SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB301-ANALOG AND DIGITAL COMMUNICATION

III YEAR/ V SEMESTER

UNIT 3 – DIGITAL COMMUNICATION

TOPIC – Properties of Line codes

UNIT III –Digital Communication

UNIT III DIGITAL COMMUNICATION 9+6

THEORY

Block diagram of Digital communication, Low pass Sampling, Quantization- Types.

Baseband Transmission: Properties of Line codes- Power Spectral Density of Line codes –ISI- Nyquist criterion for distortion less transmission – Correlative coding – Eye pattern – Equalization- Linear equalization, Decision -feedback equalization, Adaptive linear equalizer.

PROPERTIES OF LINE CODES

Definition

Electrical representation of binary data streams is called as line codes. (i.e.,) Digital digits are mapped to a pulse waveform this waveform is line codes.

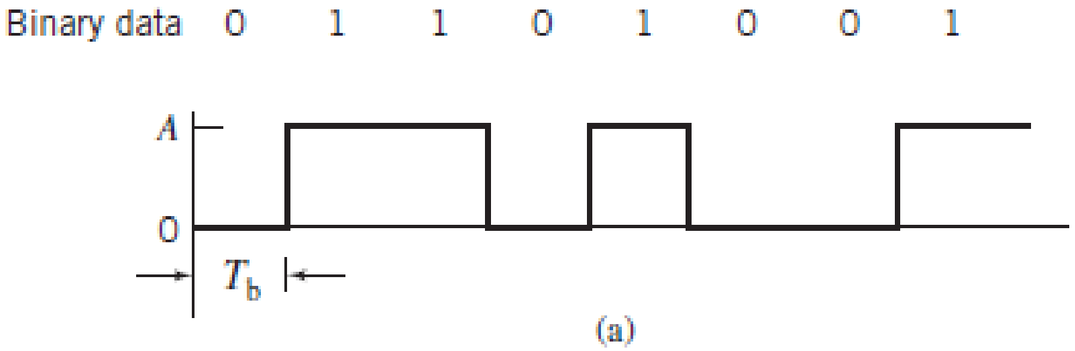
Properties of line codes

1. DC component
2. Self synchronization
3. Error detection
4. Bandwidth compression
5. Differential encoding
6. Noise immunity
7. Spectral compatibility with channel
8. Transparency

UNIPOLAR NRZ SIGNALING

In this line code, symbol 1 is represented by transmitting a pulse of amplitude *A* for the duration of the symbol, and symbol 0 is represented by switching off the pulse, as in Figure 6.24a. The unipolar NRZ line code is also referred to as *on–off signaling*.

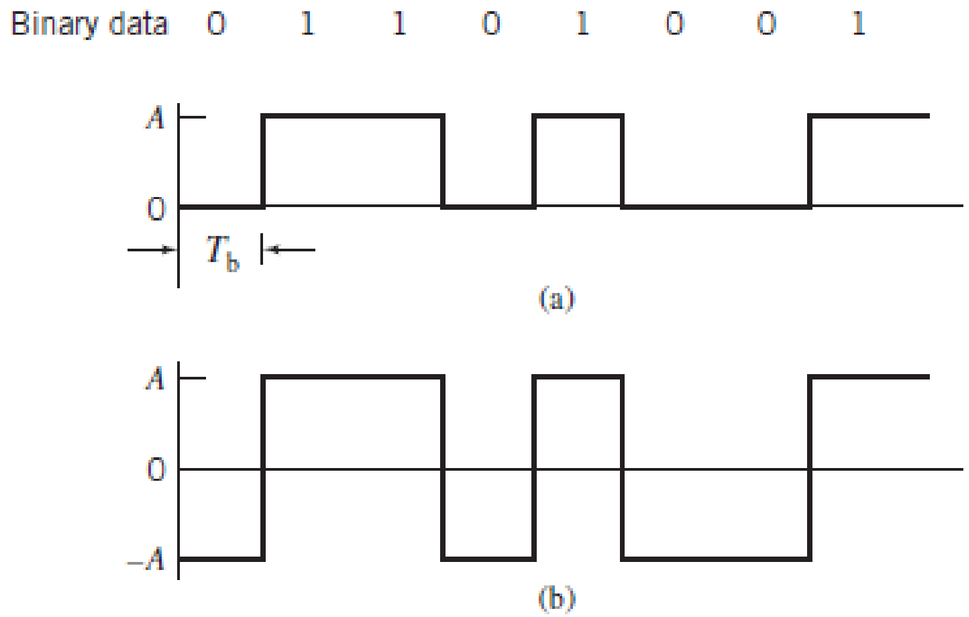
Disadvantages of on–off signaling are the waste of power due to the transmitted DC level and the fact that the power spectrum of the transmitted signal does not approach zero at zero frequency.



