GSM BASED 3 PHASE STAR DELTA STARTER FOR 3 PHASE INDUCTION MOTOR

A

Project Report

Submitted in partial fulfillments of the requirements

for the Award of the degree of

Bachelor of Technology

In

Electrical Engineering

Rajasthan Technical University, Kota

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JUNE 2022

CANDIDATE'S DECLARATION

We hereby declare that the work, which is being presented in the Project Report entitled "**GSM BASED 3 PHASE STAR DELTA STARTER FOR 3 PHASE INDUCTION MOTOR"** in the partial fulfilment for the award of the degree of **"Bachelor of Technology"** in Electrical Engineering and submitted to the **Department of Electrical Engineering, Geetanjali Institute of Technical Studies,** Rajasthan Technical University (Kota) is a record of our own investigation carried under the guidance of **Mr. Abhishek Sharma**, Department of Electrical Engineering, Geetanjali Institute of Technical studies, Udaipur.

We have not submitted the matter presented in this dissertation anywhere for the award of any other degree.

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UDAIPUR

CERTIFICATE

This is to certify that the project entitled **"GSM BASED 3 PHASE STAR DELTA STARTER FOR 3 PHASE INDUCTION MOTOR**" submitted by **Aaditya Upadhyay, Aditya Shah, Rahul Chasta, Sudhanshu Raj,** and **Virendra Singh** in partial fulfillments of the requirements for the award of the degree of Bachelor of Technology in Electrical Engineering at Geetanjali Institute of Technical Studies, Udaipur in an authentic work carried out by them under my supervisionand guidance.

To the best of my knowledge, the matter embodied in this thesis has not been submitted toany other University/Institute for the award of any degree.

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PREFACE

We feel great pleasure to prepare the project report on **" GSM BASED 3 PHASE STAR DELTA STARTER FOR 3 PHASE INDUCTION MOTOR "**. This report contains all the topics related to the subject.Neat and clean diagrams are used for explanation and their brief description and text part is used to part information about various things. Also, in the preparation of report, various websites are consulted. This project report dealswith various aspects of the smart system and also presents some applications.In this report, some future scopes are also presented.

ACKNOWLEDGEMENT

"Success is to be measured not so much by the position that one has reached in life, but as by the obstacle which he has to overcome while trying to succeed".

We extend our greatest thanks to almighty god, who so ever give us such energy to complete this task.

It was very exciting for us to work on the thesis of **"GSM BASED 3 PHASE STAR DELTA STARTER FOR 3 PHASE INDUCTION MOTOR".**

During this work we gained both practical as well as theoretical knowledge of great significance.

We wish to acknowledge our sincere gratitude and thanks to all the individuals who have helped and guided us on this thesis.

We are extremely grateful to our guide **Mr. Abhishek Sharma**, Assistant professor, Department of Electrical Engineering, GITS (Udaipur) for his kind cooperation and the time he spent with us on the thesis in spite of his busy schedule.

Specially, we would like to express our gratitude to **Dr. Vikas Mishra**, Director, GITS to give us suchenvironment and opportunities to complete this work.

Finally, we would like to express to our thanks to **Mr. Prakash Sundaram**, HOD, Department of Electrical Engineering, GITS Udaipur.

We also wish to acknowledge the strong support, technical help & sincere co-operation of the entire staff of the college.

Date:

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LIST OF SYMBOLS AND ABBREVIATIONS

GSM	Global System for Mobile communication
SMS	Short Message Service
HACS	Home appliances control system
TDMA	Time division multiple access technique
DTMF	Dual tone multi frequency
RF	Radio Frequency
GUI	Graphical User Interface
WTRP	Wireless token ring protocol
CAN	Controller area network
WCAN	Wireless controller area network
LCD	Liquid crystal displays
BOSS	Business operation support system
USB	Universal serial bus
SRAM	Static random access- memory
EEPROM	Electronically erasable programmable read-only memory
IDE	Integrated development environment
I2C	Inter-integrated circuit
PWM	Pulse-width modulation
SPI	Serial peripheral interface
TWI	Two wire interface
AREF	Analog reference

CDMA	Code division multiple access
VCC	Voltage common collector
ASCII	American standard code for information interchange
ESN	Electronic serial number
NO	Normally open
NC	Normally closed
LTE	Long term evolution

ABSTRACT

The rapidly advancing mobile communication technology and the decrease incosts make it possible to incorporate mobile technology into industries.The project report on " **GSM BASED 3 PHASE STAR DELTA STARTER FOR 3 PHASE INDUCTION MOTOR** " gives an elaborate view and understanding of the project design and functioning.

The report is divided into parts for explaining the step-by-step development of the project. The first part introduces the idea behind the project and the underlying information of the technologies used. Next chapter is dedicated for information on the equipments used and how they were accommodated in the project circuitry.

The working of the project with the programming code are explained after that. Lastly, the merits, de-merits and future prospects of the project are given.

CHAPTER 1

INTRODUCTION

1.1 General:

In today's fast changing world, everything is becoming compact, portable and mobile. The mobile handsets for communication are the biggest advancement in the area. These have made our lives much simpler and connected. Today almost everyone is familiar with it's usage, and is able to draw advantage from it. The technologies for mobile communication have been ever evolving. Each had there share of pro's and con's. The Global System for Mobile communication (originally Groupe Spécial Mobile) represents the second generation of mobile communications. It is a digital telephony system, used in most parts of the world, starting from Finland in 1991 till now, with more than 690 mobile networks providing GSM services across 213 countries. It uses time division multiple access technique (TDMA).GSM digitizes and compresses data, then sends it down a channel with other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. GSM provides with Subscribers Identity Module(SIM) to every user.It is a detachable card which identifies user's account to the network and provides authentication, that allows appropriate billing. The unique roaming features of GSM allow cellular subscribers to use their services in any GSM service area in the world in which their provider has a roaming agreement. The idea behind the project is to utilize the mobile nature of communication and application provided by the GSM technology, namely SMS.SMS stands for Short Messaging Service .

Short Message Service is an integrated paging service that lets GSM cellular subscribers send and receive data right on their cellular phone's LED display, up to a maximum of 160 characters. The use of SMS makes the understanding and use of the project quite simple to the user.

1.2 Overview of project to Agricultural Purpose:

In this project, we are going to Design and Implement Remote Control System to turn on and off a three phase motor. Farmers cannot depend only on the climate and rainfall alone for irrigation. Thisis why the farmers use motors for irrigation purpose. Three-phase motor is widely used in agriculture.Traditionally they are controlled by user manually where protection are mostly not taken care or must

be done using isolated unit. To be able to start from the cell phone, we use the Arduino and a relay module that will be the bridge between the power part (electrical part) and the control part (electronicpart). A farmer depending solely on rainfall for the purpose of irrigation is long gone. Farmers in thesedays opt for three-phase motor for irrigation. However, the operation of the motor is done manually.

In a situation where there is heavy rainfall and the motor is functioning, it does not only lead to wastageof water but also if there is lightning, there is a chance of motor destroyed. This is a huge loss to the farmer. A lot of people who live in the cities and are passionate about farming cannot afford to go backand fort from the city to their villages only for irrigation. For such people it would be more convenient to operate the motor from a distance place, conveniently from their mobile.

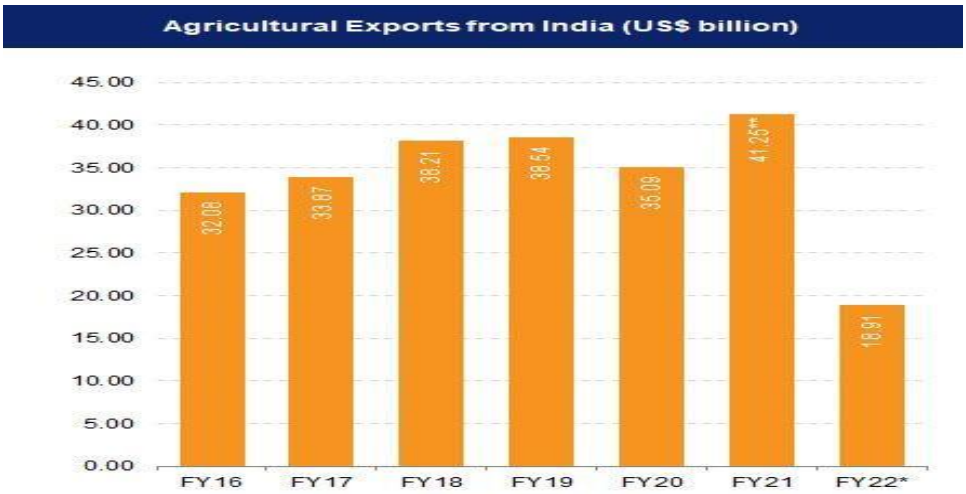


Fig.1.1 Agricultural exports from India

Area, production and yield of major Crops

Crops	Area (Lakh hectare)			Production (Million Tonnes)			Yield (kg/hectare)		
	2015-16	2016-17	2017-18*	2015-16	2016-17	2017-18*	2015-16	2016-17	2017-18*
Rice	434.99	439.93	437.89	104.41	109.70	112.91	2400	2494	2578
Wheat	304.18	307.85	295.76	92.29	98.51	99.70	3034	3200	3371
Nutri /Coarse cereals	243.89	250.08	242.05	38.52	43.77	46.99	1579	1750	1941
Pulses	249.12	294.45	299.93	16.32	23.13	25.23	655	786	841
Foodgrains	1232.18	1292.31	1275.63	251.54	275.11	284.83	2041	2129	2233
Oilseeds	260.87	261.77	246.45	25.25	31.28	31.31	968	1195	1270
Sugarcane	49.27	44.36	47.32	348.45	306.07	376.90	70720	69001	79650
Cotton@	122.92	108.26	124.29	30.01	32.58	34.89	415	512	477
Jute & Mesta#	7.82	7.63	7.35	10.52	10.96	10.14	2421	2585	2481

