

Data Communications

Lecture

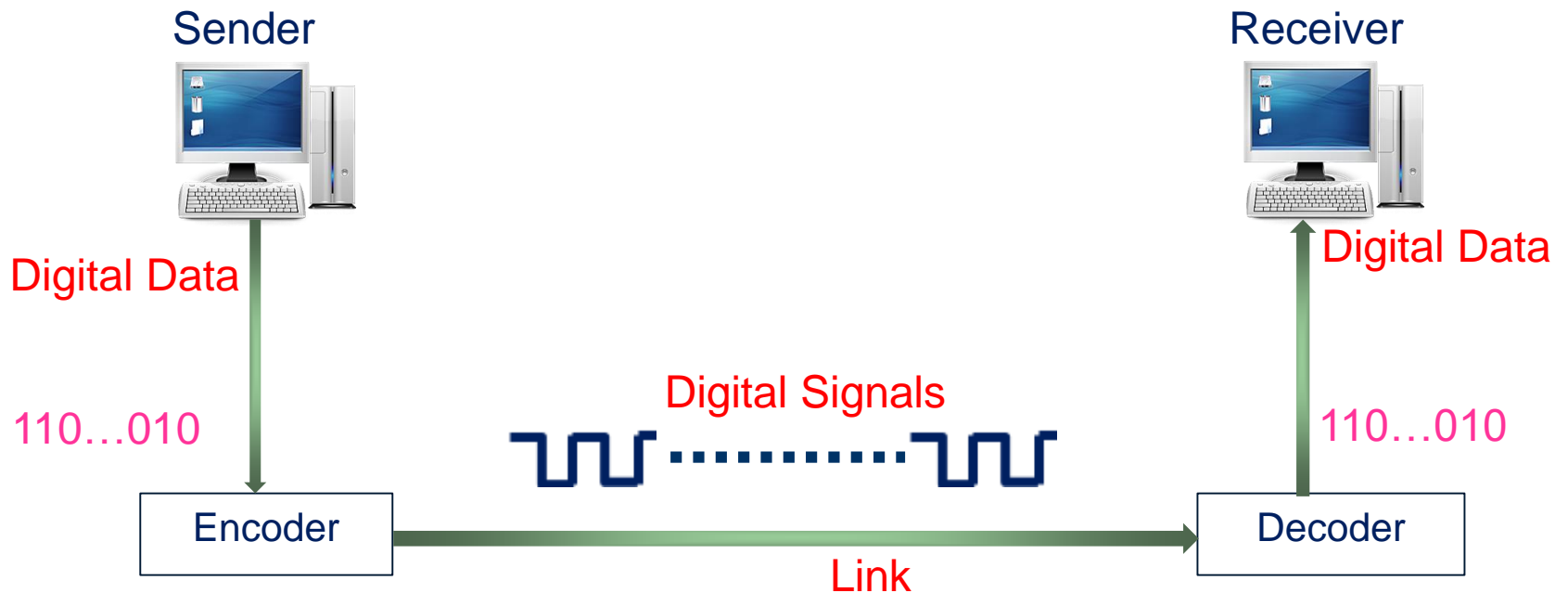
Lecture 8 contents

- Digital-to-Digital Encoding
- Types of Digital-to-Digital Encoding

Digital to Digital Encoding:

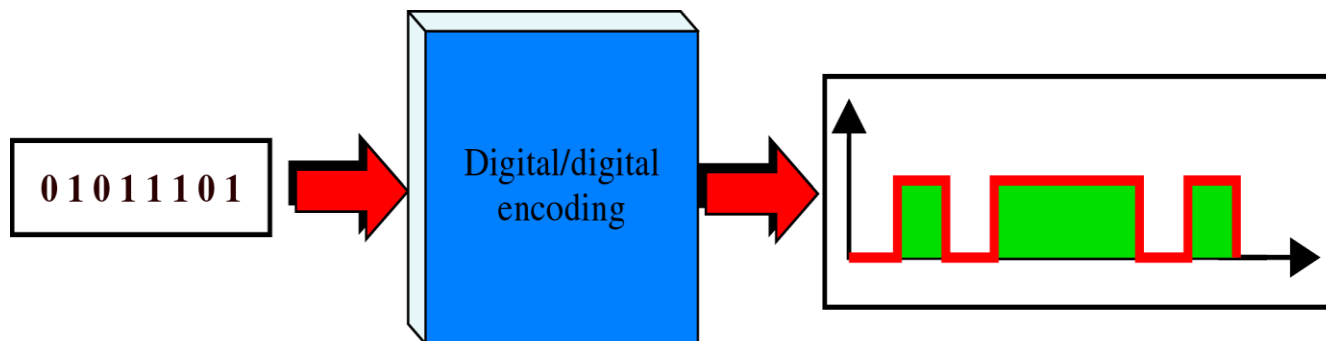
- Digital-to-Digital conversion/encoding is the representation of digital information by digital signal
- For Example:
 - When you transmit data from Computer to the Printer, both original and transmitted data have to be digital

Digital to Digital Encoding:

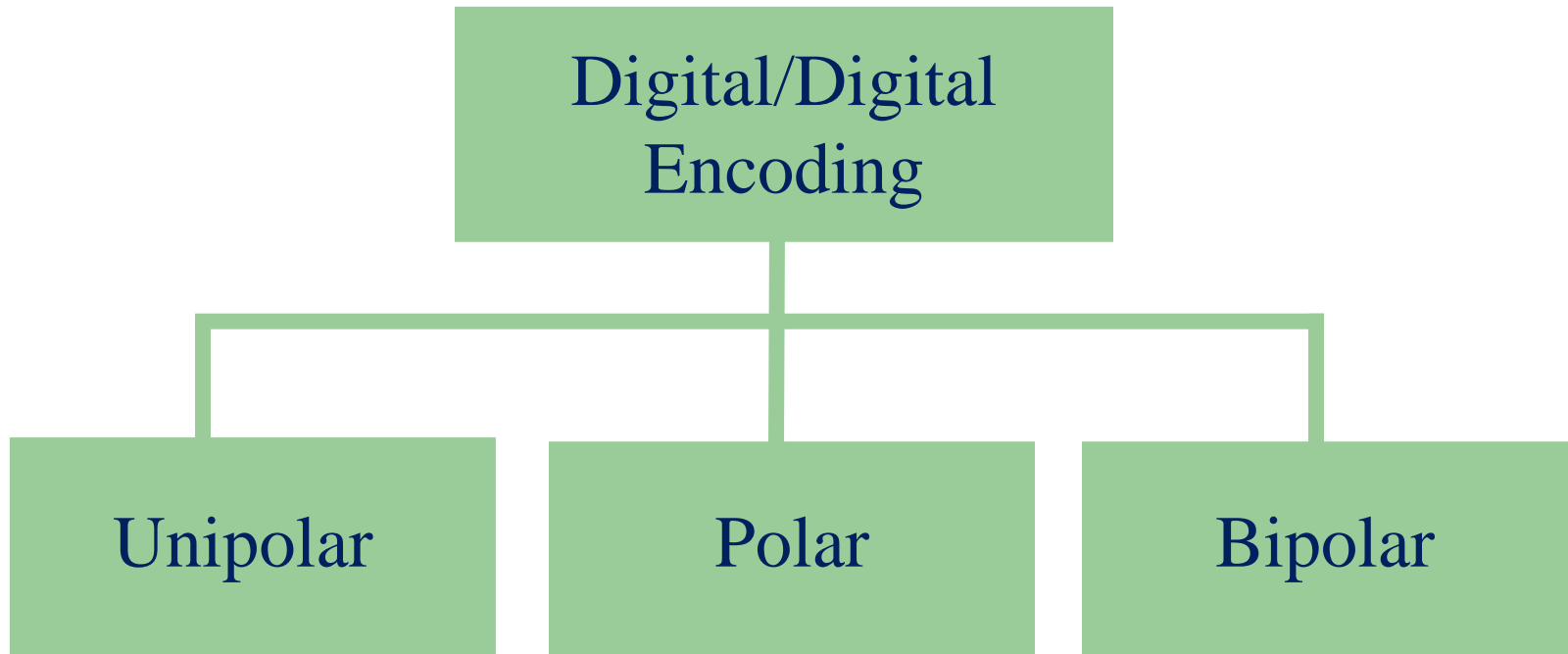


How Digital to Digital Encoding is Done

In this type of encoding, 1's and 0's generated by the computer are translated into voltage pulses that can be propagated over the wire



Types of Digital-to-Digital Encoding



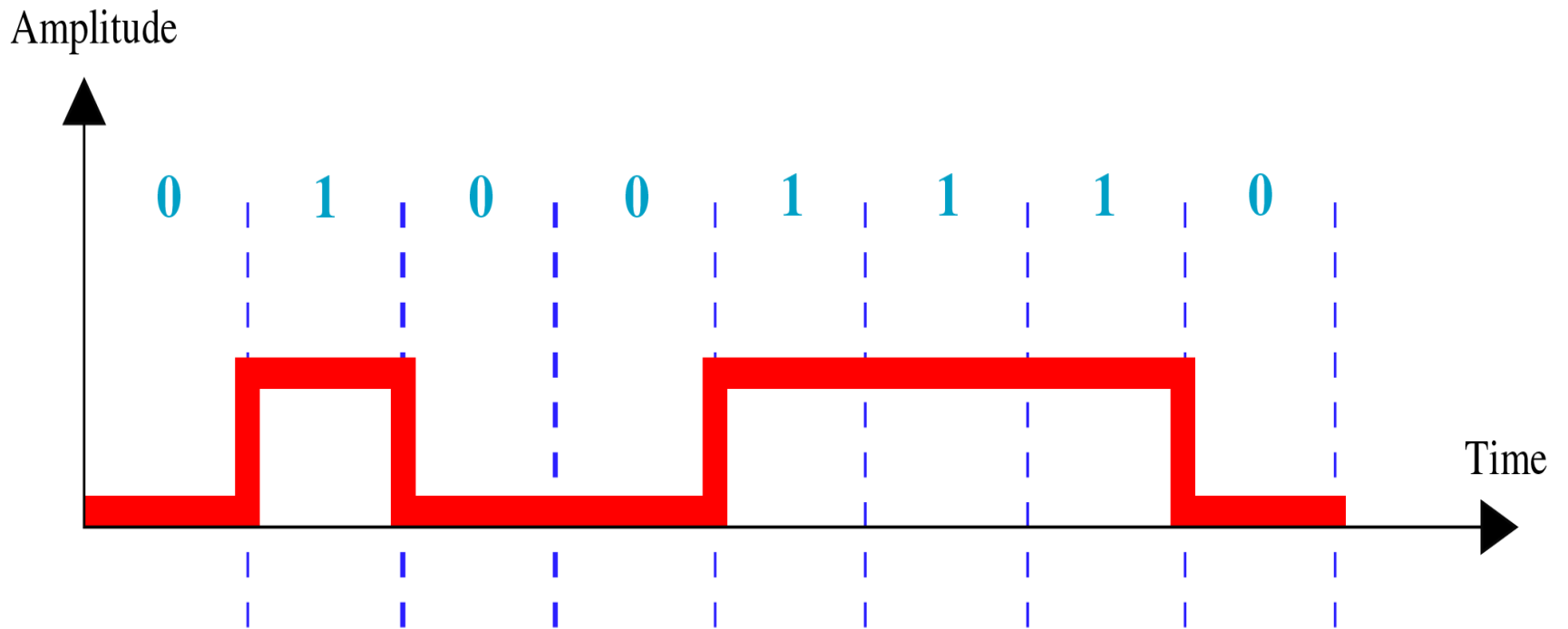
1. Unipolar Encoding

- Simple and Primitive
- Almost Obsolete Today
- Signal amplitude varies between a positive +V and 0 volts

