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Spectrum Analyzer Shop - Buy now! RF LF Handheld & IISR / 1Hz - 9GHz



This page is devoted to the repair of my **HP-8566A** spectrum analyzer. I hope you enjoy it!

HP8566A MICROWAVE SPECTRUM ANALYZER

- The HP-8566A is a high-performance spectrum analyzer for bench and ATE system use. The HP-8566A operates from 100 Hz to 22 GHz and up to 325 GHz with external mixers.
- The exceptional frequency stability of the Hewlett Packard 8566A make measurements with a 10 Hz resolution bandwidth easy. This narrow resolution bandwidth yields sensitivities to -135 dBm.
- Excellent frequency stability, sensitivity, and frequency-reference accuracy combine to allow very accurate measurement of small signals in the presence of large ones.
- Typical HP-8566A applications include EMC testing, broadband signal surveillance, and component stimulus-response testing.

Unit as listed at eBay

The unit was sold as two separate auctions, one for the **DISPLAY SECTION** and another for the **RF SECTION**. I won both ;-)

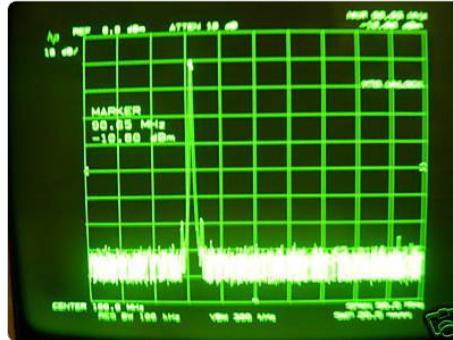
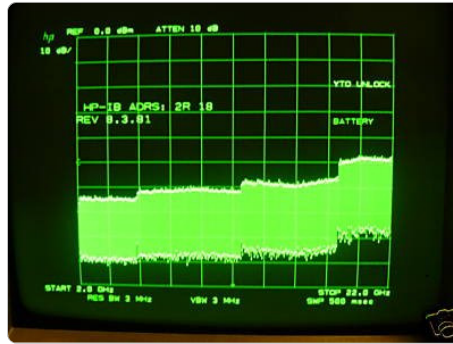
It was listed as working DISPLAY SECTION but unworking RF SECTION, as it generated a **YTO UNLOCK** message.

Here you have some pictures of the unit which were put on the eBay listings:



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**Unit as received... ouch!!!**

Packaging was extremely POOR as you can see in this picture

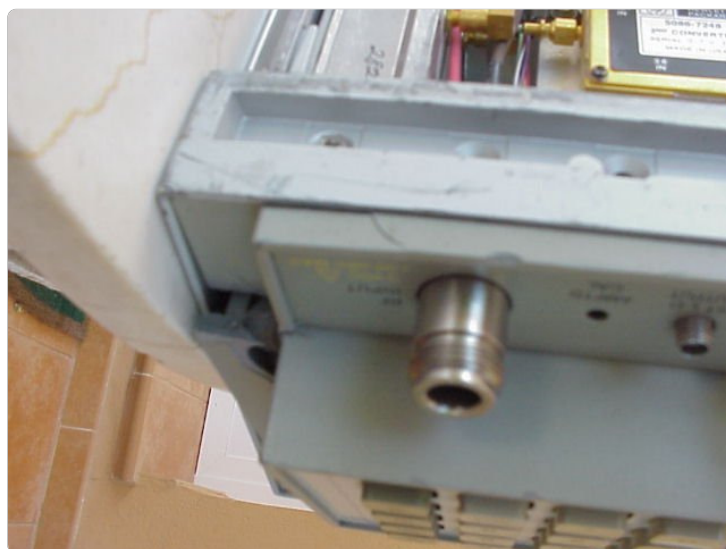


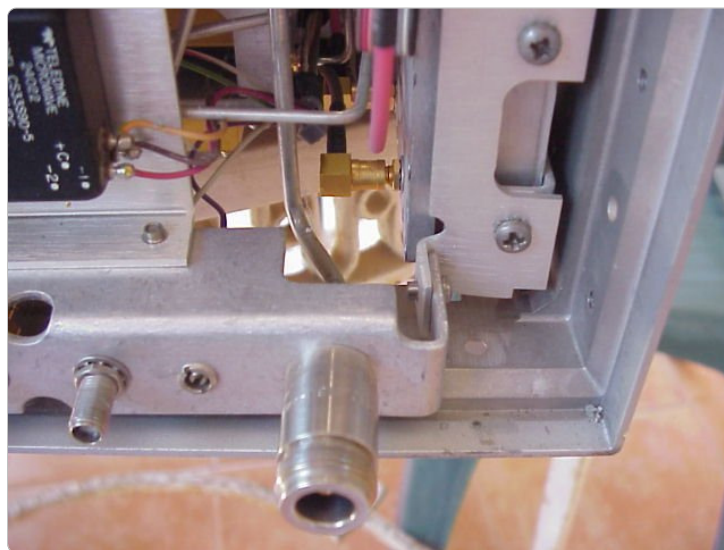
So I was sure there would be some damage... and there was :-)



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I did my best to fix the unit



After checking for loose cards (which there were some!) and loose screws, I connected and powered the unit. It showed the STAND-BY LEDs

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But then, after toggling the POWER, all I got were all LEDs ON and a flashing ADRS'D LED

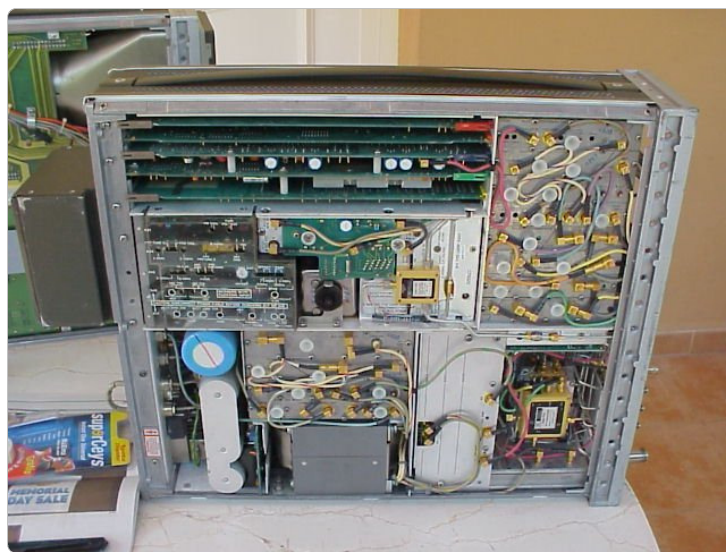


Only good thing so far is that RF unit seems to be an updated one, as you can barely see in this picture

UPDATE: it seems someone swapped the 'B' control boards, rear panel and front panel for the 'A' version. But, as I found later, some PCBs, as the YTO/POWER SUPPLY ones, are 1986 vintage, so they correspond with this label. All in all, what I have is an hybrid 'A'/B' version which I hope to convert to a full 'B' version if I can get the needed parts. Any help on this ;-)?

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Here you have some more pictures of the inner works... it is a really wonderful engineered instrument!

RF UNIT, TOP SIDE**RF UNIT, BOTTOM SIDE****DISPLAY/IF UNIT, TOP SIDE**

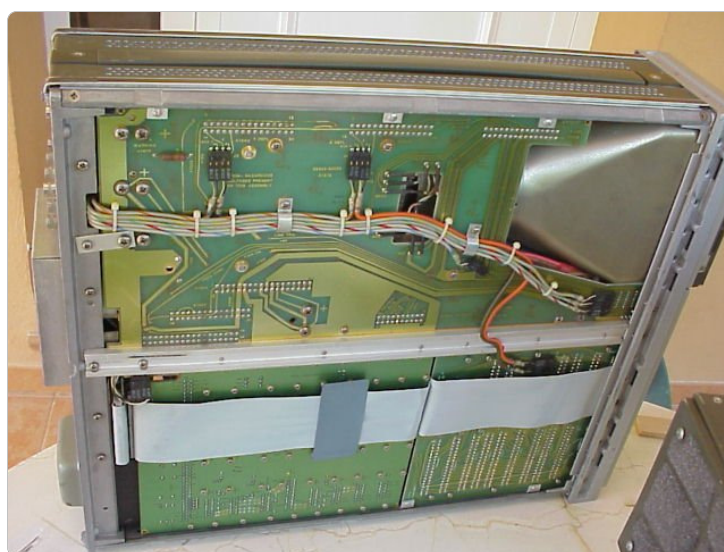
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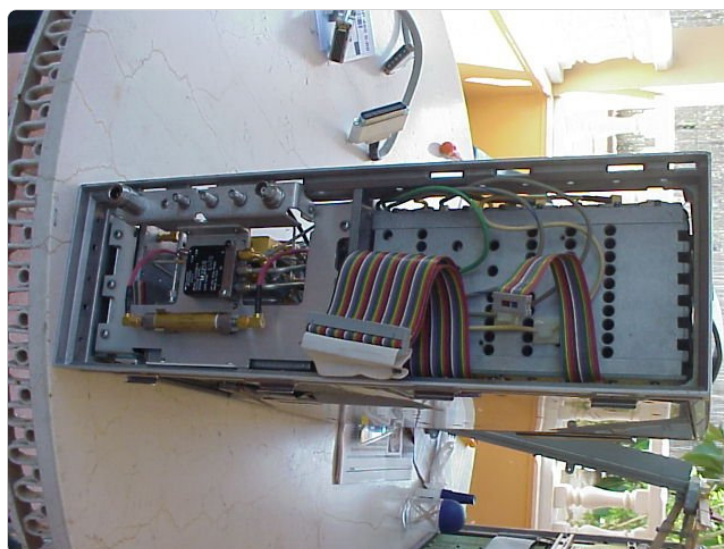
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DISPLAY/IF UNIT, BOTTOM SIDE

