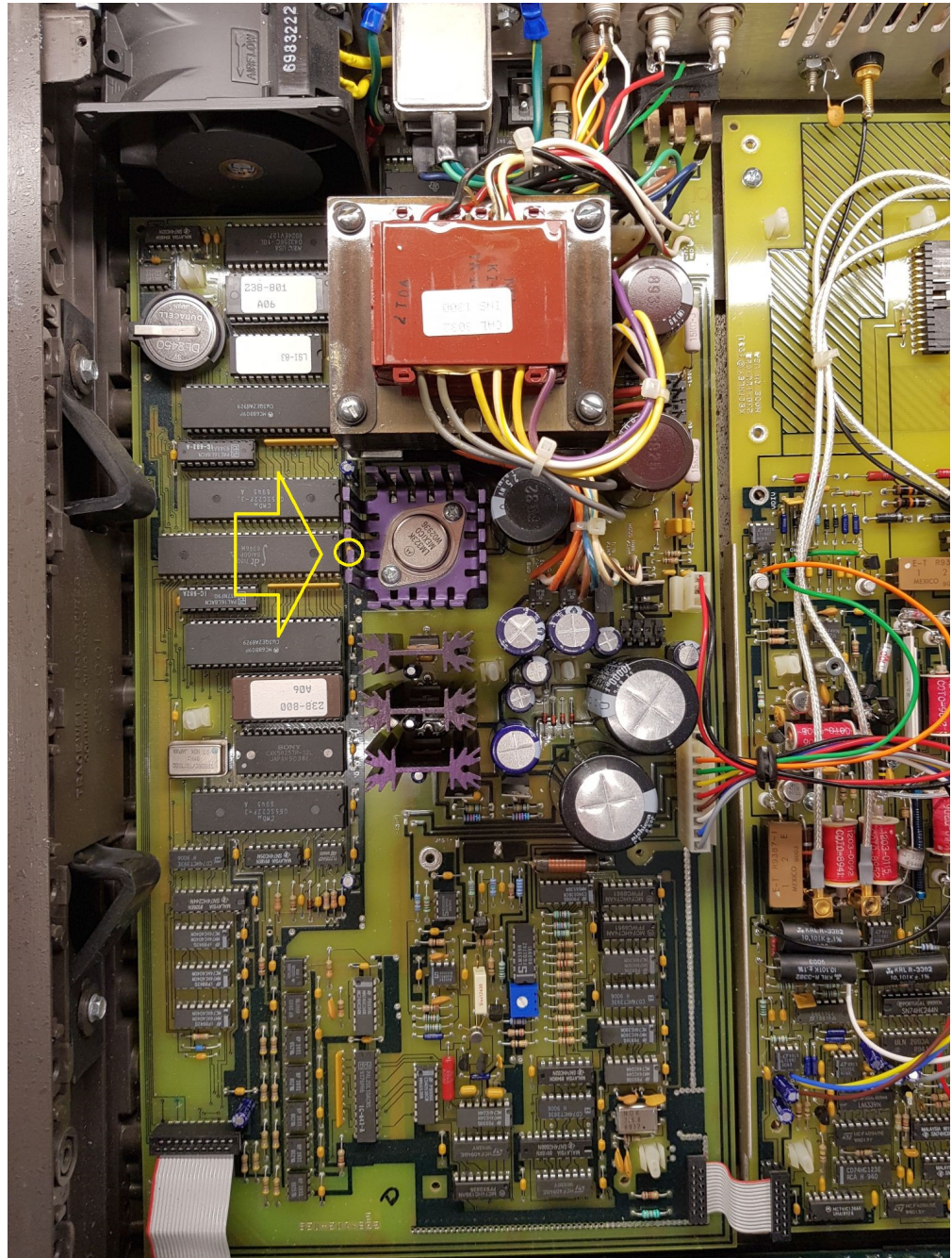
Nuclear Materials Scientist



Could you please do me a favour and identify a capacitor on your digital board for me? I labelled the location on the attached picture. [attach=1]

My guess is that it is a 0.01 uF capacity (20 %, 50 V, CERAMIC) as noted in the Keithley 236/7 service manual parts list. The broken capacitor on my board does not have signs of a label and I do not have a service manual for the Keithley 238 with schematics. 🙄

Thanks!



