

DESIGN OF AIR QUALITY MONITORING SYSTEM

**Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in
Electronics and Communication Engineering**

by

NAGARAJU BHUPENDRA SAI (37130269)

PAKA DHANESH (37130294)



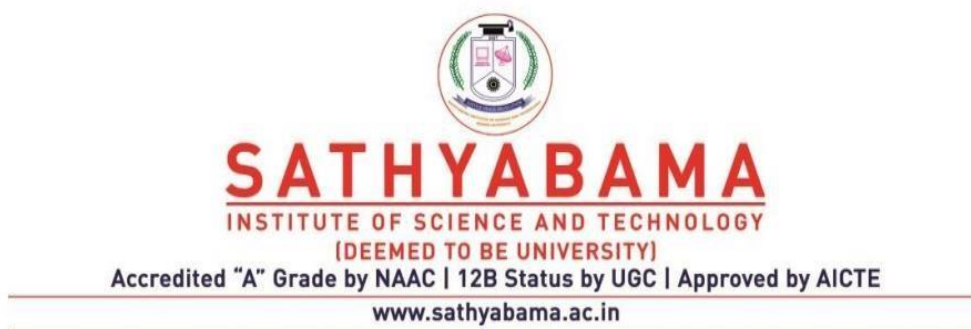
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO BE
UNIVERSITY) Accredited with Grade "A" by NAAC**

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL 2021



DEPARTMENT OF ELECTRONICS AND COMMUNICATIONENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **PAKA DHANESH (37130294)** and **NAGARAJU BHUPENDRA SAI(37130269)** who carried out the project entitled "**DESIGN OF AIR QUALITY MONITORING SYSTEM**" under my supervision from September 2020 to April 2021.

Internal Guide

Mrs. L. Magthelin Therase, M.E.,

Head of the Department

Dr. T. RAVI, M.E., Ph.D.,

Submitted for Presentation held on_____

Internal Examiner

External Examiner

DECLARATION

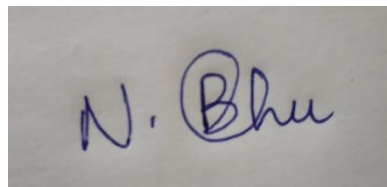
We, **PAKA DHANESH (37130294)** and **N BHUPENDRA SAI (37130269)** hereby declare that the Project Report entitled “**DESIGN OF AIR QUALITY MONITORING SYSTEM**” done by us under the guidance of **Mrs . L. Magthelin Therase M.E.**, at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

DATE : 19-04-2021

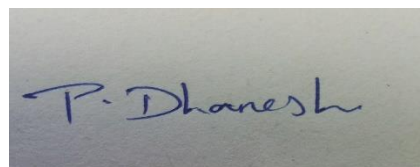
PLACE: CHENNAI

SIGNATURE OF THE CANDIDATES

1. Nagaraju Bhupendra Sai (37130269)

A photograph of a handwritten signature in blue ink on a light-colored surface. The signature is written in a cursive style and reads "N. Bhupendra Sai".

2. Paka Dhanesh(37130294)

A photograph of a handwritten signature in blue ink on a light-colored surface. The signature is written in a cursive style and reads "P. Dhanesh".

ACKNOWLEDGEMENT

We are pleased to acknowledge my sincere thanks to Board of Management **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. T. RAVI, M.E., Ph.D.**, Head of the Department of Electronics and Communication Engineering for providing me necessary support and details at the right time during the progressive reviews.

We would like to express my sincere and sense of gratitude to my Project Guide **Mrs. L. Magthelin Therase, M.E. ,Assistant Professor , Department of Electronics and Communication Engineering** 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 Teaching and Non-teaching staff members of the Department of **Electronics and Communication Engineering** who were helpful in many ways for the completion of the project.

We express our gratitude to our parents for their constant encouragement and support for the completion of the project.

ABSTRACT

Our project monitors the air pollution level and transfers information by using BLYNK app. The level of pollution has increased with times by lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human well being by directly affecting health of population exposed to it. In order to monitor in this project we are going to make an IOT Based air pollution monitoring System in which the Air Quality is monitored over a web server using internet. It will trigger an alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO₂, smoke, alcohol, benzene and NH₃. It will show the air quality in Parts per million (PPM) on the Liquid crystal Display (LCD) and as well as on web page so that we can monitor it very easily. In this IOT project, we can monitor the pollution level from anywhere using our computer or mobile.

TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	ABSTRACT	iv
	LIST OF FIGURES	viii
	LIST OF ABBEREVIATION	ix
1.	INTRODUCTION	1
	1.1 INTERNET OF THINGS ELEMENTS(IOT)	2
2.	LITERATURE SURVEY	4
3.	AIM AND SCOPE OF PRESENT INVESTIGATION	6
	3.1 BLOCK DIAGRAM	6
	3.2 EXISTING MODEL	7
	3.3 DISADVANTAGES	7
	3.4 PROPOSED MODEL	8
4.	MATERIALS, METHODS AND ALGORITHMS USED	10
	4.1 HARDWARE REQUIREMENT'S	10
	4.2 SOFTWARE REQUIREMENTS	10
	4.3 FEATURES OF 16×2 LCD MODULE	12
	4.4 BRIEF DESCRIPTION ON LCD MODULES	12
	4.5 RELAY MODULE	13
	4.6 BRIEF DESCRIPTION ON 7805 VOLTAGE REGULATOR IC	25
	4.7 ARDUINO NANO (MEGA 328P)	27

CHAPTER NO.	TITLE	PAGE NO.
4.8	DIFFERENCE BETWEEN ARDUINO UNO AND ARDUINO NANO	28
4.9	UPLOADING YOUR FIRST PROGRAM	29
4.10	CENTERTAPPED TRANSFORMER	31
4.11	DHT11 SENSOR (TEMPERATURE AND HUMIDITY)	33
4.12	ESP-01 WIFI MODULE	36
4.13	ARDUINO IDE SOFTWARE	37
5.	RESULT AND DISCUSSION	44
6.	FUTURE SCOPE AND CONCLUSION	47
6.1	CONCLUSION	47
6.2	FUTURE SCOPE	47
	REFERENCES	48

LIST OF ABBREVIATIONS

GPRS	-	General Packet Radio Service
GPS	-	Global Positioning System
IoT	-	Internet of Things
LCD	-	Liquid crystal Display
PPM	-	Parts per Million
SOC	-	System On a Chip

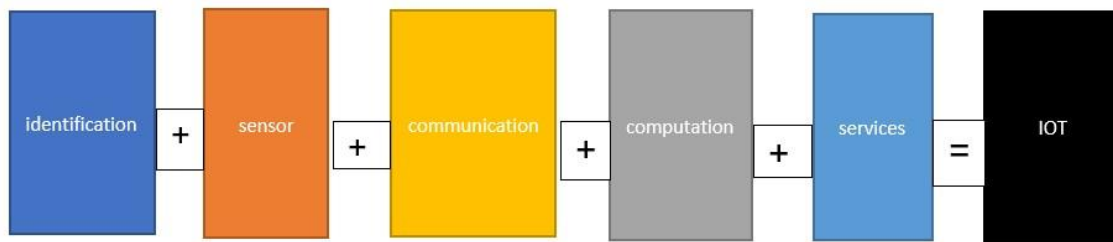
CHAPTER 1

INTRODUCTION

The main objective of IOT Air Quality Monitoring System is that the Air and sound pollution is a growing issue these days. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. Due to flexibility and low cost Internet of things (IoT) is getting popular day by day. With the urbanization and with the increase in the vehicles on road the atmospheric conditions have considerably affected. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma. Monitoring gives measurements of air pollutant and sound pollution concentrations, which can then be analyzed interpreted and presented. This information can then be applicable in many ways. Analysis of monitoring data allows us to assess how bad air pollution and sound pollution is from day to day.

Internet of Things provides wireless infrastructure with distinctive identifiers and the capability to discussion information over a network. The world of electrical, communicating devices is growing at a rapid pace as a result of the growth of consumer electronics in the 1980's and 1990s, the Internet in the 1990s and the 2000s, and the increasingly mobile connected devices of the 2000s and 2010s. The growth is expected to continue over the next decades with the breakthrough of the Machine-to-Machine.

1.1 INTERNET OF THINGS ELEMENTS (IOT)



The main objective of IOT Air quality Monitoring System is that the Air and sound pollution is a growing issue these days. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. Due to flexibility and low cost Internet of things is getting popular day by day. With the urbanization and with the increase in the vehicles on road the atmospheric conditions have considerably affected. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma. Monitoring gives measurements of air pollutant and sound pollution concentrations, which can then be analyzed interpreted and presented. This information can then be applicable in many ways. Analysis of monitoring data allows us to assess how bad air pollution and sound pollution is from day to day.

The system is based on WIFI board as an internet of things system. The WIFI module is connected to the internet from the HOTSPOT of the smart phone via WIFI connection as the Arduino has ESP-01 WIFI module to connect with the internet.

WIFI to be connected to the HOTSPOT of the smart phone, needs to be identified to the name of HOTSPOT, the password and token code letting the server of BLYNK connects them together. You may need the computer once to transfer code from Arduino IDE to the WIFI module kit to prepare the software part of the project. It shows that the server of BLYNK application will process the smartphone.

WIFI connection. BLYNK libraries are ZIP files can be downloaded from GITHUB website to be imported to the Arduino IDE library.

BLYNK server will check for internet connection, WIFI with android HOTSPOT the WIFI code includes the token code, the name of HOTSPOT and it's password. The information included to the code must be match with the HOTSPOT information to allow ESP01 connect with the WIFI to be as a channel to exchange commands between smart phone and module. Remaining processes are just commands sent from BLYNK application to WIFI to control loads those are connected to the relay kit . And sensor output value is sent reverse to the BLYNK application from WIFI kit.

CHAPTER 2

LITERATURE SURVEY

Several papers have been presented to provide security to smart homes in low cost. Mrutyunjaya Sahani, Chiranjiv Nanda, Abhijeet Kumar Sahu and Biswajeet Pattnaik proposed Web-Based Online Embedded Door Access Control and Home Security System Based on Face Recognition. Rhythm, Arjun Trivedi, Hitarth Mehta, Prof.A.B. Upadhyay proposed Implementation of Web-surveillance using raspberry pi. Jinsoo Han; Chang-Sic Choi; Ilwoo Lee, proposed "More efficient home energy management system based on Zigbee communication and infrared remote controls,".Erdem, H.; Uner, A., Proposed "A multi-channel remote controller for home and office appliances."

