

Power Billing with Load Sharing System on Energy Meter Using Lab View

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ABSTRACT

Power has become a crucial job in our regular day to day existence and widely used for domestic, commercial and agricultural purposes. There is a great demand for electricity and it is increasing day by day, also there are lots of problem regarding distribution and metering. Our system monitors the usage of energy consumption in energy meter along with cost and it will be updated to the EB station through Zigbee transceiver module. It will be display in LCD Display and messages will be send to the customers mobile number. So it will be very useful to consumers. Based on our government system, first 100 unit of energy is not calculated by energy meter, which is used to calculate the electricity consumed unit in the consumer node. Keypad is used for intimations like power demand, no need for power connections, etc. At the time of shutdown, the electricity board will share the power to a certain area at the time of energy demand. If the usage of that power is increased than the certain limit. Then it will alert and trip the main supply automatically. Thus a daily consumption reports are generated which can be monitored through the system and improve reliability, security and efficiency of the electric system.

Keyword: Automatic energy billing system, Optocoupler, PIC Microcontroller(16F877A), Keypad, LCD display, Zigbee Module, GSM Module, USB to UART converter, PC(LabVIEW)

INTRODUCTION

Electrical power has become indispensable to human survival and progress. The energy meter reading is a difficult job where the meter reader has to travel on foot and take the readings from each consumer manually to generate the bill. ZigBee is a low-cost, low power and the network standard which is dedicated for wide development to control and monitoring applications. The energy meter delivers the reading details to the EB station through the ZigBee. The energy meter monitoring system aim is to minimize these difficulties. In the time of power failure or any other complaints, we can inform to EB office from consumer node through keypad and which will be display. Intrusion arrives from EB board which is displayed in the consumer node LCD display. This is to measure the energy consumption, monitor its quality and communicate this information from meter to concentrator. The results are lower costs, higher reliability. This integrates the entire power system

right from generation to end user in one system. Labview based monitoring of energy meters at lower cost is made possible.

Energy effectiveness is getting progressively significant in industry just as in the private area. In any case, because of the intricacy and variety of processing gadgets, incorporating energy effectiveness into pervasive registering is as yet in its outset. Adding each new gadget into the climate requires a lot of work. In the wake of choosing which specific gadget to coordinate, the keen home designer should decide how to arrange it and interface with it. At that point the gadget should be associated and actually incorporated it into the climate. As of now the microcontrollers are assuming significant part in metering framework. Nowadays, the energy utilization and energy dissemination has gotten a major subject for conversation in light of colossal distinction in energy creation and utilization. In such manner, energy buyers are dealing with such countless issues because of the incessant influence disappointments, another significant justification influence slices is because of the un-restricted energy utilization of rich individuals. In this viewpoint, to limit the force slices and to disseminate the energy similarly to all spaces, some limitation ought to have over the force utilization of every single energy shopper, and as per that the public authority should execute an arrangement, by presenting self-ruling energy meters wherever in homegrown area. Henceforth, the need has come to think on this line and an answer must be arisen out.

LITERATURE REVIEW

R.B Hiware., The flow arrangement of Electricity charging is mistake level and furthermore tedious. Mistakes presented at each stage are partial to blunders with electro-mechanical meters, human mistakes while noticing down the meter perusing, and blunders while preparing the covered bills and the due bills. The significant inconvenience of a post paid framework is that there is no control of utilization from the buyer's side. There is a ton of wastage of force because of the customers be shy of preparing of electrical utilization in an efficient manner. Since the stock of force is restricted, as a dependable resident, there is a need to utilize power in an improved and proficient manner. There are numerous nations wherever a prepaid framework has diminished the use (wastage) by an incredible amount. Extra benefit of the prepaid framework is that the human mistakes created understanding meters and handling bills can be decreased to a lot. Advance in innovation have made trade of data is extremely rapid, secured and honest. Here two procedures were exhibited paid ahead of time just as postpaid. Utilizing GSM the SMS of bill where send and get to the client.