* 4th advance estimates

@ Production in million bales of 170 kg each

Fig.1.2 Area, production, and yield of major crops in India

1.3 Overview of project to home automation:

With the increase in the consumption of energy and population, there is a great need to conserve energy in every way possible. The inability to access and control the appliances from remote locations is one of the major reasons for energy wastage. This project presents the development and implementation of a Global System for Mobile Communication (GSM) based remote control system for electrical appliances and lighting that enables complete control of the interface on which it is based. GSM Shield was used for receiving short message service (SMS) from the homeowner's mobile phone that automatically enables an Arduino microcontroller to take the necessary actions like switching OFF and ON electrical appliances such as fan, light, air-conditioner, supply mains and so on. Basically, it reads the SMS and acts according to the message. Similar products commercially available are Internet dependent and so lack the true sense of real mobility and security. However, the present GSM based remote control system allows the homeowner to control household appliances from anywhere using the mobile phone and also prevents unauthorized access to these appliances. Crucial to the present system is the provision of security on detection of intrusion via SMS using GSM technology. This GSM based HACS is recommended for implementation in every home to tackle the rampant energy wastage.

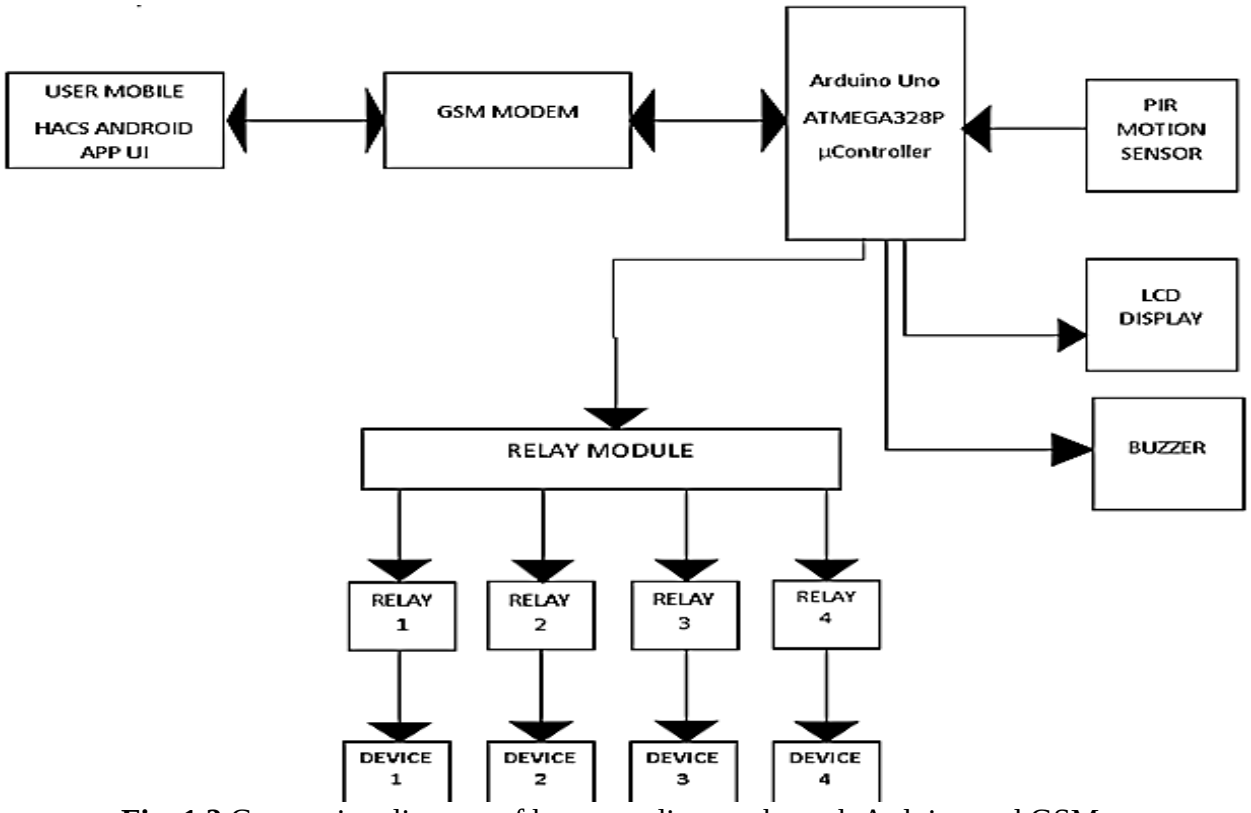


Fig. 1.3 Connection diagram of home appliances through Arduino and GSM

1.4 Thesis Objectives:

Based on the discussion above, this works aims to develop a SMS operated controller for 1phase/ 3 phase induction motor. The main objectives of this thesis are as follows:

- To develop automatic controller for agricultural purpose motors.
- To develop automatic controller for industrial motors.
- To develop automatic controller for Home appliances using GSM.

1.5 Outline of the thesis:

Chapter 1: Presents an introduction and overview of the project to agricultural purpose,Industrial purpose, and home appliances control.

Chapter 2: Provides in detail the literature reviews of the some typical problems related to the presented work, like three phase motor control, home automation, home security system, automatic wheelchair control, and automatic agricultural motor control etc.

Chapter 3: Focuses on the components requirements and their costing which are used in this project.

Chapter 4: Presents the circuit diagram, connection of the various components and their working details. Also provides the details of all components related to their inner and outer construction.

Chapter 5: Explain the whole software code which are used in this project.

Chapter 6: Provides the working of project and result is discussed.

Chapter 7: Briefly concludes the objectives achieved in this thesis, also explains applications, and project related advantages and disadvantages.

CHAPTER 2

REVIEW OF LITERATURE

Rikshith U. Uchil *et.al* [1] presented a new control strategy for a three-phase motor based on GSM. In India agricultural field play a very important role in economic development. Farmers facing a variety of problems. Electric power supply not available in 24 hours. The farm is very far away from farmers house, hence to on and off the motor automatically this project is very useful. This automatic control can control the motor from far off place and get feedback fromthe motor itself. So here the target is to regulate the motor from the distant place by mobile SMS and get feedback by SMS while its in ON or OFF condition. This provides the event of mobile phones as an overseas control application for the induction motor pump which is employed in agriculture. In India frequent power cuts and abnormal voltage conditions is very big issue, so it is necessary to distribute water efficiently to the fields during normal conditions. This can be followed by exchanging the data between the user phone and GSM within the sort of messages. This technique is developed with Micro Controller which is connected to the GSM and the motor.

A.D Kadage *et.al* [2] proposed the new concept to manage the agricultural equipment's remotely by using GSM. ON/OFF operation of appliances can be done by users just by dialling keypad from where they are calling. Wireless Control System for agricultural motors incorporate the global GSM technology which was developed with the aim of providing economical and easy control solutions using a cell phone. A motor or device may be switched on/off by phoning the cellular number which is registered in the device. This system operates by sending and receiving SMS. Apart from this, it will prevent the motors from single phasing, dry run, overload etc. If the said problems are existing, the farmer will be getting message regarding problem details and the motor will automatically OFF. It will also indicate the water level of the reservoir and the temperature of the motor. A potential user only needs to use his cell phone (any type or brand, only contract phones) in order to monitor and control agricultural field motors.

Lisa Muhury *et.al* [3] presented a secure real time method to control device. In this method Dual Tone Multi-Frequency (DTMF) used as an alternative means of communication to

Radio frequency (RF) to control electrical appliances. Home appliances and industrial machines can be control by DTMF tone. Advantage is that GSM technology is used for communication & at a time control of many devices. Any GSM mobile phone can be employed to send DTMF Tone.

Prof. Swami L.B *et.al* [4] presented a project that my help in agricultural development of India. This system provided protection against over voltage, over current, three phase detection,and dry and helps to OFF motor during dry conditions. ATMEGA 328 microcontroller is used tocheck all conditions of the motor. Controller sends signal to GSM modem which reports to consumer via message for the conditions of motor. After checking all the conditions consumer caON/OFF motor by sending text message by registered mobile number. If the condition of the motoris abnormal consumer receives information about fault & motor gets OFF.

Gang Cao *et.al* [5] presented a wireless remote power controller for the home automation based on GSM is introduced. Power in our home can be remotely controlled by the controller through TC35 module at any time and from anywhere. The part of the controller is controlling center and remote receiving module. This controller can easily and flexibly control the home appliances.

Deepali Kothari *et.al* [6] presented an automation for control of electrical motor or pump used in agriculture domain. Automation is preferred in every sector because of its flexibility, high accuracy, and reliability in long term operations. With the help of emerging technologies, many wireless communication techniques are introduced which have lower operating cost. The system operational range is scaled up by the use of the GSM communication system. The proposed model enables the farmers to control the field devices over a wireless link which is GSM based and can read real signals from sensors connected in the field. Testing for switching ON & OFF the motor or pump is performed by GUI (Graphical User Interface) which is developed for android device.

