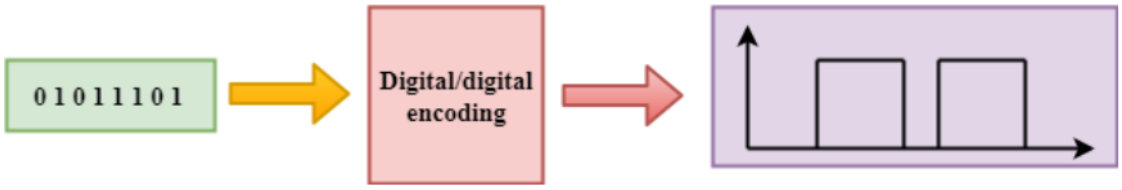
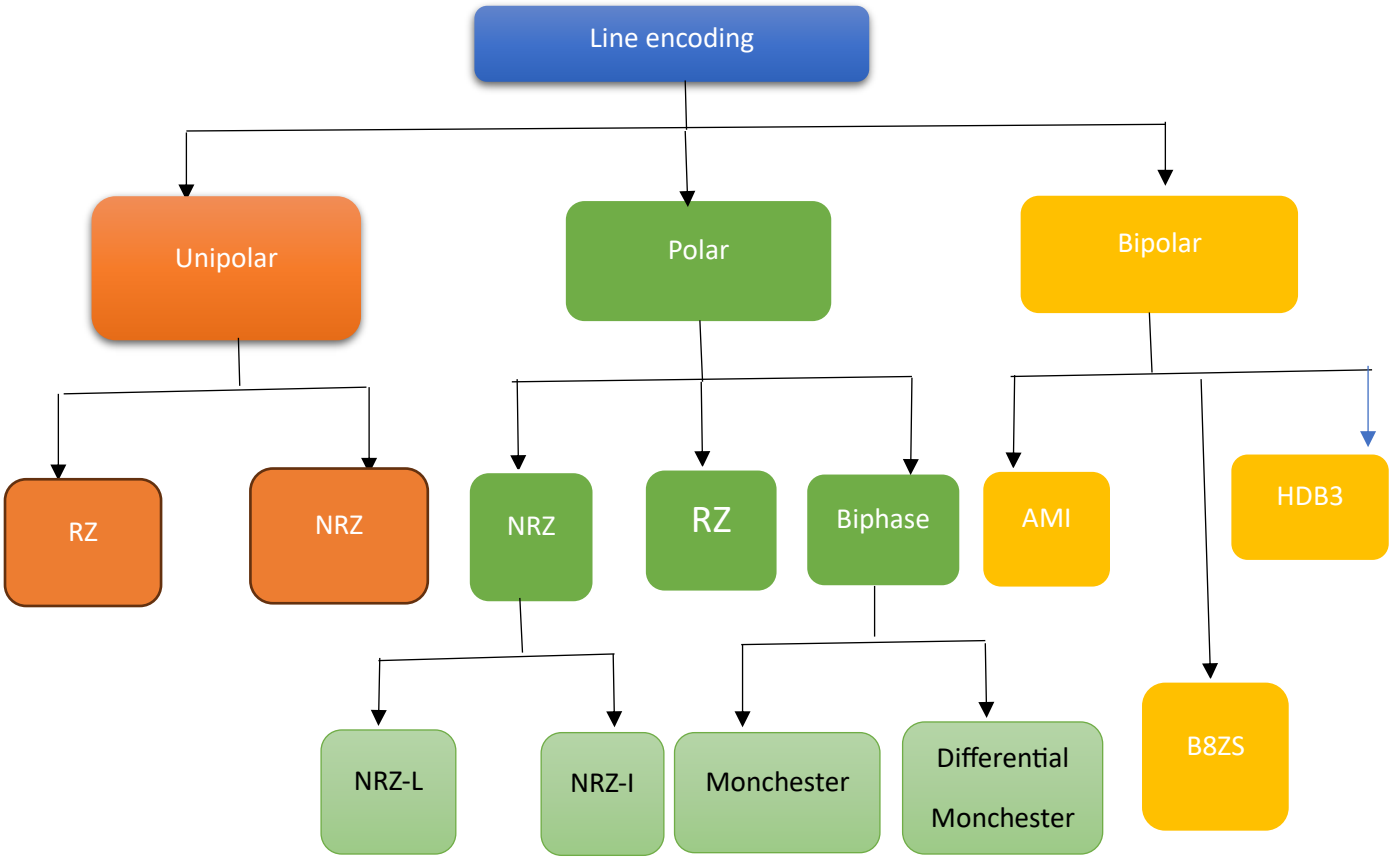
Digital Transmission

Data can be represented either in analog or digital form. The computers used the digital form to store the information. Therefore, the data needs to be converted in digital form so that it can be used by a computer.