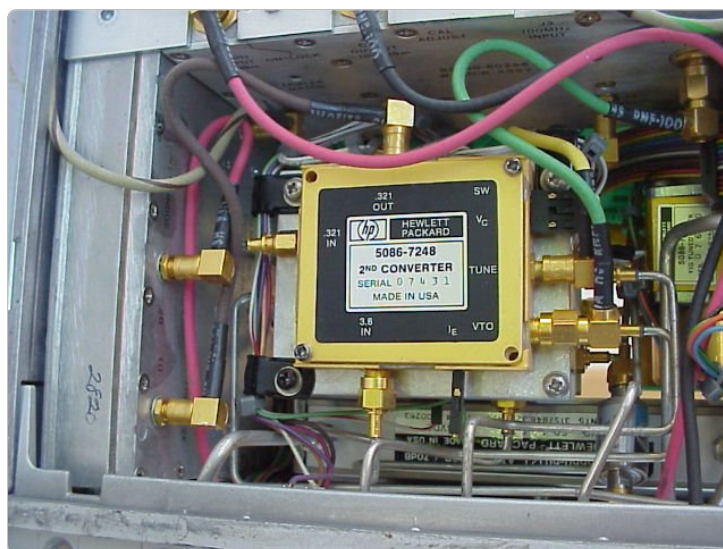
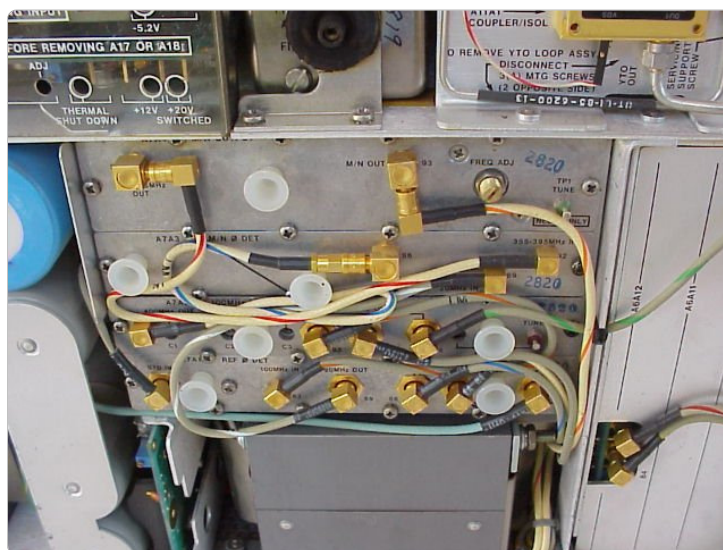
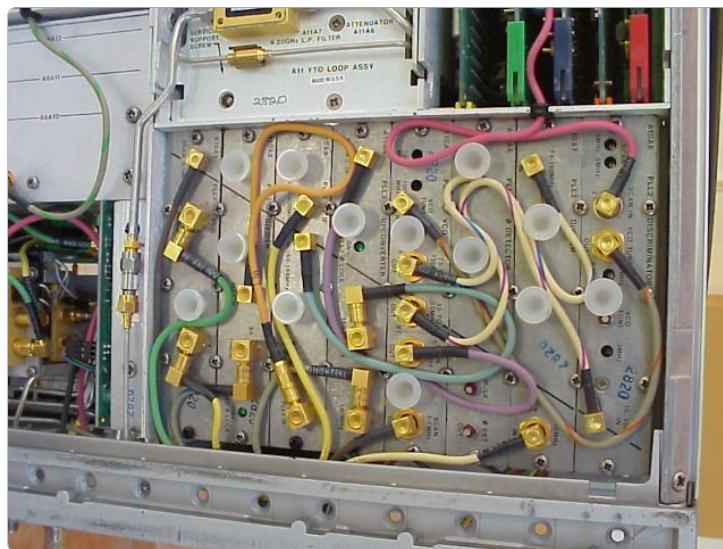


RF UNIT, without keyboard



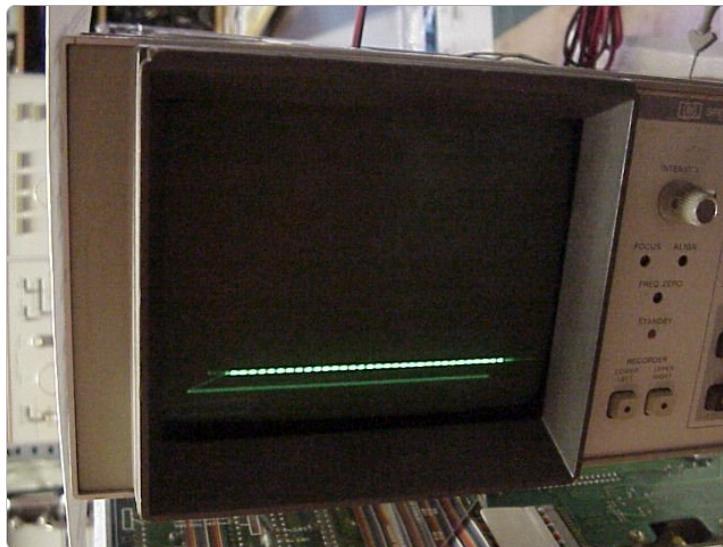
DISPLAY/IF UNIT, REAR PANEL (partial)

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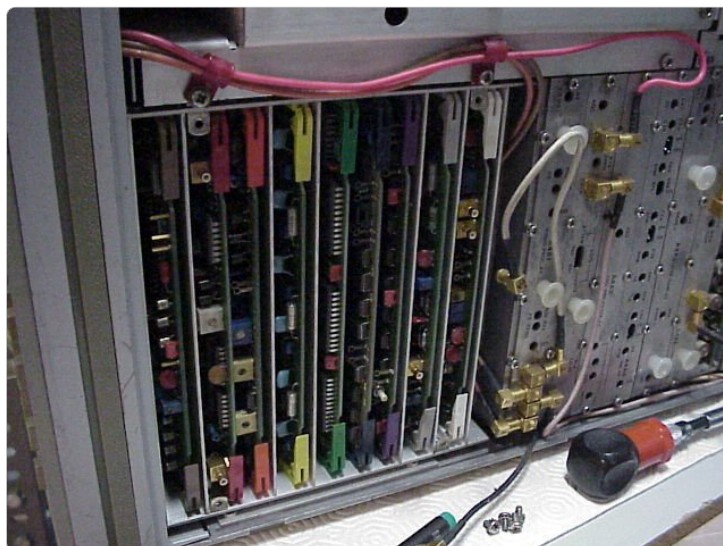
Well, I couldn't do anything to fix the disastrous trip, so I needed to move on and start troubleshooting!

I began with the display section. There is a way to operate it without the RF unit, by placing a couple jumpers, one to start the unit and another one to select TEST mode. Once done, pressing RESET button you should get a test display... this is what I got:

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Not too pretty :-)

I took some cards out of the display area, which is this:

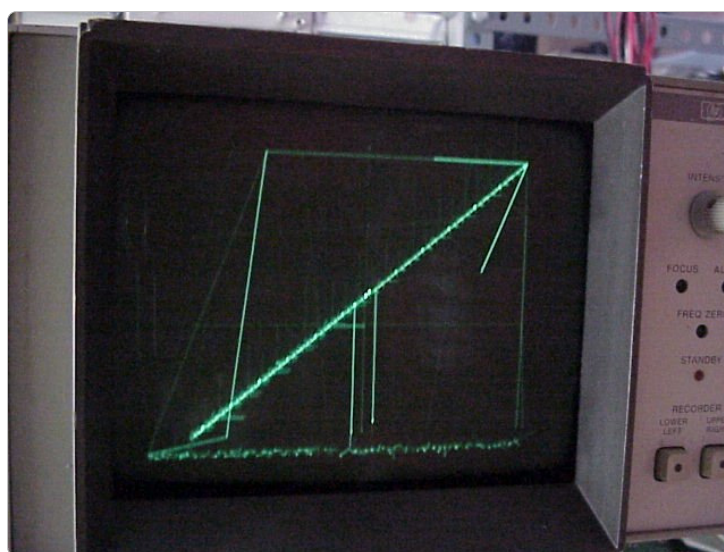


And then, once reinserted, I got a better picture!

