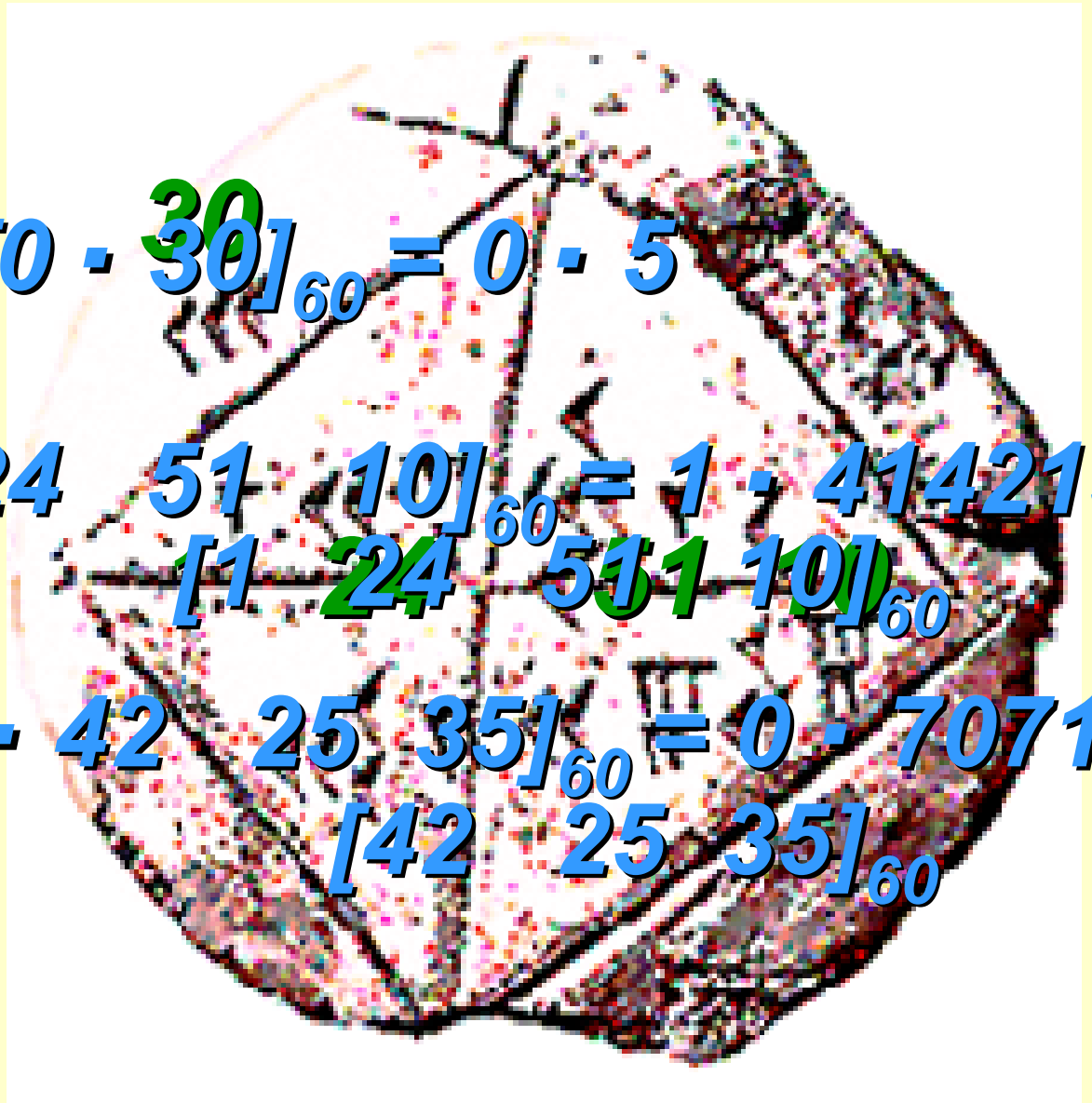
Babylon



$[0 \cdot 30]_{60} = 0 \cdot 5$

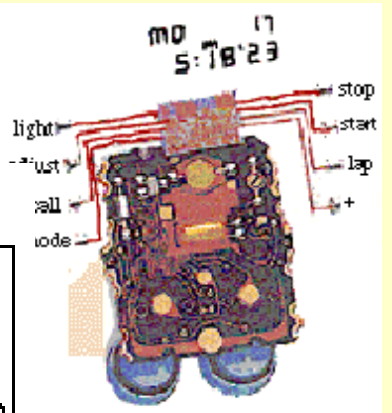
$[1 \cdot 24\ \ 51\ \ 10]_{60} = 1 \cdot 414213\ldots$

