

DESIGN OF INTELLIGENT WIRELESS POWER PARAMETER DETECTION

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Electronics and Instrumentation Engineering

By

JOHN WILLIAM.M (37180010)

RIYAZ AHAMED.L (37180015)



**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

**Accredited with Grade “A” by NAAC | 12B status by UGC | Approved by AICTE
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119**

APRIL – 2021



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with “A” grade by NAAC | 12B status by UGC | Approved by AICTE
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600119.



www.sathyabama.ac.in

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **JOHN WILLIAM.M (37180010)** and **RIYAZ AHAMED.L (37180015)** who carried out the project entitled **DESIGN OF INTELLIGENT WIRELESS POWER PARAMETER DETECTION** under my supervision from November 2020 to April 2021.

Internal Guide
(Ms.V.AMALA RANI,M.E,(Ph.D))

Head of the Department
(Dr. S. LALITHAKUMARI, M.E, Ph.D)

Submitted for Viva voce Examination held on 19-04-2021

Internal Examiner

External Examiner

DECLARATION

We **JOHN WILLIAM.M, RIYAZ AHAMED.L** hereby declare that the Project Report entitled **“DESIGN OF INTELLIGENT WIRELESS POWER PARAMETER DETECTION”** done by us under the guidance of **Ms.V. AMALA RANI, M.E, (Ph.D)** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering in Electronics and Instrumentation engineering.

DATE:19-04-2021

PLACE: CHENNAI

John William.M(37180010)
Riyaz Ahamed.L(37180015)

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

We are pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey our thanks to **Dr. N. M. NANDHITHA, M.E., Ph.D.**, Dean School of Electrical and Electronics and **Dr. S. LALITHAKUMARI, M.E., Ph.D.**, Head of the Department of Electronics and Instrumentation Engineering for providing me necessary support and details at the right time during the progressive reviews.

We would like to express my sincere and deep sense of gratitude to my Project Guide **Ms.V.AMALA RANI,M.E,(Ph.D)** for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work.

We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of Electronics and Instrumentation Engineering who were helpful in many ways for the completion of the project.

ABSTRACT

Electricity burglaries are growing every year across national as well as manufacturing domains which affect the monetary status of the republic. Numerous wireless communiqué systems are accessible to detect the power theft, but absences the essential organization needed to hire them. The project's aim is to style a system to watch the facility consumed by load and to detect and eliminate the facility theft in transmission lines and energy meters. This work is moreover attentive on connecting the theft evidence to Electricity Board (EB) through ZIGBEE. As a web of devices is linked like sensors it has the ability to exchange real time info through wireless network. In this project ARDUINO ATMEGA328P is utilized to detect power theft and send command to zigbee module which sends the theft information message to EB. The employment of this technique will help save great deal of electricity. And This paper represents the advantage, benefits and efficiency of modern technology over traditional method. This paper gives us a thought about the system known power theft detection on power cable . In earlier days across INDIA we were unaware of many problems which come across. Due to poverty the people used illegal method which can risk for life. So during this system whenever an individual tries to some illegal action on power lines it can immediately detected by the distributor. This is helping the distributor to stay track on supplied resource which is definitely help both distributor and consumer. This system will effectively help in reducing charges of electricity units. The main objective of the system is to style the system to avoid the issues for the user from theft regardless of the used of electricity thanks to theft using ZIGBEE technology

TABLE OF CONTENT

CHAPTER NO	TITLE	PAGE NO
	ABSTRACT	V
	LIST OF FIGURES	Vii
	LIST OF ABBREVIATION	Viii
1	INTRODUCTION	1
	1.1 GENERAL	1
	1.2 EXISTING SYSTEM	1
	1.3 DISADVANTAGES	2
2	LITERATURE SURVEY	3
3	AIM AND SCOPE	6
	3.1 EXISTING SYSTEM	6
	3.1.1 DISADVANTAGE	6
	3.2 PROPOSED SYSTEM	6
	3.2.1 ADVANTAGES	6
	3.2.2 PROPOSED SYSTEM BLOCK DIAGRAM	7
	3.3 BLOCK DIAGRAM DESCRIPTION	7
	3.4 PROPOSED SYSTEM CIRCUIT DIAGRAM	10
4	EXPERIMENTAL OR MATERIALS AND METHODS;	11
	ALGORITHM USED	
	4.1 METHODOLOGY	11
	4.2 HARDWARE AND SOFTWARE COMPONENTS	11
	4.3 ARDUINO OVERVIEW	11
	4.4 EMBEDDED SOFTWARE	12
	4.5 HARDWARE DESCRIPTION	12
	4.5.1 CURRENT TRANSFORMER	12
	4.5.1.1 FEATURES	13
	4.5.1.2 APPLICATION	13
	4.5.2 ZIGBEE MODEM	15
	4.5.2.1 ZIGBEE PHYSICAL LAYER	16
	4.5.2.2 ZIGBEE NETWORKS	16

	4.5.3 ARDUINO ATmega328P	19
	4.5.3.1 SUMMARY	21
	4.5.3.2 POWER, MEMORY, I/P & O/P	22
	4.5.4 LCD DISPLAY	26
	4.5.4.1 TYPES OF LCD	27
	4.5.4.2 PHYSICAL DATA	27
	4.5.5 INTERFACE WITH ARDUINO	29
	4.5.6 RELAY	32
	4.5.6.1 TYPES OF RELAY	32
	4.5.7 LED	32
	4.5.8 POWER SUPPLY	33
	4.6 SOFTWARE DESCRIPTION	35
5	RESULTS AND DISCUSSION	36
6	CONCLUSION	41

LIST OF FIGURES

FIGURE	TITLE	PAGE NUMBER
3.1	PROPOSED SYSTEM DIAGRAM	7
3.2	PROPOSED SYSTEM CIRCUIT DIAGRAM	10
4.1	CT CONNECTION	14
4.2	ZIGBEE APPLICATION	19
4.3	ATMEGA328P PINOUT	21
4.4	LCD DISPLAY	27
4.5	EXTERNAL DIMENSIONS OF LCD	28
4.6	BLOCK DIAGRAM OF LCD	28
4.7	ARDUINO INTERFACE WITH LCD	30
4.8	INTERFACE CABLES	30
4.9	RELAY DIAGRAM	32
4.10	LED DIAGRAM	33
4.11	BLOCK DIAGRAM OF POWER SUPPLY	34
4.12	LINEAR POWER SUPPLY	35
5.1	NO POWER IS USED	38
5.2	40W BULB IS SWITCHED ON	38
5.3	40+60W BULB IS SWITCHED ON	39
5.4	40+60+100W BULB IS SWITCHED ON	39
5.5	EXCEEDS 250W OF POWER	40

LIST OF ABBREVIATIONS

- 1 EB-Electric Board
- 2 LCD-Liquid Crystal Display
- 3 CT-Current Transformer
- 4 VT-Voltage Transformer
- 5 MAC-Wireless Medium Access Control
- 6 ZC-ZigBee coordinator
- 7 ZR-ZigBee Router
- 8 ZED-ZigBee End Device
- 9 LED-Light Emitting Diode
- 10 PAN-Personal Area Network

CHAPTER 1

INTRODUCTION

1.1 GENERAL

These days, social orders are considerably more snared in to power on account of the eradication of petroleum derivatives and progressive movements to electric versatility. Power misfortunes happen normally during the entire activity of the electrical organization lattice, however the huge measure of misfortunes is brought about by power burglary primarily inside the influence circulation organization. Identification of force burglary is a significant issue overall these days in order to safeguard the dependability and subsequently the more productive activity of the power conveyance power lattices. All things considered, power burglary rates are little in industrialized nations, in total terms they cause a generous measure of power that is not bill. Specialized misfortunes are an inalienable outcome of the activity in any power appropriation arrange and emerge on the grounds that the influence courses through gear like links, overhead lines and transformers. Specialized misfortunes likewise are related with low influence quality event on account of the voltage varieties, the recurrence changes additionally on the grounds that the influence vacillations because of the little time span request occasions, the while period request occasions or the occasional influence varieties for the most part. Embedded frameworks are every now and again utilized in home, office, plant, additionally in thruway vehicle checking and picture identification. This framework is fundamentally for tracking down the current robbery in businesses. We utilized our insight into instrumentation to plan this task.

1.2 EXISTING SYSTEM

A particular range of power to be transmitted is decided based upon production of industry. This statement is given by Electricity Board (EB). Sometimes there may occur current theft by connecting extra load. In existing system they use a buzzer to alert the over usage of power to the authority only within the industry.

1.3 DISADVANTAGE

- Bugler alarm or buzzer is used which is outdated, when compare to wireless technology.
- With this system only the authority of the industry will alerted, but not the authority in Electricity Board (EB).
- Lack of updating the power used in industry to Electricity Board (EB)

CHAPTER 2

LITERATURE SURVEY

2.1 Electric power theft detection and location tracking using iot”:

Ajay Mahato, Abhishek Nanda, Ajay Kumar Pal, Chandan Kumar Singh

2.1.2 concept:

The proposed system claims to sense power burglary in real time, along with location of theft. The system will have an online database which store all the data related to the distribution system along with the time and date. This statistics include power transmitted, voltage spent at a pole and the serial no of the electric pole. The voltage worth will be planned against time. The pole number gives us with the position of the stealing of power.

2.1.3 drawbacks:

Continuous monitoring of power used is not available.If current theft happens continuous monitoring help to find when theft happened.

