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Design of Manchester Digital to Digital Encoding Data Transmission

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Abstract: -. Manchester coding is a very common data coding method, probably the most common used today. With Manchester coding, we can encode both clock and signal into one, and transmit the signal serially. One distinctive characteristic about this method is that the encoded signal has always an average DC level of 50%. This means that averaging the HIGH and LOW pulse durations of a complete encoded data, will result into (½) of the HIGH voltage level. This feature is very helpful in cases where the power output is a function of the data, such as in AM modulation. Using Manchester encoding, the average power is always the same, no matter what data are transmitted. Manchester encoding is also widely used in infrared data transmissions. This paper deals with the design of biphase digital to digital encoding (Manchester) data transmission using microcontroller , latch, darlington amplifier , solid state relay, personnel computer and Bascom programming language .

Keywords: *- microcontroller , Bascom , Biphase, , Digital to Digital Encoding , Latch , Darlington Amplifier, Solid State Relay , Computer.*

I. INTRODUCTION

Biphase encoding is probably the best existing solution to the problem of synchronization.. In this method, the signal changes at the middle of the bit interval but does not return to zero. Instead, it continues to the opposite pole. As in RZ, these mid interval transitions allow for synchronization. There are many schemes of digital to digital encoding. Some schemes lack synchronization and have a dc component in the encoded data . These two disadvantages are considered a big handicap and should be eliminated . The Manchester digital to digital encoding scheme offers an acceptable solution to the problem of synchronization. At the same time the Manchester encoding eliminates the dc component.

II. MANCHESTER ENCODING SCHEME

Manchester encoding uses the inversion at the middle of each bit interval for both synchronization and bit representation. By using a single transition for a dual purpose, Manchester encoding achieves the same level of synchronization as RZ but with only two levels of amplitude.
Like all other coding methods, Manchester code follows an algorithm to encode data. This algorithm goes like this: The data are represented NOT by logic 1 or 0, but with line transitions. A logic 0 is represented by a transition from **HIGH to LOW**, and a logic 1 is represented by a transition from **LOW to HIGH**. Figure (1) below shows a 5-bits example:

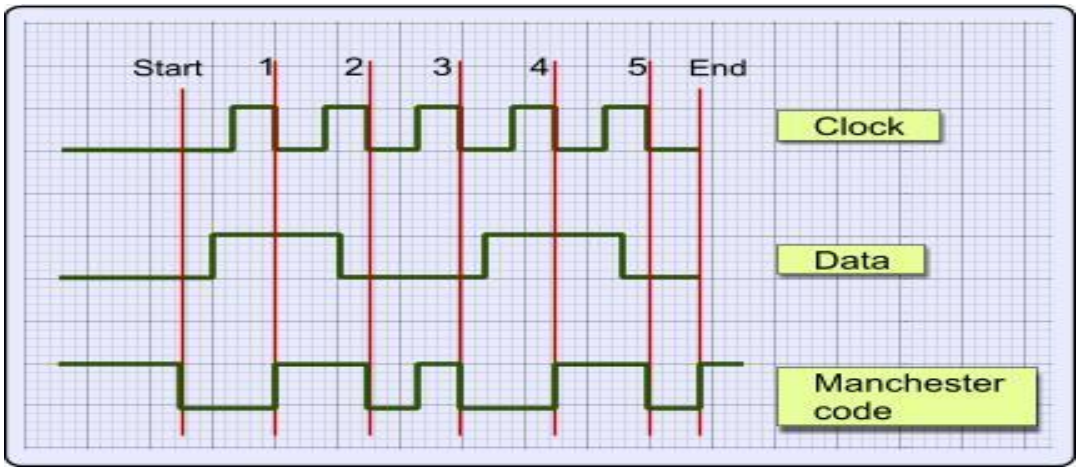


Figure (1) A five bits example Manchester code.

The data to encode is the binary number 10010, reading from left to right. The coding occurs on every falling edge of the clock. On the first falling edge of the clock, the coded signal has a LOW to HIGH transition, because the data is HIGH. On the second falling edge of the clock, the code has a HIGH to LOW transition because the data is LOW. The same algorithm is applied for the rest of the signal.

