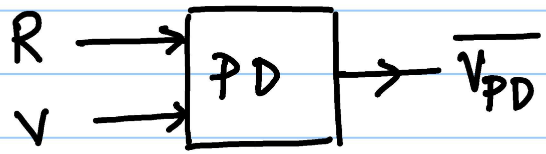
lecture # 15

Note Title 08-10-2020

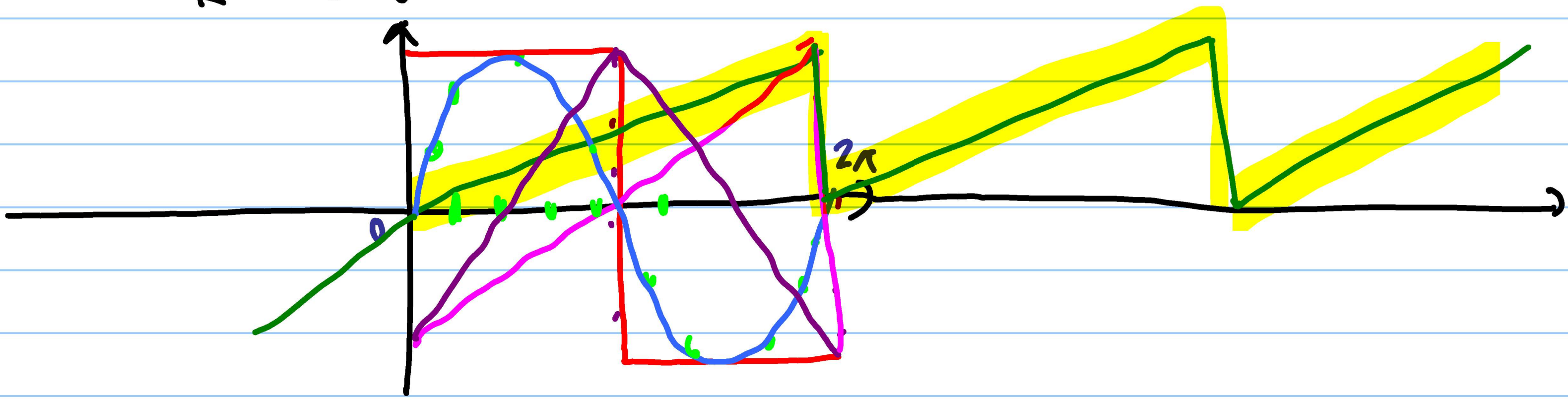


$$\frac{f_R}{f_V} = \frac{T_R}{T_V} = \frac{T}{0.9T} = \frac{10}{9}$$

