

Monitoring of Energy Meter with Arduino Uno

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Abstract— The assignment of this task is to removed checking and control of the home Energy meter. This framework empower the Electricity Department to peruse the meter readings often without the individual visit each house. This can be achieving by the use of Microcontroller unit that reliably screens and records the Energy Meter readings in its ceaseless (non-unstable) memory position. This system in like manner uses a GSM modem for remote checking and control of Energy Meter. The Microcontroller based framework continually accounts the perusing and the live meter perusing can be sent to the Electricity division on request. The power division can likewise send the bill from side to side GSM message which will be show on the LCD show. This plan likewise can be utilized to remove the power give to the house .in the event of non-installment of power bills. A gave GSM modem with SIM card is important for every energy meter. The Microcontroller is modified by method for Embedded C language.

Keywords: GSM Modem, SIM Card, Embedded C Language, Energy Meter

I. INTRODUCTION

Smart electrical Energy meter innovation have been research and produced for around 10 years. An assortment of innovations have been created and used to quantify the electrical utilizations. For the charging, the clients will obtain the bill since the energy panel after they produced and gave utilizing the few techniques. The clients should hold up the bill of vitality utilizations for consistently to pay their vitality bill. A power meter or imperativeness meter is a device that gauges the proportion of electric essentialness completed to residence or business. The bill to the clients. There are two sorts of household normal Power Consumers meters single stage and three phases. There are two sorts of household normal Power customers meters single stage and three stages. The vitality utilization is estimated by every electrical administration utilizing kilowatt-hours meter with allude to kilowatt-hours (kWh).

At that point electronic meters was present with like capacity with the electro-mechanical, however it supplant from simple to advanced framework. With this framework clients can note down the voltage, control perusing unit, current and the time, date of the vitality utilization. This framework just gives some reward over the past meter perusing. After the electronic ones, the meter examining made with the Bluetooth based development which is the remote correspondence and moreover known as Automatic Meter Reading (AMR). This structure is remote and the PC could be used to record the power use of vitality meter. The examination meter will spare the database and bill will be created. The most recent innovation is utilizing a Global System for Mobile Communication (GSM) based framework. This framework changes the Bluetooth innovation and the

information sent utilizing Short Message Service (SMS) to the client and the vitality board.

A. Features

- 1) Provides user responsive remote energy meter monitor
- 2) Supports calculating of meter.
- 3) Can be controlled anywhere in the earth.
- 4) Non-volatile memory base energy-reading store.
- 5) Auto cut off characteristic.

The project provides the following learning's:

B. Energy meter operational.

- 1) Alteration of AC supply to DC supply.
- 2) Interfacing energy meter to Microcontroller.
- 3) LCD interfacing to Microcontroller.
- 4) GSM technology.
- 5) Embedded C programming.
- 6) PCB scheming.

II. PROPOSED WORK

A. Block Diagram:

- 1) Regulated Power Supply.
- 2) Microcontroller.
- 3) GSM Modem.
- 4) Electromagnetic Relay and Relay Driver.
- 5) Digital Energy Meter.
- 6) LCD Display with driver.
- 7) Buzzer with driver.
- 8) Crystal oscillator.
- 9) LED indicators

The necessary conclusion theory include the step by step processes that should mention in the continually order; the main working parts that should be enclosed in arrange for the conclusion of the project are as mentioned below:

- Assembly of the essential microcontroller kit.
- Creation of the power path for the microcontroller equipment.
- Taking the pulses out from the energy meter.
- Interfacing of the energy meter with microcontroller using opto-coupler (PC817).
- Learn of the basic GSM Module.
- Creation of the MAX232 circuit for GSM Modem. Also here in sim300 max232 circuit is provided inbuilt.
- Interfacing of GSM Modem with microcontroller via MAX232 circuit.
- Interfacing of the load.
- Codding/Programming

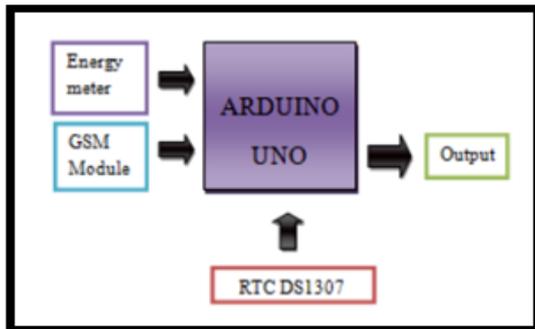


Fig. 1: Block Diagram

This paper include of following squares Arduino UNO AVR coordinator is place for all plotting this dedicated energy meter. Energy meter is another significant one in this framework which is utilized for live perusing of electrical vitality consumption and which is interface with controller to speak with server and which works agreeing server directions.

