

't Meezenest



Restoration of Tektronix 564 Storage Oscilloscope

Version 1.0
May 7, 2019

M.T. Konstapel

Preface

This document describes the restoration of a Tektronix 564 Storage Oscilloscope from 1963. I bought this device in a second hand shop for 25 Euro. It came with a one week warranty. Of course, I did not take this to seriously, because they obviously did not know what they were selling. And I was not going to bring it back if it was not working. I was going to restore it, of course.

Cleaning

A 55 year old device is dirty. So I used an air compressor to blow out most of the dirt. After that, I took a moist cloth to clean the interior. I also took out every tube to clean it, making sure not to wipe out the text on the glass. At the same time, I inspected the tubes looking for a white mist inside it. This is an indication of leakage. Fortunately all the glass tubes looked fine. The metal Nuvistor tubes could not be inspected this way.

Replacing electrolytic capacitors

As a preventative measure, all the electrolytic caps had to be replaced. They have a limited lifetime. Even the high grade capacitors Tektronix used are probably internally leaking. On the outside however, no leaking electrolyte was visible.

The electrolytic capacitors on the ceramic strips were removed and replaced by new capacitors. I made sure I used solder with 4% silver. This is important as the ceramic strip is impregnated with silver in order to establish a mechanical bond with the ceramic. Using ordinary solder may loosen this mechanical bond.

In the main cabinet, I replaced capacitors C667, C667, C876, C904, C935, C732, C757. On the time base module (3B3), I replace capacitor C115 and on the vertical amplifier module (3A6), I replaced capacitor C453.

The main filter capacitors had to be replaced as well, but I wanted to keep these old capacitors in the main cabinet, as these are typical for this era. So, I designed two printed circuit boards which could be placed on the existing mounting screws of the old capacitors. The wires going to the old capacitors could now be unsoldered and solders to the new pcbs. This way, the old capacitors where still in the cabinet, but not electrically connected. A neat solution that could also be removed to restore the oscilloscope to its former original state.



Image 1: First PCB with main filter capacitors (not connected yet)

