

Multiplex Data Transmission System over a Twisted Pair of Cable

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Abstract: Several information channels are required with several different RF transmission frequencies for wireless communication because of requirements of many selective RF receivers. This requirement leads to the complex network which indirectly increases the cost of the system. This paper provides the solution for the above problem by using a Time Division Multiplexing (TDM) system which uses distributed system of data acquisition and control in which pair of one twisted wire is used to transmit the multichannel data into different time slots. A low frequency carrier communication (LFCC) is used as a highly modular data point oriented building block which produces a cost effective solution.

Keywords: RF transmission, Time Division Multiplexing (TDM), data acquisition, low frequency carrier communication (LFCC).

1. Introduction

In the field of wireless communication number of information channels is directly proportional to cost. It means increasing communication channels increases the ratio of cost/benefits disproportionately. Single cable transmission is able to provide the solution for this problem. Here we have to use TDM technique to transmit the multichannel data over the twisted pair of wire.

Low frequency carrier communication (LFCC) is used to solve the above problem which based on only two wires which replaces all the transmission cables. Easy installation and simplicity will make this system more attractive for panel builders, electrician and installer. This paper deals with the system which provides the suitability for connecting widely spread monitoring and control signal for the far spread location to centrally located control and supervisor equipment which

A two-way communication is possible by using this technique and cable can be branched in as many directions as required.

In section two, the overall system is explained in detail. In section three, system components are discussed with their working. Whereas, he software flow with the conclusion is discussed in further sections.

2. Proposed System

The proposed system mainly consists of Timing generator as a heart of the system which is interfaced with the several transmitter and receiver through two wire network as shown in fig.1.

It works on the principal that the timing generator generates the waveform various number of time slots (Channels). Here we are using 64 time slots to optimize the system [2].

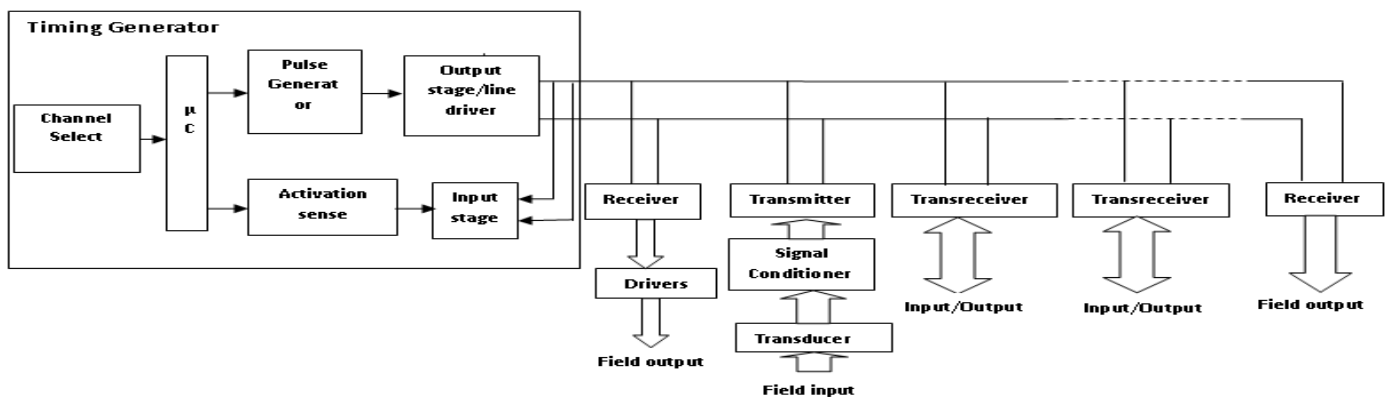


Figure 1: Testing data- load current (amperes)

may vary from personal computer (PC) to simple ON/OFF switches [1].

By using LFCC we can distribute and interface (Digital, analog, counters, levels, temperature, etc) signal to any place.

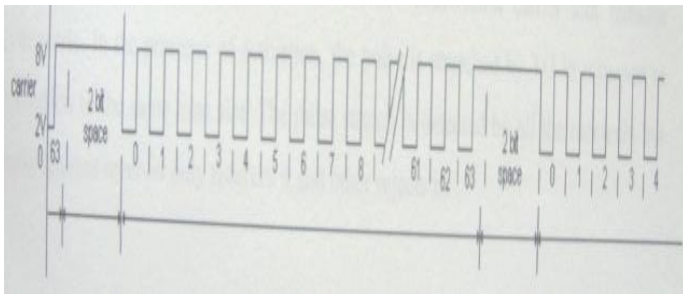


Figure 2: Channel Scheme with 64 Time Slot.