K238 - Digital Board Top Overview ADC.jpg (1104.63 kB, 1512x2016 - viewed 181 times.)

[Report to moderator](#) Logged

MASc, EIT, PhD Candidate

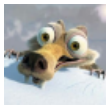
MiDi
Frequent Contributor



Re: Keithley 238 restoration
« **Reply #27 on:** September 04, 2020, 05:20:08 am »

[Say Thanks](#) [Reply](#) [Quote](#)

According to 236/237 service manual with schematics all those caps are 10nF 50V ceramic - C35 is connected to U12 7130SA100P.



Posts: 548

Country:


 leighcorrigan

Frequent Contributor



Posts: 393

Country:

Nuclear Materials Scientist


 JxR

Supporter



Posts: 352

Country:



The digital part of 238 should be same as 236/7.
Those are decoupling caps, if one is removed it should not affect function of unit.

« Last Edit: September 04, 2020, 06:05:12 am by MiDi »

Report to moderator Logged

 Re: Keitley 238 restoration

« Reply #28 on: November 13, 2020, 03:24:26 pm »

Say Thanks

Reply

Quote

Quote from: JxR on April 22, 2020, 07:34:38 am

Quote from: MiDi on March 08, 2020, 04:32:36 pm

There is Firmware rev A06 installed, is this the latest release?
Would be nice if you could tell what revs there are (it tells fw rev on power up).

I have attached the A10 firmware for the Keithley 238 to this post. This firmware was pulled from my own unit. I do think A10 is the latest FW, although I'm not 100% sure.

Can anyone else verify that this firmware is working? I uploaded the EPROM firmware and all it has done is showed random lights on the front panel and killed my calibration constants. What settings do I need to apply to the EPROM programmer?

I have already transferred the original A06 firmware to the new EPROM chips, but I can't seem to use the A10 firmware that JxR has uploaded. What is going on? Any help would be most appreciated.

« Last Edit: November 13, 2020, 03:33:29 pm by leighcorrigan »

Report to moderator Logged

MASC, EIT, PhD Candidate

 Re: Keitley 238 restoration

« Reply #29 on: November 14, 2020, 02:48:33 am »

Say Thanks

Reply

Quote

Quote from: leighcorrigan on November 13, 2020, 03:24:26 pm

Quote from: JxR on April 22, 2020, 07:34:38 am

Quote from: MiDi on March 08, 2020, 04:32:36 pm

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Is it possible you uploaded the two different firmware files to the wrong eproms? 801 is near the fan, while 800 is closer to the middle of the board.



238_eprom_locations.jpg (2976.05 kB, 4032x3024 - viewed 111 times.)

Report to moderator Logged

leighcorrigan

Frequent Contributor



Posts: 393

Country:

Nuclear Materials Scientist



Re: Keitley 238 restoration

« Reply #30 on: November 14, 2020, 03:08:44 am »