$[1\ \ 24\ \ 51\ \ 10]_{60}$

$[0 \cdot 42\ \ 25\ \ 35]_{60} = 0 \cdot 707106\ldots$

$[42\ \ 25\ \ 35]_{60}$

Digital Watch



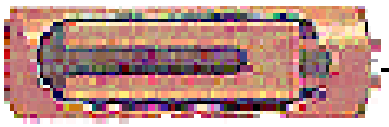
Heures Minutes Secondes

hd[7] hu[7] md[7] mu[7] sd[7] su[7]

Dec7 Dec7 Dec7 Dec7 Dec7 Dec7

hd[4] hu[4] md[4] mu[4] sd[4] su[4]

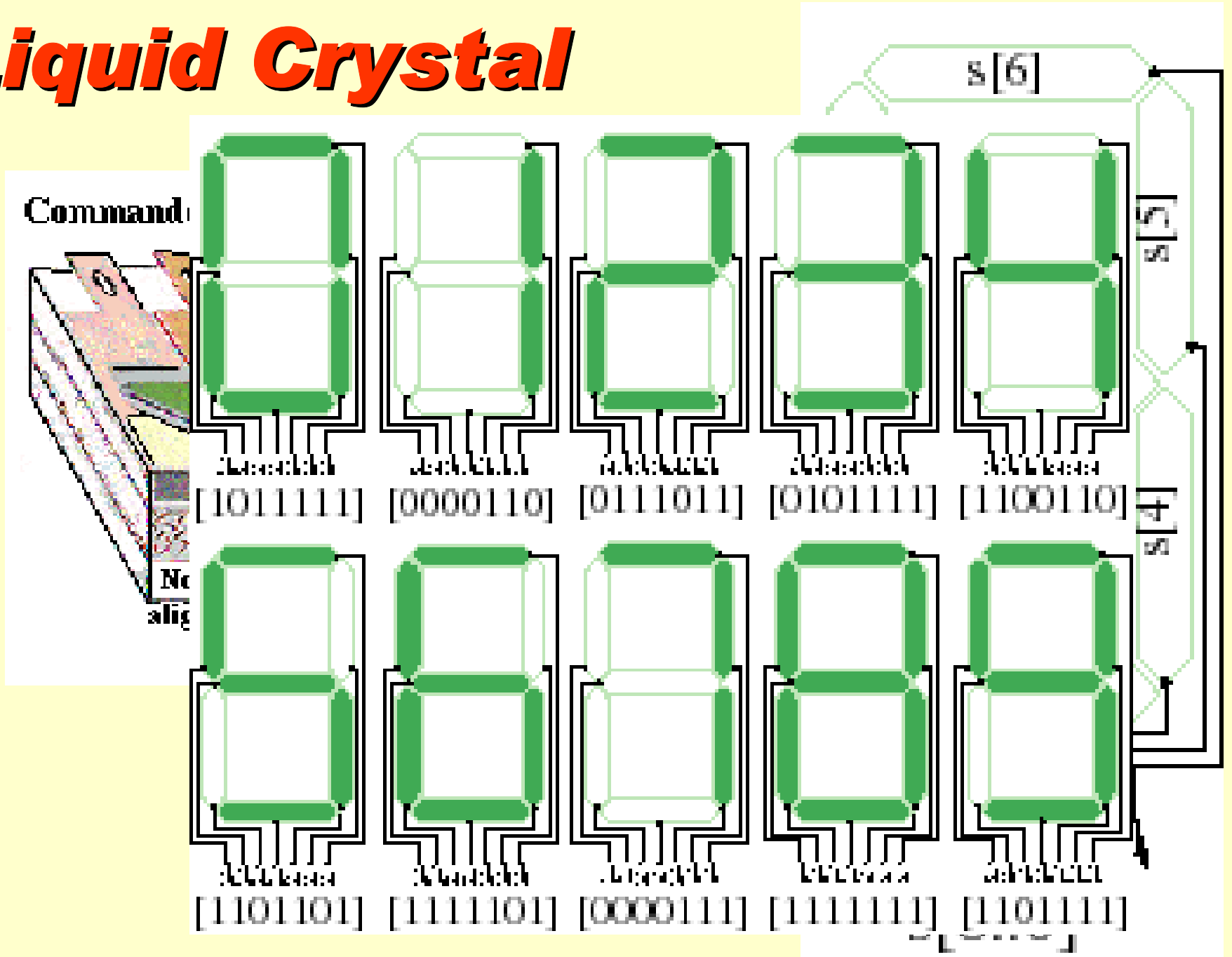
DCCM24 hr DCCM60 mn DCCM60