Unipolar Encoding

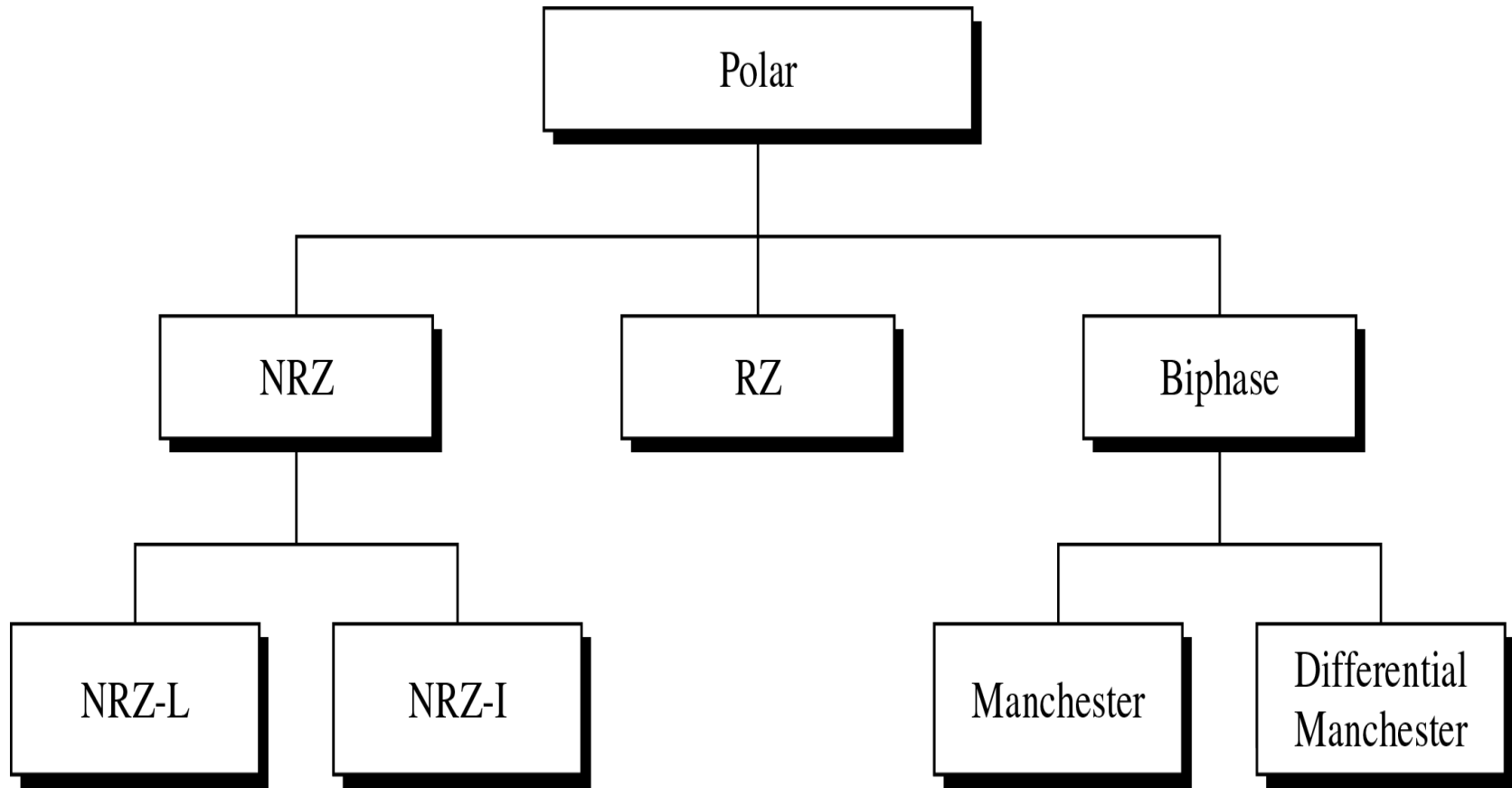
- Digital transmission system works by sending **voltage pulses** on the transmission medium
- One voltage level stands for binary 0 while the other stands for binary 1
- It is called Unipolar because it uses only one polarity
- This polarity is assigned to one of the two binary states usually a '1'
- The other state usually a 0 is represented by zero voltage

Unipolar Encoding



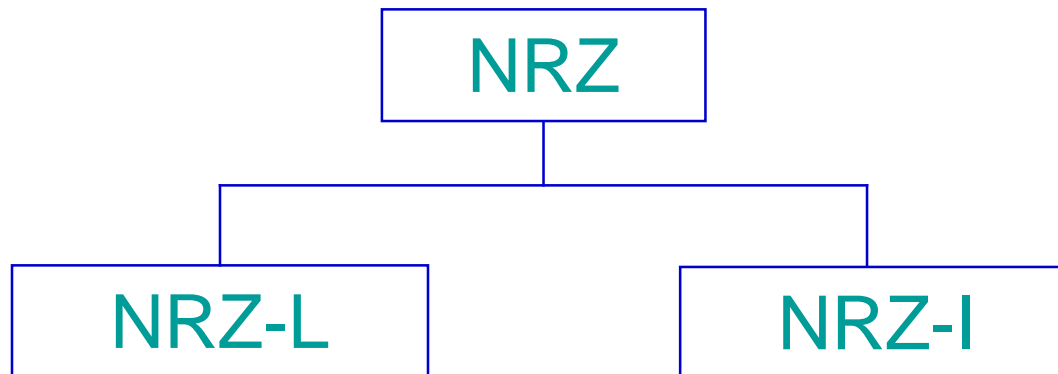
2. Polar Encoding

- Polar encoding uses two voltage levels
 - One positive and one negative\
- The level of signal is either positive or negative