Say Thanks Reply Quote

Quote from: JxR on November 14, 2020, 02:48:33 am

Quote from: leighcorrigan on November 13, 2020, 03:24:26 pm

Quote from: JxR on April 22, 2020, 07:34:38 am

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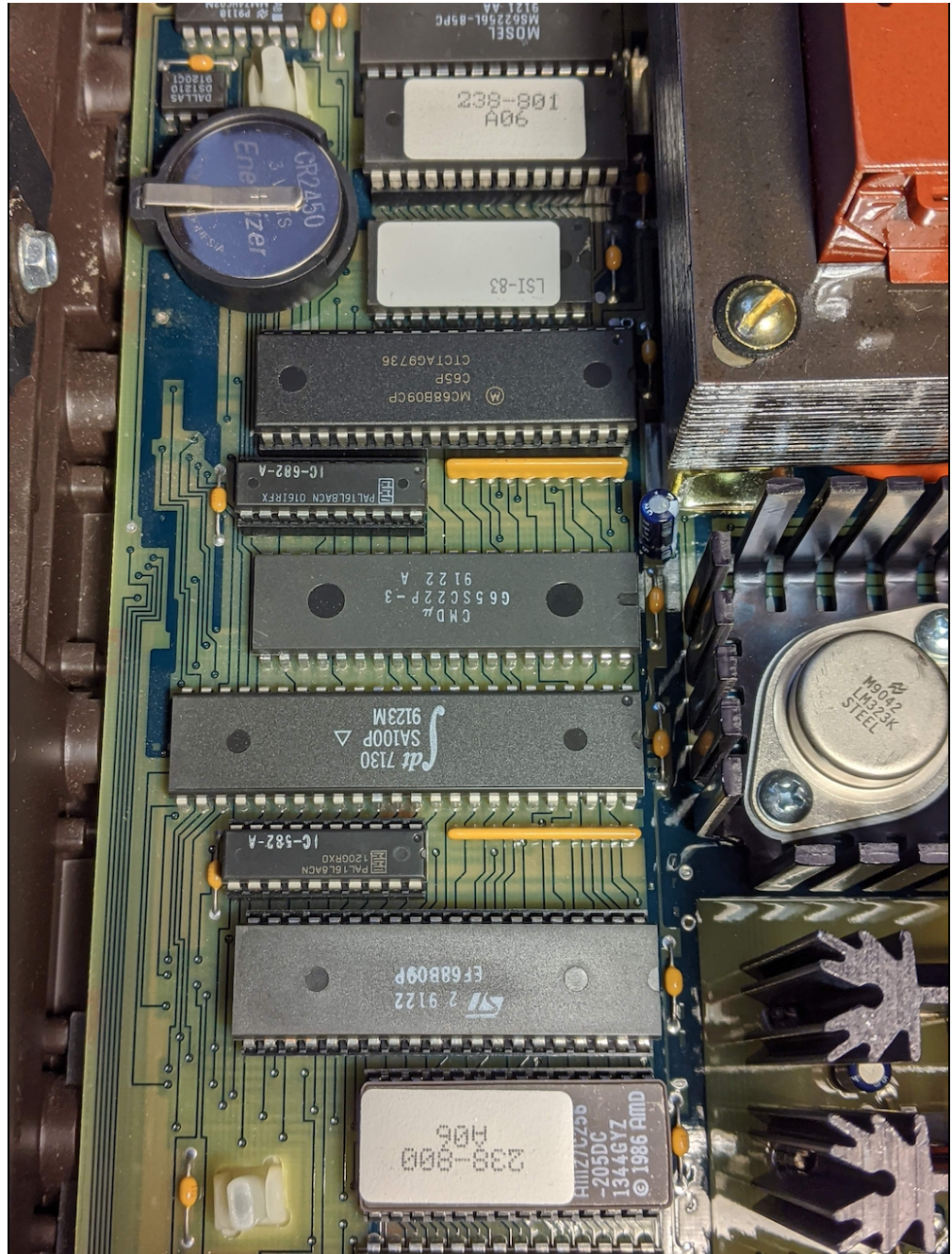
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On another note, I have another Keithley 238 with the A10 firmware. Is it possible to copy the firmware without losing the calibration constants? Otherwise, if you have a copy of the A10, could you please email it to me?

Regards.



Screen Shot 2020-11-13 at 22.08.19.png (2961.68 kB, 1028x1366 - viewed 112 times.)

« Last Edit: November 14, 2020, 03:21:58 am by leighcorriganl »

Report to moderator Logged

MASc, EIT, PhD Candidate

Re: Keitley 238 restoration

« Reply #31 on: November 14, 2020, 03:24:25 am »

Say Thanks Reply Quote

Quote from: leighcorriganl on November 14, 2020, 03:08:44 am

Quote from: JxR on November 14, 2020, 02:48:33 am

Quote from: leighcorriganl on November 13, 2020, 03:24:26 pm

Quote from: JxR on April 22, 2020, 07:34:38 am

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JxR

Supporter



Posts: 352

Country:



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On another note, I have another Keithley 238 with the A10 firmware. Is it possible to copy the firmware without losing the calibration constants? Otherwise, if you have a copy of the A10, could you please email it to me?

Regards.

The only copy I have of the A10 firmware is already posted above. That was from my own unit. I haven't had a need to look into where the calibration constants are stored, so I just don't know for sure.

I verified the firmware matched the transferred version when I performed the copy, although I haven't had a need to ever re-flash my own unit. The 238 is kind of a PIA to calibrate. If I had working firmware and the calibration was already good I would probably leave it alone.

