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Power Line Data Transmission Based Remote Control with Status Feedback

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Abstract: The paper describes the design and implementation of data transmitting based remote control using FSK-KQ330 module and microcontroller. This design implements the transmission of data through existing electrical cables. The model uses hardware components such as FSK-KQ330 power modem, P89V51RD2 microcontroller, 16x2 Liquid Crystal Diode, power cable and resistive loads. Multi-channel device is used to operate the multiple outputs which are included in the electrical loop. The power line cable also acts as sending feedback of the load-status to the transmitting end module. So that, the load can be controlled according to the user's need. The data transmission and receiving process depends on FSK-KQ330 modem which is placed between electrical cable and microcontroller.

Keywords: FSK KQ-330 Power Modem, Modulation And De-Modulation Of The Signals, Remote Control Data Transmission, Utilization Of Multi-Channel Devices.

I. INTRODUCTION

The power line data transmission, carries data and control operations in between load and the operator. In the present technology, application of communication technology in power system is through Globalized System for Mobiles (GSM) and Radio Frequency Methods. But these are costly, difficult to operate multi number of appliances at a time, consumes more power during transmission of data, there is no feedback during transmission of data, the range during transmission of data is within limits and cannot cover longer distances and if any disturbance occurs during the transmission of data then it will not take place between two systems. To overcome these disadvantages we are proposing power line data transmission based remote control technology which helps in operating multi number of appliances in home automation at a time and from any place and distance. Power line based remote control technology can be implemented in Remote areas, home automation, commercial purpose, Industrial and Street lighting. Interfacing of loads to a simple existing electrical cable will make the data transmission device cheaper. The data transmission will takes place in between transmission module and receiving module. The loads are connected to the receiving module and the operating of loads can be done from transmitting module from any place and any distance within the loop which the electrical cable exists. Both the transmission and receiving modules contain P89V51RD2 microcontroller, FSK-KQ330 modem and LCD display, the multi-channel device is connected at the transmission module and the loads are protected by the relay board which is connected at receiving end.

II. BLOCK DIAGRAM OF POWER LINE DATA TRANSMISSION BASED REMOTE CONTROL WITH STATUS FEEDBACK

The power line data transmission is mainly divided into two modules. They are Transmission module and Receiving module. The required status can be shown in LCD display by selecting the load through matrix key board at transmission module as shown in Fig.1. After selecting the load, the control signals can be given through matrix keyboard and these signals can control the load at the receiving module according to the program given to the P89V51RD2 microcontroller. The signals will transfer through FSK-KQ330 power modem from transmitting module to the receiving module through electrical cable. The FSK-KQ330 modem acts differently during transmission and receiving of data. It modulates the signal during transmission of data from microcontroller to electrical cable and demodulates the data during transmission of data from electrical cable to microcontroller.

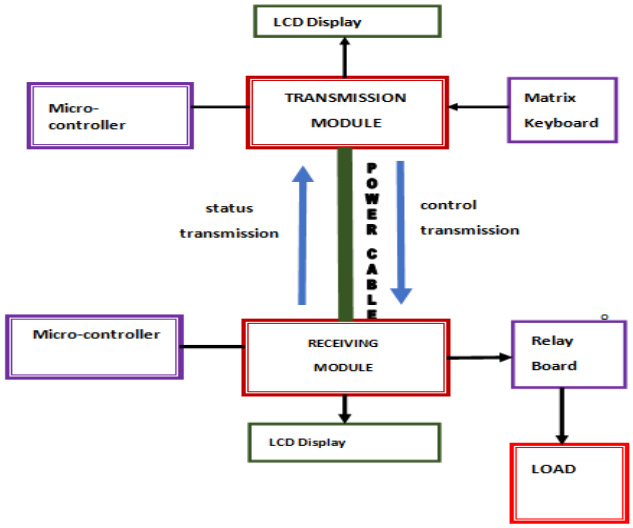

Fig.1.Block Diagram of Power Line Data Transmission With Status Feedback.

III. TRANSMISSION END MODULE

The status of the required load can be displayed in LCD by selecting status key from the keyboard of transmission end module. Depending on status of the load the control signals can be sent to the receiving end module through FSK-KQ330 modem which modulates the signals received from microcontroller and sends to the receiving end module through AC line as shown in Fig.2.

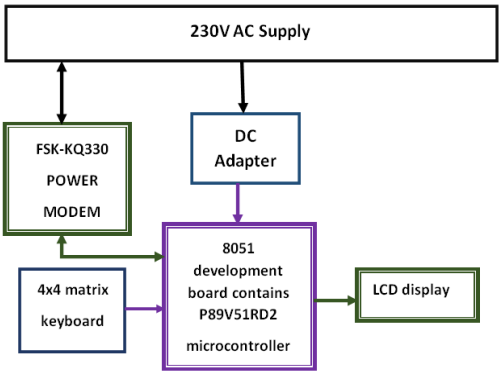

Fig.2. Block Diagram of Transmission End Module.

IV. RECEIVING END MODULE

The control signals can be received from the transmission end module and the received signals can be demodulated by the FSK-KQ330 modem and will given to the microcontroller as shown in Fig.3. The microcontroller controls the load according to the control signals and the status can be sent back to the transmission module. The load can be protected by the relay board.

