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An Embedded Control Strategy for Industrial Remote Electric Appliances Using Power Line Carrier Communication Signaling

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Abstract: Intra Industrial Communication is one of the most important aspects of industrial sectors. Industries select communication methodologies depending on their available resources. We cannot expect a separate communication lines in each industry. Here in this paper we propose a scheme that utilizes the existing power cables to communicate between two destinations inside the industry. In this system, a basic power frequency signal as the carrier wave for communication is used. The voltage is taken as the carrier for data transmission. The wave is modulated with the data from one end and the same is demodulated and data is extracted at the other end. For this DTMF (Dual Tone Multi Frequency) encoders and decoders are used.

Key words: PKEIL · DTMF · CPU · MCU · CM8870 IC · LCD

INTRODUCTION

The DTMF bandwidth ranges from 0 Hz to 3 KHz and depending upon the data entered, the DTMF encoder generates a frequency [1]. The frequency is used as modulating frequency. The modulated wave is demodulated and the frequency is extracted. The frequency is then converted in to an equivalent digital value by DTMF decoder [2].

In this system, a keypad connected with microcontroller as input module is used. Key pressings are scanned and corresponding value is fed to the DTMF decoder. In the receiver end the decoded value is given to the microcontroller. On the basis of received data corresponding action be initiated or stopped by the microcontroller [3].

This system uses AT89C51 as the CPU and embedded 'C' as the programming language.We use "KEIL" as cross compiler and "MASUBA" as ROM burner [4-6].

Block Diagram

Transmitter Section: The transmitter section consists of Power Supply unit, Microcontroller unit, a keypad, Relay unit, DTMF encoder and an Amplifier. A keypad which consists of two push on keys is connected with microcontroller and it is the input module. The microcontroller (AT 89C51) is programmed in such a way that the Key pressings are scanned and corresponding value is fed to the DTMF encoder. An automatic reset for microcontroller is provided. There is an LCD interface used for display. The Relay unit consists of a Relay driver IC (ULN 2003) and Electromagnetic relays depending on the number of operations. The DTMF Encoder consists of UM91215B IC which encodes key combinations into the particular frequencies ranging from 600 Hz-2 kHz. The encoded signal is amplified by 810 Audio Amplifier. Then the signal is transmitted through the Neutral line [7].

Receiver 1(On/Off Control): The receiver unit consists of a similar Power supply unit as that of Transmitter, DTMF Decoder, Microcontroller unit and Relay unit and the load to be controlled.

In the receiver section 1, the carrier data signal in the neutral wire which is transmitted from the transmitter section is decoded by DTMF decoder (CM8870 IC) and it is given to the microcontroller unit. The microcontroller check the signal and the corresponding outputs are given to the driver circuit to drive an electromagnetic relay which is used to ON/OFF the load [8].

Receiver 2 (Illumination or Speed Control): In the receiver section 2, the analog frequency carrier data signal in the neutral wire which is transmitted from the transmitter section is decoded by DTMF decoder

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(8870 IC) and given to microcontroller. The microcontroller, in turn operates a combination of optocouplers to vary the brightness level of the lighting load or to vary the speed of the motor load [9].

For each of the operation, the status is displayed in the LCD unit of the transmitter section.

Algorithms for Various Sections

Transmitter:

```
if(sw1==0)
{
while (!sw1);
cnt++;
 if (cnt==1)
{
r1=1;

Disp(1);

for (del=0;del<32000;del++);
r1=0;
}
if (cnt==2)
{
cnt=0;
r2=1;

Disp(2);

for (del=0;del<32000;del++);
r2=0;
}

Disp(0);

}
```

Receiver1:

```
if (RECEIVE==1)
{
if(relay1==0&&relay2==1&& relay3==0 && relay4==0)
{
RL1=1;
RECEIVE=0;
}
if(relay1==0&&relay2==1&& relay3==1 && relay4==1)
{
RL1=0;
RECEIVE=0;
}
```

Receiver2:

```
IC11=IC12=IC13=1;
for(;;)
{
if(ACK==0)
{
while(!ACK);
RECEIVE=1;
}
if(RECEIVE==1)
{
if(relay1==0&&relay2==1&& relay3==0 && relay4==1)
{
RECEIVE=0;
IC11=1;IC12=1;IC13=0;
}
if(relay1==1 && relay2==0 && relay3==0 && relay4==0)
{
RECEIVE=0;
IC11=1;IC12=0;IC13=0;
}
}
}
```

Advantages:

- Intra industrial communication by using the existing power line itself.
- Less noise since we are using only the neutral wire to transmit the data.
- Centralized control of all the equipments in an industry and status verification possible at a nominal cost.

Applications of Power Line Networks:

- Home Control
- Home Networking
- Internet Access
- Utility Applications
- Transmitting Radio Programmes
- Industrial automation and control applications….

Hardware and Software Required:

- ATMEL AT89C51 - MCU
- Electromagnetic relay, DTMF encoder and decoder, LCD display, driver circuit and optocoupler circuit, triac and diac for illumination control and speed control.

- Embedded 'C'programming language.
- KEIL-cross compiler and
- MASUBA-ROM burner.

Why Embedded Systems?