The firmware has been downloaded a number of times, so hopefully someone here can confirm if they used it.

[Report to moderator](#) [Logged](#)

leighcorrigan

Frequent Contributor



Posts: 393

Country:

Nuclear Materials Scientist



Re: Keitley 238 restoration

« **Reply #32 on:** November 14, 2020, 03:41:52 am »

[Say Thanks](#) [Reply](#) [Quote](#)

Quote from: JxR on November 14, 2020, 03:24:25 am

Quote from: leighcorrigan on November 14, 2020, 03:08:44 am

Quote from: JxR on November 14, 2020, 02:48:33 am

Quote from: leighcorrigan on November 13, 2020, 03:24:26 pm

Quote from: JxR on April 22, 2020, 07:34:38 am

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Regards.

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The firmware has been downloaded a number of times, so hopefully, someone here can confirm if they used it.

According to the service manual, calibration constants are stored on the chip labelled 'LSI-83'. It is a little too late to leave things alone as I have already invested in an EPROM programmer, new chips, and the firmware posted has somehow corrupted my calibrations. I have to recalibrate now. Before I do this, I wanted to upgrade so it was not such a loss. Hopefully, someone who has already downloaded your firmware can confirm whether it works.

[Report to moderator](#)  [Logged](#)


MASc, EIT, PhD Candidate

 **JxR**

Supporter



Posts: 352

Country: 



 **Re: Keitley 238 restoration**

« **Reply #33 on:** November 14, 2020, 03:55:01 am »

[Say Thanks](#)

[Reply](#)

[Quote](#)

Quote from: leighcorrigan on November 14, 2020, 03:41:52 am

Quote from: JxR on November 14, 2020, 03:24:25 am

Quote from: leighcorrigan on November 14, 2020, 03:08:44 am

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On another note, I have another Keithley 238 with the A10 firmware. Is it possible to copy the firmware without losing the calibration constants? Otherwise, if you have a copy of the A10, could you please email it to me?

Regards.

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You mentioned you have a working 238 already on A10. Why not just copy its firmware? I would be interested in knowing if you find something wrong with the firmware I posted if you can validate it against your own. But, the validation check out when I originally copied it, so I don't have a reason to suspect a problem.

Also, I honestly don't know if Keithley made any hardware changes between A06-A10 that would cause an issue. The service manual for the 238 doesn't even contain the schematic like the 236, nor does it contain any revision changes I saw.

« Last Edit: November 14, 2020, 04:02:41 am by JxR »


Report to moderator  Logged

 **leighcorrigan**

Frequent Contributor



Posts: 393

Country: 

Nuclear Materials Scientist



 **Re: Keitley 238 restoration**

« Reply #34 on: November 14, 2020, 04:04:09 am »

Say Thanks

Reply

Quote

Quote from: JxR on November 14, 2020, 03:55:01 am

Quote from: leighcorrigan on November 14, 2020, 03:41:52 am

Quote from: JxR on November 14, 2020, 03:24:25 am

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Also, I honestly know if Keithly made any hardware changes between A06-A10 that would cause an issue. The service manual for the 238 doesn't even contain the schematic like the 236, nor does it contain any revision changes I saw.

I cannot risk corrupting the calibration constants of another Keithley 238 that has just been professionally calibrated. This is why I am trying to get another copy of the firmware. As for the A06 to A10 update, I cannot be certain if there are any hardware changes. The differences must be subtle because I never noticed. The board material is definitely different, but the layout looks identical.

[Report to moderator](#)  Logged

MASc, EIT, PhD Candidate

 **JxR**

Supporter



Posts: 352

Country: 




 **leighcorrigan**

Frequent Contributor



Posts: 393

Country: 

Nuclear Materials Scientist



 **Re: Keitley 238 restoration**

« **Reply #35 on:** November 17, 2020, 04:21:25 am »

[Say Thanks](#)

[Reply](#)

[Quote](#)

Did another dump on the 238 A10 EPROMS. Welcome to see if it makes a difference.

« *Last Edit:* November 20, 2020, 02:42:47 am by JxR »

[Report to moderator](#)  Logged

The following users thanked this post: leighcorrigan

 **Re: Keitley 238 restoration**

« **Reply #36 on:** November 17, 2020, 04:42:38 am »

[Say Thanks](#)

[Reply](#)

[Quote](#)

Quote from: JxR on November 17, 2020, 04:21:25 am

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JxR,

Thank you so much for going out of your way! I will look it over shortly.

