



## TDMA Start-up and Restart Synchronization Using PIC Micro-controller

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**Abstract-** In this paper, Time Division Multiple Access (TDMA) scheme for wired communication media is proposed. Time-division multiplexing (TDM) is a technology in which transmission and reception of each independent signals is achieved through a common signal path. CD 4051 is used for time division multiplexing and time division demultiplexing of signals. Also for amplitude modulation and amplitude demodulation purpose MC1496 is used.

**Keywords-** Amplitude modulation, Amplitude demodulation, TDMA, Time division multiplexing, Time division demultiplexing.

### I. Introduction

Multiple Access schemes allows sharing of a finite amount of radio spectrum. The spectrum sharing is essential to achieve high capacity by using the bandwidth or amount of channels which are available to multiple users. Without degrading the performance of the system this results into high quality communication. In wired or wireless medium having multiple users, multiplexing methods are used for providing communication services. TDMA is multiple access method which allows several terminals to share same frequency channels.

It divides signals into various time intervals. Such time intervals known as time slots or time slices. Synchronization is essential for transmission and reception of the signal. Each signal is transmitted during particular time slots. In TDMA, signal multiplexing is achieved using time division multiplexing. For this purpose CD 4051 is used which is Single 8-Channel Analog Multiplexer/ Demultiplexer with three binary control signals. The MC1496 is balanced modulator/demodulator designed gives output voltage which is a product of an input modulating signal and a carrier signal.

### II. Multiplexing

Multiplexing is a technique in which multiple analog signals are combined into one signal and this signal is transmitted through a common channel. Traffic increases as data and telecommunications use increases.

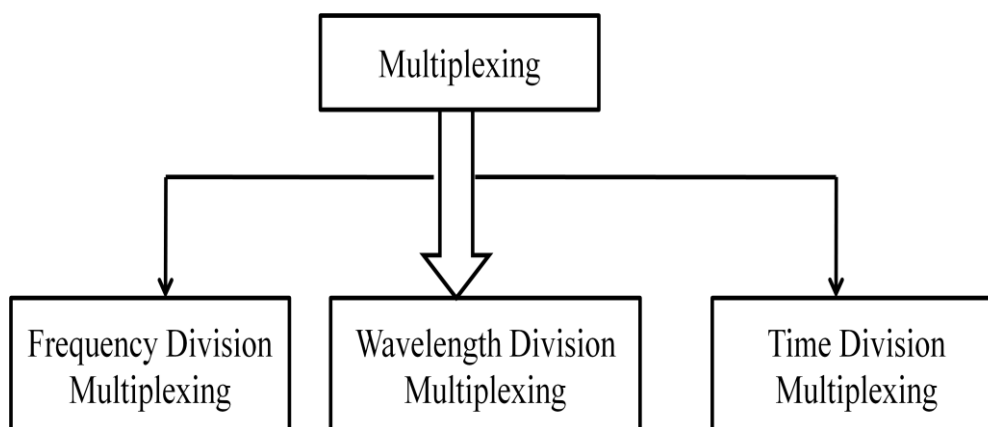


Figure 1: Types of Multiplexing

#### A. Time Division Multiplexing:

Production of time division multiplexing is shown in figure 2. Sine wave and square wave applied as  $x_1(t)$  and  $x_2(t)$  respectively. Pulse generator is used for carrier generation. Clock is used for synchronization purpose. Here CD 4051 is used as multiplexer. CD 4051 is a single analog multiplexer. It consists of three binary inputs for the selection of modulating signals. A, B, and C, and an inhibit input. The three binary input signals select 1 channel which is turned ON from 8 channels and connect the input to the output. In this paper, sine wave and square wave used as  $x_1(t)$  and  $x_2(t)$  respectively. Simulation is carried out using proteus software.