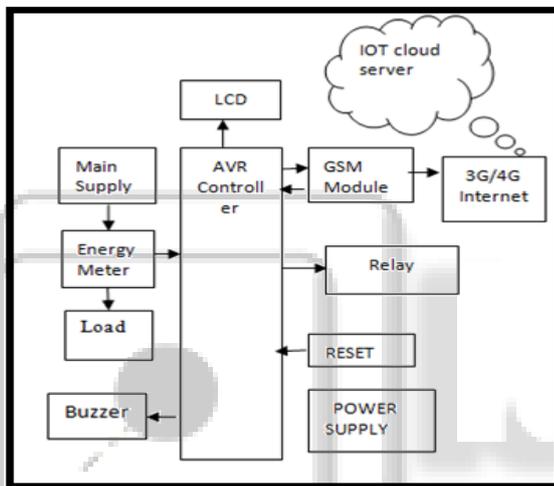


Fig. 2: Block diagram of Smart Energy Meter

The above chart spoke to the square graph of our framework. It comprise of sensor for notice current setting off to the heap with the goal that we can figure the absolute power request by the heap which are sense and further prepared by microcontroller pack. Microcontroller drives LCD show which shows the behavior. Further exchanging segment and hand-off circuits are accommodated driving burdens if important. At the point when the readings from the sensor stray as for the info esteems from the controller. The microchip conveys a sign to the effecters to change the interfering with to the info esteems.

III. FUNCTIONS OF COMPONENTS

A. Arduino Uno:

It is an open asset PC equipment and programming and programming organization venture and client gathering of individuals that drawing and production single-board microcontrollers and microcontroller unit. Equipment assets arduino circuit and programming assets where we can type our program or direction the arduino. So basically it has different sides like programing to control the undertaking and equipment pay arduino machine.



Fig. 3: Arduino UNO

It is gadget for deal with the task or give the preparation to the circuit or venture. Arduino UNO is anything but difficult to utilize and it is cost skilled and just realistic in the commercial center. The straightforward c programming language is utilized and easy to apply the program like promptly interface the arduino to PC utilizing connector link and apply the program.

B. Energy Meter:

An power or electric meter is a device that transactions the quantity of electrical energy consumed by a housing, business or an electrically motorized device



Fig. 4: Energy Meter

Electric meters are normally in calibrate in bill units, the majority one being the kilowatt hour. It dealings electrical units which was used in an electrical appliance. Electrical energy meter is nothing but the device which is used to calculate the electrical units. SI unit of unit is Kilowatt hour [Kwh].

72 cycles = 1 unit = 1 Kwh
1000 watts = 1 kilowatt
For example, 1000 watts in one day
Therefore $1000 \times 24 = 24000 / 1000$
 $= 24 \text{ Kwh} = 24 \text{ units}$

C. GSM Module:

GSM is a portable correspondence modem it represent Global System for Mobile correspondence. A GSM modem is a specific classification of modem which acknowledges a SIM card and work simply like a cell phone. From the versatile administrator perspective a GSM modem looks simply like a cell phones. At the point when a GSM modem is associated with a PC this enables the PC to utilize the GSM modem to compare over versatile system.



Fig. 5: GSM modem

While this GSM modems are for the most part normally used to supply versatile web, web accessibility a few of them can similarly be utilize for sending and accepting SMS. It is utilized for transmitting versatile voice and information administration work at the 850 MHz, 900 MHz, 1800 MHz and 1900 MHz recurrence groups.

D. LCD:

The lion's share all-inclusive LCD's associated with the microcontroller are 16 x 2 and 20 x 2. Along these lines 16 character for each line by 2 line and 20 character for every line by 2 line separately.



Fig. 6: LCD

An LCD or Liquid Crystal Display, is a kind of screen that is used in a lot of computers, TV's, digital cameras, tablets & cell phones.

E. Relay:

It is electrically operate switch. Relay are used where it is a necessary to manage a circuit by a low power signal or where a quantity of circuit has to be control by one signal.