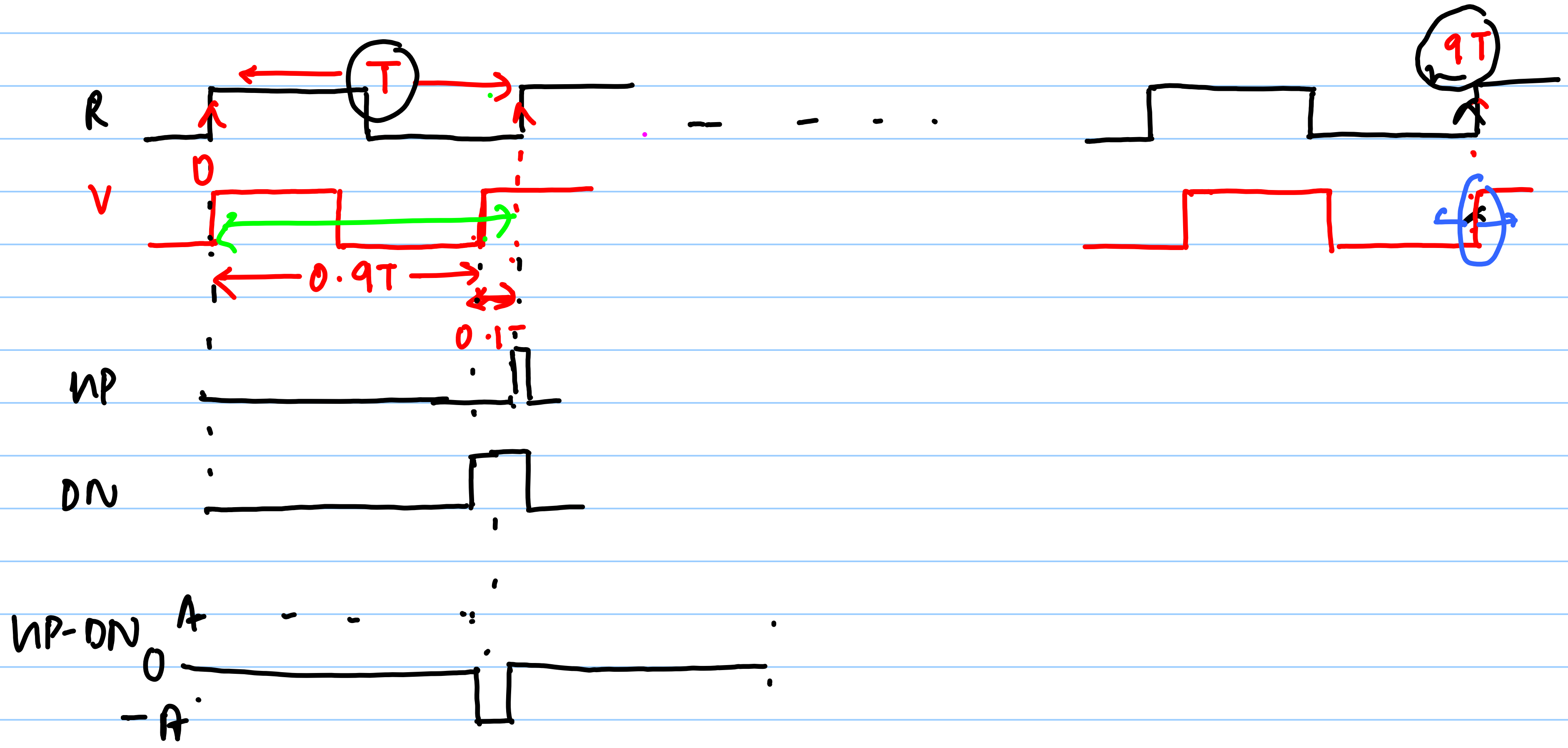
$$\Rightarrow 9T_R = 10T_V$$

$\Delta t = 0, 0.1T, 0.2T, \ldots\ldots, 0.9T,$

$\phi_{er} = 2\pi \cdot \frac{\Delta