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Description:	<ul style="list-style-type: none"> • High-voltage tether transmission of 500 V to 800 V • Power density of 1000 W/in³ 	 Download Datasheet

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Author

Topic: **Fluke 5200a AC Voltage Calibrator Teardown and Repair** (Read 22458 times)

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CaptnYellowShirt

Frequent Contributor



Posts: 447

Country:

Scooty Puff Jr.



Fluke 5200a AC Voltage Calibrator Teardown and Repair

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« on: February 05, 2014, 08:58:52 pm »

I have recently been working on a Fluke 5200a with a bad case of the power supply flu. Several bad capacitors have caused a cascade of problems through the voltage regulation and main amplifier sections of the device. I'm still in the process of tracking down and repairing all the bad components, but while I have most of the 5200a's guts splayed out on my workbench, I thought some people here might be interested in seeing what makes this thing tick.

<Safety Warning>

Before I begin, its worth mentioning that working on this device requires some added care. While the unit is operational*, the power supply generates lethal potentials of +300 / - 300 Volts. These supply rails are exposed and easily "bumped into" if the case is opened. In summary, the manual puts it best: "DEATH ON CONTACT may result if you do not understand and follow safety procedures."

*In my case, the +190 / -190 V rails were still energized well after power off because the bleed-down resistors were fried.

</Safety Warning>

For those of you who don't already know, the Fluke 5200a is an 53 lbs (24.1 kg) rack-mount AC Voltage Calibrator behemoth. It is able to produce AC voltages in the range between 1mv and 100V at 10Hz to 1MHz. It offers six decades of selectable voltage sub-division and 4 decades of selectable frequency division with a basic AC voltage accuracy of around 500 ppm, which is extendable to the 100 ppm range with an added device-specific characterization and compensation.

Back in the day, the list price was almost 12,000 (USD). Now a days you can pick one up for a few hundred on eBay.

At its core, the Fluke 5200a is a massive servo-controlled amplifier, and by some standards a complete waste of space -- \$/gain (main amp) = \$4,000 (yup, the main amp's gain is fixed at around 3), power density (watt/lb) = 0.005 (a 741 op amp handles the same power), and completely NON-RoHS compliant (even looking at it for brief time can give you terminal bonetitis). But these things (obviously) aren't the reason you'd invest in one of these bad boys. Not when \$10 and a smile will buy you one of these guys: <http://www.digikey.com/short/p4p3m>.

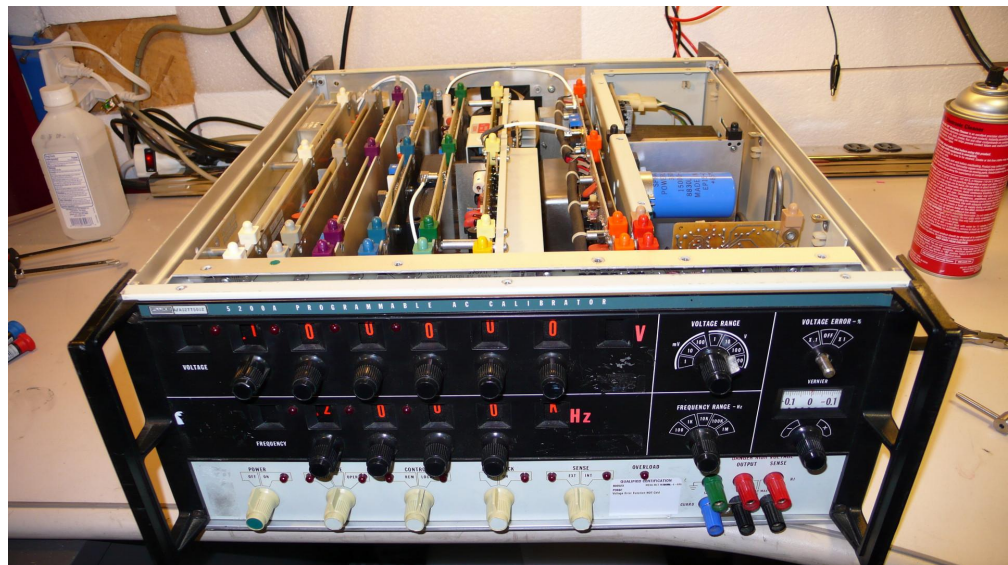
As many of you with degrees in engineering may find a smile overtly expensive some days, it is worth mentioning that no smile is required to operate a 5200a. All you'll need is an ability to turn knobs -- ALL 19 OF THEM. Which, let's face it, is where the 5200a really shines (only \$630/knob!).

Inside the device, you will find 6 or 7 boards that are all connected to a main back-plane. The functionality of the 5200a is logically subdivided onto these boards. Here's the basic theory of operation:

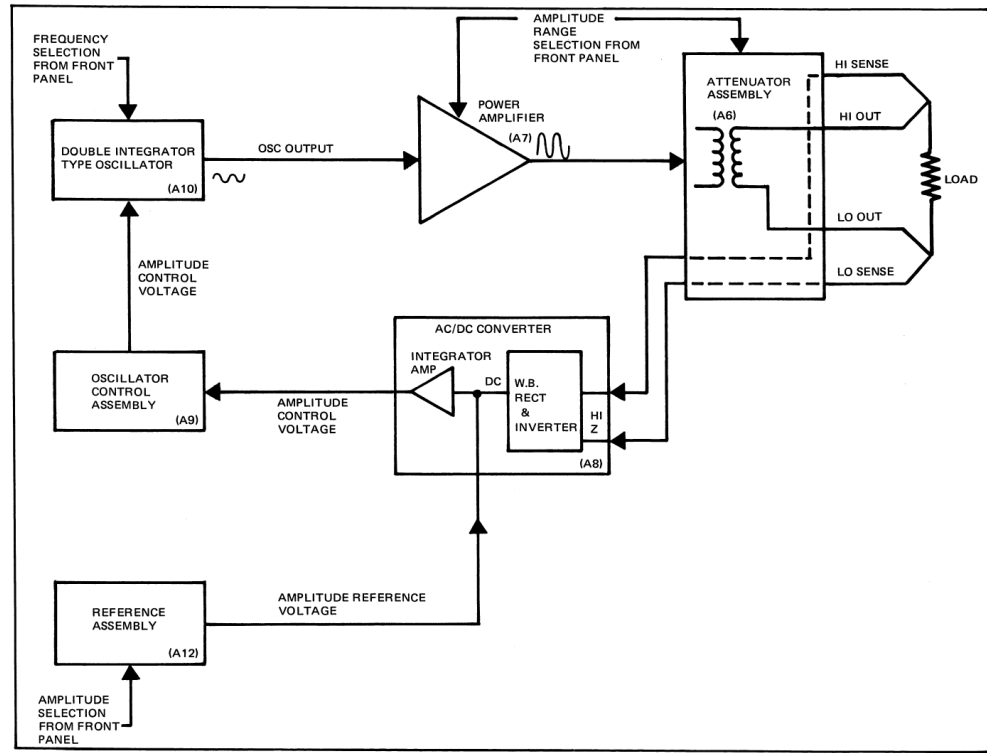
The big goal here is to create a voltage servo-controlled amplifier. The servo loop starts on the AC Oscillator Assembly (purple tabs) where an AC sinusoid is created. This sinusoid is fed into the Power Amplifier Assembly (yellow tabs), where, as previously mentioned, its voltage is increased by a factor of around three. The output of which is fed, by way of a small SMB coax to the Attenuator Assembly (orange tabs) where it is met with an array of precision step-down transformers. The transformer in operation is selected by the range knob on the front of the device (mV, V... etc). If you want the full 100V output, the step-down transformers are bypassed and the main amplifier is cranked to a neck-breaking gain of 30 (gasp!). The output of the active transformer is fed to the front of the device where it is outputted for your use -- diabolical or otherwise. The final output is sensed (internally or externally) and fed into a precision AC->DC converter (see: <https://www.eevblog.com/forum/projects/high-speed-signal-rectification-for-accurate-amplitude-measurement/msg352457/>). This AC DC Converter Assembly (green tabs) performs a high-speed conversion of the peak AC signal to a DC level. This DC level is compared to another DC level provided by the Reference Assembly (white tabs). This reference assembly is built around the device's DC voltage standard a ye olde SZA263 -- which is really just fancy talk for a temperature controlled buried zener. The error of this comparison, is fed into the Oscillator Control Assembly (blue tabs), which closes the servo loop by directing the AC Oscillator Assembly to correct its output voltage to the main amplifier. Voilà! Couldn't be easier, right?

For the careful observer, the board that has been omitted from the discussion thus far is the RCU Assembly (grey tabs). It is the optional seventh board that allows the 5200a to be remote controlled.

Detailed pictures of each section with commentary will be added and linked to later. Stay tuned.



5200a_Front.JPG (531.06 kB, 1920x1080 - viewed 1187 times.)



Fluke_5200a_TheoryOfOperation.gif (54.88 kB, 1407x1083 - viewed 941 times.)

« Last Edit: February 06, 2014, 05:31:53 pm by CaptnYellowShirt »

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lowimpedance

Super Contributor



Posts: 1092

Country:

Watts in an ohm?



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #1 on: February 05, 2014, 10:29:46 pm »

Say Thanks Reply Quote

Nice 'bench weight', looks nice and clean inside.
Looking forward to some nice pictures

Report to moderator Logged

The odd multimeter or 2 or 3 or 4...or.....can't remember !.

CaptnYellowShirt

Frequent Contributor



Posts: 447

Country:

Scooty Puff Jr.



Oscillator Assembly

« Reply #2 on: February 06, 2014, 12:06:57 am »

Say Thanks Reply Quote

First things first: the Oscillator Assembly. This is where the magic happens. And by magic, I mean tedious and boring. And by happens I mean I'm glad I wasn't the one who had to count out all those resistors and capacitors!

From the manual, Fluke says this is a "double-integrator type, RC oscillator". Which is really just fancy-speak for a http://en.wikipedia.org/wiki/Phase-shift_oscillator.

For any oscillator to work, you need: 1) power gain and 2) frequency selection. In this case, the output of the amplifier is filtered though an RC network and fed back into the input of the amplifier. The iterative filtering and phase shifting means only one frequency can exist though the feed back process -- all others are attenuated.

In my experience, the 5200a has a pretty awful frequency stability and accuracy (10% error?). Luckily if that kind of thing is important to you, you can phase lock the oscillator to an external reference.

On to the pictures. Nothing really exciting here. You see the quadrature, summing, and gain amplifiers on the left, while on the right you find the FET selectable RC networks.

