

Smart Energy Meter using Arduino and WIFI Module: A Review Paper

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Abstract— In the as of now working framework, power meter perusing for power utilization and charging is finished by human laborers from one home to another and working to structures. The motivation behind this undertaking is to foster a Shrewd Power meter utilizing GSM. This can decrease human blunders and assists with recovering the ongoing meter esteem by means of GSM and send it to client's cell phone through GSM. This likewise permits power board to alter the variable bundle cost in unambiguous term. The chairman can dissect the clients power utilization information and produce the report from the information on the web. The model will actually want to acquaint the charging framework with the clients, get the power utilization information from shrewd meter, keep the information in incorporated data set and produce the report.

Keywords: Smart Energy Meter, Arduino, WIFI Module, GSM

I. INTRODUCTION

Power is one of the imperative prerequisites for sustainment of items throughout everyday life. It ought to be utilized sensibly for its legitimate usage. Yet, in our country we have parcel of region where we have excess stockpile for the power while numerous areas don't approach it. Our arrangements of its dissemination are likewise somewhat liable for this since we are as yet not ready to accurately appraise our precise prerequisite yet power robbery is winning. Then again, shoppers are likewise not happy with the administrations of force organizations. More often than not they have objections in regards to factual blunders in the month-to-month charges. with this we can screen meter and track on the off chance that any shortcoming is there or not. In past meter a round metal strip turns and as per that revolution we ascertain the utilization our meter deals with heartbeat which is made by utilization and we recently associated android board which screen the beat and as per beat the bill is created. With the assistance of this venture, we are intending to get the month-to-month energy utilization from a far-off area straightforwardly to unified office. In this manner we can lessen human endeavors expected to record the meter readings which are till now recorded by visiting each home separately.

II. EXISTING FRAMEWORK

A. Plan of a Programmed Meter Perusing Framework:

This paper portrays the Programmed Meter Perusing (AMR) system, an incorporated and programmable meter perusing and control framework over existing phone organizations. The AMR framework is and robotized, two-way framework for remote perusing and man-understanding of utility meters. The meter perusing and the executives' processes are liberated from human association. Exactness, speed, productivity, and cost-adequacy are the normal advantages

reachable utilizing the AMR framework. The general framework depends on the current phone organizations; subsequently, the assistance can reach anyplace there is a phone. This is achieved electronically and really naturally, subsequently finishing manual (and self-loader) meter perusing and section, call-backs, understanding mistakes, and charging floats. The AMR framework ought to give 100.

B. Information Gathering from Shrewd Meters in a High-level Metering Framework:

The traditional answer for gathering information from energy meters, in view of relocations of people groups, will in general be supplanted by current arrangements: drive-by and Computerized Meter Perusing (AMR). Drive-by implies that information is gathered by cell phones which pass close to the meters. The work force is extensively decreased and physically readings and records are wiped out. AMR means to consequently gather information from meters and send them to a focal PC. The benefits of AMR are: scaled down costs for meter readings, probability to get to meters in any case challenging to go to on account of their situation or security reasons, support for continuous evaluating, expanded extortion recognition, decreased read-to-charge time and so on. AMR requires shrewd meters. Other than their traditional job, to peruse the utilizations, savvy meters should likewise have the option to send the readings over correspondence lines. For cutting edge frameworks, the meters should likewise have the option to perceive their location and to actuate/deactivate inside modules. A meter interface should satisfy the necessities of perusing the information from the traditional piece of the meter and answering the orders got from the lines. AMR requires a particular framework. It tends to be unidirectional, meaning information are sent occasionally by meters, or bidirectional which adds the likelihood to deal with the framework, for instance to associate/disengage clients, to gather the information from the meters as indicated by certain standards, to bunch the meters and so forth. Such a foundation is called Progressed Metering Framework (AMI). The correspondence medium in an AMI framework should guarantee the correspondence shrewd meters information authority (or door) and information gatherer (passage) focal PC. There are two arrangements: wired or remote. The picked arrangement should consider the distances between the gadgets and, for monetary reasons, the current framework. For instance, as a rule an electrical cable foundation exists. It very well may be utilized for Perusing (AMR) and Energy Profiling Framework (EPS) began, which give a compelling method for energy utilization data assortment, and its investigation, for precise charging. Radio recurrence-based EPS can utilize Handheld, Versatile, and Fixed network. In handheld and contact-based EPS, a handheld PC furnished with a handset is utilized (radio recurrence or contact) to gather readings, however it doesn't utilize the AMR proficient meters, as