S.I Swarnajith., The flow method with respect to the charging interaction for power is certifiably not a completely mechanized framework. It includes manual cycles from the time the Meter peruser begins perusing the meter until the framework is refreshed with the current perusing. Back in the workplace an information passage official enters the meter readings into the framework physically. The strategy is a long way from agreeable and it is accepted a superior framework utilizing accessible advancements would be a benefit. A system based on mobile to capture, process and give information on user about bill consumed. As unit consumed image gets capture all information is collected image processing technique will be done in the mobile device and these numerical value can be sent to the user.

A.Vijayaraj., The Automated EB charging proposed framework depends on the utilization of new current advances and execute them into more reasonable fields. These arrangements with the

execution of Wireless impromptu organizations in the field of power charging. We can utilize this innovation so much to such an extent that even unpredictable issues can be dealt with in a simpler manner. Remote organizations are the famous modern substitution of links and electrical cables that associate each family in a specific region. This kind of organizations can likewise be utilized for making crisis reaction organizations. It wipes out the requirement for utilizing EB meter perusers and this arrangement of businesses can be utilized somewhere else. The measure of time spent in doing every one of these works physically can be diminished as a result of this sort of organization execution. Every family is assigned a specific id so they can be remarkably recognized. The focal EB office has prompt admittance to all shopper homes for a territory with the assistance of a RF framework. The power charge (EB) office can get to each and every client with the assistance of radio recurrence framework.

THE PROBLEM

In Present scenario, electricity system has major drawbacks due to manual work. The services of power companies are also not good and perfect. Customers are also not satisfied with the current system because many times they have complaint about to statistical error in monthly bills. Thus we are trying to represent the idea about minimization of error, reduce the paper work, human dependency in the system.

- Manually taking the readings of EB bill and removing the fuse carrier.
- To address this problem in a different way by using modern technologies, we also record the energy consumption during our daily usage.
- Based on this information, will be required to be monitor through LabVIEW software and controlled the system in real time.

The main problem in our billing system...



OBJECTIVE

The objective is to monitor the system and to control it when it goes to abnormal condition.

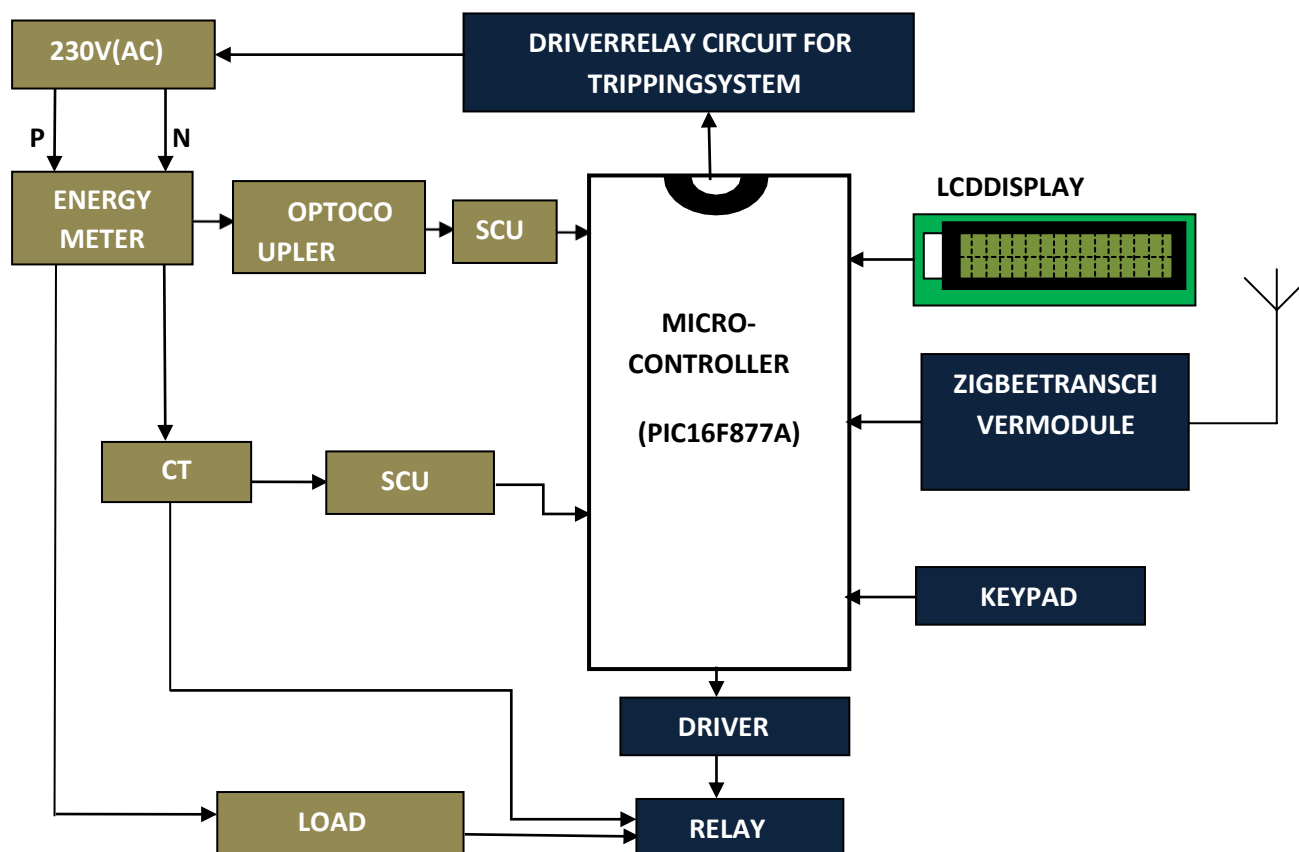
- It monitor the energy meter of all consumer homes on real time basis
- Customer can know their regular information and how much energy they utilized
- To analyze lots of time and power saving for electricity department
- Simulate the design using PIC microcontroller
- Implement the simulated design along with hardware and software specifications