Wei Lun Ng *et.al* [7] presented a wireless remote controller which provided a wireless sensing solution for home users to operate simple lightings to sophisticated electronic devices. A wireless token ring protocol (WTRP) has been modified and changes into wireless controller area network (WCAN), which is proposed to be applied in managing concurrency control of home

appliances. WCAN is an adaptation from, controller area network (CAN) protocol which has not been properly defined. WCAN system helps the wireless controller to communicate with the standalone server, which communicates with the rest of sensing nodes. Standalone server provides command to each node and based on the message identifier each node, either executing the command or discarding it. WCAN system has been chosen to become the backbone network of the system.

Udayan S Patanakar *et.al* [8] proposed a low cost easily maintainable watering solution for farmers by using Mobile GSM Network and automatic AC motor starter. With the help of this we will control the action of water irrigation system. SEE-SAW structure of starter automation is adopted for the design. The focus of this design is to keep design critically as less as possible, which makes it easy to maintain and repair.

A.R Al-Ali *et.al* [9] presented one of the emerging application of the GSM technology. Standalone embedded system design is used to monitor and control home appliances locally using built-in input and output peripherals. Homeowner can monitor and control home appliances via mobile phone by sending commands and receiving the appliances status as well. The system has two parts: hardware and software. The hardware consists of an 8- bit microcontroller, a driver circuit, and an LCD display.

S.V Nimbhore *et.al* [10] implemented the idea of the wireless communication between a mobile phone and a microcontroller. In this design, we can control another home appliance without changing the programming of microcontroller. This system consists of AT89C51 Microcontroller and GSM. The microcontroller includes the protection against dry running and single phasing.

Sharan N *et.al* [11] designed a project to operate a three-phase motor using a mobile application. The target is to control the motor from distant place by mobile application. The farmers follow the traditional manual method, which is both energy and time consuming to check if the three-phase current is available. So, for checking three phase current through their mobile phones is a faster and convenient approach. During rainy conditions it is very difficult to switching on the motor because it can destroy a motor within no time. Hence, rain detector is present to indicate rain and lighting to protect the motor.

Shubham Magar *et.al* [12] presented smart home automation which plays an important role in modern lifestyle because of its high quality which will save time by decreasing human work automatically. The home automation is electric devices stand alone and do not communicate; it is programmable, such as sensors remote controller and communication system. Electronic devices can be control by home automation remotely and automatically. This technology is focused on control household appliances like light, fan, AC etc. automatically. This is very useful for old aged and handicapped person. The cost of Smart Home Automation System is low and systems wireless.

N.S Ishak *et.al* [13] presented a prototype to maintain soil moisture for plants. This prototype uses Arduino UNO R3 board which is easy to program and economical. It will sense themoisture level of the soil by programming and supply the water is required. It is used for general plant care, as part of caring for small and medium orchard for small and medium enterprise (SME).The system water the plants according to the reading from the moisture sensor. This system uses GSM technology, and by the help of that user can control the motor by sending and received the SMS (Short message service).

S. Rajadurai *et.al* [14] presented a home automation technique based on ARM controller. Person can be detected by IR sensor. Keypad will be activated after the person is detected by the IR sensor and SMS will be sent to the owner for authentication. The door will open after the owners reply. Buzzer will be activated when the person enters a wrong password. Electrical appliances is controlled by android application. Machine codes for the program are stored in the non-volatile flash memory of the embedded controller.

Bharath Ravi Prakash *et.al* [15] presented a new technology with the help of a GSM module to provide SMS acknowledgment when a particular appliance is turned ON/OFF. Current technology of the Automation system has the facility to control every appliance at home.

Zannatul Raiyan *et.al* [16] presented the design of an Arduino based voice controlled automated wheelchair with a voice recognition system. To control the wheelchair by voice command, physically disabled person have to give the voice command. The design consists of Arduino Mega2560, Easy VR3 speech recognition module, SIM900A GSM module and relay-

based motor controller circuits. The designed wheelchair system does not require any wearablesensors for using other biomedical signals to control wheelchair movement. The speech processing is done solely with the available integrated speech processing module which removes the necessity of any bulky complex extra computing device.

Amrita Sneha. A *et.al* [17] presented a robot capable of performing operations like automatic ploughing, seed dispensing, fruit picking, and pesticide spraying. It also provides manual control when required. AVR mega microcontroller is used as a main component that supervises the entire process. An ultrasonic sensor is used for navigation which continuously sends data to the microcontroller. The robot operates an automated mode in the field, but outside the field it strictly operated in manual mode. Bluetooth pairing app is used for manual control.
The Humidity sensor is fitted in the field that continuously monitor the environment for humidity levels and alerts the farmers. The alerting mechanism uses GSM module that sends a text message to the farmers. The farmers can respond via SMS to either switch on the water sprinklers or ignore the alert.

M. Suresh *et.al* 18] proposed system that enables us to power the devices using GSM and can translate the signals from the associated sensors in the ground. GUI were elaborate for android devices and perform testing to switch ON and OFF the motor.

Prachi Patil *et.al* [19] presented a project that focused an automating the irrigation system for social welfare of Indian agricultural system. The system consists of PIC16F877A and GSM SIM300 modem. Soil moisture conditions can be controlled and monitored by this system and accordingly switching the motor ON/OFF for irrigation purposes. The system regulates or stop the water flow when moisture reaches a particular level. Water in the water source also monitored by the circuit and switches off the motor if the water level in water source is low. GSM modem is also used in circuit which provides information about critical conditions occurring during irrigation process.

S.M Saifur Rahman Faisal *et.al* [20] proposed an automatic dam gate system which automatically control the dam gate without human effort. Low-lying area can be protected by the tidal water using this system and it can also be used in an irrigation canal, power plant, factories

etc. The system is capable of sensing drain water and tidal water. It can control a pump to irrigate excessive water by sensing drain water. Movement of dam gates have controlled by DC motors. Arduino UNO is used as the processor. The condition of the whole system can be observed by a control box.

Bharath Kumar. V *et.al* [21] designed and implemented a PIC controller based low-cost digital meter, which monitored the temperature and humidity of our environment. The sensors used for measured temperature and humidity are LM35 & DHT11. LCD screens are used to display the measured parameter. When the fire catches the home, and the sensor value exceeds the limit, an alert SMS will be sent to the person living in the home through the SIM900 GSM module. An SMS carrying the home address will be sent to the fire department which alerts the fire fighters.

Chandidas Karmokar *et.al* [22] presented a GSM module and sun tracking solar system based smart irrigation system using Arduino. This system is very convenient and affordable for the people of rural areas. In this flexible smart irrigation system with the help of cell phone the status of the submersible pump can be observed. The design is based on a standalone Arduino UNO board where the communication between the cell phone and the Arduino UNO board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. This project is very useful for the rural people of the underdeveloped and developing countries.

Jalpa Shah *et.al* [23] proposed a low-cost system with highest efficiency to control home appliance in maximum range. 15 devices can be on-off by using a single remote. Works range is 20-30 meters. The GSM modem also includes the system which will notify the owner about the current on or off status of the appliances to his registered mobile number. Also, we can control the speed of a DC motor of some appliances like Dryers, from distance. This whole system is based on RF modules which are capable of generating powerful signals, which could travel to distance.

Mr. AJJ Mouton *et.al* [24] created a wireless remote link between the remote site and a technician. The node controller is used to provides connectivity for 32 protection systems. Node controller captures the data and exchange motor related data via the GSM network to a technician.

To prevent the unauthorized intrusions into the system, GSM network is employed. The message transfer is done with Short Message System (SMS). This system helps the technician to keep in touch with the remote site.

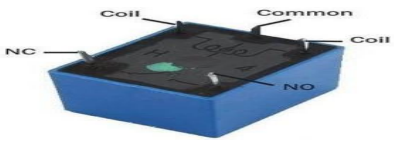
Hong Gu *et.al* [25] presented a wireless vending machine based on the GSM network. The whole vending machine system is based on USSD. Control modules are developed which realize data transmission and control function of terminal device, middleware which connects application and BOSS (business operation support system). The operating support system of wireless vending machine system is formed, which integrate vending machine and also manage sale information, logistic information and consumer information on-line.

CHAPTER 3

COMPONENTS & COSTING

The following components are used in project and their price are calculated below:

Table 3.1

COMPONENT	QUANTITY	FIGURE	COST(Rs)
ARDUINO UNO	1		650
GSM 900A MODULE	1		1300
LCD DISPLAY	1		145
SIM	1		100
ADAPTOR	2		280
RELAY	1		60
JUMPER WIRES	50		100

PCB	1		10
POTENTIOMETER	1		30
ARDUINO CABLE	1		60
TOTAL COSTING			**2735/-**

CHAPTER 4

CIRCUIT DIAGRAM & COMPONENT DETAILS

This is the main circuit diagram we used in project; the circuit was made using Autocade. We describe all the parts of circuit down below:

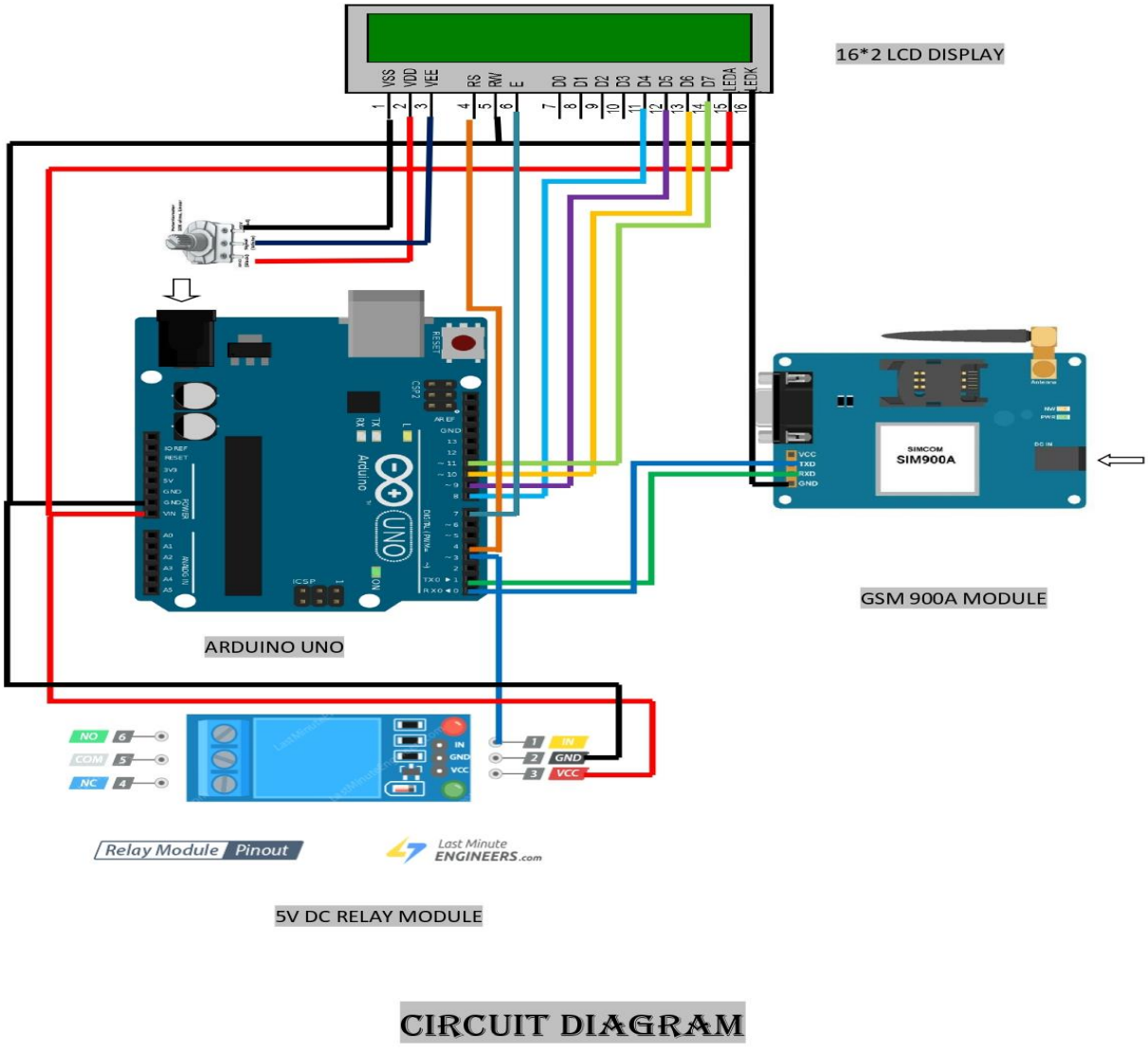


Fig.4.1 Circuit diagram of connection of the whole circuit

4.2 COMPONENT DETAILS:

4.2.1 ARDUINO UNO: The **Arduino Uno** is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment),via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software.The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes preprogramed with a bootloader that allows uploading new code toit without the use of an external hardware programmer. While the Uno communicates using the originalSTK500 protocol, it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB- to-serial converter.

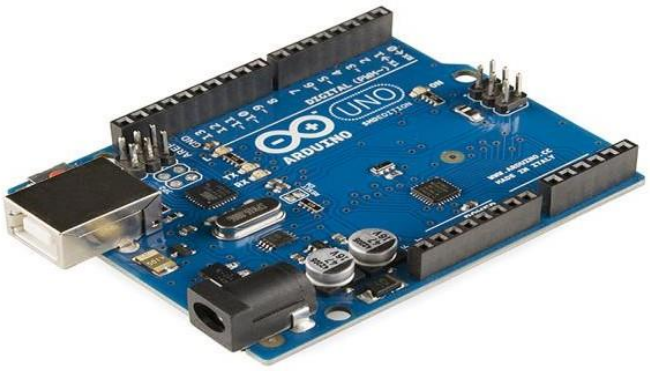


Fig.4.2: Arduino Uno Board

Technical Specifications of Arduino Uno:

- Microcontroller: Microchip ATmega328P
- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 can provide PWM output)
- PWM Pins: 6 (Pin # 3, 5, 6, 9, 10 and 11)
- UART: 1
- I2C: 1
- SPI: 1
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g
- Power Sources: DC Power Jack & USB Port

General pin functions:

- **LED**: There is a built-in LED driven by digital pin 13. When the pin is high value, the LED ison, when the pin is low, it is off.
- **VIN**: The input voltage to the Arduino/Genuino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). Youcan supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V**: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator and can damage the board.

- **3V3**: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND**: Ground pins.
- **IOREF**: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to workwith the 5V or 3.3V.
- **Reset**: Typically used to add a reset button to shields that block the one on the board.

Special pin functions:

Each of the 14 digital pins and 6 analog pins on the Uno can be used as an input or output, under software control (using pinMode(), digitalWrite(), and digitalRead() functions). They operate at 5 volts. Each pin can provide or receive 20 mA as the recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50K ohm. A maximum of 40mA must not beexceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5; each provides 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though it is possible to change the upper end of the rangeusing the AREF pin and the analogReference() function.

In addition, some pins have specialized functions:

- **Serial / UART**: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL serial chip.
- **External interrupts**: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM** (pulse-width modulation): pins 3, 5, 6, 9, 10, and 11. Can provide 8-bit PWM output with the analogWrite() function.
- **SPI** (Serial Peripheral Interface): pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK). These pins support SPI communication using the SPI library.
- **TWI** (two-wire interface) / I²C: pin SDA (A4) and pin SCL (A5). Support TWI communication using the Wire library.
- **AREF** (analog reference): Reference voltage for the analog inputs.

4.2.2 GSM 900A MODULE: SIM900A GSM Module is the smallest and cheapest module for GPRS/GSM communication. It is common with Arduino and microcontroller in most of embedded application. The module offers GPRS/GSM technology for communication with the uses of a mobile sim. It uses a 900 and 1800MHz frequency band and allows users to receive/send mobile calls and SMS. The keypad and display interface allows the developers to make the customize application withit. Furthermore, it also has modes, command mode and data mode. In every country the GPRS/GSM and different protocols/frequencies to operate. Command mode helps the developers to change the default setting according to their requirements.

Fig.4.3 GSM 900A modem view

SIM900A Pin Configuration:

The Module SIM900A looks like a single chip but it has a bunch of features that can help to build almost many commercial applications. Although, there are a total of 68 pins on SIM900A and using these pins helps to build the applications. But we will need few pins if you we use a module for interfacing with Arduino. We lists details of pinout diagram in next section.

GPIO Pins

The GPIO pins help to perform the simple and advance I/O function. All pins give the maximum outputequal to the power supply which is useable to control most of the devices like sensors and other modules. All GPIO pins in SIM900A are:

- GPIO1 – Pin40
- GPIO2 – Pin41
- GPIO3 – Pin42
- GPIO4 – Pin43
- GPIO5 – Pin44
- GPIO6 – Pin47

- GPIO8 – Pin49
- GPIO9 – Pin50
- GPIO10 – Pin51
- GPIO11 – Pin67
- GPIO12 – Pin68