2.1 Non-Return to Zero

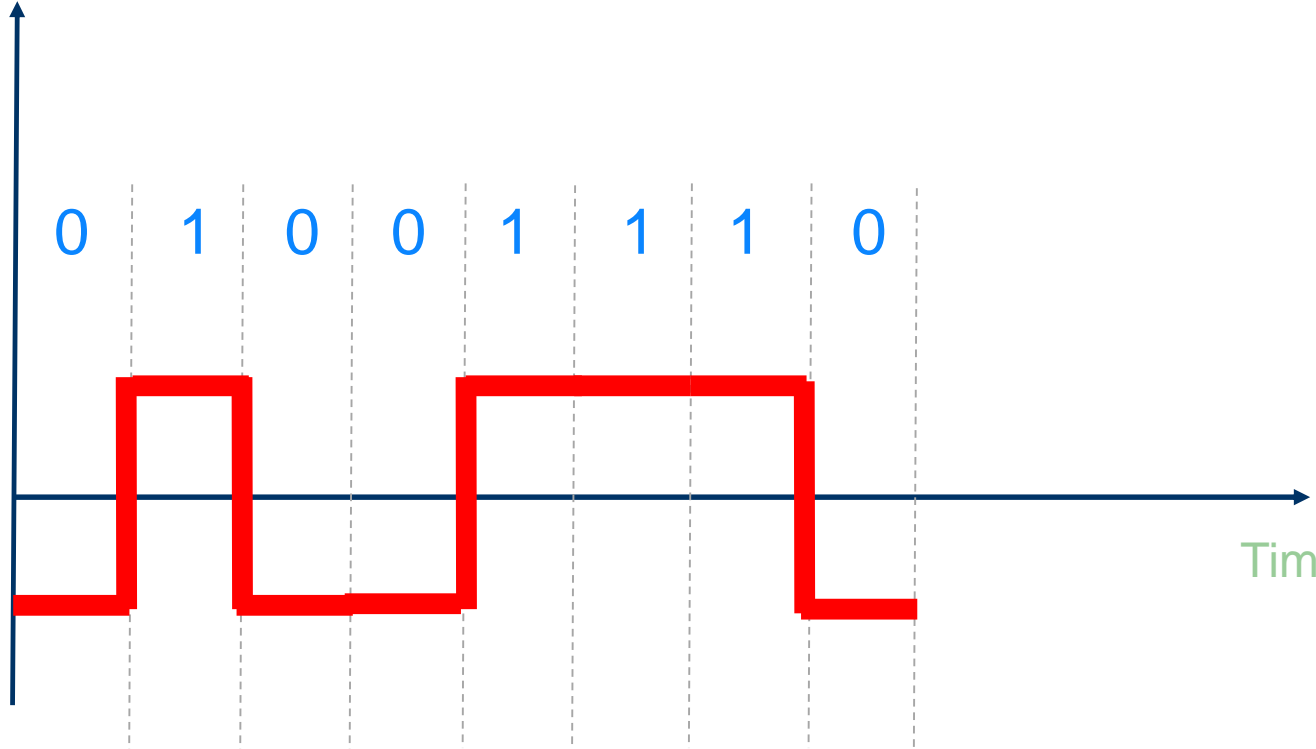
The level of signal is either positive or negative and does not return to zero in the middle of a bit



2.1.1 NRZ-L

- Non Return to Zero - Level
- Level of the signal depends on the type of bit it represents
- A positive voltage usually means the bit is a 1 and a negative voltage means the bit is a 0 (vice versa)

