USB-Delay device

USB-Delay is a unit used to examine at which time a person notices and react to a time delay on USB devices. The system also consists of a software that makes it possible to carry out tests on the time delay effect.

USB-Delay is serial connected between the device selected and a computer. The time delay is set in milliseconds with three individual knobs. Sampling frequency in USB HID (Human interface devices) specification is 100 Hz which means a sample is captured each 10 ms.

Due to this sampling polling rate in regular USB HID communications (when the mouse is connected directly to the PC) exists a delay time since a movement is produced until the data is polled for the PC. Depending in which moment during the polling waiting period the movement is produced the delay can go from 0 to 10 milliseconds.

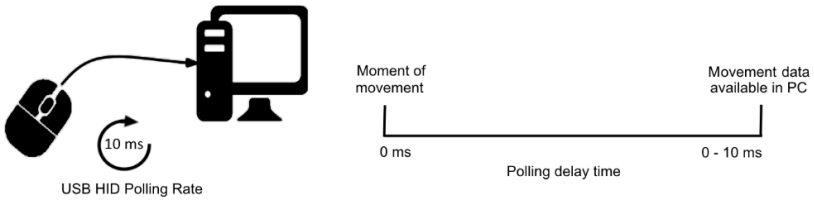

***Figure 1**: Normal USB mouse polling timing*

Using the USB-delay device the polling delay will be double than in the previous case due to 2 communications are made in series.

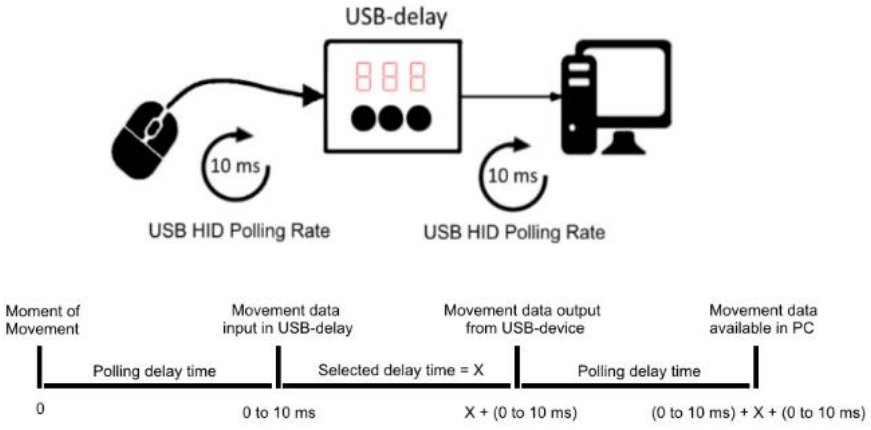

***Figure 2**: USB pooling timing using USB-delay*

The final delay formula using the USB-delay will be: **(0-20 ms) + selected delay (0-999 ms).**

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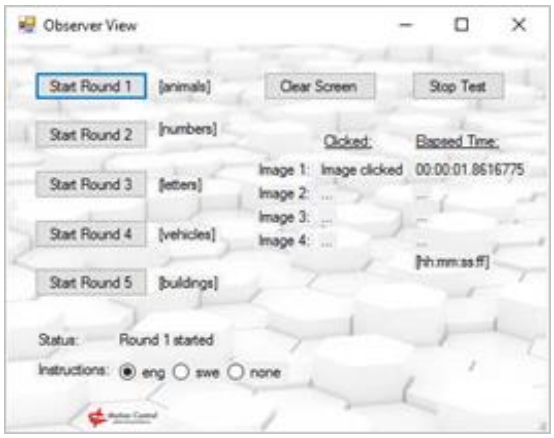
USB-Delay device

The software consists of two main windows. One window presents a visual test procedure to the test person, the second window allows controlling the test procedure and display performance data from the test person. The software makes an image appear on the screen that the test person is supposed to click. The test consists of five rounds, and there are four different pictures per round. The desired delay time is set before each round, and the test person makes simultaneously notes how they experience the delay. Each image is shown for a period three seconds with a three second downtime before next image appears. The collected data can then be analyzed together with the notes, and the maximal accepted delay time can be determined.



Controlpanel software *Test persons view*

Figure 3: *Software interface*

Device specifications:

Hardware:

Size	125 x 103 x 48,8 (61,2 knobs included) mm
Weight	~ 290 g
Connection to computer	USB-B
Connection to USB device	USB-A
Display	3 digits, 7-segment LED
Power supply	Via USB
USB Spec	1.0
USB protocol	HID
Polling rate	10 milliseconds
Measuring range	0 to 999 ms
Delay error	From 0 to 5 ms – error ±33% From 6 to 30 ms – error ±3% From 31 to 999 ms – error ±0.5%

Software:

System requirements	Windows 7/8/10
Program size	3,1 Mb
Programming language	C#
Number of rounds	5 different themes with 4 images each
Number of views	2 pcs; Operator and test person

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