2.2 Smart Power Theft Detection System:

Nitin K Mucheli; Umakanta Nanda; D Nayak; P K Rout; S K Swain; S K Das; S M Biswal

2.2.1 concept:

Force robbery is typically done by two strategies that is bypassing or snaring. So to spot it, a framework is arranged in which the homegrown inventory of flow is done in a roundabout way from the electric post to a halfway merchant box and afterward to the different houses. The current is estimated infrequently in the provider box and is presented on the worker information base for every family utilizing GSM/GPRS module. Additionally, for each house electric meter is planned which can quantify the estimation of the flow and post something similar to the worker information base occasionally utilizing GSM/GPRS module. At the hour of the

establishment of the electric meter the subtleties of the clients are put away in the inventory through an easy to use versatile application including the location, scope, longitude utilizing convenient GPS and the preview of the client's home/territory. Upon powerful correlation between the flow esteems from wholesaler box and electric meter in the worker in the event that we get an insignificant contrast between the flows, the burglary is identified.

2.2.2 drawbacks:

Theft alert system and continuous monitoring of power used is not exist in the system.

2.3 Proposed An Intelligent System for Electricity Theft Detector at Smart City Scenarios:

Syifaul Fuada

2.3.1 concept:

The framework proposed in this paper is set up with keen sensors to perform recognizing of misfortunes because of one or the other specialized or non-specialized, and to finish understanding that such misfortunes are brought about by power burglary. Thereafter, a representative may represent further examination by going to the crime location. Additionally, this framework is Upheld by smart processing frameworks. Framework establishment is acted before all else, for example, adjusting specialized misfortunes. Thusly, the official can begin planning the misfortunes brought about by specialized elements and those planted in inserted frameworks through registering. On the off chance that the misfortunes recognized have more prominent worth than the planned misfortunes, power burglary might be positive. Associations from SMP to JTR ought to likewise be taken into concern, that every association should be adjusted (for example $T-N = R-N = S-N$ upwards of 10 clients). Albeit in various limits (450, 900, 1300) planning should in any case be possible if any current oddities at a specific stage happens, such in, R/S/T. By then the official can overview the territory where the showed irregularities are found to check if power robbery truly occurs.

2.3.2 drawbacks:

This system requires physical contact with target, very slow in response, contact bounce, it has distance limitations.

2.4 Power Monitoring and Theft Detection System using IoT:

R.Meenal, Kevin M Kuruvilla, Adrin Denny, Rejin V Jose, Renoy Roy

2.4.1 Concept:

The most well-known issue in our nation is electrical force burglary. Populace in India is high and the electrical burglary is likewise expanding step by step. Consistently, the nation is confronting number of homegrown power robberies and force burglaries in mechanical inventory, which brings about loss of disseminated capacity to the provider. As a result of force robbery, the nation is dealing with ceaseless issues like force cut both in metropolitan and rustic areas. It is assessed that India's force area misfortune is around \$16.2b consistently because of burglary alone. This venture assists with limiting and keep away from issues as of now looked by the entire country. The investigations on power robbery recognition are attempted by different specialists. Prepaid power charging meter is proposed by certain scientists to screen family electrical machines . A microcontroller based charging framework for single-stage meters of dispersed customers is proposed . There are various ways utilizing which power robbery should be possible, so it is hard to follow how a burglary has happened. Our proposed project is a power burglary recognizing framework which is utilized to distinguish the robbery naturally at whatever point either the transmission line or the meter is skirted. In this strategy a current transformer is utilized to detect the aggregate sum of current devoured by the heap. In the event that any tapping has done in the transmission lines or extra burden is presented, the sensor draws more current. This makes the ADC esteems builds the predetermined worth and recognizes the robbery and send orders through GSM Module (SIM900a) to EB.

2.4.2 drawback:

Continuous monitoring of power used is not available in this module.

CHAPTER 3

AIM AND SCOPE

The main objective of the project is to propose a system, which is used to find the current theft happening in industries when an extra load is connected and so by using ZIGBEE wireless technology user (authority) is alerted.

3.1 Existing system

A particular range of power to be transmitted is decided based upon production of industry. This statement is given by Electricity Board (EB). Sometimes there may occur current theft by connecting extra load. In existing system they use a buzzer to alert the over usage of power to the authority only within the industry

3.1.1 Disadvantage

- Bugler alarm or buzzer is used which is outdated, when compare to wireless technology.
- With this system only the authority of the industry will alerted, but not the authority in Electricity Board (EB).
- Lack of updating the power used in industry to Electricity Board (EB)

3.2 Proposed system

To monitor the power consumed by load and to detect and eliminate the power theft occurs in transmission lines and energy meter by addition of extra load. The authority of Electricity Board is intimated .Situation can be conveyed to remote places. They are alerted using ZIGBEE module.

3.2.1 Advantage

- Bugler alarms or buzzer are replaced by highly efficient Zigbee system Technology.

- With this system even the authority of Electricity Board (EB) can have a eye on the range of power usage of the industry.
- Using zigbee system the usage of power by the industry also updated continuously via Text messages.

3.2.2 Proposed system block diagram

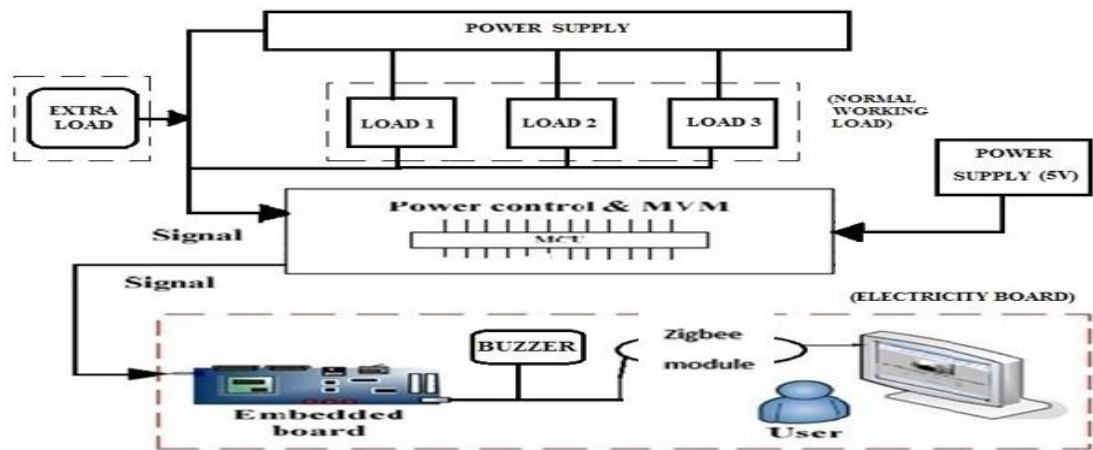


Fig. 3.1: Proposed system Block diagram

3.3. Block diagram description

3.3.1 Load

The load used here is bulb, normally for a given range of power (current) the number of loads (process) is decided. When the load happens to increase, it leads to power (current) theft. The load used here is bulb.

Number of bulb used here is 4[40W(1),60W(1),100W(2)]. Normally for a given range of power (current) the number of loads (process) is decided. When the load exceed the threshold value, it leads to power (current) theft. The load varies according to the requirement. The load is monitored regularly.

3.3.2 Arduino

The Arduino ATMEGA328P microcontroller is used. The Arduino is used to read the data from extra load connected and so the current theft is detected and the alert is given to the authority through ZIGBEE system. ATMEGA328P is high performance, low power controller from microchip. ATMEGA328P is an 8-bit microcontroller grounded architecture. ARDUINO ATMEGA328P microcontroller is programmed using embedded 'c' language. It is used to read the data from load connected. Thus current theft is detected and authorities are alerted through ZIGBEE.

3.3.3 Power supply

A power supply is a device that supplies electrical energy to one or more electric loads. I.e. 12-15 V power supply is used here, the power supply to the components is provided by AC supply which is converted to DC.

3.3.4 ZIGBEE module

In this current correspondence world, there are various high rate correspondence norms that are accessible, yet none of those meet the sensors' and control gadgets' correspondence principles. These high-information rate correspondence principles require low-inertness and low-energy utilization even at lower data transmissions. The accessible restrictive remote frameworks' Zigbee innovation is minimal effort and low-power utilization and its great and amazing attributes make this correspondence best fitted to a few implanted applications, modern control, and home mechanization, etc. The Zigbee innovation range for transmission removes primarily goes from 10 – 100 meters upheld the yield of force additionally as natural qualities. Zigbee correspondence is exceptionally worked for control and sensor networks on IEEE 802.15.4 norm for remote individual territory organizations (WPANs), and it's the product from Zigbee union. This correspondence standard characterizes physical and Media Access Control (MAC) layers to deal with numerous gadgets at low-information rates. These Zigbee's WPANs work at 868 MHz, 902-928MHz, and 2.4 GHz frequencies. The information pace of 250 kbps is best fitted to intermittent

likewise as transitional two-path transmission of information among sensors and regulators. ZIGBEE modules are like modems, however there is one contrast. A ZIGBEE Modem is outside hardware, though the ZIGBEE Module is a module that can be coordinated inside gear. It is an implanted piece of equipment. Zigbee might be a remote innovation created as an open worldwide norm to manage the novel necessities of low-cost, low power remote IoT networks. The Zigbee standard works on the IEEE 802.15.4 actual radio particular and works in unlicensed groups including 2.4GHz, 900MHz and 868MHz. It is an inserted piece of equipment

3.3.5 LCD

Fluid Crystal Display is interfaced with Arduino. It is utilized to show the order appointed to it. LCD shows use two sheets of polarizing material with a fluid gem arrangement between them. Fluid Crystal Display is interfaced with microcontroller. A LCD board is made of numerous layers. These comprise of a polarizer, captivated glass, LCD liquid, conductive associations etc. Polarisation is an interaction where the vibration of light waves is confined to a solitary plane, bringing about the development of light waves known as spellbound light. Since fluid precious stones don't deliver light of their own, they need an outside light source to work. A LCD board has sets of spellbound glass comprising of fluid gem materials in the middle of them. At the point when the outer light goes through one of the spellbound glasses and electric flow is applied on the fluid gem atoms, they adjust themselves so that enraptured light goes from the primary layer to the second captivated glass, making a picture show up on the screen.

