SMART ENERGY METER USING GSM MODULE

Prof. Dr.R.V.Maheswari[1], C.Mariappan[2], P.Pon Ganesh[3], R.Raja Deepak[4], J.Ravi Shankar[5]

[1]Professor[2,3,4] Student,
Electrical and Electronics Engineering Dept.,
National Engineering College, Kovilpatti.
Anna University

Abstract- This project focuses on developing a wise energy meter that eases the work of a personality's. within the period, this metering technology was absolutely analog.for the future technological developments these days it's become digital however not absolutely automatic it too required a large human personnel. The above-mentioned 2 techniques have a great deal of drawbacks like inaccurate and required a great deal of your time for the repair, which provides faulty unitreadings,the second provides readings digitally with some accuracy however can not be sent to the asking purpose directly . It required a great deal of; human personnel frequently to require readings. The GSM technology introduced here eliminates all the preceding drawbacks by absolutely automating the energy meter .i.e. the meter readings ar taken and perceived mechanically and perceived units ar frequently sent to the asking purpose victimisation the GSM and corresponding bills ar calculated and sent to the user at the right time. It reduces the time, it reduces the human personnel, can offer correct readings. this method replaces ancient energy meter reading strategies and permits remote access of existing energy meters by the energy supplier. they'll monitor the readings frequently while not visiting the person's house.Thismeter conjointly sends data to the customers and also the Electricity consumed and also the charges for energy consumed. in order that the customers are often awake to what proportion energy they need consumed and also the correct value of charges for the energy consumed. the mixing of the Arduino and GSM Short Message Service (SMS) provides the meter reading system with some automatic functions that ar predefined. The projected energy meter system will incorporate with embedded controller and GSM electronic equipment to transmit the info like consumed energy in kWh, generated bill, security services (line Cut/On) over GSM mobile network like information are often then fed and integrated into existing energy management systems situated at power firms or organizations to supply the services among the shoppers while not man-power.

***Keywords:-*Arduino,GSM module,smart energy meter,LCD display.**

I.INTRODUCTION

Smart voltage meter technologies are investigated and developed updated only for rougly within ten years. varied **t**echnologies are developed and used to calculate the electrical consumptions. For the billing process, the users can get the bill from the electricity board when they generated and provided using the many ways. At the instant, most of the residences in Asian country for example use the ancient electro - mechanical watt meters and the readings square measure not machine-driven. The users can have to wait the bill of energy consumptions for each month to pay their energy bill. Normally, at end of the month, a workers from the meter board asking can visit each house to browse the meter reading and at identical time, provide the bill to the users. A electricity meter or energy meter could be a device that measures the number of electrical energy consumed by residence or business. There square measure 2 kinds of Domestic normal Power customers meters single part and 3 phases. The energy consumption is measured by all electrical services By kilowatt-hours meter with discuss with kilowatt-hours (kWh)

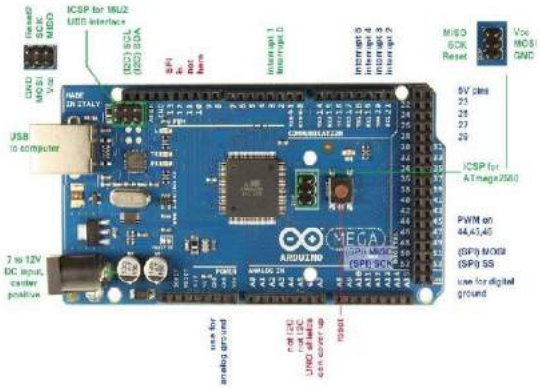
Then electronic meters was introduced with similar operate with the electro-mechanical, however it replaces from analog to digital system. With this technique users will note down the voltage, power reading unit, current and therefore the time, date of the energy consumption. this technique simply provides some advantage over the previous meter reading. when the electronic ones, the meter reading developed with the Bluetooth based mostly technology that is the wireless communication and conjointly noted as Automatic Meter Reading (AMR). this technique is wireless and therefore the personal pc may be used to record the power consumption of energy meter. The reading meter are saved to the info and bill can be generated. The latest technology is mistreatment a international System

II.DESIGN SPECIFICATION

A. ARDUINO

The Arduino MEGA 2560 is an open-source microcontroller board based on the Microchip ATmega328P microcontroller. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 54 Digital pins, 16 Analog pins, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 5 and 20volts.

