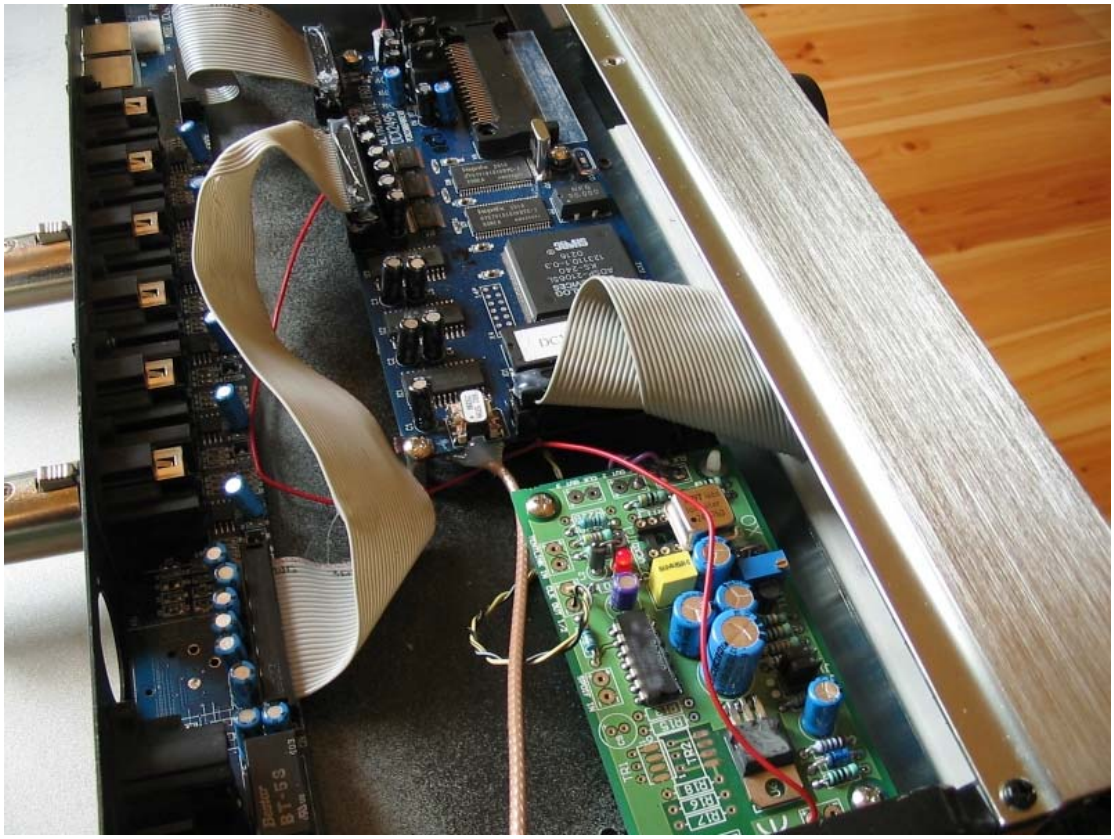
TentLabs XO2 fitting instructions for Behringer DCX2496 digital crossover.



Intro.

The Behringer DCX2496 unit has gained a lot of interest among audiophiles as a very affordable entry into digital crossing of loudspeakers. I chose the unit for just that reason.

Still as a low price unit from mass production professional audio company there are a number of tweaks one can do to make the unit perform much better than in original stock form.

This paper will concentrate on how to improve a clocking in the unit with the help of ultra low jitter master clock unit from TentLabs (www.tentlabs.com).

Technical background.

The DCX2496 uses a not so common solution for clocking inside the unit. Namely the usual way is to recover the master clock from incoming SPDIF or AES/EBU digital signal when the unit is used with digital input enabled. Such solution will almost always introduce more jitter in the signals going to DAC chips compared to one box solutions.

Luckily Behringer has chosen to use Crystal CS8420 Digital Audio Sample Rate Converter in such mode that in addition to resapling all incoming digital signal streams to 24bit 96kHz signal streams it also reclocks the data stream coming out of the Crystal chip with the help of one master clock, NOT the usual PLL recovered clock.

