

FREE NOTES ON ELECTRONICS

10TH JUNE
2010

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Tektronix 7603 mainframe repair

In today's episode I'm going to describe briefly the repair process of the TEK 7603.

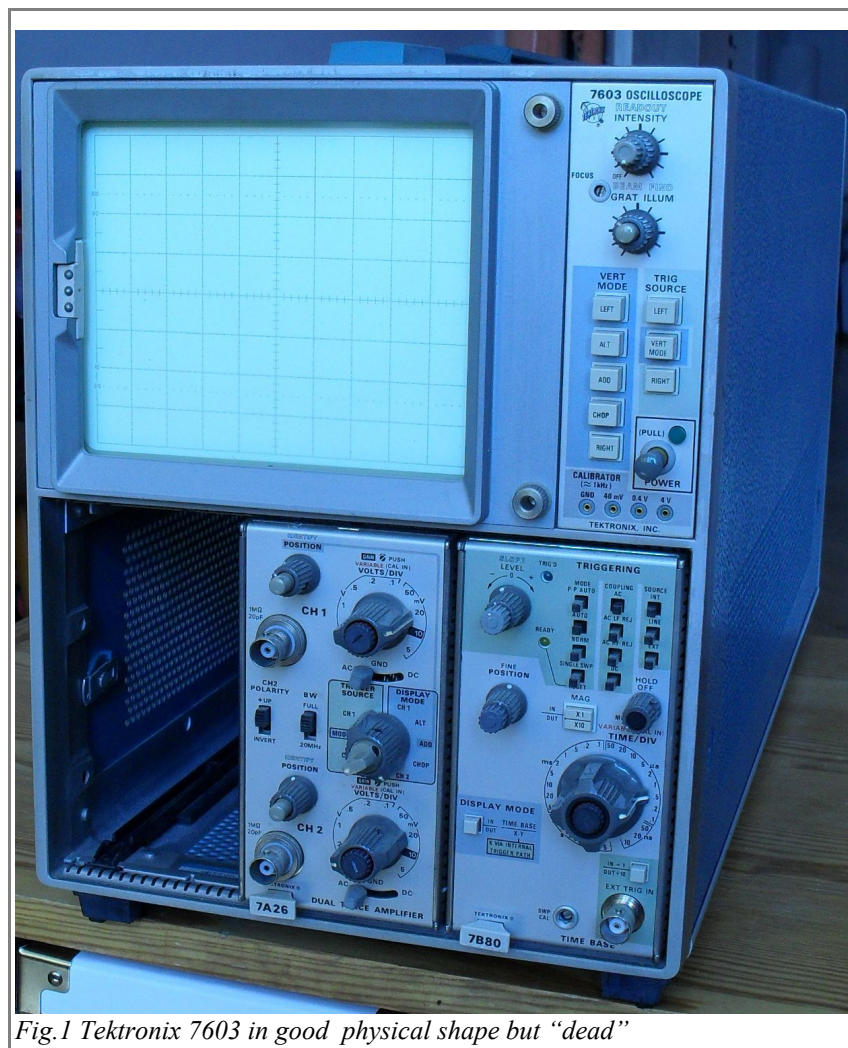


Fig.1 Tektronix 7603 in good physical shape but "dead"

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10TH JUNE
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b y d o k t o r p y t a [a t] g m a i l . c o m

Symptoms:

Completely NO reactions after powering the unit: no fan hum, no scale illumination, blanked CRT, "POWER ON" lamp on the front panel was off.

Repair:

After opening the housing it became obvious that I've bought option 01- the cheapest version without CRT readout and without the fan. So two problems off :).

At the beginning I downloaded the service manual from the best website for test equipment enthusiasts -

" <http://bama.edebri.com/manuals/> ".

It was found that the +5V and +15V voltages were missing, they even went 0,6V negative. I started tracking, which voltages in the power supply section are +15V dependent. I have disconnected supply cables from every board in the scope EXCLUDING the main board. Why? Because the main board provides all "SENSE" feedback connections and without these feedbacks most of the PSU circuits can't work properly. Please refer Fig.2 for details.