(a)

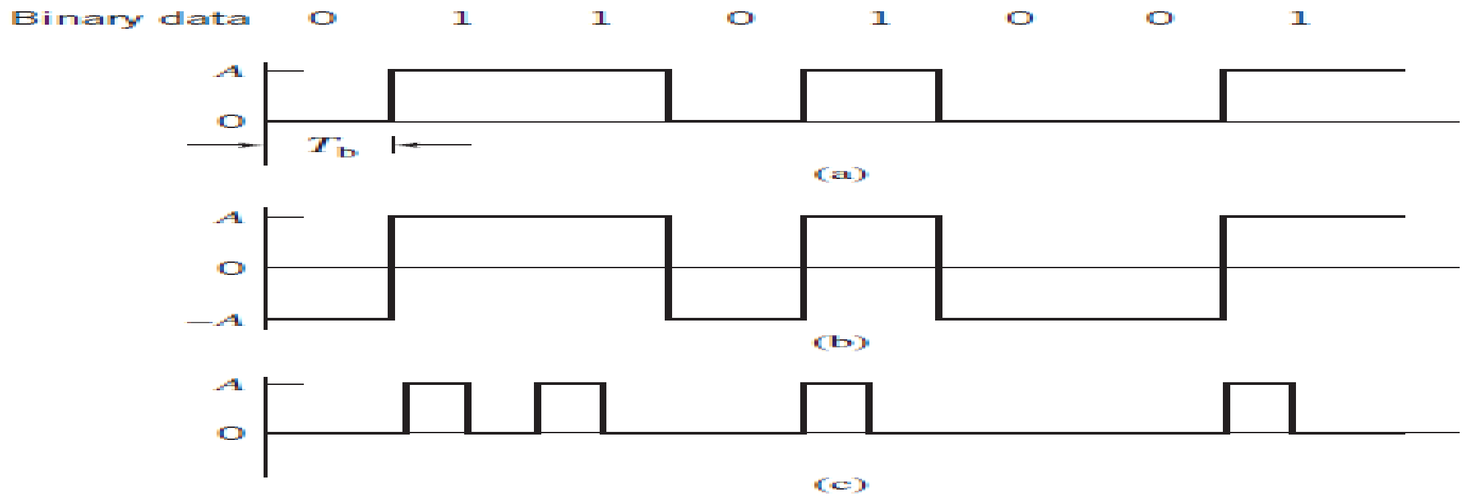
POLAR NRZ SIGNALING

In this second line code, symbols 1 and 0 are represented by transmitting pulses of amplitudes +A and –A, respectively, as illustrated in Figure 6.24b. The polar NRZ line code is relatively easy to generate, but its disadvantage is that the power spectrum of the signal is large near zero frequency.



