8254 (8253) Programmable Interval Timer

8254 generates accurate time delays & can be used for applications such as a real-time clock, an event counter, a digital one shot, a square wave generator, and a complex waveform generator.

The 8254 includes 3 identical 16 bit counters that can operate independently in any one of the six modes. It is a packaged in a 24 ~~dip~~ pin DIP and requires a single +5V power supply.

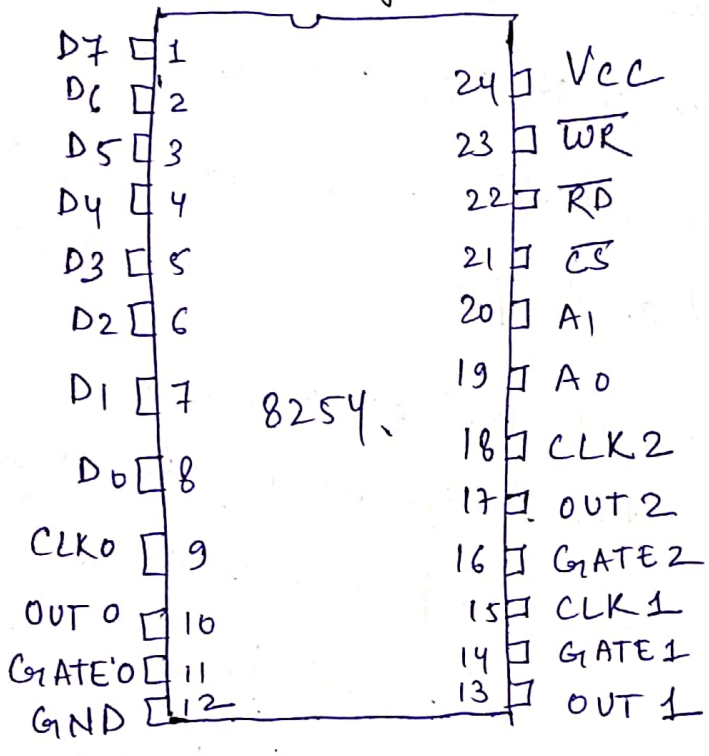
To operate a counter, 16 bit count is loaded in its register & on command, begins to decrement the count until it reaches 0. At the end of the count, it generate a pulse that can be used to interrupt the MPU.

The 8254 is an upgraded version of 8253, & they are pin compatible. The features of these two devices are almost identical except that.

1) 8254 can operate with higher clock frequency range (DC to 8MHz & 10MHz for 8254-2) & the 8253 can operate with clock frequency from DC to 2MHz.

2) the 8254 includes a status Read-Back Command that can latch the count & the status of the counters.