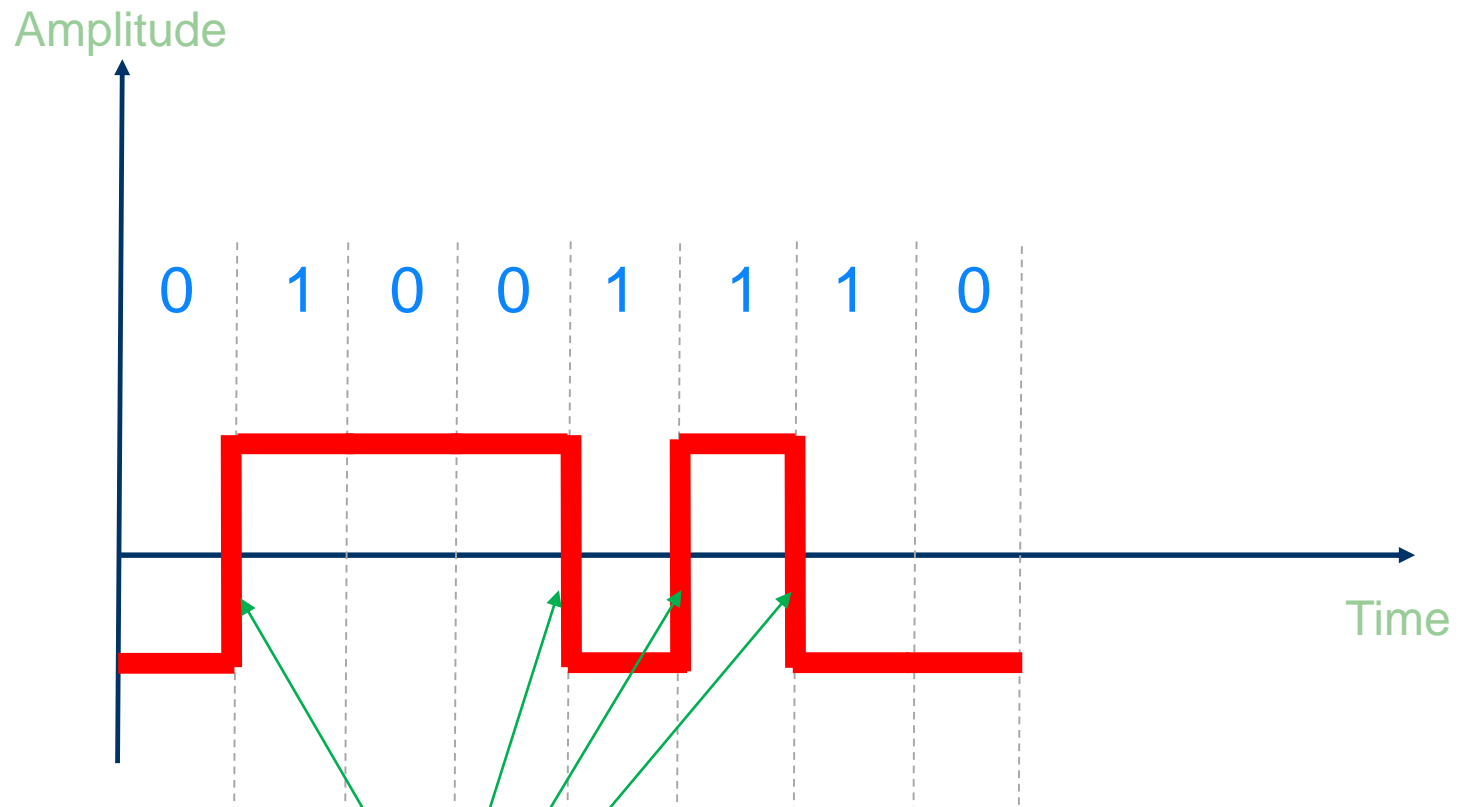
Amplitude



Time

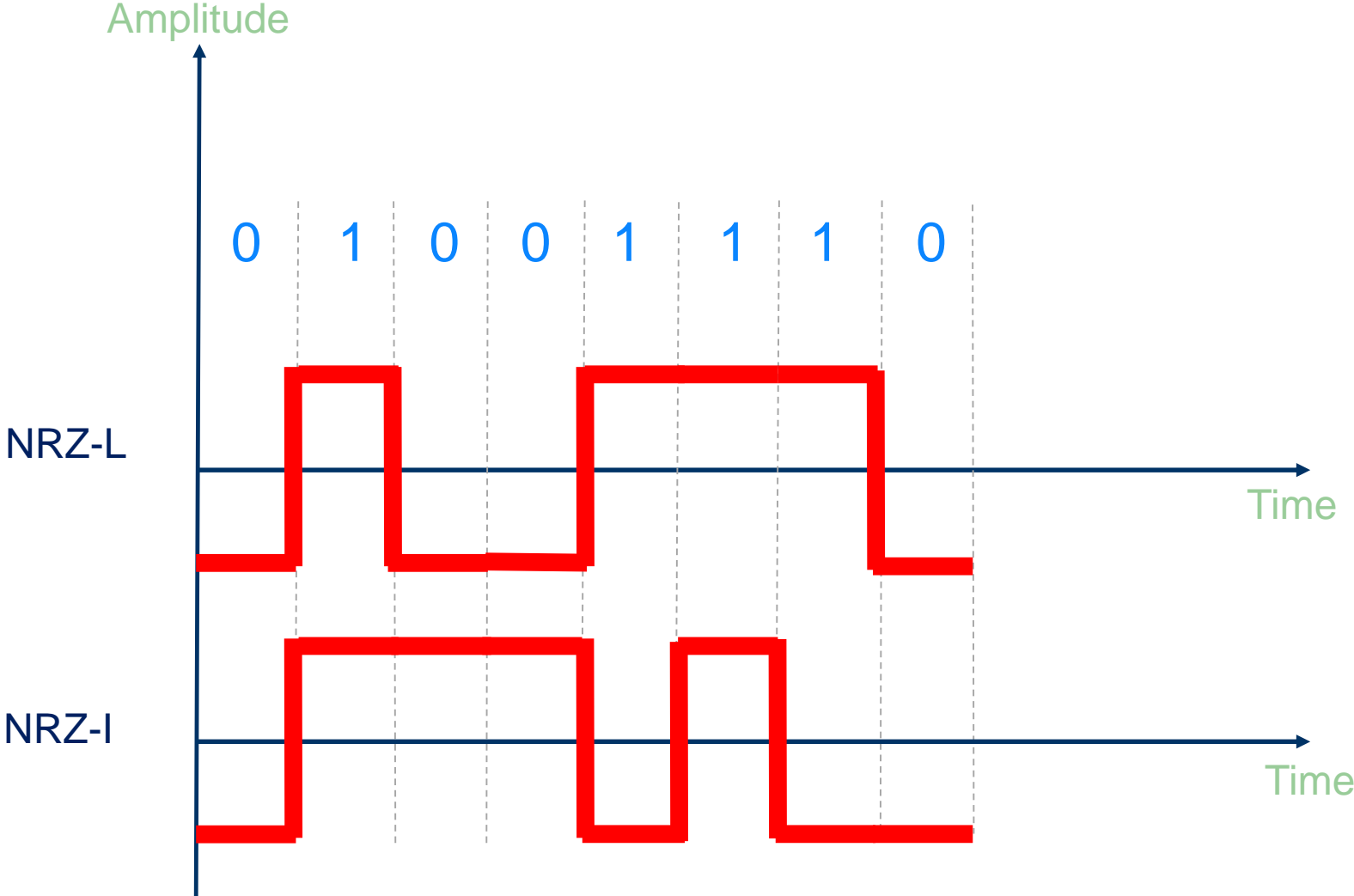
2.1.2 NRZ-I

- Non-Return to Zero - Inverted
- The inversion of the level represents a 1 bit
- A bit 0 is represented by no change



Transition because
next bit is 1.