3.4 Proposed system circuit diagram

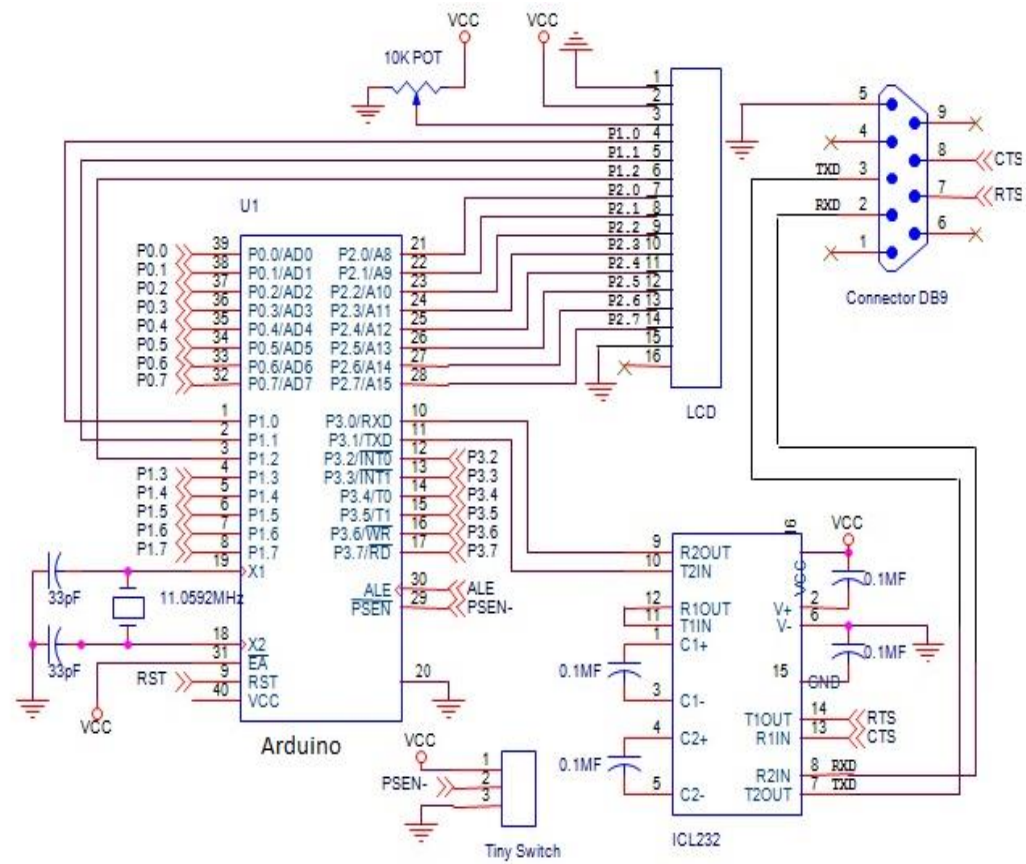


Fig. 3.2: Proposed system Circuit diagram

CHAPTER 4

EXPERIMENTAL OR MATERIALS AND METHODS; ALGORITHM USED

4.1 Methodology

- ARDUINO ATMEGA328P microcontroller is Programmed using Embedded 'C' language using arduino software.
- Zigbee wireless technology is used.

4.2 Hardware and software components

- Load(bulb)
- Arduino ATMEGA328P Microcontroller
- Power supply
- Zigbee module
- LCD
- And embedded C software

4.3 Arduino overview

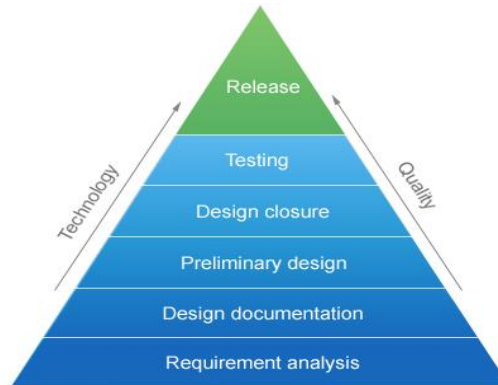
The Arduino Uno SMD is a translation of the Arduino Uno, at any rate utilizes a surface mount variety of the Atmega328P rather than the through-opening change. This design was made considering a need supply of the through-opening Atmega328P. The board depends upon the ATmega328 . It has 14 robotized data/yield pins,6 fundamental wellsprings of information, a 16 MHz important stone oscillator, a USB connection, a force jack, an ICSP header, and a reset button. It contains all that typical to help the microcontroller; fundamentally interface it to a PC with a USB association or force it with an AC-to-DC connector or battery to begin.

4.4 Embedded Software

Embedded software interacts with hardware circuitry to generate the desired functionality. Embedded Programming Languages are,

- Low level language - Assembly Level
- High level language - Embedded C, C++, JAVA

Here, we used AURDINO for programming in Embedded 'C'



4.5 HARDWARE DESCRIPTION

4.5.1 *Current transformer*

A flow transformer (CT) is utilized for estimation of electric flows. Current transformers, along with voltage transformers (VT) (possible transformers (PT)), are known as instrument transformers. At the point when current in a circuit is excessively high to straightforwardly apply to estimating instruments, a current transformer creates a diminished current precisely corresponding to the current in the circuit, which can be helpfully associated with estimating and recording instruments. A current transformer likewise disengages the estimating instruments from what might be exceptionally high voltage in the checked circuit. Flow transformers are usually utilized in metering and defensive transfers in the electrical force industry. Like some other transformer, a current transformer has an essential winding, an attractive center, and an auxiliary winding. The exchanging current streaming in the essential delivers an attractive field in the center, which at that point instigates a current in the optional winding circuit. An essential goal of current transformer

configuration is to guarantee that the essential and auxiliary circuits are effectively coupled, so the optional current bears an exact relationship to the essential current.

4.5.1.1 Features

- Current transformers are used extensively for measuring current and monitoring the operation of the power grid..
- There are two main ideals to which current transformers are intended. IEC 60044-1 (BSEN 60044-1) & IEEE C57.13 (ANSI)
- Most CTs have rating factors for 35 degrees Celsius and 55 degrees Celsius.
- The minimum primary current a CT can accurately measure is "light load," or 10% of the nominal current

4.5.1.2 Application

- Monitor current loads..
- Signal processing.
- Measurement.

4.5.1.3 Theory of operation

A CT is useful for measurements made on AC waveforms. It acts a bit like a daily voltage transformer, but typically has just one primary winding (the wire carrying the present to be measured). Unlike a daily voltage transformer, there's no physical connection made to the measured line. The CT uses magnetic fields generated by the AC current flowing through the first wire to induce a secondary current. The ratio of the number of secondary turns to the number of primary turns determines the amplitude of the current on the output. The output of a CT acts as a current source. Current transformers (CT's) provide an easy , inexpensive and yet accurate means of sensing current flow in power conductors. They are available in 3 basic configurations:

1. Ring Core CT's are available for measuring currents from 50 to 5000amps, with windows (power conductor opening size) from 1" to 8"diameter.
2. Split Core CT's are available for measuring currents from 100 to 5000amps,

with windows in varying sizes from 1" by 2" to 13" by 30". Split core CT's have one end removable in order that the load conductor or bus bar doesn't need to be disconnected to,put,in the,CT.

3. Wound Primary CT's are intended to live flows from 1 amp to 100 amps. Since the heap current goes through essential windings inside the CT, screw terminals are accommodated the heap and optional conductors. Wound essential CT's are accessible in proportions from 2.5:5 to 100:5 (Models189 and 190 are tests of wound essential CT's)

4.5.1.4 Connection of CT

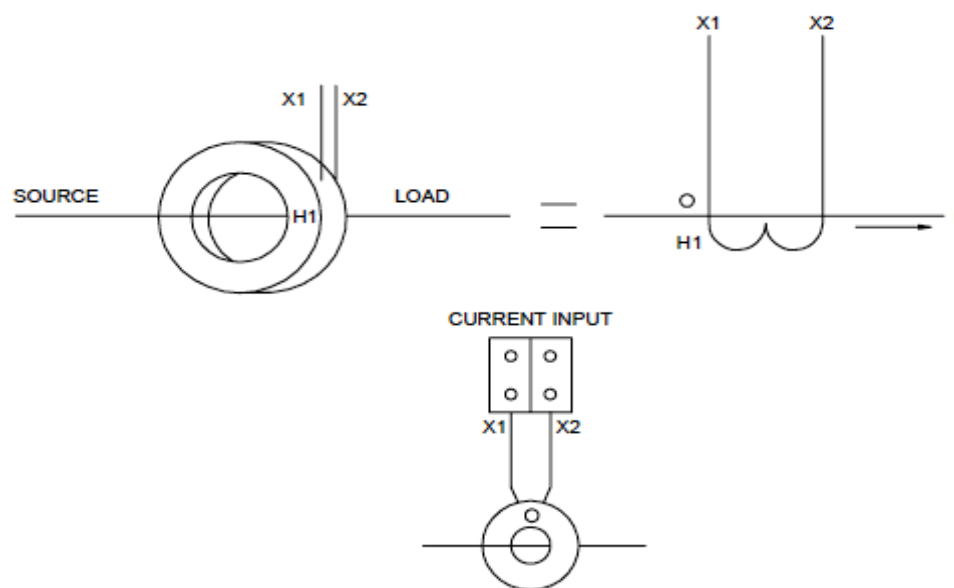


Fig. 4.1: CT connections

4.5.1.5 Design of CT

As through and through transformers, blunders emerge because of an extent of the initially input current becoming accustomed to charge the center and not moved to the auxiliary loop . The extent of the primary current utilized for this reason decides the amount mistake. The substance of good plan of estimating current transformers is to guarantee that the charging current is adequately low to guarantee that the blunder indicated for the exactness class isn't surpassed.