Arduino UNO is used for RF transmitter and receiver pair operations.UNO has 14 digital pins and
6 analog pins and programmable with

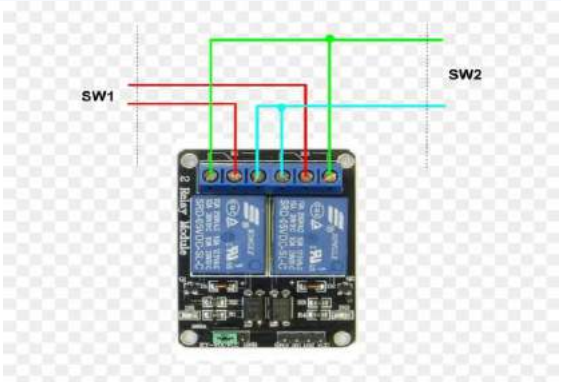


IDE(Integrated Development Environment) via B type USB cable.

Fig.2. Arduino MEGA

B.RELAY

A relay is a electrically operated switch. Most of the relay circuits use a electromagnet magnet to mechanical switch, another principles are often conjointly used, like solid-state relays. This relay circuit is operated over a electric switch that permits shift on or off a circuit using the voltage or current that is above a microcontroller handling capability. The functions of a relay is to safeguard every circuit from the opposite. There are 3 connections for every channel within the module and these are COM and no connection(NC).



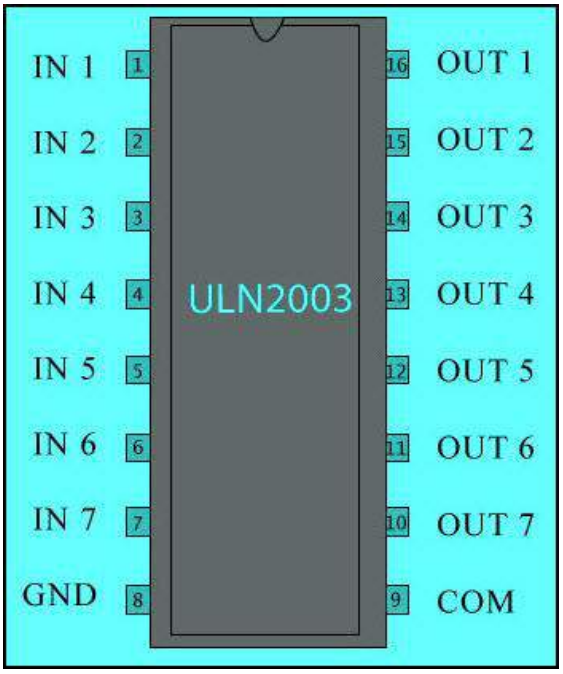
C.POWER SUPPLY UNIT

In electronic device that provides electrical energy to the electrical load. As all recognize any invention of the most recent technology can not be activated without the supply of power. All the electronic elements ranging from diode to Intel IC's only work with a DC provide typically starting from ±5v to ±12v. we have a tendency to area unit utilizing for constant, the most cost effective and usually offered energy supply of 230v-50Hz and stepping down, rectifying, filtering, and control the voltage to convert it into appropriate DC voltage. In our project, the specified voltage is +5V & +6V to run the Energy meter IC, Microcontroller, and show unit.

D.ARDUINO GSM SHEILD

The GPRS shield depends on module SIM-900 from SIMCOM additionally it's compatible with Arduino. The special electronic equipment of 3V3/5V TTL interfacing circuit is designed, that permits to directly interfacing to the microcontrollers of 5v and 3V3 Microcontrollers i.e. ARM, ARM Cortex XX. At the terribly 1st stage electronic equipment is in Auto-baud mode. This GSM/GPRS TTL electronic equipment has an enclosed TCP/IP stack to modify you to attach with the net via GPRS. it's appropriate for
SMS likewise as knowledge transfer application the interface. The GPRS defend provides you the simplest way to speak victimisation the

GSM mobile phone network. The GSM shield permits to achieving SMS, MMS, likewise as GPRS, and Audio via UART by sending AT commands..The shield additionally has the twelve GPIOs, two PWMs andd an ADC of the SIM900 module (They are all 2V8 logic) present onboard. This shield connects Arduino to the wireless network using the GPRS



E.DARLINGTON TRANSISTOR

The ULN2003A is a array of seven NPN Darlington transistors capable of 500mA, 50V output. It options common-cathode flyback diodes for switch inductive masses. It will are available in PDIP, SOIC, SOP or TSSOP packaging. The ULN2003 is one amongst the foremost common motor driver ICs that homes a array of seven Darlington semiconductor unit pairs, every capable of driving load up to 500mA and 50V. Basically, a Darlington combine could be a combine of transistors, wherever the second amplifies the output current of the primary transistor.

