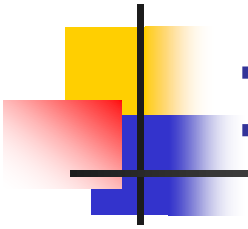


# Binary amplitude shift keying（2ASK）

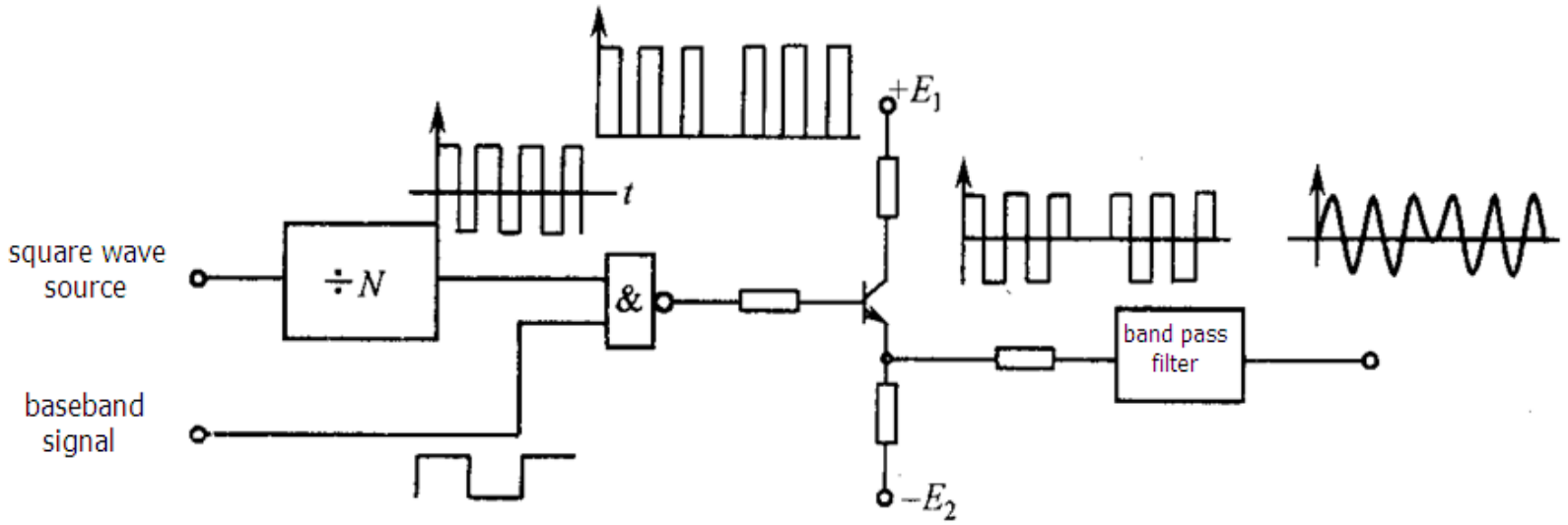
## Modulation & Demodulation



# Introduction

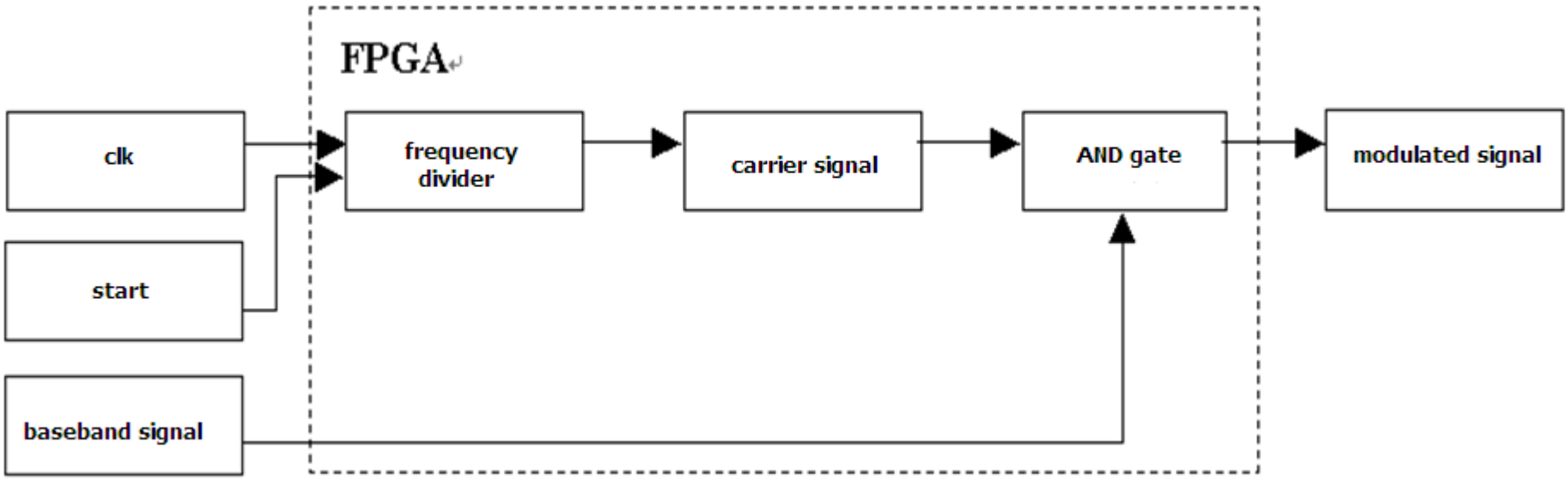
- Amplitude-shift keying (ASK) is a form of modulation that represents digital data as variations in the amplitude of a carrier wave.