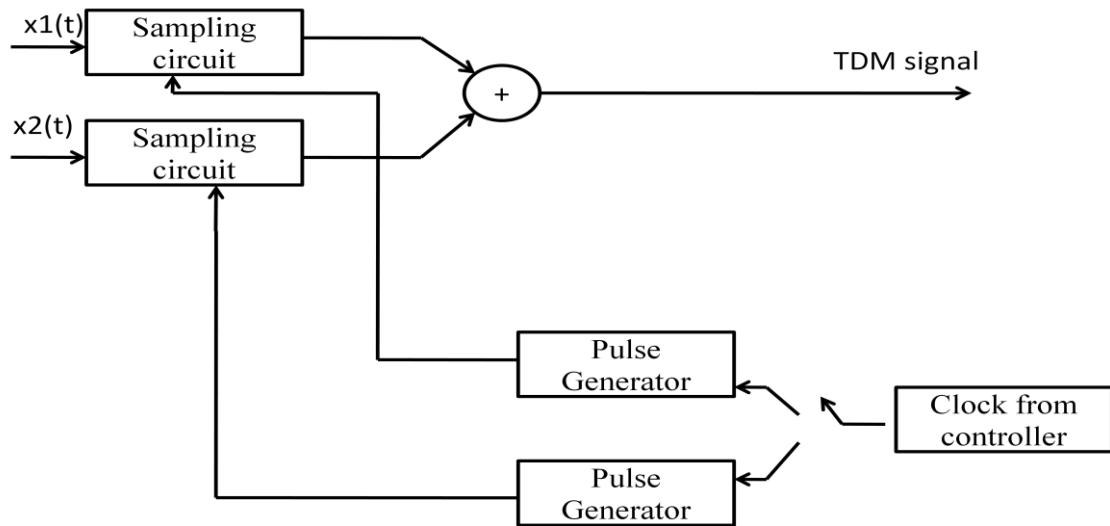


Figure 2: Production of TDM signal

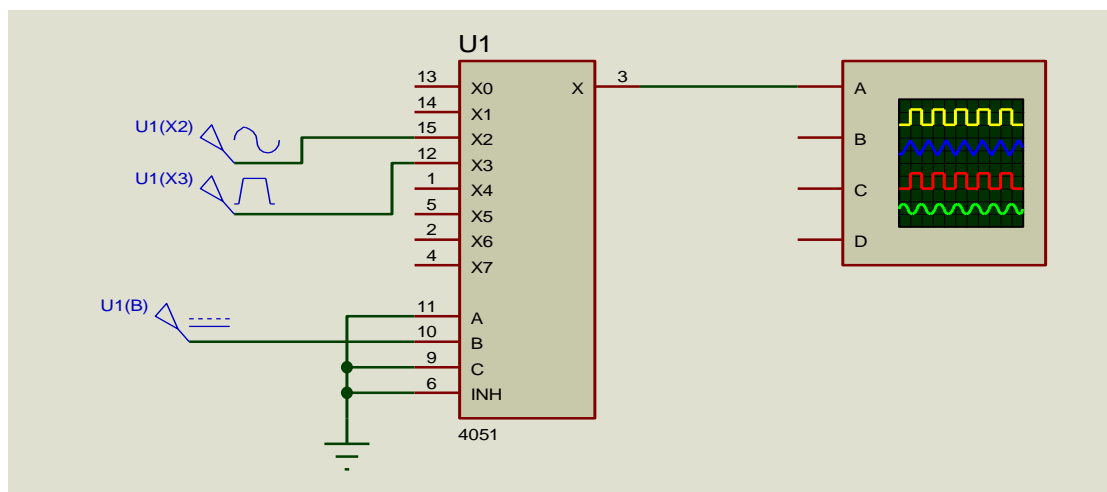


Figure 3: Simulation of Multiplexer CD401 using proteus 8 software

### III. Demultiplexing

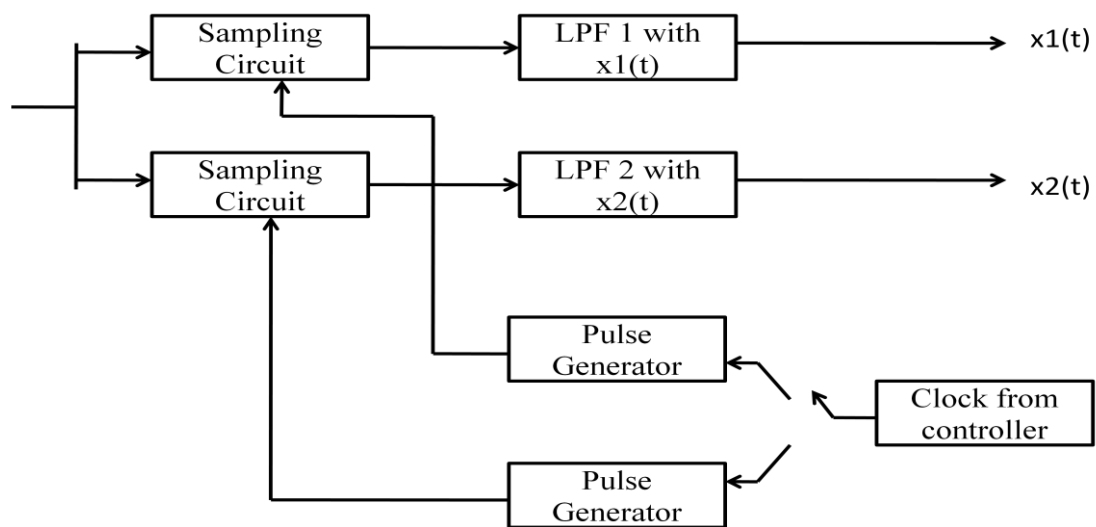


Figure 4: TDM receiver circuit

Figure 4 shows TDM receiver circuit. Proper synchronization between TDM transmitter and receiver is necessary for recovery of the original signals from TDM signal. Therefore, it is necessary to pass clock signal correctly from transmitter to receiver. Demultiplexer is also designed using CD 4051 and simulated using proteus 8 software.

