# Modification of Tektronix 7S14 for a better X-Y (Lissajous) Display

My dual trace sampler 7S14 had a problem when switching from the CH1/CH2 dual trace- to the XY-mode. My mainframe is the 7904 – but that's not relevant for this topic here.

Using the "CH1/CH2 DUAL TRACE" for two ideal identical input signals (generated with a power splitter and exactly symmetrical cabling) gave a phase difference of zero even for signals up to 1GHz – as it should be.

Switching to "CH1 Y CH2 X" the expected ideal lissajous display (straight line) changed to different ellipsoid displays depending upon setting of SCAN and HOLD OFF.

An external X-Y-scope connected to the outputs of the 7S14 (VERT and HORIZ) didn't show this effect – the lissajous was always an ideal straigt line!

Solution:
Asking the manual /1/ and looking for the location where the HORIZ signal is split into the external and internal path, I found on the PARTIAL HORIZONTAL ("5B") the output of the OPAmp U180B (see picture 1).

1. Via R176 the HORIZ signal is fed directly to the external connector J140
2. Via R181, R183, R190 and C190(!) the HORIZ signal is fed to the internal horizontal amplifier of the mainframe

C190 is the problem!

Reason: C190 (22nF) is in conjunction with R183 (2kOhm) + R190 (4,75kOhm) a lowpass filter. These two resistors are a source with an impedance of 6kOhm; R181 (100kOhm) can be neglected. 6kOhm and 22nF give a 3dB-cutoff frequency of 1.2kHz with 45 degrees phase shift.

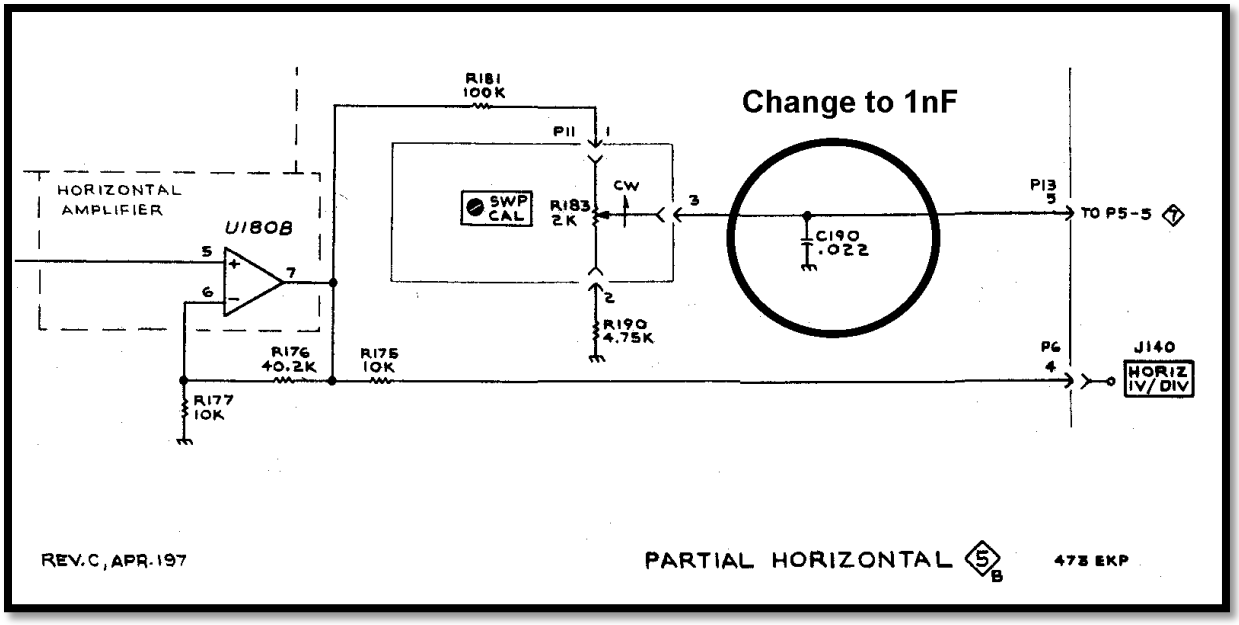
The sampled values in the 7S14 are between some hundred Hz and some kHz depending upon setting of SCAN and HOLD OFF. So when using these controls this lowpass is "swept" and therefore causing the problem.

Solution: Reduce C190 from 22nF to 1nF

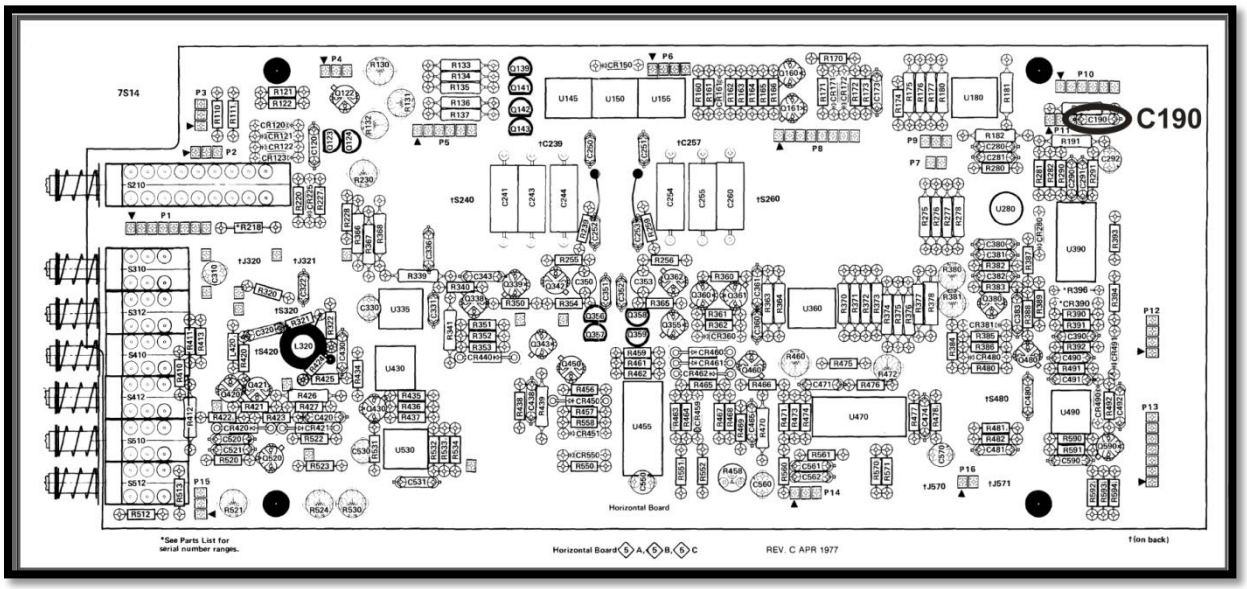
C190 can be replaced without uninstalling the complete PARTIAL HORIZONTAL board (picture 2); this board may stay installed. Carefully use soldersucker and a calm hand.

Disadvantage: This capacitor is necessary for a smoother horizontal signal and can´t be deleted completely (I had bad experiencies)!

A value of 1nF is a good compromise and had no further negative effects.




Picture 1: Schematic PARTIAL HORIZONTAL




Picture 2: Location C190 on the Horizontal Board

I don´t know whether this problem was solved in later units - please check before modifying!

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*Another hint: Don´t forget to change the batteries inside the sampler board!*

/1/ Instruction manual “7S14 DUAL TRACE DELAYED SWEEP SAMPLER” (Tektronix)