Smart home security control system has become indispensable in daily life. The design and development of a home security system, based on human face recognition technology and remotely monitoring technology, to confirm visitor identity and to control door accessibility has been reported in this paper. This paper describes about the implementation and deployment of wireless control system and accessibility in to a home environment for authenticated people only. A wireless network technique Zigbee based and image processing technique PCA based, dedicatedly make the security system alive a the request. Zigbee module and electromagnetic door lock module combinedly operate the door accessibility, has been designed and developed. Face detection and recognition algorithms, as well as a wireless interface are used to detect and identify visitors and send an email and/or an alert message about the current home environment status via GSM network automatically to the home owner's mobile phone or any communication devices.

The concerned authority can control the system through his/her mobile phone or any communication devices by sending AT Commands to GSM MODEM or by taking necessary actions for authentication through email, which is again password protected. Users can monitor visitors and control the door lock on active Web pages enhanced with JavaScript and HTML. This system finds a wide application in areas where physical presence is not possible all the time. The entire control system is built using ARM1176JZF-S microcontroller and tested for actual use in home environment.

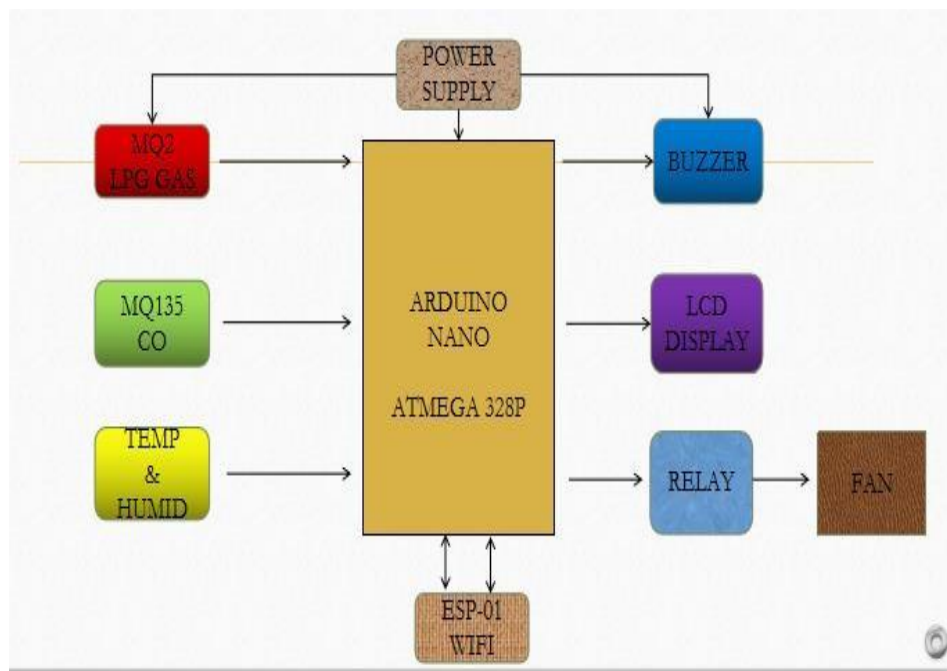
IOT Based Air Pollution Monitoring System monitors the Air Quality over a web server using internet and will activate an alarm when the air quality goes down beyond a certain level, means when there is amount of harmful gases present in the air like CO₂, smoke, alcohol, benzene, NH₃, NO_x and LPG. The system will show the air quality in PPM on the LCD and as well as on web page so that it can be monitored very easily. Temperature and Humidity and supervised in the system.

CHAPTER 3

AIM AND SCOPE OF PRESENT INVESTIGATION

Aim and scope of the present system is IOT Based Air Quality Monitoring System that monitors the Air Quality over a web server using internet and will activate an alarm when the air quality goes down beyond a certain level, that means when there is amount of harmful gases present in the air like CO₂, smoke, Temperature, Humidity, LPG gas, The system will show the air quality in PPM on the LCD and as well as on web page so that it can be monitored very easily. Temperature and Humidity is detected and supervised in the system. The below block shows the process of the system.

3.1 BLOCK DIAGRAM



3.2 EXISTING MODEL

The commercial meters available in the market are Fluke CO220 carbon monoxide meter for CO, Amprobe CO₂ meter for CO₂, Forbix Semicon LPG gas leakage sensor alarm for LPG leakage detection. The researchers in this field have

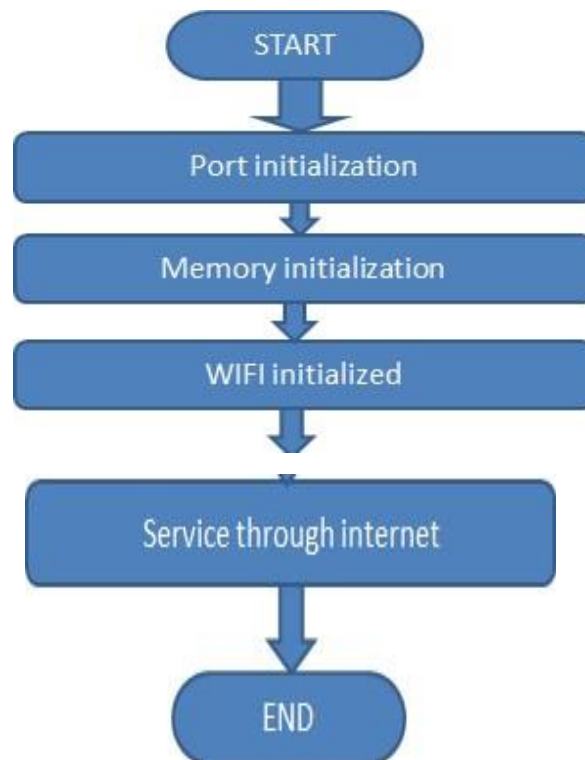
proposed various air quality monitoring systems based on WSN, GSM and GIS. Now each technology has limited uses according to the intended function, as Zigbee is meant for users with Zigbee trans-receiver, Bluetooth. GIS based system is designed, implemented and tested to monitor the pinpoints of air pollution of any area. It consists of a microcontroller, gas sensors, mobile unit, a temporary memory buffer and a web server with internet connectivity which collects data from different locations along with coordinate's information at certain time of a day. The readings for particular location are averaged in a closed time and space. The Global Positioning System (GPS) module is attached to a system to provide accurate representation of pollution sources in an area. The recorded data is periodically transferred to a computer through a General Packet Radio Service (GPRS) connection and then the data will be displayed on the dedicated website with user acceptance. As a result large number of people can benefited with the large.

3.3 DISADVANTAGES

- Here Zigbee module is used for wireless transmission. The system mainly concentrates on sensor based alerts and it lacks improved techniques like camera, web server for uploading files etc.
- The improved real time home security system using Beagle Board and Zigbee Remote alert on intruder detection are the main features of the system. It uses improved techniques such as camera, GSM, FTP server etc. But it is not utilizing the advantage of live streaming and alerting techniques such as phone calls, SMS and email etc.,
- Most of the previously utilized Zigbee based WSN has limited range and bandwidth.
- This system is not sending any notification to user whenever any event occurs in his home. User has to monitor his home continuously and also it lacks sensor based alerts.

3.4 PROPOSED MODEL

We propose an air quality monitoring system that allows us to monitor and check live air quality in an area through IOT.



System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit level and reports it. The sensors interact with ARDUINO NANO which processes this data and transmits it over the application.

This allows authorities to monitor air in different areas and act against it. Also, authorities can keep a watch on this pollution near schools, hospitals and no honking areas. When all are connected to ESP01 WIFI module will use BLYNK app its used as third party app. BLYNK app is open source for all .

Creating an app is tough think so we take help of BLYNK app . With help of WIFI esp01 with ARDUINO will be connected to BLYNK app components that are used in system are ARDUINO NANO which is small in size and cost free when comparing to old model UNO,WIFI ESP01 is updated module for old WIFI module ESP8266, MQ135(CO)and MQ2(GAS) sensors are used quality of air check,

REGULATORS (7805) are used to regulate 5v. DIODES (IN4007), 2 CHANNEL RELAY MODULE is used FOR EXHAUST FANS to evacuate harmful gas present in air, CENTERTAPPED TRANSFORMER (230V/3A) is used as input,

BUZZER starts beeping when the following sensors reach their limit and message will be sent to the connected device.

The system is based on WIFI board as an internet of things system. The WIFI module is connected to the internet from the HOTSPOT of the smart phone via WIFI connection as the Arduino has ESP-01 WIFI module to connect with the internet.

WIFI to be connected to the HOTSPOT of the smart phone, needs to be identified to the name of HOTSPOT, the password and token code letting the server of BLYNK connect them together. You may need the computer once to transfer code from Arduino IDE to the WIFI module kit to prepare the software part of the project. It shows that the server of Blynk application will process the smartphone

WIFI connection. BLYNK libraries are ZIP files can be downloaded from GITHUB website to be imported to the Arduino IDE library.

BLYNK server will check for internet connection, WIFI with android HOTSPOT the WIFI code includes the token code, the name of HOTSPOT and its password. The information included to the code must match with the HOTSPOT information to allow ESP01 connect with the WIFI to be as a channel to exchange commands between smart phone and module. Remaining processes are just commands sent from BLYNK application to WIFI to control loads those are connected to the relay kit. And sensor output value is sent reverse to the BLYNK application from WIFI kit.

CHAPTER 4

MATERIALS, METHODS AND ALGORITHMS USED

4.1 HARDWARE REQUIREMENT'S

MQ135 CO SENSOR

MQ2 LPG SENSOR.

ARDUINO NANO ATMEGA 328P.

WIFI MODULE ESP01.

LCD DISPLAY.

DHT11 SENSOR (TEMPERATURE AND HUMIDITY).

CENTERTAPPED TRANSFORMER (230/3A).

RELAY MODULE (WITH EXHAUST FAN).

BUZZER.

4.2 SOFTWARE REQUIREMENTS

EMBEDDED C LANGUAGE.

ARDUINO SOFTWARE.

