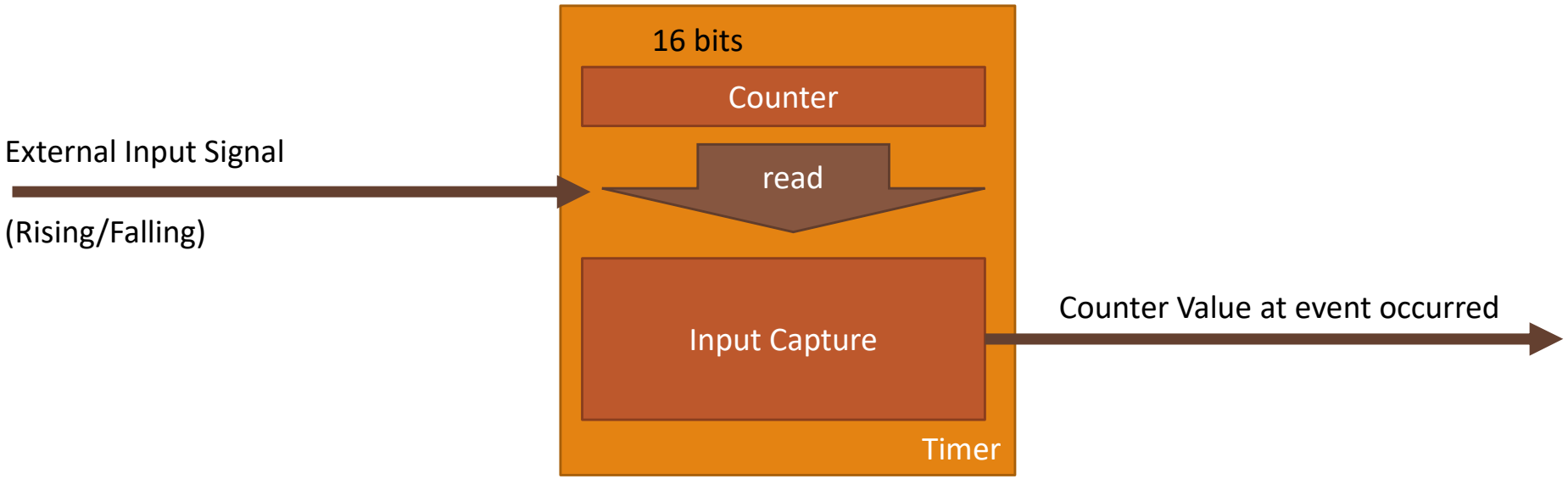
FRA222 Microcontroller Interface

06 - 0 INPUT CAPTURE

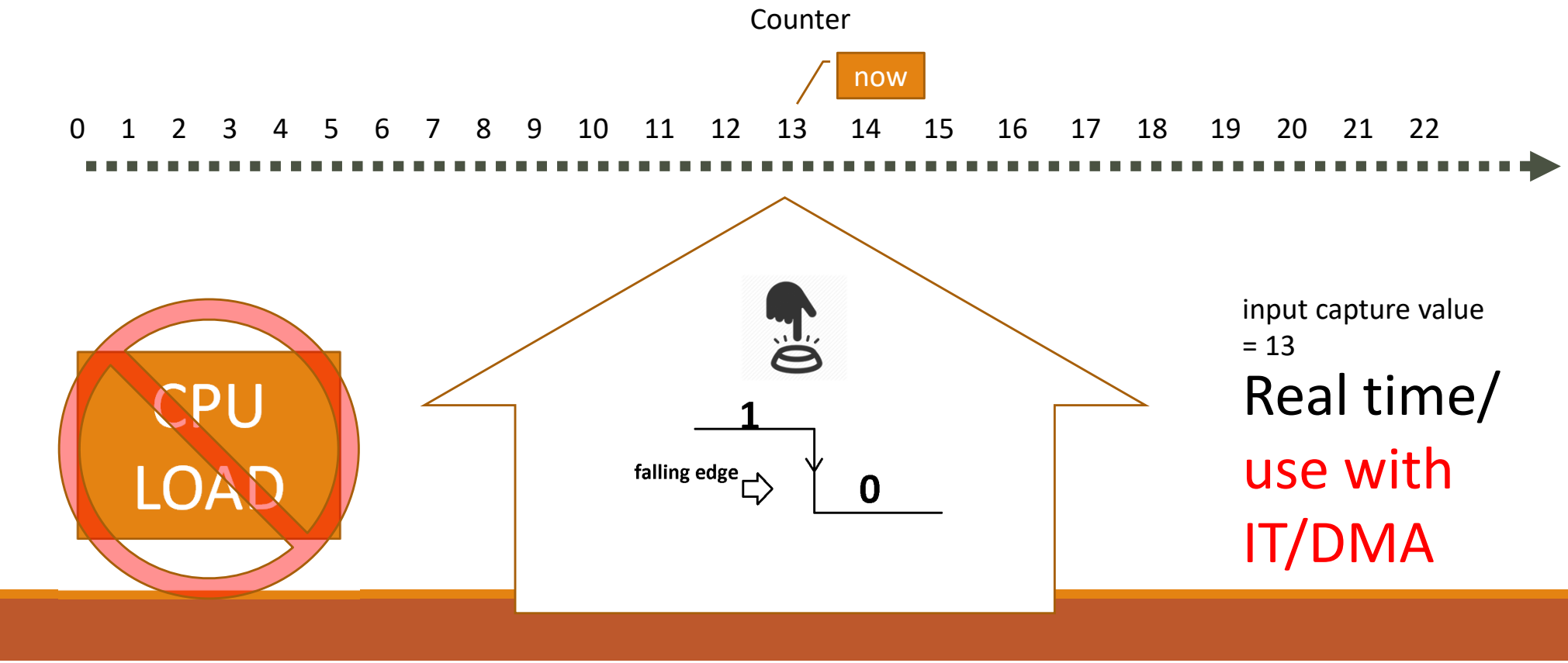
OUTPUT COMPARATOR

Input Capture



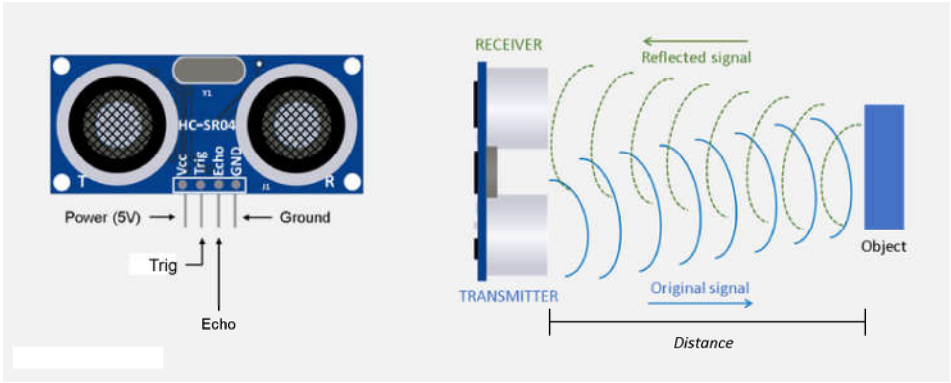
Input Capture

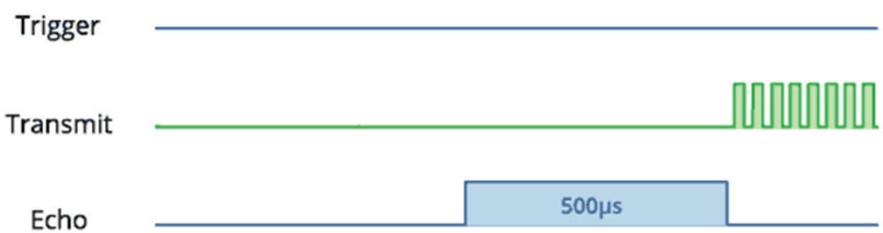
capture mode – Signal Falling

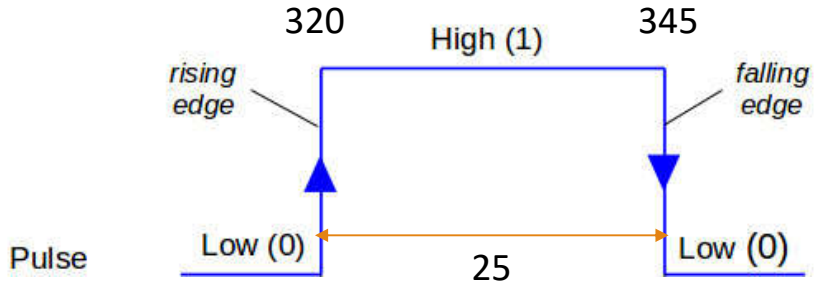


Input Capture Example

capture mode – Both Edge



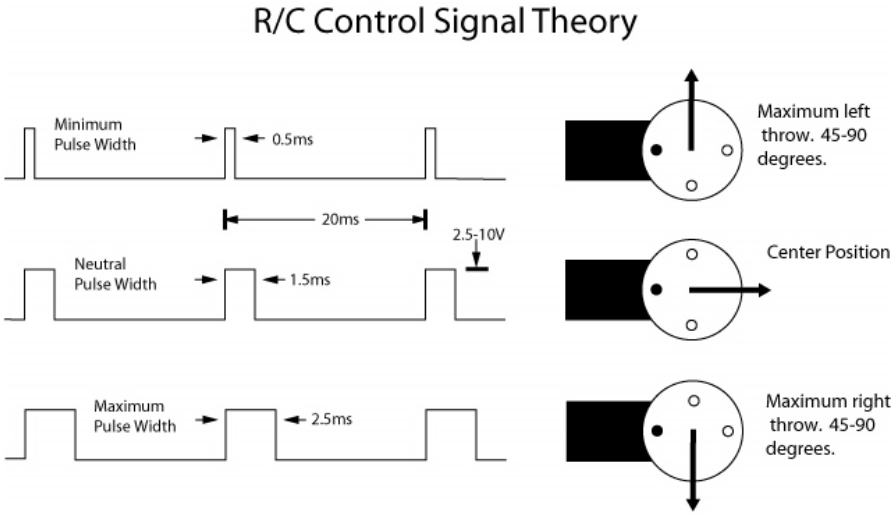




Timer clock = 250kHz| 1 timer Pulse = 4ms | 25 timer pulse = 4x25 = 100 ms

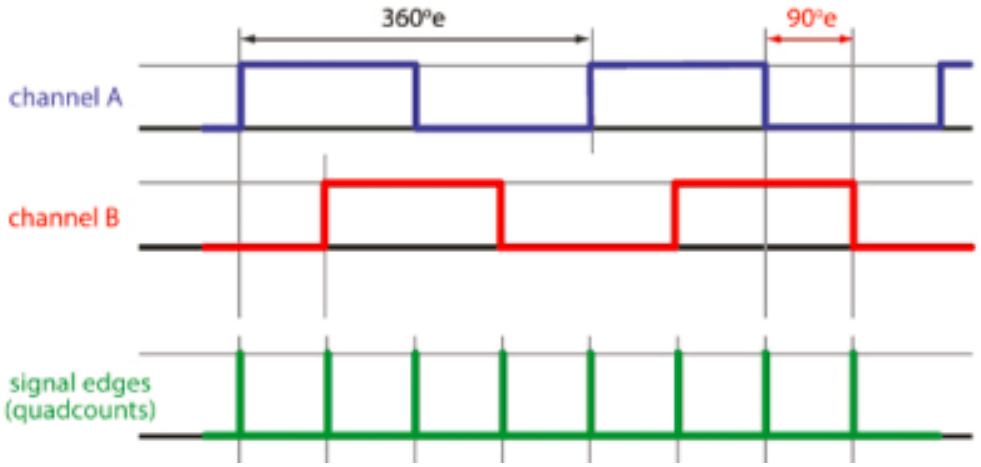
Input Capture Example

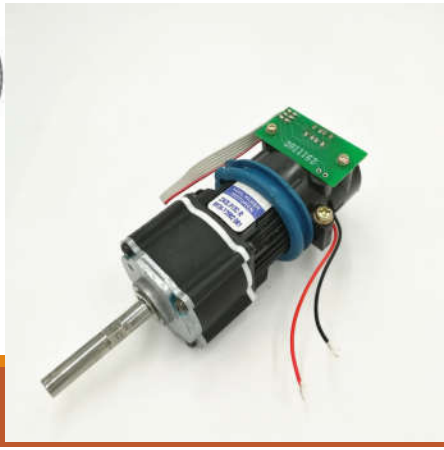
capture mode – Both Edge



The minimum and maximum pulse width for different manufacturers can vary considerably; however, the neutral position is generally quite near 1.5ms regardless of manufacturer. Typical variance for the minimum pulse width is from 0.5ms to 0.8ms, and the typical variance for the maximum pulse width is from 2.5ms to 3.0ms. The frequency of the signal is generally near 50Hz; however, it can range from 30Hz to 200Hz. The output voltage can vary from 2.5V to as much as 10V.