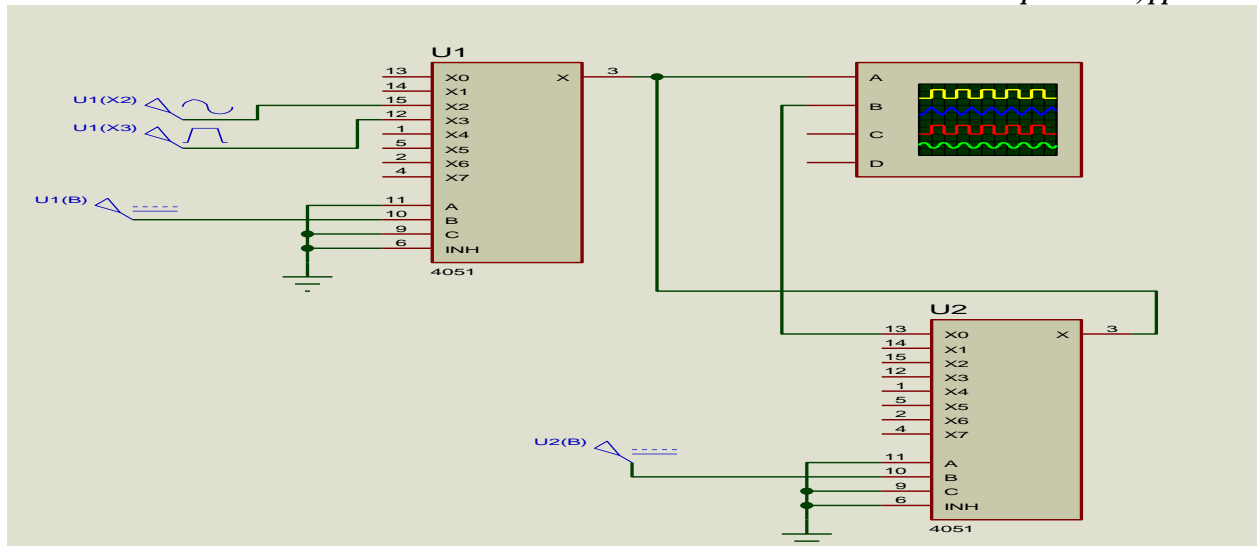


Figure 5: Simulation of Demultiplexer CD401 using proteus 8 software

#### IV. Modulator

In this paper, MC1496 is used as modulator as well as demodulator. MC1496 is a balanced modulator with a monolithic transistor array. The internal structure of MC1496 includes three differential amplifiers. Internal connections are done in a such way that the output is a product of carrier signal  $V_c$  and modulating signal  $V_s$ . Thus modulated output  $V_{out}$  is,

$$V_{out} = E_x E_y [\cos(W_x + W_y)t + \cos(W_x - W_y)t]$$

MC1496 is operated at low voltage. Hence sine wave of 20mV with 100Hz is applied as modulating signal. Square wave of 5V with 2KHz is applied as carrier signal. Modulation index is 0.5 which can adjustable through 51KΩ. Modulator and demodulator simulated using multisim 10 software.

