

AUTOMATIC POWER METER READING SYSTEM USING GSM NETWORK

D.Gopikrishna, G.Chandrashekar, Student, Department of Electronics and Communication Engineering Sreenidhi Institute of Science and Technology, Ghatkesar, Hyderabad, India.
Dr.D.Asha Devi, Professor, Department of Electronics and Communication Engineering Sreenidhi Institute of Science and Technology, Ghatkesar, Hyderabad, India.

Abstract—

The development of a GSM-based energy meter reading system and SMS load control are the primary goals of the project. Every month, the electricity department sends employees to read the meters, which is a costly and time-consuming job. A convenient and effective solution to this issue is provided by the proposed project. SMS can be used to obtain readings from consumers' energy meters for both the electricity department and the user. Using this project, the user of this system can also control the loads through SMS.

A digital energy meter that takes the reading from the energy meter and displays it on an LCD effectively interfaces with a microcontroller input. Using a SIM-loaded GSM modem, the energy meter reading is also sent via SMS to the control room. This GSM modem can also control the owner's electrical loads by receiving commands from their cell phone. It counts for necessary action with a standard digital energy meter that sends output pulses to the microcontroller. It can turn the loads ON or OFF upon receiving a command.

In addition, this project can be connected to a keypad and a nonvolatile memory IC like EEPROM so that the user can change their mobile number as needed.

Keywords-Power Meter, GSM, Microcontroller, LCD, IC, EEPROM.

I. Introduction:

The current method of manually reading energy meters for billing purposes is prone to human errors and lacks reliability. This traditional approach involves utility workers visiting each premise to record meter readings, leading to sluggish and laborious processes. Moreover, it opens doors for potential manipulation of readings through corrupt practices such as current reversal, partial earth fault conditions, meter bypassing, and magnetic interference. Additionally, in cases of non-payment, the electricity worker has to physically disconnect the power supply, further adding to the time and effort involved. To address these challenges, the implementation of an Automatic Meter Reading (AMR) system using the GSM network offers promising solutions. This advancement leverages the widespread proliferation of wireless communication, enabling the automatic collection of meter measurements and facilitating remote command transmission to the meters. Instead of relying on manual readings, this system connects to the energy meter through an RS-232 interface and transmits measurements via the GSM network to the utility company. By adopting digital energy meters, which employ high-frequency sampling through analog-to-digital converters, the system translates real-world waveforms into binary words for accurate and stable measurements. These digital meters exhibit improved accuracy over a broader current range and are resilient to fluctuations in temperature, voltage, and line frequency. The current scenario involving human operators manually visiting customers' homes for meter readings and bill production can be significantly enhanced through the integration of GSM-based Energy Meter Reading and billing applications. This innovative technology automates the collection of energy consumption data and its automatic transmission to a central database. Consequently, the invoicing process can be handled by a centralized server, reducing the effort required from operators and minimizing the risk of misplaced bills. Moreover, any issues or malfunctions in the data can be promptly analyzed and addressed.

II. Literature review:

Existing method:

The present system is like, a person from electricity department has to go to each and every house to take the readings from the digital meter and present these details to the billing department and after all their processing, they generate a bill and another person comes and gives the electricity bill to us and finally we have pay the bill.

Proposed method:

The proposed project work is centred on smart energy metres; the topic of smart energy metres is becoming more and more popular due to the variety of functions they provide. The idea used here is fairly novel; by utilising GSM technology, the available debit information from the pre-paid energy metrebe automatically sent to the concerned mobile phone.