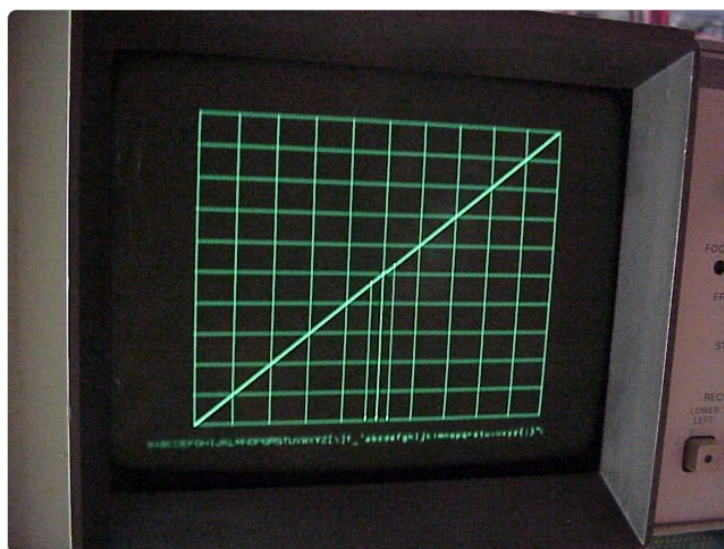


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Wiggling somewhat the cards I got an still better one

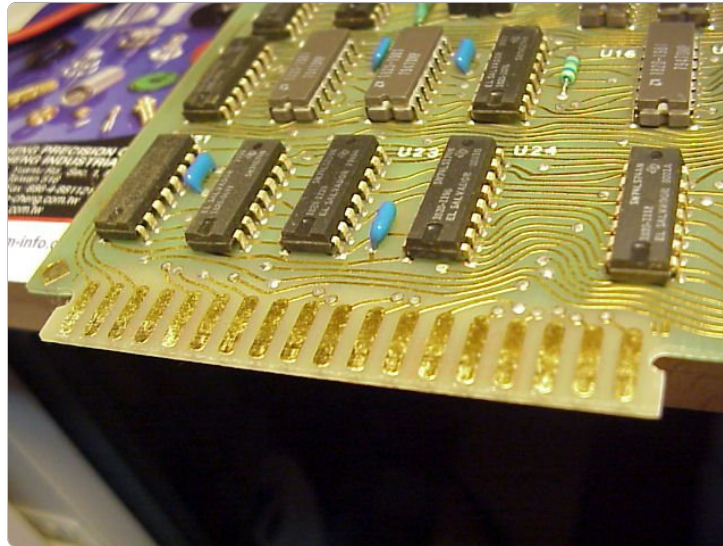


And then... surprise!



Right image come and went by barely touching the cards, specially the A6 one. So I got it out and found some oxide on its edge connector

Image is not focused and FOCUS control does nothing... but well, that is an analog problem which will take care of later.

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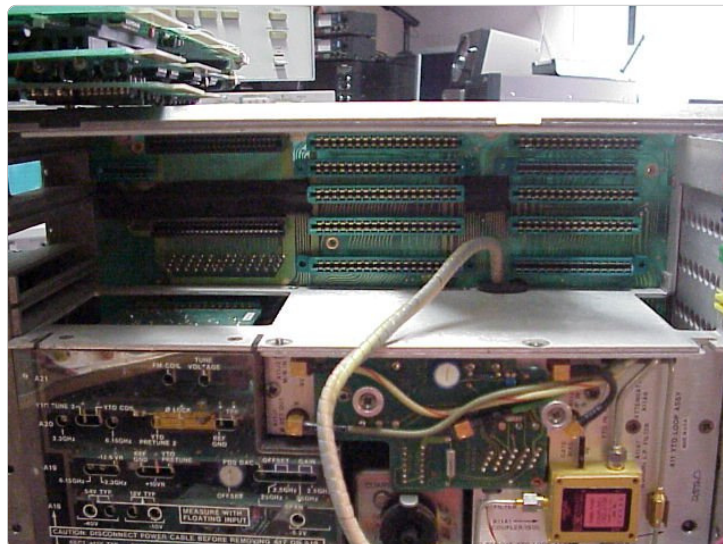
Once cleaned, display unit showed a nice test pattern consistently so I decided to connect it again with the RF unit... but not, it didn't work. So I decided to get all cards out and carefully clean them and the card cage



I am now reinserting them...

Working on the RF SECTION (I)

As the DISPLAY SECTION seemed to work (at least it displayed the TEST pattern), I went back to the RF module and took a similar approach: remove all digital boards:

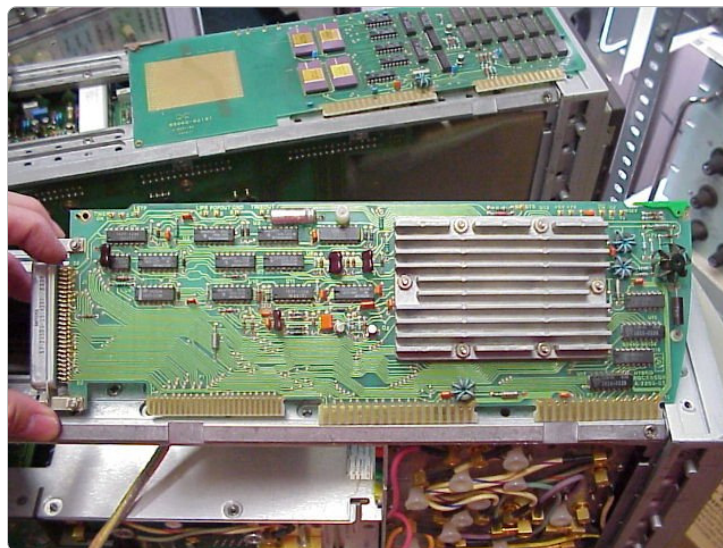
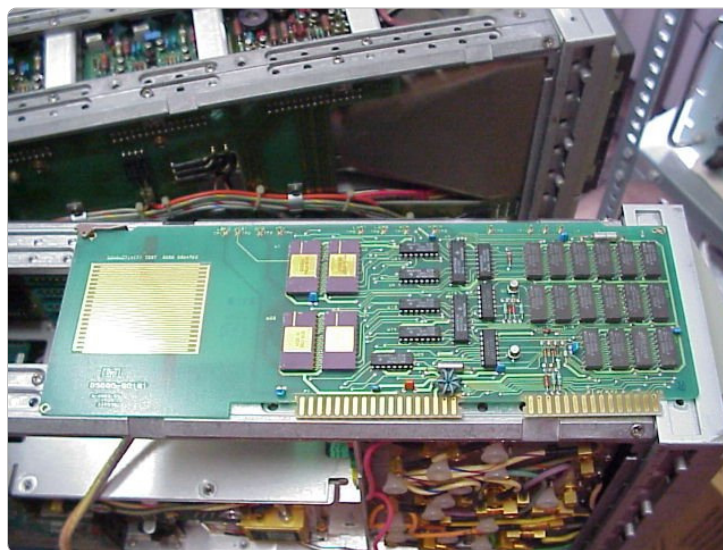
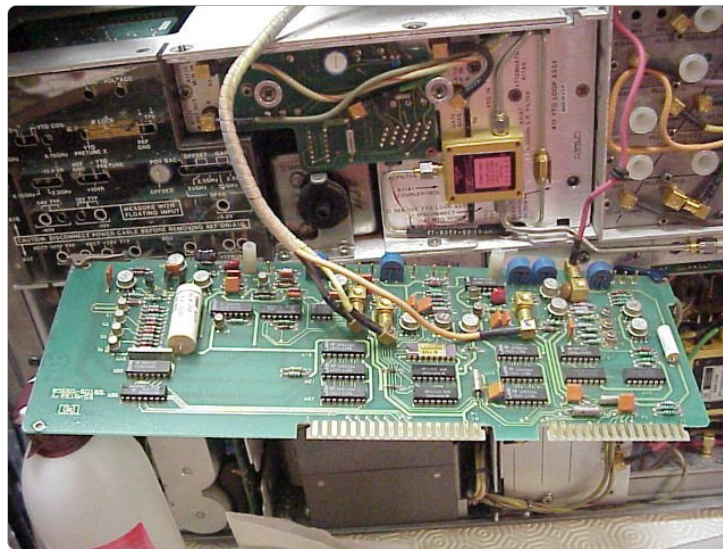


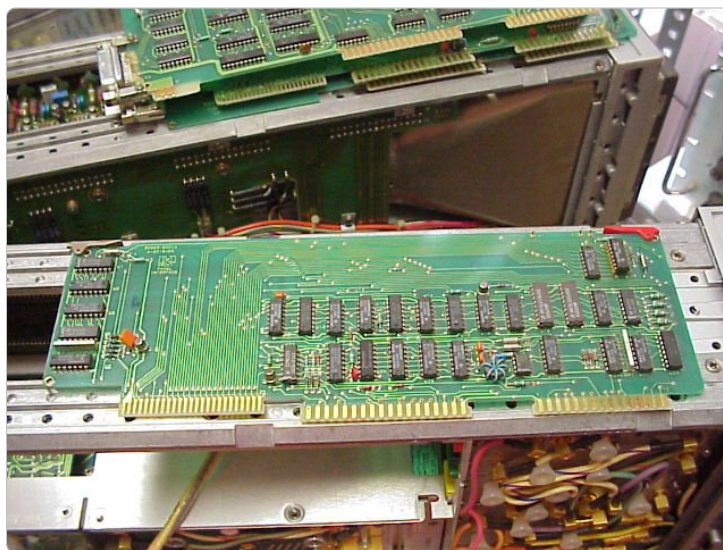
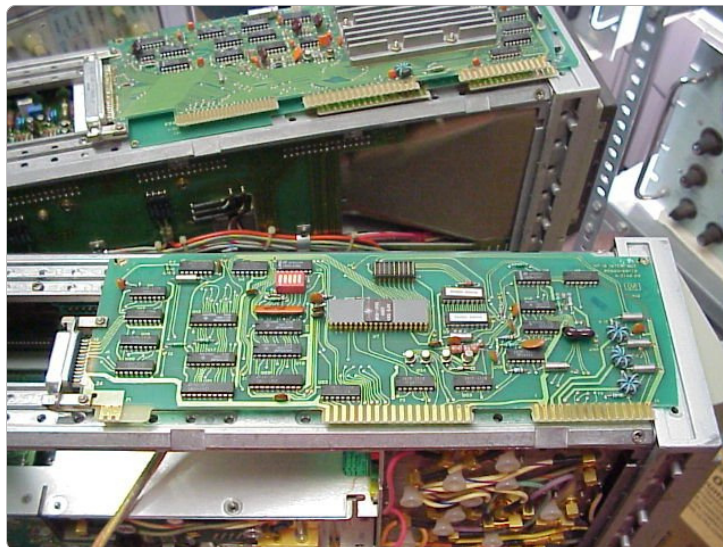
Here you have all of them, one by one:

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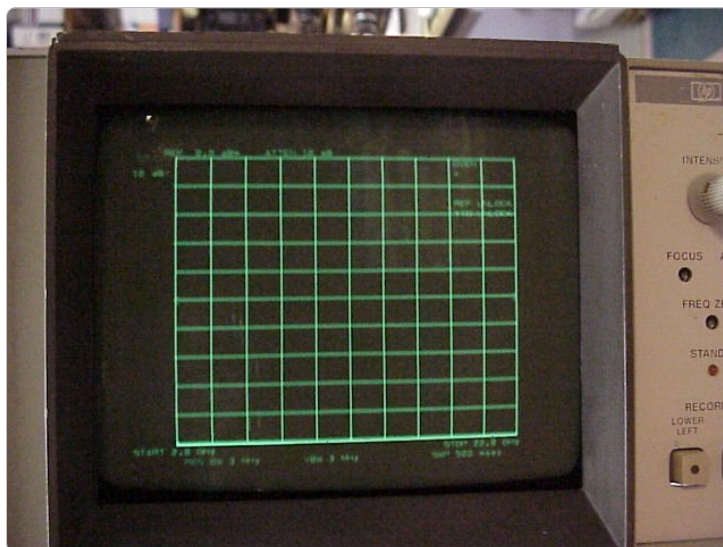
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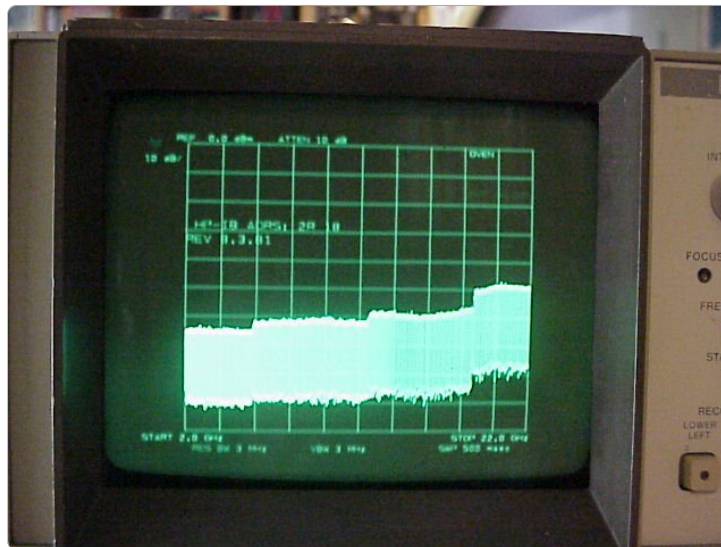
I carefully cleaned the edge connectors, added some contact cleaner, reinserted them and hoped for the best... and **it happened!!!**



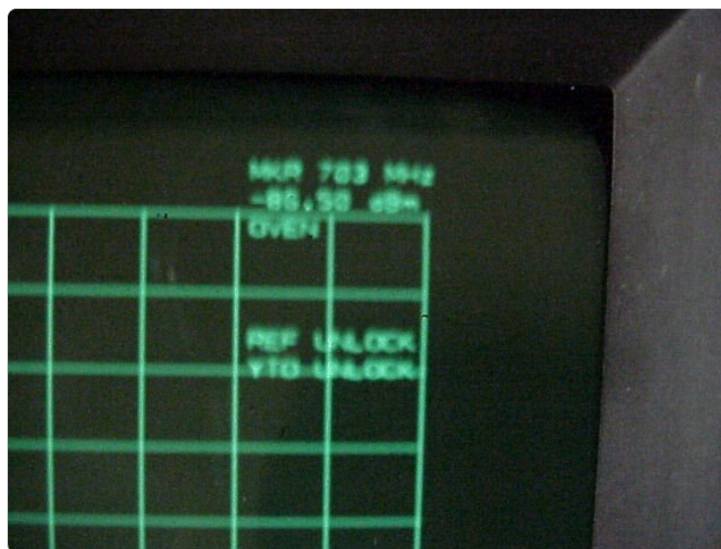
GREAT NEWS!!!. So I pressed the **INSTR PRESET** button... and got this:

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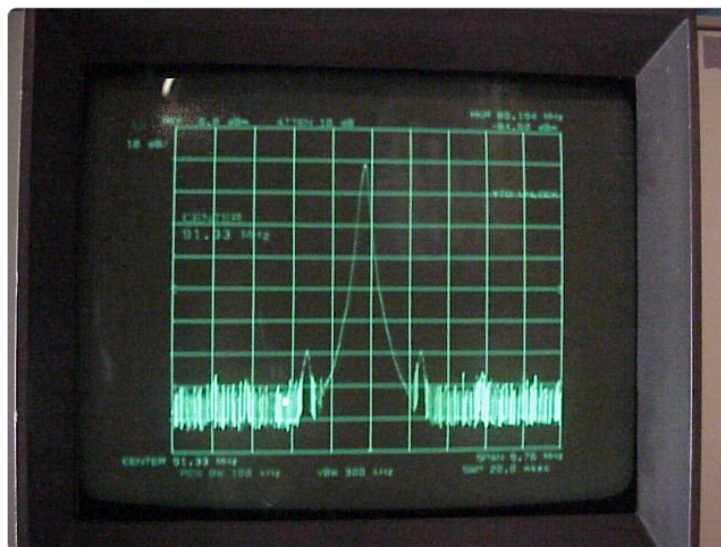
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As oven was still heating, there were some errors:



I hooked the calibrator and... voila!!!



So unit kind of works!!!. It shows the **YTO UNLOCK** error, which was already present in the display of the eBay listing and now, besides, it can't be focused... but, so far, so good :-)!!!

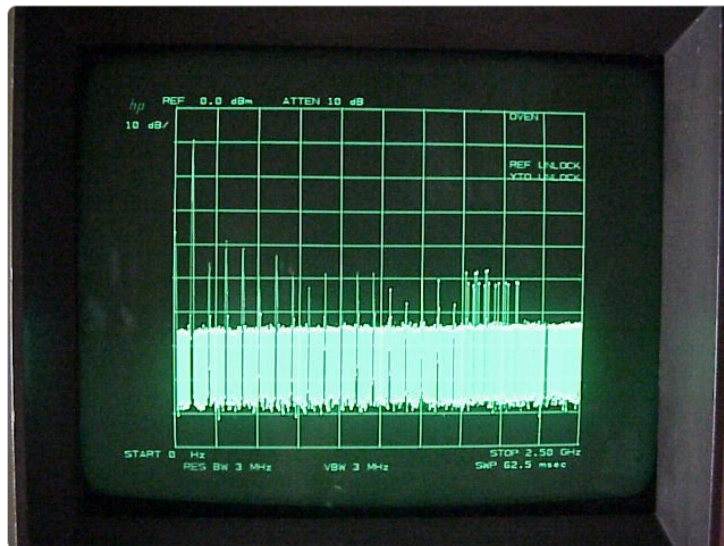
Working on the DISPLAY SECTION (II)

I decided to go for the FOCUS problem. Checking the service manual, I found the circuit which managed it. It is a small PCB, just over the CRT. It is the Z-axis circuit.

I got it out and found a resoldered transistor, just in the FOCUS circuit. Workmanship was not too fine so I redid it and

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also cleaned the PCB edge connector. Once I got the unit back to the system, I got this nice display:

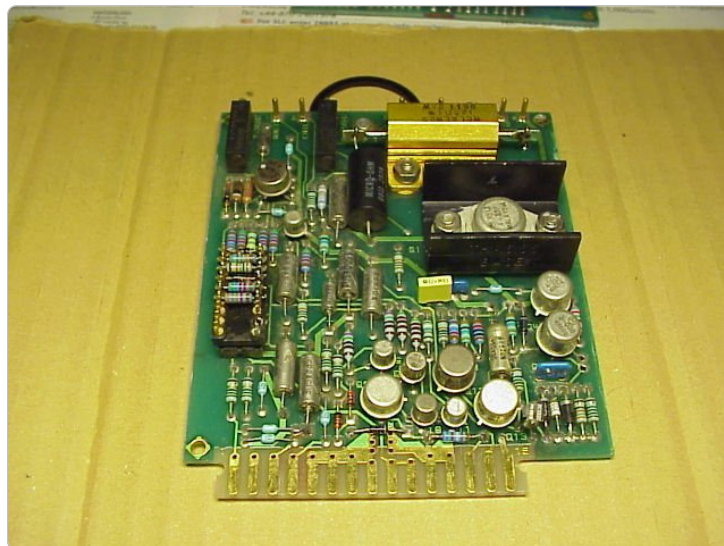
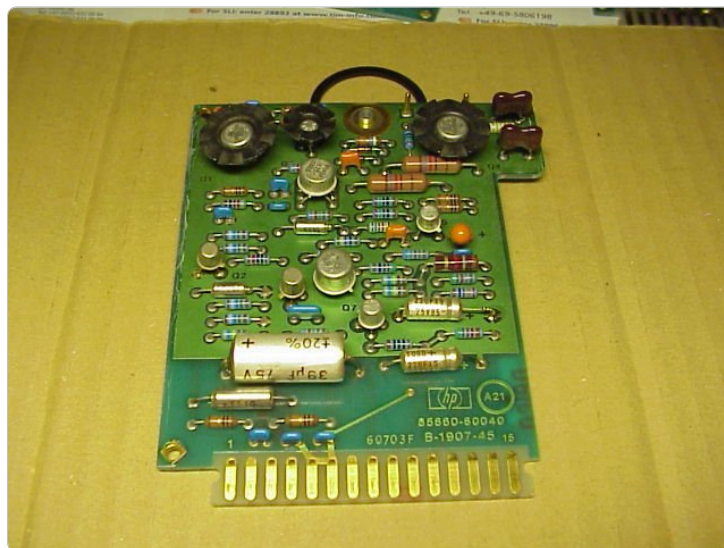