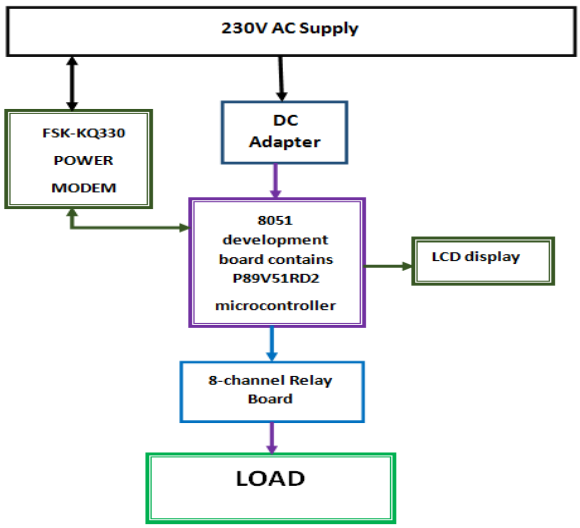

Fig.3. Block Diagram of Receiving end Module.

V. THE FUNCTIONOF POWER LINE CARRIER (FSK-KQ330) MODEM

The design of power line data transmission can be divided based on data transmission and data reception according to the data flow. The transmission of data is as follows, At first, the system employs the direct interface of P89V51RD2 micro-controller and FSK-KQ330 module. After that, the data transmission is modulated by FSK-KQ330 module through the external circuit which contains resonance detection circuit and amplifying circuit. Here, the square wave is converted into sine wave. Finally, the isolation transformer isolates the interference signal and then the signal is coupled to the power line. The receiving of data is as follows, At first, the received signal is detected by the resonance detection circuit, after the signal is isolated by the transformer, the waveform is shaped by the resonant circuit, finally the shaped waveform is demodulated by the FSK-KQ330 module. After the demodulation, the demodulated data is given to the P89V51RD2 micro-controller. Zero-crossing detecting circuit is present in the receiving data part.

VI. SYSTEM HARDWARE DESIGN

Hardware implementation of Transmitting side module:

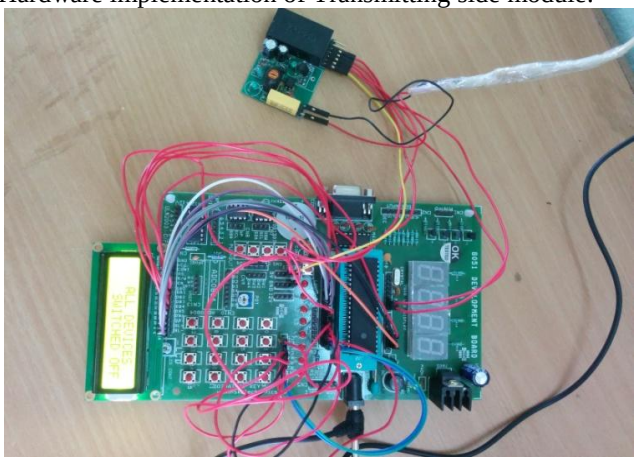

Fig.4. Circuit of transmitting end module.

Fig. 5. lcd display at transmitting end when all loads are switched off.

At first, all the devices are in OFF state and the LCD display at transmission end shows the status of the all devices as shown in Figs4 and 5. Hardware implementation of Receiving end module as shown in Figs.6 and 7:

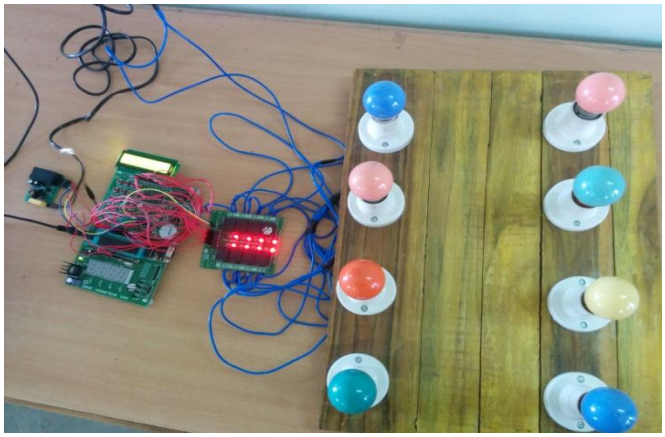

Fig.6. circuit of receiving end module contain eight light loads.

Fig. 7.lcd display at receiving end when all the loads are in off state.

Function of the modules when the load is in ON state: Let us consider the load-1 in ON state and it can be shown in figs. 8 to 10 below.

Fig. 8. Circuit of Load-1 in On State And Remaining Off.

Fig.9. Display of LCD to Find Status of Load-1 at Transmission End Module.

Fig.10. Status of Load-1 Displaying On LCD at Transmission End Module.

Let us consider the load-3 and to find the status of the load we send the status signal from transmission end module to the receiving end module as shown in fig. 11.

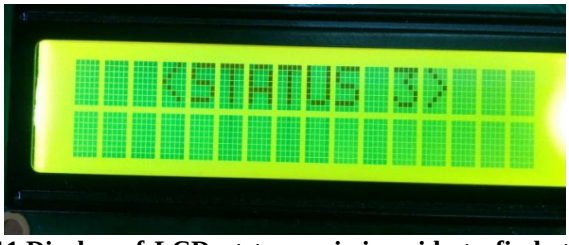

Fig.11.Display of LCD at transmission side to find status of load-3.

In the above fig. 8, the load-3 is in off state and the status of that load can be send from receiving end module to the transmission end module as shown in fig. 12.

Fig.12. Status of Load-3 Displaying On LCD at Transmission End Module.

In this, above mentioned manner we can operate the loads from any place and distance and by this method we can overcome wastage of electricity from unwanted wastage.

Fig. 13. Circuit Showing All the Loads in On-State.

The above fig. 13 shows all the loads are in ON state. The above operation can control from any place by knowing the status of each device. The transmission end module is a plug and play device it can be carry from place to place.

VII. CONCLUSION

The Power line data transmission based remote control with status feedback is alternative technology to the GSM and Radio Frequency technology. Though this technology is not famous yet, it will be available soon because of its low cost, accurate results and effective communication.

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