clk 1024Hz CM1024 sec

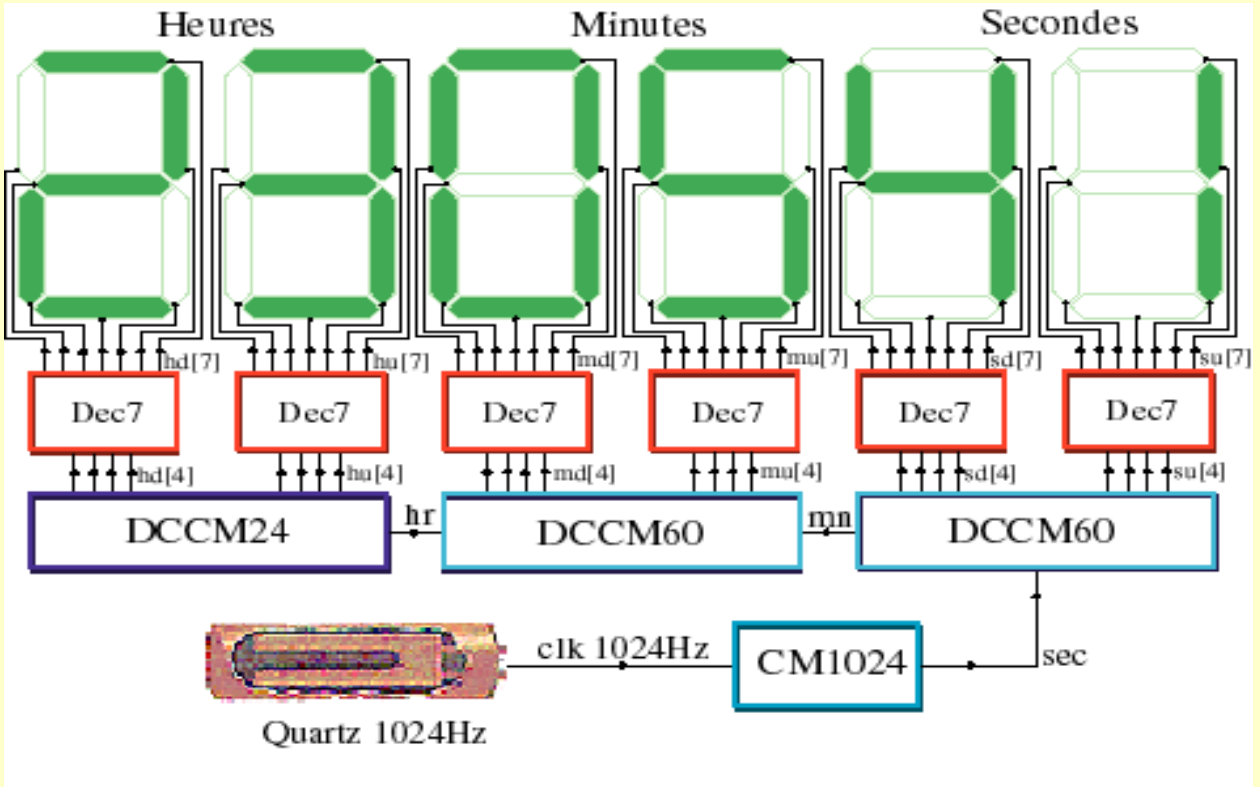
Quartz 1024Hz

Liquid Crystal



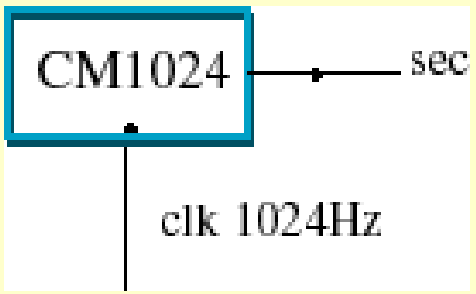
Digital Watch: Structure

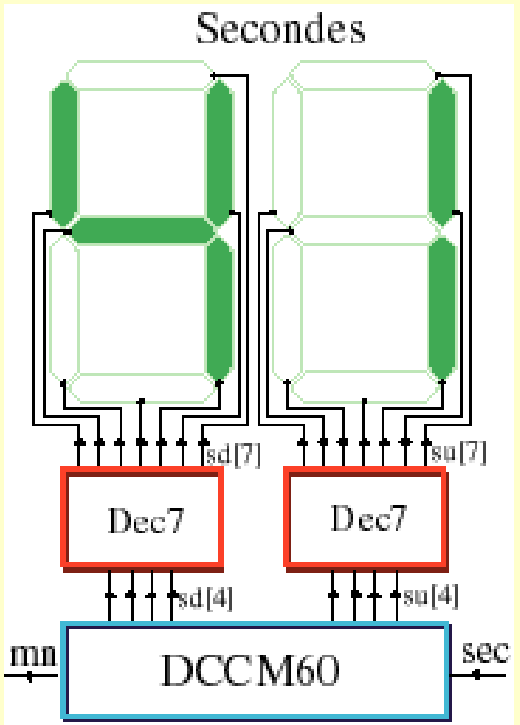
```
fun Montre()=(Six7Segs:net[7][6], day:net)
{
// Divides quartz frequency by 1024
   sec = CM1K();
  (DCB[0],DCB[1],mn) = CM60(sec);
  (DCB[2],DCB[3],hr)   = CM60(mn);
