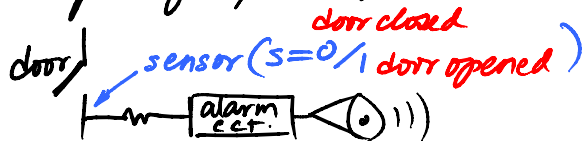


## 5.1-2 Storage elements (aka sequential circuit)

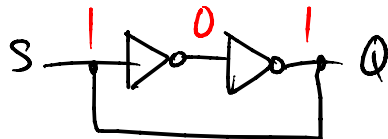
Combinational circuit: a logic ckt. in which the outputs depend only on the present (current) values of the inputs

Sequential circuit: a logic ckt. in which the outputs depend on both the present and the previous values of the inputs

example of a stored state

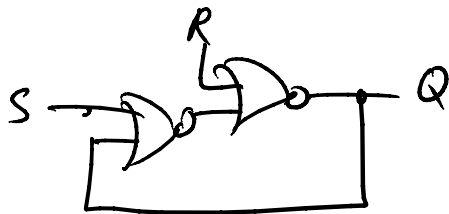


We need to store ( $S=1$  when the door is opened) and hold that value until the system has been reset.



→ ability to store a value

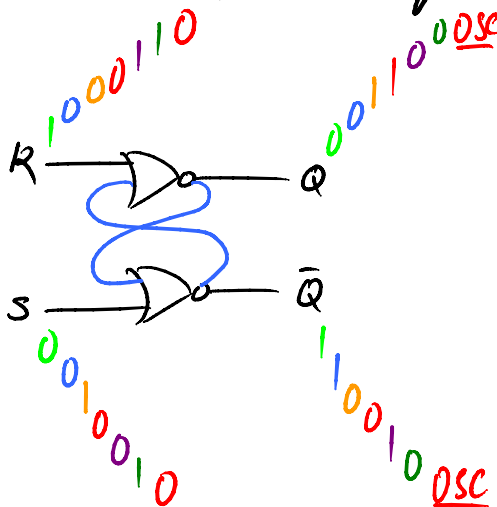
→ but doesn't allow the value to change



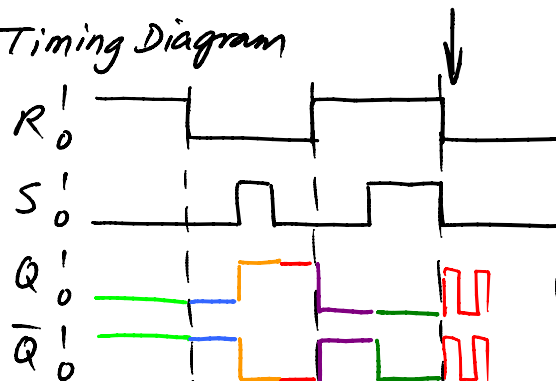
Operation:

1. We reset the system ( $R=1$ )  $\Rightarrow Q=0$  (at this moment  $S=0$ )
2. Let  $R=0$  (system is now armed)  $Q=0$
3. open the door ( $S=1$ )  $Q=1$  alarm!
4. Close the door ( $S=0$ )  $Q=1$

R-S Latch (cross-coupled NOR gates)



Timing Diagram



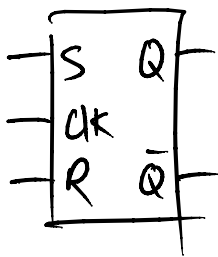
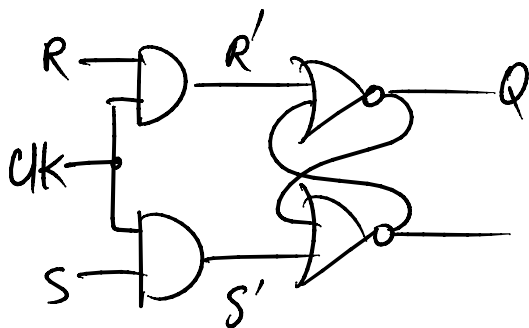
must a void  
 $R=S=1$   
condition

depending on which (R or S)  
reacts first.

Truth Table	S	R	Q	$\bar{Q}$	
	0	0	x	x	(store previous value)
	0	1	0	1	reset
	1	0	1	0	set
	1	1	0	0	(do not use)

} Able to change values

## Gated SR latch



Note: Setting  $clk=0$ ,  $R'=S'=0$

clk	S	R	Q(t+1)	
0	x	x	Q(t)	(store old value)
1	0	0	Q(t)	(S'=R'=0)
1	0	1	0	(reset)
1	1	0	1	(set)
1	1	1	?	(do not use)

## (NAND gates) Gated SR latch

