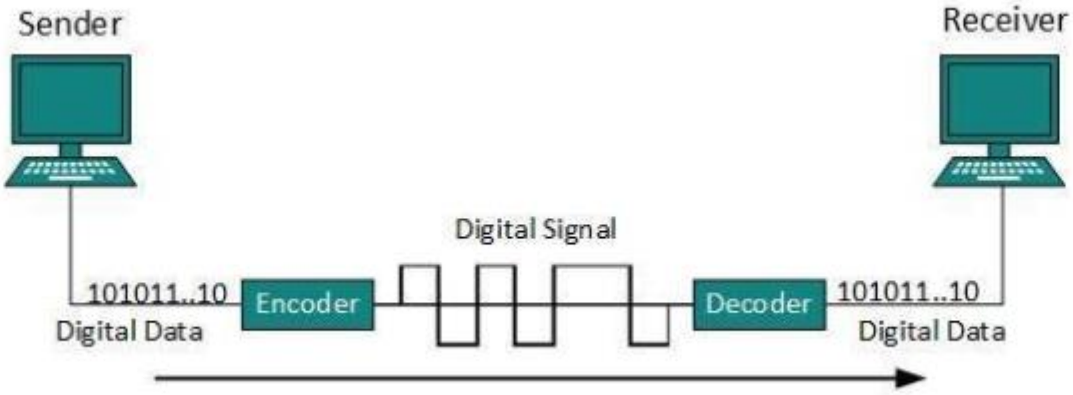
Lab Manual 5

Line Encoding Schemes

Line coding consists of representing the digital bits to be transported, by a waveform that is optimally tuned for the specific properties of the physical channel (and of the receiving equipment). The pattern of voltage, current or photons used to represent the digital data on a transmission link is called *line encoding*. The common types of line encoding are unipolar, polar, bipolar, and Manchester encoding.



Why do we need a line coded signal:

- the line-coded signal can directly be put on a transmission line, in the form of variations of the voltage or current .

  If two persons want to communicate through a wire and codes are to send

  - 11 for Hello
  - 00 for by
  - 01 for how are you?
  - 10 for fine.

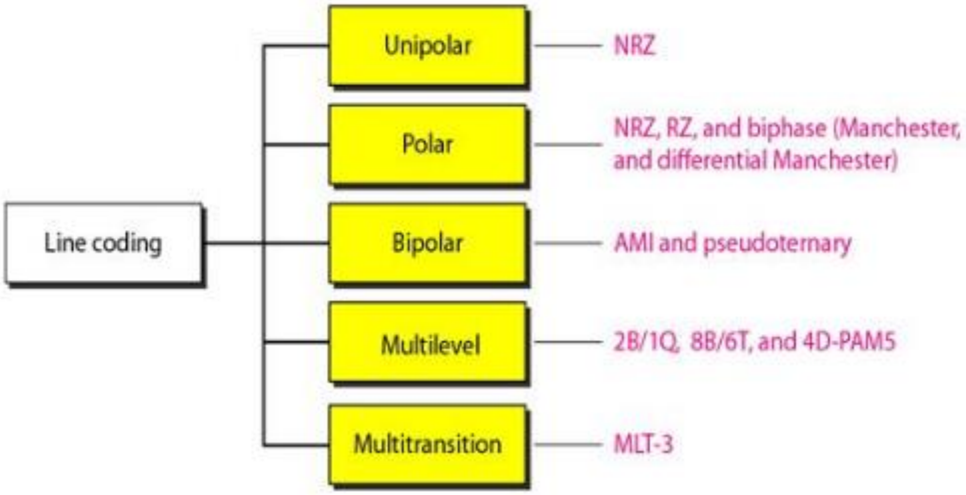
How can we transmit bits through wire?

We need to interpret bits into the voltage levels. That is why we use line encoding schemes.