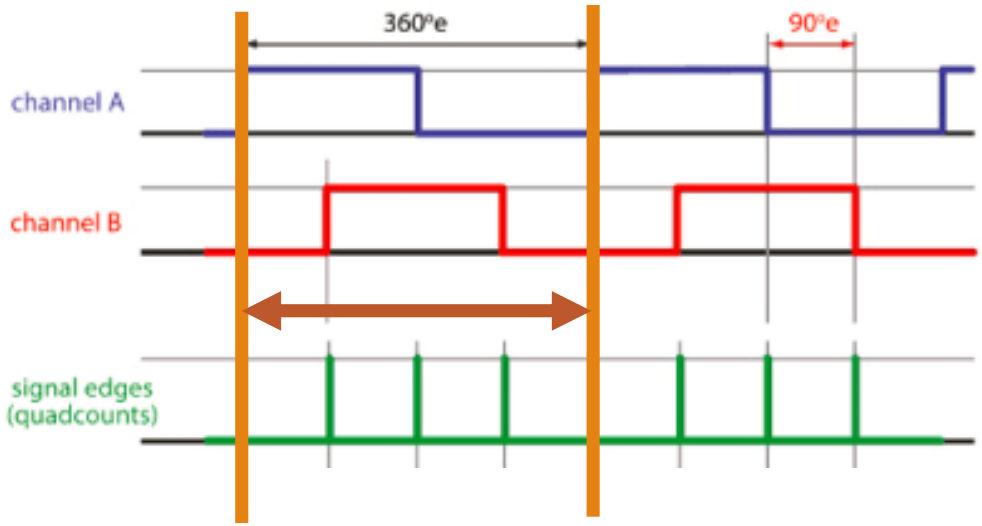
Input Capture Example





Input Capture Example

capture mode – Signal Rising



720 P/R

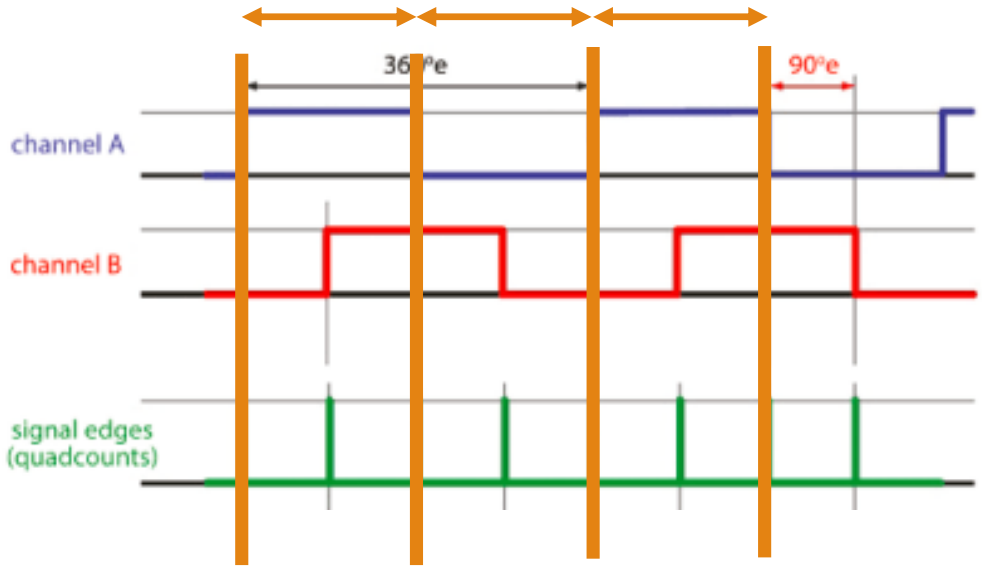
720 Cap/R

speed 720 p/s = 1 round/s

Speed [p/s]= 1 / input capture value(Converted)

Input Capture Example

capture mode – Both Edge



720 P/R

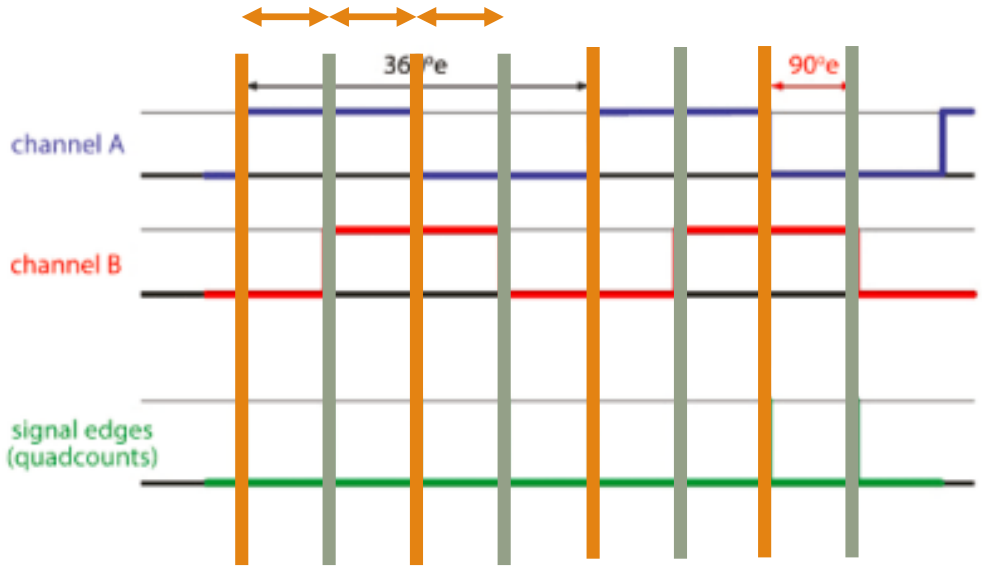
720 x 2 Cap/R

Speed [p/s]= 1 / input capture value(Converted)