F.4N35 OUTOCOUPLER

The 4N35 is a optocoupler for general purpose application. It consists of Ga chemical compound infrared Light Emitting Diode and a element NPN phototransistor. What a optocoupler did is to interrupt the affiliation between signal supply and signal receiver, therefore on stop electrical interference. In alternative words, it's wont to forestall interference from external electrical signals. 4N35 may be employed in Av conversion audio circuits. generally it's wide employed in electrical isolation for a general optocoupler.See the interior structure of the 4N35 below. Pin one and two are connected to a infrared light-emitting diode. once the light-emitting diode is galvanized, it's going to emit infrared rays. to safeguard the light-emitting diode from burning, sometimes a resistance (about 1K) is connected to pin 1. Then the NPN phototransistor is power on once receiving the rays. this will be done to manage the load connected to the phototransistor. Even once the load tangency happens, it will not have an effect on the control panel, so realizing sensible electrical isolation

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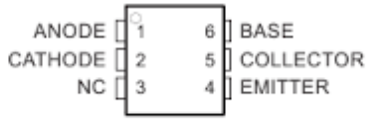
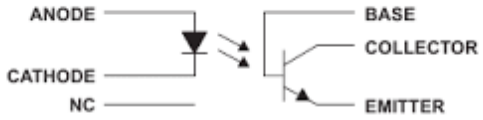


NC – No internal connection



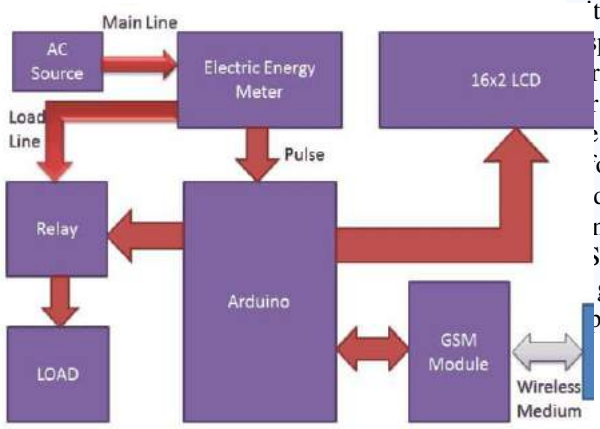
G.ENERGY METER

The meter that's used for measuring of the energy utilises by the electrical load is known as a result of the energy meter. The energy is that the whole power consumed and utilized by the load at a particular interval of some time. it's used in domestic and industrial AC circuit for measuring of the ability consumption. The meter may be a smaller quantity high-priced and a lot of correct.The energy meter has the Al disc whose rotation determines the ability consumption of the load. The disc is placed between the air gap of the series and shunt magnet. The shunt magnet has the pressure coil, and additionally the series magnet has this coil .The pressure coil creates the field of force as a result of the provision voltage, and additionally this coil produces it as a result of this.The field induces by the voltage coil is insulation by 90° on the force field of force of this coil as a result of that eddy current evoked at intervals the disc. The interaction of the eddy current and additionally the sphere of force causes force., that exerts a force on the disc. Thus, the disc starts rotating. The force on the disc is proportional to the current and voltage of the coil. The magnet controls Their rotation. The magnet opposes the movement of the disc and equalises it on the ability consumption. The cyclometer counts the rotation of the disc

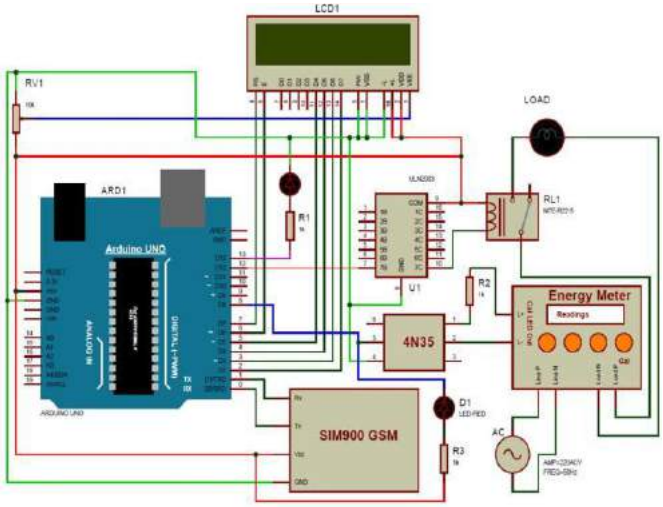
H.LIQUID CRYSTAL DISPLAY(LCD)

