

Design and Implementation of Remotely Located Energy Meter Monitoring with Load Control and Mobile Billing System through GSM

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Abstract- These days, even though there are many new IT services, these cause another types of problems. There are increases in the diversity of services and service quality, but there is also much higher energy consumption. Related solutions are being developed and commercialized by many companies but these products have a passive property. That is, these kinds of solutions need to include intelligent management because of passive operation according to hourly variation or battery status. For example, even though there are various variables such as future power demands, generation status depending on weather conditions, and current battery status, current solutions do not consider these variables, so it is hard to expect high efficiency .Therefore, for much higher efficiency of renewable energy, an intelligent system is needed to monitor these statuses and provide proper management services. In this paper, we propose an intelligent energy management system (IEDM). The concept of dynamic assignment of priorities for all the consumer is established in this project. Slicing of interrupt timings is also discussed which can be used to improve the performance .According to the generated power amount, power shut down will be announced and it will reach the consumer in the uniform level based on priorities.

Keywords- Arduino UNO, GSM, Current status, IEDM, Power, priority based system.

I. INTRODUCTION

The efficient way of power consumption is implemented in this project according to the current and power transformer values or the power consumption the priority of the device will be changed and accordingly now a days people have to go each and every house for the calculating the current bill and also all the households don't know the status of the power consumed in their house. Here a new way for the power consumption is described where accordingly it will change the priority of the electrical appliances and will switch off or switch on the appliance according to the power consumption and whenever the person want to know the status of the power consumption in their house they have to push a button and as

the button is pushed it will send the SMS using the GSM module which is programmed with the mobile number of the household. This project make the work easy and more efficient.

a. Remote Monitoring & Control

The proposed system also includes an intelligent automation system where according to the power consumption the priority will change. This technology plays a crucial role in enabling the electrical devices automatically and also monitor the system according to the power consumption, here Arduino Uno plays the major role which is programmed using embedded C and connected to the GSM. If the household want to know the status of the power consumption then just pushing the button SMS will be sent to the household with all the status of the house.

II. SYSTEM DESIGN&ARCHITECTURE

A. System Architecture

The proposed system is a combination of various modules namely, current transformer (CT), potential transformer (PT) which are connected to the Arduino UNO which will sense the amount of current and voltage consumed and will send the power consumption of it and will change automatically the priority of the electrical device connected to it. The remote access or the status of the power consumption will send to the house hold just by clicking a button in it through the GSM module the status of the power consumption will be send as the SMS.

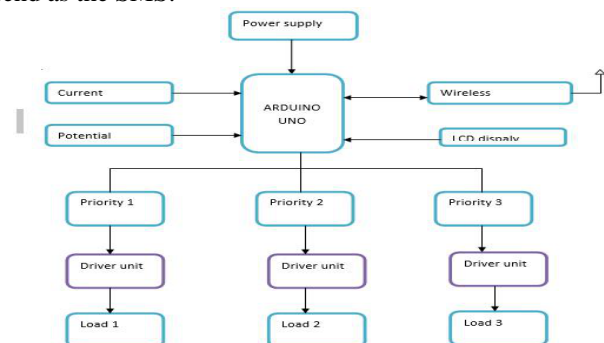


Fig.1: Block Diagram

The heart of this system is the core module which is realized using the Arduino UNO, its responsibilities include, and acquiring the power consumption, processing the acquired electrical devices, GSM is required to monitor the power consumption in the house and generate the bill according to the power consumption.

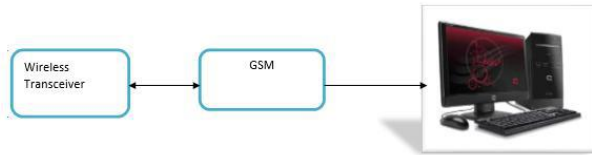


Fig.2: Monitoring System

III. SYSTEM DESCRIPTION

This section gives an overview of the various concepts, components and modules of the proposed system.

A. ARDUINO UNO

It is a microcontroller board developed by Arduino.cc and based on Atmega328. Electronic devices are becoming compact, flexible and cheap that are capable of doing more function as compared to their predecessors that happened to cover more space, turned out costly with the ability to perform fewer functions. Microcontrollers are widely used in embedded systems and make devices work according to our needs and requirements. We have already discussed the controllers like 8051, Atmega16, Atmega328 and PIC16F877. Arduino Uno is a very valuable addition in the electronics that consists of USB interface, 14 digital I/O pins, 6 analog pins, and Atmega328 microcontroller. It also supports serial communication using Tx and Rx pins.

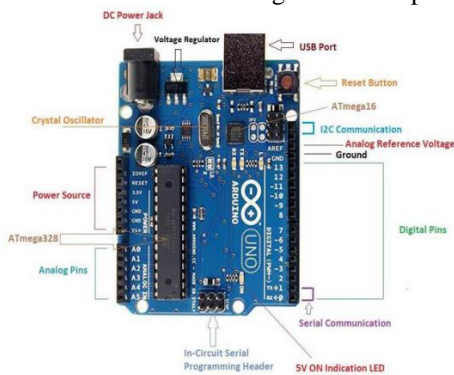


Fig.3: ARDUINO UNO

B. Current Transformer (CT)

Like any other transformer, a current transformer has a primary winding, a magnetic core, and a secondary winding. The alternating current flowing in the primary produces an alternating magnetic field in the core, which then induces an alternating current in the secondary winding circuit. An

essential objective of current transformer design is to ensure that the primary and secondary circuits are efficiently coupled, so that the secondary current bears an accurate relationship to the primary current.