This is accomplished by choosing reasonable center materials and the fitting cross-sectional space of center. Regularly in estimating flows of 50A and upwards, it's advantageous and actually stable for the main twisting of a CT to have one turn as it were. In these commonest cases the CT is outfitted with an optional curl just, the first being the link or busbar of the most conductor which is gifted the CT gap inside the instance of ring CTs (I .e. single essential turn) it ought to be noticed that the lower the appraised essential current the more troublesome it is (and the more costly to accomplish a given exactness. Thinking about a center of certain fixed measurements and attractive materials with an optional twisting of say 200 turns (current proportion 200/1 turns proportion 1/200) and say it takes 2 amperes of the 200A essential current to polarize the center, the blunder is in this manner only one roughly. Anyway thinking about a 50/1 CT with 50 auxiliary actuates a comparable center it actually takes 2 amperes to charge to center. The mistake is then 4% around. To get a 1% precision on the 50/1 ring CT a lot bigger center as well as costly center material is required. Used to expand the force yield source

4.5.1.6 Safety Precautions

Care should be taken that the optional of a current transformer isn't separated from its heap while current is streaming in the essential, as the transformer auxiliary will endeavor to keep driving current across the viably endless impedance. This will create a high voltage across the open optional (into the scope of a few kilovolts at times), which may cause arc. The high voltage delivered will bargain administrator and gear wellbeing and for all time influence the precision of the transformer.

4.5.2 ZIGBEE MODEM

ZigBee" starts from bumble bees' technique for imparting newly discovered food sources and it was created in 1998. Open worldwide standard giving remote systems administration Standardized as IEEE 802.15.4 and exploiting an incredible actual radio in 2003. Low-rate, remote individual territory organizations. Mechanical Standard Created for Control and Sensor Networks. It was made by the ZigBee

Alliance. IEEE Standard for Telecommunications and data trade between frameworks. Nearby and metropolitan territory organizations.

Remote Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low Rate Wireless Personal Area Networks (LR-WPANs). It is the reason for the ZigBee determination, which further endeavors to offer a total systems administration arrangement by building up the upper layers which are not covered by the norm. ZigBee is focused at radio-recurrence (RF) applications. Low information rate, long battery life, and secure systems administration Transmission range is somewhere in the range of 10 and 75 meters (33~246 feet). The tending to space permits of outrageous hub thickness—up to 18,450,000,000,000,000,000 gadgets (64 bit IEEE address) utilizing nearby tending to, straightforward organizations of beyond what 65,000 hubs can be designed, with decreased location overhead. The radios utilize direct-arrangement spread range coding, which is overseen by the advanced stream into the modulator. To guarantee solid information transmission

4.5.2.1 ZIGBEE PHYSICAL LAYER

Characterizes the physical and electrical attributes of the network. Involves regulation and spreading procedures that map pieces of data so as to permit them to go through the air. Determines for recipient affectability and communicate yield power. Empower/handicap the radio transceiver. Link quality sign (LQI) forgot parcels. Energy discovery (ED) inside the current station. Clear channel evaluation (CCA).

4.5.2.2 ZIGBEE NETWORKS

Zigbee networks are called individual region organizations (PAN). Each organization contains a 16-bit identifier called a PAN ID .ZigBee characterizes three distinctive gadget types – facilitator, switch, and end gadget. An illustration of such an organization is appeared beneath .Node Types/Sample of a Basic ZigBee geography .Facilitator – responsible for choosing the channel and PAN ID. The facilitator begins another PAN. Whenever it's begun a PAN, the facilitator can permit switches and end gadgets to hitch the PAN. The facilitator can send and get RF information transmissions, and it can help with steering information

through the lattice organization. Organizers are not planned to be battery-controlled gadgets. Since the facilitator should be prepared to permit joins as well as course information, it ought to be mains fueled. Switch – A switch should join a ZigBee PAN before it can work. In the wake of joining a PAN, the switch can permit different switches and end gadgets to join the PAN. The switch additionally can communicate and get RF information transmissions, and it can course information bundles through the organization. Since switches can permit joins and take an interest in directing information, switches can't rest and ought to be mains fueled .End Device – An end gadget should join a ZigBee PAN, like a switch. The end gadget, in any case, can't permit different gadgets to hitch the PAN, nor would it be able to help with steering information through the organization. An end gadget can communicate or get RF information transmissions. End gadgets are planned to be battery controlled gadgets. Since the top gadget may rest, the switch or facilitator that allows the top gadget to hitch should gather all information bundles expected for the top gadget, and cushion them until the top gadget wakes and is in a situation to get them. The switch or facilitator that permitted the end gadget to join and that oversees RF information for the benefit of the end gadget is known as the end gadget's parent. The end gadget is viewed as an offspring of its parent. ZIGBEE networks are framed when a facilitator initially chooses a channel and PAN ID. After the organizer has begun the PAN, switches and end gadgets may join the PAN. The PAN ID is chosen by the organizer when it begins the PAN. Switches and end gadgets become a neighborhood of the PAN (and acquire the organizer's PAN ID) when they join a PAN. ZigBee upholds network steering inside the organization, permitting information bundles to navigate different hubs (numerous "bounces") to prevail in the objective hub. This permits ZigBee hubs to be opened up over an outsized locale, and still help interchanges among all gadgets inside the organization.. All gadgets during a ZigBee network get a 16-bit address (network address) when they join a PAN. The 16-digit address of the facilitator is generally 0.

SUPPORTING NETWORKS

- Non Beacon-enabled networks

- CSMA/CA channel access device is used
- ZigBee Routers typically have their receivers nonstop active, requiring a more strong power supply
- Beacon-enabled networks
 - ZigBee Routers convey periodic beacons to check their presence to other network nodes
 - Nodes may sleep between beacons, thus depressing their duty cycle and lengthening their battery life
 - Beacon intervals may range from
 - 15.36 ms to 251.65824 seconds at 250 kbit/s,
 - 24 ms to 393.216 seconds at 40 kbit/s
 - 48 ms to 786.432 seconds at 20 kbit/s

4.5.2.3 NETWORK ACCESS METHOD

CSMA/CA:

Conveyance coordination work. A station wishing to send needs to initially tune in to the channel for a foreordained measure of time to check for any movement on the channel. On the off chance that the channel is detected "inactive" the station is allowed to communicate. On the off chance that the channel is detected as "occupied" the station needs to concede its transmission. On the off chance that the channel is detected "inactive" it will communicate a sign onto the organization to tune in for impact situations and to advise different gadgets not to communicate.

4.5.2.4 DATA SECURITY

32-bit to 128-bit AES encryption with authentication by using common network key. Doesn't provide a mechanism for moving security keys around a network. Keys can be "hard-wired" into application. Coordinators act as the trust centers.

ZIGBEE DEVICES

- ZigBee coordinator(ZC):
 - Root of the network
 - One ZigBee coordinator in each network

- acting as the Trust Centre & repository for security keys
- ZigBee Router (ZR):
 - Middle router, passing data from other devices
- ZigBee End Device (ZED):
 - Contains functionality to talk to its parent node

FEATURES

- Reliability and self-healing
- Support for a large number of nodes
- Fast, easy deployment
- Very long battery life
- Security
- Low cost
- Ability to be used globally
- Product interoperability
- Vendor independence

ZIGBEE APPLICATIONS

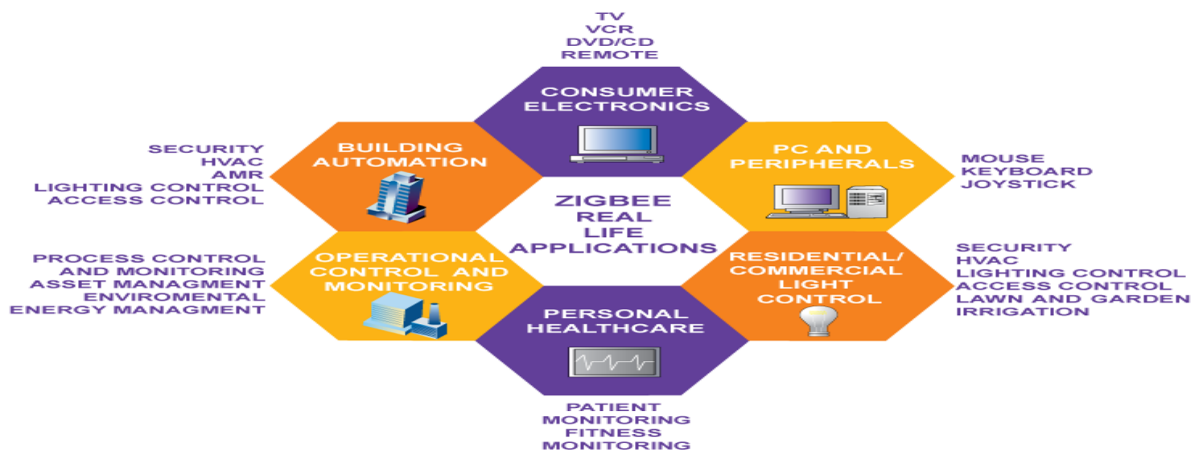


Fig. 4.2: Zigbee application

4.5.3 ARDUINO Atmega328P

The Arduino Uno SMD is a variation of the Arduino Uno, yet uses a surface mount transformation of the Atmega328P instead of the through-opening version. This version was made considering a lack in supply of the through-opening Atmega328P. The board relies upon the ATmega328P. It has 14 progressed data/yield pins, 6 basic data sources, a 16 MHz jewel oscillator, a USB affiliation, a power jack, an ICSP header, and a reset button. It contains all that normal to help the microcontroller; basically interface it to a PC with a USB connection or power it with an AC-to-DC connector or battery to start.

