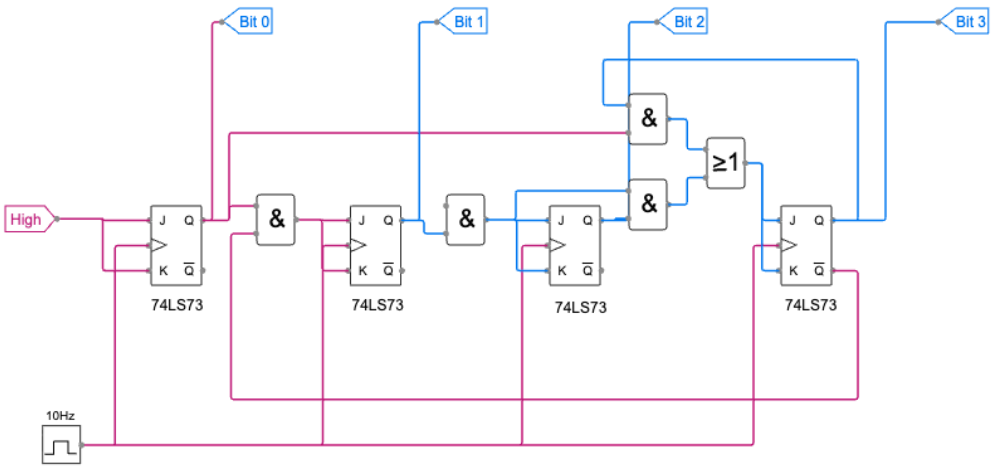
Decade Counter

4-bit Synchronous Counter

A 4-bit **decade** synchronous counter can also be built using synchronous binary counters to produce a count sequence from 0 to 9. A standard binary counter can be converted to a decade (decimal 10) counter with the aid of some additional logic to implement the desired state sequence. After reaching the count of “1001”, the counter recycles back to “0000”. We now have a decade or Modulo-10 counter.



Triggering A Synchronous Counter

Synchronous Counters use edge-triggered flip-flops that change states on either the “positive-edge” (rising edge) or the “negative-edge” (falling edge) of the clock pulse on the control input resulting in one single count when the clock input changes state.

Generally, synchronous counters count on the rising-edge which is the low to high transition of the clock signal and asynchronous ripple counters count on the falling-edge which is the high to low transition of the clock signal.

Synchronous Counter Summary

summarise some of the main points about Synchronous Counters:

- Synchronous Counters can be made from Toggle or D-type flip-flops.
- Synchronous counters are easier to design than asynchronous counters.

- They are called synchronous counters because the clock input of the flip-flops are all clocked together at the same time with the same clock signal.
- Due to this common clock pulse all output states switch or change simultaneously.
- With all clock inputs wired together there is no inherent propagation delay.
- Synchronous counters are sometimes called parallel counters as the clock is fed in parallel to all flip-flops.
- The inherent memory circuit keeps track of the counters present state.
- The count sequence is controlled using logic gates.
- Overall faster operation may be achieved compared to Asynchronous counters.

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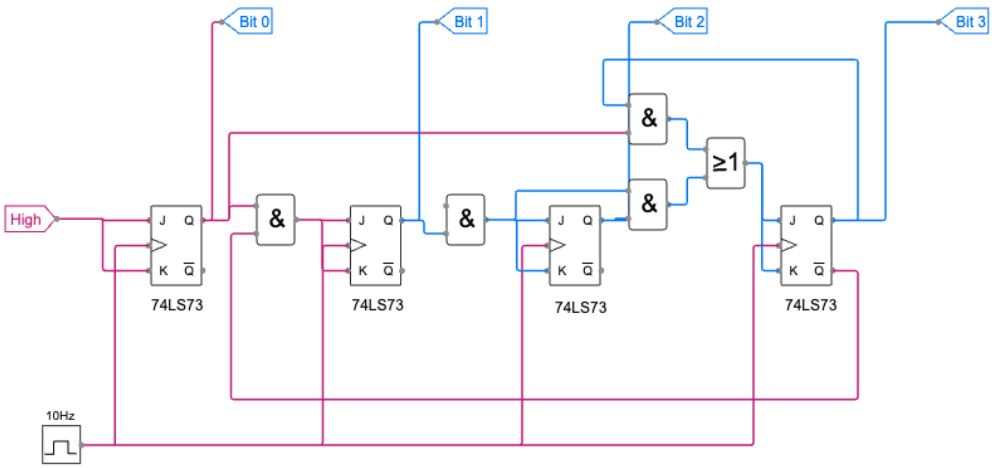

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