meter perusing work force are required. Versatile or Drive-by meter perusing is one more methodology where a perusing gadget is introduced in a vehicle. Because of the short scope of portability, it again requires a group for assortment of meter readings. AMR can likewise be carried out by utilizing Electrical cable Correspondence (PLC), yet it has an inborn weakness of obstruction and commotion, which considers it inconsistent. Wi-Fi, ZigBee and 3G advances have additionally been utilized for transmission of metering data, however have not been broad as they require establishment of office/passageways to cover the assigned regions and consequently don't give a savvy arrangement in existing conditions. Our natively evolved GSM transmission module actuate straightforwardness in the ongoing meter understanding framework, by working with minimal expense continuous observing of customer energy utilization. Computerization would prompt a proficient energy metering framework by eliminating human mistakes. Our framework likewise permits the energy provider organization to remotely control the shopper energy meter. A significant element is the consideration of a client utilization profiling framework, available to clients and the energy supply organization. By integrating control combined with profiling, an extra component investigated is the traffic profiling utilizing Worldwide Situating Framework (GPS) to demonstrating the area of purchasers which is very advantageous on the off chance that utilized as a team with sensor circuits to show meter burglary. Correspondence as well, the arrangement being called Electrical cable Correspondence (PLC). There are a few PLC guidelines, one of them being Lon Work Distant Energy Checking, Profiling and Control Through GSM Organization: To devise a proficient metering framework, the idea of Programmed Meter

III. SYSTEM ARCHITECTURE

In the current framework, power meter perusing for power utilization and charging is finished by human laborers from one home to another and working to structures. This requires gigantic number of laborers and long working chance to accomplish total region information assortment and charging. Human laborers charging is inclined to perusing blunder as at some point the houses electric meter is put where it isn't effectively available. Work charging position is some-time likewise confined and dialed back by terrible ecological condition. Paper charging has the inclination of losing in the post box. The expanded improvement of private lodging and modern structures in the non-industrial nation such as, India require more human specialists and longer working hours to finish the use understanding assignment. These expands the energy supplier activity costs for meter perusing.

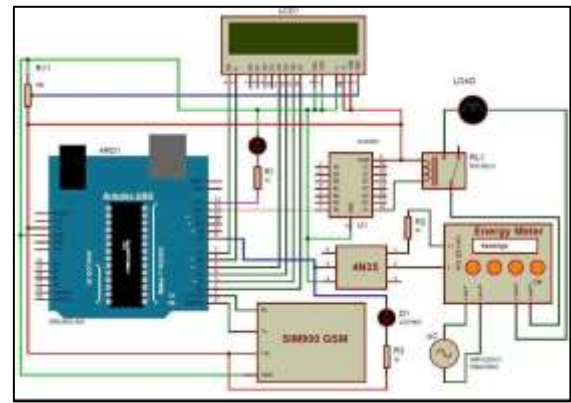


Fig. 1: BLOCK Diagram

The energy meter records how much energy consumed by the heap. In the more established days electro mechanical sort of energy meter is accessible and presently a day's advanced energy meter is accessible. The energy meter for the most part chips away at the ongoing augmentation in measure of current course through circuit makes the circle turn, implies that the rotational speed of plate is straightforwardly corresponding to how much current moving through circuit. Old sort turn impact of circle type meter makes the stuff instrument work in like manner and in comparable way power utilization by the heap is recorded by the miniature regulator the flickering pace of Driven coordinated inside the meter. Present sort of energy meter likewise had a squinting driven for the counting the beats are shipped off the microcontroller and these readings are put away into outer memory of the microcontroller. Outside memory is an EEPROM. This memory can store past energy consumed as the need might arise to check present Energy consumed status. LCD is associated with microcontroller; microcontroller makes an impression on LCD show unit so we can see the situation with GSM Modem. GSM impart over remote framework; GSM modem is associated with the microcontroller unit through MAX 232 IC. GSM modem imparts at RS232 standard voltage levels. MAX 232 proselytes the RS232 voltage levels into TTL voltage levels and MAX 232 believers the TTL voltage levels into RS232 voltage levels.

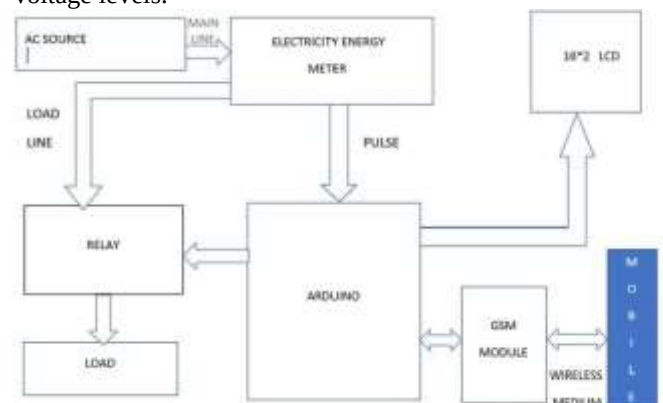


Fig. 2: Circuit Diagram

IV. REQUIREMENTS:

A. Software:

- Arduino IDE

B. Hardware:

- Arduino
- GSM Modem
- ENERGY METER
- OPTOCOUPLER
- LCD DISPLAY
- Potentiometer

V. COMPONENTS DETAILS

A. Arduino

The sheets are furnished with sets of advanced and simple info/yield (I/O) sticks that might be connected to different development sheets (safeguards) and different circuits. The sheets highlight sequential correspondences interfaces, including Universal Serial Bus (USB) on certain models, which are additionally utilized for stacking programs from PCs. The microcontrollers are ordinarily customized utilizing a lingo of highlights from the programming dialects C and C++. As well as utilizing customary compiler instrument chains, the Arduino project gives a coordinated improvement climate (IDE) in light of the Processing language project.