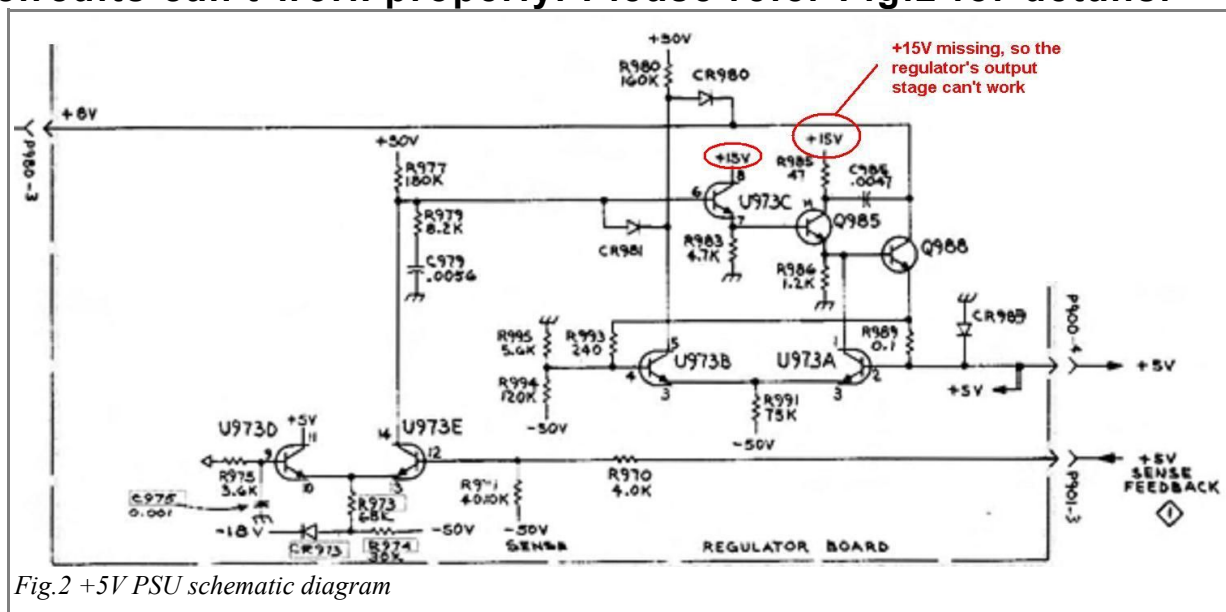


Fig.2 +5V PSU schematic diagram

FREE NOTES ON ELECTRONICS

10TH JUNE
2010

b y d o k t o r p y t a [a t] g m a i l . c o m

As You can see, the +5V can't work until the +15V supply is provided. To ensure my thesis I connected external bench power supply set for 15V and 1A of current limit. The CRT turned on and the scope was brought back to life.

It was a time to find the cause of +15V PSU failure. After few minutes of measuring few potentials the diagnosis was : Q931 fault (Fig.3). I found it's parameters on the web and the closest equivalent I had was BSX61 (fT doesn't matter in this circuit, voltage and current ratings are important).