speed 1440 p/s = 1 round/s

Input Capture Example

capture mode - Both Edge
2 Channel



720 P/R

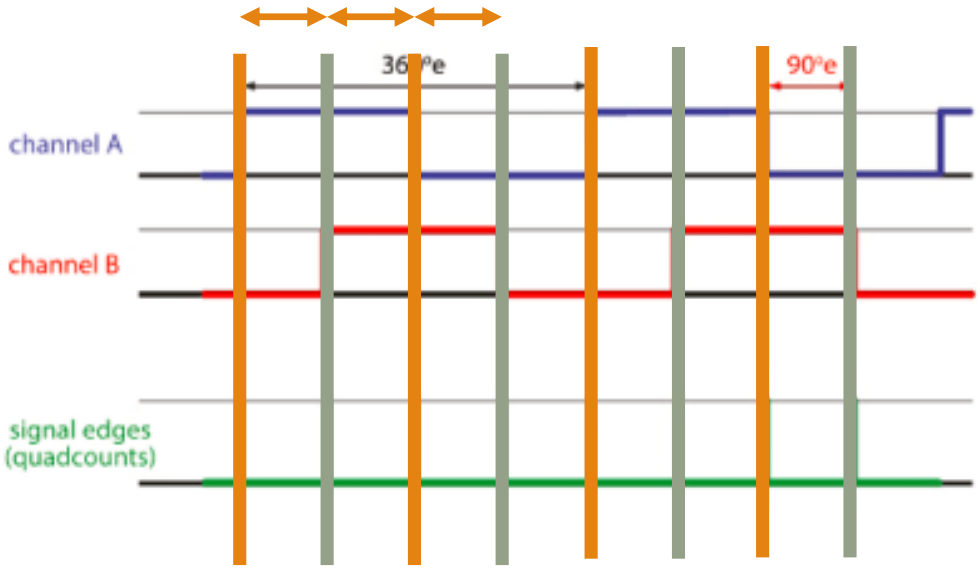
720*4 Cap/R

Speed [p/s]= 1 / input capture value(Converted)

speed 2880 p/s = 1 round/s

Input Capture Example

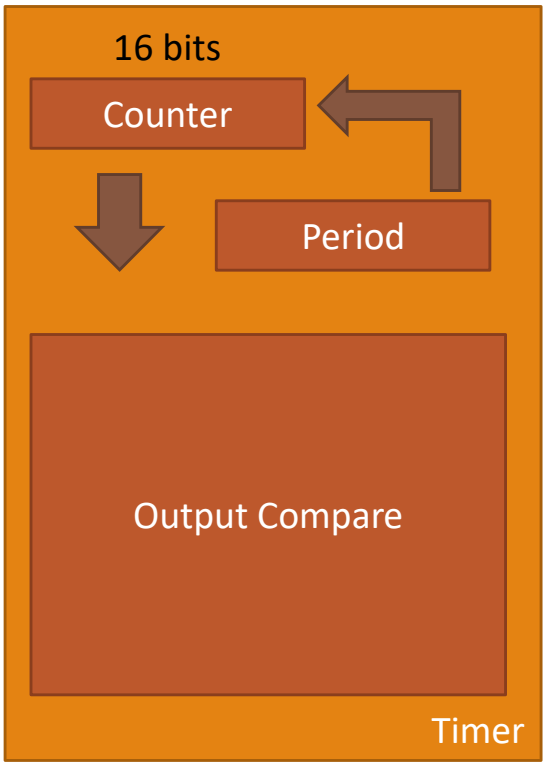
capture mode - Both Edge
2 Channel

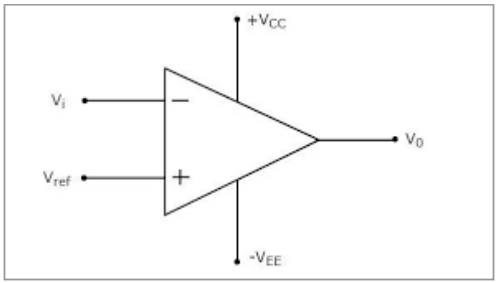


Good to Use for encoder speed read?

- Good for **slow** Rotation
- Evil for fast Rotation
- May confuse some control system