Fig. 3: Arduino

B. Arduino IDE: -

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

C. GSM Modem

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most

frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. For the purpose of this document, the term GSM modem is used as a generic term to refer to any modem that supports one or more of the protocols in the GSM evolutionary family, including the 2.5G technologies GPRS and EDGE, as well as the 3G technologies WCDMA, UMTS, HSDPA and HSUPA.

Energy Meter
An electricity meter, electric meter, electrical meter, or energy meter is a device that measures the amount of electric energy consumed by a residence, a business, or an electrically powered device. Electric utilities use electric meters installed at customers' premises to measure electric energy delivered to their customers for billing purposes. They are typically calibrated in billing units, the most common one being the kilowatt hour [kWh]. They are usually read once each billing period. When energy savings during certain periods are desired, some meters may measure demand, the maximum use of power in some interval." Time of day" metering allows electric rates to be changed during a day, to record usage during peak high-cost periods and off- peak, lower-cost, periods.

D. LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special even custom characters (unlike in seven segments), animations and so on.

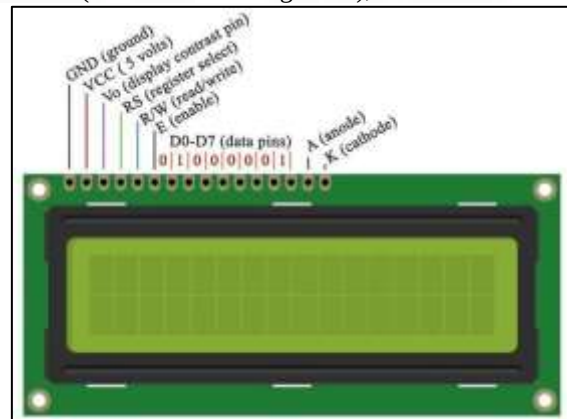


Fig. 4: LCD display

VI. CONCLUSION

This paper is planned to introduce an outline of prepaid energy meter which have some control over the utilization of power on purchaser said to stay away from wastage of force. Prepaid energy meter is an idea to limit the power robbery with an expense productive way. The clients not will undoubtedly pay abundances measure of cash, clients need to pay as per their necessity. Prepaid energy meter is more dependable and easier to understand. This prepaid far off energy meter ends up being a help in the power area. It

controls the utilization of power on purchaser said to stay away from wastage of force. It serves to the country income by halting current robbery and rebuffing the untrustworthy clients. In any case, their plan needs to fulfill specific prepaid guidelines and guidelines. The main concern is the security and protection of information as they are inclined to digital assault. Notwithstanding, the utilization of GSM in this specific framework gives various benefits over techniques that have been recently utilized. Information transmission is charged at guidelines SMS rates; accordingly, the charges are not in light of the length of information transmission. The expense proficient of readings. Created framework likewise gives data about day to day, month to month and yearly power utilization. Insights about day-to-day power utilization will assist shopper with dealing with their power use. This created framework is dependable and secure as just approved individual can get to the framework.

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REFERENCES

- [1] Sh-Wei Lee, Cheng-Shong Wu, Meng-Shi Chiou, Kou- Tan Wu *A re- search paper on*, Design of an Automatic Meter Reading System National Chung Cheng University
- [2] M. Popa *A research paper on*, Data Collecting from Smart Meters in an Advanced Metering Infrastructure, Politehnica University, Timisoara, Romania
- [3] Adnan Rashdi, Rafia Malik, Sanam Rashid, Anam Ajmal, Sulaiman Sadiq, *A research paper on*, Remote Energy Monitoring, Profiling and Control Through GSM Network, 1 National University of Sciences and Technology, Islamabad, Pakistan
- [4] Ali Abdollahi, Marjan Dehghani, and Negar Zamanzadeh, *A research paper on*, SMS based Reconfigurable Automatic Meter Reading System
- [5] *A research paper on*, Electronic Energy Meter with Instant Billing
- [6] Jawed Ahmed, M. Afshar Alam, Abdul Mobin, Shahla Tarannum⁴, *A research paper on*, A Soft Computing Approach for Obesity Assessment Computer Science, Jamia Hamdard, New Delhi