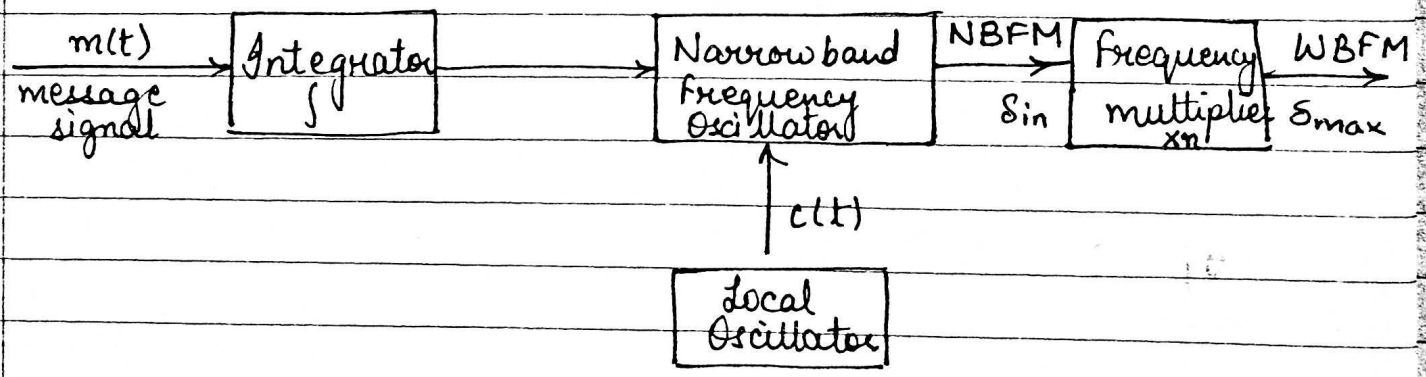
Generation of F.M. signal

- Direct method
  - V.C.O. Method (Voltage controlled oscillator)
  - Varactor diode modulator
  - Reactance Modulator circuit (FET or MOSFET)
- Indirect method (Armstrong method) NBFM

Indirect Method

It is also called Armstrong method. This method is given by the scientist Armstrong. In this method we obtain NBFM signals and then converted into WBFM signals using frequency multiplier. The value of frequency multiplier n depends on the maximum frequency deviation required in the WBFM signals.

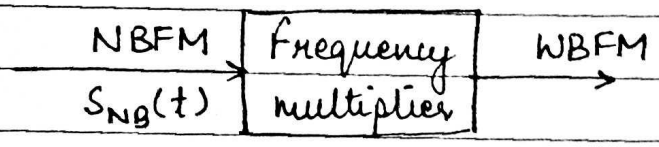


$$n = \frac{\text{Maximum modulation index } (m_f)}{m_f \text{ (NBFM)}} = \frac{\delta_{max}}{\delta_{NBFM}}$$

Maximum allowed frequency deviation at the input of frequency multiplier:

$$\delta_{in} = \frac{\delta_{max}}{n}$$

Q. Consider the frequency multiplier shown in fig. and the NBFM signal $S_{NB}(t) = A \cos(\omega_c t + m_f \sin \omega_m t)$ with $m_f < 0.5$ and $f_c = 200\,kHz$. Let the range of f_m be from 50 Hz to 15 kHz and maximum frequency deviation at the output of frequency multiplier is 75 kHz. Determine required frequency multiplication factor n and the allowed maximum frequency deviation at the input of frequency multiplier.



Soln- $S_{NB}(t) = A \cos(\omega_c t + m_f \sin \omega_m t)$

$m_f < 0.5$

$f_c = 200\,kHz$

$50 < f_m < 15\,kHz$

$n =$

$$(m_f)_{max} = \frac{\delta}{f_m} = \frac{75\,kHz}{50} = 1500$$

$$(m_f)_{min} = \frac{\delta}{f_m} = \frac{75\,kHz}{15\,kHz} = 5$$

$$n = \frac{1500}{0.5} = 3000$$

$$\delta_{in} = \frac{\delta_{max}}{n} = \frac{75\,kHz}{3000} = 25\,Hz$$