

EB Charge Monitoring System using Embedded System

Haritha J, Vinodhini S, Ramya E, Gayathri S

Abstract: The word 'monitoring' means to observe a situation for any changes which may occur over time. In order to know the state of the system have to be monitored continuously. This helps to update about some important factors. In current situation people come to know about their electricity consumption only when a person from Electricity Board comes to take readings. This method can be avoided by this project by continuously monitoring the electricity consumption. "Electricity Board charge monitoring" helps to know about the daily electricity usage by counting the revolutions made by the disc. A microcontroller is adopted for sensing and displaying the information. The main advantage of this project is to know about the power consumption every time, thus resulting in the awareness of charge for power usage.

Keywords: 'Monitoring' Means To Observe A Situation For Any Changes Which May Occur Over Time.

I. INTRODUCTION

In this project the number of revolutions made by the aluminium disc in the analog energy meter is calculated using the sensors namely the opto coupler. Since a particular amount of revolutions correspond to one unit in the analog energy meter we are considering about the revolution [1]. The sensed revolution is send as input to the microcontroller. This microcontroller calculates the amount for the power usage or for the number of revolutions as programmed earlier. The calculated amount is visible to the consumer through Liquid Crystal Display (LCD). Not only the charge for the power usage is displayed but the revolutions are also displayed.

The total setup can be reset using a "reset button" provided in the setup. The previous value can be seen in the display. A provision is seen which the fault key input is. The use of it is for our future enhancement that is to indicate the line problems commonly occurring in our homes to the Electricity Board through some wireless communication like GSM modem.

Another option is the "switch off button" to switch off the main automatically to the consumer if they did not pay the electricity charge at the right time. This is also for future use to cut the power supply simply through a message. Similarly the power supply can be made available to the consumer by the same method.

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II. BLOCK DIAGRAM

The overall block diagram of EB billing automation is shown below

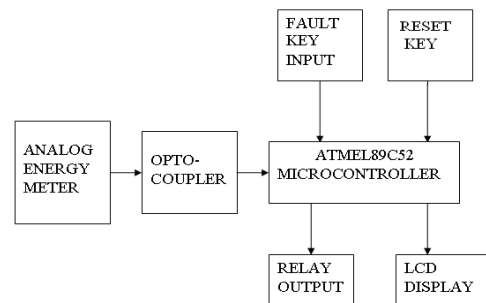


Figure 1 Overall Block Diagram

Main parts of the block are

- Opto coupler unit
- Analogenergymeter
- Microcontroller 89C52
- Fault key input
- Relay circuit
- LCD display

III. CIRCUIT OPERATION

The disc revolution is sensed using the opto coupler arrangement. This sensed output is given as input to the microcontroller as shown. The microcontroller using the revolution count as specified by the manufacturer, calculates the amount for electricity. The calculated amount is send to the LCD panel which gives information regarding the revolutions and the charge. A pull up resistor is employed for driving LCD panel.

If the fault key is pressed during some line problems then the message is displayed that the problem has been reported to the Electricity Board which is the option for future use. Similarly there is a key to totally reset the unit which is called reset key.

The main power supply flows through a 12V DC operated relay which disconnects the power to the consumers when they did not pay their electricity charge. A chip called ULM2003A which latches the 5V from the microcontroller to the 12V supply. The fault key and the power disconnecting relay are for future use. The overall circuit diagram is shown in figure 2.

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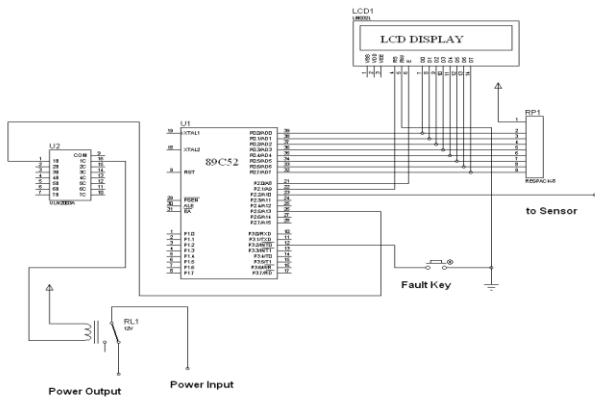


Figure 2 Overall Circuit Diagram

IV. OPTO COUPLER UNIT

The figure 3 shows the construction for sensor (opto coupler unit). The lamp and the photodiode comes in phase with each other when the holes pass them during disc rotation. During that time the photodiode conducts. This makes the voltage available to the transistor (BC107). The voltage from the collector to emitter starts flowing. This means that the transistor is turned on. Thus the input to the microcontroller is made available at the time when the disc hole passes through the opto-coupler arrangement. The figure 4 shows the power supply circuit for the system.