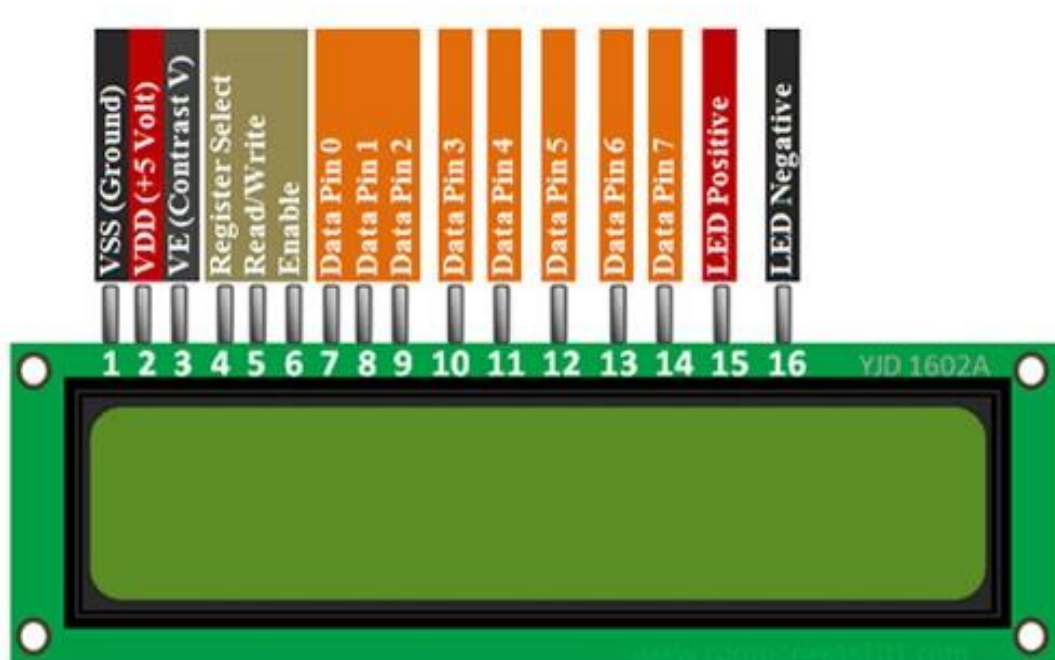


Fig 4.1:16*2 LCD DISPLAY MODULE

Pin Configuration

Pin No	Pin Name	Description
1	Vss (Ground)	Ground pin connected to system ground
2	Vdd (+5 Volt)	Powers the LCD with +5V (4.7V – 5.3V)
3	VE (Contrast V)	Decides the contrast level of display. Grounded to get maximum contrast.
4	Register Select	Connected to Micro controller to shift between command/data register
5	Read/Write	Used to read or write data. Normally grounded to write data to LCD
6	Enable	Connected to Micro controller Pin and toggled between 1 and 0 for data acknowledgement
7	Data Pin 0	Data pins 0 to 7 forms a 8-bit data line. They can be connected to Micro controller to send 8-bit data. These LCD's can also operate on 4-bit mode in such case Data pin 4,5,6 and 7 will be left free.

8	Data Pin 1	
Pin No	Pin Name	Description
9	Data Pin 2	
10	Data Pin 3	
11	Data Pin 4	
12	Data Pin 5	
13	Data Pin 6	
14	Data Pin 7	
15	LED Positive	Backlight LED pin positive terminal
16	LED Negative	Backlight LED pin negative terminal

4.3 FEATURES OF 16×2 LCD MODULE

- # Operating Voltage is 4.7V to 5.3V
- # Current consumption is 1mA without backlight
- # Alphanumeric LCD display module, meaning can display alphabets and numbers
- # Consists of two rows and each row can print 16 characters.
- # Each character is build by a 5×8 pixel box
- # Can work on both 8-bit and 4-bit mode
- # It can also display any custom generated characters
- # Available in Green and Blue Backlight

4.4 BRIEF DESCRIPTION ON LCD MODULES

LCD modules are very commonly used in most embedded projects,

the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO 's or calculators. The appearance and the pin outs have already been visualized above now let us get a bit technical.

16×2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have ($16 \times 2 = 32$) 32 characters in total and each character will be made of 5×8 Pixel Dots. A Single character with all its Pixels is shown in the below picture.

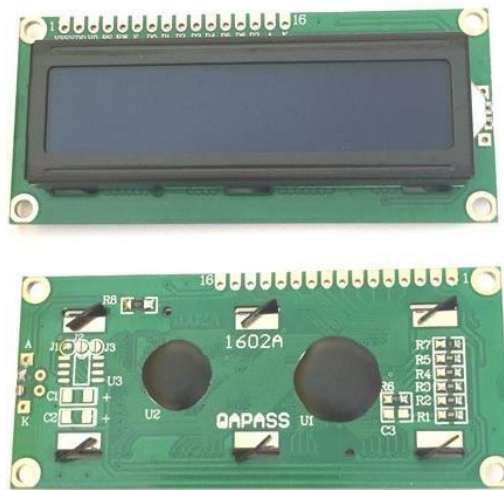


Fig. 4.2 LCD Modules

4.5 RELAY MODULE

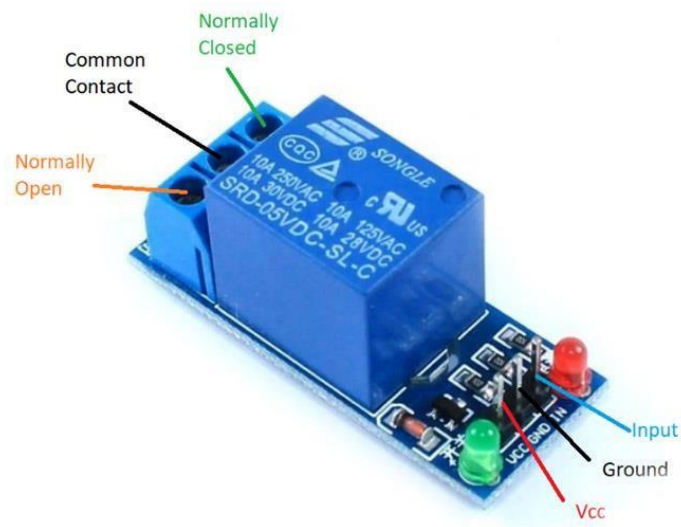


Fig. 4.3 Relay Module

Relay is an Electro mechanical device that uses an electric current to open or close the contacts of a switch. The single-channel relay module is much more than just a plain relay, it comprises of components that make switching and connection easier and act as indicators to show if the module is powered and if the relay is active or not.

Single-Channel Relay Module Specifications

- Supply voltage – 3.75V to 6V
- Quiescent current: 2mA
- Current when the relay is active: ~70mA
- Relay maximum contact voltage – 250VAC or 30VDC
- Relay maximum current – 10A

Components Present on a 5V Single Channel Relay Module

The following are the major components present on a relay module; we will get into the details later in this article.

5V Relay, Transistor, Diode, LEDs, Resistors, Male Header pins, 3-pin screw-type terminal connector, etc.

Single-Channel Relay Module Pin Description

Pin Number	Pin Name	Description
1	Relay Trigger	Input to activate the relay
2	Ground	0V reference
3	VCC	Supply input for powering the relay coil
4	Normally Open	Normally open terminal of the relay
5	Common	Common terminal of the relay
6	Normally Closed	Normally closed contact of the relay

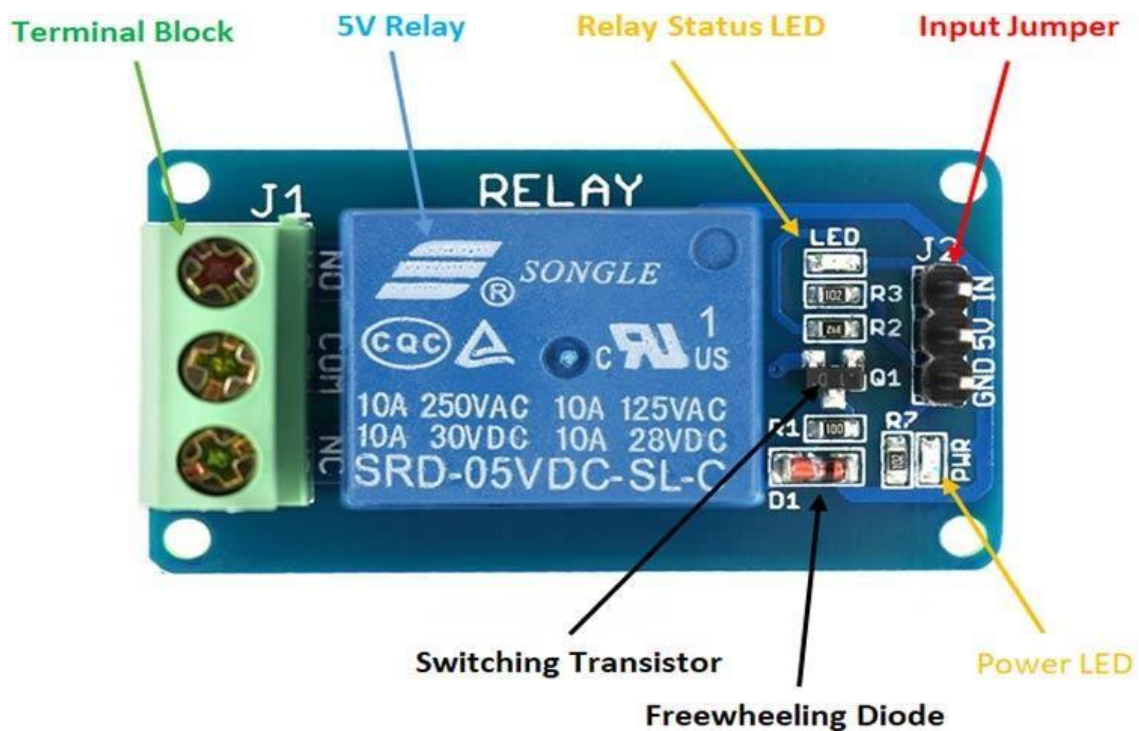
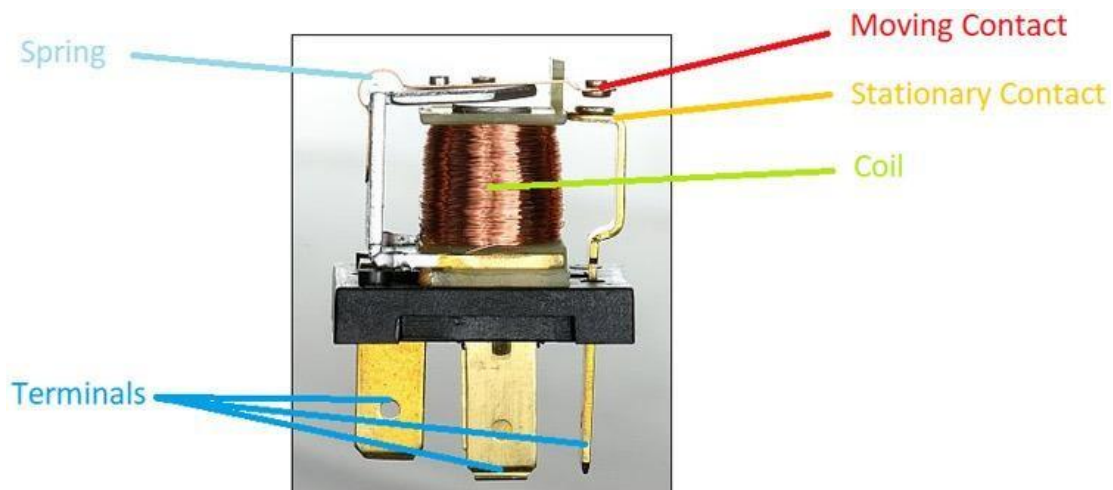


Fig. 4.4 Single-Channel Relay Module

The single-channel relay module is much more than just a plain relay, it contains components that make switching and connection easier and act as indicators to show if the module is powered and if the relay is active.