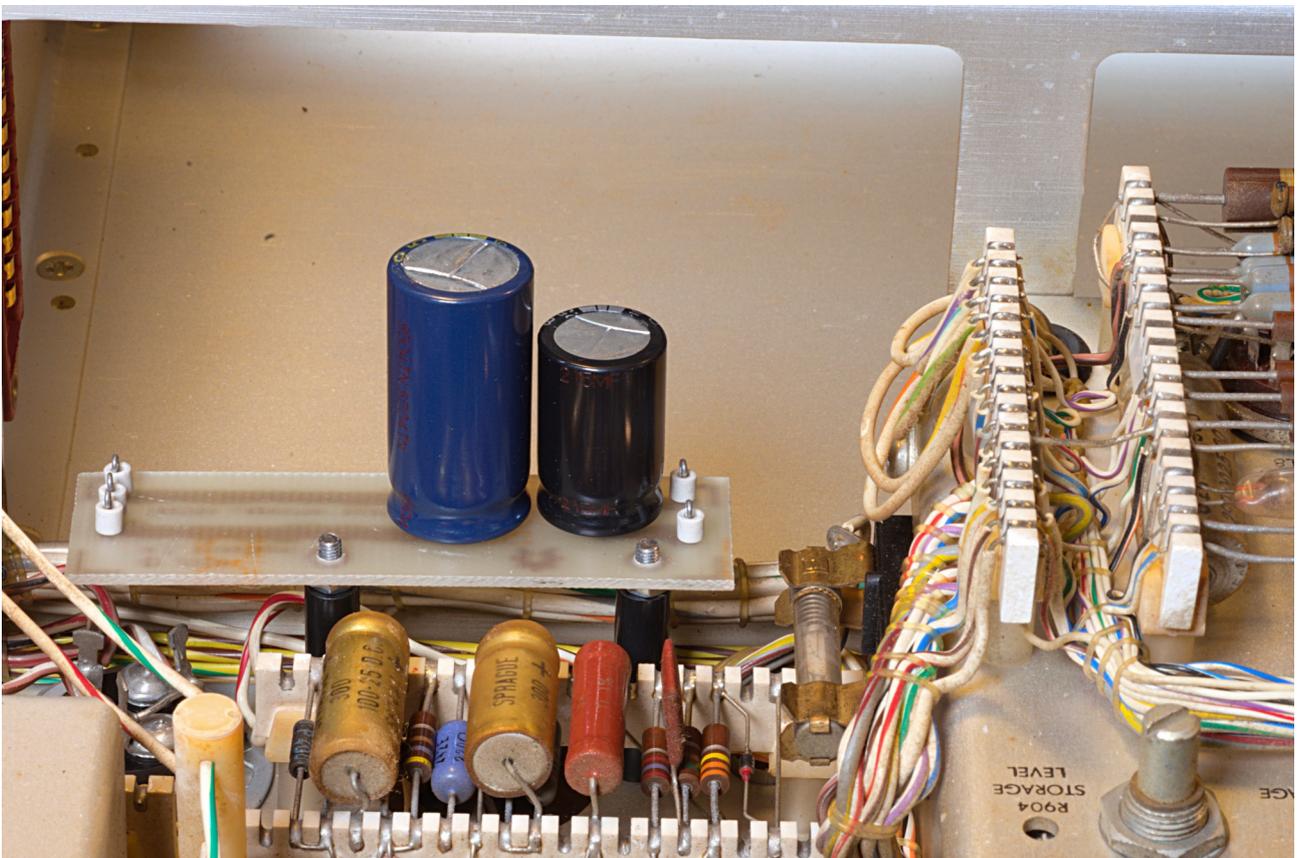


Image 2: Second PCB with main filter capacitors (not connected yet)