Studying the DCX2496 showed that the master clock in the unit is realized with a very common method of using an oscillator built around 74HCU04 inverter and uses a frequency of 24.576 MHz. So to upgrade the unit one 24.576 low jitter master clock is needed. Yes, but that's not all. Digging some more inside the unit shows that the DAC and ADC chips actually use different clock frequency, namely it is exactly the 24.576 MHz clock divided by ½, so a 12.288 MHz.

With the help of Guido Tent we found a solution by using a custom version of his XO2 master clock.

What is needed to get the job done !

First of all, some frightening words.

- Do not attempt the mod by yourself if you do not have at least some years of experience on soldering and basic electronics.
- Use common sense and preferably precautions for ESD as all of the electronics inside the DCX unit are ESD sensitive.
- The authors of this document are not responsible for any damage to the unit caused by the attempt of modifications on the unit.

List of items needed for the modification described in this paper.

- **Special version of XO2 clock for Behringer DCX2496 from TentLabs**
- Phillips type screwdriver
- Needle nose pliers
- Wire cutters
- Soldering iron with preferably quite small tip
- Unsoldering pump
- Glasses if you wear them, we are dealing with very small stuff here ☺

Getting started.

Step 1.
Open the top cover of the unit…

The picture below shows the DSP board. This is the one we have to remove to make the modification described below.

Attention: Behringer has been very fond of a hot glue gun, so all the connectors are hot glued. I used needle nose pliers to SLOWLY and CAREFULLY remove the glue. Take your time. It is all too easy to bend the pcb board too much and damage the unit!!!

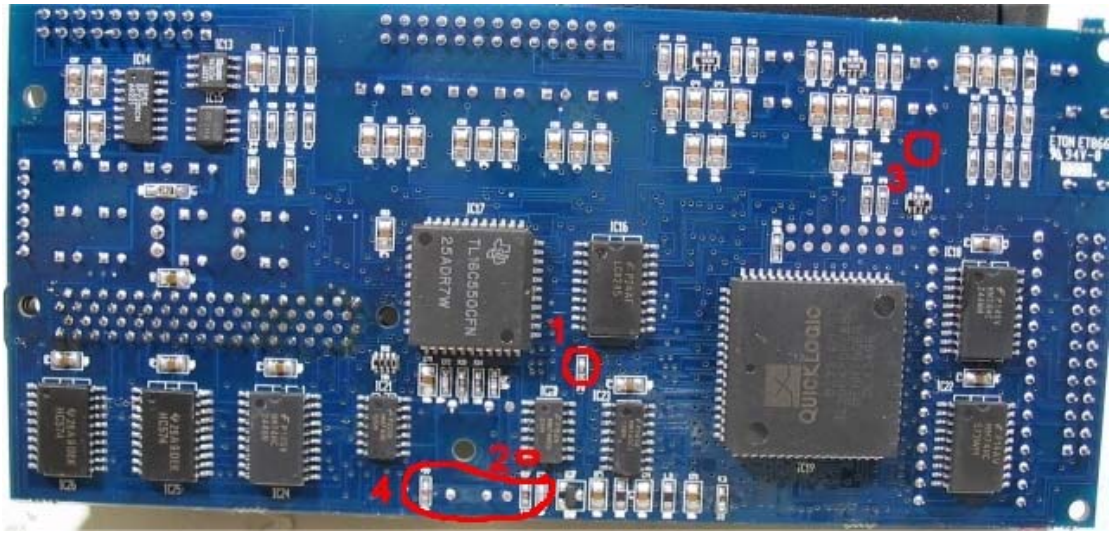
When the glue is removed disconnect all the connectors.

There are 4 screws holding the board in place – unscrew those and slowly lift the board out.

Take care handling the board. Preferably hold it only from edges and try to avoid touching the components on board – this is needed for protection against ESD.

Step 2.

Take a look at the underside of the board. On the picture below I have marked the spots where one has to perform some work to install the clock.



- The red circle marked **1** - it is needed to remove resistor R33 (22 ohm) and to solder the “+” output of 24.576 MHz clock signal from XO2 to the upper soldering pad.
- The red circle marked **2** - one needs to solder the “–“ output of 24.576 MHz clock signal from XO2 to the pin 7 (GND) of IC20
- The red circle marked **3** – one needs to cut the trace, clean part of the trace remaining and to solder the “+” output of ½ clk signal coming from XO2
- The red circle marked **4** – one has to remove capacitors C76 and C77 and a quartz Q3.