The Uno contrasts from all previous sheets in that it doesn't utilize the FTDI USB-to-chronic driver chip. All things considered, it includes the Atmega8U2 customized as a USB-to-chronic converter "Uno" signifies one in Italian and is named to stamp the impending arrival of Arduino 1.0. The Uno and form 1.0 will be the reference variants of Arduino, pushing ahead. The Uno is the most recent in a progression of USB Arduino sheets, and the reference model for the Arduino stage; for an examination with past adaptations, see the file of Arduino sheets.



Fig. 4.3: ATMEGA328P pinout

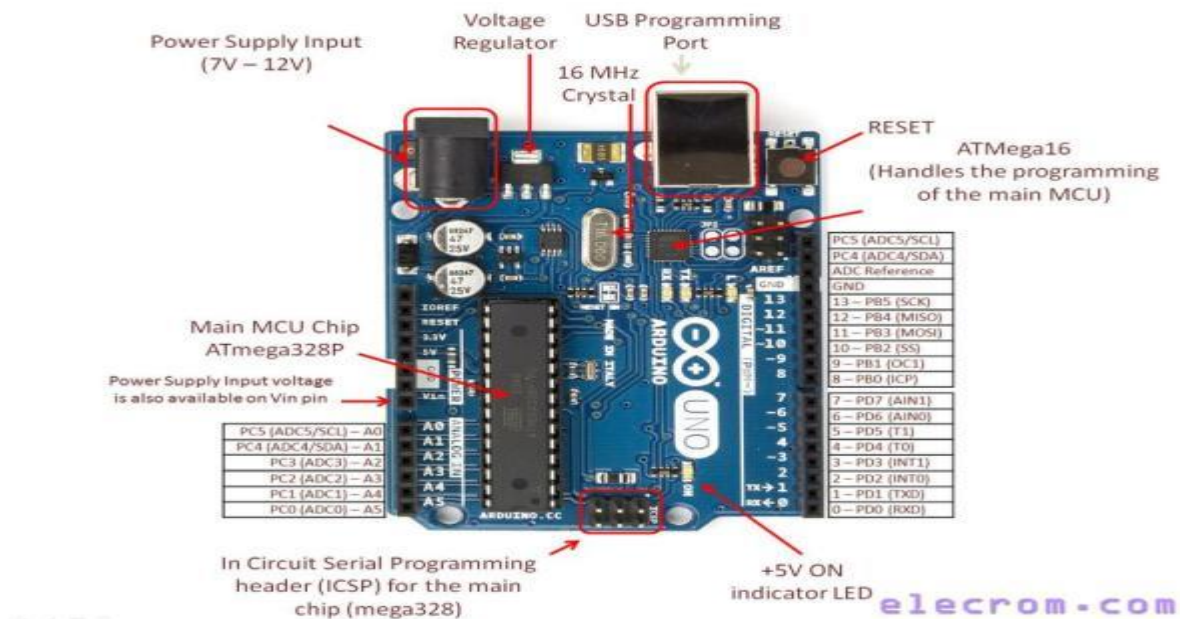


Fig. 4.4: Arduino pinout

4.5.3.1 Summary

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 Ma
DC Current for 3.3V Pin	50 Ma
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

4.5.3.2 POWER, MEMORY& I/P, O/P

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

Outside (non-USB) force can come either from an AC-to-DC connector (divider mole) or battery. The connector can be associated by connecting a 2.1mm focus positive attachment to the board's force jack. Leads from a battery can be embedded in the Gnd and Vin pin headers of the POWER connector.

The board can work on an outside supply of 6 to 20 volts. Whenever provided with under 7V, in any case, the 5V pin may supply under five volts and the board might be insecure. In the event that utilizing more than 12V, the voltage controller may overheat and harm the board. The prescribed reach is 7 to 12 volts. The power pins are as follows:

- VIN. The information voltage to the Arduino board when it's utilizing an outer force source (instead of 5 volts from the USB association or other controlled force source). You can supply voltage through this pin, or, if providing voltage by means of the force jack, access it through this pin.
- The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.

Memory:

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output:

Every one of the 14 advanced pins on the Uno can be utilized as an information or yield, utilizing `pinMode()`, `digitalWrite()`, and `digitalRead()` capacities. They work at 5 volts. Each pin can give or get a limit of 40 mA and has an inside pull-up resistor (disengaged naturally) of 20-50 kOhms. Also, a few pins have particular capacities:

- Serial: 0 (RX) and 1 (TX). Used to get (RX) and communicate (TX) TTL sequential information. These pins are associated with the comparing pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. These pins can be designed to trigger a hinder on a low worth, a rising or falling edge, or an adjustment in esteem. See the `connect Interrupt()` work for subtleties.
- PWM: 3, 5, 6, 9, 10, and 11. Furnish 8-digit PWM yield with the simple `Write()` work.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI correspondence utilizing the SPI library.
- LED: 13. There is an implicit LED associated with advanced pin 13. At the point when the pin is HIGH worth, the LED is on, when the pin is LOW, it's off.

The Uno has 6 simple sources of info, marked A0 through A5, every one of which give 10 pieces of goal (for example 1024 unique qualities). Of course they measure from ground to 5 volts, however is it conceivable to change the upper finish of their reach utilizing the AREF pin and the `analogReference()` work. Also, a few pins have specific usefulness:

- I2C: A4 (SDA) and A5 (SCL). Backing I2C (TWI) correspondence utilizing the Wire library. There are a couple of other pins on the board:

- AREF. Reference voltage (0 to 5V only) for the analog inputs. Used with analog Reference ().
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

See also the mapping between Arduino pins and ATmega328 ports.

4.5.3.3 Communication

The Arduino Uno has different workplaces for talking with a PC, another Arduino, or other microcontrollers. The ATmega328 gives UART TTL (5V) consecutive correspondence, which is available on cutting edge pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this consecutive correspondence over USB and appears as a virtual com port to programming on the PC. The '8U2 firmware uses the standard USB COM drivers, and no external driver is required. Regardless, on Windows, a .inf archive is required. The Arduino programming joins a persistent screen which licenses direct content based data to be sent off and from the Arduino board. The RX and TX LEDs on the board will streak when data is being sent through the USB-to-successive chip and USB relationship with the PC .A Software Serial library considers sequential correspondence on any of the Uno's advanced pins. The ATmega328 likewise upholds I2C (TWI) and SPI correspondence. The Arduino programming incorporates a Wire library to improve on utilization of the I2C transport; see the documentation for subtleties. For SPI correspondence, utilize the SPI library.

4.5.3.4 Programming

The Arduino Uno can be tweaked with the Arduino programming (download). Select "Arduino Uno from the Tools > Board menu (as shown by the microcontroller on your board). For nuances, see the reference and instructional activities .The ATmega328 on the Arduino Uno comes pre lighted with a boot loader that licenses you to move new code to it without the usage of an external hardware computer programmer. It passes on using the primary STK500 show (reference, C header

files). You can in like manner evade the boot loader and venture the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these headings for nuances. The ATmega8U2 firmware source code is existing. The ATmega8U2 is stacked with a DFU bootloader. The Uno SMD has a pulldown resistor tying the HWB pin to ground, so everything necessary to enter DFU mode is to immediately short enough to short pins 5 and 6 of the 8U2 connector. This will relate the 8U2 reset pin to ground. You would then have the option to use Atmel's FLIP programming (Windows) or the DFU engineer to stack another firmware. Or then again you can use the ISP header with an external computer programmer . See this customer contributed instructional exercise for more information.*4.5.3.5 Automatic (Software) Reset*

Maybe than requiring an actual press of the reset button before a transfer, the Arduino Uno is planned in a way that permits it to be reset by programming running on an associated PC. One of the equipment stream control lines (DTR) of the ATmega8U2 is associated with the reset line of the ATmega328 by means of a 100 Nano farad capacitor. At the point when this line is stated (taken low), the reset line drops sufficiently long to reset the chip. The Arduino programming utilizes this capacity to permit you to transfer code by essentially squeezing the transfer button in the Arduino climate. This implies that the bootloader can have a more limited break, as the bringing down of DTR can be very much organized with the beginning of the transfer.

This arrangement has different ramifications. At the point when the Uno is associated with either a PC running Mac OS X or Linux, it resets each time an association is made to it from programming (by means of USB). For the accompanying half-second or something like that, the bootloader is running on the Uno. While it is customized to disregard contorted information (for example anything but a transfer of new code), it will capture the initial not many bytes of information shipped off the board after an association is opened. On the off chance that a sketch running on the load up gets one-time design or other information when it initially begins, ensure that the product with which it imparts holds up a second subsequent to opening the association and prior to sending this information.

The Uno contains a follow that can be sliced to incapacitate the auto-reset. The cushions on one or the other side of the follow can be fastened together to re-empower it. It's marked "RESET-EN". You may likewise have the option to incapacitate the auto-reset by interfacing a 110 ohm resistor from 5V to the reset line; see this gathering string for subtleties.

4.5.3.6 USB Overcurrent Protection

The Arduino Uno has a resettable polypus that shields your PC's USB ports from shorts and overcurrent. Albeit most PCs give their own inner insurance, the breaker gives an additional layer of assurance. In the event that in excess of 500 mA is applied to the USB port, the circuit will consequently break the association until the short or over-burden is eliminated.

4.5.3.7 Physical Characteristics

The greatest length and width of the Uno PCB are 2.7 and 2.1 inches separately, with the USB connector and force jack stretching out past the previous measurement. Four screw openings permit the board to be joined to a surface or case. Note that the distance between computerized pins 7 and 8 is 160 mil (0.16"), not even different from the 100 mils separating of different pins.
pins.

Microcontroller	ATmega328
Clock Speed	16MHz
Operating Voltage	5V
Maximum supply Voltage (not recommended)	20V
Supply Voltage (recommended)	7-12V
Analog Input Pins	6
Digital Input/Output Pins	14
DC Current per Input/Output Pin	40mA
DC Current in 3.3V Pin	50mA
SRAM	2KB
EEPROM	1KB
Flash Memory	32KB of which 0.5KB used by boot loader

4.5.4 LCD DISPLAY

LCD shows use two sheets of polarizing material with a fluid precious stone arrangement between them. An electric flow is gone through the fluid makes the gem adjust with the goal that fluid can't go through them. Every precious stone, hence, resembles a shade, either permitting light to go through or impeding the light.