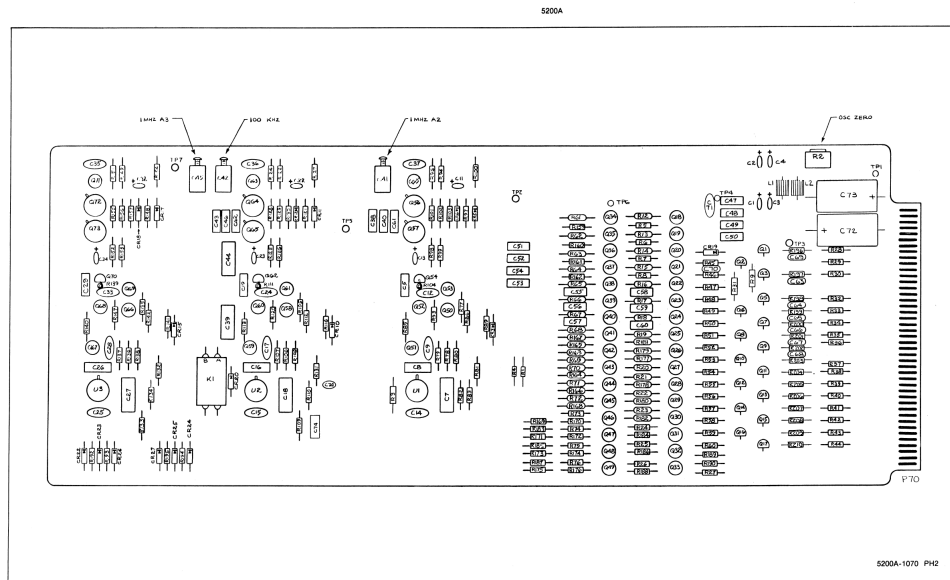
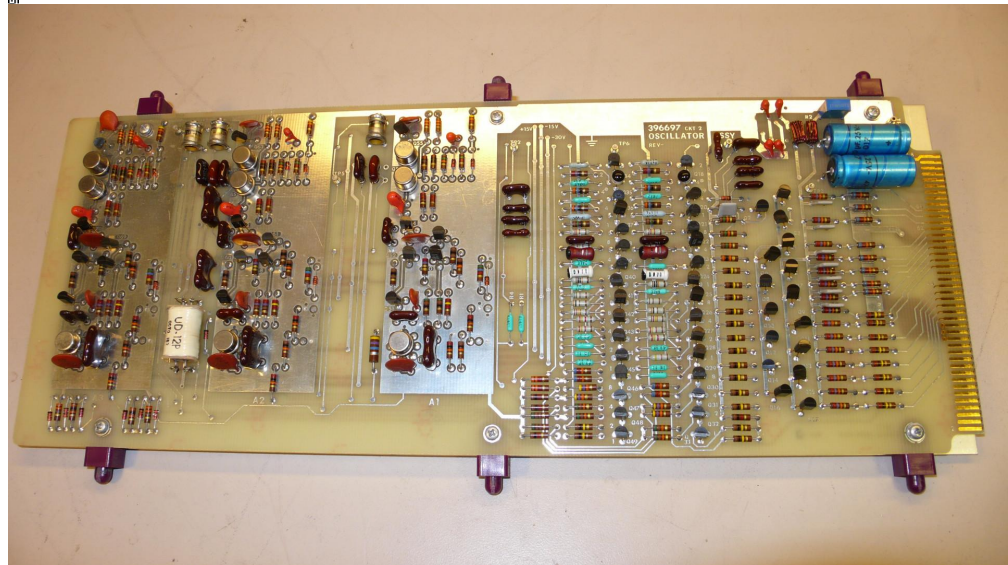
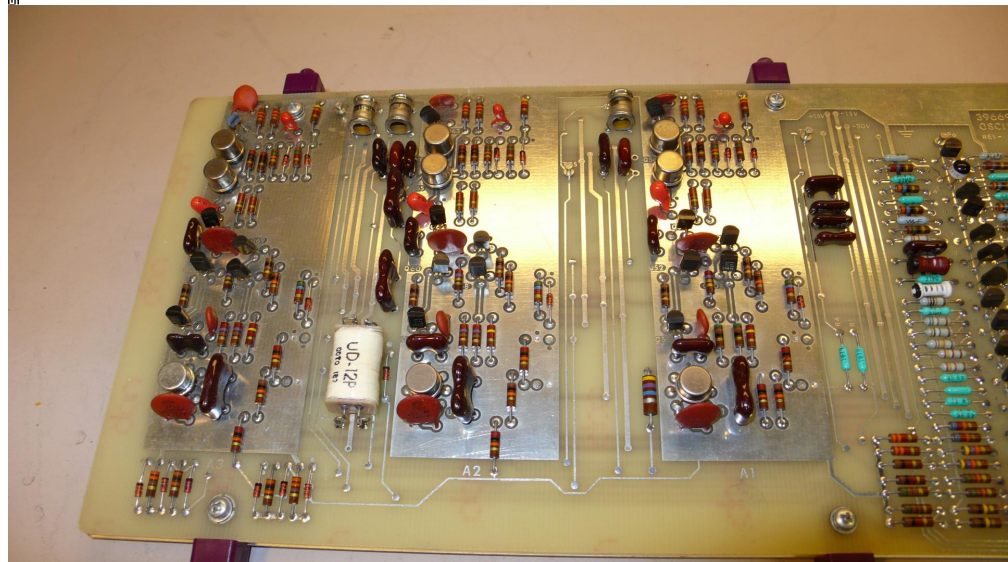


Figure 8-8. A10 Oscillator PCB Assembly

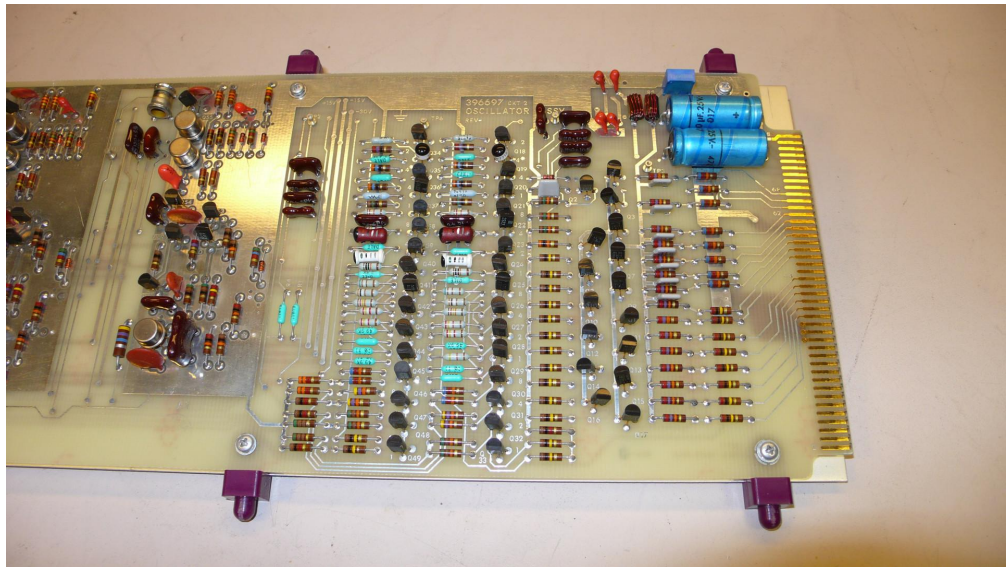
5200a_Oscillator_PCB.gif (223.21 kB, 2495x1560 - viewed 890 times.)



5200a_Oscillator_1.JPG (533.73 kB, 1920x1080 - viewed 929 times.)



5200a_Oscillator_2.JPG (518.77 kB, 1920x1080 - viewed 744 times.)



5200a_Oscillator_3.JPG (529.44 kB, 1920x1080 - viewed 683 times.)

« Last Edit: February 06, 2014, 02:51:22 am by CaptnYellowShirt »

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CaptnYellowShirt

Frequent Contributor



Posts: 447

Country:

Scooty Puff Jr.



Oscillator Assembly pt 2

« Reply #3 on: February 06, 2014, 12:09:02 am »

Say Thanks

Reply

Quote

2mb/post limit! Blah

More Oscillator Schematics...

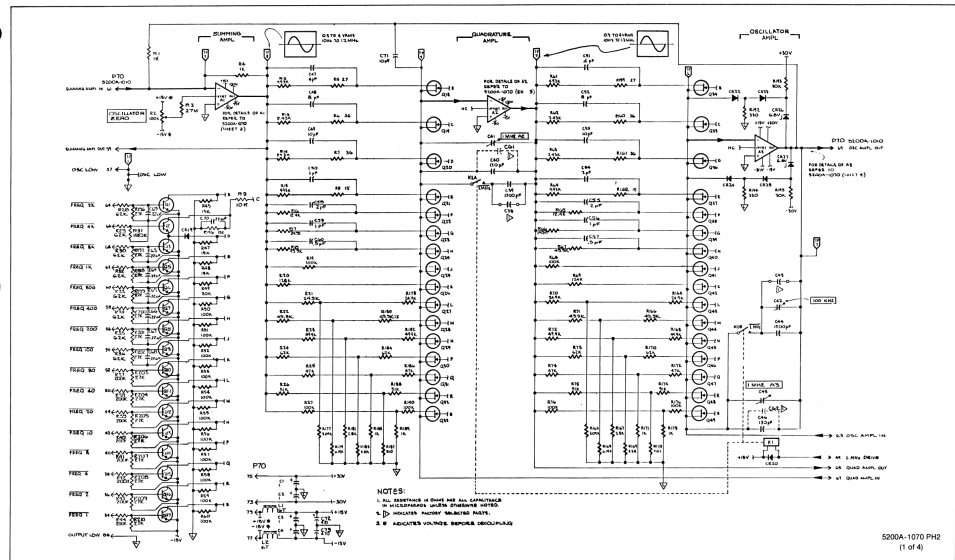


Figure 8-8. A10 Oscillator PCB Assembly (cont)

8-27/8-28

5200a_Oscillator_SCH1.gif (273.58 kB, 2495x1560 - viewed 769 times.)

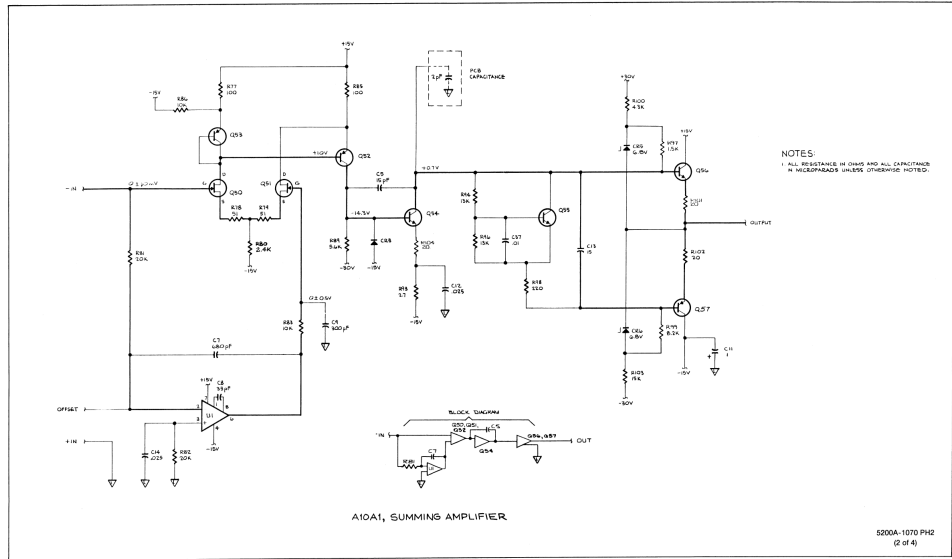


Figure 8-8. A10 Oscillator PCB Assembly (cont)

8-29/8-30

5200a_Oscillator_SCH2.gif (98.17 kB, 2495x1560 - viewed 549 times.)

