

## Camera Adapter for Tek 7000-Series Mainframes

### Introduction

Beyond the mechanical solution for attaching a digital camera to a 7000-Series mainframe, I tried to trigger automatically the camera when a picture appears in the STORE mode (single sweep mode).

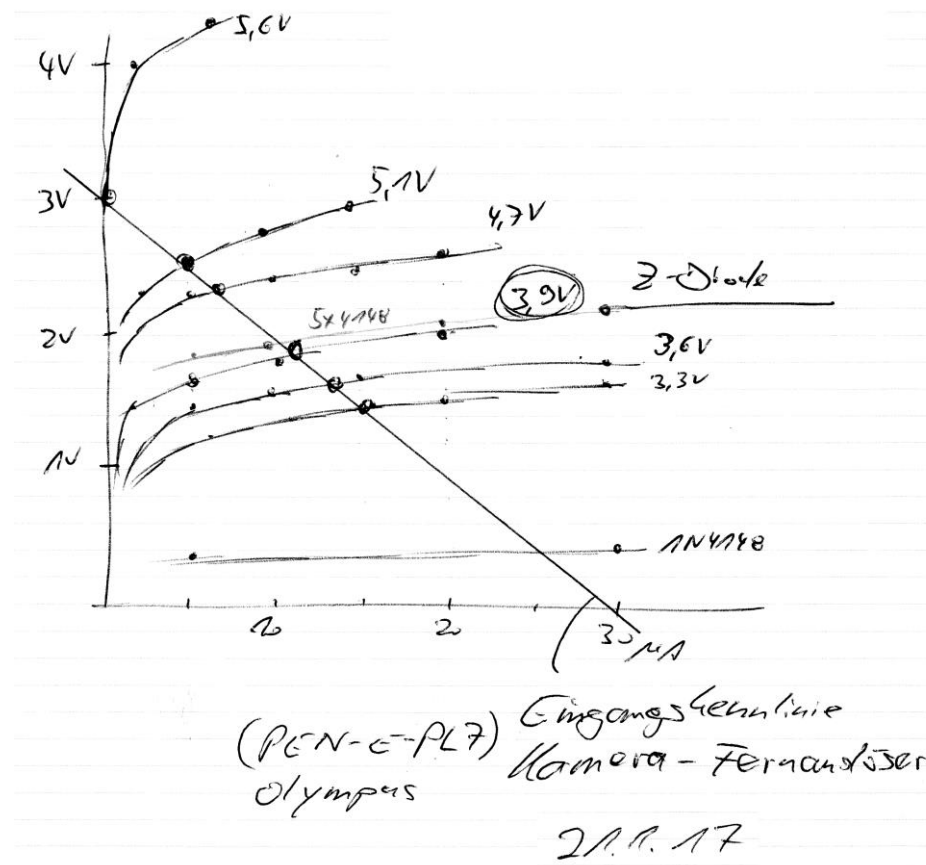
It can also be useful for non permanent signals (bursts), which occur by chance in the NORMAL trigger mode (not AUTO).

A useful output is the so called "GATE", which goes high for the duration of the horizontal sweep (+10V) and goes low (0V) at the end of each sweep; refer to the manual of the scope.

**Note:** Some mainframes have internal switches to specify which timebase (A or B) is controlling the GATE-output – choose the right one! Typically I use the "A"-timebase.

### The digital camera

First I checked the remote control input of my camera, which is an OLYMPUS PEN-lite E-PL7; but the results may be similar for other types and brands.



Picture 1 Input characteristic of digital camera (remote control)

The input of the remote control is 3V/0µA and 0V/30µA (straight line in picture 1). This represents 3VDC in series with 100kOhms.

## The schematic

The goal was to use only a passive circuit without any additional supply.