t}{T} = 0, 0.2\pi, 0.4\pi, \ldots$



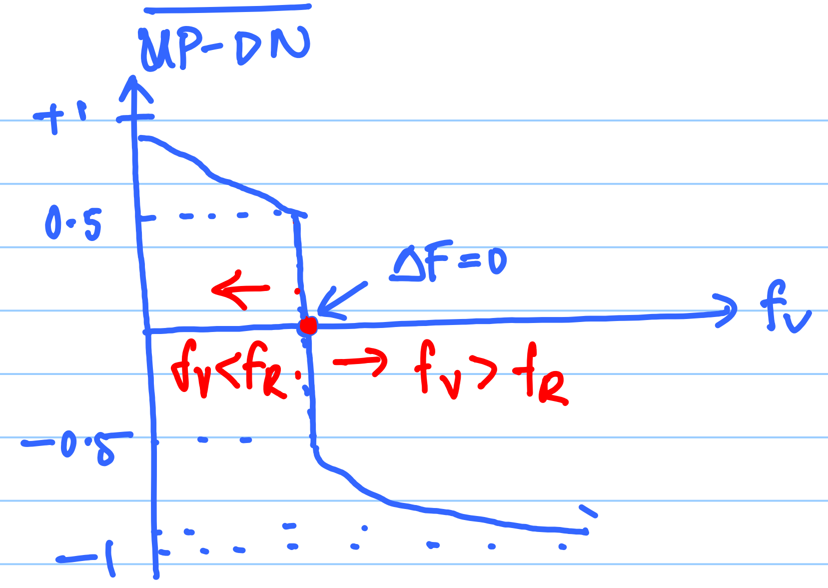
PFD

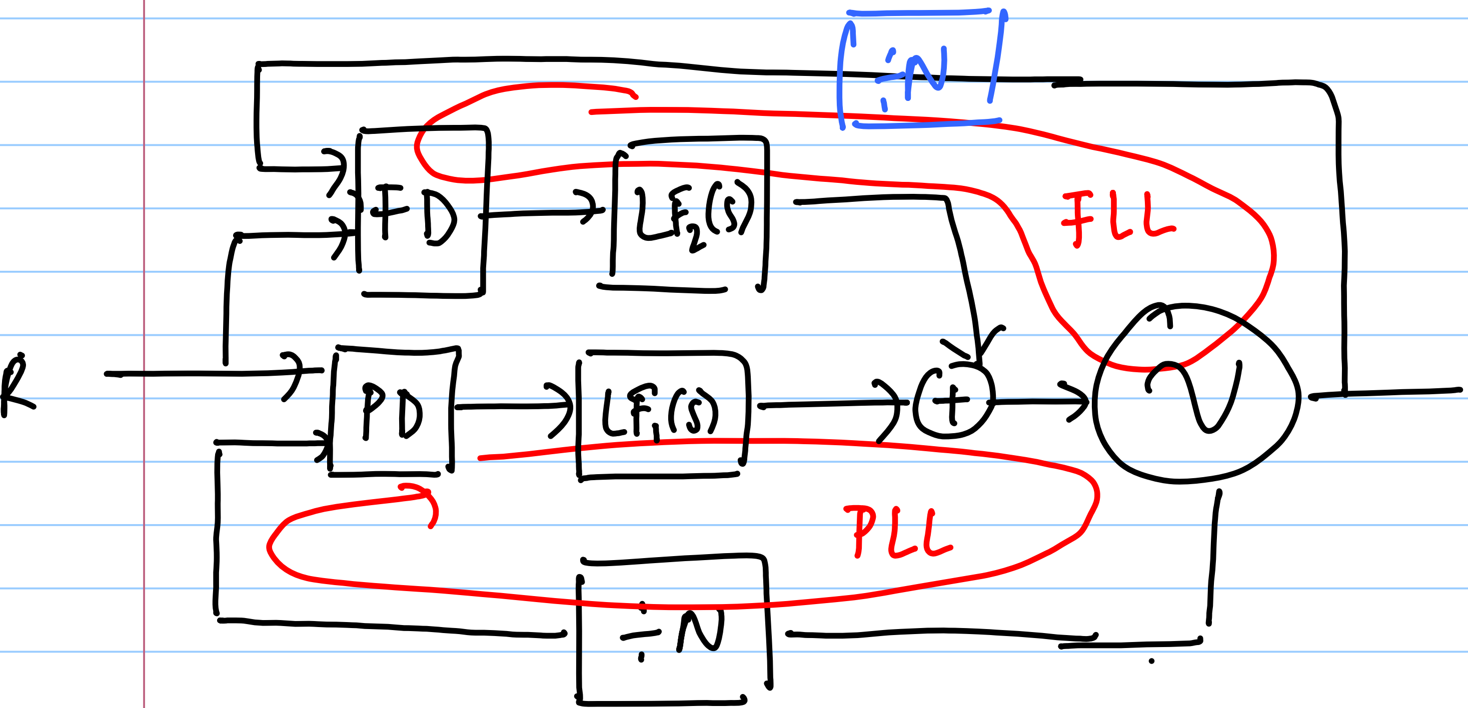


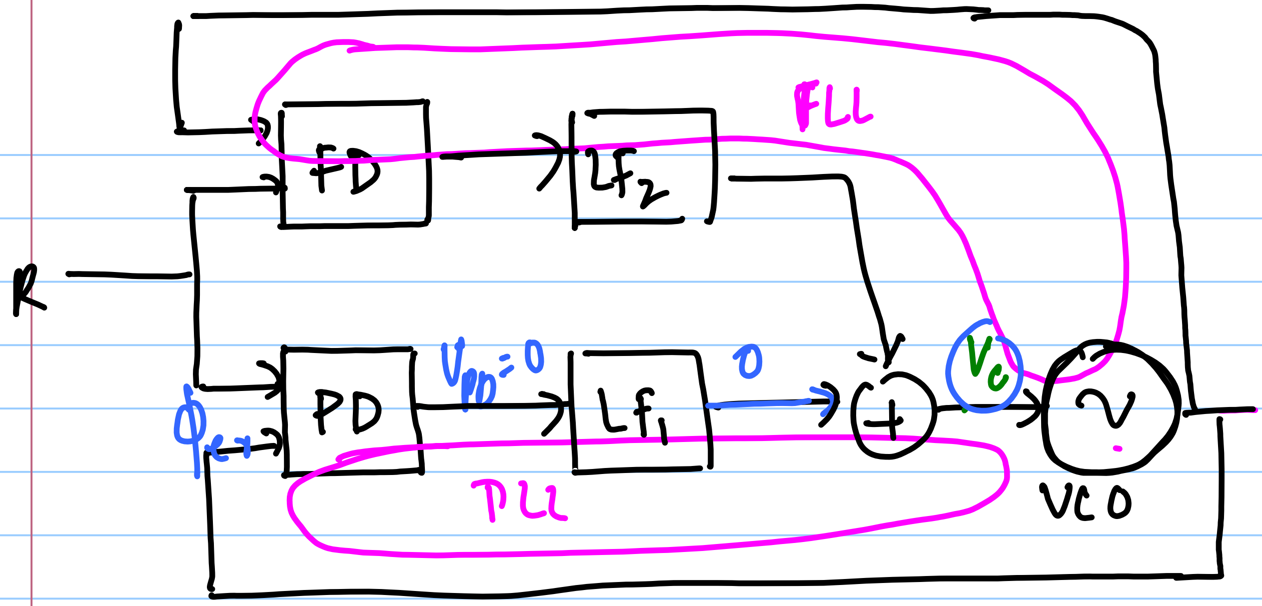