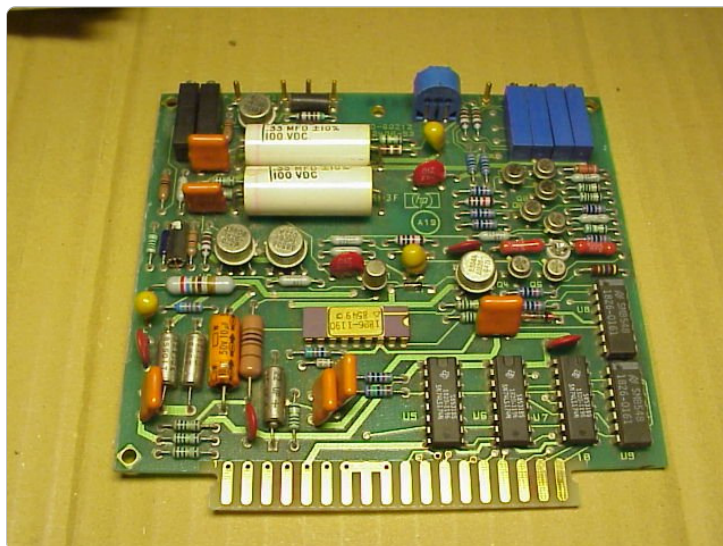
And now FOCUS control works as it should :-) !

Working on the RF SECTION (II)

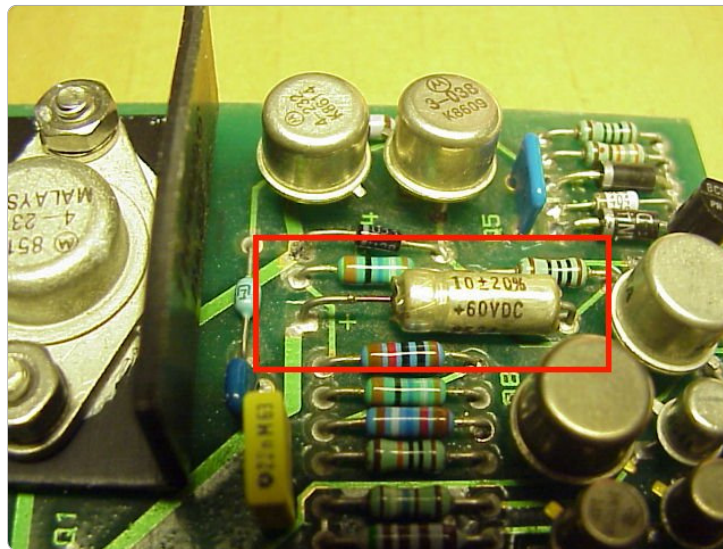
There was just a pending error, the **YTO UNLOCK**. Everybody suggested it was a matter of failed capacitors in the YTO control boards. So I took out all boards in that section.

BTW, a curious thing is that most of the ICs in ALL these boards have *manufacturing dates up to 1986...* so the **85660B** in the rear label has some truth on it...



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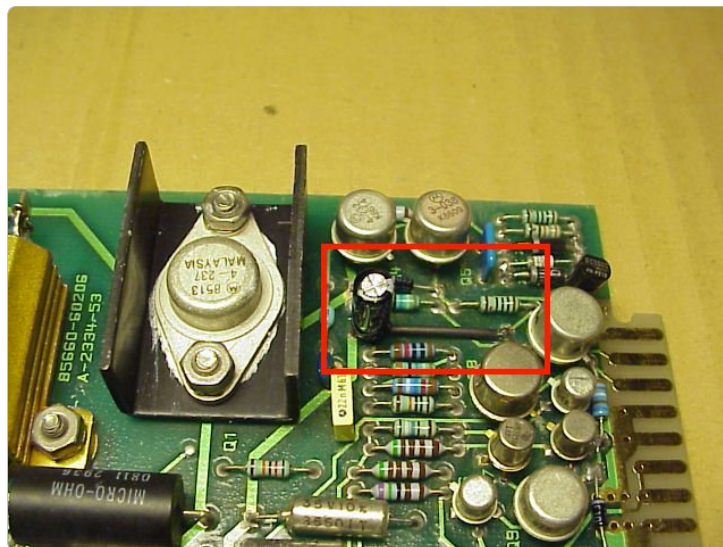
I was looking for bad capacitors, so this one seemed very suspicious (look the discoloration in one side):

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So I took my trusty ESR meter to check all of them:

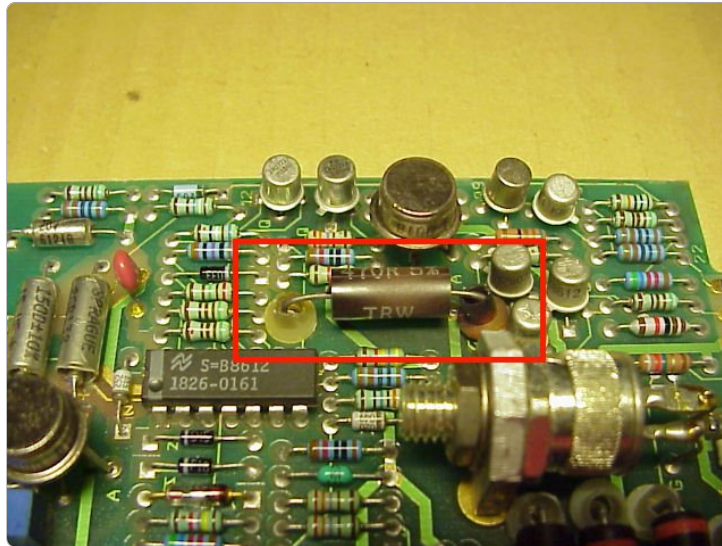


And, yes, all were OK except for the suspicious one, which was open :-)!!!. It was a 10uF/60V capacitor. All what I had in stock were 10uF/50V 105C, so I replaced it with one of them

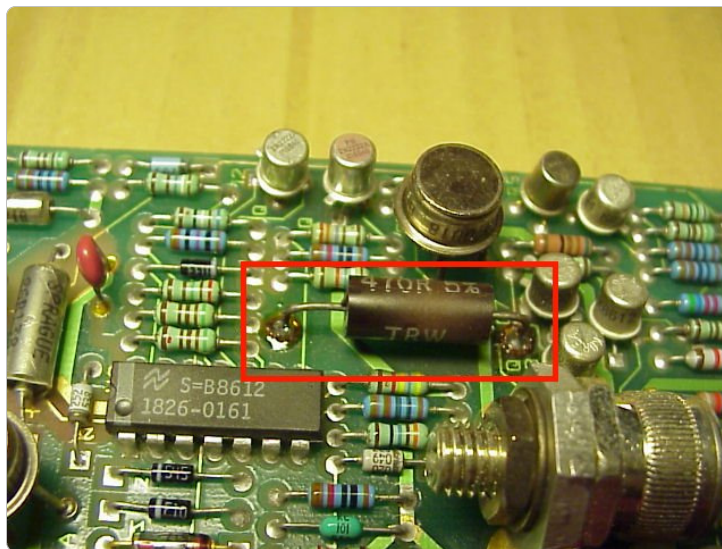


I did a thoroughly visual inspection of the boards, and found a power resistor with overheated solder joints:

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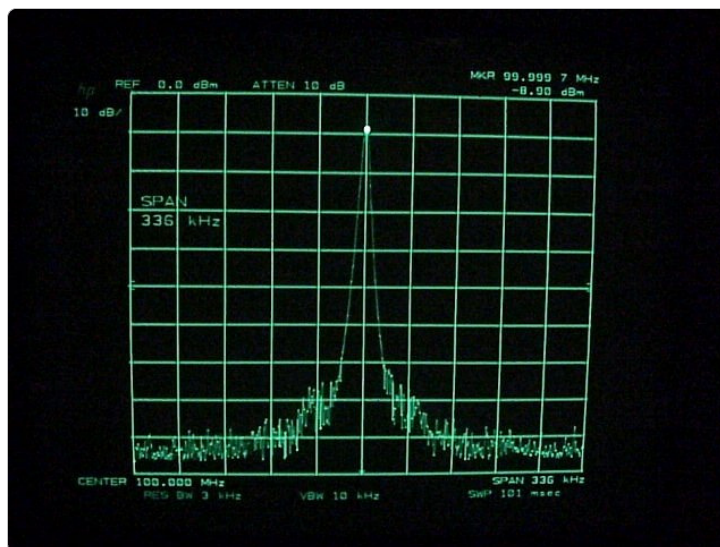
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So I cleaned and resoldered it carefully... this was a problem waiting to show up in the future!