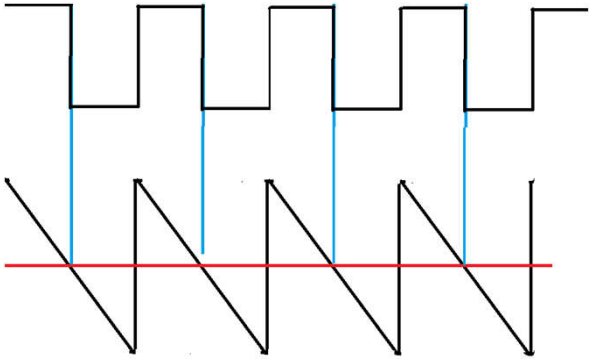
Output Comparator

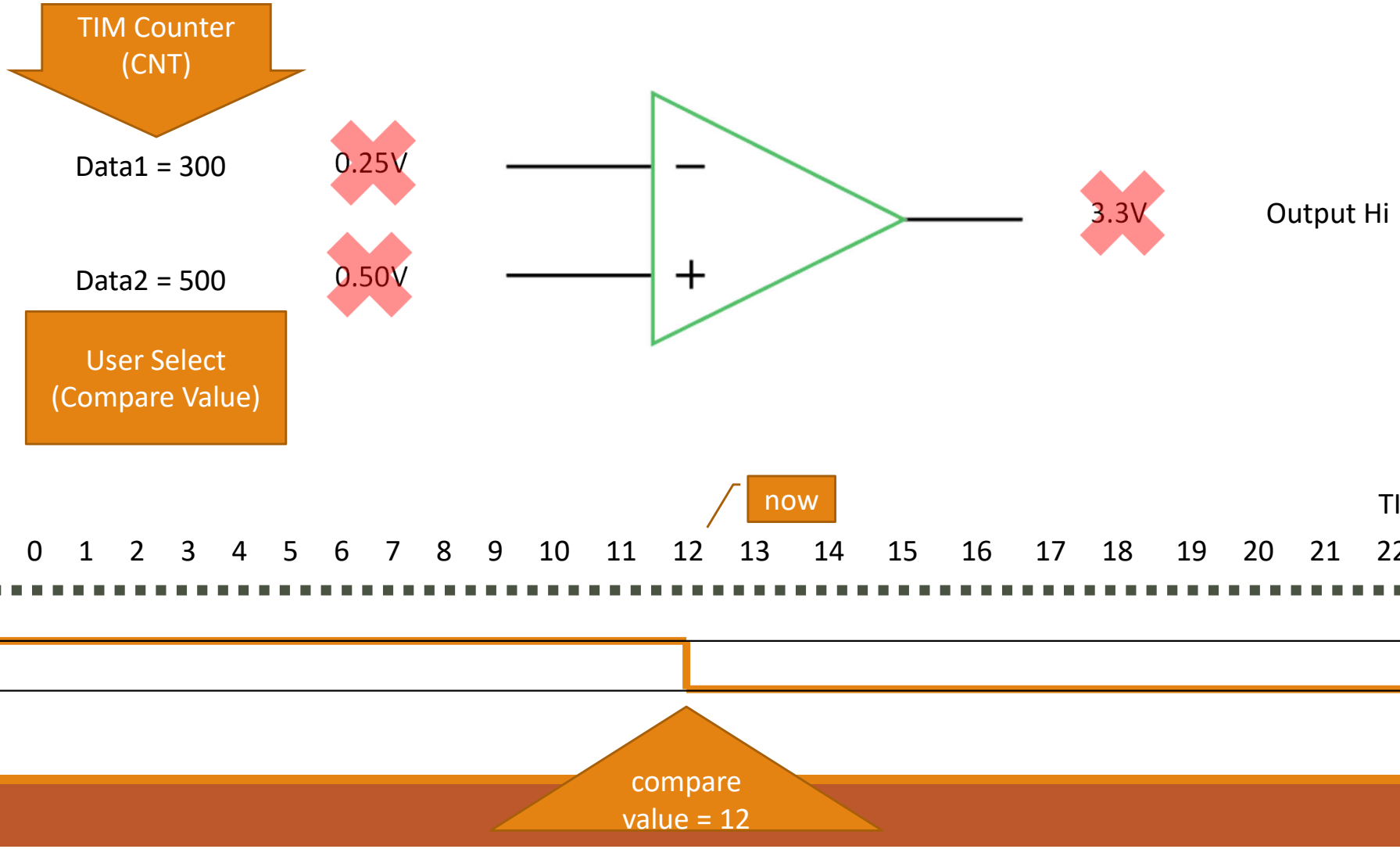


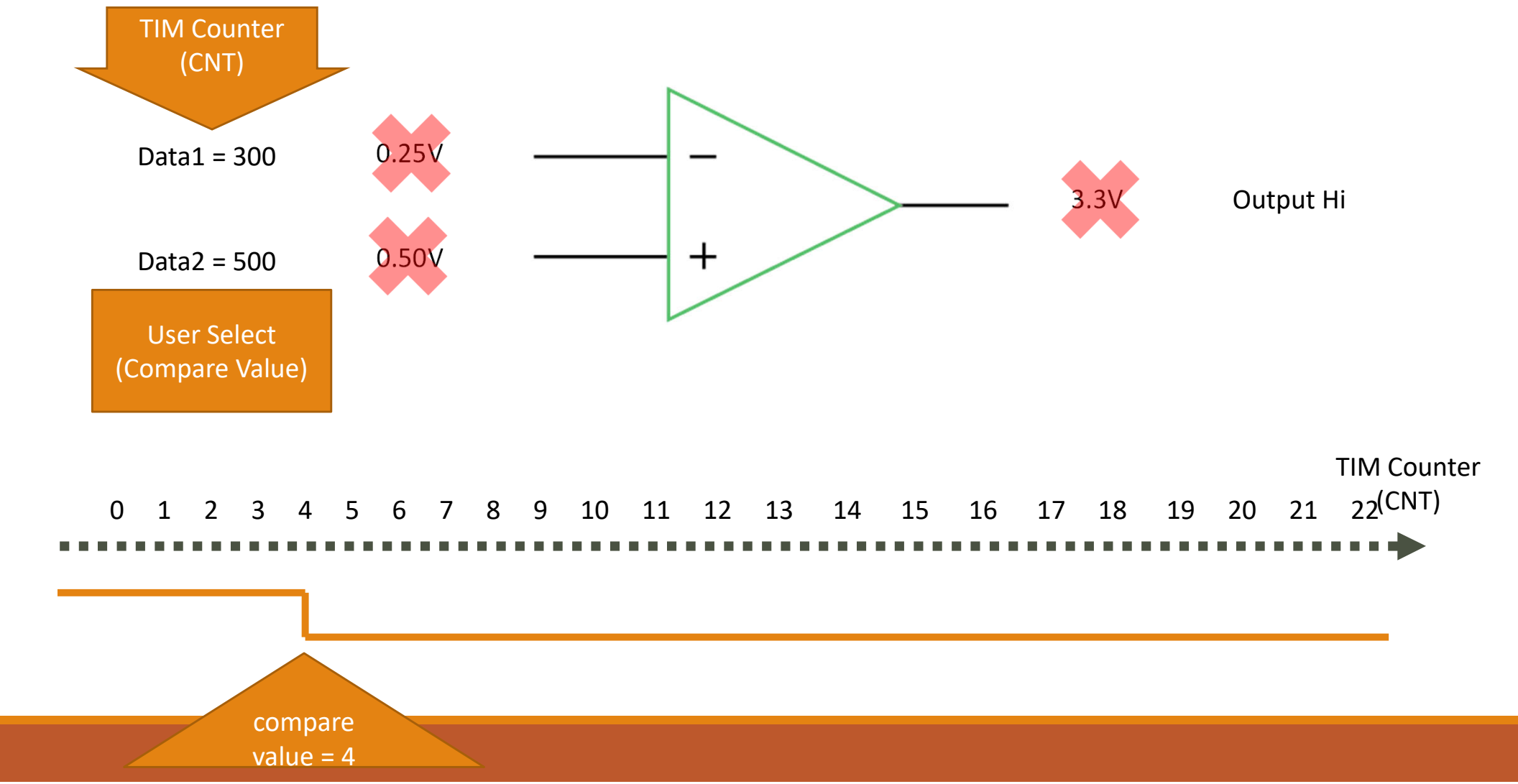


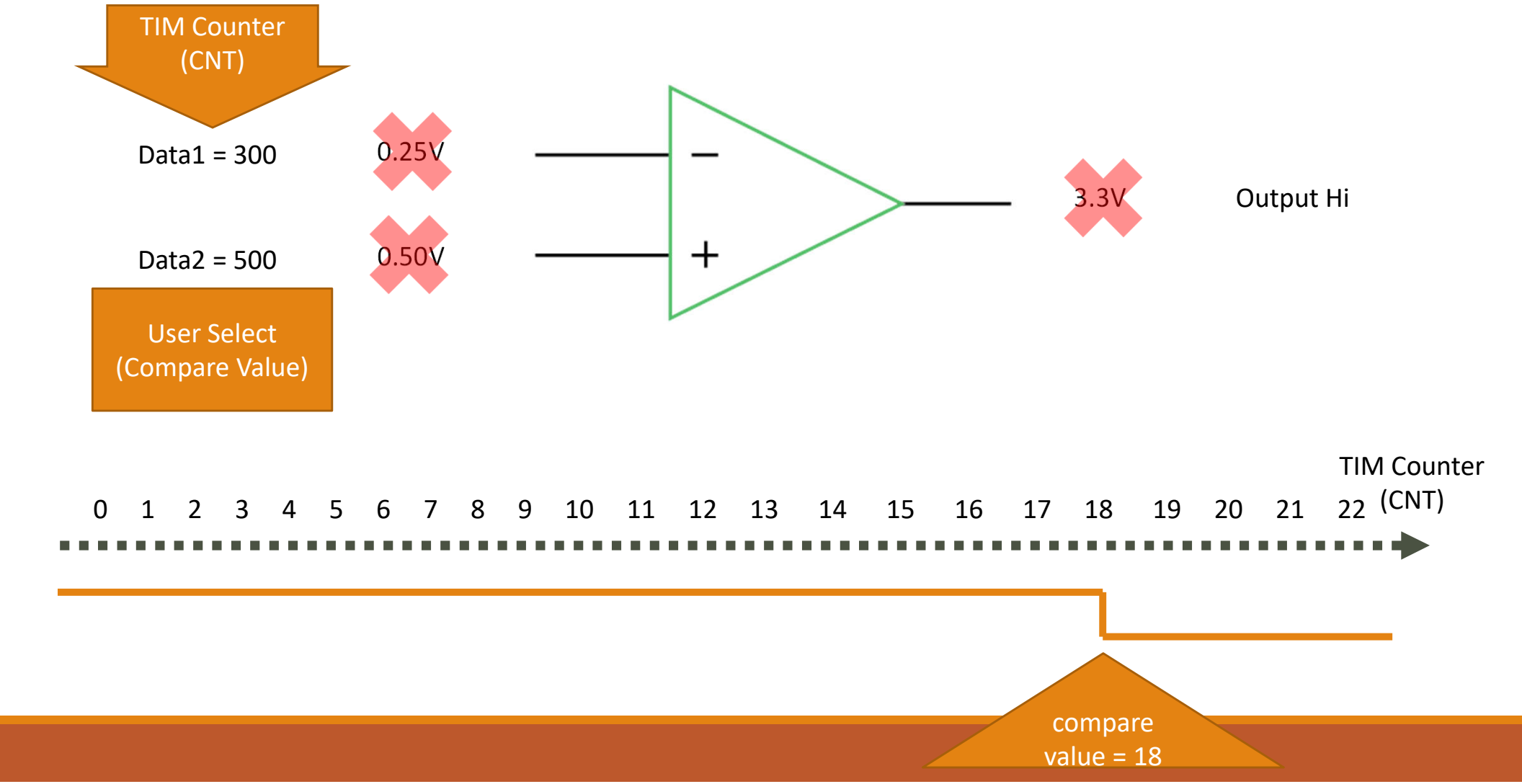
output

input
Vref

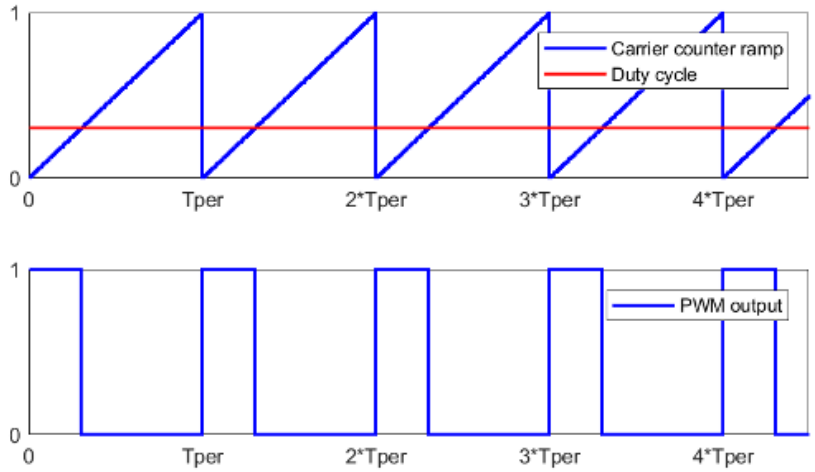