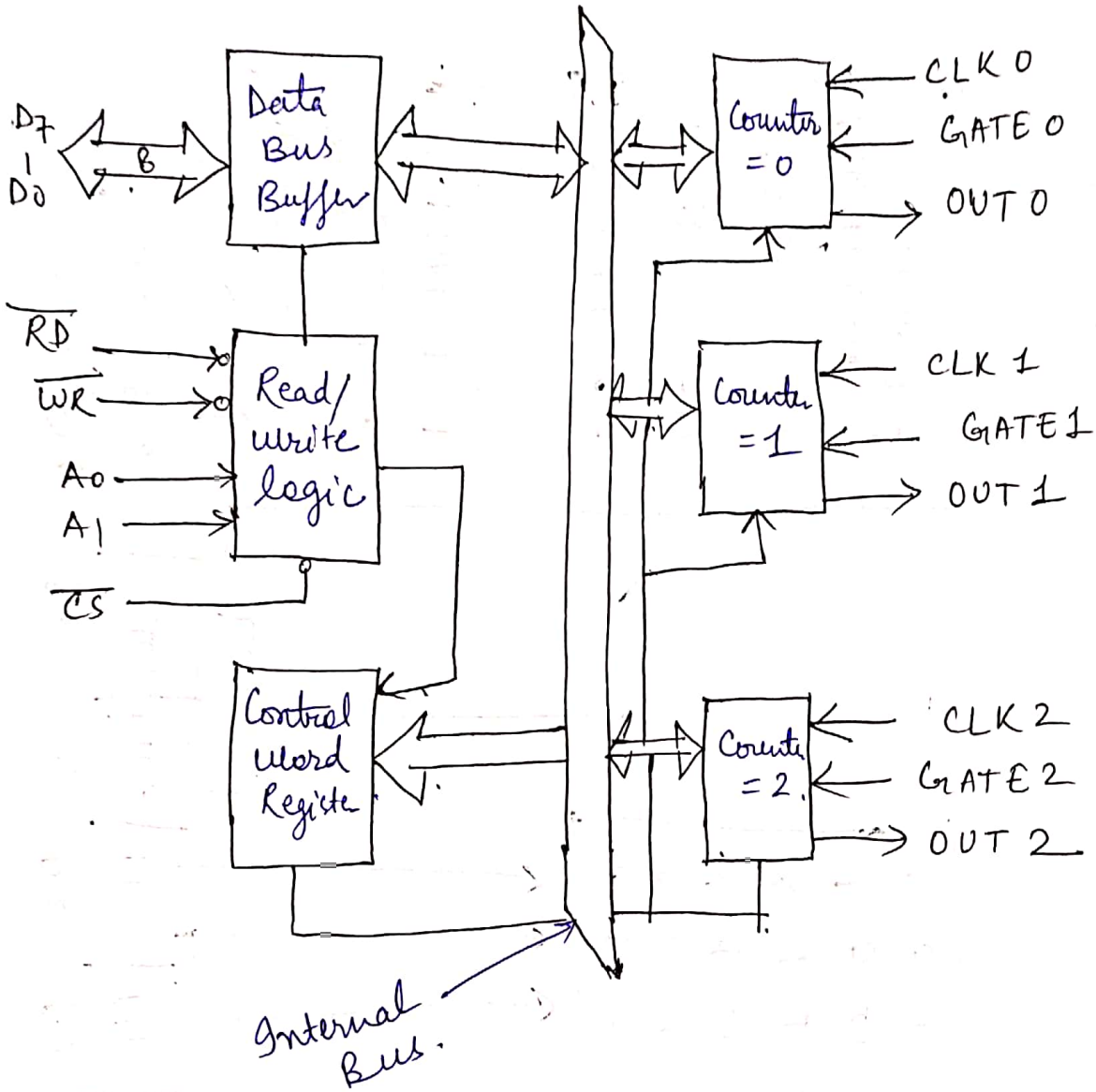
Pin diagram



Block diagram of the 8254

It includes three Counter (0, 1 & 2), a data bus buffer, Read/write control logic, & a control register. Each Counter has two input signals — clock (CLK) & gate & one output signal — OUT.