$$\frac{-A \times 0.1T}{T} = -0.1A \qquad = -0.2A \quad \cdots$$

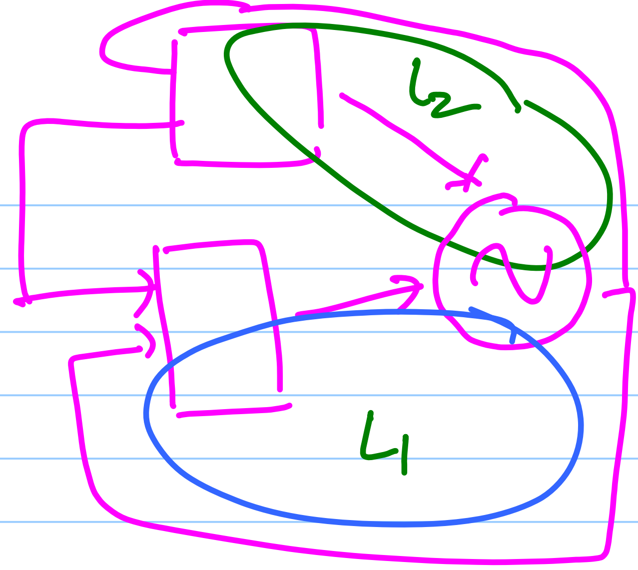
$$\overline{V_{PFD}} = \frac{-0.1 - 0.2 - 0.3 \cdots - 0.9}{9T} = 0.5$$