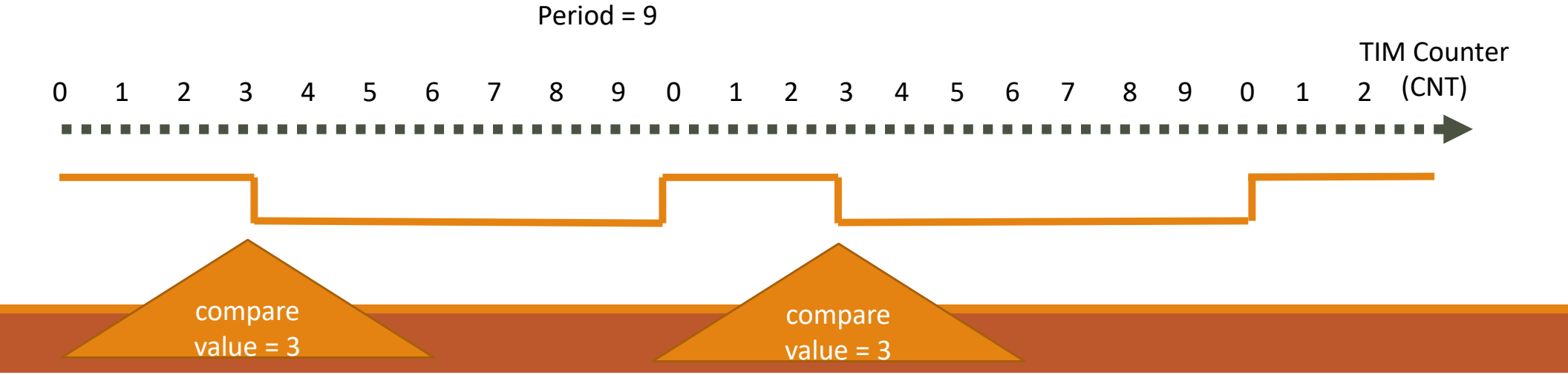

TIM Counter
(CNT)
Data1 = 300
0.25V
Data2 = 500
0.50V
User Select
(Compare Value)
3.3V
Output Hi
now
TIM Counter
(CNT)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
compare
value = 12