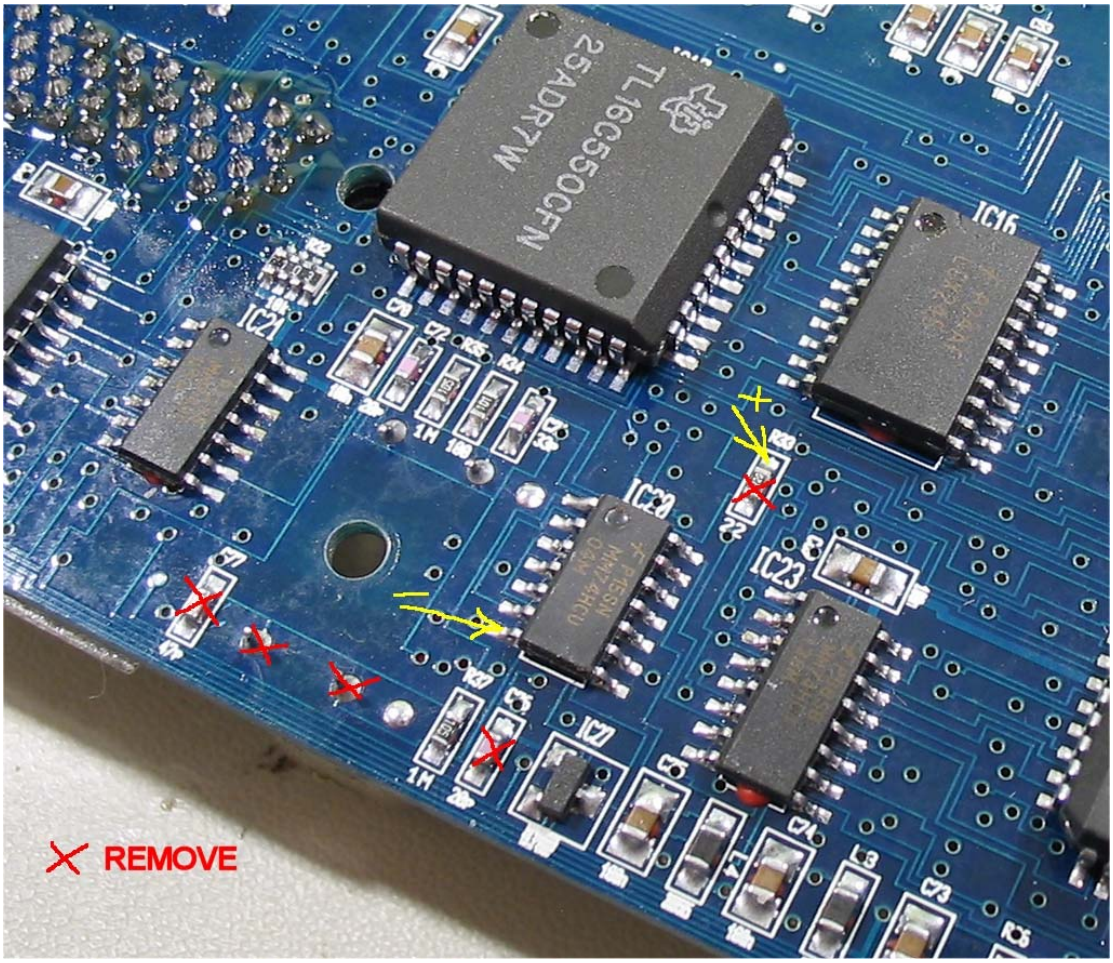
Now continue to Step 3 only if you are 100% sure that you can do the job! If not seek for someone with enough experience who would do it for you.

Step 3.

