Generating a switching signal pattern for Skynet Spectrometer

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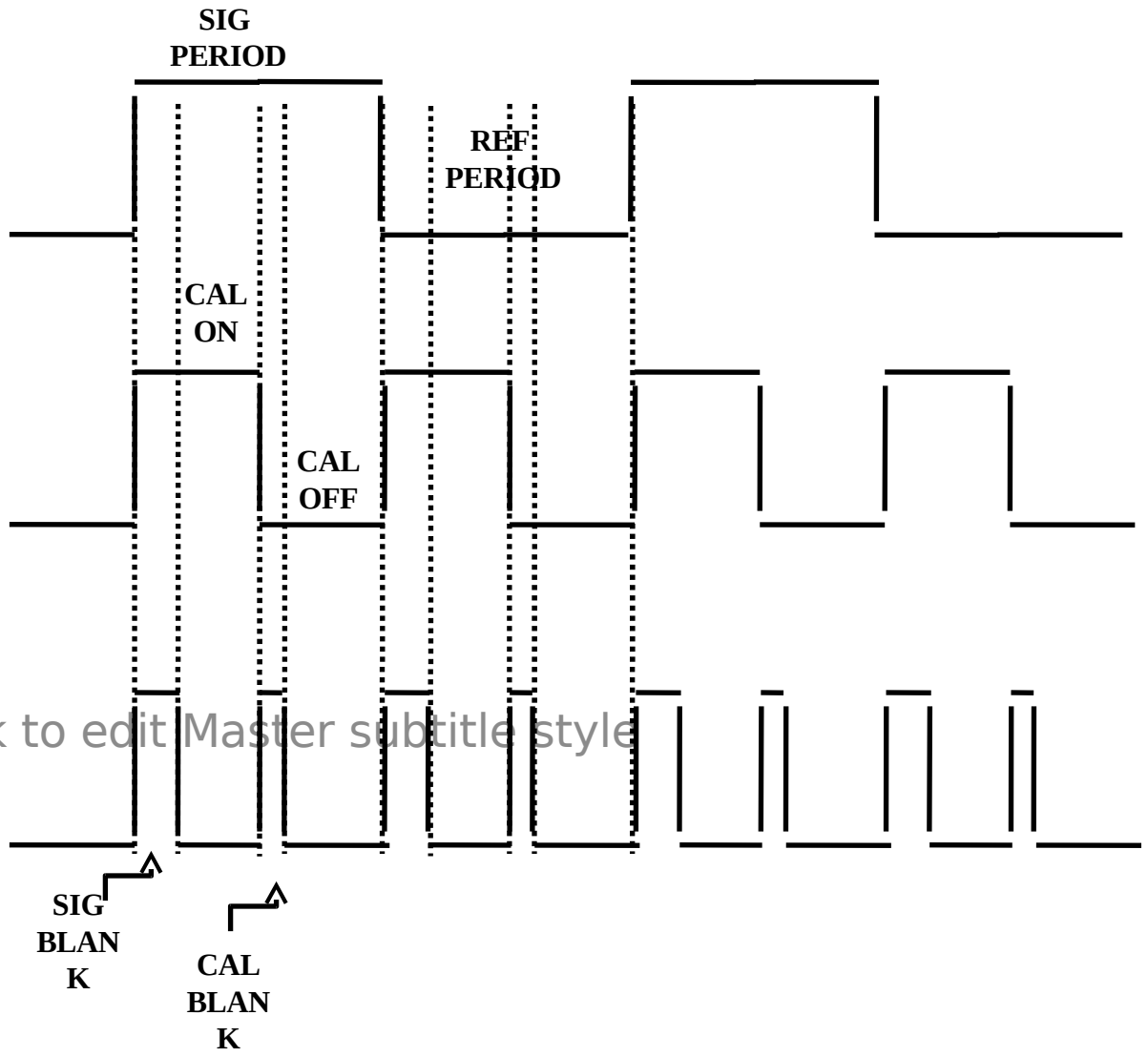

