

Dynamic BG removal filter  
 From application note Xylinx #ref  
 24 bits data input and output  
 The k factor is  $1/65536$  (16 bit are added to the accumulator)  
 That give a time constant for 192kHz sampling rate (input clock)  
 of 2.35s for reach 1/1000 error  
 $RC = T_{ss} \cdot k = 5.21e-6 \cdot 65536 = 0.341s$   
 For 0.1% error (1/1000),  $t = RC \ln 0.001 = 2.36s$   
 For 0.06 ppm error (24 bits),  $t = RC \ln 0.06e-6 = 5.7s$

This function take 138 LE  
 Compiled the 06/04/2017 Quartus 9.1

The autozero minimum time for each sampling rate (48k,96k and 192kHz)  
 to reach the 24bits accuracy is  
 $RC@48k = 1.36s$   
 $RC@96k = 0.683s$   
 $RC@192k = 0.341s$   
 For 0.06 ppm error (24 bits),  $t = 1.36 \ln 0.06e-6 = 22.6s @ 48kHz$   
 For 0.06 ppm error (24 bits),  $t = 0.683 \ln 0.06e-6 = 11.35s @ 96kHz$   
 For 0.06 ppm error (24 bits),  $t = 0.341 \ln 0.06e-6 = 5.7s @ 192kHz$   
 With a clock of 375ms period (50MHz/16750000), we need an integer number  
 of period for each calibration time  
 $64 \cdot 0.375s = 24s (48kHz) // 32 \cdot 0.375s = 12s (96kHz) // 16 \cdot 0.375s = 6s (192kHz)$   
 The 50MHz main input clock must be divided by 16 750 000 to get a 0.375ms period signal.

The CAL input allow to perform DC offset calibration by activating the HPF filter  
 only for a period of calibration time of 6,12 or 24s depending on active sampling rate. When this time is reached,  
 the final DC value is memorized and HPF is turned off.