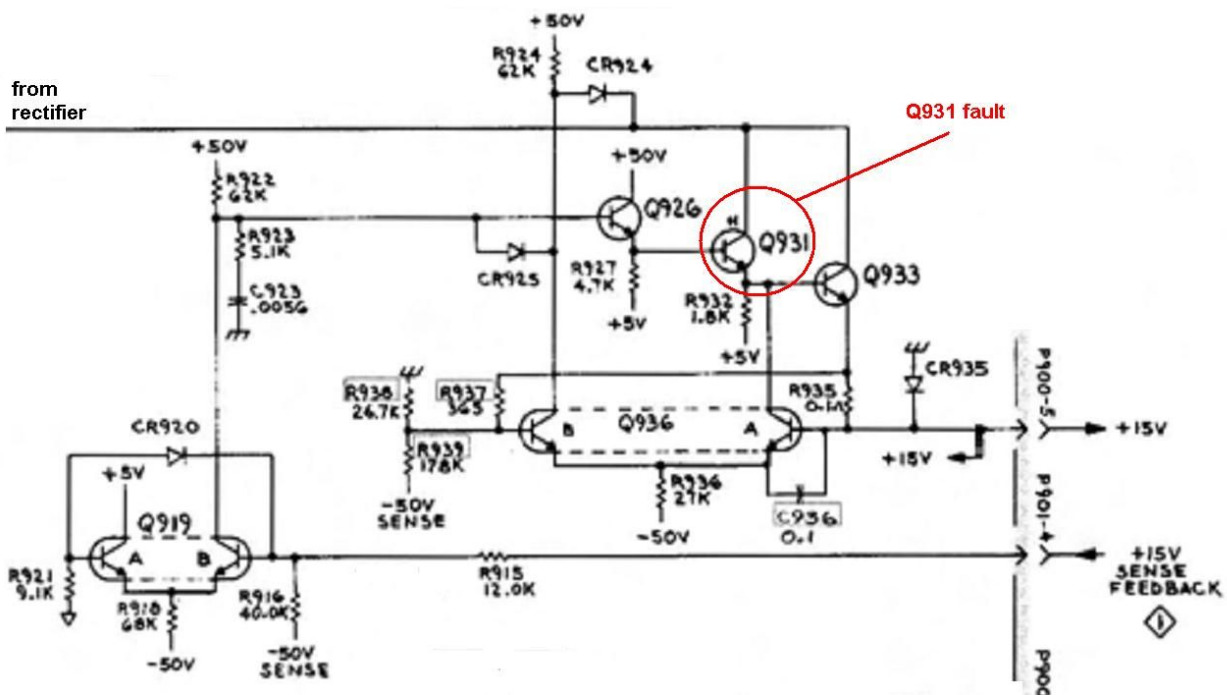


Fig.3 +15V PSU schematic diagram

I checked everything once again and it worked stable and properly. All voltages coming out from the PSU unit had less than 2% tolerances, so I could go further with checking. I connected all boards' supply connectors back on their places.

FREE NOTES ON ELECTRONICS

10TH JUNE
2010

b y d o k t o r p y t a [a t] g m a i l . c o m

Then I used two TEK plug-ins I was sure to work fine: vertical amplifier 7A26 and time base 7T80. I also applied 1kHz 1V test signal to the vertical plug-in input. I tried to obtain the correct view, but I couldn't. What I've seen was only bright, VERTICAL trace. I've presumed that the horizontal part was faulty. I checked the timebase and all signals produced by 7T80 plug-in were correct (Fig.5). Using the second oscilloscope I found, that signals coming into U510 were correct, but there was no signal at the output of this IC switch. Rotating the "LIMIT CENTERING" potentiometer resulted in moving of the X position of displayed trace, so I assumed that following horizontal amplifier was OK. I needed to ensure, that the U510 was faulty so I put out the same type from working 7613 scope. The scope showed a proper sinewave on the screen. Fortunately the custom TEK IC's were available on eBay for about 10 Euro so I've bought one.