III. METHODOLOGY

The circuit diagram for the method of biphase digital to digital encoding data transmission consists of two elements as follows :

A . Hardware:

The hardware components consists of:

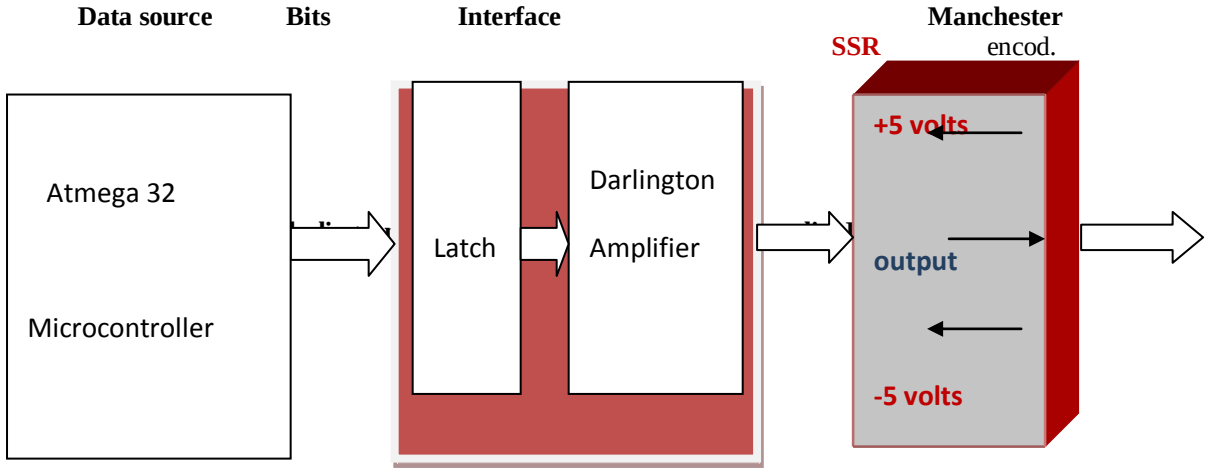
- Latch SN 74373 : used as a buffer to store data.
- Amplifier ULN 2003-500 m A : used to increase the current of the signal .
- Double contacts Solid State Relay : used to change the signal level status from high to low and vice versa .
- Atmega 32 microcontroller : It is used to drive the interface devices connected to its ports.

. Computer : It is used to program the microcontroller.

- Lab link : The lab link is used to connect the parallel port of the computer to program the microcontroller.

B. Software:

Bascom programming language: is used to send data bits to the designed circuit. The circuit diagram consists of an interface circuit as shown in Figure (2). The method is based on creating an input digital data by the microcontroller. One bit passes and processed serially each time. The output depends upon the input bit value. This process will be repeated until the end of data.



IV. ALGORITHM

The microcontroller algorithm includes a sequence of steps for the performance of biphase Manshester digital to digital encoding . Each byte will be send serially bit by bit to the interface circuit .. A termination byte denotes the end of data . The algorithm is shown in figure (3) below:

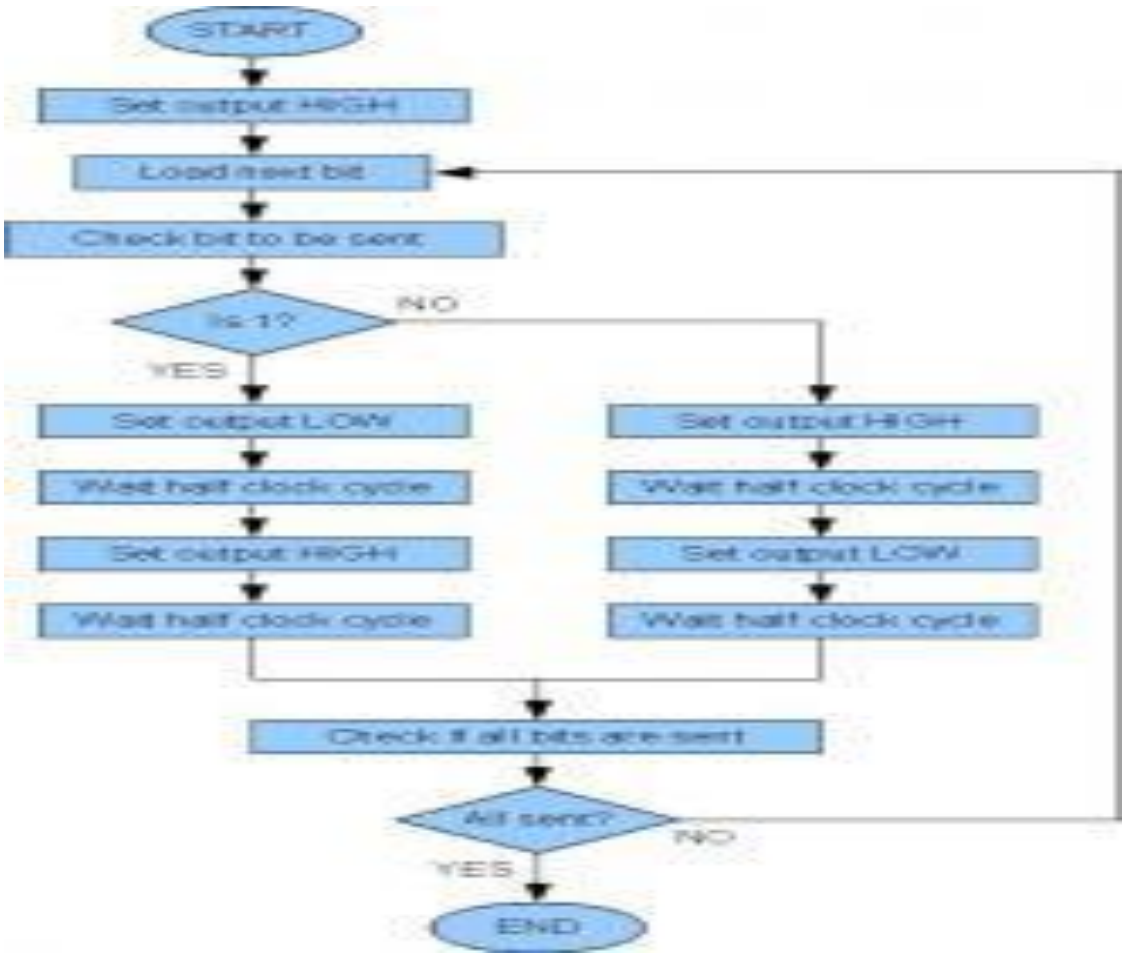
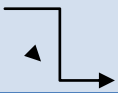
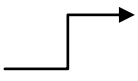
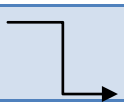
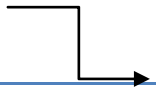


Figure (3) The microcontroller flow chart for Manchester encoding

V. RESULTS

The circuit for biphase digital to digital encoding consists of a microcontroller connected to an interface circuit ..The task of the interface circuit is to transform the solid state relay (SSR) from one state to another .The change over position of the SSR depends upon the value of the incoming bit .The final output from the interface circuit will be a signal voltage that varies according to the bit value. Table (1) shows the result of biphase digital to digital encoding (Manchester) for a nibble entry.

Table (1) Biphase digital to digital encoding (Manchester) for a nibble

Bit value	Latch output	SSR position	SSR pos. (with CK.)	Final output
0	0	High-to-Low	+5v. To -5v.	
1	1	Low-to-High	-5v. To +5v.	
0	0	High-to-Low	+5v. To -5v.	
0	0	High-to-Low	+5v. To -5v	

VI. CONCLUSION

All of the biphase techniques require at least one transition per bit time and may have as many as two transitions. Thus, the maximum modulation rate is twice that for NRZ; this means that the band width required is correspondingly greater. On the other hand , the biphase digital to digital encoding scheme offers synchronization between the transmission and reception entities.. The synchronization is achieved because there is a predictable transition during each bit time. The receiver can synchronize on the transition in the bit interval . For this reason, the biphase codes are known as self-clocking codes. The second advantage is that there is no dc component. Biphase codes have no dc component, yielding the benefits described earlier.

The third advantage is the error detection. The error detection is possible when an absence of an expected transition happens .This technique can be used to detect errors. Noise on the line would have to invert both the signal before and after the expected transition to cause an undetected error. The disadvantage of this scheme is that for encoding each bit we need two clocks. The design of the electronic circuit is made simple and easy to connect to the microcontroller . The circuit can be easily modified to accommodate other digital to digital encoding schemes .

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