$$\overline{UP-DN} = \begin{cases} 1 - \dfrac{0.5 f_v}{f_R} & \text{if } f_R > f_v \\ \dfrac{0.5 f_R}{f_v} - 1 & \text{if } f_R < f_v \end{cases}$$









in steady state

FLL : low bandwidth

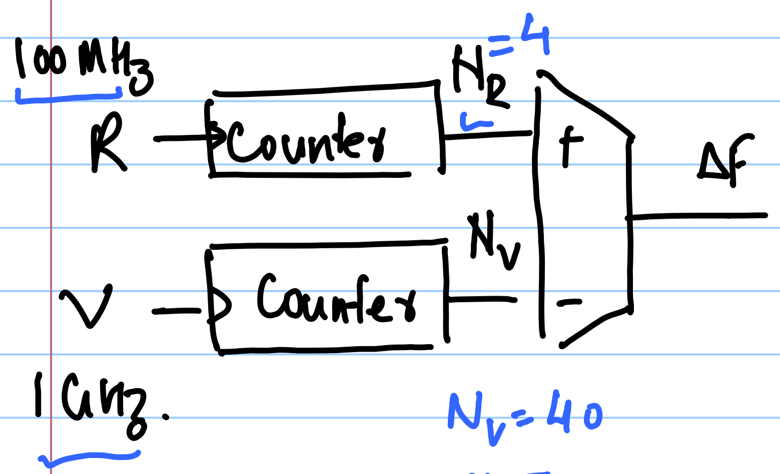
PLL : higher bandwidth.

in initial stage.

FLL : at higher rate or larger bw

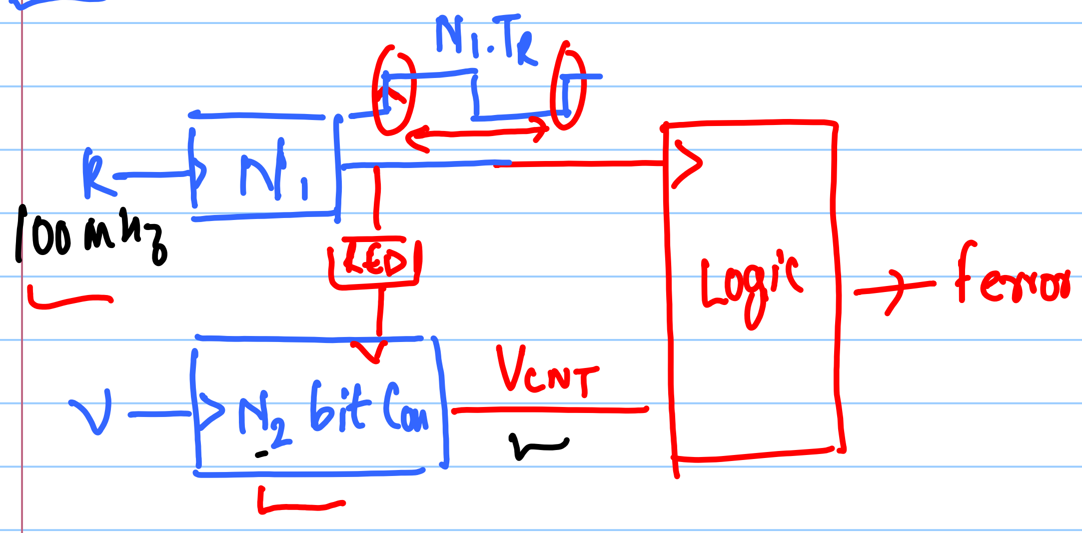
PLL :

Counter-based Freq. Det.



Frequency Error $= \frac{\Delta F}{f_R} \times 10^6$ (ppm)

$N_1 = 100$, $N_1 = 10000$



1·00001 GHz.

$$\frac{f_R}{f_V} = \frac{100\ M}{1.00001\ G} = \frac{100}{1000.01}$$

$$\frac{T_V}{T_R} = \frac{10000}{1000.01}$$