The voltage level of the carrier pulse is initially between 2 to 8V. Initially, the channel is in OFF position, when a particular input is detected, the voltage level pulls down the 3V level. When it is registered to be below 2V during the sampling, the channel turns to ON position.

3. System Components

The system consists of four main blocks i.e. Timing generator, Transmitter, Receiver and Transceiver

3.1 Timing Generator

It consists of CPU card and timing generator interface. The CPU card is basically consists of microcontroller and supporting devices due to this it is software specific so common in hardware for all the components such as timing generator, transceiver, transmitter and receiver. By assigning different port to each and every component, we can use it simultaneously for all components.

In timing generator interface, timer is programmed in such a way that it is operated in a square wave generation mode. Output of this timer is 1 KHz square wave and synchronization with this carrier wave is generated. A monostable multivibrator is used in hardware, for pulse stretching in response of activation by transmitter. This activation is indicated on a board by LED indicator [3].

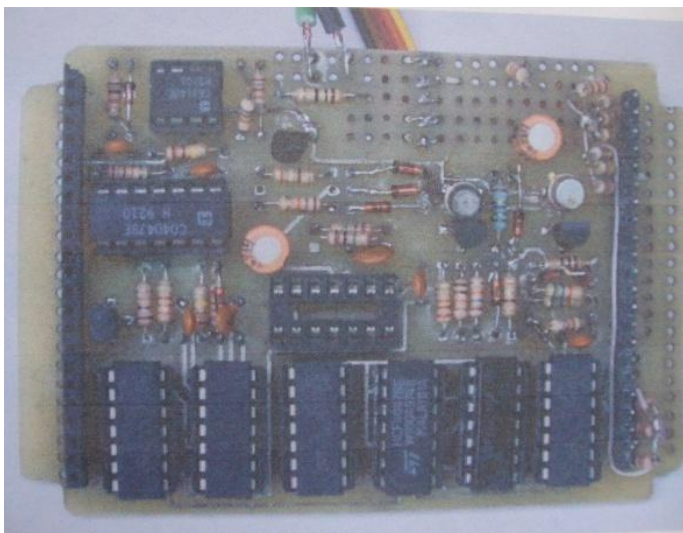


Figure 3: Timing generator circuitry

3.2 Transmitter:

It is an input device of the system, which accepts the signal from transducer. Then it transmits this signal over the twisted pair of wire. Transmitter check for the active input, if this happens it gives activation to Timing Generator

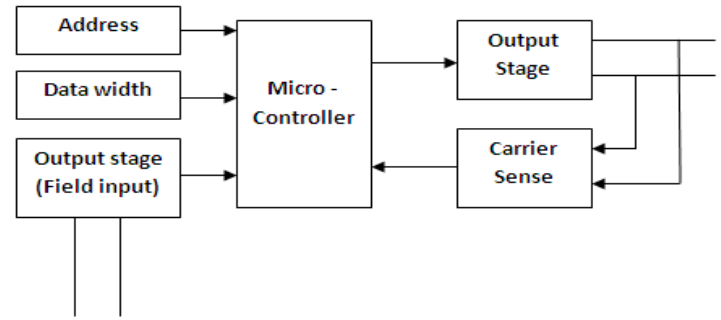


Figure 4: Transmitter of the system

3.3 Receiver:

It is an output device of the system, which received the signal from twisted pair of wire According to which they are connected to lamps, relays, instruments etc. It uses a counter to monitor the digital pulses emitted by the Timing Generator

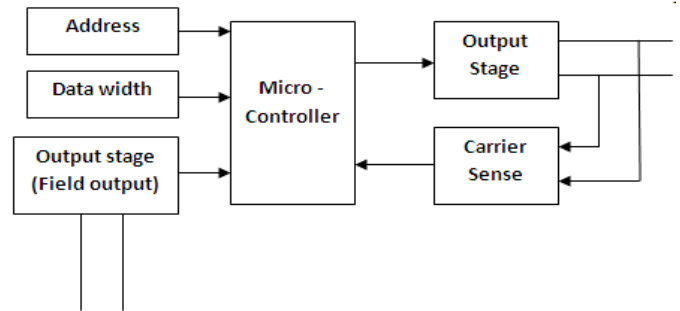


Figure 5: Receiver of the system

3.4 Transiever:

It is an input/output device of the system, which accepts the signal from transducer and then connects to lamps, relays, instruments etc according to the information received via the twisted pair of wires. They are equipped with the required software/hardware so that it can be function as both the receiver and transmitter.