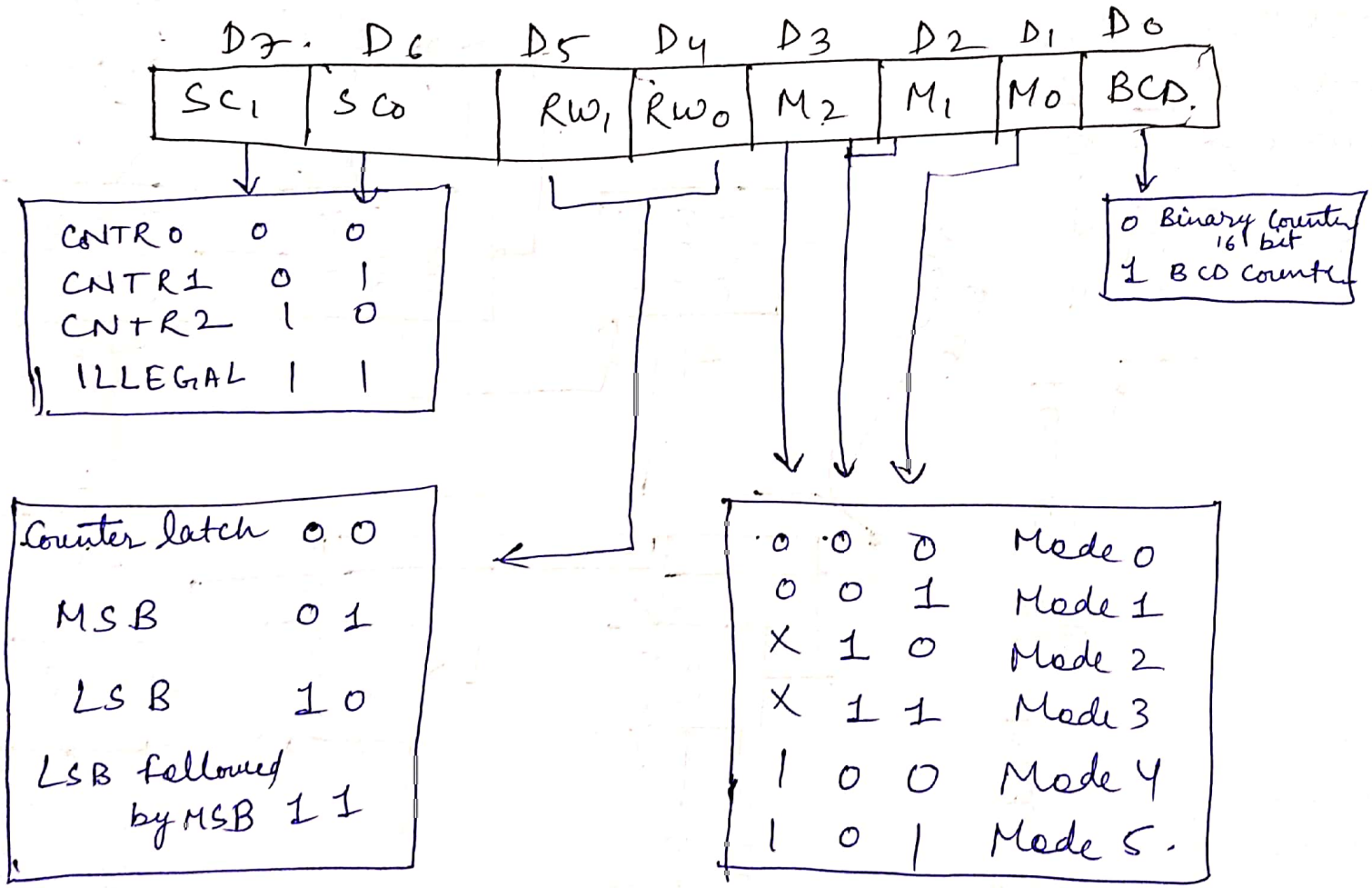
Block diagram



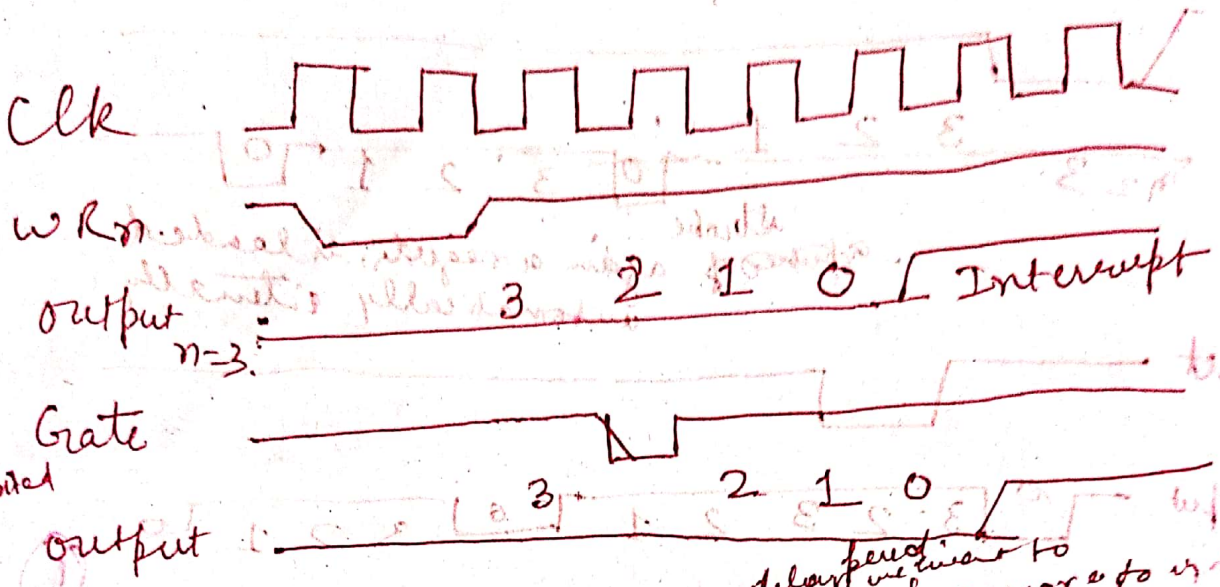
Addressing & format of Mode Control Register