Digital-To-Digital Conversion

Digital to digital encoding is the representation of digital information by a digital signal. When binary 1s and 0s generated by the computer are translated into sequence of voltage pulses that can be propagated over a wire, this process is called digital-to-digital encoding.

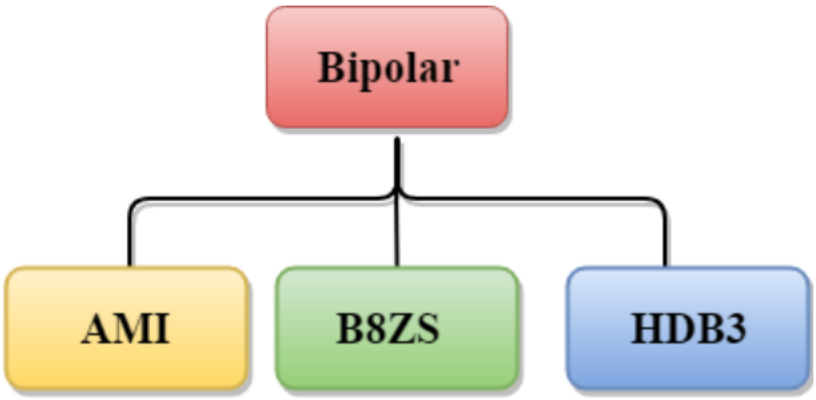




Bipolar

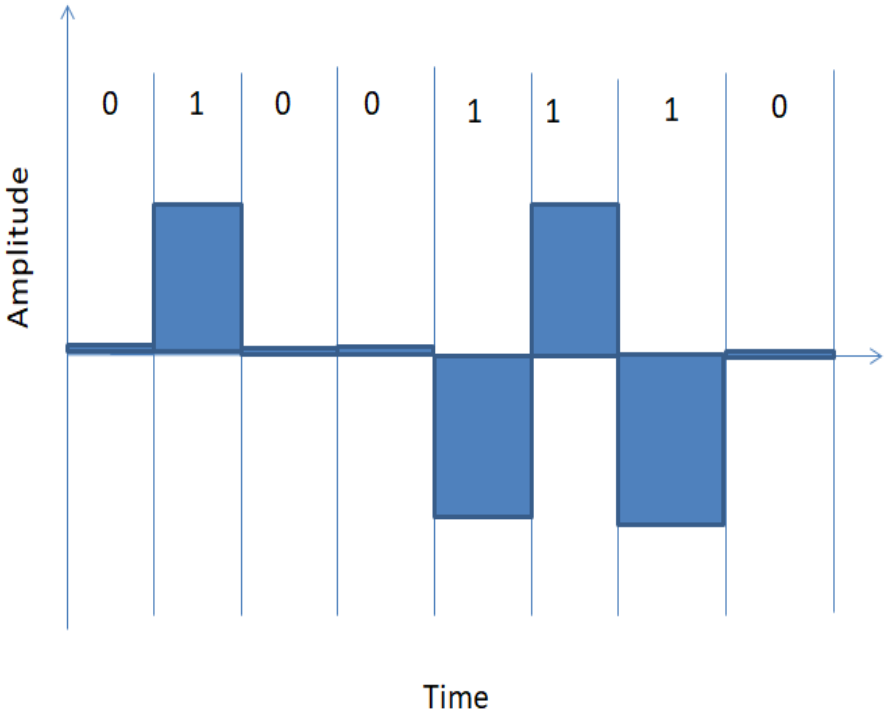
- Bipolar encoding scheme represents three voltage levels: positive, negative and zero.
- Zero level in bipolar is used to represent binary 0.
- Binary 1 is represented by alternating positive and negative voltages.
- If the first 1 bit is represented by positive amplitude, then the second 1 bit is represented by negative amplitude, third 1 bit is represented by the positive amplitude and so on.

