Waveforms

Chapter 8

There are two types of general uni-polar digital waveforms by which any binary number can be represented using a Mark (1) or a Zero (0).

I. Non-Return to zero (NRZ) form
II. Return to Zero (RZ) form

Both these types have to be synchronized with a clock pulse. Therefore the clock is generated at both the transmitting and receiving sides.

Before the end of the clock pulse every mark should come to zero in the Return to Zero wave type. That means a mark only takes half of the time taken for a full clock pulse. In this case it should be half of 448ns.

The Non-return to Zero means the mark does not come to zero before the end of the clock pulse. Hence any mark or zero will have a time period of 448ns. This can be analyzed using an example.

Take the binary number 11010011. This can be represented both by NRZ and RZ forms as shown in figure 8.1.

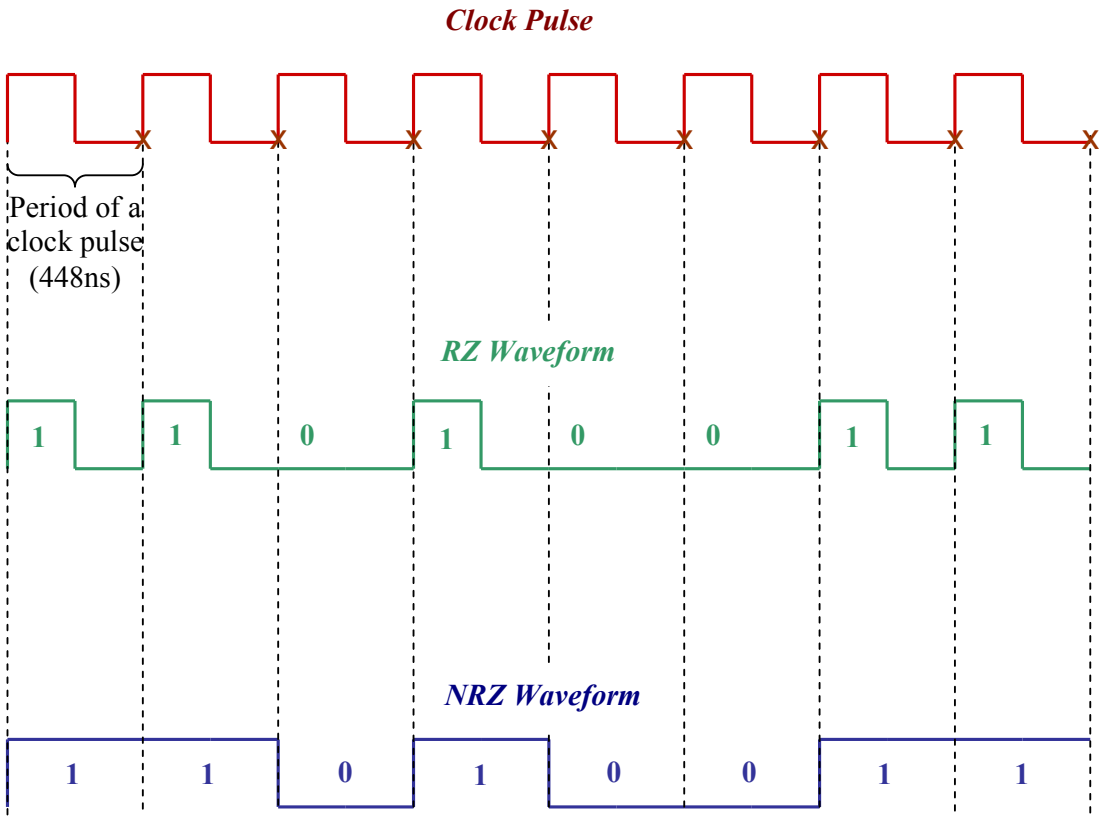

Figure 8.1

As can be seen clearly these two waveforms are uni-polar. Therefore there will be a positive D.C.(direct current) average value for both. These coded values have to be transmitted through a transformer. As transformers do not pass D.C. voltages, it was necessary to keep a D.C. average of 0V.