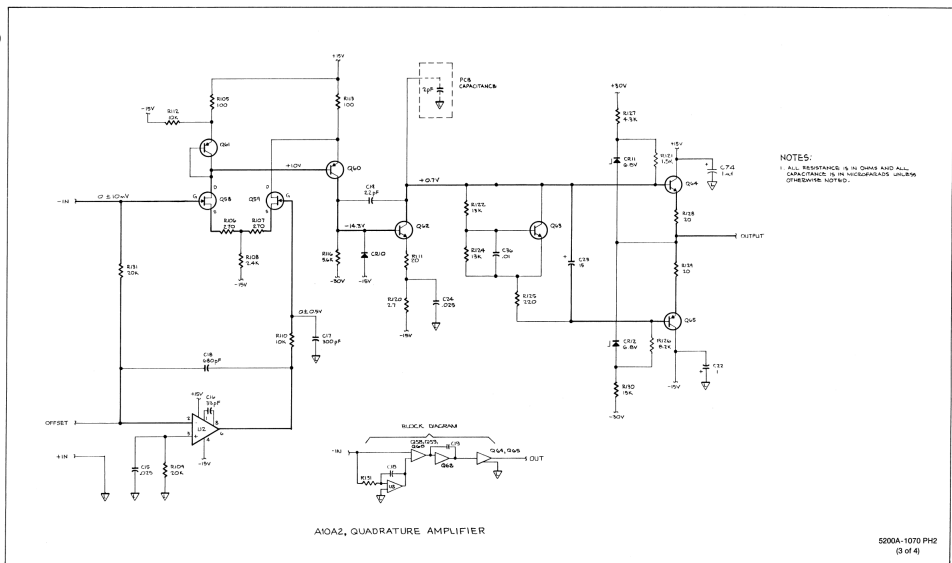
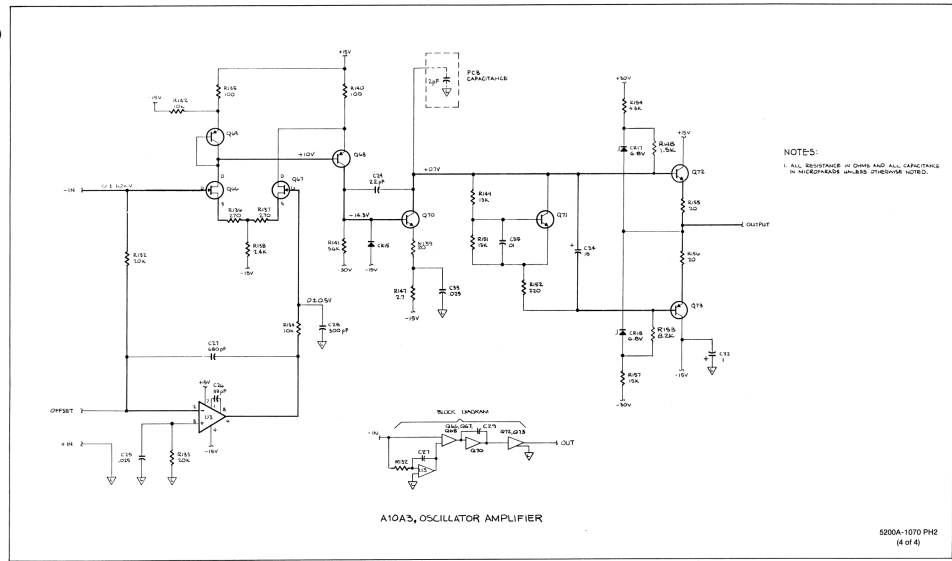


Figure 8-8. A10 Oscillator PCB Assembly (cont)

8-31/8-32

5200a_Oscillator_SCH3.gif (101.08 kB, 2495x1560 - viewed 622 times.)



5200a_Oscillator_SCH4.gif (100.14 kB, 2495x1560 - viewed 615 times.)

Last Edit: February 06, 2014, 12:11:57 am by CaptnYellowShirt »

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Vgkid

Super Contributor



Posts: 2616

Country: USA



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Reply #4 on: February 06, 2014, 03:44:37 am »

Say Thanks Reply Quote

Thanks for the uploads, I desire more.

That board looks to have almost as many fets/bjt's as my multimeter has total about 91. 🙄

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If you own any North Hills Electronics gear, message me. L&N Fan

casinada

Frequent Contributor



Posts: 600

Country: USA



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Reply #5 on: February 06, 2014, 05:24:59 am »

Say Thanks Reply Quote

I thought I was the only crazy enough to purchase one of those 🙄

On mine the amplitude is right on but the frequency is a little bit off. It is not an issue because I can check the frequency by other means 🙄

I also purchased the 5215A amplifier, that is serious hardware, each time I turn it on it sounds like a nuclear reactor and the whole room warms up rather quickly as it uses vacuum tubes. The cable to link the 5200 to the 5125 was impossible to find so I had to build one myself. I tested both bad boys together and I was able to generate 1000VAC, really scary stuff.

One of this days I'll open the 5200A to calibrate the frequency. If you need any pictures from mine, please let me know. 🙄

Report to moderator Logged

Dr. Frank

Super Contributor



Posts: 1946

Country: Germany



Re: Oscillator Assembly

Reply #6 on: February 06, 2014, 04:46:49 pm »

Say Thanks Reply Quote

Quote from: CaptnYellowShirt on February 06, 2014, 12:06:57 am

In my experience, the 5200a has a pretty awful frequency stability and accuracy (10% error?). Luckily if that kind of thing is important to you, you can phase lock the oscillator to an external reference.

Hello,

I think, it's possible to adjust the frequency accuracy to a few %.

But don't be fooled by your feelings, as the same happened to me with my 5200A.

It's better to read the specification very carefully; the accuracy decreases on the higher frequency

ranges as 10kHz, 100kHz and 1MHz.

On the highest range, the last two dials lose their meaning, and on 100kHz the last dial is unprecise.

On 100 Hz and 1kHz ranges, the frequency setting should be quite accurate, otherwise there's an error somewhere in the R2C network.

But that's documented in the spec.

Btw: The 5200A weighs 24kg -only-.

The 5205 and 5215 kV-amplifiers weigh that much, 54kg-

It's really a very nice instrument, and can also be used as a precision, low distortion audio oscillator.

Do you know those ultra low distortion oscillators from Krohn-Hite, eg. the 4024 or the 4402B?

Those function in exactly the same manner, but were trimmed for 0.0002% distortion, instead of ultra stable / precise amplitude.

I once used those also, but it's a pity, they are not available yet on the 2nd hand market.

Frank

« Last Edit: February 06, 2014, 04:58:32 pm by Dr. Frank »


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 **CaptnYellowShirt**

Frequent Contributor



Posts: 447

Country: 

Scooty Puff Jr.



 **Re: Oscillator Assembly**

« **Reply #7 on:** February 06, 2014, 05:31:24 pm »

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

Quote from: Dr. Frank on February 06, 2014, 04:46:49 pm

Btw: The 5200A weighs 24kg -only-.

The 5205 and 5215 kV-amplifiers weigh that much, 54kg-

You're right! Let me fix that.


[Report to moderator](#)  Logged

 **CaptnYellowShirt**

Frequent Contributor



Posts: 447

Country: 

Scooty Puff Jr.



 **Power Amplifier Assembly**

« **Reply #8 on:** February 07, 2014, 06:57:03 pm »

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

This amplifier makes me wish I had paid more attention in school.... haha...pfft... they didn't cover this kind of stuff in school.

But seriously, I did have to pull out my copy of Art of Electronics and re-read the section "Some Amplifier Building Blocks" to get my head wrapped around it. Speaking of which, a prize to anyone who can answer a trick question at the bottom of the post.

As previously mentioned, the amplifier has a fixed gain of around 3. This gain value is increased to 30 when the 5200a is placed in its "100V" mode. There are three stages to the amplifier, the first (the "Input Stage") is a "differential voltage-to-current amplifier". Q3-Q8 form a push-pull style current amplifier which provides minimal zero-crossing distortion to its output. The left side of the current mirror (Q3,5,7) forms the positive input branch which responds to the input signal provided by the FET Q1. The right side of the current mirror (Q4,6,8) forms the negative input branch which responds to the DC-zeroing feedback path (through U1). This feedback path removes any DC bias from the output of the entire assembly. I'm not sure if there's any reason for this feedback path beyond the obvious removal of DC current and wasted power from the Attenuation Assembly and its transformers (hysteresis?).

The next stage (the "Mid Stage") boosts the signal (now in current <- that's really important to remember if you're probing around w/ your 'scope) and uses Q15 to switch back from current to voltage. However, Q15 is now floating at around -190V, which allows the next stage to operate between the +190v and -190v rails without being tied directly to either as the output stage's ground reference.

Lastly the "Output Stage" consists several transistors which form a "complementary emitter-follower bootstrap amplifier". The manual says the bootstrapping action is provided by CR8 and CR9 -- frankly, I'm not getting that? I would have guessed R43/L10, but what do I know? Answer: I know I'm glad someone else designed this bad boy. Anyway, the transistor pairs of Q17/21 and Q18/22 form darlington pair. And the output of the Q21/Q22 appears on "P33" which joins up with a small coax and connects with the Attenuator Assembly.

<Repair Notes>

This is where my repair began. It turns out that the +30V rail had a bad cap in the power supply. This was giving the rail a DC value of around 25V and an AC value of around 7V (120Hz). This was playing

havoc with Q2 on the input stage -- causing the Overload Detector to fire at around 120Hz. This gave huge spikes on the output and made a really annoying bz.bz.bz.bz noise as relay was activating and deactivating (at least, I hope it was a relay).

I repaired the power supply -- the +15, -15, and +5 rails also had problems. But after fixing all of that, I plugged the amplifier back in to find several more problems. Long story short: after futzing with it for about 30mins, I overloaded something in the -190V regulator section. This caused a failure of R92, R88, and R87 (I forget what order they failed in). R87 and R88 are soldered directly on top of a ground plane. So when they failed, I had a 190V DC plasma arc eating away at the ground plane and the nearby components. R87 came out in several pieces. (Note to self: replace with flameproof components).

</Repair Notes>

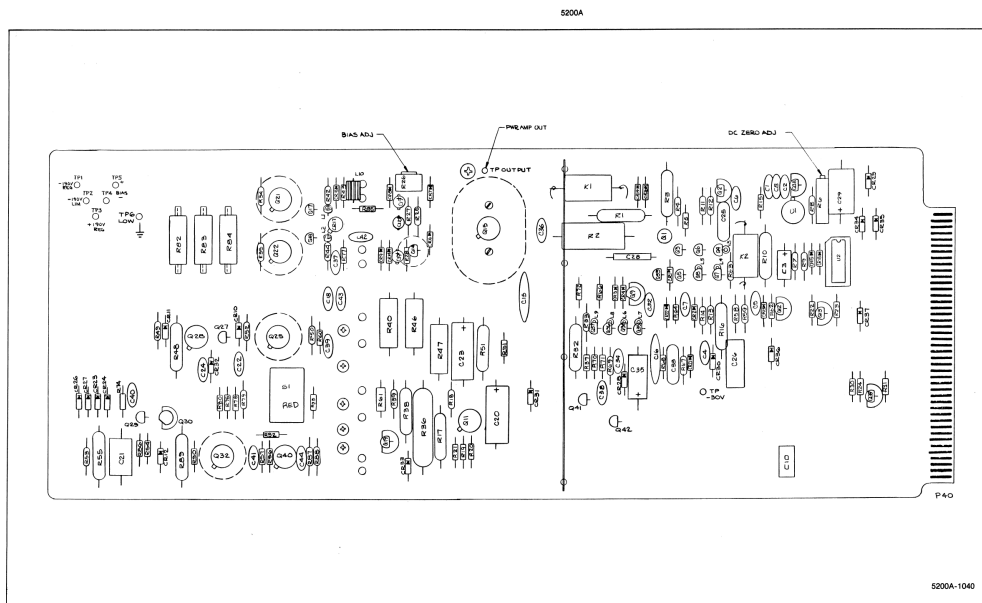


Figure 8-5. A7 Power Amplifier PCB Assembly

5200a_PowerAmp_PCB.gif (195.59 kB, 2397x1534 - viewed 643 times.)