First is the screw terminal block. This is the part of the module that is in contact with mains so a reliable connection is needed. Adding screw terminals makes it easier to connect thick mains cables, which might be difficult to solder directly. The three connections on the terminal block are connected to the normally open, normally closed, and common terminals of the relay.

The second is the relay itself, which, in this case, is a blue plastic case. Lots of information can be gleaned from the markings on the relay itself. The part number of the relay on the bottom says “05VDC”, which means that the relay coil is activated at 5V minimum – any voltage lower than this will not be able to reliably close the contacts of the relay.

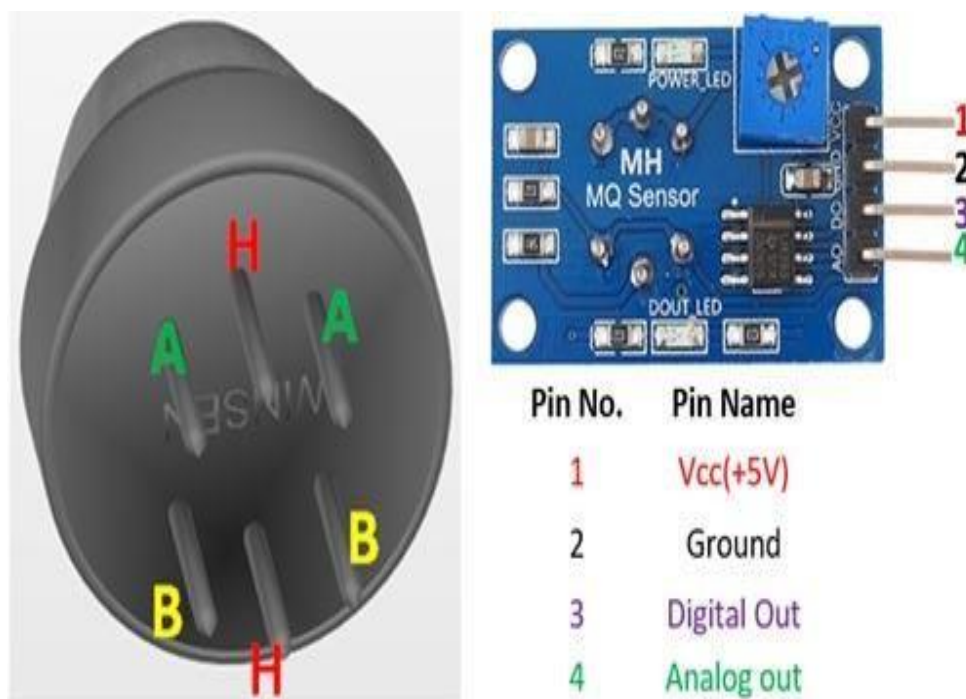


The relay uses an electric current to open or close the contacts of a switch. This is usually done using the help of a coil that attracts the contacts of a switch and pulls them together when activated, and a spring pushes them apart when the coil is not energized.

MQ2 Gas Sensor



Fig. 4.5 MQ2 Gas Sensor



Pin Configuration

Features

Pin No	Pin Name	Description
For Module		
1	Vcc	This pin powers the module, typically the operating voltage is +5V
2	Ground	Used to connect the module to system ground
3	Digital Out	You can also use this sensor to get digital output from this pin, by setting a threshold value using the potentiometer
4	Analog Out	This pin outputs 0-5V analog voltage based on the intensity of the gas
For Sensor		
1	H -Pins	Out of the two H pins, one pin is connected to supply and the other to ground
2	A-Pins	The A pins and B pins are interchangeable. These pins will be tied to the Supply voltage.
3	B-Pins	The A pins and B pins are interchangeable. One pin will act as output while the other will pulled to ground.

- Operating Voltage is +5V
- Can be used to Measure or detect LPG, Alcohol, Propane, Hydrogen, CO and even methane
- Analog output voltage: 0V to 5V
- Digital Output Voltage: 0V or 5V (TTL Logic)
- Preheat duration 20 seconds
- Can be used as a Digital or analog sensor
- The Sensitivity of Digital pin can be varied using the potentiometer

Where to use MQ-2 Gas sensor

The **MQ-2 Gas sensor** can detect or measure gasses like LPG, Alcohol, Propane, Hydrogen, CO and even methane. The module version of this sensor comes with a Digital Pin which makes this sensor to operate even without a micro controller and that comes in handy when you are only trying to detect one particular gas. When it comes to measuring the gas in ppm the analog pin has to be used, the analog pin also TTL driven and works on 5V and hence can be used with most common micro controllers.

So if you are looking for a sensor to detect or measure gasses like LPG, Alcohol, Propane, Hydrogen, CO and even methane with or without a micro controller then this sensor might be the right choice for you.

How to use MQ-2 Sensors to detect gas

Using an MQ sensor it detects a gas is very easy. You can either use the digital pin or the analog pin to accomplish this. Simply power the module with 5V and you should notice the power LED on the module to glow and when no gas is detected the output LED will remain turned off meaning the digital output pin will be 0V. Remember that these sensors have to be kept on for pre-heating time (mentioned in features above) before you can actually work with it. Now, introduce the sensor to the gas you want to detect and you should see the output LED to go high along with the digital pin, if not use the potentiometer until the output gets high. Now every time your sensor gets introduced to this gas at this particular concentration the digital pin will go high (5V) else will remain low (0V).

You can also use the analog pin to achieve the same thing. Read the analog values (0-5V) using a micro controller, this value will be directly proportional to the concentration of the gas to which the sensor detects. You can experiment with these values and check how the sensor reacts to different concentrations of gas and develop your program accordingly.

Applications

- Detects or measure Gases like LPG, Alcohol, Propane, Hydrogen, CO and even methane
- Air quality monitor
- Gas leak alarm
- Safety standard maintenance
- Maintaining environment standards in hospitals

MQ135 Gas Sensor

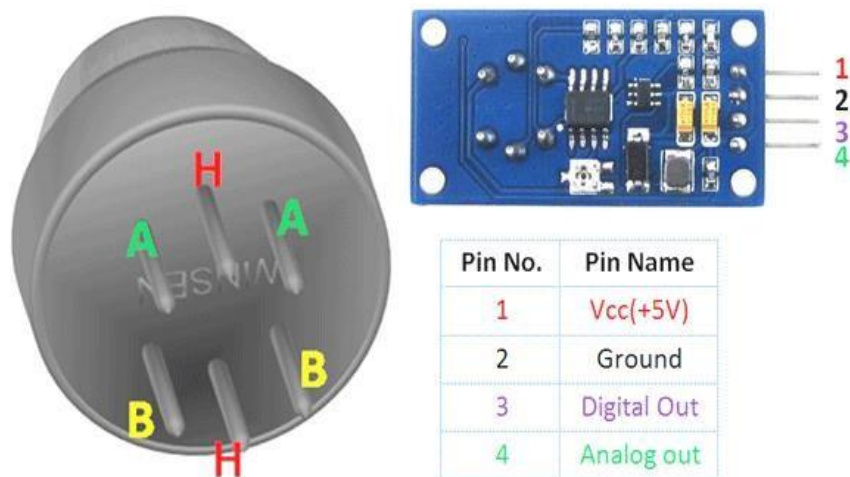


Fig. 4.6 MQ135 Gas Sensor

MQ-135 Sensor Features

- Wide detecting scope
- Fast response and High sensitivity
- Stable and long life
- Operating Voltage is +5V
- Detect/Measure NH₃, NO_x, alcohol, Benzene, smoke, CO₂, etc.

- Analog output voltage: 0V to 5V
- Digital output voltage: 0V or 5V (TTL Logic)
- Preheat duration 20 seconds
- Can be used as a Digital or analog sensor
- The Sensitivity of Digital pin can be varied using the potentiometer

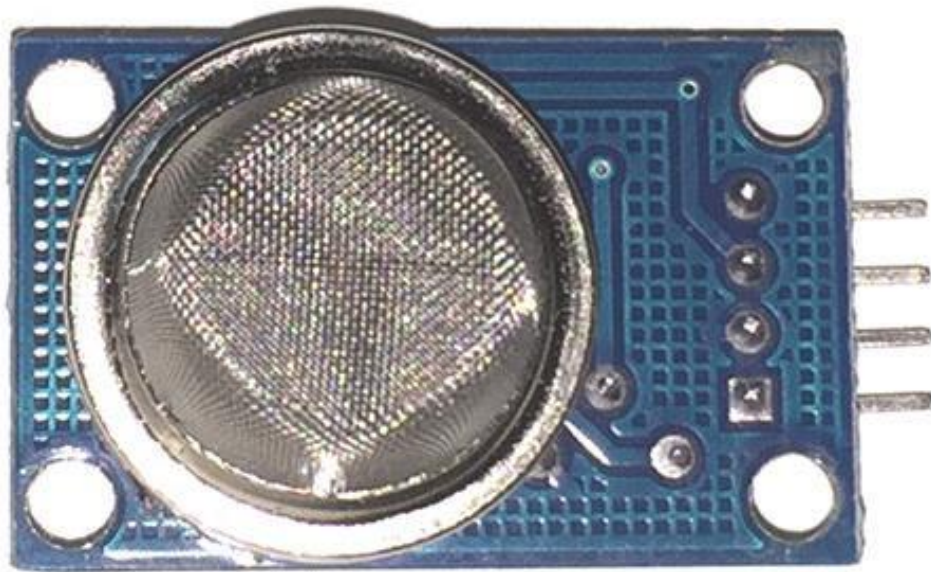


Fig. 4.7 MQ-135 Sensor Features

Pin Configuration

Pin No	Pin Name	Description
For Module		
1	Vcc	Used to power the sensor, Generally the operating voltage is +5V.
2	Ground	Used to connect the module to system ground.
3	Digital Out	You can also use this sensor to get digital output from this pin, by setting a threshold value using the potentiometer.

4	Analog Out	This pin outputs 0-5V analog voltage based on the intensity of the gas.
For Sensor		
1	H -Pins	Out of the two H pins, one pin is connected to supply and the other to ground
2	A-Pins	The A pins and B pins are interchangeable. These pins will be tied to the Supply voltage.
3	B-Pins	13031. A pins and B pins are interchangeable. One pin will act as output while the other will be pulled to ground.

Where to use MQ-135 Gas sensor

The MQ-135 Gas sensors are used in air quality control equipments and are suitable for detecting or measuring of NH₃, NO_x, Alcohol, Benzene, Smoke, CO₂. The MQ-135 sensor module comes with a Digital Pin which makes this sensor to operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. If you need to measure the gases in PPM the analog pin need to be used. The analog pin is TTL driven and works on 5V and so can be used with most common microcontrollers. If you are looking for a sensor to detect or measure common air quality gases such as CO₂, Smoke, NH₃, NO_x, Alcohol, Benzene then this sensor might be the right choice for you.