PROPOSED MODEL

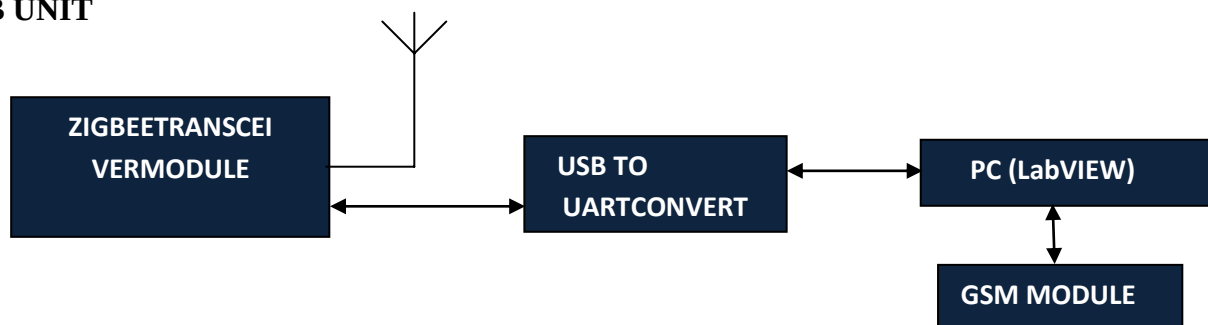
BLOCK DIAGRAM

This describes the block diagram of the consumer and EB unit. It consists of energy meter, optocoupler, current transformer, lcd display, zigbee module, keypad, GSM module and microcontroller. Here we are using, 230 V Single phase AC Supply. From that I am giving the load through energy meter. So, the 230 V which is from the energy meter gives the controller as input 5V and current which is 40-50 amps. Here we using two modes of supply one is electrical and other is electronic. This electrical should not go to electronic, so here we keeping optocoupler to isolate two different circuits. We are using sub meter, in this I will be disconnecting the CALL led in energy meter. And also we can see that the LED on meter continuously blinks which counts the meter reading. When it is blinking, the units are counted. Normally, 3200 blinks is one unit. In our project, I disconnect the supply and for system convenient we program has, when the LED is blinking at one time it will consume one unit. The IC which is here MCT2E and output as PIC microcontroller. This relay is an electromagnetic relay, which operates at 12V DC. If any fault occur, this relay will do the switching operations ON or OFF from the circuit. Through USB we can read the data. At the same time through zigbee we can read and call the data. So we connect zigbee to UART converter.