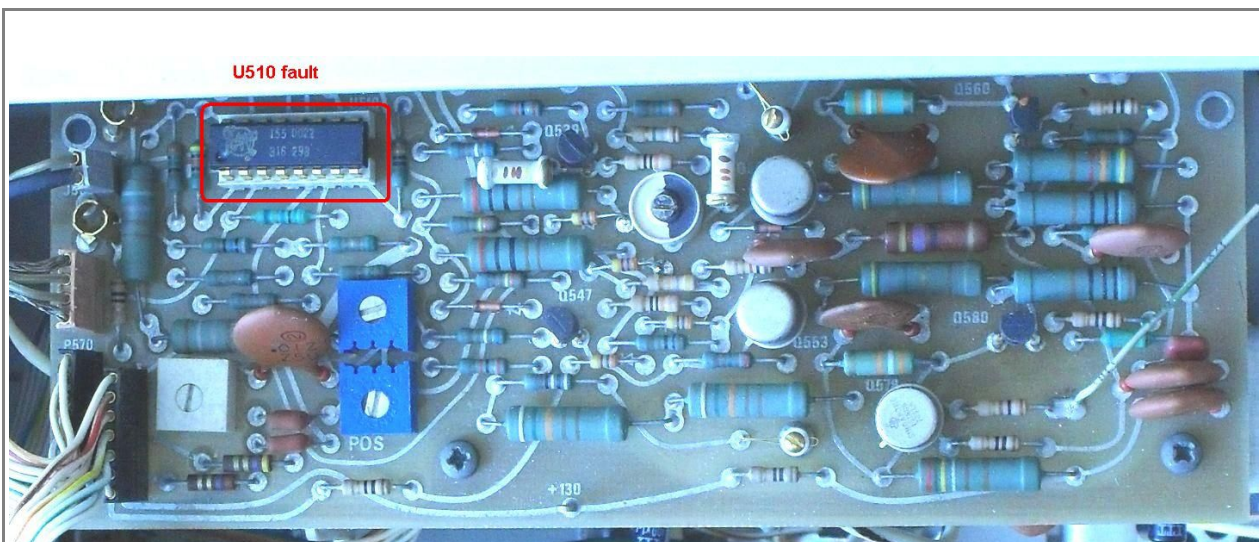


Fig.4 Horizontal amplifier and switch PCB

FREE NOTES ON ELECTRONICS

10TH JUNE
2010

b y d o k t o r p y t a [a t] g m a i l . c o m

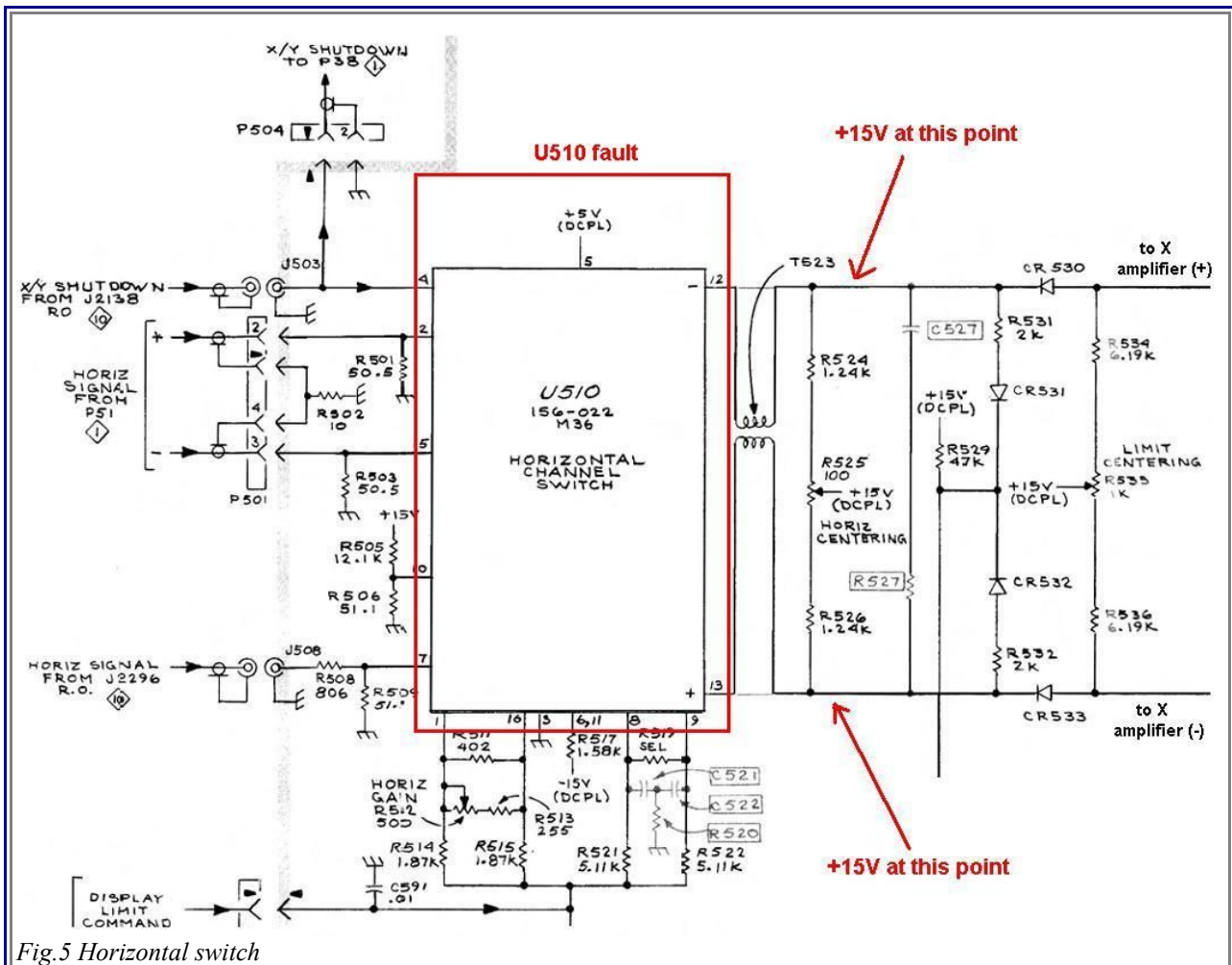


Fig.5 Horizontal switch

The next thing - let's say less important - was no reaction on rotating the "GRAT ILLUM" knob. Soon it was clear that ALL three 6V bulbs were burned out. I checked few shops to find bulbs with the same bulb holder but it was impossible