Assuming a GATE signal from the scope, with 10V peak, the circuit is acc. picture 2:

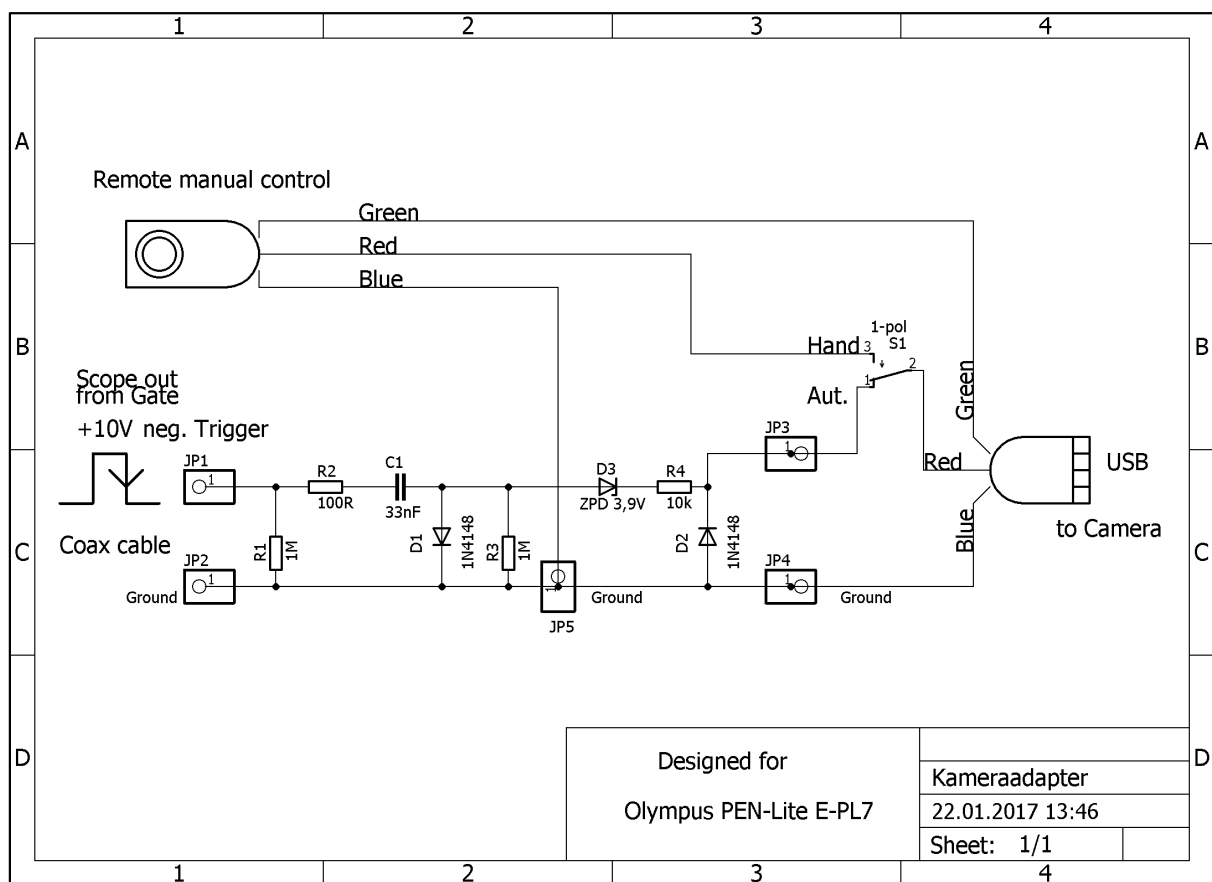
The positive slope charges C1 via R2 and D1; the following negative slope at the end of the sweep triggers the camera via D3 and R4, if S1 is in position "Aut."

D2 protects the camera. D3 is selected acc. Picture 1 with 3,9V, considering D1//R3 in series.

It is important to know, that Z-Diodes have at very low currents ( $\mu\text{A}$ -range) much lower voltages than rated, in this case the 3,9V diode has only 2,8V threshold!

Therefore a "selection during production" of D3 is recommended. D3 has to be selected so that the camera isn't triggered without GATE signal from the scope.

S1 in position "Hand" activates the normal remote manual control without automatic.