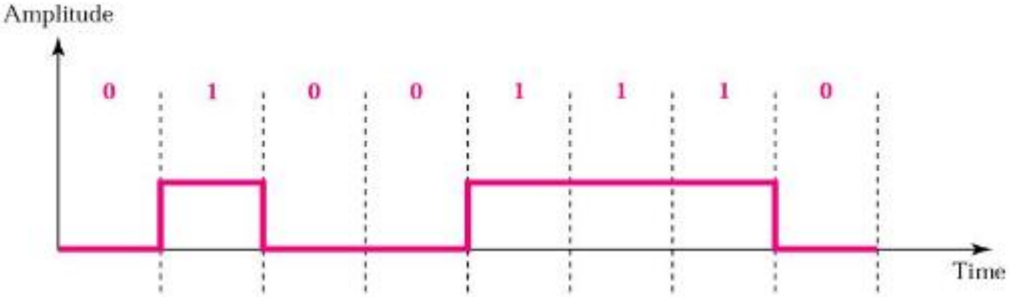
There are different lone encoding techniques to implement.Each line code has advantages and disadvantages.By adding different featrures to existing technique we get new improved technique. Then a particular line code used is chosen to meet one or more of the following criteria:

For detail goto:
http://www.myreadingroom.co.in/notes-and-studymaterial/68-dcn/719-different-line-coding-techniques.html

Line Encoding Techniques:

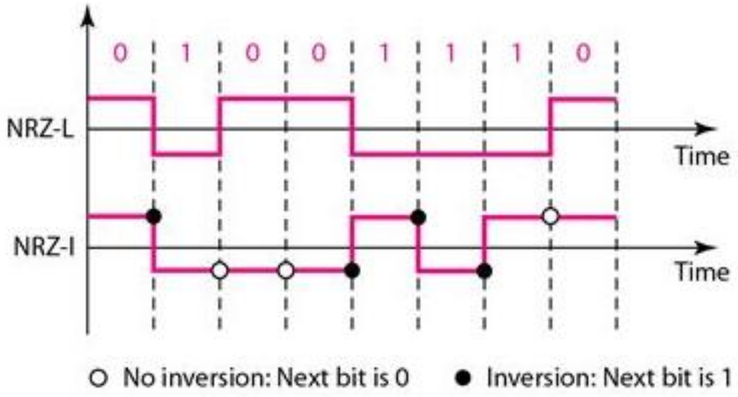

Line coding
Unipolar
Polar
Bipolar
Multilevel
Multitransition
NRZ
NRZ, RZ, and biphase (Manchester, and differential Manchester)
AMI and pseudoternary
2B/1Q, 8B/6T, and 4D-PAM5
MLT-3

Unipolar:

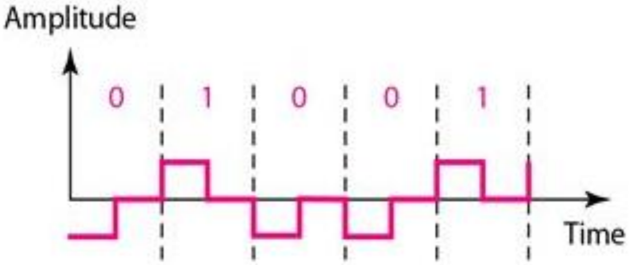


Polar:

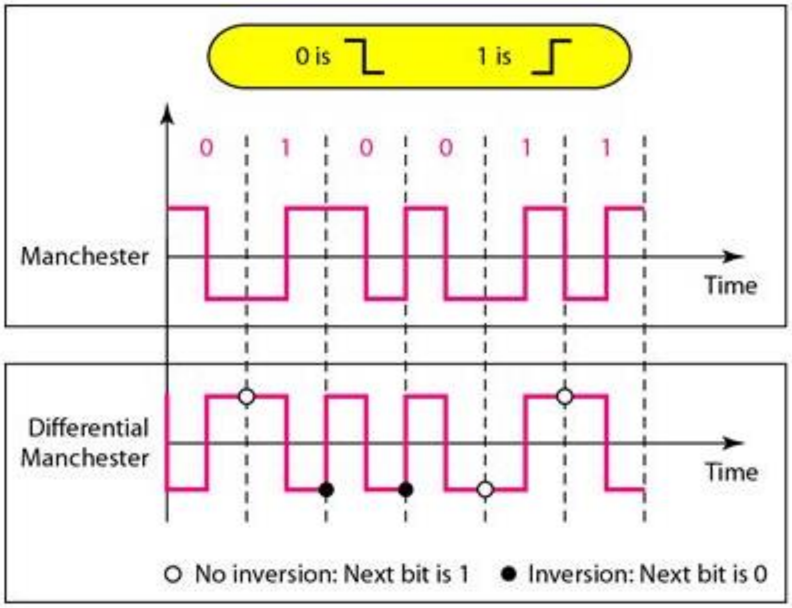
Non-Return-to-Zero (NRZ):