NRZ-L vs. NRZ-I

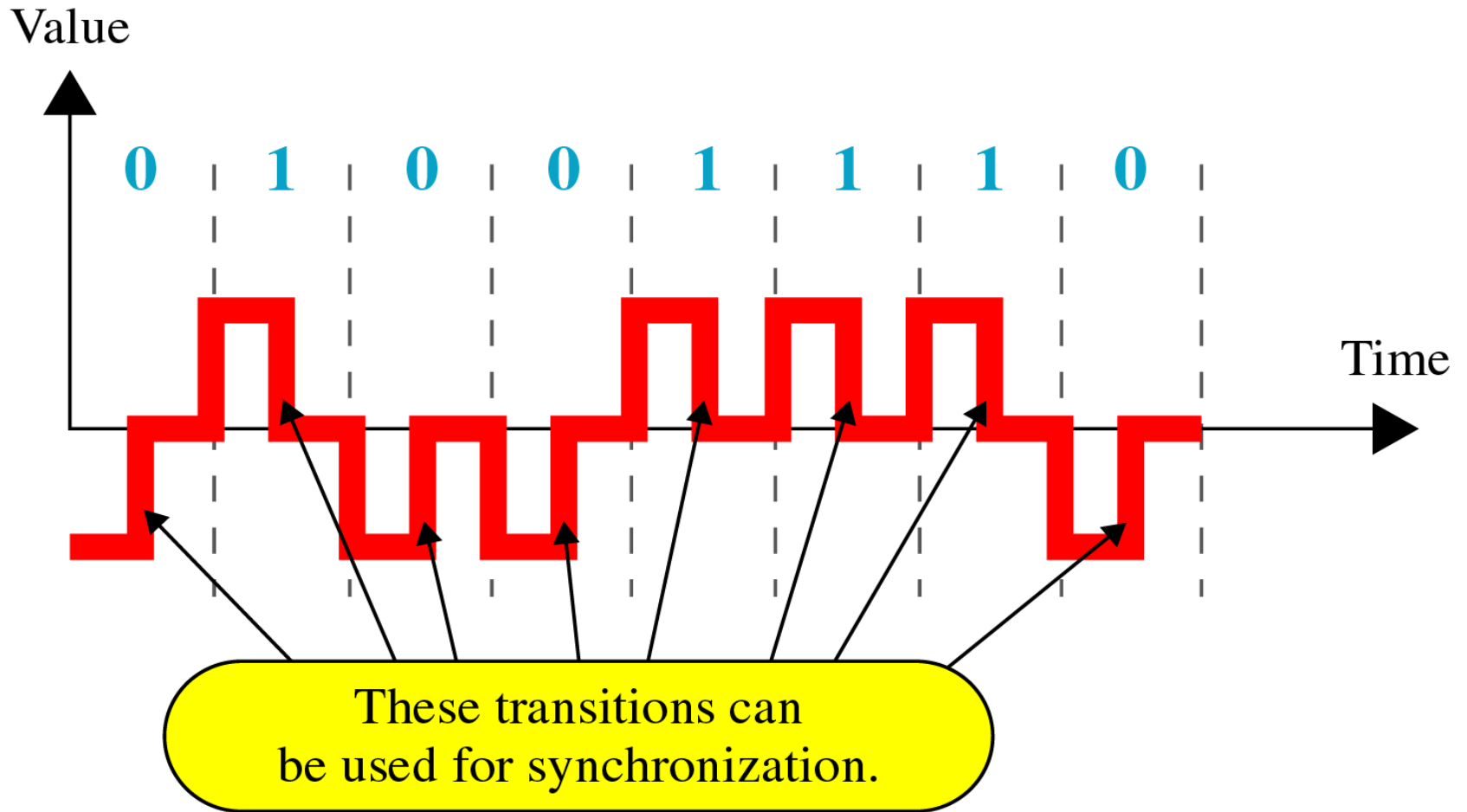


2.2 Return to Zero

RZ encoding uses 3 values : Positive, Negative and Zero

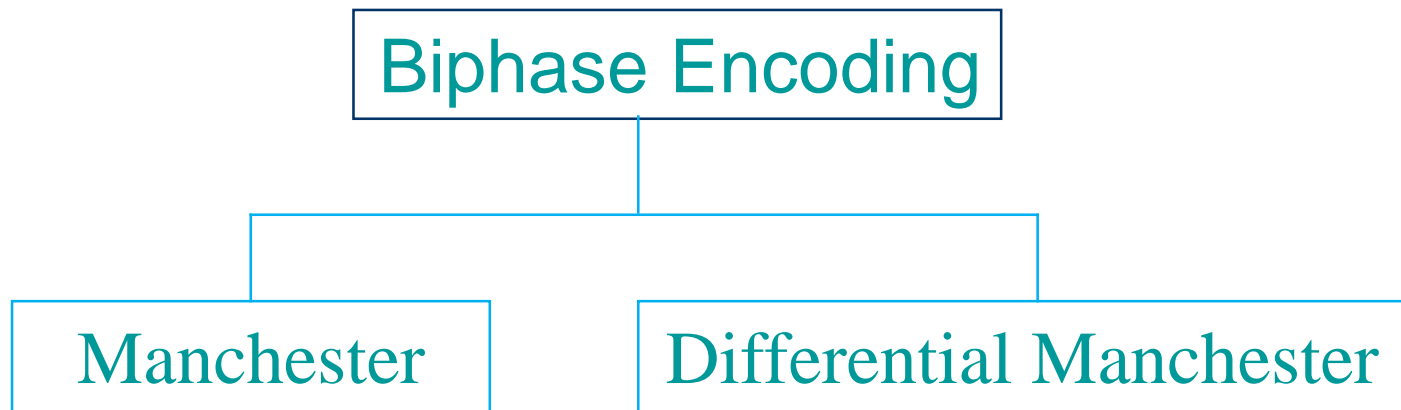
- Signal changes during each bit.
- Like NRZ-L , positive voltage means 1 and a negative voltage means 0, but unlike NRZ-L, half way through each bit interval, the signal returns to zero

A 1 bit is represented by **positive to zero** and a 0 is represented by **negative to zero** transition



2.3 BiPhase

- Signal changes at the middle of bit interval but does not stop at zero
- Instead it continues to the opposite pole