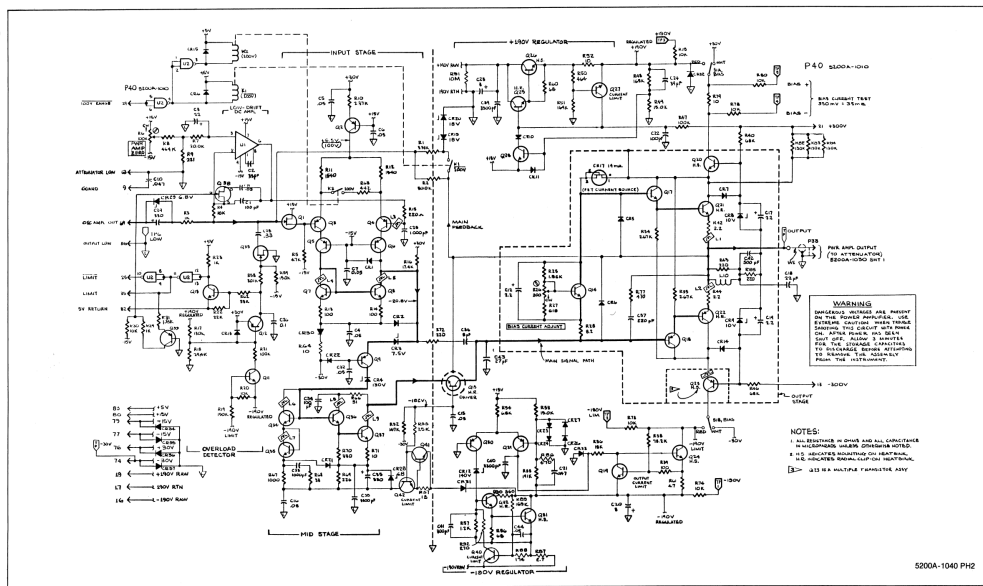
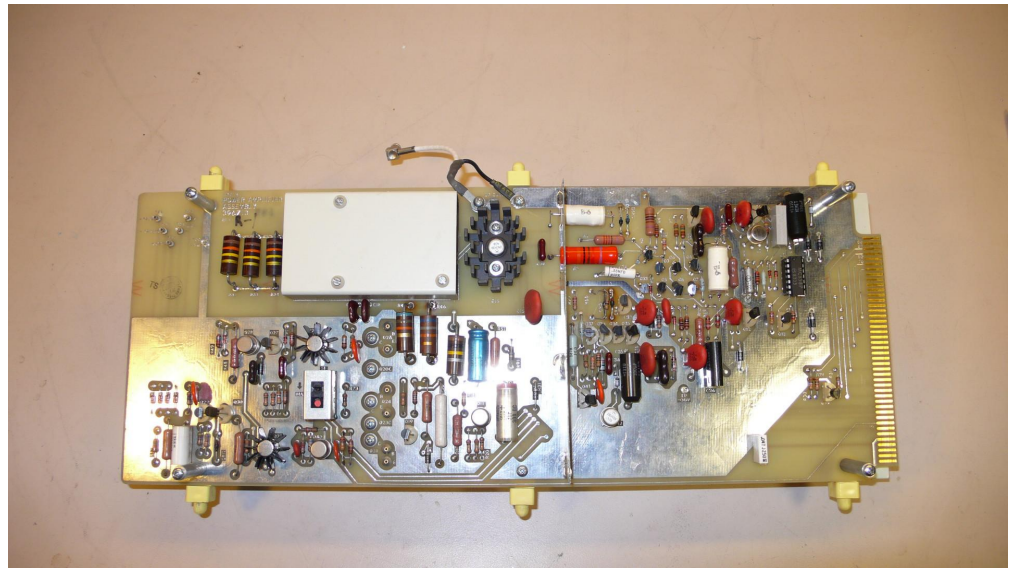
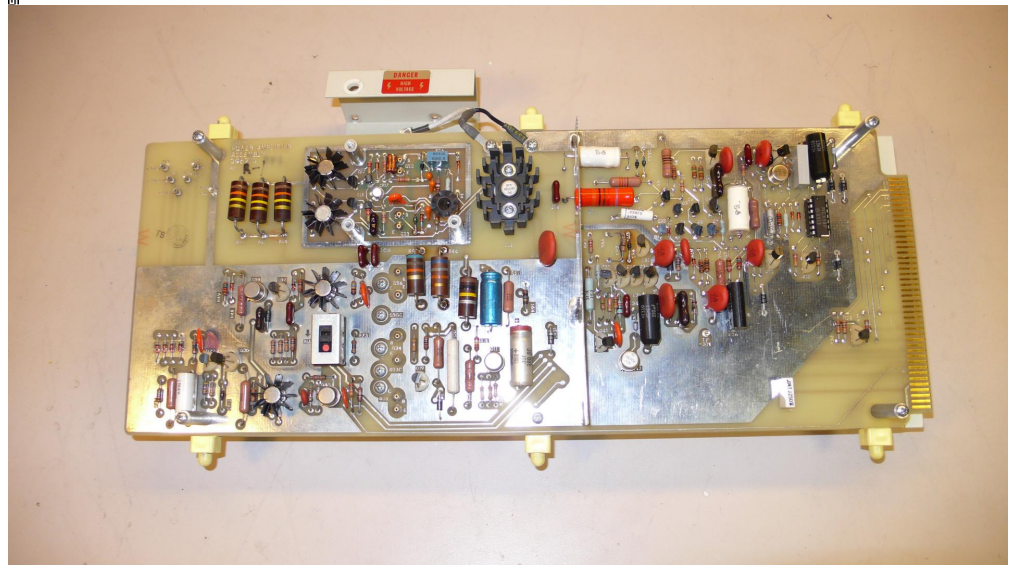


Figure 8-5. A7 Power Amplifier PCB Assembly (cont)

5200a_PowerAmp_SCH.gif (261.5 kB, 2397x1534 - viewed 855 times.)



5200a_PowerAmp_1.JPG (441.24 kB, 1920x1080 - viewed 694 times.)



5200a_PowerAmp_2.JPG (462.94 kB, 1920x1080 - viewed 1045 times.)

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CaptnYellowShirt
Frequent Contributor

Power Amplifier Assembly pt 2
« **Reply #9 on:** February 07, 2014, 06:58:22 pm »

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Posts: 447
Country:
Scooty Puff Jr.



[More Pictures...](#)

Q15 (the Mid-to-Output stage bridge transistor) is the big one, top center with a heat sink that looks like something out of Samurai Jack



5200a_PowerAmp_3.JPG (342.7 kB, 1920x1080 - viewed 663 times.)



5200a_PowerAmp_4.JPG (537.81 kB, 1920x1080 - viewed 736 times.)



5200a_PowerAmp_5.JPG (538.75 kB, 1920x1080 - viewed 853 times.)



Q15_HeatSink.png (456.77 kB, 640x480 - viewed 825 times.)

« Last Edit: February 07, 2014, 07:03:14 pm by CaptnYellowShirt »

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Vgkid

Super Contributor



Posts: 2616

Country:



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #10 on: February 08, 2014, 12:40:43 am »

Say Thanks Reply Quote

Thanks for the pictures, that 330uf kemet cap is rather interesting.

Report to moderator Logged

If you own any North Hills Electronics gear, message me. L&N Fan

CaptnYellowShirt

Frequent Contributor



Posts: 447

Country:

Scooty Puff Jr.



Attenuator Assembly

« Reply #11 on: February 08, 2014, 10:56:20 pm »

Say Thanks Reply Quote

Up next is the Attenuator assembly.

For many of the selectable ranges of the 5200a (1mV, 10mV, 100mV) the output of the Power Amplifier Assembly is too high (~1V). To output the correct voltage, a series of precision transformers are used to scale the voltage down.

Three transformers with several taps each. 1) Select the right tap. 2) Route the output to the terminals on the front. 3) Hook up the sense leads though the correct scaling tap. Done. It is worth noting the impressive bank of "DAC" relays does the complex switching.

The transformers are both shielded and sealed (see pictures). I was excited that the shield might have been some kind of exotic material (e.g. Mu-Metal), but alas it was simply tinned steel. The foam looks to me like polystyrene.

The metal box on the top left houses R8 and C3 which look to be some kind of phase compensation for the high voltage divider. It was soldered shut, so I didn't bother to open it.

The manual suggests that during a fault's diagnostic work to de-couple the Attenuator Assembly from the Power Amplifier Assembly. This helps to logically isolate the fault to a certain assembly board. I found it extremely helpful during my repairs!

5200A

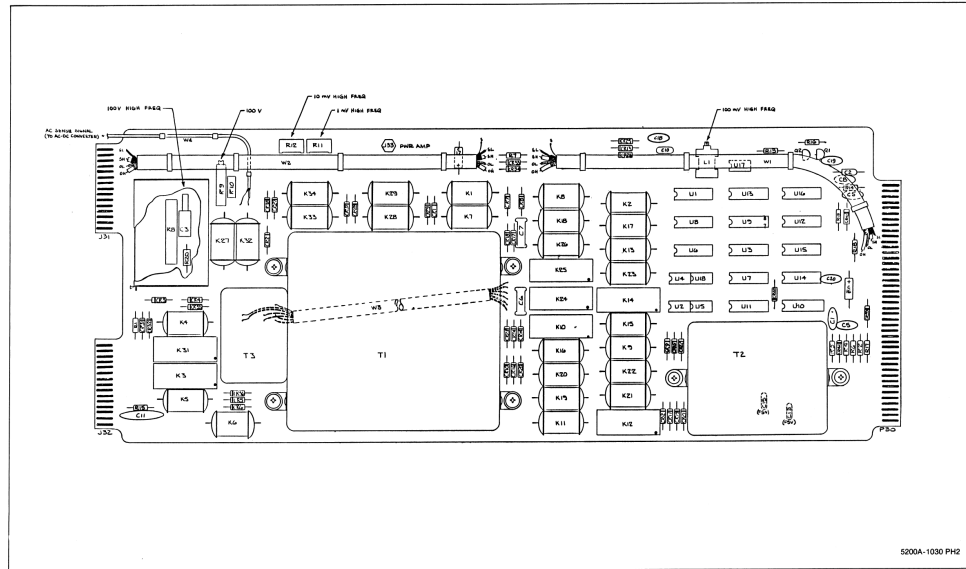


Figure 8-4. A6 Attenuator PCB Assembly

8-8

5200a_Attenuator_PCB.gif (170.98 kB, 2449x1553 - viewed 568 times.)

5200A

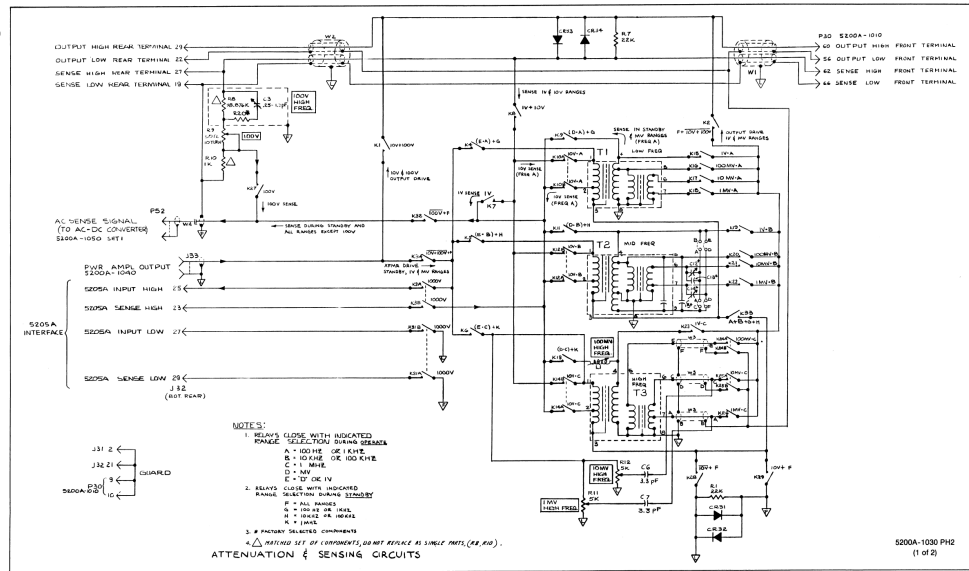


Figure 8-4. A6 Attenuator PCB Assembly (cont)

8-9/8-10

5200a_Attenuator_SCH1.gif (208.21 kB, 2449x1553 - viewed 1335 times.)