  (DCB[4],DCB[5],day) = CM24(hr);
  // Decode from Binary Coded Decimal
  // to 7 segment display
  for (k<6)
    Six7Segs[k]  = Decode7segs(DCB[k]);
}
```

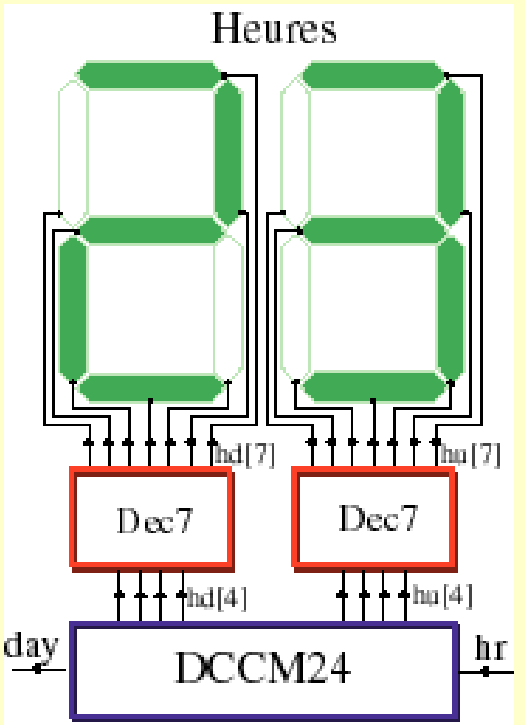


Digital Watch: Components

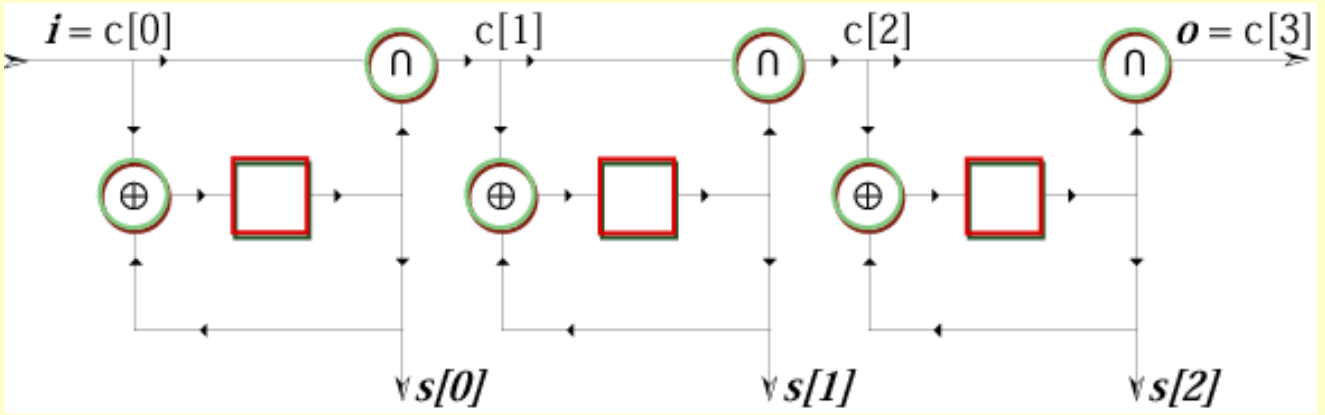
1. Counter Modulo 1024: CM1024
2. Counter Modulo 60: DCCM60
3. Counter Modulo 24: DCCM24
4. Seven Segment Decode: DEC7