- 2ASK----The level of amplitude can be used to represent binary logic 0s and 1s.

# Modulation

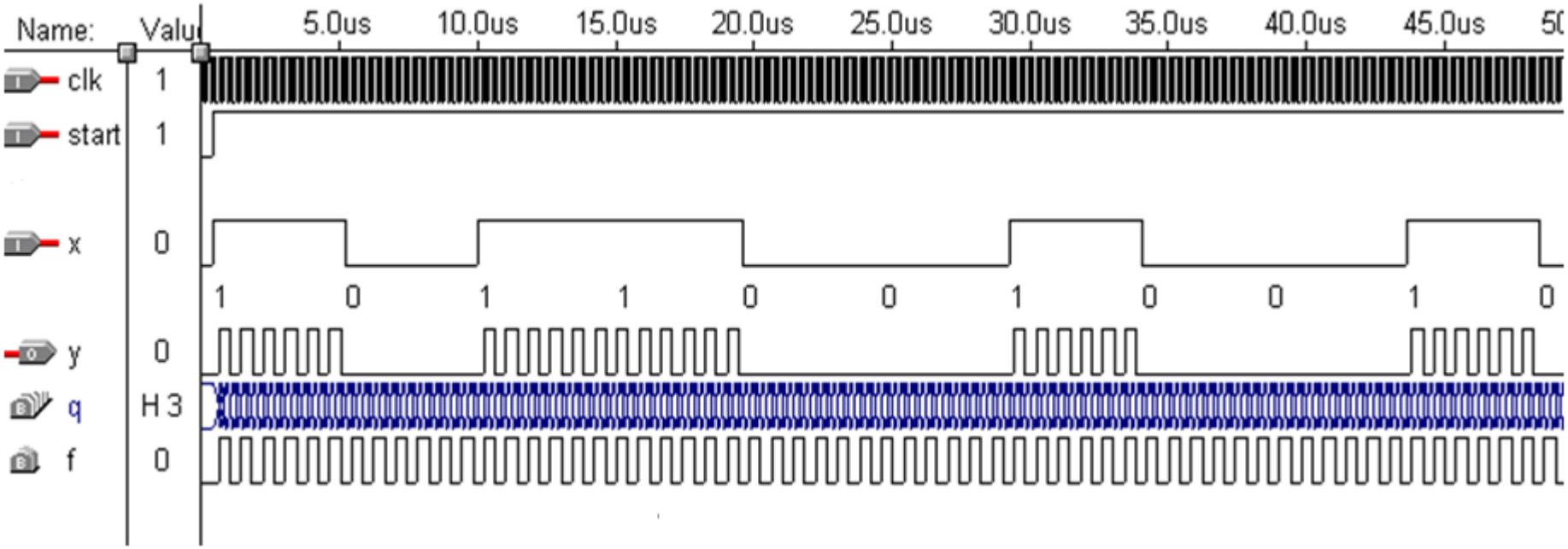



- Multiplying the carrier signal by the baseband signal---- using a multiplier.
- Multiplier is used for spectrum shifting.
- Through a band-pass filter to remove the interference of high freq & low freq wave.