to buy them. I decided to crash the glass of the TEK bulbs and I prepared my own bulbs using the POXIPOL and bulbs rated at 6V/ 40mA which I've bought earlier. The results are shown on the Fig.6.

FREE NOTES ON ELECTRONICS

10TH JUNE
2010

b y d o k t o r p y t a [a t] g m a i l . c o m

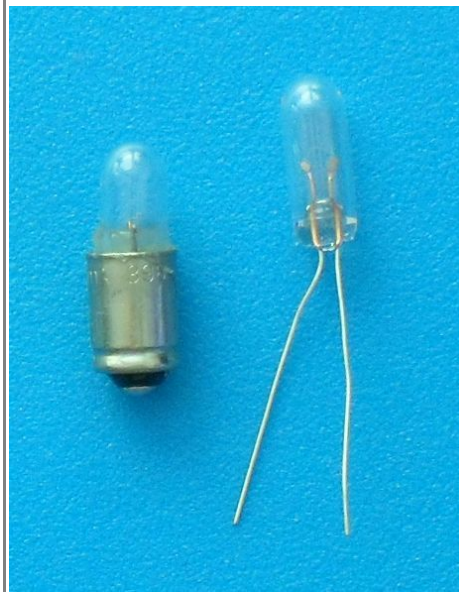


Fig.6 Scale illumination bulb reconstruction

Everything was fine until one day I've seen something as on the photo below (the trace was shaking).