CONSUMER UNIT



EB UNIT



At the point when the different machines of the family burn-through energy the energy meter peruses the perusing consistently and this burned-through burden can be seen on meter. Consequently, we are attempting to create, a framework wherein PIC Microcontroller go about as principle regulator, which persistently screen energy meter. According to the squinting of LED on energy meter the microcontroller will quantify the unit utilization. The deliberate perusing with the estimation of the expense will be ceaselessly shown. The meter will automatically trip, when exceeds at the due date. In case power failure, our system sends the information to EB office from consumer place. In our proposed system reduce the manual work we are going to measure the energy consumption and it will be updated in the EB station through Zigbee transceiver module. The Power sharing be done from electricity board at the time of shutdown. The power usage at the time of shutdown should be low. But if the usage exceeds than the certain limit, then it will alert and trips the supply mains. We are using PIC microcontroller for controlling and monitoring the entire system. It will operates in 5V DC supply. Then in EB station they will be monitor the energy consumption using Zigbee transceiver module through LabVIEW software. Hence the human errors will be avoided by using our system.

MODE – I (POWER BILLING)

In this, first 100 unit of energy is not calculated by energy meter. One intimation will be send to the customer, if they not pay the EB bill at the date, through the software one trip button will be fixed. So the EB line will get disconnect automatically and it send the information through the GSM module to the customer node. So the customer can also receive the messages in their mobile phone like customer id and usage of unit along with the cost.

MODE – II (KEYPAD)



Keypads are a part of HMI or Human Machine Interface. It is used for communicating, consumer node to EB station. Matrix keypads are well known for their simple architecture and ease of

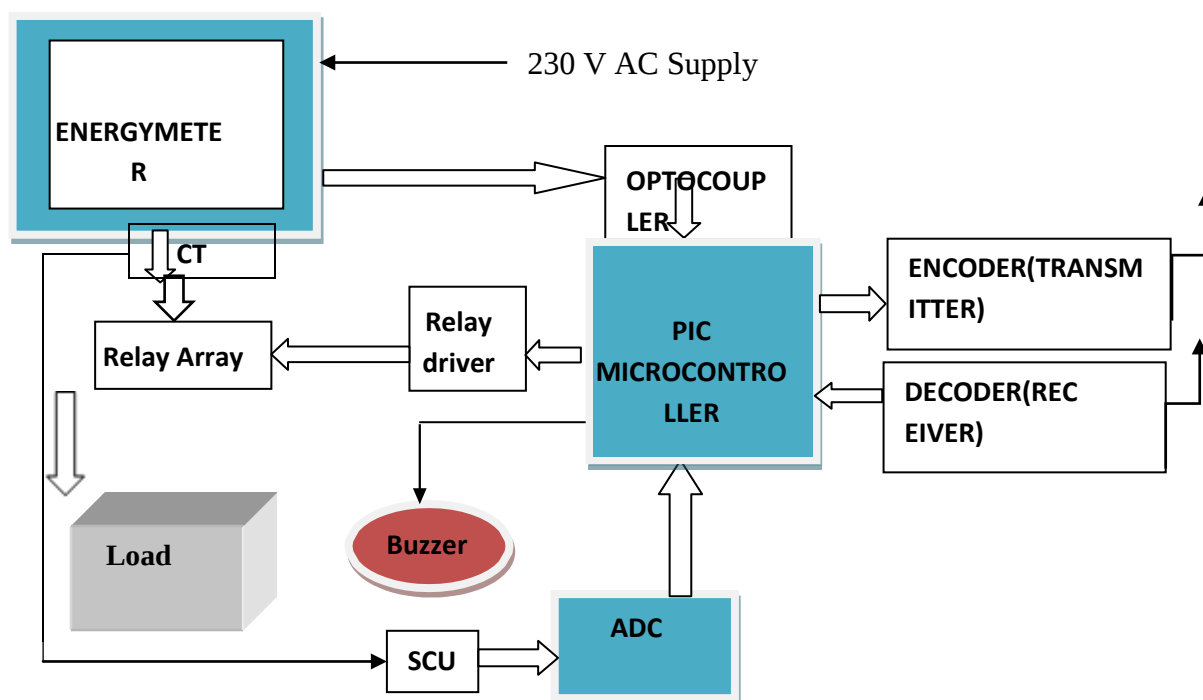
interfacing with PIC microcontroller. We use 3X4 keypad. Usually, each number in keypad have individual functions like complaints, then to inform no need for power connections.