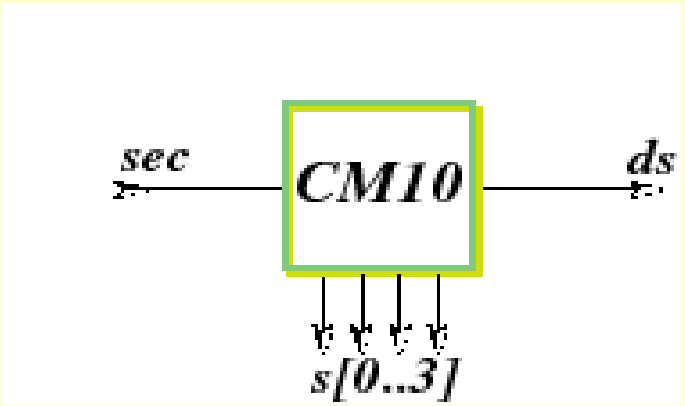


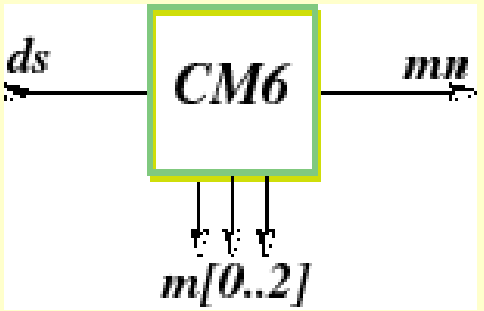
Binary Counter

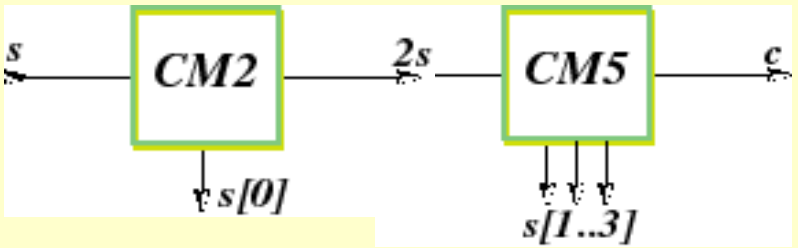


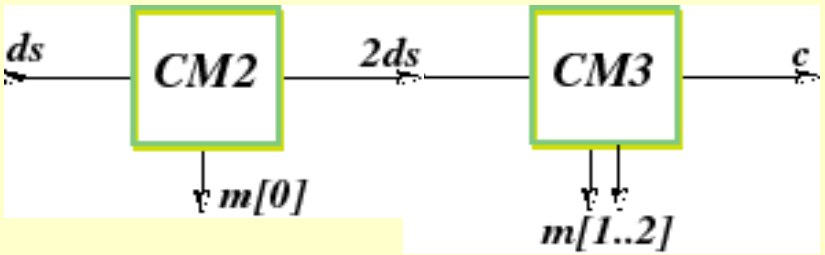

```
// Binary n bit counter
fun Counter(n:int)(incr:net)= (s:net[n], ovfl:net)
{
  c[0]=incr;   // carry in
  ovfl=c[n];   // carry out
  for (k<n) {
    s[k] = reg(s[k] ^ c[k]);
    c[k+1] = s[k] & c[k];
     }
}
```