A liquid-crystal show (LCD) may be a flat panel show or different electronically modulated device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals don't emit lightweight directly,
[1] instead employing a backlight or reflector to supply pictures in color or monochrome.
[2] LCDs is out there to show capricious pictures (as in a very general laptop display) or mounted pictures with low data content, which might be displayed or hidden, like predetermined words, digits, and seven-segment displays, as in a very digital clock. They use a similar basic technology, except that capricious pictures is made of a matrix of tiny pixels, whereas different displays have larger componentsLCDs will either be commonly on (positive) or off (negative), betting on the polarizer arrangement. for instance, a personality positive digital display with a backlight can have black inscription on a background that's the colour of the backlight, and a personality negative digital display can have a black background with the letters being of a similar color because the backlight.

BLOCK DIAGRAM



CIRCUIT DIAGRAM



The main part of this project is Arduino Uno. It takes additional power consumption for the operation because of the additional and sensitive devices is connected with it. As per the circuit, the Arduino board takes the affiliation of current and voltage measuring pins through the present sensing element (ACS712) and voltage sensing element circuit. the present sensing element output pin is connected with Arduino board pin A0. The voltage sensing element output (DC five V) is connected with the Arduino board pin A1. Here, the voltage sensing element circuit has been designed as a resistor circuit with a adjustable electrical device to line the voltage vary of 5V. This setup will be made sort of a rectifier circuit employing a Zener diode. The input of the rectifier circuit is connected with a 230 V AC provide. For the present sensing element, a separate 5V DC provide should lean to the pin of Vcc. This voltage will be obtained from alternative bridge rectifier circuits. during this rectifier circuit, regulated 5V (IC 7805) is employed. The input of the present sensing element is directly connected with the AC provide unit. The output pin of the present sensing element is connected ith the load. during this project, a 16x2 show|LCD|digital splay|alphanumeric display} is employed to display the rameters like AC voltage, AC, and Energy consumption load utilization. the provision of 5V is given to liquid crystal display from the Arduino board. the o transferring pins square measure connected with the duino board as per the circuit. GSM module is nnected with the Arduino board pins z0(Rx) and 1(Tx). SM may be a needed provide unit. So, the provision will given to that through laptop computer or any parate supply unit.

RESULT

There is 2 components that was combined to build the system. The 2 components that was combined were circuit for interfacing energy meter to arduino and interface from GSM module to Arduino. Circuit operation was in sensible condition with the proper sequence of program that uploaded into microcontroller.For light-weight to voltage sensing element half,Arduino with microcontroller ATmega238 was used to count the input, calculate the bill and store it into EEPROM. Real clock was wont set the reset counter monthly. LED indicator was blinking once input from sensing element detected. the worth of unit and bill worth was show at the {lcd|liquid crystal show|LCD|digital display|alphanumeric display} display as set within the microcontroller. At the program, the quantity of movable user was set to receive a message once limit reach. In GSM network, the network set up SIM card was used to transmit message to movable. to mix this 2 half system, the GSM module American state and Rx was connected to pin two and three severally to Arduino whereas RTC used analog pin A4 and A5 at Arduino for CLOCK and RS. The different parts like LCD, LED and light-weight to

voltage sensing element were connected to digital port four to thirteen To verify the accuracy of the system, I was examined underneath numerous load conditions and results obtained were compared with the readings taken on the traditional meter underneath same loading and for identical period.Some of the observations area unit tabulated in following table to point out the comparison between the readings of standard the traditional|the standard} system and the projected system it is clearly finished that the projected system produces results almost like that of conventional meters. within the tabulated results, the most important deviation from the quality typical energy meter reading

CONCLUSION

The advancement in the power distribution is a non-stop process and new technology is alw progress. In this project, an Arduino and a GSM-based smart energy meter have been proposed. The Units are purchased by using GSM technology. Power measurement is done for resistive loads using the Arduino environment. The result of the given load is shown in the simulation and hardware parts. Arduino-based Power Measurement is an advanced method of determining power. The advantages of Arduino over other software's are it simplifies the amount of hardware and software development required to get a system running. In this also measure the energy consumption in real value and store its display with the help of LCD. Also, the charges are clearly shown on the consumer mobile.

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