Were you able to copy the firmware without corrupting your calibration constants?

Regards.

[Report to moderator](#)  Logged


MASc, EIT, PhD Candidate

 **JxR**

Supporter



Posts: 352

Country: 



 **Re: Keitley 238 restoration**

« **Reply #37 on:** November 17, 2020, 04:51:17 am »

[Say Thanks](#)

[Reply](#)

[Quote](#)

Quote from: leighcorrigan on November 17, 2020, 04:42:38 am

Quote from: JxR on November 17, 2020, 04:21:25 am

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Regards.

Accuracy seems normal for not being warmed up. Since you looked up that the calibration is stored on a different chip, I think it is unlikely to affect anything. Also the analog section is sealed off with its own covers, and I've never noticed any negative changes when physically removing just the outer case cover.


[Report to moderator](#)  [Logged](#)

leighcorrigan

Frequent Contributor



Posts: 393

Country: 

Nuclear Materials Scientist



Re: Keitley 238 restoration

« **Reply #38 on:** November 17, 2020, 05:25:41 am »

[Say Thanks](#)

[Reply](#)

[Quote](#)

Quote from: leighcorrigan on November 17, 2020, 04:42:38 am

Quote from: JxR on November 17, 2020, 04:21:25 am

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I checked over both firmware copies that you have uploaded, JxR. Looks like they are identical in terms of checksums. Again, I really appreciate you doing this for my benefit. I think I will keep it as a copy if ever my Keithley 238 (A10) variation firmware dies.

My guess is that my A06 hardware variation is incompatible with your A10 firmware for whatever reason. The A06 model I have is much older in appearance:

- white cabling to triax connectors from the analogue board
- different serial number tag (no barcode) and placement
- the contrast of the screen is not as good by comparison
- inner shielding is white rather than brown
- circuit boards are translucent yellow but are of higher build quality
- IC date stamps are from the mid-'80s
- the transformer lacks a model number

Without the schematics, it's anyone guess. It would be fun to try and swap out the digital boards, but I feel like I might damage something.

On a separate note, you mentioned how difficult it is to calibrate a Keithley 238. I would say otherwise. The instructions are terrible, yes, but the procedure is rather simple if you have the following equipment:

- electrometer/picoammeter (preferably with a triaxial input, but BNC works too)
- source or source measure unit of similar specifications
- digital multimeter with 6.5 or greater

3 steps:

- 1) 110 V to 0 uV (connect a DMM directly to the SMU with a triax cable and a triax to banana adapter in DCV mode)
- 2) 1 A and 100 mA (same procedure as step 1, except in DCI mode)
- 3) 10 mA to 0 nA (source current to an electrometer with a triax, then source the same current through the triax to the instrument to be calibrated, provide the electrometer measurement to the instrument)

I was able to complete the procedure within a day, without any previous experience. The whole thing can be done faster because I made an Excel sheet that provides step-by-step commands after entering measurements.

If you are interested, please PM me.

Regards.

« *Last Edit:* November 24, 2020, 02:43:19 am by leighcorrigan »

[Report to moderator](#)  [Logged](#)

MASc, EIT, PhD Candidate

JxR

Re: Keitley 238 restoration

Supporter



Posts: 352

Country:



« Reply #39 on: November 17, 2020, 05:44:38 am »

Say Thanks

Reply

Quote

Quote from: leighcorrigan on November 17, 2020, 05:25:41 am

Quote from: leighcorrigan on November 17, 2020, 04:42:38 am

Quote from: JxR on November 17, 2020, 04:21:25 am

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I was able to complete the procedure within a day, without any previous experience. The whole thing can be done faster because I made an Excel sheet that provides step-by-step commands after entering measurements.

If you are interested, please PM me.

Regards.

Well, I technically just said it was a (PIA) pain in the ass, which I still stand by. I certainly had no issue doing it either, but it still took quite a while. I had an in calibration 2450 so did the entire procedure with that from what I remember.