TIM Counter
(CNT)
Data1 = 300
0.25V
Data2 = 500
0.50V
User Select
(Compare Value)
3.3V
Output Hi
TIM Counter
(CNT)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
compare
value = 4

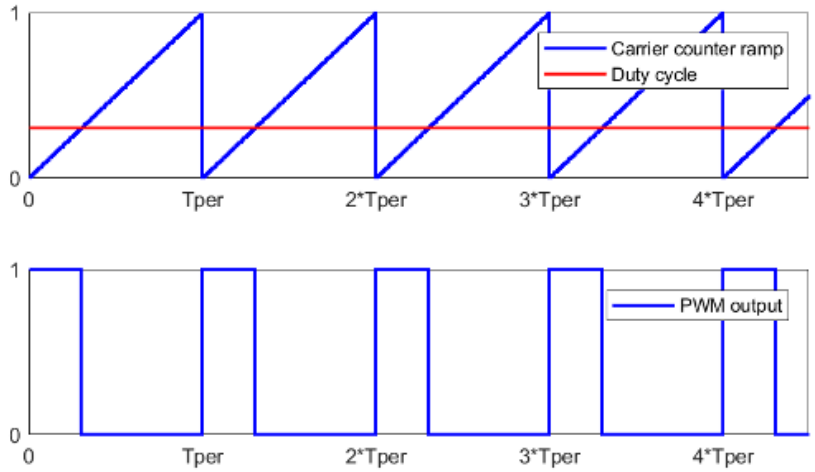

TIM Counter
(CNT)
Data1 = 300
0.25V
Data2 = 500
0.50V
User Select
(Compare Value)
3.3V
Output Hi
TIM Counter
(CNT)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
compare
value = 18

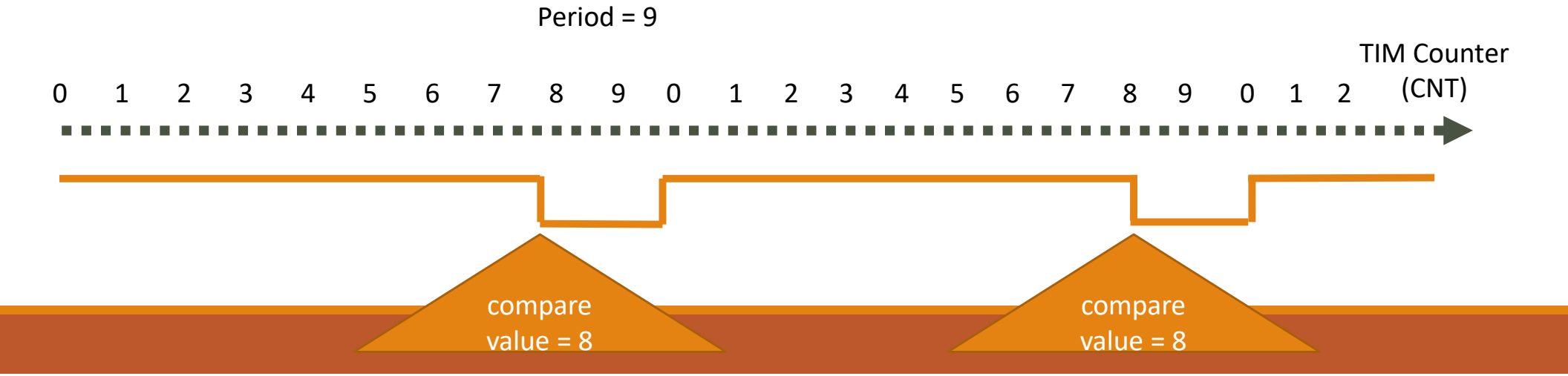
PWM


1
0
Carrier counter ramp
Duty cycle
0
Tper
2*Tper
3*Tper
4*Tper
1
0
PWM output
0
Tper
2*Tper
3*Tper
4*Tper


Period = 9
TIM Counter
(CNT)
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
compare
value = 3
compare
value = 3

PWM

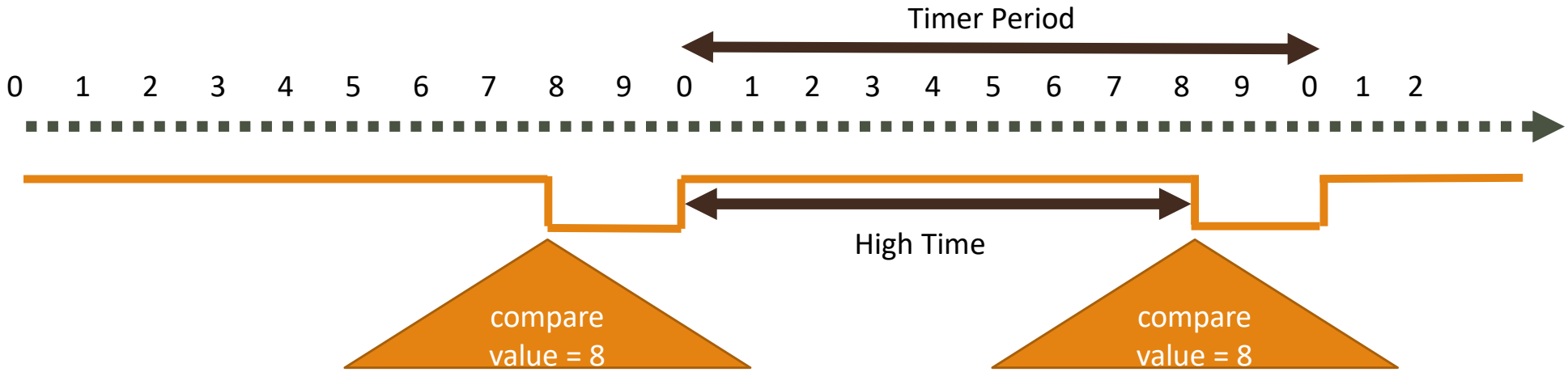

1
0
Carrier counter ramp
Duty cycle
0
Tper
2*Tper
3*Tper
4*Tper
1
0
PWM output
0
Tper
2*Tper
3*Tper
4*Tper