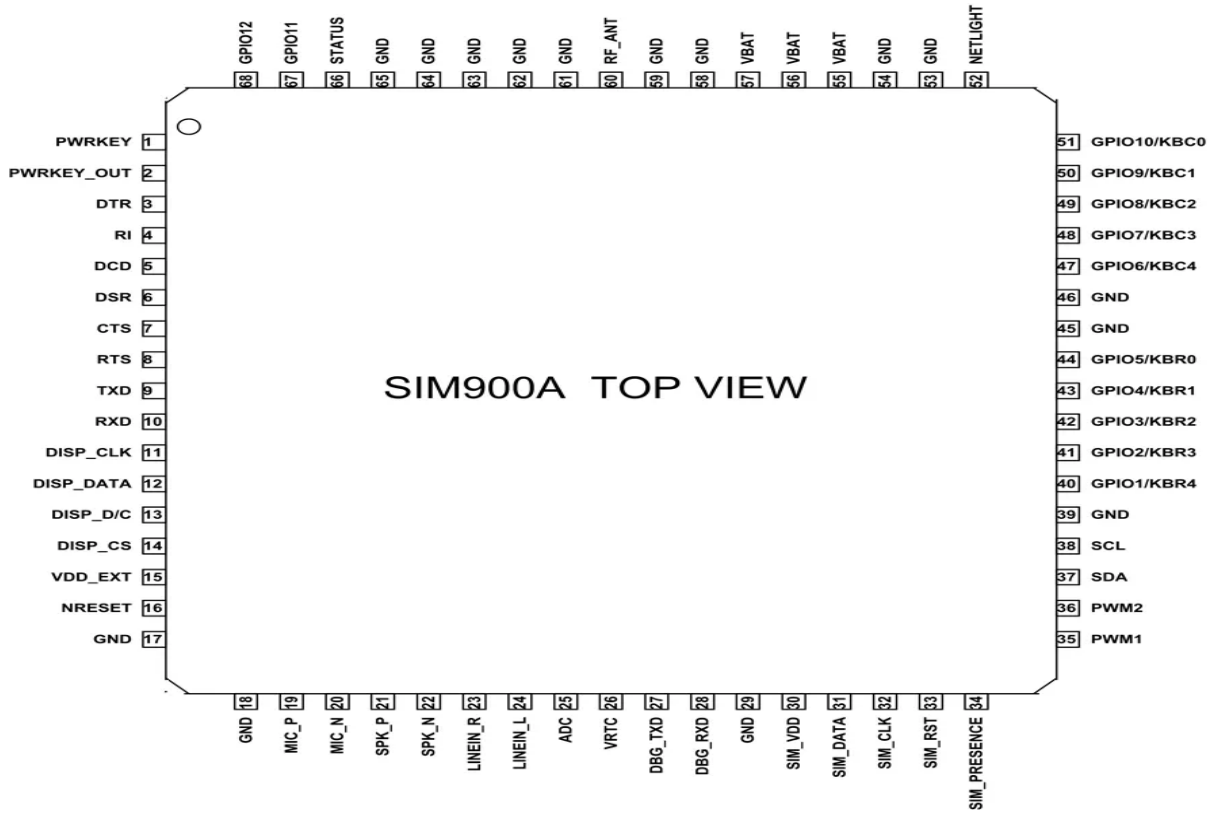


Fig.4.4 GSM 900A modem top view

Status Pins

The module has two status pins which help to indicate two different kinds of status. The first one is the working status of the module and the second for communication status. Net status means either themodule is connecting to the network or other network functions, etc. Both these pins can't operate LED directly. They always act with a combination of a transistor.

- STATUS – Pin52
- NIGHTLIGHT – Pin66

SIM900A Display Interface Pins

The device offers a 4 pin display interface with itself. The display isn't necessary, it is only in case ofrequirement. The use of interface helps to get the visualization with the module and make it an application. All display pins are:

- DISP_DATA – Pin12 – For Display Data
- DISP_CLK – Pin11 – For Clock Input
- DISP_CS – Pin14 – To enable the display
- DISP_D/C – Pin13 – To select between data and command

I2C Pins

SIM900A has multiple kinds of communication and I2C is one of them due to is popularity. The module has a single I2C protocol pin, which helps to build the application with any module with that communication.

- SCL – Pin38
- SDA – Pin37

SDA for data and SCL for clock pulse.

SIM900A GSM Module Keypad interface Pins

The two-pin keypad is interfaceable with the module. The module will take the keypad data as a 2D matrix value from the KCB pins for each value. The keypad interface pins in the module are:

- KBR0~KBR4 (ROWS) – Pin40~Pin44
- KBC0~KBC4 (COLUMN) – Pin47~Pin51

Serial Port

The UART serial interface uses the two pins for proper data communication, which are RX and TX.Both pins have no independence on any other pins or modules. In SIM900A these pins are available but it also has some other pins for status/indication of data. By combining these pins, the serial porthelps to generate the RS-232 connector too. All the serial pins are:

- RXD – Pin10 – To receive the data
- TXD – Pin 9- To send the data
- CTS – Pin7 – To clear the send request
- RI – Pin4 – Ring indicator
- DSR – Pin6 – To indicate that data set ready
- DCD – Pin5 – To indicate data carry detect
- DTR – Pin3 – To indicate data terminal ready

Debug Interface

Debugging helps the developers to debug the module and update its firmware. In this module, thereare sperate serial interface pins for debugging. Both pins are:

- DBG_TXD – Pin27 – For Data Transmission
- DBG_RXD – Pin28 – For Data receiving

SIM Interface

As we know that module SIM900A is a GPRS/GSM module. The module is dependent on some devices for some of its features. The most important one is the SIM. The SIM needs to connect with the module for GPRS/GSM functions to fully operate. All the sim interface of the module is:

- SIM_VDD – Pin30 – Power Supply of the SIM
- SIM_DATA – Pin31 – For data output
- SIM_CLK – Pin32 – For clock pulse
- SIM_RST – Pin33 – For reset
- SIM_PRESENCE – Pin34 – To detect the SIM

SIM900A Analog to Digital converter Pins

The module has only a single pin to detect and convert the analog signal to digital for SIM900A. Thevoltage range on the ADC pin is from 0 to 3 only.

- ADC – Pin25

PWM Pins

The PWM is mostly in microcontrollers for industrial applications but due to IoT, the module offers two PWM pins which helps to make the IoT and PWM based device without using any third interface.

- PWM1 – Pin35
- PWM2 – Pin36

Audio Interface

The audio interface will help to connect the mic and speaker with SIM900A. The connection of Line,Audio and Speaker will help to make the calls through the modules.

- MIC_P – Pin19
- MIC_N – Pin20
- SPK_P – Pin21
- SPK_N – Pin22
- LINEIN_R – Pin23
- LINE_L – Pin24

Control Pin

There is power on pins on the device, which helps to turn it on using external signals. There is two power on pins. The first one is PWRKEY which requires a LOW signal to power on/off the system. To do that, the pins require an input signal for a little bit long time. The second pin is PWRKEY_OUT,which gets short with the PWRKEY pin and turn on/off the device.

- PWRKEY – Pin1
- PWRKEY_OUT – Pin2

Reset pins

The device has an external LOW input signal reset pin to reset the device with the use of an external signal.

- NRESET – Pin16

SIM900A GSM Module RF Antenna

To extend the range of the SIM900A the antenna pin needs to connect with an external wire. The official antenna is also available for the module.

- RF_ANT – Pin60

Power Pins

The module SIM900A has multiple types of power pin. Some works as input and some as output. Themost important one to understand is VRTC, which acts as a backup for the internal RTC of the device.All power and ground pins of the module are:

- VBAT(Input) – Pin55, Pin56, Pin57
- VRTC (Input/Output) – Pin26
- VDD_EXT(OUTPUT) – Pin15
- GND – Pin17, Pin18, Pin29, Pin39, Pin45, Pin46, Pin53, Pin54, Pin58, Pin59, Pin61,Pin62, Pin63, Pin64, Pin65

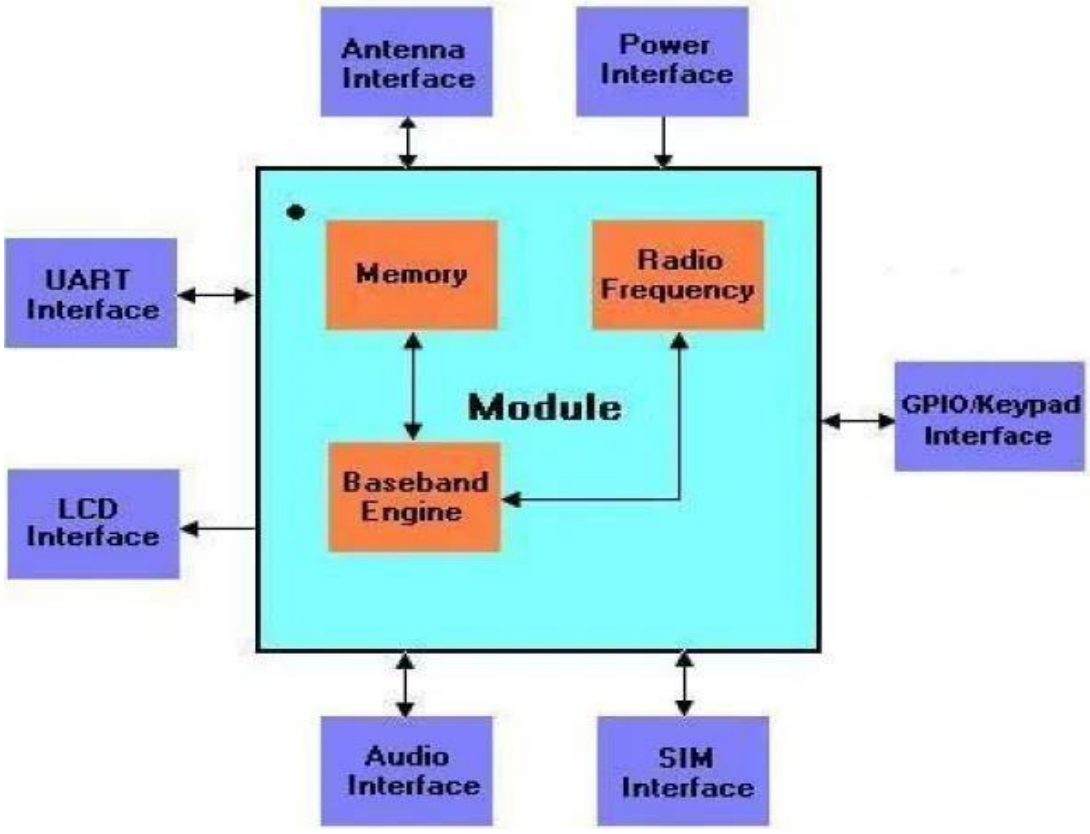


Fig.4.5 SIM900A internal structure of the module

Table 4.1SIM900A GSM Module Main Features

FEATURES	DETAIL
Power Input	3.4V to 4.5V
Operating Frequency	EGSM900 and DCS1800
Transmitting Power Range	2V for EGSM900 and 1W for DCS1800
Data Transfer Link	Download: 85.6kbps, Upload:42.8kbps
SMS	MT, MO, CB, Text and PDU mode.
Antenna Support	Available
Audio Input/output	Available
Serial Port	I2C and UART
Serial Debug Port	Available

4.2.3 LCD 16x2 PIN CONFIGURATIONS & ITS WORKING: The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displaysare mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

The LCD 16×2 working principle is, it blocks the light rather than dissipate.