III. Methodology

A) BlockDiagram

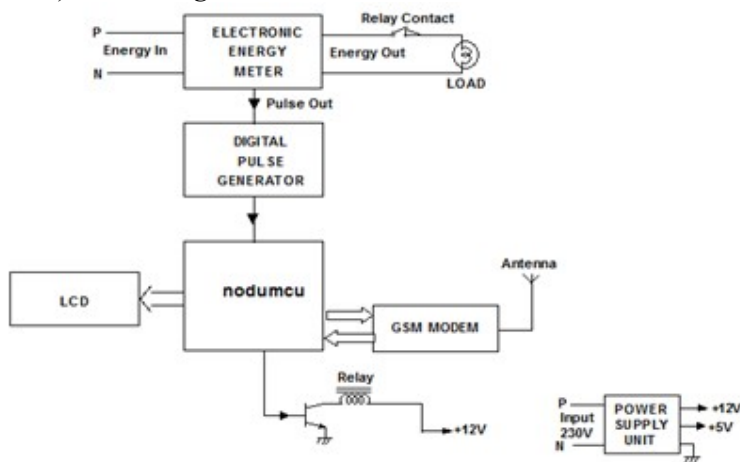


Fig 1. Block Diagram

B) Hardware Specifications

1. Microcontroller

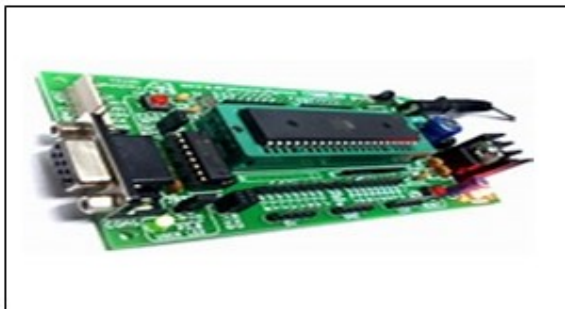


Fig 3.1 Microcontroller

2. LCD Display

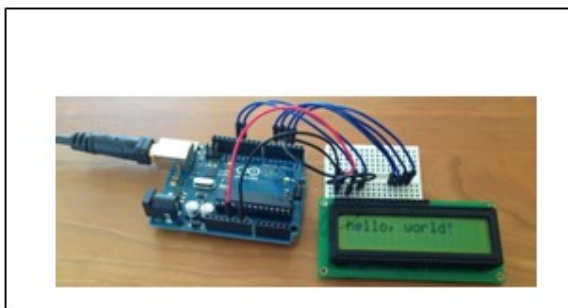


Fig 3.2 LCD Display

3. 7805 – Voltage Regulator



Fig 3.4 7805 – Voltage Regulator

4. Energy Meter



Fig 3.5 Energy Meter

6. GSM



Fig 3.6 GSM

7. Transformer



Fig 3.7 Transformer

IV Working

The process of execution:

1. Hardware Setup :

Microcontroller: Utilize a reasonable microcontroller board like Arduino or Raspberry Pi as the principal control unit of the framework.

Electronic Energy Meter: Interface the microcontroller with a computerized energy meter. The

output pulses from the energy meter ought to be proportional to the amount of energy used.

LCD Monitor: Associate a LCD module to the microcontroller for showing the energy meter perusing.

Modem GSM: Interface a GSM modem with a SIM card to the microcontroller for SMS correspondence.

Keypad and optional EEPROM: If you want to let the user change the registered mobile number, add a keypad and non-volatile memory like EEPROM.

2. Software Requirements :

A C-language program is loaded into the GSM Module, a kit is made, all soldering is done, and the project is ready to go. Therefore, when the program is dumped from the GSM Module, a System Ready message is sent to the registered mobile number.

3. Reading a Meter of Energy:

The digital energy meter's output pulses are constantly monitored by the microcontroller. Count the pulses and use a predetermined conversion factor to figure out how much energy is used. Display the calculated reading in real time on the LCD module.

4. Sending Meter Perusing through SMS:

Set up the microcontroller to periodically send the energy meter reading to the control room via SMS. Utilize the GSM modem to send a SMS containing the perusing to a predefined versatile number. In the SMS, include relevant information like the energy meter reading and the customer's identification.

5. Load Control through SMS:

Allow the user to use SMS commands to control electrical loads from afar.

A registered mobile number sends SMS commands to the GSM modem.

The necessary load control actions are carried out and the SMS commands processed by the microcontroller.

For instance, if the command is to turn off a particular load, the microcontroller turns on the appropriate relay or control mechanism.

6. Unpaid bills cause power outages:

Carry out a component to really look at the installment status or due date of the bill.

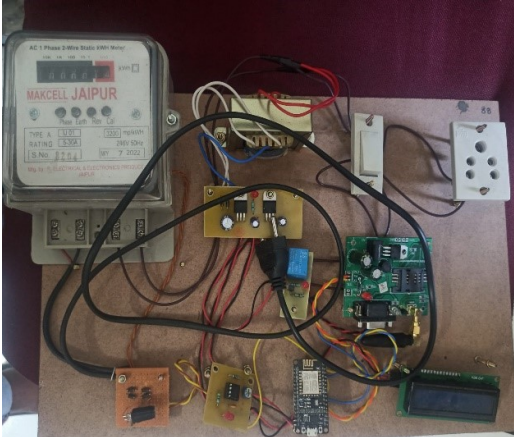
Integrate with a payment system or database or store the status or due date of the payment in the microcontroller's memory. Utilize the stored information or query the payment system to check the status of payments on a regular basis. In the event that the bill is not paid in the allotted time, the power supply will be cut off by activating the relay switch. By controlling the microcontroller's control pin, activate the relay switch. Send the customer a text message informing them that their power will be cut off because they haven't paid.

7. Reactivation of Bill Payment:

Update the payment status in the microcontroller or retrieve the updated status from the payment system or database when you receive notification or confirmation of bill payment via SMS or another method.

Deactivate the relay switch to restore power supply to the customer's electrical connection if the bill has been paid.

Send a SMS warning to the customer to illuminate them that the power has been re-established.



