Higher Order PCM

Basic Features of Higher Order PCMs

Chapter 1

1.1 Characteristics of Primary PCM

In Primary PCM there are 32 channels (CEPT system) where each channel will have 8 bits. Each bit will be of 488ns. The primary PCM will lead to generate 2.048 Mbps and carried from one end to another end in a given transmission medium. There are two fundamental questions to be addressed i.e. why not use 8 media to send each time slot 8 bits in parallel from one end to another end. Another question will be why we need 488ns to represent a binary bit where this is the fundamental micro information of a sample (where sample information will have 8 bits).

To answer the first question it is obvious that the cost of having media from one end to another end will be very high when compared to a single medium. Another disadvantage will be synchronization of 8 bits at the receiver end for a given sample deriving from 8 different media resulting in the reception of wrong sample values.

To answer the second question it is the maximum period that can be given for a bit where the sampling theorem has to be followed with the 32 channel Time Division Multiplexing Primary PCM system.

1.2 Characteristics of Higher Order PCMs

In higher order multiplexing system further extension of a bit period will be considered. Do we really need 488ns to identify a bit? No. Then 488ns for a bit is needed to satisfy the sampling theorem and 32 Channel multiplexing. In the higher order multiplexing the transmitter and the receiver of the primary bit stream will be of 488ns bit period while in between the transmitter and receiver with using the same media another bit streams of the same nature will be multiplexed and transmitted through one transmission media and at the receiver first it will be de-multiplexed to the original 488ns bit period then sent to the Primary receiver.
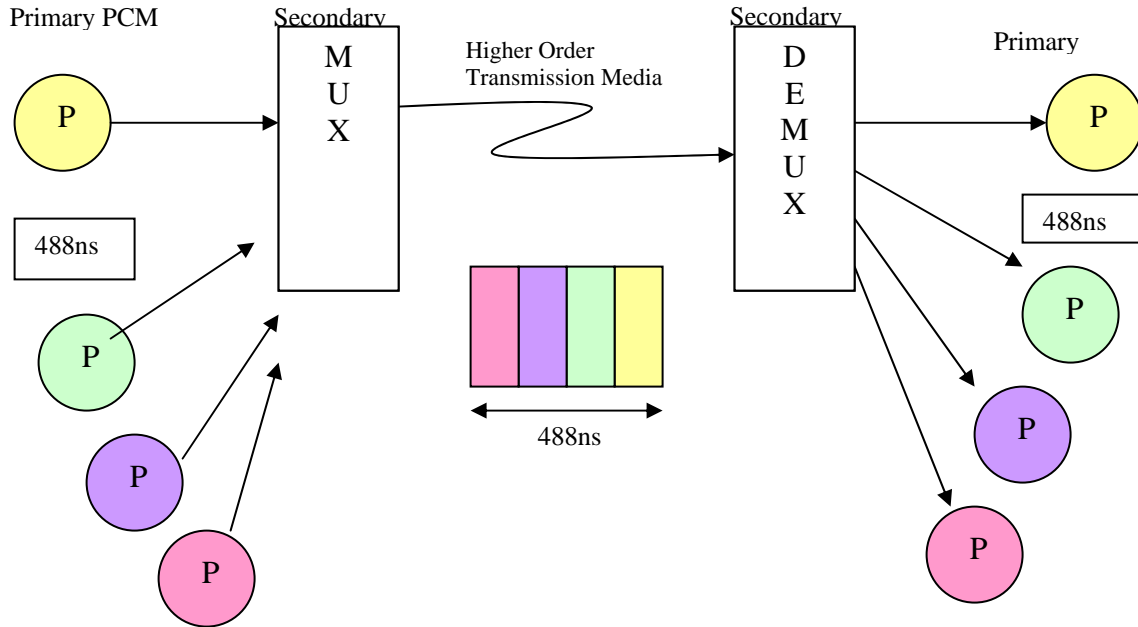
Figure: 1.1

In the above Diagram four forward Primary PCM are arriving from different originating points to a single location of station X where all these PCMs are traveling to station Y and from station Y each Primary PCM will follow a different destination. Here from station X to station Y one transmission media is used to transport all Primary PCMs information to station Y. The bit information of Primary PCM is carried in 488ns while in the secondary PCM same information will be carried in 488/4 ns and at station Y this 488/4 ns is further expanded back to 488ns. Hence the original bit period will be seen at the receiver. From station X to station Y to represent a bit a period is not defined and can use any period to represent a bit which is normally less than 488ns. In this case it has become 144ns. At station Y a bit will be identified at one side with 144ns and sent to the primary side representing a bit with 488ns. This phenomena is possible due to the fact that a bit to be identified in a station does not need much time only a moment is enough to identify whether it is a bit or not.

The above example can be further illustrated as follows.

Assume the PCM streams are P_0, P_1, P_2 and P_3 and further assume all the streams are synchronized. If the 1 bit of all the PCMs are 1,1,0,1 and will be carried in NRZ format the above example can be observed as follows.
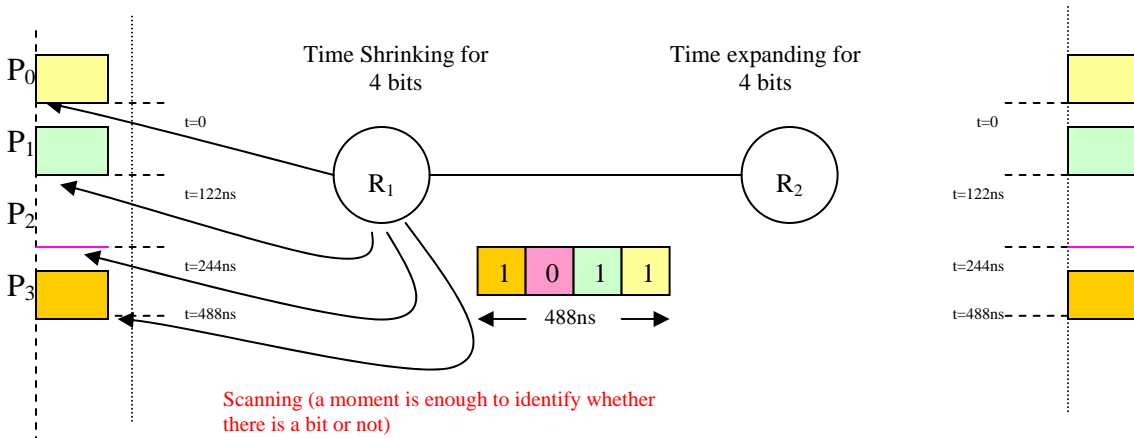
Figure: 1.2