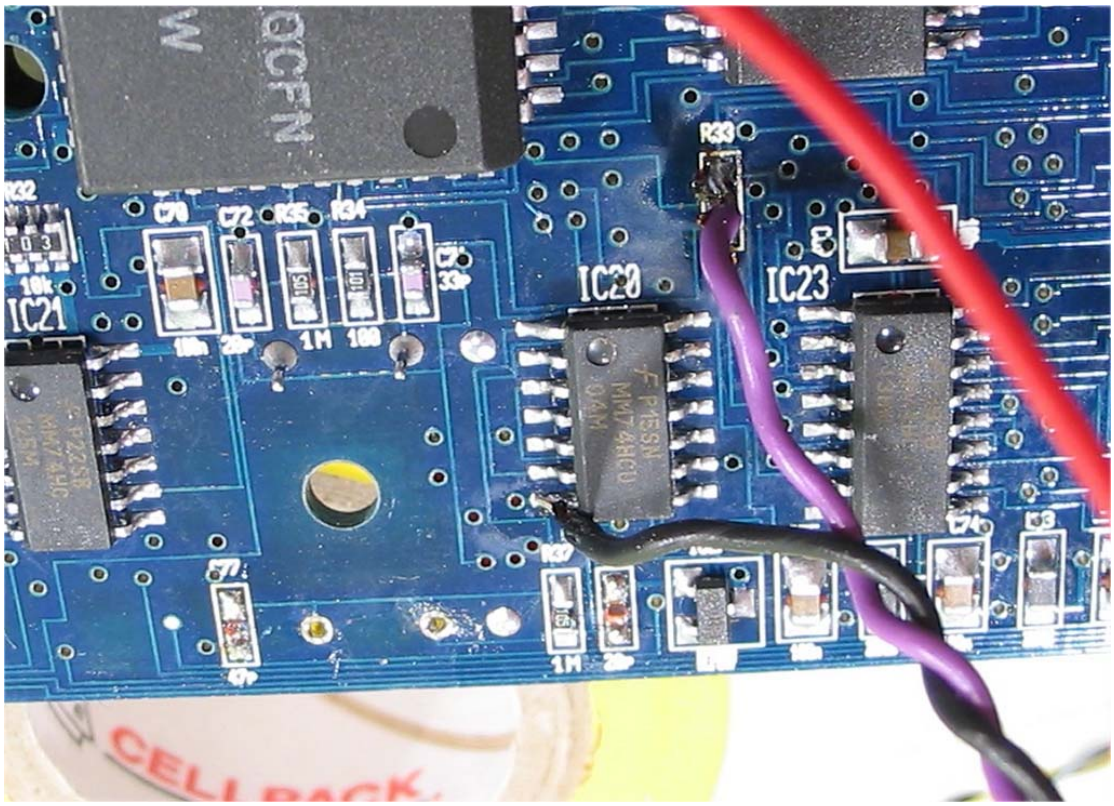
Remove all the components marked with X

Use unsoldering pump to unsolder the crystal Q3. Take notice that the crystal is also soldered to ground on the top side of the board!

Now connect the “CLK OUT1” twisted wires so that the “+” wire goes to the top solder pad of R33 and the “-“ wire goes to pin 7 of IC20 as shown by yellow arrows on the image below.