Return to Zero (RZ):



Biphase Manchester and Differential Manchester:



Example(s):

Matlab code for Uni Polar Non returning to zero encoding scheme:

```
bits=[1 0 0 1 0 1 0 1 0 0 0 0 0 0 0 1 1 1 0 1 0 1 0 1 0 1 0];
bitrate=10;

%   [T, X] = UNRZ(BITS, BITRATE) encodes BITS array using unipolar NRZ
%   code with given BITRATE. Outputs are time T and encoded signal
%   values X.

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T = length(bits)/bitrate; % full time of bit sequence
n = 200;
N = n*length(bits);
dt = T/N;
t = 0:dt:T;
x = zeros(1,length(t)); % output signal
 j=1;
for k=1:200:length(t)-200

   if(bits(j)==1)
       x(k:k+200)=1;
   else
    x(k:k+200)=0;
    end
     j=j+1;
end

plot(t,x,'LineWidth',2);
```

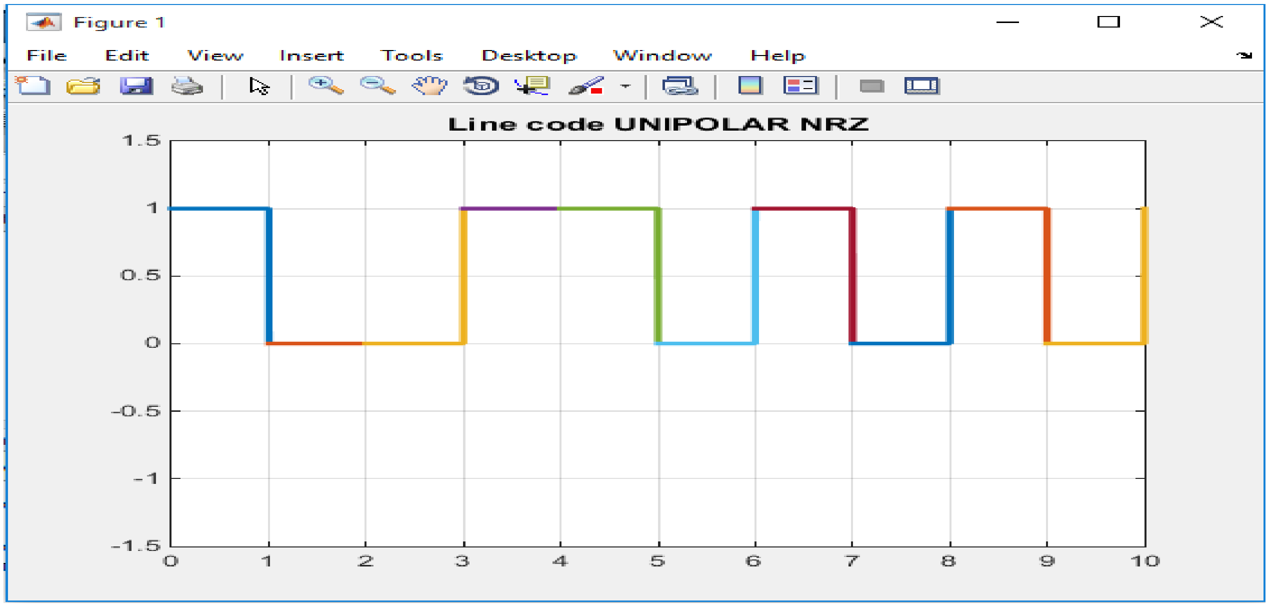

TASKS:

1: Apply given encoding schemes on the binary data given below:

1. **Unipolar(NRZ and RZ)**
2. **Polar(NRZ-L, NRZ-I and RZ)**
3. **Biphase Manchester and Differential Manchester**

X=[0 0 0 1 0 1 0 1 0 1 0 1 0 1 1 1 0 1 1 0 0 1 1 1 1 0 0 0];

2: Take same Data that you have encoded in task one, increase it's bits per level by applying 8-ary encoding scheme and answer how it effects the frequency of the transmitting wave?

- **By comparing it with the previous example.**
- **Plot DFT to verify your answer. And to show which signal requires more bandwith plot FFTs.**