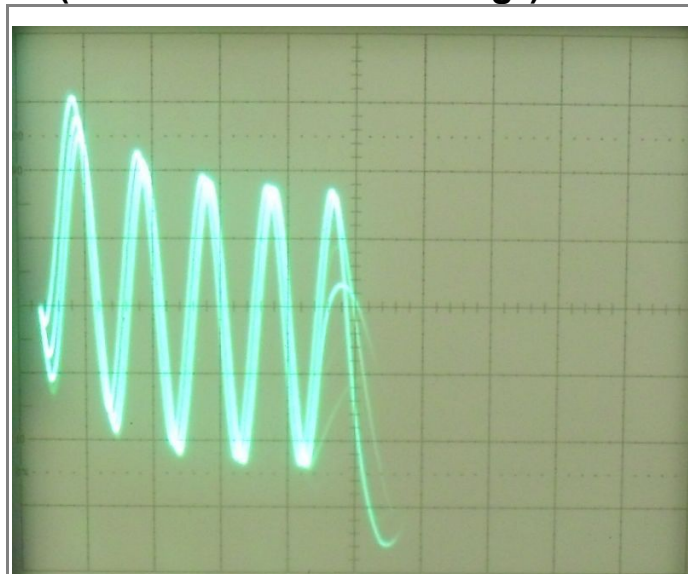


Fig.7 Strange traces on the display (1kHz 1V test sinewave applied)

FREE NOTES ON ELECTRONICS

10TH JUNE
2010

b y d o k t o r p y t a [a t] g m a i l . c o m

Once again I've checked the PSU for the AC ripple using an external oscilloscope. The transformer/ rectifier/ filter module needed to be pulled out to do further inspection. After removing 6 screws I pulled the module out (Fig.8 and 9)