This is how the work this far should look like, or something similar at least ☺

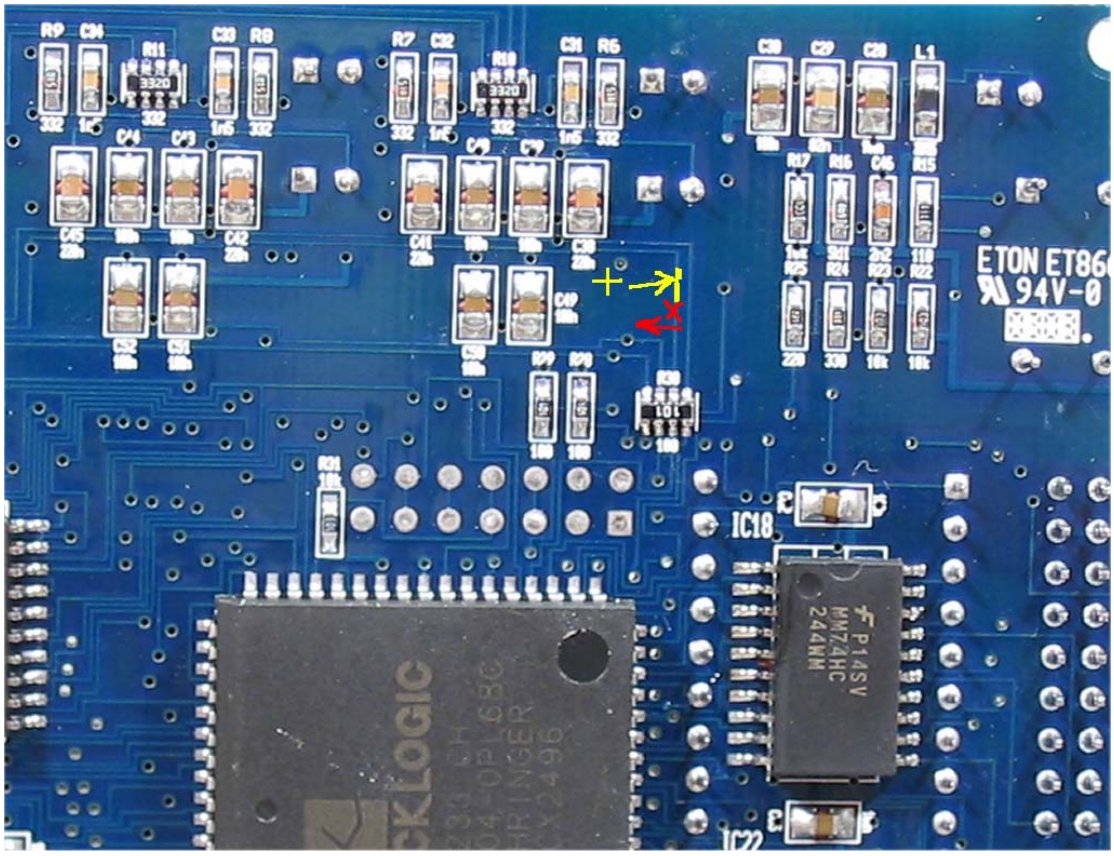


Step 4.

This step is the most trickiest to do. The pcb trace that we need is marked with yellow stripe. One has to cut the trace marked by X. Use a sharp knife or similar to do it and it is suggested that the cut is made in a direction of the red arrow. This way there is less danger of damaging the trace running on the right of the one to be cut.

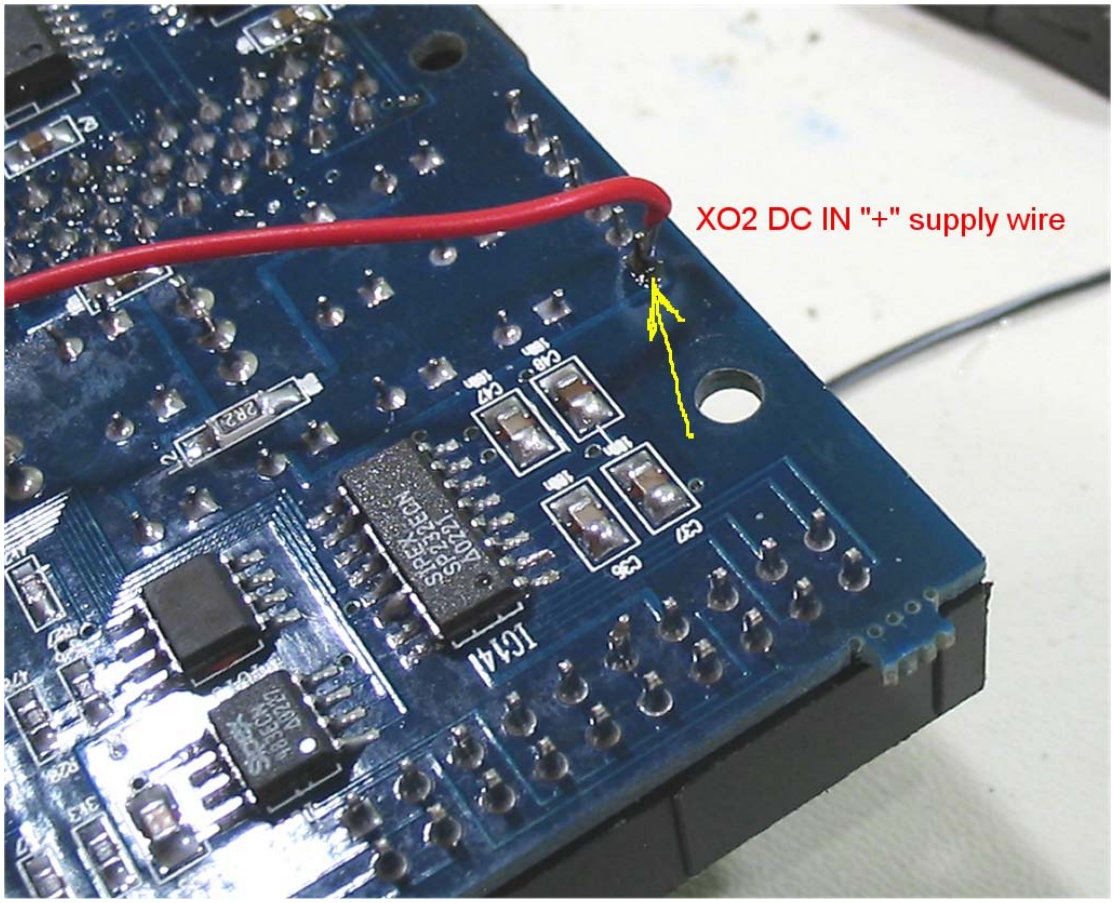
When the trace is cut clean the upper part of the remaining trace carefully with the tip of knife and put some flux and pre solder it. Now connect the “+” wire from CLK OUT ½ to this point