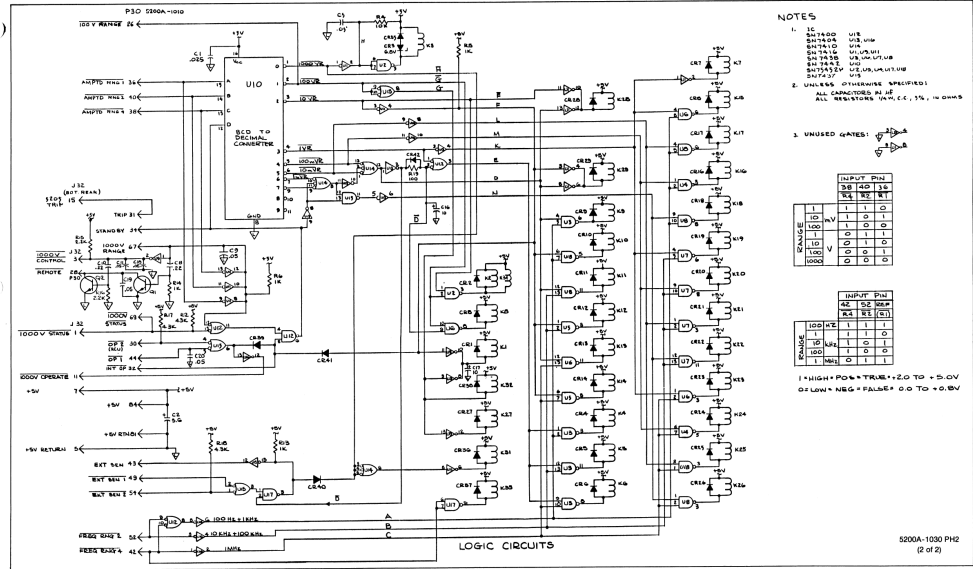
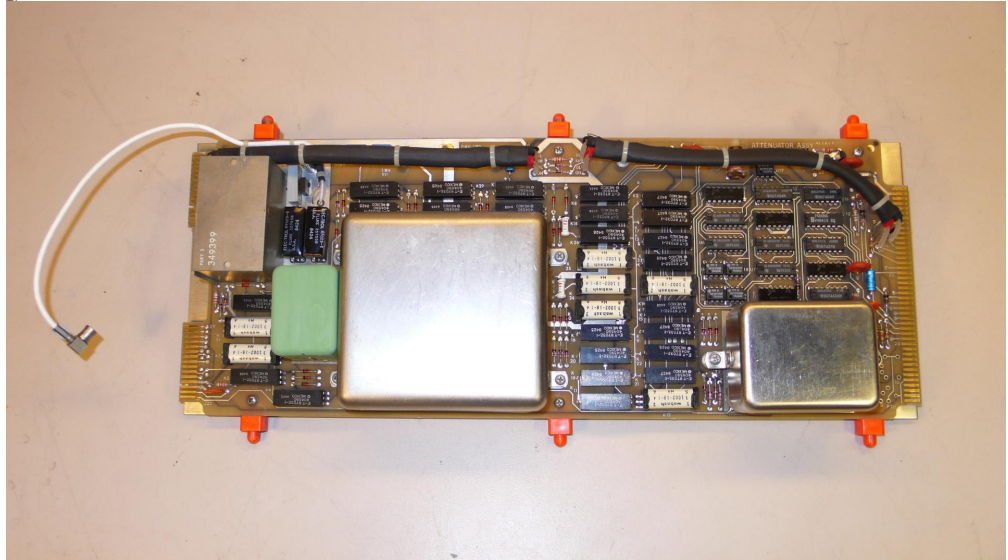


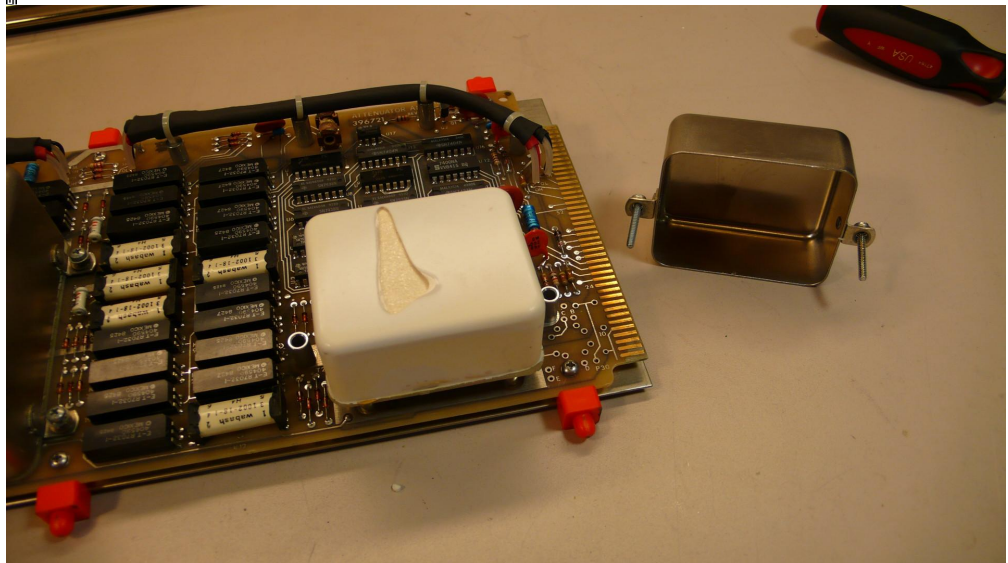
Figure 8-4. A6 Attenuator PCB Assembly (cont)

B-11

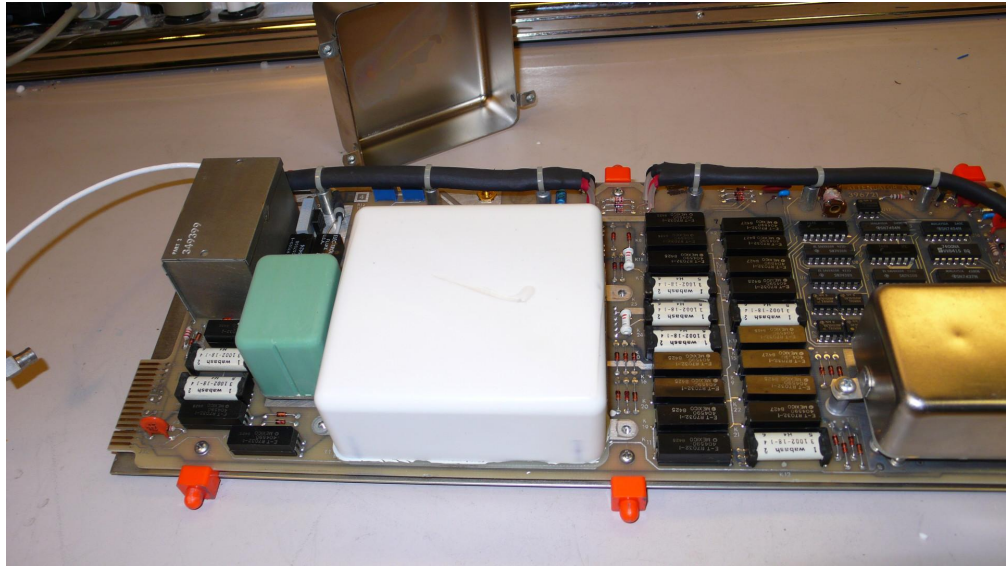
5200a_Attenuator_SCH2.gif (266.29 kB, 2449x1553 - viewed 509 times.)



5200a_Attenuator_1.JPG (408.23 kB, 1920x1080 - viewed 599 times.)



5200a_Attenuator_2.JPG (382.15 kB, 1920x1080 - viewed 582 times.)



5200a_Attenuator_3.JPG (384.92 kB, 1920x1080 - viewed 535 times.)

« Last Edit: February 08, 2014, 10:59:10 pm by CaptnYellowShirt »

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CaptnYellowShirt

Frequent Contributor



Posts: 447

Country: 

Scooty Puff Jr.



 **AC-DC Converter Assembly (For Those About to Rock We Salute You)**

« Reply #12 on: February 09, 2014, 08:14:59 pm »

Say Thanks

Reply

Quote

Now how do we verify the output voltage?

Sample, FFT, abs(). Right?

Oh wait... 1975 just called and reminded me why SkyLab's main computer only had 32k of memory. (http://en.wikipedia.org/wiki/IBM_System/4_Pi)

Ok, baring modern high accuracy ADC's and fast computers... how do we do this? We use an ideal rectifier! And we build such a device using an opamp. (http://en.wikipedia.org/wiki/Precision_rectifier) In this case, a discrete opamp.

Rectify the AC input, change it to a DC value, sum that DC value with inverted reference DC value. If the summation is zero, no correction signal is sent to the Oscillator Control Assembly. If the summation is not zero, a correction signal is sent to the OSA and the entire system is servo'd back into a correct AC output level.

It is important to note that the AC level dials on the front device control different Assemblies. The LSD dial makes its modification in in the AC/DC Converter Assembly, while all the other voltage dials command the DC Reference Assembly to change its DC reference level.

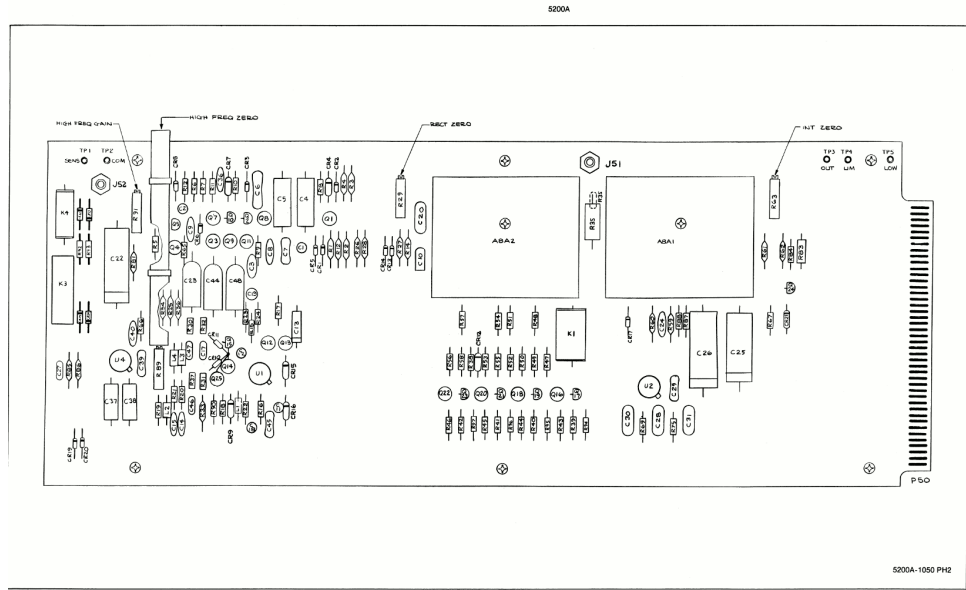


Figure 8-6. AB AC-DC Converter PCB Assembly

5200a_ACDC_PCB.gif (161.75 kB, 1702x1080 - viewed 441 times.)

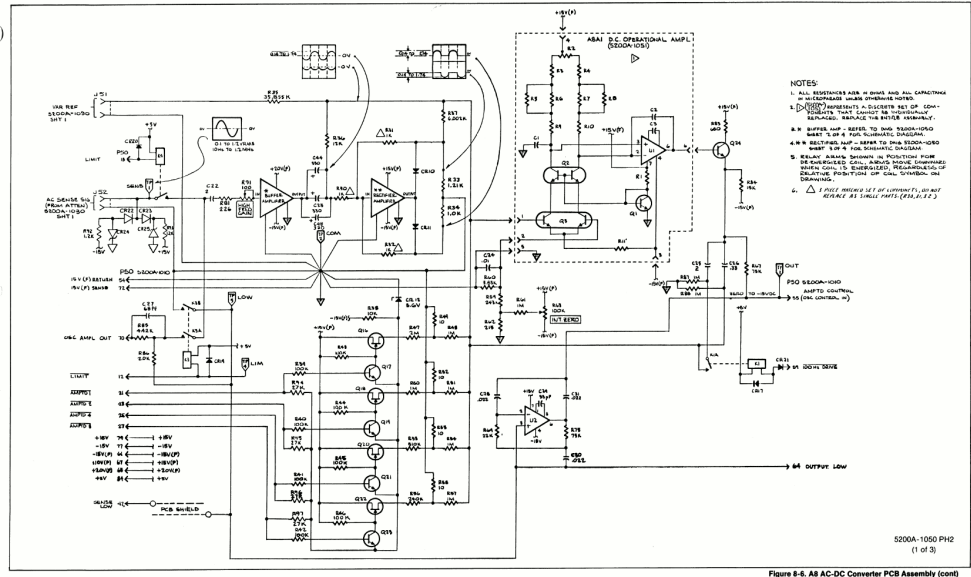


Figure 8-6. AB AC-DC Converter PCB Assembly (cont)

5200a_ACDC_SCH1.gif (209.72 kB, 1702x1080 - viewed 492 times.)