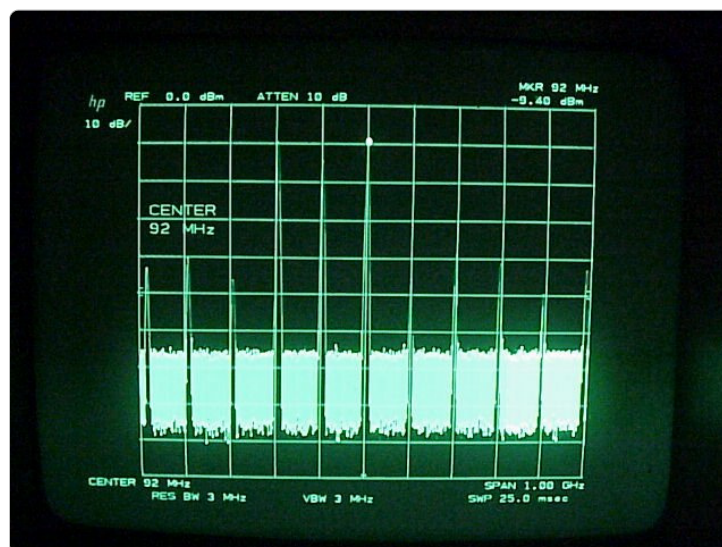
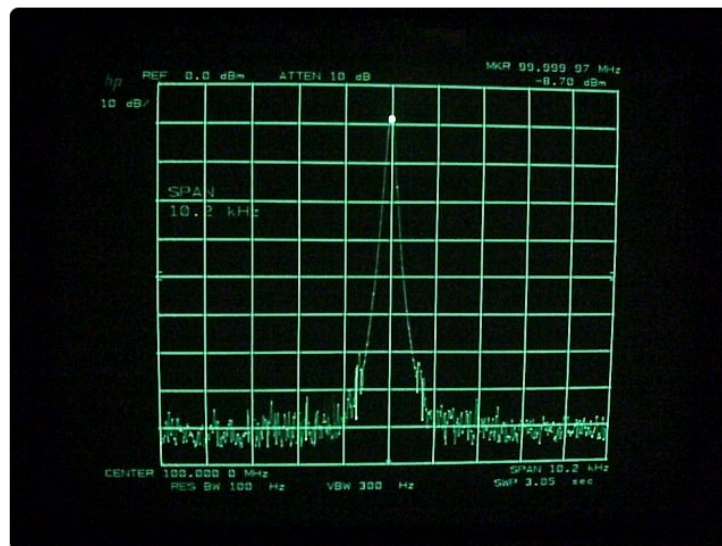


Once I got all cards in again, I fired the unit... and **YTO UNLOCK** was gone!!!!

This is the calibrator signal with several spans:



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I have checked in several frequencies and spans and, so far, **YTO UNLOCK** is gone for good :-)

Checking the unit

Well, today I have put back the covers of the 8566A system, as I need to move the unit in short time for an upcoming shack/lab rebuilt. But, before moving it to its temporary storage location, I have checked it with the aid of my **HP-8672A** generator (another nice instrument!). Well, I have found some things:

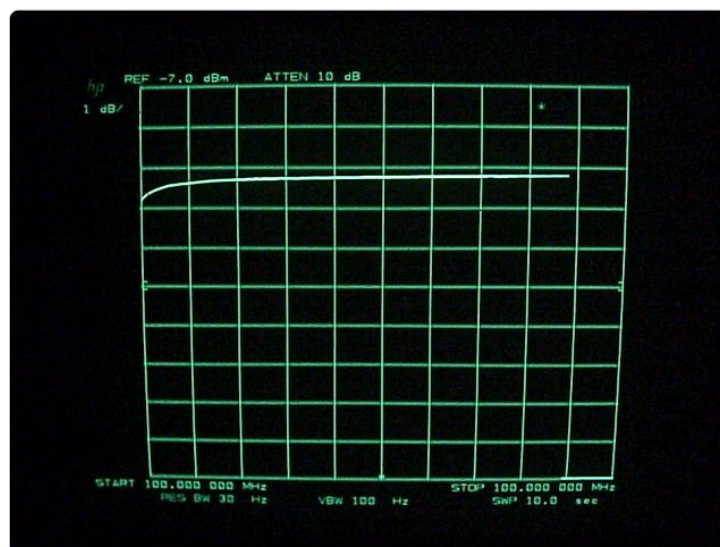
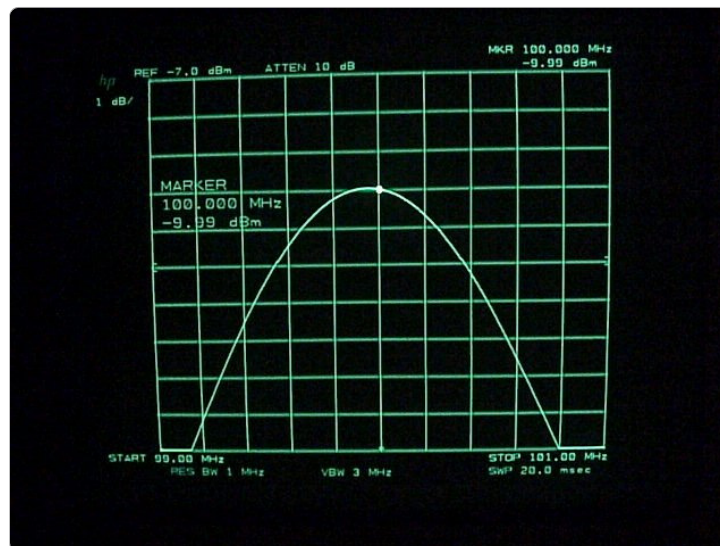
- There are still some **YTO UNLOCKS**, but only in some frequency ranges and which sometimes vanish (when unit gets hot they are almost gone). I have found them from 2.250GHz to 2.930GHz and also from 5.550GHz to 6.565GHz. As I did not align the YTO before replacing the faulty cap, I think this will be just a matter of fine alignment.
- Heathsink temperature: I have found that RF SECTION rear heathsink was at almost finger-burn temperature!. Then I have seen that someone had replaced air filter element with a foam which is clearly not good for that purpose, as it reduces airflow a lot. So I have temporarily removed it and temperature has gone to reasonable levels, but still very hot.
- And this is my main concern so far: using a 2.5GHz test signal, when CENTER FREQUENCY goes from about 2.4990 to 2.5 GHz, there is an internal relay switching noise and peak level drops about 30dB!. Checking block diagram, I see there is a different circuit from 0-2.5GHz than for 2.5-22GHz so clearly this is the switching I heard. But something is not working fine to have such a big difference.

All in all, my main use for this SA will be in frequencies below 2.5GHz but, of course, it would be great if I get it working fine in all its range. So I will investigate more about this... work continues!

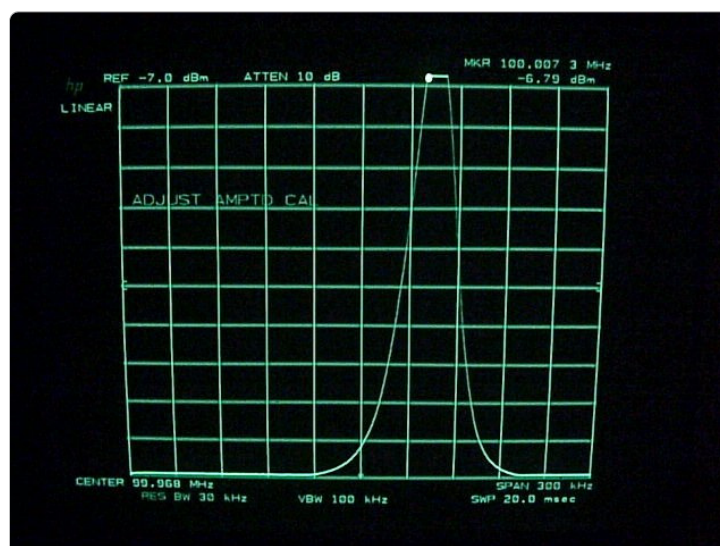
After some interesting exchanges with John Miles in the HP-Agilent Yahooogroup, it seems that the difference I have observed in the 2.5GHz signal can be corrected by a *preselector trimmer calibration*. By now, I have resorted to using **PRESEL PEAK** as it gets the signal almost at the correct level. But the associated **DAC** needs to be set at about 50, far from the factory standard of 32 (range is 0 to 63)

I have then checked the **ERROR CORRECTION ROUTINE**, which *measures the amplitude and frequency error factors and corrects the display for them*, according to the HP-8566 Manual. But it always ends with the message **ADJUST AMPTD CAL** and aborts the procedure. In that case, the manual calls for a **Manual Calibration Procedure**, explained also there. It consists of an amplitude calibration (pressing **RECALL 8** and using the **AMPTD CAL** control) and a frequency correction (pressing **RECALL 9** and adjusting by means of **FREQ ZERO** control), both based on the CAL signal. Here you can see the displays for both adjustments:

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They can be successfully passed, but then, when I try again the **ERROR CORRECTION ROUTINE**, it fails in same point. Here you have the display showing the fault:

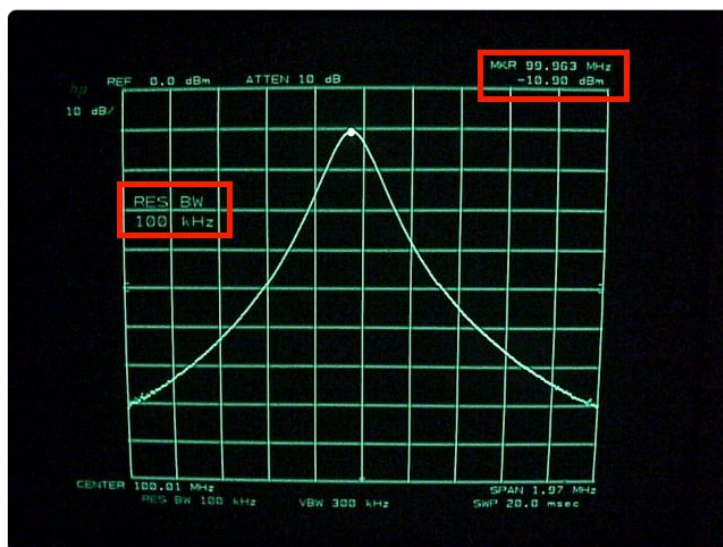
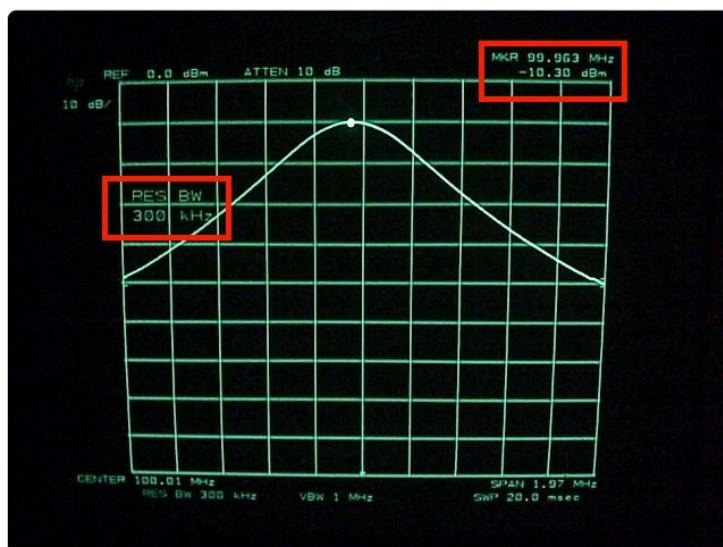
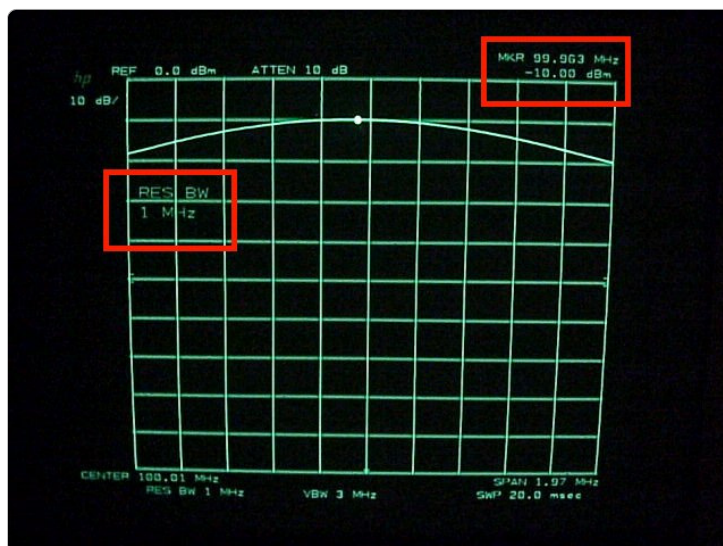


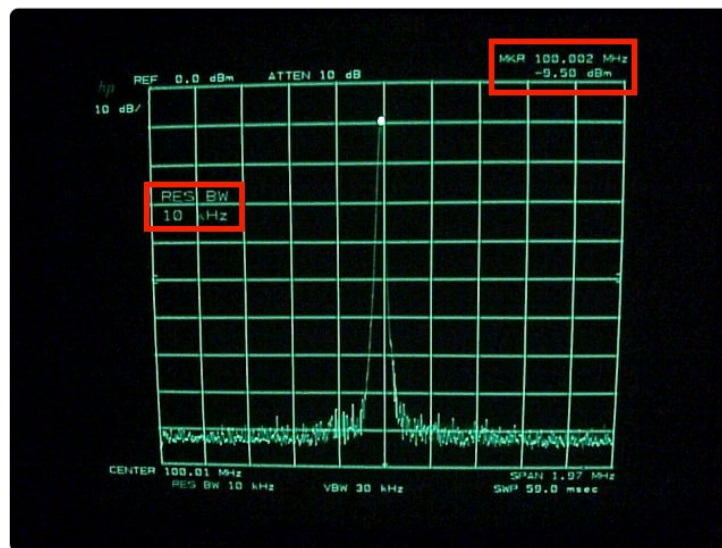
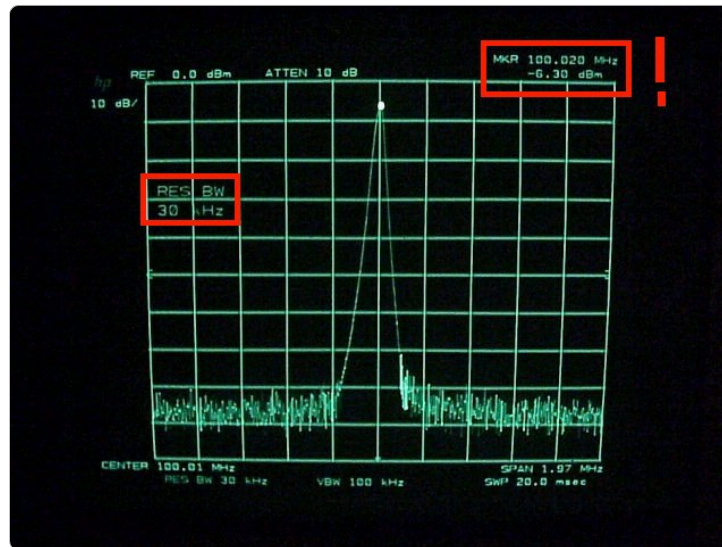
In previous steps, signal keeps inside the graticule but in this one, it is all over the top of it... suspicious!

I will investigate what is happening exactly at that moment, as previous steps run fine, in order to try to correct the problem and have the unit finish the procedure.

As I suspected and John suggested, the extra gain was a problem. It seems gain is too much to be compensated by the auto-calibration system. I have checked the CAL signal at different bandwidths and, yes, **30kHz RBW** has about 3dB more gain than the other RBWs:

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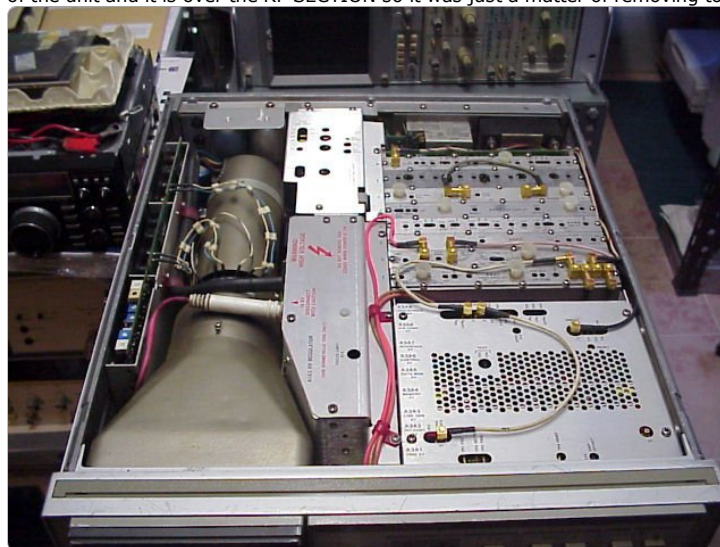
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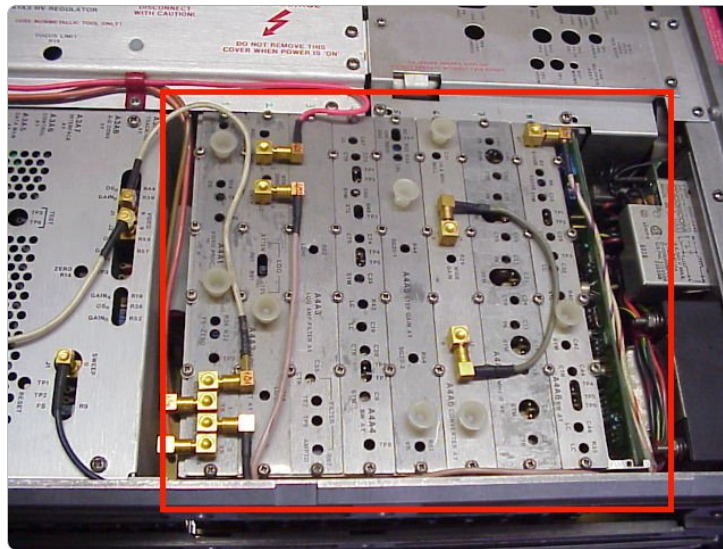
So now I need to find how to modify that gain...