1. When keypad number “#” is pressed it will inform to EB station to register their complaints.
2. When keypad number “*65#” is pressed it will inform about disconnection or no need for power supply by an consumer.

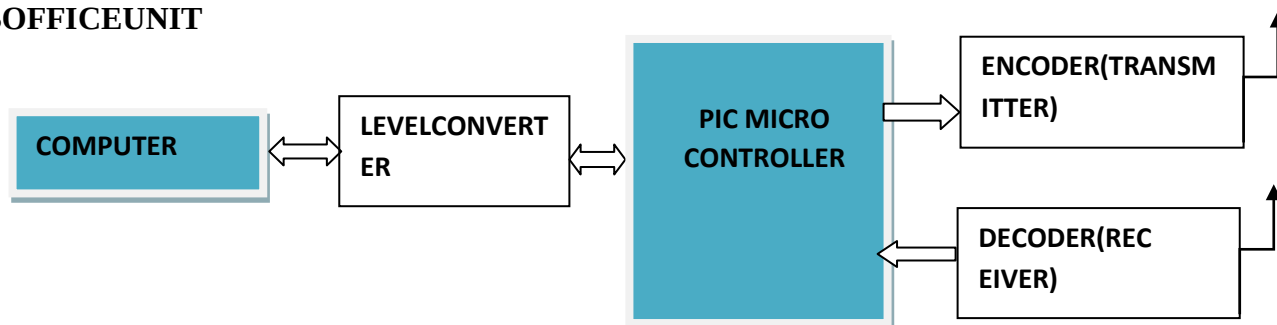
MODE – III (LOAD SHARING)

It consists of 3 units, namely 1. EB Office unit. 2. Residential unit - I & Residential -II

RESIDENTIALUNIT-I&RESIDENTIALUNIT-II



EB OFFICE UNIT



The data identified with power restricting will be sent from the PC at a pre-characterized stretch to the particular territory. The framework will be created utilizing PIC microcontroller (16F877A) utilizing low level computing construct which is having program memory of 8K bytes.

In Load sharing concept in area 1 totally power shutdown means, in area 2 they will be utilizing more number of energy. In area 1 they are suffering without energy. So, area 2 they can use 75% and give 25% to area 1. Through energy meter on that day alone, we send the data to area 1 which they can use one light and one fan for emergency purpose. In case suppose, they are using more energy and misusing the consumption energy means, it will extra charged on that day and warning message will be given. Therefore, also they not consider means the main power will trip automatically.

ENERGY METER

In Energy meter or watt-hour meter is an electrical instrument that actions the measure of electrical energy utilized by the customers. The energy meter generated the 3200 pulses per kilowatt hours. The single phase 230 V AC supply which is from energy meter gives the controller as input which is 5V. Inside this energy meter one CALL LED will there, In real time the CALL LED when it is blinking 3200 times it will consume 1 unit. For system convenient we program has, when they use 1 unit at one time the LED will be blinking from that one pulse will be generated. This force is coordinated throughout a period span, which gives the energy used throughout that time span. Energy meter estimates the fast voltage and flows, ascertain their item and give immediate force.

$$P = \frac{3600 \cdot Kh}{t}$$

OPTOCOUPLER



An Opto-isolator (also called optocoupler) is a device that transfers electrical signals between two isolated circuits by using light. It is mainly used to provide electrical isolation between two devices. It consists of 4 pins there are: positive pin, negative pin, collector of the photo transistor, emitter of the photo transistor. Here one side of LED will be connected with the supply on another side it will be generated. So, when the LED on, the LDR which is photo diode or phototransistor from the opposite side will be detected. Between these two no connection or information will not be there. And optocoupler will be safe the circuit from damage. If any abnormal conditions occurred on this side. So we are keeping optocoupler here.