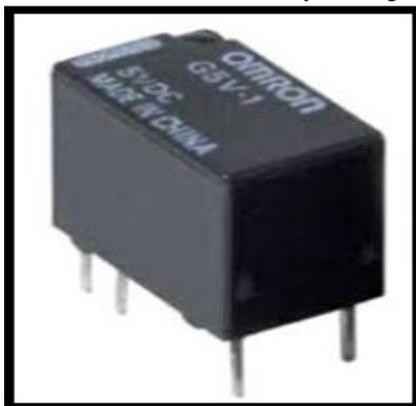


Fig. 7: Relay

Relays with calibrate in use character & sometimes numerous operating points are used to protect electrical circuits from overload or faults. It used to shutting off power supply when due limit is in excess of.

F. Power Supply:

Power supply is a path it convert unregulated DC into constant DC with the help of rectifier. It converts AC supply into DC.

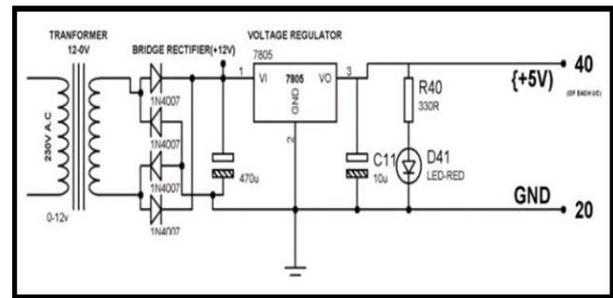


Fig. 8: Power Supply

Its principle is to supply a steady voltage to a circuit or machine that must be operate within certain power supply restrictions. The output from the regulated power supply maybe alternating or unidirectional, but is about for all time DC.

IV. WORKING

The advanced Energy meter accounts the amount of intensity use. It functions on the establishment of flickers of the LEDs arranged inside the meter. An optocoupler, which comprises of an IR diode and a photograph transistor, is use to detect the quantity of flicker by connecting it to a LED. Each example the LED squints, current streams during the IR diode inside the opto coupler. It at that point discharges infrared light with respect to the current. This released light is occasion on the base of the photograph transistor, cause it to switch-ON and lead in a way similar to a standard bipolar transistor. The beats from the photo transistor are every hour. In the framework actualize, in any case, the microcontroller is modified to regard 320 flickers as one unit for each 6 minutes (1 hour=60 minutes/10). It checkup the use for 10 such cycles in a single hour and after that resets after every hour. LCD is associated with the smaller scale controller to demonstrate the present cycle of microcontroller. Toward the finish of each cycle, the microcontroller ascertains the charging sum utilizing standard nearby rates and sends both the complete utilization and the charging amount to the GSM module through a RS232 link. GSM module is connected to the microcontroller by means of MAX 232 IC which changes over the RS232 levels into TTL rationale levels and the other way around. The GSM module is modified utilizing AT directions to remotely transmit the data set up, to the client in the state of a SMS.

V. ADVANTAGES & DISADVANTAGES

A. Advantages

- 1) Positive feedback.
- 2) Fewer time consuming.
- 3) Automation is achieved.
- 4) A suitable and capable method to keep away from the difficulty of electricity division transfer employees for taking meter reading each month.
- 5) No human error in taking the meter readings.
- 6) Free from outside interference, incoming the private places.
- 7) Inexpensive and easy to use.

B. Disadvantages

- 1) Network difficulty.

- 2) Reduce the figure of employees.

C. Applications

- 1) Electricity department.
- 2) Household Energy meter monitor.
- 3) Railway electrical systems.
- 4) Industrial Energy remote monitor.
- 5) Remote controlling systems.

D. Software's used

- 1) PIC-C compiler for Embedded C programming.
- 2) PIC kit 2 programmer for discarding code into Micro controller.
- 3) Express SCH for Circuit plan.
- 4) Proteus for hardware simulation.

VI. CONCLUSION

The considered energy screen framework has perceived to effectively get exact estimations for vitality meter. An extremely arranged methodology has been utilized for the general structure of the venture, in which power utilization components were to be limited. This framework will convey clearness between supplier and shopper. The IOT based vitality meter for ascertaining expended control and showed in LCD has been accomplish. The committed power is send through sequential correspondence to the virtual terminal built in PROTEUS. This venture can subsequently illuminate association about dawdled and avoidable outings, accounting and charging since it gives an exact bookkeeping of units driven since of the counteractive action of unfortunate behavior.

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