How to use MQ-135 Sensors to detect gases

You can either use the digital pin or the analog pin to do this. Simply power the module with 5V and you should notice the power LED on the module to glow and when no gas it detected the output LED will remain turned off meaning the digital output pin will be 0V. Remember that these sensors have to be kept on for pre-heating time (mentioned in features above) before you can actually work with it. Now, introduce the sensor to the gas you want to detect and you should see the output LED to go high along with the digital pin, if not use the potentiometer until the output gets high. Now every time your sensor gets introduced to this gas at this particular concentration the digital pin will go high (5V) else will remain low (0V).

You can also use the analog pin to achieve the same thing. Read the analog values (0-5V) using a microcontroller, this value will be directly proportional to the concentration of the gas to which the sensor detects. You can experiment with this values and check how the sensor reacts to different concentration of gas and develop your program accordingly.

Applications

- Used to detect leakage/excess of gases like Ammonia, nitrogen oxide, alcohols, aromatic compounds, sulfide and smoke.
- Air quality monitors.

Buzzer (Active and Passive)

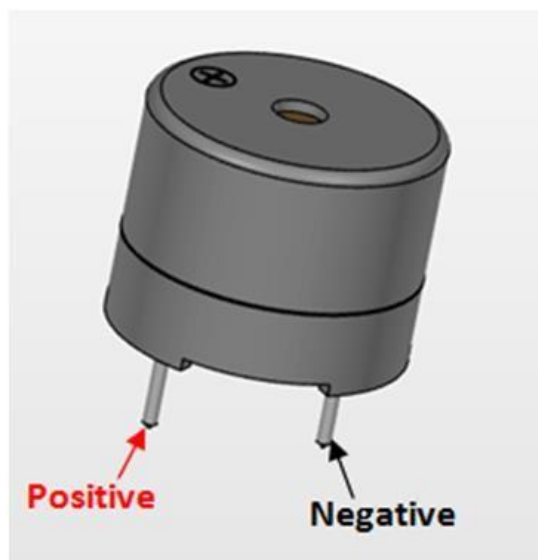


Fig. 4.8 Buzzer (Active and Passive)

Buzzer Pin Configuration

Pin Number	Pin Name	Description
1	Positive	Identified by (+) symbol or longer terminal lead. Can be powered by 6V DC
2	Negative	Identified by short terminal lead. Typically connected to the ground of the circuit



Fig. 4.9 Buzzer Pin Configuration

Buzzer Features and Specifications

- Rated Voltage: 6V DC
- Operating Voltage: 4-8V DC
- Rated current: <30mA
- Sound Type: Continuous Beep
- Resonant Frequency: ~2300 Hz
- Small and neat sealed package
- Breadboard and Perf board friendly

How to use a Buzzer

A **buzzer** is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Per Board and even on PCB which makes this a widely used component in most electronic applications.

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a ready made buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application.

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

Applications of Buzzer

- Alarming Circuits, where the user has to be alarmed about something
- Communication Equipment.
- Automobile electronics
- Portable equipment, due to its compact size

Voltage Regulator (7805) IC

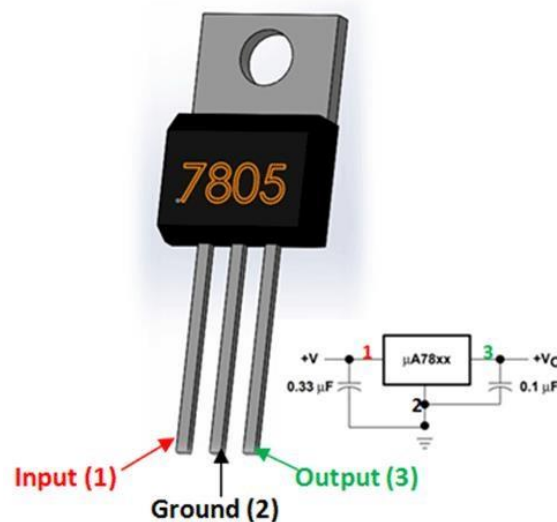


Fig. 4.10 Voltage Regulator (7805) IC

Pin Configuration

Pin Number	Pin Name	Description
1	Input (V+)	Unregulated Input Voltage
2	Ground (Gnd)	Connected to Ground
3	Output (Vo)	Outputs Regulated +5V

7805 Regulator Features

5V Positive Voltage Regulator

Minimum Input Voltage is 7V

Maximum Input Voltage is 25V

Operating current (I_Q) is 5mA

Internal Thermal Overload and Short circuit current limiting protection is available.

Junction Temperature maximum 125 degree Celsius

Available in TO-220 and KTE package

4.6 BRIEF DESCRIPTION ON 7805 VOLTAGE REGULATOR IC

Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. In our case the 7805 IC is an iconic regulator IC that finds its application in most of the projects. The name 7805 signifies two meaning, “78” means that it is a positive voltage regulator and “05” means that it provides 5V as output. So our 7805 will provide a +5V output voltage.

The output current of this IC can go up to 1.5A. But, the IC suffers from heavy heat loss hence a Heat sink is recommended for projects that consume more current. For example if the input voltage is 12V and you are consuming 1A, then $(12 - 5) * 1 = 7W$. This 7 Watts will be dissipated as heat.

7805 as +5V Voltage Regulator

This is a typical application circuit of the 7805 IC. We just need two capacitors of value 33uF and 0.1uF to get this IC working.

The input capacitor 0.33uF is a ceramic capacitor that deals with input inductance problem and the output capacitor 0.1uF is also a ceramic capacitor that adds to the stability of the circuit. These capacitors should be placed close to the

terminals for them to work effectively. Also they should be of ceramic type, since ceramic capacitors are faster than electrolytic.

7805 as adjustable output Regulator

This IC can also act as an adjustable output voltage regulator, meaning you can also control the output voltage for your desired value using the below circuit.

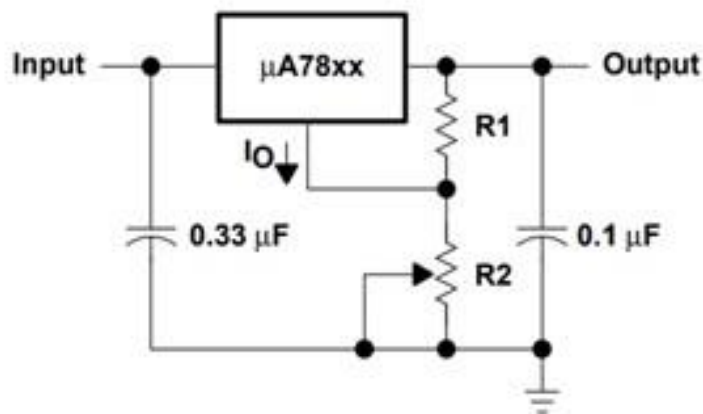


Fig. 4.11 7805 as adjustable output Regulator Circuit

Here, the input voltage can be anywhere between 9V-25V, and the output voltage can be adjusted using the value of resistance R1 and R2. The value can be calculated using the below formulae.

$$V_O = V_{xx} + \left(\frac{V_{xx}}{R_1} + I_Q \right) R_2 \quad (4.1)$$

Where, $V_{xx}=5$, $I_Q = 5 \times 10^{-3}$

7805 Applications

Constant +5V output regulator to power microcontrollers and sensors in most of the projects

Adjustable Output Regulator

Current Limiter for certain applications

Regulated Dual Supply

Output Polarity-Reversal-Protection Circuit

4.7 ARDUINO NANO (MEGA 328P)

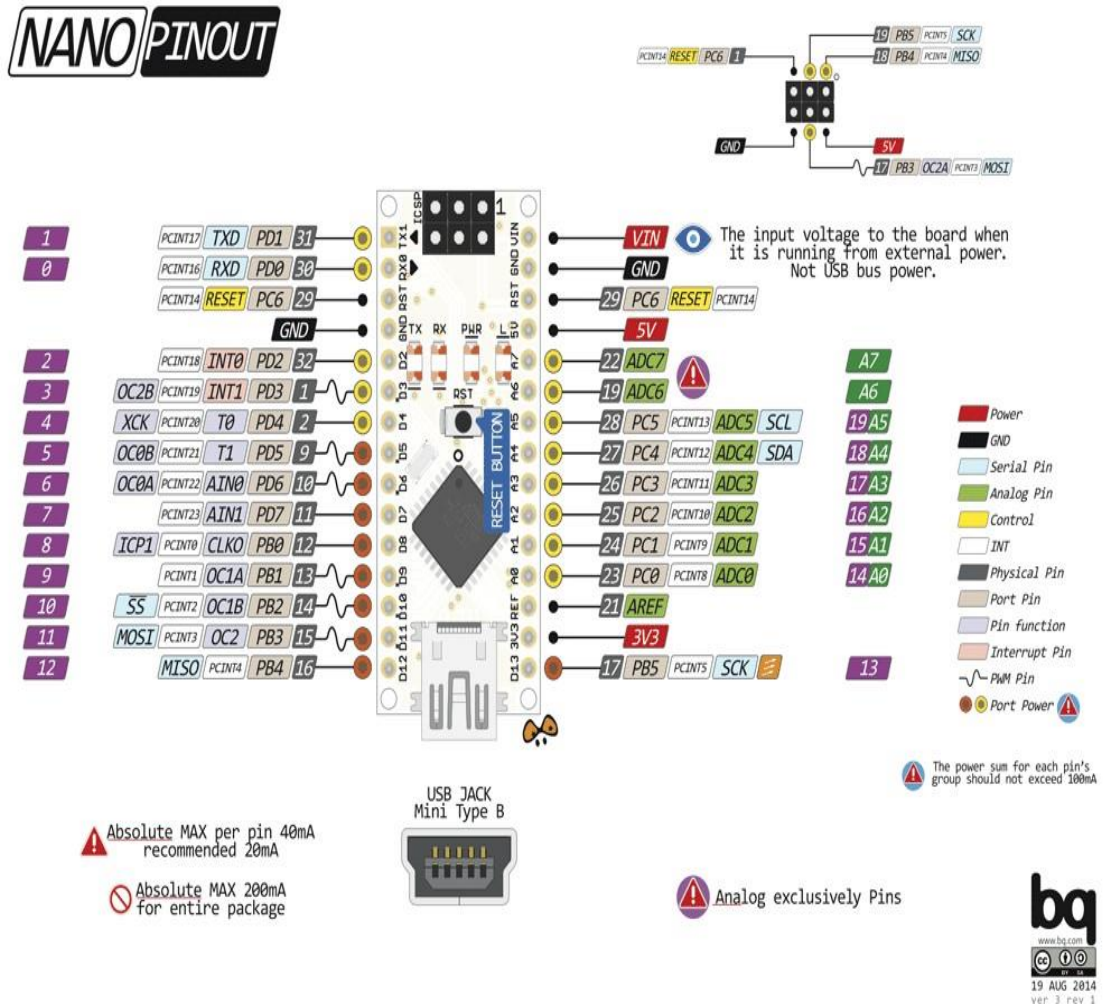


Fig. 4.12 Arduino Nano (MEGA 328P)

Pin Configuration

Pin Category	Pin Name	Details
--------------	----------	---------

Power	Vin, 3.3V, 5V, GND	Vin: Input voltage to Arduino when using an external power source (6-12V). 5V: Regulated power supply used to power microcontroller and other components on the board. 3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 50mA. GND: Ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	A0 – A7	Used to measure analog voltage in the range of 0-5V
Input/Output Pins	Digital Pins D0 - D13	Can be used as input or output pins. 0V (low) and 5V (high)
Serial	Rx, Tx	Used to receive and transmit TTL serial data.
External Interrupts	2, 3	To trigger an interrupt.
PWM	3, 5, 6, 9, 11	Provides 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	13	To turn on the inbuilt LED.
IIC	A4 (SDA), A5 (SCA)	Used for TWI communication.
AREF	AREF	To provide reference voltage for input voltage.