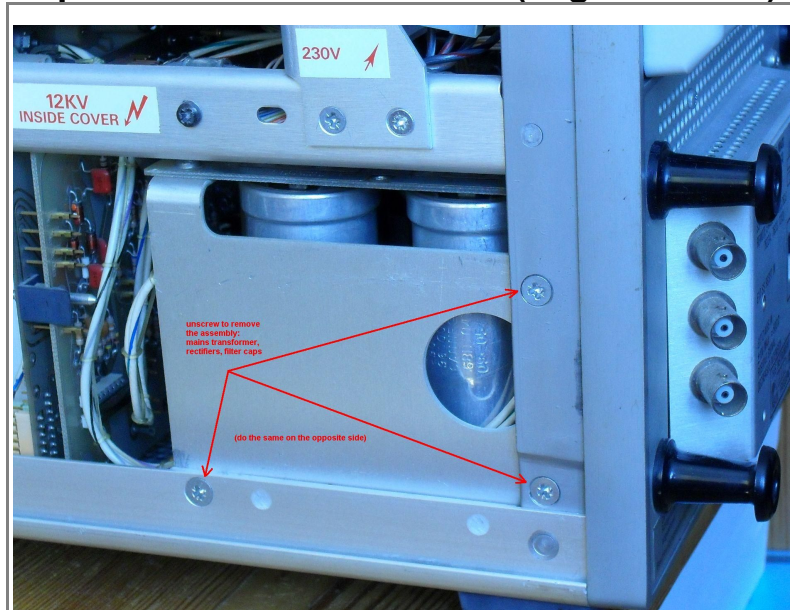


Fig.8 Removing the PSU assembly

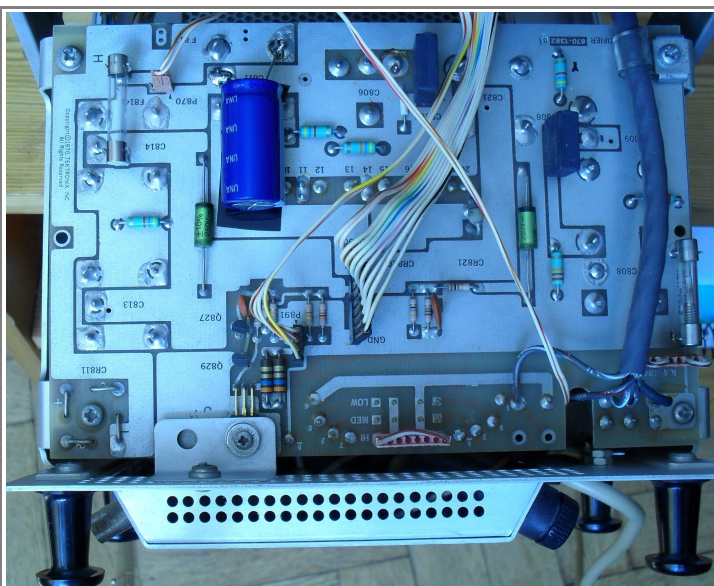


Fig.9 PSU assembly ready for the repair

FREE NOTES ON ELECTRONICS

10TH JUNE
2010

b y d o k t o r p y t a [a t] g m a i l . c o m

I turned out that the capacitor C811 in the -18V PSU was dry.