ZIGEE MODULE



Zigbee is a range of communication, it can transmit and receive the data with more number of zigbee pairs. We can know the consumed energy in the consumer node and it will monitor through labview software, exactly with the help of zigbee communication. It is targeted at radio frequency (applications) that require a low data rate, long battery life and it will be simple and less expensive. Hence our aim is to minimize all the difficulties by providing energy through zigbee module.

GSM MODULE



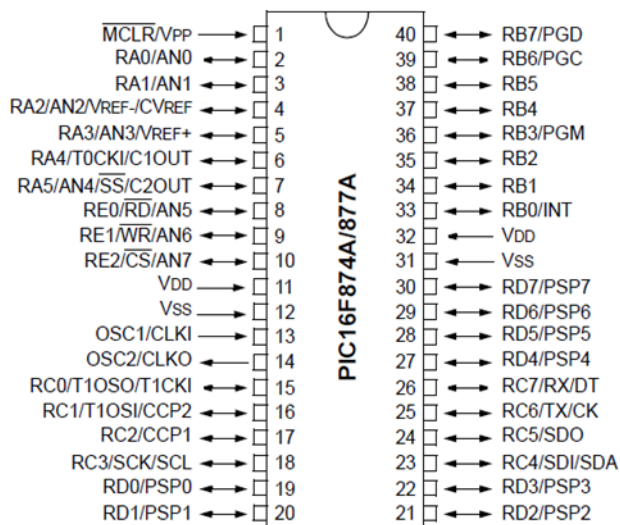
GSM Module (Global system for mobile communication) is a chip or circuit that will be used to establish communication between a mobile device or computing machine. GSM uses digital technology and is a second-generation (2G) cell phone system. To send an SMS we need a GSM Module. IM900 communicates with external controller on UART interface. SIM900 GSM utilizes AT commands for its configuration and working. AT Command replies back of the status of the GSM Module.

LCD DISPLAY



Liquid crystal displays (LCDs) are used in similar applications where LEDs are used. It has 16 pins, interfaced with PIC microcontroller. The inward surface of the glass plates is covered with straightforward anodes. It is layered between glass sheets with straightforward cathodes saved within faces. These applications are show of numeric and alphanumeric characters in speck network and segmental showcases. On the off chance that the EB official send any information or data to the client, they can get the message through LCD show and it is for yield reason.

PIC MICROCONTROLLER (16F877A)