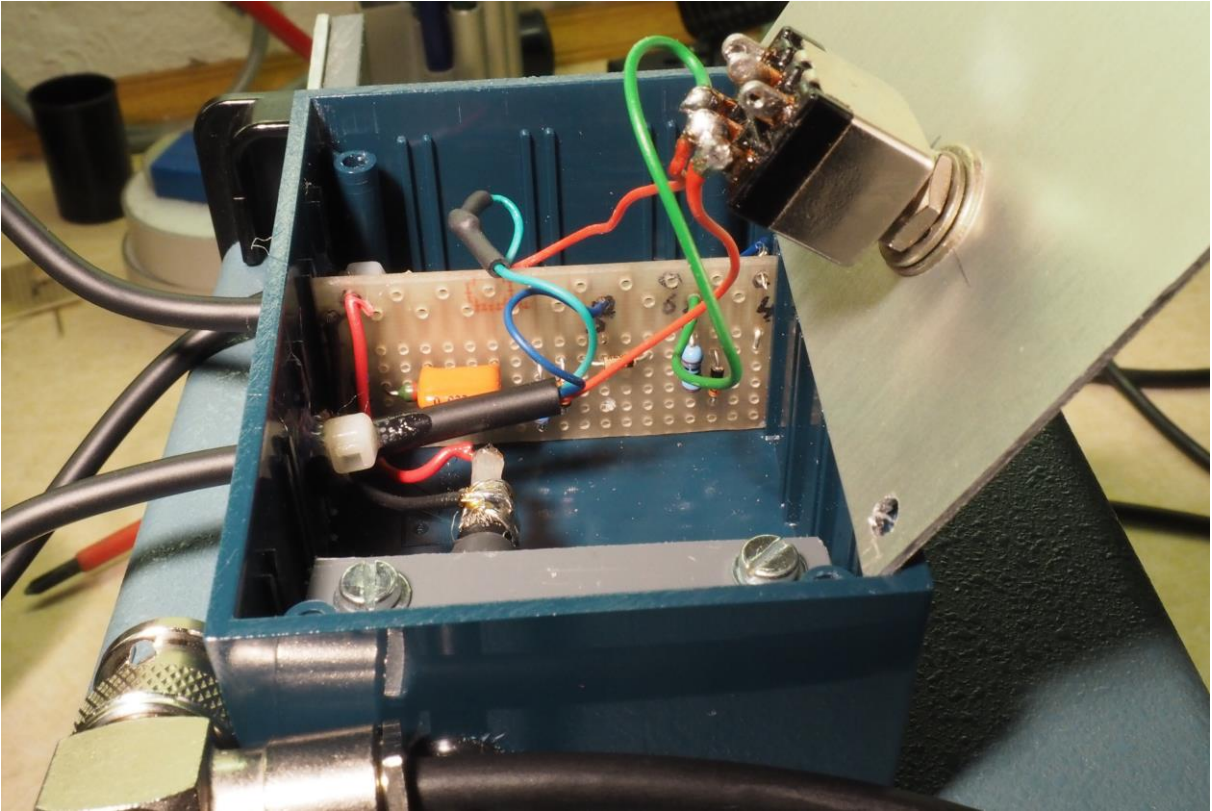
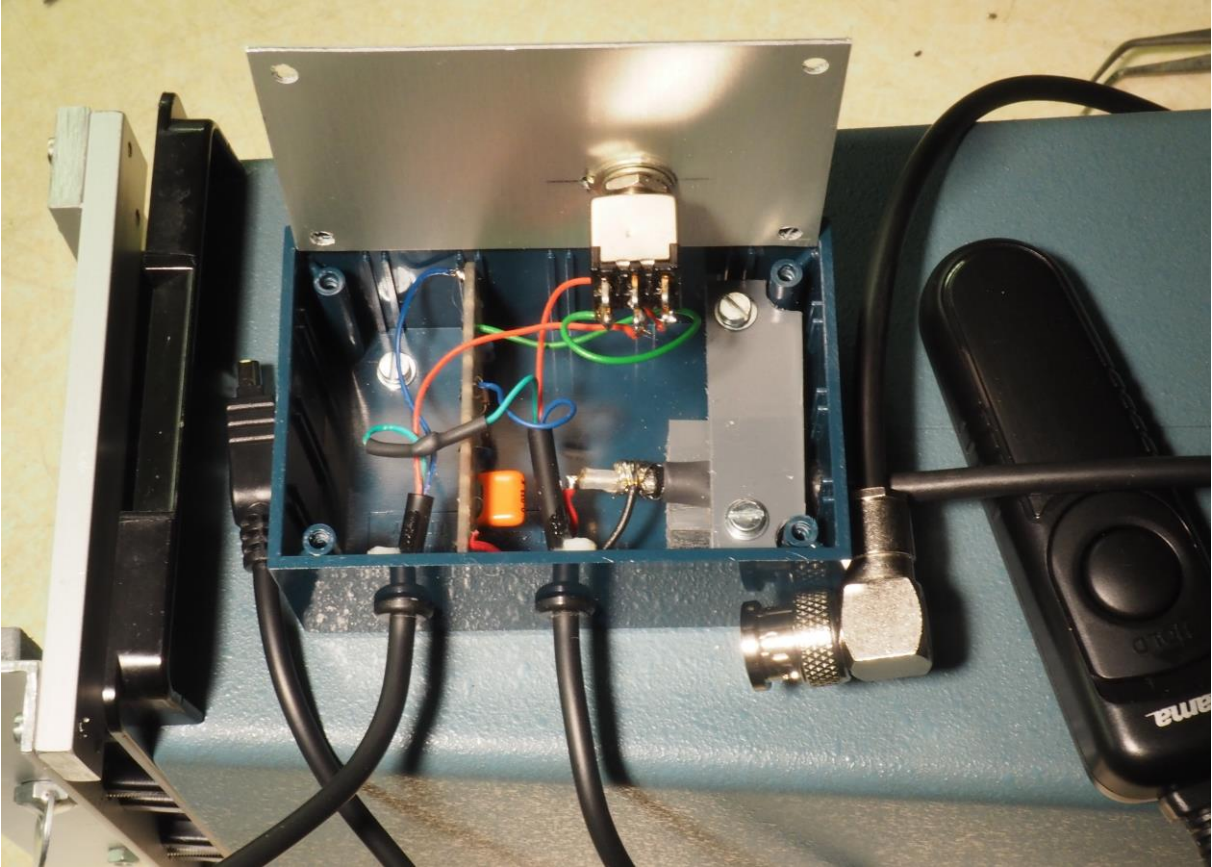