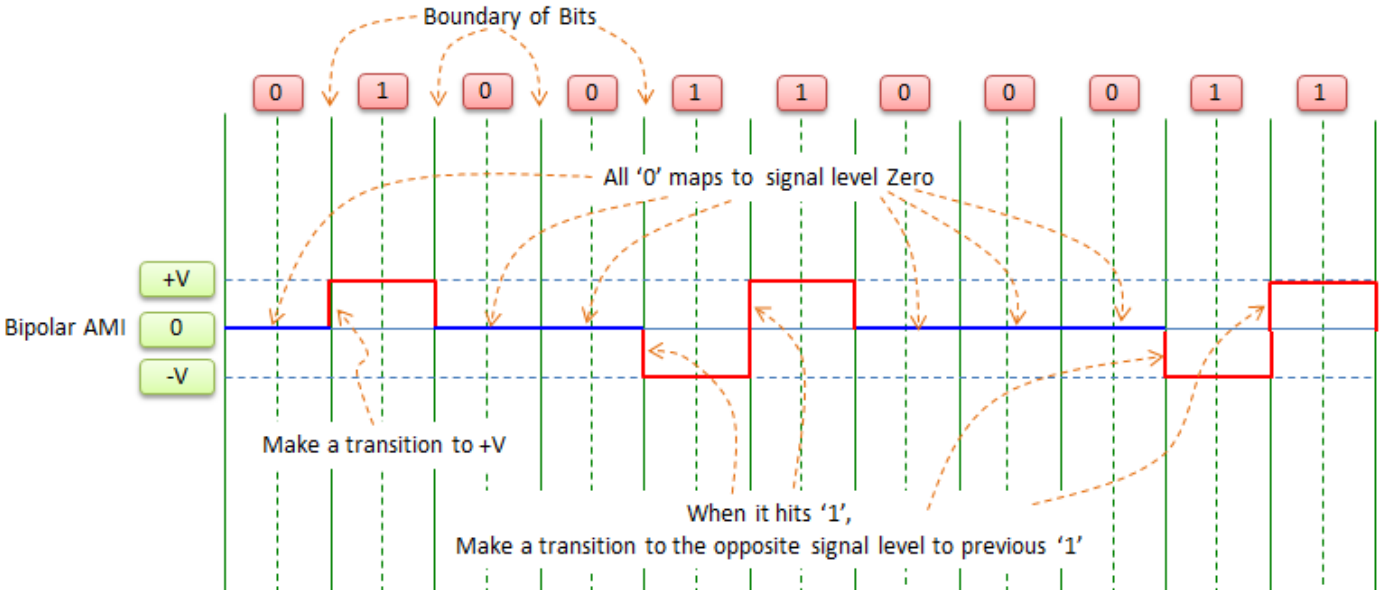
Bipolar can be classified as:



1. AMI

- AMI stands for alternate mark inversion where mark word comes from telegraphy which mean 1. So, it can be redefined as alternate 1 inversion.
- 0 bit is represented by zero 0 level.
- 1 bit is represented by alternating positive and negative voltages.





Advantages:

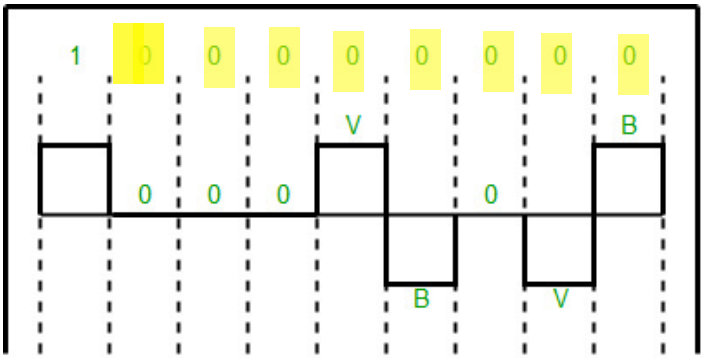
- DC component is zero.
- Long sequence of 1s bits are synchronised.

Disadvantage:

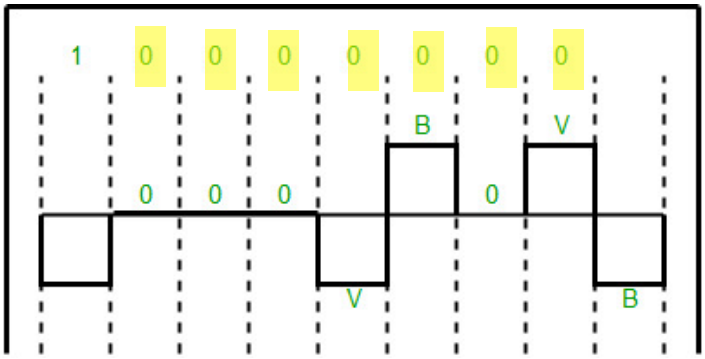
- This encoding scheme does not ensure the synchronisation of a long string of 0s bits.