2.3.1 Manchester

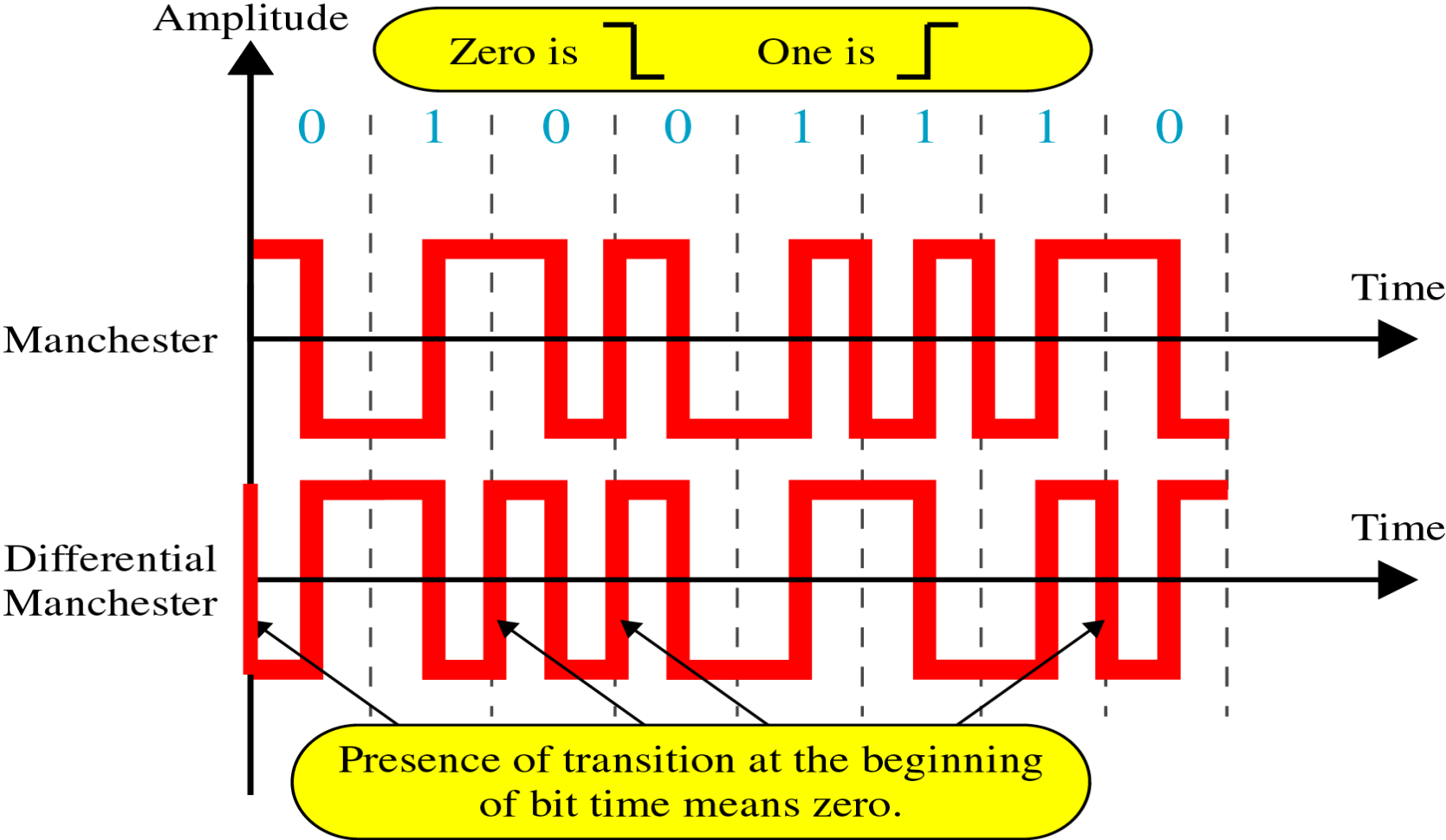
It uses inversion at the middle of each bit interval for bit representation

- Negative-to-Positive Transition = 1
- Positive-to-Negative Transition = 0

2.3.2 Differential Manchester

- Like Manchester it also uses inversion at the middle of a bit interval, but also an additional transition at the beginning of bit interval to represent a bit.
- A transition means binary 0 & no transition means binary 1
- Requires 2 signal changes to represent binary 0 but only one to represent binary 1