Picture 2 Schematic of the adapter

## The adapter

Following some pictures. The adapter is built in a small box (picture 3 and 4) attached to a slaughtered old original scope camera from Tektronix Type C5 (picture 5).

The homemade mechanical construction depends upon the camera and is a little bit difficult, but after it, it fits perfectly to the mainframe (picture 6) and maybe adapted to other cameras by replacing the blue/grey plastic (sets the height).



Picture 3 and 4 Inside of the adapter



Picture 5 Mechanical construction of the adapter



Picture 6 Attached to the mainframe

## Operation

Two modes are available:

### **Hand:**

The most usual mode, the camera is focused and then triggered by hand via the remote control switch. Refer to the camera manual for settings.

In this mode, the adapter is bypassed (S1 in position “Hand”).

### **Aut/Scope:**

Especially for the STORE mode of the scope (single sweep), a trigger of the camera via the “GATE” output is useful in cases of non repetitive signals occurring by chance.

In this case the camera is triggered AFTER the completion of the horizontal sweep.

Refer to the camera manual for settings; especially the focus has to be made manually before automatic photo shootings!

### **Note....**

At very high horizontal sweep rates, the passive circuit may be too slow.

My scope and camera combination has a limit of 1 $\mu$ s/div (totally 10 $\mu$ s per sweep).

### **...and now a trick:**

For required higher sweep rates use two time bases:

One with high rate for the signal and the other with a lower rate to trigger the camera.

Measuring (single sweep) with e.g. 50ns/div and STORE mode via time base A.

The HORIZONTAL MODE at the mainframe is set to “A” (not ALT, CHOP) for the measured/viewed signal!

Time base B set to 1 $\mu$ s/div or slower and same trigger source as time base A for the camera.

Even if this time base B is not selected via the HORIZONTAL MODE, it controls the GATE output for the camera adapter.

### **Important:**

Look for the internal switch of the “GATE” output, which has to be set to the chosen timebase for the camera; in this example to “B”

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