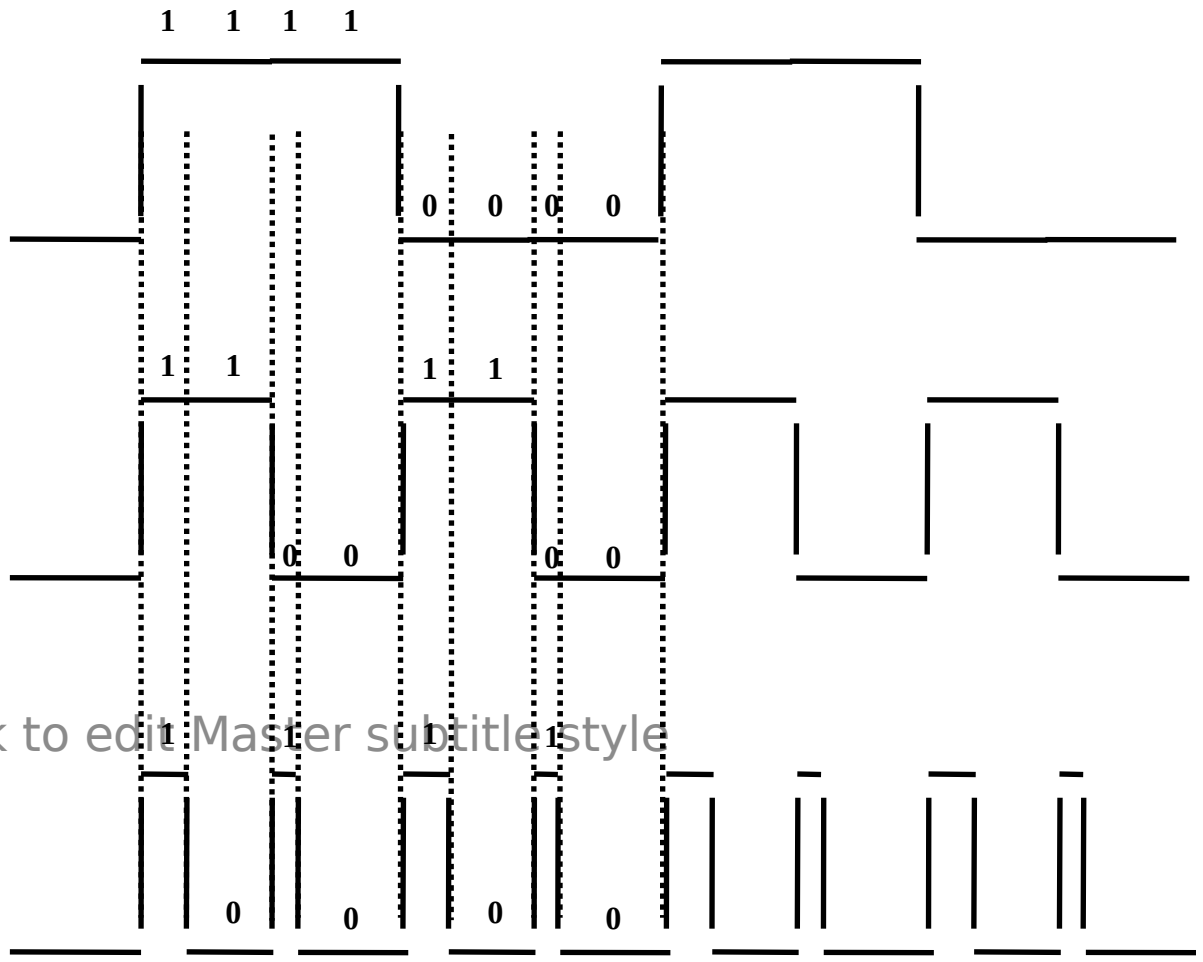

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In this project, Tcy is fixed to be 8 ns which is 125 MHz.

Spectral Period (SP)= 1024/4= 256 Tcy = 2.048e-06 s

Assuming this are the requirements for the switching signal pattern:
CAL ON=0.5 s and CAL OFF=0.5s
SIG =1 s and REF = 1s
SIG BLANK = 40 msec
CAL BLANK = 2 msec

Calculating the values of the above parameters in terms of spectral period times powers of 2 . This might have a slight effect on the parameters.

The result will be:

CAL BLANK = 2.097152 ms = 1024 SP
SIG BLANK = 33.554432 ms = 16384 SP
CAL ON = 0.536870912 s = 262144 SP
CAL OFF = 0.536870912 s = 262144 SP
SIG = 1.073741824 s = 524288 SP
REF= 1.073741824 s = 524288 SP

So the total period of one switching cycle is about 2.14 s.

State Changes			No. of spectral period cycles required for the corresponding state change
SIG	CAL ON	SIG BLANK ON	16384
SIG	CAL ON	SIG BLANK OFF	262144-16384=245760
SIG	CAL OFF	CAL BLANK ON	1024
SIG	CAL OFF	CAL BLANK OFF	262144-1024=261120
REF	CAL ON	SIG BLANK ON	16384
REF	CAL ON	SIG BLANK OFF	262144-16384=245760
REF	CAL OFF	CAL BLANK ON	1024
REF	CAL OFF	CAL BLANK OFF	262144-1024=261120
TOTAL SPECTRAL PERIOD CYCLES			**1045876**

State Changes in terms of Bits			Values that is to be written in to the BRAM Addresses
1	1	1	16384*32+7=524295
1	1	0	245760*32+6=7864326
1	0	1	1024*32+5=32773
1	0	0	261120*32+4=8355844
0	1	1	16384*32+3=524291
0	1	0	245760*32+2=7864322
0	0	1	1024*32+1=32769
0	0	0	261120*32+0=8355840

Number of state changes = Number of BRAM Locations.
Number of spectral period cycles for a state change is multiplied with a number 32 to do a shifting which takes care of the cal/sig/blank duration and adding the equivalent decimal value of the state change gives us the binary representation of SIG/CAL/BLANK signals.

Sample Code to write these values in to the Look up Table BRAM:

```
import struct

fpga.write('SSG_BRAM',struct.unpack('>L',524295),offset=4*0)
fpga.write('SSG_BRAM',struct.unpack('>L',7864326),offset=4*1
)
fpga.write('SSG_BRAM',struct.unpack('>L',32773),offset=4*2)
fpga.write('SSG_BRAM',struct.unpack('>L',8355844),offset=4*3
)
fpga.write('SSG_BRAM',struct.unpack('>L',524291),offset=4*4)
fpga.write('SSG_BRAM',struct.unpack('>L',7864322),offset=4*5
)
fpga.write('SSG_BRAM',struct.unpack('>L',32769),offset=4*6)
fpga.write('SSG_BRAM',struct.unpack('>L',8355840),offset=4*7
)



fpga.write_int('SSG_LENGTH',1048576)
fpga.write_int('SSG_LENGTH',256)
```