Counter Modulo 60



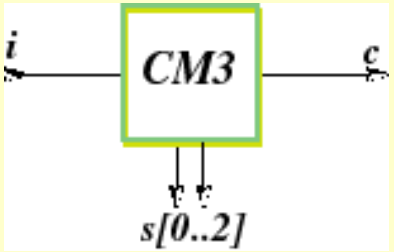




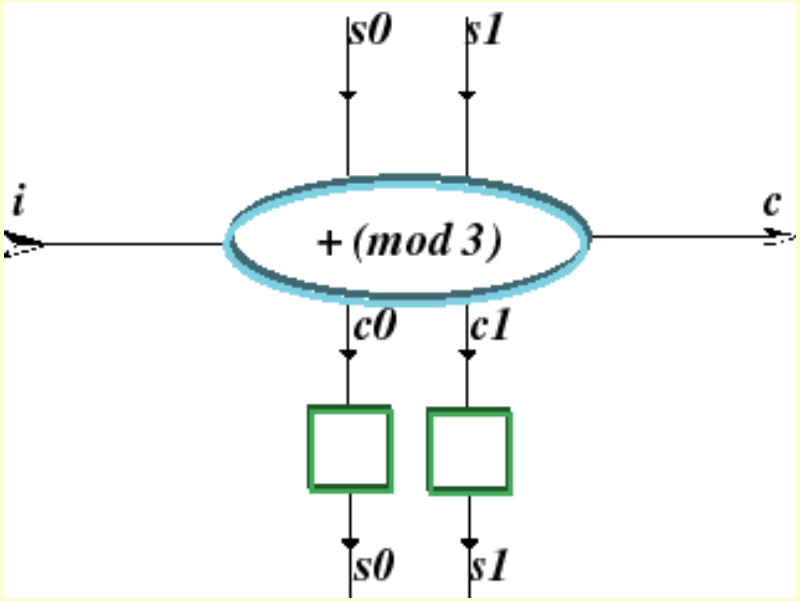


1. Counter Modulo 2: CM2
2. Counter Modulo 3: CM3
3. Counter Modulo 5: CM5

Counter Modulo 3



$$i+s_0+2s_1 = c_0+2c_1 \pmod 3$$



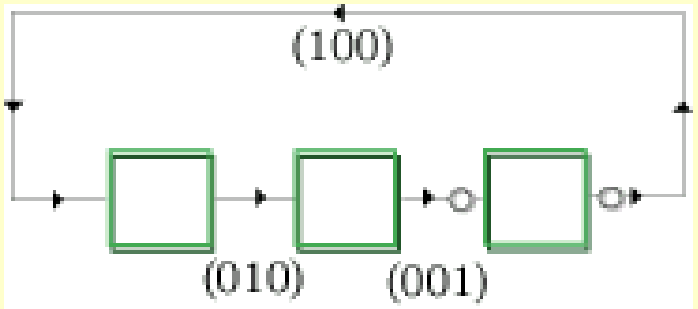
$$c_0 = (1-i)s_0+i(1-s_0)(1-s_1)$$

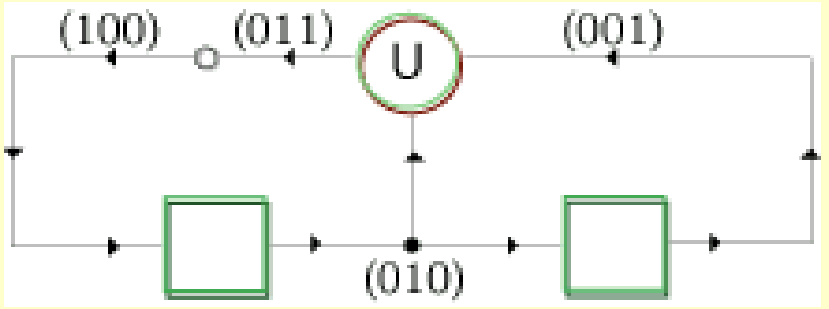