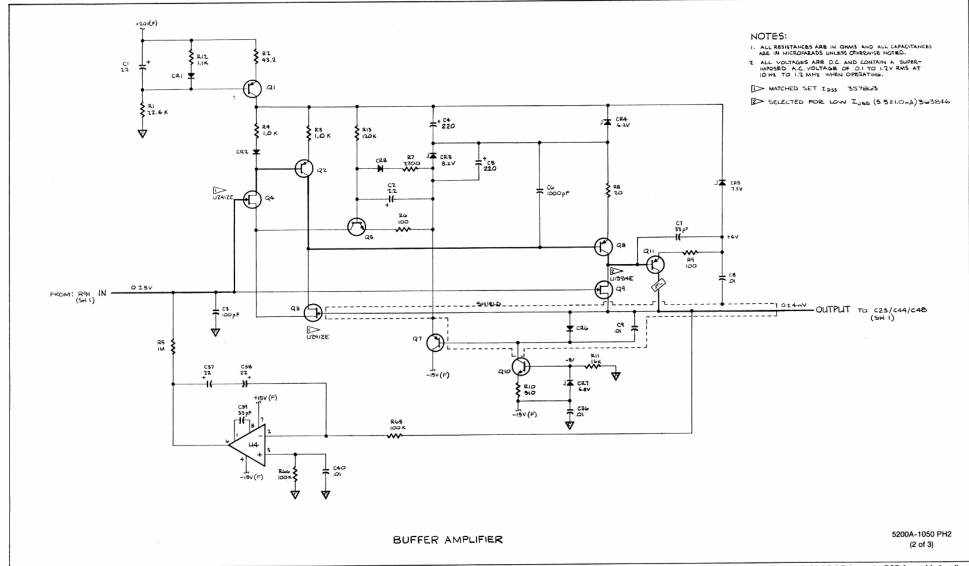


Figure 8-6. AC-DC Converter PCB Assembly (cont)

8-17/8-18

5200a_ACDC_SCH2.gif (106.68 kB, 1702x1080 - viewed 469 times.)

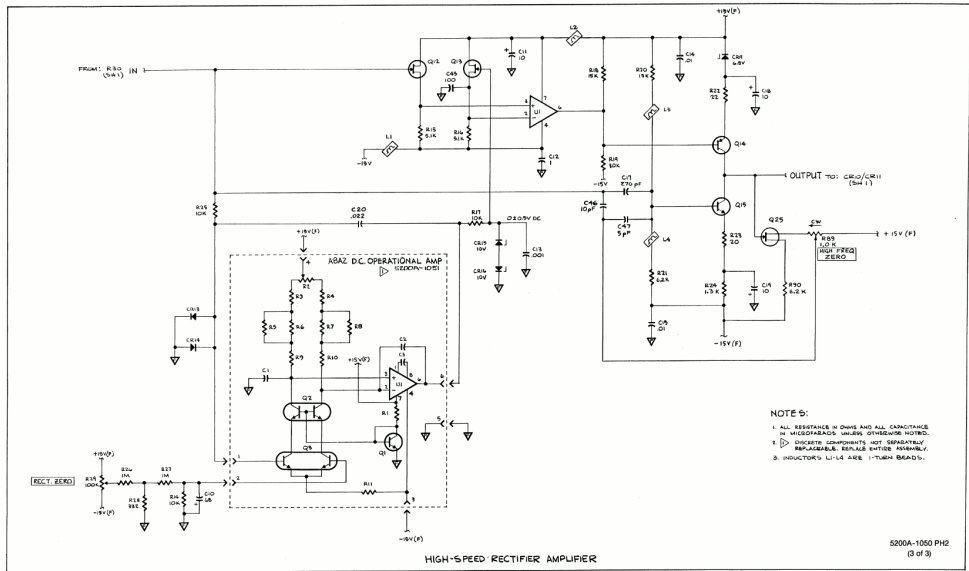
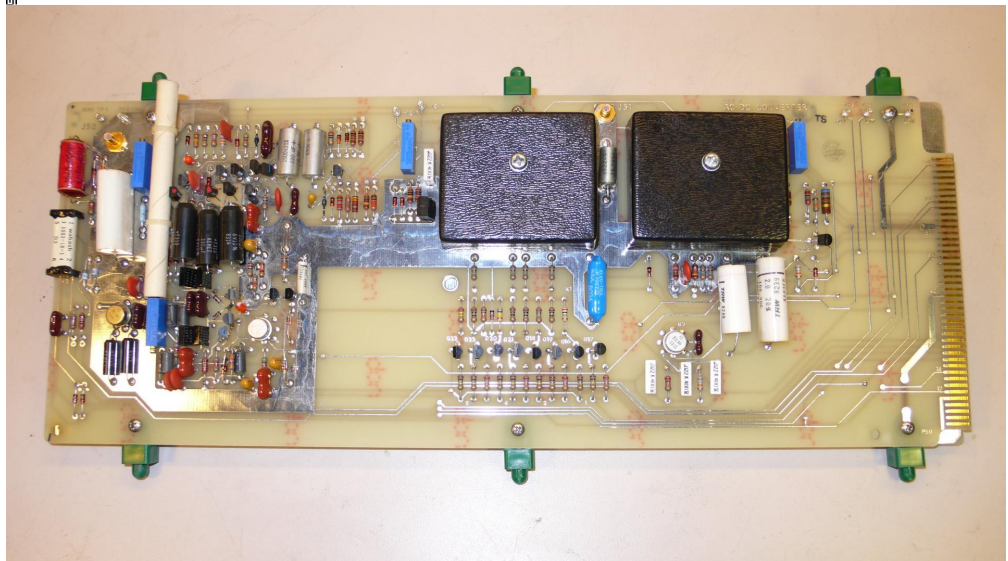


Figure 8-6. AC-DC Converter PCB Assembly (cont)

8-19

5200a_ACDC_SCH3.gif (121.87 kB, 1702x1080 - viewed 801 times.)



5200a_ACDC_1.JPG (505.97 kB, 1920x1080 - viewed 561 times.)



5200a_ACDC_3.JPG (504.84 kB, 1920x1080 - viewed 909 times.)

« Last Edit: February 09, 2014, 08:26:33 pm by CaptnYellowShirt »

Report to moderator Logged

casinada
Frequent Contributor



Posts: 600
Country:



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Say Thanks Reply Quote

« Reply #13 on: February 10, 2014, 07:23:25 pm »

Probably an oscilloscope to make sure the signal is clean sinusoidal and the frequency and voltages are at least close to the expected values.

A good DMM that is at least an order of magnitude better in accuracy than the 5200a
The service manual always shows the list of equipment necessary to perform verification and calibration but 99% of us don't have the equipment so we have to figure out how to do it with what we have. 😊

Report to moderator Logged

CaptnYellowShirt
Frequent Contributor



Posts: 447
Country:
Scooty Puff Jr.



DC Reference Assembly

Say Thanks Reply Quote

« Reply #14 on: February 10, 2014, 07:31:52 pm »

The 5200a uses a Motorola SZA263 buried Zener diode as its DC voltage reference. This standard predated the now (in)famous LTZ1000. Most every standard from Fluke during the period before the 1980's used one of these SZA's -- 731/2, 5440, 5100, etc.

The voltage that is produced by this zener in its reverse bias break down mode is nominally 7 volts. This voltage is adjusted for use in the AC-DC Converter Assembly - to compare in the servo voltage control loop - using a PWM technique. The DC voltage is switched to some duty cycle that is set by the voltage knobs on the front (all but the LSD knob -- see last post). This (now) AC signal is low pass filtered using a 5-pole active filter and outputted to the AC-DC Converter for comparison.

Every "Assembly" board in the Fluke 5200a has a sturdy ground plane attached to the back of the board -- it serves a structural purpose, but also to keep the AC coupling under control inside of the unit. The DC Reference Assembly has three shields! One top and bottom like a sandwich, but then two more which separate different parts of the reference board.

5200A

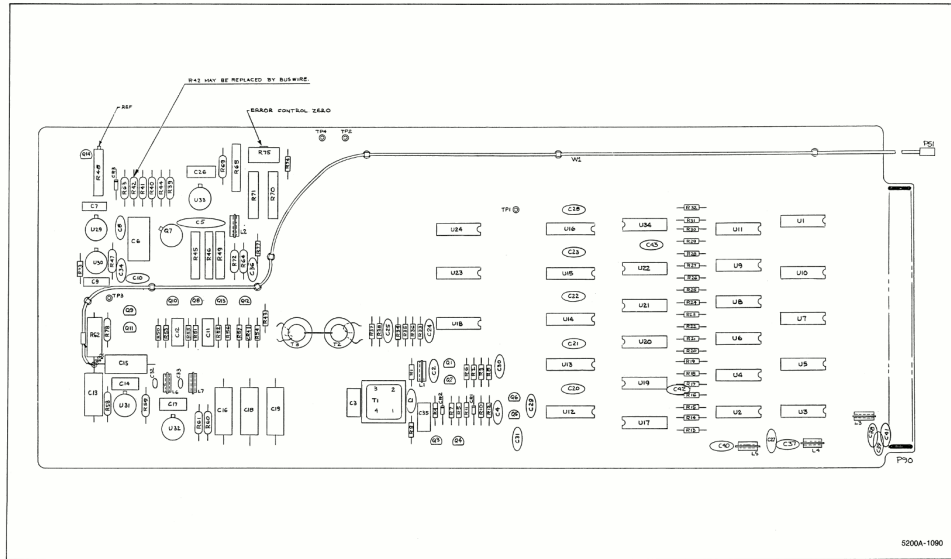


Figure 8-10. A12 Reference Supply PCB Assembly

8-38

5200a_DCRef_PCB.gif (151.5 kB, 1710x1080 - viewed 427 times.)