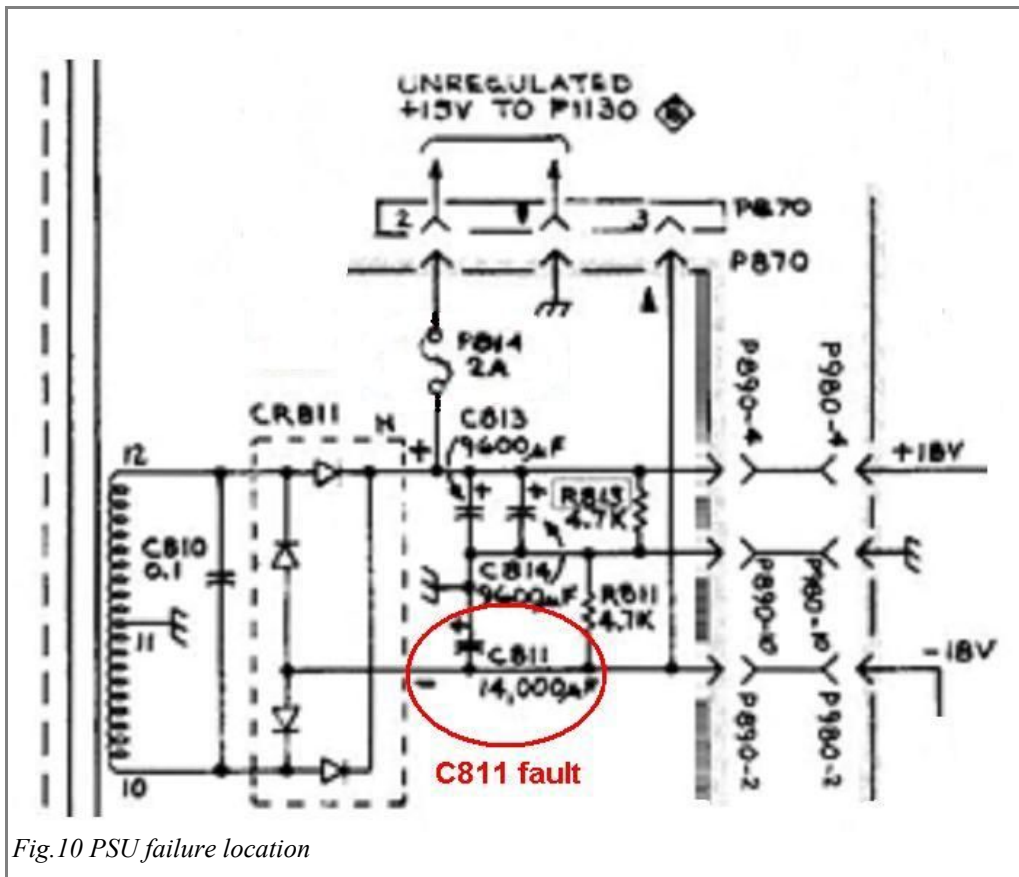


Fig.10 PSU failure location

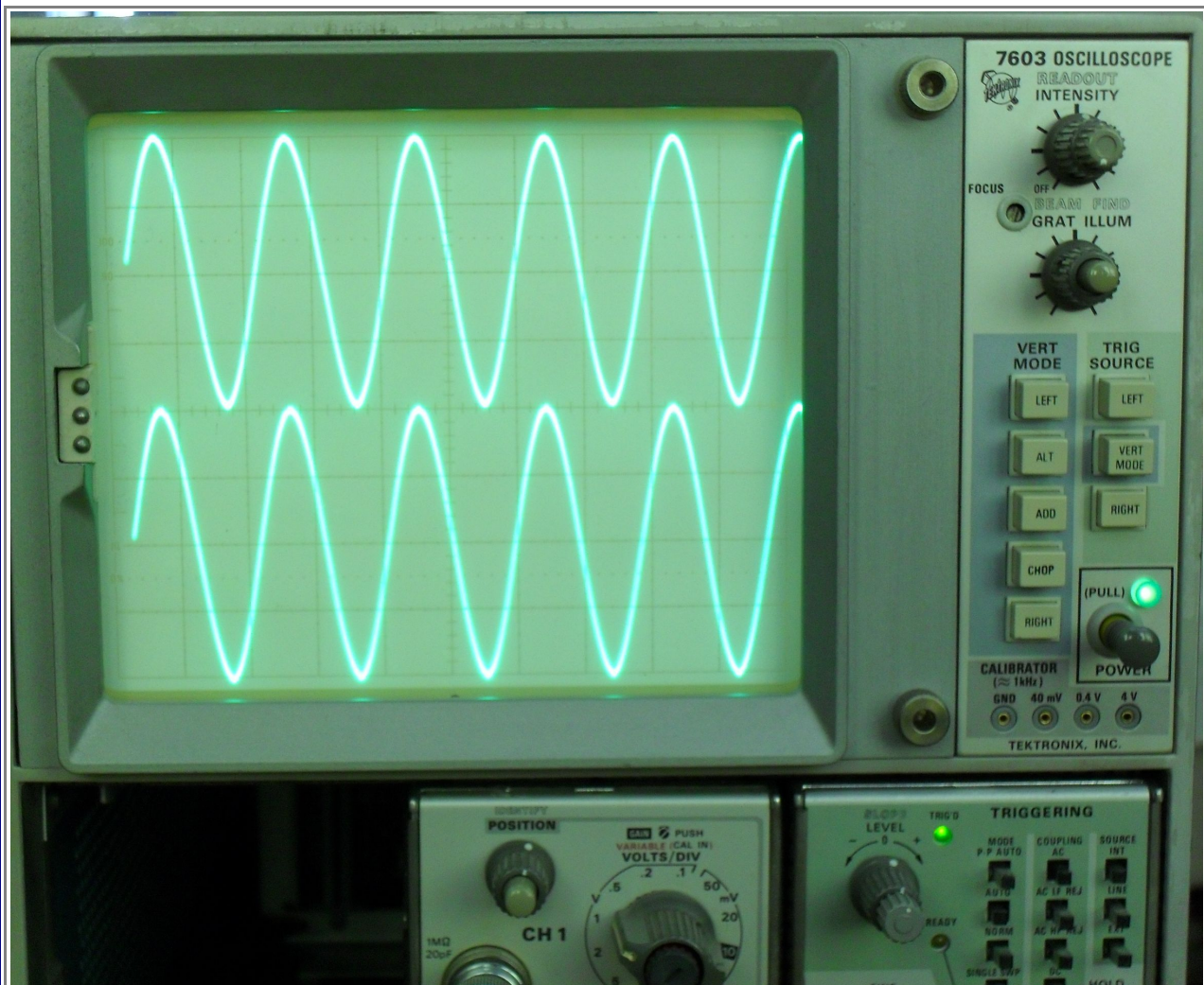
The C811 was 14000uF but I had only 10000uF/ 25V so I used one :)

FREE NOTES ON ELECTRONICS

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b y d o k t o r p y t a [a t] g m a i l . c o m

Now It's the time to see the TEK 7603 happy face. Priceless :)



**ALL. COMMENTS.
AND. SUGGESTIONS.
ARE. WELCOMED.**