$$c_1 = (1-i)s_1+i\ s_0\ (1-s_1)$$

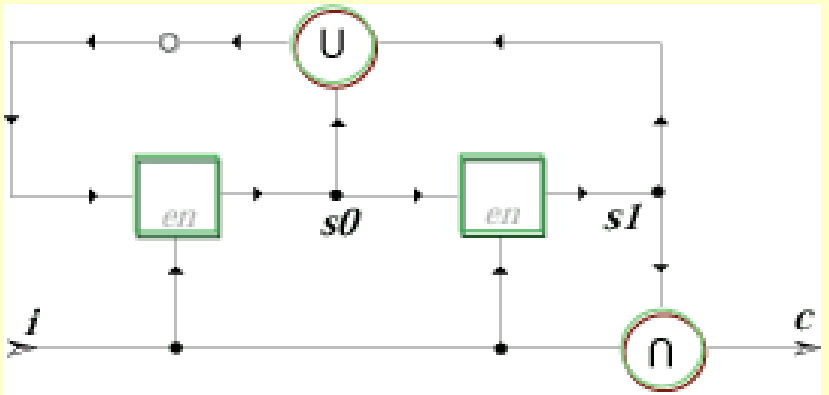
$$c = i\ s_1$$

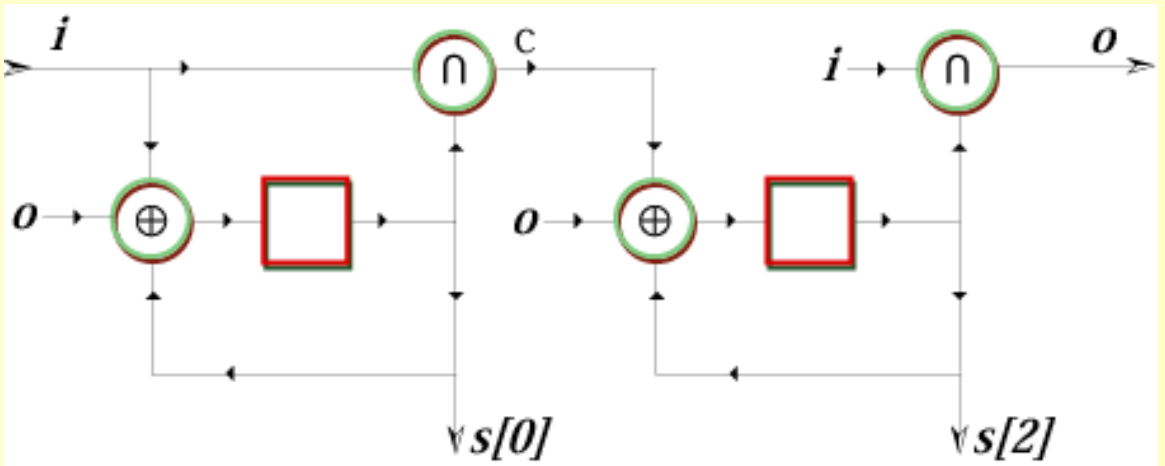
i	s[0]	s[1]	c[0]	c[1]	c
0	0	0	**0**	**0**	**0**
0	1	0	**1**	**0**	**0**
0	0	1	**0**	**1**	**0**
0	1	1	*	*	*
1	0	0	**1**	**0**	**0**
1	1	0	**0**	**1**	**0**
1	0	1	**0**	**0**	**1**
1	1	1	*	*	*