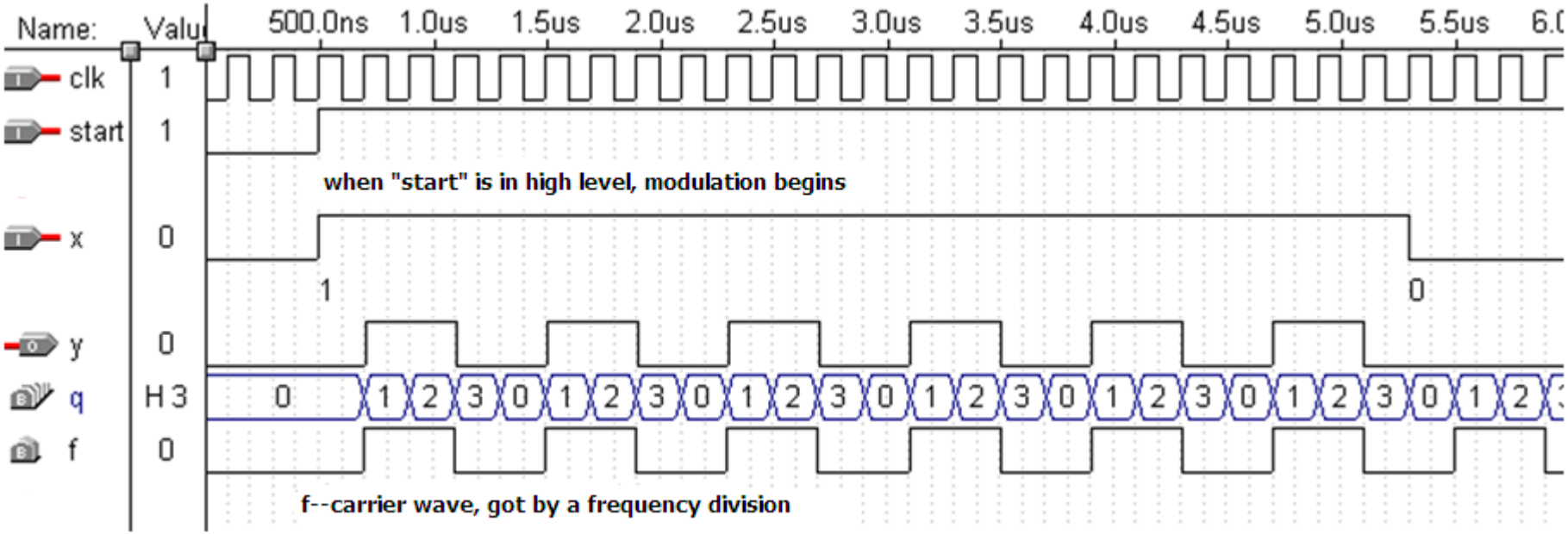
# Modulation


FPGA
clk
start
baseband signal
frequency divider
carrier signal
AND gate
modulated signal