Fig.4: Current Transformer

In this system the current transformer play a crucial role for measuring the current consumed by the appliances.

C. Potential Transformer (PT)

A voltage transformer theory or Potential Transformer theory is just like theory of general purpose step down transformer. Primary of this transformer is connected across the phases or and ground depending upon the requirement. Just like the transformer, used for stepping down purpose, potential transformer i.e. PT has lower turns winding at its secondary. The system voltage is applied across the terminals of primary winding of that transformer, and then proportionate secondary voltage appears across the secondary terminals of the PT.

This system control and measure the amount of voltage consumed by the transformer to measure the power consumption.



Fig.5: Potential Transformer

D. Global systems for mobile communication (GSM)

The Global System for Mobile Communications (GSM) is a second generation (2G) standard for mobile networks. In the early 1980s, a group was formed by the European Telecommunications Standards Institute (ETSI) to develop a digital mobile communication system. A group named GPRS (General Packet Radio Service), its main task was to develop a single, consistent network for all of Europe and come up with a better and more efficient technical solution for wireless communication. The GSM standard operates on three different carrier frequencies: the 900 MHz band, which was used by the original GSM system; the 1800 MHz band, which was added to support the swelling number of subscribers and the 1900 MHz frequency, which is used mainly in the U.S. Although GSM is based on the time division multiple access (TDMA) system, its technology uses digital signaling and speech channels and is considered a second generation (2G) mobile phone system.



Fig.6: GSM

IV. HARDWARE IMPLEMENTATION

This section emphasizes on the actual hardware implementation of the proposed system, the various modules, components, peripherals and the interconnections between them are discussed here.

The first stage of the implementation is to prepare Arduino Uno with the development of the set of instructions with the embedded C, here it is given a power supply of 5Volts.

The Current Transformer and the Potential Transformer is used to calculate the power consumption of the appliances. The priority of the device will change according to the power consumption of the device.

Using Embedded C programming language the set of instruction is given in such a way that it will automatically send the SMS with the use of GSM in order to get the status of the house power consumption.

V. PRINCIPLE OF OPERATION

The standards define a voltage transformer as one in which "the secondary voltage is substantially proportional to the

primary voltage and differs in phase from it by an angle which is approximately zero for an appropriate direction of the connections." In a "practical" transformer, errors are introduced because some current is drawn in the primary and secondary windings due to leakage reactance and winding resistance. One can thus talk of a voltage error, which is the amount by which the voltage is less than the applied primary voltage, and the phase error, which is the phase angle by which the reversed secondary voltage vector is displaced from the primary voltage vector.

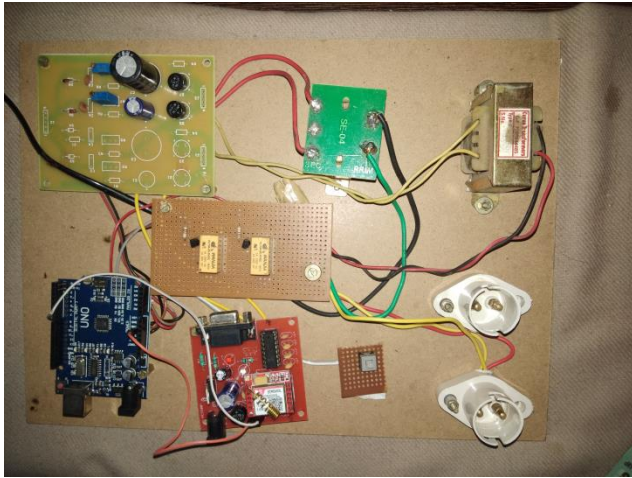
A current transformer is defined as "as an instrument transformer in which the secondary current is substantially proportional to the primary current (under normal conditions of operation) and differs in phase from it by an angle which is approximately zero for an appropriate direction of the connections." This highlights the accuracy requirement of the current transformer but also important is the isolating function, which means no matter what the system voltage the secondary circuit need be insulated only for a low voltage. The current transformer works on the principle of variable flux. In the "ideal" current transformer, secondary current would be exactly equal (when multiplied by the turns-ratio) and opposite to the primary current. But, as in the voltage transformer, some of the primary current or the primary ampere-turns is utilized for magnetizing the core, thus leaving less than the actual primary ampere turns to be "transformed" into the secondary ampere-turns. This naturally introduces an error in the transformation. The error is classified into two—the current or ratio error and the phase error.

VI. CONCLUSION

The proposed adjustment is acclimated to advise the activity of bulk and authoritative bulk according to priority. The authoritative is from EB base it will accomplish according to bearing if bearing is top they will acquiesce accumulation to all antecedence lines, if the bearing low they will acquiesce accumulation to abandoned top antecedence lines. This adjustment abide CT and PT appliance these two transformers it will admeasurement the activity and will displays on LCD with Amount. If any bulk cantankerous the absolute it will displays on LCD like adeptness theft.

Now we are ecology and authoritative the load, and we are chiral paying bulk to EB base due to this time adjournment and not able so, in approaching we can pay the absolute bulk of activity from home through wireless appliance GSM.

VII. RESULT



VIII. REFERENCES

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