Counters Modulo 3

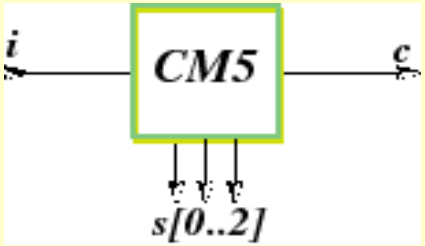






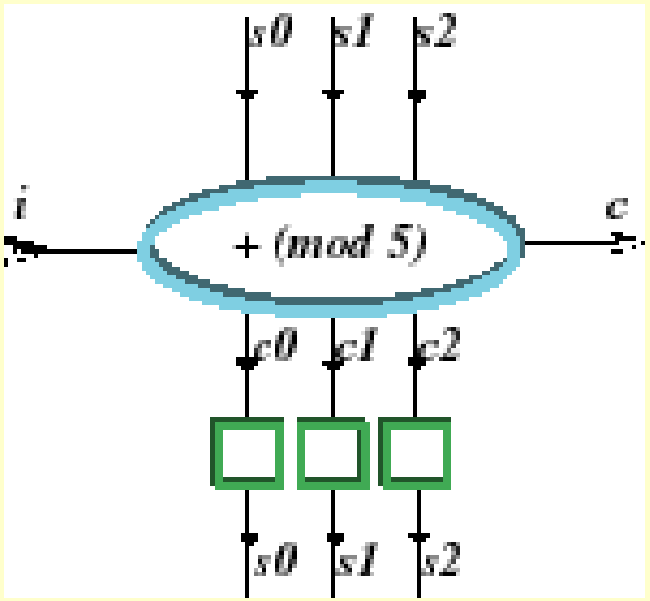


Counter Modulo 5



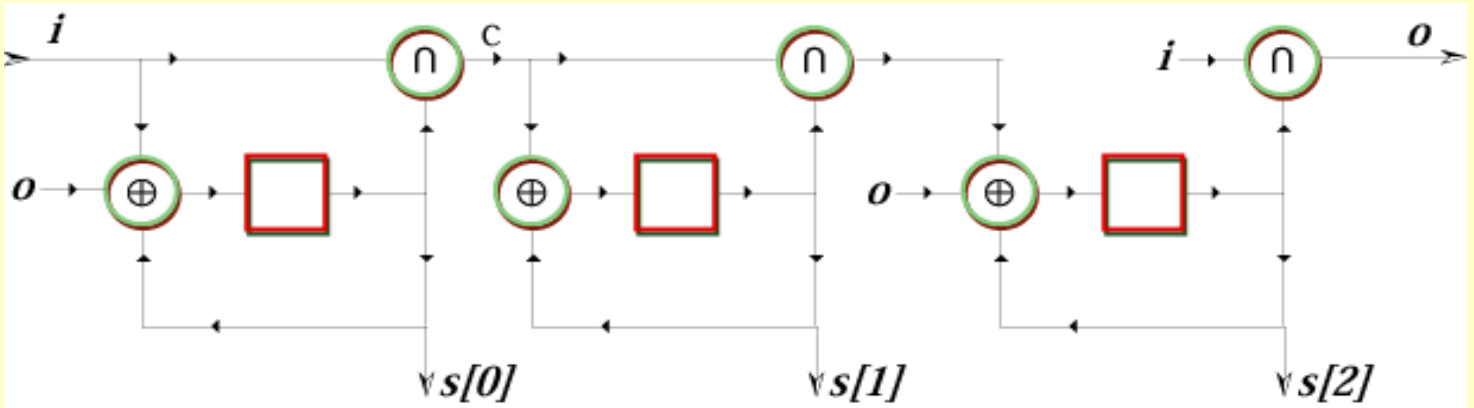
$i+s_0+2s_1+4s_2 = c_0+2c_1+4c_2 \pmod 5$

$c = i\ s_2$



i	s[0]	s[1]	s[2]	c[0]	c[1]	c[2]	c
0	0	0	0	0	0	0	0
0	0	0	1	0	0	1	0
0	0	1	0	0	1	0	0
0	0	1	1	*	*	*	*
0	1	0	0	1	0	0	0
0	1	0	1	*	*	*	*
0	1	1	0	1	1	0	0
0	1	1	1	*	*	*	*
1	0	0	0	1	0	0	0
1	0	0	1	0	0	0	1
1	0	1	0	1	1	0	0
1	0	1	1	*	*	*	*
1	1	0	0	0	1	0	0
1	1	0	1	*	*	*	*
1	1	1	0	0	0	1	0
1	1	1	1	*	*	*	*

Counter Modulo 5



Seven Segments Code

B	b[0]	b[1]	b[2]	b[3]	s[0]	s[1]	s[2]	s[3]	s[4]	s[5]	s[6]
0	0	0	0	0	1	0	1	1	1	1	1
1	1	0	0	0	0	0	0	0	1	1	0
2	0	1	0	0	0	1	1	1	0	1	1
3	1	1	0	0	0	1	0	1	1	1	1
4	0	0	1	0	1	1	0	0	1	1	0
5	1	0	1	0	1	1	0	1	1	0	1
6	0	1	1	0	1	1	1	1	1	0	1
7	1	1	1	0	0	0	0	0	1	1	1
8	0	0	0	1	1	1	1	1	1	1	1
9	1	0	0	1	1	1	0	1	1	1	1
10	0	1	0	1	1	1	1	1	1	1	1
11	1	1	0	1	1	1	0	1	1	1	1
12	0	0	1	1	1	1	0	1	1	1	1
13	1	0	1	1	1	1	0	1	1	1	1
14	0	1	1	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	0	1	1	1	1