4.8 DIFFERENCE BETWEEN ARDUINO UNO AND ARDUINO NANO

The **Arduino Nano** is very much similar to the Arduino UNO. They use the same Processor (Atmega328p) and hence they both can share the same program. One big difference between both is the size UNO is twice as big as Nano

and hence occupies more space on your project. Also Nano is breadboard friendly while Uno is not. To program a Uno you need Regular USB cable where as for Nano you will need a mini USB cable. The technical difference between Uno and Nano is shown below.

Pin Configuration

Name	Processor	Operating / Input Voltage	CPU speed	Analog In/Out	Digital IO/PWM	EEPROM / SRAM[kB]	Flash	USB	USART
Uno	ATmega328P	5V / 7-12V	16 MHz	6 / 0	14 / 6	1 / 2	32	Regular	1
Nano	ATmega328P	5V / 7-12V	16 MHz	8 / 0	14 / 6	1 / 2	32	Mini	1

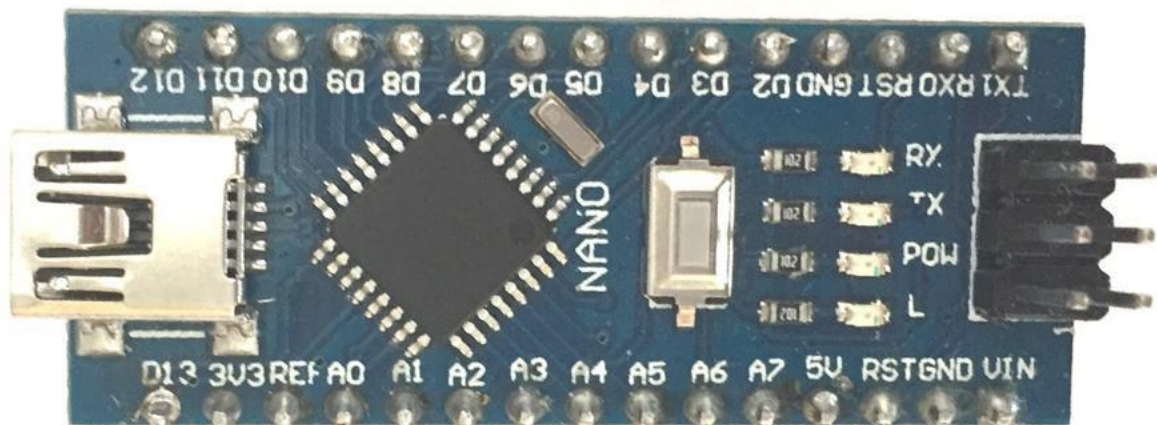


Fig. 4.13 Arduino Nano

4.9 UPLOADING YOUR FIRST PROGRAM

Once ARDUINO IDE is installed on the computer, connect the board with computer using USB cable. Now open the ARDUINO IDE and choose the correct board by selecting Tools>Boards>Arduino/NANO and choose the correct Port by selecting Tools>Port. Arduino UNO is programmed using Arduino programming language based on Wiring. To get it started with Arduino UNO board and blink the built-in LED, load the example code by selecting Files>Examples>Basics>Blink. Once the example code (also shown below) is loaded into your IDE, click on the

'upload' button given on the top bar. Once the upload is finished, you should see the Arduino's built-in LED blinking. Below is the example code for blinking:

```
// the setup function runs once when you press reset or power the board void
setup() {

  // initialize digital pin LED_BUILTIN as an output.

  pinMode(LED_BUILTIN, OUTPUT);

}

// the loop function runs over and over again forever void loop() {

digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
delay(1000);           // wait for a second digitalWrite(LED_BUILTIN, LOW); // turn
the LED off by making the voltage LOW delay(1000);           // wait for a second

}
```

Applications

- Prototyping of Electronics Products and Systems
- Multiple DIY Projects.
- Easy to use for beginner level DIYers and makers.
- Itiple I/O interfaces and communications.

4.10 CENTERTAPPED TRANSFORMER

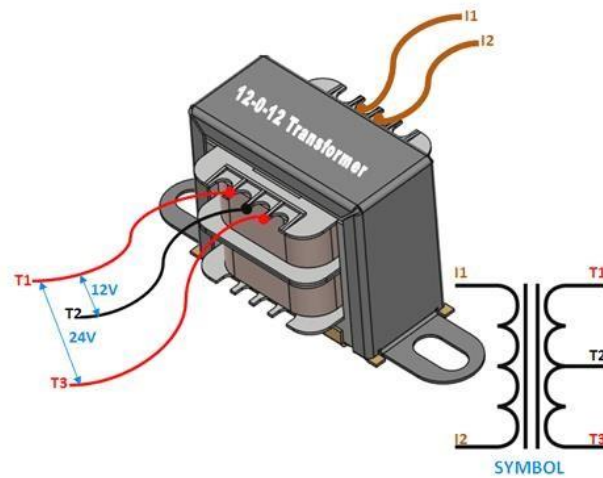


Fig. 4.14 Centertapped Transformer

Transformer Terminal Description

No	Terminal	Description Name
1	I1 and I2	These are the input wires for the transformer, it is connected to the phase and neutral of AC mains
2	T1 and T3	There are the output terminals of the Transformer, the voltage across it will be 24V AC
3	T2	This is the centre tapped wire of the transformer; this wire can be combined with either T1 or T3 to get 12V AC across it. It's very useful for rectifier circuits

12-0-12 Centre Tapped Transformer Specifications

- Step-down Centre tapped Transformer
- Input Voltage: 220V AC at 50Hz
- Output Voltage: 24V, 12V or 0V
- Output Current: 1A
- Vertical mount type

- Low cost and small package

Where to Use Centre Tapped transformer

A **centre-tapped transformer** also known as **two phase three wire transformer** is normally used for rectifier circuits. When a digital project has to work with AC mains a Transformer is used to step-down the voltage (in our case, to 24V or 12V) and then convert it to DC by using a rectifier circuit. In a center-tapped transformer the peak inverse voltage is twice as in bridge rectifier hence this transformer is commonly used in full wave rectifier circuits.

How to use Center Tapped Transformer

The operation and theory behind a Center tapped transformer is very similar to a normal secondary transformer. A primary voltage will be induced in the primary coil (I1 and I3) and due to magnetic induction the voltage will be transferred to the secondary coil. Here in the secondary coil of a centre tapped transformer, there will be an additional wire (T2) which will be placed exactly at the center of the secondary coil, hence the voltage here will always be zero.

If we combine this zero potential wire (T2) with either T1 or T2, we will get a voltage of 12V AC. If this wire is ignored and voltage across T1 and T2 is considered then we will get a voltage of 24V AC. This feature is very useful for the function of a full wave rectifier. Let us consider the voltage given by the first half of the secondary coil as V_a and the voltage across the second half of the secondary coil as V_b as shown in the diagram below.

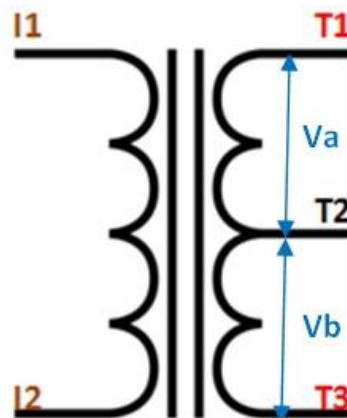


Fig. 4.15 Secondary coil as Vb

As we know the voltage across the coil depends on the number of turns on the primary and secondary coil. Using the turns ratio formulae we can calculate the secondary voltage as:

$$V_a = (N_a / N_p) * V_p$$

$$V_b = (N_b / N_p) * V_p$$

Where,

V_a = Voltage across the first half of Secondary coil

V_b = Voltage across the second half of Secondary coil

V_p = Voltage across the Primary coil

N_a = Number of turn in the first half of Secondary coil

N_b = Number of turn in the second half of Secondary coil

N_p = Number of turn in the Primary coil

Applications

- Rectifier circuits
- AC-AC step down
- Full wave rectifiers

4.11 DHT11 SENSOR (TEMPERATURE AND HUMIDITY)

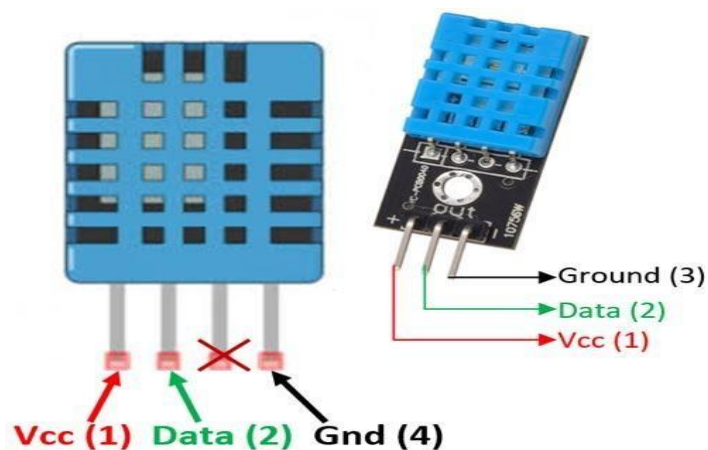


Fig. 4.16 DHT11 Sensor

Pin Identification and Configuration

No	Pin Name	Description
For DHT11 Sensor		
1	Vcc	Power supply 3.5V to 5.5V
2	Data	Outputs both Temperature and Humidity through serial Data
3	NC	No Connection and hence not used
4	Ground	Connected to the ground of the circuit
For DHT11 Sensor module		
1	Vcc	Power supply 3.5V to 5.5V
2	Data	Outputs both Temperature and Humidity through serial Data
3	Ground	Connected to the ground of the circuit

You can buy DHT11 sensor module from [here](#).