Manchester and Differential Manchester Encoding



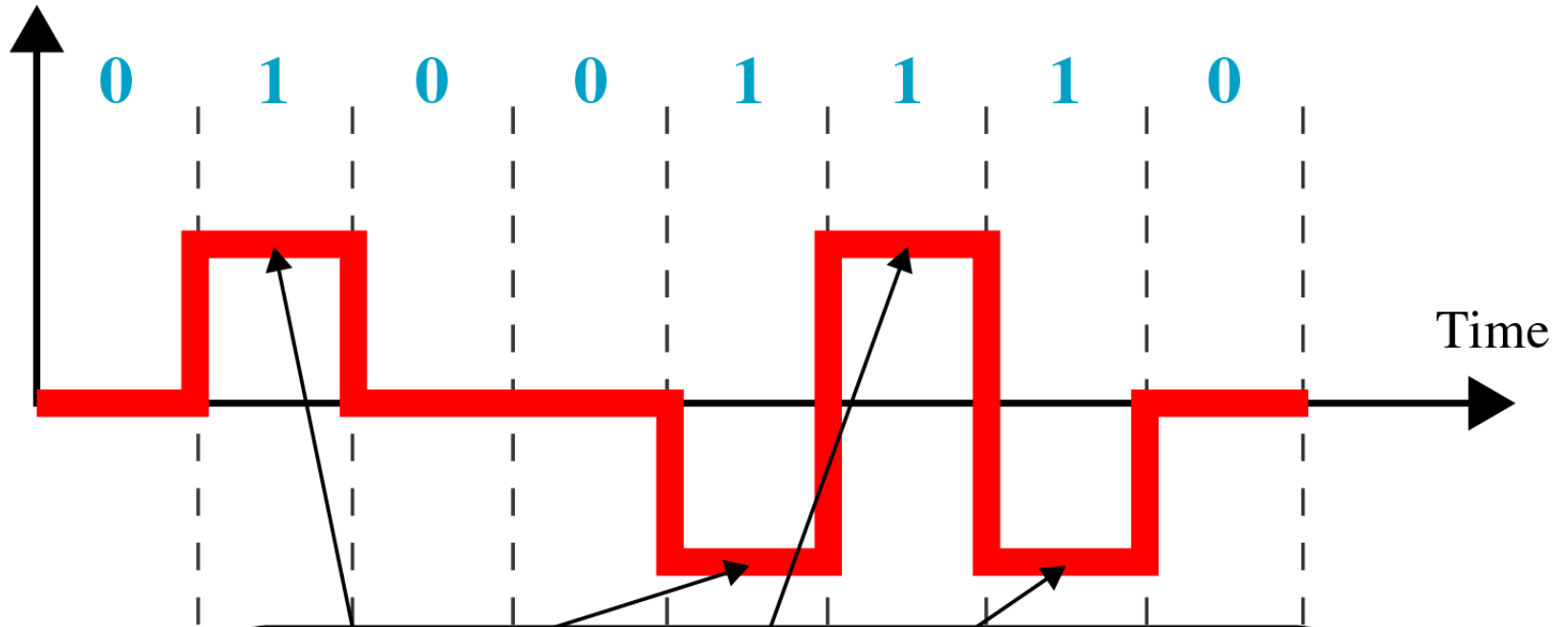
3. Bipolar Encoding

- Like RZ, it uses three voltage levels:
- Unlike RZ, zero level is used to represent binary 0
- Binary 1's are represented by alternate positive and negative voltages

Alternate Mark Inversion (AMI)

- Simplest type of Bipolar Encoding
- Alternate Mark Inversion means Alternate '1' Inversion

Amplitude

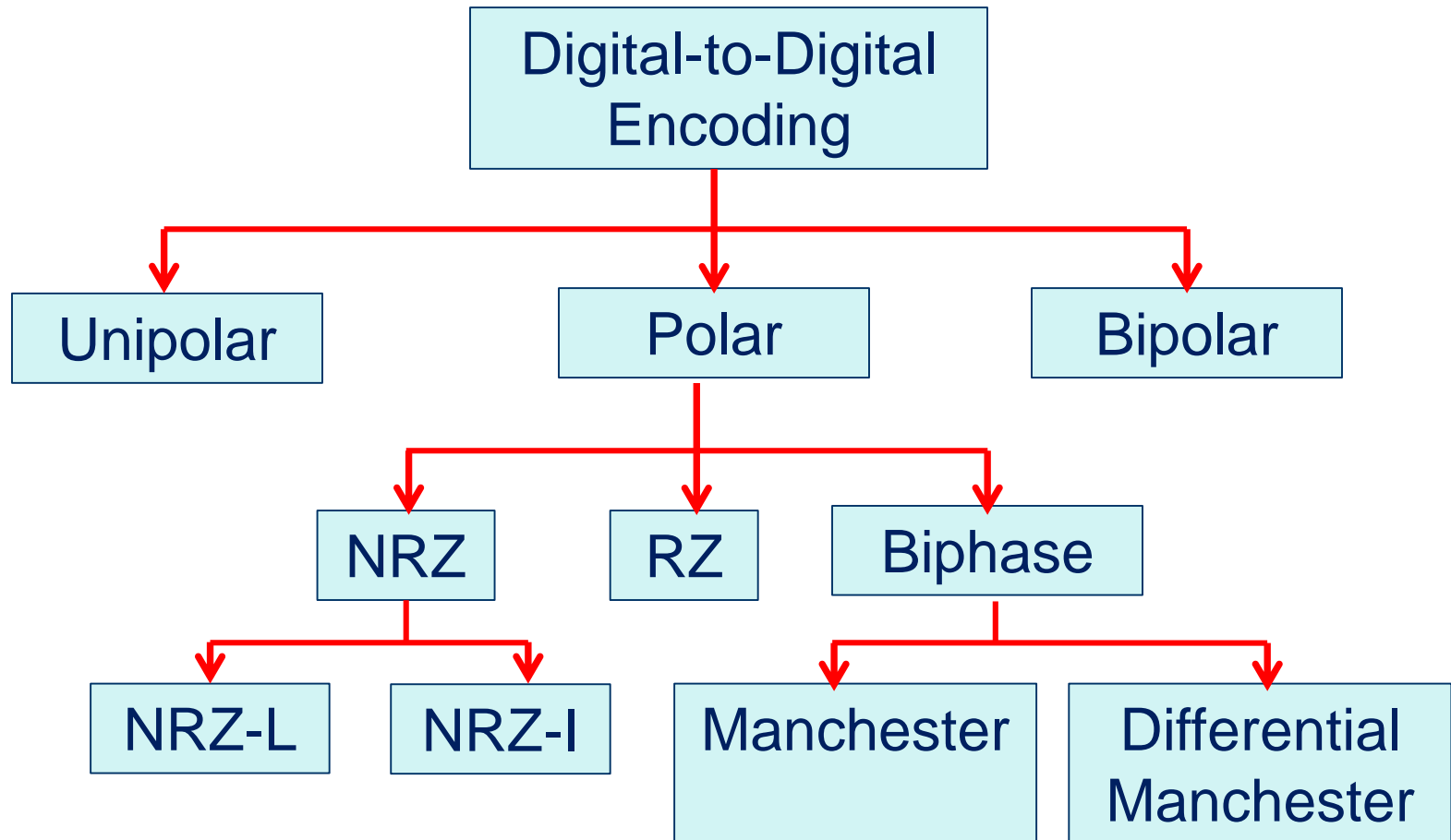


The 1s are positive and negative alternately.

Conclusion

- ❖ Digital-To-Digital Encoding
- ❖ Types of Digital-To-Digital Encoding
 1. Unipolar
 2. Polar
 - NRZ
 - NRZ-L
 - NRZ-I
 - RZ
 - Biphase
 - Manchester
 - Differential Manchester
 3. Bipolar
 - AMI

Conclusion



Q uestions? ?