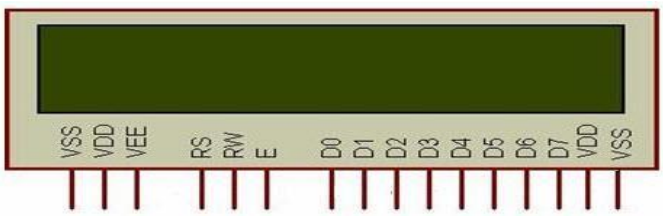


Fig. 4.6 Pin diagram of 16×2 LCD display

Table 4.2 Description of Each Pin in 16x2 LCD display

Pin No	Pin Name	Pin Description
Pin 1	GND	This pin is a ground pin and the LCD is connected to the Ground
Pin 2	VCC	The VCC pin is used to supply the power to the LCD
Pin 3	VEE	This pin is used for adjusting the contrast of the LCD by connectingthe variable resistor in between the VCC & Ground.
Pin 4	RS	The RS is known as register select and it selects the Command/Dataregister. To select the command register the RS should be equal to zero. To select the Data register the RS should be equal to one.
Pin 5	R/W	This pin is used to select the operations of Read/Write. To perform the write operations the R/W should be equal to zero. To perform theread operations the R/W should be equal to one.
Pin 6	EN	This is a enable signal pin if the positive pulses are passing through apin, then the pin function as a read/write pin.
Pin 7	DB0 to DB7	The pin 7 contains total 8 pins which are used as a Data pin of LCD.
Pin 15	LED +	This pin is connected to VCC and it is used for the pin 16 to set up theglow of backlight of LCD.
Pin 16	LED –	This pin is connected to Ground and it is used for the pin 15 to set upthe glow of backlight of the LCD.

Features of LCD 16x2

The features of this LCD mainly include the following.\

- The operating voltage of this LCD is 4.7V-5.3V
- It includes two rows where each row can produce 16-characters.
- The utilization of current is 1mA with no backlight
- Every character can be built with a 5×8 pixel box
- The alphanumeric LCDs alphabets & numbers
- Is display can work on two modes like 4-bit & 8-bit

Registers of LCD

A 16×2 LCD has two registers like data register and command register. The RS (register select) is mainly used to change from one register to another. When the register set is '0', then it is known as command register. Similarly, when the register set is '1', then it is known as data register.

Command Register

The main function of the command register is to store the instructions of command which are given tothe display. So that predefined tasks can be performed such as clearing the display, initializing, set thecursor place, and display control. Here commands processing can occur within the register.

Data Register

The main function of the data register is to store the information which is to be exhibited on the LCDscreen. Here, the ASCII value of the character is the information which is to be exhibited on the screenof LCD. Whenever we send the information to LCD, it transmits to the data register, and then the process will be starting there. When register set =1, then the data register will be selected.

16×2 LCD Commands

The commands of LCD 16X2 include the following.

- For Hex Code-01, the LCD command will be the clear LCD screen
- For Hex Code-02, the LCD command will be returning home
- For Hex Code-04, the LCD command will be decrement cursor
- For Hex Code-06, the LCD command will be Increment cursor
- For Hex Code-05, the LCD command will be Shift display right
- For Hex Code-07, the LCD command will be Shift display left
- For Hex Code-08, the LCD command will be Display off, cursor off
- For Hex Code-0A, the LCD command will be cursor on and display off
- For Hex Code-0C, the LCD command will be cursor off, display on
- For Hex Code-0E, the LCD command will be cursor blinking, Display on
- For Hex Code-0F, the LCD command will be cursor blinking, Display on
- For Hex Code-10, the LCD command will be Shift cursor position to left
- For Hex Code-14, the LCD command will be Shift cursor position to the right
- For Hex Code-18, the LCD command will be Shift the entire display to the left

4.2.4 SIM(subscriber identity module): A SIM card, also known as a subscriber identity module, is a smart card that stores identification information that pinpoints a smartphone to a specific mobile network. Data that SIM cards contain include user identity, location and phone number, network authorization data, personal security keys, contact lists and stored text messages. SIM cards allow a mobile user to use this data and the features that come with them.

Without a SIM card, some phones would not be able to make calls, connect to internet services such as 4G LTE or send SMS messages. SIM cards are removable and have anywhere from, 32KB to 128KB.

Not all phones with SIM cards work the same, however. There are two distinct technologies used; GSM (Global System for Mobile communication) and CDMA (Code Division Multiple Access).GSM is the most widely adopted technology digital mobile network. Network carriers such as AT&Tand T-Mobile use GSM. If a carrier uses GSM, that means that users can remove their SIM card froma device and move it to another mobile device with all the same data and contacts on it. The network carrier will still be able to identify the user.

CDMA enabled phones do not need a SIM card; instead, the mobile device will use an electronic serialnumber (ESN). Users that have a phone with an ESN cannot switch between devices as easily as userswould need permission from their network carrier. Network carriers such as Sprint and Verizon use CDMA.

Even though carriers such as Sprint and Verizon do not need SIM cards, SIM cards are can still be found in devices under those networks. This is because mobile devices need the use of SIM cards to use 4G LTE.

A device called a SIM card reader can be used to upload data from a SIM card to a computer or otherdevice.

Fig. 4.7 subscriber identity module

Types of SIM cards

SIM cards have come in a variety of different sizes over time. Types of SIM cards include:

- Standard SIM cards measure 25x15mm and are used in older and basic phones.
- Micro SIM cards measure 15x12mm and are more likely to be found in phones from the 2010s and up.
- Nano SIM cards measure 12.3x8.8mm and are used in newer smartphones.
- eSIM, or embedded SIM's, measure 6x5mm, and has the SIM card installed in the phone already. eSIM's are activated remotely by the network carrier.

Benefits of SIM cards

A SIM card can be switched easily from one phone to another and this portability of data offers a number of benefits. For example, a user that buys a new phone can install the current SIM card to associate the new phone with the same number and user preferences as the old one. In another commonsituation, if a phone's battery runs out of power, the user can easily install the card to another subscriber's phone to borrow it without running up that user's minutes. Some vendors offer prepaid SIM cards that can provide travelers with local numbers, as long as their cell phones are not locked toa specific carrier.

4.2.5 ADAPTOR: An adapter or adaptor is a device that converts attributes of one electrical device or system to those of an otherwise incompatible device or system. Some modify power or signal attributes, while others merely adapt the physical form of one connector to another.

Fig.4.8 Adaptor diagram

Travel adapters

Many countries with ties to Europe use 230-volt, 50 Hz AC mains electricity, using a variety of powerplugs and sockets. Difficulty arises when moving an electrical device between countries that use different sockets. A passive electric power adapter, sometimes called a *travel plug* or *travel adapter*, allows using a plug from one region with a foreign socket. As other countries supply 120-volt, 60 Hz AC, using a travel adapter in a country with a different supply poses a safety hazard if the connected device does not support both input voltages.

AC-to-DC Adapters

An AC-to-DC power supply adapts electricity from household mains voltage (either 120 or 230 volts AC) to low-voltage DC suitable for powering consumer electronics. Small, detached power supplies for consumer electronics are called *AC adapters*, or variously *power bricks*, *wall warts*, or *chargers*.

Computer Adapters

A *host controller* connects a computer to a peripheral device, such as a storage device, network, or human interface device. As a host controller can also be viewed as bridging the protocols used onthe buses between peripheral and computer, and internally to the computer, it is also called a *host busadapter*. Likewise, specific types may be called adapters: a network interface controller may be calleda *network adapter*, and a graphics card a *display adapter*.

4.2.6 RELAY MODULE: Relay is one kind of electro-mechanical component that functions as a switch. The relay coil is energized by DC so that contact switches can be opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC). This article discusses an overview of the 5V relay module & its working but before going to discuss what is relay module is, first we have to know what is relay and its pin configuration.

What is a 5V Relay?

A 5v relay is an automatic switch that is commonly used in an automatic control circuit and to controla high-current using a low-current signal. The input voltage of the relay signal ranges from 0 to 5V.

5V Relay Pin Configuration

The pin configuration of the 5V relay is shown below. This relay includes 5-pins where each pin andits functionality are shown below.

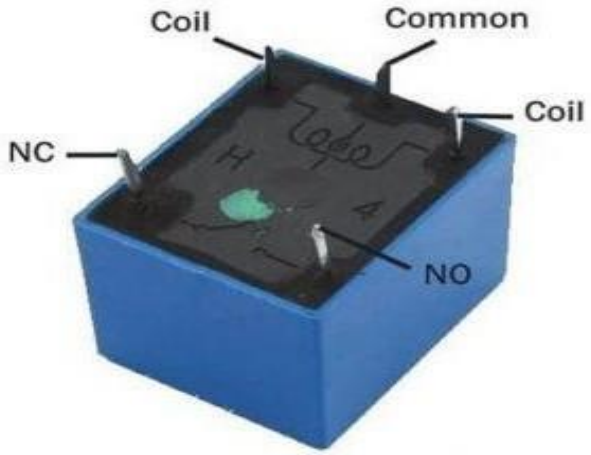


Fig.4.9 Relay pin diagram

Table 4.3 Relay pin configurations

Pin No.	Pin Name	Description
1	Coil End 1	Used to trigger(On/Off) the Relay, Normally one end is connectedto 5V and the other end to ground
2	Coil End 2	Used to trigger(On/Off) the Relay, Normally one end is connectedto 5V and the other end to ground
3	Common (COM)	Common is connected to one End of the Load that is to be controlled
4	Normally Close (NC)	The other end of the load is either connected to NO or NC. If connected to NC the load remains connected before trigger
5	Normally Open (NO)	The other end of the load is either connected to NO or NC. If connected to NO the load remains disconnected before trigger

Features

- Normal Voltage is 5V DC
- Normal Current is 70mA
- AC load current Max is 10A at 250VAC or 125V AC
- DC load current Max is 10A at 30V DC or 28V DC
- It includes 5-pins & designed with plastic material
- Operating time is 10msec
- Release time is 5msec
- Maximum switching is 300 operating per minute

4.2.7 JUMPER WIRES: Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuitas needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires.