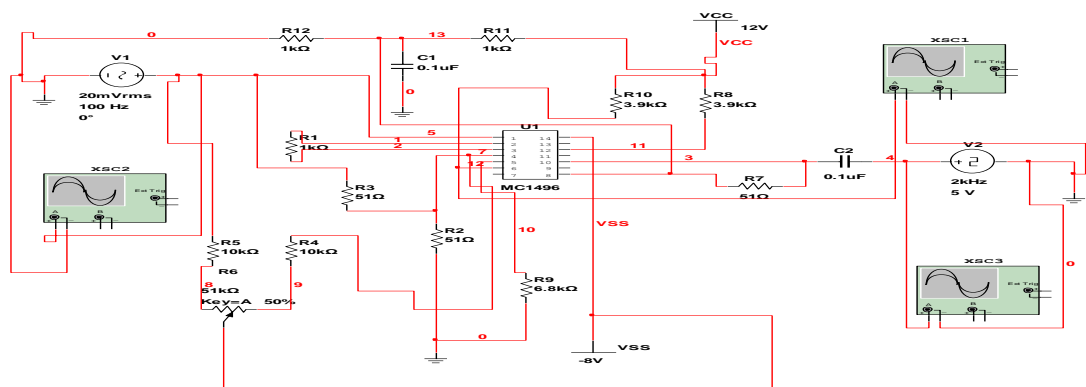


Figure 6: Simulation of modulator using MC1496 with multisim 10 software

#### V. Demodulator

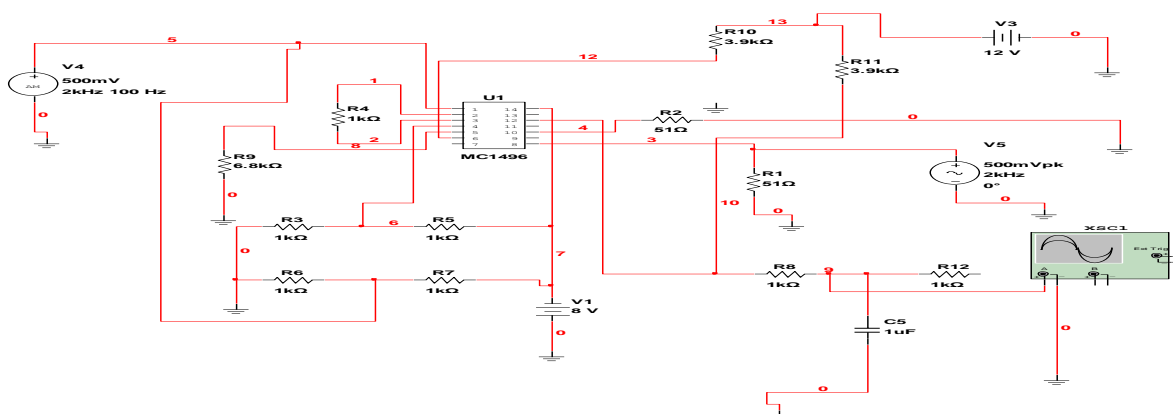


Figure 7 Simulation of demodulator using MC1496 with multisim 10 software

## VI. Result

The proposed method is implemented using CD 4051 and MC 1496. Figure 8 shows the output of multiplexer and demultiplexer when input is applied as sine wave with control signals 001. Figure 9 shows modulator output when sine wave applied as modulating signal. Figure 10 shows demodulator output.



Figure 8: Output of Multiplexer and demultiplexer

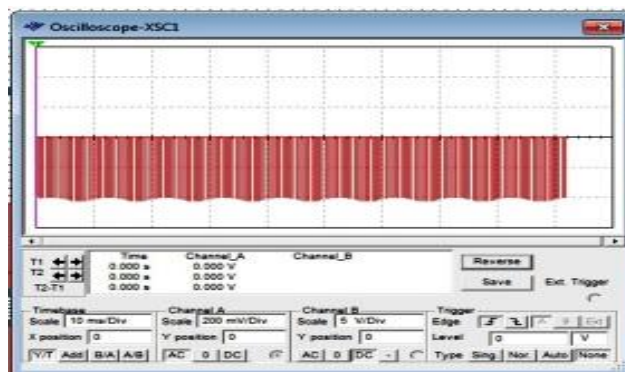


Figure 9: Output of Modulator

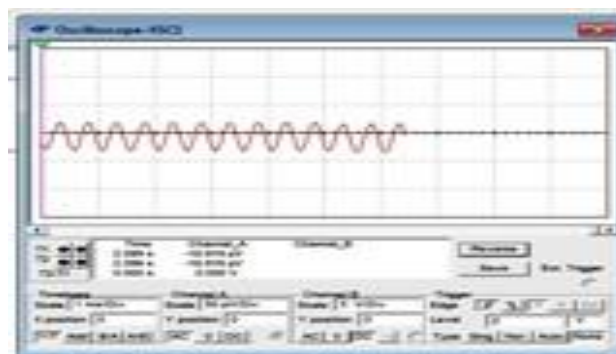


Figure 10: Output of Demodulator

## VI. Conclusion

In this modulation and demodulation is achieved by using MC 1496. Transmission of modulating signal is achieved. For reception of signal synchronization is necessary. Synchronization can be achieved by using PIC micro-controller.

## References

- [1] MC 1496, 1496B balanced modulators/demodulators- datasheet on semiconductors <http://onsemi.com>
- [2] AN 189 Balanced modulator/demodulator applications using the MC1496/1596-application note by Philips semiconductors [www.glsle.com/files/downloads/MC1496&1596.pdf](http://www.glsle.com/files/downloads/MC1496&1596.pdf)
- [3] MC 1496, B balanced modulators/demodulators-datasheets Motorola
- [4] CD4051BM/CD4051BC Single 8-Channel Analog Multiplexer/Demultiplexer-datasheet national semiconductor
- [5] Vilgot Claesson, Member, IEEE, Henrik Lonn, Neeraj Suri, An Efficient TDMA Start-Up and Restart Synchronization Approach for Distributed Embedded Systems VOL. 15, NO. 7, JULY 2004
- [6] Time division multiplexing pdf <http://nptel.iitk.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Computer%20networks/pdf/M2L7.pdf>