Fig. 4.5: LCD display

4.5.4.1 Types of LCD

Monochrome LCD pictures normally show up as blue or dim dark pictures on top of a grayish-white foundation. Shading LCD shows utilize two essential methods for delivering shading. Detached network is the more affordable of the two advancements. Dainty Film Transistor or dynamic lattice, produces shading pictures that are pretty much as sharp as conventional CRT shows, however the innovation is costly.

4.5.4.2 Physical Data

Item	Contents	Unit
LCD type	STN	---
LCD duty	1/16	---
LCD bias	1/5	---
Viewing direction	6	o'clock
Module size (W×H×T)	80 × 36 × 14MAX (3.15" × 1.42" × 0.55"MAX)	mm
Viewing area (W×H)	64.5 × 13.8 (2.54" × 0.54")	mm
Number of characters (characters×lines)	16 × 2	---
Character matrix (W×H)	5 × 8	dots
Character size (W×H)	2.95 × 4.35 (0.116" × 0.171")	mm
Dot size (W×H)	0.55 × 0.50 (0.022" × 0.020")	mm
Dot pitch (W×H)	0.60 × 0.55 (0.024" × 0.022")	mm

4.5.4.3 External dimensions of LCD

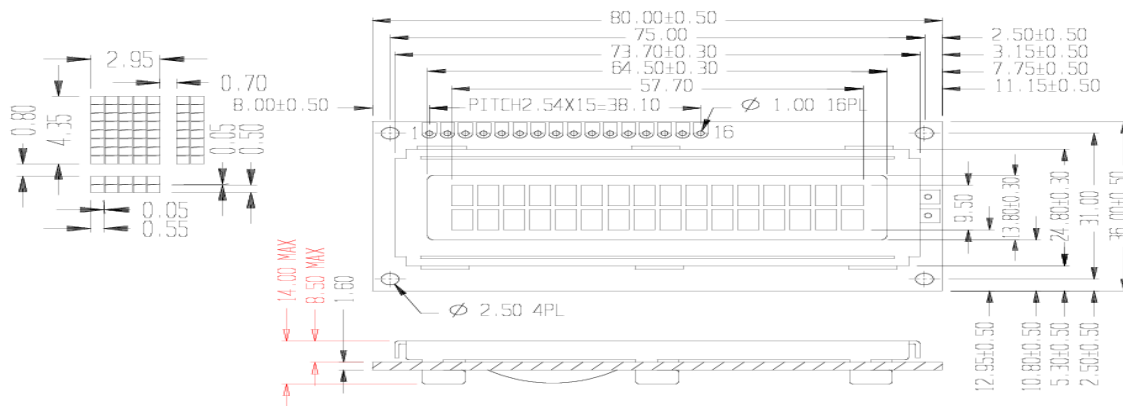


Fig. 4.6: External dimensions of LCD

4.5.4.4 Block Diagram of LCD

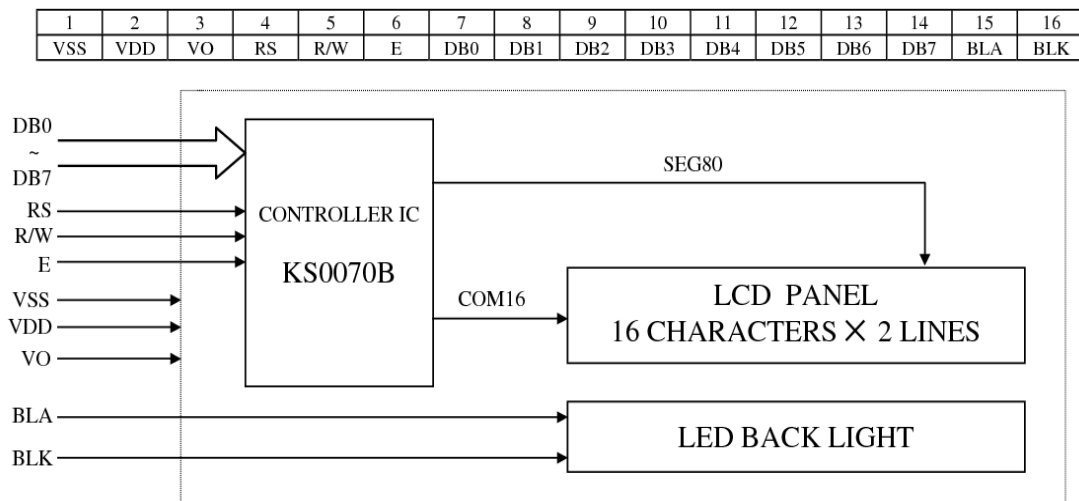


Fig. 4.7: Block Diagram of LCD

4.5.5 INTERFACE WITH ARDUINO

USART represents Universal Synchronous Asynchronous Receiver Transmitter. It is here and there called the Serial Communications Interface or SCI. Simultaneous activity utilizes a clock and information line while there is no different clock going with the information for Asynchronous transmission. Since there is no check signal in no concurrent activity, one pin can be utilized for transmission and another pin can be utilized for gathering. Both transmission and gathering can

happen simultaneously this is known as full duplex activity. Transmission and gathering can be freely empowered. Be that as it may, when the sequential port is empowered, the USART will control the two pins and one can't be utilized for broadly useful I/O when the other is being utilized for transmission or gathering. The USART is most ordinarily utilized in the no concurrent mode. The most widely recognized utilization of the USART in offbeat mode is to impart to a PC sequential port utilizing the RS-232 convention. If it's not too much trouble, note that a driver is needed to interface to RS-232 voltage levels and the Arduino .MCU ought not be straightforwardly associated with RS-232 signs.

4.5.5.1 RS-232

Electronic information correspondences between components will by and large fall into two general classes: single-ended and differential. RS232 was presented in 1962, and regardless of bits of gossip about its initial end, has remained generally utilized all through the business. Free channels are set up for two-way correspondence. The RS232 signals are addressed by voltage level as for a typical system. RS232 has various handshaking lines and furthermore determines a correspondence protocol. RS232 information is bi-polar. The yield signal level ordinarily swings among +12V and - 12V. A RS-232 port was at one time a standard element of a PC for associations with modems, printers, information stockpiling, uninterruptible force supplies, and other fringe gadgets. In any case, the restricted transmission speed, moderately huge voltage swing, and huge standard connectors.

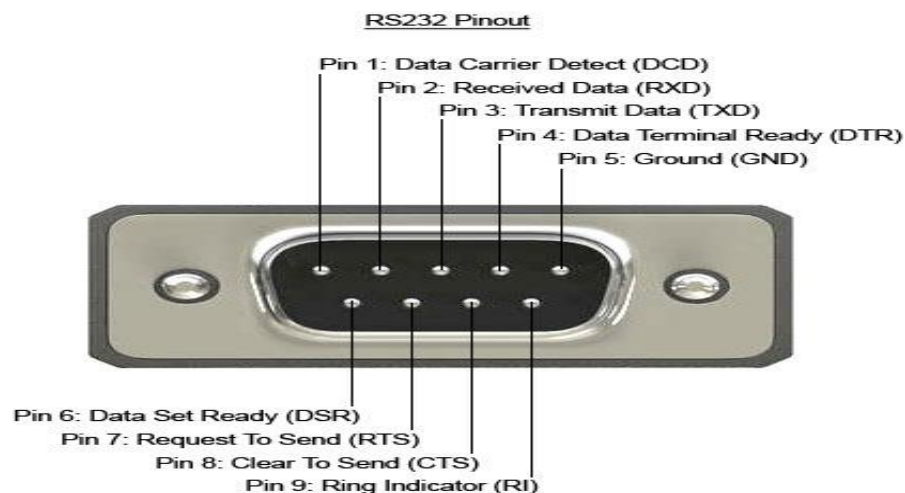


Fig. 4.8: RS-232 Pin out

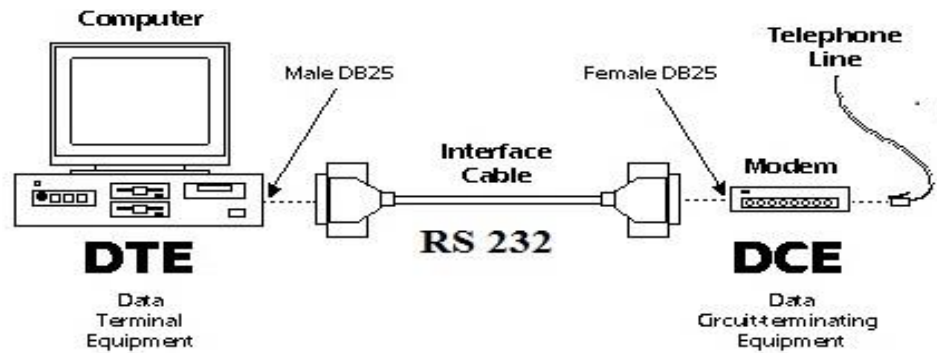


Fig. 4.9: RS 232 Interface cables

4.5.5.2 MAX-232

The MAX232 IC is utilized to change over the TTL/CMOS rationale levels to RS232 rationale levels during sequential correspondence of Arduinos with PC. The regulator works at TTL rationale level (0-5V) while, the sequential correspondence in PC chips away at RS232 guidelines (- 25 V to + 25V). This makes it hard to build up an immediate connection between them to speak with one another. The middle connection is given through MAX232. It is a double driver/recipient that incorporates a capacitive voltage generator to supply RS232 voltage levels from a solitary 5V stock. Every collector changes over RS232 contributions to 5V TTL/CMOS levels. These recipients (R1 and R2) can acknowledge $\pm 30V$ inputs. The drivers (T1 and T2), likewise called transmitters, convert the TTL/CMOS input level into RS232 level. The transmitters take contribution from regulator's sequential transmission stick and send the yield to RS232's beneficiary. .