In order to do so the above waveforms must be changed so that they give an average of 0V. Hence in order to suit for the transmission medium, Alternate Mark Inversion (AMI) is introduced.

Using AMI the RZ and NRZ waveforms can be converted into bi-polar waves. AMI rule is consecutive marks should be of opposing polarity. Accordingly the above waves can be redrawn in AMI form as follows.

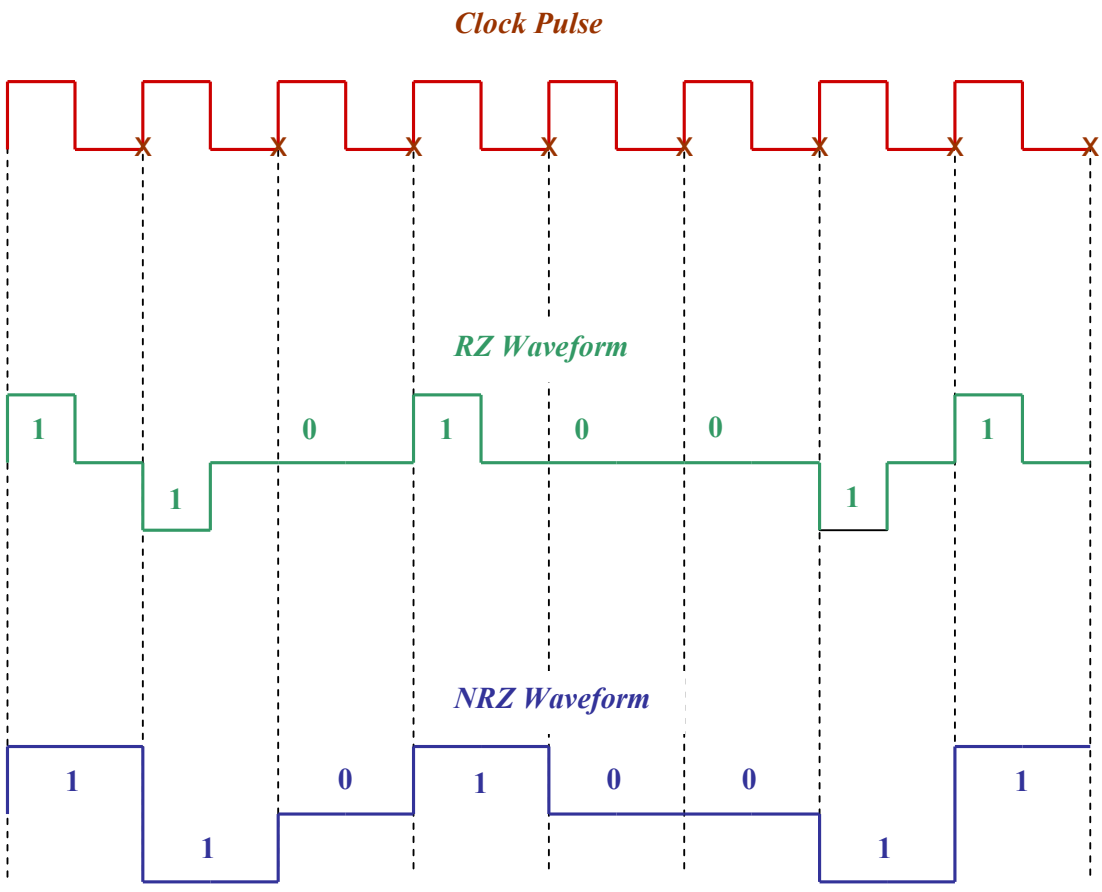

Figure 8.2

Assuming that 50% of the transmitted waves are Marks and the other half are Zeros, the D.C. average then comes to 0V. Hence these types of waveforms are suitable for transmission. But this method is not used. To understand the reason for not using this method, first let us analyze the function of a repeater.