Period = 9
TIM Counter
(CNT)
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
compare
value = 8
compare
value = 8

PWM

Timer Period = PWM Period
Compare value = High Time

Duty cycle of PWM = Compare Value/ Timer Period
PWM Frequency = 1 / Timer Period in second



$$PWM_{freq} = \frac{1}{Period(sec)}$$

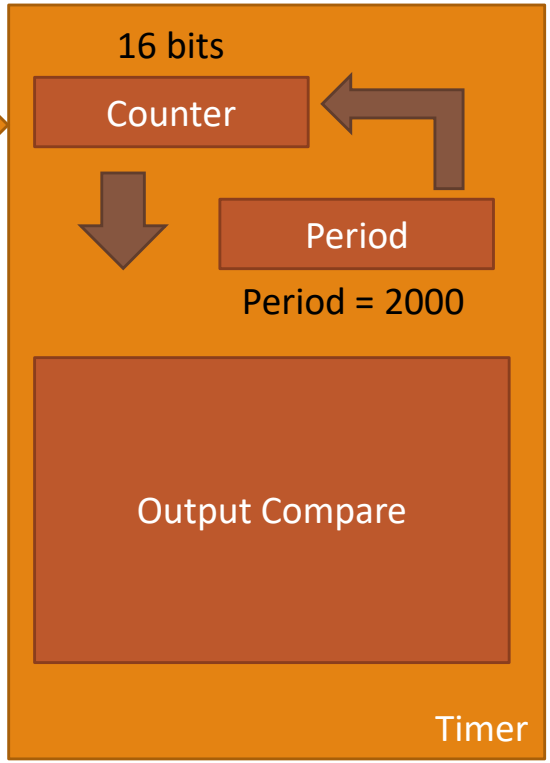
$$Period(sec) = Period \times \frac{1}{250kHz}$$

$$Period(sec) = 2000 \times 0.000004$$

$$Period(sec) = 0.008\ \text{s}$$

$$PWM_{freq} = \frac{1}{0.008} = 125\ Hz$$

timer Freq 250 kHz

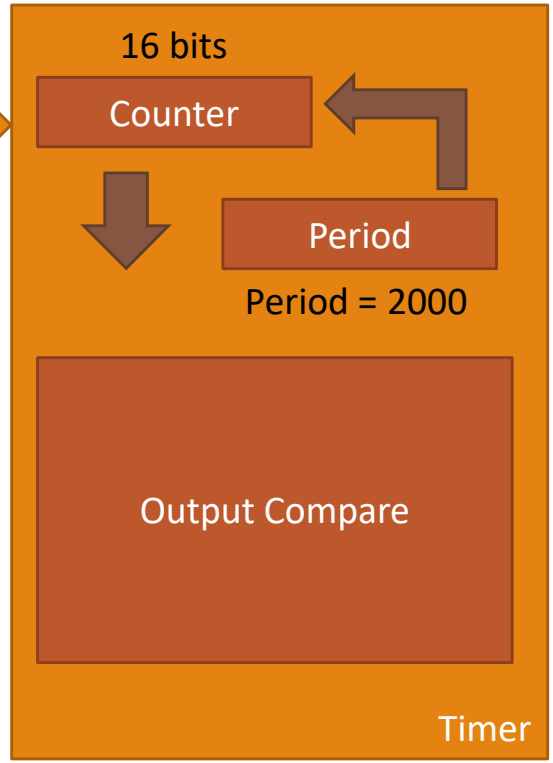


Compare Value = 1500

$$PWM_{freq} = 125\ Hz$$

Duty cycle of PWM = Compare Value / Timer Period

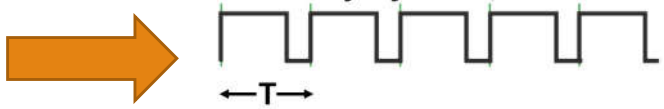
timer Freq 250 kHz



$$Duty\ Cycle = \frac{1500}{2000} = 0.75 = 75\%$$

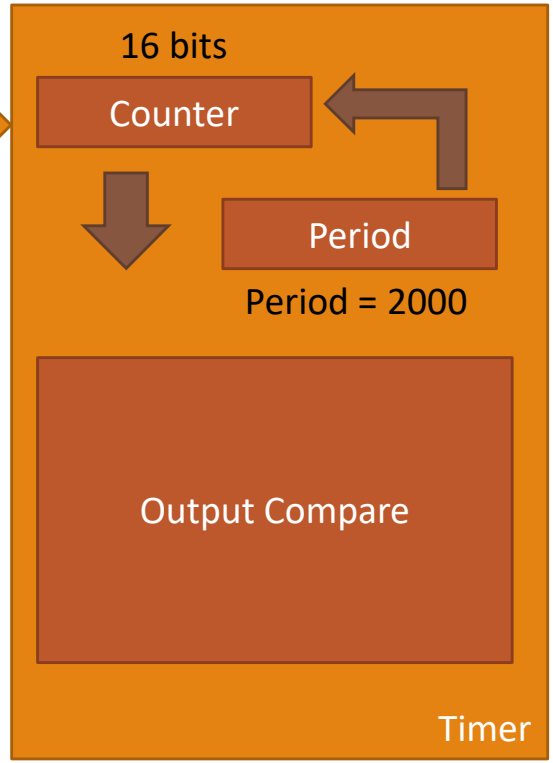
Compare Value = 1500

$$PWM_{freq} = 125\ Hz$$



Duty cycle of PWM = Compare Value / Timer Period

timer Freq 250 kHz



$$Duty\ Cycle = \frac{500}{2000} = 0.25 = 25\%$$

Compare Value = 500

$$PWM_{freq} = 125\ Hz$$