# Modulation

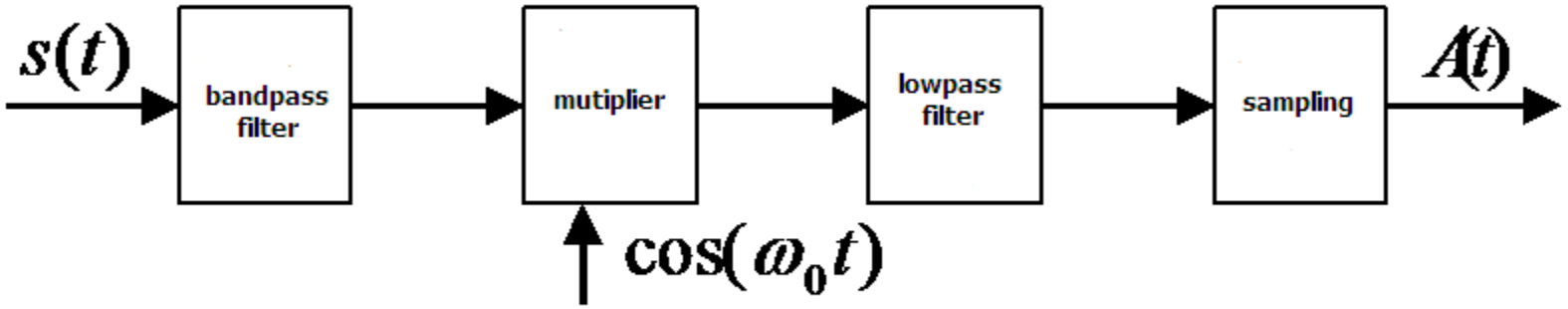

Name:
Valu
5.0us
10.0us
15.0us
20.0us
25.0us
30.0us
35.0us
40.0us
45.0us
clk
1
start
1
x
0
1 0 1 1 0 0 1 0 0 1 0
y
0
q
H 3
f
0

# Modulation




Remark : The modulated signal y has a delay of a period of “clk”.

# Demodulation




- Through a band-pass filter to remove the interference of outband
- Mutiplier used for baseband signal recovery
- Lowpass filter suppress high-freq harmonic interference

# Demodulation

Suppose Received signal $s(t)$ and Noise $n(t)$

$$y(t) = s(t) + n(t) \qquad 0 < t \le T$$

$$s(t) = \begin{cases} A\cos(\omega_0 t) & send\text{“}1\text{”} \\ 0 & send\text{“}0\text{”} \end{cases}$$

$$n(t) = n_c(t)\cos(\omega_0 t) - n_s(t)\sin\omega_0 t$$

$$y(t) = \begin{cases} [A + n_c t]\cos\omega_0 t - n_s(t)\sin\omega_0 t & send\text{“}1\text{”} \\ n_c(t)\cos\omega_0 t - n_s(t)\sin\omega_0 t & send\text{“}0\text{”} \end{cases}$$

# Demodulation

If there is no noise

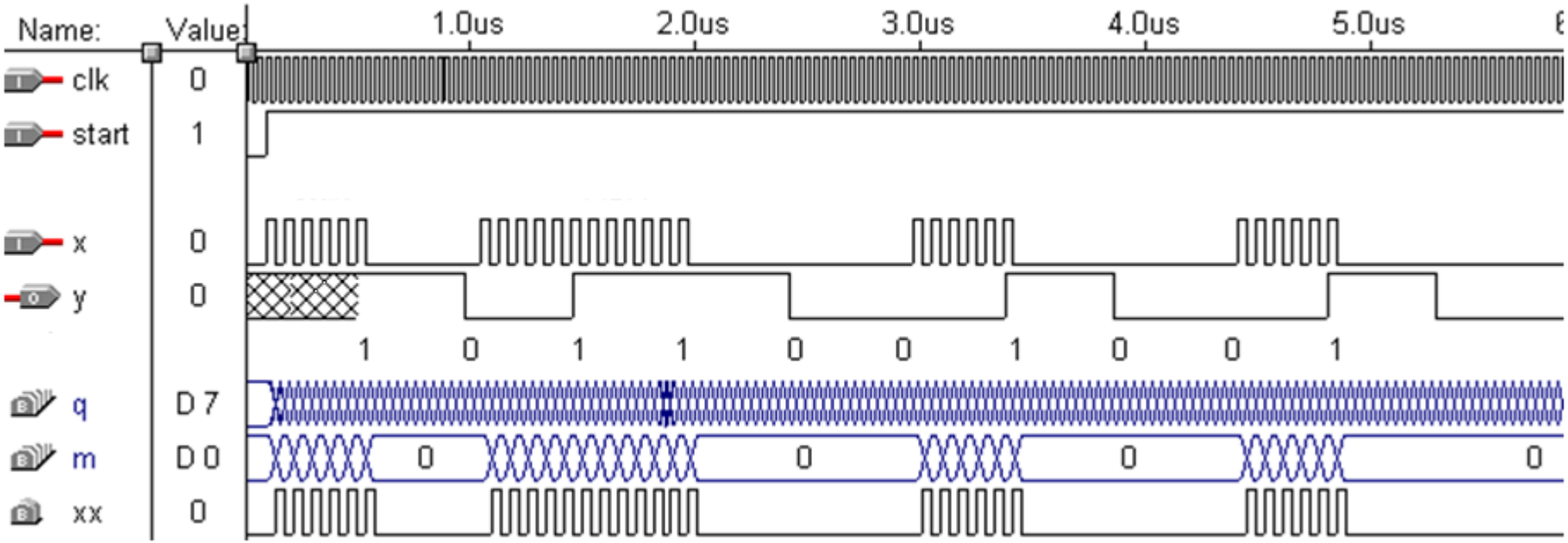
$$A(t) = \begin{cases} A & send\text{“}1\text{”} \\ 0 & send\text{“}0\text{”} \end{cases}$$