Working on the DISPLAY SECTION (III)

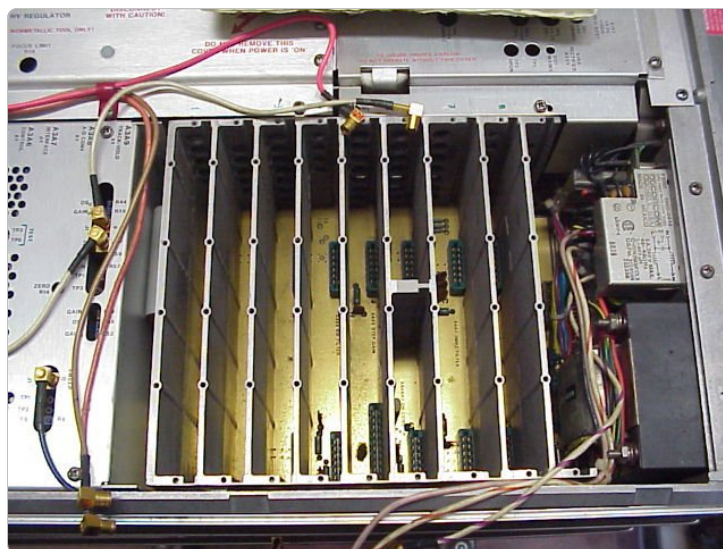
After the problems found in previous section and the good advice I got from the HP-Agilent Yahoogroup (thanks to John, Vladan and all people there!), I decided to go back to the **DISPLAY SECTION**. Luckily, all the adjustments are on the top of the unit and it is over the RF SECTION so it was just a matter of removing top cover:



This is the area with the 9 PCBs involving IF and the rest of analog processing:

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Once removed all boards, you can see the shiny gold-plated PCB:



Here you have all the boards, one by one:



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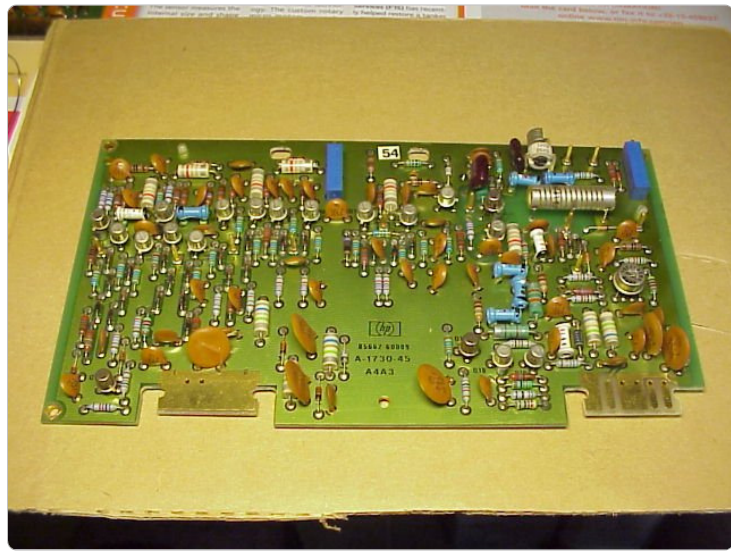
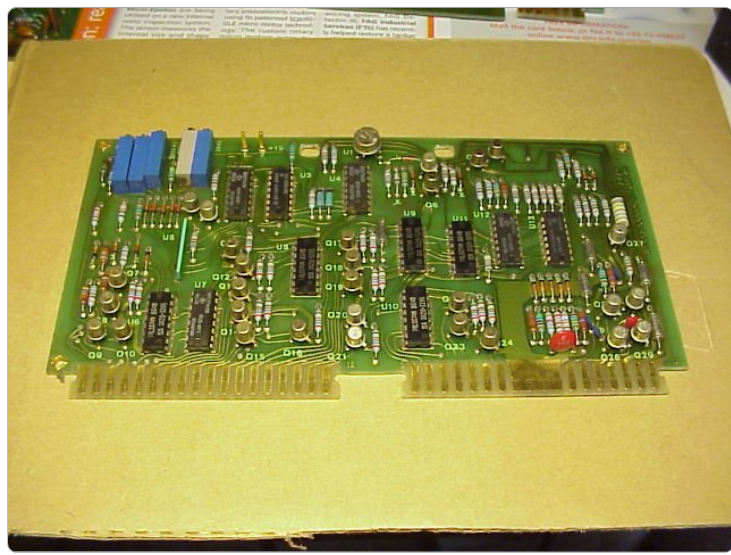
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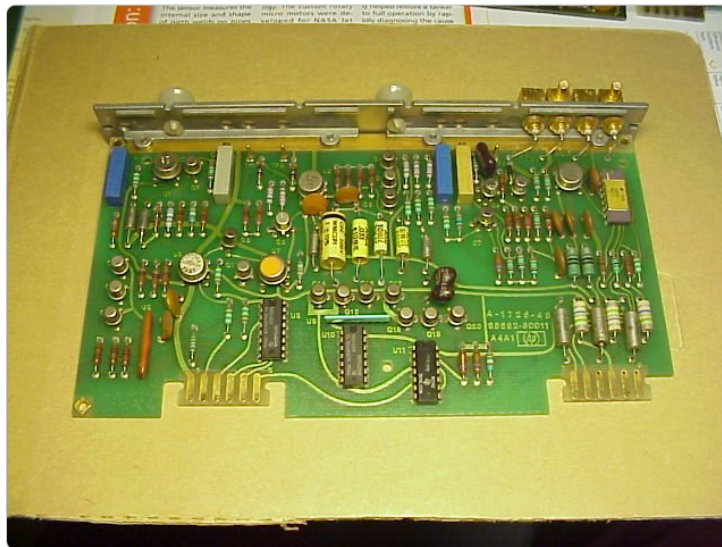


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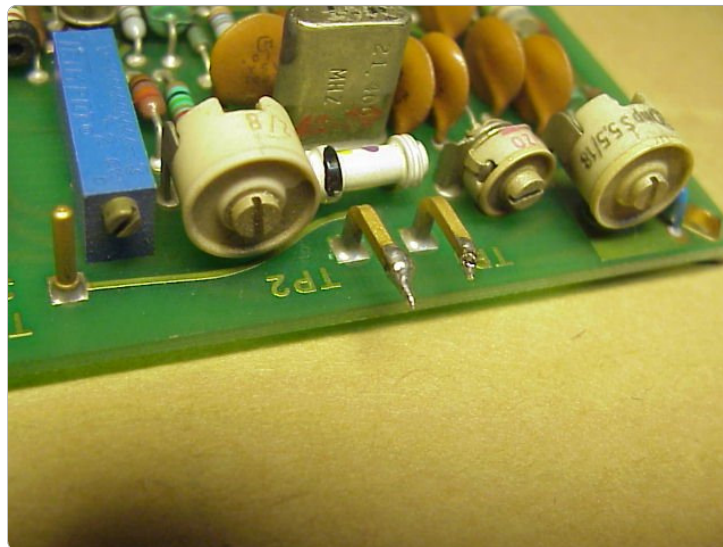


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Someone had been here before, as there were some test pins with globs of solder. Of course, I cleaned them. But here you have the tiny work done by the *tech*:



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I got some info from Vladan regarding the 30kHz RBW problem. He told me:

Message from Vladan

Hi Jose,

Just to make sure, check that the problem is only (or mostly) in the 30kHz BW setting. If it's only in 30 kHz, it's probably one of the following adjustments:

A4A4C20
A4A4C74
A4A4C73

A4A8C29
A4A8C44

This is an adjustment in the 21.4MHz IF filters (top box, spread out over two boards). There is one adjustment in each of the five filter stages. You will need to build bypass networks (4 of them). The network consists of a resistor and a capacitor. Make sure you build the correct one for your vintage boards. In addition, there are separate bypass networks for the 3MHz filters, which you will need if you decide to adjust that in the future (leave that for later, after the shack is remodeled). The network is described in the manual.

This adjustment requires you to minimize the amplitude of the signal. Each stage has to be adjusted while the others are bypassed with those networks. If one of the stages is not adjusted, the amplitude will be too high.

If the amplitude is high in all bandwidths from 3kHz to 30kHz, it's something else.

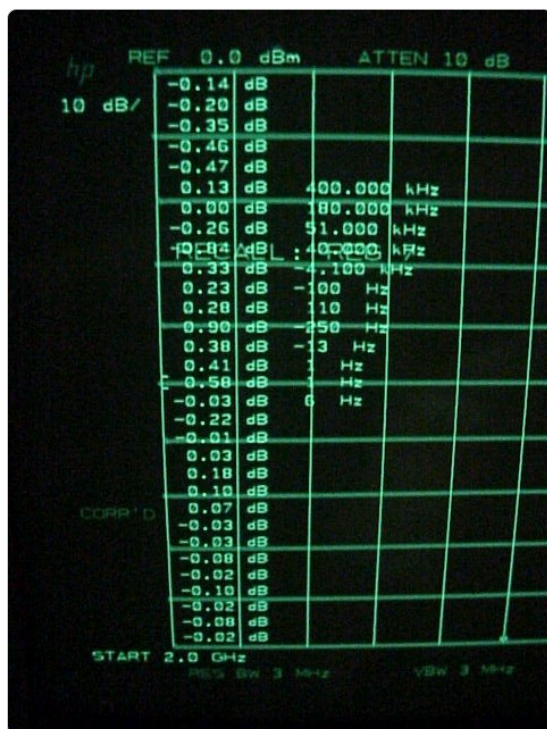
Vladan

So, once all the cards had been carefully cleaned, including edge connectors, I got them back to the unit and checked again, just in case it was only a matter of bad contacts... but not, problem was still there. So I marked the current position of the trimmers Vladan commented and, while 30kHz was selected as RBW, carefully moved a bit **A4A4C20**... I got a *nice* peak distortion so it went back to original position. Then I moved to **A4A4C74** and, just by readjusting it about 5 degrees, I got a more symmetrical display AND I was able to get the gain back to show a perfect -10dBm signal... Yes, I know this is NOT the correct way to deal with this and I would need to do as Vladan suggested, but I have no time now to devote so much work to the unit and, well, I was eager to have a fast solution, even if not perfect.

So I run again the **ERROR CORRECTION ROUTINE** pressing **SHIFT-W**. Here you have a link to a very low quality video of it... I hope at least you can see something!

[ERROR CORRECTION ROUTINE video](#)

After it passed :-), I pressed **SHIFT-w** to find out the correction parameters. They seem fine enough, as there is none which exceeds 1dB:

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So, all in all, it seems we are progressing :-)!

More to come soon... keep tuned!

2.7GHz Spectrum Analyzer

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New Handheld RF spectrum analyzers with 4.3" colour touch screen #1194

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