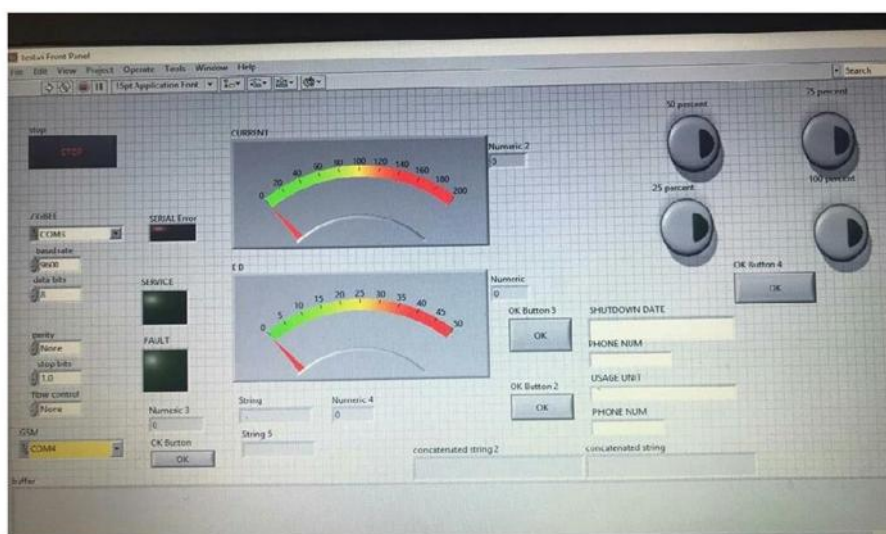


It is a programmable IC and it integrates a number of components of a microprocessor system into a single chip, and it has inbuilt ADC. It has 40 pins enclosed in 5 ports. Each port holds 8 pins which are bidirectional input/output pins. This microcontroller has program and hardware.

SOFTWARE DESCRIPTION

LabVIEW

LabVIEW is the abbreviation for Laboratory Virtual Instrument Engineering Workbench. It is a Graphical-based programming language like C, C++. This product is just to plan the circuit utilizing VISA device with electrical parts. The VI has three principle parts: 1. Front board Right snap on the control range spring's up, it is utilized to connect with the client 2. Block chart Right snap on the capacity range spring's up, here it contains the code 3. Connector hub It implies passing the information to other VI. This sheet terminals show the shade of information. LabVIEW is a continuous module that helps in planning amazing machine observing and control applications.



FUTURE SCOPE

The development of the automation process of taking a meter reading and computing the billing by examining the number of units consumed by the user of that particular registered energy meter and sending a computed bill to the registered mobile number of a user. This system also helps to monitor the daily reports and hence can reduce the manual work of management system. This method finally helps in keeping the system more reliable. Thus, the energy meter is made more efficient. Thus it will be monitored for the better performance of the system. The next generation electric power system is actual way of digital transmission of electricity. This technique brings a lot of change where it avoids all the manual billing systems and also reducing manpower for generating and collecting the bills in the electricity meter readings. In this project the above requirements are fulfilled with the advanced technology and this project provides greater advantage in future. This system also favours the human involvement and hence it is more accurate.

CONCLUSION

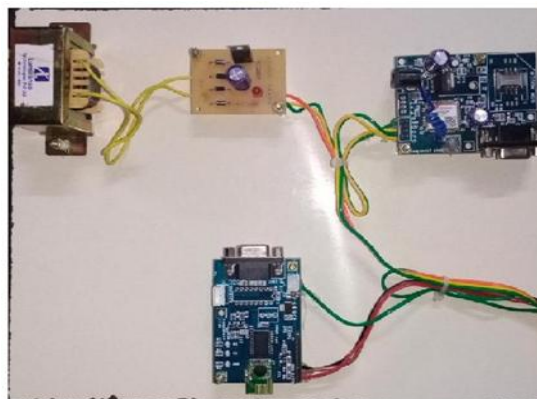
In this paper it presents a thought on ongoing observing of the dissemination transformer and the energy charging framework estimates the energy utilization, logs information continuous and controls any gadget associated with power yields. The force utilization was estimated by the shrewd energy meter model and the determined information was sent through Zigbee correspondence to PC (Personal Computer). With the PC programming, result shows that Zigbee can be utilized to communicate the information constantly for a distance of 85 meters. It is the most ideal alternative for low information rate sensor network with little size, low force necessity. Hence power charging includes complete validation over getting to information from energy meter and gives precise and opportune charging. This venture work is the execution of shrewd method of taking care of an issue is the most essential assignment. It helps the public authority in legitimate/severe assortment of bills. The greater part of the misbehaviors can be stayed away from. The GSM based procedures associated with it and makes an impression on a specific client SIM in regards to the subtleties. It is a computerized innovation that permits creative two route correspondence among utility and clients. Keypad is used for intimation like power demand in the consumer node. In load sharing concept, will share the power to a certain area at the time of energy demand, if it is increased at a certain limit and it will trip the main supply automatically and it will be very helpful in energy demand time/shutdown period. This methodology will bring a impactful solution to the distribution and metering system.

PROJECT KIT

CONSUMER UNIT



EB UNIT



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