5200A

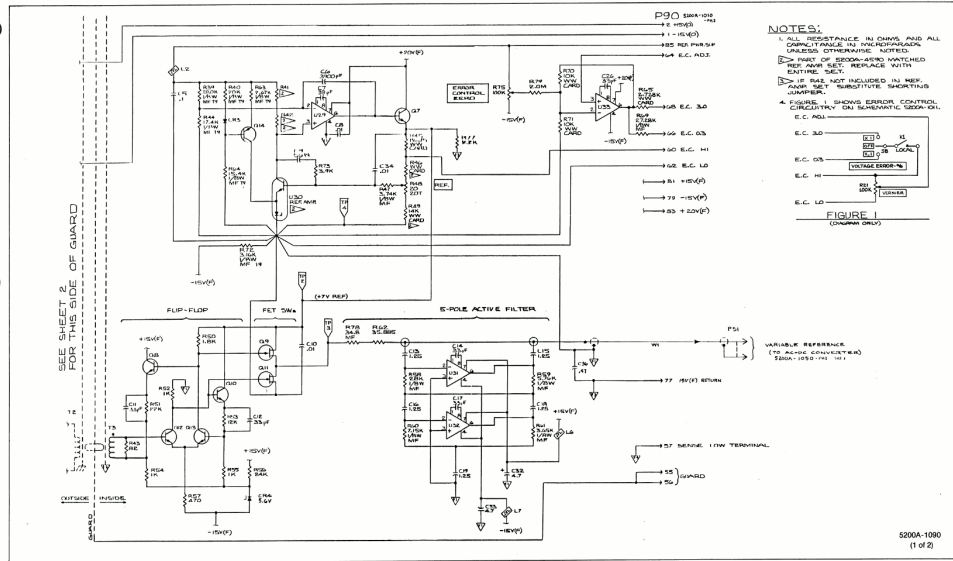
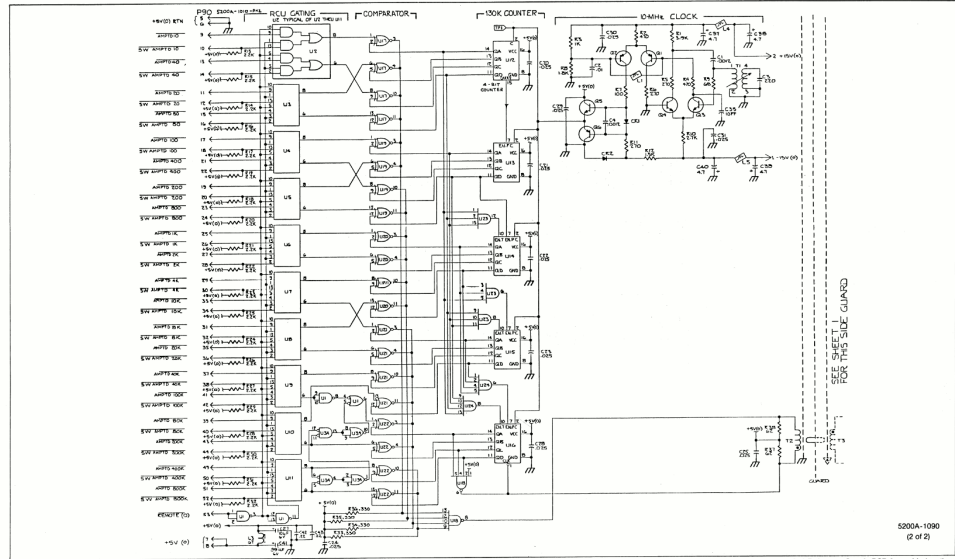


Figure 8-10. A12 Reference Supply PCB Assembly (cont)

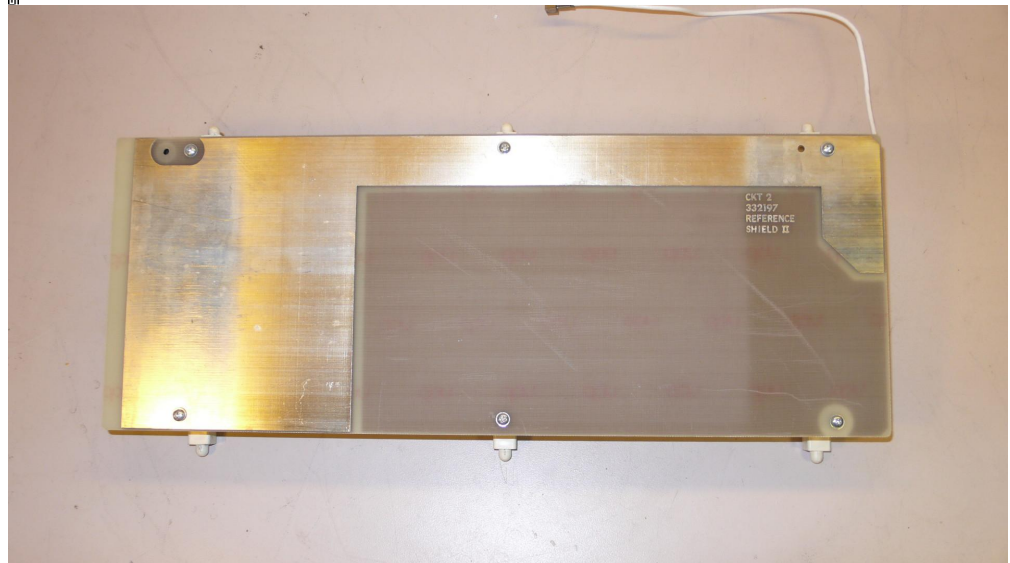
8-39/8-40

5200a_DCRef_SCH1.gif (190.04 kB, 1710x1080 - viewed 459 times.)

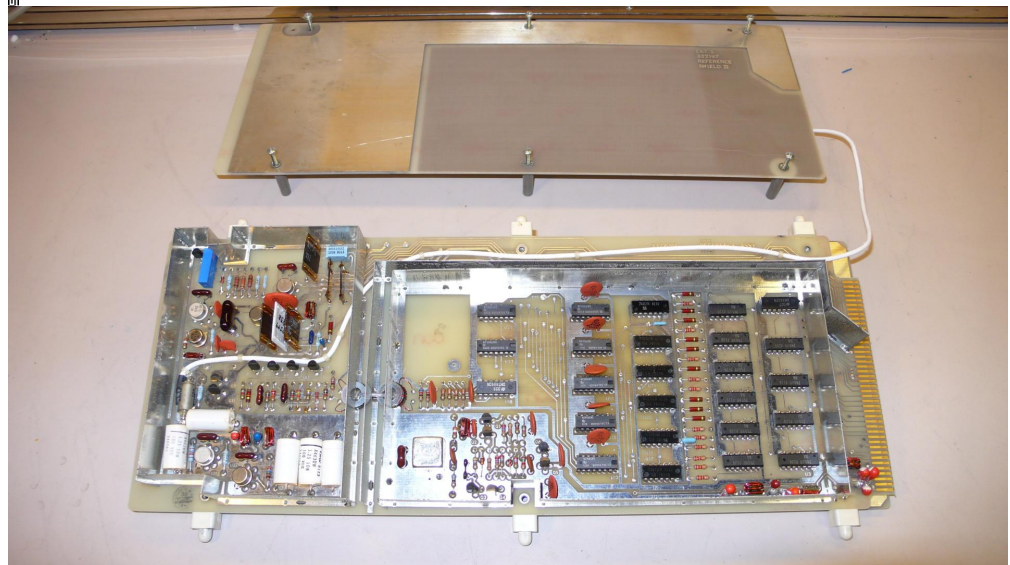


8-41

5200a_DCRef_SCH2.gif (241.58 kB, 1710x1080 - viewed 481 times.)



5200a_DCRef_1.JPG (305.7 kB, 1920x1080 - viewed 479 times.)




5200a_DCRef_2.JPG (456.67 kB, 1920x1080 - viewed 569 times.)

 **CaptnYellowShirt**

Frequent Contributor



Posts: 447

Country: 

Scooty Puff Jr.



 **DC Reference Assembly pt 2**

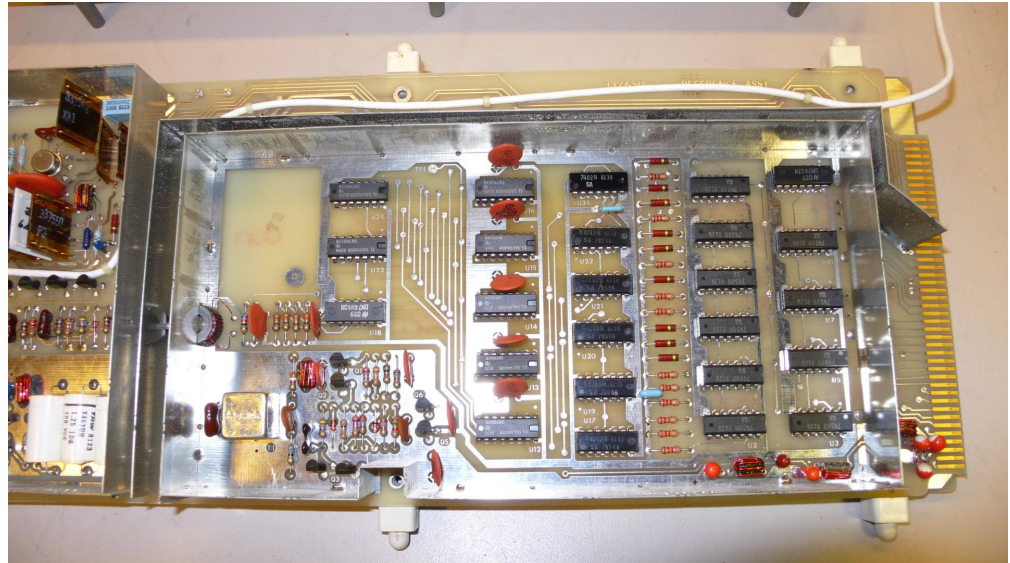
« Reply #15 on: February 10, 2014, 07:33:00 pm »


[Say Thanks](#)

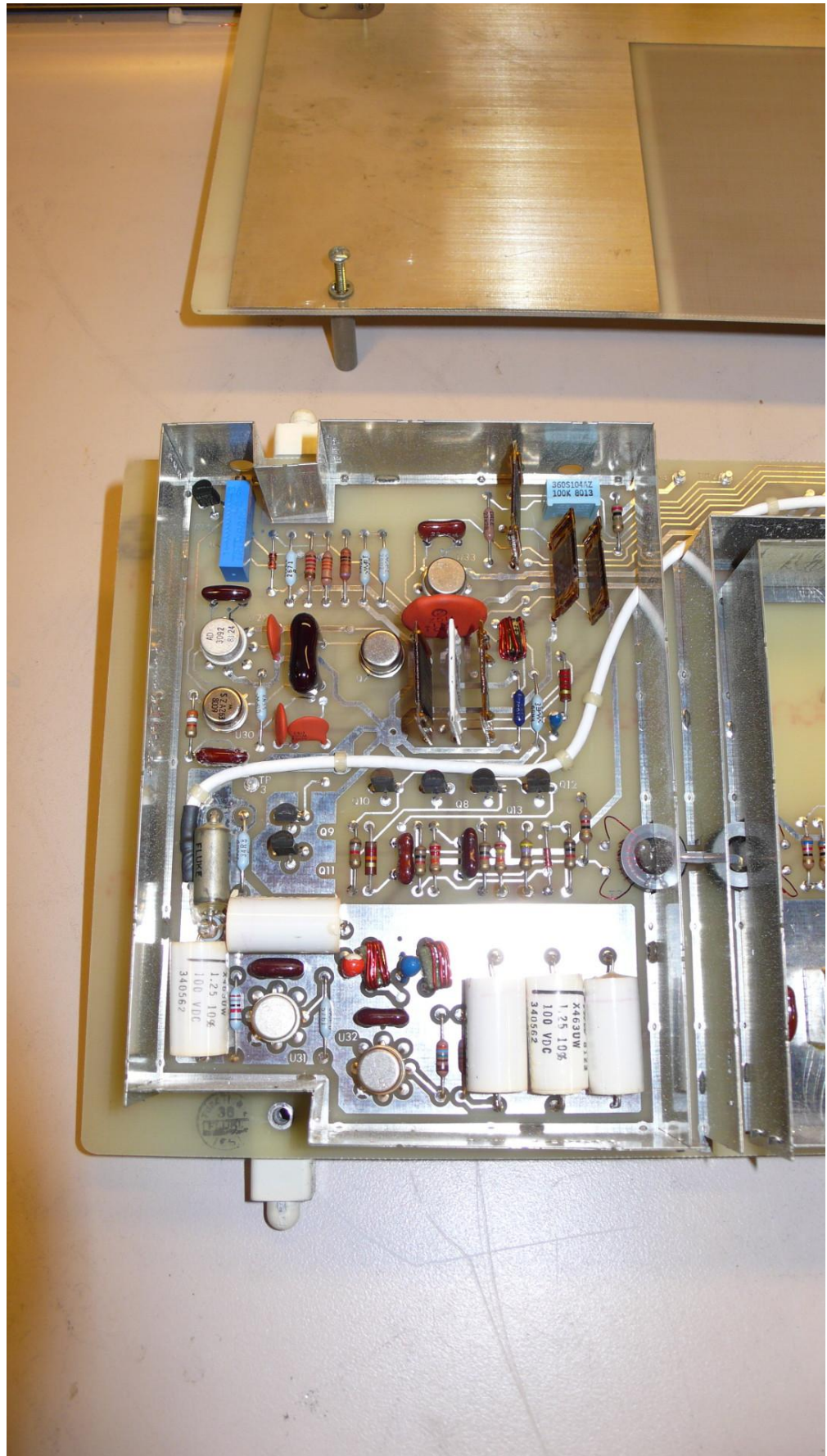
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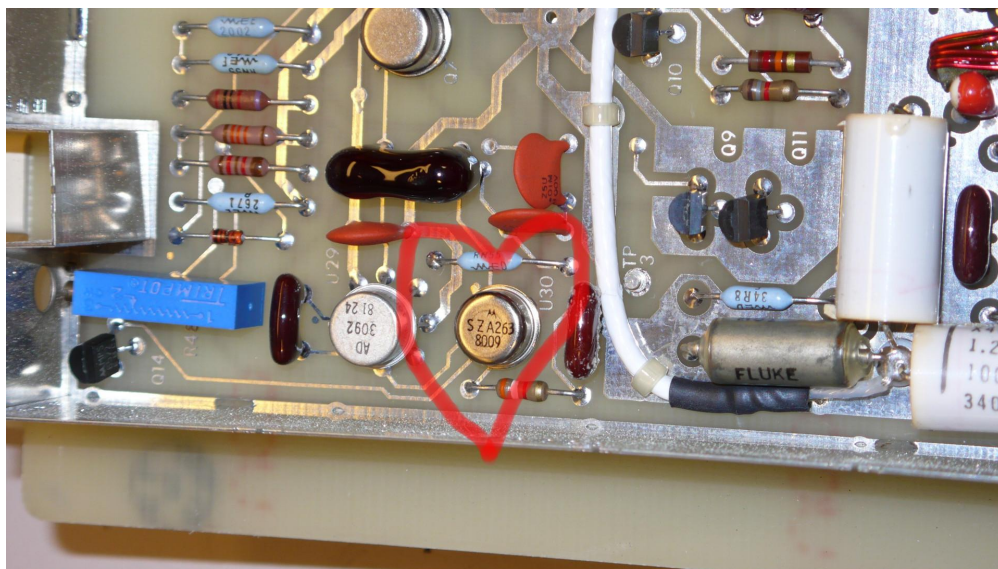
[More DC Ref pics...](#)