Unipolar RZ Signaling

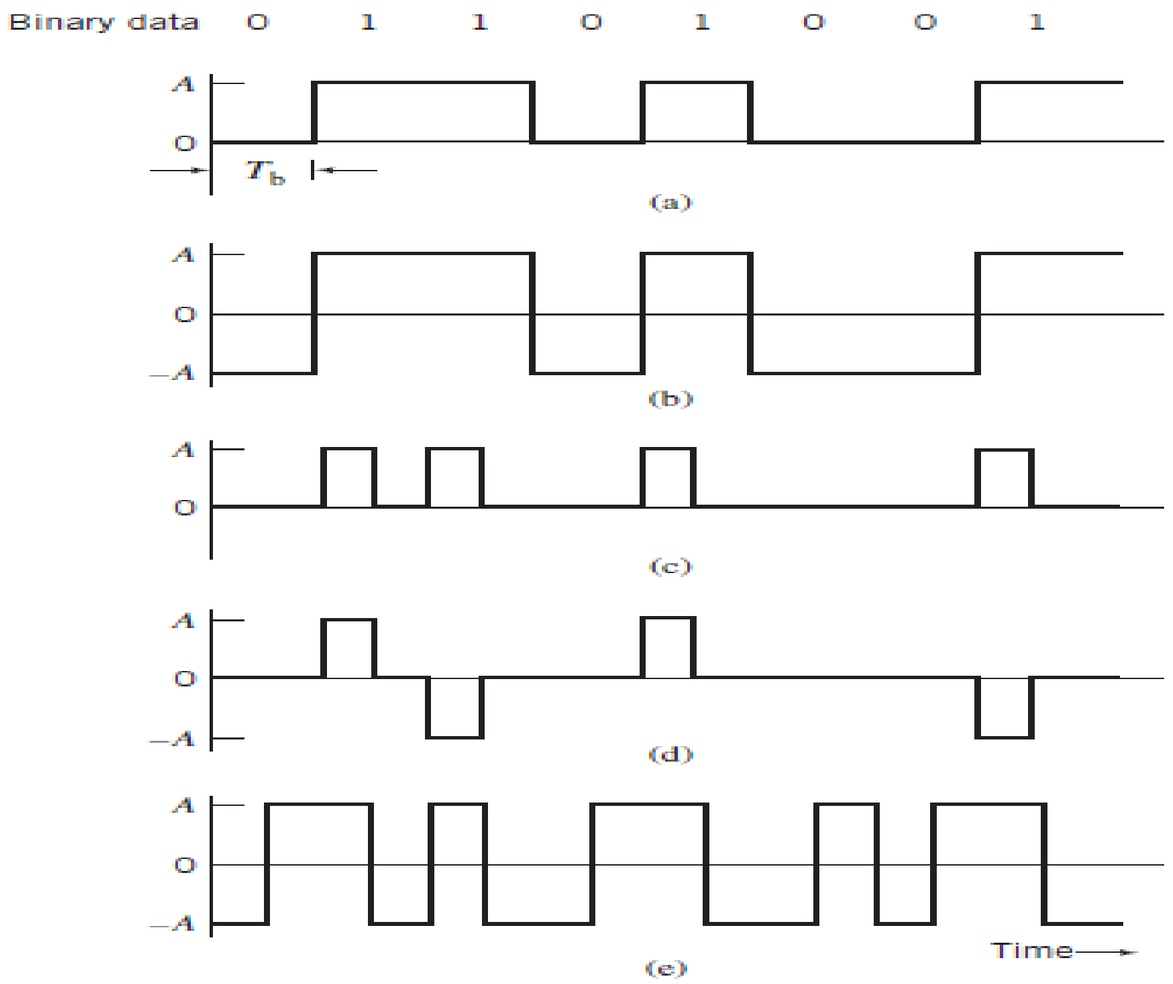
In this third line code, symbol 1 is represented by a rectangular pulse of amplitude A and half-symbol width and symbol 0 is represented by transmitting *no* pulse, as illustrated in Figure 6.24c. An attractive feature of the unipolar RZ line code is the presence of delta functions at $f = 0, \pm 1/T_b$ in the power spectrum of the transmitted signal; the delta functions can be used for *bit-timing recovery* at the receiver. However, its disadvantage is that it requires 3 dB more power than polar RZ signaling for the same probability of symbol error.



Bipolar RZ Signaling

This line code uses three amplitude levels, as indicated in Figure 6.24(d). Specifically, positive and negative pulses of equal amplitude (i.e., $+A$ and $-A$) are used alternately for symbol 1, with each pulse having a half-symbol width; no pulse is always used for symbol 0. A useful property of the bipolar RZ signaling is that the power spectrum of the transmitted signal has no DC component and relatively insignificant low-frequency components for the case when symbols 1 and 0 occur with equal probability. The bipolar RZ line code is also called *alternate mark inversion* (AMI) signaling.

Bipolar RZ Signaling



Split-Phase (Manchester Code)

In this final method of signaling, illustrated in Figure 6.24e, symbol 1 is represented by a positive pulse of amplitude A followed by a negative pulse of amplitude –A, with both pulses being half-symbol wide. For symbol 0, the polarities of these two pulses are reversed. A unique property of the Manchester code is that it suppresses the DC component and has relatively insignificant low-frequency components, regardless of the signal statistics. This property is essential in some applications.