DHT11 Specifications

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: $\pm 1^{\circ}\text{C}$ and $\pm 1\%$

Where to use DHT11

The **DHT11** is a commonly used **Temperature and humidity sensor**. The sensor comes with a dedicated NTC to measure temperature and an

8-bit micro controller to output the values of temperature and humidity as serial data.

The sensor is also factory calibrated and hence easy to interface with other micro controllers.

The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of $\pm 1^\circ\text{C}$ and $\pm 1\%$. So if you are looking to measure in this range then this sensor might be the right choice for you.

How to use DHT11 Sensor

The DHT11 Sensor is factory calibrated and outputs serial data and hence it is highly easy to set it up. The connection diagram for this sensor is shown below.

As you can see the data pin is connected to an I/O pin of the MCU and a 5K pull-up resistor is used. This data pin outputs the value of both temperature and humidity as serial data. If you are trying to interface DHT11 with Arduino then there are ready-made libraries for it which will give you a quick start.

If you are trying to interface it with some other MCU then the datasheet given below will come in handy. The output given out by the data pin will be in the order of 8bit humidity integer data + 8bit the Humidity decimal data +8 bit temperature integer data + 8bit fractional temperature data +8 bit parity bit. To request the DHT11 module to send these data the I/O pin has to be momentarily made low and then held high as shown in the timing.

The duration of each host signal is explained in the DHT11 datasheet, with neat steps and illustrative timing diagrams.

Applications

- Measure temperature and humidity
- Local Weather station
- Automatic climate control

- Environment monitoring

4.12 ESP-01 WIFI MODULE



Fig. 4.17 ESP-01 WIFI Module

Details

The ESP01 is an impressive, low cost WiFi module suitable for adding WiFi functionality to an existing micro controller project via a UART serial connection. The module can even be reprogrammed to act as a standalone WiFi connected device – just add power!

- 802.11 b/g/n protocol
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack

This module is a self-contained SOC (System On a Chip) that doesn't necessarily need a micro controller to manipulate inputs and outputs as you would normally do with an Arduino, for example, because the ESP-01 acts as a small computer. Thus, you can give a micro controller internet access like the Wi-Fi shield does to the Arduino, or you can simply program the ESP8266 to not only have access to a Wi-Fi network, but to act as a micro controller as well, which makes the ESP8266 very versatile.

4.13 ARDUINO IDE SOFTWARE



Fig. 4.18 Arduino IDE Software

Arduino Software (IDE)

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple micro controller board, and a development environment for writing software for the board.

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicate with software running on your computer. The boards can be assembled by hand or purchased pre assembled; the open-source IDE can be downloaded for free.

The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

CODE

```
#include <ESP8266_Lib.h>
#include <BlynkSimpleShieldEsp8266.h>
#include "dht.h"
#define dht_apin A2 // Analog Pin sensor is connected to
#define buzzer 8
#define Fan 9 dht
DHT;

#include <LiquidCrystal.h>
const int rs = 2, en = 3, d4 = 4, d5 = 5, d6 = 6, d7 = 7;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

unsigned int sensor1=A0; unsigned int sensor2=A1;
unsigned int corbon,gas_value,flag=1; int
TEMP,HUMDY; char auth[] =
"06BrmUpQhSf0XslafuFCug8rXxHH_tHc"; char ssid[] =
"loadshare"; char pass[] = "loadshare";
#define ESP8266_BAUD 115200
#define EspSerial Serial
ESP8266 wifi(&EspSerial);
//////////send message//////////

//////////setup//////////

void setup()

{
```

```

Serial.begin(115200);
Blynk.begin(auth, wifi, ssid, pass);
pinMode(sensor1,INPUT);
pinMode(sensor2,INPUT);
pinMode(buzzer,OUTPUT); pinMode(Fan,OUTPUT);
lcd.begin(16, 2);
//lcd.clear();          //clear
lcd.setCursor(0,0); lcd.print("WELCOME");
delay(500);
}

```

```

////////////////////////////////loop////////////////////////////////

```

```

int db=0;

```

```

void loop()
{

```

```

gas_value=analogRead(sensor1);
corbon=analogRead(sensor2); TEMP=DHT.temperature;
HUMDY=DHT.humidity;
DHT.read11(dht_apin);

```

```

Serial.print("Current humidity = ");
Serial.print(DHT.humidity);
Serial.print("% ");
Serial.print("temperature = ");
Serial.print(DHT.temperature);
Serial.print("C ");

```

```
Serial.print(gas_value);  
Serial.print(" ppm ");  
Serial.print(corbon);  
Serial.println(" ppm ");
```

```
if (gas_value > 600 )  
{  
  Blynk.run();  
  Blynk.notify("LPG GAS IS HIGH IN AIR");  
  Blynk.virtualWrite(V0,gas_value);  
  Blynk.virtualWrite(V1,corbon);  
  Blynk.virtualWrite(V2,DHT.humidity);  
  Blynk.virtualWrite(V3,DHT.temperature);  
  // Serial.println(corbon);  
  // Serial.println("lpg is high");  
  //lcd.clear();  
  lcd.setCursor(0,0);  
  lcd.print("LPG : ");  
  lcd.print(gas_value); lcd.print("  
PPM"); lcd.setCursor(0,1);  
  lcd.print("LPG IS HIGH: ");  
  digitalWrite(buzzer,HIGH);  
  digitalWrite(Fan,LOW);  
  delay(1000);  
}
```

```
if (corbon > 70 )  
{  
  Blynk.run();
```

```

Blynk.virtualWrite(V0,gas_value);
Blynk.virtualWrite(V1,corbon);
Blynk.virtualWrite(V2,DHT.humidity);
Blynk.virtualWrite(V3,DHT.temperature);
Blynk.notify("CO IS HIGH IN AIR");
Serial.println(corbon);
Serial.println("carbon is high");
//lcd.clear();
lcd.setCursor(0,0);
lcd.print("CO :");
lcd.print(corbon); lcd.print("
PPM"); lcd.setCursor(0,1);
lcd.print("CO IS HIGH: ");
digitalWrite(buzzer,HIGH);
digitalWrite(Fan,LOW);
delay(1000);
}

```

```

if (TEMP > 30 )
{
  Blynk.run();
  Blynk.virtualWrite(V0,gas_value);
  Blynk.virtualWrite(V1,corbon);
  Blynk.virtualWrite(V2,DHT.humidity); Blynk.virtualWrite(V3,int(DHT.temperature));
  Blynk.notify("TEMP IS HIGH IN AIR");
  Serial.println(corbon);
  Serial.println("TEMP is high");
  // lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("CO :");

```

```

lcd.print(corbon); lcd.print("
PPM"); lcd.setCursor(0,1);
lcd.print("Temp IS HIGH: ");
digitalWrite(buzzer,HIGH);
digitalWrite(Fan,LOW);
delay(1000);
}

```

```

else
{
  flag=1; //lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("LPG:");
  lcd.print(gas_value);
  lcd.print("PPM ");
  lcd.print("CO:");
  lcd.print(corbon);
  lcd.print(" PPM");
  digitalWrite(buzzer,LOW);
  digitalWrite(Fan,HIGH);
  lcd.setCursor(0,1);
  lcd.print("H:");
  lcd.print(DHT.humidity);
  lcd.print(" ");
  lcd.print("T:");
  lcd.print(DHT.temperatur
e); Blynk.run();
  Blynk.virtualWrite(V0,gas_value);
  Blynk.virtualWrite(V1,corbon);
  Blynk.virtualWrite(V2,DHT.humidity);
}

```

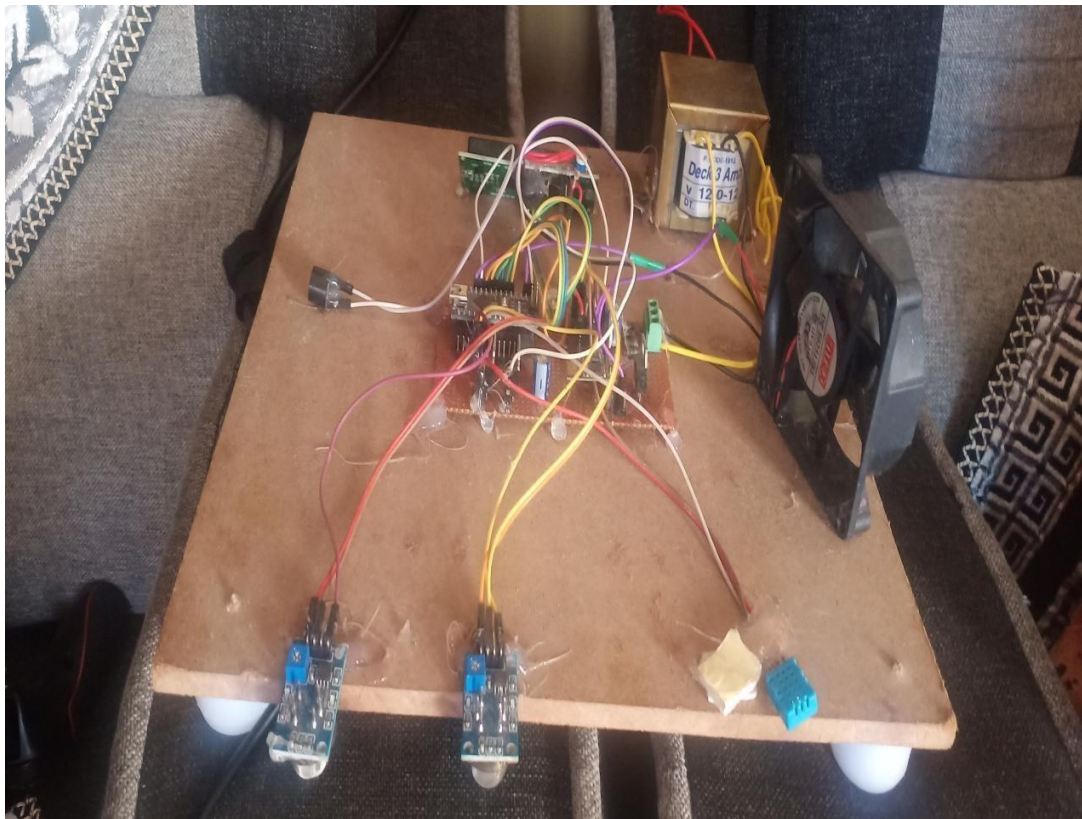
```
Blynk.virtualWrite(V3,DHT.temperature);  
}  
}
```