- Avoids lots of Electronics Components
- Built in rich Features
- Reduces the cost, space
- Less Down Time for Maintenance
- Probability of Failure is reduced
- Easy interface with Computers

CONCLUSION

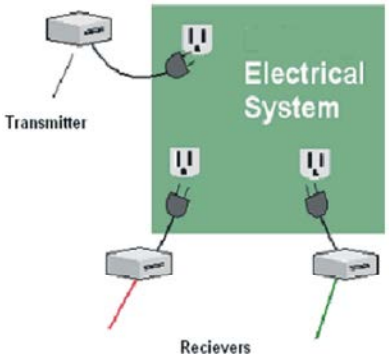
Automation is the most sought word now days. In this system there is a provision for automating the process of energy billing. In conventional systems every house is fitted with an energy meter. The assessor's visit every house read the meter reading and authenticate the energy bill. This method involves lots of man-hour and has lots of difficulties.

Here we propose a system in which there is a provision for sending the energy reading of a consumer line through power line itself. Here we use power line as communication medium. The frequency of the power line is 50Hz. In this project we use this as our career frequency. We may send numerical values through power line. Normally Power line will supply load current. In this system, we are using Power line to control devices at various sectors.

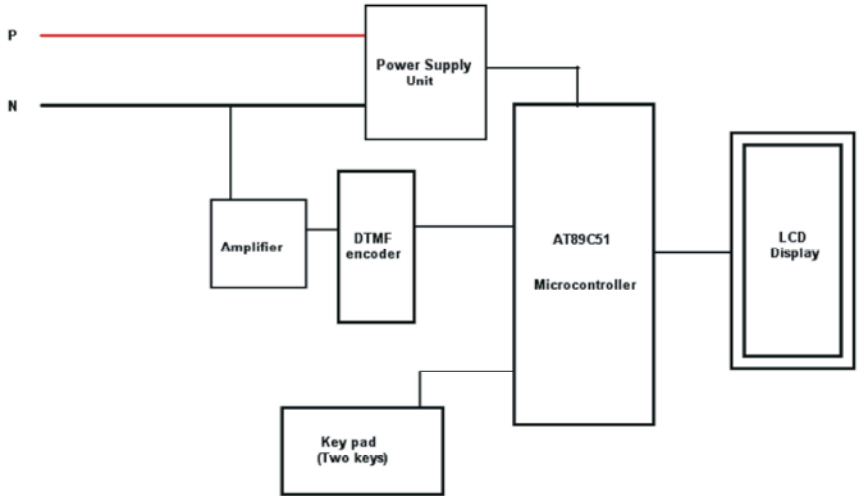
REFERENCES

1. Mukherjee, M.K., 1997. "Solar Photovoltaic Energy conversion", IE (I) Journal EL, 78: 1-5.
2. "Motorola Power MOSFET Transistor Data", Motorola Inc., New York, 1998.
3. Abraham I. Pressman, 1987. "Switching power supply", Tata McGraw Hill publications, New Delhi.
4. Muhammad H. Rashid, 1995. "Power electronics circuits, devices and applications", Prentice Hall of India Pvt. Ltd., New Delhi.
5. Udayakumar, R., V. Khanaa and T. Saravanan, 2013. Analysis of Polarization Mode Dispersion in Fibers and its Mitigation using an Optical Compensation Technique, Indian Journal of Science and Technology, ISSN: 0974-6846, 6(6): 4767-4771.
6. Khanaa, V., K.P. Thooyamani and T. Saravanan, 2013. Simulation of an All Optical Full Adder using Optical Switch, Indian Journal of Science and Technology, ISSN: 0974-6846, 6(6): 4733-4736.
7. Gopalakrishnan, K., M. Prem Jaya Kumar, J. Sundeep Aanand and R. Udayakumar, 2013, Optical Performance of Doped Azopolyester and its Application, Indian Journal of Science and Technology, ISSN: 0974-6846, 6(6): 4783-4788.
8. Kanniga E, K. Selvaramarathnam and M. Sundararajan, 2013, Embedded Control using Mems Sensor with Vovie Command and CCTV Camera, Indian Journal of Science and Technology, ISSN: 0974-6846, 6(6): 4794-4796.
9. Kiran Kumar T.V.U and B. Karthik, 2013, Improving Network Life time Using Static Cluster Routing for Wireless Sensor Networks, Indian Journal of Science and Technology, ISSN: 0974-6846, 6(5S): 4642-4647.

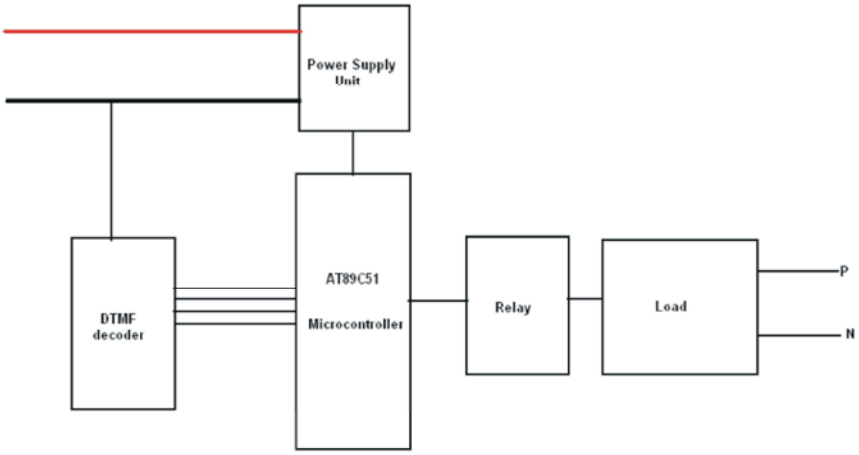
I. BLOCK DIAGRAM:



II. TRANSMITTER SECTION



III. RECEIVER 1(ON/OFF CONTROL)



IV. RECEIVER 2 (ILLUMINATION OR SPEED CONTROL)