Hardware setup

VI Results



After successful setup

VII Advantages and Applications

ADVANTAGES

- 1.Reduced Time and Money: The project saves money on sending employees to collect readings because it eliminates the need for manual meter reading. Additionally, it reduces the amount of time and effort required for manual data entry and processing.
- 2.Efficiency and Convenience: SMS meter reading is simple and effective thanks to the system. Energy meter readings are easily accessible to customers and the electricity department without having to physically interact.
- 3.Automated Shutdown of Power: The inclusion of a power cutoff function and relay switch facilitates the payment of electricity bills. In the event that a bill stays neglected inside the predefined time period, the framework naturally removes the power supply, guaranteeing convenient installment.
- 4.Continuous Monitoring: Through the digital energy meter, the system permits real-time monitoring of energy use. Customers can monitor their energy use and take the necessary actions to effectively manage their electricity use.
- 5.System of Notification: An SMS notification system is included in the project to keep customers updated on their energy usage, meter readings, load control actions, and any power outages caused by nonpayment. This makes it easier for the electricity department and customers to communicate with each other and ensures openness.
- 6.Enhanced Precision: The project reduces the likelihood of human error in manual dataentry and processing by automating the meter reading procedure. This works on the precision of the recorded

APPLICATIONS

1. Residential Energy Management: The system can be installed in residential buildings to allow for load control, real-time meter readings, and energy consumption monitoring. Occupants can deal with their power utilization effectively and control their electrical loads from a distance, bringing about energy reserve funds and cost decrease.

2. Energy Monitoring for Industries and Businesses: The project can be used to control loads, track meter readings, and monitor energy use in commercial and industrial settings. It enables businesses to remotely manage electrical systems and equipment, identify areas for improvement, and optimize energy use.

3. Companies that provide utilities: This system can be used by electricity utilities to improve customer service, automate billing processes, and streamline meter reading procedures. Automated power cuts off for unpaid bills, lower costs associated with manual meter reading, and remote meter reading collection are all made possible by the system.

4. Providers of energy services: Energy specialist organizations can coordinate this framework to offer worth added administrations to their clients. They can offer customized load control options, real-time energy usage data, and efficient energy management. Energy service providers may be able to benefit from the system by offering targeted energy-saving solutions and increasing customer satisfaction.

5. Smart Homes and Smart Grids: The venture lines up with the idea of shrewd homes and brilliant matrices. Energy management systems can be integrated with the smart grid infrastructure as a whole, allowing for demand response, load balancing, and effective energy distribution.

VIII Conclusion

In conclusion, numerous advantages and applications are provided by the proposed project, which includes a GSM-based energy meter reading system, SMS load control, and power cutoff functionality. The system makes energy meter reading and load management simple and effective by making use of a microcontroller, digital energy meter, GSM modem, and optional components like EEPROM and keypad. By eliminating the need for manual meter reading, this project saves money and time, makes it easier and more efficient to access energy meter readings remotely via SMS, and makes it possible to remotely control electrical loads. By ensuring timely payment of electricity bills, the project's value is increased by the integration of a relay switch and power cutoff functionality.

The system can be used in smart grid systems, utility companies, energy service providers, and residential, commercial, and industrial settings. It supports energy conservation initiatives, reduces costs, enhances customer service, and contributes to efficient energy management. In general, the project provides a novel and practical answer to the problems associated with power management, load control, and meter reading. The electricity department and the consumer will benefit from improved efficiency and convenience as a result of its implementation, which can result in increased accuracy, automation, and transparency in energy consumption monitoring.

REFERENCES

- [1] Personal and mobile communication systems developed by: RAJPANDYA
- [2] Myke Predko's Customizing and Adjusting the 8051 Microcontroller by GERALD E. WILLIAMS
- [3] The IRJET diary, "Power Energy Meter utilizing IoT," vol.: 2020, pages: 1177–1182, by Y. Rajkumar, P. Anjali Rao, J. Ravichander, K. Sindhuja, and M. Sravya.
- [4] Small regulators' thoughts and highlights by: Performance issues in the current communication

environment:

- [5] Raj Kamal, S.N. Chandra Shekhar, N.S. Murti Sarma, and Krishna Samalla's "An examination," published by Dodo Books Indian Sea Ltd., a division of the OmniScriptum S.R.L. Distributing group, Researchers' Press, ISBN: 978-613-8-82581-4.
- [6] "A Smart Wireless Electronic Energy Meter Reading Using Embedded Technology," by Pallavi Vethekar, Kavita More, Shraddha Male, and Prof. V. K. Bhusari, in Ijera Vol.
- [7] "GSM Based Programmed Energy Meter Perusing Framework with Moment Charging" by Ashna.k and Sudhish N. George, IEEE (2013) 4, January 2014, Volume 3, Issue 1.
- [8] Gadgets in Advanced Form by Joseph J. Carr Monthly Magazine for Gadgets for You
- [9] S.P.V.SubbaRao, S.N.Chandrasekhar, D.VishnuVardhan "A MAC Protocol with CAC algorithm for Wireless Networks," International Journal of Engineering Research, Volume No. 3 Issue #: Second Featured Issue: 17-21 (on the web), 2347-5013 (print) ISSN: 2319-6890

s
i
g
n
e
d