# Timing Devices

1.

A device used to count the input clock pulses at regular interval ($\delta t$) of time is known as timing device. These counts are both stored and incremented on every input pulse. The count register on the output pins store the output bits of the device for a period equal to count which is given as,

$$\text{Time} = \text{Counts} \times \text{Interval}(\delta t)$$

The time interval between two instances for which present count bits and initial counts are read is represented as,

$$\text{Time between two instances} = (\text{Counts} - \text{Initial counts}) \times \delta t$$

The input pin is used to reset i.e., to make all count bits $= 0$ and an output pin is used when all count bits are made equal to 0 after reaching the maximum value i.e., time out on overflow.

## 2. Counting Device

A device used to count the input for the events occurring at either regular or irregular intervals of time is known as counting device. The count represents the number of input events or pulses occurred from its last read. The most commonly used counting device is the free running on blind counting device.

The device employs the concept of blind counting synchronization which makes use of prescaling, compare and capture registers for its operation. The prescaling is used for the clock input pulses, programmed as $P = 1, 2, 4, 8, 16, \ldots$. The compare register compares the counts with the ones preloaded in compare registers on overflow or after the timeout, the output pin contains an output when all count bits equal 0 after achieving a max value. The time interval for which the counter undergoes overflow is,

$$\text{Time for overflow} = P \times 2^n \times t$$

Where,

$$P = 1, 2, 4, 8, 16, \ldots$$
$$\delta t = \text{Regular or irregular interval}$$
$$n = \text{Number of counts.}$$

If all the count bits equal to the count preloaded in the compare register, then an output is enabled at the input pin or a control bit in control register. A status bit or output pin is set in and an event of comparison equality also occurs at the same instant.

It finds its applications in alarm or processor interrupts (at present instance or after preset intervals with respect to another event from another source) and for initiating a sequence of actions.

## 3. Timer Cum Counting Devices

Timer cum counting device is used to count both irregular and regular events occurring at the input port of the device. It is both time and counting device and performs the following two operations.

(i) It counts the inputs occurring due to irregular time intervals and

(ii) It counts clock input pulses occurring at regular intervals of time.

The device functions as either a timer or a counter depending on the input or status bit of a timing device register.

The count designates the number of input events or pulses from its last read. The device consists of an output port for output if all the count bits are made equal to '0', after attaining a condition called overflow interrupts to the processor or timeout.