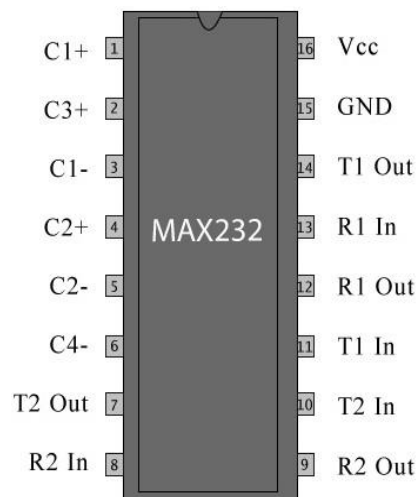


Fig.4.10: Pin configuration of MAX-232

(i) Pin description of MAX-232

Pin No	Function	Name
1	Capacitor connection pins	Capacitor 1 +
2		Capacitor 3 +
3		Capacitor 1 -
4		Capacitor 2 +
5		Capacitor 2 -
6		Capacitor 4 -
7	Output pin; outputs the serially transmitted data at RS232 logic level; connected to receiver pin of PC serial port	T ₂ Out
8	Input pin; receives serially transmitted data at RS 232 logic level; connected to transmitter pin of PC serial port	R ₂ In
9	Output pin; outputs the serially transmitted data at TTL logic level; connected to receiver pin of controller.	R ₂ Out
10	Input pins; receive the serial data at TTL logic level; connected to serial transmitter pin of controller.	T ₂ In
11		T ₁ In
12	Output pin; outputs the serially transmitted data at TTL logic level; connected to receiver pin of controller.	R ₁ Out
13	Input pin; receives serially transmitted data at RS 232 logic level; connected to transmitter pin of PC serial port	R ₁ In
14	Output pin; outputs the serially transmitted data at RS232 logic level; connected to receiver pin of PC serial port	T ₁ Out
15	Ground (0V)	Ground
16	Supply voltage; 5V (4.5V – 5.5V)	Vcc

4.5.6 RELAY

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field, which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw switches.

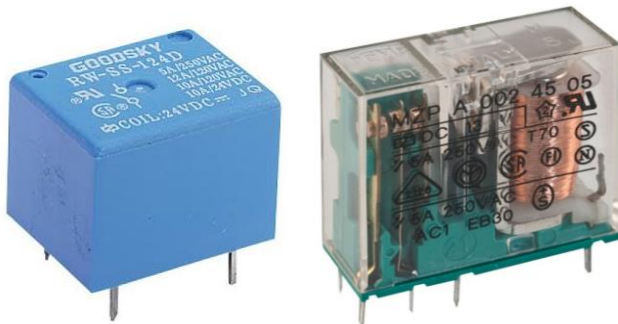


Fig. 4.11: Relay

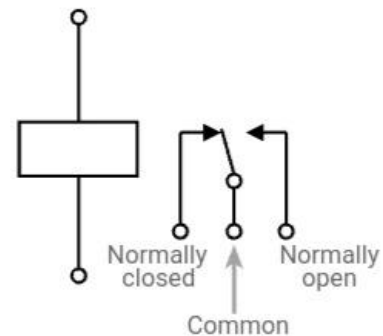


Fig. 4.12: Relay Circuit Diagram

4.5.6.1 Types of relays

- ✓ Single Pole Single Throw Relay.
- ✓ Single Pole Double Throw Relay.
- ✓ Double Pole Single Throw Relay.
- ✓ Double Pole Double Throw Relay.

4.5.6.2 Advantages of relays

- Relays can switch AC and DC, transistors can only switch DC.
- Relays can switch high voltages, transistors cannot.
- Relays are a better choice for switching large currents.
- Relays can switch many contacts at once.

4.5.7 LED

Various peripherals interfacing with any embedded controller are LED, LCD, Keyboard etc..Thus, when interfacing an LED to a TTL output, the maximum current through the LED is 16 mA.

4.5.7.1 Features

- Lower power consumption.
- Require series resistors to limit the current.
- Displaying decimal digits.

4.5.7.2 Diagram of LED

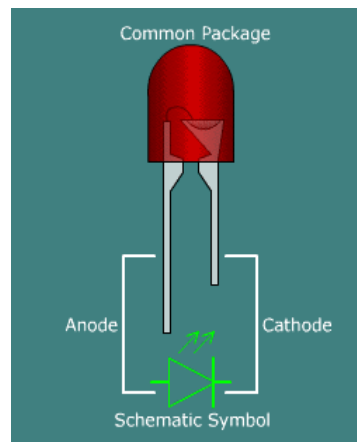


Fig. 4.13: Diagram of LED

4.5.8 POWER SUPPLY

Force Supply is the gadget that moves electric force from a source to a heap utilizing electronic circuits. Force supplies are utilized in numerous modern and aviation applications and furthermore in customer items. A portion of the necessities of force supplies are little size, light weight, minimal effort, and high force transformation effectiveness. What's more, some force supplies require the accompanying: electrical segregation between the source and burden, low consonant contortion for the info and yield waveforms, and high force factor if the source is ac voltage. Some unique force supplies require controlled course of force stream. Common use of force supplies is to change over AC input capacity to a managed voltage needed for electronic hardware.

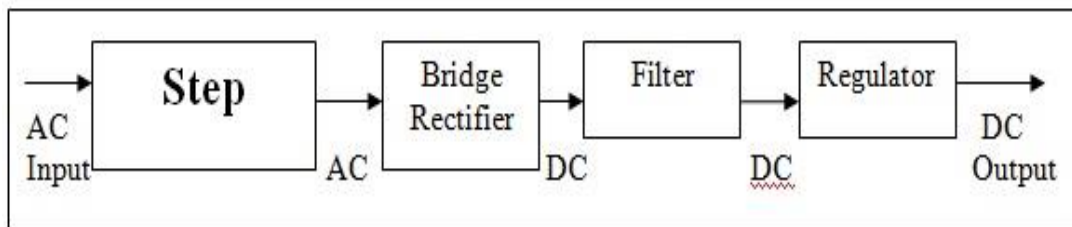


Fig. 4.14: Block diagram of Power Supply

4.5.8.1 Linear Power Supply

A direct force supply is the most established and easiest sort of force supply. In these force supplies, electrical disengagement must be given by cumbersome line recurrence transformers. The AC source can be redressed with a scaffold rectifier to get an uncontrolled DC, and afterward a DC-to-DC converter can be utilized to get a controlled DC yield. The yield voltage is directed by dropping the additional information voltage across an arrangement semiconductor. They have minuscule yield swell, hypothetically zero commotion, enormous hold-up time and quick reaction. The activity of a transformer is with the end goal that a period fluctuating AC voltage or current is changed to a sequential worth, as set by the transformer turns proportion. The transformer doesn't add power, so it follows that the force on either side should be steady. That is the explanation that the twisting with more turns has higher voltage yet lower current, while the twisting with less turns has lower voltage however higher current. The progression down transformer changes over the AC

contribution with the more elevated level to some lower level. A scaffold rectifier changes over the AC voltage into DC voltage. A four-semiconductor converter (Bridge Rectifier) that can create the most noteworthy yield power than different sorts of rectifiers. The channel circuit opposes the undesirable AC signals. The controller at that point changes a DC voltage over to a lower DC voltage of a similar extremity.

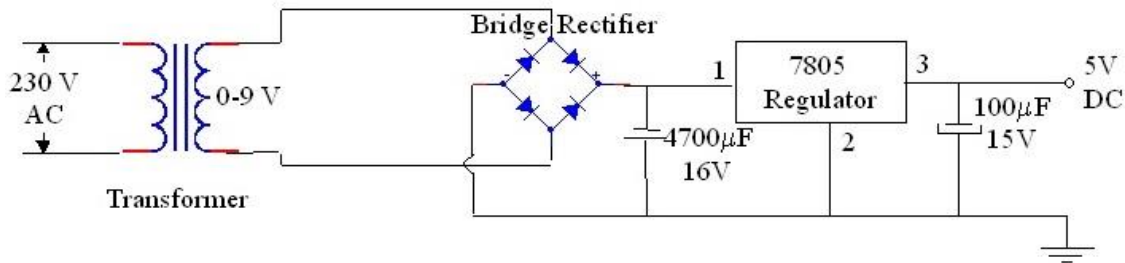


Fig. 4.15: Linear Power supply

4.6 SOFTWARE DISCRIPTION

4.6.1 Arduino Program Description

Arduino is Programmed utilizing Embedded 'C' language utilizing Arduino programming, and WIN xp for downloading. To execute the program WINx talk is utilized. The various capacities utilized in this program are, void deferral () work is utilized to cause time delay regarding milli seconds. What's more, this capacity is utilized at different occurrences in the program to cause time delay. The capacity void transmit_Zigbee_command (unsigned roast cluster []) is utilized to communicate the order utilizing ZIGBEE. void communicate (unsigned scorch array[]) work is utilized to send signal through ZIGBEE. void send(unsigned singe) work is utilized to send message to the number we doled out prior.void lcd init() work is utilized to instate the variable related with the LCD.Dependng on the regulator yield because of expansion of additional heap, ZIGBEE module,LCD goes to dynamic state.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 HARDWARE

- Initially when no load is given, so current is zero , power is zero and no bulb is ON.
- When 40W bulb is switched ON, current and power is known and it is normal , theft is not found.
- Same for 40+60W, 40+60+100W the theft is not found , power is normal.
- Likewise When it exceeds 250W of power it gets tripped off and power is cut off due to power theft