Sampling: Take the middle value of 0 ~ A : A / 2,

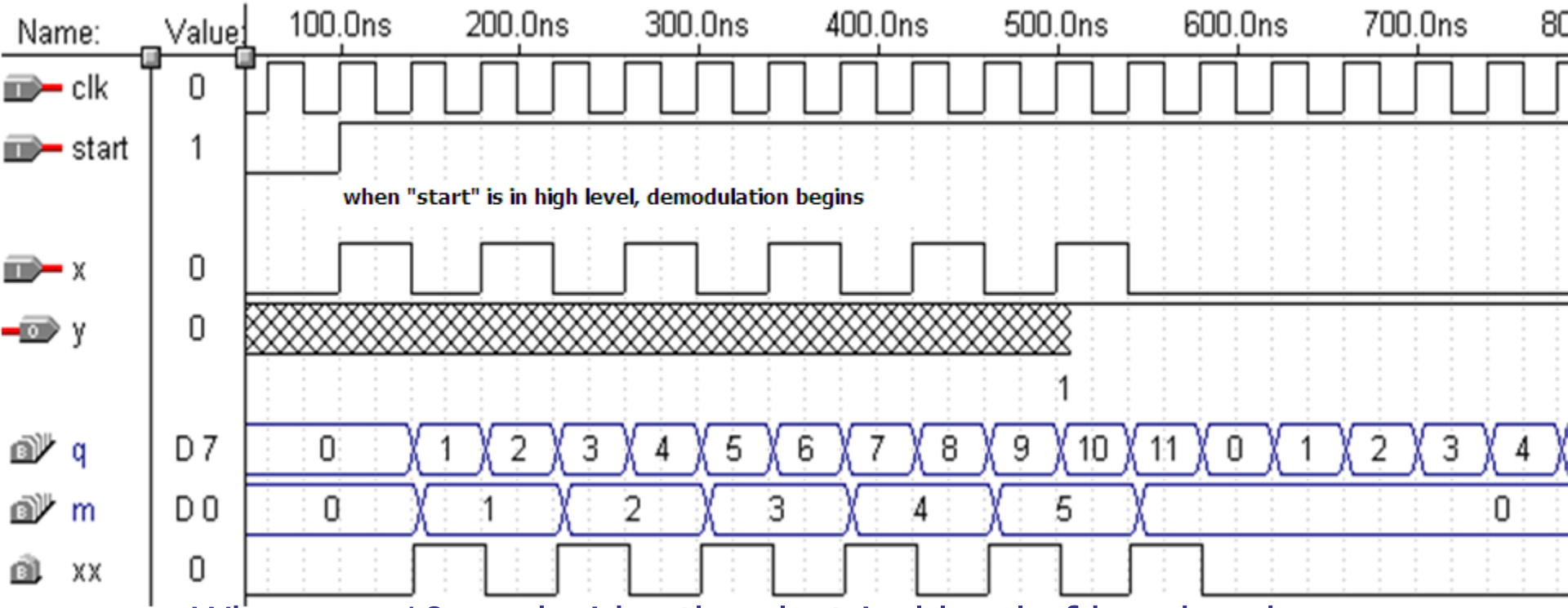
If the result greater than A / 2, consider it as “1”,

if less than A / 2, consider it as “0”.

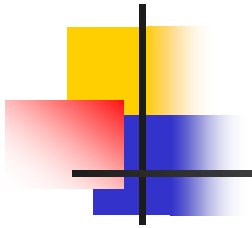
# Demodulation



# Demodulation




- When q = 10, m decides the electrical level of baseband signal (>m/2, <m/2)
- When q = 11, m cleared
- The output baseband signal has a delay of 10 periods of “clk”



# Thank you!