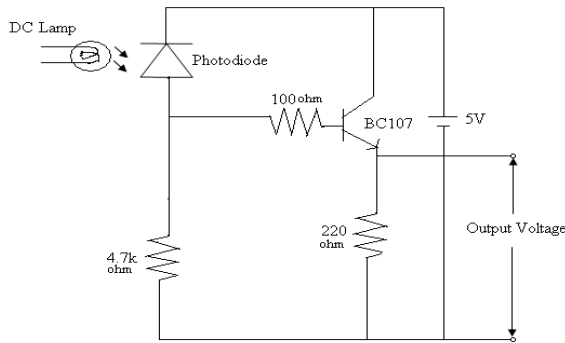


Figure 3 Circuit Diagram for Sensor

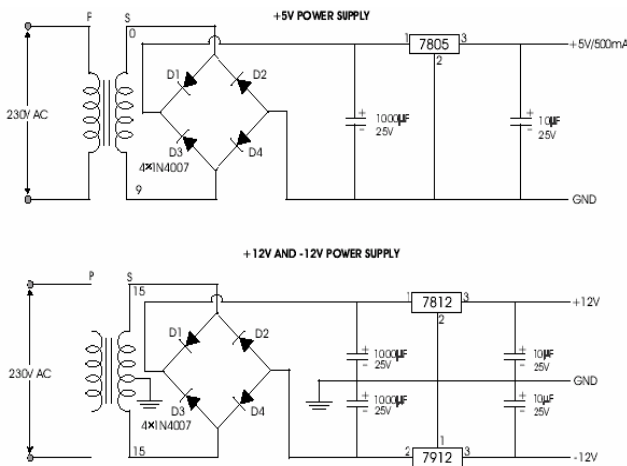


Figure 4 Circuit Diagram of Power Supply

V. ENERGMETER

Energy meter is used to measure the power consumption in houses, industries, etc. The conventional energy meter

used in houses is analog electrical energy meter. It uses register and counting mechanism to indicate the power consumption in kilo watt hour.

VI. MODIFICATION DONE IN ENERGY METER

An arrangement for holding photodiode and lamp source is made. This arrangement is coupled to the energy meter. A hole is drilled in the rotating aluminium disc through which the light from lamp source meets the photodiode to create pulse. The figure 5 shows the modified energy meter.

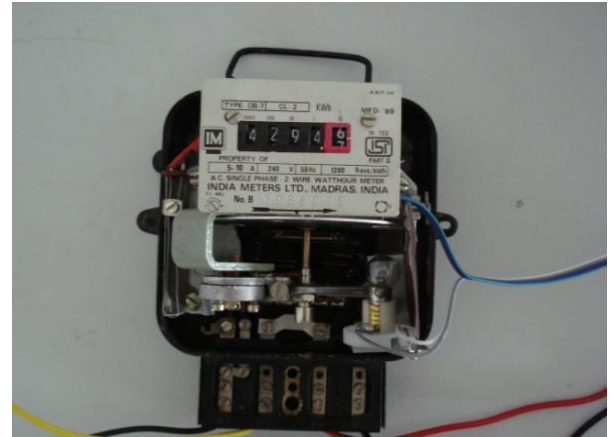


Figure 5 Modified Energy Meter

A. Relay

Relays are low power circuit that are used for electrical isolation and also as a switch. Relays are composed of a coil of wire around a steel core, a switch, a spring that holds one or more contacts. When an electrical current flows through the coil it becomes energized, acting like an electromagnet. The refuse field opens the contacts and closes the circuit. When the electrical current stops flowing, the opposite occurs. Relays are used to buzzers and bells. Starter solenoids in automobiles or modems, which have low current and low voltage required. To operate the horn or headlights in an automatic used for small appliances such as blenders where there is a switch to turn on a motor.

B. Relay Operation

The figure 6 shows the relay circuit. The relay is normally off in nature. When the control signal comes from the microcontroller, then the relay is get excited through the chip ULM2003A. This ULM2003A latches the 12V source to the relay as the microcontroller signal is only 5V dc which is not possible to drive the 12V relay. When the relay is actuated the house hold voltage (230 V) is disconnected and hence the power does not flow. The relay circuit is shown in figure 6.

VII. MICROCONTROLLER

The microcontroller used for this project is 8052. Port 0 (0.0 to 0.7) and port 2 (2.0 & 2.1) are used as output port. Port 2 (2.2 & 2.5) and port 3 (3.2) are used as input port. [2][3][4][5]



VIII. RESULT AND DISCUSSION

In conventional energy meter the unit can be calculated by considering the reading at the start and end of the month and with the difference in the reading the charge can be calculated. But in this project the reading and charge for consumed power is displayed directly on the LCD display and every month it can be reseted after taking the reading. In case of failure of bill payment by the consumer the power supply can be cut off by pressing a key which would operate the relay circuit and thereby cuts off the power which is not available in the conventional energy meter.

IX. CONCLUSION

Thus EB charge monitoring system is designed using microcontroller. The designing is much easier using KEIL C software. The project is working with satisfactory conditions. The readings are displayed in the LCD display. This can be operated easily and cost effective compared to other digital energy meter available commercially.

FUTURE SCOPE

At present the readings and charge for consumed power are displayed on LCD using microcontroller. In future the readings can be sent to the billing station through GSM modem via SMS. And in case of any delay of payment the power can be cut from the billing station just by sending a SMS with the help of a relay circuit.

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