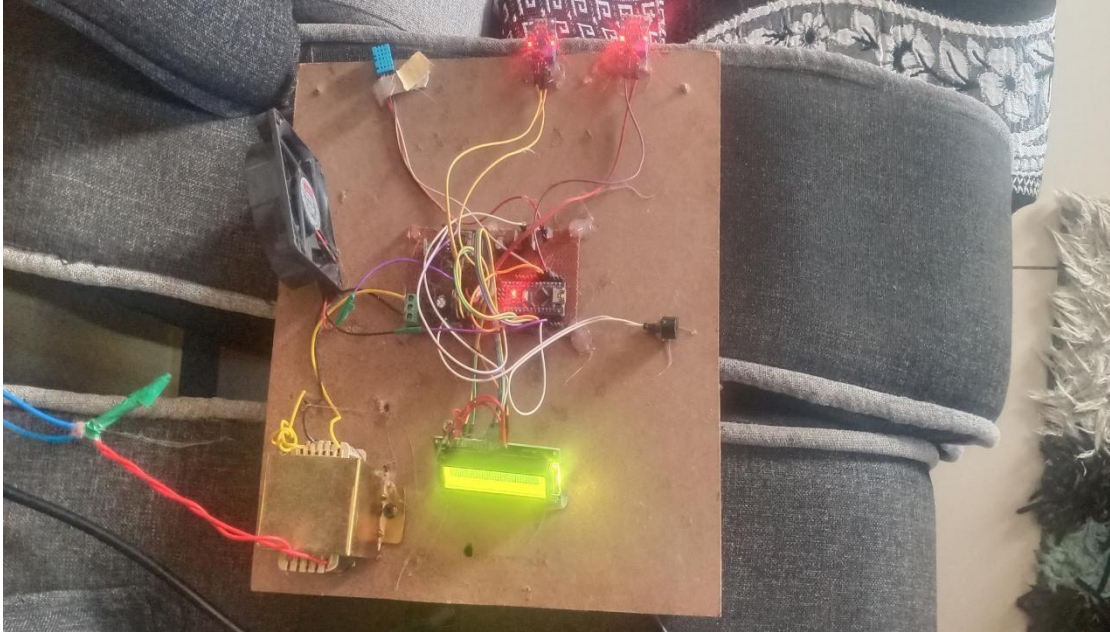
CHAPTER 5

RESULT AND DISCUSSION

For our project, ARDUINO NANO is the heart of the project. All the sensors are connected to the system. After connecting the WIFI successfully to the ESP-01, it gets established with Things peak account with the help of the BLYNK APP of our account provided.

Things peak needs 15 seconds of refresh interval to push to the data. MQ135 and MQ2 sensor values which made to convert to PPM the graphical analysis of the values collected with time on X axis and Air Quality PPM on Y axis.

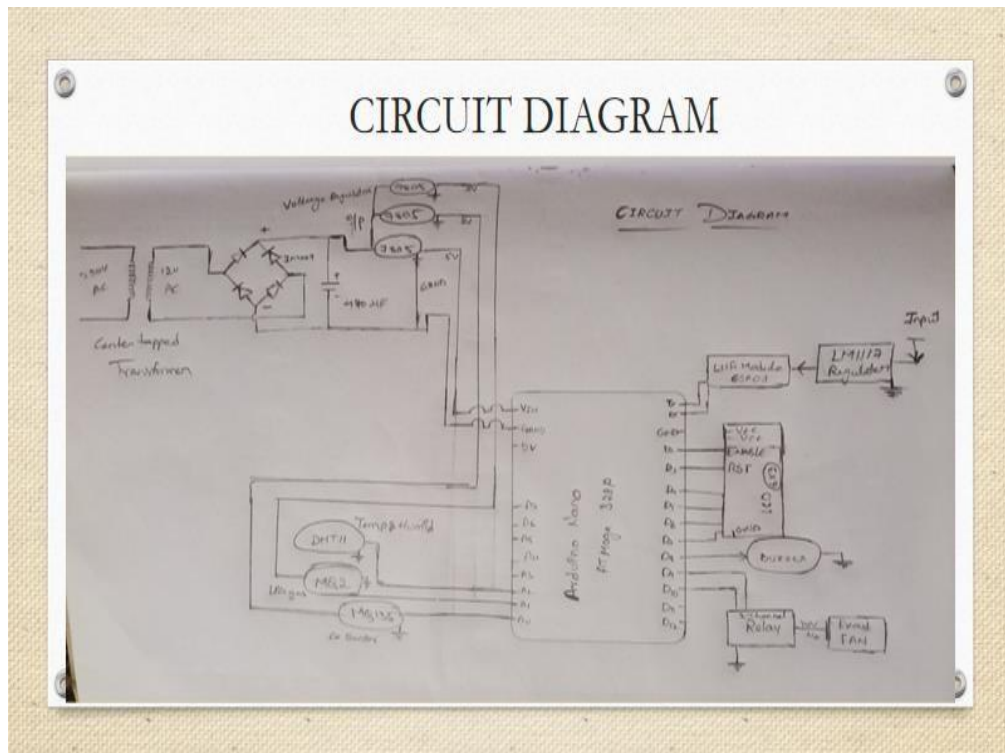




DISCUSSION

We propose an air quality monitoring system that allows us to monitor and check live air quality in an area through IOT. System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit level and reports it. The sensors interact with ARDUINO NANO which processes this data and transmits it over the application. This allows authorities to monitor air in different areas and act against it. Also, authorities can keep a watch on this pollution near schools, hospitals and no honking areas. When all are connected to ESP01 WIFI module will use BLYNK app its used as third party app. BLYNK app is open source for all . Creating an app is tough think so we take help of BLYNK app. With help of WIFI esp01 with ARDUINO will be connected to BLYNK app.

Components that are used in system are ARDUINO NANO which is small in size and cost free when comparing to old model UNO, WIFI ESP01 is updated module for old WIFI module ESP8266, MQ135(CO) and MQ2(GAS) sensors are used quality of air check ,REGULATORS(7805) are used to Regulate 5v.DIODES(IN4007),2 CHANNEL RELAY MODULE is used FOR EXAST FANS to evacuate harmful gas present in air, CENTERTAPPED TRANSFORMER(230V/3A) is used as input, BUZZER starts beeping when the following sensors reach their limit and message will be send to the connected device.



The system is based on WIFI board as an internet of things system. The wifi module is connected to the internet from the HOTSPOT of the smart phone via WIFI connection as the Arduino has ESP-01 WIFI module to connect with the internet. WIFI to be connected to the HOTSPOT of the smart phone, needs to be identified to the name of HOTSPOT, the password and token code letting the server of BLYNK connects them together. You may need the computer once to transfer code from Arduino IDE to the WIFI module kit to prepare the software part of the project. it shows that the server of BLYNK application will process the smartphone WIFI connection. BLYNK libraries are ZIP files can be downloaded from website to be imported to the Arduino IDE library.

BLYNK server will check for internet connection, WIFI with android HOTSPOT the WIFI code includes the token code, the name of HOTSPOT and it's password. The information included to the code must be match with the HOTSPOT information to allow ESP01 connect with the WIFI to be as a channel to exchange commands between smart phone and module. Remaining processes are just commands sent from BLYNK application to WIFI to control loads those are connected to the relay kit. And sensor output value is sent reverse to the BLYNK application from WIFI kit.

CHAPTER 6

FUTURE SCOPE AND CONCLUSION

6.1 CONCLUSION

- The system to monitor the air of environment using Arduino NANO IOT Technology is proposed to improve quality of air. With the use of IOT technology enhances the process of monitoring various aspects of environment such as air quality monitoring issue proposed in this paper. Here the using of MQ135 gas sensor gives the sense of different type of dangerous gas and ARDUINO is the heart of this project which controls the entire process.
- Wi-Fi module connects the whole process to internet and LCD is used for the visual Output. The Automatic Air management system is a step forward to contribute a solution to the biggest threat.
- The air monitoring system overcomes the problem of the highlypolluted areas which is a major issue. It supports the new technology and effectively supports the healthy life concept. This system has features for the people to monitor the amount of pollution on their mobile phones using the application.

1.2 FUTURE SCOPE

1. To make it available in very less cost to ruler area peoples and schools.
2. Reducing more complexity of things and easily available to people.

REFERENCE

- [1] Exploring Arduino : Tools and Techniques for Engineering Wizardry by Jeremy Blum 1st edition [10] Ms. Sarika Deshmukh, Mr.Saurabh surendran and Prof.M.P. Sardey:Air Quality Monitoring System using IoT Volume: 5 Issue: 6
- [2] Ezhilarasi, L., Sripriya, K.,Suganya , A., Vinodhini K.. A System for Monitoring Air and Sound Pollution using Arduino Controller with IOT Technology Vol. 3 Issue 2 (2017) Pages 1781 – 1785.
- [3] <https://circuitdigest.com/microcontroller-projects/iot-air-pollutionmonitoring-using-arduino>
- [4] <https://circuits.io/>
- [5] <https://www.arduino.cc/>
- [6] <https://www.tinkercad.com/>
- [7] Navreetinder Kaur , Rita Mahajan and Deepak Bagai: Air Quality Monitoring System based on Arduino Microcontroller Vol. 5, Issue 6, June 2016
- [8] Palaghat Yaswanth Sai: An IoT Based Automated Air Pollution Monitoring System Vol. 6, Issue 3, March 2017
- [9] Riteeka Nayak, Malaya Ranjan Panigrahy , Vivek Kumar Rai and T Appa Rao:IOT based air Quality monitoring system Vol-3, Issue-4, 2017

DESIGN OF AIR QUALITY MONITORING REPORT

ORIGINALITY REPORT

6%

SIMILARITY INDEX

6%

INTERNET SOURCES

2%

PUBLICATIONS

3%

STUDENT PAPERS

PRIMARY SOURCES

components101.com

3%

1

Internet Source

irjet.net

1%

2

Internet Source

Submitted to Middle East College of

1%

3

Information Technology

Student Paper

Sahani, Mrutyunjaya, Chiranjiv Nanda, 4
Abhijeet Kumar Sahu, and Biswajeet Pattnaik. "Web-
based online embedded door access control and
home security system based on face recognition",
2015 International
Conference on Circuits Power and Computing
Technologies [ICCPCT-2015], 2015.

<1%

Publication

link.springer.com

5 Internet Source

<1%

6 Agus Kurniawan. "Chapter 1 Setting up a Development

Environment", Springer Science <1% and Business Media

LLC, 2021

Publication

Submitted to Universiti Teknologi Malaysia

7 Student Paper

<1%

Submitted to Ahsanullah University of Science
8 and Technology

Student Paper

<1%

Submitted to American University of Kuwait

9 Student Paper

<1%

ijariie.com

10 Internet Source

<1%

www.ijmra.us

11 Internet Source

<1%

"Air Pollution Monitoring and Prediction

12

System for Sustainable Metropolitan Cities using IoT",
International Journal of Engineering and Advanced
Technology, 2020

Publication

<1%

sciencepubco.com

13 Internet Source

<1%

www.ijrte.org

14 Internet Source

<1%

Exclude quotes On

Exclude matches Off

Exclude bibliography On