Report to moderator Logged

 JxR

Supporter



Posts: 352

Country:



Re: Keitley 238 restoration

« Reply #40 on: November 24, 2020, 01:58:26 am »

Say Thanks

Reply

Quote

So, your going to hate me but here it goes. I'm an idiot and selected the wrong chip size when I originally copied this firmware(not once but twice). This was discovered last week when I said, "I should get some EEPROMs and change these chips out."

I even labeled my original firmware files with the wrong chip sizes and so I of course ordered a few of those first, wasting ~\$30 for NOS EEPROMs I don't have a need for (These chips are getting hard to find). I had to dig into the K236 schematics to find out where I went wrong. Oh, and of course I lost my calibration in the process, which is probably karma for being a dumbass.

So to be perfectly clear:

U17 or A10-800 is a 27C256 OTP. This was replaced with an Atmel 27C256R-15 OTP.

U31 or A10-801 is a 27C512-200. This was replaced with a Windbond W27C512-45Z.

I can 100% confirm that the files provided successfully flashed to these chips, and the K238 went

through start up successfully. Course I now have to re-calibrate it.

All I can say is sorry for wasting anyone's time who was unlucky enough to try and burn my previously posted firmware(which I removed). I will have to wait about a month until I will have sufficient free time to re-calibrate my own unit.

Actual working firmware attached (for real this time).

 Keithley238_A10_Firmware.zip (34.27 kB - downloaded 20 times.)

Report to moderator  Logged


The following users thanked this post: 2N3055, MiDi

leighcorrigan

Frequent Contributor



Posts: 393

Country: 

Nuclear Materials Scientist



 **Re: Keitley 238 restoration**

« Reply #41 on: November 24, 2020, 03:24:46 pm »

Say Thanks

Reply

Quote

Quote from: JxR on November 24, 2020, 01:58:26 am

Actual working firmware attached (for real this time).




I can confirm that this A10 firmware above is working on my Keithley 238. At least this correction will help members in the future.

What I am concerned about now is that xDevs.com has picked up your corrupt firmware and has added it to their website:

<https://xdevs.com/doc/Keithley/238/firmware/> (**WARNING: DO NOT USE THIS FIRMWARE!**)

I cannot say for certain, but the filenames match your description and the sizes are also incorrect, suggesting that this is your broken firmware. You should contact them to tell them to take it down. I tried to contact them about where they got it from a while ago, but no one seemed to reply.

Thank you for being honest with everyone, JxR. You did the right thing. 

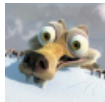
Report to moderator  Logged

MASc, EIT, PhD Candidate


The following users thanked this post: JxR

MiDi

Frequent Contributor



Posts: 548

Country: 



 **Re: Keitley 238 restoration**

« Reply #42 on: November 24, 2020, 08:19:30 pm »

Say Thanks

Reply

Quote

Forwarded to TiN from xDevs.

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The following users thanked this post: JxR

JxR

Supporter



Posts: 352

Country: 



 **Re: Keitley 238 restoration**

« Reply #43 on: November 24, 2020, 08:41:34 pm »

Say Thanks

Reply

Quote

Quote from: leighcorrigan on November 24, 2020, 03:24:46 pm

Quote from: JxR on November 24, 2020, 01:58:26 am

Actual working firmware attached (for real this time).



I can confirm that this A10 firmware above is working on my Keithley 238. At least this correction will help members in the future.

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your broken firmware. You should contact them to tell them to take it down. I tried to contact them about where they got it from a while ago, but no one seemed to reply.

Thank you for being honest with everyone, JxR. You did the right thing. 🙌😊

I just took care of uploading the new firmware to the xdevs ftp, with explanation to replace the old one.

Just FYI, I can't personally remove the existing firmware or place it in the normal area most people navigate to. The upload is done based on these instructions.

<https://doc.xdevs.com/contact/>

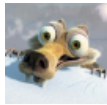
« Last Edit: November 24, 2020, 08:49:35 pm by JxR »

Report to moderator Logged

The following users thanked this post: leighcorrigan

Midi

Frequent Contributor



Posts: 548

Country:



Re: Keitley 238 restoration

« Reply #44 on: November 24, 2020, 08:51:26 pm »

Say Thanks Reply Quote

TiN has replaced them, should be fine now.

Report to moderator Logged

The following users thanked this post: JxR

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