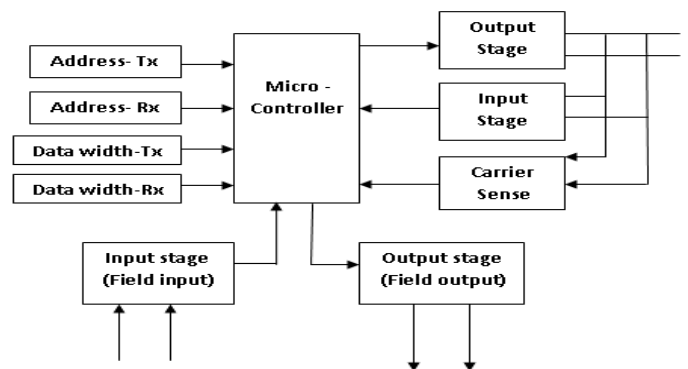


Figure 6: Transiever of the system

4. Software Flow:

Initially, the initialization of all input output ports of microcontroller and LCD display takes place then it will check for activation. If any activation is detected, microcontroller well senses the address and bit width and will compare the address with the receivers address. If a match occurs for a particular receiver then the transmission of data will takes place and again this whole process is takes place. The complete can be depicted in the figure7.

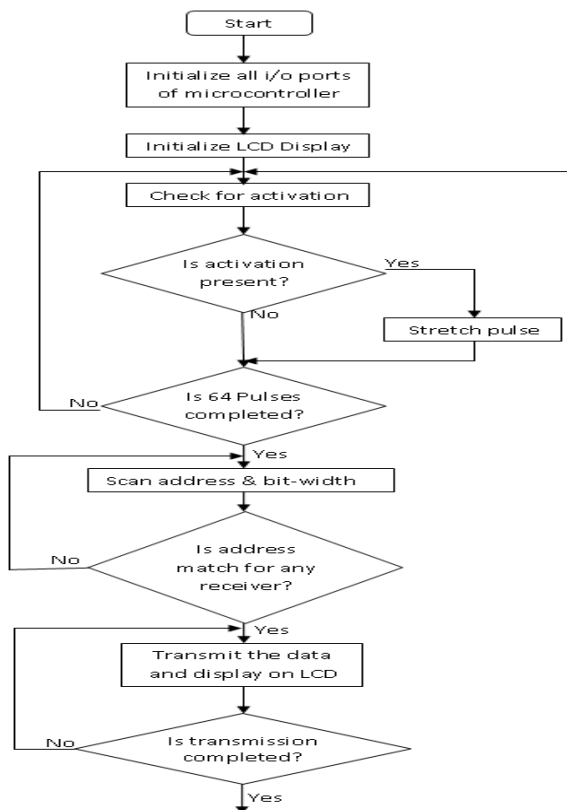


Figure 7: Software flow for the given system

5. Conclusion

This paper discusses in detail the MIMO Communication System Design for data transmission over a twisted pair of cable. It also explains how large amount of data is transferred over a two wires only. Here detailed hardware description of our very cost effective proposed communication system is discussed which consist of timing generator, transmitter, receiver and related circuitry. Communication system can handle large amount of data easily and very cost effective.

In future we can extend this for various applications where cost/benefit ratio is crucial factor without compromising with quality of communication system.

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References

- [1] Douskalis W.: "A Number Theoretic Approach to Time Division Multiplexing" IEEE Transactions on Communications, vol. 38, No. 9, Sep./1990.
- [2] Avinash M Bhole and Prof.D.L.Bhombe. Article: Data Acquisition System for Slow Variable using Low Frequency Carrier Communication (LFCC) Over Two Wires. *IJCA Proceedings on 2nd National Conference on Information and Communication Technology* NCICT(2):, November 2011

[3] D. Kessner, "Design of a Time-Slot-Interchanger and Other TDM bus Interfacing Issues", IEEE Conference on Aerospace, Proceedings. Vol. 4, pp. 515-521, March 1998.

[4] R. N. Braithwaite , S. Carichner and M. J. Hunton "Data acquisition for digital-controlled adaptive analog predistortion of a power amplifier", *IEEE Radio Wireless Symp.*, pp.411 - 414 2007

[5] J. F. Hayes *Modeling and Analysis of Computer Communications Networks*, 1984 :Plenum

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