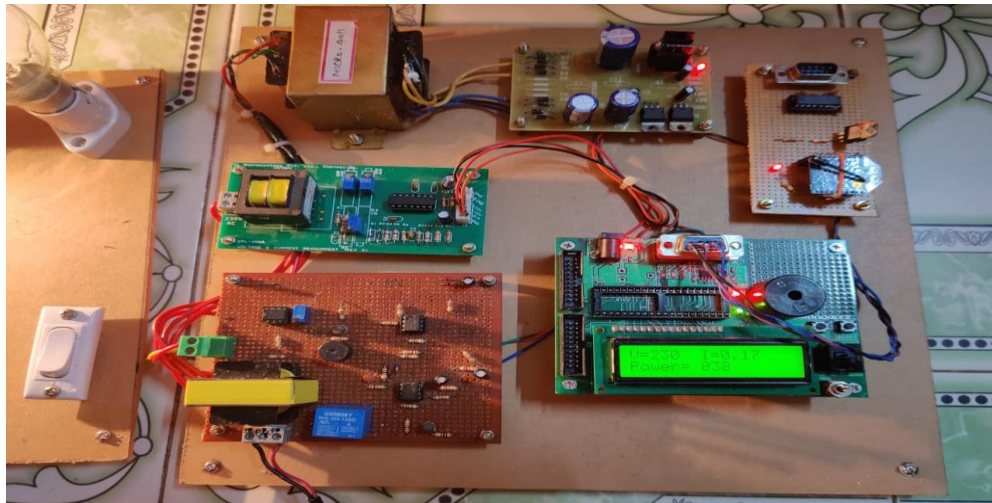


Fig. 5.1: Hardware1



Fig. 5.2: Hardware2

POWER STATUS:

LOAD	POWER CONSUMED (watts)	CURRENT (amps)	STATUS
No load	0	0	Power is normal
40W	38	0.17	Power is normal
40+60W	104	0.46	Power is normal
40+60+100W	213	0.93	Power is normal
40+60+100+100W(exceeds 250W)	Power tripped off	Current is cut-off	Power theft Detected

5.2 Output



Fig. 5.3: Output(1) No power is used

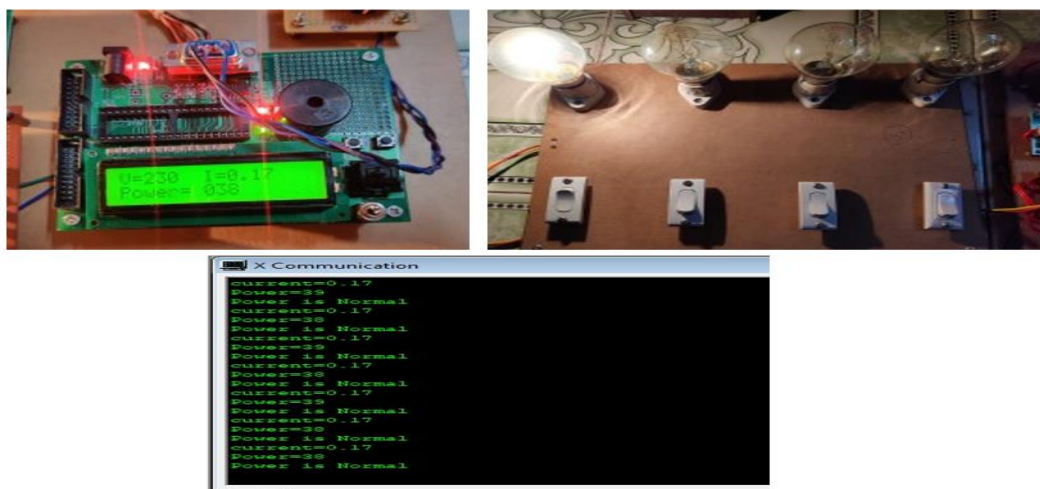


Fig. 5.2(ii) : Output(2) 40W bulb is switched ON



Fig. 5.4 : Output(3) 40+60W bulb is switched ON



Fig. 5.5 : Output(4) 40+60+100W bulb is switched ON



Fig. 5.5 : Output(5) Exceeds 250W of power(40+60+100+100W) it gets tripped off

5.3 Result

Thus a system is proposed to find the current theft happening in industries when an extra load is connected along with the range of power used and thereby alerts the industry authority and the Electricity board (EB) by using ZIGBEE system and is frequently updated via text message

CHAPTER 6

CONCLUSION

This paper is the consolidated equipment advantage for both utility and the client. Arduino, hand-off, and ZIGBEE positioned Energy Meter, power burglary identification, and voltage variety is constructed which can peruse and send information by means of remote convention utilizing ZIGBEE innovation through ZIGBEE modem, equipped for overseeing and controlling the stockpile to that meter through transfer. On account of force robbery, defaulter meter line cutting/joining work framework is decreased. Force utilization, power quality, and its exactness can be observed by the purchasers straightforwardly in their framework. This interaction will lessen the work and human mistake in the dissemination framework and furthermore secure the buyer gear.

FUTURE SCOPE

- The project model reduces the manual guidance work and theft.
- The administration saves money by the control of theft in energy meter and also more beneficial for customer side and the government side.
- Cost wise low when compared to other energy meter without mindless meter reading and theft control.
- This method will reduce the energy wastage and save a lot of energy for future use.

REFERENCES

1. Ajay Mahato, Abhishek Nanda, Ajay Kumar Pal, Chandan Kumar Singh, "Electric power theft detection and location tracking using iot". international journal for research in applied science & engineering technology (IJRASET),Vol-no:4,year:2018,page.no: 2456-3307
2. Babar D.G, DR.patil.D.Y, mohale V.P, " ingenious energy monitoring control and management of electrical supply",2018 international conference on energy systems and application ,vol-no:07, year:2018,pg.no:12001-12003
3. Naidu H.K, ankush gutte .S, "power meter building plus load control using GSM", international journal for research in applied science & engineering technology (IJRASET),Vol-no:5, August 2017, page.no 210-212.
4. Nitin K Mucheli; Umakanta Nanda; D Nayak; P K Rout; S K Swain; S K Das; S M Biswal, "Smart Power Theft Detection System",Vol-no:5,year:2019,page no- 450-500
5. Patel H.B, patel darshit, " GSM Based Energy Meter Monitoring And Load Control". IRJET, vol-04, March 2017, Page.no 360-363.
6. Syifaul Fuada,"Proposed An Intelligent System for Electricity Theft Detector at Smart City Scenarios", international Journal of Applied Power Engineering (IJAPE), Vol. 5, No. 1, April 2016, page no- 51-58
7. R.Meenal, Kevin M Kuruvilla, Adrin Denny, Rejin V Jose, Renoy Roy,"Power Monitoring and Theft Detection System using IoT",Journal of physics:conference series,volume 1362.vol-no:8.year:2019, page no-504-554

John

by wins research

Submission date: 18-Apr-2021 10:57AM (UTC-0400)

Submission ID: 1559864228

File name: plagiarism_check_report.doc (22.09M)

Word count: 5442

Character count: 29174

ORIGINALITY REPORT

23%

SIMILARITY INDEX

17%

INTERNET SOURCES

12%

PUBLICATIONS

19%

STUDENT PAPERS

PRIMARY SOURCES

1

Submitted to SASTRA University

Student Paper

3%

2

www.elkor.net

Internet Source

2%

3

www.circuitointegrato.com

Internet Source

1%

4

Submitted to University of East London

Student Paper

1%

5

R Meenal, Kevin M Kuruvilla, Adrin Denny, Rejin V Jose, Renoy Roy. "Power Monitoring and Theft Detection System using IoT", Journal of Physics: Conference Series, 2019

Publication

1%

6

www.banlinhkien.vn

Internet Source

1%

7

Submitted to Pathfinder Enterprises

Student Paper

1%

8

Submitted to Al Musanna College of Technology

Student Paper

1%

9	grietinfo.in Internet Source	1 %
10	Submitted to SVKM International School Student Paper	1 %
11	Submitted to Royal Melbourne Institute of Technology Student Paper	1 %
12	ierjournal.org Internet Source	1 %
13	Submitted to Stefan cel Mare University of Suceava Student Paper	1 %
14	ethesis.nitrkl.ac.in Internet Source	1 %
15	www.authorstream.com Internet Source	1 %
16	Submitted to University of Western Sydney Student Paper	<1 %
17	iaescore.com Internet Source	<1 %
18	Submitted to Borders College Student Paper	<1 %
19	Submitted to Federal University of Technology Student Paper	<1 %

20	Submitted to GESCI Student Paper	<1 %
21	www.semanticscholar.org Internet Source	<1 %
22	Vivek Kumar Jaiswal, Hritik Kumar Singh, Kuldeep Singh. "Arduino GSM based Power Theft Detection and Energy Metering System", 2020 5th International Conference on Communication and Electronics Systems (ICCES), 2020 Publication	<1 %
23	ieeexplore.ieee.org Internet Source	<1 %
24	ijsrcseit.com Internet Source	<1 %
25	"Technological Innovation for Collective Awareness Systems", Springer Science and Business Media LLC, 2014 Publication	<1 %
26	wiki.sj.ifsc.edu.br Internet Source	<1 %
27	Submitted to Jaypee University of Information Technology Student Paper	<1 %
28	Submitted to Arab Academy for Science, Technology & Maritime Transport CAIRO	<1 %

29	ijrat.org Internet Source	<1 %
30	www.engineeringworldchannel.com Internet Source	<1 %
31	Submitted to Informatics Education Limited Student Paper	<1 %
32	Submitted to Udayana University Student Paper	<1 %
33	Submitted to Institute of Technology, Nirma University Student Paper	<1 %
34	www.irjet.net Internet Source	<1 %
35	docplayer.net Internet Source	<1 %
36	ijseas.com Internet Source	<1 %
37	plc-scada-dcs.blogspot.com Internet Source	<1 %
38	en.wikipedia.org Internet Source	<1 %

Exclude quotes On

Exclude bibliography On

Exclude matches Off