$\overline{CS}$	A_1	A_0	Reg.
0	0	0	Counter 0
0	0	1	Counter 1
0	1	0	Counter 2
0	1	1	Control Register.

PTO

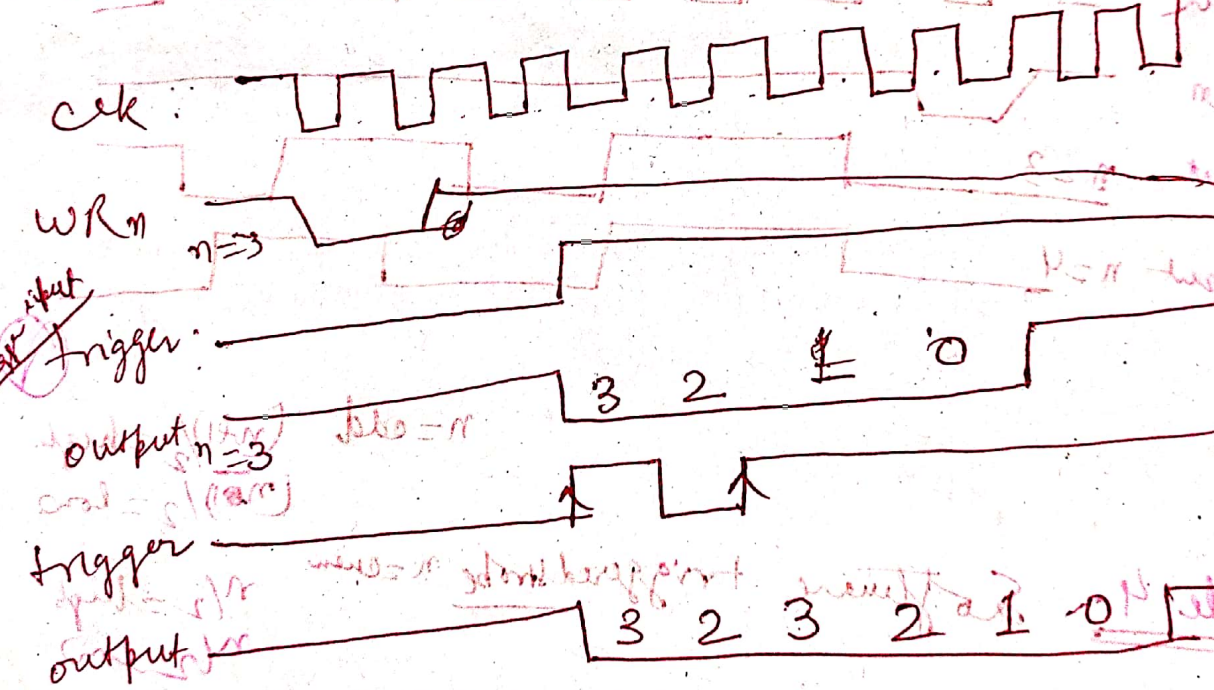


Mode 0:- Interrupt on terminal Count:

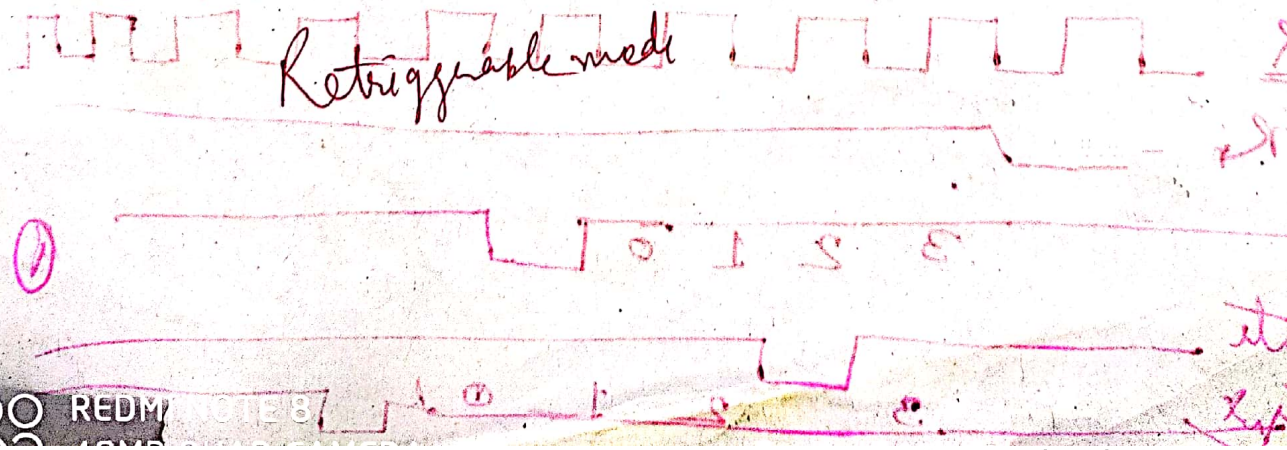


Application :- to generate delay equivalent to ... microprocessor ...