 5200a_DCRef_3.JPG (587.59 kB, 1920x1080 - viewed 499 times.)



5200a_DCRef_4.JPG (497.6 kB, 1080x1920 - viewed 436 times.)



5200a_DCRef_5.JPG (503.37 kB, 1920x1080 - viewed 689 times.)

Report to moderator Logged

Dr. Frank

Super Contributor



Posts: 1946

Country:



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #16 on: February 10, 2014, 08:52:57 pm »

Say Thanks Reply Quote

I think, you have gone through all PCBs..

THANKS FOR SHOWING!

I never disassembled my 5200A, and that is a fault. The schematics are just beautiful, but the PCBs are even more.

I'm now curious about your fault repair.

Freank

Report to moderator Logged

CaptnYellowShirt

Frequent Contributor



Posts: 447

Country:

Scooty Puff Jr.



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #17 on: February 10, 2014, 10:02:41 pm »

Say Thanks Reply Quote

Quote from: Dr. Frank on February 10, 2014, 08:52:57 pm

I'm now curious about your fault repair.

Me too! Heh.

So far, I've found a few things of interest. Many of the caps in the power supply are of the high-quality "Sprague" brand. But one that went toes-up on the +5V rail is (no joke) labeled "Spargue". This is doubly funny to me as I'm dyslexic and these two words look identical -- it took me a while to realize why I couldn't find a replacement part. But it does leave me wondering where this little guy came from?

Pictures to follow when the new parts get here.

Report to moderator Logged

CaptnYellowShirt

Frequent Contributor



Posts: 447

Country:

Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #18 on: March 28, 2014, 04:34:04 pm »

Say Thanks Reply Quote

Well, its official. I give up. This repair has been a time vampire, and now I need the desk space for another project.

Here's where I got to:

I was able to repair the power supply with out much incident. A new rectifier, a few new caps, and a few new bleed-down resistors. No problem. The 5v, 15v, and 190v rails were effected.

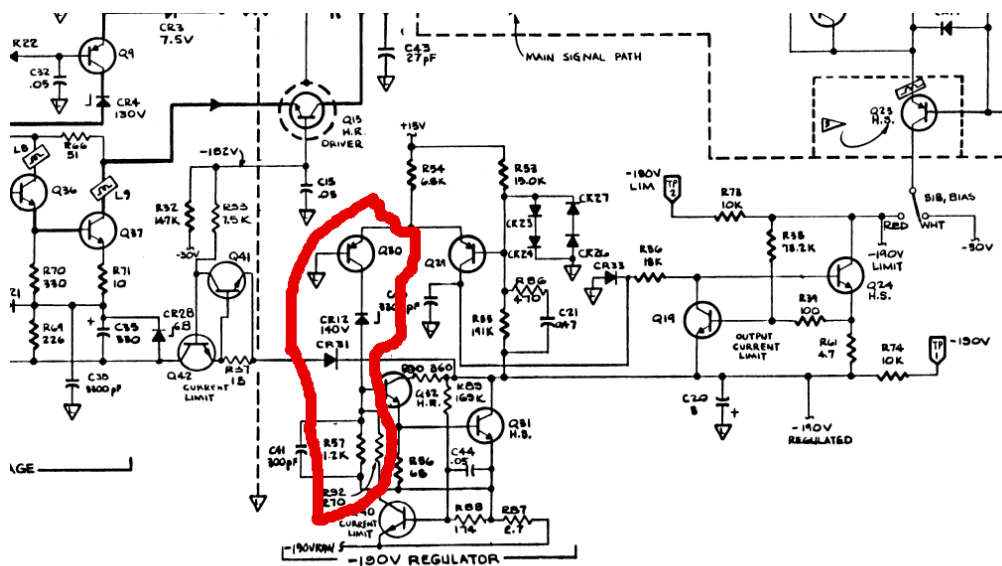
Scooty Puff Jr.



However, when I plugged the unit back in, I fried the section highlighted in red in the picture below (on the power amplifier board). That 140v zener: shorted, the Q30 transistor: shorted, the 1.2k resistor: explosively turned into plasma.

So I've replaced all of those components at least once, but the problem is somewhere else in the system, and I'm just tired of disassembling the thing, checking something, reassembling it and then watching it blow again.

I'd appreciate any suggestions people have, or more things to check.



Fluke_Fail.gif (60.24 kB, 1008x600 - viewed 619 times.)

Report to moderator Logged

SeanB

Super Contributor



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #19 on: March 28, 2014, 06:52:16 pm »

Say Thanks Reply Quote

Post it to me.....

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Posts: 15474

Country: [Flag]



CaptnYellowShirt

Frequent Contributor



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #20 on: March 28, 2014, 07:25:39 pm »

Say Thanks Reply Quote

Quote from: SeanB on March 28, 2014, 06:52:16 pm

Post it to me.....

It might be cheaper if you box yourself up and ship that box here... 00

Report to moderator Logged



Posts: 447

Country: [Flag]

Scooty Puff Jr.



casinada

Frequent Contributor



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #21 on: March 29, 2014, 06:35:52 am »

Say Thanks Reply Quote

Sad to hear. May be an extender board would help in the debug process. Post in the Fluke Yahoo group, maybe somebody else might have ideas. I'm repairing a 5102B, only Low DC Voltage, OHMs and DC Currents work so I know it won't be easy

to repair it specially with so many different revisions of each board and elusive manuals. My 5200A works so haven't messed up with that unit. It helped me finish calibrating the DMM of my 2465BDM 😊

I know a local junk yard that have a couple of bad units, may be they are willing to part with the board you need.

Next time I go there I can ask.

Report to moderator Logged

CaptnYellowShirt

Frequent Contributor



Posts: 447
 Country:
 Scooty Puff Jr.

Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Say Thanks Reply Quote

« Reply #22 on: March 29, 2014, 03:53:46 pm »

Quote from: casinada on March 29, 2014, 06:35:52 am

I know a local junk yard that have a couple of bad units, may be they are willing to part with the board you need.
 Next time I go there I can ask.

Please do!

And yes, the repair manual talks heavily about the use of those extender boards. I've had to solder on temp leads to get an idea of whats happening where. But its seriously time consuming.

Report to moderator Logged

casinada

Frequent Contributor



Posts: 600
 Country:

Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Say Thanks Reply Quote

« Reply #23 on: April 04, 2014, 04:46:37 pm »

For Parts?

http://www.ebay.com/itm/291116624633?ssPageName=STRK:MEWAX:IT&_trksid=p3984.m1423.l2649

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CaptnYellowShirt

Frequent Contributor



Posts: 447
 Country:
 Scooty Puff Jr.

Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Say Thanks Reply Quote

« Reply #24 on: April 04, 2014, 04:50:06 pm »

Quote from: casinada on April 04, 2014, 04:46:37 pm

For Parts?
http://www.ebay.com/itm/291116624633?ssPageName=STRK:MEWAX:IT&_trksid=p3984.m1423.l2649

Yeah! I spotted that! NOONE ELSE BID!!! 😊

Report to moderator Logged

casinada

Frequent Contributor



Posts: 600
 Country:

Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Say Thanks Reply Quote

« Reply #25 on: April 04, 2014, 09:06:24 pm »

not yet 😊

Report to moderator Logged

CaptnYellowShirt

Frequent Contributor



Posts: 447
 Country:
 Scooty Puff Jr.

Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Say Thanks Reply Quote

« Reply #26 on: April 04, 2014, 09:37:33 pm »

Well its only the 4th and I've already spent too much money on ebay. If you win it, and it doesn't work, look me up.

Report to moderator Logged

casinada

Frequent Contributor

Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

Say Thanks Reply Quote



Posts: 600
Country:



« Reply #27 on: April 05, 2014, 12:08:33 am »



My 5200A works and is on top of the 5215A that is a monster and then came the 5102B that is not fully functional so no space in my man cave 😞
If anything I'm looking for 5100B stuff. Somebody picked up a Fluke 5100B for \$50 on ebay as local pick up only somewhere in North Carolina 😞
I haven't gone to the Junk yard to check the 5200A for parts. Which parts do you need?

Report to moderator Logged

CaptnYellowShirt

Frequent Contributor



Posts: 447
Country:

Scooty Puff Jr.



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #28 on: April 05, 2014, 02:21:03 am »

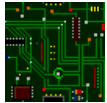
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The main amp board

Report to moderator Logged

Zucca

Supporter



Posts: 3213
Country:

EE meid in Itali



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #29 on: July 11, 2014, 07:00:11 pm »

Say Thanks Reply Quote

Maybe it is stupid but next time you should turn it on and then slowly going up with the AC power voltage by using a TRIAC between the unit and the plug in the wall...
When you are going up with the voltage check where the current is flowing/temperature is going up and which device is not doing his job
Just my 2 cents, I have no experience with the Fluke 5200a but it would be my next step after replacing the fried components once again.

Report to moderator Logged

Can't know what you don't love. St. Augustine
Can't love what you don't know. Zucca

robin051

Newbie

Posts: 1



Re: Fluke 5200a AC Voltage Calibrator Teardown and Repair

« Reply #30 on: July 02, 2015, 09:58:32 am »

Say Thanks Reply Quote

Sorry for bringing this topic up. I have a Stanford Research Systems SR830 lock-in amplifier which just arrives in brand new state. The manual suggests using Fluke 5200A as an AC calibrator to verify SR830's voltage output amplitude accuracy and flatness.

Is there any modern implementation of Fluke 5200A? Is there anything special about this 5200A? Would it be possible to replace this with a signal generator capable of accurate voltage output across the desired frequency range?

Cheers,
Robin.

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