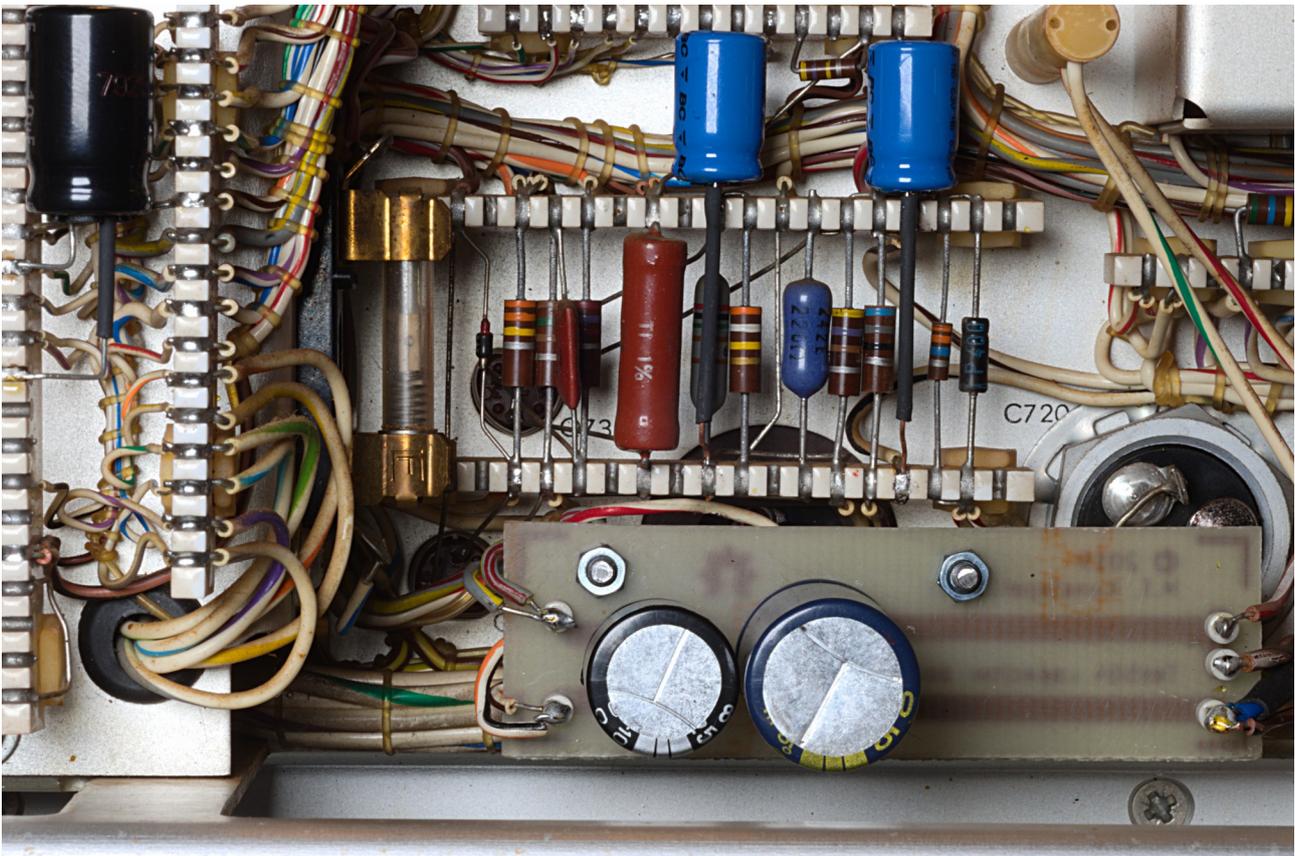


Image 3: C732 and C757 on ceramic strip (blue caps), also connected second PCB

List of replaced capacitors

Designator	Value	Brand and ordering number
C644, C640A, C642A	470 μ F 250V	BC Components 2222 057 53471
C640B, C642B, C667, C876, C904	10 μ F 450V	Panasonic EEUED2W100
C646	82 μ F 250V	Panasonic EEUED2E820
C935	1 μ F 160V	Panasonic ECA2CM010
C732, C757	100 μ F 63V	BC Components 2222 136 68101
C720	4700 μ F 25V	Panasonic EEUFC1E472
C115	10 μ F 50V	Panasonic EEUEB1H100S
C453	22 μ F 50V	Panasonic EEUFR1H220B

The design is open source hardware. The files are available on request.

Repair

As is to be expected when dealing with old equipment, there were a few issues. When powering on the oscilloscope without the vertical and horizontal modules, there was a dot visible on the screen. Which is good. The main cabinet was functioning.

Switching it on with the time base installed, the screen showed a horizontal line instead of a dot. When lowering the time scale from 1 millisecond to 1 second, the line changed to a moving dot. Success again!

When I inserted the vertical amplifiers, the screen went blank. After a lot of trouble shooting, I found a defective potentiometer: the wiper did not made contact with the resistive material. I removed and disassembled it in order to clean it with some contact cleaner. This seemed to repair the potentiometer.



Image 4: Opening the potentiometer to clean it

After testing the module, it still did not work. Because I could not reach the ceramic strips when the module was installed in the oscilloscope, taking measurements was very difficult. But in the end I found the culprits: the two input Nuvistors were blown. I ordered two Nuvistors and replaced the defective ones and the scope, once again, was in full working condition.

Calibration

The only thing to do was to calibrate the oscilloscope. Luckily, the service manual from Tektronix was very comprehensive.

Video

I made a video of the restoration. It is in dutch, which is my native language. The video is available on request.

Colofon

PCB design: M.T. Konstapel

Author: M.T. Konstapel

Video: M.T. Konstapel

Date: April and May 2019

Mees stands for Marcel's Elektronica En Software (Marcel's Electronics and Software) and is pronounced as 'Mace' (the spice).

<https://www.meezenest.nl/mees>

©2019 M.T. Konstapel