Fig.4.10 Jumper wires diagram

Types of Jumper wires

Jumper wires typically come in three versions: **male-to-male**, **male-to-female** and **female-to-female**. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

4.2.8 POTENTIOMETER: A **potentiometer** is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider.[1] If only two terminals are used, one end and the wiper, it acts as a **variable resistor** or **rheostat**.

The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name.

Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

Fig.4.11 potentiometer diagram

Nomenclature

There are a number of terms in the electronics industry used to describe certain types of potentiometers:

- **slide pot** or **slider pot**: a potentiometer that is adjusted by sliding the wiper left or right (or up and down, depending on the installation), usually with a finger or thumb
- **thumb pot** or **thumbwheel pot**: a small rotating potentiometer meant to be adjusted infrequently by means of a small thumbwheel
- **trimpot** or **trimmer pot**: a trimmer potentiometer typically meant to be adjusted once or infrequently for "fine-tuning" an electrical signal.

Theory of operation

The potentiometer can be used as a voltage divider to obtain a manually adjustable output voltage at the slider (wiper) from a fixed input voltage applied across the two ends of the potentiometer. This istheir most common use.

The voltage across R_L can be calculated by:

$$V_L = \frac{R_2 R_L}{R_1 R_L + R_2 R_L + R_1 R_2} \cdot V_s.$$

If R_L is large compared to the other resistances (like the input to an operational amplifier), the output voltage can be approximated by the simpler equation:

$$V_L = \frac{R_2}{R_1 + R_2} \cdot V_s.$$

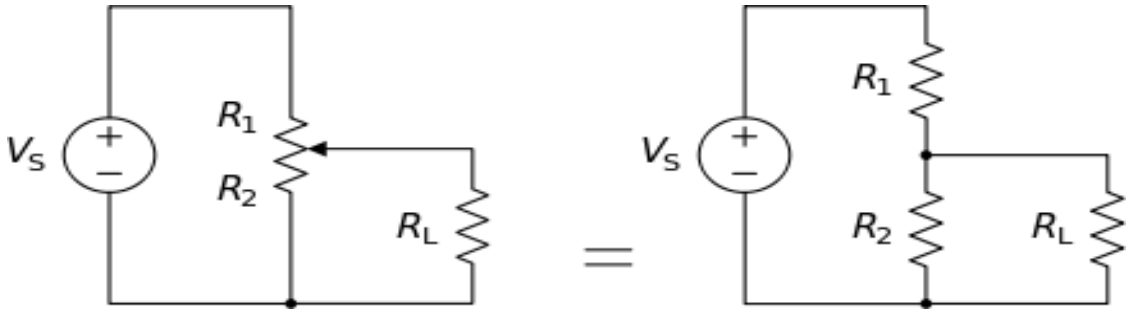


Fig.4.12 potentiometer with a resistive load

One of the advantages of the potential divider compared to a variable resistor in series with the sourceis that, while variable resistors have a maximum resistance where some current will always flow, dividers are able to vary the output voltage from maximum (V_S) to ground (zero volts) as the wiper moves from one end of the potentiometer to the other. There is, however, always a small amountof contact resistance.

In addition, the load resistance is often not known and therefore simply placing a variable resistor inseries with the load could have a negligible effect or an excessive effect, depending on the load.

4.2.9 ARDUINO CABLE: An Arduino typically only requires a USB cable to be used as a power source and to connect to a computer for programming. A USB Type B cable can be used for the mostpopular Arduino model (Uno), however other Arduino boards may require Type B-mini or micro connectors. A power adapter cable can also be plugged into the Arduino to power the board when separate from a USB power source.

As a general rule, the length of cable used to connect the Arduino should be **no longer than 5 meters** though it is recommended to keep the cable under 3 meters of length. To power the Arduino over a longer distance a regular AC power cable can be used in conjunction with a suitable power adapter.

Fig. 4.13 Arduino USB cable

Table 4.4 USB cables for powering various Arduino boards

Arduino Board	USB Cable Connector
Uno	Type B
Nano	Mini Type B
Due	Micro Type B
Mega	Type B
Micro	Micro Type B

CHAPTER 5

CODE OF PROGRAMMING

```
#include<LiquidCrystal.h>
#include<SoftwareSerial.h>
LiquidCrystal lcd(4,7,8,9,10,11);
```

\\ 5.1 Introduction part:

```
#define motor 3

int temp=0,i=0;
int led=13;

char str[30];
void setup()
{
  lcd.begin(16,2);
  Serial.begin(9600);
  pinMode(led, OUTPUT);
  pinMode(motor, OUTPUT);

  lcd.setCursor(0,0);
  lcd.print("   TEAM TESLA   ");
  delay(3000);
  lcd.setCursor(0,1);
  lcd.print("4TH YEAR PROJECT");
  delay(2000);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("GSM BASED 3PHASE");
  delay(2000);
  lcd.setCursor(0,1);
  lcd.print("   STAR DELTA   ");
  delay(2000);
  lcd.clear();
  lcd.setCursor(0,0);
```

```
 lcd.print("     STARTER   ");
 delay(2000);
 lcd.setCursor(0,1);
 lcd.print("  FOR 1&3 PHASE  ");
 delay(2000);
 lcd.clear();
 lcd.print("INDUCTION  MOTOR ");
 delay(2000);
 lcd.setCursor(0,1);
 lcd.print("     AT GITS    ");
 delay(2000);
 lcd.clear();
 lcd.print("Initialising.... ");
 delay(4000);
 lcd.setCursor(0,1);
 lcd.print("  SYSTEM READY!  ");
 //mySerial.println("AT+CNMI=2,2,0,0,0"); // AT Command to receive a live SMS
 //delay(1000);
 Serial.println("AT+CNMI=2,2,0,0,0");
 delay(500);
 Serial.println("AT+CMGF=1");
 delay(1000);
 lcd.clear();
 lcd.setCursor(0,0);
 lcd.print(" 3PH MOTOR ~ ON  ");
 lcd.setCursor(0,1);
 lcd.print(" 3PH MOTOR ~ OFF  ");
}
```

\\ 5.2 Logic:

```
void loop()
{
 if(temp==1)
  {
 check();
 temp=0;
```

```
  i=0;
  delay(1000);
 }

 }
 void serialEvent()
 {
  while(Serial.available())
  {
    if(Serial.find("#A."))
    {
      digitalWrite(led, HIGH);
      delay(1000);
      digitalWrite(led, LOW);
      while (Serial.available())
      {
      char inChar=Serial.read();
      Serial.print(inChar);
      delay(100);
      str[i++]=inChar;
      if(inChar=='*')
      {
        temp=1;
        return;
      }
      }
    }
   }
 }

void check()
{
   if(!(strncmp(str,"motor on",8)))
    {
      digitalWrite(motor, HIGH);
```

```
    delay(100);
    SendMessage1();
    delay(1000);
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print(" 3PH MOTOR ~ ON  ");
    delay(1000);

  }
 else if(!(strncmp(str,"motor off",9)))
  {
 digitalWrite(motor, LOW);
 delay(1007);
 SendMessage2();
 delay(1000);
 lcd.clear();
 lcd.setCursor(0,0);
 lcd.print(" 3PH MOTOR ~ OFF  ");
 delay(1000);
 }

}
```

\\ 5.3 Feedback:

```
void SendMessage1()
{
 Serial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
 delay(1000);  // Delay of 1000 milli seconds or 1 second
 Serial.println("AT+CMGS=\"+918209012506\"\r"); // Replace x with mobile number
 delay(1000);
 Serial.println("STATUS: 3PH MOTOR IS ON");// The SMS text you want to send
 delay(100);
 Serial.println((char)26);// ASCII code of CTRL+Z
 delay(1000);
 }
void SendMessage2()
```

```
{
 Serial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
 delay(1000);  // Delay of 1000 milli seconds or 1 second
 Serial.println("AT+CMGS=\"+918209012506\"\r"); // Replace x with mobile number
 delay(1000);
 Serial.println("STATUS: 3PH MOTOR IS OFF");// The SMS text you want to send
 delay(100);
  Serial.println((char)26);// ASCII code of CTRL+Z
 delay(1000);
 }
```

CHAPTER 6

WORKING & RESULT

Single & Three Phase motor can be switch ON/OFF using this project consisting of ARDUINO UNO,GSM 900A,RELAY with a mobile message The Purpose of this project is to control & switch 1&3 Phase motor by using a mobile phone message.when we turn on the the system.first of all system shows the introduction on LCD DISPLAY of project then after that the GSM MODULE's NW led starts blinking with a 3s delay that means the system is in the network. Now in the app, we need to set keys for on/off. their corresponding value that must be transmitted when that key is pressed. Then we are ready to control the loads. When a key is pressed in the smart phone, the GSM MODULE receives the corresponding data and intern transmits that data to Arduino.