2. B8ZS

- B8ZS stands for Bipolar 8- zero substitution.
- This technique is to provide synchronization of a long sequences of 0 bits.
- In most of the cases, the functionality of B8ZS is similar to the bipolar AMI, but the only difference is that it provides the synchronization when a long sequence of 0s bits occur.
- When eight 0 occurs, then B8ZS implements some changes in 0s string pattern based on the polarity of the previous 1 bit.
- If the polarity of the previous 1 bit is positive, the eight 0s will be encoded as zero, zero, zero, positive, negative, zero, negative, positive.
- If the polarity of previous 1 bit is negative, then the eight 0s will be encoded as zero, zero, zero, negative, positive, zero, positive, negative.



Previous level is positive

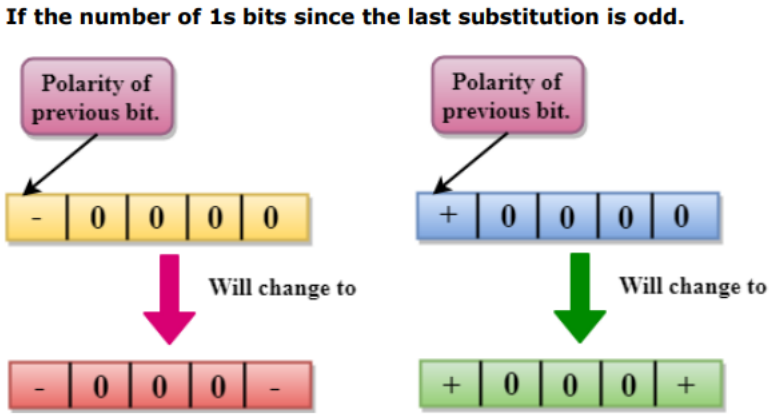


b. Previous level is negative.

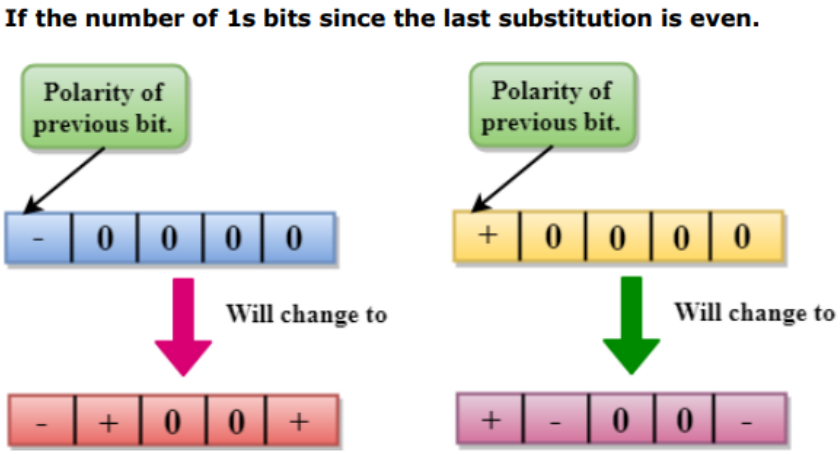
3. High-Density Bipolar 3(HDB3)

- HDB3 stands for High-Density Bipolar 3.
- HDB3 technique is designed to provide the synchronization of a long sequence of 0s bits.
- When four 0s occur, HDB3 looks at the number of 1s bits occurred since the last substitution.

- If the number of 1s bits is odd, then the violation is made on the fourth consecutive of 0. If the polarity of the previous bit is positive, then the violation is positive. If the polarity of the previous bit is negative, then the violation is negative



- If the number of 1s bits is even, then the violation is made on the place of the first and fourth consecutive 0s. If the polarity of the previous bit is positive, then violations are negative, and if the polarity of the previous bit is negative, then violations are positive.



No of nonzero voltage	Previous voltage	Substitution
ODD	POSITIVE	0 0 0 +
	NEGATIVE	0 0 0 –
EVEN	POSITIVE	- 0 0 -
	NEGATIVE	+ 0 0 +