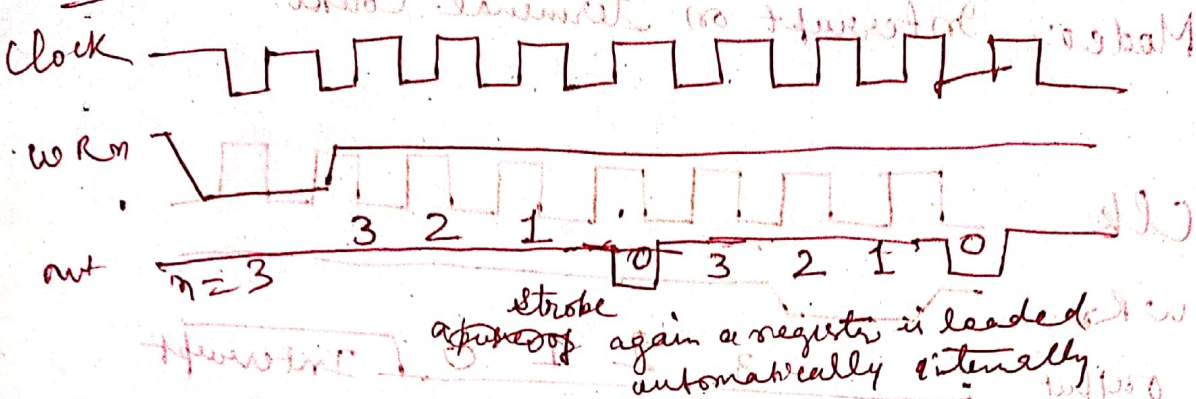
Mode 1. Hardware Retriggerable one-shot

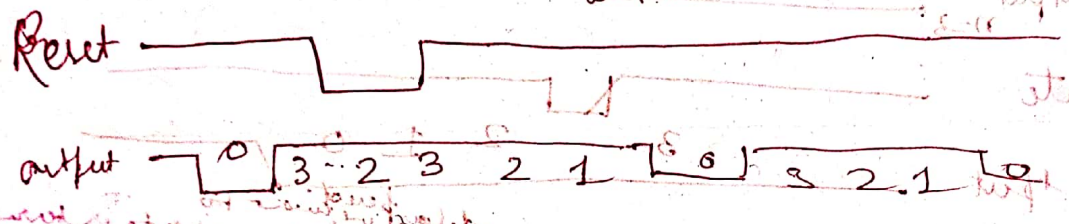


Retriggerable mode

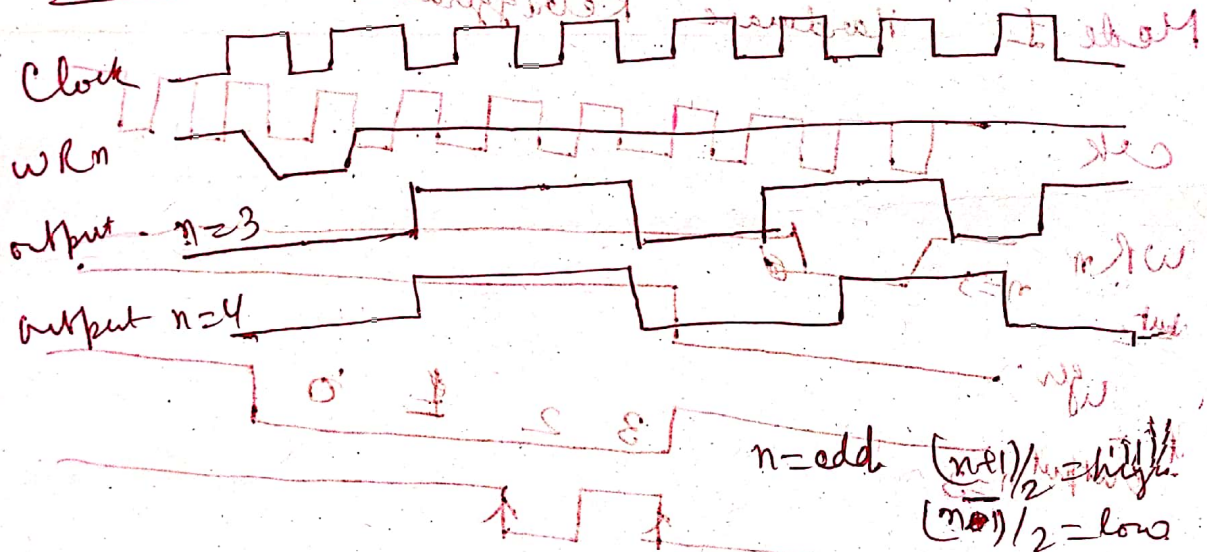


Mode 2 Rate generator

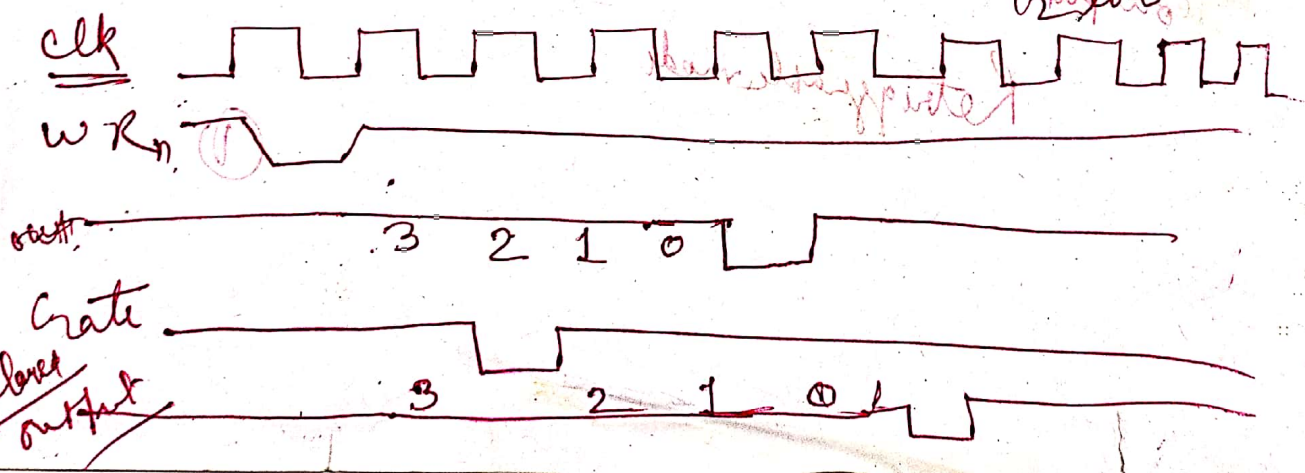




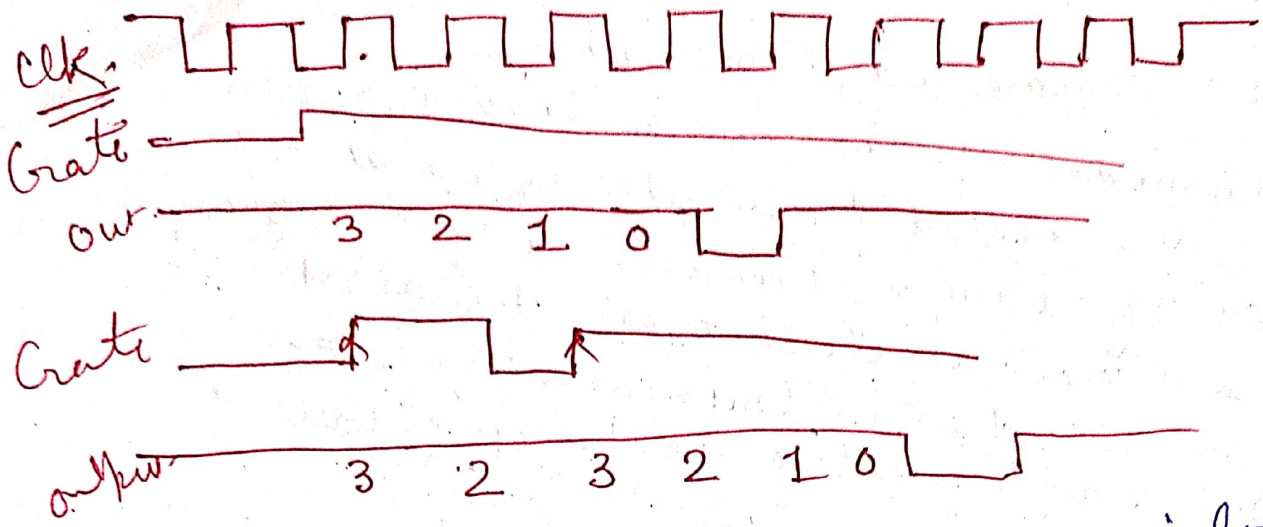
Mode 3 Square wave generator



Mode 4. Software triggered strobe



Mode 5 Hardware triggered strobe.



Mode 0 → In this mode, initially the OUT is low. Once a count is loaded in the register, the counter is decremented every cycle. & when count reaches zero, the out goes high this can be used as an interrupt the OUT remains high until a new count or command word is loaded. fig. also shows that the count is temporarily stopped when the gate is disabled & continued when the gate is at logic 1.

Mode 1 In this mode OUT is initially high. when the gate is triggered OUT goes low and at the end of count OUT goes high again, thus generating a one shot pulse.

Mode 2 this mode is used to generate a pulse equal to the clock period at a given interval. when a count is loaded, the out stays high until the count reaches 1 & OUT goes low for one clock period. the count is reloaded automatically, & the pulse is generated continously. the count 1 is illegal in this mode.

Mode 3 Square wave generator.

In this mode when a count is loaded, the OUT is high; the count is decremented by two at every clock cycle & when it reaches zero, the OUT goes low & the count is reload again. this is repeated continously thus a continous square wave with period equal to the period of count is generated.

Mode 4 → In this mode the OUT is initially high it goes low for one clock period at the end of the count, the count must be reloaded for subsequent outputs.

Mode 5 This mode is similar to Mode 4, except that it is triggered by rising pulse at the gate. Initially, OUT is low & when the gate pulse is triggered from low to high, the count begins, at the end of count, the OUT goes low for one clock period.