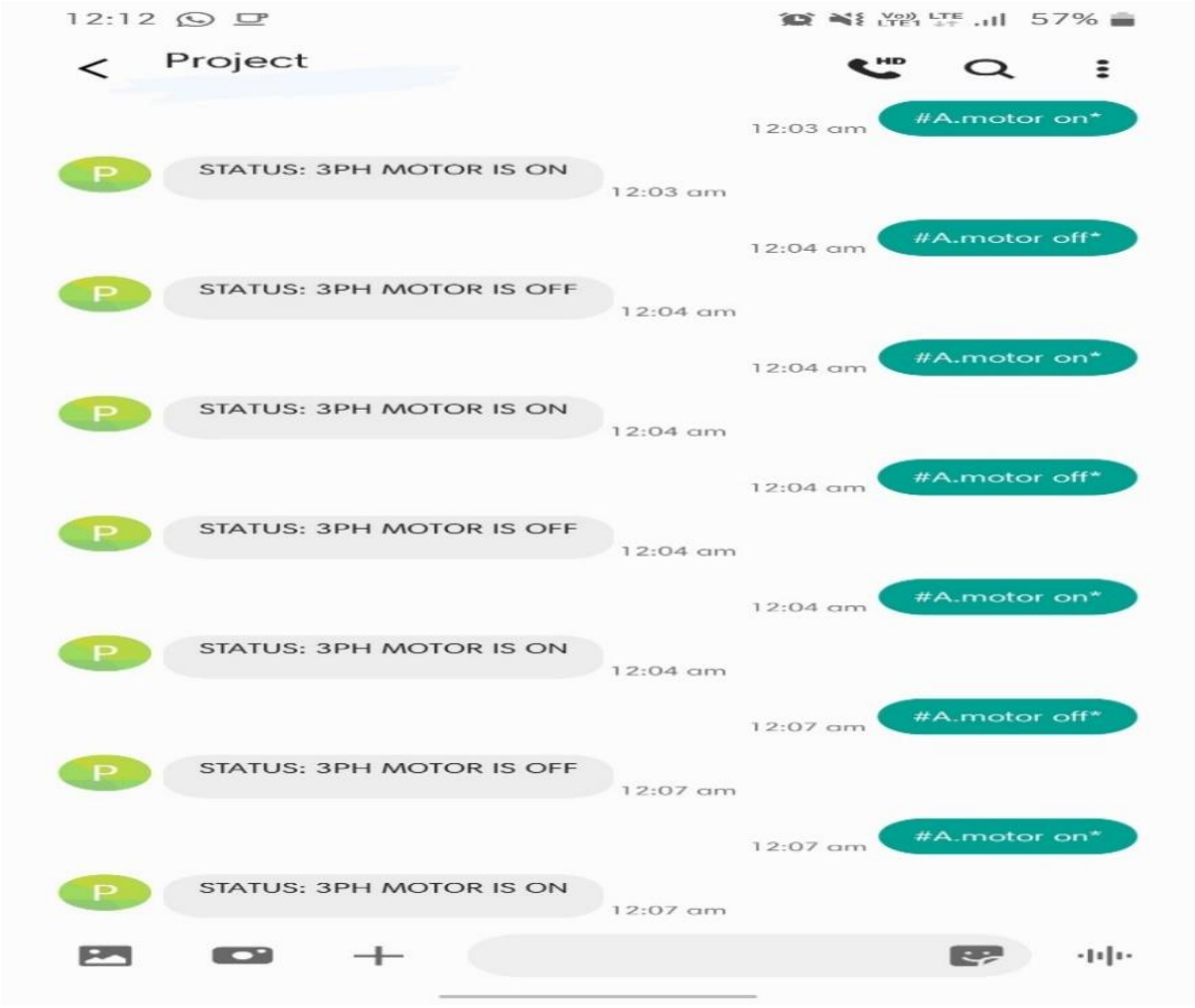
If we send "#A.motor on*", then the data received by the GSM MODULE. This data is transmitted to Arduino then compares the received data with the data written in the sketch and accordingly turns on the 'motor on'. The similar action can be applicable to other key for off. Using this type of connection, we can switch on and off to any 1 & 3 Phase Motor

"#A.motor on*" for Switch on the Motor &

"#A.motor off*" for Switch off the Motor**.**

6.1 LCD display introduction: Below are some messages which display on LCD.

6.2 Feedback SMS to the mobile: This are the feedback SMS which will given by the GSM when motor will start and off.



6.3 Working diagram of the project:

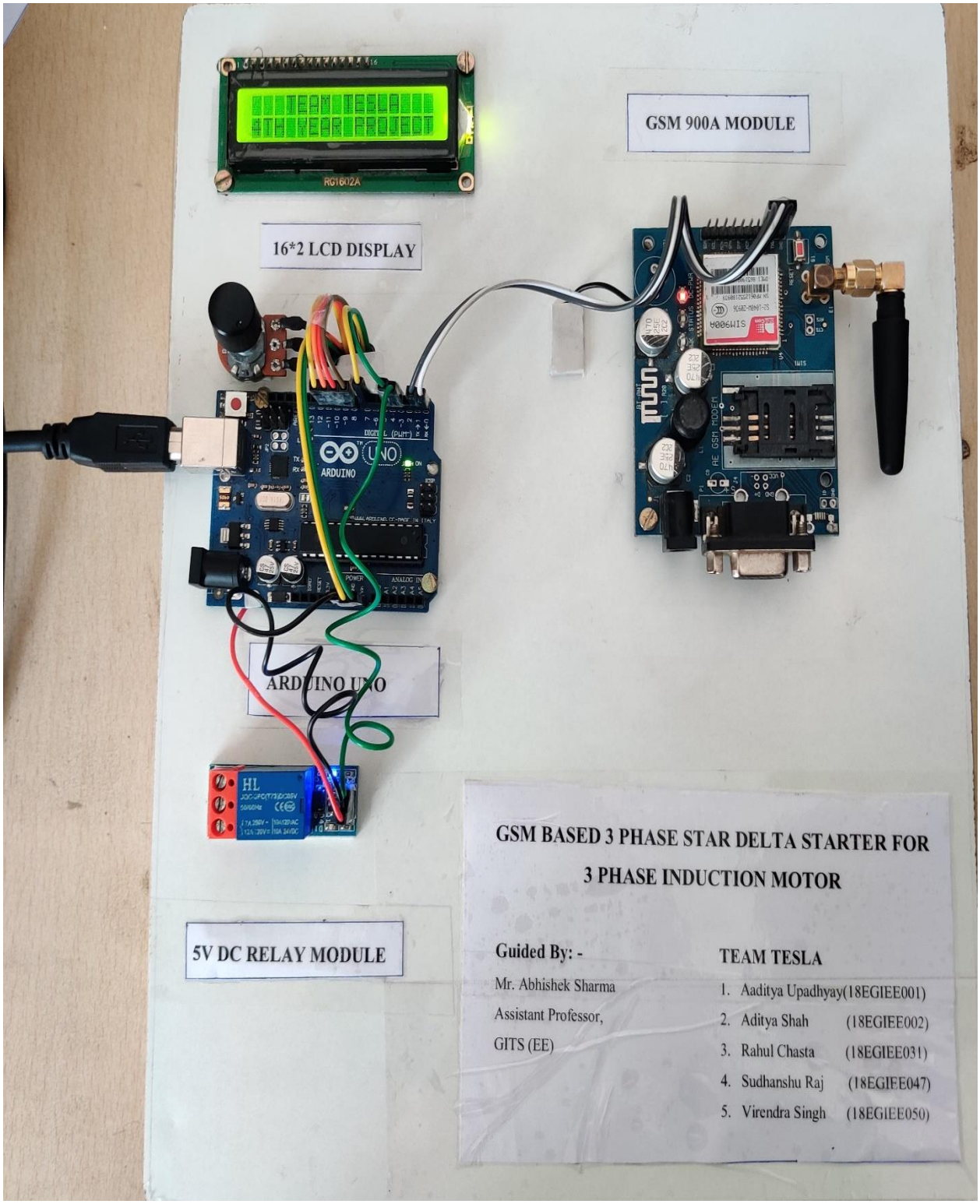


Fig. 6.3 Working diagram of the project

CHAPTER 7

CONCLUSION & FUTURE SCOPE

This project is made with best of capabilities and dedication. Details were taken care of in preparing it. The project encountered in various steps were taken into account and eliminated to much extend so that they may not harm the project functioning. Every system is not perfect in all aspects. They have some associated limitations. Here are presented some advantages and disadvantages of the project:

Advantages:

- Devices can be controlled from long distances.
- Economical design
- Can be easily implemented at fields
- Can be used by everyone with just the knowledge of text SMS.
- Format of SMS is simple to understand.

Disadvantage:

- The system is network dependent. Hence, network congestion can reduce the reliability of the system.

Conclusion:

The project intends to interface the Arduino with GSM modem and start the motor as per the message received from the user mobile. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of unit. Thus monitoring the functioning of the motor automatically using GSM technology got designed with the specific parameters.

It can be concluded that the design implemented in the present work provide portability, flexibility and the data transmission is also done with low power consumption.

Future Scope:

- The project can be used as a base for realizing a scheme to be implemented in other projects of greater level such as weather forecasting, temperature updates, device synchronization, etc.
- The project itself can be modified to achieve a complete Home automation.
- PLC version for remote factory control.
- Mobile robotics educational module.

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