The “-“ wire that is twisted around the “+” wire will not be connected in this end to avoid ground loops. Turn the “-“ wire back a little and put some heat shrinking tube on it or tape it.

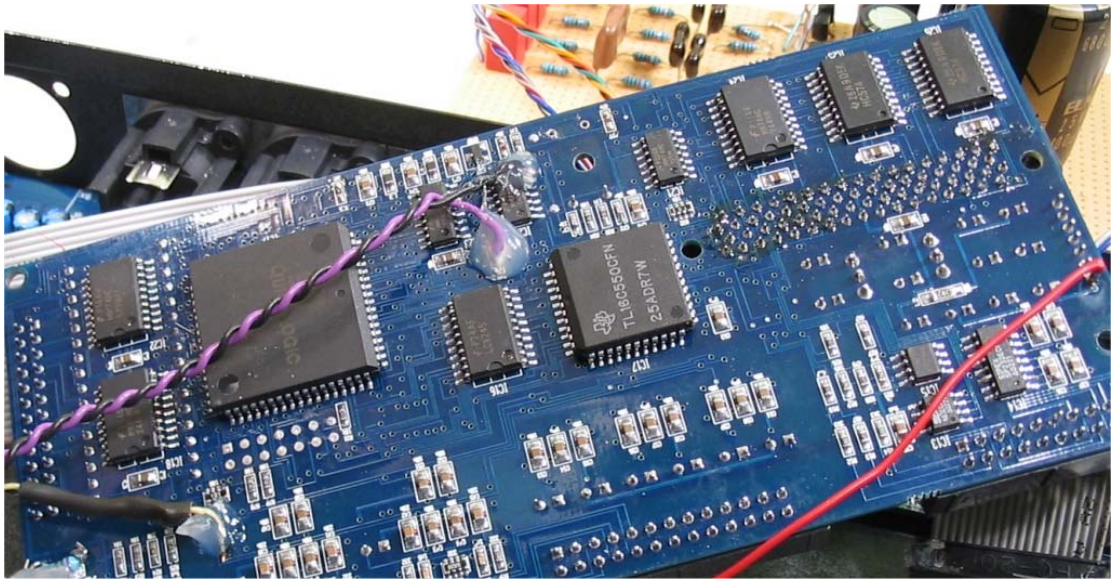


Step 5.

Connect the DC IN “+” wire from XO2 to pin1 in power connector (analog +15V)



This is how it should look like after the steps 3, 4 and 5 are done.



Step 6.

Figure out a physical mounting of XO2 module.

I chose 2 threaded spacers for screw mounting and two plastic spacers.
PS. (I replaced all the spacers of DSP board also as I was not happy with the quality of those)

Step 7.

The modification work is now done. It can all be put together again ☺

PLEASE, check and recheck everything very carefully before final assembly!

If all looks OK the unit is ready for power up.

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If the unit powered up OK and the sound is coming out of the speakers – **Congratulations** ☺ Go get a glass of wine and have a listen.

Conclusion.

The modification done is most worthwhile and I hope you agree by now.

Thank you goes to Guido Tent for supplying the XO2 and for support.

The initial modification presented here was done by Ergo in Tallinn, Estonia on the 27th of August 2004.

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