1.3 Multiplexing and De-multiplexing of PCM Systems

Telecommunication is a bi-directional transmission. From Station X to Station Y there should be two transmission media to carry the voice of two parties connected with Station X and Station Y. Hence at a given Station X multiplexing and de-multiplexing will occur and at the other given Station Y De-multiplexing and Multiplexing will occur which is shown as follows
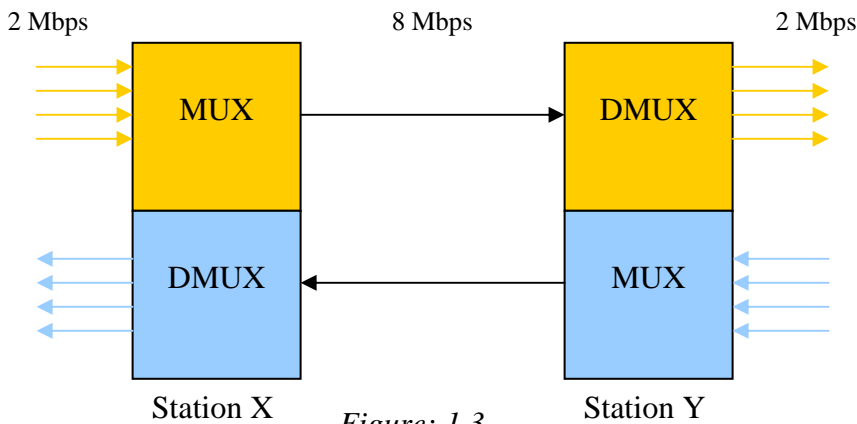

Figure: 1.3

1.4 Concepts to be analyzed for higher Order PCMs

In the primary PCMs the starting of a frame for every 256 bits will be identified by 8 bits out of 256 bits. Hence primary PCM multiplexing and De-multiplexing can be achieved with Time Slot 0 synchronization byte. Now from Station X to Station Y (vise versa) the four PCM streams are being treated to carry more bits. Hence at Station Y De-multiplexing to be carried out additional synchronization byte needed in addition to the Primary PCM synchronization. This will be true even for Station X for the backward bits stream. In addition to this synchronization byte Station X maintenance personnel need to contact the maintenance personnel of Station Y for the management of this high order PCM . How to accommodate all these requirements?

Further overhead bits to be added in addition to the primary PCM Time Slot information at Station X and these bits to be extracted at Station Y for the forward higher order PCM. Same phenomena applied from Station Y to Station X of backward higher order PCM.
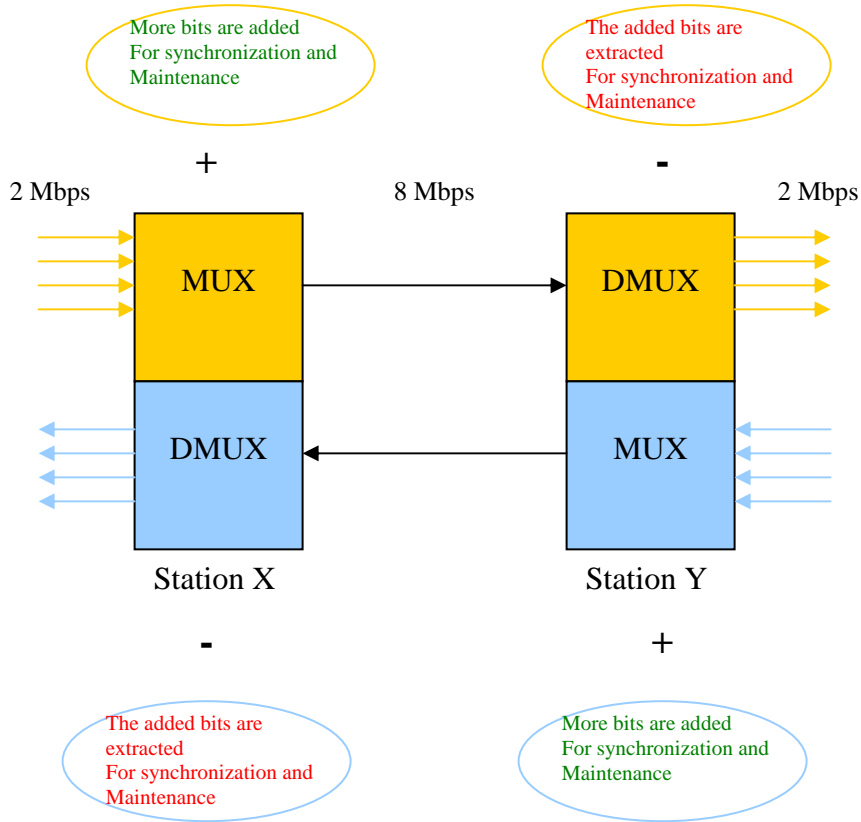

Figure: 1.4